The SHORT WAVE Magazine

55p

VOL. XXXIX FEBRUARY 1982 NUMBER 12

TRIO

Now from Trio another superb piece of equipment to compliment the existing range of amateur and general coverage receivers — the Trio R600.

A simple to use general coverage receiver covering 150 kHz to 30 MHz in 30 bands at an amazingly affordable price. Use of PLL synthesized circuitry provides high accuracy of frequency & excellent stability with the maximum ease of operation.

R600 FEATURES are:

- 150 kHz to 30 MHz continuous coverage, AM, SSB, or CW.
- 30 bands, each 1 MHz wide, for easier tuning
- Five digit frequency display, with 1 kHz resolution.
- 6 kHz IF filter for AM (wide), and 2.7 kHz filters for SSB, CW, and AM (narrow).
- Up-conversion PLL circuit, for improved sensitivity, selectivity, and stability.
- Communications type noise blanker eliminates pulse-type noise.
- RF Attenuator allows 20 db attenuation of strong signals.
- Tone control.
- Front mounted speaker.
- "S" meter, with 1 to 5 SIMPO scale, plus standard scale.
- Coaxial, and wire antenna terminals for 2 MHz to 30 MHz. Wire terminals for 150 kHz to 2 MHz.
- 100, 120, 220, and 240 VAC, 50/60 Hz. (Selector switch on rear panel) & alternative 12 Volt dc operation.

Other features include carrying handle, record jack & head phone jack.

For those of you who want more than a superb general coverage receiver, the R1000 is just the rig, with all the performance of the R600 but having a higher specification.

The R1000 is your ticket to a trip around the world, courtesy of the short wave broadcast stations.

R600 £235.00 inc. VAT carriage £5.00

R1000 £297.85 inc. VAT carriage £5.00

LOWE ELECTRONICS

CHESTERFIELD ROAD, MATLOCK, DERBYSHIRE DE4 5LE

Telephone: 0629 2817/2430

JRC *Japan Radio Co., Ltd.*

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, a new 96 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 515HF Receiver **Price £1090.20**

now available **NSD 515**

matching amateur band transmitter ring for details.

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

UHF VHF

TR9000 The exciting TR9000 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 TR9000 is ideal for mobile installation, add on its fixed station accessories and it becomes the obvious choice for your shack.

TR9000

£394.00 inc. VAT. Securicor carriage £5.00

TR9500 The TR9500, a 70cm multimode mobile giving SSB, FM and CW operation in a compact rig based on the phenomenally successful 2 metre 9000. Combining the convenience of FM with the "DX ability" of SSB on the 70cm band this is the rig all discerning VHF and UHF amateurs have been waiting for.

TR9500

£449.88 inc. VAT. Securicor carriage £5.00

TR7800 Trio's remarkable TR7800 2-metre FM mobile transceiver provides all the features you could desire for maximum operating enjoyment. Frequency selection is easier then ever, and the rig incorporates new memory development for repeater shift, priority, and scan. The TR7800 by Trio, the only FM mobile.

TR7800

£284.97 inc. VAT. Securicor carriage £5.00

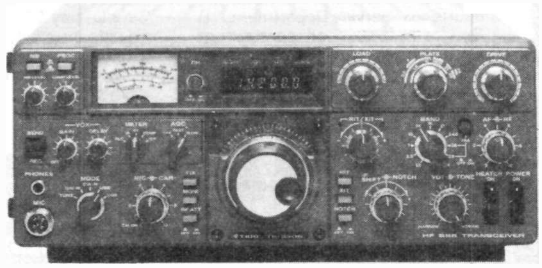
HEAD OFFICE AND SERVICE CENTRE
Chesterfield Road, Matlock, Derbys. Tel. 0629 2817 or 2430.
Open Tuesday-Friday 9-5.30, Saturday 9-5.00. Closed for lunch 12.30-1.30.
For all that's best in ham radio, contact us at Matlock.
For full catalogues send 70p in stamps with your address. Mark enquiry SWM.

LE

TRIO *pacesetter in amateur radio* HF

We've handled a lot of equipment in our time as radio amateurs but the TS830S really took us by storm. As you will hear if you listen on the air, its reputation is high all round the world. We think the TS830S is exactly right for the operator who has carefully considered all the features necessary for top performance, put aside all the gimmickry and found the TS830S.

This rig offers you all band coverage; true frequency readout on all modes; variable bandwidth and passband tuning; rugged, reliable 6146B valves in the PA; top quality both in construction and design; and, above all, the Trio reputation for giving you the best equipment at a reasonable price. Thousands of happy users worldwide will confirm that if you want total satisfaction, try the TS830S. Send for comprehensive details today.



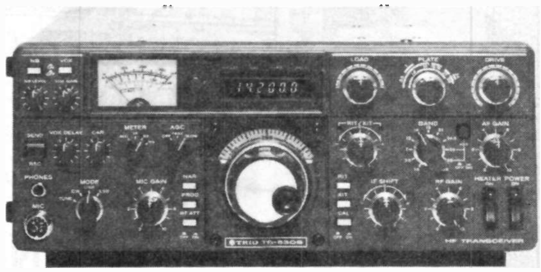
TS 830S

£694.30 inc. VAT. Securicor carriage £4.50

A recent addition to the Trio HF range, and proving amazingly popular is the new TS530S. Designed as a "little brother" to the TS830S, the TS530S uses the same PLL system, same RF boards, same readout system and many other features of the 830 but without the variable bandwidth facility. You do, of course, have the famous Trio I.F. shift system for dodging the QRM.

We really believe that the TS530S is the finest mid-price HF base station transceiver on the market and we would like the opportunity to prove it to you. Why not call us, or call in person to see and try out this super rig.

If you like to read lists of features, how about 160-10 metres including new bands : passband tuning on all modes: 6146B PA tubes for low intermod: low power tune up : digital readout shows *true* frequency at all times : VOX built in : CW sidetone : speech processor : noise blanker : etc., etc.

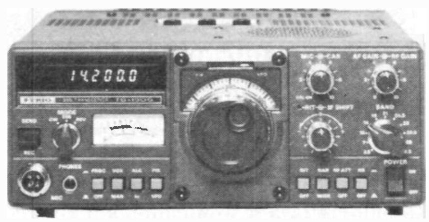


TS 530S

£534.98 inc. VAT. Securicor carriage £4.50

For the keen mobile/portable enthusiast, the "no-tune" solid state transceiver has proved irresistible, and the Trio TS130S is probably the best of the bunch. When the original TS120 was introduced, there were gasps of amazement at Trio's achievement in making a first class HF rig in such a small size. With the advent of the TS130S, the mobile rig really comes to maturity. Imagine an 8 band transceiver with digital readout, I.F. shift, vox, speech processor, single conversion PLL derived transmitter and receiver, 100W output, red hot receiver — and all in a package you can carry on the palm of one hand. It's really a staggering thought.

The unquestioned excellence of Trio design and manufacture shows in every aspect of the TS130S — why not see it and try it for yourself.



TS130S.V

£525.09 inc. VAT. Securicor carriage £4.50

TS130V £445.05 inc. VAT.

The compact DFC230 Digital Frequency Controller provides maximum efficiency and flexibility for mobile and fixed operation by combining a 20 Hz step digital VFO with 4 memories. ● 20 Hz step digital VFO: ● Four memories: Frequency can be transferred from VFO to memory or from memory to VFO. ● Built-in digital display: Shows digital VFO or memory frequency. ● Perfect for mobile installation. ● UP/DOWN manual scan: Frequency can be shifted with UP/DOWN microphone (supplied with DFC-230) or with FAST STEP switch on front panel. ● Cross-operation switch: Allows split-frenquency operation, with transceiver VFO on transmit and DFC230 (VFO or memory) on receive, or vice versa. ● RIT (receiver incremental tuning). ● RIT, VFO, and MEMO indicators: LEDs show functions in operation. ● Compatibility with TS830S, TS120S/V and TS130S/V.

DFC 230

£179.86 inc. VAT. Securicor carriage £4.50

LOWE IN LONDON

NOW OPEN, OUR EMPORIUM IN THE CITY
278 PENTONVILLE ROAD, LONDON N1 9NP (NO MAIL ORDERS)
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LE

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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 £3.90!! Biggest stocks of amateur equipment in UK. Twenty-two years of professional experience.

FREE FINANCE

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

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, without spares, service or advise back-up.

YAESU MUSEN

As UK Agents, we show some major Yaesu items; VHF multimode hand portable, general coverage Rxs, multimodes for VHF and UHF FM, Tx/Rxs for VHF, UHF and VHF/UHF, HF transceivers (SSB, CW, FSK, AM, FM) and a fistful of VHF and UHF handhelds. NB: 150 Yaesu accessories complement the above super range.

The FT-ONE is the culmination of an all-out design project, without the usual cost constraints, a revolutionary blend of computer and RF technology.

£1295 inc. VAT @ 15% & Securicor

FOX TANGO ONE

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. For commercial use the FT-ONE may be programmed to transmit throughout 1.8-29.99MHz range.

KEYBOARD FREQUENCY ENTRY
Fully digitally synthesised, the FT-ONE uses a front panel keyboard for initial frequency entry. Frequency change is then accomplished via the main tuning dial or the pushbutton scanner, with tuning in either 10Hz or 100Hz steps. The FT-ONE permits extremely fine tuning and instant band changes.

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 transmit, receive, or transceiver 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 net operations, a non-volatile memory board is available as an option, (eliminates the possibility of dumping).

FULL CW BREAK-IN
Recent advances in solid-state technology have made full CW break-in reliable enough to be incorporated into the FT-ONE. You can select traditional semi-break-in (for use with amplifiers not equipped for 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 provides superb reliability.

'ELITE' CLASS PERFORMANCE
In addition to the full break-in and superb receiver filters, the FT-ONE is packed with subtle virtues that others might have overlooked. 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
Utilizing 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 utilizes a diode ring module followed by 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 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 and an audio peak and notch filter is standard. 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 eliminates costly 1.5kHz or 1.8kHz filters.

EXPANDED OPERATING DISPLAYS
Digital displays for the VFO frequency, memory channel, and RIT offset are provided. The large front panel meter provides easy viewing of transceiver operating parameters, including finals collector current, input voltage, FM discriminator, processor compression, 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 options.

SOUTH MIDLANDS COMMUNICATIONS LTD

S.M. HOUSE, OSBORNE ROAD, TOTTON, SOUTHAMPTON, SO4 4DN, ENGLAND
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Buckley	Howarth	GW3TMP	(0244) 549563
Swansea	Peter	GW8EBB	(0792) 872525
Buckley	Howarth	GW3TMP	(0244) 549563

FT101ZD £635 inc. VAT @ 15% & SECURICOR

2 year Guarantee and Free finance available

- ★ 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/Analogue — AM/FM options.

*Option.

FT902DM £885 inc. VAT @ 15% & SECURICOR

2 year Guarantee and Free finance available

- ★ 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 — lambic, 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

2 year Guarantee and Free finance available

- ★ 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.

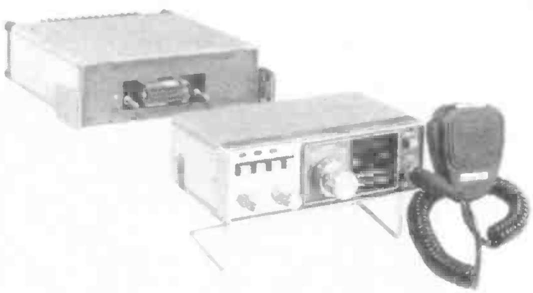
*Option.

FT707 £569 inc. VAT @ 15% & SECURICOR

2 year Guarantee and Free finance available

- ★ 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 Ω 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

2 year Guarantee and Free finance available

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

2 year Guarantee and Free finance available

- ★ 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) × 150(W) × 195(D) (1.3kg)
- ★ RX, 70mA, TX, 800mA (FM max)
- ★ 8" C" Nicads or Drys Internal
- ★ 8.5-15.2V DC External
- ★ Scan on memory (±10k Hz)!!
- ★ Long battery life SMC 2.2A/Hr

FT480R(2m) FT780R(70cm.)

2 year Guarantee and Free finance available

- ★ USB-LSB-CW-FM (A3j, A1, F3).
- ★ 30W PIP A3j, 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

2 year Guarantee and Free finance available

- ★ 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.

FT780R £499 inc. VAT @ 15% & SECURICOR

† FT780R 1.6 fitted 1.6 MHz Shift £459 inc.

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

FRG7 £199 inc. VAT @ 15% & Securicor

2 year Guarantee and Free finance available

- ★ "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) × 153 (H) × 285 (D) mm.
- ★ Optional battery holder.

FRG7700 £329 inc. VAT @ 15% & Securicor

2 year Guarantee and Free finance available

- ★ 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.
- ★ Quartz clock/timer, advanced noise blanker.
- ★ No preselector, auto selected LPF's.
- ★ Antenna 500ohm to 2MHz, 50ohm to 30MHz.
- ★ 20dB pad plus continuous attenuator.
- ★ 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.
- ★ FRV7700E; 140-150, 150-160, 118-130 MHz.
- ★ FRV7700F; 150-160, 170-180, 118-130 MHz.
- ★ FF5; 500kHz (for improved VLF reception).
- ★ MEMGR7700; 12 Channels (easy internal fitting).

FT208R(2m) FT708R(70cm).

2 year Guarantee and Free finance available

- ★ 4 bit CPU chip frequency control
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- ★ 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) × 61(W) × 39(D)mm
- ★ C/w NiCad pack, helical

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FT208R £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

2 year Guarantee and Free finance available

FT708R £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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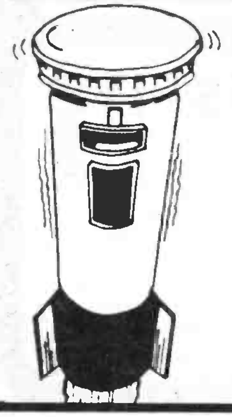
FRG7700	Dig. syn. 200kHz-30MHz AC 240v/12v DC AM/CW/FM/SSB	319.00 (—)
FRG7	Analogue tuning 500kHz-30MHz 240v AC/12v DC AM/CW/SSB	189.00 (5.00)
SRX30D	Dig. syn. 200kHz-30MHz AC 240v AM/CW/SSB	195.00 (5.00)
TM56B	2m band FM scan. 12 + 14 chan. 10 xtals fitted 12v DC/240v AC	89.00 (1.00)
M0008	2m band FM scan. 8 chan. 2 fitted. Handheld nicads + charger	39.00 (1.00)
M161	2m band FM 16 chan. scan. 2 fitted. Car mounting 12v DC	55.00 (1.00)
MF083	2m band FM 8 scan. chan. + FM broadcast. 12v DC	85.00 (1.00)
Bearcat	220FB Monitor 68MHz-512MHz. Dig. readout 240v/12v	229.00 (2.00)
SX200N	Monitor 26MHz-512MHz. Dig. readout FM/AM 240v/12v	260.00 (2.00)
SR9	2m FM Mon. Tuneable + 11 chan. 12v DC car mount	46.00 (1.25)
AR22	2m FM syn. handheld. Including nicads & charger	89.00 (2.00)
AR22M	Marine version of above	95.00 (2.00)
FX213	Tuneable aircraft monitor. Handheld (less dry cells)	13.50 (1.00)
Ingersoll	MW/VHF broadcast and aircraft monitor	12.95 (1.00)
R517	Professional air monitor. Tuneable + 3 channels. Handheld	49.50 (1.00)
R528	Professional air monitor. 6 scan. channels (xtals extra)	69.50 (1.00)

2M VHF FM & MULTIMODE TRANSCEIVERS

TR9000	2m Dig. readout. FM/SSB/CW 10w trans. 12v DC	374.00 (2.00)
BO9	Matching base plinth for above	34.95 (1.50)
TS770E	2m/70cm dual band base station. Dig. readout 230v/12v	784.00 (—)
TR7730	2m Digital readout. 25w FM transceiver. 12v DC	247.00 (2.00)
TR7800	2m Digital readout. 25w FM with keypad entry 12v DC	284.00 (2.00)
TR7850	2m Digital readout. 40w version of above	314.00 (2.00)
TR2300	2m FM 1w portable. 80 chan. with case and AC char.	166.75 (—)
TR2500	2m H'held. Dig. r'dout with keypad entry. Nicads & char.	207.00 (—)
FT480R	2m Dig. readout. FM/SSB/CW 10w trans. 12v DC	365.00 (2.00)
FT290R	2m Portable transceiver. 3w FM/SSB/CW 12v DC	249.00 (—)
FT208	2m FM handheld. Digital readout keypad entry	209.00 (—)
M700EX	2m 25w FM transceiver. Digital readout. 12v DC	199.00 (—)
M750E	2m 10w FM/SSB/CW Digital readout 12v DC	289.00 (—)
EXP430	70cm 10w expander unit for above	219.00 (—)
T1200	2m 4w FM handheld. Digital readout inc. charger	179.00 (—)
PCS3000	2m 25w FM computer controlled transceiver. 12v DC	219.00 (—)
PCS300	2m 3w FM handheld with nicads and charger	184.00 (—)
AR245	2m 5w FM handheld with nicads and charger	178.00 (—)

HF SSB/CW/AM/FM BASE AND MOBILE TRANSCEIVERS

TS830S	9 band 100w o/p trans. 240v AC. Digital readout	694.00 (—)
VFO230	Matching remote VFO for above	215.00 (5.00)
TS530S	9 band 100w o/p SSB/CW trans. 240v AC. Dig. readout	534.00 (5.00)
AT230	9 band ATU power meter and coax switch for above	119.00 (5.00)
TS130V	8 band SSB/CW 10w solid state rig. 12v DC	445.00 (—)
TS130S	As above but 100w output	525.00 (—)
PS30	20amp DC power supply for above. 240v AC input	89.00 (5.00)
AT130	100w 8 band ATU for TS130 series inc. SWR meter	79.00 (2.00)
FT-1	1.5-30MHz solid state all mode rig. 240v AC	1,259.00 (—)
FT101ZFM	9 band 100 o/p SSB/CW/FM trans. 240v AC	590.00 (—)
FT101ZDFM	As above but digital readout	640.00 (5.00)
FT902DM	9 band 100w o/p transceiver AM/SSB/CW/FM	885.00 (—)
FC902	9 band ATU power meter and coax switch	135.00 (—)
FL2100Z	9 band 1kw linear. 240v AC	425.00 (—)
FT107DMS	9 band 100w solid state trans. 12v DC	799.00 (—)
FT707	8 band 100w solid state trans. 12v DC	549.00 (—)
EP707	Matching AC 240v psu for above	125.00 (5.00)
FC707	8 band ATU	85.00 (2.00)



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


NOW EVEN BETTER VALUE FOR MONEY

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


Reviewed 'Shortwave' Mag. Nov.

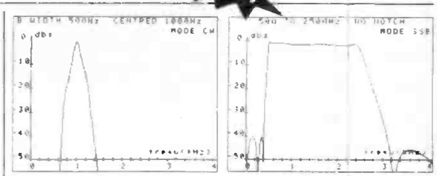
Model PC1

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


Reviewed 'Shortwave' Mag. Aug.

Model DC144/28

YET ANOTHER 2 METRE CONVERTER?
Yes but not just another. Model DC144/28 is designed to overcome the overload and spurious signal problems experienced by conventional converters. It uses a Schottky diode balanced mixer with about 7dbm of local oscillator drive. This, coupled with a 3SK88 r.f. amplifier, gives an excellent combination of low noise figure and strong signal handling capability. Its input and output gain controls also help you get the best out of your main receiver without flattening it with excessive gain.
Model DC144/28 is available either as a complete cased unit (die cast box, S0239 connectors) or as a ready built and tested PCB module.



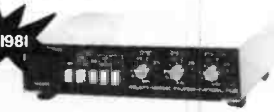
VARIABLE SELECTIVITY FOR ANY RECEIVER
Have a look at these curves (and the others in our data sheet) and you will see why a U.S. reviewer commented that the FL2 is "incredible – it's like having a tunable crystal filter."*
With Model FL2 connected in series with your speaker you can wipe out off-tune "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 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

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


Reviewed 'CQ-DL' Feb. 1981

Model FL2

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

FL1	59.00 (67.85)	MPU	6.00 (6.90)
FL2	78.00 (89.70)	DC144/28	31.00 (35.65)
PC1	105.00 (120.75)	DC144/28 Module	25.00 (28.75)
ASP	69.00 (79.35)	Keyboard Morse Sender	112.20 (129.00)
VLF	22.00 (25.30)	RFA	25.50 (29.32)
D70	43.00 (49.45)	Codecall (Linked)	24.00 (27.60)
D75	49.00 (56.35)	Codecall (Switched)	25.50 (29.32)
RFC/M	23.00 (26.45)		
AD270	33.00 (37.95)		
AD370	45.00 (51.75)		
AD270+MPU	37.00 (42.55)		
AD370+MPU	49.00 (56.35)		

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

DATONG ELECTRONICS LIMITED

ALL DATONG PRODUCTS ARE DESIGNED AND BUILT IN THE U.K.

NEW PRODUCTS PREVIEW

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

BROADBAND PREAMPLIFIER – MODEL RFA
- Wide bandwidth, 5 to 200 MHz, lets Model RFA replace a whole collection of single band amplifiers.
- Low noise figure, high intercept point (+ 25dbm), and moderate gain (9dbs) make Model RFA ideal for improving the sensitivity of HF and VHF transceivers, scanner receivers, PMR, marine VHF, without difficulties with overload.
- RF switched for convenient use with transceivers.
- Solid construction (same die cast case as Models VLF and DC144/28) with S0239 connectors.

Price: £25.50 plus VAT (£29.32 total)
Expected Availability: early January.

"CODECALL" SELECTIVE CALLING DEVICE
The new Datong Codecall adds "selective call" to any radio voice channel. A single self-contained unit at each end of the link sends or receives a coded audio signal. When the correct code is received, the receiver bleeps loudly.
The only connection needed to a transceiver is to the external loudspeaker jack. Sending is via direct audio into the microphone.
"Codecall" allows totally silent stand-by operation yet with confidence that when that specific call comes, you won't miss it.
Over 4000 different codes can be selected by internal link or by three 16-way panel switches, depending on the model. This practically eliminates false alarms.
Full details free on request.
Availability: late January.
Price per unit: Link programmable £24.00 + VAT (£27.60)
Switch programmable £25.50 + VAT (£29.32)

Data sheets on any products available free on request – write to Dept S.W.

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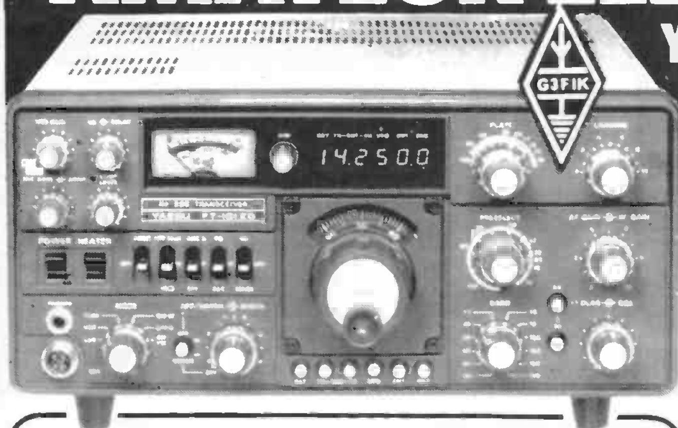

FT-101ZD Mk III

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-902DM Competition grade HF transceiver

The YAESU world famous pace-setter with the acknowledged unbeatable reputation. 160 thru 10 metres including the new WARC bands. All-mode capability, SSB, CW, AM, FSK and FM transmit and receive. Teamed with the FTV-901R transverter coverage extends to 144 & 430 MHz.

FT-707 All solid-state HF mobile transceiver

The definitive HF mobile rig, digital, variable IF bandwidth, 100 watts 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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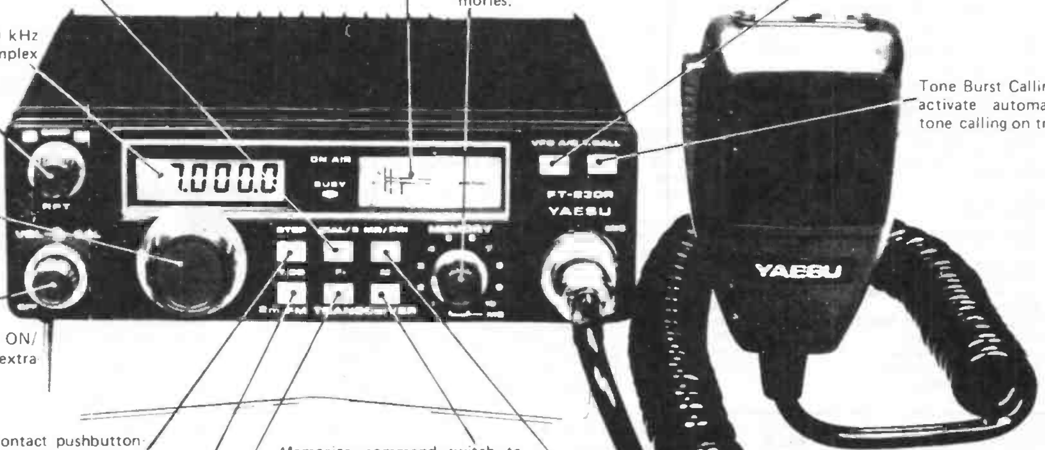
For full details of these new and exciting models, send today for the latest YAESU PRICE LIST and LEAFLETS. All you need to do to obtain the latest information about these exciting developments from the world's No. 1 manufacturer of amateur radio equipment is to send 36p in stamps and as an added bonus you will get our credit voucher value £3.60p – a 10 to 1 winning offer.

FT-ONE SUPER HF TRANSCEIVER

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). All mode operation LSB, USB, CW, FSK, AM, *FM • 10 VFO system • FULL break-in on CW • audio peak filter • notch filter • variable bandwidth and IF shift • keyboard scanning and entry • RX dynamic range over 95dB! and NO band switch!!!

*Optional

NEW! FT-230R 25W 2metre FM mobile



Specially designed LCD viewing system provides an exceptionally wide viewing angle of the large digits, even with no external illumination; this you have to see to believe.

Tuning selector for choosing between Dial tuning or scanning.

Brightly lit meter and Liquid Crystal Display illumination give extra clear readability under every possible lighting condition, from total darkness to direct sunlight.

Memory Selector chooses between the 10 memory channels or scanning of all of the memories.

Choose between two independent VFOs for working odd repeater splits or checking alternate frequencies without loosing your primary frequency pair—even if it's an odd split!

3-position switch for ±600 kHz repeater offsets, or for simplex operation.

Tone Burst Calling switch to activate automatic special tone calling on transmissions.

Main Dial with selectable tuning steps.

Concentric Squelch and ON/OFF Volume controls for extra ordinary convenience.

Momentary contact pushbutton for choosing tuning steps of Main Dial and Scanner.

Memorize command switch to store displayed frequency into selected memory.

Tone Squelch ON/OFF (U.S. model), or Power High/Low Switch (European model).

Function activator to initiate special functions. Special function status indicated on Display along with frequency.

Memory Recall and Priority Recall command switch.

£239.00 incl. VAT

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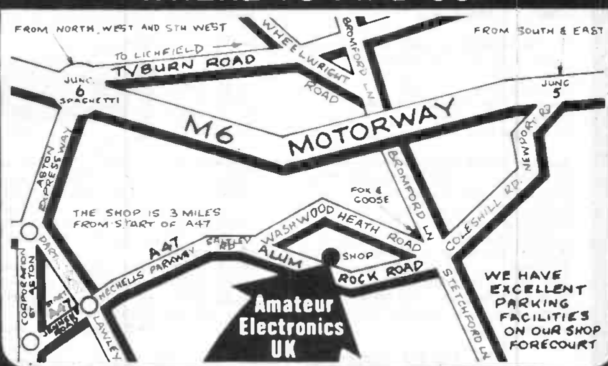

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General Coverage receiver

£235

TRIO		£	carr.
TS830S	160-10m Transceiver 9 Bands	694.00	(–)
VFO230	Digital V.F.O. With Memories	215.00	(2.00)
AT230	All Band ATU/Power Meter	119.00	(2.00)
SP230	External Speaker Unit	34.98	(1.50)
DFC230	Dig. Frequency Remote Controller	179.00	(1.50)
YK88C	500Hz CW Filter	29.00	(0.50)
YK88CN	270Hz CW Filter	32.66	(0.50)
TS130S	8 Band 200W Pep Transceiver	525.00	(–)
TS130V	8 Band 20W Pep Transceiver	445.00	(–)
VFO120	External V.F.O.	85.00	(1.50)
TL120	200W Pep Linear For TS120V	144.00	(1.50)
MB100	Mobile Mount for TS 130/120	17.00	(1.50)
SP120	Base Station External Speaker	23.00	(1.50)
AT130	100W Antenna Tuner	79.00	(1.50)
PS20	A.C. Power Supply – TS130V	49.45	(2.50)
PS30	A.C. Power Supply – TS130S	88.55	(5.00)
MA5	5 Band Mobile Aerial System	86.00	(5.00)
MC50	Dual Impedance Desk Mic.	25.76	(1.50)
MC35S	Fist Microphone 50K OHM IMP	13.80	(0.75)
MC30S	Fist Microphone 500 OHM IMP	13.80	(0.75)
LF30A	H.F. Low Pass Filter 1kW	17.90	(0.75)
TR9000	2m Synthesised Multimode	371.00	(–)
BO9	Base Plinth for TR9000	34.96	(1.50)
TR7800	2m Synthesised F.M. Mobile 25W	284.00	(–)
TR7730	2m Syn. F.M. Cmpt. Mble. 25W	247.00	(–)
TR2300	2m Synthesised F.M. Portable	166.00	(–)
VB2300	10W Amplifier for TR2300	58.00	(1.50)
MB2	Mobile Mount for TR2300	17.71	(1.50)
RA1	Flexible Rubber Ant. for TR2300	6.90	(0.50)
TR2500	2m F.M. Synthesised Handheld	207.00	(–)
ST2	Base Stand	46.23	(1.50)
SC4	Soft Case	12.00	(0.50)
MS1	Mobile Stand	28.29	(0.75)
SMC25	Speaker Mike	14.49	(1.00)
PB25	Spare Battery Pack	22.30	(0.75)
TR8400	70cm F.M. Syn. Mobile T'ceiver	334.00	(–)
PS10	Bse. Station Power Supp. for 8400	64.86	(2.00)
TR9500	70cm Synthesised Multimode	449.00	(–)
R1000	Syn. 200KHz – 30MHz Receiver	297.00	(–)
SP100	External Speaker Unit	26.90	(1.50)
HC10	Digital Station World Time Clock	58.88	(1.50)
HS5	Deluxe Headphones	21.85	(0.75)
HS4	Economy Headphones	10.35	(0.75)
SP40	Mobile External Speaker	12.40	(1.50)
R600	Gen. Cov. Receiver	235.00	(–)

ICOM			
IC730	H.F. Mobile Transceiver 8 Band	586.00	(–)
IC720A	H.F. T'ceiver & Gen. Cov. Rec.	883.00	(–)
PS15	Power Supply for 720A	99.00	(3.00)
IC251E	2m Multimode Base Station	499.00	(–)
IC25E	2m Syn. Compact 25W Mobile	259.00	(–)
IC290E	2m Multimode Mobile	366.00	(–)
IC2E	2m F.M. Synthesised Handheld	159.00	(–)
ICL1/2/3	Soft Cases	3.50	(0.50)
ICHM9	Speaker/Microphone	12.00	(0.50)
ICBC30	230 V.A.C. Bse. Charger and Hod	39.00	(1.50)
ICBC25	230 V.A.C. Trickle Charger	4.25	(0.75)
ICCP1	Car Charging Lead	3.20	(0.50)
ICBP2	6V Nicad Pack for IC2E	22.00	(1.00)
ICBP3	9V Nicad Pack for IC2E	17.70	(1.00)
ICBP4	Empty Case for 6 x AA Nicads	5.80	(0.75)
ICBP5	11.5V Nicad Pack for IC2E	30.50	(1.00)
ICDC1	12V Adaptor Pack for IC2E	8.40	(0.75)
ICML1	10W Booster	49.00	(1.00)

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Ferrite Rings 1½" Dia. Per Pair	0.80	(0.20)
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Low Pass Filter LP30 100W	3.95	(0.50)
Trio Low Pass Filter LF30A 1kW	17.30	(0.75)
Yaesu Low Pass Filter FF501DX 1kW	23.00	(0.75)
HP4A High Pass Filter T.V. Down Lead	5.95	(–)

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H1 - Q Balun 1:1 5kW Pep (PL259 Fitting)	9.95	(0.75)
T Piece Polyprop Dipole Centre	1.00	(0.20)
Ceramic Strain Insulators	0.40	(0.10)
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Large Egg Insulators	0.50	(0.10)
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300 OHM Twin Feeder – Per Metre	0.14	(0.02)
URM 67 Low Loss 50 OHM Coax – Per Metre	0.60	(0.20)
UR76 50 OHM Coax – Per Metre	0.25	(0.05)

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FC902	All Band A.T.U.	136.00	(1.50)
SP901	External Speaker	31.06	(1.50)
FT101Z	160-10m 9 Band T'ceiver	559.00	(–)
FT101ZD	160-10m Band Transceiver Digital R.O.	635.00	(–)
DCT101Z	DC/DC Power Pack	42.55	(1.50)
FAN101Z	Cooling Fan for 101Z/ZD	13.80	(0.75)
FT707	8 Band Transceiver 200W Pep	569.00	(–)
FT707S	8 Band Transceiver 20W Pep	485.00	(–)
FP707	Matching Power Supply	125.00	(5.00)
FTV707R(2)	Transverter – 2M	198.00	(–)
FV707DM	Digital V.F.O.	203.00	(–)
FC707	Matching A.T.U./Power Meter	85.00	(1.00)
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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 FM Synthesised Handheld	219.00	(–)
NC7	Base Trickle Charger	26.85	(1.30)
NC8	Base Fast/Trickle Charger	44.10	(1.50)
NC9C	Compact Trickle Charger	8.00	(0.75)
FBA2	Batt. Sleeve for use with NC 7/8	3.00	(0.50)
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)
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Nicads	2.2 AMP HR Nicads Each	2.50	(–)
FL2100Z	160-10m 1200 Watt Linear	425.00	(5.00)
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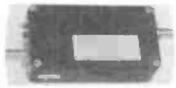

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CN	620A RF Power Meter 1.8 to 150Mhz 1Kw	£49.99
CN	630 RF Power Meter 140-450 Mhz 200w	£69.00
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Yaesu FT 707	£569	£230	£28.27
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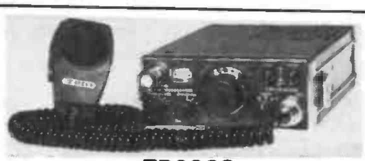

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TRIO

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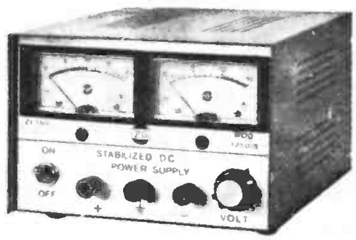

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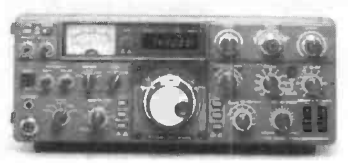

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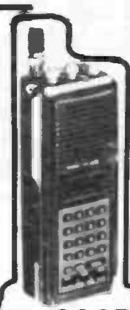

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SHORT WAVE MAGAZINE

(GB3SWM)

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CONTENTS

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COMMUNICATION and DX NEWS

E. P. Essery, G3KFE

DOUBTLESS there will be two things readers will recall in years to come about January 1982 and the month preceding it: the opening of our new 10 MHz band, the first new allocation at HF since we got 21 MHz around a quarter-century and more ago; and the *weather,* the like of which we have not seen before Christmas in the writer's lifetime. Arising from which, G3KFE has staked his one small claim to DX history . . . there can be little doubt that his was the first 10 MHz aerial to fall victim to gravity!

Various people we know have made their preparations for the new band's opening in various ways; for myself, the existing ATU and another piece of wire were to be fed from the existing rig, which had merely to have a link removed to open up the transmit facility. We know of at least one TS-520S owner who is progressing with a suitable modification, and others are building a separate rig for the band or transverters. On the aerial side of things improvisation has been the order of the day and we hear that, for example, a G5RV aerial has been persuaded to take RF at 10.1 MHz. Others have been putting up dipoles or Best Bent Wire aerials. So far, we do not seem to have seen an enormous degree of activity on the band, but it does seem to have the feel of a useful bit of spectrum-space for our use.

And of course, the third memory of the end of 1981 must be the agony of the SPs. Lots of them playing in the contest of that fateful weekend on the Saturday, almost none on the Sunday . . . and none heard by the writer since then. All we can do is to realise that if we do come across one — and he would hardly be foolhardy enough to come up on Phone — the best we can do is not to transmit his callsign at all, but, simply a BK de G3--- and then to be sure that the copy on his signal is taken down 100% letter-perfect, and if possible taped as well to back up. One thing is for sure, and that is he won't be transmitting for fun, but hoping and praying his message will be received and understood and disseminated in the Free World. One must make quite sure that no damfool journalist is asinine enough to publish the SP callsign in any press report. They — the scribblers — won't know that a callsign is a name-and-address for the secret police to come and collect.

The Bands

Outdoor shacks quite went out of fashion last month! Similarly, anyone living near enough to power-lines will have had a thin time of it; even the normally quieter high-voltage lines have been kicking up a mighty din, as the volts break-over the snow on the insulators. We have turned the shack chair round and doused the light, and watched it happening over on the horizon. Those with an indoor shack, warmth, and no nearby overhead power lines to disrupt don't know just how lucky they have been.

All the close-disharmony aside, band conditions have been just about what one would expect at this time of the year; typically deep-winter conditions as much on Ten as on Top Band. Ten almost certainly dead before one has time for a bite and a dive into the shack, Top Band free of much of the summer static and open to DX at, for Top Band, civilised hours, before midnight. So — let's have us a peep at things as seen through the eyes of our correspondents.

Top Band

Just a couple of reports this time and one passing reference. G4AKY (Harlow) offers some 89 stations, all of which are DX in one or another way, two of them on SSB, and three Gotaways. Summarising it, we may say the CW log began at VK6HD, through European and Asiatic Russians, FC9VN, KP4KK/DU2, W1, 2, 3, 4, 8, VEs, V0, KV4FU, TF30F, HI8DAF, and including much smaller fry. On SSB, GI20QR and W2HCW were raised, but JA2GQO, KB8AC, and KV4FZ all got away.

Our other Top Band entrant is G2HKU (Minister) who apologises for lack of activity as he has been building a toy caravan — the ones he saw in the shops were not what Ted wanted to give his grand-daughter!

A new reporter on this band is G4NKM, who was G8EIU. Welcome aboard, Steve. The gear is an IC-720, HW-7, ATU and an assortment of aerials covering Top Band right up to UHF. Now, G4NKM lives in West Wickham, in Kent, and he felt an ambition to work G4AKY; an ATU was lashed-up, and one RF-burn later(!) G4NKM was in business — but instead of G4AKY he has had to settle for GM4DMK at 0100.

Ten

The other end of the spectrum, so far as *CDXN* goes. Our first mention must be with the Ten-UK group, and their activities. They have some 55 members, but no affiliated clubs despite having circulated all the known ones. They have various articles in the pipeline with various publications, and they have had a stand at the Harlow Rally. If their latest newsletter is the average they are aiming at then this group is well-worth joining.

Looking at the satellite position on Ten, we have OSCAR 8, UOSAT-OSCAR 9 almost ready to 'come on stream' and, most recently, no less than *six* RS ones — RS 3-8 and we hear that these have been used by some EU amateurs. More details elsewhere.

Now we look at the words of G3RKH (Retford) who wonders how things on this band will pick up during the spring. Since his last report, G3RKH has worked KA7BAU (Wyoming), KA7BPD (Idaho), W7EOI (Montana), P29NUK, AP2P, 5Z4WL, 7X4AN, KV4AD, Z23JO (first day of the new Prefix), CR9AN, ZP5JB, KB7XJ (Nevada), and DU1RD, not to mention pages and pages of small-fry like East Coast Ws and so on.

"CDXN" deadlines for the next three months —

March issue — February 4th
April issue — March 4th
May issue — April 1st

Please be sure to note these dates

We turn from one reverend gentleman to another, now; from G3RKH to G3RJV. George has been playing in the QRP Winter Sports and took 'Ben', as he forecast, on to 10 MHz for the first few hours of its existence — of which more anon. On Ten, five watts input hooked up with WB2RZU, KM8X, VE3ABT, and AK4Z; and during the period of the Sports most of these stations were raised several times, notably WB2RZU and KM8X, and they were two-way QRP. As G3RJV comments, with his aerial system five watts is enough to make *many* good QSOs.

Now we turn to new reporter G4NKM, who says his HF QSOs so far have all been SSB — he has only tried CW on two metres! The first fortnight's operations on HF gave 28 MHz contacts with WA4RXC, UA9AAP, and UQ2OP.

G3NOF (Yeovil) has been off the air with rig troubles, but on Ten, Don says he found SP openings to VK around 1200-1300, to an accompaniment of an occasional *obbligato* from CR9, VS6 and VU, not to mention South America. The Ws came in at about 1130 and stayed until

1800, with W6 and W7 types appearing at 1600. Don's log of SSB contacts included CN8CY, CN8EA, DU1RD, HK3DDD, HK0EHM, HK0FBF, FP8HL, HC8MD, HP1XAW, J3AH, K6AXC, K6YRA, KN6M, KV4JC, N6FX, TI2CC, VK3AKR, W6MEF, W6POC/7, W7EQI, W1BLQ/7, W0YK, WA7VGT, YV1DQU, YV4BDD, 3B7CF, and 8P6OR.

G4LDS starts with a summary of his first year on Ten, while apprehensively looking out of the window at the snow on the aerials. The first eleven months on the band have given 103 countries worked and 61 confirmed. The QSO tally seems to have been VK6AXG, W6QL/8R1, KA5JZF, K70XB, WOGWL for three new States, VK2DOG, 9HIFZ, VU2OF, PP5VK, CN8EA, 3V8AA, W6s assorted, some more VKs, A4XJC, A4XJO, CS1SL, DU1RD, who turned out to be a fellow-member of WACRAL, VE3s, more Ws, VP2MFZ, 6J6J, V3ME, LU3FAN, TG9GI, more VKs with a YO8 slipped in for interest, JY9AF, Z22JK, ZS6PS, LA3FL/MM (the Royal Viking ship in the Caribbean), 4U1UN, W6MEF, UA6LHB, UA9EJ, and VU2GJ.

Our next stop must be with G2DHV (Sidcup) who seems to have at last beaten the Post Office into submission over his unwanted telephone wires — and as expected, the beam now behaves a bit more like 'the book' says. George only operates CW these days, although he does listen to Phone now and again. Ten gave with KA5DL, WB7UYW in Las Vegas, WB6SAR, N7DDX (a YL in Las Vegas), CX7BBB, N6EPK/2, and VE1SEW who faded out before the QSO was really over.

Final reporter for this band was G4HZW (Knutsford) who was somewhat puzzled when he tripped over the beacon-and-downlinkery of the Russian RS3-RS8 satellites; as he puts it "good luck to the Reds for adding a bit more interest to the band". In terms of actual QSOs, Tony mentions 6J6J, W6YB/3D6, AP2A, CR9AN, GU4LJC, GM4FDM, both on back-scatter, HK4BKB, J28DL, JAs, JG3QGI early one morning, JR6UGZ (Okinawa), JX6BAA, NP4CC, umpteen Ws in most States, PA0GN for a new country, PJ2VR, YV3IUP, KH6AT, KB7IJ/KH2, KH2AP, SP5BR (perhaps his last SP for a while), TF3YH, UI8CAJ, UA9s, VO2CW, some UA and UK0 in interesting places, VS6CT, VS6GZ, VS6DT, VK1-6, VK8RF and VK3NYG (Cocos-Keeling), V3ME, XE1MX, HI8GB, HI3AMF; ZL2AAG, ZL4BO, ZL2AAG all on long-path, ZF2AG, and ZS6AND. All on CW save for VK5NJR. As a postscript, Tony comments "plenty of CB-ers interloping and to be blasted out back to their own territory".

Comments

We do hear some odd reasons for absence at times... G4LDS says he missed the sked contact between Chelmsford Essex and Chelmsford Mass. — because it was Christmas Day and he hadn't finished the washing-up!

G3RKH may be a parson but he has a nice line in dry humour — discussing his Lid of the Month (a YU of well-known vintage trying for VK3NYG and failing completely, MC and all) he adds "It's like driving a car — you must assume everyone else is a congenital idiot. Still, it's better listening to that than clearing snow off the drive"!

Out to VP8 now. VP8WA writes again to make mention of the position of the VP8s, *vis-a-vis* LU3ZY. There is a treaty, the Antarctic Treaty which covers the operations of LU and VP8 stations. However, the South Sandwich Is. are *outside the Treaty area,* and S. Sandwich is wholly and only owned by the British Crown. Thus, in no way can the *position of LU3ZY be legal with that callsign.* VP8WA says they have the information through their own Territory Government, although they point out the U.K. Government are responsible. What he is saying, in DX-ers lingo, is that LU3ZY is a pirate, and in no way should a QSO with him be considered as valid for DXCC credit.

Now some results: the CQ WW 160 contest 1981 shows again a thin entry from U.K. but lots of quality. GD4BEG made 180117 points for European winner (compare W8LRL at 164912 for Stateside winner, and World high NP4A at 439200 points) followed up by G3SZA and G3ZYY/A all over the 100K points, while for the multi-op categories we hear GM3IGW at 106132 and G3RPB at 94824. Congratulations all.

Crystal Ball Dept.

We hear that as The Gambia is totally surrounded by Senegal, there is a likelihood of the two countries merging; this would delete C5 and 6W8 from the current DXCC list, so get at them before the time runs out! It is believed that the new Senegambia will sign 6W8.

Since January 1 it has been possible to submit 1A0KM for DXCC credit, and we hear that there is some reconsideration of the position of AD0S/KH5 Palmyra cards, there having been some documentation submitted to ARRL.

This should make the old-timers sit up — we hear by way of *TDXB* that Gus Browning was going to spend the winter hitting various spots in the Caribbean as pre-training for an extended DX-pedition. This should be great — but we must add that we wonder whether Gus still has the physical stamina at his age to cope with the conditions at most of today's "most wanted' DX spots. We hope so, because the operating standards of this wizard are something to recall.

Those rumours about a pending Navassa DX-pedition sponsored by *IDXF* were all bunkum — this from *IDXF* to *TDXB,* and who are we to argue?

This long-awaited and long rumoured DX-pedition to ZA is, at the time of writing, stalled for one bit of paperwork which will give the permitted days of operation, and they are still hopeful of being on during February.

9Y4KG, Lloyd and Iris Colvin, made some 9000 contacts before they went QRT. They told *TDXB* that "Trinidad features complicated, time-consuming and costly customs procedures". It seems it took eight days to get their gear released to them.

On that Bouvet operation, we hear that it has been put off for at least a year by the German team involved; it seems their request for donations to the tune of 36000 dollars ahead of the start fell on stony ground. This old square isn't surprised!

Early December-time saw a station signing ZA2HAM on 14 and 21 MHz, but all the signs are that this one was Phoney Phred again. Phred sure gets about!

YI1AS is OK though, and expects to be in Iran for a couple of years. Best day for him is a Friday when he is off work all day.

Lloyd and Iris have been raising a fair old dust at the time of writing, signing this time W6QL/8R1.

10 MHz

Our nice new band. Quite a few people have been on it and we hear that G3HTA has worked DL, F, G, GI, GM, GW, HB, LA, OE, OY, OZ, VK, YU, ZD8, ZL4U, and 5N, with two other countries heard in SM and LX.

G3RJV took his Ben to work on the band, right at the opening hour, and found, at first, chaos. His rig managed a few Gs in the opening hours, with some Europeans later in the day, and he says it was surprisingly like 7 MHz without the hassle; he was also interested to note that some of the stations worked quite obviously hadn't used a key for some time. To bring some SSB ops back on to CW can't be a bad thing.

We have already indicated our own involvement on this band, but we have to admit that we agree with G3RJV, that an awardless, phoneless, HF amateur band will be a revelation to those who have only known the overcrowding and ill-temper of the other bands on SSB. In between the fireworks we heard quite a few G and European signals on, even with the aerial lying on the snow.

Eighty & Forty

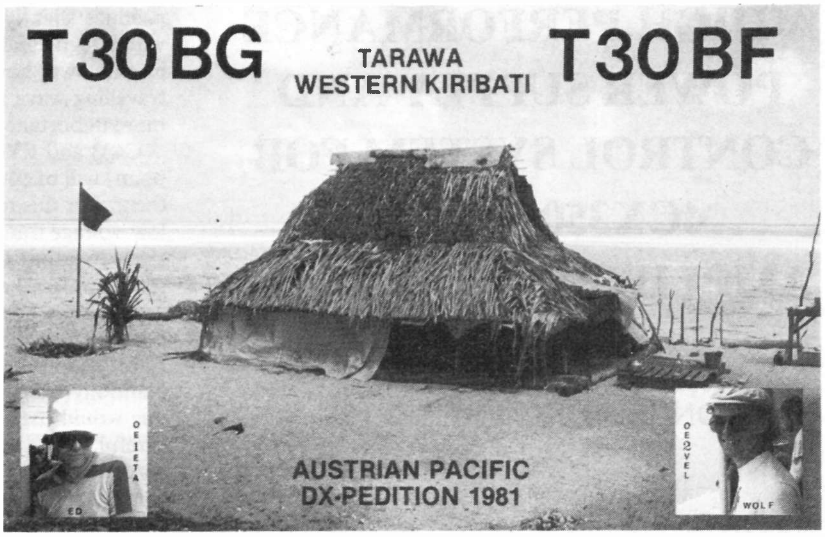
For daylight DX you don't normally head for 3.5 MHz but G2NJ reports hearing SM2CBS knocking off a brace of JAs at 1400z on CW.

At G2HKU we notice just two CW contacts mentioned, with PP7IV and OD5LX. Sad to say, after mentioning these two, Ted notes that his wife had a fall on an icy unmade road, and broke a wrist.

Most of the HAB and WAB operation seems to occur on 80 and 40, so maybe this is as good a place as any to mention the letter from GW3SSY (Blaenavon) in which he says that Ordnance Survey do a 1:625000 map in two sections called "Map of Great Britain (Local and Government Areas)". These two maps show all the counties and administrative areas within the Ordnance Survey grid marks — very handy for the out-of-the-way little places WAB-wise, and you soon learn not to disregard local signals which might be out /M or /P.

G4NKM just tried out Eighty, and raised SP4PIN and DL3YBM around 0100z for a good starter.

G3RJV looked at both bands with his Argonaut 515, which has displaced the old Argo 505 in the shack. QRP on Eighty looked like EI6BA, G3SYC, G4CTS, F9YZ, GD3FXN, G3VTT, EI6BA, OK2BMA, G3ZWH, G4IYL, (twice), G3TKO, G4HCP, again G3VTT, and GW3SB. The 7 MHz log includes G8PG, G4JZO, GM3OXX, G4JRC, GM3OXX again, G4CQK, G4JRL, ON6MC, a couple more QSOs with GM3OXX and ON6ML.



One of the QSL's going out to those who worked the recent OE2VEL/OE1ETA DX-pedition to the Pacific; *see* "Snippets".

Snippets

G3KPO recently did a trip round the globe, and he says he was quite surprised at the places in which he found people looking for Gs; for example VS6BS calling G stations daily on 21155 kHz at 1300z, while on the other side of the world KH6IJ, now retired, looks for Gs on 28015, 21015 and 14015 kHz daily between 0900 and 1000z on whichever spot seems best. KH6IJ lives at the foot of an extinct volcano, and G3KPO ventured into the crater to take photos. Over in Bangkok, HS1WR is looking for SS/TV stations in G land, which should be pretty easy as he runs a 3-element beam atop a 140 foot tower!

Scarborough club, says G4EDR, celebrate their 50th anniversary this year, and so they are offering a certificate to commemorate. You must work G4BP (the club station) and five members to claim the award, details of which are available from G4EDR at 39 Clarence Drive, Filey, N. Yorks., YO14 0AZ.

We have an advance view of the QSLs going out for those who worked the OE2VEL/OE1ETA DX-pedition to the Pacific; they have quite a bit of interesting information on the places visited, and it might well rate a little piece to itself.

A special-activity station, signing GB2SDD will be put on by the British Steel Corporation Amateur Radio Section (Port Talbot) to celebrate St. David's day. There is to be continuous operation for the full 24 hours of March 1. There is an award, involving working the GB station, plus extra GWs, to the tune of ten for G applicants, seven for European stations, and five for the rest of the world. Log extracts to be sent to GW3EOP, QTHR, along with 80p, or 5 IRCs, or two dollars US for the certificate. The GW stations must be worked during March and April 1982.

14 & 21 MHz

Trying to get it all in before the red pencil has to fall. . . .

G3RKH first. John mentions JA and VK on 21 MHz, and on Twenty he found himself talking to EP2TY, KL7LB, TF3A, HV3SJ, and KH6BB. The latter was the last one for the 1981 WAS, and in fact but for New Mexico there could be a WAS in three months.

G2DHV is sticking in the main to Ten, but he does mention that 21 MHz is noisy and full of UAs; for all that, VE7CIQ, WD6CVC, KL7IWS, KA7AQM, and W7LI were heard, while on Twenty a QSO was made with VE2WQ on CW for a pleasant surprise, and VU2BK was heard.

Just to show the difference, G4LDS tried Twenty once in a while, and this collected him up 5B4LD (who admits to being GM4DIV at home), then S81WCC, 5N8ASS, ZD7SD, 5N9GM, and ZS1VX, these six all being the fruit of one speculative CQ call. Then came 9H1MRL, where the ops wait their own calls.

For G3NOF, activity was non-existent on Twenty, with no QSOs recorded; but on 21 MHz the short path to JA, VK and the Pacific was open on occasions and of course the usual Ws, with the West Coast surfacing around 1700z. Don made SSB QSOs with CR9AN, FK8DH, JD1BAT (Marcus Is.), UI8FFF, UJ8JCT, P29FV, W7KTI, ZF2AG, 3A2EE, and 8P6AH.

On now to G2HKU who mentions sked contacts in the mornings with ZL3FV and ZL3RS on SSB, with UA0KBC, VE7NH and W9RKP falling to the CW.

G4NKM passes over 14 MHz tersely: never liked the band — UP3ME and UB5ZCE worked. 21 MHz is preferred and here he brought down I1YUM, YU4EBL, UA0QDH, JA5SCQ, WB0HUR, 5B4KB, W6USG, LU1DRC, mostly taken in the afternoons.

That leaves us with G3RJV and his QRP set-up. He keyed on Twenty with CT4CH, I0SKK, SM6AMQ, I7CCT, DK5RY, and DJ3PT. Turning to 21 MHz, George notes CT4CH, OK1DKW, PJ1ZB, OK2BMA, the latter three times — all taken during the QRP Winter Sports.

Finale

So there it is for another time; let's hope that by next month all fallen aerials (including mine) will be up again, and that snowshoes and skis will have been packed away again! The date is in the 'box', and the address, as ever "CDXN", SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ. *BCNU!*

March issue due to appear on Friday, February 26th.

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

CONCLUDING THE SERIES

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

IN the final variant, the drive circuitry was mounted on a small PCB which was placed back-to-back with another PCB carrying the inductors; this can be seen from the photographs. The mains filter was also mounted inside the box. Mains connexions into and out of the thyristor stack were made with EP series connectors which were removed from some surplus equipment: these were used because the current involved, as discussed, is quite high.

Finally, it is worth mentioning a few practical points about the EHT unit in general. More because one was available than out of any necessity, a 15H 500 mA choke was used in the final design and is shown as L401 in Fig. 6. There is no reason why a simple capacitor bank, provided that it has a value greater than about 30 μF, cannot be used as the entire EHT smoothing, since ripple is not a large problem with any tetrode and regulation is looked after by the system itself. Not that a tetrode amplifier is particularly sensitive to poor regulation anyway, but under certain circumstances of use as linear amplifiers, the 4CX family seem to produce slightly more consistent intermodulation performance with a regulated supply such as this one. The supply would come into its own, however, if used as part of the power supply for a travelling-wave tube, where regulation and ripple content are more important than they are for a tetrode.

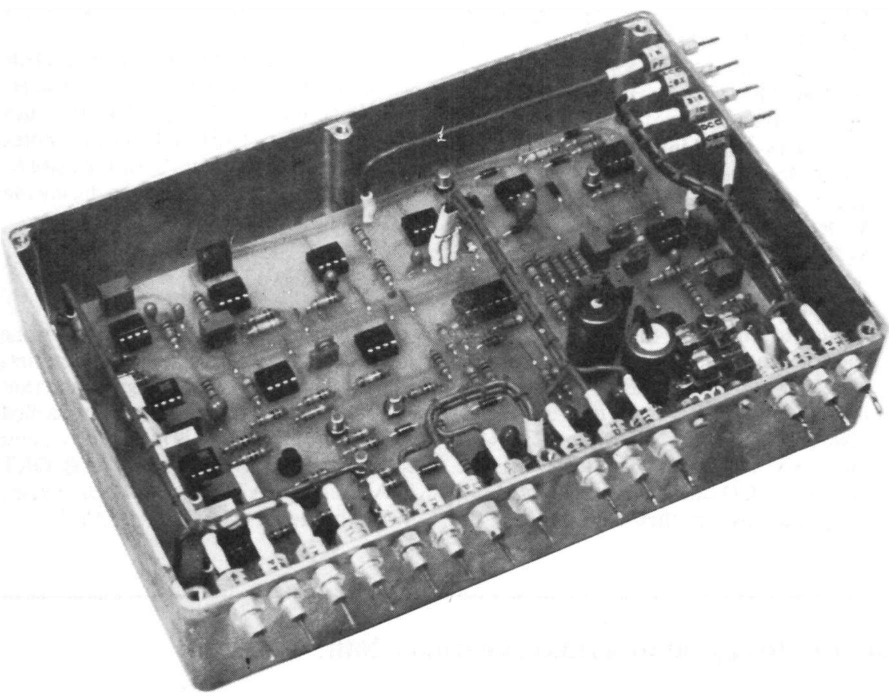
C423 and RV401, which are used to adjust the flashover trip point, will of course have the full output potential of the unit on them. For this reason, it is suggested that they are set up on the low-voltage transformer, as discussed shortly, and no attempt is made to adjust RV401 when the system is in use for high-voltage service unless the insulation of its spindle and/or the tool used to adjust it can be guaranteed beyond doubt at the output voltage.

Other than these points, the EHT unit can be built as any other EHT supply, with the addition of the thyristor stack box. Naturally, this implies the normal construction techniques which one would use for high voltages, the main points of which are careful work, no dry joints or sharp edges (which could cause corona) good insulation and "finger-proof" metalwork. If the rectifier stack is built on a PCB, it is well worth giving the track side a coating of anti-corona aerosol spray and mounting the board off the chassis with either nylon bolts or pillars of some kind. It is worth remembering that the ripple current ratings of the smoothing capacitors will need derating if they are closer than about 15mm. to each other.

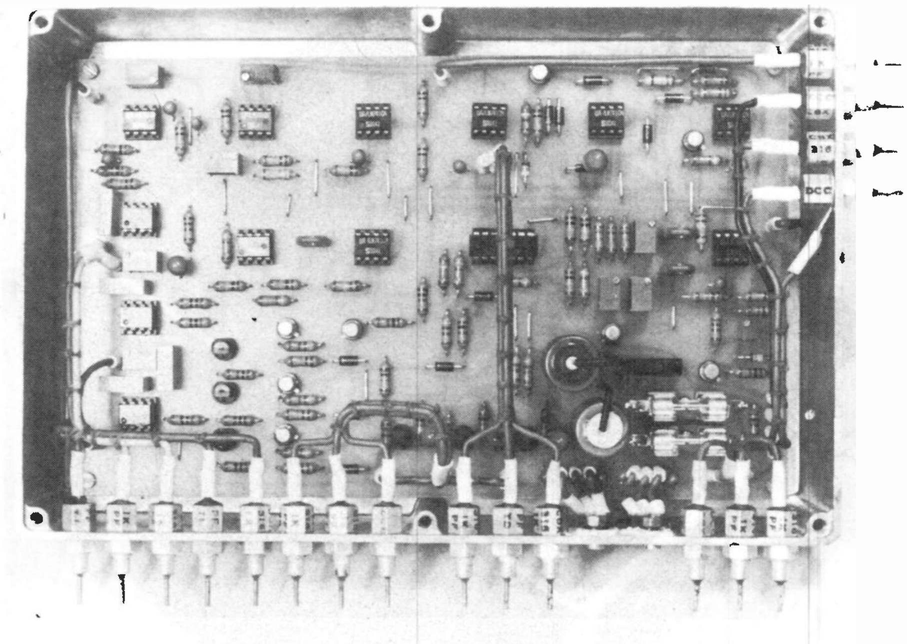
Another point to consider is how to convey the EHT to the amplifier, bearing in mind the voltage ratings of the usual types of connectors. The UHF series (PL259) are only rated for 500V, and so are some BNC connectors; some N-type connectors are rated for use at 2000V DC but *not* the bakelite-insulated ones, and it should not be automatically assumed that any old N-type will handle the voltage. The best connectors seem to be the PET series, which are available from the usual sources — they are rated to 3 kV and have been used at G4FRX with no problems for some years.

For EHT cable, the simplest solution seems to be the inner core and insulation of ordinary coaxial cable, preferably UR67 or UR43; the latter will fit a PET 100 connector with no difficulty and should prove very reliable.

So let us now assume that the system has been built and is ready for setting-up. The circuit may look a little complicated, but it will be found that getting it all working is very simple.



A general view of the control unit — note the feedthrough capacitors used to take connections into and out of the box. The unit contains all the control electronics, trip sense amplifiers, low-voltage regulators for the op-amp supplies and everything necessary to drive the SCR stack. It is basically Figs. 2, 3, 4 and 7.



Looking into the control unit. The 3423 trip sense amplifiers are the vertical row of ICs to the left of the photograph, with the 741 op-amps in two horizontal rows at the top of the board. The 14-pin DIL IC in the second row is the CA3046 transistor array used in the analogue multiplier. Power supply regulators can be seen on the bottom wall of the box adjacent to the smoothing capacitors and fuses. 10-turn vertical presets are used in the prototypes and are visible in the photographs. For reasons of space, the mains transformer is not mounted in the box; its secondary voltages are taken into the rectifier via the three feedthroughs visible at lower right.

Setting-up

The following discussion assumes that at every stage there is no equipment fault and that no component decides to depart for another world during the procedure. The voltages in use tend, if nothing else, to make any failures of a rather explosive nature, and constructors are advised to keep the EHT and mains sections as far away as possible from each other when the EHT transformer is in circuit. Old hands tend to play this game "one hand only", keeping the other hand in the pocket; the cynic, of course, will say that they only lose one arm at a time that way . . . .

The first step is to remove the EHT transformer and replace it with a low voltage transformer, for example a 24-0-24V component. This will reduce the possibility of a disaster during the remainder of the process. At the same time R423 and R425 should be bridged by 10K resistors so as to match the feedback to the lower output voltage. The mains supply to the thyristor stack and transformer should be disconnected at first, and only connected where indicated in the procedure. Carry out the following steps:

1. Set RV1, RV2, RV3, RV101, RV201, RV401, RV501, RV502, RV503, at minimum; RV102, RV103, RV104, RV301 at maximum.

2. Disconnect test points TP101, 102 and 103.

3. Switch on. Check the power supply rails for + 15 and − 15V. LED201 should light after a short delay, indicating that the output of IC3 has gone from positive to negative. Check that the output of IC4 is rising and that it stabilises at 10V; the voltage across D11 should stabilise at about 5V. Leave the voltmeter across D11.

4. Switch off, wait 20 seconds and switch on again. The voltage across D11 should initially be zero and should rise to 5V.

5. Connect a voltmeter, set on a low AC range, to the output of the gain multiplier at TP103. Ground the input at TP102. Connect a 6V AC source, such as a heater transformer, to the input of TP101, and adjust RV102 for minimum output at TP103. Then ground the input at TP101 and connect the AC source to TP102; RV103 is then adjusted for minimum output at TP103. Finally, ground both TP101 and TP102 and adjust RV104 for zero volts at TP103. When this is done, return to the beginning of this step and repeat it all — then pass to the next item.

6. Switch off and reconnect test points TP101 and TP102.

7. MAKE SURE that the mains is disconnected, and then connect up the mains feed to the thyristor stack.

8. Connect a voltmeter across the primary of the substitute transformer and switch on. Adjust RV1 so that the meter needle *just* rises from the end-stop and then back off RV1 by a fractional amount — this sets up the ramp voltage. Switch off and disconnect the voltmeter.

9. Connect the output side of test point TP103 (*i.e.* the side connected to R116) to the − 15V rail *via* a 100K resistor, to give + 10V on the output of IC104. Connect a 40W lamp across the primary of the substitute transformer. Switch on, and adjust RV201 to make the lamp glow as brightly as possible: RV201 should then be backed off fractionally. If RV201 is set too high, the lamp will rapidly flash, which indicates unstable operation. This step sets the maximum possible pedestal voltage, so that the main thyristors cannot be overrun. Switch off.

10. Disconnect TP103 from the − 15V rail and reconnect it to the output of the gain multiplier. Connect a voltmeter to the output of the unit, and another one between test point TP101 and ground, leaving TP101 connected to the gain multiplier. Switch on and leave for one minute to allow the soft start to operate and stabilise.

11. Adjust RV104 until the output voltmeter is just beginning to lift off its endstop; note that a reducing value of RV104 gives an increasing output.

12. Raise RV1 so that the output voltmeter indicates 18V. Adjust RV2 for the maximum gain commensurate with stable operation, and then back RV2 off by about 20% of this setting. Adjust RV3 to give zero volts at test point TP101, and whilst doing so maintain the output at 18V by adjusting RV1.

13. Connect a 24V 3W lamp across the output of the unit and raise the setting of RV101 to the maximum commensurate with stable operation (*i.e.* the lamp not flickering). Check dynamic stability by removing the load and then replacing it.

14. Switch off for 10 seconds and then switch on again to check that the soft start is working. Reset the output voltage to 15V *via* RV1.

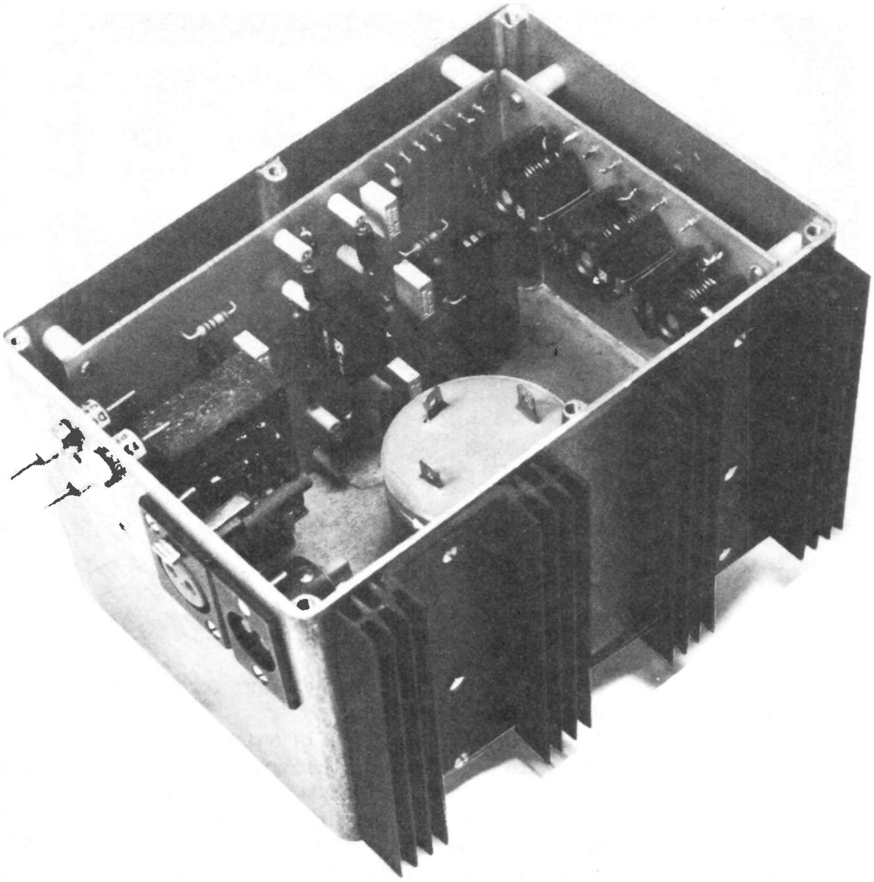
15. Increase the load with more lamps until they represent something of the order of an 800 mA load. Then increase the setting of RV501 until the unit just trips at this current.

16. Adjust the load so that the output is 750mA. Increase the setting of RV502 until the unit just trips at this current.

17. Remove the load from the unit. Increase the setting of RV401 until the point is reached at which a 0.47 μF capacitor connected to the output of the unit will cause a trip. Obviously, the capacitor must be removed and discharged between adjustments.

18. Raise the output of the unit to 24V and raise the setting of RV503 to check the operation of the over-voltage trip. Return RV503 to minimum after this step.

19. Switch off, disconnect the mains supply and all the test equipment; you may wish to award yourself some refreshment at



General view of the SCR stack box. The heatsinks carrying the main thyristors are rated at 4 degrees C per watt, and TO220-style devices were used in this particular version. Note the two vertical PCBs carrying the main electronics and the inductors used for dV/dT protection and RFI suppression. The photograph shows one of the engineering prototypes before wiring was complete.

this stage, especially in view of what is to come! Remove the substitute transformer and install the real one; and from this point on, *you have got to be very careful*. Connect a 40W mains lamp across the primary of the EHT transformer and a suitable voltmeter across the output of the unit. Set RV1 at minimum. Remove the 10K resistors which were used to shunt the feedback chains. Take a careful look round and switch on.

20. Let the soft start operate by waiting for a minute or so, and then slowly increase the setting of RV1 to give 200V output (note that this part of the procedure assumes the use of a 2000-0-2000V transformer, so that the voltages given in this section may be adjusted *pro-rata* to suit your own particular component). As discussed earlier, do not be surprised if either the transformer or the rectifier stack makes a certain amount of noise. Adjust RV2 for maximum gain commensurate with stable operation and then back it off by about 20%. Next, connect a voltmeter between test point TP101 and ground and adjust RV3 to give zero volts at TP101; this will require a continuous adjustment of RV1 to maintain 2000V output. Re-check the setting of RV2 and then again RV3.

21. Increase the output to 2500V, and increase the setting of RV503 until the unit trips; you may like to note the lack of drama with which everything quietly switches off. Remove mains input, wait 30 seconds and switch on again. Observe the soft start working, and then note the output voltage at which the overvoltage trip operates. Decrease the setting of RV1 a little and switch off.

22. MAKE SURE that the unit is switched off and that the capacitor banks are discharged.

23. Make up two banks of load resistors, each consisting of eight 60W domestic lamp bulbs wired in series with a switch. The switches *must* be connected in the earthy side of the line and should be fitted through an earthed metal plate to protect you from shock: they will also need to be fairly robust and capable of breaking the inevitable arc. Connect both load banks to the output of the unit, after reading step 22 again.

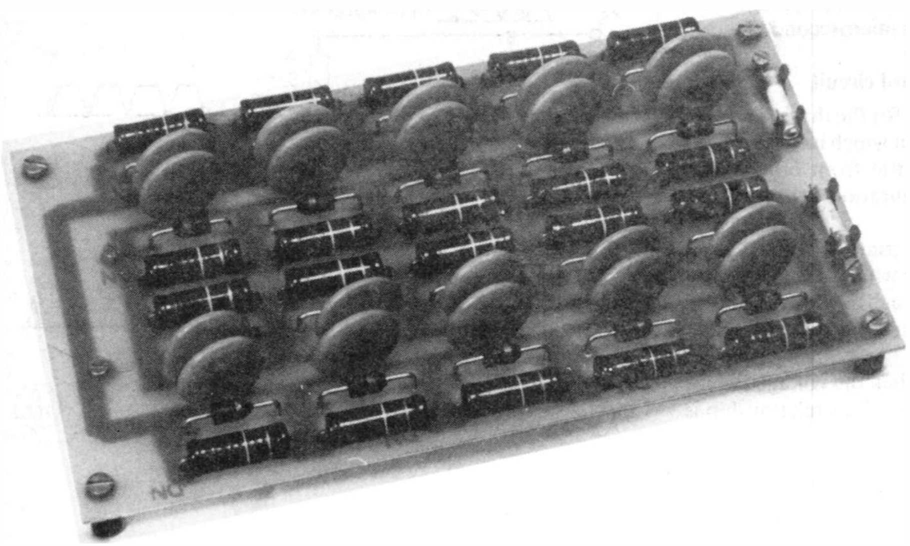
24. Switch on, let the soft start wind up and set the output to 2000V. Turn on one load bank and then turn it off again to check the stability at zero load. If there is instability, set RV101 to minimum and repeat step 20. If the unit is stable, turn on both load banks in turn and adjust RV101 for maximum gain commensurate with stable operation: it should then be backed off a little. Stability can be checked fully with step load changes using both load banks — in fact, most of the prototypes have been extremely docile in this respect, and it should easily be possible to set the unit up for only a few tens of volts change at 2000V between no load and full load. The unit in use at G4FRX is completely stable except for a very minor instability just after starting up and passing through about 100V, and the regulation is such as to give a drop of about 14V at 2000V when going to a 500mA load from no load.

25. Switch off, let all the capacitors discharge and then remove all the test equitment. Take another look round to check that everything is in order, and then replace all covers, lids, etc. The unit is now ready for use, so you may now relax, make some tea and stand-down the emergency services!

Conclusions

After the completion of the setting-up, the system should prove flexible and useful in service, as well as affording good protection to the valves (drive to the thyristors ceases about 3 microseconds after a trip occurs, and all power is removed after a period of between 5 microseconds and 20 milliseconds, depending on the point in the mains cycle reached by the thyristors).

The general principles described in the article should be useful in other areas, since it would seem that the SCR is still a much misunderstood device amongst the amateur fraternity; certainly the author knows a great deal more about them now than he did when this project was commenced, but that seems to be the beauty of home-brewing. For those who find it a rather baroque way of doing an essentially simple job, please remember that this way is



The rectifier stack used in the prototypes; note the equalising resistors and capacitors. The latter are rather vocal when thyristor drive is in use! Note also the "anti-Murphy" fuses in clips at one end of the board. Correct fusing for semiconductors is most important, and is discussed in the text.

only one of infinitely many, and is described as much to demonstrate the general principles of power control with thyristors, and bring out some points which are sometimes forgotten about high-voltage supplies, as to describe a 4CX350 anode supply. Having said that, however, the performance of a 4CX amplifier which is correctly set up and whose power supply is put together in a purposeful manner, bearing in mind some of the points which have been discussed in this series, should be essentially that of which the valves are inherently capable; that is to say, very much better than represented by the majority of high-power transmissions heard on VHF and UHF.

In a future article, we hope to discuss a switched-mode power supply with all the performance of this one but in about one-tenth of the size — however, the prototype looks like being an even better broadband noise jammer than the prototype of this one was!

Acknowledgments

The author wished to acknowledge with gratitude the efforts of Michael Moroney, Melvyn Noakes, G4JZQ, Dave Crisp G8IXG, Norman Fitch G3FPK, and his YL Elaine. Thanks are also due to his many friends at EMI-Varian and Eimac, for data and facilities.

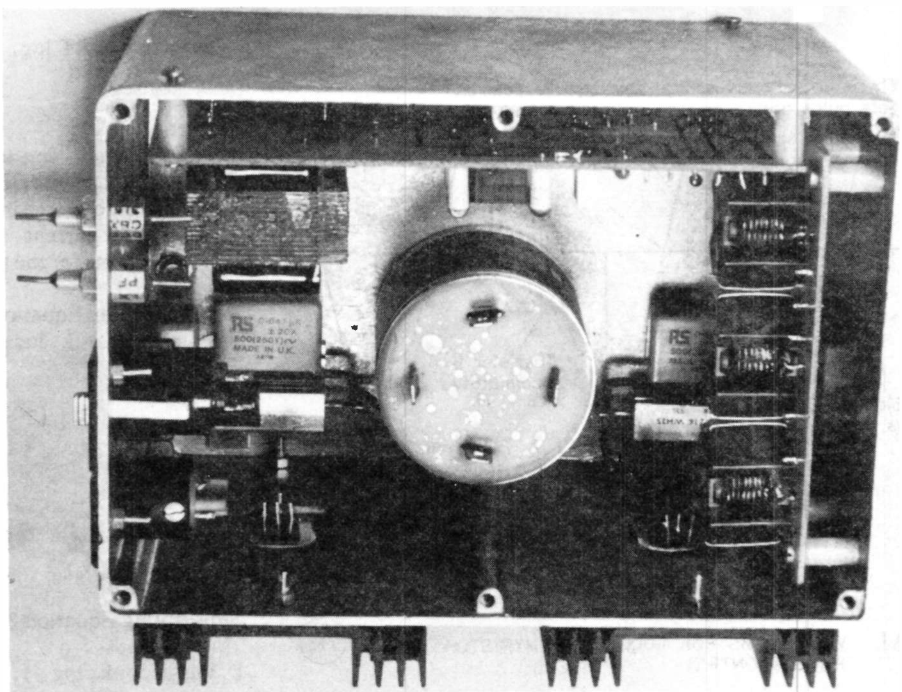
APPENDIX

Phase control with thyristors

Thyristors control the amount of power delivered in an AC circuit by "chopping" the waveform of the supply. This is achieved by switching the thyristor on for only the latter part of each half-cycle. At the end of the half-cycle the thyristor will automatically switch off as the current falls to zero — this process is known as "commutation". The delivered power is modulated by moving the point in the half-cycle at which the thyristor switches on; the principle is shown graphically in Fig. A1, which describes the waveforms around a full-wave phase controlled rectifier.

Thyristors are switched on by a positive pulse at the gate of about 3V amplitude and a current of about 50 mA for the larger

Looking into the SCR stack box. This contains the Fig. 5 circuitry, and again is shown prior to wiring-up for clarity. The cylindrical component in the centre of the box is the mains filter (see text) and the vertical PCB at the left of the photograph carries L301, 302 and 303. To the left and right of the mains filter are the RFI suppression and dV/dT protection components for the main thyristors. The PCB at the bottom of the photograph is that shown elsewhere, carrying the phase control and drive circuitry. The mains input and output connectors (Cannon XM series in this variant) are seen at upper right, and the two feedthrough capacitors carry current from the control unit to the opto-isolator on the PCB.



devices. The transition from the non-conducting (blocking) state to the conducting (on) state takes about a microsecond.

The ramp and pedestal control circuit

This is a means of providing gate pulses for the thyristor which are synchronised with the AC waveform but which have a variable phase relationship. As such, it differs little from other phase control circuits but this particular configuration lends itself to control by an external voltage.

Refer to Fig. A2. The supply to the control circuit (V_s) is obtained from a rectified sine wave source which is in phase with the main AC source. This is dropped through a resistor (R_s) and stabilised by a zener diode to give the main supply voltage (V_1) to the circuit.

The unijunction transistor will trigger when the voltage (V_2) at its emitter reaches a fixed proportion of V_1. This relationship is defined by the equation:

$$V_f = V_1 \frac{(\mu R_{BB} + R_{B1})}{R_{B1} + R_{B2} + R_{BB}} + 0.5V$$

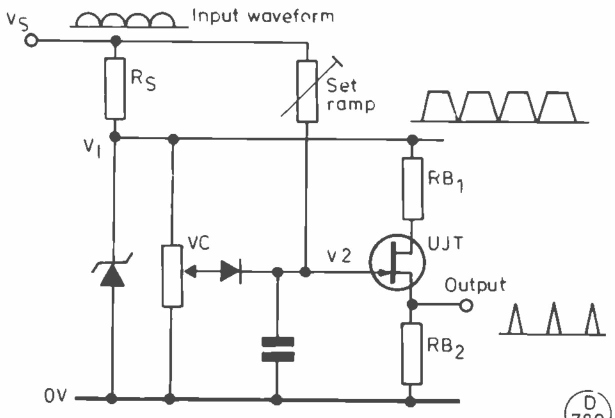
where:
V_f = the value of V_2 to trigger the unijunction
μ = the intrinsic standoff ratio for the unijunction (about 0.64)
R_{BB} = the inter-base resistance of the unijunction (about 10K)

When the unijunction transistor triggers, it discharges the capacitor through R_{B2}, producing a voltage pulse at the top end of R_{B2}. Since V_1 collapses to zero at the end of each half-cycle (because the supply is not smoothed) a pulse will appear at R_{B2} and the capacitor will be discharged at some point in each half-cycle for any value which V_2 reaches.

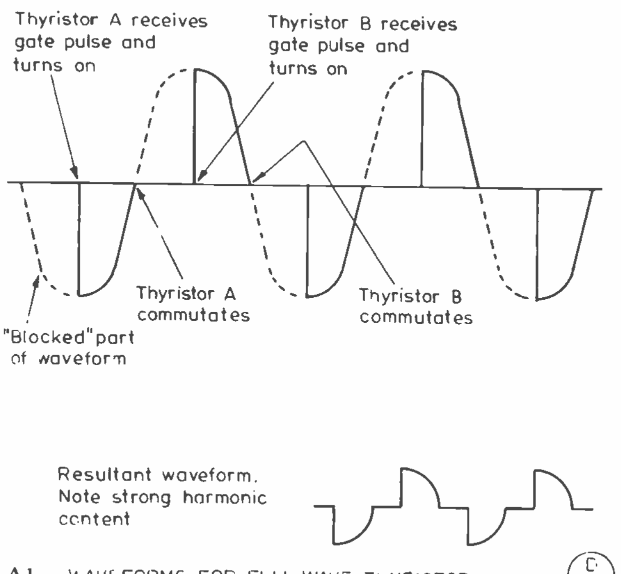
The intention of the circuit is that the pedestal voltage should appear on the capacitor at the very beginning of each half-cycle, and then the capacitor should ramp up from this voltage *via* the ramp control until it reaches V_f and the unijunction triggers; the ramp control is preset, so fixing the ramp. The pedestal voltage is varied so as to achieve phase control.

The point from which the ramp supply is taken will determine the gain characteristic of the circuit. If, as shown, it is taken from V_s, where V_s is large by comparison with V_f, then the ramp voltage will correspond with the integral of the supply waveform. This will give a linear relationship between the pedestal voltage and the output of the thyristor stack, although the relationship between phase angle (at the trigger point) and the pedestal voltage would be distinctly non-linear. This is the correct mode of operation for the power supply described in the main text.

The design of the circuit must allow for a relatively small source impedance for the pedestal voltage, so that it can build up rapidly at the start of each half-cycle. It must also allow for a current to flow through the ramp control which is greater than the peak-point current for the unijunction transistor, that is to say the current which flows into the emitter when it is just on the point of triggering. If this criterion is not met, the unijunction will not trigger since the capacitor voltage will not be able to reach V_f.



A2 RAMP AND PEDESTAL CONTROL



A1 WAVEFORMS FOR FULL WAVE THYRISTOR PHASE CONTROL

The four-quadrant multiplier; theoretical background

The design for the multiplier used in this unit is borrowed directly from G. B. Clayton's book "Operational Amplifiers", although the actual origin is believed to be earlier than this. (Ref. 2, 4.) The circuit analysis is as follows:

Referring to Fig. A3, the base-emitter voltages of the four transistors must sum to zero because of the collector-base shorts on TR1 and TR4. Thus:

$$V_{E1} - V_{E2} + V_{E3} - V_{E4} = 0 \qquad (1)$$

Now, the emitter-base voltage of a transistor is linked to the collector current by the equation:

$$-V_E = 2.3 \times \frac{kT}{q} \log_{10} \frac{I_c}{I_o} \qquad (2)$$

where:
k = Boltzmann's constant
T = absolute temperature in degrees K
q = electronic charge in coulombs
I_c = collector current
I_o = a constant for the transistor

We can re-state Equation 2 as:

$$-V_E = -k_2 + k_1 \log_{10} I_c \qquad (3)$$

where:

$$k_1 = 2.3\frac{kT}{q} \qquad (4)$$

and:

$$k_2 = k_1 (\log_{10} I_o) \qquad (5)$$

Substituting Equation 3 in Equation 1 we get:

$$k_1 \log_{10} I_1 - k_1 \log_{10} I_2 + k_1 \log_{10} I_3 - k_1 \log_{10} I_4 = 0 \qquad (6)$$

and thus $\log_{10}(I_1 - I_2 + I_3 - I_4) = 0$

and: $\log_{10} I_1 + \log_{10} I_3 = \log_{10} I_2 = \log_{10} I_4$

and antilogging:

$$I_1 I_3 = I_2 I_4 \qquad (7)$$

Note that this is only true if all the transistors are identical and at the same temperature, which is one reason for using a transistor array such as the CA3046.

Referring back to Fig. A3, and comparing it to Fig. 3 in the main text, V_x is the voltage at TP101, V_y is the voltage at TP102 and V_s is the supply voltage. It will be seen that we have two "tail reference" currents. One is set by a transistor to vary with V_x in the relationship:

$$I_{REF1} = 2(I_R + I_x)$$

where: $I_R = \dfrac{V_s}{R_1}$ and: $I_x = \dfrac{V_x}{R_x}$

and the other is set by a resistor to give:

$$I_{REF2} = 2I_R$$

Where I_R is set by design to be the same as for the other tail reference current.

If we now examine the currents in Fig. A3, we have:

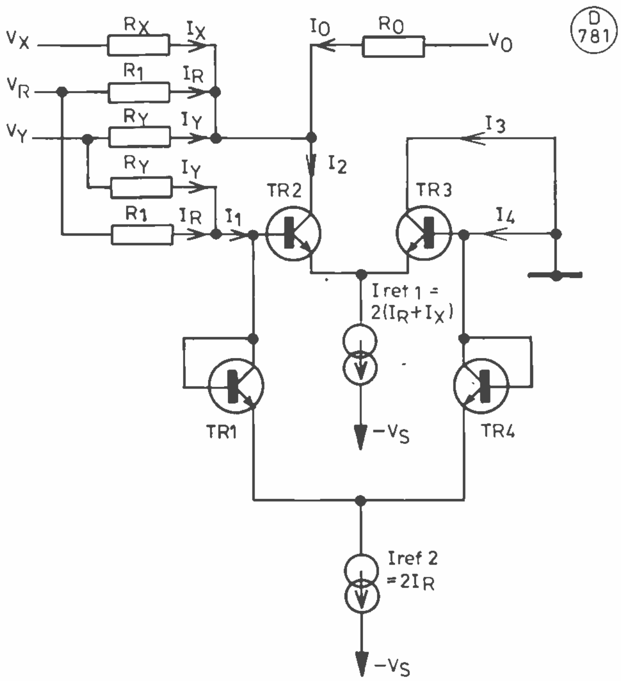
$$I_1 = I_y + I_R$$

$$I_3 = 2(I_R + I_x) - I_2$$

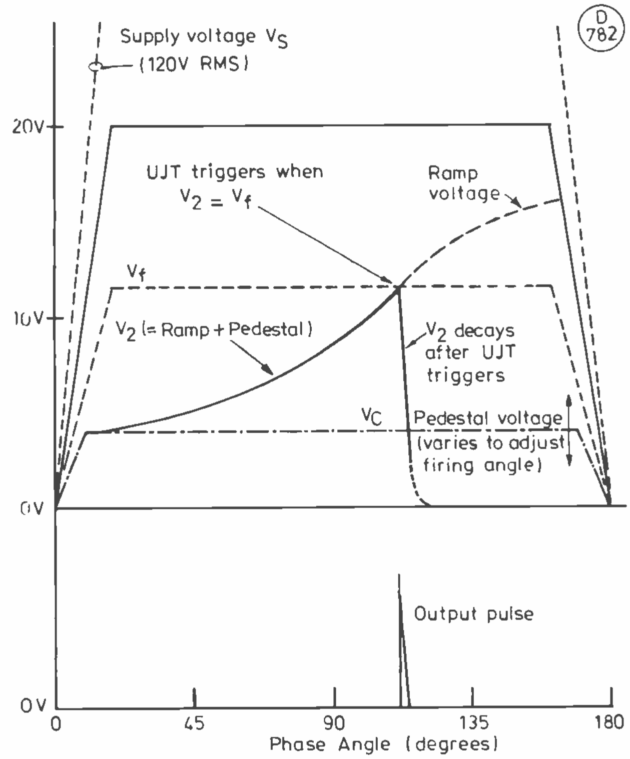
$$I_4 = 2I_R - I_1 = I_R - I_y.$$

Substituting these relationships in Equation 7 and carrying out a phenomenal amount of rearranging, we get:

$$I_2 = I_x + I_y + I_R + \frac{I_x I_y}{R} \qquad (8)$$



A3 A MODEL OF THE FOUR QUADRANT MULTIPLIER



A4 SINGLE (HALF) CYCLE WAVEFORMS FOR Fig. 2

but we already know that:

$$I_2 = I_x + I_y + I_R + I_o$$

and thus, substituting this in Equation 8:

$$I_o = \frac{I_x I_y}{I_R} \qquad (9)$$

Now $I_x = \dfrac{V_x}{R_x}$, $I_y = \dfrac{V_y}{R_y}$, $I_R = \dfrac{V_s}{R_1}$ and $V_0 = \dfrac{I_0}{R_0}$,

thus, substituting this in Equation 9:

$$\frac{V_0}{R_0} = \frac{\dfrac{V_x}{R_x} \times \dfrac{V_y}{R_y}}{\dfrac{V_s}{R_1}}$$

Re-arranging this we find that:

$$V_0 = \left[\frac{R_1 R_0}{R_x R_y V_s}\right] V_x V_y \qquad (10)$$

For a constant supply voltage, we may re-state the above as:

$$V_o = k\, V_x\, V_y$$

where k is a constant.

References

1. "SCR Manual." Various authors: General Electric Company (USA), fifth edition, 1972.
2. Clayton, G.B., "Operational Amplifiers". Butterworth, 1971.
3. Clayton, G.B., "Linear Integrated Circuit Applications." Macmillan, 1975.
4. Gilbert, B., "Analogue Multiplier". New Electronics, 10, 38.

A SIMPLE SPEECH PRE-AMPLIFIER

D. G. Blake, Tech(CEI), G3MWV

Table of Values
Fig. 1

R1 = *see text*	C2 = 0.22 μF
R2 = 47K	C4, C6 = 47 μF tant.
R3 = 100K	C7 = 10 μF tant.
R4, R5 = 330R	RFC1 = 5 μH VHF choke
C1, C3, C5 = 1000 pF disc	TR1 = BC149

A number of Oriental grey boxes have a low sensitivity microphone input circuit. This becomes very apparent when replacing the standard hand microphone with a high quality desk unit such as the Kenwood model MC-50. On most transceivers the mic. gain controls are set to maximum and it is necessary to talk quite close to the microphone, for full modulation.

To overcome this problem a simple pre-amp as shown in Fig. 1 has been incorporated into the author's transceiver input circuit. It was built on a small section of matrix board using very short leads.

The input impedance being 50K ohms, the output can be adjusted between 500 ohms and 2K ohms, R1's value should be selected to match the microphone input impedance of the transceiver, *i.e.* 600 ohms for the Trio TS-700 series. Note the liberal use of RF decoupling capacitors.

The frequency response of this pre-amp is excellent, being nearly flat from 70 Hz to 20 kHz, the frequency response of the transmissions being controlled by the normal roll-off audio bandpass of the transceiver in use. Local stations say that this pre-amp gives natural voice characteristics on G3MWV's transmissions using both FM and SSB.

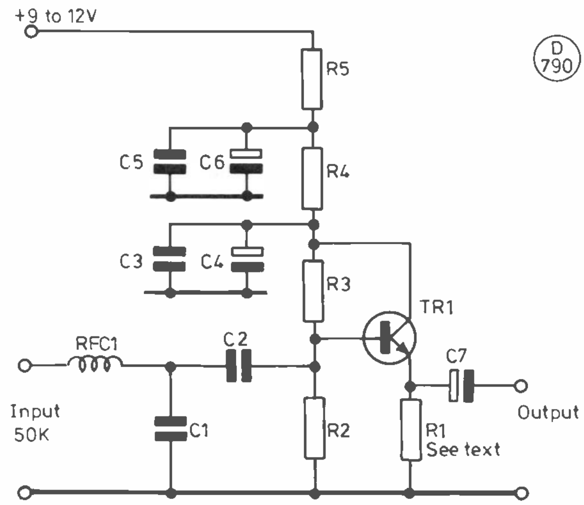


Fig. 1

An engineer at the BBC's monitoring centre at Caversham checks the tuning on one of the Racal RA-1792 HF receivers used for listening to Polish news broadcasts.

Equipment Review

THE ICOM IC-730 TRANSCEIVER

THE **Icom IC-730** HF bands transceiver is primarily aimed at the mobile market in competition with the Yaesu Musen FT-707, reviewed in the November, 1980 issue of the *Magazine,* and the Trio TS-130S. It can be directly connected to the car battery and for home use, an AC Power Supply is available.

Packaging and Accessories

The equipment received consisted of the transceiver with hand-held microphone type **IC-HM7**, the AC PSU type **IC-PS 15** and the desk microphone type **IC-SM5.** The manufacturer's packings were in the usual cartons with expanded polystyrene supports, these in turn packed in a single carton by *Messrs. Thanet Electronics Limited* and safely delivered by Securicor Limited.

The Manuals

The transceiver manual is a 29 page, high quality A4 size production, logically starting with the specifications and descriptions of the IC-730's functions and features. The installation section is clearly illustrated with numerous diagrams and the following one describes, in detail, the functions of all the operating controls. The fifth section covers operating instructions and includes diagrams showing how to connect the matching IC-2KL linear amplifier. The circuit description comes next followed by inside views of all the various boards with all the important components and adjustment points identified. There is a section on trouble-shooting followed by a block diagram. The last page shows the numerous accessories that are available, if required.

Icom provide a separate, double-sided, fold-out schematic diagram with all components identified with values and many semi-conductor terminal voltages are indicated. Finally, there is an A1 size board layout sheet identifying every component on each of the p.c.b.'s, including pin-out diagrams of the semiconductors. The AC PSU manual is a leaflet containing the specifications, connexion information, schematic and block diagrams.

Descriptions

241mm. wide by 94mm. high and 275mm. deep, with the tuning knob projecting another 25mm., the **IC-730** is virtually identical in size to the Yaesu FT-707. A retractable foot tilts up the front panel to 42mm. above the operating surface.

There are 25 selectable functions on the front panel. Below the bright green, six-digit frequency display is the tuning knob. No analogue readout is provided, but the skirt of the tuning knob is divided into 50 divisions. Immediately to the right are six push buttons and from top to bottom these are:— Normal/Split, for either transceive or split frequency working; VFO selection; 1 kHz, 100 Hz and 10 Hz tuning rates, which equate to 100 kHz, 10 kHz and 1 kHz frequency change per tuning knob revolution, and the Dial Lock button. This latter disconnects the VFO knob electronically.

On the extreme right the top slide control is the IF Passband Shift. The 12-way band selector is immediately underneath and is continuously rotatable. At the bottom right is the RIT knob with its selector button to its left. RIT on is indicated by an adjacent LED. To the right of the meter is the function push button. The S-meter function is automatically selected on receive mode. On transmit mode, either ALC or relative power output can be selected. A red LED comes on when on transmit. To the left of the meter is the Mode switch, immediately above the Power push button. The two buttons to the left of the tuning knob are Frequency Write-in and Memory Set/Recall. The five buttons below these from left to right are:— Transmit/Receive, VOX, Noise Blanker, AGC Time Constant and Preamplifier Selection. At the bottom left is the eight pin Microphone Socket and next to it the Headphone jack socket. The two concentric controls under the buttons are Mike Gain/RF Power and RF Gain/AF Gain.

On the top of the case is a removable access cover under which are six more "pots" and three slide switches. The "pots" are for CW Sidetone Level, VOX Gain, VOX Delay, Anti-VOX, PLL Reference Oscillator fine adjustment, and the SWR Set control. The slide controls cover Speech Compressor on/off, SWR Switching and the selection of Narrow or Wide band noise blanking. The eight sockets on the rear panel are for 13.8 volts DC power input, Antenna, Earth, Key, Accessories, External Loudspeaker, External ALC input and Memory Back-up.

The AC PSU measures 180mm. wide by 110mm. high and 290mm. deep. A tilt-up foot is provided, but no on/off switch, this being accomplished from the transceiver. At the back are the Fuse, Earth terminal and flying leads to the house mains and the **IC-730.** Power on is indicated by a red LED on the front panel.

Circuit Description

The amateur bands covered are the "old" 3.5 to 28 MHz ones and the three new, WARC ones at 10, 18 and 24 MHz. As supplied, the transmit function was disabled on the new bands. The reviewer is always very keen to see how the new generation of receivers and transceivers compare to earlier, valved gear and how the designers cope with the conflicting requirements for high sensitivity, strong signal handling and the "Russian Woodpecker." *Icom's* approach to the dynamic range problem is to feed the incoming signal straight to the first, double-balanced diode mixer, *via* one of six Low Pass Filters and one of eight Band Pass Filters. An optional preamplifier stage can be switched in between these two filter networks. The first IF is 39.7315 MHz and there are third overtone crystal filters before and after the 3SK81, dual-gate MOSFET IF amplifier stage. Some 39 MHz signal is taken after the second filter to the noise blanker circuit which comprises amplifying stages, a noise detector and blanker gate control. Its AGC time constant can be selected to deal with either wide or narrow band noise.

The second local oscillator is a VXO. Its frequency is varied through a digital-to-analogue converter by the output signals from a Central Processing Unit — CPU — between 30.71901 and 30.72000 MHz in 10 Hz steps, and between 30.7181 and 30.7200 MHz in 100 Hz steps. The resulting second IF is 9.0115 MHz and this signal is fed through the AM crystal filter. Optional SSB and narrow CW filters can be fitted, selectable by the front panel mode switch. They were fitted in the review model. The 2nd IF signal is amplified before being fed to the IF Passband Shift circuit, where it is mixed with a 9.4665 MHz LO to give a 455 kHz signal. This is then routed to either a ceramic filter for AM reception, or to a mechanical filter for SSB and CW modes. The 455 kHz signal is re-mixed with the 9.4665 MHz LO to get back again to 9.0115 MHz. If shift of *plus/minus* 1.5 kHz is achieved by varying the frequency of the 9.4665 MHz LO. When the **FL-30** crystal filter is fitted, the IF Shift becomes a Pass Band Tuning system.

SSB and CW signals are demodulated in a product detector IC, using separate crystal oscillators for USB, LSB and CW modes. AM detection is by diode rectification. The AF signal is routed through an active Low Pass Filter to cut out unnecessary higher audio frequencies. AGC voltage is derived from part of the IF signal which is rectified, amplified and applied to the 39 and 9 MHz IF stages. Short and long time constants can be selected.

The transmitting chain commences with the **HM-7**, hand-held dynamic microphone which includes a single stage amplifier to provide the required 120mV AF to the IC-730's speech amplifier IC. This IC incorporates the speech processor circuitry. The output is fed to the balanced modulator — *alias* product detector in receive mode — to produce a 9 MHz DSB, suppressed carrier signal in SSB mode. On AM and CW, the BM is unbalanced. The microphone output is also applied to the VOX stages. Semi-break-in CW operation is achieved through the VOX control stage and an 800 Hz sidetone signal is fed to the receiver AF output IC for monitoring purposes.

The whole point of a transceiver is to use as many stages as possible in both receive and transmit functions, so much of the Tx chain of the **IC-730** is the reverse of the Rx one. In Tx mode, a buffer amplifier is introduced between the 9.4665/9.0115 MHz mixer and the crystal filter in the 9.0115 MHz IF chain, this buffer being keyed on CW by a switching transistor. Another buffer amplifier is used in the 39 MHz IF and this is ALC controlled. The 1st Rx DBM and BPFs are used in the Tx chain, the signal then being fed to the broadband PA stages. The output transistors are a pair of 2SC2097s in push-pull, with negative feedback. Any undue rise in the temperature of these is detected by a thermal switch which controls the speed of the cooling fan. The VSWR is detected and, if high, the ALC voltage is increased to effectively reduce power to a safe dissipation level. The panel meter can be switched to read either relative power output or ALC level, from the front panel, or VSWR by means of slide switch below the top access cover on the case. No means of measuring the final transistors' collector voltage or current is provided.

The CPU IC in the Logic Module is a μPD650, 4-bit microcomputer and processes date received from the up/down signal detection control, dial clock control, tuning rate and input/output control circuits. A photochopper, directly connected to the tuning knob, generates the dial clock signals. The CPU puts out the necessary output signals to control the tuning steps, digital display, operating frequency etc., from data received from the function switches.

The Phase Locked Loop LO operates at 13.667 MHz and is tripled twice to 123 MHz. The VCO circuit covers 132 to 139 MHz, the difference mixing product being 9-16 MHz. This signal is fed to the programmable divider in the TC9125 PLL IC and divided down to 10 kHz and compared with the 10 kHz signal derived from the 9 MHz crystal oscillator. The progammable divider is controlled by the frequency data from the CPU. The VCO output is fed to a divide-by-ten circuit to result in a 13.2 to 13.9 MHz signal in 1 kHz steps. RIT is achieved by VXO control of the 13.667 MHz CO by a varactor diode.

The **IC-730** incorporates a Premix Unit in which the 13.2 to 13.9 MHz signal from the PLL unit is mixed with a further LO signal selected by the band switch, this mixer providing the appropriate 1st LO frequency. All signal switching is done with 1SS53 diodes.

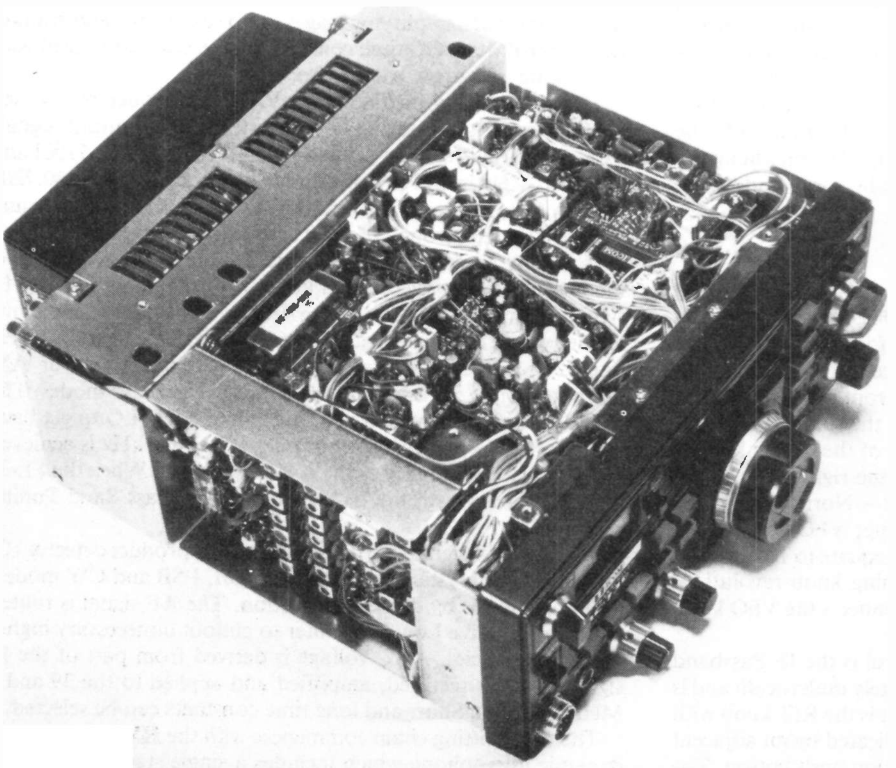
Construction

The **IC-730** is another masterpiece of miniaturisation. The top and bottom U-shaped covers are removed by undoing eight and four cross-head screws respectively. Underneath the top cover are the Main Unit and Detector Unit p.c.b.'s. This "layer" is on a tray that can be hinged open to gain access to the Logic Unit, Display Board, 2nd IF and 2nd LO Unit boards. Underneath the bottom cover are the Mike, Sensor, RIT, PLL, Premix Unit and BPF Unit boards. The RF Unit board is on the left hand side, viewed from the top front. Access to the LPF, Accessory and PA Units is gained by undoing another eight screws.

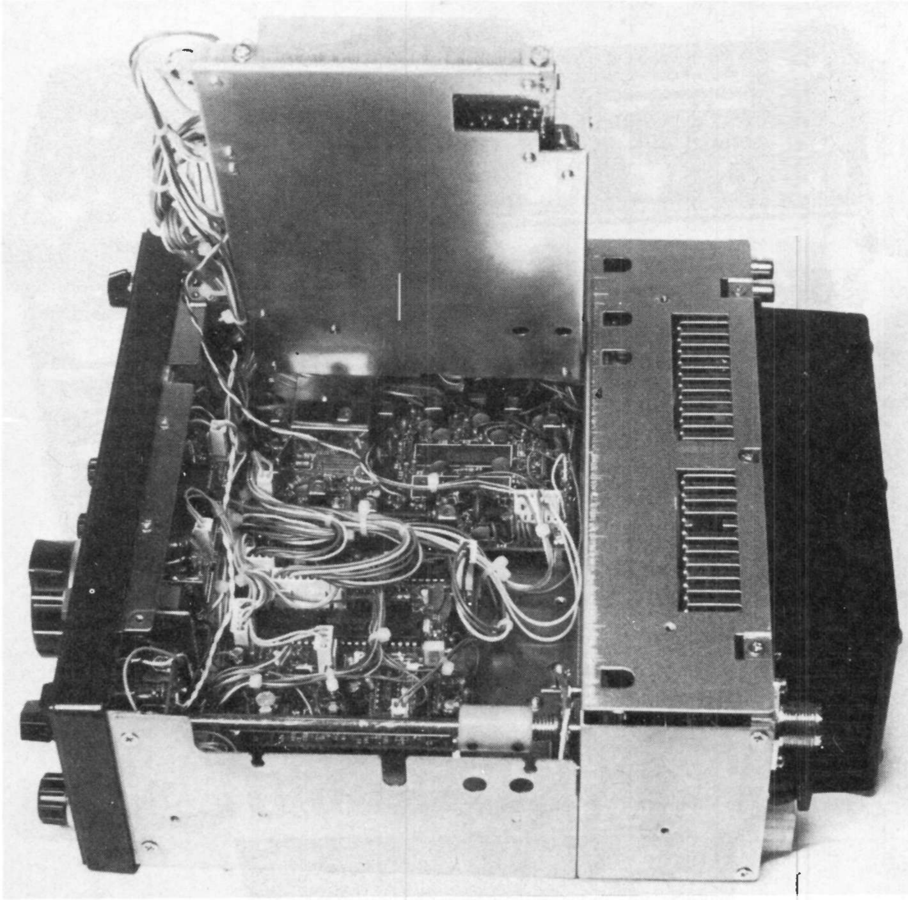
The p.c.b.'s are of SRBP material, rather than fibreglass. All components are clearly identified by white lettering. Inter-board connexions are by harnesses and numerous plugs and sockets. The Accessory socket on the rear panel is a 24-pin one but with only 11 active pins. It appears to be of the same pattern as *Maplin Electronic Supplies Ltd's* "Multicon" range, so more poles could be fitted, if required, and a mating plug and pins purchased.

Performance

The receiving function was first put through its paces. The S-meter scale is calibrated to S9, then plus 20, 40 and 60 dB. Tests with the Heath IG-42 signal generator revealed an exceptionally constant sensitivity over the eight amateur bands. In the AM mode, without the preamplifier, S9 was indicated when a 30μV signal, plus/minus one microvolt, was applied to the Antenna socket. In SSB mode S9 required another 4 to 6μV. Sensitivity across each band was absolutely constant. On the 24.5 MHz



Top view of the Icom IC-730 transceiver showing the Main Unit p.c.b. which accommodates the Tx mike amplifier, VOX and CW sidetone stages, the Rx AF stages and the common IF strip. At the rear left is the 455 kHz mechanical filter for SSB. The six "pots" for VOX, etc., are accessible through a trap door in the top of the case. The Detector Unit p.c.b. occupies the right-hand third of the area and the vacant space at the front, left corner is for the optional frequency calibrator marker. The RF Unit is mounted vertically on the left side and includes the Rx preamplifier, first mixer and 39.7315 MHz first IF stages.



Underneath the Main Unit p.c.b. are the Logic Unit board, nearest the bottom of the picture; and the Second IF Unit p.c.b. with spaces for the optional SSB Passband Tuning and Narrow CW filters (added later) to the right rear. The Second Local Oscillator board is under the screening box at the left.

band, 30μV gave an S9 indication, 180μV S9+20 dB, 910μV S9 + 40 dB and 15mV S9 + 60 dB. This corresponds to steps of 15.6, 14.1 and 24.3 dB respectively. The gain of the preamplifier stage averaged out at 9.5 dB.

With so many oscillators in operation, it would be a miracle not to find a few "birdies" in some bands, so a careful tuning session was undertaken across all, eleven bands, using a screened dummy load in place of an antenna. No *spurii* were noticed on the 10 and 24.5 MHz bands. A total of sixteen were discovered in the others, four of which were not in U.K. amateur allocations, though. Most of these were quite insignificant in level and would usually be masked by general band noise and traffic.

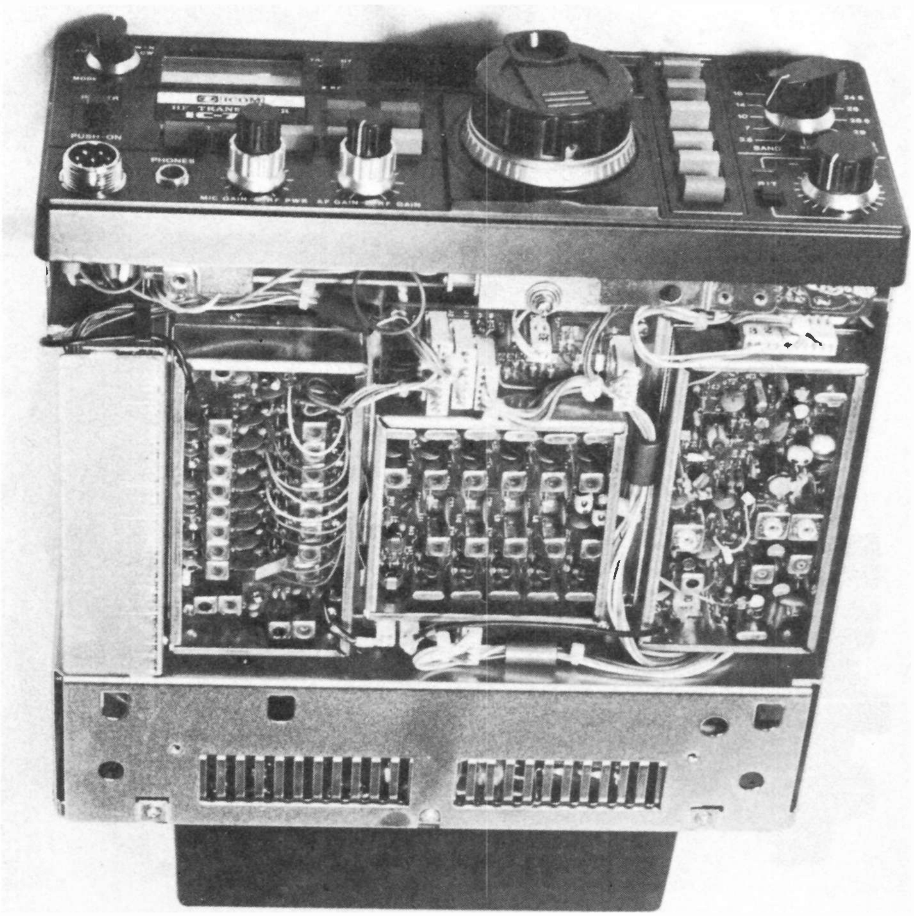
The antenna system used was a makeshift contraption made from half the driven element of a tri-band beam, set vertically about five feet over the lawn and with three sets of radials for the 14, 21 and 28 MHz bands. This was matched through an *LAR Modules Limited* "HF Omni-Match" ATU. This set up could also be tuned up on the new 10 MHz band with surprisingly good results. The first impression when using the 10 Hz tuning rate was one of poor selectivity until it was realised that one turn of the VFO knob was only a change of one kilohertz. Some weeks after receiving the transceiver, the narrow CW and passband tuning filters were added. The former has a − 6 dB bandwidth of 600 Hz and a 6/60 dB shape factor of 2.5 and is an essential accessory for serious CW operation in crowded bands.

There are still a number of American amateurs using AM in the 29 MHz band and these came in very well on the AM detector. Also, FM signals can be acceptably slope-detected. The speech quality on both AM and SSB was remarkably good from the little loudspeaker in the lid of the **IC-730**. The volume was quite adequate and the AF stage can deliver two watts to a bigger, external 'speaker for car use, if necessary.

There are two VFOs selected by a front panel push button and the tuning range *per* band is 700 kHz. Split frequency operation anywhere in any one band is possible by use of the NOR/SPT button. In the SPT position, with the 28.5 MHz band selected, for example, one could transmit on VFO B on 28.405 MHz and listen on VFO A on 29.095 MHz. Pushing the VFO Select button would reverse this. The frequency of the unused VFO remains fixed at whatever frequency it was on before switching to the other one. This is a very useful feature when one wants to keep monitoring a particular frequency from time to time. VFO A has one memory. The particular frequency is first dialled up and then the MEMO button pushed in. The frequency is written in by depressing the WRITE button, then the MEMO button can be released. A different frequency can be retained in the memory on each band. The manual states that the RIT control has a range of plus/minus 800 Hz but it was found to be plus/minus 1.7 kHz, which is no bad thing.

The noise blanker dealt very effectively with ignition-type pulse interference and with some other kinds of electrical QRM. In many cases, an S9 noise level, which completely masked weak signals, was virtually wiped out by use of the noise blanker. The manual suggests that the noise blanker in wideband mode, ". . . will work for woodpecker's noise . . .". When these OTHR pulses were actually in the band being used, some 30 dB reduction was obtained, making an otherwise impossible situation, tolerable. However, these pulses can be heard as a background over large parts of the band at a lower level and the blanker seemed to have little effect on these. It is possible for very strong signals to operate the noise blanker themselves, when wide bandwidth is used, causing distortion. However, if a signal is that strong, the blanker need not be used.

As supplied, the **IC-730** has an IF Shift control. This moves the entire passband up or down about the nominal IF. It is very useful in removing splatter from a signal on one side, but you can bring up similar interference on the other side. With the *FL-30* filter installed, the IF Shift becomes Pass Band Tuning in which the skirt of the filter nearest the BFO frequency stays where it is, and the PBT control narrows the actual bandwidth continuously by up to 800 Hz.



Bottom view. The boards from left to right are the Bandpass Filter Unit, Premix Unit and PLL Unit, shown here with the clip-on screening covers removed. The screw for altering the "feel" of the tuning knob can be seen on the bottom below the knob and can be accessed through a hole in the bottom cover of the case.

The specification states that on SSB and CW, the sensitivity is better than $0.3\mu V$ for a 10 dB/(S + N)/N ratio. With a 2.4 kHz bandwidth, this equates to a noise figure of about 6 dB which is considerably better than what is generally deemed to be usable on the HF bands. Dynamic range is also very important and can be calculated knowing the intercept point and receiver noise floor figures. The IP of the first mixer in the **IC-730** is + 18 dBm. The noise floor. N_o, without the preamplifier and assuming *Icom's* sensitivity figure to refer to the with-preamp. case, would be − 124 dBm. The spurious-free dynamic range, DR, can be calculated from DR = $\frac{2}{3}(IP - N_o)$ and yields a figure of 94.7 dB. The other important parameter is the maximum input power, Pi, which will produce 3rd order IMD products just equal to the noise level, this being given by $P_i = \frac{1}{3}(2IP + N_o)$. In this case, the figure is − 29.3 dBm, or approximately $750\mu V$ across 50 ohms. In the model tested, $750\mu V$ signal would be indicated by S9 + 40 dB on the S-meter scale, to put matters into perspective. Calculations apart, what really counts is how the IC-730's Rx performed in the role of amateur bands receiver and this can be summed up in one word, "Impressively."

Next the transmitting function was investigated, first tests being to measure the power output on the various bands. For these tests, a 50 ohms dummy load was used but, although the specified output impedance is given as 50 ohms, the only frequency where a near 1:1 VSWR was indicated between transceiver and load was 3.4 MHz. Accordingly, the ATU was used. On each of the eight bands, the power output was constant over the whole of the particular band and the results are shown in Table 1. The loss through the ATU at 3.4 MHz was 6%, so it may be assumed that the actual power outputs are some 6% higher than indicated.

The claimed carrier suppression in SSB mode is given as, "More than 50 dB below peak output," and as supplied, this was achieved. Judicious twiddling of the two carrier balance controls inside improved this to − 62 dB in the USB mode at the expense of a slight degradation on LSB. This latter figure represents a mere 63 *micro watts*.

The VOX circuits were very easy to set up following the instructions in the manual. On both SSB and CW, operation was very clean. Tests with both local and distant stations verified that the AF speech processor very effectively increased the talk power without introducing distortion. As observed on the station monitoring oscilloscope, the fan noise did come up somewhat in pauses in the speech, and the increase in average signal was confirmed. The CW keying wave form was text book stuff and quite click and thump free. On another station receiver, the first indication of a signal was when one actually tuned it in; there just were not any clicks to indicate its presence way out of the passband.

The RF Power control was very smooth and gave a 10 dB power reduction in perfect agreement with the 10 to 100 watts figures quoted.

Although now primarily a VHF operator, the reviewer has always been a keen DX hunter on the HF bands, most of the available countries having been long since confirmed. Consequently new ones are hard to find and likely to be DX-peditions which thousands are also trying to work. With the rather crude antenna system described, however, a couple of welcome, all-time new countries were worked on 20m. CW: ZK2AD, who gave a generous 599 report from Niue, and ZL4PO/C on Chatham Is., who offered 559. The respective pile-ups were cracked after no more than half a dozen calls, so there is no doubt that the **IC-730** delivers the goods.

Although it can be of little serious interest for HF band users, AM mode is included for transmission as well as reception. The manual does not give any proper guidance on setting up the

Table 1. CW power output from the IC-730 into a 50 ohms dummy load. For matching purposes, an aerial tuning unit was used which introduced a loss of about 6% at 3.4 MHz, so the above figures are a little conservative.

Frequency MHz	Power output Watts
3.65	93
7.05	89
10.12	68
14.17	97
18.12	82
21.22	104
24.94	131
28.60	115

IC-730 for this transmission mode. Without a 'scope, it would be difficult to get it right, but once done, the picture revealed a perfect AM signal, more than adequate to tell the illegal AM CB-ers to clear off the lower end of the 10m. band!

Use with a VHF Transverter

Icom provide an accessory, the **IC-EX205** TRV Unit, enabling the **IC-730** to be matched to a VHF or UHF transverter requiring a 28 to 30 MHz driving source. All the accessories come with a little instruction manual covering installation and, where necessary, setting up. The descriptions and illustrations are quite clear but installation of the **EX205** proved to be a very fiddly job as one has to delve inside the LPF Unit. All it is is a simple, two-pole changeover relay and a few plugs and sockets. When the transceiver is switched to the 10m bands, and pins 10 and 11 shorted together at the accessory socket, the relay is activated and re-routes the antenna lead from the SO-239 socket to the ALC socket instead, at the same time disabling the main PA stage.

The low level 28 MHz output is just 150mV across 50 ohms, which is *half a milliwatt* and insufficient for any popular transverter known to this reviewer. The Microwave Modules range can be quite easily modified to work from this tiny signal, however, but those with "Europa" type transverters are faced with the problem of getting over 20 dB more gain. A possible solution is to run the **IC-730** at its lowest, 10 watts level and feed the Tx output through a 20 dB attenuator. A changeover relay is needed to route the IC-730's antenna socket to either the transverter's Rx output, or its Tx input through the attenuator. If 12v. relays are used for this and for the aerial change over, they can be powered from the 13.8v. at the accessory socket. This socket also has relay contacts brought out.

The transceiver was used with a Datong 2m. converter, as reviewed in the August, 1981 issue of the *Magazine* and, with proper attention to gain control settings, proved to be a near "bomb-proof" combination. It is intended to box up the interface unit and use the **IC-730** Datong converter/Europa transverter combination as the main VHF station.

Power Supply

The **IC-PS15** AC PSU was originally intended for the earlier IC-720 transceiver which it matches in height. It accepts mains voltages between 100 and 240 at 50 or 60 Hz and uses a large, standard 550 VA transformer with two, tapped 117v. primaries. The entire supply current is regulated, the output voltage being set by a potentiometer inside the case. The pass transistors are two 2SD797s in parallel mounted on a large heatsink which forms the rear end of the unit. Regulation is excellent with only a 50mV change in output voltage between receive current and full power drain on transmit; a regulation of 0.36%.

Conclusions

One minor disadvantage with this transceiver, controlled as it is by a microcomputer, is that on switching off the power, all the memories are lost. For example, if the set were tuned to 14.285 MHz and switched off, when switched on again the display would read 14.089.5 if on USB mode. In the mobile installation, this can be overcome by connecting the car battery to the Memory Back-up terminal on the rear panel when frequencies in VFOs A and B, and the Memory will be retained, even with the set switched off. For base station use, *Icom* offer the **BC-10A** accessory, which is powered from the house mains. The transmit button is quite close to the power switch and the reviewer has switched the whole lot off once or twice, instead of switching to transmit, thus losing all the frequencies. That apart, the **IC-730** is very easy to drive.

Icom Inc. obviously have very innovative designers who seem to think their designs through more thoroughly than do some of their rivals. Typical examples are the transverter drive facility, and provisions for operating the matching IC-2KL amplifier and IC-AT500 Automatic Antenna Tuning Unit. The **IC-730** has an impressive specification and excellent all round performance, so can be throughly recommended both as a home station and as a compact mobile transceiver.

N.A.S.F.

THE 'TRUE' MEASUREMENT OF MORSE SPEED — WORDS PER MINUTE, OR DOTS PER SECOND?

I. T. WOOD, G4MCN

THERE is an appreciable difference in the speed at which randomly generated letters and plain text messages are sent if the unit of measurement is 'words per minute'. For example, it is necessary to receive random five letter groups at least at '15 w.p.m.' in order to take plain English text at '12 w.p.m.' Conversely, it is necessary to send random groups at only '10 w.p.m.' in order to acquire the correct pace for sending plain language at '12 w.p.m.' The reason for this difference is due to the decidedly non-equal use of each letter of the alphabet made by the English language. The unit of measurement 'words per minute' is ambiguous; a more appropriate unit would be 'dots per second'. In perfectly spaced morse a dot length of 0.1 seconds, or 5 dots per second, is equivalent to a plain language transmission at 12 w.p.m. and also satisfies the morse test requirement to send fifty numerals in one-and-a-half minutes.

Whilst preparing for the morse test for radio amateurs by listening to local and foreign slow morse transmissions and also to computer generated signals, appreciable differences have been noted between passages sent at what purport to be the required twelve words per minute.

Randomly generated characters have the advantage that the reader cannot anticipate subsequent letters. However, after some time training the ear to coded information, the listener is likely to have difficulty when interpreting plain language text. An initial part of this problem is undoubtedly due to his allowing the mind

A	•—	5	N	—•	5
B	—•••	9	O	———	11
C	—•—•	11	P	•——•	11
D	—••	7	Q	——•—	13
E	•	1	R	•—•	7
F	••—•	9	S	•••	5
G	——•	9	T	—	3
H	••••	7	U	••—	7
I	••	3	V	•••—	9
J	•———	13	W	•——	9
K	—•—	9	X	—••—	11
L	•—••	9	Y	—•——	13
M	——	7	Z	——••	11

The dot lengths of the letters of the alphabet

Fig. 1 a

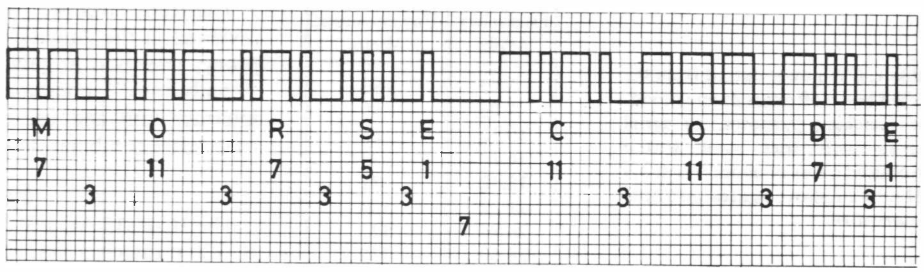


Illustration of the number of dot units in the letters, inter-letter and inter-word spacing of the phrase 'Morse Code'

Fig. 1 b

D 642

to read the letters he has written rather than copy what is coming. Less obviously, randomly generated character groups tend to have a more complex dit-dah structure than plain language words and so allow the mind a longer time to interpret them. For example, in perfectly spaced morse — in which a dah is equal to three dots, the inter dit-dah space is one dot, inter-letter spaces are equal to three dots, and inter-word spaces are seven dots long — the random letter group FXZKC has a total length of 63 dot units; the word "teeth" has the same number of letters but is only 27 dot units long. Is this not untypical example, if the speed of transmission is measured in characters per second (12 w.p.m. is equal to 60 characters per second) it might appear that in order to cram five random letters into five seconds it would be necessary to more than double the speed of dot transmission relative to that needed to send the word "teeth". Alternatively, if the dot speed is kept constant, the random combination is sent over a time 63/27 longer than the plain word, so allowing the mind considerably more time to transform the sound into the characters.

The average dot length of twelve groups of five randomly generated characters is easily calculated. If all twenty-six letters of the alphabet are analysed into their 'dot lengths', for example:

'A' (. –) is $1+1+3 = 5$ dots long, and

'Z' (– – . .) is $3+1+3+1+1+1+1 = 11$ dots long,

then since random generation of letters implies by definition that each letter has an equiprobable chance of being selected, the average random letter will be 8.23 dots long. The average text of twelve five random letter groups will thus be

$12\times5\times8.23+12\times4\times3+11\times7 = 715$ dots long, allowing for the correct inter-letter and inter-group spaces. Transmission of this 60 letter code in one minute will result from a dot length of 0.084 seconds. The average length of a random letter is thus 0.69 seconds (8.23×0.84).

It is well known, and used by Morse when designing his code, that the English language does not use the letters of the alphabet with equal preference and that the letters E,T,A,O,N are the most frequently occurring — four of these letters have the simplest dot-dash structures. A frequency count was carried out on an 1800 character extract from a narrative section of an English novel and the two letters E and T, both single symbol morse characters, were found to account for almost one quarter of the total of 1800 letters in the sample. Three quarters of this total comprised the ten letters E,T,A,O,S,N,H,I,R,D which occurred 242, 171, 149, 122, 116, 111, 88 and 77 times respectively. All these letters have relatively simple dot-dash structures. By assigning the dot length appropriate to each letter in the sample it is found that the average length of a letter in a plain language text is 6.02 dot units long. Hence, allowing for inter-letter and inter-word spaces, a sentence comprising twelve plain language five letter words will have a length of

$12\times5\times6.02 + 12\times4\times3 + 11\times7 = 582$ dot units.

When these sixty letters are sent in one minute the corresponding length of a dot is 0.103 seconds; the average length of a plain text letter is then 0.62 seconds (6.02×0.103).

A similar analysis of the numerals shows that in order to send ten groups of five digits in one-and-a-half minutes the length of the dot unit must be 0.098 seconds.

An appropriate time setting for the length of a dot when preparing for the Post Office morse test is thus 0.1 second. This setting will have a true rate of 5 dots per second (five dits and five spaces) and is equivalent to plain text sent at 12 w.p.m., this rate also corresponds to the required speed for numerals. It is important to note that this dot rate will generate only 50 random letters per minute; in such groups there will be many of the more complex morse characters than are found in plain text and also a dearth of short bursts of E's and T's that occur so often in plain language. Hence it is easier to read than plain language and in order to receive text at 12 w.p.m. it is necessary to be able to interpret random letters sent at 15 w.p.m. Conversely, it is necessary to send random letter groups at only 10 w.p.m. (50 random letters per minute) in order to achieve the same pace of sending that is equal to plain language of 12 w.p.m.

In contrast, a test sentence such as "she has sixteen hissing geese" when sent at the correct pace, with a dot length of 0.1 second, represents a character speed — over that phrase — of almost 16 w.p.m. A most useful learning exercise is to acquire a computer generated tape in which only characters from the ten most frequently occurring letters are randomly selected.

Whilst the 'words per minute' unit of measurement has the virtue of apparent simplicity, it is obviously ambiguous and a more appropriate unit of measurement would relate transmission speed to 'dots per second'.

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"BEN"—THE LITTLE TRANSCEIVER FOR TEN, PART II

CONCLUDING THIS LOW-COST TRANSCEIVER FOR THE NEW 10 MHZ BAND WITH A DESCRIPTION OF THE TRANSMITTER SECTION

REV. G. C. DOBBS, G3RJV

I WONDER how many radio amateurs are aware that the word "amateur" comes from the same Latin root as the French word "amour". Sadly in popular usage "amateur" often seems to imply someone who is not so skilled as a professional exponent of the particular subject. What it really means is someone who does something for the love of it. Obviously there must be radio amateurs who love their expensive commercial equipment; they possibly polish it lovingly and display it with pride, inviting their friends to view the box they use "to talk to the world". But it is the home constructor who has the real love affair with his equipment. He builds up the relationship slowly with soldering iron and wire cutters, nurses it through teething troubles, is patient about its little shortcomings. The homemade rig is his friend: it might not be beautiful, but he loves it.

Sorry . . . I was getting carried away. Back to Ben. The first part of this article (*S.W.M.,* Jan 1982) described the project in outline and gave details of the receiver portion of this project. The transceiver is a superhet design making use of the inexpensive TV colour burst crystal with a frequency of 4433 kHz as an intermediate frequency, and is well suited to be a first superhet transceiver project for a constructor. The transmit circuits are relatively simple and are shown in the circuit diagrams of Figs. 1, 2 and 3.

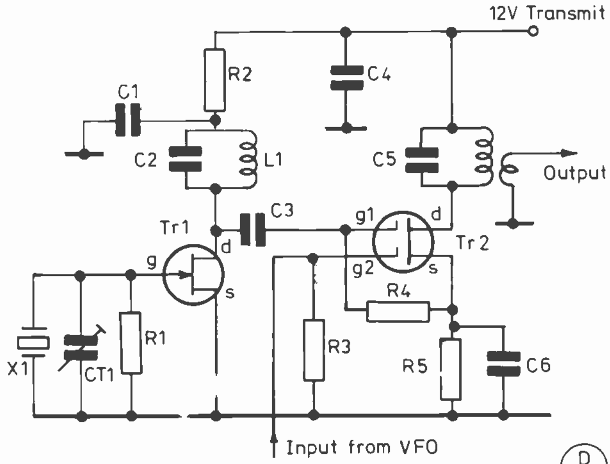


Fig. 1 TRANSMIT MIXER CIRCUIT

The Circuits

Fig. 1 shows the transmit mixer circuit. The VFO which is common to both transmitter and receiver sections, was described in *Part I.* It has a frequency coverage of 5.667 MHz to 5.717 MHz, that is 4433 kHz below the desired band range. Hence the transmitter input has to be mixed with a 4433 kHz signal so that the sum of this signal and the VFO signal produces a transmitter input on the band. TR1 is a simple crystal oscillator which follows the design of the oscillator in the receiver BFO. L1 and C2 form a tuned circuit at 4433 kHz giving the drain of TR1 an RF load. CT1 is included across the 4433 kHz crystal, X1, so that it can be pulled slightly to provide a matching transmit and receiver frequency for correct transceive operation. The mixing is performed by a dual gate MOSFET, TR2, which is one of the cheap equivalents to the 40673 sold by *J. Birkett* of Lincoln. The output from the crystal oscillator is coupled through C3 into gate 1, and the VFO signal is fed into gate 2. The resultant outputs appear at the drain of the dual gate MOSFET and the sum of the two signals, on the required band, is tuned by L2 and C5. A small winding on L2 couples the signal to the main transmit board.

The main transmit board circuit is shown in Fig. 2. It has three stages: a pre-driver, a driver and the power amplifier. The two driving stages are tuned and both are keyed. This may seem a fussy circuit for a simple QRP transmitter, the transmit section with the devices recommended here is capable of some 3 watts DC input power, but even in the simplest transmitters sometimes "belt and braces" can be helpful. Both driver stages work in Class-A and are based upon a circuit by Wes Hayward, W7ZOI, in the *Ham Radio* for November, 1974. It is useful to have an extra stage thus reducing the required gain per stage as an aid to stability. Also Class-A stages have the advantage of maintaining linearity and although this is a CW-only transmitter, spurious components in the signal are greatly reduced in a linear circuit. Filtering the output of the mixer with a single tuned circuit (L2/C5) is technology at its lowest! So the added protection of two linear driver stages is worthwhile and tuning their outputs, as in this circuit, is also wise.

Tuning both driver stages and having a fixed pi-network (L3/C7/C8) at the output of the PA means that the bandwidth of this amplifier chain is somewhat restricted, but in a band 500 kHz wide this is hardly a problem. In practice the difference in output over the entire band was hardly measurable. The PA is delightfully simple, a single transistor, TR3, with an RF choke load feeding a fixed pi-network to give a 50 ohms output. Quite a selection of transistors was tried for TR3, the final choice falling

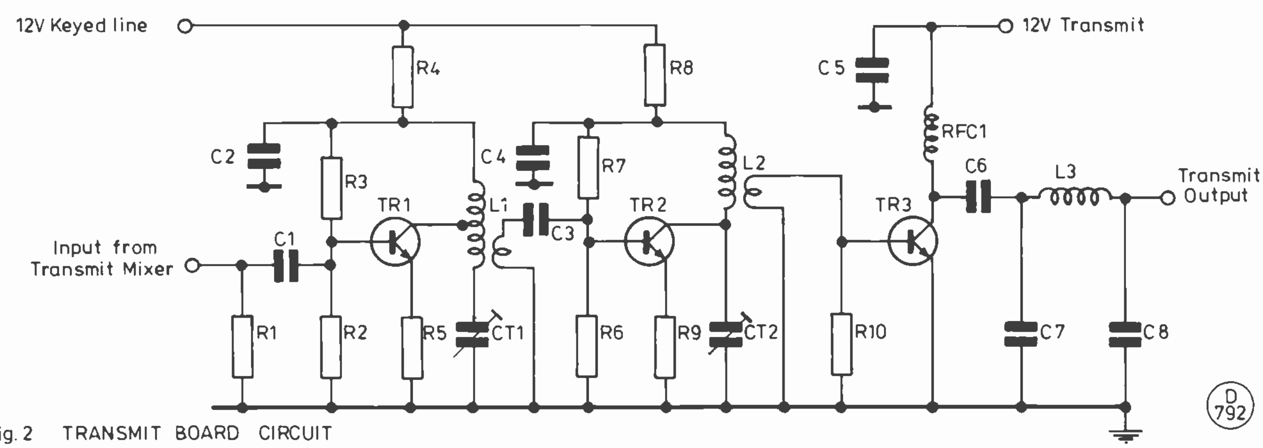


Fig. 2 TRANSMIT BOARD CIRCUIT

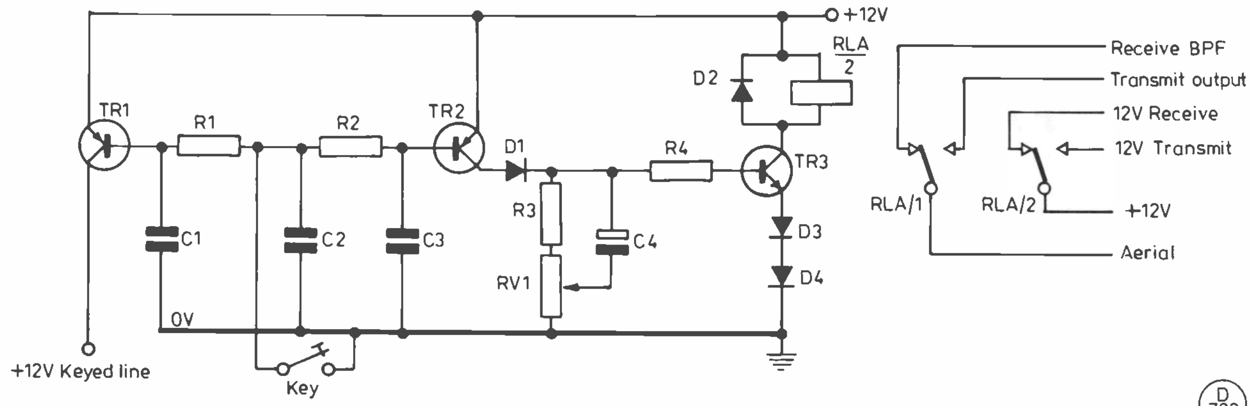


Fig.3 CHANGEOVER CIRCUIT

to an unknown junk box type; a fuller description of the devices suitable for TR3 is given later in the section on building the transmit board.

Although it would be simpler to have manual switching from transmit to receive on the transceiver, semi-break-in is so easy to add that it was used for Ben. Full break-in with instantaneous change over, and "listening between the dits" is obviously better, but full break-in circuits to avoid PA stage damage and nasty plops in the audio involves complex sequencing which can be a minefield to the unwary. The Change-Over Circuit of Fig. 3 is one that I have used many times and has appeared over and over again in QRP transmitter circuits. TR1 and TR2 are a couple of *pnp* transistors used as DC switches controlled by the key through R1 and R2; C1, 2 and 3 help to provide a little shaping to the keying to give a pleasing transmitted note. TR1 gives the keyed 12 volts for the transmit driver stages. TR2 switches TR3, which is a relay driver. TR3 has a time delay circuit in its base, formed by R3, RV1 and C4. The result is that when the key is pressed the relay switches in but on release there is a slight delay before it falls back again. This gives a small time hold to prevent the relay clattering in and out with the keying.

RV1 is adjusted to a desired time delay which ensures that when the operator stops keying at his usual CW speed, the change-over can occur, as the relay falls out. For those concerned about the number of diodes around TR3 (D2, 3 and 4) the facetious answer is "why not . . . they are cheap enough." The real answer is that D2 acts as a diode clamp to reduce spikes as the relay field collapses. Remember the induction coil at school? Well a similar effect when the field in the relay drops can give hefty voltage spikes which could damage TR3, but D3 holds these down to some 0.7 volts. Diodes D3 and D4 do a sort of zener diode job and provide a cut off voltage of some 1.4 volts for TR3. This reduces the static current in TR3 which if too high could cause the relay to drop out when the bias decays across the timing circuit. So at 6p for the three, they do a good job!

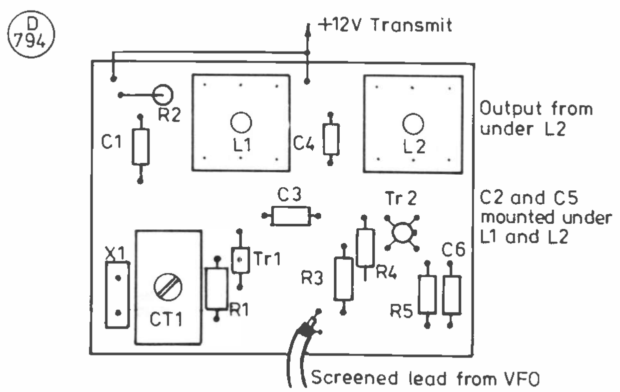


Fig.4 TRANSMIT MIXER LAYOUT (actual size)

Table of Values

Fig. 1

R1 = 47K	C2 = 450 pF
R2 = 56R	C3 = 100 pF
R3 = 150K	C5 = 68 pF
R4 = 100K	CT1 = 80 pF trimmer
R5 = 390R	TR1 = 2N3819
C1, C4, C6 = 0.1 μF	TR2 = 40673

Coil data: L1 = 25t, 30 s.w.g.; L2 = 25t, 30 s.w.g. (secondary = 4t). Both wound on 3/16" former with core.

Fig. 2

R1, R2, R6 = 220R	C2, C4, C5 = 0.1 μF
R3, R7 = 1K	C7, C8 = 310 pF
R4, R5 = 100R	CT1, CT2 = 3-60 pF
R8 = 47R	Mullard trimmers
R9 = 56R	TR1 = 2N3904
R10 = 39R	TR2 = BFY51
C1, C3, C6 = 0.01μF	TR3 = *see text*
	RFC1 = 8t on a ferrite bead

Coil data: L1 = 22t, 22 s.w.g. centre tapped (secondary = 2t, 22 s.w.g. PVC covered). L2 = 22t, 22 s.w.g. (secondary = 2t, 22 s.w.g. PVC covered). L3 = 13t, 22 s.w.g. *Note:* All coils wound on T-50-6 cores.

Fig. 3

R1, R2 = 2K2	C4 = 68 μF, 16v. tant.
R3 = 10K	D1 to D4 = 1N914
RV1 = 10K preset	TR1, TR2 = BCY31 (2N2906
C1, C2 = 0.01 μF	TR3 = BFY51
C3 = 10 nF	

Fig. 8

C1 = 100 pF. C2 = 0.01 μF. D1, D2 = germanium diode (*e.g.* 1N34A)

Construction and Testing

The construction of the transmit circuits followed the principles used in the receive sections of Ben. Build a little at a time and test as the construction proceeds. Four boards were built: a mixer board, a transmit board, a change-over board and a small board for the pi-network circuit. The prototype Ben used home produced printed circuit boards, which are very simple to make, *see Part I.* However it is quite possible to build any of the circuits on perforated board or even plain insulated board drilled to fit the components with soldered wire interconnections. The layout obviously depends upon the physical size of the available components, the prototype layouts are shown in Figs. 4 to 6. The important thing in a simple project like Ben is to avoid spending money. Make use of what is available cheaply, or better still for nothing. Then amend the layout to suit the components to hand.

The layout for the Transmit Mixer Board is shown in Fig. 4. The crystal oscillator stage TR1, which is as for the receiver BFO

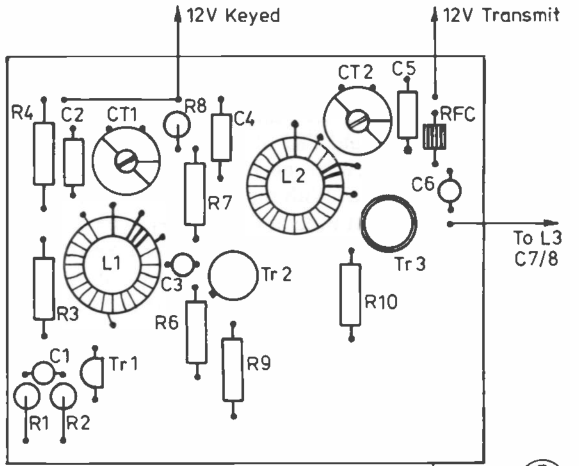
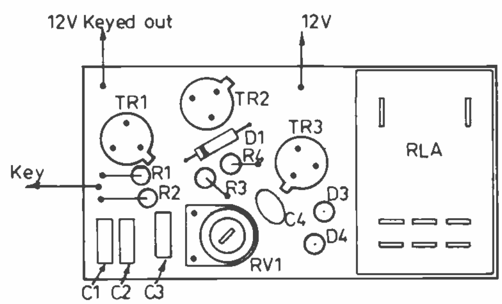


Fig. 5 TRANSMIT BOARD LAYOUT (actual size). D 795

circuit described in the first part of this article, should be built first. The actual layout for the prototype used a small HC25U crystal which came from a scrap TV chassis, but there is room on the board to use the more common HC6U mounting for the surplus TV 4433 kHz crystals. CT1 is a postage stamp type trimmer and such trimmers have variation in physical size, so CT1 may determine if the board size has to be increased. L1 is wound on a 3/16" diameter former with a slug mounted in a small aluminium can. These are sold cheaply as a surplus item by *J. Birkett* of Lincoln. The capacitor C2 which forms the tuned circuit C2/L1 is mounted under the board across the pins of the coil former bearing the winding of L1.

The oscillator circuit should be built as far as C3 and then tested, to follow the "build a bit — test a bit" philosophy. The output of the oscillator can now be tested. It is possible to listen to the output on a receiver which tunes 4433 kHz, or for the fortunate it can be checked with a frequency counter. The tuned circuit L1/C2 needs to be peaked to the output frequency, and the easiest way to do this is to use a diode RF probe. This is a simple piece of test equipment which will be used to test the transmitter during construction; the circuit is shown in Fig. 8. The probe feeds a multimeter set on a low voltage scale, and a scale should be chosen which gives an adequate reading. If no voltage scale is low enough a low current reading scale can be used. The probe should be built using short connections either with stiff wire or on a small tag board; a screened lead to the input side is also useful. Connect the probe to the output of the oscillator, between the output side of C3 and earth. The core of L1 is then adjusted to give a peak in the output recorded on the meter.

The mixer stage TR2 can now be built. L2 is wound on a similar former to that used for L1 and the 40673 dual gate MOSFET can be the inexpensive equivalent sold by *J. Birkett*. Once again the tuned circuit capacitor, C5, is mounted under the coil on the board reverse side. Take care to ensure the correct polarity for the 40673. A lot has been said about the delicate nature of dual gate



D 796

Fig.6 CHANGEOVER CIRCUIT BOARD (actual size).

MOSFETs and indeed the earlier types were necrophilic. The 40673 is diode protected and I have connected them wrongly by mistake but the device has lived, though I don't advise you test this statement.

When completed the whole mixer board can be tested. For such a test the VFO from the receiver section, described in *Part I* of the article, is required. This is connected *via* a screened lead to the board as shown in Fig. 4. The sum of the two frequencies, from the VFO and the crystal oscillator, has to be tuned as an output by L2/C5. This has the potential problem that the second harmonic of the VFO is close to the required sum of these frequencies on 10.1 MHz. In practice this proved no real problem and in fact I could not find the second harmonic of the VFO as an output when tuning L2. However it is worthwhile identifying that the output being tuned *is* the required one in the 10.1 to 10.15 MHz range. This can be done by listening on a receiver which covers these frequencies or using a frequency counter. Once again the tuned circuit is aligned with the diode RF probe. This is connected across the small winding which accepts the output from L2. There should be a considerable peak as L2 is tuned, with its core, onto frequency. We now have an output on the required band, and the transmit board will amplify this to a usable level.

The layout for the transmit board is shown in Fig. 5. This layout is quite compact as the boards were required to fit into an old case I used to house the prototype. Cases, boxes and hardware in general can be the most expensive items when building radio equipment. So don't hesitate to use old cases and boxes. The prototype Ben was built in a rather neat case, the front of which was peppered with holes. Just put on a new front panel, redrill and they are as good as new. It may be that constructors with a little more space to play with may want to make the transmit board a

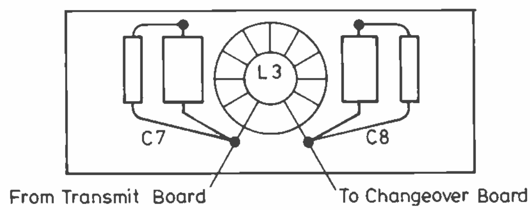


Fig.7 TRANSMITTER FILTER BOARD D 797

little larger, in which case the general layout will still serve—just stretch it out a little. Naturally with RF circuits the board should be reasonably compact to reduce lead lengths and interstage distances. It will be noticed that toroid cores are used for the coils in the transmit circuitry. For transmit circuits these are a better bet having close fields which reduce radiation problems from the windings. I tend to use these formers (obtainable from *TMP Electronics*) for transmit circuitry, but they are not cheap so the surplus canned formers described in the mixer board section replace the toroids for receiver and less critical circuits. The toroid cores require a variable capacitance to alter the tuned circuit, so CT1 and CT2 are used to tune the outputs of the first two stages of the transmit board.

The transmit board should be built a section at a time, beginning with the pre-driver stage TR1 as far as the output winding on L1. When this section has been completed the probe is connected across the secondary winding of L1 and the output peaked with CT1. The stage around TR2 can now be built and the output from L2 peaked with the RF probe. The PA stage TR3 is relatively simple and should give no trouble. There is considerable folk lore about transistor PAs, regarding their ability to destroy transistors at will and oscillate cunningly at very high frequencies. With a little care this circuit should do neither. Build it carefully and it is as tame as a Church of England vicar . . . what am I saying!

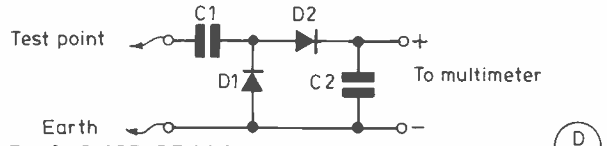


Fig. 8 DIODE RF PROBE

A word about component choices may be helpful. The transistor used for TR3, which is a QRP output stage, can be chosen from a variety of devices. The final choice for the prototype was an unknown computer switching transistor which gave some 2 watts of RF output. This is of little help to the general constructor so a transistor holder was wired into the TR3 position and a range of transistors was tried. The results below refer to actual RF output measured with a homemade RF meter and the DC input power can be expected to be about twice the value quoted.

Transistors which gave 1.5 watts of RF output or more include: 2N3553, 2N4427, BLY33, BSX61, 2N5108. Transistors which gave 1 to 1.5 watts of RF output include: BFY51, 2N3866, 2N2102 and some examples of the 2N3053.

The RF Choke RFC 1 in the collector of TR3 is homemade from 8 turns of 30 s.w.g. enamelled wire on a ferrite bead. TR3 requires a heat sink, a suitable "star type" heat sink should serve the purpose well. An ultra-cautious constructor could safeguard against parasitic oscillations in the PA by slipping a ferrite bead onto the base wire of TR3. This is common practice amongst some solid state PA builders, but I have never done it and it did not seem necessary in this circuit.

When the transmit board has been built as far as the output capacitor C6, the whole board can be tested. The PA stage will not like being run without a load, so a dummy load will have to be applied to the output. This ought to be a non-inductive resistance of about 50 ohms capable of handling 2 watts. A single carbon resistor or a made-up value of low wattage types can be used. This is connected between C6 and earth and the probe is connected across this load. Apply power to all the circuits under test including the PA stage and a considerable output should be noted on the meter. Switch the keyed 12 volt line on and off. When the supply to TR1 and TR2 of the transmit board is off there should be no output shown on the meter. If there still is a reading this will probably mean the PA is oscillating and the problem may be with the layout, or in some cases particular transistors might cause this problem; none of the transistors I tried oscillated in the PA even with a transistor holder used at TR3. Key the transmit board and listen to the output on a receiver and also try tuning either side of the signal to hunt for "nasties". The transmitter is completed by building up the simple pi-network filter as shown in Fig. 7. C7 and C8 are made up from two silver mica capacitors, the very small dipped mica types can present heating problems if used in this circuit. A final test can be made with the probe connected to the transmit output point, again a load of some 50 ohms should be placed across the output.

The Change-Over Circuit board now remains. This is a very simple switching circuit and should present no problems. The choice of relay is open to variation. Using such a circuit I have had good results from miniature 12 volt relays with coils ranging from about 500 ohms to 1,000 ohms. The layout in Fig. 6 is quite compact and the actual layout used by other constructors will depend upon the physical size of the relay. The layout is not critical, but if long leads are to be used for the 12 volt keyed line a decoupling capacitor of about 0.1μF would be a recommended addition. The leads for the antenna change-over operation should be screened and as short as possible. This board ought to be tested for correct switching action before it is wired into the rest of the transceiver circuitry.

Another task which ought to be performed before the circuits are finally wired up to the change-over board is to set the frequency of the transmitter in relation to the receiver. Both share a common VFO and the transmit signal is obtained by mixing with the transmit mixer board crystal oscillator. CT1 on the crystal oscillator section of the transmit mixer board needs to be adjusted so that the frequency being transmitted corresponds to that being received. For this to be set all the receiver circuits (*see Part I*) need to be switched on at the same time as the transmit mixer circuit board and stages TR1 and TR2 of the transmit board. The PA is not required for this test so the 12 volt transmit line to the PA should not be connected. With these circuits on, CT1 is adjusted to give the required beat note in the receiver. The circuit boards may now be interconnected *via* the change-over board or direct to the 12 volt line as required. There are four power lines: 12 volts, 12 volts (receive), 12 volts (transmit) and 12 volts (keyed), these must be connected as indicated in the circuit diagrams.

Conclusion

The transceiver is now ready for use. The output of the transmitter is fixed pi-network tuned for 50 ohms output, so must either feed a correct impedance aerial for the band, for example a dipole, or be fed *via* a suitable ATU to match the aerial.

The transceiver is a QRP device and what better for a projected all-CW, no-contest, band. A neat little transceiver for a neat little band. See you on 10 MHz!

Components: Most should be obtainable from *J. Birkett*, 25 The Strait, Lincoln, LN2 1JF. Toroid cores from *TMP Electronics*, Unit 27, Pinfold Workshops, Pinfold Lane, Buckley, Clwyd CH7 3PL.

References: "Solid State Design for the Radio Amateur" (ARRL), obtainable from *Short Wave Magazine* Publications Dept.

A RECEIVING PRE-SELECTOR FOR THE LOW FREQUENCY BANDS

A SIMPLE CIRCUIT FOR IMPROVED FRONT-END SELECTIVITY

P. C. COLE, G3JFS

THE pre-selector unit to be described here was designed to improve the front-end selectivity of a simple medium and short wave radio that suffered from spurious signals and severe cross-modulation when it was connected to an efficient aerial. Despite its simplicity the circuit works well and it can be recommended for use with any receiver that needs better selectivity and some extra gain at the signal frequency. As the circuit is easy to build and to get working it could be a worthwhile weekend project for the home constructor.

Circuit Description

Fig. 1 shows the circuit of the pre-selector with component values to cover the frequency range of approximately 1.4 to 5.00 MHz. Incoming signals from the appropriate input socket — Input 1 for an high impedance source such as an end-fed wire, or Input 2 for a low impedance coaxial feeder — are applied to the top capacity coupled tuned circuits VC1/L1 and VC2/L2 which determine the overall selectivity characteristics of the pre-selector.

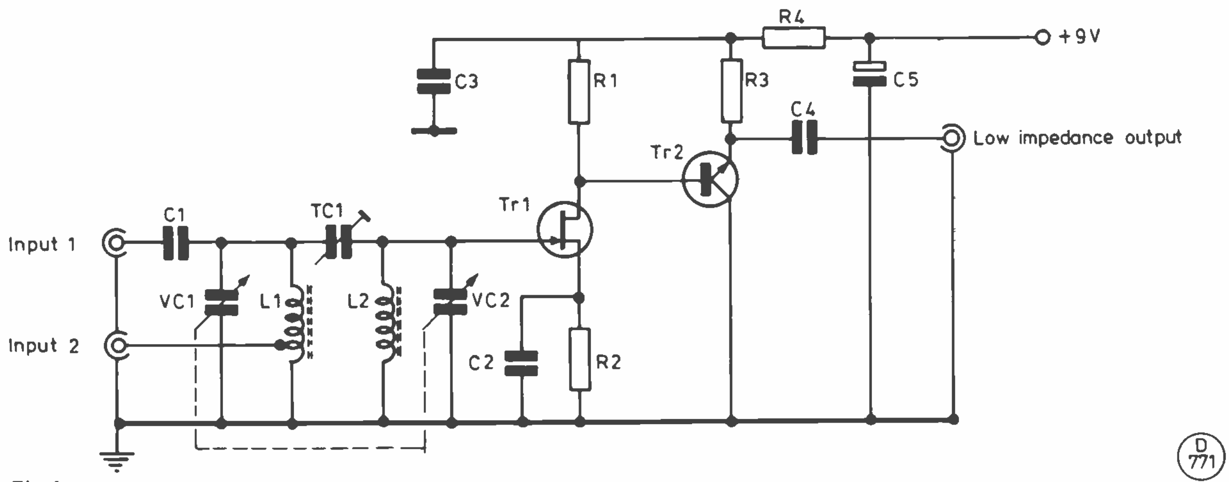


Fig. 1

The circuit of the pre-selector as built to cover a frequency range of 1.4 to 5.00 MHz. Other frequencies can be covered by proper choice of L1 and L2.

Table of Values
Fig. 1

R1 = 1K5	C5 = 4.7 μF electrolytic
R2 = 330R	TC1 = 4.5-20 pF trimmer, 15V working
R3 = 680R	TR1 = 2N3819
R4 = 33R	TR2 = 2N3906
C1 = 10 pF cer.	VC1, VC2 = twin-gang variable capacitor,
C2, C3, C4 = 0.1 μF	20-350 pF each section

L1, L2 = 60 turns 30 s.w.g. enamel covered wire close-wound on ⅜" dia. dust-cored former; L1 is tapped at 8 turns from the earthy end.
Note: All resistors are ¼-watt.

After passing through these tuned circuits the signals are then amplified by TR1, an N-channel FET, which is directly coupled to the *pnp* transistor TR2 connected as an emitter follower. Signal output is taken from the emitter of TR2 *via* the DC blocking capacitor C4 to the input of the main receiver. The combination of TR1 and TR2 has the advantage of a high input impedance to minimise damping of the tuned circuits, a low output impedance suitable for connecting directly to the input of most receivers and good isolation between input and output. Also the circuit gives some gain to make up for losses in the coupled circuits, and boosts the signal level if an inadequate aerial such as a whip or short indoor wire has to be used for reception.

Construction

The circuit is quite stable and the component values are not critical. Any preferred method of construction may be used, but whatever the assembly technique chosen the layout should be arranged to minimise stray coupling between the tuned circuits and to keep the input and output sockets well separated.

Fig. 2 shows the layout used for the prototype which was built with junk box components on a piece of *Veroboard* 130mm x 65mm. The construction was quite conventional except that sockets were used for TR1 and TR2 so that different types of transistor could be tested in the circuit.

Power Supply

The unit was designed to operate from a nominal +9 volt supply but this is not critical and anything from 6 to 12 volts will give good results. Current consumption at 9 volts is about 6 mA and this is best obtained from the main receiver or from a separate low voltage power supply, rather than from a battery.

Alignment

Alignment consists of setting the two tuned circuits to cover the required frequency range, and adjusting the coupling between them for the desired selectivity. Because of the simple coupling arrangement used the tuned circuit response will change with frequency and some compromise will be inevitable if the full tuning range of the specified variable capacitor is to be used. Alternatively the tuned circuits can be aligned to favour a relatively narrow range of frequencies such as a single amateur band.

The completed pre-selector is best adjusted with a signal generator but it is quite easy to use on-the-air signals or external noise if test equipment is not available. Connect an aerial (or signal generator) to the input of the pre-selector and run a coaxial cable from the output socket to the input of the main receiver. Set

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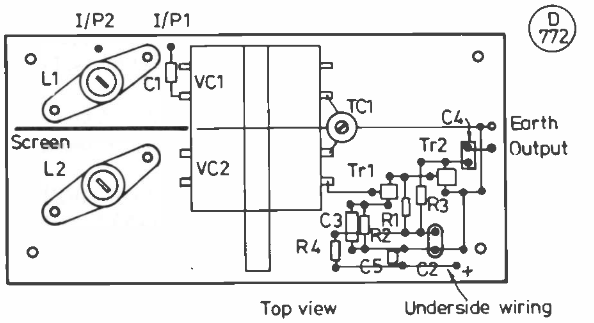

Fig. 2

The component layout for the pre-selector. Components are assembled on a piece of *Veroboard* 130mm x 65mm.

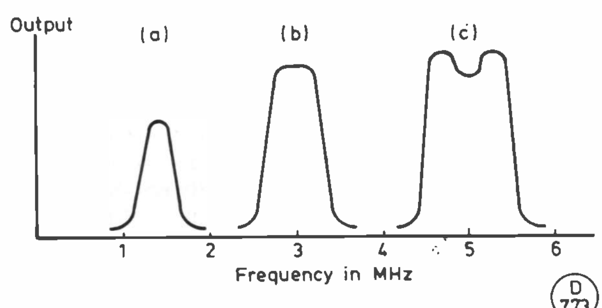

Fig. 3

A simple representation of the change in selectivity over the frequency range of the pre-selector due to the increase of coupling between the tuned circuits as the frequency is increased.

CLUBS ROUNDUP

By "Club Secretary"

THIS is the first piece to be actually written in 1982; we thought we would have a "light" month with the deadline falling over the Christmas/New Year break, but . . . we nearly drowned in 'em!. Here we go again, then, as briefly as we may.

From the Top . . .

Acton, Brentford & Chiswick will be taking a look at the eternal problem of "Aerials for Restricted Spaces" under the expert guidance of G3IGM; Chiswick Town Hall, High Road, Chiswick, London W4, at 7.30 on February 16.

The mobile operators among us—and that must be a sizeable percentage—should be members of **A.R.M.S.**, which caters for mobileers, here and overseas. Details from the Hon. Sec.—*see* Panel.

By the time this reaches you, the **Aylesbury Vale** group will have had an AGM; so about all we can say is to go to Elmhurst Youth Centre, Fairfax Crescent, Aylesbury, on the last Tuesday of the month, or to contact the Hon. Sec.—*see* Panel for his address.

At **Barking** the Hq is at Westbury Recreation Centre, Westbury School, Ripple Road, Barking. The 'main' meeting is on Thursdays, but the club rooms are open on Mondays, Tuesdays, and Wednesdays also for various activities. February 11 is down for junk sale—that should fetch 'em!.

The **Barry College of Further Education** group has a place in the Annexe, Weycock Cross, which they say is next to the zoo, on Thursdays. The first Thursday is usually given over to a talk-demonstration, and the third one to a surplus sale; they have a good shack and a keen contest group as well. Details from the Hon. Sec.—*see* Panel.

B.A.R.T.G. caters for the RTTY buffs, whether their interests lie in the old-fashioned clanking variety or the more 'with-it' VDU or home-computer set-up; quite interesting to observe on a recent issue of *CQ Magazine* a chap using a bug key as his RTTY keyboard! Details of the club from the Hon. Sec.—*see* Panel.

Now to **Bolsover**; there is a pub called "The Angel" in this town, in which foregather the more angelic ones among the local amateur radio fraternity, every Wednesday evening; the general rule is try and fix up something once or twice each month, and let the other dates be informals.

Next we head up to the **Borders** gang, and we must ask you to contact the Hon. Sec. (*see* Panel), as at the time of writing there was a hang-up over the Hq premises and they were looking for somewhere else.

Now **Bournemouth**, who are now based on Kinson Community Centre, Pelhams, Milhams Road, Kinson, Bournemouth; for the rest we must refer you to the Hon. Sec.—*see* Panel.

A changed front for the **Brighton** newsletter; but it hasn't got a February programme in it, so all we can say is "every second Wednesday commencing at 7.45," at 47 Cromwell Road, Hove. For the rest—the Hon. Sec. at the address in the Panel.

February 22 is down for a talk by Ross Clare, GW3NWS about HF linear amplifiers; the club is **Bristol City** RSGB group; the venue is the Queens Building in the University of Bristol.

Now to **Cambridge**; the locals have a booking at the Visual Aids Room of the Coleridge Community Centre, Radegund Road, off Coleridge Road. In addition they have the use of the Tower Room for the club station G2XV. Normally, the gathering of the clans is on every Friday evening.

February in **Chelmsford** is the first Tuesday, at Marconi College, Arbour Lane, for a Black Box evening.

We must now head for **Cheltenham**, and the Old Bakery in Chester Walk, Clarence Street. On February 4, G4BVY will talk about Receiver Performance and on 19th there is a Natter Nite.

Now we turn to **Chesham**, and at the time of writing about all we can do is refer you to the Hon. Sec. at the phone number shown in the Panel. On the other hand we know their Hq is at Church Room, Church Lane, Wormley, and we know that there are natter evenings on February 3 and 17, while on February 10 Dave Woollard will be talking about Aerials, and on 24th, to round off the month, G8JDU will be talking about Sierra Leone.

Down to the coast now, and **Chichester** where they have a home at the Spitfire Club in Tangmere on the first and third Mondays of each month. Thus February 1 is a film showing how oil rigs are constructed and installed; on 15th, G8DHE will be explaining all about UOSAT, and demonstrating how to decode the data transmission from the bird.

At the time of writing, the **Chiltern** programme had, against the date February 24, the words "How about offering to give a lecture?"—a good thought. The group are based on the John Hawkins' Furniture Works, Victoria Street, which lies off Oxford Road (A40) in High Wycombe.

February 19 is the date when the Hon. Treasurer of **Clifton** will be putting on a video show of technical matters. Meetings on Fridays at the New Cross Inn, which is at the junction of New Cross Road and Clifton Rise, London.

Colchester are at Colchester Institute, Sheepen Road, Colchester, on February 4 to hear G4MOV talk about Freedom, and on 18th for a talk on Raynet, given by G3AJS and G3GNQ.

Deadlines for "Clubs" for the next three months—

March issue—January 29th
April issue—February 26th
May issue—March 26th
June issue—April 30th

Please be sure to note these dates!

The **Conwy Valley** club will welcome a member of British Telecom on February 11, and their topic will be Radio Interference and the Radio Amateur, with a questions-and-answers session straight afterwards. The venue is Green Lawns Hotel, Bay View Road, Colwyn Bay.

Change!

This happens at **Cornish** where they have the meeting on February 2 which is a Tuesday (instead of the usual Thursday), to welcome *ETS* video equipment and tapes for a display and show. As always the venue is the SWEB Club Room, Pool, Camborne.

Another change is the name and address of the secretary at **Coventry**; unfortunately he missed out telling us the February programme and the venue. However our card-index says Baden-Powell House, 121 St. Nicholas Street, weekly on Fridays.

At **Crawley** the venue is the United Reformed Church Hall in Ifield, alternating with informals in each other's homes. For more details, try the Hon. Sec.—*see* Panel.

Cray Valley still foregather at Christchurch Centre, High Street, Eltham SE9, and we believe the form to be the first and third Thursday in each month.

A bit of difficulty for the **Crystal Palace** group—G3FZL was ill at the time of writing the newsletter, and so G4AVV had to step into the breach to remind us that it all happens on the third Saturday in the month at Emmanuel Church Hall, Barry Road, East Dulwich, 7.30 for 8 p.m.

The top floor of 119 Green Lanes, Derby, belongs to **Derby**, and they fill it up on Wednesdays; a junk sale on 3rd, a talk by G2CVV on 10th, a visit from *Lowe Electronics* on 17th, and on 24th the Night-on-the-Air.

Names and Addresses of Club Secretaries reporting in this issue:

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WEST KENT: B. P. Castle, G4DYF, 6 Pinewood Avenue, Sevenoaks, Kent TN14 5AF. *(Sevenoaks 56708)*
WIMBLEDON: E. G. Allen, G3DRN, 30 Bodnant Gardens, Wimbledon. *(01-947 3914)*
WIRRAL: G. Lee, G3UJX, 30 Manor Drive, Upton, Wallasey. *(051-677 1518)*
WORCESTER: D. Pritt, G8TZE, 15 Paxhill Lane, Twyning, Nr. Tewkesbury, Glos.
YEOVIL: D. L. McLean, G3NOF, 9 Cedar Grove, Yeovil, Somerset.
YORK: K. R. Cass, G3WVO, 4 Heworth Village, York.

On now to **Edenbridge** where they foregather on February 9 for an informal; the venue is the conference room of the Women's Institute in Station Road, Edenbridge, Kent.

The **Edgware** lot have the second and fourth Thursday of each month at Watling Community Centre, 145 Orange Hill Road, Burnt Oak. February 11 is an Introduction to Amateur Radio, to be given by G3SJE; and on 25th they have the new ARRL Film "World of Amateur Radio." On a personal note it was interesting to see some words by G3SVE, not heard of for some 15 years or so!

If you (or your parents) were born or naturalised in U.K. and domiciled abroad, then you are eligible to become a member of the **Ex-G Club**—details from the U.K. Hon. Sec., at the address in the Panel.

Exmoor is a place one thinks of in terms of holidays and walking boots. The club in South Molton has its Hq at "Loughrigg", East Street, South Molton, every Thursday. They have a station on VHF and an RTTY section is brewing up.

Fareham have weekly meetings at Portchester Community Centre on Wednesdays; we have in front of us a six-month programme which stops short at January—hint for an up-date?

At **Farnborough** the gang foregather at the Railway Enthusiasts Club on February 10 for a talk by G4HGJ on his QRP transmitter, while the detail of the 24th meeting was still unconfirmed at the time of their letter. Doubtless the Hon. Sec. will be pleased to tell you—*see* Panel.

The flea-power artists in amateur radio are, or should be, members of the **G-QRP Club,** now heading for 1300 members largely by virtue of their excellent magazine *Sprat* and its interesting contents, as well as the thrill of QRP working. Details from the Hon. Sec. at the address in the Panel.

It's off to **Harrow** now, where the new PRO has managed to give us the January details . . . it happens to us all sometimes! However, we know they are at the Harrow Arts Centre (Roxeth Room) in High Road, Harrow Weald.

Hastings next. They have a 'main' meeting at West Hill Community Centre, Hastings on the third Wednesday of each month. In addition they have weekly meetings on Mondays and Fridays at their own place at 479 Bexhill Road, St. Leonards-on-Sea.

The weekly meetings of the **Havering** club at Fairkytes Art Centre, Billet Lane, Hornchurch are held every Wednesday, and the general rule is to alternate informals with lectures. Details from the Hon. Sec.—*see* Panel.

A paid-up membership of 66 says **Hereford** club have the formula for success—they have been building slowly but steadily ever since they first began reporting. They meet in County Control Civil Defence Hq, Gaol Street, Hereford, on February 5 for the AGM and on 19th for an Informal.

On we go now to **Horndean** where the venue is the Merchiston Hall, on the second Thursday of every month with various interesting activities set up. More details from the Hon. Sec.—*see* Panel.

The change of venue at **Hull** should be noted; they are now based on West Park Recreation Centre, Walton Street, Hull. For the other details, we must refer you to the Hon. Sec.—*see* Panel.

Now to **Ipswich** and their excellent newsletter, "QUA". Find them on the second and fourth Wednesdays in each month at the "Rose & Crown", which is at the junction of the A45 Norwich Road and Bramford Road. The room is, in fact, detached from the public bars so junior members are always welcome.

Sad to say the **IRTS** Hon. Sec. has had to resign, so for the moment we have taken the liberty of putting in the President's name and QTH in the Panel — hope he won't mind! IRTS is the national society for Eire and they can give you all the details about amateur radio activities in the Republic.

Tuesdays and Fridays at Unity Hall, near the Sloop Inn, Wootton Bridge are the **Isle of Wight** details. For more, contact the Hon. Sec.—*see* Panel.

From **Kidderminster** this time we have only a note of the new slate of officers. However, the card-index says Aggborough Recreation Centre, Hoo Road, on alternative Tuesdays.

On the second Tuesday of each month, there is a meeting at the "Red Lion", Great Malvern, of the **Malvern Hills** group; they start at 7.30 with some Morse and the meeting proper is down for 8 p.m.

Over to GW now, and **Meirion**, where we see they have February 4 down for a film show, at the Royal Ship Hotel, Dolgellau.

It's February 19, the big night for the **Melton Mowbray** group; the Hq being at the St. John Ambulance Hall, Asfordby Hill, Melton Mowbray.

The **Mexborough** crowd are based on the Harrop Hall, Dolcliff Road, Mexborough every Friday evening; for more details, contact the Hon. Sec.—*see* Panel.

Thoroughness is the word at **Midland**, where we not only have a copy of *Probe* but a letter too! This last gives us February 16 for the RSGB video-tape called "The Secret Listeners". Nice to see also from the Wise Old Man of Midland that he intends to 'do summat' about bringing their and our deadlines into sync! Useful chap that wise old man—he designed our nicad charger, although we wouldn't like him to see our construction of it!

Now we must turn our attention to **Mid-Sussex**, in their hideaway in Marle Place Further Education Centre, Leylands Road, Burgess Hill; they have just had their AGM so the Hon. Sec. will have to be contacted for all the latest details—*see* Panel for his address.

Mid-Warwickshire is another name for the Leamington/Warwick area. They are based at 61 Emscote Road, Warwick, on the first and third Tuesdays; for February, this means February 2 for the AGM and February 16 for G8UKT to chat about Top Band D/F.

At the Thames Valley A.R.T.S. annual party, Alan Watson G4DZS (centre) was presented with the Cullen Trophy for the year, which is contested annually by Thames Valley and Sutton & Cheam societies during the RSGB Affiliated Societies Contest. On the left is Alan Mears G8SM, the Thames Valley President, with Bob Tillen G3MES, Sutton & Cheam's President, on the right.

Mid-Ulster foregather *chez* GI4BAC in Banbridge, Co. Down; sharp at 3 p.m. on the first Sunday in the month.

February 4 and 18 it is at **Pontefract**; the first for a Construction Evening—bring along your latest masterpiece—and on the latter date G8CJS will be talking about fast-scan TV. Carleton Community Centre is the place, on the top floor.

Our next is a 'must'; **R.A.I.B.C.**—the club for the invalid and blind members of the amateur radio fraternity whether they be licensed or SWL. Obviously if you have a disabled person who is a potential member, you pass him on to the Hon. Sec.—but lots of helpers and representatives are needed, plus lots of donations to help keep the good work going. Details from the Hon. Sec.—*see* Panel.

A novel idea appears in the programme for **Silverthorn** for February 12—they have a film show and talk to be given by the Scotch Whisky Association, and the Hon. Sec. adds a postscript —"don't forget to bring a glass!" This is at Friday Hill House, Simmons Lane, Chingford, London E4.

On to **Southampton** now, where February 10 is down for a talk by G30ZT on the Intruder Watch. The venue is the Toc H, Little Oak Road, Bassett, Southampton.

The **South Birmingham** lot have their Hq at Hampstead House, Fairfax Road, West Heath. The first Wednesday is the main meeting each month—a surplus sale this time. In addition they have an HF Night-on-the-Air every Thursday evening, and every Friday is an open evening.

The **Southdown** chaps are based on the Chaseley Home for Disabled Ex-Servicemen, Southcliff, Eastbourne, where they are to be found on the first Monday of each month.

The **Southgate** group will be hearing all about Raynet on February 11, the speaker being G8PRR. The Hq address these days is St. Thomas Church Hall, Prince George Avenue, Oakwood. All welcome, contact the Hon. Sec. for details.

We haven't an update from **Stevenage** although we know they are based on British Aerospace Plant B in Six Hills Way, twice monthly; for the rest we must refer you to the Hon. Sec.—*see* Panel.

New Club

Stirlingshire (Falkirk) foregather on the first Tuesday in each month; details of the venue and so on from the Hon. Sec.—*see* Panel for his details.

On to **Surrey** now, at their Hq, 34 The Waldrons, South Croydon. February 1 is not settled as to programme at the time of writing, while the February 15 is an informal.

Swansea next—quite a crop of GWs this time! Try the first and third Thursday in the month, Room 'N' fourth floor, Applied Sciences Building, Swansea University College, where on February 18 GW4HNT will talk about the causes and cures of TVI.

On February 2, the **Thames Valley** group have the Monster Surplus Sale—everything from junk to first-class. This is at Dittons Library Meeting-Room, Watts Road, Thames Ditton.

On alternative Fridays the Radio Club of **Thanet** members head for Birchington Village Centre; February 12 is a bring-and-buy, while on 26th there is a talk on aerials.

Torbay reckon to have had a very good year one way and another; find them at Bath Lane (rear of 94 Belgrave Road), Torquay, every Friday evening for the informals plus a monthly Saturday business-and-lecture formal meeting.

Slowly we whittle the pile down, noting some familiar 'fists' on the way—one of these belongs to the Hon. Sec. of **Tyneside;** they still have the same old routine, of meeting every Monday evening, at the Community Centre, Wallsend—which is also the address for the Hon. Sec. (*see* Panel).

The **Vale of the White Horse** venue is the "White Hart" in Harwell village, every Tuesday with the first one in each month a formal. For February this will be G3SEK talking about facts and fancies about Yagi aerial design.

Another familiar one is **Verulam;** but we miss the extra letter that gives us the latest programme! We can tell you that they are at the Charles Morris Memorial Hall, Tyttenhanger Green, Tyttenhanger, near St. Albans, on the fourth Tuesday in each month.

WACRAL is the name of a club for committed Christians of any denomination, anywhere in the world, who are active amateurs or SWLs—details from the Hon. Sec.

At **Wakefield** they will be at Hq on February 9 for a talk on UHF by G3HCW, and on 26th for a junk sale. The Hq address is: Holmfield House, Denby Dale Road, Wakefield.

If you are a **West Kent** member attending the meeting on February 5, you will find yourself in to a discussion and planning session on HF/VHF Field Days. The Adult Education Centre, Monson Road, Tunbridge Wells, is the spot, on alternative Fridays. On the Tuesdays following the Friday meetings, they have an informal in the Drill Hall, Victoria Road, Tunbridge Wells.

Nice to see **Wimbledon** picking up again—they have the second and last Fridays in each month at the St. John Ambulance Hall, Kingston Road.

Now **Wirral** who have their new venue settled; first and third Wednesdays at Minto House School, Birkenhead Road, Hoylake. The dates are February 4 for a discussion on the contests for 1982, while on 18th they have an exhibition of members equipment.

Worcester have G6CBP to talk about TVI and some of the remedies on the first Monday in February, at the "Old Pheasant", New Street, Worcester.

Yeovil seem to be well settled in Building 101 at Houndstone Camp every Thursday, with G3MYM being the mainstay of the talks—but a popular one, obviously. On the 35th aniversary of the club formation, October 4, 1981, they put G3CMH and G8YEO on the air and worked 126 stations in 52 countries and all six continents.

At **York** they are 'at home' to visitors and members at the United Services Club, 61 Micklegate, York, on every Friday except the third one in each month. The gang are keen on showing the flag; and the word seems to be getting around the other organisations in the area, which will keep them busy in 1982.

Finale

The end of another pile. Lots, it will be noted, need updating, so let's have your news, to arrive by the dates shown in the box, addressed as ever to your scribe, SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ. *Cheerio!*

OBITUARY

BILL CORSHAM, G2UV

WILLIAM Edward Frederick Corsham, G2UV, died suddenly on December 12, 1981.

Bill started his interest in amateur radio during World War I, when he left his job in the GPO to join the Signals Regiment, and found himself serving at the training establishment near Bletchley, where such new things as spark transmitters were to be seen and used.

On return to the GPO the interest was maintained, and at the second try a licence was obtained and Bill became 2UV. On the operating side, the early gear was spark and tonic-train, until some 'R' type valves were acquired; at that time there was a maximum of ten watts of CW allowable, with HT from dry batteries or a hand generator. Next came telephony, and like many other experimenters in those pre-BBC days, records and the occasional "live" artists were broadcast.

By now, 2UV was active in Harlesden Wireless Society, a member of the British Wireless Relay League and, already, President of the GPO Mount Pleasant Wireless Society. In 1921, 2UV took part in the first Transatlantic Tests and met Godley of ARRL, when the latter came over to operate in the tests, first from Wembley and then from Ardrossan. Bill then organised BWRL's Round-Britain Tests in 1922, meeting up with R. D. Spence of Huntly, Aberdeen (with whom he shared third place in the Transatlantics).

It was in 1922 that 2UV produced the first ever QSL card in Europe, and almost certainly the world. Technically, Bill was using a three-valve receiver in 1921 while most of the competitors were using 5 or 6; and thus he set a trend of simplification in receivers.

On the "political" front, he realised that to have in existence BWRL, plus the Amateur Radio Research Association and the Radio Transmitter Society was hardly conducive to the advancement of the hobby, and so he worked hard to bring first BWRL and then the others under the umbrella of the RSGB's T & R Section; thus Bill Corsham may be said to have been instrumental in the formation of RSGB in the form in which it was to carry the flag until W.W.II; 2UV and 2DX (present G2DX, Ken Alford) were the first, joint, Traffic Managers. In 1924, experimenters were not allowed contacts with stations abroad, and in a broadcast talk given over 2LO on June 12, 1924 Bill changed the final words from the agreed script of his talk, to virtually challenge the Post Office to withdraw licences on this point — they did not take him up, and another point had been won.

All his working life was spent at the Post Office, latterly with the Travelling Post Office as security superintendent, retiring before the Great Train Robbery; the hours were such that most of his "wireless work" was done at unusual times of the day. During W.W.II his first-class Morse naturally brought him into RSS, in which he specialised in Japanese transmissions.

G2UV was elected a Vice-President of RSGB in 1973, after he had collaborated largely in the history of the early days in "The World at their Fingertips", which was published by RSGB with G6CL as the writer. He was a founder-member of RAOTA, and was to be seen at RSGB, RAOTA and Harrow club functions regularly; latterly his efforts were largely aimed at putting the affairs of the Radio Amateur Old-Timers Association on to a footing which would enable it to survive his passing. Perhaps the last event in that chain was the obtaining of the call-sign G2OT as the club call of RAOTA.

That, in brief, was the life of G2UV, Bill Corsham; we must add that Bill was a very wise counsellor in the background of amateur radio affairs. His wisdom sat lightly on him, and his pleasant nature made him liked in all the circles in which he moved. His death has made a gap in the Amateur Radio movement which will be very hard indeed to fill.

"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 — It takes a lot to stir me from my usual lethargy so that I put pen to paper (or, more accurately, finger to typewriter key); however, G8ADD and G8SUH *et al* ("A Word in Edgeways" January 1982) have provided the incentive!

How 8ADD can have the nerve to accuse 3RKH of not showing Christian charity then launch into such a divisive diatribe beggars understanding.

Where, 8ADD, do you get the data to justify your claim that "probably more than 90%" of Class A licensees have forgotten their CW? My own experience certainly does not support such a claim. Of the Class A licensees that I know personally, the majority use CW at some time albeit, in some cases, infrequently. I should add that I am not a keen CW operator who only talks to other keen CW operators. In fact, I use the mode only occasionally although I *do* use it and would be capable of passing the test.

No one is prepared to make us a present of the considerable part of the HF spectrum that has been allocated to the amateur service without there being some good reason for so doing. One of the justifications, perhaps the only real one, for amateur radio is that it provides a means by which a country can establish a pool of experienced operators at little or no cost to the government concerned. Without this justification, it is unlikely that we would have emerged from the last WARC as strong as we did.

Note, however, that the words I used were "experienced operators". This does not mean being capable of pressing a button and talking into a microphone — anyone capable of operating a telephone is able to do this. Listen round the HF part of the spectrum some time, not just the amateur bands, and you will find out just how much traffic is still carried by CW — not because it is "fun" or of quaint interest but because it simply remains one of the most effective communication modes. The "experienced operators" then, are those capable of using CW — telephony operators can be trained very easily when required.

Remember, we do not have any rights to the amateur bands, our privileges are granted only because the governments of the world can see that they gain benefits from the service. The pressures on this meagre resource, the HF spectrum, are enormous; the justifications for allocating space in this area have, consequently, to be compelling.

Let us now consider 8ADD's comments on the 4m., 6m and 10m bands.

Firstly, the 4m band is an anomalous one since it has been "loaned" to us by the military, on their terms, and is not part of the general Home Office or WARC allocations. Even having lost 200kHz of it, we still have 475kHz more than any other country in Europe. That we have retained any part of the band is due to the efforts put in by the RSGB.

Secondly, the 6m bands. Agreed, we seem to have lost the initial skirmish for the band. I cannot, however, accept that there is "no chance of getting our hands on it" until a positive allocation has been made to another service and they have started to make use of it.

Thirdly, the 10m band. The level of intrusion has already shown a reduction since the introduction of the legal CB service. I suspect that a significant part of the problem that we used to have, resulted from ignorance rather than intent. As the legal service becomes more accepted and the pre-legalisation rigs fall into disuse, it is likely that the level of intrusion will continue to fall. Those of us capable of operating on 10m, however, need to keep a watchful eye on the band during the years of sunspot minimum.

It is probably significant that, whilst gloating over the "loss" of bands, 8ADD does not mention the granting three new HF bands — one of which is in use now. Before the WARC, there was a very real fear that political pressures from other HF users would result in the existing HF bands being whittled down. It is only because of the efforts put in by the various national amateur radio societies, particularly the RSGB, that we not only kept the old bands but also gained some new ones.

Perhaps the reason for 8ADD's *liber querulus* is evident in his comment "dinosaurs on the DC bands" — sour grapes?

Turning now to 8SUH and co. I rather take issue with their statement "when a determined body legally pursues its aims" in connexion with the legalisation of CB. Legally? Really? If 8SUH thinks that that particular pursuit was legal, I would hate to hear his definition of illegality!

The commercial pressures and rampant law breaking that led to the allocation of 27MHz to CB have done both amateur radio and CB itself a disservice. In time, when the novelty value has worn off and the "cowboy" operators have returned to whatever activities they indulged in before CB, the hard core of CB'ers with a genuine need for the service will be left with a quite unsuitable lump of the spectrum in which to pursue their legitimate interests.

It seems unfortunate that the Class B licence has become accepted merely as a stepping stone on the way to a "full" licence. This was not the original intention, when it was recognised that there was a need for an experimenter's licence — not as a second class substitute for a Class A licence but as an end in itself. There are still plenty of fields to conquer on *all* amateur bands, let us go our individual ways to satisfy our own, legitimate, interests without complaining about what other people can or can't do.

Anthony Plant, G3NXC

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

(continued from p. 665)

TC1 to its minimum capacity, VC1/2 to maximum capacity and adjust the dust cores of L1 and L2 for maximum output from a signal of about 1.4 MHz. Next tune in a signal around 4.5 MHz and after setting VC1/2 for maximum output increase the capacity of TC1 for slight overcoupling, which will produce a double-humped frequency response as shown in Fig. 3(c). With this setting of TC1 the selectivity curve will vary with increasing frequency from undercoupling, through critical coupling, to overcoupling, as shown in Fig. 3. This is the best compromise that can be reached without using a much more elaborate coupling arrangement, but in practise it does give very good results. If it is desired to favour a narrower band of frequencies it is suggested that TC1 is set to give slight overcoupling at the centre of the chosen band as this will give the best rejection of unwanted signals.

Results

With this pre-selector you can expect to get a considerable improvement in RF selectivity, with an accompanying increase in gain and sensitivity, when it is used with the simpler type of general coverage receiver that does not have an RF stage ahead of the mixer. Other frequency ranges can be covered by fitting suitable coils and the circuit has been used in various applications at frequencies from 15 kHz to 10 MHz.

VHF BANDS

NORMAN FITCH, G3FPK

Soviet Space Spectacular

DECEMBER 18, 1981 saw the launch of the second series of Soviet amateur radio *RS* series satellites when six were put into successful *polar* orbits. They are officially identified as *RS-3* through *RS-8*. As usual, no prior warning was received of the launch, nor was any orbital information forthcoming from the U.S.S.R. However, the periods, *apogees* and *perigees* and track separations are now known with sufficient accuracy to enable long term orbit predictions to be compiled.

RS-3 and *RS-4* have not been heard in transponder mode, so far, and it is suggested they are purely experimental satellites. Initially, their telemetry frequencies were 29.321 and 29.360 MHz, respectively. The other four all carry 2m to 10m transponders and *RS-5* and *RS-7* have "robots" on board. With *RS-5*, the 29.331 MHz channel is often heard in an idling mode, interspersed with the message, "CQ, CQ de RS-5," followed by the 2m uplink frequency to be used. This "robot" could be the *RS-0* referred to last month. *RS-7's* "robot" is on 29.341 MHz and indicates a QSU of 145.840 MHz.

The idea of these "robots" is that you call them on 145.83 or 145.84 MHz in reply to their CQ calls and they will send you back a report and QSO number. However, you have to allow for the *Doppler* shift on your own 2m. signal of *plus/minus* 3.42 kHz. The *Doppler* shift of the spacecrafts' 10m signals is *plus/minus* 0.69 kHz. Calls should be sent at the same speed as the "robot" sends, in the form;- "RS-5 de G3FPK AR." If it does not receive your call properly, it may send "QRM," etc. At certain times, the QSO information stored by the computer is transmitted down to Moscow, or wherever, so that the QSLs can be sent out from Box 88. On a recent AMSAT 80m net, someone reported that *RS-5's* telemetry channel on 29.452 MHz was being used for the "robot" operation and the 29.331 MHz one for TLM.

RS-6's TLM is on 29.411 or 29.453 MHz; *RS-7* also uses 29.501 MHz, while *RS-8* operates on 29.461 and 29.502 MHz. The mean altitudes of the six spacecraft varies from 1,628.4 kms. for *RS-3* to 1,684.3 kms. for *RS-8*. For the moment, your scribe is working on the following data for the period and track separation for *RS-3* to *8* respectively;- 118.519m. and 29.7547°; 119.396m. and 29.974°; 119.555m. and 30.0134°; 118.718m. and 29.8026°; 119.198m. and 29.9254° and 119.763m. and 30.0663°.

AMSAT-UK has a nightly net on 80m from 1900, nominally on 3,780 kHz but liable to shift due to QRM. Latest news, both "official" and from individual observers, is disseminated concerning *0-8*, *U-0-9* and *RS-3* through *8*. There is also the net on Sunday mornings from 1015 on the same frequency. Those wanting reference orbits for any spacecraft are advised to get them from this source as any published data, particularly for *U-0-9* does get out-of-date rather quickly.

From G3FPK, a number of QSO's have been made through *RS-5* through *8*. Using about 50 watts RF output to 10 dB. of aerial gain, access at extreme range is quite easy. Tests carried out on early orbits showed one's signal was automatically attenuated if the transponder's receiver received too strong a signal. Access has been achieved at 2,500 kms. range with as little as 5w. RF output, although one's 10m signal tends to be rather weak and easily missed! Rapid fading is quite bad and it is possible to get, say, the letter K on CW, received with the middle dot missing. It can be quite difficult to read calls accurately. SSB signals often sound like VHF signals do when an aircraft causes flutter fading.

Based upon the average altitude of all the satellites, the slant range is 4,882 kms. and the sub-satellite point 4,165 kms., giving a maximum ground range of 8,330 kms. This brings in range of the U.K. the entire Indian sub-continent, all of Africa north of latitude 20° south, almost all the U.S.A. and Canada, nearly all of Asiatic Russia, to Peking in China. On occasions, the 10m downlink signals have been copied when the spacecraft are over northern Japan, but of course that is well out of range of access for the 2m up-link signals. The orbits are *posigrade* with an inclination of 82.96° to the Equator. This means that *ascending node* passes — those coming from the south — cross the Arctic region to the *east* of the North Pole, whereas *A-0-8* and *U-0-9* do so on the *western* side, known as *retrograde* orbits.

There is no Soviet confirmation of the actual up- and down-link frequencies but it seems that the following applies;— *RS-5*, 145.915-950 up and 29.405-440 down; *RS-6*, 145.910-950 up and 29.405-445 down; *RS-7*, 145.955-999 up and 29.455-500 down; *RS-8*, 145.970-999 up and 29.470-500 down. These are rather tentative and, no doubt, over the next few weeks, users will carry out their own tests to confirm the foregoing, taking account of *Doppler* shifts.

As to availability, from London, orbits which cross the Equator going north between 226 and 299° west are out of range and these occur between 0155 and 0740 GMT approximately, at present.

VHF Convention

By the time this appears, the 1982 *RSGB* VHF Convention will be only seven weeks away. The date is Saturday, March 20 and the venue, the same as last year, the Sandown Park Racecourse in Esher, Surrey. The doors open at 1030 and this year the Trade Show will occupy the *Tote Hall* on the ground floor, with twice as much area as in 1981. The catering will be much better this year, following last year's short-comings which were due to a misunderstanding by the caterers about the estimated attendance.

As usual, there will be three afternoon lecture streams from 1415 to 1715. The "A" stream comprises Oscar Bächman, SM5CHK, on Antenna Gain Measurements; John Nelson, G4FRX, on The 4CX250/350 series of valves and PSUs, as featured in his articles in the *Magazine;* and the VHF Contests Committee Forum. Stream "B" starts with Amateur Satellite Research and Development by an AMSAT-UK team led by Ron Broadbent, G3AAJ. This is followed by: Pilot SSB, The Replacement for FM? by David Holmes, G4FZZ, the last lecture being Meteor Scatter, by David Butler, G4ASR. The "C" stream is the Microwave one and begins with Peter Tunbridge, G8DEK, on Solid State Power Generation at Microwaves. The second talk is in two parts. First is Heath Rees, G3HWR, on The Implications of the New Microwave Allocations, followed by Charles Suckling, G3WDG, on GASFET Preamplifiers for the Microwave Bands. The last talk is Mobile Systems for 1.3

70 CENTIMETRE ANNUAL TABLE

Final Placings at December 31, 1981

Station	Counties	Countries	Total
G8TFI	60	13	73
G8FMK	56	11	67
G8HHI	48	12	60
G8VLQ	45	14	59
G8RZP	46	12	58
G2AXI	46	10	56
G8GXE	46	9	55
GD2HDZ	45	9	54
G3PBV	43	9	52
G8RZO	40	11	51
G3BW	41	7	48
G6ADC	43	5	48
G4JZF	42	5	47
G4MUT	34	11	45
GW3NYY	35	10	45
G8KAX	32	8	40
G4IGO	30	7	37
G8WUU	31	4	35
G3FIJ	28	4	32
G3CO	22	5	27
G8LXY	20	6	26
GW3CBY	17	6	23
G4FKI	16	4	20
G8TIN	12	3	15
G4MJC	5	4	9
G4GXL	7	2	9
G8VR	6	1	7
G4LDY	4	1	5
G6CSY	3	1	4
G8SKY	2	1	3
GM4COK	2	1	3
GM4CXP	1	1	2

GHz by Graham Murchie, G4FSG, and Mike Walters, G3JVL. Something for everyone in that lot, no doubt.

It is hoped to arrange *ad hoc* meetings for specialist groups. There is a PA system in the *Tote Hall* which will be used for such announcements. The Echelford Radio Club will provide talk-in stations on VHF and UHF. It seems that many people do not want a band and dancing during the evening social so this year there will just be background music by a pianist. The social will be a buffet supper in the *Cavalry Room* from 7 to 11 p.m., with tables and chairs and a bar, so that folk can drink, eat and natter in a convivial atmosphere.

Prior booking for this year's Convention is being handled by the RSGB Headquarters office, and tickets for the Convention only are £1.00 (75p for the under eighteens) or £7.00 for the Convention and Buffet. As usual, tickets can be bought at the door for the Convention. However, if you decide only then to attend the Buffet, it will cost you an extra £7.50 on top of your £1.00, so it would certainly pay to book in advance.

ANNUAL VHF/UHF TABLE

Final Placings at December 31, 1981

Station	FOUR METRES Counties	FOUR METRES Countries	TWO METRES Counties	TWO METRES Countries	70 CENTIMETRES Counties	70 CENTIMETRES Countries	23 CENTIMETRES Counties	23 CENTIMETRES Countries	TOTAL Points
G2AXI	58	9	65	19	46	10	*7*	*1*	207
G3BW	42	6	65	29	41	7	*7*	*5*	194
GD2HDZ	49	7	67	15	45	9	*5*	*4*	192
G8FMK	—	—	66	17	56	11	28	3	181
G8HHI	—	—	62	19	48	12	16	2	159
G8VLQ	—	—	69	26	45	14	—	—	154
GW3NYY	—	—	78	30	35	10	—	—	153
G8TFI	—	—	66	14	60	13	—	—	153
G3FIJ	41	5	60	15	28	4	—	—	153
G3PBV	*3*	*2*	60	23	43	9	12	3	150
G8RZP	—	—	68	21	46	12	—	—	147
G8GXE	—	—	55	11	46	9	17	5	143
G4JZF	—	—	74	21	42	5	—	—	142
G8RZO	—	—	68	21	40	11	—	—	140
G4IGO	—	—	67	31	30	7	—	—	135
GW3CBY	27	6	58	15	17	6	*3*	*2*	129
G6ADC	—	—	62	11	43	5	—	—	121
G8VR	32	3	44	32	6	1	—	—	118
G8WUU	—	—	61	15	31	4	—	—	111
G8KAX	—	—	43	11	32	8	11	3	108
G4MUT	—	—	49	12	34	11	—	—	106
G4DEZ	—	—	73	31	—	—	—	—	104
G4HAO	—	—	82	21	—	—	—	—	103
G3FPK	—	—	74	22	—	—	—	—	96
G3CO	14	3	39	8	22	5	—	—	91
G4FKI	37	5	20	5	16	4	—	—	87
G8VFV	—	—	68	18	—	—	—	—	86
G4ARI	18	2	54	10	—	—	—	—	84
G8XMP	—	—	64	17	—	—	—	—	81
G4GXL	—	—	55	15	7	2	—	—	79
GM4COK	—	—	5	22	2	1	—	—	77
GW8TVX	—	—	55	15	—	—	5	2	77
G8RWG	—	—	57	15	—	—	—	—	72
G4LDY	—	—	52	12	4	1	—	—	69
G6AJA	—	—	58	9	—	—	—	—	67
G8TGM	—	—	48	18	—	—	—	—	66
G8LXY	—	—	33	6	20	6	—	—	65
G8XTJ	—	—	52	11	—	—	—	—	63
G8RZA	—	—	50	12	—	—	—	—	62
G8TIN	—	—	40	7	12	3	—	—	62
G8TRW	—	—	47	11	—	—	—	—	58
G6ABB	—	—	44	12	—	—	—	—	56
G6ECM	—	—	44	11	—	—	—	—	55
GM4CXP	3	1	35	13	1	1	—	—	54
G8SKG	—	—	39	10	2	1	—	—	52
GW3MHW	44	8	—	—	—	—	—	—	52
G4MJC	—	—	29	11	5	4	—	—	49
G8MBI	—	—	28	9	—	—	—	—	37
G6CSY	—	—	21	4	3	1	—	—	29
GM4ELV	—	—	10	3	—	—	—	—	13

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

Tabular Matters

Congratulations to Syd Harden, G2AXI, the clear winner of the 1981 Annual VHF/UHF Table contest with 207 points. Bill Hodgson, G3BW, with 194 points, just beat his rival, Arthur Breese, GD2HDZ, who notched up 192, for second place. G2AXI also topped the 4m individual table with 67 points, Syd being the only entrant to work nine countries on the band. GD2HDZ was second with 56 pts. and John Baker, GW3MHW, third with 52. On 2m, the first three all made over 100 points. Walt Davidson, GW3NYY, won with 108 points, and Bryn Llewellyn, G4DEZ, was second with 104. Both MS operators, their country totals were 30 and 31 respectively. Rob Mackean, G4HAO, was third with 103 points and worked 82 of the British Isles counties and regions. Highest country score for 1981 was that of Ken Willis, G8VR, with 32.

Chris Easton, G8TFI, heads the 70cm table with 73 pts. including 13 countries, ahead of Ray Cox, G8FMK, with 67 pts. John Pilags, G8HHI, was third with 60 pts. Ten operators included scores for the 23cm band which was introduced to enable Class B licensees to compete with those able to operate on 4m on a fairer basis. G8FMK headed this table with 31 points, and Tony Collett, G8GXE, was second with 22, and G8HHI third with 18 pts.

The 1982 Annual Table will embrace the same bands. All readers may participate, scores representing counties and countries worked on the various bands. Scores for all four bands may be submitted, but only the highest three will count in the total column. The counties and regions are the 78 listed in *Radio Communication* every January, *plus* the 26 EI ones. As far as countries are concerned, the ARRL's *DXCC* list is used, but with Sicily (IT9) and the Shetland Is. (GM) counting as extra countries. The first listings for 1982 will appear next month.

The QTH Squares Table will re-appear in March, too. This has become quite lengthy now so those few participants from whom nothing has been heard the previous twelve months will be deleted. They can always re-enter any time. Since the Annual Table will probably be short, initially, we will publish the latest All-Time 23cm. Table in March, so please update your scores.

AMSAT-UK Notes

AMSAT-UK secretary Ron Broadbent, G3AAJ, advises that the P.C.B's for the NBFM Rx and TV Rx interface units as described in the *UOSAT Handbook* should be available in mid-February. It is now hoped to have Volume 2 of *The Best of Oscar News* ready in a couple of months. Of interest to clubs and schools are the sets of twenty, colour, 35mm. slides of the building and launch of *UOSAT* at £3.20 including postage. Also for schools, a leaflet is available describing the educational aspects of *UOSAT*, for the "price" of an *s.a.e.* The Annual General Meeting is scheduled for Saturday afternoon, April 3, at London House, as last year and members will receive formal notification in the next *Oscar News* which should be despatched shortly after this appears.

Contest News

The 432 MHz Fixed Contest is on Feb. 7 from 1000 to 1500 and is all-mode with radial ring scoring. Usual RS(T) and serial number, QTH locator and QTH information to be exchanged. There are two sections;—Single-op. and Multi-op. The March 6/7 weekend sees the 144/432 MHz and *s.w.l.* contest, for which further details will appear next month.

Cumulatives are established contests on the UHF and SHF bands and serve to generate activity, as well as enabling those who cannot participate in the longer, single events, to indulge in a little friendly competition. This idea has been extended to 70 MHz and the first session is on Jan. 31. The remaining five are on Feb. 14, Mar. 14 and 28, Apr. 11 and 25. The times are all 100 to 1200 *local*. Rules and scoring as for normal contests of this type, with participants choosing the best three sessions for their entry.

Saturday, March 20, from 1900-2300, is the period of the first of the 1982 *AGCW-DL* VHF/UHF CW Contests, this one being on 432 MHz. This is a Single-op. only affair with three categories. "A" is less than 3.5w. RF; "B" is less than 25w. and "C" is over 25w. Exchange to consist of RST and serial no., class and QTH locator, *e.g.* 579022/C/ZL60j. The scoring per QSO is;—Class "A" with Class "A" 9 pts; "A" with "B" 7 pts; "A" with "C" 5 pts; "B" with "B" 4 pts; "B" with "C" 3 pts. and "C" with "C" 2 pts. QSO's with stations not sending a complete report are worth 1 pt. There are multipliers; each primary QTH locator square worked is worth one point and each DXCC country worked counts an extra five points. The final score is the QSO points times the sum of the multiplier points. All logs to Edmund Ramm, DK3UZ; P.O. Box 38; D-2358 Kaltenkirchen; Fed. Rep. of Germany, to be mailed not later than the last day of the following month. The 2m events are on June 26 and Sept. 25.

DK3UZ has sent the results of the 2m AGCW-DL Contest on Sept. 26, 1981 in which no G stations entered the Class "A" part. In Class "B" there were 28 entries and G4GGV (ZL37g) came 17th. with 1,334 points, and G5HD (XK09d) last with 36. G4KWQ (YM30b) came 8th. out of 12 in the Class "C" part with 1,334 pts.

Tony Haas, G4LDY, has sent the results of the Harlow Club Contest held last Aug. 29 and 30 in which the overall winner was John Brakespear, G8RZP, (Kent) with 13,720 pts. Alan Nottage, G8KPZ, (Kent) was 2nd. with 12,650 pts. and The GD4IOM Contest Group, 3rd., with 10,608 pts. It seems that most participants liked the two session event and this format will be retained this year. The scoring system did confuse some folk and will be clarified next time. Winner on the 29th. was G8KPZ and on the 30th., G8RZP took the honours.

Six Metres

John Baker, GW3MHW, was surprised, like most of us, that the *solar flux* was still as high as 305 on Dec. 9, some two years after the peak of cycle no. 21. He mentions that, on Dec. 7, W0SF received BBC TV sound on Channel 3 on 53.25 MHz. John had many 10/6m. crossband QSOs with the W5, 8 and 0 call areas, many at great strength. On the 8th., the W6s were working to the East Coast and the nearer Ws were making crossband QSOs with Europe. On the 12th., GW3MHW contacted TF3T at 1149 for the first GW/TF 10/6m QSO, and a couple of minutes later, he worked 8P6CX for the first GW/8P6 QSO. The YV5 beacon was heard at 1250.

6m. conditions remained good to Dec. 16, but tailed off as the *solar flux* fell. Even with the *S.F.* down to 138, VE1YX got his signal across the "pond," and on the 23rd., John had a QSO on SSB with him at RS 52, with the *S.F.* at 153. By the 27th., 6m. was in full swing again and on the 31st., 8P6KX and 8P6MH, on 50.115 MHz, were working many Gs and Europeans. After three years of trying, VE1YX worked ZD8TC on 6m. SSB on Dec. 28. There are now 82 countries on 6m. and GW3MHW has now made 423 crossband QSOs.

Four Metres

On Dec. 8, EI6AS, EI6DT, G3APY, G2AOK and GW3MHW made 4/6m. crossband QSOs with VE1ASJ. John Baker's contact was the last, at 1353 and was a "first" GW/VE 4/6m. effort. Most 70 MHz reports were RST 339 with strong *E's* on the Canadian side, as well as F2-layer propagation. G3ENY, (Salop) is now back on 4m. with 50w. and a dipole, while G6XM, (Wilts.) is listening and expects to be transmitting soon. George Haylock, G2DHV, (Kent) reports very poor conditions on the band.

Two Metres

First, the MS happenings. The *Geminids* and *Quadrantids* showers are now over and a number of readers managed to work Polish stations before their licences were suspended when Martial Law was declared. For Bryn Llewellyn, G4DEZ, (Essex) many *Geminids* skeds failed due to icing or wind damage to the aerials. A successful test on sporadic meteors was made with SM3BIU (HX) on Dec. 10, and in the shower proper, he completed with OK3KFF (II), I1ANT (EE) and OH5IY (NU) on the 12th. In the *Quadrantids,* on Jan. 2, Bryn completed with LA1K (FX), and on the 3rd., with OH1AA (LU) on SSB; OH6NU (MW) ; LA8OW (EU) and DF7RG (GI). Bryn remarks on the continuing activity on the random MS SSB frequency of 144.200 MHz in the January shower and singles out OH5NW who was S9-plus-20 dB. for 45 seconds. G4DEZ's station now comprises the *Yaesu* FT-225RD and *Tempo* 6N2 amplifier with a pair of 16-ele. *Tonna Yagis,* spaced at 12′-10″, up at 36 ft.

TWO METRE ANNUAL TABLE

Final Placings at December 31, 1981

Station	Counties	Countries	Total
GW3NYY	78	30	108
G4DEZ	73	31	104
G4HAO	82	21	103
G4IGO	67	31	98
G3BW	69	29	98
G3FPK	74	22	96
G8VLQ	69	26	95
G4JZF	74	21	95
G8RZO	68	21	89
G8RZP	68	21	89
G8VFV	68	18	86
G2AXI	65	19	84
G3PBV	60	23	83
G8FMK	66	17	83
GD2HDZ	67	15	82
G8HHI	62	19	81
G8XMP	64	17	81
G8TFI	66	14	80
G8VR	44	32	76
G8WUU	61	15	76
G3FIJ	60	15	75
GM4COK	52	22	74
GW3CBY	58	15	73
G6ADC	62	11	73
G8RWG	57	15	72
G4GXL	55	15	70
GW8TVX	55	15	70
G6AJA	58	9	67
G8TGM	48	18	66
G8GXE	55	11	66
G4LDY	52	12	64
G4ARI	54	10	64
G8XTJ	52	11	63
G8RZA	50	12	62
G4MUT	49	12	61
G8TRW	47	11	58
G6ABB	44	12	56
G6ECM	44	11	55
G8KAX	43	11	54
G8SKG	39	10	49
GM4CXP	35	13	48
G3CO	39	8	47
G8TIN	40	7	47
G4MJC	29	11	40
G8LXY	33	6	39
G8MBI	28	9	37
G4FKI	20	5	25
G6CSY	21	4	25
GM4ELV	10	3	13

Rob Mackean, G4HAO, (Liverpool) made four QSOs in the *Quadrantids* on Jan. 3. LA3WU (CU); OZ1DSK (EP); DL7AN (GM) and IV3HWT (GF), all between 1200 and 1730. Rob suggests this shower peaked in the afternoon as all his morning skeds were abject failures. Ken Osborne, G4IGO (Bristol) mentions two MS contacts on Jan. 3; EA3ADW (BB) and YU3ULM (GF). Ken has worked HG1YA several times but cannot get a QSL. Anyone else had better luck?

In the *Geminids,* Paul Turner, G4IJE, (Essex) had two completed SSB MS skeds; SM0GWX (JT) and OZ2ZB (EQ) on Dec. 13. On Dec. 9, UK2RDX (MT) was a new country and square, and the same day, an MS back scatter QSO with GW3NYY (XL) was completed when both were beaming towards YP square. YU7AJH

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(JF) and SP6AZT (IL) were worked on Dec. 10 and 11 respectively. The 12th. brought OK3KFF (II); HG2SU (JH) and his first G station; SP8AOV (LL). The 13th. brought YU2IQ on random SSB (HE) and YU7QED (KF) on CW. YU3ES (GF) and I6WJB (HC) were worked on the 20th., LA1K (FX) for a new square on the 22nd., YU3ES again on the 26th., both stations only running 25w! The 30th. brought YU1ONB (KE) and DF7RG (GI).

In the *Quadrantids,* Paul got four new squares on Jan. 3; I2AV (EF); I3YXQ (FF) on SSB; UA2FAY (KO) by "tail-ending" G8VR's sked and the star turn, and best ever MS DX, UA3LAW (PO). The QRB is 2,056 kms. and Paul got a 22 sec. burst at S9 to complete the QSO in 50 mins. To round off, YU3ES was again worked on random SSB. Paul reckons the *Geminids* shower was fairly good, but not spectacular, while the *Quadrantids* appeared to have two peaks; the one, as predicted, around 1400, with a second at 22-24 GMT.

Graham Taylor, G4JZF, (Staffs.) had one QSO in the *Geminids* with IV3HWT for country no. 22 and the 118th. square. George Gullis, G8MFJ, (Wilts.) had a letter from Pavel Chmelar, OK2SGY (IJ) asking for skeds with stations in XM, XN, YM, YN and ZM squares. His address is;—Jana Svermy 35, 7570101 Valasske Mezirici, Czechoslovakia. CW or SSB modes. From the 20m. VHF net, your scribe gleaned that OK1DPB (HK) runs 300w. output to a 16-ele. *Yagi,* with a 1.2 dB., BFT66 preamp. on receive. UK2RDX (MT) runs 500w. to a 9-ele. *Yagi* and the Rx has a 2N5397 1st. RF stage.

There were no significant Auroras in this period and tropospheric propagation was somewhat mediocre. An end-of-year note from Table winner Syd Harden, G2AXI, reveals little radio activity in the last three months. G2DHV (Kent) writes that he has called 16 stations on CW and had no replies, which he cannot understand. George's aerial is a rotatable, 6-ele. *Yagi.* In frustration, he monitored the *Oscar 8* satellite and was amazed at the strength of the 10m. downlink signals, considering the low power and long distances involved. He heard seven countries, including a UA3.

FOUR METRE ANNUAL TABLE

Final Placings at December 31, 1981

Station	Counties	Countries	Total
G2AXI	58	9	67
GD2HDZ	49	7	56
GW3MHW	44	8	52
G3BW	42	6	48
G3FIJ	41	5	46
G4FKI	37	5	42
G8VR	32	3	35
GW3CBY	27	6	33
G4ARI	18	2	20
G3CO	14	3	17
G3PBV	3	2	5
GM4CXP	3	1	4

Dave Sellars, G3PBV, (Devon) reckons 1981 to have been a poor year for tropo. with *E's* not too good for his area. He mentions G8FMK's achievements in the tables using all home built gear. Dave remarks on the fact that several times a lift has occurred a day after our deadline for letters, citing Dec. 3. In the Fixed Contest on Dec. 6, conditions were flat with 68 stations worked at an average QRB of 200 kms. He was quite surprised on Dec. 13 when, after G3CHN had read the *GB2RS* news bulletin, Roger was called by G3ZSS/PA0 in the Hague. There was a blizzard at the time and the barometer was reading about 28.8″

G4HAO's total of 82 counties over 1981 is quite remarkable as Rob was only at his Liverpool home for 22 weeks. He is now well set up for MS work, so the countries score should be even better this year. G4IGO reckons 1981 to have been slightly better than 1980, with much more ionospheric DX. Ken worked 133 of the 158 squares heard. G4JZF commented upon the notes about his local interference problem, mentioned last month, and says it read as if it was *his* amplifier which was at fault. It was somebody else's, though. Sorry for the ambiguous reporting, Graham. (Cries of "Resign!"). The Dec. 6 Contest saw a slight increase in the number of QSOs but a drop in points due to the indifferent conditions from Cannock.

Jon Stow, G4MCU, (Essex) now has 93 squares confirmed of the 118 worked. Martyn Hunt, G6AJA, (Cumbria) is just one year on the band and has thoroughly enjoyed it. His station comprises a *Yaesu* FT-221R and 12-ele. *ZL-Special.* Welcome to another new correspondent Mick Cuckoo, G6ECM, from Herne Bay in Kent who, since he was licensed last September, has managed 44 counties and 11 countries on the band using the Icom IC-206E and *Microwave Modules* 144/100S amplifier and 8-ele. *Yagi* at 185 ft. *a.s.l.* He found December a quiet month after some nice DX on Nov.3 *via* tropo.

John Lemay, G8KAX (Essex) remarks that he has not known 2m. so poor for so long as recently, so has worked nothing new lately. Neil Clarke, G8VFV, (W. Yorks.) also has not worked anything new from Sept. 4 last. John Fitzgerald, G8XTJ, (Bucks.) had a go in the Dec. 6 contest and remarks on some of the grotty signals. One local with an overdriven amplifier and speech processor turned up too much, deprived him of a QSO with GM8YJU. In submitting his final 1981 scores, Arthur Breese, GD2HDZ, refrains from comments on recent conditions as they would be unprintable!

Another new reader is Russ Clarke, GW3CCF, from Gwernymynydd in Clwyd, who will feature in the tables this year. His station comprises the *FDK* 750 with Expander, covering 2m. and 70cm. and he hopes to get on 23cm. too, later on.

23 CENTIMETRE ANNUAL TABLE

Final Placings at December 31, 1981

Station	Counties	Countries	Total
G8FMK	28	3	31
G8GXE	17	5	22
G8HHI	16	2	18
G3PBV	12	3	15
G8KAX	11	3	14
G3BW	7	5	12
GD2HDZ	5	4	9
G2AXI	7	1	8
GW8TVX	5	2	7
GW3CBY	3	2	5

UHF Bands

Little to report this month on 70cm. and up. DF3RU (FJ49j) is looking for 70cm. MS skeds. Karl runs four, 19-ele. *Yagis* and also mentioned *Ar* contacts. G2AXI hopes to have a go soon at finishing his 23cm. gear. G3PBV heard FX1UHF (BI) on Dec. 3, but weakly, but DD1EK (DL) was a good signal. On 23cm., GB3BPO was S9-plus, and GB3AND, GB3CLE and GB3MLE were all quite strong, so Dave concentrated on this band working G4GLN, G3MCS and G8FMK. QSB was slow and deep with diversity reception effects notable between Newton Abbot and G4MAW in Paignton. Dave reckons the new 23cm. repeaters will be useful propagation indicators and thinks the "meandering carrier" near 1,297.225 MHz recently might have been GB3WX at Brighton.

G4MCU is now up to 32 squares on 70cm. the latest being GW3NYY (XL) worked on Dec. 3. That day saw activity from G8FMK and produced QSOs with G4HPU (Ipswich), G4CCH (Humberside), G4MAW and G3PBV in Devon. On the evening of the record low temperature in Shropshire, GB3CLE was very strong but there was no activity. Ray's 70cm. aerial lost directivity for a few days due to snow, but the 23cm. one, usually adversely affected by rain and freezing fog, was unaffected. A high level of construction is anticipated in 1982 and a 13cm. Tx is contemplated. In a letter dated Dec. 6, which missed last month's piece, Reg Woolley, GW8VHI, (W. Glam.) informs that G8DPV is QRV from Cornwall on 70cm. with 50w. and a 48-ele. *Multibeam.* Also, EI9Q is waiting for a 2 x 4CX250B amplifier for 70cm. and masthead pre-amp. Dick has a pair of 88-ele. *Multibeams* up.

Deadlines

An early deadline for the March feature. It is *Feb. 3.* For the following month it is Mar. 3. All your letters and table scores to;—"VHF Bands," SHORT WAVE MAGAZINE, 34 High Street, WELWYN, Herts. AL6 9EQ. *73 de G3FPK.*

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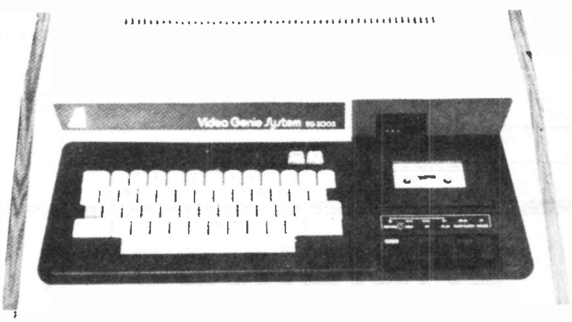

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144.4 (433.2)	b	e	b	e	e	b	e	e	e	e	e
144.800	e	e	e	e	e	c	c	c	e	c	e
144.825	e	e	e	e	e	e	e	e	e	e	e
144.850	e	e	e	e	e	e	e	e	e	e	e
145.000/ROT	a	c	a	c	c	b	e	b	e	a	c
145.025/R1T	a	c	a	e	e	b	e	b	e	e	e
145.050/R2T	a	c	a	e	e	b	e	b	e	e	e
145.075/R3T	a	c	a	e	e	b	e	b	e	e	e
145.100/R4T	a	c	a	e	e	b	e	b	e	e	e
145.125/R5T	a	c	a	e	e	b	e	b	e	e	e
145.150/R6T	a	c	a	e	e	b	e	b	e	e	e
145.175/R7T	a	c	a	e	e	b	e	b	e	e	e
145.200/R8R	a	c	a	e	e	b	b	b	a	e	c
145.300/S12	e	e	e	e	e	e	e	e	e	e	e
145.350/S14	e	e	e	e	e	e	e	e	e	e	e
145.400/S16	e	e	e	e	e	e	e	e	e	e	e
145.425/S17	e	e	e	e	e	e	e	e	e	e	e
145.450/S18	a	e	a	e	e	b	b	b	a	a	e
145.475/S19	a	e	a	e	e	b	b	b	a	a	e
145.500/S20	a	c	a	c	c	b	b	b	a	a	c
145.525/S21	a	c	a	c	c	b	b	b	a	a	c
145.550/S22	a	c	a	c	c	b	b	b	a	a	c
145.575/S23	a	c	a	c	c	b	b	b	a	a	c
145.600/R0R	a	c	a	c	c	e	b	b	a	a	c
145.625/R1R	e	e	e	c	c	e	b	e	a	a	c
145.650/R2R	e	e	e	c	c	e	b	e	a	a	c
145.675/R3R	e	e	e	c	c	e	b	e	a	a	c
145.700/R4R	e	e	e	c	c	e	b	e	a	a	c
145.725/R5R	e	e	e	e	c	e	b	e	a	a	c
145.750/R6R	e	e	e	c	c	e	b	e	a	a	c
145.775/R7R	e	e	e	e	c	e	b	e	a	a	c
145.800/R8R	a	c	a	c	c	b	b	b	a	a	e
145.950/S38	a	e	e	c	e	e	e	e	a	e	e

PRICES: (a) £2.15, (b) £2.55, (c) £2.80, and (e) £4.87.

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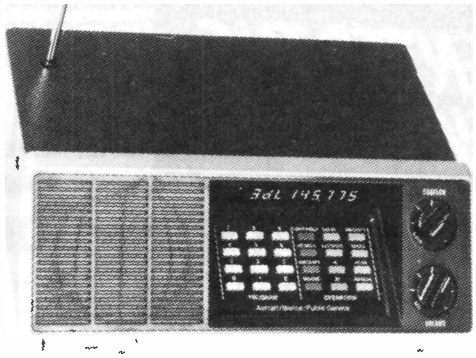

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R1	4.0284	8.0569	12.0854	14.9916	18.1281	44.9750
R2	4.0291	8.0583	12.0875	14.9944	18.1312	44.9833
R3	4.0298	8.0597	12.0895	14.9972	18.1343	44.9916
R4	4.0305	8.0611	12.0916	15.9000	18.1375	45.0000
R5	4.0312	8.0625	12.0937	15.0027	18.1406	44.0083
R6	4.0319	8.0638	12.0958	15.0055	18.1437	45.0166
R7	4.0326	8.0652	12.0979	15.0083	18.1468	45.0250
S8	–	–	12.1000	14.9444	18.1500	44.8333*
S9	–	–	12.1020	14.9472	18.1531	44.8416*
S10	–	–	12.1041	14.9500	18.1562	44.8500*
S11	–	–	12.1062	14.9527	18.1593	44.8583*
S12	–	–	12.1083	14.9555	18.1625	44.8666*
S13	–	–	12.1104	14.9583	18.1656	44.8750*
S14	–	–	12.1125	14.9611	18.1687	44.8833*
S15	–	–	12.1145	14.9638	18.1718	44.8916*
S16	–	–	12.1167	14.9667	18.1750	44.9000*
S17	–	–	12.1187	14.9694	18.1781	44.9083*
S18	–	–	12.1208	14.9722	18.1812	44.9166*
S19	–	–	12.1229	14.9750	18.1843	44.9250*
S20	4.0416	8.0833	12.1250	14.9777	18.1875	44.9333
S21	4.0423	8.0847	12.1270	14.9805	18.1906	44.9416
S22	4.0430	8.0861	12.1291	14.9833	18.1937	44.9500
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	4	200 (total)	100 to 999.999kHz	–	£6.00
	5	50	1.00 to 1.499MHz	£9.00	£6.00
	6	10	1.50 to 1.999MHz	£4.75	£4.20
	7	10	2.00 to 2.599MHz	£4.75	£4.00
	8	10	2.60 to 3.999MHz	£4.55	£3.70
	9	10	4.00 to 20.999MHz	£4.55	£3.60
	10	10	21.00 to 24.000MHz	£6.00	£5.40
3rd OVT	11	10	21.00 to 59.999MHz	£4.55	£3.60
5th OVT	12	10	60.00 to 99.999MHz	£5.00	£4.00
	13	10	100.00 to 124.999MHz	£6.15	£5.20
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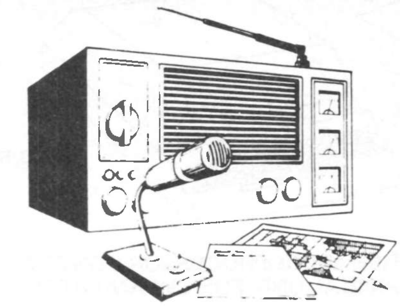

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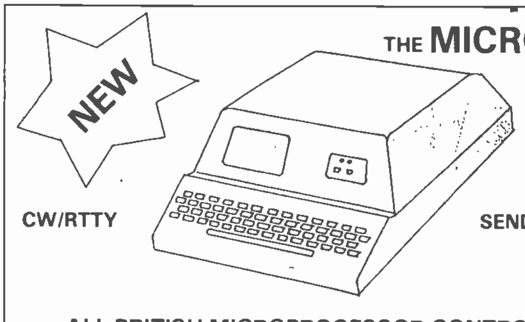

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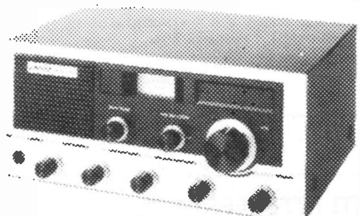

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