

The SHORT WAVE Magazine

VOL. XXXVI

JUNE 1978

NUMBER 4

OPEN UP THE EXCITING WORLD
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TS520S

Setting new standards in 6 band transceivers



TS520S

The TS520 from Trio was, as we expected, an outstanding success and many thousands are now in use around the world. Following the Trio practice of listening to suggestions and comments from users of the equipment, the TS520 was updated and appears as the TS520S. All accessories such as the TV502, VFO520 and SP520 are fully compatible with both models so there is no obsolescence. Major new features in the TS520S are:

Full band coverage from 160-10 metres with WWV at 15 MHz and a most important uncommitted band which will be used following any expansion or modification of amateur HF bands at WARC in 1979. This provision is typical of Trio advanced planning. Now that LORAN has finally gone from 160 metres, a whole new area of operation has opened up for the amateur and the TS520S gives you top performance for top band.

New speech processor using the latest audio compression techniques to give you extra signal punch when in the pile up but without introducing any clipping or distortion. The compressor can be put into use instantly by front panel switching.

Advanced noise blanker is built into the TS520S for virtual elimination of impulse interference such as ignition noise. The TS520S also incorporates the 3SK35 dual gate MOSFET in the RF amplifier for outstanding cross modulation and spurious response characteristics. The 3SK35 has a low noise figure (3.5 dB typ) and high gain (18dB typ) which contributes to the excellent receiver performance—less than 0.2µV required for 10dB S/N ratio on all bands. When the signal levels are exceptionally high, a 20dB attenuator can be inserted at the touch of a push button.

Razor sharp selectivity resulting from the use of an 8 pole HF crystal filter with 2.4 kHz bandwidth and better than 2:1 shape factor.

Skirt selectivity and ultimate stop band rejection are outstanding. Dual gate MOSFET devices in all receiver IF stages give first class AGC characteristics with no overloading or popping on speech peaks. The AGC has switchable time constant and can also be turned off for the keen CW operator.

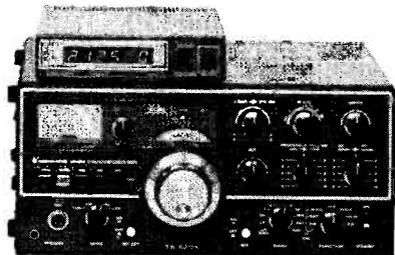
A matching 8 pole 500 Hz CW filter is available and can be fitted by the set owner in a few minutes. This filter gives the CW operator really excellent selectivity with stop band rejection of a very high order.

Multi function metering of signal strength, ALC level, PA input current, RF output and HT voltage to the PA not only keeps the operator informed about the performance of the rig, but also allows instant calculation of power input. A built in low noise cooling fan keeps cabinet temperatures very low, even over extended operating periods. Break in CW with keyed sidetone and an advanced VOX system give easy control at all times.

Tuning up the TS520S is simple and fuss free due to the provision of a low power tune up facility. No need to worry about the crackling noises which are often apparent in transmitters using line output tubes; rugged 6146B tetrodes in the 520S give high power output with very low intermod products—in fact, the Trio TS520 series transceivers have always sounded outstandingly good on the air due to this fact.

The TS520S has all the features desirable in a high quality transceiver—RIT control, 25 kHz calibrator; separate mic gain and carrier level controls; built in speaker; power saving heater switch; provision for up to 4 fixed channels; all connector provision for linear and transverter control and many, many more.

Ask anyone about the TS520S, all reports are the same—it's the best around.



DG-5

The luxury of digital readout is available on your TS520S by connecting the new DG-5 readout unit. More than just the average readout system, the DG-5 mixes the carrier, VFO and heterodyne oscillator outputs to show your exact frequency at all times in all modes. This handsome accessory can sit on the TS520S for in-shack use... or on the dashboard during mobile operation for safety and convenience. Six bold digits display your operating frequency, and the digital hold switch serves as a memory.

Unique feature—the DG-5 can be used as a general purpose counter reading signals from 100 Hz to over 50 MHz so it's more than just a readout system.

N.B.—The DG-5 can be fitted to earlier TS520 models by using the adaptor kit DK-520.

TS520S £489 inc. VAT

DG-5 £132 inc. VAT

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0629-2430 or 2817

FOR FULL CATALOGUE SIMPLY SEND 45p in stamps to Matlock.



TRIO TS700S

NEW TS700S. 2 metre all mode transceiver

The TS700S is intended to be top of the line in 2 metre multi mode stations. Building on the solid foundation of the TS700G with its outstanding signal quality and unbeatable receiver dynamic range. TRIO have now incorporated all the facilities which customers have expressed a wish to see in the 700 series. Main new features are:

Digital readout

Built into the rig using the same easy on the eye blue/green read out tube as the TS820. The counter is a complete frequency measuring system and incorporates the VFO and carrier oscillator frequencies to measure the CW transmits/receive shift as well as USB/LSB shift. The display reads to 100 Hz on SSB and CW but is automatically rounded off to the nearest 1 kHz on FM—However—if you insist on reading to 100Hz, the touch of a switch restores this facility on FM also.

Smooth accurate tuning

Using the new dual ratio gearbox with flywheel action for fast band scanning. It is true to say that nothing compares with a real VFO backed up by first class mechanical engineering, when it comes to pin point accurate tuning of SSB and CW.

Receiver pre amplifier

The TS700S is fitted with a low noise receiver pre amplifier with carefully calculated gain figures to give that extra performance when digging into the noise for real DX. When signal levels are high, simply remove the pre amplifier at the touch of a front panel switch.

Vox operation

And break in CW using the built in VOX system. Front panel gain and delay controls allow instant adjustment to suit every situation.

High/low power

A front panel button allows instant selection of high power or a nominal 1 watt low power transmitter output.

Split frequency working

Using the new external VFO unit VFO/700S. The frequency of the external VFO is checked by the digital readout on the TS700S. A press switch on the VFO allows instant frequency checking at any time and any frequency split or full transceiver operation can be carried out using external VFO. A unique accessory for the VHF operator.

New standards of performance

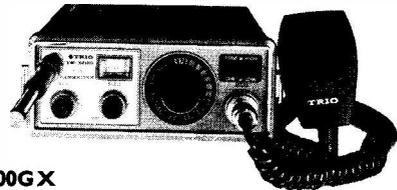
On the samples which we have checked, the 10dB S/N ratio sensitivity is around 0.15 μ V on SSB and the 20dB quieting level is less than 0.2 μ V on FM. This gives the TS700S a real lead over any other rig around.

Plus of course all the features which make the 700 series so outstanding. Remember the signal quality resulting from the use of a high supply voltage on the PA and driver giving unbeaten linearity (TRIO patent). Remember the rugged, go anywhere construction which makes the 700 series so popular on expeditions and field days. Remember the all mode (AM, FM, USB, LSB, CW) operation—not all rigs have them. Remember the Simplex/Repeater/Reverse repeater operation available at the turn of a switch.

Finally, remember the combined reputations of TRIO and Low Electronics and you will agree with us that for the ultimate 2 metre all mode station it has to be the TS700S.

TS700S £580 inc. VAT

VFO700S £104 inc.



TR2200GX

TR2200GX, £147 (3 ch.) £177 (12 ch.) inc. VAT

This is the definitive 2 metre FM portable rig which has won praise from all over the world. Over 2W transmitter output with switched reduction to 400mW for local contacts. High gain receiver with double IF filtering at 10.7 MHz and 455 kHz for razor sharp selectivity. The TR220GX is supplied with all accessories including the battery charger for the optional Nicad battery pack, the removable telescopic antenna, the carrying case, the shoulder strap, external power lead, microphone and handbook. Fitted with 12 channels, the price is only £177 inc. VAT. If you wish to start out at a lower price, we can supply the rig fitted 3 channels for only £147. With all its performance, the TR2200GX is a must for the portable operator. At the price, it has to be the best around. Just look around at the next rally and see how many operators are carrying them.

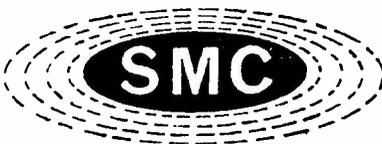
LOWE ELECTRONICS—FOR ALL THAT IS GOOD IN AMATEUR RADIO

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Gace eolas faoi earraí TRIO in Eirinn fáil ó Donald White, Ballyjourney, Macroom, Co. Cork.
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NEW DE-LUXE GENERAL COVERAGE RECEIVER



The FRG7000 is a digital readout, to 1 kHz, general coverage receiver which inclusively covers 250 kHz to 30 MHz. The receiver is sensitive (0.7 μ V for 10dBs(N) and very stable. Selectivity is switchable; ± 1.5 kHz for CW/SSB and ± 3 kHz (at -6dB) for AM. A digital clock is incorporated (settable to local and GMT time with a relay timer circuit (for switching on tape recorder etc).

FRG7000 Digital Receiver, £306 + VAT.

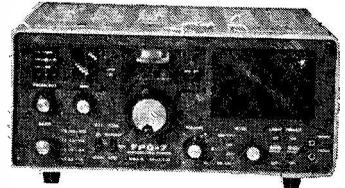
YH55 Headphones, £8.75 + VAT

FRG7 Analogue or SMC Digital Readout

The FRG7 is a general coverage solid-state receiver with specifications unparalleled in its price range. It uses a Barlow Wadley Triple-mix, drift cancelling loop for continuous, spin-tuned coverage of 0.5 to 30 MHz. The receiver is sensitive (0.25 μ V for 10dB S+N(N)SSB) and stable with AM, SSB and CW modes catered for. A three position audio filter, RF attenuator, dial lamp conservation switch, recorder and phone sockets are fitted. It is mains powered, but should the supply fail, or portable operation be required, eight dry cells are automatically switched in. The U.K. Sales of many thousand FRG7's last year amply demonstrates the outstanding value and enormous versatility of the unit with applications in Amateur (First Rx or standby), SWL (Amateur and BCL) or far less demanding professional applications.

FRG7 Analogue £164 + VAT SMC Counter, £50.00 + VAT

FRG7 Digital, £217 + VAT YH55 Headphones, £8.75 + VAT



The SMC, full specification, internally mounted counter (easily installed in existing receivers provides: a 100Hz readout (100 fold improvement), flashing \pm digit (to indicate VFO over range) and adjustable gate time.



The FR101 COMMUNICATIONS RECEIVER

The FR101D (de luxe) wide coverage (23 (from 1.5 MHz) 500 kHz bands + 4 and 2 metres) receiver. Analysis of the signal path shows: 0-20dB switchable attenuator, two section permeability tuned input filter, Mosfet R.F. stage and mixer (crystal controlled), three section top coupled bandpass filter, no gain at first IF, IC balance mixer. 20 kHz wide crystal filter, shunt diode noise blander, single FET buffer stage. AM, CW or SSB (RTTY) filter, appropriate detector and audio stage. Add to this, two excellent VHF converters, squelch, FM detector, 1 kHz readout, excellent stability, TX monitor control, crystal control facility, switchable AGC transceive capability (FT or FL101) and that digital readout options are available of this (de-luxe) or the standard (less the plug-in optionals of converters, broadcast band crystals, filters, etc.).

FR101S Standard Receiver, £372.00 + VAT
 FR101SD Standard Digital, £453.50 + VAT

FR101 De-luxe Receiver, £465.00 + VAT
 FR101DD Digital De-luxe, £541.00 + VAT

FOR THE VHF MOBILE THE FT227R FROM YAESU

The new FT227R uses a "single knob" tuned digital synthesizer employing a photoelectric sensor or an optical coupled system which eliminates both noisy, unreliable rotary switches, and crystal banks. Full coverage of 2 metres in 5kHz divisions with a ± 600 kHz shift plus a memory feature which permits recall of any entered frequency or particular offset. Bright large, digital readout gives unequivocal readout of the frequency in use. The receiver offers 0.3 μ V (for 20dB S + N/N) sensitivity into a ± 6 kHz (at 6dB) bandwidth whilst maintaining a remarkable immunity to overload and image problems. The 20W DC input transmitter features Hi/Low power outputs, AFP tone burst on repeaters and an out of band inhibition trip, etc.

EX STOCK IN TOTTEN

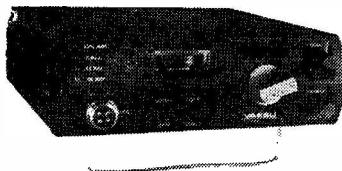
REMEMBER SMC FT227RS HAVE FULLY AUTO T-B ON REPEATER SHIFT ONLY



THE FT223 2M LOW COST FM TRANSCEIVER

The FT223 is an FM transceiver operating on 23 crystal controlled channels (or by external VFO) across 144 to 148 MHz. For mobile uses it is safe; illuminated; meter (RX 'S' and TX out) and main dial (crystalled), LED's indicate; squelch open, high 10W or low 1W operation, on air, or if the special frequency is selected. Housed in heavy metal case and supplied complete with mounting bracket cables, connectors, microphone, etc., it is equally at home as a compact 7" x 2 1/2" (3") x 8 3/4" (10") base station with a 12v. PSU (0-45A Rx. 1-2A LTX, 2-3A HTX). The dual conversion receiver is sensitive (mosfet R.F. and mixer) and selective (12 kHz a 6dB) delivering 2W to the internal 3" or an external 4 Ω speaker.

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



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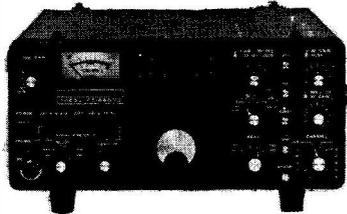
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New Multi Mode 144MHz Transceiver and more!



FT225RD

THE FT221R MULTIMODE FROM YAESU

The FT221R. The multimode USB, LSB, AM, FM, CW (with semi-break in and side tone), 2m transceiver offering the choice of phase locked VFO or 44 crystal channels, simplex or repeater (600 Hz up and down shifts), with unique "double push" auto tone burst, mains or 12v. (2A) operation, excellent selectivity SSB 2.4 kHz (1.7 SF) or FM 12 kHz. Front panel adjustable VOX and mic gain, a calibrator (1 MHz \pm 10), 1 kHz readout and linearity, sensitive squelch, clarifier with IRT and IRT with ITT (makes FSK easy), switchable "S" and centre zero tuning meter, noise blanker, serviceable plug in boards all contained in 11 $\frac{1}{2}$ " (14") x 5" x 11 $\frac{1}{2}$ ", 22lb. rigid package. 600 kHz and 1.6 MHz shifts over 4 MHz.

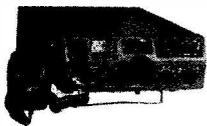
FT221R, £357 + VAT YC221, £72.50 + VAT MANUAL, £9.50

Based upon the extremely popular FT221, Yaesu proudly present the top line multi mode 2 metre transceiver. Super accurate mode sensitive 100 Hz digital readout, 10W. of AM, 25W of FM (Continuously variable) and even more power on SSB. Repeater up-down 600 kHz and aux shift. 11 crystals control positions (per 1 MHz band) and full memory facility.
 FT225R £470.00 FT225DRD £506.50
 Counter £57.75 Memory £84.50
 All prices are VAT exclusive



FT221R

THE FT7 MOBILE TRANSCEIVER



This is a 10-80m. transceiver, VFO controlled (to 1 kHz accuracy) plus crystal control facility. Selectable sidebands. CW, crystal calibrator, clarifier and an advanced noise blanker are some of the features packed into a cabinet only a few inches high, but through careful design the front panel remains remarkably uncluttered. Designed for a linear 10W. output consisting only a few Amps it eliminates \pm 30A cables from the passenger compartment and the cooling problems of a massive heat sink. Need more power? Flick in a FL110 (a 200W. PIP linear) installed in any suitable place in your car.
 FT7 £300.00 F84 £29.50 FL110 £110.00



FL110
 ALL BAND
 LINEAR
 AMP.

10-160m. Switched L.P.F. 15W. \rightarrow 200W PIP A1/A31, 4W \rightarrow 75W FI. Negative feedback with ALC to exciter. RF sensing (Adjustable hang time) with override.

THE FT101E THE MOST POPULAR RIG IN THE WORLD !!!

The FT-101E a complete mains or 12v. DC station contained in a compact 30 lb. package, 260W. P.I.P. of SSB (with in-built R.F. speech processor) 180W., CW and 80W. of AM 10 to 160m. (incl) 10 MHz RX). The sensitive and selective (permeability) tuned RF stages and 8 pole crystal filter. receiver offers : threshold adjustable noise blanker, switchable 25 and 100 kHz calibrator, \pm 5k clarifier (with separate on/off switch), etc., etc. The VFO is stable and linear (readout to 1 kHz) external VFO or crystal control can be selected with LED indicators illuminated accordingly. Carrier level is adjustable for : tune up, AM and for CW operation, whose performance with the semi break in keying, with side tone, and the optional filter installed in a high order. Linear and transmitter provisions are made with sockets for : relay contacts, ALC output, all internal HT supplies, low level RF heater links and switches, etc., etc.
 FT11E, £485.00 + VAT FT101EE, £469.00 + VAT FT101EX, £440.00 + VAT



FT101E



FT901DM

THE FT901—SIMPLY UNBELIEVABLE PERFORMANCE

160-10m. (+ WVVV Rx) 12 and 234v. (PSU Built-in). SSB, AM, CW, FSK and FM (Tx & Rx). 180W.PIP, 80W. FI. Analogue 1 kHz and Digital to 100Hz. Sensitive, $\frac{1}{2}$ μ V with AGC controlled Mosfet RF to push pull FET RF. Balance active mixer, push pull IF amp. to crystal filter then noise blanker. Continuously variable selectivity 300Hz to 2.4 kHz and fixed 600Hz, 2.4 kHz, 6 kHz and 12 kHz (at 6dB) 90dB cross mod. rejection, 90dB desensitisation immunity (at 20kHz off at 14 MHz) Audio Peak and separate notch tuning. Negative RF feedback on 6146B toroidal tuned output stage (\sim 31dB 3rd order) RF processor, VOX, Curtis electronic keyer, tune button (10sec. on full power), PLL VFO with memory for any TX, RX or TRX frequency. Modular plug-in construction, permeability tuning (for possible new band allocations) 25 kHz calibration, 20dB switchable attenuator sidetone clarified advance noise blanker are all features of the FT901—The 1980's Transceiver available.
 FT901DM, £805.00 + VAT FT901D, £695.00 + VAT FT901DE, £695.00 + VAT

STOP PRESS 160m. to 70cms. SSB-CW-AM-FSK-FM CO-CHANNEL, SPLIT, REPEATER, SATELLITE

The best amateur transceiver now has the best range of accessories. The YC901, ATU/Power meter, the SP901(P) speaker (patch). The YO901 monitor scope, the FV901 external VFO —Not just an oscillator but digital and analogue readout, multi channel memory with manual and auto scanning. The FTV901 transverter another first, three band transverter (with repeater shift) 50 (70), 144 and 432 MHz (8 MHz) in a standard external speaker size box. Watch this space for further details when available. E. & E.O.

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 30W peak 15W cont. 50 ohms PL259
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DL20 P & P 25p + 8% VAT **£4.75**



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 1.5-250 MHz on fundamentals battery c/w earphone and 6 plug-in coils 2 kHz modulation. -15 MHz Crystal facility.
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LPM880 Absorption. 1-8-500 MHz. 5-20-120W. FSD P & P.95p **£69.00** + 8% VAT

QUARTZ CRYSTALS LOW PRICE
 FT75(B), FR101(S), FT200(B), FT301(S), FT221(R), FT220, MS2, MR2, Converter **£2.20** each (+ 12½%), FT2F, FT2FB, FT2 Auto, FT224, FT223, KP202, Mu:11, FR2200(G), C146A, **£4.00** pair (+ 12½%) (P & P 20p)



BOOM MICROPHONE HEADSET
 600 ohm magnetic lightweight boom mic. Ideal for mobile or contests, etc (Post free but VAT + 12½%).
 Microphone only ... **£9.75**
 Footswitch only ... **£5.95**
 MD35 complete ... **£14.75**



ULTRA BAL 2000
 Ferrite Balun 3-30 MHz 50/75 ohm 9 ozs Body $6\frac{1}{2}''$ long x $1\frac{1}{4}''$ dia. Rated to 2000W PIP. SO239 socket UBI 1:1, **£9.00** + 12½% (P & P 40p)



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 1:05:1 VSWR, 0.2dB loss, 40dB isolation, 200W handling at 150 MHz. KSW1 3 SO239 sockets **£7.70** (+ 8%) KSW1A 2 SO239, 1 PL259 plug **£8.20** (+ 8%)



SML SWR METER
SWR25
 Twin meter SWR25 Up to 160 MHz. Calibrated to 3:1 SWR SO239 P & P 40p **£10.00** (+ 8%)



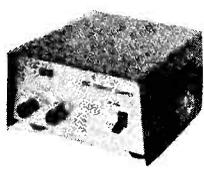
AMPERE LINEAR AMPLIFIERS
 RF sensing. All modes c/w bracket. 10W drive. Free delivery. UK only
 AP882A 145 MHz 80W out., **£110.50**
 AP857A 432 MHz 45W out., **£110.50**
 AP887A 432 MHz 80W out., **£214.00** (+ VAT 12½%)



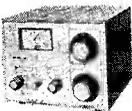
CUSHCRAFT COLINEAR (illustrated right) EX STOCK
RINGE RANGER: -6dB gain over \pm ground plane. Uses 3x4 in phase and $\frac{1}{4}$ stub. Ultra low angle radiation. Extremely low wt.
 ARX450 432 MHz RINGO RANGER Post 65p **£21.50** (+12½%)
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WATTMETER REMOTE RF HEAD
 50-150 MHz ideal for mobile use. separate directional coupler $3'' \times 2\frac{1}{2}'' \times 1\frac{1}{2}''$ and illuminated indicator $5\frac{1}{2}'' \times 2\frac{1}{2}'' \times 1\frac{1}{2}''$ c/w brackets, etc. Power 20 and 200W FSD ($\pm 10\%$) SWR to 3:1 ($\pm 3\%$).
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 12V. DC from 240V. AC 3 amps. (5A peak) $3\frac{1}{2}''$ lbs. $3'' \times 4\frac{1}{2}'' \times 6''$ + 8% VAT **£12.55**
 Binding post terminals with 4mm. socket, inbuilt. Mains neon indicator.
 ODR 123C post free + 8% **£13.42**



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 3-5-30 MHz, 50/75 coax (SWR <5) and single wire (10-250 ohms) feed transformed to 50 ohm. Wattmeter 20 & 250W FSD, SSB 500W PIP. Post free + 12½% VAT **£80.50**

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 12v. DC 50 ohm, Silver plated. (P & P 30p (VAT + 8%))
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MFJ ANTENNA TUNERS
 10-160m. 200W. 12 position Inductor.
 1610 L+C SO239 **£29.50** + 12½%
 900 1L+C SO239 **£36.75** + 12½%
 901 900 + Balun etc. **£44.25** + 12½%



CRYSTAL FILTERS P & P free VAT 12½%
 Wide range 3-18-9-10.7 MHz C.F. SSB (2,4), FM (12 kHz) CW (600 + 350 Hz.) BW.
 YF30F350 350Hz F*101 6 pole **£16.75**
 YF30F600 600Hz F*101 6 pole **£16.75**
 YF30H350 350Hz F*101 8 pole **£19.40**
 YF30H600 600Hz F*101 8 pole **£19.40**



FM BOOSTER T203
 88-108 MHz low noise pre amp. Fitted flying leads (car plugs) up to 20dB gain. 12 volts with LED indicator $1\frac{1}{2}'' \times 3\frac{1}{4}'' \times 2\frac{1}{2}''$
T203 £7.75 (+12%) P & P free)



MORSE KEYS FROM H I MOUND
 HK707 (illustrated left) P & P 60p Hand key 0.5 Kg ex-stock (12½%) ... **£8.80**
 BK100 P & P 60p (+ 12½%) Mechanical Semi Auto Bug key ... **£13.40**
 HK808 P & P 80p (+ 12½%) Hand key marble plinth (1-1 Kg) ... **£28.90**



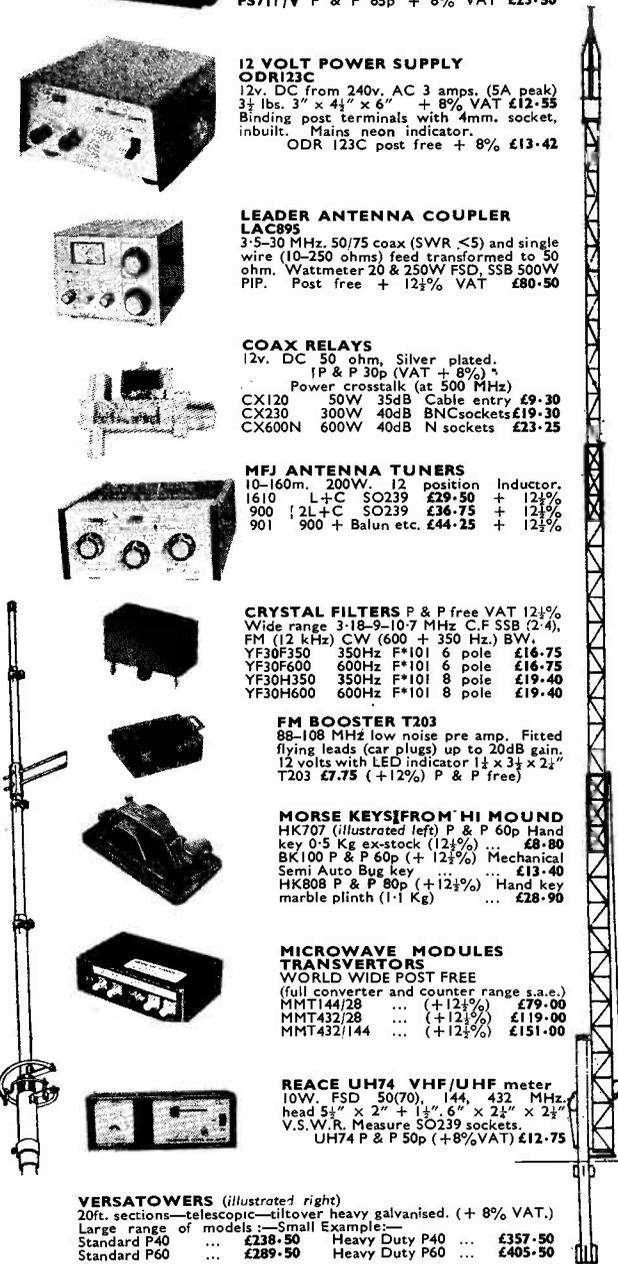
MICROWAVE MODULES
TRANSVERTORS
WORLD WIDE POST FREE
 (full converter and counter range s.a.e.)
 MMT144/28 ... (+12½%) **£79.00**
 MMT432/28 ... (+12½%) **£119.00**
 MMT432/144 ... (+12½%) **£151.00**



REACE UH74 VHF/UHF meter
 10W. FSD 50(70), 144, 432 MHz. head $5\frac{1}{2}'' \times 2'' \times 1\frac{1}{2}''$, $6'' \times 2\frac{1}{2}'' \times 2\frac{1}{2}''$ V.S.W.R. Measure SO239 sockets.
 UH74 P & P 50p (+8% VAT) **£12.75**



VERSATOWERS (illustrated right)
 20ft. sections—telescopic—tilt-over heavy galvanised. (+ 8% VAT.)
 Large range of models—Small Example:—
 Standard P40 ... **£238.50** Heavy Duty P40 ... **£357.50**
 Standard P60 ... **£289.50** Heavy Duty P60 ... **£405.50**





FRG7 DIGITAL £180

LEE ELECTRONICS LTD.

ESTABLISHED FOR MORE THAN TWO DECADES
OPEN MONDAY - SATURDAY TELEX 298765
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400 EDGWARE ROAD, PADDINGTON W2
LONDON'S LARGEST STOCKISTS OF YAESU ● ANTENNA
SPECIALISTS ● STANDARD ● ICOM ● BANTEK
JAYBEAM ● REVCO ● QM70 ● ATLAS ● ETC.

FRG-7 — DIGITAL DISPLAY

Yes. The world famous FRG-7 is now available with digital read-out fitted by Lee Electronics in place of kHz dial

Special Price £190 + VAT

For customers who already own FRG-7's we can supply the digital read-out complete with installation instructions ... £37.00 + VAT
FRG-7 Digital £190 FRG-7 with analogue dial £154 + VAT
FRG-7 Perspex cover as illustrated £3.50 All plus 12½% VAT

YAESU MUSEN PRICES (ALL AVAILABLE FOR IMMEDIATE DELIVERY)

FT301 T/RX 1.8-30. 100W. 12v. ... £490.00	FRG7 Digita ... £190.00	FR10SD Digital Readout "S" ... £435.00	YC500J 500 MHz Counter 10 PPM ... £145.50
FT301 D Digital Readout "D" ... £585.00	FT221R 2m. "All mode" digital ... £357.00	FR10DD Digital readout "D" ... £505.00	YC601 Dig. Display 10l and 40l ... £113.00
FV301 External VFO ... £70.50	FT227 10W, 400 ch. mobile, digital ... £285.00	FT10IE Transceiver 230v ... £453.00	YO301 Monitor scope ... £145.00
FP301 PSU/speaker ... £85.00	FT223 T/RX 2m. FM23 ch. 12v. ... £139.50	FL101 T.X. 1.8-30 MHz ... £359.00	YO100 Monitor 2 tone oc. ... £145.00
FT200B T/RX 3.5-30 ... £285.00	FR101D De Luxe "S" BC, FM ... £435.00	FL2100B Linear 1.2kW PIP ... £279.00	SIGBOR T/RX. 2m. FM 80 x 25 kHz 12v. ... £195.00
FP200B AC PSU/speaker ... £60.00		FT10IE T/RX 1.8-30 AC/DC ... £438.00	
FRG RX 5-30 cont. AC/DC ... £164.00			

ALL + VAT 12½% EXCEPT MONITOR SCOPE, CLOCK, COUNTER, WATTMETER, + 8%

MICROWAVE MODULES DESPATCHED TO ANY PART OF THE WORLD POST FREE

MMT144/28 Transverter ... £79.00	FREQUENCY COUNTERS	CONVERTERS	ATV435/51 converter ... £24.00
MMT432/28 Transverter ... £97.00	MMD 050/50 MHz counter ... £62.00	MMC70, 4m. converter ... £18.00	MCC1296 converter 28 or 144 MHz IF ... £2.00
MMT432/285 with Oscar shift ... £119.00	MMD 050/500 MHz counter ... £79.00	MMC70/LO, 4m. converter ... £20.00	All 2m. converters can be supplied with IF outputs of 2-4-12-14-18-28 MHz 70cm. models with i outputs of 28-14-18 or 144 MHz
MMT432/144 Transverter ... £133.00	Divide by 10 prescaler, 500p ... £25.00	MMC144, 2m. converter ... £18.00	
MMT432/144 with 1.6 MHz shift ... £151.00	VARACTORS	MMC144/LO 2m. converter ... £20.00	
MMP12/3 Power supply 12v. 3A stabilised ... £50.00	MMV 1296, 23cm. varactor ... £33.00	MMC432 70cm. converter ... £24.00	

ALL MICROWAVE MODELS SUBJECT AT VAT IN UK 8% ON FREQUENCY COUNTERS, ALL OTHER MODELS 12½%

A.S.P. MOBILE AND BASE STATION ANTENNAS

Asp201 ½w. 2m. mobile ... £3.25	Asp 393 ½w. 3dB 2m. mobile ... £17.00	Asp E462 70cm. 3dB mobile ... £7.23	Special offer A.S.P. A680 U.K. 6dB 144/148 MHz Co-linear. Power handling 350W. Length approx. 12ft. List £51. Special offer £41.50
Asp2009 3dB 2m. mobile ... £5.95	Asp no hole boot mount ... £3.70	Asp E667 70cm. 3dB mobile ... £16.90	
Asp629 ½w. 3dB 2m. mobile ... £7.60	Asp magnetic mount ... £8.95	Asp A659 UK 70cm. 5dB base antenna ... £19.00	
Asp677 3dB 2m. mobile ... £13.50	Asp cutter clip less cable ... £3.85		

ICOM RANGE

IC215 2m. 8ch. ... £139.00
IC215 2m. 10ch. (fitted 6 repeaters plus 4 simplex) ... £144.00
IC202 2m. SSB ... £152.00
IC22A 10W. mobile ... £145.00
IC240 10W. mobile ... £159.10
IC245E 10W. FM/SSB ... £352.00
IC211E 10W. FM/SSB ... £470.00

All Transceivers +12½% VAT

SPECIAL OFFER. Constant current Ni-Cad chargers. Adjustable charge rate for AA or C type Ni-Cads * Ideal for C202/215, C146A, Trio, etc. ... Price **£8.35 + VAT** p & p 50p

ICOM ACCESSORIES

Extals S21 or S22 ... pf. ... £4.50
ER Case 202/215 ... £6.67
Mobile Bracket 202/215 ... £10.23
Helical Antenna £3.25 , p & p 25p

KYOCUTO DIGITAL MODEL

2015 ... £245.00
10W mobile 400ch. Tx/Rx ... £245.00

J-BEAM ANTENNAS

ALL MODELS IN STOCK

F.D.K. RANGE

Multi UI (Ull) 70cm. mobile ... £221.00
Multi 11-2m. mobile ... £184.00
Multi 2700 Fm/SSB Tx/Rx ... £435.00
2m. with 13 BNC ... ea. £3.85
2m. with ph 259 ... ec. £3.85
2m. for IC215, Trio 2200 Gx, standard C146A ... £3.25
All + post 25p + 12½% VAT

STANDARD RANGE

C146 2M Hand held with carry case, tone burst, S20 and S22 ... £119.95
New Mobile Mastre. 2W. input 10W. output ... £39.50
Base Master ... £19.50
Mobile adaptor ... £4.95
Helical antenna ... £5.50
Small charger ... £5.25
C8600 10W. Mobile ... £115.00
C830S Marine H/Held ... £145.00

GM70 40W Liner amplifier ... **£46.20 + VAT 12½%**

ALPHA W63 2M 10W Mobile with scanning Channels fitted with 9 Channels. **£139.95 + VAT 12½%**

YES WE CAN NOW SUPPLY THE FT227R WITH AUTO-SCAN FACILITIES, DESIGNED AND MANUFACTURED EXCLUSIVELY FOR US—NOTE THESE STAR-FEATURES:

- ★ Scans 40 channels
- ★ 2 speed scan rate
- ★ Locks out unwanted channels
- ★ Automatic tone burst for repeater operation
- ★ Reverse repeater facility
- ★ Scans between 145-146 MHz in 25 kc/s. steps
- ★ Scanning facility

Controlled by switch fitted to microphone (not illustrated)

PRICE: £229 + VAT

YAESU FT227R + LEE ELECTRONICS AUTO-SCAN

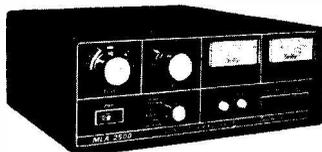




WATERS & STANTON

TELEPHONE HOCKLEY (03 704) 6835 (2 LINES)

TWO SUPER POWER HOUSES . . . IMPORTED DIRECT BY US



Den Tron MLA 2500

160-10m. 2kW
PEP

£695 inc. VAT
In Stock Now

- ★ 1kW DC continuous
- ★ ALC circuit
- ★ 3 speed cooling
- ★ Military specifications
- ★ 234v./117v. AC
- ★ 2 of EIMAC 8875 tubes

- ★ R.F. Wattmeter
- ★ Size 5½" x 14" x 14"
- ★ Weight 47lb.
- ★ Ideal for SSTV/RTTY
- ★ 3rd order down 30dB +
- ★ 40 watts drive for 1kW

IN STOCK

NAIGAI 2200 Linear

£399

(carriage £4.50)



- ★ 230v. AC
- ★ 4CX-350F tube
- ★ Receiver pre-amp
- ★ 10-13 watts drive
- ★ SWR meter built-in

- ★ 500W. PEP input
- ★ 400W. FM/CW input
- ★ Fan cooled
- ★ 12v. DC output
- ★ covers 144-146 MHz

. . . AND HERE'S JUST TWO OF OUR TUNERS 300W—3kW!



Den Tron JR Monitor

160-10m.
300W

£59.95 inc. VAT
In Stock Now

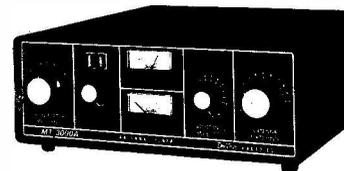
- ★ Continuous 1.8-30 MHz
- ★ Forward reading RF indicator
- ★ Built-in balun
- ★ Mobile mount
- ★ 50 or 75 unbalanced

- ★ 75-600 ohm balanced
- ★ Random wire
- ★ Ceramic 1,000 volt capacitors
- ★ Ideal for FT101 etc.
- ★ Ideal for HF mobiles!

Den Tron Military MT 3000A

160-10W. 3kW

£275 inc. VAT
In Stock Now



- ★ Antenna selector (5)
- ★ Exciter dummy load (250W)
- ★ 3kW continuous
- ★ 3 core balun
- ★ Tuner by-pass switch

- ★ Compact 5½" x 14" x 14"
- ★ Watt meter 200W/2kW
- ★ Forward/Reverse Watts
- ★ Matches any antenna
- ★ Military construction

Also 1kW 10-160 at £99.50. MT 2000A 3kW ATU £175. SW-2 SWR/Power/PEP meter £69.95.

VHF AERIALS GALORE!

(carriage charges shown in brackets)

JAYBEAM VHF/UHF ANTENNAS

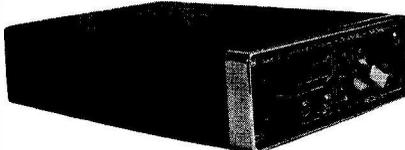
PMH2/AM 2 way harness	... £9.39 (£0.75)
C5/2M 5dB colinear	... £30.95 (£2.00)
5Y/2M 5 el. yagi	... £7.70 (£1.00)
8Y/2M 8 el. yagi	... £10.00 (£1.00)
10Y/2M 10 el. yagi	... £21.32 (£1.50)
PBM10/2M parabeam	... £25.37 (£1.50)
PBM14/2M parabeam	... £31.16 (£2.00)
5XY/2M 5 el. x'd yagi	... £15.97 (£1.50)
8XY/2M 8 el. x'd yagi	... £19.91 (£2.00)
10XY/2M 8 el. x'd yagi	... £26.33 (£2.00)
PMH/2C circular harness	... £5.00 (£0.50)
Q4/2M 4 el. quad	... £16.31 (£1.50)

O6/2M 6 el. quad	... £21.71 (£2.00)
D5/2M el. slot	... £13.61 (£1.50)
D8/2M el. slot	... £18.22 (£1.50)
SYMK/2M vertical slot kit	... £3.83 (£1.00)
UGP/2M ground plane	... £7.03 (£1.00)
HO/2M halo head	... £3.26 (£0.75)
HM/2M halo + mast	... £3.88 (£0.75)
PMH2/2M 2-way harness	... £6.80 (£0.75)
PMH4/2M 4-way harness	... £16.34 (£1.00)
D8/70cm. el. slot	... £15.47 (£1.50)
PBM 18/70cm. parabeam	... £18.56 (£1.50)
MBM48/70cm. multibeam	... £21.65 (£2.00)
MBM88/70cm. multibeam	... £28.97 (£2.00)

12XY/70cm. 12 el. x'd yagi	... £29.70 (£2.00)
PMH2/70cm. harness	... £5.90 (£0.50)
PMH4/70cm. harness	... £12.26 (£1.00)
C8/70cm. 8dB colinear	... £39.37 (£2.00)
D15/1296 yagi	... £23.06 (£1.00)

ANTENNA SPECIALISTS

ASP 201 ½ wave	... £2.95 (£0.50)
ASP 2009 ¾ wave	... £7.95 (£1.00)
ASP 677 de luxe ¾ wave	... £14.95 (£1.00)
ASP no hole boot mount	... £3.50 (£0.50)
K220 magnetic mount	... £8.50 (£0.75)



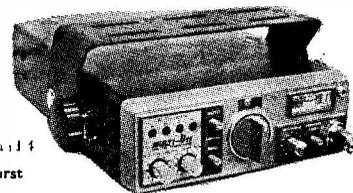
**TM 56B
VHF
Monitor
In Stock**

The TM56 is one of our most popular models, combining great performance with modest price. The TM56B has the basic receiver design of our mobiles and includes its own 230 volt AC supply, plus external 12v. DC input. 12 fixed channel positions are included, plus 4 autoscans positions. Any one of the Autoscans channels can be cancelled. Price includes 10 channels, R3, R4, R5, R6, R7, SO, S20, S21, S22 and S23, necessary leads, etc., and 12 month guarantee. At £95 it is unbeatable! 10 channel marine version £113.60 inc. VAT.



**70 cms.
Multi-UII**

- ★ Fitted 6 repeaters 1:1:4 simplex
- ★ Automatic tone-burst
- ★ 12 watts output
- ★ Receiver RF pre-amp
- ★ Receiver RT control
- ★ 4 channel autoscans



£259 inc. VAT

ELECTRONICS

TELEX 897406

**FAST
MAIL ORDER
SERVICE
& EXPORT**



Multi-2700 Mk. II



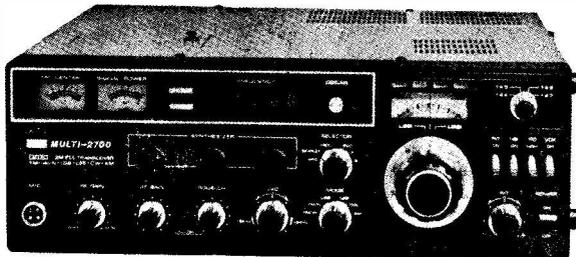
The Ultimate 2m. All-Mode!
STILL £489 inc. VAT!

The Multi-2700 is the ultimate in 2m. all-mode transceivers. Established now for 2 years, the sales of this model increase every month! Proof indeed of its popularity and value for money. Unfortunately, within the limited space of this advertisement, it is just not possible to list all its many features. The manufacturers brochure runs to 4 pages! However, a S.A.E. will bring you a copy of this free of charge. What we can do is list for you some of its main features, then perhaps you will begin to see why more and more people are trading up to the Multi-2700.

IN STOCK NOW

FEATURES:

2 VFO's for instant QSY (one analogue the other synthesised) both useable on all-modes with VXO for fine tuning on SSB; FM, SSB, AM, CW; 16 watts output, 143-149 MHz reception (Tx 144-146 MHz), 230V. AC and 12v. DC; WBFM/NBFM; OSCAR downlink receive converter; speech processor; VOX; IRT; 100kHz calibrator; noise blanker; automatic tone-burst: + or - 600 kHz shift; + 1.6 MHz shift (for 70 cms.); RF gain; RF pre-amp; squelch; separate FM/SSB mic. gain



controls; variable AGC; Antivox; variable compression; CW semi break-in; accessory sockets at rear; supplied complete with mic. cables handbook and even log book! Don't buy any other model until you have compared it with the Multi-2700 Mark II. S.A.E. for full details.

Quartz-16



at £149.75 inc. VAT . . .
You Can't Beat It



2m. FM Model
In Stock Now

FEATURES:

23 channels + 2 priority
True "S" channel readout
12 watts output
7 channels fitted R3-R7, S0, S20

**SPECIAL OFFER: S21, S22, S23,
£7.50 inc.**
Quick release mobile mount
Mic and DC leads
Automatic tone-burst fitted.
S.A.E. for full details



M800D

25 Watts FM

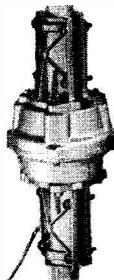


The Multi-800D is a 25 watt FM transceiver with 800 synthesised channel 144-148 MHz. Tuning is manual or automatic with 3 speeds from 10 kHz second to 500 kHz second. Tone-burst is automatic and power is infinitely variable from 1 to 25 watts. A remote digital display is available and reverse repeater is obtainable at the flick of a switch (no need for re-tuning). There is a memory for two programmable frequencies, both are retained even after switch-off. The memory facility also enables other shifts to be programmed in (1.6 MHz for 70 cms.) and the LED readout always reads true transmit and receive frequencies.

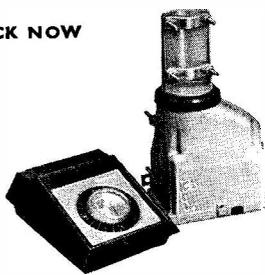
**PRICE £249 inc. VAT
REMOTE DIGITAL DISPLAY £16 inc. VAT**

Heres our tip for the top . . . in Rotators

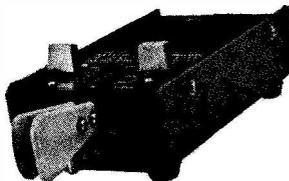
IN STOCK NOW



JAYBEAM KR400 supports 1/2 ton
costs £95 inc. VAT



JAYBEAM 9502 ideal for VHF,
£45 (only needs 3 core cable)



EK121 Keyer

- ★ Built-in paddle
- ★ 6-35 wpm
- ★ Internal batt. or ext. DC
- ★ DC150V/1A Max.
- ★ Plug-in board
- ★ Space-Dash ratio adjust

PRICE £29.95 inc. VAT



MM202G Microphone

- ★ High quality condenser mic.
- ★ Boom weighs 5 grams
- ★ Tx/Rx switch clips on gear lever
- ★ Matches most transceivers (ex. IC240)
- ★ Makes for safer driving
- ★ Matches 600-50K ohms

PRICE £19.95 inc. VAT.

**MAIL ORDER & CALLERS: Hockley Audio, 31 Spa Road, Hockley, Essex. Tel.: 03-704 6835 (2 lines)
ALL PRICES INCLUDE VAT CARRIAGE IN BRACKETS**

AGENTS: G3XTX J.R. Electronics, 198 Collier Row Lane, Romford Essex.
Tel.: Romford (0708) 68956
GM3GRX Eric Simpson, 6 Drossie Road, Faskirk, Stirlingshire. Tel.: 0324-24428
G3OQT Bredhurst Electronics, The Street, Thakeham, Fulborough, W. Sussex.
Tel. 07983 3056

Monday to Saturday 9 a.m.-5.30 p.m. Early closing Wednesday



**PAUL
G3VJF**

ICOM FOR QUALITY

OFFER A SUPERB RANGE OF TRANSCEIVERS FOR THE SUMMER

All are available ex-stock and delivery is free



IC-240 Think of the features you would install in a mobile to provide a combination of optimum usefulness AND SAFETY. You will probably come up with the following requirements:

- 1 Easy channel selection with minimum knob twiddling—yet with all the normal FM channels available.
- 2 A fully automatic tone burst which operates only in repeat mode with NO buttons to press either on the front or on the back of the set.
- 3 Instant reverse repeat at the flick of a switch without any re-tuning or memory programming.
- 4 A very sensitive receiver with a spurious response performance for better than the average and a very clean transmitter with excellent clear, crisp modulation. (We measured a sensitivity of 0.1µV pd for 10dB sinad).
- 5 A reasonable price—but (more important) a quick, reliable after sales service.

COMPARE THIS LIST WITH PREVIOUS ADS FOR VARIOUS TRANSCEIVERS AND YOU WILL SEE THAT THE 240 WINS EVERY TIME.

IC-240

alone £198
inc. VAT

SUPERSCAN £77.63 inc. VAT
(fitting £6.00 extra)

IC-202

£162 inc. VAT



◀ **IC-202**

IC202 The 2m. SSB/CW portable which is clean enough to use as a prime mover to drive a linear. The VXO gives continuous coverage over the ranges 144.0-144.2 and 144.4. The coverage can be extended with extra crystals switchable from the front panel. This is the ideal set to buy if you are thinking of sampling the delights and advantages of SSB on 2m. as it gives full coverage of the SSB and CW portions of the band with easy, continuous tuning.
Now available ex stock, delivered free for £162 inc. VAT.

IC-215

£159 inc. VAT
and delivery



IC-215 ▶

IC-215 By far the best 2m. FM portable on the market—with more power (3W) than most and batteries some 4 times as big thus giving a reasonable period of operating use. Add to this the superb, clear modulation for which ICOM are so famous and a good receiver, plus a solid, reliable construction and you have really good value for money.

Total channel capacity = 15.
Channels fitted = 9(S20, S22, R3, R4, R5, R6, R7, R8, R9).

Now available at the special offer price of £159 inc. VAT and delivery.

AGENTS (Phone first—All evenings only except Norfolk and Burnley)

London—Terry G8BAM (01-556 9366) **Scotland**—Ian GM8DOX (0786-822 212) **Norfolk**—Ted G3FEW (05088 632)
Wales—Tony GW3FKO (0222 702982) **Burnley**—(0282 34841) **Midlands**—Tony G8AVH (021 329 2305) **North West**—Gordon G3LEQ (Knutsford (0565) 4040) **SHOP: Thanet Northern, Wombwell, Barnsley, S. Yorks,**
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DAVE
G4ELP

WITH THE TECHNICAL KNOWLEDGE AND EQUIPMENT TO
SERVICE THEM PROPERLY BOTH BEFORE AND AFTER SALES



IC-211E ▼

£549

Giving you FM/CW/USB/LSB, all produced from the amazing ICOM synthesizer and patent LSI chip. Frequency read out is to the nearest 100Hz and is amazingly stable and accurate. You can use the two frequency stores as separate VFOs or for any repeater shift required. The tone burst is automatic, of course, and reverse repeat is available at the flick of a switch. Add a keypad (we will give you the circuit to make your own or you will be able to buy one shortly) and find a new facility which is quite impossible with old-fashioned rigs. The original waiting list has now been dealt with and you can now have one from stock.



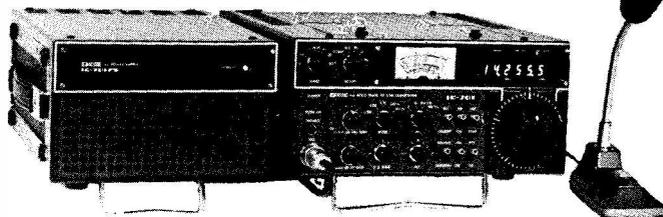
IC-701

IC-245E ▲ £396

This truly amazing little box gets you mobile on FM, USB or (if you really think it a good idea) CW! The synthesizer is the same as the IC-211E and can be tuned to the nearest 100Hz, again with amazing accuracy. Of course such a versatile little box will often be used as a base station and facilities such as keypad operation can be added. They are now ex-stock—but only just!

◀ Introducing "SLIM JIM" SJ2

144-146 MHz—High efficiency 2 metre omni-directional vertical
An omni-directional 2 metre aerial developed by T & T from a design by F. C. Judd (G2BCX). Derived from the "J" the SJ2 is a free space aerial with better than 50% greater efficiency than conventional ground plane types due to the very low angle radiation field. The aerial is slim and compact (58 inches long) and as there are no radials it is unobtrusive and has low wind resistance. Supplied complete with mast clamp, £15.50 inc. VAT (carriage £1.00).



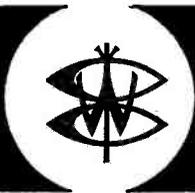
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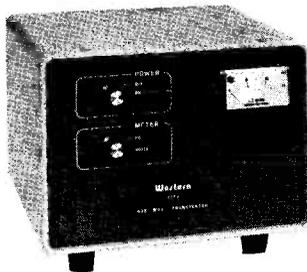


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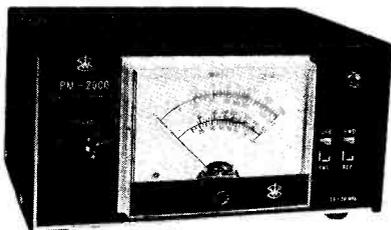
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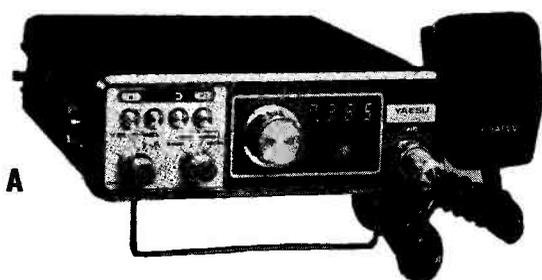
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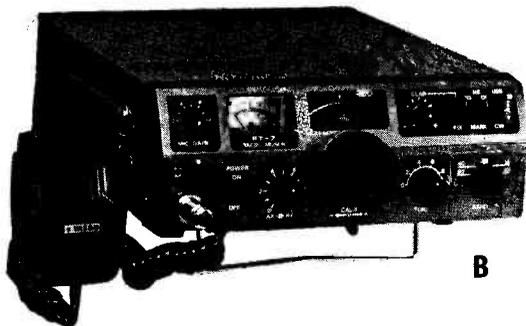
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See Catalogue Page 19

B FT-7 The all-solid state FT-7 mobile transceiver provides high performance on the 80 through 10 metre bands. The operator may select upper or lower sideband or CW operation and the compact package provides many features engineered for convenience while mobile. A single knob provides all transceiver tuning and the state-of-the-art noise blanker minimises impulse-type noise such as that found in mobile applications. The FT-7 is designed for operation directly from your car's 12 volt battery. Can also be used as a base station with the matching FP-4 AC PSU.

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C FT-901DM Unparalleled receiver performance plus advanced transmitter features make the FT-901DM the ham's dream come true. The receiver features rejection tuning, dual-filter variable band width tuning and audio peak frequency tuning for maximum rejection of unwanted signals. Transmitter includes built-in Curtis keyer and RF Speech Processor and features a 10 second "TUNE" timer to safeguard your finals. Includes memory for both transmit and receive frequencies, an advanced noise blanker and off-set tuning on both transmit and receive. All modes, USB, LSB, CW, FSK, AM and FM, 160 thru 10.

See Catalogue Page 3

D FT-225RD This is the very latest of the growing 2 metre range and incorporates digital frequency read-out, optional repeater shift, variable power output, noise blanker, selectable AGC and gives all-mode operation on LSB, USB, CW, FM and AM. The 225RD is, of course, fully portable and can be operated off mains supply or 12v. DC and has a host of other fine features including provision for an optional memory unit. Model 225R analog version also available.

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See Catalogue Page 13

F FRG-7000 New all solid-state digital read-out general coverage receiver. Covers from 0.25-29.9 MHz AM, SSB, CW. Has unique digital clock feature which incorporates timer which controls rear apron connections to external equipment such as tape recorder, etc., etc. This de-luxe receiver has everything for the dedicated SWL and professional user and supplements the famous FRG-7 which continues in production of course.

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UV-3E	144-432 MHz FM Transceiver	£440.00	£495.00
PS-3	AC Power Supply for UV-3E	£62.00	£69.75
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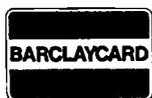
PS-7	120/240v.	for TR-7	£114.00	£128.25	RP-500	Receiver protector	£56.00	£63.00
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TR-4CW (RIT)	Transceiver—SSB, CW with R.I.T.		£448.00	£504.00				

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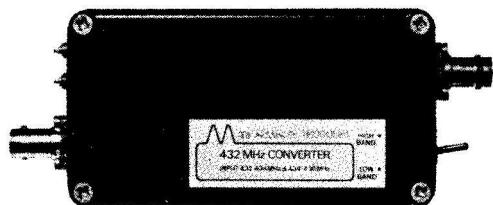


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Maximum frequency error at 432 MHz : ± 5 kHz
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SHORT WAVE MAGAZINE

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(GB3SWM)

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Editor: PAUL ESSERY, G3KFE/G3SWM

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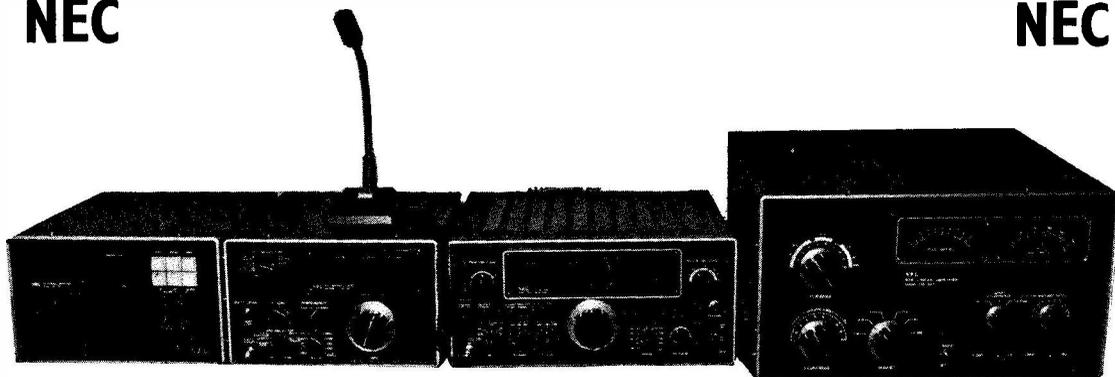
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The SHORT WAVE Magazine

EDITORIAL

Untimely Inefficiency

We were surprised to read in the April issue of *CQ* that UK subscriptions to that magazine, paid to the RSGB acting as subscription agents, had been notified by the RSGB to the *CQ* circulation department, but that the money collected had not been forwarded; the subscriptions therefore failed to come into operation. Naturally, the result was letters direct to *CQ* from irate customers who knew nothing of the muddle at RSGB Hq.

The RSGB then decided to take no further subscriptions on behalf of *CQ* but the first intimation of this to the American journal was when they received the copy of *Radio Communication* which carried the announcement of the decision.

We are not in any way suggesting that there is dishonesty at RSGB Hq., merely that this is yet another example of their seemingly incurable inefficiency. Members have a right to know what went wrong *this* time.

That particular *CQ* editorial paragraph is being read all over the world, and can only do harm to the status of our national society at a time when we are coming up to the vitally important WARC 79 deliberations.

Over the years we have heard many protests from licensed amateurs and SWL's who object to the term 'ham' in connection with Amateur Radio. Until now we have agreed with that view, but we must all move with the times: we are stuck with the word, which is in world-wide usage. Although it is a slang word of somewhat uncomplimentary implication, the *Complete Oxford Dictionary* gives a separate definition of it as 'a radio amateur'—no more, no less. All we need do is remember that.

John
G3KFE.

COMMUNICATION and DX NEWS

E. P. Essery, G3KFE

LAST time round we mentioned the possibility of some Iraq signals; in the event these materialised, and indeed by now those first 1500 QSL's may have been used up. However, they are on exciter power only, and things are needed on the aerial front; the whole exercise, though, is one of training *YI* nationals in the arts of Amateur Radio, so it is a bit unfair to carp at the quality of the operating. After all, the *YU's* running the training are going to insist at this stage that the *YI* students operate in accordance with the letter of the licence, not only for the benefit of the youngsters but, more important, so that no-one in Iraq can cavil at the way things are being done. At the time of writing it is understood that two actions are being pushed to help mop up the demand—firstly, the provision of some more power and improved aerials and, secondly, the application for a licence from the Finnish Embassy which would let Martti Laine, OH2BH, in for a session. OH2BH, readers will be aware, is a DX-er of enormous ability with much experience of the sharp-end of pile-ups.

Conditions

As we rise from the bottom of the sunspot cycle, with increasing speed, so do we find conditions in general improving. But of course not all that glistens is gold; trust Murphy for that! Solar storms occur with a frequency broadly related to the sunspot cycle, and these can put us out of business at times—though that is just part of the way of things; there can be no doubt that the occasional drop-out is part of the fascination of trying to work the DX. However, let's look at the picture our correspondents unfold for us.

Eighty

G2NJ (Peterborough) spent most of his time on 3.5 MHz CW, looking for the QRP types, and Nick notes such observations as "band conditions grim" and "does the band seem dead to you?" High noise level, deep fading, and a general shortage

of signals were noted; a particularly bad day was on April 11, when from 1430z switch-on, and for the next hour, there was nothing to be heard at all, CW or phone, on Eighty, nor for that matter on Forty. On the following day, while in QSO, G2NJ commented on this and was told the wipe-out went right the way down to 28 MHz. However conditions weren't quite that bad all the time, and in the better periods Nick connected with G2CAS, out /P again; later, G2BOF (Leeds) who was running 1.5 watts and G3BFE (Stow-on-the-Wold) who had a sixty-foot wire strung up a tree, /P. After which there wasn't a lot of joy until the very end of the period, when QSO's were made with G4FAI in N. London, who had three watts, G3WWJ on two watts, and G4FJF of Dover who had five watts.

On a different tack, G2NJ/M and G5NX/M were both operating from the same car, G5NX at the wheel and the VHF phone rig, while G2NJ was pounding the brass on the back seat—two different stations in one car on the move and being operated simultaneously must be something of a "first."

G3PKS (Wells) has one of the neatest comments on the band over the past month—"Frying tonight!"—which in fact, on occasion, extended right through *our* spectrum of interest. Europeans were worked, among them ON4GM who chipped in to a QSO between G3PKS and G4GTW, at about RS57/8 between all three stations; Serge then explained that he was using phased verticals of 70 feet, spaced quarter-wavelength apart, firing North-West from near Brussels. Upon changing the phasing to fire North-East, ON4GM virtually disappeared to both G station, and Jack reckons there was close on 50 dB ratio between front and null.

G3PPR (Sherborne) returns to the fold after some 15 years of QRT; Rod has started an amateur radio society with some ten members, and they have a dipole on Eighty, a vertical for 21 MHz and, at the time

of writing, a ten-metre beam built (out of old TV aerial bits) but not erected. A new interest is CW—a mode never used by G3PPR when he was in Birmingham; it isn't the same as Phone, but it has a charm all its own once you try it in earnest. A move of home QTH is imminent, and once that is sorted-out G3PPR will be setting-up with his old Panda PR-120V and AR88 which has been rebuilt as suggested in *Short Wave Magazine* for July 1974; a memorable contact on Eighty was with G4GQH, who has rebuilt no less than *eleven* AR88's using the article in question. There's enthusiasm for you!

'CDXN' deadlines for the next three months—

July issue—June 1st

August issue—July 6th

September issue—August 3rd

Please be sure to note these dates.

G2BY (I.o.W.) comes back to life again this month; Bert found himself a few QSO's with other OT's on the band but otherwise didn't think much of conditions.

Before we leave Eighty, let G2NJ have a last comment, in which he notes that after about 1800z things started to perk up a bit with G's up to the S8/S9 mark. One G operator worked around this time is an octogenarian who sends perfect w.p.m. Morse for as long as you care to ragchew and can speed it up if you care to try and copy.

Forty

Not much in the way of reports this month. G2BY found things generally not as good as they were a twelve-month ago, but still managed to hook VK3MR, VK3IM, VK3MJ, HI3PC and sundry *W* and *VE* stations around 0800z.

G3PKS confined himself to saying that there was some DX around, and mentions G3EIW who fired up his /M rig during the middle of the evening and was promptly called by a *VK*; pretty fair considering G3EIW

was only using 50 watts input and a short whip.

Comments

One wishes one had the facility to include colour pictures in the *Magazine*, the more so when one gets pictures like the one sent by G4GOF (Hastings); this is a view over the sea from his QTH up on Battery Hill, obviously taken early in a summer afternoon, and by summer we mean just that—the warm, dry, sunny sort of day that we all dream about. From here, G4GOF launches an output on Eighty, dodging the French and Belgian trawlers with their 15 kHz spread, when what Jesse describes as QRN is not about (we suspect that this “QRN” is controlled by a thermostat, and that it needs suppression!). All these snags however, have not stopped G4GOF getting in some 170 QSO's with his AT-5, all made on CW and all on Eighty. Incidentally, just in case someone recognises the call-sign and can't think why, look back to the *Editorial* for January of this year.

G3XAP (Stowmarket), of our current Aerial series, was surprised to receive a letter from W1BB, who reckons Phil's series is the real McCoy—a comment that pleases your old scribe as much as it does Phil. G3XAP, of course, still plays aeriels and so still operates, but he doesn't say much about the DX worked.

Now, what about the Faeroes and Iceland? We have known for a long time that these were the proposed places for the GM3YOR/GM3OLK summer expedition. We now have it that the activity will be in OY between July 18 and 21 and TF from July 23 to August 5. The callsigns will be GM3YOR/OY and GM3YOR/TF, G4DXC similarly suffixed and GM8NCM ditto—but that doesn't mean those are the lot, as they will be backed up by GM3OLK, G4DSE and possibly by G8HDR. On CW look for them some 12 kHz up from the lower band-edge, and on SSB try 3736, 7072, 14236, 21272, and 28536 kHz. If they can get permission for Top Band and 70 MHz, they will cover these bands as well, in which case Top Band CW will be on 1835 kHz, and the SSB around 1912 kHz. No skeds are being taken at all, and most of the operation will

be at LF or HF, because it is known that a group of OZ's are going to be around and concentrating on VHF. GM8NCM will deviate a little from the rule, as there may be some meteor-scatter work on 144-175 kHz.

RTTY now, and we have two copies of the announcement about the eighth S.A.R.T.G. World-Wide RTTY Contest, in which the operating times are: 0000 to 0800z on Saturday, August 19, 1600 to midnight on the same day, and 0800 to 1600z on August 20. Coverage is from 3.5 MHz to 28 MHz, with single-op, multi-op, and SW classes; the exchange is RST plus QSO number. Points are massed at the rate of 5 for a contact in one's own country, 10 for a contact outside the home country but in the same continent, and 15 if the country is on a different continent. Work a given station once on each band only, for QSO and multiplier points. Score is the sum of the QSO points times the sum of the multiplier points. DXCC defines the countries for multipliers, save that each VE/VO, W/K and VK district will count as a country, and provided that the multiplier claimed either appears in at least five logs, or himself puts in a log. Send the logs to arrive by October 10, and to contain band, date, time in GMT, callsign, exchange sent and received, points claimed and multiplier claimed; address to OZ2CJ, C. J. Jensen, Meisnersgade 5, 8900 Randers, Denmark.

G3WW (Wimlington) has used the rough weather as an excuse to have a comb-through of his logs since October 1972, in order to find out what his score was. Some 94 countries were worked, two-way SS/TV, out of some 1049 QSO's in the mode. That total breaks down to 125 G stations, 358 in the rest of Europe, 386 in W/VE (only 22 were in VE), while DJ/DL accounted for 98 and I's for 115. There were a hundred or so cases where the G3WW SS/TV was heard, and viewed, but where no return picture was allowable by licence conditions such as, for instance, Russian and YO stations.

G2ADZ (Chessington) says it is getting so easy working and hearing DX on Ten that he'll have to try something a bit harder! What about

a Top Band DXCC? That at least should provide some interest in both the technical and operating sense! On an entirely different tack, G2ADZ worked NS4CL and wonders just where in the great new USA callsign scheme of things this one fits, being pretty sure the signal originated in the Antarctic somewhere.

At the AGM of the WAB, held at Drayton Manor on April 23, G4DQS was elected President, and the originator of the idea, G3ABG, Treasurer. One item on the agenda concerned the statement given to the amateur radio press that “all profits are donated to RAIBC” in connection with the WAB Counties Award. This is not strictly true, but suffice it to say that a fixed sum each year is set aside for this purpose: and we guess that the rest is a simple matter of the Treasurer making quite sure that enough provision is made to enable to “show to stay on the road.”

Top Band

Here again not much in the way of activity reported, which is probably all very fine and dandy for those who still use the band! G2HKU (Sheppey) is one of these, and Ted mentions PAØINA, and PAØPN on SSB, plus CW with OKIHAS, PAØLVB/P, PAØINA and OL8CGS; things have been somewhat slowed down simply because of the acquisition of a KW-204, and the work subsequently required to persuade it to give break-in working in conjunction with the Eddystone 888A.

Another reported on the band is G2BY, who remarks how he first heard Niton Radio on a crystal receiver back in 1921, when GNI was using spark—now he comes in at strength nine with no aerial connected to the receiver. Incidentally, Bert recently came across one of the black-box operators who proudly informed G2BY that he had never listened to the amateur HF bands, and who thought GNI was a broadcasting station!

Twenty

Here let G4DJY take the first strike, having been missing from the bands for three months, between a fault in the transmitter and other commitments. Peter uses about 100 watts to a Joystick from St. Ann's-on-Sea, a set-up which so

far has yielded some 140 countries worked in all continents; it is a bit ironic that the *YI* contact among that lot is probably a phoney that came on before the real *YIIBGD* could set up shop. The *CQ WW* Phone contest accounted for *UL7JAW*, *4B1HR* for an *XE* special prefix, *KL7HR*, *KP4RF*, *D4CBC*, *VP9IB*, *TF3IRA*, *VU2ACD*, *4Z4IX*, *KZ5FR*, *8P6FX*, *VE5UA*, *UA9CIH*, *UA0ZBW* (Zone 19), *UA9PP*, *J28AG*, *JX3P*, *ZS1PH*, *EL2AE*, *JA7AMK*, *JA2FUA*, *JA6VZB*, *JA6AKW*, *OE5CWF/YK*, the earlier ones on Phone, and from *8P6* onwards the favourite *CW* mode.

G2BY looked at the bands, and notes contacts with *UAØ* in Sakhalin, *ZP5*, *PP7* (Alagoas, Brazil), *VE7*, and an assortment of *W* and *W7*, Wyoming being represented by *K7LFY/7*, and Utah by *WB7EWW*.

The Seer of Sheppey, *G2HKU*, managed to continue his *ZL* skeds, with *ZL1VN*, *ZL1AAE* and *ZL3SE* at 0700, which this year had held up five weeks longer than the previous year at the time of his letter. *SSB* of course, but *CW* was also used to work *KV4AA* and *VK3MJ*.

GM4DZX would appear to have stuck to 21 and 28 MHz, as under the 14 MHz heading of his letter it simply says "What's that?" A good question, indeed.

G3PKS only mentions one contact on the band, namely *EP2IA*; it looks as if Jack devoted his activities to other parts of the bands for which, it must be admitted, there has been excuse.

G3NOF (Yeovil) found things varying between poor and good; opening time has been as early as 0630 for *W4-W5* stations, followed in due course by *VK*, *ZL* and the Pacific stations. It added up to *SSB* QSO's with *BV2B*, *CEØAE*, *DU6FG*, *FO8DO*, *HK2YO*, *KM6FC*, *KV4AA*, *KZ5ED*, *P29JS*, many *VK* signals including *VK8OB*, *W5VAS*, *W5PZA*, *YIIBGD*, *YS1RVE*, *ZL4AU*, *ZL4LX*, *8P6BN* and *9V1NR*.

Some good openings to South America were noted by *G4GMW* (Bristol), using a sloping dipole, 6ft. at one end and 25ft. at the other, running *NW-SE*, and fed with the *FT-101B* and occasionally the *FL-2100B* linear. The list includes *AP2SMT* (Martyn's first *AP*),

LU4DLP, *LU8DB*, *PY2CSV*, *PY7EC*, *SV1JG*, *UK9WAA*, *VE2AFU*, *VP9GE*, *W4APS* and *ZP5LOB*.

Here and There

G2ADZ notes the death of *G5YV*—an old friend of his, and an operator well-known on the *VHF* Bands for many years, along with *G5BY*, *G5MA* and *G2UJ*; he will be missed in many ways.

Another Silent Key is that of *W6TS*, Ed Willis, the son of *AC3PT*, the Crown Prince of Sikkim.

On a completely different theme now, *G3PKS* mentions a QSO which at the time seemed quite reasonable but smelt a bit after it was mullied over. This was a QSO with *CG1TX*, giving name as Roger and *QTH* as either Sydney or Sidney (Jack didn't write it down as it was sent)—either way he most certainly doesn't seem to be in the area in which the *CG* prefix could apply.

At fairly regular intervals, *W6AM* (Palos Verdes) has an Open Day, at his shack at Rhombic Farm, some ten miles from Don's Long Beach home. There, he has nine rhombics, each one reversible to give eighteen directions of fire, the rhombics mostly being on 140-foot poles. The shack (some 100ft. long!) is well filled with all the needs for communication on *SSB* or *CW*, although Don's favourite mode is *CW*. All this leads up to the fact that the next Open Day is going to be on June 18; the date has been so chosen because the 'YL Single Sidebanders' are having their Convention locally and so *W6AM* is looking forward to meeting *YL*'s from Sweden, Japan, Yugoslavia, New Zealand, Australia, and of course America. So—any *YL* with some time and money for the fare could well go and show the *G* flag. This writer has been dreaming of a trip to see the wonders of *W6*, and another to meet *W1BB*, but never seems to be able to finalise either plan!

Fifteen Metres

G2ADZ (Chessington) remarks that he has now used the band daily for a year; the conclusion is that the band conditions have improved enormously to the point where, for example, one could find propagation to *JA* and *W/VE* simultaneously, and indeed the rapidly changing skip is one of the features of the band. For the current month

we note *EP2LA*, *HP8ARK*, *YB1KW*, *9M8HG*, *3B8DU*, *YB1GF*, *EP2FN*, *JF3LAP*, *VO1NZ*, *VU2BK*, *K7HZO*, *VP1KS*, *W5FGO/MM*, *JR6SBA*, *JR6FCZ*, *FM7BA*, *VU2CP* and *KA6RR*, all of course on *CW*.

After some four years of near-*QRT*, *G3YRR* (Grimsby) is returning to the fold; Charles blames partly work, partly the need for a five-miles walk daily, and most of all the flat conditions on his favourite band. As mentioned elsewhere, a couple of new ones were worked by changing from the beam to the vertical. No 'reflection' on the beam he says!

GM4DZX (Glasgow) finds that while conditions on Ten have fallen off somewhat as compared with the previous month, he still managed quite a few contacts, among which we find most of the stations noted in our *QSL* List.

Martyn, *G3GMW*, informed us of a small error last month by which we put some of his 3.5 MHz QSO's into the 7 MHz list. Back to this month, and we have all *SSB* contacts on 21 MHz with *A4XGY*, *EP2YK*, *KL7JAI*, *N4UF*, *W1HN*, *WT3NAS/MM* in the Red Sea, *W4EFS* and *YU5XVP*, the aerial in use being a one-element Quad loop at twelve feet.

Now we come to *G2HKU* and his *CW*, which enabled him to work *VE3JKZ*, *W6VD* and *W9IV*.

Looking down to the relevant bit of the *G3PKS* epistle, we find that Jack, like so many others found the band very mixed; sometimes just a few Russians, and at others *DX* from all over the world, including *JA*'s by the bucketful.

The analysis of things presented by *G3NOF* indicates that during this month, the morning *VK/ZL* stations have been long-path contacts as it seems rather as though the short path just didn't open, but the North Americans have been around from around 1200z right on to as late as 2300. Thus it came to pass that *G3NOF* talked to *CN8AK*, *K6AXC*, *OE6DK/YK*, *VK2BBB*, *VK2NHV*, *VK2NOT*, *VK5NCP*, *VK7RX*, *VK7NOW*, *W5NGE*, *W6KTE*, *W7KW* (Arizona), *WA7UWE*, *WD5BXP*, *ZS6AD* and *9J2WR*.

Yet another who reports variable conditions on 21 MHz is *G2BY*—on some days he could only find

short-skip to Europe, and on other days far better. Late evenings have been available on the good days, and late afternoon has seen quite a few *W6* and *W7* contacts made.

The G4DJY log indicates SSB contacts with ZB2BL, UL7JAW, FPOLK, VE6MP, K7RI, XK6WQ (a *VE6* special), VE7IG, VC7WJ, CG4SW, HI8MOG, CG5RA, VE4RP, VE4GV, OA4PQ/YV5, VC7CCC, VE6ASI, CT3/OH2BC, JA6LLO, HC1BU, N5AU, KH6CJJ/4X, YV5CVE and PY5EG. As for the keyer, that was also used and found EL2AE, JA7AMK, JA2FUA, JA6VZB, JA6AKW, LU1DZ, JH6KZP/6, KH6IJ, W7EEJ, LU5EIO, 4X4WN/W6, VE7DBV/W6, W5CKT and LU3FL, several being picked out during the Common Market Contest.

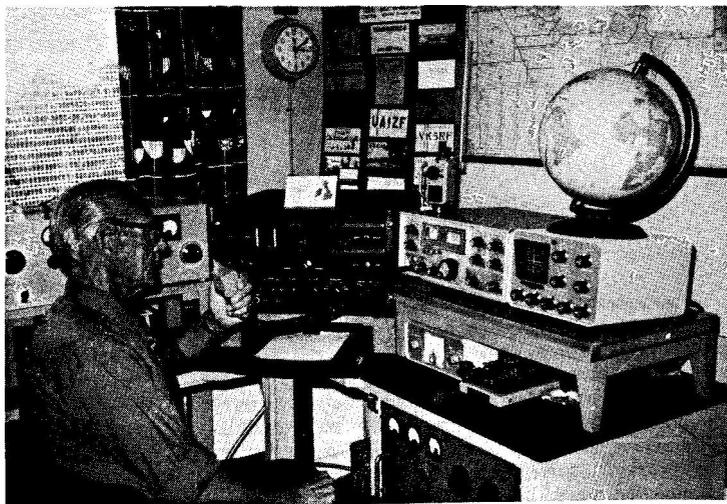
QSL Addresses

Perhaps the best way of keeping tabs on these is by way of a subscription to Geoff Watts' *DXNS*, at 62 Belmore Road, Norwich NR7 0PU, which each week sports some 35 or so QSL addresses, not to mention more up-to-date DX information than a monthly magazine could ever do, if only because often we get the information about a forthcoming expedition, and news of the result between one issue of *CDXN* and the next! However: A4XFE, to Box 8530, Sultanate of Oman; C5AAF, to WB4ZNH; EL2AH to Box 380, Monrovia; HA9IARU to HA9KOB; 5H3JR to W2SNM; TI2NA to Box 661 San José, Costa Rica; J3AH to Box 312, St. George's, Grenada; and FP0LK to VE1ASJ must suffice for this time from the list sent in by GM4DZX, to whom our thanks.

Ten Metres

G2BY remarks on the fact that sometimes Ten can be 'giving' at times when 21 MHz seems dead—Bert mentions his contacts with all *W* call areas but *W7*, plus *PY*, *LU*, and *ZP*, all of course worked on CW.

That ten-metre DSB rig of his, says G2BJY, was not up to the mark; but having, as they say, 'laid an egg' Geoff immediately set to and built a better machine. In spite of all his comments on how little activity was to be found, Geoff managed to find time to knock fifty countries by the time of his letter, the last one being GW4GSS



John Frisby, G8CA, operates this fine station, and the picture shows, left to right: two home-brew ATUs, the trusty AR88D, FT-DX401 transceiver, Heath monitor 'scope, SWR/Power meter and Marconi marine key. Hidden by G8CA is a dummy load and coax antenna switch; on the lower panel is a 1950 home-built CW/AM driver stage. John (who was a member of the pre-war Civilian Wireless Reserve and held the AA call 2BLK) is Chairman of the Axe Vale A.R.C., and during working hours is in charge of the Amateur Radio Dept. of Reg. Ward & Co. Ltd. of Axminster; chief interests are the HF bands and antenna experimentation.

near Wrexham, a steady *S7* right through a long CW QSO at about sixty miles, doubtless some sort of odd VHF propagation effect. On a different tack, Geoff has decided to tackle the construction of a direct-conversion receiver, which should give him lots of entertainment; they look simple, they are simple, but they have to be *right* if they are to be of any use!

Our next stop is with G3NOF; Don made no contacts during the month, there being only Russians and, occasionally, openings to *W/VE* at the times when Don was listening.

A rather different situation appears in the letter from G2ADZ, who found it admittedly not quite like March but good nevertheless, good enough to cause some of the DX operators to get in one QSO and then change frequency so as to avoid the hordes of callers. Only one flat day was noted, that one being April 6, and the only Gotaways were HS3BP, SU1MI, VP2VI, KG6JIH, OE5CD/YK and HK1RCB. That left CW exchanges to be entered in the log, from C6ABA, VO1EM, KZ5EK, VK2, VK3, VK6, ZL3GQ, G4CBC/MM on the way to Australia, HZ1HZ, LU, JA's, ZD8TD who will soon be going to ZD7-land, YV's,

CE1FA, OE8WLK/MM (who was anchored off Takoradi with hatches all battened-down and loading with cocoa stopped completely because of torrential rain), KV4AA, NS4CL and assorted *UA9* and *UA0* types.

G3PKS adds a comment to the effect that it is surprising how often one hears one or two good DX signals on an otherwise empty band; stations worked included UK6HAQ, N4HV, UA9XSE, KP4EQF, UA6DG, UA6HGR, the CG1TX aforementioned, WB4LGI, RA6HMQ, OD5LX, PY7CC and PY4MIL.

G2HKU also looked at the band, and his CW was on tap for W9FSR.

As for GM4DZX, Bob found conditions rather a disappointment after the March lift, but he still managed quite a few interesting QSO's with the Caribbean and in to YV, PY, ZP and HK, plus some African stations.

Finale

Deadline dates are shown in the 'box,' and your letters sent, as always, to "CDXN," SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ. Meantime, excuse us please—we have a matter of a mast and a tribander to see to. . . .

AMATEUR RADIO— COMMUNICATION OR TECHNOLOGY, OR BOTH? PART IV

N. H. SEDGWICK, G8WV

WE have reached the stage when the subject of *HF transmitters* must be treated in some detail; but since the modulation system used to convey the message intelligence by means of the RF power generated by the transmitter will greatly affect the parameters determining its design, it seems we should first look at such modulation systems as are likely to arise in HF amateur radio communication requirements. Our licences allow us to do things that have little merit in the pursuit of the hobby (such as use of A2 and F2) and which may well cause annoyance to others trying to communicate in the restricted and over-crowded frequency bands allocated for amateur HF use: we shall not include them in our list of systems likely to arise, for they are rightly shunned by the majority

A1 Telegraphy

This consists of simply turning the transmitter on for a 'mark' and off for a 'space,' which is a two-state system with no intermediate states requiring the subtlety of comparison with a reference standard in detection. Coarsely, and without apology to those modernists who would already be throwing in the word 'binary', its excellent simplicity can be expressed: "If you hear it, it's a mark, but if you don't it's a space!" This simplicity is reflected in the transmitter requirement, which needs to be just a clean RF generator of suitable frequency stability followed by as much amplification as is necessary to produce the required power; since one is not concerned with intermediate power levels there is no linearity requirement, so that design may concentrate on power efficiency. Because our licences still rate our power in DC input terms, the greater our power efficiency the more we can use, up to the point when power out equals power in!

Furthermore, since all or none of the power generated is used to signal the marks or spaces, the intelligence efficiency of the A1 system is 100 per cent. However, although determination of a mark or space at the receiving end theoretically conveys intelligence, there must clearly be a lot of such bits of intelligence to convey a message of greater significance than plain 'yes' or 'no', and a third dimension must be introduced by sending the bits of information sequentially in time. Note that even if the whole content of the message were the two-state 'yes' or 'no,' and it was agreed that 'yes' should be signalled by a single mark, it would be useless to indicate 'no' by a single space because this could mean anything from a transmitter breakdown to a receiver failure. Thus, such a modulation system requires transitions from space to mark and from mark to space to be taking place for even the simplest passage of intelligence.

If we use a number of bits of the basic two-state intelligence to convey the smallest element of a message (*i.e.* a letter of the alphabet) and a number of these letters are strung together in time sequence to spell a word, how should the start and finish of each letter be distinguished? In Morse code the indication is a gap in time between the last mark of a letter and the first mark of the next, of a duration too long to be confused with a space bit during a letter transmission; in teleprinter code there are no gaps in time between letters, and the system relies on time synchronism between transmitting and receiving mechanisms. Character recognition at the receiving end is done by a machine, and to make the synchronism requirement easy, all letters have the same number of bits and so occupy the same time, and the speed at which messages are sent is fixed and cannot readily be varied to meet variations in radio conditions.

In fact, A1 telegraphy will not reasonably support teleprinter signalling in the 'start-stop' mode on HF, because the synchronism requirement is too touchy to cope with noise, fading, and multipath effects (bearing in mind that the receiving machine is an awful dunce which sulks for several characters if it happens to miss one start signal, and has great difficulty in recognising honest marks and spaces as distinct from noise and fades).

It is extremely difficult to make a machine which will receive Morse code and transcribe its marks and spaces into alphabetic characters, and so write the message on paper for us. The Morse operator is limited in the maximum speed at which he can read and write down messages received in Morse to around 25 words per minute; the really professional Morse operator can probably read a short message in his head quicker than he can write it down.

To handle Morse at higher speeds in order to make more economical use of radio channels when they are propagating well, the professional method has been to print out the marks and spaces as received on a tape which is then transcribed into alphabetic characters by a Morse operator at the slower speed determined by his capability. Several operators may be necessary to read the output from one HF Morse channel running at 60 w.p.m., or more. The amateur will never be in that situation because his messages are so limited and he is never under pressure as is the commercial operator passing traffic for third parties.

It looks as if Morse code is even less suitable than teleprinter code for use with A1 telegraphy, but in fact it is the other way about. An operator cannot read teleprinter code by ear because he lacks the capability of timing and synchronising to the traffic stream, but his brain has the complexity necessary for the recognition of Morse signal groups as alphabetic characters, and to record on paper those characters in message form simultaneously with the recognition process. Additionally, his recognition of marks and spaces is quite uncritical and he can read through noise, fading, and QRM with an accuracy that no machine could hope to achieve.

Given such a sophisticated receiving device as a trained human brain, Morse code can be varied to still further extend its readability in adverse conditions: the operator weighs in his judgment all the information he receives. The only redundancy in the code is when

conditions are good, and the sending operator is using a slower speed than the receiving operator is capable of taking down.

In adverse conditions slowing transmission speed will improve readability; we can also improve readability still further by using the sharpest possible receiver selectivity that will adequately pass the modulation waveform, so giving protection against noise and QRM. At the slow speeds used by amateurs this can mean very tight selectivity requiring a high order of frequency stability of both transmitter and receiver, but since the operator is constantly monitoring the received signal he will manually keep it tuned if it drifts. Exactly the same thing occurs in the case of SSB, and that is why amateurs pioneered the use of that system on HF while professionals avoided fully suppressed carrier working until such time as their equipment could cope with the order of frequency stability required.

Determination of the bandwidth required to pass a telegraphy signal is a direct function of the 'reversals' frequency of the signal, regarded as a square wave. By 'reversals' in Morse, we mean a continuous stream of dots at the speed at which dots are being sent in, say, letter 'H' or figure '5' in the messages, as this represents the highest keying frequency that occurs in use. As a general rule-of-thumb in telegraphy practice, the bandwidth required is five times the reversals frequency—so that up to and including the fifth harmonic of the frequency is passed, thus maintaining the square waveform adequately for the purpose of telegraphy; if none of the harmonics were passed the square-wave reversals would turn into a sine waveform of the same frequency.

In fact, from the point of view of a Morse operator, he would not quibble at the shaping of the keyed tone Morse signals if the bandwidth were limited to the reversals frequency, so that each dot appeared as a sine-wave half-hertz instead of a square-wave half-hertz: the dots would just reach their peak amplitude in this circumstance and the operator would have no difficulty in recognising them as dots. The same degree of shaping would affect the onset and offset of the dashes, but since each dash is three times the length of a dot, the dashes would reach and hold their peak amplitudes. A figure '5' in Morse at a speed of ten words per minute takes around one second to send, so that this speed is equivalent to a 'reversals' frequency of 5 Hz.

The legendary CR-100 receiver (which saw regular professional service in the days when the Post Office used Morse code for its regular main line radio telegraphy service) has an audio filter with a bandwidth of 85 Hz at the half power points, but the operating instructions do rather emphasise its limitations due to receiver tuning drift. It was intended to be used on commercial circuits and was often remote from the place where the operators read the Morse—from undulator tape on which it had been recorded: this is quite a different requirement from reading Morse as it comes out of a receiver in the form of keyed tone. The connection between the receiver and undulator would certainly involve the use of polarised electro-mechanical relays and/or side stable electronic flip-flops which have a threshold voltage at which they just operate; if the leading edge of the applied signal slopes, and so offers a voltage gradient, there will be a delay in time before the operating threshold voltage of

the receiving device is reached. If the signal amplitude changes due to fading (as of course it will), the point in time along the signal at which the threshold amplitude is reached will slide, so that fortuitous telegraph distortion of the bit lengths is introduced. In a bad case, the dot may fade below the threshold of the following device and so be missed, although an operator would have heard and recorded it.

A teleprinter receiving Murray code requires its receiving mechanism to be in synchronism with the transmitting mechanism, so that each of the five signal bits which make up a letter finds the character store ready to receive it as it comes along: at standard 50 bauds signalling speed, each signal bit is 20 milliseconds long and the necessary minimum time taken to record it in the receiving store is 7 milliseconds on a Creed 7B teleprinter. The unavoidable difference in motor speed between the sending and receiving teleprinters will introduce some time displacement in the signals and so will multipath propagation effects. In 'start-stop' Murray code signalling the timing of the bits of each character stems from receipt of the start signal; if this is displaced for any or all of the reasons mentioned, all the following bits of the character will be displaced by the same amount as far as the receiving mechanism is concerned because it is measuring the times from an incorrect starting point, and to this is added their own individual inaccuracy in time. One cannot afford to run any risk of introducing signal distortion by over-filtering against noise, and so one really has to include some odd keying frequency harmonics in the filter bandwidth to keep the square waveform of the keying more or less inviolate.

F1 Telegraphy

This is a narrow-band modulation system in which a small change of the signal frequency denotes a change from mark to space. The general convention is for a mark to be represented by the higher frequency. It is again a two-state system with the advantage that transmitter intelligence is 100 per cent efficient with all the power going into the intelligence, but since the transmitter radiates full power under both mark and space conditions, there is no ambiguity about space, and noise is less significant to the receiver because there is always a signal voltage present to combat it; however, Automatic Gain



"I find the Yagi gives more gain"

Control is seriously limited due to selective fading. The mark and space frequencies fade at different times so that a strong mark signal may be immediately followed by a weak space signal, which finds the receiver sensitivity backed right off by the big AGC voltage arising from the big mark signal and still held on by the circuit time constant. AGC time constant must therefore be very short, and the change in frequency (shift) kept small to reduce as far as possible the selective fading effects. Professionally, a shift of 850 Hz was used pretty generally for many years, but latterly shifts were reduced as frequency stabilities improved.

The frequency shift system provides some protection against noise by cancellation in the discriminator, and against interference by capture effect. The improvement F1 gives over A1 as a telegraphy bearer system was found to permit use of 'start-stop' teleprinter working on HF, and this is what is known to amateurs as RTTY. Let there be no doubt about it, the system is poor, and this has always been known! The telegraphy code and synchronising system were developed for line working and are particularly unsuitable for an HF bearer circuit. Each alphabetic character is made up of five signal bits (marks or spaces) plus a start (space) and a stop (mark) signal for synchronising. Mutilation of any one of those bits will result in a wrong letter and hence the loss of all of them. In effect, the system multiplies the chances of incorrect read-out by 7:1. In addition, if a start signal is mutilated, not only does the remainder of the character get lost but the receiving machine is driven right out of synchronism by interpreting the next space it does receive as a start signal—with a consequential loss of about three characters whilst it gets back into synchronism, or loss of 21 bits as a result of mutilation of 1 bit!

RTTY takes advantage of an effective HF bearer modulation system to offset the disadvantage of a rotten synchronising and signalling system (when applied to HF) and there is nothing clever about it. The RTTY enthusiasts cannot claim to have pioneered the system, as the amateur fraternity can claim to have pioneered the HF band for DX communication, and SSB for high efficiency telephony. In fact, they are perpetuating an out-dated system which was used professionally as a stop-gap whilst its predictable weakness awaited the development of fully synchronous error-correcting systems such as *Autoplex*, or the completely different approach of *Piccolo* with its very modest synchronising requirement.

Although the actual signal keying speed frequency does not exceed 25 Hz and can be filtered following the discriminator to get rid of noise, the HF bandwidth of the circuitry preceding the discriminator must allow for the shift plus the keying frequency; this will typically be greater than 1000 Hz, so that the system occupies very much more of the narrow amateur frequency allocation than does an A1 Morse signal at hand speed. The teleprinter is, of course, a high traffic volume device originally developed to reduce the number of processes, and hence staff, through which telegraphic traffic had to pass at line terminals. Just where it fits in and serves a *useful* purpose in an amateur station which has no function or authority to pass on telegraphic traffic, little need to retain the short messages it is entitled to

receive for more than a few minutes, is a matter for conjecture.

F1 transmission can, of course, be used with advantage as bearer circuit for other systems than 'start-stop' RTTY, such as synchronous teleprinter systems, and although facsimile is called F4 in the licence, the radio equipment is the same as for F1. However, F1 is no help in operator-read Morse code telegraphy, for he would need to distinguish between two tones instead of 'tone' and 'no tone', and his brain is better equipped for the latter.

A3 Telephony

Until ousted by SSB this was the normal modulationⁿ system used for amateur telephony. It implies carrier plus double side-band transmission, half the transmitter power being devoted to the carrier (which is used at the receiver as a reference frequency enabling the audio frequency of the original modulating signal to be reproduced by beating the modulation side-bands with the carrier in the demodulator circuit). The reference frequency could equally well be generated in the receiver, so retention of the carrier in the transmitting output amplifier is a waste of the power-handling capacity of the stage, as is also the use of both side-bands (which doubles the bandwidth of the transmission when only one side-band is necessary to convey the complete message intelligence).

Since only part of the transmitter power capacity is available to handle the intelligence, it is usual for the output to be provided by a high-efficiency Class-C amplifier which is non-linear in operation and would distort the modulation waveform if the modulation were applied to the input of the amplifier. Modulation has therefore to be applied at high level to the output of the power amplifier, which reduces the overall power efficiency considerably but does not count against the licensed input power to the PA. It is an expensive and inefficient method of modulation which has now been replaced in amateur practice by the A3J single side-band suppressed carrier system, well-known in line and long-wave radio service back in the 1920's, but awaiting the development of practical side-band filters for use in the HF spectrum.

We should not expect any return to use of A3 modulation, which is wasteful of power and bandwidth. Nor should we expect any interest in A3H, because A3J so clearly gives better results than either A3 or A3H.

A3J Telephony

As described above, this system occupies only the bandwidth necessary to the audio modulation, which in amateur practice is about 2500 Hz; there seems to be no easy way of reducing this bandwidth without reducing intelligibility, so there is scope for development in this respect. Because of the careful placement of the side-band filter relative to the carrier generator frequency, it is not practicable to carry out the SSB generation in a part of the circuit which is frequency-agile; therefore side-band generation and carrier suppression is invariably carried out in a fixed-frequency low-level circuit, the output of which is mixed with the frequency-agile devices and fed into tunable amplifiers. Consequently,

all the amplification employed must be linear to avoid distortion of the modulation waveform—which is a strict but not particularly arduous requirement. It does mean a reduction in amplifier power efficiency compared with Class-C, but taking into account the removal of the redundant components, *i.e.* the carrier and one sideband, the capability of the linear amplifier completely dedicated to amplifying just the intelligence in the signal results in a much better *useful* output. The output amplifier will operate in Class AB1, AB2, or B, according to the type of valve used.

Although it is true to say that all the power developed at the output of an A3J transmitter is intelligence bearing, this means its contents are all initiated by the modulation input; in fact if the modulation is speech, we know that it will contain much that is redundant to intelligibility, even if important to recognition of the speaker by his voice. Also there will be wide variations in the power of the speaker's voice, between phrases, words, vowels, and consonants, so that the Peak Envelope Power must be adjusted for the loudest sounds, and the others are radiated at reduced power (unlike A1 telegraphy in

which every bit of intelligence goes at maximum power and there is no redundancy). The power variations of the voice can be electronically compressed to reduce, but not completely eradicate, this trouble but this gives the side effect of reducing the modulation signal-to-noise ratio.

A3J is another example of the message intelligence generator (the voice) requiring a high quality bearer circuit to make good the short-comings of the generator and its poor adaptability to the HF propagation medium. Unlike the man-made 'start-stop' teleprinter code, the voice is a natural means of communication which biases us tremendously in our desire to use it, and there is quite a lot of research going on into the technology of processing speech with the object of making it more suitable for telecommunications transmission. One hears of 'digital speech,' and if speech can be turned into a two-state telegraphic signal stream it can clearly be treated as telegraphy, which looks like quite a breakthrough, albeit well out of the reach of our fraternity for the present!

to be continued

BOOK REVIEW

"LEARNING TO WORK WITH INTEGRATED CIRCUITS"

THE writer's first awareness of computers came after reading an article on the *ENIAC* machine developed in the U.S.A. with its 15,000 valves. Then began the age of the semiconductor, quite easy to comprehend at first with simple bipolar devices, but later to become very much more complicated when Integrated Circuits arrived. Now we have such mysteries as "64-bit bipolar scratch pad memories", "look ahead carry generators", "14-stage binary ripple counters", not forgetting micro-processors.

Articles on IC's generally seem to fall into two categories. Either they deal solely with the theory of the devices, such as gates and decoders, or they describe a piece of equipment, such as a counter, on the assumption that the reader knows how everything works. A more satisfactory approach is adopted by the ARRL in its new publication, *Learning to Work with Integrated Circuits*.

The book consists of reprints of *QST* articles by Jerry Hall, K1TD, and Charles Watts, KH6FB, describing a digital voltmeter and frequency counter. It aims to teach the reader how IC's work while covering the design and construction of the projects. There are nine short parts the first of which describes how IC's are made and work, the design philosophy of the DVM and DFM, and the power supply. Part 2 deals with binary arithmetic and BCD and includes the circuit and parts layout of the readout display.

The third part covers TTL IC's and introduces the reader to the truth table, "The Ouija board of digital circuit designers", to quote from the chapter heading.

In this section inverters, NAND gates and the 7447 decoder-driver IC are described. "How a Frequency Counter Does It's Thing" is the title of Part 4, in which waveforms, monostable multivibrators, Schmitt triggers and flip-flops are covered, along with the etching patterns for the display and clock boards. Part 5 is devoted to the counter section and includes the counter p.c.b. layout to complete the digital part of the book.

Linear IC's are given the treatment in Part 6, in particular the 741 operational amplifier used in the voltage-to-frequency converter board, and Part 7 shows how to put all the bits together, construct the probes and calibrate the DVM. The DVM clock is derived from the American 60 Hz mains but a simple modification is thoughtfully incorporated for those of us on 50 Hz supplies.

Part 8 is devoted to optional extras enabling the 4-digit readout DVM to be used as an equivalent 8-digit DFM with crystal controlled time base, again all the p.c.b. layouts being shown full size. As with all "perfect" designs, improvements are discovered later and the final part mentions these.

Learning to Work with Integrated Circuits comprises 48 pages size 10 $\frac{7}{8}$ by 8 $\frac{1}{2}$ inches and contains an index and shopping list for the resistors, capacitors, semiconductors and mounting hardware. The book is written in a highly informative and humorous style being well illustrated with excellent diagrams and photographs. This reviewer thoroughly recommends it to anyone keen to learn about IC's and/or who wishes to build some very useful pieces of test gear. It is available at £1.65 including postage/packing from the Publications Dept., Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts. AL6 9EQ.

“AND IT HAD AN IVORY KNOB”

D. J. BRADFORD, G3LCK

THIS story is near enough true and some old and middle timers may recognise its basis.

The Welworthy Radio Club was a well organised affair; the Second World War had not all long passed and so there were plenty of very good CW operators available. The standard of technical expertise was high owing to the number of electronics firm that had moved into the area and prospered during the war, and as a result the annual turn out for *the* contest was a most satisfactory blend of operating skill and technical equipment. The fact that old G3— was also the local Boy Scout leader and G5— was in the catering business simply added a gloss to an already well finished set up.

The friendly neighbourhood farmer had made the usual big field, plus tractor and trailer available; the latter pair were used to haul the mounds of heavy tents, poles and gear to the chosen site. Soon the young members were beginning to arrive on their bicycles to do battle with the piles of canvas, and then in groups they would be available to help Mrs. G5— to keep the ‘brew up’ coming to the operators and log keepers. To keep the log, once they had cottoned on to what was necessary, was a rare privilege afforded to those whose Morse was ‘coming on’. Since the gear was run off vibrator packs and rotary converters, another chore was to hump the heavy duty lead-acid batteries to and from the clearing where the war-surplus *Onan* generator cracked a brisk charge into them.

Unlike most NFD’s the weather was warm and sunny. The surplus gas capes and wellies, that were just that, lay in an untidy heap in the brown 160lb. tent—the one set aside for rest and recreation. Oh yes indeed! Old G6— was putting his surplus training to good effect. The whole place was abuzz with useful activity, with Bob keeping his eagle eye on things. “Hump that pole, tote that box—and when in doubt blanco yer socks,” warbled a youthful voice. G6— turned an icy stare towards the perpetrator of this verbal outrage, “By God I’ll have him on a charge!” was his initial thought; he checked the desire to say so.

This was rural Britain in 195— not the western desert in 1944. “Saucy young devil,” was the only comment he permitted himself, and that in an undertone.

There was a cheer as the spiders web of wires that was a 560ft. double Zepp, with its ceramic rungged step ladder, rose majestically into the air. “Blimey!” breathed the very new G3G—, “How the hell could I get that into my 50ft. garden?”

A lofty young man with aspirations to a physics degree and a penchant for metal work rather than coil winding, commented that with a radiator that long it wasn’t surprising that you could work ‘em. As he said, “Most of ‘em can’t be all that far from the ends of a wire *that* long, anyway.” He then fell into a deep conversation about the troposphere, with a spotty youth from a village some miles away. The spreaders and the eight-inch pyrex insulators (ex-RN?) caught the sun and sparkled.

A series of superbly coupled expletives revealed that Bert, a former 8th Army man and accredited wizard of the PE generator, had rested his hand on the exhaust pipe of the *Onan*; since this had run for twenty minutes before spluttering into silence it had ‘warmed’ not a little, and it was generally agreed that it was all the infernal things he said it was. Anyway Mrs. G5— was well out of earshot. “What’s up Bert?” called G6—, after a decent pause. “Nothing I can’t fix,” came the reply in a tone that must have had the carburettor cowering in the grass. As if to underline the force of that remark a cheerful, well tuned crackle revealed that an early QRT was not on the cards—well not due to flat batteries, at least.

Another small cheer, this time from the operating tent, revealed another triumph over adversity, or that special branch of Murphy’s Law which is reserved for NFD aerial matching units: this one actually caused current to flow *up* the ceramic spaced ladder. The previous year’s effort, the last-moment product of Stan the Slapdash, despite ten months advanced warning, had started off by failing to match anything; the bit of 12 s.w.g. copper wire which shorted across the input socket had eluded everyone until most other groups were handing out serial numbers approaching three figures, and this had created a certain muted hostility towards poor old Stan (the extent of this muted quality of feeling was a reflection of the sense of incompetence of all the ‘experts’ in locating the error). Its detection in the end had been the work of one of the two ‘tea boys’; he had meekly asked what was the purpose of “that piece of wire?” It was not a happy moment in the Club’s history. So it was that someone at the Transmitter Design Department of International Electronics Ltd., had been asked nicely to help: he had done a grand job—or someone at the lab. had, hence all those lovely mills. of RF.

Next the HRO-5; The HRO-5 of G6— was reverently placed on the table and attached to its vib. pack, its 6-volt battery seeming almost to sag under the strain! From the head phones a splendid cacophony of CW revealed that things were indeed looking promising. Then there came the moment for the final checks.

“Charlie’s on for the first two hours.” This was G6— speaking with that tone of certainty of one accustomed to command. “Anyone seen him?” Silence, a scurry of looking in tents and behind bushes, but no Charles. “You can’t blame me this time,” thought Stan.

G6— was dumfounded. *He* had made the schedules and circulated everyone *twice!* Once more he suppressed thoughts of ‘Court Martial,’ ‘Cashiered and shot.’ The clock ticked on at an apparently accelerating pace towards ‘kick-off.’

No one actually saw the slightly stooping, grey haired, dark suited old chap appear on the site. However, there he was, complete with a brown paper parcel under his arm. It was only when he said to a by-now somewhat distraught G6—, “Good afternoon, I am G2—, I live locally and heard you were having NFD here. I rather enjoy a spot of W/T, perhaps I could help to operate while the lost—I think you said Charlie—is found.” “Oh struth,” said young Nick, G3—, of whom it was said that he filed bits off the weight on his J36 bug key to make it go faster. “I should think he drove the works at Poldhu!” “Shh!” said Mrs. G5—, he looks a very charming old gentleman.” G3F— said nothing but his face

was a picture.

"Yes, er—, well," said G6—, "I suppose—um, thank you." The ancient Op sat down and surveyed the equipment. "Aha," he said, "the HRO, a fine receiver, yes indeed." His hands flickered across the controls, deftly flitting from BFO; to Phasing; to Selectivity and back to BFO. G3F—, who had grudgingly agreed to log, was seen to stop glowering. The frowns faded into a look of amazement. Afterwards he was wont to report that signals appeared and QRM vanished in a quite uncanny fashion.

"Superb filter," muttered the ancient Op, "now for the key." With that he unwrapped the parcel. A quite distinct gasp went up as the block of mahogany was set on the table. (It's actual size varied at subsequent recountings but it never went under eighteen inches long). This was topped by a most intricate mass of lacquered brass, on the end of which was a 'damned great ivory knob'. "Oh my lord! Here we go, eight words a minute," was G3F—s, of speedy-dot fame, inner groan.

"Five, four, three, two, one, zero!" chimed the spectators. A silence fell as the ancient Op's hand slipped to the key: it is a great shame that no one bothered to photograph the ensuing set of stunned faces. From the monitor tone in the headphones rang forth a faultless 38 w.p.m. "CQ, CQ, CQ, G6—/P calling CQ." G3F— was so surprised that he dropped his pencil. The AO smoothly slid across a piece of paper with call sign, time, reports and serials in an exquisite copper-plate hand which no one had seen him write. Signing off QSO 001 and raising the next one seemed to take seconds—and another—and another—and so it went on. No one spoke, they just looked. "Let us hope young Charles does not turn up," quipped the intending B.Sc., "with yonder ancient 'machine' who needs operators?"

After 50 minutes, during which time the serial had gone to 048, a somewhat flustered Charles arrived in his Austin 7, muttering something quite disgusting about "bloody mothers-in-law," and burst into the tent. The AO looked up. "Ah, so you are Charles, allow me to vacate the Operators' chair. You have a wonderful set up here so I must not get in the way of the number one Op." The scoring rate dropped sharply.

"Where is he?" asked G6—, who was on the point of offering the visitor a cup of tea. "Over there." "Where?" "Good Lord!—I—Oh well, never mind." In subsequent discussions G6— could never be quite sure whether the slightly stooping figure had gone out of sight *behind*, or just *before* the hedge on the far side of the field.

The NFD session had been over the better part of a week, and the trodden patches of grass where the tents had stood matched the rest of the greensward with grasses upright once more. That celebrated HRO had been returned with due reverence to its detached residence; G3F—'s bug key had cooled down; G3G— had stopped looking into the window of the posh house



Members of the Exeter A.R.S. set up a demonstration station, G4ARE/A, at the recently-held Exmouth Hobbies Exhibition; on show was RTTY, an HF station, closed-circuit TV, an SWL station and Two-metres SSB/FM. Left to right: Ted Conway, SWL; Malcolm Richards G4APF, Gordon Wheatcroft G3HMY (E.A.R.S. Chairman and Secretary, respectively); Alec Jeffries, G8GON.

agents who sold 'det. res. with approx 1/2 acre mature gdn.' A brief glance at his last salary cheque had finally made him accept the inevitable, 520, 260, even 130ft. of wire would not be his: life was indeed harsh.

No one had said very much about the AO and his amazing Morse key. The log checkers set about writing up the copy of the log that went off to RSGB HQ. (the one that was always sighted as *the way to do it* in the final report).

"Oi!" said the cheerful SWL who was sorting log sheets by bands, "why have we got a gap at the start?" He placed the sheets in front of G6—. "Look, nothing until G3— came on just under an hour after the start. Oh hell, I thought he was our sharpest Op., he must have changed bands and the first sheets have got lost." G6— and the others searched and researched for the papers, but there was no sign of the missing sheets.

As this activity was reaching its climax G3F— entered the club room. "Hey, what gives?" said he. "Why do these serials start at 049?" demanded the scribe in inquisitorial tones. "Cos' that grey haired old chap finished at 048," came the reply, "you know, G2—." "Don't be daft," came the voice of G8—, who had not been at NFD, "he couldn't have been operating." "Why not?" demanded several voices in unison. "Why not? He was killed early on in the war, that's why not. By gum but he was a fantastic telegraphist—used to use a ruddy great brass key. Do you know, it had a damned great *ivory knob!*"

With that G8— stopped speaking and no one else said anything at all—for a very long time.

The End

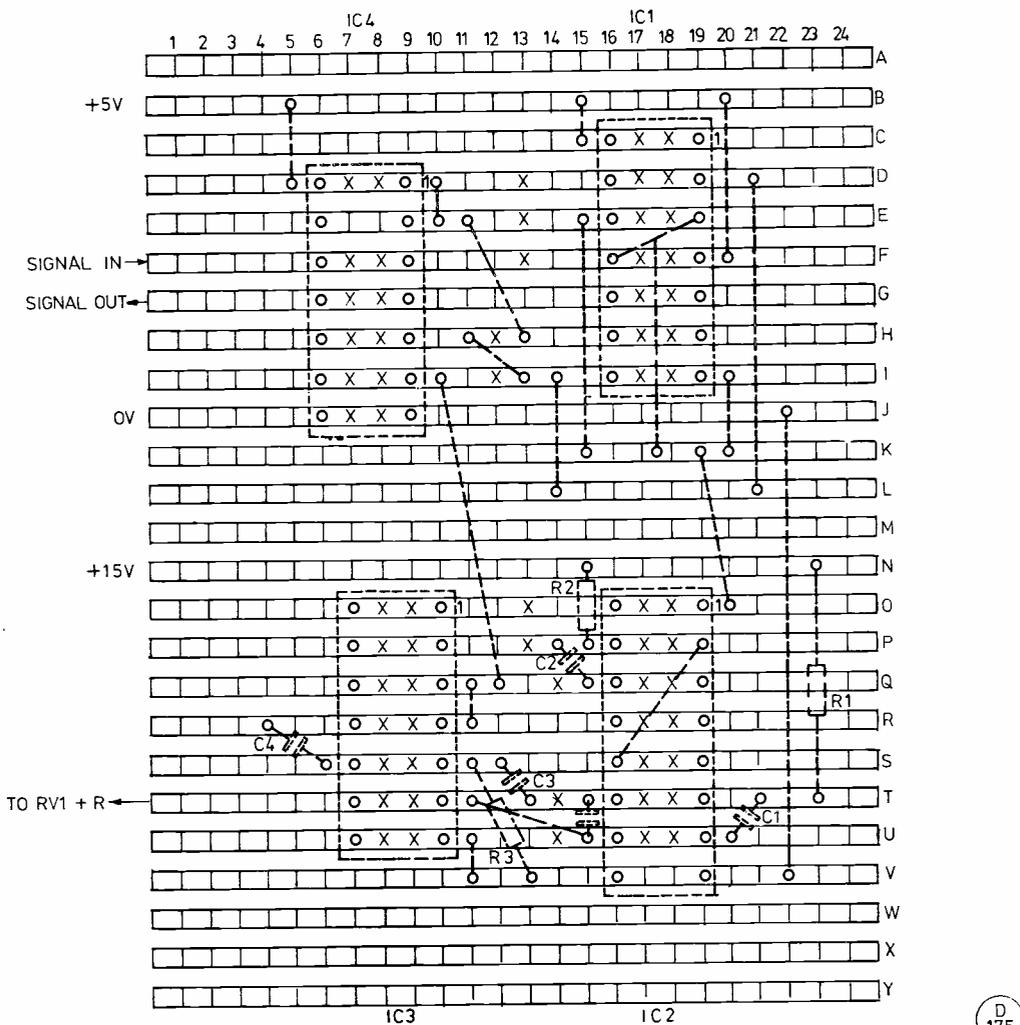


FIG. 7 CONTROL BOARD LAYOUT (UNDERSIDE)

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175

as soon as the gate opens. The reset pulse is also applied to the "clock" input of IC1a, which in reality controls the whole shooting-match. When the J input is high and the K held low, on receiving the reset pulse just mentioned Q output goes high and \bar{Q} low. In this situation, when the clock pulse arrives IC1a, having J high and K low, will change state so that the Q output goes low and \bar{Q} goes high. Thus we have a suitable output to control the gate; the gate is one half of a 7400 quad dual-input NAND gate. The gate-control signal is also applied to another of the gates in this IC which is wired as an inverter driving an LED lamp; the LED glows when counting is taking place, and is just visible on the fastest gate time of 1 millisecond.

The \bar{Q} output of IC1b is fed back to the reset terminal of IC1b which sets IC1a with Q low and \bar{Q} high, biasing IC1b such that the next down-going edge causes IC1b

Table of Values
Fig. 7

IC1 = 7473	C1, C2 = 150 pF poly-styrene
IC2 = 74121	C3 = 47 μ F, electrolytic
IC3 = 74123	C4 = 220 μ F, electrolytic
IC4 = 7400	VR1 = 22K linear
R1, R2 = 15K	LED = any small one will suffice
R3 = 22K	
R4 = 180 ohm	
R5 = 220 ohm	

On the Veroboard the following links should also be made:
B14 to N13
J17 to Q20
J22 to V22

The latch output is taken from S20; the reset output is taken from R15. The delay potentiometer and its associated fixed resistor go to T1; the signal input goes to F1; the output to the counter going from G1. The LED is fed from F10.

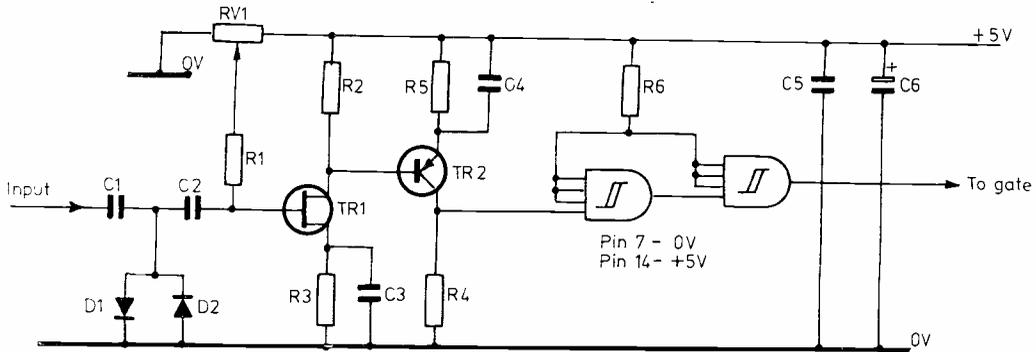


FIG 8 CIRCUIT OF INPUT AMPLIFIER

D
176Table of Values
Fig. 8

R1 = 680K	C3, C4 = 0.01 μ F ceramic
R2 = 180 ohm	C5 = 1000 pF ceramic
R3 = 220 ohm	C6 = 100 μ F, 15 vw electrolytic
R4 = 330 ohm	D1, D2 = 1N914 silicon diodes
R5 = 22 ohm	IC1 = 74S13
R6 = 1000 ohm	TR1 = 2N3819
VR1 = 50K, linear carbon	TR2 = 2N3905
C1, C2 = 0.1 μ F, 125 vw polyester	

Power Supply

The whole counter runs off a five-volt supply, which is obtained from a 9 volt 1.5 ampere transformer, the output from which is bridge rectified then fed to a high value reservoir capacitor. This smoother voltage is then fed to a stabiliser comprising a 741 op-amp driving a BC108 which in turn drives a 2N3055 series-pass transistor. Output voltage is set by VR1, which *must be done before the PSU is connected to any loads*. See Fig. 9.

Construction

With a fairly complex instrument such as this it is best to get all the components and then build the instrument in some logical order. As far as the writer was concerned the power supply came first, haywired on the

to change state again; its Q goes low and \bar{Q} high. The Q output causes the gate to close and the "gate-open" LED just mentioned to turn off. (The \bar{Q} is not wasted, as it removes the reset-hold on IC1a). With both \bar{Q} outputs high the output of IC4c will go low, triggering the delay monostable IC2 (a 74121), starting the whole cycle off again. The gate is held closed until the next reset pulse to IC1a, for the reason that with the J input low and K high on IC1b, it cannot change state until a reset pulse appears on IC1a—inverting the inputs and so *enabling* the clock pulses to cause a change of state in IC1b.

In summary then, the routine is: open gate for one period and count; close the gate and set the delay monostable; end delay; transfer to latches; reset counter and control bistable; and the next clock pulse then opens the gate and starts it all over agin.

Input Amplifier

The circuit is shown in Fig. 8. It must provide a square-wave output up to the maximum frequency that the counter will take. The amplifier is DC coupled, using a 2N3819 FET as input, into a BSX20 in common emitter and a 2N3702 *pn*p transistor also in common-emitter; the collector load resistor connects to one side of a 74S13 dual Schottky Schmitt-trigger, which gives the fast square wave which the counter likes. The operating conditions are set by VR1 which can be either panel-mounted or preset—if the latter, then set it so that you get best sensitivity at the fastest frequency the counter will accept.

Table of Values
Fig. 9

R1 = 470 ohm	ZD1 = 3.3v. Zener diode
VR1 = 10K pre-set	DB1 = 50v., 2A. bridge
C1 = 2000 μ F, 25 vw electrolytic	TR1 = 2N3053
C2 = 100 μ F, 25 vw electrolytic	TR2 = 2N3055

Transformer has 9v., 1.5A. secondary which is built on to a small piece of *Veroboard* soldered to the tags of C1.

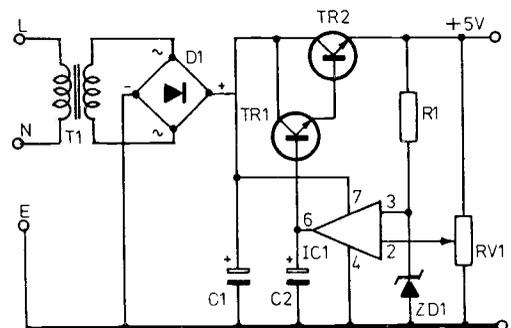


FIG 9 POWER SUPPLY CIRCUIT DIAGRAM

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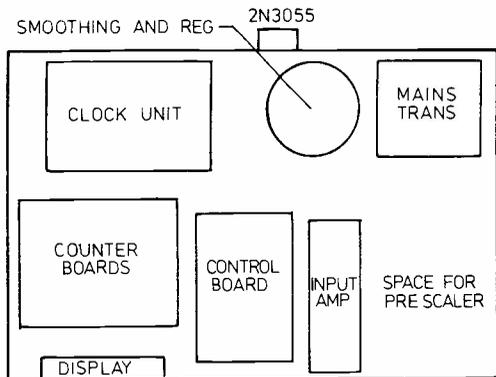


FIG. 11 INTERNAL LAYOUT

D 179

and to the right of the counter "stack"; to the right again is the input amplifier; and yet further right is the space for the prescaler; the PSU fits at the right rear of the box. The box is made of two "U" sections, and fitted with rubber buffer feet.

Setting-Up

Most of the sections have already been set up in the previous text. All that remains is to beat the clock oscillator against *Radio 2* on 200 kHz; on the prototype it was found possible to get the beat as low as one cycle in seven seconds with a steady hand, and once set it would "stay put" for several hours. This is more than accurate enough since it must be remembered that the frequency display is only accurate to ± 1 digit.

The input amplifier pot has already been noted; if it is made to be a front-panel control, a tweak on it may help when one is at the uppermost range of the box.

Choosing the input 7490: when the input amplifier is completed, one can select the 7490—connect a volt-meter to pin 11 of the 7490 and ground. As long as the 7490 is counting the meter will sit at some intermediate value; thus one can inject a signal-generator into the input amplifier winding the frequency up until the 7490 output latches up to rail or down to ground, and note the frequency. Repeat for the other counter 7490's, and select the fastest for the first stage, fed directly from the gate.

Results and After-thoughts

Does the counter meet the design requirements? Yes, and surprisingly enough the maximum frequency the

prototype will count directly is 54 MHz; thus a pre-scaler to VHF/UHF will need only one divide-by-ten. An alternative input amplifier was also tried, using discrete components rather than the 74S13; the Schmitt trigger in this case is made of a couple of BSX20 transistors and a diode, as in Fig. 10. Setting-up is just as before, although it was noted that as the maximum frequency is approached the count suddenly jumps to half frequency, at which point a tweak of the variable will bring back the correct count.

It seems, with hindsight, to be a miracle how the writer ever measured frequency accurately before! Every oscillator around has been measured, with some surprising results—some "stable" oscillators weren't, and others which were thought to be less stable turned out better than expected. Other uses are many; the output frequency of the generator can be accurately noted by using a tee-piece in its feeder; the grid-dipper can be measured by way of a coupling loop (very handy indeed if you are 'playing aerials'). The other possibilities are legion, limited only by your own ingenuity!



The new Model EDL144S 2m. linear-amplifier from Polar Electronic Developments Ltd., of Liverpool. Developed from the earlier Model EDL144, the new version has several improvements, of which one is the addition of a switch to change the operating conditions of the PA stage for use on FM or SSB (Class-C or AB2). The specifications quote an input of 10 watts nominal on all modes (5-20 watts); output of 100 watts SSB and 50 watts FM; efficiency of 50% SSB and 60% FM; pre-amp. gain of 20dB, and 2dB NF.

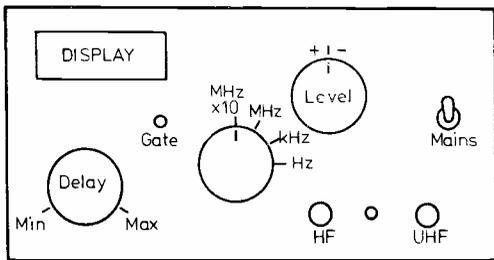


Fig 12 FRONT VIEW

D 180

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THE MONTH WITH THE CLUBS

BY 'Club Secretary'

LAST time around, at the very last moment, we had to find a bit of extra space and so there were a couple of scribes who didn't see their offerings in print. Please don't shoot us!

Up North

Apart from the third Friday which is missed each month, the York chaps turn up on Fridays at the United Services Club, 61 Micklegate, York. Their particular forte is in demonstrating our hobby to others, by way of a station at this-or-that event; one is coming up at the Great Yorkshire Show over the 11-13 July period at Harrogate.

Just now and again we hear from Otley. They showed their faith in the Hon. Sec. by re-electing him and adding a comment about a rising membership—good. They get together at an Hq. address near the centre of Otley on each Tuesday evening—it is suggested that you contact the Hon. Sec. for guidance as to how to get there. Incidentally, July 6 will see that same Hon. Sec. talking about his '48 years of radio.'

Westwards

We have the IRTS *Newsletter* and report on the AGM; it shows some 362 paid-up members of whom 233 are licensed. The total number of EI's licensed is some 554, with centres of activity well scattered around the Republic. If you want to know full details we strongly recommend having words with the Hon. Sec.—see Panel.

Back into England again, to Torbay, where the Hq. address is Bath Lane (rear of 94 Belgrave Road), Torquay. For the current information as to what is on the programme, we suggest you make contact with the Hon. Sec., at the new address in the Panel.

We have to refer you to the Hon. Sec. again; the issue of the *Cornish Newsletter* is almost wholly devoted to the AGM. However we can say that the general routine is to foregather at the *SWEB* Clubroom, Pool, Camborne, on the first Thursday in each month, the starting time being 7.30. If you've never been before, we recommend giving yourself plenty of time to find the Hq. and to get a seat—this is one club where the room is always full!

Our next stop is with the City of Bristol RSGB group, at their Hq. in Queens Building, University Walk, Clifton, Bristol 8; it should be noted that they start earlier than most clubs, namely at 1900. During June, on 26th, they will be entertaining G3RPE, the current RSGB President, and of course they will have plenty of work to do in connection with the Longleat Rally.

Over the border now and into (almost) Wales. The Blackwood crowd have a place at Oakdale Community Centre every Friday, where, apart from the club meeting they also have an RAE class and a Morse session. The main programme covers RAEN, discussed on June 2 by GW3MMU, followed by a talk and demonstration of Amateur TV by Gwent TV Group. June 16 is a talk and

demonstration of TVI causes and cures by GW3NWS, and on 23rd some twelve members, selected by a draw a couple of weeks earlier, will be visiting the BBC TV studios at Cardiff. The last date in June is 30th, and on this occasion GW4COJ will be talking and demonstrating his MSF Time Code clock.

Midlands

Our first stop this time is with Peterborough, where the Hq. address is at the Scout Hut, Occupation Road, and the start set at 7.30. June 16 is the date, and the activity will be by way of preparation for VHF NFD.

The Cheltenham venue is The Old Bakery, Chester Walk, on the first Thursday, and the third Friday in each month. Unfortunately the May issue of the *Newsletter* we have to hand was blessed with a surplus of material, and this probably accounts for the absence of forward programme details. It is interesting to notice how, even though the group is a fusion of two already strong and active clubs, the general impression one gets is of even more strength and activity. There must be a moral here!

Deadlines for "Clubs" for the next three months—

(For July issue—May 26th)

For August issue—June 30th

For September issue—July 28th

For October issue—August 25th

Please be sure to note these dates!

Another group which seems to maintain a high and consistent level of activity is the one at Derby. They are normally booked-in at 119 Green Lane, Derby every Wednesday; June 14 will be an exception in that this is set apart for a Barbecue at Drum Hill, Little Eaton. Of the others, June 7 is a Junk Sale, and on 21st there is an RSGB Tape-and-Slide lecture. The month will be rounded off on June 28 by a talk on simple receivers.

Stourbridge have a base at Longlands School for the formals and the activity nights, but the informals are held at the Shrubbery Cottage, Heath Lane, Oldswinford. June 5 is this month's activity evening, with the informal on the following evening June 6; they lead up to June 19, when they have a talk on Digital IC's.

If you are within the catchment area of Kidderminster you will no doubt be aware of the Youth Centre, Bromsgrove Street, as being the Hq. of the local club. On June 7 they have a Films evening, which will include one called 'The Tale of a Tower' detailing the work resulting from the falling of the Emley Moor TV mast, and another about the 'flying labs of the Civil Aviation Authority.' The third one to be screened is entitled 'Aerial Synthesis.' On June 21, they are in the great outdoors, with a Fox Hunt starting from the Hq.

Now we head for South Birmingham, where the venue is still at Hampstead House, Fairfax Road, West Heath. On the first Wednesday of each month they have the main session—June 7 with G3MTI discussing the GB3MH and GB3MA repeaters—as well as weekly openings of the club shack on Thursdays for HF activity nights, and on Fridays for everyone.

It seems years since we heard last from Willenhall, but is does rather look as though they have been doing "quite nicely, thank you." They now have a new home, at the Little London Community Centre, Bloxwich

Road South, Willenhall. They will be there on June 14 for an 'On the Air' night using the club G4ETW call, and are booked in for alternate weeks. An outside event occurs on Saturday, June 10, by way of the Willenhall Carnival, and they have a station prepared; it will be located in Willenhall Memorial Park.

Every Friday evening the Coventry gang get together in Wheatley Room, Baden-Powell House, 121 St. Nicholas' Street, Radford, Coventry. This give us June 2 for a Night-on-the-Air, and June 9 for a Treasure Hunt. June 16 is a Night-on-the-Air with a difference—VHF and out /P. June 23 is set aside for a club D/F event, and on 30th, they are getting ready for VHF NFD.

Wolverhampton have their place at Neachells Cottage, Stockwell End, Tettenhall, Wolverhampton. On June 5, the subject is Digital Logic, by G8HHK, followed on 12th by a Natter session in the clubroom. June 19 sees a talk on Microwave Ovens—something which we don't recall being covered before in a club programme—the speaker being G3LUP. June 26 is Committee meeting night, and on July 3, the gang will be hearing G8BHH talking about SSB above 432 MHz.

We now go right to the northern limit of our arbitrary "midlands" to Bury, where they have a weekly date at the Mosses Centre, Cecil Street, Bury, on Tuesdays. The main attraction for June is on June 13, when G8BCG will be talking about D/F Techniques, genning the lads up ready for the July Fox Hunt. On a different tack, it is hoped that the RAE classes may be resumed in September

at Bury Technical College, so the Hon. Sec. would be very pleased to hear of intending candidates, by letter or phone. Back to the club programme again, and like so many others they have a "trip out" in June, not like the rest into the sun and fresh air but rather to the technicalities of a visit to the Lancashire Police Hq. Control Room.

Hereford seems to have gradually built up over the years until now an attendance of 35 people is almost a normal thing, and very good for a relatively thinly populated area. The venue is the County Control, Civil Defence Hq., Gaol Street, Hereford; they are there on June 2 and June 16, on both of which dates the programme was 'open' at the time of their *Newsletter* printing. However, as we have said, they hold a relatively large membership, so doubtless something will have been set up by the time this comes to be read.

On to **Wirral**, and their Hq. at the Sportscentre, Grange Road West, Birkenhead (we need to get the venue in quickly so we don't confuse anyone between the two clubs on the Peninsula!), where they get together on the first and third Wednesdays of each month. The copy of the *Newsletter* we have on hand doesn't cover the programme beyond the end of May, but the new editor is otherwise doing a good job in the face of the usual shortage of material. One of the few offerings he did have was a rather good letter from G3CSG on the subject of home-brew and the absence of SSB designs these days—no need for him to worry much longer,

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 WOLVERHAMPTON: J. Cook, G8EDG, 75 Windmill Lane, Castlecroft, Wolverhampton WV3 8HN.
 YORK: K. R. Cass, G3WVO, 4 Heworth Village, York.

we will soon have something to help him along!

G4AEJ is back in the Hon. Sec. seat for **Solihull**, and his last-minute note tells us that on June 20 they have G4ELO talking about Microwave Links, at the Manor House, High Street, Solihull. It is nice to know that things are all back on the lines after the sad and unexpected death of their previous Hon. Sec., G3PYR.

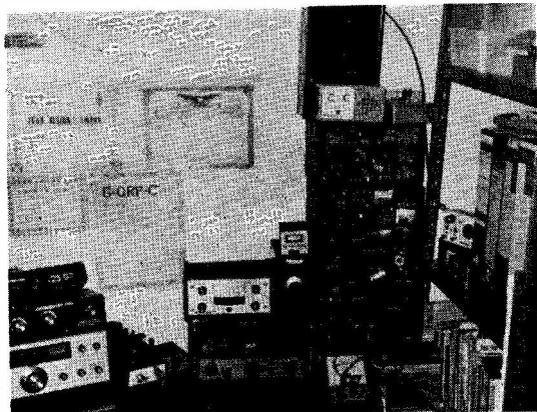
Although they have lost the use of the old club shack in Shady Lane, the **South Manchester** chaps have been able to get a room at their existing Hq. for use as a shack and for the Monday meetings—they hope to have it all set up by the time this comes to be read. On to their “main” meetings, on Friday evenings at the Community Centre, Norris Road, Sale, where the programme looks rather like: June 2, a talk by G3USF on Sporadic-E Anomalous Propagation; June 9 the winner of the homebrew competition to be selected; the official opening of the new Shack set down for June 23; and on June 30 the Hon. Sec. will himself take the stand, to discuss the design of a Cathode Ray Oscilloscope for use in the amateur station.

Nationwide

In fact, all the entries in this lot are *international* in their membership. For example, we have in front of us the *AMSAT Newsletter*; most people will be aware that this is the world-wide organisation which supports the building of the *Oscar* satellites. Reading the *Newsletter* carefully we notice that the cost of one of the Phase III satellites is around 250,000 dollars—this covers two units of course, and the “back-up” unit will be available for another launch later on. Of the sum mentioned the main items for each unit include, for example, 2400 solar cells at 10 dollars a time, two transponders, 2 *Cosmic* computers and a kick motor, making some 62,400 dollars as a start for each of the pair of units. No wonder the programme needs support! It is of great interest to notice how much the educational aspect of *Oscar* has interested folk outside Amateur Radio—there are donations from companies, and of course many schools are making use of the *Oscar* telemetry for educational purposes. Details of AMSAT-UK can be obtained from the Hon. Sec.—see Panel.

The **G-QRP** Club is as active as ever, and its *Newsletter* is one of the best around. Low-power operation is something of interest, the more so as so much of the gear is home-brew—which in its turn means that there is a lot of good constructional stuff in *Sprat*. Furthermore, they have an arrangement whereby most of the magazines from overseas are scanned for articles of interest to the QRP home-brewer, and interesting ones added to the “library.” A list is published in each issue, and anything on the list is made available for the price of a member's *s.a.e.* and a few coppers. For all the details, contact the Hon. Sec.—see Panel for his new address.

On now to **A.R.M.S.**, and on the front cover we notice that there is a reproduction of the standard A.R.M.S. QSL card; on the inside front cover we see a list of goodies available through the club. The amateur radio mobile station is the chap they cater for, whether fully licensed or SWL; and for those who go to foreign parts, the question of reciprocal licensing and how to go about the formalities is dealt with by their information service. Well worth a subscription—for



The shack of that well-known QRP-er, Rev. G. C. Dobbs, G3RJV; George is also Secretary of the G-QRP Club, and a frequent contributor to *Magazine* columns. To the left is the main rig, a Ten-Tec ‘Argonaut’; above, an SWR bridge, two ATU’s and the clock. At the side is a home-built CMOS keyer and straight key, and over the Eddystone standby Rx is a PSU, ATU and SWR bridge for 160m., and LP wattmeter. The rest includes various items of home-brew test equipment and small QRP projects.

details, contact the Hon. Sec., at the address in the Panel.

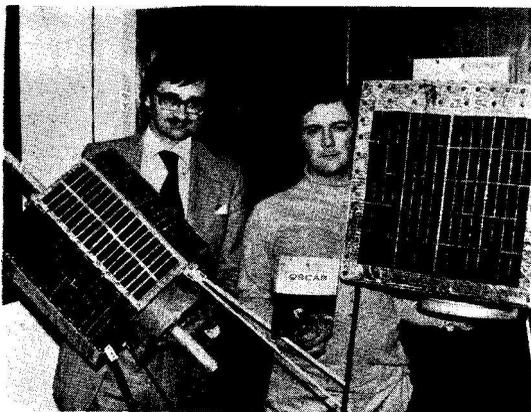
R.A.I.B.C. caters for the blind and invalid among us, whether SWL or licensed. In the current issue of *Radial* we see an appeal for a new Hon. Sec., for the simple and sad reason that G2CLP has been told to stop rushing around so much by the medics. One has to say that the size and extent of RAIBC now is such that it is a bit more than a one-man task, and yet not enough to cover a full-time secretary's salary. So G2CLP seeks to split the workload at present associated with the task so that, come an illness such as he recently had, the “system” has enough slack to keep all on the rails while the sick one recovers. (We could add that that sort of thing also applies to holidays; there is nothing worse than a return from holiday to find a large backlog of work which lays you right back where you were before the holiday started!). So, *volunteers are required*—write to G2CLP at the address in the Panel.

WAMRAC is the one for those in our hobby of Methodist faith—at least, that was how it started, but it seems to be adding members from all denominations of Christianity, worldwide. Details of their activities are best obtained from the Hon. Sec. at the address in the Panel.

Southern

Our first out of the hat is **Verulam**, who are to be found in the Market Hall, St. Albans on the fourth Thursday in each month, for their “main” meeting. During the summer months they are also found on the second Thursday in each month at Salisbury Hall, London Colney. This month they have an extra, in the form of a joint meeting with the Edgware group on June 22, when they will have a Trade Show put on by *Amcomm Services* of South Harrow.

Reigate seem to have June 20 as their “members evening”, which we understand to be what others call their formal date; G3VLH will be talking about simple circuits. There is also a Natter evening, at the Marquis of Granby in Redhill. The formals are held in the



At the March meeting of the Thames Valley Amateur Radio Transmitters Society, Richard Limebear G3RWL (right) who is Communications Officer of AMSAT-UK, presented a lecture and practical demonstration of *Oscar* satellites. During the meeting *Oscar 8* passed overhead and a satisfactory down-link demonstration was mounted. On the left is Victor Brand, G3JNB, Chairman of T.V.A.R.T.S.

Constitutional Centre, Warwick Road, Redhill.

Now to **Crawley**, who have their place at Trinity United Reformed Church Hall, Ifield, on June 21. This group also have informals, but these are held at members homes in rotation. An extra date for at least some of the gang in June is on June 17 for a visit, along with some of the Crawley Astronomical Society, to the home of Cdr. Henry Hatfield.

At **Cheshunt** the Hon. Sec. says that he always seems to get his programme finalised just in time to miss the deadline! However, for June we see a visit by G3AAJ on 7th, followed a week later on 14th by a talk on getting started with QRP by G4FAI; and on 21st they will be hard at it preparing everything for the exhibition station at Rosedale Sports Club on 24th. The last line of the programme appears to refer to June 31(!) but as it is a normal Natter evening at Hq., it seems more likely that June 28 was meant.

If you are looking for a club in the **Stowmarket** area, all you have to do is to find the railway station, and then you should be able to see the Red Cross Hall, where it all happens. As for the date it is easy to recall—the first Monday in each month; the June date will be a talk on Mobile Interference, and the July one is set apart for their preparations for the station to be shown at Stowmarket Carnival.

One of the well-organised scribes is the one from **Cray Valley**, where the details are set out in a standard format so that sheets can be pre-printed. From it we see June 1 as a main meeting, at which G4FAM will talk about his month in the United States, while June 15 is a Natter evening. June 18 sees the group putting on a station at Greenwich Festival for which they have applied for the callsign GB3GF. The Hq. address for this club is Christchurch Centre, High Street, Eltham.

It is quite a while since last we heard from **Maidstone YMCA**, who used to write in so regularly and, to judge by the letters, must be one of the best equipped clubs around in terms of shack, gear, aerials, accommodation and so forth. The New Hon. Sec.—see Panel—makes

it quite clear that things are still very much alive, and issues an invitation to visitors and potential new members to look in on any Friday evening at the 'Y' Sportscentre, Melrose Close, Maidstone, Kent, where they have quite a lot of things set up for member's entertainment in the coming weeks.

For the first time we note that a club is to spend an evening discussing the revised 1979 RAE syllabus; **Acton, Brentford & Chiswick** is the one, on June 20, at Chiswick Trades and Social Club, 66 High Road, Chiswick, London W4.

Although they normally have a booking for the first Monday of each month, the **Southdown** group are so organised that if this should fall on a Bank Holiday, their booking is put back a week. June 5, at Chaseley Home, South Cliff, Eastbourne is covered by a talk on 'Metalwork Principles and Practice,' by G8NPC.

Bournemouth (Wessex A.R.G.) group have a place at the Dolphin Hotel, Holdenhurst Road, into which they can just about cram all the regular attenders; and that doesn't mean a small group, because it's a big room! Find them on June 2, for a talk by G8AKA on UHF converters (432 MHz input and 70 MHz output—a bit unusual, but possibly a good idea). June 16 will also be of interest in that G2MI, for so many years the hub of the QSL Bureau system in this country, will be talking about some of the problems and the highlights of amateur radio between 1920 and 1939.

On the list of activities for **Chiltern** we note a special-event effort at Bellingdon Fete on Saturday, June 24, and on June 28 they are 'at home' to members of the Oxford club. The clubroom is at 42 Castle Street, High Wycombe—there is limited parking at the back of the building, or you can try Corporation Street, or the local multi-storey car-park from Level 6 of which a footpath runs to Crendon Street, just opposite Castle Street.

Now to **Addiscombe**, which is mainly a contest club, although they obviously like other things too. They can be located on any Tuesday at the Spread Eagle, Portland Road, South Norwood from 9.15. Looking through



Among those attending the Raynet Symposium in Leicester on April 15th were, left to right: G4EKW, G4EAN, G4AFJ, G8LVO and G8DKV.

their list of events, we notice something for everyone, right through from 3.5 MHz to the microwave regions.

At **Surrey** the *Newsletter* includes a letter from the chairman, who this year retires under the three-year rule. We also notice that G3FWR is standing down as Hon. Sec. after many years in the post; but for this time, at least, his name remains in the Panel for the simple reason that we don't as yet have the details of his successor. The lads are based at *T.S. Terra Nova*, 34 The Waldrons, South Croydon, where they have the first and third Wednesdays.

At the **Crystal Palace** AGM the Hon. Sec. was re-elected, and under A.O.B. they discussed the GB3LO situation. As a result, the committee were able to brief their ASR as to the views he should put forward at the subsequent RR's meeting, with the hope that their view would prevail and be noted and actioned at RSGB Council level. The group meet at Emmanuel Church Hall, Barry Road, S.E.22 on the third Saturday in each month, the meeting being arranged so that some Morse tuition can be given beforehand.

There are two places where one might find the **Sutton & Cheam** gang, namely Sutton College of Liberal Arts, and Ray's Social Club. In June, we notice that there is a session on WARC 79 on June 22 at the College, and a picnic on Sunday, June 4, not to mention the coach trip to the Longleat Mobile Rally on June 25, and an entry in NFD—no wonder there isn't a date at Ray's social club until July 19!

The **Barking Newsletter** doesn't make any mention of the programme, but we know they are to be found at Westbury Recreation Centre, Westbury School, Ripple Road, Barking, on most weekday evenings. The group will be on display at Dagenham Town Show, which one would guess requires most of the June period for preparation; but we do notice one break for them, in the form of a Field Weekend over June 17 and 18.

June 1 is the date for **Stevenage** to hear from G3AGP about Electronics in Medicine, while on 15th G4DDX will be talking about D/F Receivers. The venue is the Hawker Siddeley Dynamics Canteen in Gunnels Wood Road.

Finally, we go to **West Kent** who are at the Adult Education Centre, Monson Road, Tunbridge Wells, on June 9, when G8DET will be talking about the side of the Post Office which the customer does not see or hear. June 23 is down for a talk about Logic, how to design and use it; we'd like to mention the speaker's name but for once the Hon. Sec's. usually clear handwriting can't be deciphered with any certainty. However, the rest is clear, that these are the formal Friday dates, and that at the same venue they have informal Natter sessions on the Tuesday of the alternate weeks to the formals.

QRT

Down to the bottom of the pile again, and it remains just to ask you to send in your August material by the date shown in the 'box' in the piece (if you are thinking about July, you've missed the bus!), addressed as ever to "Club Secretary," **SHORT WAVE MAGAZINE**, 34 High Street, Welwyn, Herts. AL6 9EQ.

THE OTHER MAN'S STATION— G4AYG

OUR subject this time is John Elsworth, G4AYG, 27 Balton Way, Dovercourt, Essex. The first picture, taken some nineteen years or so ago, shows the young G4AYG-to-be at his seat of office as signals instructor to 2194 Sqdn., A.T.C., where he first learned to enjoy putting a station on the air each Sunday morning. Of



course, if you expose yourself to a germ, you must expect to be infected—which is how John came to be seen in the second picture, with a little less thatch on top and more round the sides! The rig at the time of the later photograph was a KW-2000A used with an MFJ audio filter, to enable G4AYG to pursue his interest of CW QSO's on Eighty in the mornings. He may well be using something different by now, as we understand some fourteen different rigs have been tried! Outside there is the aerial, and this is where the work starts. Umpteen radials, all buried ¾-inch below the lawn deal with the ground side of things, and there are 66 and 33-foot wires to feed Marconi-wise. Fourteen years have gone by working in electronics, and John is now hard at work for the sea-going R/O ticket, followed by the D.o.T.I. Radar Servicing Certificate and then, hopefully, by a few trips to see the sea. In the car G4AYG, like so many, uses VHF gear; between Lowestoft Technical College and Harwich the journey seems shorter with the rig running, and of course it is handy when one gets lost!

So there it is—another amateur enjoying his licence in his own distinctive manner.



VHF BANDS

NORMAN FITCH, G3FPK

Solar Events

WOW! Reportedly the biggest solar flare for ten years has been responsible for several complete blackouts on the HF bands and some mammoth auroral events on the VHF's. As this month's column is being started, your scribe is still piecing the story together, so more later.

VHFCC Awards

Jack Kay, G3CO, from Wakes Colne near Colchester, Essex, has been awarded VHFCC Certificate No. 11 for 4m. operation, to keep company with one for 2m. AM awarded in January, 1960. First licensed with the "A.A." call, 2CKB in 1937, Jack's present call was issued in early 1938. Sporadic 4m. operation started in the late 1950's from a previous location but really got underway from the present QTH following the purchase of a *Europa B* transverter in 1975, since when G3CO has been regularly active on Sunday mornings and during contests. The aerial is a 4-ele. *Jaybeam* yagi at 30ft. The "prime mover" is an HF bands transceiver the *KW-2000B* and Jack also operates regularly on 80m., as well as on 2m. and 70 cm. He plans to re-erect his 3-ele. 10m. beam soon.

For 2m. operation, VHFCC Certificate No. 296 goes to Ray Devereux, G8HQL, from Wokingham in Berkshire, who was first licensed in August of 1973. From December, 1973, AM operation with a *Pye Ranger* Tx and *Microwave Modules converter/Eddystone* 680X Rx combination was the order of the day, these being supplanted by an *Icom* IC-210 in June, 1975. The present transceiver is the popular all-mode *Yaesu* FT-221R acquired last July and to which a 3N204 preamplifier has been added. Ray's present aerial

is a 5-over-5 array at 35ft., the QTH being 200ft. *a.s.l.* Current activity is building the 4CX250B amplifier featured in the *Magazine* in the July and August 1973 issues.

Contest News

Results: From GB2RS comes the results of the March 144/432 MHz events. These are given in the order, call, points and QSO's for each of the four contests. 144 MHz Single-Op. G8KMW, 2463 (352); G8JAG/P, 1839 (244); GW4GTE, 1597 (240). Multi-Op. 144 MHz G3PIA/P, 4340 (560); G3PMH/A, 3855 (506); GW3OXD/P, 3537 (461). Single-Op. 144/432 MHz G4ASR/P, 4886 (346); G8GP, 2320 (98); G3SPJ, 2172 (203). Multi-Op. 144/432 MHz GW8BHH/P, 7733 (525); GW4ALE/P, 5068 (306); G8KUC, 5026 (432). Congratulations to all. In the 1296 MHz Open Contest on April 1, the winner was G4BEL/A with 2638 points from 34 contacts. In second place was G3SBV/P 1124 (23) and third was G4DDC/P 1118 (21). In the 432 MHz Open the following day, the Fixed section was won by G3VPK 608 (94), with G3WOH 315 (48) second and G8GP 283 (73) third. In the Portable event, the winners were G3PMH/P 643 (126) with GW3UBX/P 563 (83) second and G3NNG/P 524 (103) third.

Coming Events: The Microwave Contest is scheduled for the weekend June 17/18. In the absence of any further information it is assumed the rules will be as last year.

VHF NFD is from 1600-1600 GMT on July 1/2 and is an IARU event on 144, 432 and 1296 MHz with 70 MHz for those who have this band, including ON4ERX. The rules are as for last year so single band 144 MHz entries will not be accepted.

On June 24 the German CW Activity Group, AGCW-DL, is running a CW affair from 1900-2400 GMT on 2m. There are three categories. "A" is below 3.5 watts output; "B" is below 25 watts o/p and "C" is over 25 watts o/p. Exchanges to be the usual RST plus serial number followed by your power category and QTH locator. *E.g.* 579001/B/EL25a. Complicated scoring system but, as entries can be post-marked up to October 31, there is plenty of time to write to DK3UZ at P.O. Box 38, D-2358

Kaltenkirchen, German Federal Republic to ask.

Super DX Region 1

Following the stop press item last month, Ray Cracknell, ZE2JV, in Salisbury, Rhodesia, and George Vernadakis, SV1AB, 15 km. north of Athens, concluded a CW QSO on April 12 between 1756 and 1806 GMT on 2m. over a calculated distance of 6258 km.

On April 28, ZE2JV worked Costas Fimerellis, SV1DH, in Athens at 1737 GMT, followed by Spyros Chimarios, SV1CS, at 1748. During the latter QSO, Paul Galea, 9H1BT, in Malta heard ZE2JV. Paul's signals have also been heard by ZE2JV but as of April 30, no two-way contact had occurred. Thanks to Professor Martin Harrison, G3USF, for passing on the above.

In line with *Magazine* policy to give maximum publicity to the scientific aspect of our hobby, a full report of this season's achievements and tests on transequatorial propagation will appear as a separate article in the July issue.

Sporadic E

Possibly by the time this issue appears, there may have been some *E*'s QSO's on 2m. On April 26, Mike Dormer, G3DAH (Kent), mentions having heard what sounded like Spanish-speaking stations on 144.250 and 144.170 MHz at about 1400 for ten minutes, but he was unable to break in. On the *DUBUS* 20m. VHF net on May 6 the Norwegians and Swedes were talking about VHF *E*'s propagation to eastern Europe, while at 0900 the previous day, SM3BIU heard DLØPR for about 1½ minutes possibly *via E*'s

It is proposed to develop an *E*'s warning net in an attempt to enable more amateurs to participate in this interesting and rewarding type of propagation. However, it is stressed that those in the system will be expected to file reports giving full details of times, stations heard, as well as worked, QTH locators, etc. All reports received by G3FPK will be forwarded to the RSGB Scientific Studies Committee. Eventually, when enough data has been received on each *E*'s event, Serge Canivenc, F8SH, the IARU Region 1 VHF *E*'s

Coordinator, will produce a report for the CCIR in Geneva.

Would any readers interested please write to Ian White, G3SEK, at 83 Portway, Didcot, Oxon., OX11 0BA, giving full details of their monitoring facilities on VHF—e.g. bands covered, in addition to amateur, from 45 MHz up—aerial and receiver details and home and work telephone numbers. Ian will then try to evolve some kind of warning system. It is proposed to use it also for auroral warnings.

Beacon Information

The frequency of the 6m. band VHF beacon ZS6PW in Pretoria, mentioned last month, is 50.029 MHz. Permission has been given for a 50 MHz beacon in Cyprus, 5B4CY. As this is being edited, it is not certain if the QRG will be 50.08 or 50.5 MHz, however it is already to go and will beam toward the U.K. The licence for the 70 cm. Crowborough beacon, GB3WHA, on 432.81 MHz has been issued and it could be in operation by the time this appears. Reception reports to G4BOO (QTHR).

DX-Pedition Calendar

The G8MME/PE1AVU trip to the Shetlands is scheduled to commence on June 4 for 12 days. (See page 23 in the March issue and page 108 in the April edition). The GM3JFG and G8AGU trip to Barra from June 6 to 9 is imminent—see page 156, May. From June 11 for 10 days, Gordon Meddings, G4DGM, and Tony Fegen, VE3BUL/GW3TFF, will be operating mobile and portable in the northeast and southwest of Scotland. They will be QRV on 144.245 and 432.245 MHz with 80 watts output on each band, SSB.

From June 28 to July 26, OZ3TZ and OZ7IF are reported to be going to the Faroe Islands, one object being to install 2m. and 70 cm. beacons. Drew Givens, GM3YOR, has sent details of the proposed Faroes and Iceland trip covering all bands from 160m. through 70 cm. if allowed. The party comprises GM3YOR, GM3OLK, GM8NCM, G4DSE, G4DXC and possibly G8HDR. The dates are:—July 18-21, OY and July 23—August 5, TF. On VHF the call GM8NCM/OY and -/TF will be used. When your scribe spoke to Alistair, no licences has been received but he did not



The Vange A.R.S. Contest Group's station, G3YCW/P, operating in the 432 MHz Open Contest on April 12th from Langdon Hill, Essex. Gear included the club's FT-101EE, Modular Electronics transverter and home-brew 'Plumbers Special' linear, feeding four 18-ele. Parabeams. Left to right: Keith Naylor, G8FUF and Steve Glass, G8GKA.

foresee any problems. The CW frequencies would be 70.072, 144.012 and 432.012 MHz and the SSB ones, 70.236, 144.236 and 432.236 MHz. No skeds are being accepted except for MS on 144.175 MHz SSB, now pretty well fully booked.

From July 25 for two weeks, Jon Dougherty, G4FUT, will be on holiday in Luxembourg. He plans to be on 144.38 MHz SSB/CW from about 2000 onwards but it is basically a touring holiday. Dave Storrs, G8GXP, will be on holiday in Cornwall in the last week of July and first week of August with gear for 2m. and 70 cm. A one day trip to the Scillies is planned.

Moonbounce

In the first leg of the ARRL E-M-E Contest, Ian White, G3SEK, had a QSO with K1WHS on April 15. His aerial system is on a polar mount which is a great advantage. Doug Parker, G4DZU, has his 56-ele. array fully *az-el* controlled now and remarks how the general urban noise diminishes when he points it skywards. Dave Price, GW4CQT, has concluded E-M-E contacts with W6PO, W7FN, K1WHS and SM7BAE. All the above on 2m.

Satellite News

Many *Oscar 8* users are complaining about the weak downlink signals, particularly on Mode "J" and it does seem that a good receiving

set-up with low noise pre-amp. and a gainy, well-aimed aerial system is required. The main point to emphasise is that on no account should lots of power be used in an attempt to hear your own signal due to deficiencies in the Rx system.

AMSAT has decreed Mondays to be QRP days on O-8 and this would indicate 8-10 watts *e.r.p.* for Mode "A" and about one watt *e.r.p.* for Mode "J."

O-7 is reported to have been switched into Mode "A" by pulsed transmissions from a commercial station in Norfolk, operating in the 70 cm. band. Naturally this caused a lot of indignation but it must be remembered that this band is allocated to amateurs on a *secondary* basis on the understanding that we do not interfere with other services. Nevertheless, it does seem rather provocative that the Home Office allocated frequencies in the most used part of the band. These transmissions have now ceased but will reappear in the autumn from another part of the U.K. for a few days.

New stations on the satellites include A9XBC on 29.43 MHz and H18XRM on 29.44 MHz while UA1ABS, UC2AAB, UC2ABB, UC2ABN and UG6AD have been heard on Mode "B."

Meteor Scatter

Chris Bartram, G4DGU, welcomes the idea that a list of MS operators'

QRG's be published and advises that he uses 144.117 MHz. Clive Morton, G4CMV (Leeds), complains that the *Lyrids* shower of April 21-23 was a non-event with reflexions little better than sporadic meteors, a point echoed by many on the *DUBUS* net the following weekend. However, he managed QSO's with SM2CKR (KX12g) and DJ5MS (GI15e) on CW on the 22nd. The best reflexion from DJ5MS lasted 15 seconds but most were weak and less than two seconds duration.

Alistair Simpson, GM8NCM (Fife), uses 144.175 MHz for his SSB MS operation and worked DM2BYE (HM53a) on the 22nd April, via 11 bursts and 23 pings. He received 21 bursts and 50 pings from F6FHP (AE21g) but the Frenchman seemed to have QRM on his end so no QSO was made. Clive Penna, G3POI (Downe), has added four more squares by MS thanks to F1ANY (BD), YU2RGO (HF), YU1NOK (JF) and SM5BEI (JU).

Auroras Galore

In case anyone is in any doubt, although the peak of sunspot cycle no. 21 is not expected for a couple of years yet, the Sun is very active at present, one result being an abundance of auroral events. George Szymanski, GM4COK, reports these on April 3, 4, 5, 11, 12, 13, 14, 23, 24 and 27. His letter was dated the 28th and there were events on the 30th and on May 1, 2, 3 and 4.

Thanks to Charlie Newton, G2FKZ, here is a potted history of what happened at the end of April. On April 28 at 1330 GMT a major solar noise storm erupted lasting 25 minutes at 136 MHz and 82 mins. at 95 MHz. The *solar flux* reached 197, an all-time high for cycle no. 21. (N.B. The highest figures for the *maxima* of cycles 20, 19 and 18 were 165, 245 and 190 respectively).

The immense solar flare which caused this erupted from a sunspot group of area 1,200 millionths, the largest for ten years, at 22°N and 41°E, at 1308 GMT. It lasted for 106 minutes and the intensity was 2400 *flux units*. This was a category "10" flare and caused an immediate *sudden ionospheric disturbance* which blacked out all HF bands communications for a couple of hours. A secondary "10" flare of 150

f.u's lasting six minutes was recorded at 2144.

Unfortunately over the weekend of April 29/30 no data were transmitted from Meudon. On May 1, 2, 3 and 4, the *solar flux* indices were 179, 180, 179 and 175 respectively. When the event started on the 28th, the sunspot count was 119 and on May 1-4, the numbers were 215, 247, 142 and 106 but it is worth pointing out that it is the *solar flux* level which is the most important parameter. Another parameter is the *Ap figure*, which is

QTH LOCATOR SQUARES TABLE

Station	23 cm.	70 cm.	2 m.	Total
G8FUF	2	84	207	293
G3JXN	26	65	88	179
G3COJ	17	61	72	150
G8GML	8	50	89	147
G8HVY	—	48	96	144
G2AXI	1	47	80	128
G8LEF	4	43	87	134
G8EOP	8	36	38	82
G4BAH	—	32	92	124
GD2HDZ	10	32	59	101
G3OHC	4	31	98	133
G4DKX	5	30	68	103
G8IWA	—	29	77	106
G8HHI	—	28	82	110
G3FIJ	—	27	62	89
I4EAT	—	25	196	221
GM4CXP	—	25	127	152
G4BWG	—	25	110	135
GJ8AAZ	1	24	66	91
G4GEE	—	23	41	64
G4FCD	—	22	89	111
G8GII	—	22	63	85
G4AEZ	2	22	57	81
G3XCS	—	21	110	131
G4ERX	1	21	60	82
G3BW	1	21	47	69
G8BKR	1	19	93	113
G8IFT	7	18	49	74
9H1CD	—	13	126	139
G8ITS	—	11	51	62
GD3YEO	—	8	59	67
G8KUC	—	7	60	67
G4FBK	—	5	73	78
GJ8ORH	—	5	22	27

GM8NCM	—	4	65	69
G4CMV	—	3	109	112
G8LHT	—	1	71	72
G8KLN	—	1	62	63
G8LLG	—	1	38	39
G8JAH	—	1	35	36
G3POI	—	—	218	218
G3SEK	—	—	152	152
G3CHN	—	—	148	148
G3FPK	—	—	142	142
G4DEZ	—	—	105	105
9H1BT	—	—	94	94
G4AWU	—	—	85	85
G6UW	—	—	85	85
9H1C	—	—	83	83
G8JJR	—	—	79	79
GM4COK	—	—	76	76
G8JHX	—	—	74	74
G4GET	—	—	69	69
G8KGF	—	—	68	68
G8KPL	—	—	64	64
G8JAG	—	—	63	63
G4CIK	—	—	62	62
G4GCQ	—	—	61	61
G3KPU	—	—	60	60
G8KSP	—	—	60	60
G8JEF	—	—	58	58
G8KSS	—	—	58	58
GW4FJK	—	—	57	57
OZ9IY	—	—	53	53
G4EYL	—	—	41	41
G8JGK	—	—	34	34
G8JAJ	—	—	24	24
G8JKA	—	—	21	21

Starting Date January 1, 1975. No satellite or repeater QSO's. "Band of the Month" 70 cm.

Daily Equivalent Planetary Amplitude of magnetic activity. The *Ap* figure for the 28th was low, at 13, but the May 1-4 values were 50, 55, 33 and 50. Other laboratories have reported a category "10" flare at 1940 GMT on May 1 of 2860 *f.u's* and another at 0638 on the 2nd lasting six minutes.

So much for the solar event, now to what it meant to VHF/UHF operators. The first of the auroras was on the afternoon of April 30. Jon Dougherty, G4FUT (Sunder-

THREE BAND ANNUAL VHF TABLE
January to December 1978

Station	FOUR METRES		TWO METRES		70 CENTIMETRES		TOTAL Points
	Counties	Countries	Counties	Countries	Counties	Countries	
G3SPJ	45	5	51	11	31	4	147
G8GXP	—	—	55	12	40	7	114
G4ERX	15	1	49	11	15	4	95
G3CO	25	3	31	9	17	3	88
G3FPK	—	—	69	16	—	—	85
G4DEZ	—	—	65	17	—	—	82
G3FIJ	23	2	35	5	13	2	80
G2AXI	9	3	35	8	16	4	75
G8KGF	—	—	59	13	—	—	72
G8BKR	—	—	47	8	12	3	70
G8HHI	—	—	31	9	23	6	69
G8APZ	—	—	50	12	3	1	66
GD2HDZ	16	2	12	7	23	3	63
G4BWG	16	3	31	8	1	3	62
G18EWM	—	—	36	9	9	6	60
G4GXT	—	—	48	7	—	—	55
G8LYH	—	—	41	10	—	—	51
GM4CXP	—	—	36	11	1	1	49
G8OGD	—	—	38	5	4	1	48
G8LHT	—	—	36	10	—	—	46
G8KSS	—	—	40	6	—	—	46
G8NYS	—	—	39	6	—	—	45
G8ITS	—	—	22	6	10	3	41
G8BIJ	—	—	32	6	—	—	38
G8MKW	—	—	34	4	—	—	38
GJ8AAZ	—	—	20	6	6	5	37
G4FKI	3	1	14	3	8	1	30
GJ8ORH	—	—	7	6	3	5	21

land) reported it starting at 1518, fading out at 1702. He worked LA, GM, PA, ON, OZ and DL, with OH2PF an incomplete exchange. Clive Morton, G4CMV (W. Yorks.), worked three LA's, SMØFUO (IT), SM3DCX (IV) and a PAØ. GM8NCM, using SSB, worked "... some continental stations for a change . . ." including DL1BP (DN36b), PEØSKA (CN68e), PAØAKN (CL11j) and ON6UG (BL79g) at QTF's 30-45° and about a dozen G, GI and GM stations. At G3FPK, the event was discovered at 1556 when an unreadable GM was heard on SSB. GM4COK (YP04b) and GM4CXM (XP19a) were worked on CW for a couple of new regions in 1978. Furthest

heard was SMØDJW and it fizzled out by 1700. No second phase was observed.

The first phase of the May 1 event appears to have started around 1328 GMT when G4FUT heard GB3LER aurorally. He worked PA, DL, DM before fade-out at 1415. GM8NCM managed a couple of Dutchmen. At G3FPK, GI, GM and GW stations were logged with the last weak GM disappearing at 1416.

G4FUT missed the start of the second phase but stayed the course until fade-out at 0250 GMT the next morning. Pick of his 33 QSO's were:—SP1ADM (HN29), UR2ARB (MS70), SP2LU (JN61), SM5BEI (JU72), UR2RQT (MS80),

RR2TEJ (NT72g), SM3FGL (IW26) and SM3AKW (IW30). He was called by OF1MG at 0130 but could not make it due to the tremendous QRM, however, Jon did work 13 countries in the 24 hours.

G4CMV missed phase 1 and did not get in on the act of phase 2 till 2345 GMT and stayed on till fade-out at 0235. At first, he was hearing only EI, GI and GM "locals," but things hotted up from 0100. Clive's best DX were:—OH1FA (LU42h), UR2RQT (MS80e) and SMØFLV (JT62h). He noticed that, towards the end of the event, QTF's affected the "quality" of the signals and beaming about 15° further east produced a much rougher note. Also the Doppler shift was about 500 Hz LF whereas in most other auroras, Clive has noticed a 1-2 kHz HF shift.

At G3FPK, the second phase was in progress when the rig was switched on at 2130 GMT for a sked. GB3CTC (XK64a) was 41a at 2200 and GB3GI (XO41j) was very strong all the time, EI- GI and GM were worked but no real DX was copiable in London up to 0030 when your scribe threw in the towel.

The best of the series was the widespread event of May 3/4. GM4COK is reported to have been on from 1400 to 0500 with a two hour break sometime, and George worked 19 countries. Coming just at deadline time, few written accounts have arrived. Using just 40 watts output to a 10-ele. yagi, Ray Elliott, G4ERX (Essex), worked into YP, YQ, YR and ZO squares between 1700 and 1830. He was on from 2215 till 0245 also and his best DX on CW included:—SM5EKQ (HS48d), LA3WU (CU47d), SM5FND (HT80g) and SM4FXR (HT57g). QTF's throughout were between 0° and 15° until the end when it swung around to 30°.

At G3FPK, the affair was in progress when the gear was switched on at 1600 but only GM, PA and G were heard. The event was still going on at switch-off at 1747. The second phase produced SM and LA contacts an interesting one being SM4EBI (GT24g) only workable at 345° when all others were best at 15°. The rig was switched off at 0045 so all the Russian DX was missed. Keith Naylor (Essex), using the call G4FUF on CW, mentioned working UA3DCR (OQ),

UK2BAB (MO), UR2RQT (MS), UR2RDR (KS), UQ2QL (KQ) and OH0's JN, AZV and AZZ in JU square between 0100 and 0300 GMT.

Another operator running only 40 watts output, "... from an ancient *Europa*..." is G4FUT whose best DX includes:—UR2RQT, OH1FA (LU42h), UR2RGM (MS47e) and OH2LX (NU04b). Jon's aerial is a 6-ele. *Quad*.

The events were not confined to 2m. and on 4m., DK2ZF heard G3SPJ and G13RXE. Angus McKenzie, G3OSS (London), worked G3LDR (Tyne & Wear), G13TLT (Co. Down) and GM3JDX in Edinburgh. Your reports on these mammoth auroras would be appreciated for next month.

The aurora of April 4 produced LA's in CS, CT, CU and FT for G4CMV, plus SM3DCX (IV63b) and SM5BEI (JU72c) on 2m. CW. Richard Diamond, operating as GM4CVI from Aberdeen, worked 41 stations in 9 countries and 26 squares on CW in the April 11/12 affair between 2320 and 0215, the best DX being OH5LK in NU. This one went on till about 0600.

The event on April 11 was very good and GM3COK (YP04b) also worked the OH5 plus OH3TH and OH1FA. George also mentions a good aurora on the 24th from 2345-0315 GMT but with very few stations participating. All the U.K. beacons plus DL0PR and SK4MPI were *Ar*. He only worked four stations including UR2RIC (LS03g) and OH2CX (MU65c).

Twenty-three Centimetres

Steven Ruff, G18EWM (Co. Antrim), did not hear a single station during the April 1 contest. G8FUF has completed his 23 cm. transverter to the DF8QK design in *VHF Communications* for 4/1977, using the local oscillator output of 1 mW at 1268 MHz from a *Micro-wave Modules* converter. Present set-up is producing one watt output with a 10 watts amplifier to follow. John Tindle, G3JXN (London), found conditions in the contest of May 6/7, "... very average ..." with the Isle of Wight his best DX. P. B. Moss, G8OGD (Nottingham), disagrees with the idea of 2m. SSB repeaters but suggests that just one on 1296 MHz might create more activity.

Seventy Centimetres

GM4COK promises to be QRV soon on 70 cm. with 10 watts to a pair of 48-ele. *Multibeams*. In the May 6/7 contest, G3JXN's transverter blew up! G18EWM is QRV Wednesday evenings on 432.2 MHz looking for contacts. He only worked four stations in the contest on April 2 and blames the Belle Vue show for the lack of activity in the northwest.

Two Metres

Dr. David Hutchinson, G14FUM, moved to Lisburn (Co. Antrim) on

Dec. 29 last and lists 106 different GI's worked on 2m. since then—98 of them on FM! He uses an *Icom* IC-202 SSB transceiver and has a 10-ele. Yagi to put up sometime. A 35 watts amplifier is available. G4FUT mentions a very nice temperature inversion in the early afternoon of April 19 along the northeast coast which brought in GB3LER at S9-plus-40 dB. He writes:—"Unfortunately all the GM's appeared to be playing with the new Aberdeen repeater and no contacts were made." Bob Mackean, G8LYH (Liverpool), mentions the lack of GI's and wonders why they do not point their beams across the water.

Conditions for the CW contest on April 23 were rather dismal. The leading stations appear to be G3POI with 780 points from 66 QSO's, G3IMV 615 (94), G3SPJ/P 521 (69) and G3BDQ 519 (72). Colin Wooff, G3SPJ (London), used a "barefoot" IC-202 from YO78d his aerial straddling the Lancs./N. Yorks. border.

Deadlines

Another exciting month over and several items had to be omitted. The absolute deadline for the July issue is June 8 and for the August edition, July 6. Everything to:—"VHF Bands," *SHORT WAVE MAGAZINE*, 34 High Street, WELWYN, Herts., AL6 9EQ. 73 de G3FPK,

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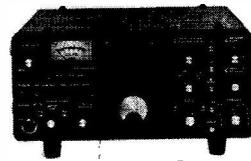
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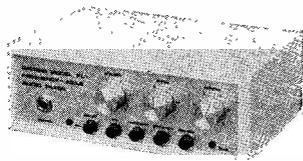
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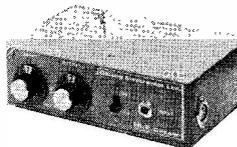
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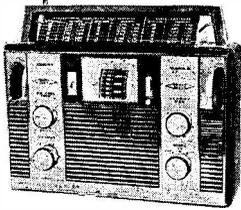
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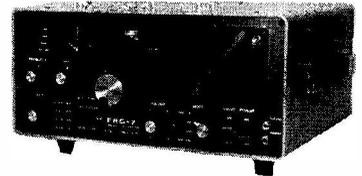


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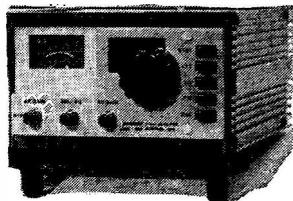
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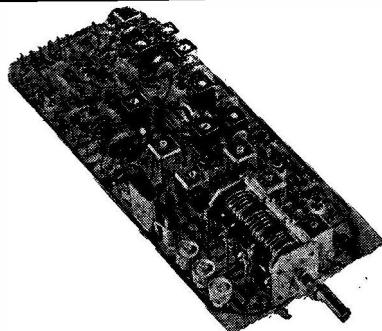
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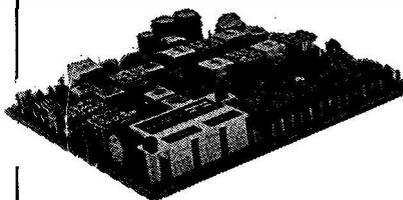
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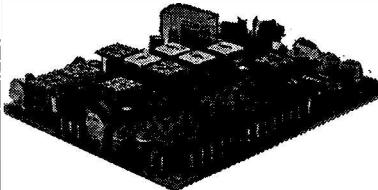
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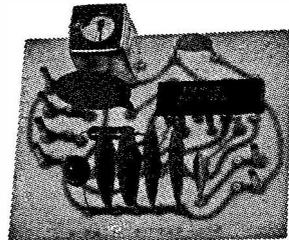
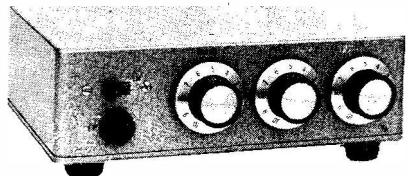
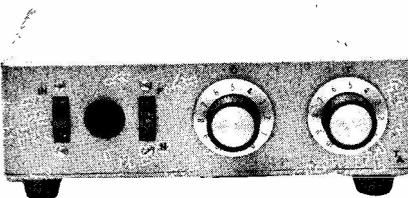
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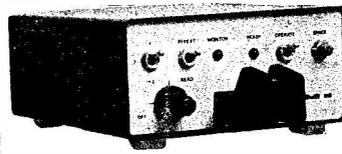
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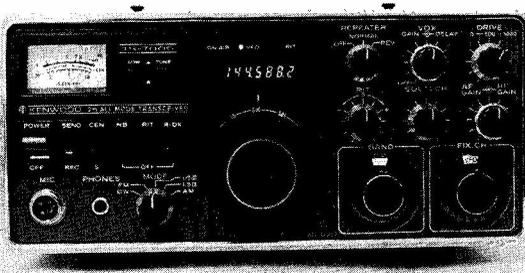
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PC-120	Plug-in Noise Blanker ... £40.50
10X	Crystal Oscillator ... £42.75
DD-6B	Digital Display ... £180.00
VX-5	VOX accessory ... £36.00
DL-200	Dummy Load ... £6.75

TELEX

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(imported and distributed by Radio Shack Ltd.)



MODEL CM-1320

Deluxe dual receiver dynamic headphone with audiometric-type headphone elements. Close talking ceramic boom microphone with 51dB output limits ambient noise pick-up and provides superior intelligibility. Has convenient inline push-to-talk switch. Foam filled circumaural earcushions are removable for cleaning. For use with any mobile or base station requiring high impedance mic input and 3-2 to 20 ohm audio output. Ten foot unterminated cord.

TRIO EQUIPMENT

TS-820	160-10 metre HF TRANSCEIVER 200w.	£645.00
VFO-820	External VFO	£112.00
DG-1	Digital readout unit 6 digit display	£127.00
DS-1A	12v. DC Inverter	£40.00
YG-88C	CW Filter 500 Hz y-pole...	£36.00
SP-520	Matching Speaker 8 ohms	£19.00
TV-502	2m. Transverter all solid state	£178.00
HS-5	Tailored response headphones	£22.00
TS-520S	160-10 metre HF TRANSCEIVER 200w.	£469.00
VFO-520S	External VFO	£94.00
DG-5	Digital display/freq. counter to 40 MHz	£132.00
R-599D	160-10m. RECEIVER CW/SSB/AM/FM	£403.00
T-599S	80-10m. TRANSMITTER CW/SSB/AM/FM	£383.00
S-599	Matching Speaker 8 ohms	£18.00
CC-30A	2m. Converter for R-599D	£20.00
TS-700G	2m. TRANSCIEVER CW/SSB/FM/AM	£426.00
VOX-3	Matching VOX unit (free with TS700G)	£19.00
SP-70	New Matching Speaker	£18.00
TS-700S	De luxe 2m. DIGITAL TRANSCEIVER...	£542.00
VFO-700S	External VFO (split-freq. facilities)	£83.00
TR-7010	2m. 10w. FM mobile TCVR. 40 ch. pil.	£225.00
PS-5	Matching AC psu/digital clock	£58.00
	Spare 2-pole DC power plug	0.25
TR-7200G	10w. FM mobile. 10 channels auto t.b.	£189.00
VFO-30G	Matching VFO with repeater shift	£92.00
TR-7400A	2m. 30w. FM mobile TCVR. 800 ch. pil.	£329.00
TR-7500	2m. 10w. FM mobile TCVR. 40 ch. pil.	£225.00
PS-6	Matching Speaker and AC power unit	£57.00
TR-2200G X	2m. FM TCVR. with battery charger, mic., carrying case, fitted 3 channels	£139.00
TR-2200GX	As above but fitted 12 channels	£169.00
RA-1	Helical rubber antenna for TR2200GX	£6.30
MB-1A	Quick-release mobile mt.	£9.70
	Spare external power lead 2200G/GX	£1.25
	Set of 10 rechargeable batteries	£9.72
VB-2200GX	Mobile 10w. AMPLIFIER (swr protection)	£45.00
	Spare whip antenna	£1.90
TR-8300	70cm. fm Tcvr. mobile fitted 4 ch. T.B.	£227.00
TR-3200	70cm. fm Tcvr., portable, 3 channels with battery charger, mic., carrying case	£182.00
	Spare external power lead	£1.25
VB-3200	Mobile 10w. amplifier with rx preamp.	£95.62
R-300	General coverage Receiver	£184.50
	Spare ac mains lead for R.300	£1.25
HC-2	World Time Clock	£15.50
MC-10	Microphone hand-held p.t.t. 50K	£9.00
MC-50	Microphone desk model 50K/500 ohms	£25.00
LF-30A	HF low pass filter 1kW.	£17.00
BPF-2A	2m. band pass filter 100w. pep	£27.75

Test Equipment

CS-1570	Dual trace 'scope DC — 30 MHz	£464.40
CS-1560A	Dual trace 'scope DC — 15 MHz	£324.00
CS-1562	Dual trace 'scope DC — 10 MHz	£270.00
	(price includes two matching full bandwidth X10 probes)	
PF-810	Station power meter in-line measurement with 3 ranges. 2-way antenna switch	£64.80
CO-1303D	Single trace 'scope DC — 5 MHz	£108.00
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HTC-2	1-6 oz. Twin Receiver headphone ... £14.40
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SWL-610	2000 ohms Dual Receiver Magnetic ... £7.99
C-1210	3-2-20 ohms Dynamic foam padded ... £18.45
C-1320	3-2-20 ohms TELEX'S finest ... £25.65
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CM-1210	As C-1210 with high Z Ceramic microphone ... £38.25
CM-1320	As 1320 with high Z Ceramic microphone ... £47.25
CM-1320S	As CM-1320 with single headphone ... £36.90
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ProCom 11	Electret Variable Gain ... £17.55
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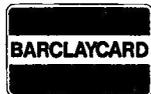


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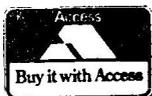
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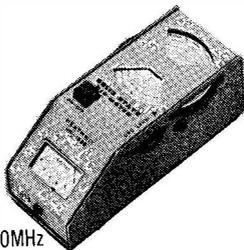
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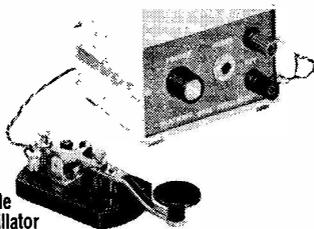
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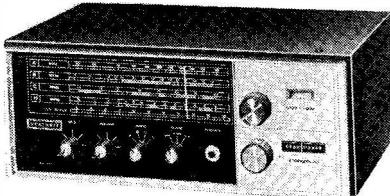
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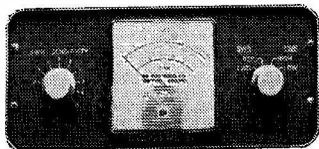


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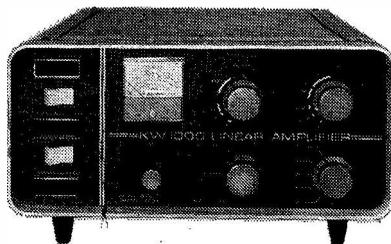
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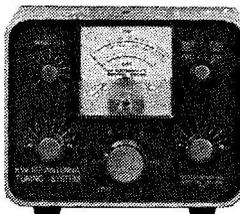
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144-080 ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
144-443-2 ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
144-480 ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
144-800 ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
144-850 ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-000/SO ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-050/R2T ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-075/R3T ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-100/R4 ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-125/R5T ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-150/R6T ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-175/R7T ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-200/R8T ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-300/S12 ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-350/S14 ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-400/S16 ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-600/S20 ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-525/S21 ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-550/S22 ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-575/S23 ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-600/S24 ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-650/R2R ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-675/R3R ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-700/R4R ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-725/R5R ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-750/R6R ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-775/R7R ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-800/R8R ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b
145-950/S38 ...	a	b	b	b	b	b	b	b	b	b	b	b	b	b

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