FOR THE FORTUNATE FEW — THE ULTIMATE RECEIVER

TRIO R 820

ALL BANDS: 160-10m. PLUS SW BROADCAST

ALL MODE: AM, CW, USB, LSB, RTTY


FULL TRANSCEIVE CAPABILITY WITH TS820 OR TS520/520S

PRICE FOR THIS SUPERB RECEIVER — £841 inc. VAT

LOWE SRX-30

New Receiver
500 kHz 30 MHz. AM, SSB, CW
Mains/12v Operation

£175.00
corr. £3

Drift Cancelling System for Spot On Accuracy

Ask about the CL22 Aerial Tuner made specially for the Short Wave Listener only £16.41 inc. VAT & postage

For full details of these and many more Receivers contact us now

LOWE ELECTRONICS
119 Cavendish Rd., Matlock, Derbyshire. Tel. Matlock (0629) 2430 or 2817
Trio once again lead the field with the introduction of the new TR2300 2 metre FM portable. Following the established TR2200 line, the all new TR2300 combines all the virtues of small size, ease of use and rugged go-anywhere construction but introduces for the first time full band coverage in 25 kHz steps from the same advanced synthesiser used in the TR7500. The synthesiser provides 80 FM channels from 144-146 MHz together with 600 kHz repeater shift, and a single auxiliary channel which can be crystal controlled to your favourite net frequency.

Automatic tone burst is provided for repeater operation and all in all, the TR2300 looks like being the new definitive 2 metre FM portable. Although not so obvious from the photo, the TR2300 is actually smaller than the existing TR2200 and is a totally new design with an improved specification. The high sensitivity receiver section uses a combination of effective RF filters providing optimum cross modulation rejection across the entire band. An extra low-profile speaker uses a samarium cobalt magnet to reduce equipment size whilst improving speaker efficiency and clarity of reproduction.

Switchable dial illumination is provided so as to ease dial readout in dimly lit situations. Needless to say, in line with Trio advanced planning, the TR2300 will allow for incorporation of the new IARU region 1 adoption of 121 kHz FM channels as this is gradually introduced.

Once again, Trio sensible design, attention to detail and care in providing equipment designed specifically for the user, rather than hand-me-down Japanese designs, is reflected in the TR2300—why settle for anything less!

Price: £195 including VAT.

The TR7500 is really the commonsense 2 metre FM mobile. In a small 6" x 2½" x 9" package, Trio have packed a 15 Watt transmitter, a sensitive and selective receiver and an advanced synthesiser which gives you operation across the whole 2 metre band 144-146 MHz in the recommended 25 kHz channel spacing.

Ease of operation is the hallmark of the TR7500 with its brilliant channel number display. Need to operate on S20? Turn the main knob until the display reads 20; move to S24, simply turn to 24. Repeater operation is equally easy, requiring only the touch of a switch to have repeater or reverse repeater functions. Dial readout? You guessed it, it's simply 7 for R7, 4 for R4, and so on.

Designed especially for the U.K. market, the TR7500 is a good example of the Trio advanced engineering approach as an inspection will show. Why not see it at your nearest authorised Trio stockist and make up your own mind about commonsense plus quality.

P.S. A scanner is available for the TR7500 from M.R.S. Communications—see our address box.

TR7500 — £235, including VAT. Matching PS-6 — £63-80, including VAT

ANNOUNCEMENT

Some firms in the U.K. are not officially authorised Trio dealers and Trio equipment purchased from these companies is not backed by the Trio service and spares organisation in the U.K.

FOR FULL CATALOGUE AND ANTENNA BOOK, SEND 45p IN STAMPS TO MATLOCK
LOWE ELECTRONICS LTD

TS120
MULTUM IN PARVO

We introduce yet another exciting innovation from Trio in the new TS120V HF transceiver. Equally at home in mobile or home station situations, the TS120V packs more features into a small package than any other comparable model. Measuring only 9½" x 3½" x 9½"—which is about the size of a packet of cornflakes, the TS120V can best be described as a miniature TS820. The rig covers all bands 80-10 metres—and all of 10 metres 28-30 MHz so it’s ideal for transverter driving, has digital readout built in, vox, break-in CW, RIT, noise blanker and the unique Trio passband tuning system used in the TS820. The power output is 10W, and a matching linear will be along shortly.

The TS120V is clearly a winner for mobile operation but is equally attractive at home and is perfect for the VHF/UHF enthusiast who requires a high performance I.F. system for his transverters. The transceiver is based on an advanced PLL system and the digital readout gives you the correct operating frequency at all times unlike many other rigs. Remember my previous comments about Trio attention to detail.

For ease of operation, the TS120V is unsurpassed; simply select the band required, tune the VFO to the frequency you want and there you are: no preselector or PA tuning to worry about, and a distinct safety feature for the mobile operator.

We at Matlock, have all fallen in love with the TS120V and we feel sure that you will too. At its price of £435 including VAT (and including digital readout, vox, etc.) we have no doubt that this transceiver will be another winner from Trio. See it soon.

TR7500
THE SENSIBLE 2 METRE RIG

The TR7500 is really the commonsense 2 metre FM mobile. In a small 6" x 2" x 9½" package, Trio have packed a 15 Watt transmitter, a sensitive and selective receiver and an advanced synthesiser which gives you operation across the whole 2 metre band 144-148 MHz in the recommended 25 kHz channel spacing.

Ease of operation is the hallmark of the TR7500 with its brilliant channel number display. Need to operate on S201 Turn the main knob until the display reads 20; move to S24, simply turn to 24. Repeater operation is equally easy, requiring only the touch of a switch to have repeater or reverse repeater functions. Dial readout? You guessed, it’s simply 7 for R7, 4 for R4, and so on.

Designed especially for the U.K. market, the TR7500 is a good example of the Trio advanced engineering approach as an inspection will show. Why not see it at your nearest authorised Trio stockist and make up your own mind about commonsense plus quality.

P.S. A scanner is available for the TR7500 from M.R.S. Communications — see our address box.

TR7500 — £235, including VAT. Matching PS-6 — £63-00, including VAT

SURELY THE MOST AMAZING HAND HELD TRANSCEIVER YET!

The AR240 is a truly staggering rig. In a small hand held unit, you have a fully synthesised 2 metre FM transceiver covering 144-148 MHz in 5 kHz steps. Frequency selection is by direct reading top mounted decade switches giving instant access to any frequency in the tuning range. Power output is over 1W and the receiver sensitivity is not only excellent, it’s maintained across the full tuning range by automatic voltage controlled tracking. Both up and down 600 kHz repeater shifts are built in as is a 1750 Hz tone burst.

What more could you ask for in a hand held?

AR240 price including Nicad Pack and Charger — £215 inc. VAT

FOR COMPLETE CATALOGUES SIMPLY SEND 40p IN STAMPS TO MATLOCK.
Trio once again lead the field with the introduction of the new TR2300 2 metre FM portable. Following the established TR2200 line, the all new 2300 combines all the virtues of small size, ease of use and rugged go-anywhere construction but introduces for the first time full band coverage in 25 kHz steps from the same advanced synthesiser used in the TR7500. The synthesiser provides 80 FM channels from 144-146 MHz together with 600 kHz repeater shift, and a single auxiliary channel which can be crystal controlled to your favourite net frequency.

Automatic tone bursts is provided for repeater operation and all in all, the TR2300 looks like being the new definitive 2 metre FM portable. Although not so obvious from the photo, the TR2300 is actually smaller than the existing TR2220 and is a totally new design with an improved specification. The high sensitivity receiver section uses a combination of effective RF filters providing optimum cross modulation rejection across the entire band. An extra low-profile speaker uses a samarium cobalt magnet to reduce equipment size whilst improving speaker efficiency and clarity of reproduction.

Switchable dial illumination is provided so as to ease dial readout in dimly lit situations. Needless to say, in line with Trio advance planning, the TR2300 will allow for incorporation of the new IARU region 1 adoption of 12 kHz FM channels as this is gradually introduced. Once again, Trio sensible design, attention to detail and care in providing equipment designed specifically for the user, rather than hand-me-down Japanese designs, is reflected in the TR2300—why settle for anything less!

Price: £195 including VAT.

The SB-2M portable SSB/CW transceiver makes a welcome change from the procession of FM boxes and offers the user real DX performance in a small, easily carried package. Power output is around 1 W. pep (2.5W. input) and sideband generation is by 76514 double balanced modulator and high quality 9 MHz crystal filter thus ensuring very good carrier and unwanted sideband suppression. A further 76514 is used in the heterodyne mixer to guarantee not only a clean transmission but also a receiver free from unwanted spurious responses. Frequency control is by a wide range VXO giving 50 kHz coverage from one crystal. As supplied, the SB-2M is fitted with four crystals giving a total tuning range of 200 kHz which is adequate for most operators' needs. Alternative crystals can be fitted by the user at any time without the necessity for realignment.

The receiver performance is really outstanding and we can normally hear the Wrotham beacon in Matlock using only the telescopic whip on the rig. As a mode comparison, we can seldom if ever, hear the London repeater GB3LO even using a 10XY at 40 feet and the most sensitive FM rig available.

Real DX is yours with the SB-2M and SSB. Current consumption is low enough to make operation from dry batteries perfectly feasible. However, a Niced battery pack and charger are also available at modest cost. The SB-2M comes complete with manual, microphone, carrying strap, etc., and is fitted with crystals to cover 144-144 MHz. Other crystals will be available shortly. Why not try sideband; you'll really enjoy it after a dose of FM repeater operation. After all, where does everyone on 2 metres vanish to when there's a lift?

They're working the real DX around 144.3 MHz and you can join in with the SB-2M.

Price: £165 inc. VAT.
Communications Ltd

PROFESSIONAL EXPERIENCE

SMC MAKE THE BEST EVEN BETTER!

CPU2500R
★ CPU CONTROLLED SYNTHESIZER
★ KEYBOARD OR SCANNER MICROPHONES
★ 25 OR 10 WATT TX OPTIONS
★ ± 600 kHz PLUS ANY SPLIT (TO 4 MHz)
★ SCANS BAND OR MEMORY CHANNELS
CPU2500 £283 to £308 (+12½%)

CPU2500

SMC CPU STEPPER
★ NEAT INTERNAL FITTING
★ CPU2500 FEATURES RETAINED
★ 25 kHz CHANNEL SPACING
★ 145-146 MHz OPERATION
★ KEYBOARD "ENTRY" OF "5 kHz"
STEPPER INSTALLED + £27 (+12½%)

FT227RA
★ OPTICAL COUPLED KNOB TUNING
★ PUSH BUTTON MIC STEP OR SCAN
★ ±600 kHz and 4 MEMORIES
★ SUPER SENSITIVE RECEIVER
★ SMALL 2½"H., 7"W., 8½"D.
FT227RA £229 (+12½%)

FT227RA

SMC RA STEPPER
★ NEAT INTERNAL FITTING
★ 227R FEATURES RETAINED
★ 25 kHz CHANNEL SPACING
★ CHANNEL STEP OR BAND SCAN
★ 144 to 146 OPERATION
STEPPER INSTALLED + £27 (+12½%)

FT227R

SMC RX SCANNER
★ NEAT INTERNAL FITTING
★ 227R FEATURES RETAINED
★ 40,25 kHz CHANNELS, 145 UP
★ 7 SEC. PAUSE ON SQUELCH OPEN
★ FULL LOCK/LOCKOUT FACILITIES
SCANNER INSTALLED £45 (+12½%)

FRG7
★ GENERAL COVERAGE 0.5-29.9 MHz
★ STABLE AND SELECTIVE
★ AM, CW, SSB MODES
★ 3 POSITION RF ATTENUATOR
★ INT/EXT 12v, DC EXT 240v. AC
FRG £187 (+12½%)

SMC DIGITAL READOUT
★ NEAT INTERNAL FITTING
★ FOUR LARGE LED'S
★ DIGITAL ACCURACY TO 100 Hz
★ USES INTERNAL 1 MHz CLOCK
★ REPLACES kHz DRUM READOUT £50 (8%)

SMC (Jack Tweedy) LTD
Roger Baines, G3YBO
79 Chatsworth Road,
Chesterfield, Derby.
Tel.: Chesterfield (0246) 34982
9-5 Tuesday-Saturday

NORTHERN (Leeds) BRANCH
Colin Thomas, G1PSM
257 Otley Road
Leeds 16, Yorkshire
Tel: Leeds (0532) 782326
9-5 Monday-Wednesday & Friday-Saturday

SMC (Jack Tweedy) LTD
NORTH EAST (Gateshead) BRANCH
Jack Tweedy, G1ZY
Ham Shack, Roughton Lane,
Woodhall Spa, Lincs.
Tel.: Woodhall Spa (0526) 52793
9-5 Tuesday-Saturday (appoint.)
SMC ANTENNAS
FOR THE LONGEST RANGE
FROM THE BIGGEST RANGE

SMC ANTENNAS

SMC TRAPPED DIPOLES
(Post 45p) VAT 12.5%
S500 W P.I.P. 14 SWG... £23.00 P500W P.I.P. Cu/Terylene braid c/w 75 feeder... £7.00
HPIK P.I.P. 14 SWG... £25.00

VHF ANTENNAS FIXED OR MOBILE

ASCOT (Carr. typ. 0-95p) VAT 12.5%
340 UL 7 MHz 34 Standard & base tapered whip... £6.50
310L UL 7 MHz 34 Swivel & base tapered whip... £6.25
340H UL 14 MHz 34 Standard & base short whip... £6.75
344H UL 14 MHz 34 Standard & base short whip... £6.75
430 UL 14 MHz 34 Swivel & base tapered whip... £6.75
450 UL 14 MHz 34 Base & c/w spring tapered whip... £6.75
530 UL 14 MHz 34 Long coil base tapered whip... £13.85
581 UL 14 MHz 34 Long coil base tapered whip... £13.85
430U UL 432 MHz 34 Standard & base parallel whip... £6.30
Standard cable assembly for 34 or 34 unwanted deduced... £6.40
Standard cable assembly for 34 unwanted deduced... £6.40
091 Plug Mount for 34... £4.00 092 Plug Mount for 34... £4.50
013 Blank-off, 4 or 4... £0.95 088 Wingcowl mount 34... £6.65

H-SMC (Carriage £1.60) VAT 12.5%
GD1 XFDone... £37.50 260 145 MHz gutter... £17.15
LTG6 Log Periodic... £75.95 260 70/70 MHz gutter... £17.15 25 Trunk mount... £2.95

ANTENNA ROTORS

CDE & STOLLE

AR20 Light VHF/HF... £34.50
AR22 VHF Light... £43.00
AR40 VHF Light... £67.50
AR33 Deluxe control!... £59.00
B11 Medium duty... £79.50
CD4 Medium duty... £95.00
HAM III, V. heavy duty... £139.00
2000 Automatic... £43.50
2010 Magneto... £48.00

BEARINGS

CDPE 2" and 13/16"... £6.00
RL20 Stolle (ballrace)... £10.00
MOUNTING KIT
AK131 CDE or Versatower... £3.60
CABLE per yard
5 core AR32/40/32/10/0... £0.24 8 core CD44/Ham Ill... £0.26
STOLLE & RL20... £1.30

Masts and Towers
try the people who know—and care

SMC can supply the largest range of radio masts and towers from one source in the U.K. for both home or export.
Guyed fixed masts, Guyed telescopic masts, Self supporting towers, S/s telescopic towers, Rotator provisions.

TELESTATIONS
10' telescope heavily galvanized steel mast supplied with ring etc., c/w full rigging kit.
Carriage £2-125 ex stock VAT £1.05 30' £7.50 or £4.25 c/w rigging 40' £9.75 or £6.25 c/w rigging 50' £13.80 or £11.60 c/w rigging

CABLES RF FEEDERS (Carr. extra) VAT 8% per yard
UR67 50 ohm Heavy... £1.60 30' £4.40 12p
UR75 75 ohm Heavy... £1.60 40' £4.40 15p
75 ohm Flat Twin... £1.60 40' £4.40 15p

H-Antennas
Galvanised lattice 10 sections. fits 30' telescopic drilling with clamp caps. carriage £3-05 ex stock VAT 8% 30' £27.50 or £19.45 c/w rigging 40' £35.75 or £26.25 c/w rigging 50' £47.00 or £34.95 c/w rigging
Cap fittings... £19.00

TELETOWERS
Telescope but not tilt over. Light unit weight, unobtrusive. Carriage and rigging (RK) extra
57 mast £174.00 (RK £28) 79 mast £224.50 (RK £49) 101 mast £303.50 (RK £76)

WIRE & BRAIDS 7/0.29 Soft drawn (P & F extra) VAT 8% per yard
14 SWG Hard copper... £6.11 14 SWG Hard copper... £6.11 15 SWG Hard copper... £10.55
0.12 100' Soft round... £10.40 100' Soft round... £20.40 200' Hard round... £52.70 200' Hard round... £105.40
6050-0

Cables: Aerial Southampton
Telex: 477331 SMCOMM 0
Tel: Totton (04261) 7333 (3 lines)

SOUTH MIDLANDS COMMUNICATIONS LIMITED
SH HOUSE, OSBORNE ROAD
TOTTEN, SOUTHAMPTON
HAMPSHIRE SO4 4DN

BARCLAYCARD

Jan./Feb., 1979
EXTRA PERFORMANCE!!
THAT'S WHAT DATONG PRODUCTS ADD TO YOUR STATION

"LEAVE IT SWITCHED IN, I CAN'T COPY YOU WITHOUT IT"
This is a statement well known to users of our R.F. speech processors. Using the advanced technique of R.F. clipping these units greatly increase your talk power and help your voice punch through the QRM. They work on any rig, with any speech mode, at any power level, and on any band. Simply connect in series with your microphone to get a really punchy speech signal. The use of the R.F. clipping technique raises your average power level and also enhances the intelligibility of your speech signal. MODEL ASP, our latest model offers for the first time the ultimate convenience of instant push-button selection of the desired amount of clipping. No manual knob setting or meter watching is required. Advanced circuitry does the work quicker and more accurately. Other features include: a "TONE" button (for setting the transmitter microphone gain), switchable microphone impedance, full monitoring by three light emitting diodes. The world famous MODEL RFC is still available and so is MODEL RFC/M which is a fully tested printed circuit board module as used in MODEL RFC.

PRICES: ASP £65.00 plus VAT (£73.6 total); RFC £40-00 plus VAT (£45.00 total); RFC/M £21.50 plus VAT (£24.19 total).

"GOOD GENERAL COVERAGE RECEIVERS COST A FORTUNE!"
True . . . but if you already own a good quality ten-metre or two-metre receiver or transceiver you are only £118 away from a really high performance general coverage receiver. Just add the magic ingredient, MODEL UC/1 from DATONG!
For £118-13 including VAT you get full coverage in thirty synthesised 1 MHz segments from 60 kHz (Rugby MSF) to 30 MHz, at high sensitivity and with all the facilities and high performance of your existing rig!
For good measure UC/1 also adds two-metre coverage to ten-metre receivers. If you want high performance general coverage reception, MODEL UC/1 combined with your existing amateur-bands-only rig is the answer. The fact that it costs less than even a cheap general coverage receiver is just one of life's pleasant surprises!
PRICE: £105.00 plus VAT (£118-13 total).

VIVE LE DIFFERENCE!
MODEL FLI is a most unusual audio filter. It is a highly versatile add-on unit for communications receivers which excites great flexibility in helping to extract the signals you want (SSB, CW, RTTY etc.) from background interference. It simply connects in series with the loudspeaker or headphones. Fully variable bandwidth and centre frequency plus "flat-topped" pass-band response give similar effects to "I.F. pass-band tuning" for SSB or RTTY reception, and bandwidth down to 20 Hz (with limited a.f.c.) gives an amazing capability for pulling weak CW stations out of the QRM.
MODEL FLI is also completely unique in being able to tune itself when notching out unwanted whistles. That's why we call it the "Frequency-Agile Audio Filter." If a whistle appears on your channel, MODEL FLI will normally remove it from audibility within a couple of seconds . . . completely automatically! This ability makes conventional notch filters look positively stone-age and allows the notch width to be so narrow (5 Hz) that you lose virtually nothing of the signal you want.
PRICE: £53-00 plus VAT (£59-63 total).

A GOOD RECEIVER DESERVES A GOOD AERIAL
For sensitive reception right through from MSF at 60 kHz to Band I TV DX around 50 MHz, without the need for an antenna farm, MODEL AD170 is ideal. Designed for loft mounting, MODEL AD170 has no adjustments and needs no external tuning units. The actual antenna comprises a wire dipole (overall length only 3 metres) together with a rather special FET/bipolar amplifier unit. The broadband signal from the remotely located antenna is piped via TV-type coax to the interface unit (which now contains a switchable 12 db amplifier) located near the receiver. Although only 3 metres long, MODEL AD170 has the same directional properties as a full-size dipole, even at 60 kHz. Despite its small size, signal-to-noise ratios produced by MODEL AD170 at any given frequency are similar to those from a conventional dipole cut to resonance for that frequency, and the unit makes an ideal accessory for a good general coverage receiver where space for antennas is limited.

PRICE: £29-50 plus VAT (£33-19 total); Special price complete with mains power unit: £33-00 plus VAT (£37-13 total).

NEW PRODUCT PREVIEW

The Datong Morse Tutor
Available Shortly

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

INSTANT MORSE PRACTICE
Imagine the convenience of having your own source of accurate Morse for instant receiving practice anywhere at any time!
The Datong MORSE TUTOR produces digitally a random stream of five character groups at variable speed and with variable extra spacing between letters. You can select letters or numbers or a mixture and unlike records or tapes, the sequence never repeats.
A Morse practice oscillator is also built in. Just plug in a standard key to practice sending.
The IC-240 is so popular that ICOM are making more and more

This photo shows the IC-240 with the optional "Superscan" fitted on the top. The Superscan provides the option of the ability to tune manually over the range 144-146 MHz on transmit and up to about 148 MHz on receive in 25 kHz steps. It has full 6 digit frequency readout and can be set to scan frequencies in the range 145-146 MHz and stop on an occupied channel. Any number of channels up to 39 can be locked out by pressing the lockout button and these frequencies will be passed over on future scans. The Superscan gives an added dimension to your IC-240 when used for base station use where extra channels and digital readout are worth having.

IC-240 alone... ... £168 less VAT ; £189 with VAT
Superscan alone ... £69 less VAT ; £77-62 with VAT
IC-240 with Superscan fitted £230.22 less VAT ; £259 with VAT
Fitting charge for Superscan if not bought with 240 £6
(instructions for doing it yourself are provided).

The IC-240, one of the first of the new generation of synthesised transceivers to appear on the market, is still one of the most popular. It offers all you really want for mobile use on 2m. plus a feature not found in all sets with digital display, keypads on the microphone or other gimmicks—IT IS EASY TO USE ON THE MOVE WITHOUT LOOKING!—and that MUST contribute to safety on the road.

You get a choice of 22 channels with all the UK and European repeater channels plus all the commonly used simplex channels already wired on the programmable matrix board. The dial is marked in channel numbers with 7 spare positions marked A to G for you to programme with any other channels you chose on the now standard 25 kHz channel spacing. Should 12 kHz spacing arrive (and for your sake we hope it won't) it will be very easy to modify the IC-240 to cover the in-between half channels, making 44 in all. To change channel you just turn the dial to the channel you want, with easy to feel click stops, and that's all. No 5 kHz button to get all confused about ! Repeat shift for normal or true reverse repeat and high or low power are selected by easy to feel toggle switches and the access tone is automatically introduced on duplex.

After testing all the mobile transceivers around on the UK market we still find that the 240 is as good as any, and better than some, when it comes to receiver and transmitter performance. The high sensitivity of the receiver coupled with excellent strong signal handling capabilities and high selectivity is hard to beat as is the excellent speech quality and very clean signal of the transmitter. At least one, and by the time this is published, probably two repeaters use a single IC-240 with both the transmitter and receiver operating at the same time. IC-240s have a long good service record for reliability and when they do go wrong we at least understand how to mend them.

If you want to add extra facilities for base station use it is easy to obtain all 80 channels by using only 8 toggle switches and diodes—or you can build your own scanner if you are digitally minded. If not you can BUY the Superscan for £77 which will give you receiver coverage to about 148 MHz (transmit in 2m. band only), six digit LED readout and scanning facilities with up to 40 channel lock-out. Again this is designed for 25 kHz spacing but will cope with 129 kHz with minor modification to your 240.

SOME OF THE ICOM RANGE HAS BEEN REDUCED DUE TO A FAVOURABLE EXCHANGE RATE WITH THE YEN. SO TAKE ADVANTAGE OF THE LOWER PRICES NOW.

So — Why go for anything more expensive ?

AGENTS (phone first—All evenings and weekends only, except Norfolk and Burnley)
Scotland—Jack GMBGEC (031-665 2420) Norfolk—Ted G3FEW (05088 632)
Wales—Tony GW3FKO (0222 702982) Burnley (0282 38481)
North West—Gordon G3LEQ (Knutsford (0565) 4040) Yorkshire—Peter G3TPX (022678 2517)

H.P. TERMS AVAILABLE
FOR ALL MAIL ORDERS AND SALES DURING BUSINESS HOURS
YOUR SOLE AUTHORISED UK IMPORTER FOR ICOM

THANET ELECTRONICS
143 Reculver Road, Beltinge, Herne Bay, Kent
Telephone : 02273 63859 (2 lines)
Direct Ansafone line (evenings) 64283
THANET FOR SERVICE

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

IC-211E

£559

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 it 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-245E

£399

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 10kHz 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.

ICOM.....Simply the Best

Although we specialise in ICOM—Note that the following are available from Herne Bay—with the same Back-up Service:

YAESU

LESON

MICROWAVE MODULES

T & T

DURING THE EVENINGS AND AT WEEKENDS WHEN CALLS ARE CHEAP, WHY NOT USE OUR ANSAFONE TO RECORD YOUR REQUESTS FOR DATA, ETC. (02273) 63550

J-BEAM

ICOM'S unique band-pass tune. • VOX, Semi-break-in CW, RTTY, AGC, Noise Blanker. • Build-in RF speech processor. • Extremely compact. • All filters built in. • 12v. or mains operation. • Electric desk mic.

J-BEAM

After having used this rig for many months on the air we think that it is definitely the nicest HF rig we have ever used. £999.

The HF rig to beat them all, which is available now! • All solid state including the finals. • 100W RF output Continuous Duty on All Bands. • All Modes. • All bands 1.8-30 MHz. • USB, LSB. CW (narrow), RTTY. • Double balanced Schottky Diode mixer used in both Tx and Rx. • Fully synthesized with Digital readout to 100Hz and two stores to enable split frequency operation. • ICOM's unique band-pass tune. • VOX, Semi-break-in CW, RTTY, AGC, Noise Blanker. • Build-in RF speech processor. • Extremely compact. • All filters built in. • 12v. or mains operation. • Electric desk mic.

DURING THE EVENINGS AND AT WEEKENDS WHEN CALLS ARE CHEAP, WHY NOT USE OUR ANSAFONE TO RECORD YOUR REQUESTS FOR DATA, ETC. (02273) 63550
AMATEUR ELECTRONICS UK

AEUK — Your number one

AS FACTORY APPOINTED DISTRIBUTORS WE OFFER YOU—WIDEST CHOICE, LARGEST STOCKS, PROMPTEST DEAL AND FAST, SURE SERVICE RIGHT THROUGH.

Above we show the now firmly established FT-227R 2m. Mobile now also available in its scanning versions. On the right is the superb FT-225RD, the 2m. base station that has everything, designed for the man who insists on the best. At left is the FT-202R Hand-held—so compact but so effective.

The widest choice from 2-10
The Yaesu range is now so great that it simply caters for every taste—this makes it a must to browse through Yaesu’s main catalogue—please see our offer on facing page.

The FT-90IDM is the base station par excellence and its receiver performance alone is simply out of this world. Together with the range of matching ancillary units—which are growing all the time—this builds a station which fulfils every conceivable requirement for the operator who demands the ultimate.

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

FROM SOUTH AND EAST. We are located approximately two miles from Junction 5 of the M6 from which follow signposts to Birmingham. Within ½ mile turn right at Clock Garage and proceed towards city. After one mile look for traffic lights at Fox & Goose and immediately over the lights take minor left fork into Alum Rock Road. We are located one mile from this point.

FROM NORTH. Leave M6 at Junction 6 (Spaghetti) and follow left fork down to traffic island beneath motorway complex. Take third turning off to Lichfield. One mile further on follow A 4040 to the right and within 100yds. veer again to the right, approximately one mile further brings you to the Fox & Goose. Turn right and see preceding directions.

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

Hours: 9.30-5.30 Continuous including Saturdays—Early closing Wednesday, 1 p.m.

Access or attractive H.P. terms readily available for on-the-spot transactions. Full demonstration facilities. Free Securicor delivery.
source for YAESU MUSEN!

Typically, Yaesu have not overlooked that very important group of operators—the dedicated SWL's by providing the superb value-for-money FRG-7 and the ultra sophisticated FRG-7000 general coverage receivers.

Here's a 10-1 winning offer if you'd like the full Yaesu catalogue. Just send us 4 x 9p stamps (36p) and we'll send you Yaesu's fully illustrated brochure together with our Credit Voucher for £3.60 against your eventual purchase. A couple of stamps will bring you the latest Atlas or Swan leaflets or our current used equipment list.

NEW! ADVANCED TECHNOLOGY from SWAN ELECTRONICS

100MX—The de-luxe Mobile Rig with all the extras
Solid state HF transceiver. 100 watt PEP and CW output, 80m.-10m. Broadband design featuring noise blanker, VOX, 25 kHz calibrator, CW sidetone, semi-break in CW, RIT, built-in speaker. Ultra stable PTO frequency source. Operates directly on 11 to 15v. DC, USB, LSB, CW operation. 9 MHz 8 pole crystal IF filter.

ATLAS RADIO INC.

BRANCH: AMATEUR ELECTRONICS, UK—COASTAL CLIFTONVILLE, KENT, KEN McINNES, G3FTE, THANET (0843) 291297, 9 a.m.—10.30 p.m.
BRANCH: AMATEUR ELECTRONICS UK—SCOTLAND, 287 MAIN STREET, WISHAW, LANARKSHIRE, GORDON McCallum, GM3UCI, TELEPHONE WISHAW 71382. (EVENINGS CARLUKE 70914)
AGENT: WALES & WEST—ROSS CLARE, GW3NW5, CAERLEON, NEWPORT, (CAERLEON 422232)—ONLY 20 MINUTES OVER THE SEVERN BRIDGE.

508-514 ALUM ROCK ROAD 021-327 1497
BIRMINGHAM 8 Telex 337045 6313
Midland and North West distributors for the XCR80 - unique crystal controlled receiver. This receiver is designed to provide precision frequency tuning over the full short wave spectrum up to 30 MHz with exceptional frequency stability for both AM and SSB. Separate tune wheels.

£150.00 inc. VAT

XCR-30 FM Receiver with FM band 87-5 to 101 MHz. £170.00 inc. VAT

TRIO

R820 Receiver £84.01
TS820 Transceiver £758.00
Digital readout for TS820 £86.00
VFO820 £131.00
DS1A 12v. DC Inverter £66.00
SP820 Speaker £41.00
SP220 Monitorscope £35.00
TL222 Linear Amplifier £920.00
TS5205 Transceiver £575.00
VFO50 £111.00
SP520 Speaker £19.00
DG5 Digital readout for TS5205 £134.00
TS20V ID-6 Mobile Transceiver £356.00
PS-20 AC power supply for TS20V £198.00
MB100 Mobile mounting bracket £35.00
TS7002. 900 all mode digital transceiver £357.00
SP70 Speaker £19.00
TFX900 £85.00
SSB/CW Mobile 10 watts £189.00
TR740A 30. 30 watt Mobile Transceiver £365.00
TR7500 2m. FM Transceiver £335.00
PS2 Power supply £63.00
TR2300 2m. Portable Transceiver £215.00
PB15 Battery Pack £21.00
PS220 Power supply £63.00
TR8300 70cm. FM Mobile Transceiver £247.00
TR7500 70cm. Portable Transceiver £247.00
R300 General coverage Receiver £185.00
H55 Speakers £22.00
H77 Headphones £12.00
MC50 Desk Microphones £30.00
MC30S Hand microphone 50X £14.00

Drakes

Antenna Specialists

ASPR312 £4.75
ASPR31 4.75
ASPR310 £5.44
ASPR311 £5.44
ASPR312 £5.44
ASPR313 £5.44
ASPR314 £5.44
K560 Magnetic £7.47
K500 Magnetic £7.47

SRR-1 Solid State Receiver £175.00
TV3100 Low Pass Filter £16.00

My Gain

12AVQ 3 Band Vertical £59.94
14AVV/WB 4 Band Vertical £56.19
18AVQ/WB 8 Band Vertical £149.05
BN66 Balun £14.06

Microwave Modules

MHC670 4m. Converter £34.25
MHC6824/28 LO 2m. Converter £24.24
MHC6328 70cm. Converter £27.00
MHC1256/28 23cm. Converter £31.05
MHC1256/144 23cm. Converter £31.25
MTMD26 23cm. Tripler £33.75
MDMD50 50 MHz Counter £66.96
MDMD50P 50 MHz Counter £80.32
MT4128/270m. Transceiver £133.88
MT5127/270m. Transceiver £80.32
MT4144/270m. Transceiver £80.32

Stephens James Ltd.
47 Warrington Road, Telephone Leigh, Lancs WN7 3EA

(0942) 676790

G3MCN

YAESU FRG-7 Receiver. Mains and battery operated receiver 0.5 to 30 MHz. Solid state. Advance circuitry offers excellent performance for the keen listener at a moderate price. Price £210.00

Yaesu FRG7000 Receiver £156.00
Yaesu SP1018 Speaker £19.68
Yaesu Desk Microphone £22.00

ACCESSORIES

2 way Antenna switch 50 ohm 200W, PEP £45.00
3 way Antenna switch SWL type £45.00
3 way Antenna switch 2W PEP 500 MHz £12.00
3 way Antenna switch 150 Watts 0-30 MHz £25.00
4 way Antenna switch 50 ohm 200 watts £10.00
6 way Antenna switch 1 KW PEP 0-30 MHz £16.55
Single Meter SWR 50 ohms. Watt type £10.00
Single Meter SWR desk type £10.00
Twin Meter SWR desk type 3-150 MHz £12.50
Twin Meter Model 500 3-500 MHz or 75 ohm £45.00
 Dummy Load Wattmeter DL150 3-500 £35.00
Standard Type Morse Keys £3.00
Hy Mound Morse Keys with heavy base £10.25
Hy Mound Morse Keys £10.00
Keying paddle. Chrome plated heavy base £25.50
EK150 Katsumat 240V. AC or 12v. DC £70.25
MK1042 Keyer with 1024 bit memory £140.00
MK1042 200W. £39.94
FS301 Single Wattmeter (inc. VAT) £3.00
PBB-9 Balun 50 ohm 1-1.5-40 MHz £12.00
DL 30 50 watt Dummy Load 50 ohm £15.97
DL 120 120 Watt Dummy Load 50 ohm £17.00
Daivai MA-14 2m. 2 way antenna switch £21.00
Curtis Clamps for most types £3.50
Plastic Antenna Insulators £2.50
PL250 50p, SO239 Sockets 45p, PL239 75p.

Cable Price List £16.00

All our Accessories prices include VAT and postage.

receivers and transceivers (inc. VAT and postage)

SR9 Tunable 144-146 MHz FM Receiver £59.00
AMR2178 Scanner Receiver. AC or DC operation £113.50
SB-44 144 MHz SSB Portable Transceiver £157.00

Secondhand Equipment

Due to delay in publishing secondhand lists please send SAE for our up to date lists. We have a very quick turn over in secondhand equipment, especially in receivers. If you require a specific model please let us know and we will inform you as soon as we have one available. Our secondhand equipment carries a three month guarantee. We would be pleased to sell your equipment on a commission basis, which saves you time and money advertising.

Access and Barclayscard facilities. Instant HP service.

Part exchanges always welcome. Spot cash paid for good clean equipment. If you have equipment surplus to your requirement we would be pleased to sell this on commission for you.

Shop hours: 9.30 to 5.30 Monday to Friday 9.30 to 1.00 Saturday.

No parking problems. Turn at the Greyhound Motel on the A590 (East Lancs) Road. S.A.E. with all enquiries. We will bring you latest information and prices, credited to your first purchase over £5. Postage carriage extra.

All our Prices include VAT. Prices on all importation subject to price increase.
S.T.E. Prices include VAT and postage

Arac 170 10m. and 70 cm. Receiver ... £127.00
AAI Audio Module for AR10 ... £44.50
AD4 FM Discriminator ... £3-00

The finest value for money on the market. No price increase on these items for three years!

ARAC 102 receiver, 28-30 MHz, 144-146 MHz, AM-SSB-FM-CW Price £100.00

ARAC 103 receiver, 28-30 MHz, 144-146 MHz, AM-SSB-FM-CW Price £127.00

£39.50

AA! Audio Module for ARIO Price £4.10
AD4 FM Discriminator Price £20.50
ATAL 2m, AM-FM Tx Price £127.00

£45-00

The finest value for money on the market. No price increase on these items for three years!

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

Price £127.00

£45.00

AT23. 12 Channel PM Transmitter. 3 watts, 144-146 MHz. Frequency deviation 3-10 kHz adjustable. 12v. DC operated AF input sensitivity 2mV adjustable to 50 mV. Price £50.00

455 kHz FM Discriminator Amplifier. Limiting threshold 100uV. Amplitude modulation rejection 40dB. Audio output voltage at 1 kHz 200-300mV frequency deviation + or - 3 kHz. Price £5.00

£25.00

Solid State Stabilised Power Supplies
Model 122 0-15v. 2.5Amp ... £13.53
Model 122S 15v 0.5Amp ... £16.00
Model 125 12v 5Amp ... £24.00
Model 1335 Dual meter 0-20v 4Amp ... £26.50
Model 1355 Dual meter 0-20v 4Amp ... £28.75
Model 1210S Twin meter 0-20v 10Amp ... £75.00

Further range of models up to 20 amp available shortly.

STEPSHENS-JAMES LTD.
47 WARRINGTON ROAD, LEIGH, LANCs. WN7 3EA

telephone 0942 - 676790
WE KNOW YOU ARE NOT FOOLED...

Into thinking that we would consider offering you our new, wider range of communications equipment without the knowledge and assurance that we can provide adequate after-sales and repair service.

WE PROMISE to service or repair any equipment we have supplied.

WE CAN obtain and supply manufacturers' original spares for equipment we sell.

WE WILL continue to offer the best possible range of choice and value for money.

WE ARE independent and will not subscribe to "price-ringing."

WE BELIEVE in freedom of choice and competitive pricing.

YOU MAY CONTINUE TO BUY WITH ASSURANCE FROM Western

Western are also pleased to announce a TWO-YEAR WARRANTY PERIOD ON TRANSCEIVERS, RECEIVERS, TRANSMITTERS AND ASSOCIATED EQUIPMENT

This will apply to all sales of Yaesu, Trio, Drake equipment from March 1 1979 onwards, and will be extended to include new manufacturers from time to time.

YAESU AND TRIO/KENWOOD EQUIPMENT

These well-known names in stock or expected shortly—write or phone for details and prices:

<table>
<thead>
<tr>
<th>FT101E</th>
<th>FT901DM</th>
<th>FRG-7</th>
<th>FRG-7000</th>
<th>FR227R</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS520S</td>
<td>TS820S</td>
<td>TR7500</td>
<td>TR2300</td>
<td>TL922</td>
</tr>
</tbody>
</table>

PHONE IN AFTER HOURS AT CHEAP RATES

Use our telephone message system—phone your order/enquiry with Credit Card number for rapid service
**GOOD NEWS ABOUT WESTOWERS!**

🌟 ALL PRICES ARE BEING HELD AT LAST YEAR'S LEVEL 🌟

ORDER NOW! ALL MODELS EX-STOCK!

**BITS and PIECES**

There must be something below that you need... read on and see what else we have to offer...

**STATION ACCESSORIES** (Carriage paid—please add 8% VAT to total—Items * 12½%)

<table>
<thead>
<tr>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Osker SWR200 SWR/Pwr. meter</td>
<td>£39.50</td>
</tr>
<tr>
<td>Western PM2000 HF PEP meter</td>
<td>£45.00</td>
</tr>
<tr>
<td>Western PM2001 VHF PEP meter</td>
<td>£45.00</td>
</tr>
</tbody>
</table>

**PM2000 and PM2001 PEP Wattmeters**

**RIGGING ACCESSORIES**

<table>
<thead>
<tr>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>12&quot; D-Clamper (2&quot; mast)</td>
<td>£4.50</td>
</tr>
<tr>
<td>Guy steaks 4&quot; 6&quot; galvanised</td>
<td>£3.60</td>
</tr>
<tr>
<td>Guy steaks 4&quot; 6&quot; heavy duty</td>
<td>£5.00</td>
</tr>
<tr>
<td>Turnbuckles, galvanised, 4&quot; x 5/16&quot;</td>
<td>£3.71</td>
</tr>
<tr>
<td>Turnbuckles, galvanised, 6&quot; x 7/8&quot;</td>
<td>£3.94</td>
</tr>
<tr>
<td>Cable grips, 1&quot;</td>
<td>20p</td>
</tr>
<tr>
<td>Brass cable clamps</td>
<td>50p</td>
</tr>
<tr>
<td>Thimbles, 1&quot; galvanised</td>
<td>10p</td>
</tr>
<tr>
<td>Thimbles, nylon</td>
<td>12p</td>
</tr>
<tr>
<td>&quot;O&quot; shackles</td>
<td>21p</td>
</tr>
<tr>
<td>&quot;D&quot; shackles</td>
<td>22p</td>
</tr>
<tr>
<td>Aluminium, Masting 1 39/32&quot; OD (per ft.)</td>
<td>£1.00</td>
</tr>
<tr>
<td>Earth rods 4&quot; long, copper weld</td>
<td>£3.25</td>
</tr>
</tbody>
</table>

Please add 20% carriage (minimum 70p) and then 8% VAT.

All wires/cables priced per metre; max. length aluminium masting is 10ft.

**VALVES** (P & P £1, min. order £2. Please add 12½% VAT to total)

<table>
<thead>
<tr>
<th>Valve</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>572B</td>
<td>£2.25</td>
</tr>
<tr>
<td>6A4H6</td>
<td>£1.80</td>
</tr>
<tr>
<td>6A6N6</td>
<td>£2.80</td>
</tr>
<tr>
<td>6AV6</td>
<td>£6.70</td>
</tr>
<tr>
<td>6AWB</td>
<td>£6.96</td>
</tr>
<tr>
<td>6BA6</td>
<td>£6.60</td>
</tr>
<tr>
<td>6BE6</td>
<td>£6.60</td>
</tr>
<tr>
<td>6EH7</td>
<td>£6.75</td>
</tr>
<tr>
<td>6E7</td>
<td>£6.75</td>
</tr>
<tr>
<td>6SW6</td>
<td>£6.75</td>
</tr>
<tr>
<td>6GK6</td>
<td>£6.95</td>
</tr>
<tr>
<td>6HY98</td>
<td>£6.95</td>
</tr>
<tr>
<td>6KD6</td>
<td>£6.95</td>
</tr>
<tr>
<td>6KB8</td>
<td>£6.95</td>
</tr>
<tr>
<td>6D6</td>
<td>£6.95</td>
</tr>
</tbody>
</table>

**Western Electronics (UK) Ltd**

HEAD OFFICE (All Mail/Enquiries)

FAIRFIELD ESTATE

LOUTH, LINCS, LN11 0JH

Tel: Louth (0507) 4985/6

Our Agents

Southern: Alan Paxton, G4BIZ, Southampton, Hants. (0703) 562182
Scotland: Alan Cameron, G3100J, Alloa (0259) 214653
N. Ireland: Les Lysle, G13CDF, Newtownards (0547) 812449

Opening hours:

LOUTH: 9-12; 1-5pm Mon-Fri. By appointment Sat 9-12.
LEICESTER: Mar's Hi-Fi, Churchgate (Tel: 0833-30662), Mon-Sat 9-4pm; closed Thurs.
WATERS & STANTON ELECTRONICS

2m SSB/CW PORTABLE

TM56B AMATEUR VHF MONITOR RECEIVER

230v. AC
12v. DC
10 channels fitted
12 channels + 4 autoscan

A PLEASURE TO OWN

Tune into the exciting world of amateur radio with this advanced monitor receiver. Listen to your local amateur radio stations both fixed and mobile, direct or through your local repeater. From the comfort of your fireside chair, using the built-in 230 volt AC power supply, this receiver will open up the whole new world of VHF Amateur Radio for you. Alternatively the necessary hardware supplied enables you to power the TM56B from your car radio battery for true mobile operation.

GREAT VALUE

We are really amazed at their superb performance at such an attractive price. We really are pleased to announce that we are stocking the dandy little MIZUHO SB2M SSB 2m hand-he'd. This is a real winner and its internal construction is superior to its competitors—so much room—so neat—and its performance is quite delightful. Never heard of MIZUHO—well until now this Japanese firm have specialised in QRP HF equipment but their first VHF product is really something. Of course, you won’t find it on every dealer’s shelf. MIZUHO are pretty particular about who handles their products—so why not come and see us and have a listen to this beautiful transceiver at the really competitive price, (499 inc. VAT and delivery and VAT (Marine £113) are provided. We could go on but if you have read this far perhaps it is time you sent off for the 4 page brochure giving full details of this beautiful transceiver at the really competitive price, £499 inc. VAT and Securicor delivery.

MIZUHO 2M SSB HANDHELD

WE ARE PLEASED TO ANNOUNCE THAT WE ARE STOCKING THE DANDY LITTLE

MIZUHO SBB2M SSB 2m. hand-he’d. This is a real winner and its internal construction is superior to its competitors—so much room—so neat—and its performance is quite delightful. Never heard of MIZUHO—well until now this Japanese firm have specialised in QRP HF equipment but their first VHF product is really something. Of course, you won’t find it on every dealer’s shelf. MIZUHO are pretty particular about who handles their products—so why not come and see us and have a listen to this beautiful transceiver at the really competitive price, (499 inc. VAT and delivery and VAT (Marine £113) are provided. We could go on but if you have read this far perhaps it is time you sent off for the 4 page brochure giving full details of this beautiful transceiver at the really competitive price, £499 inc. VAT and Securicor delivery.

MIZUHO SB-2M—ONLY FROM SELECTED DEALERS

THE COMPLETE HAM RADIO CENTRE

PHONE ORDERS

ACCESS BARCLAYCARD MAIL ORDER RETAIL CALLERS

IN STOCK NOW

Multi-2700 Mk II

NOW LOWEST PRICED ALL-MODE RIG

SO WHERE'S THE CATCH?

Well, putting it bluntly, there isn’t a catch. Believe it or not we are offering you a bargain! We’ve simply gambled on buying a very large shipment to get even better terms from Japan and the saving is being used to offset falling exchange rates. If, however, you are still not convinced, then send us the appropriate additional money for one of the other rigs which are just as good as the M2700—or if you’d send you a brochure on the Multi-2700

ALL MODES—ALL OCCASIONS

All modes are provided AM/FM SSB and CW. For SSB operation VOX is included and for CW fast break-in is provided with completely adjustable side tone. The 2700 can be used at home with its internal 230v. AC PSU or taken out to the local high spot and run from 12v. DC. This really has to be the QSO machine that you will never tire of.

BEAUTIFUL TO OPERATE—BEAUTIFUL TO HEAR

The transmitted audio quality of the 2700 is second to none. Its crisp, clear, quality affects the manufacturer’s knowledge to a clean signal sells more products! The Optimised 16-9 MHz 8 pole crystal filter gives clean SSB signals and good selectivity. On FM, direct modulation of the VCO gives smooth but penetrating audio. Typical power output is 16 watts but the flip of a switch and you have 60 watts and the flip of a switch and you have 60 watts for driving linear or transverters. The Multi-2700 has a built-in receiver RF pre amp. No problems here with a deaf receiver.

DUAL-VFO

Until you have handled the Multi 2700 you cannot appreciate the advantages of dual VFO control, the conventional analogue VFO with its dual speed silvery smooth feel, permits accurate tuning on all modes with 1 kHz readout. It also covers a complete 1 MHz segment at a time resulting in minimum band switching. The flip of a switch and you have full synthesised control of your transceiver. The bright LED display allows the transmitter to be immediately set to any 2 metre channel. A VXO control ensures the synthesiser is used equally well on SSB, CW or FM. The versatility of dual VFO control is quite amazing. For example: use the analogue VFO at the SSB end of the band and the synthesiser on the CW channels, set the synthesiser to the "sked" frequency and continue as normal operation of the analogue VFO: set analogue VFO to DX frequency whilst continuing normal tuning of the adjacent frequencies on the analogue VFO the combinations are endless, repeater shifts are completely taken care of. The Multi-2700 has ± 650 kHz shifts and ± 6 MHz for 70 cm operation.

ITS VERSATILITY IS ENDLESS

Inter continental contacts are possible via OSCAR. Press the OSCAR button on the front panel and you bring in the 28 MHz downlink receiver to enable true transceive operation through the satellite. An audio SPEECH PROCESSOR can be switched in to permit extra punch, the amount of compression being adjustable to suit the operator. RIT operates on all modes and both VFO’s. A NOISE BLANKER is included for really excellent suppression of ignition pulses. The receiver section covers 143 to 149 MHz (Tx covers 144-146 MHz ± 1 MHz shift only). Apart from the 2 existing repeater offsets one further shift may be programmed. AGC control is continuously variable, as is the VOX DELAY and ANT-VOX etc. All pre-set controls are easily reached through the top hatch of the transceiver. Separate centre zero and rx S-meters are provided. We could go on but if you have read this far perhaps it is time you sent for the 4 page brochure giving full details of this beautiful transceiver at the really competitive price, £499 inc. VAT and Securicor delivery.

IN STOCK NOW

2m SSB/CW PORTABLE

MIZUHO 2M SSB HANDHELD

THE COMPLETE HAM RADIO CENTRE

PHONE ORDERS

ACCESS BARCLAYCARD MAIL ORDER RETAIL CALLERS

31 SPA ROAD, HOCKLEY, ESSEX

Telephone (03704) 6835 Telex 897406

Jan./Feb., 1979
WATERS & STANTON ELECTRONICS

FDK PALM II

2M FM

SIZE: 6\" x 2\frac{1}{2}\" x 1\frac{3}{4}\"

WEIGHT: 1 lb. 3 oz

COMPARE ITS VALUE

COMPARE ITS FEATURES

* Smallest hand-held available
* Over one watt output
* AC charger included
* 6 channel capability
* Simplex or \pm 600 kHz switch
* BNC aerial socket
* Flexible whip supplied
* 50/20/22 supplied
* Extra channels cost £2.50
* Xtal controlled tone-burst
* Ni-cad battery pack supplied
* High quality condenser microphone

WE STOCK MOST NAMES

... TRY US!

YOUESU
ICOM
FDK
JAYBEAM
MIZUHO
MOSLEY
MINI-PRODUCTS
SAGANT
DENTRON
NAIGAI
ADONIS
SHURE
MICROWAVE

FDK MULTI 800D-25 WATTS

now includes remote frequency control microphone at no extra charge

THE MOST ADVANCED FM RIG!

£289 inc. VAT (Remote display £19.95)

Over 25 watts of high quality FM output at your finger tips. Consider its features and learn why more people are trading up to the 800D. * Frequency control is electronic from the master control—no rotating dial switches to wear out. * Remote frequency control is available from the new "up/down" microphone buttons. * Bright LED readout gives true frequency display in 5 kHz steps. * True frequency counter reads both transmit and receive frequencies in use. * Instant normal or reverse repeater operation—no returning ! * Xtal controlled tone-burst. * Variable power control 1 watt to 25 watts (30 watts typical). * Dual non-volatile memory that lasts even with power off ! * [44 148 MHz coverage for 70cms. transverting. * Additional programmable frequency shifts. * Simple auto-scan modification available. * Remote digital "head-up" display for dash board mounting. * Plug-in modular construction for ease of servicing. * Solid block power module . . . There are cheaper rigs available, but is that really what you want? . . . Send an SAE for the answer !

FDK 70 cm FM!

MULTI U-II OF COURSE

NOW £299 inc. VAT (fitted 10 channels)

Now's the chance to join the fun on 70 cms. With the ever-growing number of 70 cms. repeaters coming on the air, it makes sense to consider 70 cms. as the ideal mobile band. Good strong signals (aided of course by the U-II hot front end and 12 watts output) no QRM and a lot of new friends to meet. The U-II has lead the way from the start and is now regarded as THE rig for 70 cms. We can supply the U-II fitted with any of the following channels: RBO, RB2, RB4, RB6, RB10, RB14, SUB, SU16, SU18, SU20 at £5.90 per channel.

NEWS CORNER

We are pleased to advise you that we are now appointed agents in the South for Hillomasts and can supply any of the amateur models. For further information and prices on these pneumatic aerials, please send SAE. Incidentally, for any item advertised in this magazine—if you are considering H.P. drop us a line—our terms are very competitive.

Peter de G30JV
ADVERTISERS' INDEX

Page
Aero & General Supplies ..... 734
Amateur Electronics UK 664, 665 ..... 716
Amcomm Services ..... 718, 721
Amateur Radio Exchange ..... 717
Antenna Specialist UK Ltd. ..... 723
Ashley Dukes ..... 731
Baginton Electronics back cover ..... 735
B. Bamber Electronics ..... 721
J. Birkett ..... 726
British National Radio and Electronics School ..... 723
B. Brookes Electronics ..... 726
Bredhurst Electronics ..... 719
C. & C. Electronics ..... 724
Cambridge Kits ..... 733
Catronics Ltd. ..... 725
C.B. Electronics ..... 721
Colomor Electronics Ltd. ..... 733
Crayford Electronics ..... 668
Datong Electronics Ltd. ..... 733
John Dudley & Co., Ltd. ..... 731
G3HSC (Rhythm Morse Courses) ..... 733
G2DYM Aerials ..... 733
G.W.M. Radio Ltd. ..... 727
Heathkit ..... 675
D. P. Hobbs Ltd. ..... 728
Johns Radio ..... 729
K.W. Communications Ltd. ..... 733
Lee Electronics Ltd. ..... 716
Lowe Electronics front cover, inside front cover, 675
Link Electronics ..... 732
M.H. Electronics ..... 722
Mosley Electronics Ltd. ..... 728
William Munro Ltd. ..... 727
Park Electric Co. ..... 727
Partridge Electronics Ltd. ..... 725
P.M. Electronics Services ..... 720
Radio Shack Ltd. ..... 714, 715
R.T. & I. Electronics Ltd. ..... 724
R.Z.P. Electronics ..... 727
SEM ..... 721
Small Advertisements 729-734
South Midland Communications Ltd. ..... 658, 659, 660, 729
Spacemark Ltd. ..... 728
Special Air Service ..... 732
Stephens-James Ltd. ..... 666, 667
S.W.M. Publications Inside back cover, 730, 731, 734, 735, 736
Teleradio Electronics ..... 732
Thanet Electronics ..... 662, 663
T.M.P. Electronics ..... 726
Uppington Tele-Radio (Bristol) Ltd. ..... 734
Reg Ward & Co. Ltd. ..... 728
Waters & Stanton Electronics ..... 670, 671, 672
Geoff Watts ..... 735
Western Electronics (UK) Ltd. ..... 668, 669
W. H. Westlake ..... 735

SHORT WAVE MAGAZINE
(GB3SWM)
ISSN: 0037-4261
Vol. XXXVI JANUARY/FEBRUARY, 1979 No. 423/424

CONTENTS

Page
Editorial—Article Competition ..... 675
Communication and DX News, by E. P. Essery, G3KFE ..... 676
Antennas—The Weak Link, Part VII, by A. P. Ashton, G3XAP ..... 679
R.A.E. Q. & A. ..... 687
The Month with The Clubs—From Reports ..... 691
A High Frequency Converter, by N. H. Kempt, G3NRB ..... 694
Russian Roulette, by N. A. S. Fitch, G3FPK ..... 698
"SWL"—Listener Feature ..... 701
The Law of Murphy, by David Gordon, G4OG ..... 704
Constant Deviation Compressor for a Two-Metre Transmitter, by Terry Flatt, G4AZF ..... 706
Point of View ..... 707
VHF Bands, by N. A. S. Fitch, G3FPK ..... 708

Editor: PAUL ESSERY, G3KFE/G3SWM
Advertising: Charles Forsyth
Published at 34 High Street, Welwyn, Herts., AL6 9EQ, on the last Friday of the month, dated the month following. Telephone: 04-3871 5206 & 5207
Annual Subscription:
Home: £5.50, 12 issues, post paid
Overseas: £5.50 ($10.00 U.S.), post free surface mail
Editorial Address: Short Wave Magazine, 34 High Street, Welwyn Herts. AL6 9E0, England

Prices shown in advertising in this issue do not necessarily constitute a contract and may be subject to change.

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

© Short Wave Magazine Ltd.
E. & O. E. VAT Reg. No. 239 4864 25

673
You’ll make a first-class rig with Heathkit.

HR-1680 SSB/CW RECEIVER
★ High performance.
★ Built-in AC power supply or external battery operation.
★ Excellent sensitivity.
★ Complete 80-10M coverage.

This is just a small selection from the big range of Heathkit radio equipment kits. Each one has an excellent specification and an advanced design, so you can build a top-quality rig for yourself.

The step-by-step instructions make it easy for you, and your success is guaranteed.

Full details are in the Heathkit catalogue. Send for your copy now.

HA-201A 10W 2M AMPLIFIER
★ Operates from car battery.
★ Ideal for portable or hand held rigs.
★ Up to 10W for 1.5W input (8W for 1.0W input).
★ 40W amplifier also available (HA-202A).

SW-717 4-BAND SHORT WAVE RECEIVER
★ Ideal novice kit, assembled in a few hours.
★ Full 550kHz to 30MHz coverage.
★ Slide rule tuning.
★ Signal strength meter.
★ Built-in AM rod antenna and connection for external antenna.

To Heath (Gloucester) Limited, Dept XXXXX, Bristol Road, Gloucester, GL2 6EE. Please send a copy of the Heathkit Catalogue. I enclose 20p in stamps.

Name
Address

SWM/I/79

If you are already on the Heathkit mailing list then you’ll automatically receive a copy of the latest catalogue without having to use this coupon.

Registered in England, number 606177.

Optimum Performance with KW Ancillaries

DECCA-KW E-ZEE MATCH
Antenna Tuner 10-80 metres, matches 50/75 ohm input to co-ax fed antenna’s, also twin feeder and single wire systems.

DECCA-KW107 SUPERMATCH
Antenna Tuning System Incorporates E-ZEE Match, SWR/RF power meter; Dummy Load; Antenna switch.

DECCA-KW109 SUPERMATCH
A high power version of the KW107 is available.

DECCA-KW ANTENNA SWITCH
Selects up to 3 Antennas.

DECCA-KW BALUN Mk. II
The Decca-KW Balun is broadband-3 to 30 MHz, rated up to 2 KW p.e.p. Ratio 50 ohms "unbalanced" feed to "balanced" output. Water-proof moulded case. Suitable for Dipole and Beam Antenna.

Amateur Radio Products,
DECCA COMMUNICATIONS LTD.
Cramptons Rd., Otford, Sevenoaks, Kent TN14 5EA
Tel.: Sevenoaks (0732) 50911

SERVING RADIO AMATEURS WORLD-WIDE
In order to encourage new (and old!) talent to write, we propose an article competition commencing with the volume which starts with the next issue: all work published in a given volume of Short Wave Magazine will be considered at the end of that volume, and a prize of £50 awarded to the piece judged to be the best. “Best” in this context will take into account such factors as originality, simplicity of construction and testing, usefulness in the amateur radio scene, and so on; we might add that the occasional shaft of humour will also be considered. The prize is clearly to be understood as just that: all material will be paid for on publication in the normal way, and the prize will be a separate thing. So start writing!

While on the subject of articles, we would like to see more projects on complete transmitters or receivers, aerials and so on. It is our view that, despite a widespread belief to the contrary, anyone with an R.A.E. pass should be able to build and get working an SSB transmitter, given that the construction methods and testing are set out in clear detail so that the beginner-constructor can fault-find and test out each part as he completes it, thus making the final setting-up something other than “getting the brute to play.”
Article Competition

In order to encourage new (and old!) talent to write, we propose an article competition commencing with the volume which starts with the next issue: all work published in a given volume of Short Wave Magazine will be considered at the end of that volume, and a prize of £50 awarded to the piece judged to be the best. "Best" in this context will take into account such factors as originality, simplicity of construction and testing, usefulness in the amateur radio scene, and so on; we might add that the occasional shaft of humour will also be considered. The prize is clearly to be understood as just that: all material will be paid for on publication in the normal way, and the prize will be a separate thing. So start writing!

While on the subject of articles, we would like to see more projects on complete transmitters or receivers, aerials and so on. It is our view that, despite a widespread belief to the contrary, anyone with an R.A.E. pass should be able to build and get working an SSB transmitter, given that the construction methods and testing are set out in clear detail so that the beginner-constructor can fault-find and test out each part as he completes it, thus making the final setting-up something other than "getting the brute to play."
COMMUNICATION and DX NEWS

E. P. Essery, G3KFE

later came the news that a group of VU's were planning to activate this one, they being members of the Bangalore radio club; the callsign will probably be VU4RC or VU5RC. Then there are noises about Aves Is. being made, aimed at around March-April, not to mention a 1980 Malpelo effort.

Had enough? No? Then what about the Andaman Is. which we believe P29JS will be activating eons long. Not to mention the places headlined for independance; Marshall Is., Palau Is., the Federated States of Micronesia, and even a bit of land which lies between Mexico and the U.S., which we understand is the result of a change in the Rio Grande channel!

‘CDXN’ deadlines for the next three months—

March issue—February 13th
April issue—March 1st
May issue—April 5th
June issue—May 3rd.

Please be sure to note these dates.

Top Band

We must mention this one, insofar as we have a letter from GM3JAA, now 81 years young, and highly chuffed to have clicked with VK6HD and so made his WAC on Top Band at last. Now that is some achievement — we would have given long odds that geologically Jim’s home turf had managed to screw up some 150 countries on Ten during 1978. This time there were AP2KS, FB8XS, JT1BG, VS6EZ, XE1FX and ST5ZR.

F9UO (Verriere-le-Buisson) sits up in his tower-block and with a Joystick works the world; on Ten, we note CW with ZL3GQ, ZL3IS, W4TW, AC2K, UK4CAF, W2AXZ, K4FU, W1FVX, W6VD and W2FC. Incidentally, the ZL’s had already been worked on 14 MHz, so on that occasion they worked 80-40-15-10 QSO’s with ZL3GQ, and 40-15-10 contacts with ZL3IS.

Coming Events

We rather think 1979 will be an even better year for DX-chasers than 1978. Spratley, for instance, or Bouvet — this last should be still available by the time this comes to be read. Then there is the Peter Is. effort, 3Y0BZ, which should be active by the time you get this, and hopefully will be there through the summer. Somalia is another one to keep an ear open for, with LFGP/601FG scheduled for another stint there. Recently we were talking to a VU national (not an amateur) about — among other things — the Laccadives, and lo!, a day or two

COMMUNICATION and DX NEWS

Ten Metres

Last time round G2ADZ (Chessington) just missed the ‘bus, so he takes pole position this time. Bill sticks to CW, and for November he found all W call areas, VE1-7, KV4AA, VP9GG, H18MOC, K6JO/C6A, W6QJ/6Y5, XE3BL, VK2FU, VK6NDJ with 10 watts, VK2NWX, VK5NRD, VK6NCD, VK5LU, VK5NTX, FY7E0L, ZL3GQ, ZL2UW, FM0XF, FY0BE, FY7BC, AP2TN, 9K2DR, UU2DAS, C6AAZ, VS6CZ, TF5TP, ST0RK, ZS’s, W4UY/PJ7, HB0BLC, TR8RG, CX8DT, C5AAO, KL7RA, and H5IAAB. Some choice specimens there! There were a couple of interesting anomalous effects noted: November 6 around 1800, when ZL3GQ was audible by scatter, with the beam more or less anywhere. November 6 around 1800, when ZL3GQ was audible by scatter, with

G3XAP (Stowmarket) has been playing with his inverted-L and by putting in a trap at 7.1 MHz it should have become multiband—but on 14 and 28 MHz it won’t play; indeed Phil has it in mind that the PA just won’t match on Ten — though when there are no sunspots, the PA just won’t match on Ten — but on 14 and 28 MHz it won’t

UK90AD/U8W (Turkoman), RL7GDC, UL7AFD, UL7PAS, RX9XAA, VE1-3, VE6AY1, lots of W’s including W7’s in Utah, Montana, Wyoming, Oregon and Washington), YV1AD, ZP5NW, ZS2CW, ZS4D, W6QL/6Y5.

G3XAP (Stowmarket) has been playing with his inverted-L and by putting in a trap at 7.1 MHz it should have become multiband—but on 14 and 28 MHz it won’t play; indeed Phil has it in mind that the PA just won’t match on Ten — though when there are no sunspots, the PA just won’t match on Ten — but on 14 and 28 MHz it won’t

Put this one in the diary if you have the chance — the Peter Is. DX-pedition. A VU2 DAS effort, on 40, 20, 15 and 10 metres, with GM3HLY, GM3VHP, GM3RRL, GM3UGD, GM3VUP and GM3YOR, starting this month. The party is led by a member of the VU2DAS gang, GM3HLY, with about 50 years’ experience in the business. The objective is to activate the islands for 40, 20, 15 and 10 metres, with GM3HLY, GM3VHP, GM3RRL, GM3UGD, GM3VUP and GM3YOR, starting this month. The party is led by a member of the VU2DAS gang, GM3HLY, with about 50 years’ experience in the business. The objective is to activate the islands for

THE SHORT WAVE MAGAZINE

Jan./Feb., 1979
our best. We have gear for the band, and an aerial planned out and ready to be made, which should give a reasonable signal on both bands without our eternal earth-resistance problem. There didn't seem to be any time to spare after going to the trouble of pacing out the distance in 9-inch lino-tiles and putting the marking where they should go, and anyway it's been somewhat Arctic round this neck of the woods. But, by the time this comes to print we might — just might — be able to put a signal out. If so, there will be no objection to reports!

G2NJ (Peterborough) has switched his interest for the moment from 80 to Top Band with a view to picking up the threads of old friendships. One day QSO was with G3VOA, now in Oakwood Centre, Colchester, who transmits by controlling and keying the rig with his foot, as he has done so ever since becoming licensed not far from here. Then there was the GM of 81 years who was keying as well as ever, and G3IFF down in Havant, with a 1-V-1 receiver built in 1950 "in admiration of the old methods."

21 MHz

For many folk, this band is just about the ideal for a communicator — reasonable DX, TV noises not as bad as they are on 14 MHz, and all nice and gentlemanly. Which reminds us—we hear a whisper that there is a chap who is attacking the problem of TV timebase noises with some vigour, having established that, in his case at least (and here too, come to think of it!) the timebase harmonic is actually picked up by the amateur station aerial as a radiated signal.

F9UO uses green for his 21 MHz QSO, and he also does a fair amount of initial weeding-out so as to keep in focus the interesting ones. On 21 MHz we noted ST5PG, W2FC, ZL3GQ, ZL3IS, KØPNE, W60V and K1RH.

Our next reporter is G4DMN who simply says “nothing worked!” — which is not to say he hasn't been active on other bands, as chronicled elsewhere.

Only two sessions on the band are noted by G3XAP, which is not to say his improvised multi-bander isn't loading up on the band — it is, and with a good SWR too. Between them the two sessions accounted for all W call areas, VE1, 2, 3, 4, 6 and 7, which must indicate something about the skill of the op. or the length of the sessions!

We should have some more reports, but thanks to the heavy weather, the mail has been delayed — first-class now taking three days instead of the customary two, and second class out beyond its normal one week. Doubtless, on Monday, when the piece is ready for setting, the packet will surface... anything through the Big Smoke, which means about everything!

Twenty

Here we have the give-and-take of the busiest band, open at almost any time of the day or night to somewhere, if you can resolve the signal under the nice big fat TV timebase harmonics and their associated whiskers. Mr. J. L. Baird and his Idiot's Lantern have much to answer for by way of ether-pollution, whether one counts the programmes or the noises-off. Mind, we did get dragged to the box on New Year's day, to watch that bit of Blue Peter referring to our old friend G3UUZ and his Christmas on the Bishop Rock. However, he seems to have hidden the rig specially for the occasion! But it was nice to see him hale and hearty even if he was a bit more solemn than usual.

As may be gathered, the writer found the TV set to be, one way and another, a bit of a nuisance, save in the matter of G3UUZ. On the dark side we have to note the occasion on which YI2BGD was, it seems, being heard quite well in U.K. to on which YI2BGD was, it seems, being heard quite well in U.K. to... anything through the Big Smoke, which means about everything!

Forty

One of the original breeding-grounds of radio 'funny noises,' not to mention Iron or Bamboo Curtain output statistics and stations who all seem to boast the call "CQ." One of these days, when we're feeling patient, we will listen to one of the latter just to see if he ever does append a call to his CQ! On the other hand, there is 'gold in them thar hills' if you are a skilled enough receiver operator.

G4DMN says he only looked at it a couple of times, to find and work K6MYC and FK8CC.

The writer has been more interested in receivers this month, comparing the TS-520 receive function with the KW-77, Eddystone 888 and a PM-2 receive half—the latter a direct-conversion type which is part of the QRP rig. Quite an entertaining hour or two at the bench, and rather revealing—we will seriously have to look into a high-performance direct-conversion receiver with a good, best-possible DBM front-end, and see how this compares with a conventional full superhet and CW filter on 7 MHz. We will be ready to bet that the direct-conversion receiver will be a winner, purely on the quality of front-end. If only we amateurs as a clan would stop bellowing for "more gain" in a receiver, and its assorted European and other small fry.

CQ 'Hall Of Fame'

Last time around it was our own Geoff Watts; this (1978) year's award has been given to W6AM, Don Wallace in recognition of some 68 years of amateur radio activity, most of it at the top of the tree. Don sits, and has sat at the top of the DXCC Honour Roll for more years than your scribe cares to think, and in addition is up to some 250 countries from his kilowatt mobile rig. As for the home spot, Rhombic Farm is a bit of a legend; it once had 13 rhombics, but now has but nine, using 61 poles and 45 miles of wire — some of those poles are 140-footers, be it noted. Quite apart from the activity side, W6AM has done more than his fair share of waving the flag for our hobby, having given talks on DX in 90 countries. A deserved honour indeed.
inevitable following overload, cross-mod and all the rest, in favour of just enough gain to take a minimum signal and lift it to a just usable output signal into the phones or speaker, combined with a good strong-signal front-end design, we'd be a lot better off.

F9UO mentions OY7ML, F5IH, KØPNE and DFØSAR, the last one being some sort of special in the Saarland. The F5IH is of interest in that it was an emergency medical call for rare blood, asked for by Monte Carlo TV. The blood was located at the National Transfusion Centre in Paris, which then got in touch direct with the Monte Carlo Centre. This must be one of the first medical calls in Europe for twenty years, and in fact it became a means of "fiddling" drugs out of the authorities.

Here and There

A surprising bit of news is to hear that G2JL is to part with his Reine de Mai; he has had this yacht since 1952 (she was built in 1910) and has cruised with the calls G2JL/MM and FØGR/MM on 7 MHz regularly.

SWL's will be interested to note that there will be a series of Set Listening Periods this year; the first week-end of each month, to cover all bands, CW and Phone. Log all stations heard, the station they are calling or working and RS(T) date and time, and rush the log off to D. A. Whitaker, Hillcourt, 57 Green Lane, Harrogate HG2 9LN for the rest of the year are: Feb. 4, 1-8 MHz CW, 0700-0900; March 3-4 3-5 MHz Phone 2300-0100; April 7 1600-1800 on 28 MHz CW; May 6, 0700-0900 on 14 MHz Phone, June 3, 0500-0700 on 7 MHz CW; July 7, 0500-0700 7 MHz Phone; August 4, 1000-1200, 21 MHz CW; September 2, 1300-1500 for 28 MHz Phone; October 7 for 0600-0800, 3-5 MHz CW; 0600-0800 on Top Band CW on November 3; and finally on December 1, 1800-2000 on 14 MHz CW. We have already mentioned where the logs should go, and with them should go some notes on equipment used, aerials, conditions, and so on. We could possibly add that colleague Justin Cooper would doubtless be interested too.

If you think you are a snappy operator in the VHF Field Day, take a look at your QSO rate—9Y4VT, in the course of racking-up some 8 million points plus in the CQ Phone contest, managed a best of 296 QSO's in one hour!

Apropos that Desecheo operation, there seems to be a stalemate, in that KV4KV and WØDX are getting out the QSL's; ARRL are rejecting them as an illegal operation, on the grounds of a letter from the KP4 authority which administers Desecheo. On the other hand we have that WØDX and KV4KV are just standing pat on the ground that the "authority" who wrote to the DX Advisory committee hasn't got any authority to say yea or nay. This gets complicated, so if you worked 'em, save the card until the dust settles!

It has been noted that the Y11BGD signal has come up a bit of late; we understand that they now are using a two-element quad with the Atlas rig; and rumour hath it that the FT-101 and the FT-560 which were sent earlier in the year might have been released to them and set to work. They are at present stuck on Twenty—usually around 14225 kHz, give or take a bit. 14310 kHz has also been mentioned.

Ever heard of the Kingdom of Redonda? Well, now, it's an interesting tale. Start from first base; Antigua goes independent in 1979, and when it does it will have to assume responsibility for this (genuine) kingdom, an island which is a mile-and-a-half long by a half-mile, rising 100 feet above sea level. Now, it was originally claimed by one Shiel, back in 1865, and his son was duly crowned King by the Bishop of Antigua. Then Britain annexed Redonda and made it a dependency of Antigua; but it in no way invalidated the sovereignty of King Philip. Thus King Juan the Second will be travelling to Redonda sometime in the early part of 1979. He lives in Sussex, and is named Jon Wynne-Tyson, and he could give us a new country for DXCC—well, how about that!

Eighty

A place for the brave and the QRP. G2NJ has to a large degree absented himself, spending more time on Top Band. However, he did hear G2CAS in Harrogate with 1-5 watts, G3KLF at 2 watts, and G4CQK at three watts, all good solid QSO's; another QRP-QRP one overhead was that of SP6COT working another SP, the input being three watts.

"Very poor" says G4DMN, who admits that this must at least partly be accounted for by the sunspots which are making such a bonanza for ten metres. Richard isn't complaining though, with some 151 countries worked on the band in 1978 and 45 States. One supposes it was to be expected with the five-band arrays, but G4DMN now notices a few stations with eighty-metre rotatable aerials of the quad or beam variety. He worked AI5E, AE7H, CN8DO, C6AXN, CN8HC, EL2AK, FM7AV, HH2MC, JA6BSM, JA6LCJ, J4YMB, K5JX, K5MK, KØHA, KØZZ, KØ9EH (N. Dakota!), FG0EUD/FS, N5HH, N2KK/6, ST2SA, N5VU, TF5TP, T12TB, VP2SK, VE4SL, VE8MA, W5YU, W5ZX, W6EA, W6NLZ, W7FU, WØGYH, WAØTKJ, WØMJ, ZL4QL/A, ZL2BT, F9UW3/A, 6W8DY, 8P6GN/P and 9G1FF.

At G3XAP, the inverted-L seems to have been doing its thing, with CW contacts registered in the logs of W1, 2, 3, 4, 6, 8 and 0, UA9, UF6, TF3US for a new one, and 4N1Z—as to the last, he QSL's by way of YU1JRS, and had stations queueing up to work them. That being the case, reasoned G3XAP, they must be worth working, so he joined the queue. Clearly an ex-soldier is G3XAP!

Finale

That's it for another month. Deadline dates are in the body of the piece, and again we must note that there is one lot of mail which should have been written into the earlier paragraphs which is still shivering somewhere in the snows—assuming it turns up in its own good time, we'll take it in next time. So—73 and DX.

The mailing route you know—"CDXN," SHORT WAVE MAGAZINE, 34 High Street, WELWYN, Herts AL6 9EQ.
ANTENNAS—THE WEAK LINK,
PART VII
IMPEEDANCE MATCHING
A. P. ASHTON, G3XAP

In the article on feeders it was stated that for a perfectly matched system certain criteria had to be met, namely: the characteristic impedance of the feeder has to be equal to the feed impedance of the antenna, and that balanced antennas should be fed with balanced feeders—coaxial cable being used for unbalanced antennas.

We also said that the “balanced to unbalanced” condition could be corrected by the use of a ‘balun’, and that if we are to use a system that accepts a high SWR on the feeder, we must ensure that the transmitter can be coupled to the feeder in an efficient manner in order that we can still obtain an efficient power transfer.

In this article we will look at various methods of impedance matching, both between the feeder and antenna, and between the transmitter and the transmitter/ receiver—and we will also consider baluns, some of which are not strictly associated with impedance matching.

The discussion will be divided into four sections: matching with the feeder itself; matching at the antenna; matching at the transmitter; baluns.

Matching with the Feeder

If we attach a feeder to an antenna whose feed impedance is not the same as the feeder’s characteristic impedance, then standing waves will appear on the feeder. However, if we know the characteristic impedance and the feed impedance, we can calculate the impedance at certain points on the feeder. Consider Fig. 1 which shows the standing waves on a feeder of 75 ohms characteristic impedance when connected to a resonant antenna with a feed impedance of 20 ohms (for example a 3-element Yagi). Note that the maximum value of V is 3.75 times the minimum value, as the Standing Wave Ratio is 3:75 : 1 (75/20), and that the same ratio applies to the current.

It will also be seen that at distances of half and one-and-a-half wavelengths from the antenna, the voltage and current are at the same value as they are at the antenna feed-point itself, and hence the impedance at these points is the same as the antenna’s feed impedance. (In practice the values of voltage and current do drop slightly, moving from the transmitter towards the antenna due to feeder losses).

Note also that at distances of a quarter, three-quarters and one-and-a-quarter wavelengths from the antenna we have a situation where the current is at its minimum values and the voltage at its maximum—these, therefore, being maximum impedance points.

We can calculate the impedance at these points by using the formula:

\[ Z_0 = \frac{Z_R \times Z_S}{Z_R + Z_S} \]

where \( Z_0 \) is the characteristic impedance of the feeder, \( Z_R \) is the antenna feed impedance, and \( Z_S \) is the impedance on the feeder at points spaced at odd numbers of quarter-waves from the antenna. In the example shown in Fig. 1, therefore, the impedance at these points is 281 ohms. Hence, had we been faced with the problem of feeding the 3-element Yagi with a feedpoint impedance of 20 ohms, we could have simply attached a quarter-wavelength of 75-ohm twin feeder to the antenna feed-point and then attached 300-ohm twin feeder between the 75-ohm section and the transmitter, see Fig. 2a. The SWR on the 300-ohm feeder will be less than 1:1 : 1, (300/281), and the entire system will be very efficient, but it should be noted that the transmitter will probably not accept a balanced load of around 300 ohms, and we must use a matching unit at the transmitter end of the feeder.

An alternative method would be to use 75-ohm twin feeder all the way from the antenna to the transmitter, and ensure that the feeder is either an odd number of quarter-waves long (which will give an “input impedance” of 281 ohms), or an even number of quarter-waves long which will give an input impedance of 20 ohms. Either load will be purely resistive, but in both cases we must use a matching unit to ensure that the transmitter “sees” an input impedance of around 50 or 75 ohms (see later section). With the latter case, however, losses are likely to be higher than with the previous method, as the higher SWR will lead to higher feeder losses, but, provided that the feeder will withstand the voltages encountered (i.e. the feeder is of good quality), this system will still be comparatively efficient.

A further example of this type of matching would be a vertical antenna with a feed impedance of 25 ohms—by using a quarter-wave of 50-ohm coaxial cable, we “invert” the impedance to 100 ohms (25 = 1/100 x 25)—this example being briefly touched on in the article on feeders. If the antenna were simply fed with 50-ohm feeder, the SWR would be 2 : 1 (50/25), but by using a “50-ohm quarter-wave matching transformer”, and then using 75-ohm feeder between this and the transmitter, we have an SWR of only 1:33 : 1 (100/75). This system is shown in Fig. 2b.

When multiples of half or quarter-wavelengths of feeder are used in impedance matching applications, it is obvious that the feeder’s length must be accurately determined. When dealing with test instruments in a later article, we will see how to cut specific lengths of feeder, and this information will enable us to determine that our matching section will act efficiently. Feeders cut to these

![Fig. 1. Standing waves on a 75-ohm feeder connected to a 20-ohm resistive load.](image)
ANTENNAS—THE WEAK LINK, PART VII
IMPEDANCE MATCHING
A. P. ASHTON, G3XAP

In the article on feeders it was stated that for a perfectly matched system certain criteria had to be met, namely:
the characteristic impedance of the feeder has to be equal to the feed impedance of the antenna, and that balanced antennas should be fed with balanced feeders—coaxial cable being used for unbalanced antennas. We also said that the “balanced to unbalanced” condition could be corrected by the use of a ‘balun’, and that if we are to use a system that accepts a high SWR on the feeder, we must ensure that the transmitter can be coupled to the feeder in an efficient manner in order that we can still obtain an efficient power transfer.

In this article we will look at various methods of impedance matching, both between the feeder and antenna, and between the transmitter and the transmitter/receiver—and we will also consider baluns, some of which are not strictly associated with impedance matching. The discussion will be divided into four sections: matching with the feeder itself; matching at the antenna; matching at the transmitter; baluns.

Matching with the Feeder

If we attach a feeder to an antenna whose feed impedance is not the same as the feeder’s characteristic impedance, then standing waves will appear on the feeder. However, if we know the characteristic impedance and the feed impedance, we can calculate the impedance at certain points on the feeder. Consider Fig. 1 which shows the standing waves on a feeder of 75 ohms characteristic impedance when connected to a resonant antenna with a feed impedance of 20 ohms (for example a 3-element Yagi). Note that the maximum value of V is 3.75 times the minimum value, as the Standing Wave Ratio is 3.75:1 (75/20), and that the same ratio applies to the current. It will also be seen that at distances of half and one-and-a-half wavelengths from the antenna, the voltage and current are at the same value as they are at the antenna feed-point itself, and hence the impedance at these points is the same as the antenna’s feed-impedance. (In practice the values of voltage and current do drop slightly, moving from the transmitter towards the antenna due to feeder losses).

Note also that at distances of a quarter, three-quarters and one-and-a-quarter wavelengths from the antenna we have a situation where the current is at its minimum values and the voltage at its maximum—these, therefore, being maximum impedance points. We can calculate the impedance at these points by using the formula:

$$Z_0 = \frac{Z_R \times Z_S}{Z_R + Z_S}$$

where $Z_0$ is the characteristic impedance of the feeder, $Z_R$ is the antenna feed impedance, and $Z_S$ is the impedance on the feeder at points spaced at odd numbers of quarter-waves from the antenna. In the example shown in Fig. 1, therefore, the impedance at these points is 281 ohms. Hence, had we been faced with the problem of feeding the 3-element Yagi with a feedpoint impedance of 20 ohms, we could have simply attached a quarter-wavelength of 75-ohm twin feeder to the antenna feed-point and then attached 300-ohm twin feeder between the 75-ohm section and the transmitter, see Fig. 2a. The SWR on the 300-ohm feeder will be less than 1:1:1, (300/281), and the entire system will be very efficient, but it should be noted that the transmitter will probably not accept a balanced load of around 300 ohms, and we must use a matching unit at the transmitter end of the feeder.

An alternative method would be to use 75-ohm twin feeder all the way from the antenna to the transmitter, and ensure that the feeder is either an odd number of quarter-waves long (which will give an input impedance of 281 ohms), or an even number of quarter-waves long which will give an input impedance of 20 ohms. Either load will be purely resistive, but in both cases we must use a matching unit to ensure that the transmitter “sees” an input impedance of around 50 or 75 ohms (see later section). With the latter case, however, losses are likely to be higher than with the previous method, as the higher SWR will lead to higher feeder losses, but, provided that the feeder will withstand the voltages encountered (i.e. the feeder is of good quality), this system will still be comparatively efficient.

A further example of this type of matching would be a vertical antenna with a feed impedance of 25 ohms—by using a quarter-wave of 50-ohm coaxial cable, we “invert” the impedance to 100 ohms (50 = \sqrt{100 \times 25})—this example being briefly touched on in the article on feeders. If the antenna were simply fed with 50-ohm feeder, the SWR would be 2:1 (50/25), but by using a “50-ohm quarter-wave matching transformer”, and then using 75-ohm feeder between this and the transmitter, we have an SWR of only 1:33:1 (100/75). This system is shown in Fig. 2b.

When multiples of half or quarter-wavelengths of feeder are used in impedance matching applications, it is obvious that the feeder’s length must be accurately determined. When dealing with test instruments in a later article, we will see how to cut specific lengths of feeder, and this information will enable us to determine that our matching section will act efficiently. Feeders cut to these
specific lengths are known as "tuned feeders", and due to the high voltages and currents which can be encountered when dealing with large degrees of mis-match, open-wire feeders are best for this application, as losses with this type are very low.

Matching at The Antenna

This is the most common point for impedance matching, as it ensures that the feeder will operate with a very low SWR, and hence with minimum losses. There are a large number of techniques available, and these will be discussed in turn.

**Folded elements:** Folding is a very efficient method of matching, and consists of attaching additional conductors between the two ends of the antenna to form arrangements such as those shown in Fig. 3. If one additional wire is added, there is an impedance transformation of 4:1, this being raised to 9:1 by using a total of three conductors. However, these ratios assume that the conductors are of the same diameter, and are positioned fairly close together; for conductors of different diameters—Fig. 3c—the spacing will affect the actual ratio, as will the ratio of the diameters of two conductors, and it is therefore possible to increase an antenna's feed impedance over a wide range of ratios.

This latter technique is applicable to the driven element of Yagi antennas, where the elements are normally constructed of tubing and an additional conductor clamped across its ends will be rigid and maintain the prescribed spacing from the driven element. With wire dipole antennas, the conductors can be spaced by means of spacers similar to those described in the article on feeders; or, for the two-conductor folded dipole, we can actually use a length of 300-ohm twin feeder-opening the centre of one conductor for feeding, and shorting the conductors at the end of the ribbon, see Fig. 3d. (Note: the ribbon is not being used as a feeder, there is no need to correct the length for the Velocity Factor).

Referring back to the 3-element Yagi discussed above, we can see that if we use a "folded" element instead of a "single" driven element, the feed impedance of 20 ohms would be raised to 80 ohms, and this would be a very good match for 75-ohm feeder, the SWR being 1.07:1 (80/75), and this technique is very frequently used for VHF/UHF beam antennas.
A half-wave horizontal dipole for 1.8 MHz would usually be very low in terms of wavelengths above ground, a typical height being 50 ft. (0.1 wavelengths). A typical feed impedance at this height would be around 30 ohms, and by using three conductors as shown in Fig. 3b, this figure would be transformed up to around 270 ohms, providing a very good match for 300-ohm twin feeder (SWR 1:1). Another alternative is to use a two-conductor folded dipole to give a feed impedance of 120 ohms (30 x 4) and insert a quarter-wave of 75-ohm feeder to "invert" this 120 ohms to 47 ohms, thus providing a virtually perfect match to 50-ohm feeder. However, a quarter-wave of feeder on 1.8 MHz is relatively long (about 90 ft. with a Velocity Factor of 0.66) and the antenna may be too close to the transmitter for this method to be suitable. Information regarding the various impedance transformations which can be obtained by using conductors of different diameters, and at various spacings, can be obtained from the ARRL Antenna Book.

Antenna Height: In the earlier article in which we dealt with the factors which influence an antenna's feed impedance, we saw that the height above ground has a large effect, and impedance can be altered by raising or lowering the antenna. This is a method which is overlooked by most amateurs, but can be very effective in reducing feeder SWR. Its use may be somewhat limited when dealing with antennas such as Yagis or Quads, since, as they are fixed to masts or towers, their heights are usually governed by the physical height of these structures, and other methods of matching are far more suitable.

Consider, however, the case of a half-wave dipole on, say, 14 MHz, and assume that we intend mounting it at a height of 25 ft. above ground: this height corresponds to an electrical height of around 0.35 wavelengths, and this will give rise to a feed impedance of around 100 ohms. By making the extra effort required to erect the antenna at a height of about 35 ft. (a half-wave), a feed impedance of about 75 ohms will result, and we have a perfect match for 75-ohm feeder. It will be seen that this method of impedance matching has somewhat limited potential, but should not be overlooked when planning an installation.

The Delta Match: This method was mentioned in the article on feeders and relies simply on the fact that as the impedance of the half-wave antenna increases as we move outwards from its centre, we can pick the appropriate points at which the impedance is the same as the characteristic impedance of the feeder. It should be noted, however, that this method is only applicable to parallel-wire feeders—either open wire or 300-ohm “ribbon”. The technique is shown in Fig. 4, and the major difficulty is in picking the points on the antenna which are of the required impedance.

For 600-ohm open-wire feeder, experiments have shown that for a half-wave antenna, length ‘A’ is about 120/ft. and ‘B’ is about 148/ft.—where f is the frequency in MHz. In practice, errors in placement are not too important since even if the actual impedance at the point of attachment of the feeder was 100 per cent in error (i.e. the impedance was 300 or 1200 ohms), the SWR on the feeder would only be 2:1; and as we have said, provided that we can couple the transmitter efficiently to the input end of the feeder, the losses caused by this SWR on open wire feeders are negligible.

Similarly, if we wished to use 300-ohm ribbon feeder (rather than the “folded” dipole configuration), we could use the Delta Match for this also. Data gathered by experiment at G3XAP suggests that for a 300-ohm feeder, lengths ‘A’ and ‘B’ should be around 70/f and 85/f respectively—again, the loss due to feeder SWR will be very low if the incorrect points are used. It is possible to detect the presence of standing wave on twin feeders (this will be discussed when we consider Test Instruments), and the purist can therefore adjust the Delta Match to obtain a near-perfect match. It should be recognised that as the feeder wires are “fanned out” at the antenna, they will radiate at this point owing to the reasons discussed in the article on feeders.

The T-Match: This is similar to the Delta Match, the difference being that instead of “fanning out” the feeder to the points of attachment on the antenna, rigid conductors are positioned parallel to the antenna, and the feeder is attached to the inner ends of these, see Fig. 5a. These rods however display inductive reactance and this must be cancelled out if the system is to present a purely resistive load. The antenna element can be shortened in order to obtain capacitive reactance, hence cancelling out the inductive reactance present, or capacitors can be inserted in the T rods to tune out the reactance—Fig. 5b.

It is not possible to be specific about the length and spacing of the T-rods and values of capacitance as these

![Fig. 4](image1)

Fig. 4. The Delta Match; lengths 'A' and 'B' are discussed in the text.

![Fig. 5a](image2)

Fig. 5a. (a) Basic T-Match: de-tuning effect from the T-rods is compensated by adjustment of length of antenna to restore resonance; (b) T-Match with compensating capacitors which tune out the reactance introduced by the T-rods.
will vary considerably from one antenna to another. The T-match is normally only used with rigid antenna elements (such as beam antennas), as movement of the rods and the antenna in relation to one another will cause a detuning of the system.

The Gamma Match: The basic Gamma Match is shown in Fig. 6, and it will be noted that it can be considered as "half a T-match"! The Gamma Match permits a balanced load (e.g., the driven element of a Yagi) to be fed with an unbalanced feeder and is commonly used for single-band Yagi antennas. The placing of the Gamma rod in close proximity to the driven element can have the effect of detuning the array from its design frequency, and there is a tendency to tune the Gamma capacitor to give a minimum SWR on the feeder at the original design frequency. The correct procedure is to either adjust the array dimensions to restore resonance at the desired frequency, or to carry out the Gamma adjustments at the new resonant frequency. By varying the length of the rod and the value of the capacitor it is possible to obtain a virtually perfect match to either 50 or 75-ohm coaxial feeder. The actual method of adjustment will be discussed in a later article.

Stub Matching: Referring back to Fig. 2a, we saw that the value of impedance on the quarter-wave of feeder varied from 20 ohms (at the feedpoint) to 281 ohms (at the end of the quarter wave). At any point between these two extremes the impedance will be somewhere between these two values, and therefore, there must be a point where the impedance is 75 ohms—the characteristic impedance of the feeder from which the matching section is constructed! We can therefore make use of this fact and feed at this point with 75-ohm feeder; but, since the actual length of feeder between this point and the antenna is less than a quarter-wave, the 75-ohm point will also display reactance, which must be cancelled out. This is done by introducing another reactance at this point which is equal in value but opposite in type (i.e., inductive or capacitive) to that which we wish to cancel.

This reactance is introduced by means of a "stub" of feeder, and Fig. 7 shows the arrangement for the two cases in which the antenna's feed impedance is (a) lower than the feeder's characteristic impedance and (b) where it is higher. Fig. 7a shows how the method can be used with coaxial feeder—the actual case shown being that for a ground plane antenna. We require, however, to calculate the lengths 'A' and 'B' shown in the diagrams, and this is done by use of the following formulae:

\[
\text{Fig. 7a (a) Matching with open stub, where } R < Z_0; \quad (b) \text{Matching with closed stub, where } R > Z_0; \quad (c) \text{Stub matching for a ground-plane antenna using coaxial feeder. As the feed impedance is lower than the feeder's characteristic impedance, an open stub is employed.}\\
\]
If \( Z_R \) is greater than \( Z_0 \) (closed stub),
\[
\tan A = \sqrt{\frac{\text{SWR}}{1}} \quad \cdots \quad \cdots \quad \cdots (1)
\]
\[
\cot B = \frac{\text{SWR} - 1}{\sqrt{\text{SWR}}} \quad \cdots \quad \cdots \quad \cdots (2)
\]
and, if \( Z_R \) is less than \( Z_0 \) (open stub),
\[
\cot A = \sqrt{\frac{\text{SWR}}{1}} \quad \cdots \quad \cdots \quad \cdots (3)
\]
\[
\tan B = \frac{\text{SWR} - 1}{\sqrt{\text{SWR}}} \quad \cdots \quad \cdots \quad \cdots (4)
\]

These formulae give lengths in electrical degrees, and to convert these to wavelengths, we can use the formula:

\[
\text{Length (wavelengths)} = \frac{\text{Length (degrees)}}{360} \quad \cdots (5)
\]

We must then take into account the Velocity Factor of the feeder in order to arrive at the physical lengths required, and we do this by use of the formula:

\[
\text{Length (feet)} = \frac{985 \times VF \times \text{length (wavelengths)}}{f} \quad \cdots (6)
\]

where \( VF \) is the Velocity Factor and \( f \) is the frequency in MHz.

Let us now consider the case shown in Fig. 7c, and assume that the antenna's feed impedance is 20 ohms, that we wish to use 75-ohm coaxial feeder with a Velocity Factor of 0.66 and that the antenna is resonant on 14-100 MHz. The SWR is 3.75 : 1 (75/20), and from equation (3) and (4) we find that \( \cot A = \sqrt{3.75} = 1.94 \), and hence \( A = 27.3^\circ \), \( \tan B = 2.75/\sqrt{3.75} = 1.42 \), and so \( B = 54.9^\circ \). (The actual values of 'A' and 'B' in degrees are obtained from Mathematical Tables). Using formula (5), we arrive at lengths of 'A' and 'B' of 0.076 and 0.153 wavelengths respectively, and from formula (6) we find that the physical length of 'A' is 3.50 feet, whilst 'B' is 7.05 feet.

Antenna Length: The feed impedance of an antenna is dependent on its length, and we can therefore change the value of feed impedance by simply changing the antenna length. However, this gives rise to a non-resonant condition, and the reactance introduced must be cancelled out. For example, a quarter-wave vertical antenna mounted over an efficient earth system will have a feed impedance of around 25-30 ohms, and this can be raised to 50 ohms or to 75 ohms by making the electrical length of the antenna about 102° (0.28 wavelengths), or 113° (0.32 wavelengths) respectively. The reactance introduced is cancelled out by insertion of a variable capacitor at the feed point, as shown in Fig. 8. Tuning of this system consists of adjusting the capacitor until a minimum value of SWR is present on the feeder.

In addition to the methods discussed for impedance matching at the antenna itself, there is another technique available, namely matching with Lumped Constants. If the resistive and reactive components of an antenna's feed impedance are known, it is possible to make up a network that will both remove the reactance and perform the required impedance transformation. This network consists of inductances and capacitors, and these may be connected in series and/or parallel depending upon the actual conditions to be corrected. However, the author has omitted this technique for the following reasons:

(a) The average amateur does not possess equipment which will enable him to obtain the required values with sufficient accuracy.
(b) The subject is beyond the scope of this series.
(c) Having used the technique fairly extensively, the author believes it to be inferior to the methods discussed above.

However, readers wishing to gain a full appreciation of all the techniques available are urged to read further on the subject, and most antenna books include a section on Lumped Constants.

Matching at The Transmitter

As stated earlier (in the article on feeders), energy reflected from the antenna back into the feeder owing to an impedance mis-match is not lost provided that the transmitter can be efficiently coupled to the input end of the feeder. Losses resulting from the presence of standing waves are solely associated with the "real" resistance of the conductors comprising the feeder, and leakage between the feeder conductors through the dielectric. Because of this, if we wish to operate a system that accepts the presence of standing waves, we should use 'low-loss' feeders—preferably of the high impedance-open-wire type. Modern transmitters (and receivers) are designed to match into low impedance coaxial cable (50 or 75 ohm), so a versatile "antenna matching unit" should be capable of accepting power from the transmitter through low impedance unbalanced feeders, and coupling it to the input of either balanced or unbalanced feeders, with input impedances varying from as little as 10 ohms to values of several thousand ohms. It is very important to understand right from the outset that a matching unit installed at the transmitter end of the feeder merely enables power to be transferred into the feeder—it will not correct the standing waves present on the feeder, and in no way can it improve the efficiency of the antenna/feeder system. The actual functions carried out by the matching unit are as follows:
Matching at the transmitter location is also necessary when an end-fed wire is used, with the end of the wire brought right down to the transmitter. Antennas of this type are easiest to match if their length is such that the wire is either a quarter or a half-wavelength long at the lowest frequency at which it is to be used. For example, a wire approximately 135ft. long will be about a quarter-wave long on 1-8 MHz, and multiples of half-wavelengths on all the other bands from 3-5-28 MHz. With such a wire, there is little reactance present and tuning is simplified—tuners suitable for such antennas are shown in Fig. 10. Note that there are two very important points to be aware of with end-fed quarter-wave antennas: firstly, they are fed at a point of high current (low impedance) and an efficient earth is essential if the antenna is to be efficient; secondly, because this high-current portion of the antenna is also the portion from which maximum radiation occurs, and because this portion is actually inside the shack, the station equipment can become "covered with RF" if each item is not efficiently earthed.

For tuners of the type shown in Fig. 10, most efficient power transfer will occur if the ratio of inductance to capacitance is kept within certain limits—if the value of capacitance is around 1 to 2 pF per metre of wavelength, the ratio will be sufficiently close to the optimum. When antennas of this type were used at G3XAP, two tuners were used—one for 1.8, 3.5 and 7 MHz, and one for 14, 21 and 28 MHz—because, if a single tuner is used for all six bands, on the higher frequencies (especially on 28 MHz) it will be found that the adjustment of the variable capacitor becomes very critical, and only a small number of turns of the coil are required; therefore it is very difficult to maintain the correct L : C ratio. With suitable switching, it is possible to rapidly convert the tuners from parallel to series operation as the need arises. Details of tuning of antennas with the matching unit located at the transmitter-end of the feeder (or antenna) will be discussed in a later article.
Balanced antenna
to Tx

Fig. 12a

Balanced antenna
Twin feeder

Coaxial plug fitted here

Fig. 12b

Balanced antenna
Multi-band balanced antenna
Twin feeder

Coaxial plug fitted here

Fig. 12c

Balanced antenna
Twin feeder

Coaxial plug fitted here

Fig. 12

(a) Coaxial-sleeve balun permitting balanced antenna to be fed with coaxial feeder; the coax inner conductor is connected to one side of the antenna, and the screen to the other; (b) Coaxial-sleeve balun used at transmitter end of twin-feeder permits use of coaxial plug for connection to transmitter, matching unit, SWR bridge etc. One feeder conductor plus the sleeve are connected to the shell of the coax plug, the other feeder conductor is connected to the centre pin of the plug; (c) Multi-band balanced antenna with concentric sleeve baluns for each frequency. The sleeves are connected together at the end where the plug is fitted, and the plug is fitted in the same manner as with the single-band version.

It should be noted that even if the SWR on the feeder is 1 : 1, it is still good practice to use a matching unit because the Q of a typical HF transmitter's output pi-network is around 10-15, and this is not sufficient to suppress all unwanted signals—the matching unit will provide useful additional protection.

Baluns

As has been mentioned already, the use of an unbalanced (coaxial) feeder with a balanced antenna should be avoided unless a balun is inserted at the feed point. Many operators use dipole antennas with coaxial feeder and apparently experience no ill-effects, but it is a fact that the overall efficiency of the system will be improved if a balun is fitted. In the article on feeders, it was stated that one of the advantages of coaxial cable is that the "residual radiation" from the two conductors is contained within the cable itself, but this is only true if the feeder is used with an unbalanced antenna, or with a balanced antenna with balun. Baluns take several different forms: some are single-band, resonant devices, whilst others are broad-band; some baluns provide an impedance transformation whilst others are 1 : 1 devices. We will discuss the various types in turn:

4 : 1 Coaxial Balun: This device is shown in Fig. 11 and provides a 4 : 1 impedance transformation as well as balun action. A folded dipole with a feed impedance of 300 ohms may be fed with 75-ohm coaxial cable by inserting such a balun at the feed point. However, on the lower frequencies, such a device becomes physically large (a half-wave of coaxial cable with a Velocity Factor of 0.66 will be 90ft. long on 3.5 MHz!); together with the fact that they are resonant, and hence single-band devices, these baluns are not often used by amateurs.

Coaxial Sleeve Baluns: This 1 : 1 balun is simple to construct, consisting of a quarter-wave sleeve fitted over a section of feeder. Fig. 12a shows how such a device can be used to feed a half-wave dipole with coaxial cable, whilst Fig. 12b shows how such an antenna, fed with balanced feeder, can be converted to an unbalanced state for connection to a transmitter or SWR bridge with unbalanced input. The sleeve can be made from the braid of old coaxial cable and is easily fitted by bunching it up and smoothing it out after fitting. This is also a single band device, but W6SAI (in many of his publications) suggests that sleeve baluns can be mounted over each other for multi-band antennas, see Fig. 12c. This has been tried at G3XAP with satisfactory results on a 3-band Cubical Quad fed with 75-ohm twin feeder. Note that the quarter-wavelength does not take any Velocity Factor into account—it is the free-space quarter-wave.

Fig. 13. Quarter-wave open balun or Pawsey stub.

Fig. 14. Broadband toroidal balun.
The Pawsey Stub: This device—also known as a quarter-wave open balun—is closely related to the sleeve balun, and is also simple to construct. It is shown in Fig. 13 and, again, it is a single-band, 1:1 device.

Torroidal Baluns: These are broadband devices, but are somewhat more complex than those described above. As can be seen from Fig. 14, they consist of bifilar windings on a torroidal core and have the advantage of being very light and compact. However, the choice of material for the core is extremely important, as low quality cores can give rise to large losses—especially on the higher frequency bands (21 and 28 MHz). These devices are available in kit form and ready-made, and in spite of the fact that G3XAP is very much a “do-it-yourself” antenna man, it is suggested that this is one area where purchase is probably better than construction.

The Coaxial Broad Band Balun: Figs. 15a and 15b show this device, and was taken from W6SAI’s Beam Antenna Handbook (3rd Edition). Again, this balun has been used at G3XAP with satisfactory results. It consists of a 16ft. 6in. length of coaxial cable coiled up into a 9-turn coil, the outer ends forming a coaxial input, and the centre-point being used for a balanced output—after suitable modification, as shown in Fig. 15b.

Summary

The above list of matching techniques does not pretend to be exhaustive—there are many omissions such as impedance matching by the use of “lumped constants.” The author has found, however, that there is a lot to be said for the old axiom “keep it simple”, and an amateur attempting to use complex techniques can cause more problems than he cures!

It should now be apparent to readers that if we are able to establish that our antenna is resonant and what its feed impedance is, there are a number of ways in which we can match it to a feeder and hence be assured that our transmitter’s output power is being radiated. The next article will therefore deal with test instruments, and the sensible interpretation of the results obtained from them.

Finally, it cannot be overstressed that the peace of mind resulting from knowing that the antenna/feeder system is acting in an efficient manner is well worth striving for!

...to be continued

March issue will appear on Friday, March 16th.
R.A.E. Q & A.

MODEL ANSWERS TO THE MAY 1978 EXAMINATION

It should be noted that this set of answers is of academic interest only, as from May 1979 the format and the syllabus will be changed completely.

The examination was in two parts, failure in either part resulted in failure of the paper as a whole. The two questions in Part 1, both to be answered, carried 15 marks each. Any six questions from Part 2 were to be answered; they were worth 10 marks each.

PART 1

Qu. 1. The Amateur Licence A is subject to six specific limitations of use covering:
(a) situations in which the station may not be established;
(b) frequencies and classes of emissions to be used;
(c) operators and their qualifications;
(d) broadcast messages in the amateur service;
(e) use of radioteleprinter;
(f) language and content of these messages.

State these SIX limitations.

Ans. 1.

(a) Not in any dock, estuary or harbour, or in any aircraft or public service vehicle.

(b) Only within the bands listed in the schedule attached to the licence, with emissions specified in the schedule for the band in use. Use of spark is specifically forbidden.

(c) Operators should hold a current licence issued by the Secretary of State, or hold an amateur radio certificate. Such an operator is to sign the log for his contacts, and shall be at all times under the control and supervision of the licensee.

(d) No broadcast messages other than an initial call (CQ).

(e) Radioteleprinter to be at 45.5 or 50 baud speed only.

(f) No grossly offensive or obscene message may be sent; all message to be in plain language (save for procedural signals); to contain nothing in the nature of third-party messages, business, advertisement or propaganda; or for a religious, political, social or commercial organisation, or anyone other than the licensee and the person with whom he is in direct contact.

Qu. 2.

(a) At what percentage modulation should a double-sideband (A3) amplitude-modulated radio-telephone transmitter be operated for satisfactory communications?

(b) What is the effect on the radiated signal if a modulation depth greater than 100 per cent is used?

(c) Describe a method of monitoring an amplitude modulated signal in order that the desired depth of modulation is not exceeded.

Ans. 2.

(a) As great a modulation depth as is consistent with not exceeding 100 per cent modulation on peaks and, more important, on troughs; the latter in effect switches the carrier off for the period during which the signal exceeds 100 per cent modulation.

(b) Distortion of the radiated signal which reduces intelligibility, and which cause spurious signals to be generated, some of which appear in the pass-band but others spread out for many kilohertz on either side of the signal carrier which appear as “splatter” and essentially have the range of the signal proper. Thus they cause world-wide interference.

(c) Since the process of splattering just described is a departure from linearity of the output stage under modulation, it follows that the PA anode current will change with over-modulation. In practice a slight movement of the PA anode current will occur under proper modulation levels, due to the non-linearity of the valve characteristic and possibly also the power supply regulation, around two per cent of the standing anode current; over-modulation immediately causes a marked departure from the steady meter reading of anode current. Thus the requirement is to monitor the anode current and ensure it stays substantially constant: it being understood that the initial setting-up of the transmitter is of such nature that any serious faults such as parasitic oscillation or downward modulation have been corrected, before faith is placed in the anode current meter as a modulation indicator.

PART 2—Answer any six questions from this part. Each question to carry ten marks.

Qu. 3. (a) Describe how an electro-magnetic wave in the frequency band 3-30 MHz can be refracted and reflected by the ionospheric layers.

(b) What is meant by the term “Maximum Usable Frequency” (m.u.f.) with reference to long distance radio communication between two points on the earth’s surface?

Ans. 3. (a) Radio waves in the specified frequency range are subject to bending (refraction) when they meet layers of ionised gas. The effect is analogous to the effect when a straight stick is dipped in water and appears to be bent at the air-water interface. The “critical frequency” is the highest one at which a signal sent up vertically will be returned to earth, and the m.u.f. is several times higher. There are several ionised layers, known as D, E and F layers, of which latter splits on occasion into F1 and F2 layers. It is normally the F or F2 layer which does the work of bending, the D and E layers being mainly absorbers. Thus since all the layers are generated by the sun’s rays, it follows that the lower bands are only useful for local (ground wave) contacts in daylight, but sustain long-range communication at night; while the effect of absorption by the D and E layers becomes less as frequency is increased, causing the higher frequencies to sustain long-distance communication by day. The latter fail at night when the m.u.f. drops and refraction ceases. As indicated, the ionisation occurs due to the sun. It is greatest at times of high sunspot count when m.u.f.’s rise on some paths to above 30 MHz. There are seasonal and monthly effects too.

(b) When the term m.u.f. is used practically, it refers to the highest frequency which will support communication between two specified points at a given time. The Optimum Working Frequency would be around 15 per cent lower in frequency than the m.u.f. to ensure the
continuity of traffic despite momentary changes in m.u.f.

Qu. 4. (a) (i) What is meant by a linear amplifier?
(ii) Why is this type of amplifier necessary for high-power amplification in a single-sideband transmitter?
(b) What is the advantage of Class-AB1 operation of a linear amplifier device over Class-A or Class-B?

Ans. 4. (a) (i) A linear amplifier is one in which the output is a faithful reproduction of the input signal in all respects.
(ii) As the SSB signal is generated at low level, linear amplification is required to bring it up to the desired peak envelope power without further distortion.

(b) Class-A is good but inefficient in terms of power input for signal output; however it presents a constant high impedance to the driver stage. Class-B biases the grid almost to cut-off and drives the grid as far positively as can be done without distortion. Thus the input impedance seen from the driver stage varies markedly over the cycle, from high to low impedance; this often causes the driver stage to distort and so signal quality deteriorates. Class-AB1 biases the valve further back than Class-A, but not as far as Class-B; in addition it is not allowed to run into any significant degree of grid current, so that the driver stage will not see a changing load. An additional benefit is that the onset of grid current can be monitored and used electronically to reduce the system gain (ALC) thus reducing distortion due to overdriving the transmitter.

Qu. 5. (a) Describe with the aid of a sketch a dipole aerial using wave-traps (tuned rejector circuits) to enable it to be used on two or more harmonically-related frequency bands.

(b) Class-A is good but inefficient in terms of power input for signal output; however it presents a constant high impedance to the driver stage. Class-B biases the grid almost to cut-off and drives the grid as far positively as can be done without distortion. Thus the input impedance seen from the driver stage varies markedly over the cycle, from high to low impedance; this often causes the driver stage to distort and so signal quality deteriorates. Class-AB1 biases the valve further back than Class-A, but not as far as Class-B; in addition it is not allowed to run into any significant degree of grid current, so that the driver stage will not see a changing load. An additional benefit is that the onset of grid current can be monitored and used electronically to reduce the system gain (ALC) thus reducing distortion due to overdriving the transmitter.

Qu. 5. (a) Describe with the aid of a sketch a dipole aerial using wave-traps (tuned rejector circuits) to enable it to be used on two or more harmonically-related frequency bands.

(b) Describe the action of the wave-traps.

L = \frac{468}{F} feet, where L is the total length of the aerial, broken at the centre for feed, and F is the frequency for which the aerial is to be designed. The shortening results in a reduction in bandwidth and a slight loss of signal on the lower band, which is a small penalty to pay for multiband operation with one centre feed line and low VSWR.

(b) It is almost impossible to describe the action of the wave-traps further; and as will have been noted above, the traps serve as electrical isolators so that on each band the required lengths of wire are energised.

Qu. 6. Fig. 2 shows the IF and detector stages of a receiver. With the aid of this diagram:

(a) Explain the purpose of automatic gain control (AGC).

(b) State the method of obtaining AGC and describe the action of the AGC system in the given circuit.

Ans. 6. (a) The object of the exercise is to try and obtain a constant level of AF output across the track of VR1, despite variations in the level of the IF signal injected into the left-hand transformer.

(b) Signal is detected at diode D, the RF component decoupled off and AF is presented to R5 and VR1 in series. R5 is a low resistor, of the order of a few hundred ohms, VR1 around 5K. The AGC line is taken off at the junction of these two, and further decoupled at C9 before passing through R6 and C6. At this point the time constant is such that all the AF is filtered off and the remainder is a voltage level corresponding to the level of signal observed at the diode D, and of such polarity as to tend to reduce the gain of TR1 when it rises, and to increase gain when there is little signal output from D. Thus the output level at audio fed from VR1 is kept steady despite changes due to fading.
Qu. 7. (a) State a typical use for each of the following types of capacitor:
(i) Silvered mica
(ii) Paper dielectric
(iii) Electrolytic.
(b) Which one of these types requires a DC polarising potential and why is this necessary?
(c) What is the total capacitance of three capacitors of 1 microfarad, 2 microfarad and 3 microfarad which are connected
(i) in series
(ii) in parallel.

Ans. 7. (a) (i) In RF circuits where there may be some power—for example the coupling capacitor between the anode of a PA valve and its shunt-fed tank circuit.
(ii) Paper dielectric is all but obsolete, being replaced by various plastic foil constructions. It was used in high voltage power supply smoothing where electrolytics were inadequate, and was also found as decoupling capacitor for valve IF stages around 465 kHz.
(iii) The electrolytic contains a high capacitance in a small volume, the dielectric being a layer of oxide only a few microns thick. However, the dielectric is chemically formed by voltage—see below. It is used in power supplies, and for coupling and decoupling in audio amplifiers.

(b) The electrolytic; as its name implies the dielectric is formed by the presence of a DC voltage, and the dielectric tends to disappear in storage. Thus the capacitor needs continual “forming” by having DC volts across it in service, and by re-forming from a high-impedance supply for an hour before use after storage. Although still polarised, the tantalum types are better in terms of shelf life and leakage current in service.

(c) (i) The relationship is:
\[
\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}
\]  
Putting in values, we get:
\[
\frac{1}{C_T} = \frac{1}{2} + \frac{1}{3} + \frac{1}{6} = \frac{11}{6}
\]
Inverting both sides, we get:
\[
C_T = \frac{6}{11}\text{ microfarad},\text{ or }0.55\text{ }\mu\text{F.}
\]
(either the fractional or the decimal answer would be acceptable.)
(ii) \[C = C_1 + C_2 + C_3\] 
Whence C is \[3 + 2 + 1\] 
i.e. \[C = 6\text{ microfarads.}\]

Qu. 8. (a) (i) What is meant by an alternating current of sine waveform?
(ii) State one method by which such a current may be generated.

(b) An alternating e.m.f. has a peak value of 340 volts and a frequency of 50 Hz. Sketch a curve showing one cycle of this voltage and indicate the time after commencement of the cycle when maximum and minimum voltage values occur.
(c) What is the r.m.s. value of the voltage?

Ans. 8.

Qu. 9. With the aid of block diagrams explain the differences between the demodulation of double-sideband (A3) and single-sideband suppressed carrier (A3j) signals.

Ans. 9.

See Fig. 4. When the double-sideband signal reaches the detector, which is non-linear, the effect of the non-linearity is to separate the composite signal into its component parts, adding the two audio sidebands and passing them on, and passing the carrier component through decoupling and away—Fig. 1 of the exam.-paper (our Fig. 2—Ed.) shows such a circuit. In effect,
the sidebands are separated by relation of their sideband frequencies to the carrier signal. If one now removes one sideband, nothing has been lost and the receiver can still cope; but when the carrier wave is also suppressed at source, one needs to reinsert a "carrier" into the system at the receiving end. This is usually done by switching on the receiver beat frequency oscillator and setting it to the correct relationship with the sidebands as judged by the ear.

Q.10. Answer either

(a) With the aid of a circuit diagram explain the operation of a heterodyne frequency meter incorporating a crystal oscillator.

(b) (i) Sketch the front panel of a modern frequency meter of a type suitable for measuring accurately the frequency of an amateur radio transmitter. Name all the controls and explain carefully how the instrument is used.

(ii) State on what factors the accuracy of the frequency meter depends.

Ans. 10. (a) See Fig. 5. This is the circuit of the well-known BC221-AK wavemeter. On the left-hand side will be found a variable-frequency oscillator, which has two ranges selected by the "Frequency Band" Switch. The middle valve is a mixer type, and it will be noted that the hexode portion can be used as a crystal oscillator, the crystal being a 1000 kHz type. The right-hand valve is an AF amplifier for use with headphones.

Operation is as follows. At least 15 minutes warm-up time is recommended; more is suggested from experience. The BC-221 is supplied with a set of calibration curves. Turn the wavemeter to 'Check' and tune the dial to the crystal check-point number as indicated by the calibration chart as being nearest to the desired frequency; the 'Corrector' knob may now be tuned to zero-beat with headphones plugged in. Now turn the function switch to 'Operate' and tune the dial to the desired frequency by the calibration chart. With a small piece of wire on the 'ANT' terminal, the transmitter may now be tuned to zero-beat with the BC-221 as heard in the wavemeter headphones.

Technically, the process is that the tunable oscillator is, after checking by beating with the crystal, mixed with the crystal, which will produce a spectrum of frequencies. Imagine the VFO portion tunes, say, 2-3 MHz; clearly at 2 and 3 MHz there will be check points with the crystal oscillator, and when they are mixed there will be a whole series of outputs from the mixer. If the VFO is tuned to 2.5 MHz there will be outputs from the mixer at 0.5, 1.5, 2.5, 3.5 MHz, and so on. Thus, although the heterodyne wavemeter is capable of high accuracy it has several responses and care must be used to ensure that the transmitter is tuned up on the correct band (using an absorption wavemeter) before locating the frequency accurately with the wavemeter. The BC-221AK version diagrammed has the extra facility that the signal may be modulated at a turn of the function switch, which is a very useful identification in receive applications.

(b) (i)

See Fig. 6. The front panel of the frequency meter (often loosely termed 'counter') may be as shown. A
small pick-up loop may be arranged to give adequate signal to the counter; the transmitter radiates a continuous carrier and the meter reads this out digitally as a frequency.

(ii) The counter accuracy depends almost entirely on the accuracy of the master 'clock' crystal oscillator which defines the time for which the counter counts; another factor is the plus-or-minus one count in the last digit which results from the input to the chain staying at either logic 'O' or logic '1' at the commencement of the count. Additionally, presence of modulation will obviously confuse the counter. The higher the frequency the more accurate the clock count (this refers to the frequency of the clock). Assuming a six-digit counter, "over-range" may be used to obtain, say, an eight-digit read-out. This is done as follows: the clock period is set to 1 second, and a reading taken. The clock is then set to 0.01 sec. and another reading taken. Assume the frequency is 110 MHz; the 0.01 second count will show a series of zeros, while the 1.0 sec. count will show 110000; combining the two gives a count of 110 MHz plus-or-minus the error of the clock oscillator plus-or-minus one count; the machine is "over-ranged" on one count and losing two digits at one end, while the second reading will give the two missing digits but lose two at the opposite end.

The Digital Frequency Meter may have its range extended by a pre-scaler or a mixer stage; in the latter case the error inherent in the mixer stage must also be taken into account in assessing the worth of a measurement.

---

**THE MONTH WITH THE CLUBS**

By "Club Secretary"

WE must run straight on into the mail if we are to avoid space being taken up which could be usefully used for articles and projects—our Advertisers press us so hard for space!

Seriously, though, it is becoming important, if we are to be able to give worthwhile coverage of the hobby, that we keep space in this column down; and at the same time we would like to be able to help the club finances by so organising ourselves that a "serial entry" for the next few months can be accepted, thus saving the cost of postage each month. Mind, if your club feels rich enough to continue to send us a newsletter regularly, we would appreciate it. A serial entry for several months, though, must be validised by the name and address of the Hon. Sec., and give details of the pattern, e.g. 'first and third Thursday' plus the club Hq. address—maybe with a note on how to get there if it is a bit hard to find—and the name address and phone number (with both exchange and STD code where applicable) of a contact to whom we can refer enquiries. Usually this will be the Hon. Sec., but we do know of some cases where a different arrangement is preferred for any one of a number of good reasons. So—there it is, as and from next month; and we hope readers will pass the word to their club Hon. Sec., and get him to save some postage!

The Mail

First stop Cornish, at the SWEB clubroom, Pool, Camborne where on February 1, they have G3OCB talking about Home Construction. We could make a guess that with the escalation in the cost of living, many more people will be thinking about at least partly home-brew stations.

At Melton Mowbray they are based on the St. John's Ambulance Hall, Asfordby Hill, Melton Mowbray, where they will be found on February 16, to hear a talk about RTTY by G8RBY.

Change of venue is noted by the Chiltern group, having taken up an offer to hold their meetings at John Hawkins' furniture factory in Victoria Road, off Oxford Road—the A40—in High Wycombe. We see for February 28 they have a Junk Sale, and it is also noted that the new Hq. offers possibilities of a "brew-up" at some time during the evening.

B.A.R.T.G. is the one for all those radio amateurs and SWL's who are into the teleprinter mode. There is, of course the Newsletter' which is an effort any club could be proud of, both as to presentation and contents; not to mention the advertisements which indicate the way of getting hold of those hard-to-get bits for an RTTY station.

Now to Sutton & Cheam, who will be at Sutton College of Liberal Arts on February 16, and on February 28 they go to Ray's Social Club, London Road, North Cheam. For details about the programme, you will have to get in touch with the Hon. Sec.—see Panel for his address.

Another change of venue to be noted, this time at Verulam where the Hq. address is now the ex-Civil Defence Hall, Chequers Street Car Park, St. Albans.

---

Deadlines for "Clubs" for the next three months—

(March issue—February 13th)
April issue—February 23rd
May issue—March 30th
June issue—April 27th

Please be sure to note these dates!
It is here that the members will be heading on February 22, to hear Mr. D. Standley of the GPO, who will be talking about “Interference, its Causes and Cures.” This should be of great interest and we recall one of their Newsletters years ago commenting that there was not a single member free of TVI on 14/21/28 MHz. The date for this is the fourth Thursday; in addition the second Thursday in each month is set aside for an informal at the R.A.F. Association in Victoria Street, St. Albans.

Again a change of Hq. address; this is a temporary one for Chippenham, at the Liberal Club, 20 Gladstone Road, Chippenham, where they can be found on Tuesday evenings.

Now to Derby and 119 Green Lane, Derby. February 7 is a Bring & Buy Sale, followed on 14th by a Night on the Air; February 21 sees a Cheese and Wine party, and they end up with a Film Show on 28th.

Worcester are still at the “Old Pheasant” in New Street, and they will be having a talk by G3PGQ on Using Transistors—a good hint to the lads to get building for the Home-Brew contest later in the Spring.

Into the West Country again, to Exeter and the Priory School in that city, where at 1400z on February 11, they will have a talk on WARC 79, by the Chairman of the IARU Working Group, G3GVV. For more details, contact the Hon. Sec.—see Panel.

Over the border into GW, to Swansea who report the change to a new Hq., which is Sketty Park Sports and Social Club, Aneurin Way, Sketty Park, Swansea, where they have a booking every other Tuesday evening. Details and dates are to be obtained from the Hon. Sec.—see Panel.

Although the G-QRP Club is, as its name implies, a group for the low-power merchants, one can safely say there is something here for everyone; the simple receiver that one can build for oneself, the simple one-band transmitter for this band or that, a bit about aerials, a collection of reprints of articles culled from the amateur radio press worldwide, available to those interested, and a low membership sub. What more can one want? Oh, yes, apart from bumping in to one or other of the gang on the air, there is a meeting at least once a year in the tea-bar at the Leicester Show! Details from the Hon. Sec.—see Panel.

Cheshunt are at the Church Room, Church Lane, Wormley, every Wednesday evening. Look for Church Lane between the Queens Head and the Old Star on the A1170; the junction of the A1010 and A1170 puts you to the south of Church Lane; head north and it will be found on your left immediately after the “pelican” crossing. Once in Church Lane your target is on the left just before the river crossing. As to the programme it seems essentially to be an alternation of natter sessions and talks or film-shows.

A change of Hq. Sec. is noted by Dartford Heath D/F, and is reflected in the Address Panel. They are “at home” on February 9 and 18; the former for a talk on map reading, and the latter for a D/F Hunt. However, we are not sure of the venue, for which we must refer you to the Hon. Sec.

Yeovil were in at the start of the transistor era, and they claim that the first DX contact was made by the club, G3CMH, and G3CAZ in Haslemere, a distance of 90 miles, on 3-505 MHz with some 30 milliwatts of power, on February 21, 1954. They are going to use this claim to mount three special activities: firstly to repeat, 25 years later exactly the original QSO—so we hope no one will dispute their right to 3-505 MHz at 1340z on that day, February 21; secondly, on the evening of the following day they will have a detailed lecture by the club chairman, G3MYM, talking about the technical and historical aspects of the 1954 activity—February 22, Hut 101, Houndstone Camp, Yeovil. Finally, on the afternoon of February 25, G3CMH is going to come on the air with 30 milliwatts on Eighty, and there will be a special QSL for all the stations they work. Since this will be an equivalent of the original device, it will be a CW job. All from the Hq. address just mentioned. (Ed. note: while this may have been the first attempt at a reasonably long-distance QSO on 3-5 MHz, there had already been some interesting activity on Top Band; G5CV, G3CCA, and G3HMO immediately spring to mind, all on the air in 1953, one with solar power, and all reported in our pages at the time.) Lastly, we should mention that the group are at the address mentioned every Thursday evening.

At Cheltenham the address to look for is the Old Bakery, Chester Walk; February 1 for the visit of G3GKA, RR for RSGB Region 20, and February 16 for the Constructors contest.

It is some time since last we heard from the club in Ashford, Kent. They now have their meetings every Tuesday, at a Hq. at the top of Hart Hill, near Charing. By the sound of it they have a pretty well equipped set-up for the HF bands, at VHF and up into the UHF area.

Someone has thought of a delightful title for the talk on February 20 at Reigate—Logic for Illogical People! However, we have to refer you to the Hon. Sec. for the venue, as we also must for the informal meeting dates.

The Maidstone YMCA write in with the first mention of their Mobile Rally on Sunday, May 29; it is at the ‘Y’ Sportscentre, Melrose Close, Maidstone from 1100. This address serves also for the club’s weekly gatherings. Enquiries in connections with the Rally go to J. C. Parker, 42 Mote Road, Maidstone (50350), while the Hon. Sec.—see Panel—carries the details of the normal meetings should you so require.

We have mentioned IRTS Region 1 and their Newsletter many times in this column, and we still find it to be one of the best; a nice mix of personality news, club news and the technical stuff. Details from the Hon. Sec. at the address in the Panel.

It is the first Tuesday and the third Thursday in each month for Chichester, the Hq. being at Room 34A, Lancastrian Wing, Chichester High School for Boys, Basin Road, Chichester. February 5 is down as an Alignment evening, and on 15th, G4GVB will be talking about Marine Radio.

Now to Hereford, where they meet in the County Control, Civil Defence Headquarters, Gnaol Street, Hereford, on the first and third Friday of each month.

Peterborough have a Junk Sale, at the Scout Hut, Occupation Road, on February 16, commencement at 7.30.

Every Tuesday you can find the Northern Heights group at the British Sub-Aqua Club, Mountain, Queens-
burly, with an Alignment evening on February 13—a spectrum analyser will be in attendance along with G8CHN and G3TQA—and on 27th the Construction spectrum analyser will be in attendance bury, with an Alignment evening on February 13—a

CHIPPENHAM: P. J. Tuck, 178 St. Edith’s Marsh, Bromham, Chippenham, Wilts. SN15 2DJ.

Maidstone (34287).

CRAY VALLEY: P. J. Clark, G4FUG, 42 Shooters Hill Road, London SE11 (01-858 3707).

DARTFORD HEATH D/F: A. R. Burchmore, G4BWV, 49 Shooters Hill Road, London SE11 (01-858 3707).

Northchurch, Herts. EN7 6LG. (West Ashling 463.)

Hereford (32730).

Ashford (Kent): J. A. Clarke, G3TIS, Yeomans Cottage, The Street, Brook, Ashford, Kent TN25 5PF. (Wye 812888.)

B. A. R. T. G.: J. P. G. Jones, G3JGG, Heywood, 40 Lower Quay Road, Hook, Haverfordwest, Dyfed SA62 4LR.

Bishops Stortford: H. Allison, G3XSE, 89 Birch lane, Birchanger, Bishop Stortford, Herts.

Romeo, Oxford Oxfordshire OX9 4PE.

Croydon, Surrey CR0 1PB. (01-858 3707).

Cheltenham P018 9BL. (West Ashling 463.)

Cheltenham: G. Gearing, G3JJG, 158 Leckhampton Road, Cheltenham GL51 4AH.

Cheshunt: R. E. Chastell, G8LNM, 4 Fairley Way, Cheshunt, Herts. EN7 6LG. (Waltham Cross 35393.)

Chester: R. E. Chastell, G8LNM, 4 Fairley Way, Cheshunt, Herts. EN7 6LG. (Waltham Cross 35393.)

Chester: T. M. Allen, G4ETU, 2 Hillside, West Stoke, Chichester PO18 9BL. (West Ashling 463.)

Cirencester: S. T. S. Evans, G3VGO, "Glengormley," Carnon Downs, Truro, Cornwall. (Devoran 804235.)

Crawley: A. V. H. Davis, G3MGL, 41 Gainsborough Road, Crawley (020336), West Sussex RH10 1LD.

 Crawley: G. Gearing, G3JJG, 158 Leckhampton Road, Cheltenham GL51 4AH.

Crawley: V. F. Clark, G4FUG, 42 Shooters Hill Road, London SE11 (01-858 3707).

Crawley: V. F. Clark, G4FUG, 42 Shooters Hill Road, London SE11 (01-858 3707).


Bury: G. Gearing, G3JJG, 158 Leckhampton Road, Cheltenham GL51 4AH.

Cheltenham: G. Gearing, G3JJG, 158 Leckhampton Road, Cheltenham GL51 4AH.

Chichester: T. M. Allen, G4ETU, 2 Hillside, West Stoke, Chichester PO18 9BL. (West Ashling 463.)

Cheltenham: G. Gearing, G3JJG, 158 Leckhampton Road, Cheltenham GL51 4AH.

Cheltenham: G. Gearing, G3JJG, 158 Leckhampton Road, Cheltenham GL51 4AH.

Cheltenham: G. Gearing, G3JJG, 158 Leckhampton Road, Cheltenham GL51 4AH.

Cheltenham: G. Gearing, G3JJG, 158 Leckhampton Road, Cheltenham GL51 4AH.

Cheltenham: G. Gearing, G3JJG, 158 Leckhampton Road, Cheltenham GL51 4AH.

Cheltenham: G. Gearing, G3JJG, 158 Leckhampton Road, Cheltenham GL51 4AH.

Cheltenham: G. Gearing, G3JJG, 158 Leckhampton Road, Cheltenham GL51 4AH.
burry, with an Alignment evening on February 13—a spectrum analyser will be in attendance along with G8CHN and G3TQA—and on 27th the Construction Competition will be judged. The dates in between will be natter sessions.

Now we have to trot along to Solihull, where we have it that the February 20 meeting will be occupied by way of a Surplus Sale. As always, the venue will be the Manor House, High Street, Solihull. G4CLF is travelling all the way up to Bury on February 13, to talk about the Plessey SL-series linear IC's; but the group can be found every Tuesday at the Manor House, High Street, Solihull. February 13, to talk about the Plessey SL-series linear IC’s; but the group can be found every Tuesday at the Manor House, High Street, Solihull. Of a Surplus Sale. As always, the venue will be the Manor House, High Street, Solihull. February 13, to talk about the Plessey SL-series linear IC’s; but the group can be found every Tuesday at the Manor House, High Street, Solihull.

In general the routine is to have a lecture or whatever on the first date in each month, reserving the nattering for the other evening. That gives us February 1 which is a Slide Show and Ladies Night, and 15th for the natter.

At Bishops Stortford they will just be recovering from the AGM, so at this writing there would appear to be some doubt as to “what gives.” However, we can say that the routine is to foregather on the third Monday in each month at the British Legion Club, Windhill, Bishops Stortford; visitors and new members all welcome.

Addiscombe are primarily a contest club, and they foregather every Tuesday from 9.15 in the Spread Eagle, Club, 66 High Road, Chiswick; the talk will be by Tomlinson on Thursday, February 8. She has titled her own work.

Looking at the Surrey Newsletter, we see that they get together on the first and third Wednesdays of each month, at T. S. Terra Nova, 34 The Waldrons, South Croydon. However, we are a bit ahead of the game in writing this piece, so for the details we refer you to the Hon. Sec.—see Panel.

Southgate will be hearing from Miss Yolande Tomlinson on Thursday, February 8. She has titled her talk “Mostly Hot Air” and will cover the history of the lighter-than-air type of craft, balloons and airships, backed up by slides and photographs, mostly of her own work.

It is an informal on February 14 for Crawley, says the current newsletter to hand, so we will have to pass you on to the Hon. Sec. for the address; at the same time he will doubtless give you the date for the formal, at Trinity United Reformed Church, Ifield, and the speaker.

Christchurch Centre, High Street, Eltham is the home of Cray Valley group; they are there on the first and third Thursdays, doors opening 7.30 for 8.0. In general the routine is to have a lecture or whatever on the first date in each month, reserving the nattering for the other evening. That gives us February 1 which is a Slide Show and Ladies Night, and 15th for the natter.

At Bishops Stortford they will just be recovering from the AGM, so at this writing there would appear to be some doubt as to “what gives.” However, we can say that the routine is to foregather on the third Monday in each month at the British Legion Club, Windhill, Bishops Stortford; visitors and new members all welcome.

Addiscombe are primarily a contest club, and they foregather every Tuesday from 9.15 in the Spread Eagle, Portland Road, South Norwood. They seem to have a pretty fair spread across the contest field, effectively from Top Band up into the UHFs.

It is February 20 when the Acton, Brentford & Chiswick lads assemble, at Chiswick Trades and Social Club, 66 High Road, Chiswick; the talk will be by G3XPC, who will discuss his trip to Nigeria. This will be the last time we hear from WAMRAC; they have been turning from a Methodist to an inter-denominational group, and so the change has been made to be World Association of Christian Radio Amateurs and Listeners, WACRAL for short. Details from the Hon. Sec.—see Panel.

That’s the lot for this time: deadlines shown in the ‘box.’ And, note our initial paragraphs, for the format, which will be the norm in future. Cheers!
A HIGH FREQUENCY CONVERTER
A DESIGN TO EXTEND THE RANGE OF GENERAL COVERAGE RECEIVERS UP TO 30 MHz

N. H. KEMPT, G3NRB

Many older receivers are limited in utilisation by a lack of the higher frequency bands. This is particularly true of a number of otherwise excellent surplus types such as the Collins TCS series, which perform magnificently on the ranges provided between 1.5 and 12.0 MHz, but no further without extensive 'surgery.' There are plenty of converter designs around for specific HF amateur bands, but the writer's object was to extend the general coverage of a TCS up to 30 MHz with the minimum of complication and the minimum of mathematics in converting the dial readings.

The unit described here converts inputs of 12 MHz to above 30 MHz down to outputs of between 2 MHz and 12 MHz. A 10 MHz crystal controlled local oscillator produces an injection of either X1 or X2 crystal frequency (X3 if required), so it's a simple matter of adding either 1.0 MHz or 20 MHz (or 30 MHz) to the dial reading on the main receiver. In other words, to receive 14 MHz, the main receiver is tuned to 4 MHz and the converter oscillator to 10 MHz. To receive 24 MHz the main receiver stays on 4 MHz but the oscillator would be selected to give 20 MHz. To receive 29 MHz the receiver would be tuned to 9 MHz and the oscillator to 20 MHz, and so on.

In order to exploit the full capabilities of the converter, the companion receiver should tune at least 2-12 MHz, otherwise there will be gaps in the final coverage. If the main receiver tunes 3 to 9 MHz for instance, the converter would only allow reception of 13 to 19 MHz and 23 to 29 MHz when using the add-10 or add-20 modes. However, in this case there is the possibility of placing the oscillator on the high side of the received frequency and subtracting, but this defeats the simplicity of the original idea. It would be possible to adapt the general technique using a different crystal frequency to meet individual requirements.

Circuit Description

The converter consists of an RF amplifier using a 40673 or equivalent dual gate MOSFET, feeding a
similar device as a mixer. A 2N2222 is employed in the 10 MHz crystal and harmonic oscillator.

The incoming signal is link-coupled to the RF input tank which tunes approximately 10 to 35 MHz in one range. The output of the RF FET is tuned by a similar LC arrangement with the drain tapped part way down from the high end. A ten-ohm stopper in the RF drain aids stability although in some cases, dependent on frequency and input characteristics, self oscillation of the RF stage can occur. However, reduction of the RF Gain control to below the take off point adequately takes care of this problem whilst ensuring that maximum gain is available if it can be used.

The RF stage output is capacitor-coupled into G1 of the mixer, and the local oscillator into G2; the sum frequencies are taken from the mixer drain to the outboard receiver across an RF choke. A tunable LC circuit was tried in this position but offered little benefit and would have added another panel control.

The oscillator is a sure-fire circuit with the crystal operating on the 10 MHz fundamental. The collector circuit feeding the mixer is tuned by VC3 to either 10, 20 or 30 MHz, as required. Various types of overtone arrangements were tried but none could be made to produce the desired results with only one crystal. A switch is provided to turn the oscillator off, which is useful for checking if a signal is a converter function or direct breakthrough, and also enables the unit to be used as a receiver pre-amplifier, producing worthwhile gain and an improvement in image rejection.

**Construction**

The prototype was constructed in a second-hand box which happened to be about the right size. Unfortunately the previous owner of the box had drilled holes in all the wrong places on the front panel; this required the fitting of an escutcheon to mask them. Lacking anything better, this was made from 3/32nd balsa wood with holes cut to allow recess of the tuning dials and knobs to almost flush with the original metal. The balsa was varnished on both sides and glued in position. Panel writing on the wood was done in ink prior to application of the last coat of varnish. The end result was quite pleasing and sufficiently durable.

Ideally either a printed circuit or perforated board should be used in the construction. The original was built around ceramic tag blocks removed from an old command receiver. An approximate location of the various components is shown in Fig. 1.

Individual variable capacitors were used for tuning the RF and Mixer sections, mainly because a suitable two-gang unit was not available. Operation would be much simplified with both ganged together, and in this case a separate small RF peaking trimmer should be added. If variable capacitors with built-in trimmers are used, these should be disconnected or set to minimum before assembly.

The coils are all wound on quarter-inch Aladdin or similar formers; no cores are required. If possible the
resonant frequency of the coils should be checked with a dip meter and the variable capacitors with which they are to be used to ensure the correct coverage before installation. A 10 pF capacitor may be used to simulate circuit capacities during measurement.

A screen should be fitted between L1 and L2 to prevent feedback. In the original R4 was fitted through the screen and extra holes were made to allow for other through connections. The IN/BYPASS switch S1 was fitted to the rear apron between the coax connectors to permit direct wiring and reduce the possibility of direct breakthrough. Normal VHF constructional practice should be followed as far as possible with shortest RF connections, common ground points per stage, etc.

Assembly and Testing

The power supply, if included, should be built first. In the original there was insufficient space inside for the transformer, so this was mounted outside on the rear. A full wave bridge rectifies the 6.3 volts AC and the resulting 9 volts approximately of DC applied to VS1 for stabilisation to 6:1 volts. This is not really necessary, and the unit could be operated directly off the 9 volt rail if desired with slight adjustment of resistor values. Current figures following relate to 6 volt operation.

The oscillator stage is next on the list and should present no problems. Check current through S3, this
should be around 2mA; swing the tuning capacitor VC3. There should be a dip in current as the capacitor approaches full mesh corresponding to 10 MHz resonance. There should be a lesser dip around one-third mesh at 20 MHz, and another fluctuation at nearly open, this being 30 MHz. If a frequency counter is available, check the 10 MHz output for accuracy; if not, use a receiver to beat against the 10 MHz standard frequency transmission and note the audio beat frequency. Ideally it should be near zero, but will depend on the design of the crystal. In the original it was about 100 hertz off which did not warrant further adjustment. If more than 500 hertz, try small capacitors in parallel with the crystal. If this is the wrong way, C9 may be reduced in value to raise the frequency, or capacitors fitted in series with the crystal.

Wire up the Mixer department right through as far as R4; connect the meter in series with RFC1 supply and check the current to TR2 which should be in the order of 3mA. The converter can be partially tested at this point by connecting a receiver to the output and an aerial via a 15 pF capacitor to R4. Set VC3 to the 10 MHz position, receiver to about 5.1 MHz, and adjust VC2 to about half-mesh, where peaking should be heard together with signals from the 15 MHz broadcast band.

Having established that things look hopeful this far, put the RF Amplifier together and tidy up; check current into the RF Amplifier is in series with R2. This should be approximately 4mA with the RF gain control at maximum, reducing to 0.5mA at minimum.

Ensure that the converter output is connected to the receiver with a properly made up coax connector and connect aerial to J1. Tune to 15 MHz as before, peak Mixer and RF together and things should sound pretty lively. If the RF stage seems unduly prone to oscillation, reduce lead lengths in this area, examine decoupling and layout etc.

With a signal generator or aerial noise, check that the RF and Mixer tuning covers the range 12 to 30 MHz or more; calibrate VC1 and VC2 dials. On the original, marks were made every MHz to 20 MHz, then at 25 and 30 MHz. The oscillator need only be marked at 10, 20 and 30 MHz positions as determined by best results.

The output should be clean of spurious signals except for the oscillator at 10 MHz intervals. Harmonics from the main receiver oscillator may be detected at some frequencies but should not present a problem in normal usage. Sensitivity has not been measured on a calibrated generator; however, comparing received signals on frequencies which can be covered by both the TCS directly or via the converter show a considerable improvement when converted, suggesting excellent sensitivity.

In conclusion, this unit should definitely prove a worthwhile project for those using older receivers, those with limited coverage, poor HF performance or stability.
RUSSIAN ROULETTE
HOW TO FIND AND USE THE RUSSIAN SATELLITES
NORMAN FITCH, G3FPK

Introduction

The first Soviet satellites carrying amateur radio transponders were launched on October 26, 1978. Unlike AMSAT, which keeps the amateur radio fraternity fully informed about OSCAR launches, there was no authentic pre-launch publicity from the USSR authorities, just hints from various sources that something was in the wind.

Initially, therefore, everyone in the western world lacked any essential information concerning the orbit period, inclination, power requirements, or even the uplink and downlink passbands. However, a substantial amount of data is now available which enables this article to be published.

Spacecraft Description

The launch on October 26 was a multiple one and it seems that two amateur satellites were ejected into orbit, along with other non-amateur hardware. They are identified as RS-1 and RS-2, it being suggested that the letters mean “Radio Sputnik” or “Radio Sport”—the latter because amateur radio is considered a sport in the USSR.

The transponders are “Mode A” type devices with an uplink in the two metre band and a downlink in the ten metre band:

Uplink: 145-880 — 145-920 MHz
Downlink: 29-360 — 29-400 MHz

The two metre receiving aerial is an inverted “Vee,” and the ten metre transmitting aerial a quarter wave whip. The satellite is not magnetically stabilised as are the AMSAT ones. It is understood that RS-2 is an identical back-up for RS-1.

The relationship between the uplink and downlink frequencies is:

\[ F_d = F_u - 116.52 \text{ MHz} \pm \text{Doppler shift} \]

where \( F_d \) and \( F_u \) are the down and up frequencies in MHz. The telemetry beacon is on 29-400 MHz nominally and listeners have reported Codeserve type messages being transmitted on 29-380 MHz, once or twice.

Orbit Parameters

RS-1 is in the highest orbit yet for an amateur radio transponder with an apogee of 1,724 kms. and a perigee of 1,688 kms. The orbit is inclined at 82.5556° to the equator. The latest period for one revolution as communicated from Russian sources is 120-389430 minutes. On a “line of sight” basis, the average maximum ground range would be 8,500 kms. depending upon one’s latitude.

This orbit is rather different from those of past and present AMSAT satellites. First, it traverses the polar regions on the “opposite” side which makes the plot of the path on a polar projection map almost a straight line. Second, the satellites go round in the opposite sense to the AMSAT ones in that the morning orbits are the ascending ones and the evening passes the descending ones.

A graphical presentation of AOS, TNA and LOS in minutes after equatorial crossing, northbound, is given in Figure 1. For an example of how to use it, take an orbit which crosses the equator at 340° west of Greenwich, over central Africa. Looking along the bottom of the graph, we find that at 340° the satellite should come over the horizon in six minutes at a true azimuth of 145°. It would be nearest to the listener 11½ minutes later at a beam heading of 76° and would be expected to disappear at an azimuth of 14° after a further 11½ minutes.

The graph has been drawn for the author’s QTH but is reasonably accurate for England. For a user living in central Scotland, the “sausage” would need to be rotated slightly clockwise by approximately two minutes at the 360°, about its centre, since northbound orbits would be heard that much later, while southbound passes from 160° equatorial crossing would be heard a couple of minutes earlier. For the London area, orbits which cross the equator at about 6°W and 159°W pass overhead, giving a calculated maximum access time of about 25½ minutes. However, the very high MUF’s at the present time enable RS-1 to be heard all the way round the Earth at times via ionospheric propagation. Ten of the twelve daily orbits are in range of the U.K. being those crossing the equator between 300°W, via the Greenwich Meridian, round to 225°W.

Conversing the longitude increment per revolution, there are slightly conflicting figures. Over the 80 metre AMSAT net on November 19, a Russian estimate of 30-227° was stated. Without going into a lot of maths, the author cannot verify this figure with the period and with the Earth’s axial rotation in degrees per minute. Other estimates of 30° per revolution have been mentioned. While these differences do not appear very great, within a month predictions could be way out.

Ground Station Requirements

The most important factor about the RS transponder is that its receiver is so sensitive that only very little e.r.p. is necessary for reliable access. This point cannot be stressed too often. If more than a few watts e.r.p. are aimed at the satellites, the transponder will shut down, thus denying everyone the opportunity to communicate.

The extreme sensitivity means that a basic ten watt Tx feeding a ground plane or omni-directional, fixed aerial should suffice, thus eliminating the need for tracking. This should bring satellite communication to those running low power stations using simple aerials, even loft ones, provided a reasonably sensitive ten metre Rx is used.

The Telemetry

The telemetry from the Radio Sputniks is a bit more complicated in format than that for Oscar 7. Each group comprises a letter, two figures, and a letter, such as P73K, etc. The first letter indicates the parameter being measured and the two figures the value, while the last letter seems to indicate the state of the transponder.

The TLM is sent in frames consisting of either 7 or 30 groups although when analysed, only 18 parameters are being measured, the other 12 being duplicates. The TLM data is set out in Table 1 and is as up-to-date...
as possible at the time of writing. Some points to note are that when Channel 2 or 13 reach a count of 99, the transponder will switch off. When the satellite is in total darkness, Ch. 8-11 and 23-30 should read 99, while they will read 01 in full sunlight. It is assumed that when the count on Ch. 14 rises to 99, the transponder will shut down.

At the end of a 7 group frame, the TLM will be punctuated with the letters “RS” after which the next frame will be transmitted. After each 15 groups of the longer frame, “RS” is sent. When “RSRS” is sent, it indicates that the transponder Tx is also working. To positively identify the two halves of the long frame, the first group will end in a letter “U”, for example, and the second group, “K.” It has been found that when the last letter is “O,” “R” or “W” the transponder will be working with QSO’s taking place. When the last letter is “D,” “K,” “S” or “U” then only TLM will be on.

It has been suggested that the first letter of each group is really a number in reverse binary code, with the dash in the morse character indicating binary 1 and the dot, binary 0. Two examples will serve to illustrate this theory:

“C” or ---. equals 1010 in binary, which is equivalent to $1 + 0 + 4 + 0 = 5$, decimal.
“O” or ---- equals 111 in binary, which is equivalent to $1 + 2 + 4 = 7$, decimal. Following this concept through from P to S results in figures of 6 5 4 3 2 1 0 7 6 5 4 3 2 1 0, so fixing the position of a group within a frame unambiguously. It will be noticed that the first seven groups are prefaced by four bit characters and the remaining eight by three bit characters.

Operating Schedule
The Russians have stated that the RS satellites are scheduled for amateur communication use on Saturdays and Sundays and that Wednesdays are reserved for special experiments, as with the AMSAT satellites. Even so, RS-1 has been in transpond mode, albeit erratically, on other weekdays.

Feedback
The Moscow Radio Club is anxious to receive TLM reports, especially at times when the satellites are out of range of the Soviet Union. General reception reports are sought with comments upon the strength of the TLM beacon and amateur stations. Comments upon the effectiveness and reliability are needed so that the performance can be evaluated. Such reports will have an important influence on decisions concerning the launching of future RS satellites. These reports may be sent directly to:

Moscow Radio Club
P O Box 88, RS3A
Moscow
U.S.S.R.

Lists of stations using the RS satellites have been requested, together with times and dates.

Conclusions
This series of Russian satellites should prove very useful now that Oscar 7’s batteries are starting to fail, tiding amateur satellite users over, with Oscar 8, until the first AMSAT Phase III satellite is launched next May. Those requiring the latest predictions and informa-
<table>
<thead>
<tr>
<th>Ch. No.</th>
<th>First Letter</th>
<th>Parameter</th>
<th>Decoding Formula</th>
<th>Units</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>P</td>
<td>Calibration level</td>
<td></td>
<td></td>
<td>always 01</td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>Total RF power output</td>
<td>$10N$</td>
<td>mW.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>F</td>
<td>Temp. of transponder electronics</td>
<td>$N$</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Z</td>
<td>Temp. of TLM electronics</td>
<td>$N$</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>L</td>
<td>Power supply voltage</td>
<td>$0.2N$</td>
<td>volts</td>
<td>16 nominal</td>
</tr>
<tr>
<td>6</td>
<td>B</td>
<td>9 volt regulator</td>
<td>$0.2N$</td>
<td>volts</td>
<td>9 nominal</td>
</tr>
<tr>
<td>7</td>
<td>H</td>
<td>7-6 volt regulator stabilizer</td>
<td>$0.2N$</td>
<td>volts</td>
<td>7.6 nom.</td>
</tr>
<tr>
<td>8</td>
<td>O</td>
<td>No. 1 solar panel volts indication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>W</td>
<td>No. 2 ditto</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>K</td>
<td>No. 3 ditto</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>U</td>
<td>No. 4 ditto</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>G</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>D</td>
<td>Probably ALC voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>S</td>
<td>Battery charge current</td>
<td>$10(50-N)$</td>
<td>mA.</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>P</td>
<td>No. 1 battery voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>C</td>
<td>No. 2 ditto</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>F</td>
<td>No. 3 ditto</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Z</td>
<td>No. 4 ditto</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>L</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>B</td>
<td>Battery charge resistor temp.</td>
<td>$N$</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>H</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>W</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>K</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>U</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>G</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Telemetry decoding information. **Note:** A typical frame would be P01U C17U F3SU Z33U, etc.

**Acknowledgements**

Data for this article have been gleaned from many sources, including off the above-mentioned nets. The TLM information was provided by AMSAT-UK Chairman Pat Gowen, G3IOR, whose source was Leonid Labutin, UA3CR. AMSAT-UK has reliable lines of communication with both Russian and U.S. amateur satellite organisations. Full details of AMSAT-UK can be obtained from the Secretary, for a stamped, addressed 9in. x 4in. envelope, to:

Ron Broadbent, G3AAJ
94 Herongate Road
LONDON, E12 5EQ
ONCE in a while someone comes along with a request for articles on "elementary subjects" and reviews of general-coverage broadcast receivers. However, unless we run a series of pieces starting from scratch—that is, effectively an R.A.E. course series—we can't hope to meet the first requirement; the two current multi-part articles will in due course come to the bottom, and before then we will be looking at this whole question. But we do feel, along with the Boss, that the very basic stuff is probably better obtained by reading and thinking.

On the second point, readers will be glad to know that we shall soon be reviewing gear of all kinds.

As for the question of making a start in home-brewing bits for the station, there are in essence two things to overcome before one can make a success: lack of confidence in the outcome, and paradoxically, an over-ambitious project. However, any bigger project can be broken down into a group of smaller ones, and the lack of confidence will be assuaged rapidly once a simple task has been completed with some success. The main thing is to drop nothing until you have got it working, even though the process is one of greepe-and-hope. In his professional life, your J.C. finds himself fault-finding only when the test staff acknowledge defeat, so that he has no escape. Recently, such a situation arose; all tests made indicated different areas for the fault, so we "forgot" those and started again from the assumption that we had made the usual wrong deduction somewhere. Three more times round the circle and we were beginning to wonder whether it would ever be sorted out! Then, by pure chance, the high-voltage wire—of special material—was noticed to emit a moment of brightness at a point near its centre: an open-circuit piece of wire no less, and to boot, the piece we were using to make a point near its centre: an open-circuit piece of wire, so no wonder the results didn't make sense! But, when the results were looked at on the assumption that the wire was o/c, the results all fell into place.

However simple, the circuit can be broken down to smaller parts still, so that every bit can be tested as it is wired up. For example, imagine a two-stage mic. amplifier. First the mic. socket is connected, and a 'scope will show a waveform when the microphone is plugged in, and spoken into. Next one can build the first transistor stage, checking carefully as each part goes in, that it is in the right place in the circuit. We can now apply a bit of power to see if microphone noises still appear where we saw them at first, and then that we can see a larger version at the output of the first stage (i.e., between collector and earth). Now we know this bit is OK, we can set to and build the second stage, checking each component as we wire it in.

Once built, we can now be fairly sure that the fault will not lie in the stage we have already tested out, though nonetheless we put the microphone in its socket and repeat the checks on the first stage input and output, then going on to look at the second stage output where, to our horror, we find—nothing! First check that all the components are wired in their right places, then that you have joined the second stage supply volts, both to the HT rail and the earthy leg, before going on to the assumption that something is wrong with a component. If the DC voltages are checked and prove to be reasonably correct, then you can check each capacitor (remembering that you checked that it wasn't shorting before you wired it in), so it will be if anything an open-circuit one, which is easily enough checked by putting another one in parallel.

Finally, the transistor: here, one can check that it is wired in correctly and that it still works. The simplest transistor check is just the ohms range of the testmeter; if we consider its parts, any transistor, whether germanium or silicon, npn or pnp, looks like two diodes both of which either face the base connection, or turn their back on it. So if the transistor is OK it will read o/c between collector and emitter, from base to collector like a diode, and from base to emitter like a diode also. A diode, recall, conducts one way only, and reversing the testmeter will either make it conduct or not conduct. If, say, the base-emitter junction is conducting whichever way round the meter goes, then that diode, and hence that transistor, is a dud. And, as a matter of interest, since the meter terminals are marked positive and negative, and since the polarity of the leads almost always reverses on the ohms range, we can say whether the transistor is a pnp or npn device. So, we progress, finding and clearing-up the faults on each individual stage as we go along. This can be well within our abilities, whereas fault-finding the circuit when it is all built-up and complete may be quite beyond us.

Finally, it is well to bear in mind the difference between fault-finding something you are building and the same process on an existing unit that has packed up. A new unit will almost certainly reveal itself as a wiring-up error, with possibly a dud transistor or electrolytic capacitor as a result; but the unit which has been 'doing its thing' quite faithfully for years will be wired up correctly but have a dud component.

The Mail

Perhaps we should start by mentioning D. C. Casson (Reading) who seems to have had the misfortune to have his initial entry lost. However, since his second one has no errors in it, we have provisionally put him in the table as though the first one had come to hand.

A relative newcomer to the SWL game is G. Emson (Havant) who has an Eddystone 750—a good old general-coverage box indeed. However, the N78 valve was a little sorry for itself and so Gerry wrote to Eddystone, and was very pleased to receive a replacement in just three days. On a different tack, the question of the odd numbers some SWL's have after their names. These are membership numbers of various societies, such as RSGB or ISWL, which are allocated to them so that the QSL Bureau system can handle their reports and incoming cards. ISWL can be contacted at: 1 Grove Road, Lydney, Glos., GL15 5JE, while RSGB are at 35 Doughty Street, London WC1N 2AE.
An incentive now for the CW-minded listeners; G4GOF (Fairlight Cove, Hastings) says that he promises to QSL any report on his signals provided it tallies with his log, is on a CW QSO, and includes a stamped addressed envelope. Jess can usually be found between 0630-0730, 0800-0900, 1300-1400, and 1800-2000, all times GMT, of course, and anywhere between Eighty and Ten. On a different line, G4GOF wonders whether there is a list of all the HF beacons in the world, with their operating frequencies and schedules—anyone able to answer?

The simple HAC receiver has been giving sterling service to R. Jacobs (Margate) who shoots up to some 617 on the Ladder. To help things along, apart from the upsurge in conditions there have been the home-brew ATU and some juggling with aerials to help along.

M. Ribton (Oxted) sent his letter to the wrong address last time round, and so it was returned. He has now pushed his Joystick up to some 45 feet, and down below a nice shiny FR-101DD sorts out the signals. Of the DX, we notice Y11BGD took some 50 minutes to locate after the pile-up was noted, and the M1 was not claimed; this last brings up the total to 618.

Africans are a little rare, laments K. A. Burch (Plymouth) but nonetheless he seems to have a goodly selection of those few to remain available.

Like so many others, E. W. Robinson (Bury St. Edmunds) guessed the issue would be late, and sent his list in early—thanks to everyone who did this—a great help. He also notes the absolute flood of new call letters from the USA and “specials” from all over the place, most of the latter being out after points in the SWL, and R.A.E. on the other—there just isn’t enough to know how much CW one can store—old J.C. is a “easy logging” clause. However, he has a little moan about something similar to practice on!

Next we have a fat letter from A. Twelves (Rhos-on-Sea) who reckons the period in review qualifies for “memorable” status. However, he has a little moan about the “two by one” American calls not being in the Prefix List from Geoff Watts. To be fair to Geoff Watts, there seems to be a strong suspicion that even the FCC haven’t decided what they are going to do, quite apart from the old moment when their computer goes on the blink. Alan mentions the odd SM mobile on CW, explaining to an astonished G that he had the key strapped to his right leg. Safety buffs would no doubt shriek “Danger” but in fact it is quite reasonably easy to work /M on CW, provided one can “store” the incoming over in the mind, can use a side-swiper or el-bug tied to the leg or a suitable mount on the car, and have a tape-recorder to keep the log or is prepared to use the Home Office “easy logging” clause. One would be quite surprised to know how much CW one can store—old J.C. is a fan of Radio 3, and on the MW channel, at least till November 23, GNI was a fine image signal; on the way to an astonished G that he had the key strapped to his right leg. Safety buffs would no doubt shriek “Danger” but in fact it is quite reasonably easy to work /M on CW, provided one can “store” the incoming over in the mind, can use a side-swiper or el-bug tied to the leg or a suitable mount on the car, and have a tape-recorder to keep the log or is prepared to use the Home Office “easy logging” clause. One would be quite surprised to know how much CW one can store—old J.C. is a fan of Radio 3, and on the MW channel, at least till November 23, GNI was a fine image signal; on the way through the lanes to and from work one can copy GNI almost 100%. One hopes the new frequency will have something similar to practice on!

Talking about CW, we have a couple of letters from H. Scott (Wetherby) who was trained as W/Op. ’way back during the war; Haydn was quite surprised himself at the speed with which the code came back to mind and speed improved. Being in business, Haydn reckons he has to make up his mind between SWL-ing on the one hand and R.A.E. on the other—there just isn’t enough time for both! Incidentally, here we have another SWL getting tangled up in the two-by-one American calls.

### ANNUAL HPX LADDER

**Starting date, January 1, 1978**

<table>
<thead>
<tr>
<th>SWL</th>
<th>PREFIXES</th>
<th>SWL</th>
<th>PREFIXES</th>
</tr>
</thead>
<tbody>
<tr>
<td>K. Piper (Bognor Regis)</td>
<td>486</td>
<td>D. G. Sim (Southampton)</td>
<td>389</td>
</tr>
<tr>
<td>D. C. Casson (Reading)</td>
<td>482</td>
<td>K. M. Rogers (Lutterworth)</td>
<td>346</td>
</tr>
<tr>
<td>B. L. Henderson (Cheethole)</td>
<td>463</td>
<td>P. Matthews (Eastbourne)</td>
<td>268</td>
</tr>
<tr>
<td>Mrs. J. Brooks</td>
<td>444</td>
<td>S. Farkas (Birmingham)</td>
<td>247</td>
</tr>
<tr>
<td>J. Doughty (Birmingham)</td>
<td>440</td>
<td>C. Stevens (Derby)</td>
<td>226</td>
</tr>
<tr>
<td>R. C. Mackay (New Romney)</td>
<td>422</td>
<td>R. G. Williams</td>
<td>218</td>
</tr>
</tbody>
</table>

B. Musselwhite (Warminster) 205

P. L. Shakespeare (Foulness) 626

H. Scott (Wetherby) 632

R. Jacobs (Margate) 617

J. Linge (Willington) 813

D. Brooks (Loughborough) 811

D. L. Hill (Crawley) 284

Minimum score for an entry is 500 for Phone, 200 for CW. Listings in accordance with HPX Rules, and to include only recent claims. A “NIL” return is permissible in order to hold a place.

### HPX LADDER (All-Time Post War)

<table>
<thead>
<tr>
<th>SWL</th>
<th>PHONE ONLY</th>
<th>SWL</th>
<th>PHONE ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>K. Kyezor (Irchester)</td>
<td>1964</td>
<td>P. Rooney (Chester)</td>
<td>789</td>
</tr>
<tr>
<td>B. Hughes (Worcester)</td>
<td>1694</td>
<td>R. Towkson (Nottingham)</td>
<td>764</td>
</tr>
<tr>
<td>S. Foster (Lincoln)</td>
<td>1692</td>
<td>J. Nichol (S. Croxton)</td>
<td>761</td>
</tr>
<tr>
<td>R. Shilvock (Kingswinford)</td>
<td>1621</td>
<td>D. J. Byers (London N7)</td>
<td>758</td>
</tr>
<tr>
<td>J. Fitzgerald (Aberdeen)</td>
<td>1311</td>
<td>M. Shaw (Fiddersfield)</td>
<td>753</td>
</tr>
<tr>
<td>Mrs. J. Brooks</td>
<td>1552</td>
<td>K. Kniveton (Kingswinford)</td>
<td>706</td>
</tr>
<tr>
<td>R. Carter (Blackburn)</td>
<td>1510</td>
<td>S. T. Bowen (Kippax)</td>
<td>659</td>
</tr>
<tr>
<td>M. J. Quentin (Wotton-under-Edge)</td>
<td>1416</td>
<td>D. A. Robinson (Felixstowe)</td>
<td>646</td>
</tr>
<tr>
<td>E. V. Robinson (Bury St. Edmunds)</td>
<td>1407</td>
<td>D. Hill (Crawley)</td>
<td>644</td>
</tr>
<tr>
<td>P. C. Jane (East Looe)</td>
<td>1375</td>
<td>A. Twelves (Rhos-on-Sea)</td>
<td>637</td>
</tr>
<tr>
<td>H. A. Lendzoborough (Swanland)</td>
<td>1332</td>
<td>L. Stockwell (Grays)</td>
<td>626</td>
</tr>
<tr>
<td>M. C. Bennett (Datchet)</td>
<td>1319</td>
<td>M. Ribton (Oxted)</td>
<td>621</td>
</tr>
<tr>
<td>J. H. Sparkes (Trowbridge)</td>
<td>1159</td>
<td>R. Jacobs (Margate)</td>
<td>617</td>
</tr>
<tr>
<td>Mrs. J. B. Jane (East Looe)</td>
<td>1095</td>
<td>P. Leach (Camberley)</td>
<td>552</td>
</tr>
<tr>
<td>H. M. Graham (Harfield)</td>
<td>1060</td>
<td>G. Brazil (Dublin)</td>
<td>529</td>
</tr>
<tr>
<td>M. Rodger (Harford)</td>
<td>1030</td>
<td>P. Ramsay (Steventon)</td>
<td>508</td>
</tr>
<tr>
<td>A. R. Holland (Malvern)</td>
<td>988</td>
<td>H. A. Lendzoborough (Swanland)</td>
<td>1124</td>
</tr>
<tr>
<td>K. A. Burch (Plymouth)</td>
<td>911</td>
<td>D. W. Waddell (Herne Bay)</td>
<td>836</td>
</tr>
<tr>
<td>M. Law (Chesterfield)</td>
<td>902</td>
<td>J. H. Rosling (Bakewell)</td>
<td>750</td>
</tr>
<tr>
<td>D. Taylor (Harborne)</td>
<td>902</td>
<td>P. L. Shakespeare (Foulness)</td>
<td>626</td>
</tr>
<tr>
<td>B. T. Mackness (Dagenham)</td>
<td>858</td>
<td>H. Scott (Wetherby)</td>
<td>632</td>
</tr>
<tr>
<td>P. L. Shakespeare (Foulness)</td>
<td>858</td>
<td>K. Kniveton (Kingswinford)</td>
<td>310</td>
</tr>
<tr>
<td>K. Linge (Willington)</td>
<td>813</td>
<td>D. Brooks (Loughborough)</td>
<td>811</td>
</tr>
<tr>
<td>D. Brooks (Loughborough)</td>
<td>811</td>
<td>D. L. Hill (Crawley)</td>
<td>284</td>
</tr>
</tbody>
</table>

### J. Doughty (Great Barr)

J. Doughty finds his time a bit limited but at the time of his letter he was looking forward to great things on the bands—and he looks to be on a winner at that!
A new reporter is C. Stevens of Derby, who has an indoor wire tacked to an ATU and feeding an FR-DX400 receiver; there are converters for two and four metres but as yet no beams for them, although at the time of writing Clive was rotating schemes through his mind, based on the idea of a pole outside.

J. W. E. Thomas (Axminster) is looking for more information on receivers and digital displays. For the latter one could do worse than study the counter recently offered in Short Wave Magazine, May and June 1978 issues; and for the former a visit to the revived Axe Vale club to see the locals and pick their brains seems indicated!

J. Timms (London N4) has been shop-gazing, so that now he has to try and make up his mind between Sony Yaesu, Trio or Drake receivers; one would have thought that from where he is he could do it the ideal way, which is be listening to each one. One thing this writer wouldn’t bother with is a digital display, simply for the reason that one is too inclined to think of the numbers on a digital display as perfectly accurate, just because they appear as numbers, when they are in practice only as accurate as the clock oscillator and divider chain. For some reason one does not fall into this particular trap so much with a conventional dial display and calibrator.

Next we have a letter from J. Waters (Derby). Jack has an FR-50B receiver and would like to improve its performance. However, the budget is tight and he would like to hear from anyone with operating experience of the Datong Active Receiving Aerial, Type AD170. A pity Jack doesn’t mention his present aerial to give some sort of comparison, but nonetheless he would appreciate letters to him at 33 Quarn Drive, Kedleston Road, Allestree, Derby.

A new definition of the latest U.S. prefixes comes from K. Linge (Willington)—he calls it “a population explosion” and wonders just what on earth the FCC are up to. However, to his own situation; the list is a little shorter than usual because Ken is commuting each day.

Neither D. Brooks (Loughborough) nor his XYL have had much time for listening lately. There has been a change of QTH, with its inevitable aftermath of searching for this or that item packed away, and then the matter of Morse practice with a view to a G4 call each in the near future. We'll keep the columnar fingers crossed!

J. Nicol (South Croxton) seems to be busier than ever since his retirement; the current activity has been along the line of “sorting-out” the shack to make it, as Jim says, “a nicer place to hibernate in!” Morse and R.A.E. are also firmly in hand, and now there is room to move in the shack, lots of other things can be tackled. No doubt about it, a tidy shack with room to move about is a blessing—you should see our Editor clearing space for the chart in his shack on which he is doing his coastal navigation homework. It takes longer to make room than to do the work! But it must be said that there is even less room on board, and tidiness then becomes vital, as indeed it does when one has a/M station. As for hibernation, we wouldn’t go so far as that, even though most of us with a “separate” shack, whether dedicated room or garden shed, will admit to having on occasion used it as a refuge from storm and tempest in domestic or business relationships.

Apart from his R.A.E., K. Kniveton (Kingswinford) has been hearing a couple of interesting ones, in the “ZAIBY” who turned into an I2 when called by a G station, and Y11BGD heard on CW on 28050 kHz around 1630z. The first one has undertones of that kind of late eighteenth-century naval morality in which it was quite legitimate to fly false colours to bait the trap, so long as the proper flag was run up just as the trap was sprung. As for the CW Y11BGD, we wonder a little; we know the Y11BGD operation has been planning expansion, but we don’t know whether this is a fulfilment of the desire to move from one-band limitations placed in the original orginal licence.

J. Doughty (Birmingham 44) is a bit puzzled about the rules as they relate to the Annual and the All-Time HPX. Simple enough—the Annual is just that, with a twelve-month cycle from January 1 to December 31. If you go over 500 you are reckoned to have a fair idea as to what it is all about and so you go on to the All-Time. If at the end of 1978 you haven’t made the 500, put your list to one side and start again for 1979. A lot of prefixes will appear in both lists by the time the 1979 one gets to the magic 500, but there will be some which only appear in one or the other list, and maybe a few from earlier years still if you are an old-timer. All these can be added to the total when the All-Time Ladder is reached.

Others

These include J. Timms (London N4); D. Taylor (Harborne); L. Stockwell (Grays); P. Matthews (Eastwood); R. Towlson (Nottingham); M. J. Quintin (Wotton-u-Edge); M. Shaw (Huddersfield); M. Rodgers (Harwood); M. Law (Chesterfield); H. A. Loundsborough (Swanland).

Finale

The end of yet another year of “SWL” and so the time for us to mention the start of a new, 1979 Table; final scores for the 1978 Ladder should appear in the March 1979 “SWL” piece. If you have enough to make an entry for the 1979 ladder, by all means send it along and we shall take note of it. Meantime, happy listening to you all, and all your letters addressed to your scribe at SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts., AL6 9EQ.

Note: Deadline for May issue, March 22nd.
THE LAW OF MURPHY
OR FANNY HILL'S DILEMMA
DAVID GORDON, G4OG

This magazine has been responsible for the continual excoriation of an excellent fellow: poor Murphy, you make him take the blame for everything.

The weather becomes gorgeous, hand conditions out of this world—just as Field Day finishes: Murphy. Its a DX Competition weekend and come Friday night, the XYL develops 'flu and you've got to look after the junior ops: Murphy. Page 508 of S.W.M. for October 1978—a relay sticks on receive in the middle of a much sought after QSO with Wyoming: Murphy strikes again. The poor fellow confided in me that the last straw was when an apparent definition of his law was recently published. Sic—"If anything can go wrong, it will."

No, No, No! You've got it all wrong and if you don't watch out, 'e'll 'ave yer.

Speaking personally the most erudite source defines Murphy's Law as follows: "If it is physically possible to mis-assemble or incorrectly operate a particular device, then somebody, someday, will so mis-assemble or incorrectly operate said device." All quite simple and straightforward. Lets have no more of this chauvinistic tendency to blame a poor Irishman for everything that goes wrong.

A few examples of Murphy really at work. Many of you will remember the little local difficulty at the Echo Fisk oil rig several months ago. All sorts of expensive experts left their expensive swimming pools and travelled very expensively to sort out the trouble. And what did they do? They fitted the shut-off valve to cap off the oil upside down. Why? Because it was 'physically possible' so to do. And Murphy was waiting. It made him particularly pleased of course, because the incident received world-wide publicity.

Two more illustrations, from a rich field which has brought delight to Murphy over the years, that of Aviation. It used physically to be possible to assemble flying control cables in an aeroplane the wrong way round. Let us consider the case of incorrectly assembled elevator controls. Normally, when you pull the stick back on an aircraft, up goes the nose—but if you've got the wires the wrong way round . . . ? On a more sombre note, many readers may recall a Viking accident in the fifties; a non-return valve in the main fuel line from the starboard tanks could be, and was, fitted back to front. Result? All the fuel from the port wing tanks was pumped into the starboard wing where, of course, it was unusable and an aeroplane won't stay airborne for very long without engine power. No need to tell you intelligenzia of the simple ways in which these two examples have now been Murphy-proofed.

Let now turn to watch Murphy prowling restlessly amongst hardware a little nearer home to us. Probably one of the most perfect anti-Murphy devices is the coaxial cable and associated plugs and sockets. Do what he will, it is just not physically possible to assemble a coax plug the wrong way round, nor is it possible to plug said plug into coax socket incorrectly. (I sense Murphy stirring restlessly beside me as I write, but none of us have ever done it—have you?) The vile 13-amp. plug and its beastly little baby brother the 2-amp. 3-pinner are different kettles of sea food altogether. You can't plug 'em in wrong but there's nothing to stop you wiring them up incorrectly. They are one of Murphy's 'things'—the joy it brings him when you connect BROWN to E. I suppose the only answer here is three different sizes of conductor with correct terminal sizes to match—and a nightmare problem for the mass producer.

Here's a (true) story that had Murphy in convulsions. This was the assembly of my shiny new TA-33jr. antenna. Now the elements and boom of the TA-33 are colour-coded for ease of assembly though travelling time, the journey up to the top of the tower and various other factors can make the painted colour marks wear a bit thin. From memory there was a sort of maroon coloured dab of paint on the director which was repeated on the director end of the boom and so on. But it is physically possible to clamp the director on to the reflector end of the boom and vice-versa! Now if you're like me with a new antenna, all you want to do is to get it up in a hurry and then get back into the shack where you know the whole world (including elusive Wyoming) is going to jam the band in answer to your first call. It really didn't look all that funny and it was quite a while before I realised what I'd done; I glanced up at it one fine morning and did a sort of double-take.

Readers will, by now, have thought of all sorts of pro- and anti-Murphy situations. Some pros: Locking yourself out of your car in the middle of nowhere (or on a double yellow line); lighting the wrong end of a cigarette in the cinema (Murphy smokes a clay pipe of course—no chance of him being hoisted by his own petard); insertion of the U2-type family batteries into transistorised equipment—the PP3 can be safely categorised as Murphy proof. Some antis: Insertion of (I think) all types of valves in their sockets—can you imagine Murphy's bleats of joy consequent upon the invention of the transistor? Insertion of, but not the wiring up of Din plugs; the device on my dishwasher which physically prohibits if from starting until the cover is on (my downstairs neighbour has reason to wish I hadn't been able to open the door of the washing machine when it was full of soapy water). The list is endless snd its not a bad exercise for the insomniac.

So let us all beware and not imprecate Murphy when its not his fault—as an ex-Royal Air Force pilot I exhort you to take note of Gremlins, of the laws of Parkinson and Sod—and so forth. Let the right devil be given his correct dues or the wrong devil may take umbrage and find ways of getting into something which is really no business of his (Murphy has just passed me a drawing of his first prototype assembly of a coax plug with the braid going to the centre conductor).

How does Fanny Hill come into this, I hear you say. Well, although Short Wave Magazine is not really a family journal in the true sense, at least you can leave it lying around the house and not keep it in the back of the sock drawer with the Playfairs and Mayboys. So suffice it to say to those readers who, like me, are admirers of the lovely lady, that you may remember her encounter with the lusty sailor and her subsequent remonstrations to which he replied, "Any port in a storm my dear."
A gentle reminder that the Leicester Exhibition was not all expensive hardware and queues to the cafeteria! Top left, Noreen Walsh of Lowe Electronics Ltd. shows the new TR-2300 to G3TRB, SWL Jack and G3FMW; top right, Anne Fah on the Microwave Modules Ltd. stand describes a fine point of a linear amplifier to G8ALQ (left) and G3XKZ. With Anne is the firm’s principal, G3VXK; 2nd left, three members of the British Amateur Television Club on their stand: left to right, G8IQU, G8CJS and G4GEE; 2nd right, Carol Norcliffe and Christine Wood of P.M. Electronic Services doing business with (l. to r.) G8MNX, G8NVH, G8KHJ and G8IMC; bottom left, trade must have been good for Dave Stockley, G4ELP, of Thanet Electronics, because he even treated Pauline, G8NNB, to an ice-cream! Bottom right, serious study going on at the Western Electronics (UK) Ltd. stand by, left to right, G8FFC, G3EBI, G8REM and G8LJW.
CONSTANT DEVIATION COMPRESSOR FOR A TWO-METRE TRANSMITTER

TERRY FLATT, G4AZF

In the course of designing a two-metre transmitter, it became apparent that some means of controlling the maximum deviation would be required. Whilst this does not itself present a problem, setting up the transmitter to produce a nominal 3 kHz deviation and the disciplined microphone technique required to maintain this is not always easy. Indeed, to many amateurs it seems to be an eternal pre-occupation, as evidenced by the annoying and seemingly endless whistling and listening for over-deviation pips on many repeaters.

This circuit was devised with the intention of obviating the problems usually associated with setting up the deviation controls on a transmitter, and of maintaining the settings with reasonable variations of microphone and microphone technique; it was also necessary to use a minimum number of easily available components, and to be simple to set up.

After investigating a number of methods for gain control, e.g. FET’s, diode attenuators and current controlled amplifiers, it was discovered that National Semiconductors produce a variable attenuator IC in an eight-pin package, which is available from R.S. Components as RS. 306-803. This IC has a gain control range approaching 90 dB for a 3v. change in control voltage and, with the addition of a few discrete components, forms a very useful basis for a speech compressor or microphone level control amplifier. At first sight, its large dynamic range looks very attractive and it would not be very difficult to devise a circuit which makes full use of it. However, after a little thought, it can be seen that this is not really a practical proposition as such a wide range would imply that at maximum gain any small sound in the room would modulate the transmitter, and at minimum gain, the microphone would be giving several volts of output! Since the first situation is undesirable, and the second virtually impossible, we can relax some of the design requirements of the control circuitry, and the final design is shown in Fig. 1.

The Circuit

Transistor 1 is a single-stage amplifier which provides sufficient gain to enable the unit to be used with low output microphones, and should not run into distortion with higher output types. IC1 is the gain controlled stage, and the output from this is taken to the transmitter and to the input of IC2A.

IC2A is connected as an AC amplifier whose gain is set by the ratio of R3 and R4, and the working point is set by the potential divider R5, R6 and R7; in order not to affect the AC gain of the amplifier, R5, R6 and R7 have been assigned comparatively low values. IC2B is connected as a rectifier which has a minimum DC output voltage, and this is also controlled by the potential divider R5, 6 and 7. The output of the rectifier is taken
to the gain control input of IC1, and to C6 and R10.

C6 and R10 provide a time constant which allows the gain of the compressor to remain constant for the short term variations which occur in normal speech, but allow the gain to vary with different average changes in speech level. The selection of these two components affect the characteristics of the compressor and their final values will depend on the personal preferences of the user; the author suggests that the values shown should be used initially, and listening tests may be used to determine whether their values ought to be changed. Reducing their values too much will result in unpleasant pumping noises, and increasing them too much will mean that recovery from extreme speech peaks will take a long time. The values given seem to be a reasonable compromise between communication quality and fairly natural sounding speech.

**Setting-Up**

R6 has two functions; one is to set the working point of IC2A, but primarily to set the minimum control voltage of IC1. To do this properly, all that is required is a high impedance voltmeter connected across C6, then turn R6 until the voltage at C6 just begins to rise. It is a good idea to do this slowly, otherwise the time constant at C6 will tend to give misleading results. The voltage at C6 should now be about 3-35 volts, although this may vary with different samples of MC3340. Increasing the voltage at C6 slightly above this value will delay the onset of gain control, and again, listening tests should determine whether or not this is beneficial.

Adjustment of R6 should be all that is required to set up the circuit. The only other difficulty that might be encountered is the biasing of TR1, and this can be checked by measuring the voltage at the junction of R2 and C2; this should be about 5 volts. If it differs from this by more than half a volt, increase R1 if it is too low, or decrease R1 if it is too high. This should not be too difficult, but it is not worth trying to get closer than half a volt to the figure stated.

When you have got to this stage you must decide what maximum input your transmitter requires. This is not difficult if you have a deviation meter but if you don't possess, or have access to, one (have you read your licence lately?) you will have to use a roundabout strategy. Temporarily arrange the circuit in Fig. 2b, and with the help of a local station you can rely on to give reliable reports you should be able to compare the deviation with the compressor until, with normal speech, it is about the same as that from the microphone with a steady, fairly loud continuous tone.

The maximum output voltage is approximately 200mV peak-to-peak, and this may be adjusted by changing the value of R3. Increasing R3 will increase the output voltage, and decreasing it will have the opposite effect. (If you don't like playing with different fixed resistors, you can put a 10K pot on the output of the compressor, as shown in Fig. 2a).

Although the compressor was designed to be built into a two-metre transmitter there seems to be no reason why it could not be used with any existing transmitter. Since it has a relatively low output at a reasonably constant level, connecting it between the microphone and microphone-input of the transmitter should not really cause any insuperable problems. It must be remembered, though, that it was not designed as a high-grade speech processor, and if you want to use it in this kind of way you should also be prepared to incorporate some filtering between it and the transmitter. However, it is so simple to build and set up that it may well be worth experimenting along these lines.

**POINT OF VIEW**

Below we print a paragraph from the BARTG Newsletter, written by G8LT with reference to the comments by Norman Sedgwick, G8WV, in our June 1978 issue. We have no particular remark to make in either direction, except to say that, since both views are sincerely and honestly held by well-known amateurs of impeccable technical ability, BARTG's request that we publish this paragraph of G8LT's column was accepted instantly:—

“More in sorrow than in anger did I read Part IV of an otherwise excellent series of articles by G8WV in *S.W.M.* on the subject of RTTY which expressed such a one-sided view that it seems to call for some comment if none has been made elsewhere. While theory and practice in relation to the actual bandwidth needed by the different modes may be far apart, as witness some of the signals that can be heard, the question is posed as to where RTTY fits in and serves a ‘useful’ purpose in an amateur station, a point that might equally well be asked about CW and SSB. The Home Office licence restricts us to the CCIt No. 2 International 5—unit teleprinter code at speeds not exceeding 50 bauds so for the moment ASCII, error correction and other luxuries are barred. The ‘usefulness’ of RTTY in the amateur context has presently to be sought elsewhere. Technical training is still the most important reason that various governments give for allowing the amateur service to exist and with WARC not far away we would be wise to remember this fact. Such training in the science of machine telegraphy is as important today as the building and understanding of CW and AM gear was in the days when G8WV was a newcomer to the field. The upsurge of interest in RTTY of recent years has come mainly from those who are not content with a “black box” and pounding a key. No science stays still, least of all RTTY. As a body we can point to the steady improvements that have come about in demodulators, the enormous impact of microprocessors which spawn new applications in RTTY every month, to name but a few. As a medium for passing information such as satellite orbital predictions, propagation forecasts and detailed alpha-numeric information at machine speeds, it excels as many who use it for this purpose on a regular basis can testify. Add to this Auto-start Selcal and a host of other interesting developments no wonder so many get ‘hooked’ on it. Let us not sell RTTY short—it is surely here to stay: ‘warts and all.’”

*Always mention "Short Wave Magazine" when writing to Advertisers — it helps you, helps them and helps us.*
**VHF BANDS**

**NORMAN FITCH, G3FPK**

**Awards News**

For some time now many readers have realised that our VHF Century Club award has become far easier to win on 2m. in particular, although it remains a considerable achievement on 4m. and 70 cm. Recently some readers have accumulated the minimum of 100 confirmations just a few months after being licensed. Accordingly, we are proposing to issue awards based upon QTH squares confirmed which should present a greater challenge, while retaining the established VHFC.

The awards will be known as the QTHCC, the basic requirement being the possession of confirmations from, at least 100 different QTH squares—e.g. ZL, AM, BI, etc.—on the chosen band. The starting date will coincide with our "Squares Table," i.e. January 1, 1975, and stickers will be issued for every additional 25 squares confirmed.

The QTHCC Awards will be available both to fixed and portable stations but portable operation must be from the same site, such as the regular one used for contests. If during the period of collecting the cards an applicant moves his permanent QTH, provided the move is within a 50 kilometre radius of the original QTH, he will not need to start again from scratch.

Only one class of award is proposed with no endorsements for mode or propagation method. However, only direct contacts are eligible via sporadic E, auroral, tropospheric and meteor scatter propagation or moonbounce. QSO's via repeaters and satellites are excluded. All applications must be made on a claim form which can be obtained by sending a self-addressed envelope to: Awards Dept. (QTHCC), Short Wave Magazine, 34 High Street, WELWYN, Herts., AL6 9EQ.

The form contains the complete rules. It may be a little while before the certificates are printed but applications will be processed as received.

Derek Purkiss, G8NNJ, is the sole recipient of the latest VHF Century Club award number 306 for 2m. His interest in the hobby stretches back to the days of the R1155 and CR100 receivers. More recently, the purchase of an FRG-7 Rx, plus a chance meeting with a local G4 licensee, spurred Derek on to taking the R.A.E. His present station in Romford, Essex, comprises an FDK "Multi 2700" and 5-ele. ZL-Special aerial. A 50 watts amplifier and 12-ele. beam were being constructed when the award was claimed.

On a much more irreverent note, Bob Lane, G4AWU, has sent along a specimen copy of the "R.D. Award," the R.D. meaning rubber duck. The beautifully prepared certificate has been designed and produced by fellow Yorkshireman Ian Harwood, G8LHT, and entitles the recipient to membership of the "Ultimately Kinky Flimsy Mackintosh Group." 50 qualifications are listed, any of which entitles the claimant to the award. These include gems as, "Anyone who thinks CW means Citizens Wireless," "Anyone who thinks repeaters should have QSL Managers," and "Anyone who thinks propagation is not possible between channels." For further information, an S.A.E. to either G4AWU or G8LHT is suggested. (Don't bother us! Ed.)

**Beacon Matters**

Brian Bower, G3COJ, has sent along details of proposed U.K. beacon frequency changes to comply with the agreements reached at the IARU Region 1 Conference last April. These are: GB3VHF (ALS2J) to 144-925 MHz; GB3NEX (Z012a) to 144-935 MHz and GB3GI (X041j) to 144-945 MHz. These QRG's have not yet been agreed by the Home Office. A new site will have to be found for GB3NEX to avoid interference to the GB3TW repeater. It seems that it will be some while before these changes are possible. GB3SUT is QRT for a major rebuild, according to GB2RS.

HB9RO, the VHF Manager of the Swiss national society, USKA, has asked the RSGB to suggest a new QRG for HB9HB, presently on 144-125 MHz, and 144-865 MHz is a possibility. In a letter to G3COJ, Jacques Talayrach, F9QW, the VHF Manager of the REF, mentions FX4UHF (ZD52b) on top of La Rhône mountain on the Franco-Spanish border. Brian has copied it once on about 432-86 MHz.

Licences for two 24 GHz beams have been applied for in the Isle of Wight and Alderney, probably the first amateur beacons anywhere in the world in this band.

And more and more complaints are being received by letter, telephone and on the air concerning the almost continual use of 144-90 MHz by a group of FM fixed and mobile stations in the London area. It has been pointed out to these amateurs many times that this is the middle of the internationally agreed beacon sub-band and that their inconsiderate actions make reception of FX3THF and FX0THF impossible for those wishing to check propagation or tweak up receivers.

Your scribe has listened to the lengthy harangues which have ensued when polite requests for a QSY have been made. Attitudes seem to range from downright, bloody-minded, refusal to even consider the idea, to a more reasonable agreement to shift "... in the spirit of amateur radio," as one occupant put it. In the 144-500-144-850 MHz part of the band, there is just one spot frequency our licences require we should avoid—144-54 MHz. In the current band plan there are five frequencies recommended for RTTY, Data, FAX, ATV talkback and Raynet in this part of the band, which leaves acres of space for this group, one would have thought. There is no reason either why "channel-mania" should suggest only one QSO per 25 kHz. Why not use oddball frequencies like 144-711 or 144-562 MHz?

It is hoped that current users of 144-90 MHz will ask themselves what they expect to achieve by antagonising their fellow amateurs, before official complaints are lodged. In this context it is pertinent to quote Clause 4 (1) of our licence: *viz:* "The apparatus comprised in the Station shall be so designed, constructed, maintained and used that..."
the use of the Station does not cause any undue interference with *any wireless telegraphy.*" (Our italics.) It would appear that beacons licensed to operate continuously would be included in the, "... any wireless telegraphy" category.

Jimmy Bruzon, ZB2BL, writes that they are shortly expecting the new 6m. beacon Tx which will be on 50-035 MHz. They are also awaiting a mains supply at the top of "The Rock" so that it can be installed. It is then hoped to put the 4m. beacon back on the air with the aid of a filter from G3UUT via G4CFF to get rid of the 3rd harmonic which falls on the Spanish TV Ch. 10.

Rumour has it that the Lannion 2m. beacon, FX3THF, now beams towards Rhodesia with an 18-ele. long yagi in connexion with the TEP study programme. Nothing like a bit of optimism!

**VHF Convention**

March 10 is the date for all VHF men to congregate at The Winning Post Hotel, Whitten, Middx. Geoff Stone, G3FLZL, has passed along the information on this annual RSGB event. The trade show will be component, module and accessory orientated, with no complete transceivers. There are three lecture streams planned. Stream "A" is devoted to Techniques covering SS/TV G8CGK; Microprocessors for VHF by G4CDU and the RTTY repeater GB3PT by G8MEI. Stream "B" is entitled Propagation Studies including Sporadic E by G3USF; Tropo. by G3LTP and auroral by G2FKZ. The "C" stream is for Microwave addicts with lectures on receiving systems by G3WDG; on microstrip techniques by G8DEK and on operating microwave equipment in the field by G4CNV. As usual, the talks will be in the Whitten School.

The Winning Post Hotel is on the northern side of the A316 Chertsey Road, the NGR being TQ 141731. Entry to the trade show and lectures is £1.00 (50p under 18) and the full ticket including the evening buffet supper will set you back £4.00.

**Contests**

Correction: Apologies to G8OGL whose station achieved second place in the Fixed section of the 144 MHz QRP contest on July 30 last year with

---

**THREE BAND ANNUAL VHF TABLE**

Final Placings, December 31, 1978

<table>
<thead>
<tr>
<th>Station</th>
<th><strong>FOUR METRES</strong></th>
<th><strong>TWO METRES</strong></th>
<th><strong>70 CENTIMETRES</strong></th>
<th><strong>TOTAL Points</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Countries</td>
<td>Countries</td>
<td>Countries</td>
<td></td>
</tr>
<tr>
<td>G3SPJ</td>
<td>61</td>
<td>8</td>
<td>43</td>
<td>203</td>
</tr>
<tr>
<td>G2AXI</td>
<td>46</td>
<td>7</td>
<td>38</td>
<td>173</td>
</tr>
<tr>
<td>G3JOE</td>
<td>50</td>
<td>7</td>
<td>28</td>
<td>163</td>
</tr>
<tr>
<td>G8MG</td>
<td>15</td>
<td>2</td>
<td>38</td>
<td>131</td>
</tr>
<tr>
<td>G8GML</td>
<td>—</td>
<td>—</td>
<td>19</td>
<td>129</td>
</tr>
<tr>
<td>G4CMV</td>
<td>—</td>
<td>—</td>
<td>38</td>
<td>126</td>
</tr>
<tr>
<td>G8LEF</td>
<td>—</td>
<td>—</td>
<td>26</td>
<td>124</td>
</tr>
<tr>
<td>G8BKR</td>
<td>—</td>
<td>—</td>
<td>36</td>
<td>115</td>
</tr>
<tr>
<td>G6LHT</td>
<td>—</td>
<td>—</td>
<td>31</td>
<td>115</td>
</tr>
<tr>
<td>G8EMW</td>
<td>—</td>
<td>—</td>
<td>21</td>
<td>108</td>
</tr>
<tr>
<td>G3WY</td>
<td>—</td>
<td>—</td>
<td>31</td>
<td>107</td>
</tr>
<tr>
<td>G4FIJ</td>
<td>31</td>
<td>3</td>
<td>17</td>
<td>107</td>
</tr>
<tr>
<td>G8IF</td>
<td>—</td>
<td>—</td>
<td>24</td>
<td>104</td>
</tr>
<tr>
<td>G4DEZ</td>
<td>—</td>
<td>—</td>
<td>38</td>
<td>103</td>
</tr>
<tr>
<td>G4FFK</td>
<td>—</td>
<td>—</td>
<td>24</td>
<td>102</td>
</tr>
<tr>
<td>G8KNV</td>
<td>—</td>
<td>—</td>
<td>21</td>
<td>100</td>
</tr>
<tr>
<td>G8MFJ</td>
<td>—</td>
<td>—</td>
<td>14</td>
<td>99</td>
</tr>
<tr>
<td>G4BYP</td>
<td>9</td>
<td>3</td>
<td>22</td>
<td>96</td>
</tr>
<tr>
<td>G8KSS</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>89</td>
</tr>
<tr>
<td>G8KG</td>
<td>—</td>
<td>—</td>
<td>6</td>
<td>88</td>
</tr>
<tr>
<td>G4FRE</td>
<td>1</td>
<td>1</td>
<td>24</td>
<td>86</td>
</tr>
<tr>
<td>G8ITS</td>
<td>—</td>
<td>—</td>
<td>26</td>
<td>85</td>
</tr>
<tr>
<td>G4HAO</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>80</td>
</tr>
<tr>
<td>G8ORH</td>
<td>—</td>
<td>—</td>
<td>4</td>
<td>78</td>
</tr>
<tr>
<td>G8APZ</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>72</td>
</tr>
<tr>
<td>G4GXT</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>67</td>
</tr>
<tr>
<td>G4CXO</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>65</td>
</tr>
<tr>
<td>G4KI</td>
<td>14</td>
<td>1</td>
<td>10</td>
<td>65</td>
</tr>
<tr>
<td>G8OOG</td>
<td>—</td>
<td>—</td>
<td>9</td>
<td>65</td>
</tr>
<tr>
<td>G8JJR</td>
<td>—</td>
<td>—</td>
<td>6</td>
<td>61</td>
</tr>
<tr>
<td>G8BJ</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>59</td>
</tr>
<tr>
<td>G8GRT</td>
<td>—</td>
<td>—</td>
<td>3</td>
<td>57</td>
</tr>
<tr>
<td>G8MKW</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>56</td>
</tr>
<tr>
<td>G8NYS</td>
<td>—</td>
<td>—</td>
<td>5</td>
<td>52</td>
</tr>
<tr>
<td>G4GET</td>
<td>—</td>
<td>—</td>
<td>9</td>
<td>51</td>
</tr>
<tr>
<td>G8FZL</td>
<td>—</td>
<td>—</td>
<td>7</td>
<td>49</td>
</tr>
<tr>
<td>G8JGK</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>38</td>
</tr>
</tbody>
</table>
516 points from 114 QSO’s. G4APL was in third place.

Coming events: Feb. 4 from 1000 to 1500 GMT is when the 432 MHz Fixed station contests take place. Two sections; single op. and multi-op. The weekend March 4/5 sees the 144/432 MHz affair from 1600-1600 GMT, while on April 6/7 respectively, the 1296 and 432 MHz Open contests are scheduled.

Trans-Equatorial Studies

Martin Harrison, G3USF, has passed along news about the continuing trans-equatorial propagation tests between Europe and South Africa in the 2m. band. Up to late November, results had not been as good as in the April/May period, but Roland Whiting, 5B4WR, has been hearing the ZE2JV beacon from time to time.

On November 5, between 1715 and 1725 GMT, Costas Fimerellis, SV1DH, in Athens, heard the ZS6DN beacon at good strength over a calculated 7,117 kms. path; “... obviously a notable event even though a QSO did not result,” to quote Martin. In an attempt to determine the propagation mode on 2m. simultaneous tape recordings of the 2m. and 10m. ZE2JV beacons are being made by the participants at the European end. The “pulsing” noted on ZE2JV’s signal on 28-331 MHz is associated with these tests.

SV1DH has passed information that in early November, FM contacts were made on 2m. between TU and EA8, representing up to 2,700 kms. distance. Costas also mentioned FM QSO’s between CT3 and CN, but that would not seem to be an exceptional distance and could be achieved quite easily via normal tropospheric propagation.

Six Metre Happenings

Jimmy Bruzon, ZB2BL, reports what is believed to be the first 50 MHz QSO between Gibraltar and Brazil and which took place on October 23 at 2222 GMT with PY1RO. The CW reports were RST 549 at each end and then PY1RO came on SSB with a RS 54 report from Gibraltar. Jimmy was using a Pye Base Station putting out 15 watts to a 5-ele. yagi beamin due south! The Rx was a Yaesu FR-101 which Howard, G8PCU, brought all the way from England.

At the time of the QSO with Brazil, Bernard Webb, G4EMR/ZB2DV, was in the shack and also worked PY1RO.

The QSO’s took place on the ZC2VHF beacon frequency of 50-004 MHz and it is believed that other PY stations have heard this beacon. PY1RO has also copied the Cyprus 6m. beacon 5B4CY on 50-498 MHz on November 1 between 2200 and 2300 GMT and it is thought that TEP was involved. 5B4CY is beaming towards South Africa so Brazil is way off that azimuth.

According to G3USF, PY1RO is hoping to commission a beacon on 50-005 MHz with 20 watts to a five-eighths wavelength aerial, on a 24-hours per day basis. Likewise, ZS5TR plans an entry in the 6m. beacon stakes some time.

Repeater Notes

The following VHF repeaters are now operational: GB3NB on R1 from Taconelston, Norfolk; GB3PR on R3 from Perth and GB3CF on R0 in Leicester. This latter would suggest that simplex working on SO should now cease to avoid accidentally accessing the Leicester relay.

On UHF, another five repeaters are operational: GB3HC on RB6 from Hereford; GB3HE on RB4 from Hastings; GB3NR on RB0 from Norwich; GB3PB on RB10 from Peterborough and GB3SP on RB4 from near Pembroke in Dyfed.

The Satellite Scene

Ron Broadbent, G3AAJ, the secretary of AMSAT-UK, advises that they are producing a three months calendar for the Russian satellites RS-1 and RS-2. For details and costs send an s.a.e. to him at 94 Herongate Road, London, El 2 5EQ.

Predictions for the ailing Oscar 7'

Oscar 8 and the Russian birds are still being broadcast over GB2RS although it was suggested earlier they would not be. The periods for RS-1 and RS-2 are quoted as 120-389433 minutes and 120-416521 mins. respectively, the corresponding longitude increments being 30-227° and 30-234° west per revolution. RS-1 is very easily overloaded by the power-mad western European brigade and it is rare to have a successful contact through it. RS-2’s Rx appears to be some 10 dB.

At the time of the QSO with Brazil, Bernard Webb, G4EMR/ZB2DV, was in the shack and also worked PY1RO.

The QSO’s took place on the ZC2VHF beacon frequency of 50-004 MHz and it is believed that other PY stations have heard this beacon. PY1RO has also copied the Cyprus 6m. beacon 5B4CY on 50-498 MHz on November 1 between 2200 and 2300 GMT and it is thought that TEP was involved. 5B4CY is beaming towards South Africa so Brazil is way off that azimuth.

According to G3USF, PY1RO is hoping to commission a beacon on 50-005 MHz with 20 watts to a five-eighths wavelength aerial, on a 24-hours per day basis. Likewise, ZS5TR plans an entry in the 6m. beacon stakes some time.

Repeater Notes

The following VHF repeaters are now operational: GB3NB on R1 from Taconelston, Norfolk; GB3PR on R3 from Perth and GB3CF on R0 in Leicester. This latter would suggest that simplex working on SO should now cease to avoid accidentally accessing the Leicester relay.

On UHF, another five repeaters are operational: GB3HC on RB6 from Hereford; GB3HE on RB4 from Hastings; GB3NR on RB0 from Norwich; GB3PB on RB10 from Peterborough and GB3SP on RB4 from near Pembroke in Dyfed.

The Satellite Scene

Ron Broadbent, G3AAJ, the secretary of AMSAT-UK, advises that they are producing a three months calendar for the Russian satellites RS-1 and RS-2. For details and costs send an s.a.e. to him at 94 Herongate Road, London, El 2 5EQ.

Predictions for the ailing Oscar 7'

Oscar 8 and the Russian birds are still being broadcast over GB2RS although it was suggested earlier they would not be. The periods for RS-1 and RS-2 are quoted as 120-389433 minutes and 120-416521 mins. respectively, the corresponding longitude increments being 30-227° and 30-234° west per revolution. RS-1 is very easily overloaded by the power-mad western European brigade and it is rare to have a successful contact through it. RS-2's Rx appears to be some 10 dB.
516 points from 14 QSO’s. G4APL was in third place.

Coming events: Feb. 4 from 1000 to 1500 GMT is when the 432 MHz Fixed station contests take place. Two sections; single op. and multi-op. The weekend March 4/5 sees the 144/432 MHz affair from 1600-1600 GMT, while on April 6/7 respectively, the 1296 and 432 MHz Open contests are scheduled.

Trans-Equatorial Studies

Martin Harrison, G3USF, has passed along news about the continuing trans-equatorial propagation tests between Europe and South Africa in the 2m. band. Up to late November, results had not been as good as in the April/May period, but Roland Whiting, 5B4WR, has been hearing the ZE2JV beacon from time to time.

On November 5, between 1715 and 1725 GMT, Costas Fimerellis, SV1DH, in Athens, heard the ZS6DN beacon at good strength over a calculated 7,117 kms. path; “... obviously a notable event even though a QSO did not result,” to quote Martin. In an attempt to determine the propagation mode on 2m. simultaneous tape recordings of the 2m. and 10m. ZE2JV beacons are being made by the participants at the European end. The “pulsing” noted on ZE2JV’s signal on 28-331 MHz is associated with these tests.

SV1DH has passed information that in early November, FM contacts were made on 2m. between TU and EA8, representing up to 2,700 kms. distance. Costas also mentioned FM QSO’s between CT3 and CN, but that would not seem to be an exceptional distance and could be achieved quite easily via normal tropospheric propagation.

Six Metre Happenings

Jimmy Bruzon, ZB2BL, reports what is believed to be the first 50 MHz QSO between Gibralter and Brazil and which took place on October 23 at 2222 GMT with PY1RO. The CW reports were RST 549 at each end and then PY1RO came on SSB with a RS 54 report from Gibralter. Jimmy was using a Pye Base Station putting out 15 watts to a 5-ele. yagi beamin due south! The Rx was a Yaesu FR-101 which Howard, G8PCU, brought all the way from England.

At the time of the QSO with Brazil, Bernard Webb, G4EMR/ZB2DY, was in the shack and also worked PY1RO.

The QSO’s took place on the ZCZVHF beacon frequency of 50-004 MHz and it is believed that other PY stations have heard this beacon. PY1RO has also copied the Cyprus 6m. beacon 5B4CY on 50-498 MHz on November 1 between 2200 and 2300 GMT and it is thought that TEP was involved. 5B4CY is beaming towards South Africa so Brazil is way off that azimuth.

According to G3USF, PY1RO is hoping to commission a beacon on 50-005 MHz with 20 watts to a five-eighths wavelength aerial, on a 24-hours per day basis. Likewise, ZS5TR plans an entry in the 6m. beacon stakes some time.

Repeater Notes

The following VHF repeaters are now operational: GB3NB on R1 from Tacolneston, Norfolk; GB3PR on R3 from Perth and GB3CF on RØ in Leicester. This latter would suggest that simplex working on SO should now cease to avoid accidentally accessing the Leicester relay.

On UHF, another five repeaters are operational: GB3HC on RB6 from Hereford; GB3HE on RB14 from Hastings; GB3NR on RBØ from Norwich; GB3PB on RB10 from Peterborough and GB3SP on RB4 from near Pembroke in Dyfed.

The Satellite Scene

Ron Broadbent, G3AAJ, the secretary of AMSAT-UK, advises that they are producing a three months calendar for the Russian satellites RS-1 and RS-2. For details and costs send an s.a.e. to him at 94 Herongate Road, London, E12 5EQ.

Predictions for the ailing Oscar 7

Oscar 8 and the Russian birds are still being broadcast over GB2RS although it was suggested earlier they would not be. The periods for RS-1 and RS-2 are quoted as 120-389433 minutes and 120-416521 mins. respectively, the corresponding longitudinal increments being 30-227° and 30-234° west per revolution. RS-1 is very easily overloaded by the power-mad western european brigade and it is rare to have a successful contact through it. RS-2’s Rx appears to be some 10 dB.

<table>
<thead>
<tr>
<th>Station</th>
<th>Counties</th>
<th>Countries</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>G4DEZ</td>
<td>75</td>
<td>28</td>
<td>103</td>
</tr>
<tr>
<td>G3FPK</td>
<td>78</td>
<td>24</td>
<td>102</td>
</tr>
<tr>
<td>G8GPX</td>
<td>73</td>
<td>21</td>
<td>95</td>
</tr>
<tr>
<td>G4CMV</td>
<td>64</td>
<td>26</td>
<td>90</td>
</tr>
<tr>
<td>G8KSS</td>
<td>70</td>
<td>19</td>
<td>89</td>
</tr>
<tr>
<td>G8BKX</td>
<td>72</td>
<td>16</td>
<td>88</td>
</tr>
<tr>
<td>G3SJ</td>
<td>66</td>
<td>16</td>
<td>82</td>
</tr>
<tr>
<td>G8HHI</td>
<td>62</td>
<td>19</td>
<td>81</td>
</tr>
<tr>
<td>G18EWM</td>
<td>68</td>
<td>13</td>
<td>81</td>
</tr>
<tr>
<td>G8KGF</td>
<td>62</td>
<td>18</td>
<td>80</td>
</tr>
<tr>
<td>G8LEF</td>
<td>63</td>
<td>17</td>
<td>80</td>
</tr>
<tr>
<td>G4HSH</td>
<td>68</td>
<td>12</td>
<td>80</td>
</tr>
<tr>
<td>G8GML</td>
<td>64</td>
<td>14</td>
<td>78</td>
</tr>
<tr>
<td>G8JFT</td>
<td>62</td>
<td>15</td>
<td>77</td>
</tr>
<tr>
<td>G4BKT</td>
<td>58</td>
<td>18</td>
<td>76</td>
</tr>
<tr>
<td>G8MFJ</td>
<td>61</td>
<td>14</td>
<td>75</td>
</tr>
<tr>
<td>G2AUX</td>
<td>59</td>
<td>15</td>
<td>74</td>
</tr>
<tr>
<td>G4ERK</td>
<td>57</td>
<td>16</td>
<td>73</td>
</tr>
<tr>
<td>G8APZ</td>
<td>57</td>
<td>16</td>
<td>73</td>
</tr>
<tr>
<td>G8LTT</td>
<td>59</td>
<td>14</td>
<td>73</td>
</tr>
<tr>
<td>G2HDZ</td>
<td>61</td>
<td>11</td>
<td>72</td>
</tr>
<tr>
<td>G4GXT</td>
<td>61</td>
<td>11</td>
<td>72</td>
</tr>
<tr>
<td>G3SW</td>
<td>55</td>
<td>16</td>
<td>71</td>
</tr>
<tr>
<td>G3KPU</td>
<td>58</td>
<td>13</td>
<td>71</td>
</tr>
<tr>
<td>G8KKNV</td>
<td>51</td>
<td>19</td>
<td>70</td>
</tr>
<tr>
<td>G4GEE</td>
<td>58</td>
<td>12</td>
<td>70</td>
</tr>
<tr>
<td>G3C0</td>
<td>54</td>
<td>15</td>
<td>69</td>
</tr>
<tr>
<td>G8JRU</td>
<td>51</td>
<td>10</td>
<td>61</td>
</tr>
<tr>
<td>G4AEZ</td>
<td>48</td>
<td>12</td>
<td>60</td>
</tr>
<tr>
<td>G4CMXP</td>
<td>45</td>
<td>14</td>
<td>59</td>
</tr>
<tr>
<td>G8BIJ</td>
<td>50</td>
<td>9</td>
<td>59</td>
</tr>
<tr>
<td>G35ORH</td>
<td>42</td>
<td>16</td>
<td>58</td>
</tr>
<tr>
<td>G4FRE</td>
<td>49</td>
<td>8</td>
<td>57</td>
</tr>
<tr>
<td>G8MKW</td>
<td>47</td>
<td>9</td>
<td>56</td>
</tr>
<tr>
<td>G8ITS</td>
<td>46</td>
<td>9</td>
<td>55</td>
</tr>
<tr>
<td>G3FJ</td>
<td>44</td>
<td>9</td>
<td>53</td>
</tr>
<tr>
<td>G4BYP</td>
<td>44</td>
<td>9</td>
<td>53</td>
</tr>
<tr>
<td>G8NYS</td>
<td>44</td>
<td>8</td>
<td>52</td>
</tr>
<tr>
<td>G4GET</td>
<td>42</td>
<td>9</td>
<td>51</td>
</tr>
<tr>
<td>G8OGD</td>
<td>42</td>
<td>9</td>
<td>51</td>
</tr>
<tr>
<td>G4FKI</td>
<td>33</td>
<td>6</td>
<td>39</td>
</tr>
<tr>
<td>G8GRT</td>
<td>35</td>
<td>4</td>
<td>39</td>
</tr>
<tr>
<td>G8JGK</td>
<td>29</td>
<td>9</td>
<td>38</td>
</tr>
<tr>
<td>G8AAZ</td>
<td>31</td>
<td>6</td>
<td>37</td>
</tr>
</tbody>
</table>

Two-Metre Annual Table

Final Placings at December 31, 1978
dearer, which helps a little. At the beginning of February, RS-2 will be crossing the Equator 31½ mins. after RS-1 and about 8½° further west.

**Meteor Scatter**

MS seems to be the facet of the VHF scene which is rapidly gaining more enthusiasts. From Cumbria, Bill Hodgson, G3BW, has been putting YO square on the MS map and since November has concluded QSO's with: I1DMP (DF), I3LG (GF), DM2BYE (HM), SM2CKR (KX), F6DWG (BJ), DK5RQ (GI), HB9MFL (DH), which was a CW/SSB contact, DF6NA (EJ), DJ5MS (GI), SM3FGL (IV) and I4EAT (FE). Bill writes: “The QSO with I4EAT was a revelation to me; imagine bursts of machine-gun like morse for 50 seconds. Not spasmodic but almost continuous ...”

Another who is consistently beavering away at it is John Hunter, G3IMV (Bucks.), now with 32 countries to his credit on 2m. During the recent Quadrantids he worked OH3YW in MU square for a new one and enters our table at 172. The Geminids in mid-December brought HG6KVB/F (KH) and F6BVA (DD) and on Dec. 24, John made it with HG1YA (IH) and on the 30th, with ISMCFY (FD). For Clive Penna, G3POL, the Quadrantids produced a new country and square in ISOPUD (EZ). An interesting schedule was with SM3BIU (HX) during which they changed beam headings by 10° each 6 mins. in the one hour sked to test out offset calculations. It was found that best reflexions occurred when they beamed at each other although random, as opposed to shower, reflexions led to some confusion.

Tony Horsfall, G4CBW (nr. Stockport) completed a Quadrantids QSO with OH0JN, but did not complete his schedule with that station. However, John did complete with IZ0QBC (CG) on random and DM2BYE, but missed out on OK1OA. Clive Morton, G4CMV, (W. Yorks.) was active in the Geminids and completed matters with SM3COL (IW) in 12 mins. but took 1½ hours to work EA6BW (BZ) on Dec. 14, with bursts rarely exceeding two seconds. The EA6 was Clive’s 30th country on 2m. Skeds with RA3YCR (RN), LZ1CD (LU) in 50 mins. and with OE5KE (JI), Poland being a new country.

Bryn Llewellyn, G4DEZ (Oxon.), now has his two 16-ele. Tonna yagis working to good effect. Quadrantids QSO’s were completed with: F1DIK (DD), SM5BEI (JU), OH0JN, IW3QBC, but those with SM3DCX, OH7TN and YU3TCD did not come off. All those on SSB, by the way. Martyn Baker, G8KGF (Oxon.), completed with OH1FA (LU) in 50 mins. and with OE5KE (HI) in just the hour in the Quadrantids. The final “Rogers” were missing in the F1DYD (CF) sked.

Ken Osborne, G8KSS (Avon.), made it in 20 mins. on the random SSB frequency with SM3FGL, but the OE5KE contact took 1½ hours. Skeds with OH3YW and OH1FA were not completed. From Jersey, Phil Johnson, GJ8KJV, now has a 16-ele. Tonna aloft and was active in the Geminids during which he worked SP5JC (KM) and OE5JFL (GI), Poland being a new country. Alastair Simpson, GM8NCM (Fife), took part in the Geminids, his successes being: DJ3TF (FJ), SM3FGL, YU3TCD (GF), DC7UT (GM) and I1KTC (EF). He found the bursts this year very short.

The general consensus is that neither shower was all that good. Nevertheless, it is encouraging to learn how this challenging mode is catching on. For those seeking a reliable memory keyer design, your scribe has spoken to several MS types who have built the G4CIK design which was featured in the Short Wave Magazine for Dec. 1977, Sept. 1978 with corrections in Nov. 1978.

A number of operators in SSB MS skeds are now using 30 second transmission periods. Now most everybody should have accurate clocks—not those relying on the mains supply being 50 Hz though—there is no reason why this should not become the norm for this mode. However, for random SSB operation around 144-20 MHz the one minute periods should be used otherwise, chaos will ensue.

**European Notes**

Jimmy Bruzon, ZB2BL, now has his own 6m. converter back, thanks
the "appliance operator" syndrome. Quite rightly he points out that not all the newcomers can afford the black boxes and wonders if anyone has constructed a simple 2m SSB transceiver lately? If so, he would like to see it described in the magazine.

Bob Lane, G4AWU, had an unusual 2m QSO on Dec. 6 at 1510 GMT, when he worked WD3HEN/AM in Region 2. The operator was Wynn, the navigator of a B52D bomber flying at 37,000 feet, and he was using an Icom IC-245 to a quarter wave whip.

G4CMV's long letter covers November and December and Clive complains about the terrible conditions in December. The aurora on the 29th was a very brief affair during which GM3XNE (XR) and GM8NFG (Orkney) were heard. Summing up 1978, G4CMV did well on Ar but not so good via E's. Even so, nine new countries were worked.

John Dougherty's, G4FUT, letter missed the boat last month but listed some choice stuff worked in the Ar of Jan. 7. As usual, it occurred at December 31, 1978

Many readers have got off to a flying start this year, thanks to some MS and editing this lot. The deadline for the May feature is March 8 and for April 5. All to: "VHF Bands," at December 31, 1978

FOUR -METRE ANNUAL TABLE

<table>
<thead>
<tr>
<th>Station</th>
<th>Counties</th>
<th>Countries</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>G3SPJ</td>
<td>61</td>
<td>8</td>
<td>69</td>
</tr>
<tr>
<td>G3CO</td>
<td>50</td>
<td>7</td>
<td>57</td>
</tr>
<tr>
<td>G2AXI</td>
<td>46</td>
<td>7</td>
<td>53</td>
</tr>
<tr>
<td>G2DHDZ</td>
<td>45</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>G4ERX</td>
<td>38</td>
<td>5</td>
<td>43</td>
</tr>
<tr>
<td>G3FJ</td>
<td>31</td>
<td>3</td>
<td>34</td>
</tr>
<tr>
<td>G4AEZ</td>
<td>29</td>
<td>4</td>
<td>33</td>
</tr>
<tr>
<td>G4BWG</td>
<td>23</td>
<td>4</td>
<td>27</td>
</tr>
<tr>
<td>G4GEE</td>
<td>15</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>G4FKI</td>
<td>14</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>G4BYF</td>
<td>9</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>GM4CXP</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>G4FRE</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

70-CENTIMETRE ANNUAL TABLE

<table>
<thead>
<tr>
<th>Station</th>
<th>Counties</th>
<th>Countries</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>GBGML</td>
<td>53</td>
<td>12</td>
<td>65</td>
</tr>
<tr>
<td>GBGXP</td>
<td>54</td>
<td>9</td>
<td>63</td>
</tr>
<tr>
<td>G8LEF</td>
<td>46</td>
<td>16</td>
<td>62</td>
</tr>
<tr>
<td>G4CMV</td>
<td>41</td>
<td>11</td>
<td>52</td>
</tr>
<tr>
<td>G3SPJ</td>
<td>43</td>
<td>9</td>
<td>52</td>
</tr>
<tr>
<td>G2DHDZ</td>
<td>42</td>
<td>9</td>
<td>51</td>
</tr>
<tr>
<td>G4ERX</td>
<td>37</td>
<td>11</td>
<td>48</td>
</tr>
<tr>
<td>G8BKR</td>
<td>41</td>
<td>6</td>
<td>47</td>
</tr>
<tr>
<td>G2AXI</td>
<td>38</td>
<td>8</td>
<td>46</td>
</tr>
<tr>
<td>G8HFI</td>
<td>38</td>
<td>7</td>
<td>45</td>
</tr>
<tr>
<td>G3KPU</td>
<td>38</td>
<td>8</td>
<td>44</td>
</tr>
<tr>
<td>G4GEE</td>
<td>38</td>
<td>6</td>
<td>44</td>
</tr>
<tr>
<td>G8LHT</td>
<td>31</td>
<td>11</td>
<td>42</td>
</tr>
<tr>
<td>G3CO</td>
<td>28</td>
<td>9</td>
<td>37</td>
</tr>
<tr>
<td>G3BW</td>
<td>31</td>
<td>5</td>
<td>36</td>
</tr>
<tr>
<td>G4BYF</td>
<td>25</td>
<td>6</td>
<td>31</td>
</tr>
<tr>
<td>G4AEZ</td>
<td>26</td>
<td>5</td>
<td>31</td>
</tr>
<tr>
<td>G3FJK</td>
<td>21</td>
<td>9</td>
<td>30</td>
</tr>
<tr>
<td>G8FPS</td>
<td>26</td>
<td>4</td>
<td>30</td>
</tr>
<tr>
<td>G82EWM</td>
<td>19</td>
<td>4</td>
<td>23</td>
</tr>
<tr>
<td>G4FRE</td>
<td>24</td>
<td>3</td>
<td>27</td>
</tr>
<tr>
<td>G8FIT</td>
<td>24</td>
<td>3</td>
<td>27</td>
</tr>
<tr>
<td>G4BWG</td>
<td>19</td>
<td>7</td>
<td>26</td>
</tr>
<tr>
<td>G8MFJ</td>
<td>22</td>
<td>2</td>
<td>24</td>
</tr>
<tr>
<td>G8VOR</td>
<td>15</td>
<td>6</td>
<td>21</td>
</tr>
<tr>
<td>G3FJ</td>
<td>17</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>G8GRT</td>
<td>15</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>G8OGD</td>
<td>9</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>G38AZ</td>
<td>7</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>G4FKI</td>
<td>10</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>G8GKF</td>
<td>6</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>G8APZ</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>GM4CXP</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

Finale

Congratulations to Colin Woof, G3SPJ, clear winner of the Three Band Annual Contest. Many readers have got off to a flying start this year, thanks to some MS and the Ar of Jan. 7. As usual, it occurred while G3FPK was in the middle of editing this lot. The deadline for the April feature is March 8 and for May, April 5. All to: "VHF Bands," Short Wave Magazine, 34 High Street, Welwyn, Herts., AL6 9EQ. 73 de G3FPK.
These photographs should have accompanied 'Amateur Radio—Communication or Technology, or Both? Part VII' which appeared in the December issue: Fig. 1, sawing thin sheet aluminium clamped between two lengths of mild steel angle in a bench vice; Fig. 3, using a 0-Max sheet metal punch on 18 s.w.g. aluminium—the punch is clamped in the bench vice and the die drawn onto it by tightening the screw; Fig. 4, using a home-made circle cutter with a speed-reducing attachment and a standard pistol drill—backing for the sheet metal is a piece of 1\text{in.} softwood; Fig. 5, using an Abrasive to cut a rectangular hole in a die-cast box lid; Fig. 6, bending a piece of 18 s.w.g. sheet metal.
SECURICOR

Radio Shack Ltd

188 BROADHURST GARDENS, LONDON NW6 3AY

Just around the corner from West Hampstead Underground Station

Telephone: 01-624 7174


Open Monday-Friday 9-5. Saturday 9-12.30. Closed for lunch 1-2

DRAKE RECEIVERS & ACCESSORIES
R-4C. Receiver—5SB, AM, SW, RTTY £495.00
FL 250. Filter for R-4C (250 kHz) £60.00
FL300. Filter for R-4C (300 kHz) £60.00
FL 4000. Filter for R-4C (400 kHz) £60.00
FL 14000. Filter for R-4C (14000 kHz) £60.00
4-8N. Blanker for R-4C £48.00
MS-4. Matching spkr. for R-4C/T-4XC/TR-4CW £47.75
Crls. Accessory crystals for R-4C £45.00
SP-4. Receiver—general purpose £65.00
DC Power Cord for SP-4 £6.04
4-8N-Crystals operating crystals for SP-4 £6.00
DSR-2. Digital receiver £2,750.00
SS-71. Receiver-28/210 khz. £131.70

DRAKE TRANSDUCERS & ACCESSORIES
TR-7. Transmitter with DR-7 general coverage/digital readout fitted £684.00
PS-7. 120/240V. Power Supply for TR-7 £135.00
RV-7. Remote VFO for TR-7 £195.00
MS-7. Selectable VFO £19.90
NL-7. Noise Blanker for TR-7 £58.00
FARM-4.Farm receiver £275.00
AUX-7. Range prog. board for TR-7 £228.00
RR-4. Receive range module for TR-7 £36.00
RRT-7. Range transceiver for TR-7 £36.00
SL-300. CW Filter for TR-7 (300 kHz) £36.00
SL-500. CW Filter for TR-7 (500 kHz) £36.00
LM-520. AM filter for TR-7 (520 kHz) £36.00
SL-600. Filter for TR-7 (600 kHz) £36.00
MKK-7. Mobile mounting kit for TR-7 £225.00
MN-7. ATU/RF wattmeter. 160-1000w £123.75
WH-7. HF wattmeter/VSBR bridge £59.40
TR-7. Transmitter—SSB, CW with R.I.T. £504.00
AC-4. 15/240V. PSU for TR-4CW £108.00
34-PNB. Plug-in Noise Blanker for R-4C £72.00
DC-4. 12v. PSU for TR-4CW(T)/4XC £196.75
RV-4C. Remote VFO for R-4C £105.00
UV-3E. 144-432 MHz Filter £69.00
PS-1. AC Power Supply for UV-3E £69.00
UMK-3. Remote Trunk Kit for UV-3E £54.00
DS-7. TRANSMITTERS & ACCESSORIES £389.00
T-4XC. Transmitter. £365.00

DRAKE ADDITIONAL ACCESSORIES
TV-4C. LP. Low Pass Filter 10khz £10.12
TV 3300 LP. Low Pass Filter 2 kHz £18.00
RP-4C. Remote Power £17.50
7092. Hand mic. for UV-3E/TR-7 £36.00
7073. Hand mic. for UV-3E/TR-7 £36.00
7073. Hand mic. for UV-3E/TR-7 £36.00
DL-1000. Dummy Load £29.70
ROS-2. Remote control antenna switch £83.25
B-1000. Balun £54.00
The R. L. Drake Company are no longer making the following items however, we still have a few of each—please check our stock position before ordering:
FF-1. Crystal Control for TR-4CW £38.25
A-10. 10 watts 2m. Amplifier £45.00
WV-4. RF Wattmeter 200-2000 MHz £44.00

DRAKE RECEIVERS & ACCESSORIES
TH3MK3. 3 element beam for 10/15/20 £76.32
TH1MK3. 3 element beam for 10/15/20 £76.32
TH2MK3. 2 element beam for 10/15/20 £76.32
LY-520. 2 element quad for 10/15/20 £190.12
DB-16-15A. 10 and 15m. beam £129.38
2B18. 4 element 20m. beam £174.35
2B3A. 3 element 20m. beam £132.10
1B18. 1 element 15m. beam £129.38
1B3A. 1 element 10m. beam £157.38
4B2A. 2 element 40m. beam £177.75
511. 5 element Yagi £115.59
427. DX Drug spring £4.50
492. Miniature spring £4.50
LA-1. Lightning arrester £15.30
LA-2. RFI Lighting arrester £13.71
BL-12. Ferrite balun £15.19
TR-4C. TRANSMITTER £899.00
TS 2050. 160-10m. Transceiver. 20WV. £165.00
TS 5205. 1B-2B8 MHz SSB Transv. £165.00
TL 922. HF Linear. 2 kW. 160-10m. £165.00
TS 120V. 80-10m. Transceiver. 20WV. £165.00
TS 7005. 2m. all mode Transceiver **digital** £165.00
TR 7010. 3SB. SSB/mobile transceiver. 10W £189.00
TR 7400A. 2m. FM mobile transceiver. 30W. £189.00
TR 7050. 4m. FM mobile transceiver. 10W. £235.00
TR 8300. 70cm. FM mobile transceiver. £267.00
TR 3200. 2m. FM transceiver fitted 3 ch. £198.00
RD-1000. General coverage Receiver £185.00
We have listed a few Trans items—but we stock the whole range.
VHF HAM-AMS £96.75
BS. BANTEX 2m. 5/8 fibreglass whip £6.75
MAGNETI MARELLI £16.37
BD. Boat Mount £6.75
SU. Single-hold body Mount £3.89
MA-41. DAIWA 3m. wave guttermounting £12.00
AS-DM. ASASI guttermount £12.00
ESSE-8U. CALLETTI 2m. 5/8 whip £6.75
CALLETTI 2m. 5/8 whip-gutter £6.75
CALLETTI 2m. 5/8 whip-gutter. £6.75
GP-BV. CALLETTI 2m. Ground Plane £13.90
TAS. JAYBEM 2m. 5/8 whip with £5.49

MISCELLANEOUS
SR-9. VHF marine receiver 156-162 £58.50
RR-56. 2m. FM receiver tunable/crystal £54.00
MS-2. Seiwa 2m. pocket scanner 4 channels £177.10
AM-12. 2m. scanner receiver with 8 crystals £112.50
348F. Crystal for NR-56 £6.48
EK-150. KATSUMI keyer 240V. 12/1v £173.75
DC-8. SWR-2. Single-meter swr/power meter £30.93
SWR-25. Twin meter swr/power meter £72.00
HR-10. Headphones 8-16 ohms £6.75
Type F. MORSE KEYS, ex-government £1.62

BARKER AND WILLIAMSON
331A. Little Dipper 2-120 MHz grid dip meter £81.00
334A. Dummy load/Whitewater. 1kW £150.00
371. Wide-range Attenuator £23.75
379. Protax antenna switch £15.30
397. Coupler £33.75
S55A. Antenna switch 6-way £16.20
S55. Antenna switch 6-way £16.20

AMECO
Equipment
OGBK. Code practice oscillator kit £12.38
OGBW. Code practice oscillator kit £12.38
PL-2. 2ET Receiver preamp £47.25
PT-2. 2ET Transmitter preamp 10-160m £67.50
20/40. SSB Transceiver Code. 33r.p.m. £67.50
Record
101-33. Senior Code Course. 33r.p.m. £54.00
101-33. Senior Code Course. £68.48
101-33. Advanced Code Course. 33r.p.m. £82.00
101-T. Advanced Code Course. £3.78
105-33. Gen. class supplementary course 33 r.p.m. £82.00

Radio Shack Ltd

188 BROADHURST GARDENS, LONDON NW6 3AY

Just around the corner from West Hampstead Underground Station

Telephone: 01-624 7174


Open Monday-Friday 9-5. Saturday 9-12.30. Closed for lunch 1-2

DRAKE SALES SERVICE

BARCLAYCARD

HIRE PURCHASE
RADIO SHACK LTD

Volume XXXVI  THE SHORT WAVE MAGAZINE  715

SECURICOR

RAK DRAKE SALES SERVICE

HIRE PURCHASE

Radio Shack Ltd

188 BROADHURST GARDENS, LONDON NW6 3AY

Just around the corner from West Hampstead Underground Station

Telephone: 01-624 7174


Open Monday—Friday 9—5, Saturday 9—12.30. Closed for lunch 1—2

DRAKE

RADIO SHACK LTD for

inc. VAT

JAYBEAM ANTENNAS—continued

PMH/2C. 3-way phasing harness...

Q4/2M. 4 element quad yagi...

Q6/2M. 6 element quad yagi...

DS/2M. Double 5 slot-fed yagi...

DB/2M. Double 8 slot-fed yagi...

SVME/2M. Mounting kit...

UGP/2M. Unipole & ground plane...

HM/2M. Mobile halo with mast...

PHM/2M. 2-way phasing harness for two 2m. anls...

PHM/4M. 4-way phasing harness...

DB/70cm. Double 8 slot-fed yagi...

PBM/70cm. 18 element Parasbeam...

BMI/70cm. 48 element Multibeam...

TAS. 2m. 518 mobile who...

US. 70cm. Collinear 50dB...

DL. Double lashing chimney kit...

W6. 6" wall bracket...

W24 HD. 24" wall standoff bracket...

inc. VAT

14 swg enamelled copper wire...

4-core. Rotator control cable per metre...

5-core. Rotator control cable per metre...

8-core. Rotator control cable per metre...

TEN-TEC

509. ARGONAUT SW. SSB/CW Transceiver...

540. TRITON 1v. 200W. SSB/CW Transceiver 3—30...

544. Digital. TRITON 1v. 200W. SSB/CW Transceiver 3—30...

546. OMNI-A Analogue Transceiver...

546. OMNI-D Digital Transceiver...

570. CENTURY 21. 70W. CW Transceiver 3—29MHz...

574. Digital. CENTURY D...

405. Linear Amp. 100W. 3—35 MHz...

210£ (IA). 115/230v. AC/13v. DC PSU for Argonaut...

225£ (IA). 115/230v. AC/13v. DC PSU for Argonaut...

225£ (IA). 115/230v. AC/13v. DC PSU for Argonaut...

225£ (IA). 115/230v. AC/13v. DC PSU for Argonaut...

TEN-TEC

509. ARGONAUT SW. SSB/CW Transceiver...

540. TRITON 1v. 200W. SSB/CW Transceiver 3—30...

544. Digital. TRITON 1v. 200W. SSB/CW Transceiver 3—30...

546. OMNI-A Analogue Transceiver...

546. OMNI-D Digital Transceiver...

570. CENTURY 21. 70W. CW Transceiver 3—29MHz...

574. Digital. CENTURY D...

405. Linear Amp. 100W. 3—35 MHz...

210£ (IA). 115/230v. AC/13v. DC PSU for Argonaut...

225£ (IA). 115/230v. AC/13v. DC PSU for Argonaut...

225£ (IA). 115/230v. AC/13v. DC PSU for Argonaut...

225£ (IA). 115/230v. AC/13v. DC PSU for Argonaut...

HALL COMMUNICATIONS CORP.

Electronic Tuning System...

DS-3000. KSR version 3.X (ASCI/111) Bauds(Mode)

DS-3000. KSR version 2.X (ASCI/111) Bauds...

ST-4005. Demodulator/Keyer with scope...

ST-2914. Demodulator/Keyer with scope...

RVD-1005. Visual Display Unit...

DKB-2010. Dual mode keyboard with 128 key buffer memory...

Telephone 01-624 7174 with your

ACCESS or BARCLAYCARD number for immediate DISPATCH

ASTATIC MICROPHONES

T-UGK—D104. Silver Eagle gold-plated transistorised...

T-UGK—D104. Silver Eagle chrome-plated transistorised...

UG8-D104. The famous Crystal D104...

T-UGK—D104. Transisterised amplified D104 grip...

T-UPP—D104. Transisterised amplified...

525 D/L. Dynamic Hand Microphone. "Butkeye"

565 M6. Hand Microphone FET...

D104-M. Hand Microphone D104 ampl. 4—wire...

D104-M. Hand Microphone D104 ampl. 6—wire...

550 M6. Hand Mic. noise-cancelling "Trucker"

550 M6. Hand Mic. noise-cancelling...

531. Hand Mic. mobile. High Z...

531. Hand Mic. mobile. noise-cancelling...

TELEX COMMUNICATIONS INC.

Lightweight Headphones 3.2—20 MHz...

HGC-91. Underchin 1.5 oz. with foam earpad...

HMF-52. Underchin 1.5 oz. with plastic earpad...

HT-2. 1.6 oz. Twin Receiver headphone...

C-610. 3—20 MHz. Driving Amplifier Magnetic...

BW-410. 2000 libre. Dual Receiver Magnetic...

C-1210. 3—20 MHz. Dynamic foam-padded...

C-1210. 3—20 MHz. Dynamic foam-padded...

C-1220. As C-1220. ...

C-1220. As C-1220. ...

C-1220. As CM-1320 with Single...

( all the above headphones fitted ptd switch)

Microphones (hand-held battery powered)

ProCom I. Electret High Output...

ProCom II. Electret Variable Gain...

CB-78. Dynamic Noise-cancelling ...

IBM 5-6 with 6-wire universal lead...

HUSTLER ANTENNAS

H-531. Follower 600...

RM-1. Bumper mount...

C-32. Ball mount...

RM-10. 10m. Resonator...

HT-15. 15m. Resonator...

RM-20. 20m. Resonator...

RM-40. 40m. Resonator...

RM-80. 80m. Resonator...

SF-2. 2m. 5/8 whip...

DCX. Dicose VHIF/UHF 40—700 MHz...

CGT-144. 2m. Colinear with mount...

CGT-144. 2m. Colinear with mount...

GT-144A. 2m. Colinear with mount...

CGT-144. 2m. Colinear with mount...

GT-144A. 2m. Colinear with mount...

CB-2. 144—220 MHz. "Trucker"

CM-1320. As CM-1320 with Single...

4 BTV. As CM-1320 with Single...

600. High power Resonator...

531. Quick-disconnect...

5105. Top section only of QG-1...

HLM. Trunk-tip mount with coax...

We ARE SITUATED just around the corner from WEST HAMPSTEAD UNDERGROUND STATION which is on the BAKERLOO LINE.

We are closed for lunch between 1-2 p.m

WE ARE SITUATED just around the corner from WEST HAMPSTEAD UNDERGROUND STATION which is on the BAKERLOO LINE.

A few minutes walk away is WEST HAMPSTEAD MIDLAND REGION STATION and WEST END LANE on the BROAD STREET LINE. We are on the following BUS ROUTES: 38 : 59 : 159 : C 11.

WE ARE OPEN 9-5 MONDAY TO FRIDAY 9-12.30 SATURDAYS.

We are closed for lunch between 1-2 p.m
MICROWAVE MODULES DESPATCHED TO ANY PART OF THE WORLD POST FREE

**TRANVERTORS**
- MHT 144/23 Transverter £79-00
- MHT 144/238 Transverter £110-00
- MHT 342/144R Transverter £151-00

**VARACTORS**
- MV 1296 23cm. Tripler £30-00

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

**CONVERTERS**
- MMC 432/28S for Oscar £26-58
- MMC 432/445 for Oscar £26-58
- MMC 70 4m. converter £18-00
- MMC 70 4m. converter £18-00
- MMC 70 4m. converter £18-00
- MMC 144 LO 2m. converter £30-00

**A.S.P. MOBILE AND BASE STATION ANTENNAS**
- Asp 293 3w. 3dB 2m. mobile £19-90
- Asp 293 3w. 3dB 2m. mobile £19-90
- Asp 467 60cm. 3dB mobile £16-90
- Asp 667 60cm. 3dB mobile £16-90
- Asp A659 UK 70cm. 3dB base antenna £19-00

**FREQUENCY COUNTERS**
- MM4 500 MHz Counter £63-99
- MM500 10 Prescaler £25-00
- LINEAR AMPS
  - MML 432 100W. £120-00
  - MML 444 80W. £220-00

**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 £216.50 + VAT
For customers who already own FRG-7's we can supply the digital read-out complete with installation instructions £39.50 + VAT
FRG-7 Digital £236.50 + VAT
FRG-7 with analogue dial £187 + VAT
All plus 12½% VAT

**STANDARD C432 70cm TRANSCIER**
THIS 6 CHANNEL 2-2 WATT TRANSCIER COMES COMPLETE WITH LEATHER CARRY CASE AND FITTED WITH 433-2 AND 433-5 MHZ. £169.00 + VAT
THIS SOPHISTICATED UNIT HAS EXCELLENT SENSITIVITY, OUT PERFORMING MOST OTHER RIGS, JUST THE UNIT NOW 70cm. REPEATERS ARE OPENING UP ALL OVER THE COUNTRY. A FULL RANGE OF ACCESSORIES ARE AVAILABLE FOR THIS MODEL.

**ACCESSORIES**
- CMPOB External Microphone £15-00 — 12½% VAT
- SMIP30 External Spk./Mic. £16-50 — 12½% VAT
- BCA Base Charger £22-50 — 12½% VAT
- C12 Wall Charger £5-75 — 12½% VAT
- N-10 Set Ni-cad £8-50 — 8% VAT
- Helical Antenna £3-50 — 12½% VAT

**ICOM RANGE**
- IC701 transceiver and power supply £880.00
- IC215 2M Portable £141.33
- IC202S 2M £79.90
- IC402 70cm. £239.50
- IC240 2M. Transceiver £186.00
- IC301 £147.17
- IC211 £295.49

**FDK RANGE**
ALL AVAILABLE FROM STOCK

**ROTORs**
- AR22 £41.00
- CD44 £95.00
- AR60 £47.50
- HAM 11 £129.00
- KR400 £85.00

**SST TUNERS**
- SST1 Random £22.50
- SST2 Cox £22.75
- SST3 Match unit £13.50

**LUNAR LINEARS**
- 2M10-80P (2m) £130.00
- 2M75-150P (2m) £155.00
- 2M10-250P (2m) P.D.A. ALL ABOVE PRICES + VAT, CARRIAGE FREE

**J-BEAM ANTENNAS**
ALL MODELS IN STOCK

**HELICAL ANTENNAS**
- 2m. with 13 BNC ea. £3.85
- 2m. with ph 259 ea. £3.85
- 2m. for 13 BNC ea. £3.85
- Trip. 2200 Gx, standard £116.40
- All + post 25p + 12½% VAT

**STANDARD C432 70cm TRANSCIER**
THIS 6 CHANNEL 2-2 WATT TRANSCIER COMES COMPLETE WITH LEATHER CARRY CASE AND FITTED WITH 433-2 AND 433-5 MHZ. £169.00 + VAT

**ACCESSORIES**
- CMPOB External Microphone £15.00 — 12½% VAT
- SMIP30 External Spk./Mic. £16.50 — 12½% VAT
- BCA Base Charger £22.50 — 12½% VAT
- C12 Wall Charger £5.75 — 12½% VAT
- N-10 Set Ni-cad £8.50 — 8% VAT
- Helical Antenna £3.50 — 12½% VAT

**ICOM RANGE**
- IC701 transceiver and power supply £880.00
- IC215 2M Portable £141.33
- IC202S 2M £79.90
- IC402 70cm. £239.50
- IC240 2M. Transceiver £186.00
- IC301 £147.17
- IC211 £295.49

**FDK RANGE**
ALL AVAILABLE FROM STOCK

**ROTORs**
- AR22 £41.00
- CD44 £95.00
- AR60 £47.50
- HAM 11 £129.00
- KR400 £85.00

**SST TUNERS**
- SST1 Random £22.50
- SST2 Cox £22.75
- SST3 Match unit £13.50

**LUNAR LINEARS**
- 2M10-80P (2m) £130.00
- 2M75-150P (2m) £155.00
- 2M10-250P (2m) P.D.A. ALL ABOVE PRICES + VAT, CARRIAGE FREE

**J-BEAM ANTENNAS**
ALL MODELS IN STOCK

**HELICAL ANTENNAS**
- 2m. with 13 BNC ea. £3.85
- 2m. with ph 259 ea. £3.85
- 2m. for 13 BNC ea. £3.85
- Trip. 2200 Gx, standard £116.40
- All + post 25p + 12½% VAT
The Shop with the Smile!

AMATEUR RADIO
EXCHANGE

PROPRIETORS: BRENDA APTAKER, BERNARD GODFREY (G4AOG)

What makes this the best place to buy that new rig you've been promising yourself? Our stocks, our prices, our terms, these are normal. True, there's a wider range of secondhand gear than elsewhere, but the real difference is that WE CARE.

This means that, when buying, you the customer receive all the help you want... like letting you actually try the equipment—out of its box—to make sure it's really right for you, and that afterwards too you get the service you expect. So... buying, selling or just browsing... come to the shop that's different. And have a cup of Brenda's coffee as well.

---

YAESU-MUSEN

CPU2500R 25W 2m. Transceiver
CPU2500RK 25W 2m. Transceiver
CPU2500RS 10W 2m. Transceiver
CPU2500RKS 10W 2m. Transceiver
FT-202R hand-held 1W Transceiver
FT-202R General Coverage Receiver
FRG-7000 Digital General Coverage Receiver
FR-101 Series 160-2m. Receiver
FT-101E Transceiver 150-10m.
FT-101EE Transceiver 160-10m. (less processor)
FT-101EX Transceiver 160-10m. (less processor)
FT-100 Transceiver 80-10m.
FT-227R Transceiver 2m. with 1 MHz scan
FT-901 Series (all models)
FT-710W mobile HF Transceiver
FL-110 Linear for above
FP-4 AC Power Supply 12v. out
FT-225 Series 2m. FM/AM/SSB Transceiver
FT-301 Series HF Transceiver
FL-2100B HF Linear Amplifier

Plus all other YAESU Products

ICOM

IC-215 portable 2m. FM Transceiver
IC-202 portable SSB 2m. Transceiver
IC-202 70cm. portable SSB Transceiver
IC-240 synthesised 2m. FM Transceiver
IC-280E synthesised 2m. FM Transceiver
digital plus memories
IC-701 HF Transceiver
IC-245E FM/SSB 2m. Transceiver
IC-211E All mode 2m. synthesised Transceiver
IC-211E All mode 2m. synthesised Transceiver
IC-1RM3 Remote control micro processor keypad

SPECIAL OFFER ON YAESU PRODUCTS

FT-7 Transceiver now at £299 inc VAT
FF202R Hand-held Transceiver now at £99.00 inc VAT

NEW YAESU PRODUCTS AVAILABLE NOW

FT-7B New High Power HF Transceiver
FT-227RA New 2M. FM Fully Synthesised With Scan Transceiver

SPECIAL FOR ALL FRG-7 OWNERS

Modification kits available now for narrow-band SSB filter.
Using the 2.1 Kc Mech Filter by Tolo, plus step-by-step instructions for fitting into your FRG-7.

PHONE FOR DETAILS OF CURRENT STOCKS AND PRICES NEW AND SECONDHAND

CLOSED WEDNESDAY, BUT USE OUR 24-HOUR ANSAFONE SERVICE

Easy terms
up to 2 years
BARCLAYCARD
Credit sales
by telephone
INSTANT HP for licensed amateurs

So easy for Overseas Visitors—just seven stops from Heathrow—or phone your order and let us deliver it to you at the Airport.

2 NORTHFIELD ROAD, EALING, LONDON, W13 9SY Tel. 01-579 5311
### MICROWAVE MODULES

<table>
<thead>
<tr>
<th>Module</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>MM/80/2M, 5.5 dB</td>
<td>£14.00</td>
</tr>
<tr>
<td>MM/80/2M, 7 dB</td>
<td>£16.00</td>
</tr>
<tr>
<td>MM/80/2M, 10 dB</td>
<td>£18.00</td>
</tr>
<tr>
<td>MM/80/2M, 15 dB</td>
<td>£20.00</td>
</tr>
<tr>
<td>MM/80/2M, 20 dB</td>
<td>£22.00</td>
</tr>
<tr>
<td>MM/80/2M, 30 dB</td>
<td>£25.00</td>
</tr>
<tr>
<td>MM/80/2M, 50 dB</td>
<td>£30.00</td>
</tr>
<tr>
<td>MM/80/2M, 60 dB</td>
<td>£35.00</td>
</tr>
<tr>
<td>MM/80/2M, 70 dB</td>
<td>£40.00</td>
</tr>
<tr>
<td>MM/80/2M, 80 dB</td>
<td>£45.00</td>
</tr>
<tr>
<td>MM/80/2M, 90 dB</td>
<td>£50.00</td>
</tr>
</tbody>
</table>

### 2M ANTENNAS

<table>
<thead>
<tr>
<th>Antenna</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>DP1/2M, 2 elements</td>
<td>£12.50</td>
</tr>
<tr>
<td>DP1/2M, 3 elements</td>
<td>£15.00</td>
</tr>
<tr>
<td>DP1/2M, 4 elements</td>
<td>£17.50</td>
</tr>
<tr>
<td>DP1/2M, 5 elements</td>
<td>£20.00</td>
</tr>
<tr>
<td>DP1/2M, 6 elements</td>
<td>£22.50</td>
</tr>
<tr>
<td>DP1/2M, 7 elements</td>
<td>£25.00</td>
</tr>
<tr>
<td>DP1/2M, 8 elements</td>
<td>£27.50</td>
</tr>
</tbody>
</table>

### RF POWER METERS

<table>
<thead>
<tr>
<th>Meter</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>100,000, 1.5-150 MHz</td>
<td>£14.00</td>
</tr>
<tr>
<td>Race UH74 single meter</td>
<td>£17.00</td>
</tr>
<tr>
<td>Hansen FGSM 20.20-200 MHz</td>
<td>£20.00</td>
</tr>
<tr>
<td>PS 50-150 MHz</td>
<td>£23.00</td>
</tr>
<tr>
<td>Leader LPM685 shunt line watt meter/SSW</td>
<td>£26.00</td>
</tr>
<tr>
<td>20, 200, 1000, 18-24</td>
<td>£30.00</td>
</tr>
<tr>
<td>SML SWR535 twin meter 3-15 MHz</td>
<td>£34.00</td>
</tr>
</tbody>
</table>

### CRYSTAL FILTERS

<table>
<thead>
<tr>
<th>Filter</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>YF107/5400 10 7 MHz 8 pole</td>
<td>£20.00</td>
</tr>
<tr>
<td>YF30 MHz350 31.7 MHz 8 pole</td>
<td>£22.00</td>
</tr>
<tr>
<td>YF35 MHz 350 31.7 MHz 8 pole</td>
<td>£24.00</td>
</tr>
<tr>
<td>YF70 MHz2.4 10.7 MHz 6 pole</td>
<td>£26.00</td>
</tr>
<tr>
<td>YF90 MHz 9 MHz 6 pole</td>
<td>£28.00</td>
</tr>
<tr>
<td>YF90 MHz 9 MHz 6 pole</td>
<td>£30.00</td>
</tr>
<tr>
<td>YF90 MHz 9 MHz 6 pole</td>
<td>£32.00</td>
</tr>
<tr>
<td>YF90 MHz 9 MHz 6 pole</td>
<td>£34.00</td>
</tr>
<tr>
<td>YF90 MHz 9 MHz 6 pole</td>
<td>£36.00</td>
</tr>
</tbody>
</table>

### SMC MONITOR SCOPE £69 + 8% Delivery Free

- Multi U1 70cm mobile £231.00
- Multi 112m mobile £184.00
- Multi 2700 PM £321.00
- Multi 1215 VAT 12% £435.00

### FOR VISITORS TO LONDON

- Place your order by phone:
  - WE WILL DELIVER TO YOUR HOTEL OR MEET YOU ON DEPARTURE, AND ACCOMPANY YOU TO THE LANDING OFFICER AND ARRANGE CARROUSEL OF YOUR PURCHASE.
FULL TIME RETAIL PREMISES NOW OPEN

We hold stocks of all popular (and not so popular) equipment including:

- YAESU
- ICOM
- FDK
- MIZUHO
- DENTRON
- KW
- SOTA
- BELCOM
- ANTENNA SPECIALISTS
- J BEAM
- MINI PRODUCTS
- HY GAIN
- CUSHCRAFT
- PLUGS
- SOCKETS
- COAX
- ADONIS
- SHURE
- LEADER
- MFJ
- DAIWA
- CDE
- KENPRO
- ASCOT

Come and examine all the equipment and try it on the air from our fully equipped showroom—the only place that you can see ALL the manufacturers' rigs side by side—and compare them on the same aerial.

INCLUDING — THE NEW RIG FROM FDK

The MULTI 700E
The only rig ready for 12½ kHz channel spacing.

FEATURES:
- Power output 1-25 watts continuously variable.
- Digital readout of true Frequency
- Xtal toneburst fitted
- 12½ or 25 kHz channel spacing
- 12½ or 25 kHz step synthesiser

PRICE: ONLY £229 inc. VAT

Same day mail order despatch—or just phone your credit card number

PART EXCHANGE WELCOME

NEW ADDRESS — 300 yards from the sea — 500 yards from the A27

22 REGAL HOUSE
PENHILL ROAD
LANCING
WEST SUSSEX

Tel.: Lancing (09063) 63119
24 hour answering service
Open Mon.-Sat. . 9-5.

G3OQT BARCLAYCARD, ACCESS, H.P., EVEN CASH ! G3VXJ
STS FOR NEW BRITISH 70CM CHANNELS
Due to the much higher multiplex involved (3 times that on 2m) all stock is now 70cm, crystal closer to your own for our standard amateur range.

We are stocking the following channels RB0 (434-60-432-00), RS2 (434-64-433-05), RB6 (434-70-433-10), RB8 (434-75-433-15), SUB (433-20), RB10 (434-80-433-25), RB14 (434-85-433-35), SUB12 (433-45) and SUB10 (432-40) for the RTTY and 70cm filters. The above frequencies are valid for the +400 MHz Base Station and the TX crystals for the above channels. For the UOSB Base Station we have the TX crystals for all the above channels. The RX crystals for the UOSB Base Station, together with the TX and RX crystals for the remaining 5.0 MHz channels (U1, U2) are available at £3-20 (€3-60) to Amateur Spec. or £4-20 (€4-72) to Amateur Stock. Delivery approximately 4 weeks.

4.4. CRYSTALS FOR 70-26 MHZ-HC4/U
TX 8-7825 MHZ and RX 6-7466 MHZ or 29-7800 MHZ £2-32 (€2-61).
10-245 MHz “ALTERNATIVE” IF CRYSTALS £2 (€2-51).
For use in Pye and other equipment to get rid of the “birdy” at just above 145-0 MHz in HC6/U, HC18/U and HC19/U.

CRISTAL SOCKETS—HC4/U, HC13/U and HC15/U (Low loss)
16p each (18p) + 15p P & P per order (P & P free if ordered with crystals). FOR ORDERING. When ordering please quote (1) Channel ; (2) Crystal frequency; (3) Holder; (4) Circuit conditions (load in pF).

DELIVERY

P & P free if ordered with crystals.
10p P & P per order (P & P free if ordered with crystals).

BURNS ELECTRONICS

2 ALEXANDER DRIVE, HESWALL, Wirral, Merseyside. L6I 6XT
Tel: 051-342 4443. Cables: CRYSTAL BIRKENHEAD. Telex: 627371.
2M TX & RX CRYSTAL AVAILABILITY AND PRICE CHART

<table>
<thead>
<tr>
<th>OUTPUT FREQUENCY</th>
<th>450-330/16</th>
<th>450-350/16</th>
<th>450-375/16</th>
<th>450-400/16</th>
<th>450-425/16</th>
<th>450-450/16</th>
<th>450-475/16</th>
<th>450-500/16</th>
<th>450-525/16</th>
<th>450-550/16</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>452-300/16</td>
<td>452-375/16</td>
<td>452-400/16</td>
<td>452-425/16</td>
<td>452-450/16</td>
<td>452-475/16</td>
<td>452-500/16</td>
<td>452-525/16</td>
<td>452-550/16</td>
<td>452-575/16</td>
</tr>
<tr>
<td></td>
<td>452-600/16</td>
<td>452-625/16</td>
<td>452-650/16</td>
<td>452-675/16</td>
<td>452-700/16</td>
<td>452-725/16</td>
<td>452-750/16</td>
<td>452-775/16</td>
<td>452-800/16</td>
<td>452-825/16</td>
</tr>
<tr>
<td></td>
<td>452-850/16</td>
<td>452-875/16</td>
<td>452-900/16</td>
<td>452-925/16</td>
<td>452-950/16</td>
<td>452-975/16</td>
<td>452-1000/16</td>
<td>452-1050/16</td>
<td>452-1100/16</td>
<td>452-1150/16</td>
</tr>
<tr>
<td></td>
<td>452-1200/16</td>
<td>452-1250/16</td>
<td>452-1300/16</td>
<td>452-1350/16</td>
<td>452-1400/16</td>
<td>452-1450/16</td>
<td>452-1500/16</td>
<td>452-1550/16</td>
<td>452-1600/16</td>
<td>452-1650/16</td>
</tr>
<tr>
<td></td>
<td>452-1700/16</td>
<td>452-1750/16</td>
<td>452-1800/16</td>
<td>452-1850/16</td>
<td>452-1900/16</td>
<td>452-1950/16</td>
<td>452-2000/16</td>
<td>452-2050/16</td>
<td>452-2100/16</td>
<td>452-2150/16</td>
</tr>
<tr>
<td></td>
<td>452-2200/16</td>
<td>452-2250/16</td>
<td>452-2300/16</td>
<td>452-2350/16</td>
<td>452-2400/16</td>
<td>452-2450/16</td>
<td>452-2500/16</td>
<td>452-2550/16</td>
<td>452-2600/16</td>
<td>452-2650/16</td>
</tr>
<tr>
<td></td>
<td>452-2700/16</td>
<td>452-2750/16</td>
<td>452-2800/16</td>
<td>452-2850/16</td>
<td>452-2900/16</td>
<td>452-2950/16</td>
<td>452-3000/16</td>
<td>452-3050/16</td>
<td>452-3100/16</td>
<td>452-3150/16</td>
</tr>
</tbody>
</table>

CRYSTALS FOR NEW BRITISH 70CM CHANNELS

Due to the much higher multiplications involved (3 times that on 2m) all stock in 70cm., crystal frequencies are in our standard amateur range.

We are stocking the following channels R80 (434-60/432-00), R82 (434-64/433-05), R84, (434-70/433-10), R86 (434-75/433-15), SUB (434-20), R80 (434-85/433-25), R81 (434-95/433-35), SUB (434-40) and SUB (434-45). The above are in stock and can be supplied in all types: PVE UHF Transmitter (W7USU), UHF Cambridge (U10), Pocketfone (PFI) and STORNO CQL/CQ all at £3-33 (24-5-46). For the 100 Base Station we have the TX crystals for all the above channels. The RX crystals for the U450 Base Station, together with the TX and RX crystals for the remaining SU channels (SU1-13) J30-RTTY, SU1-634/J30 and SU2-123-55) for all the above equipments are available at £3-20 (€4-70 to UK) and SU spec. Delivery for about a week.

4M. CRYSTALS FOR 70-26 MHS - HC6/U

TX 8-7825 MHz and RX 6-7446 MHz or 29-780 MHz £2-50 (€2-51), 10-245 MHz “ALTERNATIVE” IF CRYSTALS £2-50 (€2-51), for use in Pye and others equipment. Specify number of crystals required to get rid of the “birdy” just above 145-0 MHz in HC6/U, HC18/U and HC75/U.

CRYSTAL SOCKETS - HC6/U, HC13/U and HC55/U (Low loss)

10 each (15p) + 15p P & P per order (P & Frsес if ordered with crystals).

CONVERTER/TRANSFORMER CRYSTALS — HC18/U

All at £1-00 (€1-17), 18-6666 MHz (144-28), 42 MHz (70-20), 48 MHz (144-28), 70 MHz (144-4), 71 MHz (144-43), 95 MHz (44-52), 96 MHz (1, 596/432/144), 101 MHz (432/28), 101-50 MHz (432/28), 105-666 MHz (144-28) and 116 MHz (144-28). Delivery for about two weeks.

CRYSTALS MANUFACTURED TO YOUR SPECIFIC REQUIREMENTS

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

A Low frequency fundamentals : Adi, tol. ± 30ppm Temp. tol. ± 100ppm 0 to 70°C, 6-0 to 19999 kHz, £1-12 (£1-32) £2-10 (€2-20) 20 to 5999 kHz, £1-17 (€1-36) £2-40 (€2-70) 50 to 9999 kHz, £1-21 (€1-40) £2-59 (€2-90) 60 to 7999 kHz, £1-21 (€1-40) £2-59 (€2-90)

B Mid frequencies : Adi. tol. ± 30ppm Temp. tol. ± 100ppm 0 to 70°C, 800 to 999-9 kHz Fundamental £5-90 (€10-69) £9-40 (€16-84) £1-60 (€10-89) £1-50 (€10-79) £1-50 (€10-79) £1-50 (€10-79) £1-50 (€10-79) £1-50 (€10-79) £1-50 (€10-79)

C High frequencies : Adi. tol. ± 30ppm Temp. tol. ± 100ppm 0 to 70°C, 105 to 180 MHz, £6-48 (£7-29) £6-48 (£7-29) £6-48 (£7-29) £6-48 (£7-29) £6-48 (£7-29) £6-48 (£7-29) £6-48 (£7-29) £6-48 (£7-29) £6-48 (£7-29) £6-48 (£7-29)
OUR PRE-AMPLIFIERS WILL IMPROVE YOUR RECEPTION ON H.F., V.H.F. OR U.H.F.

SENTINEL AUTO 2 METRE PRE-AMPLIFIER
The pre-amplifier contains an r.f. operated switch for direct connection in the transceiver aerial lead, or for "mast head" use. The transistors are selected for a 1 dB noise figure and gain is 18dB. 12v. d.c. operation. The r.f. switch has a delay for use on all modes.
£17.35* IN STOCK
70 cm. version, £20.25* IN STOCK

SENTINEL STANDARD PRE-AMPLIFIERS
Same circuits as above but without the relay switching. £10.85*, 70 cms. version, £13.50*. Both IN STOCK
Other frequencies to order. Marine, Satellite Band in stock.

PA3
The original PA3 2 metre pre-amplifier, size about one cubic inch to fit inside transceivers. N.F. 2dB. Gain 18dB.
£6.80 IN STOCK
PA3/70 for 70cms. size : 1\(\frac{3}{4}\)" x 1\(\frac{3}{4}\)" x \(\frac{3}{4}\)
£9.00 IN STOCK

H.F. WIDEBAND PRE-AMPLIFIERS 1-40 MHz
Ideal for pepping up your receiver on 15 and 10 metres. For use with OSCAR or with a short aerial they make an effective ACTIVE AERIAL. Gain 15dB, supply 12v.

SENTINEL STANDARD H.F. PRE-AMP.
£9.00 IN STOCK

SENTINEL DUAL GATE MOSFET 2 METRE CONVERTERS—I.F.'s: 2-4 MHz, 4-6 MHz, 28-30 MHz. N.F. 2dB. Gain 30dB.
Price : £20.25 IN STOCK
SENTINEL X—Same as above with an A.C. power supply.
Price : £24.75 IN STOCK

SENTINEL TOP BAND CONVERTERS—21.8-2.3 MHz to 14-14.5 MHz.
Price : £20.25 IN STOCK
* SO239 sockets available on these units at an extra cost of £1.69.

Circuits and instructions provided with equipment. For more details of any of our equipment, please ring or write. Prices include VAT and delivery.
12 months guarantee. To order: C.W.O. or credit card. Just phone your credit card number for same day service.

SENTINEL EUROPA C 2 METRE TRANSVERTER
200W. input, 2 dB N.F. Plugs straight into YAESU equipment and you are on 2 metres, any mode.
£112.50 EX STOCK. 600 kHz repeater shift, £112.50
CRS10 Power Supply for Europe to use with other equipment.
£56.25 EX STOCK

SENTINEL AUTO H.F. PRE-AMPLIFIER
SAME circuit as above with an aerial change over relay for operation with your transceiver relay, for direct connection in your aerial co-ax, £12.94* IN STOCK

SENTINEL STANDARD AUTO H.F. PRE-AMPLIFIER
SAME circuit as above with an aerial change over relay for operation with your transceiver relay, for direct connection in your aerial co-ax, £12.94* IN STOCK

SENTINEL AUTO H.F. PRE-AMPLIFIER
SAME circuit as above with an aerial change over relay for operation with your transceiver relay, for direct connection in your aerial co-ax, £12.94* IN STOCK

SENTINEL 2 METRE POWER AMPLIFIER/PRE-AMPLIFIER
We are now fitting the very latest type of power transistor available with a dissipation of 135W. and power gain of 4, e.g. 12W. IN, 48W. OUT. The circuit is linear for use on all modes. The receive pre-amplifier use a J FET selected for a 1 dB noise figure and 18 dB gain. The r.f. relay switches between the two with a time delay for use on any mode. The relay can also be operated by the transceiver. Size is only 6" x 2" panel, 4\(\frac{1}{2}\) deep. £59.62 IN STOCK. Or less the pre-amplifier, £49.50. Yes, they do work fine with the FT221 and TS700 series.

SENTINEL 70.
70cm. to 2 metre converter.
Price : £20.25 IN STOCK
SENTINEL 70.
70cms. to 10 metre converters.
Price : £22.50 IN STOCK
SENTINEL TOP BAND CONVERTERS—21-8-2.3 MHz to 14-14.5 MHz.
Price : £20.25 IN STOCK

SEM Z MATCH
The necessity to terminate modern equipment with the correct NON REACTIVE impedance is solved with our Z Match. 15–5000 ohms. BALANCED OR UNBALANCED. SO239s and 4mm. terminals for co-ax or wire. Rated up to 1KW. Calibrated slow motion dials made adjustment and re-setting easy.
Price : £39.44 IN STOCK

SEM FORWARD AND REVERSE POWER METER
At last a forward/reflected power meter designed for the British amateur. FSD 500w., 1 scale 100w. 1–30 MHz. The pick-up unit which connects in the aerial lead is separate from the readout for very convenient use.
Price : £28.50

SEM Z MATCH
The necessity to terminate modern equipment with the correct NON REACTIVE impedance is solved with our Z Match. 15–5000 ohms. BALANCED OR UNBALANCED. SO239s and 4mm. terminals for co-ax or wire. Rated up to 1KW. Calibrated slow motion dials made adjustment and re-setting easy.
Price : £39.44 IN STOCK

SEM EUROPA C 2 METRE TRANSVERTER
200W. input, 2 dB N.F. Plugs straight into YAESU equipment and you are on 2 metres, any mode.
£112.50 EX STOCK. 600 kHz repeater shift, £112.50
CRS10 Power Supply for Europe to use with other equipment.
£56.25 EX STOCK

SENTINEL DUAL GATE MOSFET 2 METRE CONVERTERS—I.F.'s: 2-4 MHz, 4-6 MHz, 28-30 MHz. N.F. 2dB. Gain 30dB.
Price : £20.25 IN STOCK
SENTINEL X—Same as above with an A.C. power supply.
Price : £24.75 IN STOCK

SEM 70.
70cm. to 2 metre converter.
Price : £20.25 IN STOCK
SENTINEL 70.
70cms. to 10 metre converters.
Price : £22.50 IN STOCK
SENTINEL TOP BAND CONVERTERS—21-8-2.3 MHz to 14-14.5 MHz.
Price : £20.25 IN STOCK

* SO239 sockets available on these units at an extra cost of £1.69.

Circuits and instructions provided with equipment. For more details of any of our equipment, please ring or write. Prices include VAT and delivery.
12 months guarantee. To order: C.W.O. or credit card. Just phone your credit card number for same day service.

SENTINEL AUTO 2 METRE PRE-AMPLIFIER
The pre-amplifier contains an r.f. operated switch for direct connection in the transceiver aerial lead, or for "mast head" use. The transistors are selected for a 1 dB noise figure and gain is 18dB. 12v. d.c. operation. The r.f. switch has a delay for use on all modes.
£17.35* IN STOCK
70 cm. version, £20.25* IN STOCK
C.B. ELECTRONICS
UNIT 3, 771 ORMSKIRK ROAD, PEMBERTON, WIGAN, WN5 8AT
Telephone: Wigan (0942) 216567
THE BEST IN THE NORTH-WEST

HOW TO FIND US:—From M6 junction 26 follow signs for Wigan A577 at first traffic lights (T junction) turn right towards Wigan. At next traffic lights you are there, BUT turn left and 10 yards further turn right by telephone kiosk. Premises are slightly to your right. Plenty of parking space. Mileage from motorway 4 mile.
From Wigan follow the A577 Skelmersdale to traffic lights at Fleet Street, Pemberton (Ye Olde White Swan on your left). Turn right then 10 yards right again. By Co-op. Mileage from Wigan 2½ miles.

<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>YAESU FT225R</td>
<td>£548.33</td>
</tr>
<tr>
<td>CDE AR40</td>
<td>£53.00</td>
</tr>
<tr>
<td>PTT mics.</td>
<td>£53.00</td>
</tr>
<tr>
<td>WESTERN FT90IDM</td>
<td>£195942</td>
</tr>
<tr>
<td>Power meter HF</td>
<td>£48.62</td>
</tr>
<tr>
<td>Power meter VHF</td>
<td>£48.62</td>
</tr>
<tr>
<td>ASP Antennas</td>
<td>£208.002009 5/8 wave</td>
</tr>
<tr>
<td>Magnetic Base</td>
<td>£48.62</td>
</tr>
<tr>
<td>Boot mount</td>
<td>£77.62</td>
</tr>
<tr>
<td>SWR Bridges</td>
<td>£249.00</td>
</tr>
<tr>
<td>Single meter</td>
<td>£249.00</td>
</tr>
<tr>
<td>Twin meters</td>
<td>£14.95</td>
</tr>
<tr>
<td>Headphones</td>
<td>£2.95</td>
</tr>
<tr>
<td>Morse Key</td>
<td>£9.75</td>
</tr>
<tr>
<td>Morse Key</td>
<td>£9.75</td>
</tr>
<tr>
<td>High Pass Filter</td>
<td>£2.95</td>
</tr>
<tr>
<td>Headphones</td>
<td>£2.95</td>
</tr>
<tr>
<td>SWR Bridges</td>
<td>£11.50</td>
</tr>
<tr>
<td>Single meter</td>
<td>£11.50</td>
</tr>
<tr>
<td>Twin meters</td>
<td>£14.95</td>
</tr>
</tbody>
</table>

DUE TO FLUCTUATING EXCHANGE RATES, PLEASE CHECK FOR CURRENT PRICES.

WANTED: RECEIVERS & TRANSCEIVERS HF or VHF
PART EXCHANGES WELCOME  S.A.E. ALL ENQUIRIES  H.P. AND CREDIT TERMS

AMCOMM SERVICES 194a NORTHOLT ROAD, SOUTH HARROW, MIDDLESEX, ENGLAND

SST T-1 RANDOM WIRE ANTENNA TUNER

All band operation (160-10 metres) with any random length of wire. 200 watt output power capability—will work with virtually any transceiver. Ideal for portable or home operation. Great for flats and hotel rooms—simply run a wire inside, out a window, or any place available. Toroid inductor for small size: \(4\frac{1}{4}\)" \(\times\) \(2\frac{3}{8}\)" \(\times\) \(3\)". Built-in neon tune-up indicator. SO-239 connector. Attractive bronze finished enclosure.

Only £23.40 including VAT and carr.

GUARANTEE All SST products are guaranteed for 1 year

Access TELEPHONE 01-864 1166
BARCLAYCARD
We'll put you on the air.

Learn how to become a radio-amateur in contact with the whole world. We give skilled preparation for the G.P.O. licence.

Brochure without obligation to:

**British National Radio & Electronic School**
P.O. Box 156, Jersey, Channel Islands.

NAME ____________________________

ADDRESS ____________________________

Block caps please

**ANTENNA SPECIALISTS UK LIMITED**

THE WIDEST CHOICE
FOR THE DISCERNING AMATEUR

For further information regarding the Antenna Specialists range some of our Amateur stockists are listed below:

- Thanet Electronics, Herne Bay, Kent 02273 63859
- Lee Electronics, London 01-723 5521
- Waters & Stanton, Hockley, Essex 03-704 6853
- Amateur Radio Exchange, London 01-579 5311
- The Amateur Radio Shop, Huddersfield 0484 20774
- C.B. Electronics, Wigan 0942 216567
- Leeds Amateur Radio 0532 452657
- Commercial Communications, Luton 0582 21884
- Electrosearch Ltd., Winterbourne, Bristol 0454 773968
- Catronics Ltd., Wallington, Surrey 01-699 6700
- J. Birkett, 25 The Strait, Lincoln 021-20767
- Appleton Wood Ltd., 313 Heele Road, Sally Oak, Birmingham 021-472 7485
- Ancomm Services, 194 Northolt Road, South Harrow 01-864 1166
- Crayford Electronics, 6 Lovelace Close, West Kingsdown, Sevenoaks, Kent 047485-2577
- Stephens-James Ltd., 47 Warrington Road, Leigh, Lancs. 0942-676790
- Charnwood Communications, 44 Ratby Lane, Markfield, Leicester 05305 2585
- M.O.H. Radio Telephones, Priory Road, Milford Haven, Dyfed 06462-5534
- Electrosearch Ltd., K9 Building, Wapping Road, Bristol 0272-20483

**ANTENNA SPECIALISTS UK LIMITED**

Bandet Way, Thame Industrial Estate, Thame, Oxon OX9 3SS

Tel.: 084 421 3621/2
R. T. & I. ELECTRONICS LTD.
where equipment is fully overhauled

EDDYSTONE EB35 Receiver
EDDYSTONE EC10 Mk. 1 Receiver
EDDYSTONE EC10 Mk. 2 Receiver
EDDYSTONE EB35 803/7 G.C. Receiver
HAMMARLUND HQ110 B.S. Receiver
HAMMARLUND S4091X G.C. Receiver
KW 201 B.S. Receiver
HEATHKIT SW717 G.C. Receiver
CODAR CR9A G.C. Receiver
TRIO TR90S B.S. Receiver
CODAR AT5 Transmitter with A.C. PSU

We are MAIN DISTRIBUTORS for AVO, MEGGER, TAYLORS and SULLIVAN INSTRUMENTS

All types of AVOMETERS and MEGGERS, normally in stock also accessories and spares

NEW DIGITAL AVOMETER TYPE DA116 in stock — £99-00

Send for details.

We also repair all types of instruments
Trade and Educational enquiries invited

S. G. BROWN'S HEADPHONES. Type "F" 120 ohm, 2000 ohm, 4000 ohm, £14.50 (11.00); Rubber Earpads for same, £1-32 per pr. (40p); Standard Jack plugs, £2.42 (12p).

SINCLAIR DIGITAL MULTIMETERS
CDM

PDM15

Price £5.00 (10-20)

Main adaptor for either model

Price £3.00 (70p)

Yaesu/Musen FRG-7 Receiver in stock

Price £187.00 (20-22)

Yaesu/Musen FRG-7 Digital in stock

Price £298.00 (20-22)

Yaesu/Musen FRG-7000 Receiver

Price £324.00 (20-22)

In present conditions we regret that all prices are subject to alteration without notice.

NOTE: 12½% VAT must be added to all prices, new and secondhand, except Test Equipment which is 8½% inc. carr. and packing.

Carriage for England, Scotland and Wales shown in brackets. 8% inc. carr. and packing. In present conditions we regret that all prices are subject to alteration without notice.

R. T. & I. ELECTRONICS LTD.
Ashville Old Hall, Ashville Road, London E11 4DX Tel. 01-539 4986
NEAREST STATION: LEYTONSTONE (Central line)

HOURS—9.30 a.m.—5.30 p.m. MON.—FRI. CLOSED SATURDAYS
The best things come in little packages?

Are you shopping for Antennas & Receivers?

The JOYSTICK VFA gives you a six amateur band or continuous tuning (0.5-30 MHz) effective ground plane, efficient, substantially harmonic free, space saving antenna. Proven performance, testimonials world-wide bulge in our files!

IN USE BY AMATEUR TRANSMITTING AND SWL STATIONS WORLD-WIDE AND IN GOVERNMENT COMMUNICATION

JOYSTICK ANTENNAS

SYSTEM 'A'

200w. p.e.p.  £41.00
OR for the SWL  500w. p.e.p.

SYSTEM 'I'

Improved 'Q'  £47.95
on receive

“PACKAGE DEALS”

COMPLETE RADIO STATIONS FOR ANY LOCATION

All packages include the JOYSTICK VFA (System 'A') 8ft feeder, all necessary cables, matching communication headphones. Delivery Securicor our risk. ASSEMBLED IN SECONDS. You SAVE £14.15 on each PACKAGE DEAL!

PACKAGE No. 1  £222.00
Features R.300 Rx.

PACKAGE No. 2  £237.45
Features FRG7 Rx.

PACKAGE No. 3  £212.45
Features SRX 30 Rx.

PACKAGE No. 4  £402.00
Our “Rolls” — Rx. FRG 7000

RECEIVERS ONLY

R.300  £184.50 FRG7  £199.95
SRX30  £174.95 FRG700  £364.50

Just telephone your card number

Phone 0843 62535 (ext. 4) or 62839 (after office hours) or write for details—send 9p stamp

NOTE: All prices are those current at the time of closing for press inclusive of current VAT at 12½% and carriage.

4. PARTRIDGE HOUSE, PROSPECT ROAD, BROADSTAIRS, CT10 1LD. (Callers by appointment).
ANNOUNCING

THE BROOKES MB6/R/RT TELEX CONVERTER, THESE UNITS SUPERSEDE THE HB5 SERIES, AND ARE OF ACTIVE FILTER DESIGN.

A DIRECT INPUT FROM RECEIVER, WITH T.T.L. AND C-MOS LEVELS FOR VDU's (SINGLE OR DOUBLE CURRENT) TO PRINTER MAGNETS, AND OSCILLOSCOPE OUTPUTS ARE AVAILABLE. RECEIVING SHIFTS ARE 170, 250, 425, 625 AND 850, TRANSMITTING SHIFTS 170 NEW TONES.

BUILT IN AN ULTRA MODERN CASE, FRONT AND BACK PANELS BEING BLACK WITH WHITE LETTERING. DIMENSIONS 8 4 x 304 x 210.

Just a Reminder

OF OUR POPULAR FDU7'S FREQUENCY DISPLAY UNIT FOR THE FRG7, WHICH FITS IN PLACE OF THE kHz DIAL. ALSO THE FDU3 FOR THE SSRI AND SRX30 WHICH IS NOW SUPPLIED IN AN ALUMINIUM CASE, FOR TOP OF THE RECEIVER USE. ALL SUPPLIED WITH FULL FITTING INSTRUCTIONS C.W.O. CHEQUE OR ACCESS ACCEPTED

MB6/R (RECEIVE ONLY) £68.00 £1.30
MB6/RT (AFSK/FSK) £72.50 £1.50
FDU7 (DISPLAY UNIT FOR FRG7) £39.00 £8.00
FDU3 (FOR SSRI & SRX 30) £36.00 £8.00

B. BROOKES ELECTRONICS
69 LEICESTER STREET, NORWICH NR2 2DZ. ENGLAND
Tel.: 0603 24573

U.K. DISTRIBUTORS
TO BE ANNOUNCED

INTERNATIONAL DISTRIBUTORS
"INTERMEDIARY" (INTERNATIONAL TRADE)
P.O., BOX 559
1007, AN. AMSTERDAM, HOLLAND
NATIONAL DR48 RF 4800 LBE
10 BAND COMMUNICATION RECEIVER

Coverage: VHF and Medium Wave
SW 1: 1-6 to 3-0 MHz IF 462 kHz
SW: 2/7 3-0 MHz to 27-3 MHz
Dual conversion: 2 MHz and 462 kHz
Fast and Slow Tuning: Ratio 12:1
7 LED Digital Readout SW 2/7
2 Position Selectivity, Ant Trimmer
5 IC's, 34 Transistors and 3 FETS
Mains/Internal Batteries or 12v. DC
Size: 19in. x 8in. x 14in. Weight: 8 Kg.
Available Ex Stock (if you're quick)

G3ST PARK ELECTRIC G8HGE
211 STREATHAM ROAD, MITCHAM, SURREY
01-648 6201

RZP ELECTRONICS

Offer a comprehensive repair and maintenance service for all makes of receivers, transmitters, transceivers, test equipment, ancillaries, etc. Industrial Electronics and professional communications equipment can also be repaired on site.

FOR REPAIR SEE RZP

Tel.: Orpington 20666
10A THE BROADWAY
BEXLEYHEATH
KENT

WILLIAM MUNRO (INVERGORDON) LIMITED

Telephone: 0349-852351
100, High Street,
INVERGORDON
Ross-shire IV18 0DN

NEC

CQ-P-2200E
2M FM Portable Transceiver. 3 Channels £179 inc. VAT and Delivery.
Additional Channels from our Xtal Stock £3 each.

CQ-R-700
6-Band General Coverage Receiver 170 MH to 30 MHz. AM-SSB-CW-RTTY £220 inc. VAT and Delivery.

CQ LINE
CQ 110E HF Bands Digital Readout Transceiver.
CQ 301 Matching Linear.
CQ 201 Matching External VFO.
SPII Matching External Speaker Unit/Digital Clock.
M110 Matching Table Microphone.

Full Spec. for the above and prices available on request. We always have several used items in stock, e.g.
IC 202, EUROPA-MEL 202-25P.

G. W. M. RADIO LTD.

All prices include VAT and post/carriage

MARCONI TF1101 RC Oscillator, 20 cycles to 4.5 Mc/s. in 4 ranges' Metered and attenuated, £65.

PCR RECEIVERS. Long/Medium/Shorts wave (6 to 22 Mc/s). Warm-time amenity set, needs 250 volts DC and 12 volts, £15.

BURDEPT UHF handy portable BE357 Mk. 2/1.5. 450 Mc/s. single channel with case, mike and nicad, £80.

G. S. BROWN 200 ohms headphones, fair condition, £3. Checked and working.

ALARM CLOCKS. Wehrle Commander. Steady/repeat alarm. Large magnificent and brand new, £9.50.

REED RELAYS for recent auto keyer designs, 200 ohm coil, 15p plus 10p post any numbers.

RECEIVERS, EDDYSTONE 730/4, 480 kc/s. to 30 Mc/s. in "as new" condition. In Military transit box with switching unit. Unrepeatable at £185 (less £10 if collected).

Speakers, 3 ohm 50 x 25. Replacement for most: mobiles, 3 for £2.

MARCONI KESTREL 3 RECEIVERS, 200 kc/s. to 45 Mc/s. or 22 crystal channels 1.5. to 4.5 Mc/s.) 12 or 24v. operation, all transistor, £31. Matching TRANSMITTER, crystal controlled, 1.6 to 4.5 Mc/s.

MARCONI ATLANTA RECEIVERS. Overhauled and good order, for 110 v. DC ship mains, £100 or for 250v. AC, £110 PLUS carriage at cost. Covers. 15 kc/s. to 150 volts DC.

REMOTE CONTROL UNITS. 12 channel. Made for the 2 metre kits we recently sold but adaptable to other equipment. Box and cable with moving coil low impedance mike in as new condition. Two types of mike, fit or stick, either £10.

JENNINGS VACUUM Variable capacitors, 2-30 pf, 10000 volts working, £5. Carriage charges included are for England and Wales only.
Terms: Cash with orders. Early closing, Wednesday.

40-42 PORTLAND ROAD, WORTHING, SUSSEX
Telephone: 72497
**D. P. HOBBS LTD.**

THE COMPONENT SPECIALISTS

**SAMSON ETM-3C C-MOS KEYER**

1 mA battery drain—Why switch off?

- Self-completing dots/dashes/spaces.
- Can be used either as normal electronic keyer or as an iambic mode squeeze keyer.
- 8-50 wpm.
- Constant 3:1 dash-dot ratio.
- Duos.
- 6 C-MOS ICs and 4 transistors.
- Plug-in PCB.
- Long battery life—typically 1 mA drain when idling—Built-in battery holder for 4 x 1.5v. batteries (but will work over 3-10v. range).
- PCB has both a lever assembly.
- Operate/Tune button.
- Sidetone oscillator.
- Gray case 4" x 2" x 6".

**ETM-4C MEMORY KEYER:** Has ETM-3C features plus 4 memories of 22 characters each (or 2 of 44). Erase/Rewrite memories as needed—Send CO's etc. by pressing a button.

**JUNKER PRECISION HAND KEY**

411 Grey case 4" x 2" x 6".

**SHURE MICROPHONES**

Model 444, £28.00; Model 201 £9.50. 240 matches

**D. P. HOBBS NORWICH LTD.**

13 St. Benedict's Street, Norwich, Norfolk. Tel: 615786

Open 9 a.m. - 5.30 p.m., Mon. - Sat. Closed all day Thurs.

**MOSELEY**

MONOBANDERS FOR DX

COMMAND YOUR BAND WITH A BIG PUNCH

IMPACT full sized arrays are designed for operation on a single band—Moseley A-310, ten metre three element and Moseley A-315, fifteen metre three element. Superb performance and construction characteristics each beam to insure satisfaction under the most adverse conditions. Antennas are 100% rust proof. Stainless steel hardware, high impact poly styrene insulators with aluminium elements and boom will provide many additional years of trouble-free operation. Low SWR over entire band. Maximum gain on all bands with an operating capacity well over 1KW. All "impact" antennas are fed with 52 ohm coax using the famous Moseley Match.

**MOSELEY ELECTRONICS LIMITED**

Administrative Address only

196 Norwich Road, New Costessey, Norwich NR5 0EX

(All antennas available ex works, carriage and VAT extra)

Send for HANDBOOK containing full range of Antennas and technical information, 28 pages 55p. Refundable upon purchase of Antennas.
TRADE

TS-520 super CW filters, 250 Hz bandwidth, £28-88. Access/Barclaycard.—Holdings Ltd., 39/41 Mincing Lane, Blackburn, Lancs. BB2 2AF. (Tel: 0254-59595/6.)

Silk-screened Radio Masts on quality T-Shirts, personalised with your own call-sign, name or slogan, only £2-65. State s/m/l. Offer closes April 20th.—B. McAleer, 59 Castledine Street, Loughborough, Leics.

Coax cables at trade prices: UR43, UR67, UR76, UR57 and UR70. Also mains and multicores. S.a.e. for lists.—W. H. Westlake, Clanton, Holsworthy, Devon.

Join them on 29-6 MHz NBFM. Local net, or work 'W' NBFM mobiles/repeaters. Fit G3LLL’s FT-101 NBFM adaptor; for 10m. or transmit to 2m. RPT shift available. S.a.e. for details.—Holdings Ltd., 39/41 Mincing Lane, Blackburn, Lancs. BB2 2AF. (Tel: 0254-59595/6.)

Components! Histab R’s and C’s including unusual values, RF connectors, relays, plus many others. Bargain prices. Send long s.a.e. for list.—G3KTF (QTHR 1979.)

Valves new and boxed: 6JM6, 6HF5, 6JS6/C, 6JB6/A, 6KD6, 6LQ6, 6146B, and other types. S.a.e. for list.—Wilson, 20 Croft Gate, Harwood, Bolton, Lancs. (Tel: Bolton 54165.)

Bristol has an Amateur Radio shop: FDK Palm II, Multi U-11, Multi 700E, Multi 2700; Revco aerials; second-hand equipment available. Part-exchanges welcome.—Ring 0272-669454, or 0272-633647 after hours.

March issue: Due to appear March 16th. Single copies at 50p post paid will be sent by first-class mail for orders received by Wednesday, March 7th, as available.—Circulation Dept., Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts. AL6 9EQ.

Good second-hand equipment always wanted. Come to AMATEUR RADIO EXCHANGE for the best deal.—2 Northfield Road, Ealing, London W13 9SY. (Tel: 01-579 3511.)

Radio Amateur Examination City & Guilds. Pass this important Examination and obtain your G8 Licence with an RRC Home-Study Course. For details of this and other Courses (GCE, professional examinations, etc.) write or phone: The Rapid Results College, Dept. JV/1, Tuition House, London SW19 4DS. Careers Advisory Service, 01-947 7272 or ring 01-946 1102 for Prospectus. (24-hr. Recordacall).

Dart Stationery presents Reception Report Letters for the Dx-er. Professionally styled letters, printed in two colours, on high-quality paper, and made into pads of 100 letters for tidy storage: 1 pad, £2-10; 2-plus pads, £1-80 per pad. All prices include post/packing. Every order received carries a 10-day return of money guaranteed if not completely satisfied. Mail orders only, please. Please send cheque or P.O. payable to Dart Stationery, 20 Bromley Road, London E17 4PS.
INTERNATIONAL CALL BOOKS
RADIO AMATEUR CALL BOOKS (1979)
"DX Listings" ..... £9.10
"U.S. Listings" ..... £9.70
(A few 1978 U.S. Listings still available at Sale price of £5.00 each inc.)
U.K. Call Book, 1979 Edn. (RSGB) ..... £3.20

MAPS
"SHORT WAVE MAGAZINE"
DX ZONE MAP (GREAT CIRCLE)
In colour. New 8th Edition. ..... £2.25
AMATEUR RADIO MAP OF WORLD
Mercator Projection - Much DX Information - in colour. Second Edition ..... £1.05
RADIO AMATEUR MAP OF THE U.S.A. AND NORTH AMERICA
State boundaries and prefixes, size 24" by 30", paper ..... 90p
RADIO AMATEUR'S WORLD ATLAS
In booklet form, Mercator projection, for desk use. Gives Zones and Prefixes (New 9th Edition) ..... £1.60

LOG BOOKS
Amateur Radio Logbook ..... £1.63
Receiving Station Log ..... £1.50
Minilog (New style) ..... £1.05
(The above prices include postage and packing).

Available from SHORT WAVE MAGAZINE
Publications Dept., 34 High Street, Welwyn, Herts. AL6 9EQ - Tel. Welwyn (043871) 5206/7
(Counter Service, 9.30-5.15, Mon. to Fri.)
(GIRO A/C No. 547 6151)

S.W.M. "DX ZONE MAP"
NEW 8th EDITION !!
In four colours, on durable paper for wall mounting, 33½in. wide by 24½in. deep. Giving essential DX information - bearing and distance of all parts of the world relative to the U.K., the Zone areas into which the world is divided for Amateur Radio purposes, with major prefixes listed separately. Distances in miles and kilometres. Time scale in GMT. Marking of Lat./Long. close enough for accurate plotting. Hundreds of place names, mainly the unusual ones, and most of the rare islands.
Prefixes corrected to August 1977
Price £2.25
including postage and special packing in postal tube to avoid damage in transit.
Publications Dept.
Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts. AL6 9EQ. Tel. Welwyn (043871) 5206/7

Quality QSL cards, s.a.e. for samples by return post. Quick delivery.—Complith Printing Services, 115 Promenade, Cheltenham, Glos. GL50 1NW.

READERS' ADVERTISEMENTS
8p per word, minimum charge £1.20, payable with order. Add 25 per cent for Bold Face (Heavy Type). Please write clearly, using full punctuation and recognised abbreviations. No responsibility accepted for transcription errors. Box Numbers 35p extra. Replies to Box Numbers should be addressed to the Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts., AL6 9EQ.

READERS
Wanted: German W.W.II military radio equipment. Does anyone have such equipment for sale, or know of someone who has? Good prices offered by collector. —Box No. 5674, Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts. AL6 9EQ.

Sale: Hallcrafter digital synthesised Rx, 1-8 to 32 MHz, £150 or near offer. FSK-1 RTTY T/U, £5. Creed keyboard Tx, £5. Precision voltage source, £5. Garrard 401 transcription turntable, £25.—Buckland, 117 Barton Avenue, Paignton (554345), Devon.

Selling: Marine-band crystals: 9-13750, 9-10625 and 9-12500 MHz, £2 each. Transistor/diode tester, £15. Type 51 waveform generator, £10. VCR-139A CRT, £5. Carriage extra. S.a.e. with enquiries.—Hayward, "Sunnyfields," Lighthouse Road, St. Margaret's Bay, Dover, Kent.

For Sale: Trio TS-820 transceiver, mint condition and in original packing, with handbook and service manual, no modifications or repairs, therefore bargain at £55.—Ring Taylor, G3SYJ, Ipswich 622942.


Exchange: Tandy TRS-80 16K Level II microcomputer with manuals, several game books and tapes for comparably valued HF transceivers. (Cambs.)—Box No. 5675, Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts. AL6 9EQ.

Sale: Eddystone 840C, very good condition, with head-phones and Joystick VFA, only £75. —Hillan, 128A Bridge Street, Deeping St. James, Peterborough PE6 8EH.

For sale: Yaesu FR-50B with Heathkit communications speaker and Hamgear preselector, £60. Sentinal mains or battery 2-metre converter, 28-30 MHz, with Sentinel pre-amp., £15. Microwave Modules 4-metre converter, 28-30 MHz, £10. Pye AM base station receiver on 70-38 MHz, no case, £10. Pye AM base station transmitter on 70-38 MHz, £25. Pye base station mic., £10. Pye AM boot-mounted transistorised transceiver, with control gear on 70-38 MHz, £25. Pye AM boot-mounted valve transceiver, on 70-38 MHz, no control gear but modified as self-contained unit, £15.—Ring Ruffell, Stoke-on-Trent 543605 after 8 p.m.

Offering: Standard C.146A 2m. hand-held, fitted 5 channels and BNC, with helical, speaker and mic. Selwa MR-2G 12-channel 2m. Rx, fitted with 8 channels and BNC, with helical. Both in immaculate condition. Offers?—Colclough, Penney Sqn., A.A. College, Harrogate, N. Yorks.

TCC power/SWR i-whip, £7. Tripler, with PSU, £6. Magmount (new) with 144 MHz whip, £10.

For sale: Eddystone 680X, excellent condition, £85. 4048. Ponsanooth, Truro, Cornwall.

Wanted: BC-455 manual and modifications. -Eddy, Little Tregadles, Laity Moor, Ponsanooth, Truro, Cornwall. (Tel: Devoran 862148.)

Wanted: K.W. VFO Type 4B. —Jenner, G3KIW, QTHR. (Tel: Fleet 22887.)


Selling: Antenna system, comprising 2-element Gem-Quad, CD-44 rotator (both almost new), plus 40-foot 10-in. triangular Dural mast which breaks down to 6ft. sections and including heavy-duty hinged mounting base and 4:1 ratio winch, mast recently overhauled and painted battle-ship grey, with 24ft. wooden gin-pole against which mast is raised and lowered, quad and mast partially assembled but not installed, the lot (excluding coax, ropes and pulleys), £175. Buyer disassembles and collects; no part sale. —Henry, G3OFK, QTHR. (Tel: 0734-733674.)

Selling: Antenna system, comprising 2-element Gem-Quad, CD-44 rotator (both almost new), plus 40-foot 10-in. triangular Dural mast which breaks down to 6ft. sections and including heavy-duty hinged mounting base and 4:1 ratio winch, mast recently overhauled and painted battle-ship grey, with 24ft. wooden gin-pole against which mast is raised and lowered, quad and mast partially assembled but not installed, the lot (excluding coax, ropes and pulleys), £175. Buyer disassembles and collects; no part sale. —Henry, G3OFK, QTHR. (Tel: 0734-733674.)

For Sale: Trio TS-700S with matching speaker, £499. NAG-144 linear amp., £325. Both boxed and few hours use only. —Ring Meapham, Haywards Heath 57609, anytime.

Selling: American R.D.O. ship’s Rx, 78-100 MHz, with R.D.P. matching panaromic adaptor, £100. B.29 VLF naval Rx, museum piece, £20. —Yates, 1 Islands Brow, St. Helens, Lancs. WA1 1PW.


Wanted: Yaesu FRG-7 short wave receiver, privately for cash. —Ring Cushing, Framlington Earl (Norfolk) 05086-2923.

Wanted: DX-100 Tx, must be in good working condition; also K.W. Vespa Tx. —Ring Thomas, G8PVT, 021-382 4048.
LOOKING FOR ADVENTURE?  
BORE AT WEEKENDS?
If you are interested in radio or live within reach of one of our locations, come and see what we have to offer.

We are:
63 (SPECIAL AIR SERVICE) SIGNAL SQUADRON
(VOLUNTEERS)
Troops at
Peronne Road
Blignmont
Wallidown
East Row
Portsmouth (62829)
Southampton (771479)
Poole (526339)
Chichester (call Portsmouth or details)

MORSE CODE RECEIVING AND SENDING
Receiving:
CASSETTE A For Amateur Radio examination preparation.
Speed slowly increasing from 1-12 w.p.m.
CASSETTE B For Professional examination preparation.
Computer produced morse from 12-24 w.p.m.
Including international procedure signs and symbols and their incorporation into messages.

Sending:
Morse Key and Buzzer Unit for sending practice and own Tape preparation.
Phone output.
Prices:
each cassette, including booklets, £4.50
Morse key and buzzer unit, £4.50
Prices include postage, etc.

P.S.U. for Mobiles

40 watt
Ref. 119

Output in excess of 3 amps. (at 13v.)
Voltage adjustable up to 22v.

Furnished regulated.
Complete Kit of parts as illustrated ... £25.00
Ready made unit ...... ..... £28.00
Tax extra 8%.
P.P. £1.25

Other regulated units from 100 ma to 1.5 amp.

TELERADIO ELECTRONICS
25 Fore Street, Edmonton, London, N.9
S.A.E. FOR LISTS.

THE LINK TO BETTER PROJECTS ...
Resistors: 1k, 10k, 50k, 100k, 500k; Polyesters, 0.01, 0.022, 0.033, 0.047, 0.056, 0.068, 0.082, 0.1, 0.15, 0.22, 0.33, 0.5, 1, 1.5, 2, 2.2, 2.7, 3, 4.7, 5.6, 6.8, 10, 15, 22, 33, 47, 56, 68, 100, 150, 220, 330, 470, 680, 1k, 2k, 3k, 4.7k, 5k, 6.8k, 10k, 15k, 22k, 33k, 47k, 68k, 100k, 220k, 470k, 1 Meg.

Many other components in stock, send spec. in stamps for full list.

LINK ELECTRONICS
98 Burrow Road, Chigwell, Essex IGF 4HB
Mail order only. Please add 30p to total for postage. Prices inc. VAT at the current rates. SAE with all enquiries please.

Wanted: Healthkit DX-4D0U Tx, working or spares.—Ring Jesney, 0203-315788.
Wanted: Lafayette HA-600 receiver, working, or faulty one.—Ring Wilson, Morecambe 414146 evenings.
Wanted: Lafayette HA-600 receiver, working, or faulty one considered. Details and price please.—Box No. 5677, Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts. AL6 9EQ.
Wanted: Polish PZL-2000 with AC/PSU, in excellent working order, complete with mics. and home-brew ATU, £180.—Baker, G4BUQ, Flat 2, 81 Lawrie Park Road, Sydenham, London S.E.26.
Wanted: Resonator dual channel, £120. Pocketfone PFT2 3-channel UHF, £100. PFT5 Pocketfone, 1-watt UHF, £70.—Ring Jolly, 0352-57239.

Morse Code
Receiving: CASSETTE A For Amateur Radio examination preparation. Speed slowly increasing from 1-12 w.p.m.
CASSETTE B For Professional examination preparation. Computer produced morse from 12-24 w.p.m. Including international procedure signs and symbols and their incorporation into messages.

Sending: Morse Key and Buzzer Unit for sending practice and own Tape preparation. Phone output.
Prices:
each cassette, including booklets, £4.50
Morse key and buzzer unit, £4.50
Prices include postage, etc.

P.S.U. for Mobiles

40 watt
Ref. 119

Output in excess of 3 amps. (at 13v.)
Voltage adjustable up to 22v.

Fully regulated.
Complete Kit of parts as illustrated ... £25.00
Ready made unit ...... ..... £28.00
Tax extra 8%.
P.P. £1.25

Other regulated units from 100 ma to 1.5 amp.

TELERADIO ELECTRONICS
25 Fore Street, Edmonton, London, N.9
S.A.E. FOR LISTS.

THE LINK TO BETTER PROJECTS ...
Resistors: 1k, 10k, 50k, 100k, 500k; Polyesters, 0.01, 0.022, 0.033, 0.047, 0.056, 0.068, 0.082, 0.1, 0.15, 0.22, 0.33, 0.5, 1, 1.5, 2, 2.2, 2.7, 3, 4.7, 5.6, 6.8, 10, 15, 22, 33, 47, 56, 68, 100, 150, 220, 330, 470, 680, 1k, 2k, 3k, 4.7k, 5k, 6.8k, 10k, 15k, 22k, 33k, 47k, 68k, 100k, 220k, 470k, 1 Meg.

Many other components in stock, send spec. in stamps for full list.

LINK ELECTRONICS
98 Burrow Road, Chigwell, Essex IGF 4HB
Mail order only. Please add 30p to total for postage. Prices inc. VAT at the current rates. SAE with all enquiries please.

Wanted: Heathkit DX-4D0U Tx, working or spares.—Ring Jesney, 0203-315788.
Wanted: Lafayette HA-600 receiver, working, or faulty one.—Ring Wilson, Morecambe 414146 evenings.
Wanted: Lafayette HA-600 receiver, working, or faulty one considered. Details and price please.—Box No. 5677, Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts. AL6 9EQ.
Selling: FT-101E, still under manufacturer’s guarantee, 2 months old, £460 no offers.—Ring Cole, Hornchurch 55733 evenings, Romford 21318 daytime.


Selling: RTTY equipment: Marconi Hu-12DD recording unit, Redifon AFS-12 twinplex converter with PSU, AFS-13 twinplex-combiner, CV-89 terminal unit for spares, B.40/C receiver, manuals included except CV-89, £60 the lot or offers.—Ring Burton, Wokingham 787457.

Sale: Realistic DX-160 with speaker and instruction book, excellent condition, £60.—Ring 041-942 7560.

For sale: Forced QRT means shack clearance. S.a.e. for list.—Jackson, G3LVZ, 73 St. Christopher’s Caravan Park, Ellistown, Coalville, Leics. LE6 1FG.

Sale: IC-211E, perfect condition, with home-brew touch-pad, £450.—Ring Cole, Hornchurch 55733 evenings, Romford 21318 daytime.

Selling: Atlas 215X, new July 1978, with microphone and power cables, £375 or near offer.—Ring Taylor, Blockley 403145.

For sale: Yaesu FR-50B amateur bands receiver, 80-10m., mint condition, very little used since new, £70.—Kerr, 26 The Vale, Kirkella, Hull. (Tel: Hull 655619).

Wanted: Ex-W.D. Tx/Rx Sets, spares and manuals. —Dorset, 15 Chalcrofts, Alton (68715), Hants.

Wanted: FRG-7, FRG-7000, or similar good receiver. Also Oscar pre-amp., 2m. converter, antenna etc. Will collect. Details and price please.—Davies, 54 Sharpenhoe Road, Barton, Beds. (Tel: Luton 881323.)

Wanted: For Pye W15M Westminster: 2nd oscillator AT26806/1 or AT25806/3; 10-7 MHz IF AT26849/1 or AT2684/9. Details and price please.—Green, G4EZM, 88A Eastpines Drive, Blackpool, Lancs.

Wanted: Ex-Army Type B or C loop aerial; Type CT-47IC multimeter; modern receiver for 10-600 kHz; large diameter loop aerial.—Passfield, 144 Gilmore Road, Lewisham, London SE13. (Tel: 01-318 5290.)

Wanted: Contact with someone owning or familiar with Lewisham, London S.E.13. (Tel: 01-318 5290.)

For sale: Two good rigs, one must go: Trio TS-520S, pristine condition, almost new, £435. FT-277/101E, with SP-101, dust cover, perfect and as new, £450.

Standard 146A, fitted S20, S22 and R7, brand new, used, £100. KW-107 ATU, £60.—Ring Moscrop, G4EMG, 01-471 1762 daytime, 01-534 3460 evenings.


Home Brew Aerials Galore
Aluminium telescopic tubing to spec.: NJ4/3 HARD. 18 gauge. Reducing sizes : 14", 1", 3", 4", 6".
Ideal for Mono Band half-wave elements and Vertical Antennas. Easily fitted with PK or Jubilee clips.
The larger sizes — or your choice of diameters — cut to suitable lengths for 10 and 15 metre Beam elements.
10 metre elements ... £6.48 15 metre elements ... £7.56
1/2 wave vertical ... £3.78 1/2 wave vertical ... £4.43
Prices include VAT
Add £1 each element for BRS carriage.
Stocks available for despatch now.
UPPINGTON TELE-RADIO LTD.,
12/14 PENNYWELL ROAD, BRISTOL 5
Telephone: 0272 557732

HEY!! THIS IS 1979
YOU KNEW THAT. OKAY, BUT ISN'T IT HIGH TIME YOU COULD SEE THE OM, OR YL YOUR WORKING. ROBOT'S "400" SSTV SCAN CONVERTER MAKES IT ALL POSSIBLE AND REALLY BRINGS BACK THE FUN TO AMATEUR RADIO. DON'T BELIEVE US, JUST ASK ANY "400" USER WHOSE ROBOT'S "400" SSTV SCAN CONVERTER MAKES IT ALL POSSIBLE AND REALLY BRINGS BACK THE FUN TO AMATEUR RADIO. DON'T BELIEVE US, JUST ASK ANY "400" USER WHOSE "400" STATION IS BACK ON THE AIR.

New Title!
SHORTWAVE LISTENER’S HANDBOOK
by NORMAN FALLON
If you’ve wanted to listen to the world, but didn’t quite know how to go about it — this book will answer your questions; even if you are an experienced listener or DX-er you’ll find many valuable tips. This convenient all-points guide covers choosing a receiver and antenna, coping with listening conditions, logging stations, hunting weak signals, and how to build simple projects to improve your equipments’ effectiveness; it also explains how to go about getting reception reports, station schedules, etc. There’s a list of the world’s major broadcast stations and a glossary of SWL terms.
138 pages £3.85 post
Order from:
Publications Dept.,
SHORT WAVE MAGAZINE LTD.,
34 High Street, Welwyn, Herts., AL6 9EQ

Wanted: Heathkit HW-100 transceiver with AC/Mobile PSU, mic., cables, speaker and manuals. Also, please can someone loan me circuit diagram for Eddystone EC-10? — Ring Koester, 04243-2177 evenings.

Selling: Stolle 2010 rotator, with control, bearing and 100-yds. of 5-core, all brand new, nearest £60 secures. — Snowden, Manor Farm, Amotherby, Malton, Yorks.

Sale: XCR-30 communications portable receiver, in mint condition, £100. — Ring White, Orpington (Kent) 24442 any evening.

For sale: Eddystone EC-10 receiver, complete with PSU and ATU/AMP., £50. — Ring Lloyd, 0782-750904.

For sale: Gunn oscillator, £5. VLF RX, 15-1500 kHz, £12. Ranger 2m. base station, £6. Variac, 20A., with spare core, £10. Microwave Modules 4m. converter, £10. 6-40 PA with PSU, less valve, needs finishing touches, £12. — Ring Mash, G8JAO, 06845-63270 after 7 p.m.

For sale: Icom IC-3PA power supply, as new, £35. — Ring Middleton, G4EJH, Bristol (0272) 843897 evenings. Selling: Catronics ST5-B; Hal RVD-1005 VDU; Pye 9in. monitor; JRC Type NRD-3 general coverage RX, 8 bands, 100 kHz to 28 MHz, 16 xtal-controlled channels, meter-tuned, transistorised, with manual, 19in. rack-mounted. Wanted: FRG-7000. — Ring Akines, 0472-71211.

Wanted: Good 2-metre multi-mode receiver or transceiver, beam and rotator. Details and price please. — Ayres, G3UNP, 3 Swallow Close, Bushey Heath, Herts.


Sale: Liner-2, with Belcom PSU, pre-amp., usual accessories, good condition, £120. HW-7 QRP transceiver, good condition, £30. — Ring Ranner, G8OGY, 01-432 4284 office hours.

For sale: FRG-7, hardly used, £100 no offers. — Ring Luton 51105.

Wanted: All types of HF transceivers, working or not, can collect, anything considered. — Ring Hall, Bolton 592929.

March issue: Due to appear March 16th. Single copies at 50p post paid will be sent by first-class mail for orders received by Wednesday, March 7th, as available. — Circulation Dept., Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts. AL6 9EQ.
FEBRUARY OFFERS

UR63, 50 ohm Coax............. £1 p per m., post 2p p per m.
UR70, 75 ohm Coax, Back in stock...... £16 p per m., post 2p p per m.
UR67, 50 ohm low loss............ £4 p per m., post 4p p per m.
UR65, 50 ohm Nycon Miniature Coax.... 5p p per m., post 5p p per m.
CX4007, 75 ohm low loss UHF TV Coax....... £16 p per m., post 2p p per m.

300 OHM TWIN RIBBON.......... £9 p per m., post 1p p per m.

HEAVY DUTY MIC CABLE. Professional Twin screened, below trade price (less than £1 in stock).... £10 p per m., post 2p p per m.

2 CORE MAINS. Flat PVC 3-5 Amp. Many amateurs have found this suitable as 75 ohm tin fedder. (S.A.E for Sample)

HCSU XTAL SOCKETS............ £12 p each, post 7p any qty.

NOW AVAILABLE. Free completely revised and up dated Crystal lists with 1,000 of units from Low kHz to over 100 MHz in HCSU, 18U, 18U25U. S.E. Available.

W. H. WESTLAKE, Clawton, Holsworthy, Devon. GM6WW

---

RADIO AMATEUR PREFIX-COUNTRY-ZONE LIST

published by GEOFF WATTS

Editor of "DX News-Sheet" since 1962

The List you have always needed, the list that gives you everything, and all on one line! For each country -

a. its DXCC "status"

b. the normal prefix

c. the special prefixes

d. the ITU call-sign block allocation

e. the continent

f. the "CO" Zone No.
g. the ITU Zone No.

Full information on Antarctic stations, USSR klub-stations, obsolete prefixes used during the past 5 years, and much more, and the List can be kept always up-to-date because ample space has been provided for adding every new prefix, each new ITU allocation, etc.

Everything arranged alphabetically and numerically in order of prefix. Ideal for Contest operators and SWL's.

Tell your Club members about it. Order a gift copy for that overseas friend.

15 pages. Price 45p (UK) or sent overseas (air-mail) for $1 or 5 IRCs (55p)

62 BELMORE ROAD, NORWICH, NR7 0PU, ENGLAND

---

80M. BAND CRYSTALS, 10 all different, our choice

MARINE BAND CRYSTALS, 10 all different, our choice

STC STARPHONE U.H.F. FM HAND PORTABLE, single channel size: 6 x 3 x 1

BURNDEPT U.H.F. POCKET SET FM, single channel, size 6 x 4 x 2

G.E.C. LANGCOM V.H.F. POCKET SET FM, 3 channel, size 8 x 4 x 2, with mic., speaker and data..... £35

CRYSTALS 64-08, 64-22, 64-40, 64-58, 64-76, 64-94, 84-99, 85-12, 85-30, 85-40, 85-60, 85-68, 85-81, 90, 91, 92, 97 kHz. 7047, 7054, 7077, 7080, 7091, 7099, 7124, 7125, 7770, 14112, 14250, 14400 kHz (less 25½ 2 or more). (50,000 others in stock, enquire with S.A.E.)..... £3

AIR BAND MONITOR RECEIVERS, crystal controlled, single and multi channel, from...

LOOP AERIALS, 150 kHz-2 MHz, 8in. dia. manual or remote operation

UHF Rx 100 MHz double superhet all-valve, single channel size 6 x 6 x 12 with circuitry

WANTED—SURPLUS RADIO TELEPHONES, AIRCRAFT RADIO, CRYSTALS AND MANUALS

CALLERS AND EXCHANGES WELCOME AT:

BAGINTON ELECTRONICS

**BETTER SHORT WAVE RECEPTION**

by William I. Orr W6SAI and Stuart D. Cowan W2LX

New 4th Edition

In the latest edition of this excellent work for all those who own (or intend to own) a radio receiver, these two well-known and respected writers have produced chapters covering: the radio spectrum and what you can actually hear world-wide; the tuning of a shortwave receiver; the business of buying a receiver, both new and secondhand; a description of the SW Rx in non-technical terms, together with receiver adjustment and alignment; DX-ing above 30 MHz; a description of the VHF receiver; building and adjusting efficient aerials; reception techniques. Thoroughly readable and "digestible," this book is without doubt a very valuable addition to the bookshelf of any SWL.

160 pages £3.15 inc. post

Order from:

Publications Dept.,
SHORT WAVE MAGAZINE LTD.,
34 High Street, Welwyn, Herts., AL6 9EQ

---

WORLD RADIO TV HANDBOOK 1979

The World's only complete reference guide to International Radio & Television Broadcasting Stations.

It includes: Frequencies, time schedules, announcements, personnel, slogans, interval signals and much more besides of value to the listener.

Lists all International short-wave stations, including frequencies, for each country; foreign broadcasts, long and medium wave stations (AM broadcast Band), TV stations and domestic programmes. All on one line.

£9.15

(The above price includes postage and packing).

from:

SHORT WAVE MAGAZINE
34 High Street, Welwyn, Herts. AL6 9EQ
a selection of specially recommended titles . . . . . .

* SIMPLE, LOW-COST WIRE ANTENNAS, by W. Orr W6SAI
* A GUIDE TO AMATEUR RADIO, 17th Edition (RSGB)
* TEST EQUIPMENT FOR THE RADIO AMATEUR (RSGB)
* WORLD RADIO TV HANDBOOK 1979
* WORLD DX GUIDE
* WORKING WITH THE OSCILLOSCOPE
* AMATEUR RADIO TECHNIQUES, 6th Edition (RSGB)
* TOWERS' INTERNATIONAL TRANSISTOR SELECTOR (New Revised Edition)
* VHF/UHF MANUAL, 3rd Edition (RSGB)
* VHF HANDBOOK, by W. I. Orr W6SAI (New Edition)
* RADIO VALVE AND SEMICONDUCTOR DATA, 10th Edition
* RADIO COMMUNICATION HANDBOOK, VOL. I (New 5th Ed.) RSGB
* RADIO COMMUNICATION HANDBOOK, VOL. II (New 5th Ed.) RSGB

(all prices include post/packing)

Available from SHORT WAVE MAGAZINE
Publications Dept.,
34 HIGH STREET, WELWYN, HERTS., AL6 9EQ
Telephone: Welwyn 52067

Latest 1979 (57th Edition)

CALL BOOK—
DX LISTINGS

(i.e. all amateur call-signs outside the U.S.A.)

In this Issue . . .

* 295,398 licensed radio amateurs
* 84,822 changes in listings
* QSL Managers around the world
* Radio Amateur Prefixes of the World, with Map
* ARRL Countries list
* Great Circle bearings
* Standard Time charts
* World-wide QSL Bureaux
* Plus much, much more!

900 pages £9.10 inc. postage

Order from:
Publications Dept.,
SHORT WAVE MAGAZINE LTD.,
34 High Street, Welwyn,
Herts., AL6 9EQ

Latest 1979 (57th Edition)

CALL BOOK—
U.S. LISTINGS

In this issue . . .

* 374,487 U.S. licensed radio amateurs
* Repeater Stations
* SSTV Directory
* Zip codes and licence class on all listings
* Stop press—late QTH's
* ARRL Countries list
* International postal information
* Census of Amateur Radio licences of the World
* Plus many other features

1,069 pages £9.70 inc. postage

Order from:
Publications Dept.,
SHORT WAVE MAGAZINE LTD.,
34 High Street, Welwyn,
Herts, AL6 9EQ
## Technical Books and Manuals

**AERIAL INFORMATION**

- Antenna Handbook (Orr and Cowan) ........................................ £4.15
- Practical Aerial Handbook, 2nd Edition (King) .......................... £6.20
- Beam Antenna Handbook ...................................................... £3.10
- Cubical Quad Antennae, 2nd Edition ....................................... £3.10
- Simple Low Cost Wire Antennas, by Orr ................................... £3.15
- Vertical Beam and Triangle Antennas (E. M. Noll) ....................... £3.75
- Dipole and Long-Wire Antennas (E. M. Noll) ........................... £3.75
- Antenna (ARRL) 13th Edition ............................................... £3.60

### BOOKS FOR THE BEGINNER

- Solid State Short Wave Receivers for Beginners (R. A. Penfold) ...... £1.10
- Beginners Guide to Radio (New 8th Edition) ................................ £3.05
- Beginners Guide to Electronics .............................................. £2.50
- Course In Radio Fundamentals, ARRL ...................................... £2.60
- Guide to Amateur Radio (17th Edition) (RSGB) ........................... £1.70
- Ham Radio (A Beginners Guide) by R. H. Warring ...................... £3.33
- Morse Code for the Radio Amateur (RSGB) ............................... £2.50
- Simple Short Wave Receivers (Data) ........................................ £1.05
- Understanding Amateur Radio (ARRL) ..................................... £3.65

### GENERAL

- How to Make Walkie-Talkies (Rayer) ...................................... £1.45
- 50 (FET) Field Effect Transistor Projects, by F. G. Rayer ........... £1.40
- Amateur Radio Awards (RSGB) ............................................... O/S
- How to Build Advanced Short Wave Receivers (Penfold) .............. £1.35
- 50 CMOS IC Projects (R.A. Penfold) ...................................... £1.15
- 50 Projects Using IC CA3130 (R.A. Penfold) ........................... £1.15
- Better Short Wave Reception, New 4th Edition ........................... £3.15
- FM & Repeaters for the Radio Amateur (ARRL) ........................ £2.90
- Easibinder (to hold 12 copies of "Short Wave Magazine" together) .. £2.35
- OSCAR—Amateur Radio Satellites ......................................... £4.20
- Test Equipment for the Radio Amateur (RSGB) .......................... £4.40
- World DX Guide (new title) .................................................. £5.35
- Radio Stations Guide ........................................................... £1.70
- Long Distance Television Reception (TV-DX) for the Enthusiast .... £1.70

### HANDBOOKS AND MANUALS


The above prices include postage and packing. Many of these titles are American in origin (terms C.W.O.).

**USEFUL REFERENCE BOOKS**

- Solid State Design for the Radio Amateur (ARRL) ...................... £5.00
- Foundations of Wireless and Electronics, 9th Edition (Scroggie) .... £4.50
- Amateur Radio Techniques, 6th Edition (RSGB) ......................... £3.95
- Engineers Pocket Book, 6th Edition ....................................... £2.03
- U.K. Call Book 1979 (RSGB) ................................................ £3.20
- Hints and Kinks (ARRL) ...................................................... £2.25
- Radio Data Reference Book RSG ............................................ £3.60
- Single Sideband for the Radio Amateur (ARRL) ........................ £2.95
- NBFM Manual (RSGB) .......................................................... £1.50
- Electronics Data Book (ARRL) .............................................. £3.25
- Getting to Know OSCAR from the Ground Up (ARRL) new title ...... £2.30

**VALVE AND TRANSISTOR MANUALS**

- Digital IC Equivalents & Pin Connections ............................... £2.82
- Towers' International Transistor Selector, (New Revised Edition) .... £5.15
- Service Valve and Semiconductor Equivalents ........................... £5.05
- Radio Valve and Semiconductor Data (10th Ed.) ........................ £2.86

**VHF PUBLICATIONS**

- VHF Handbook, Wm. 1 Orr (New Ed.) ..................................... £3.95
- VHF Manual (ARRL) ......................................................... £3.20
- VHF/UHF Manual (RSGB), 3rd Ed. ........................................ £6.70

**AVAILABLE FROM**

**SHORT WAVE MAGAZINE**

Publications Dept.
34 High Street, Welwyn, Herts. AL6 9EQ - Welwyn (043871) 5206/7

Counter Service 9.30-5.00. Mon. to Fri.

(Counter Service. 9.30-5.00. Mon. to Fri.)

(GIRO A/C. No. 547 6151)
B. BAMBER ELECTRONICS

DEPT. S, 5 STATION ROAD, LITTLEPORT, CAMBS., CB6 1QE
Tel.: Ely (0353) 860185 (Tuesday-Saturday)

CALLERS WELCOME BY APPOINTMENT ONLY

Add 8% VAT (except where shown)

IC AUDIO AMP PCB. Output 2 watts into 3 ohm speaker, 12V DC supply, site approx. 51” x 11” x 11” high, with integral heatsink, complete with circuits, £2.00 each.

NICAD CONVERTER PCB. (Low power inverter). Size approx. 4” x 12” x 1” high, with power supply, 60V DC output, through pat on PCB for charging NICADs, etc. (ideal for charging portable batteries from mobile supply). Only needs one BFY70, 51/52 or similar transistor, which can be mounted direct on the PCB pins on board, fitted with a star-type heatsink (not supplied), £2.00 each.

THE NEW EAGLE INTERNATIONAL CATALOGUE IS AVAILABLE ON REQUEST containing Audio, In-car, and test equipment, etc.

WELLER TCP2 and PU202D PSU. Temperature controlled soldering iron with matching Power Supply Unit, containing sponge and spring stand, £10.00.

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

AEI CS108/R MICROWAVE MIXER DIODES, up to X100V, 800amp, 180W, noise figure 8-56db at 9.793-797 GHz, 80p each.

Add 8% VAT (except where shown)

IC TEST CLIPS, clip over IC while still soldered to PCB or in socket, gold-plated pins, ideal for experiments or service engineers, 28 pin DIL, £1.75; 40 pin DIL, £2.06. Or clips for IC’s mounted on PCB for £1.50 each.

DECIMAL KEYBOARDS, pressure sensitive type, when pressed contacts go from D.C. to about 100 ohms. Switches only, no encoders. Size approx. 3” x 3” x 3”, with large square touch plates, £1.00, Dual Watch, and spare. Few only, £1.00 while stocks last.

MAIN TRANSFORMERS, TYPE 15/300. 240v, input, 15v, at 300mA output, £1.50 each.

MAIN TRANSFORMERS, TYPE 45/100. 240, 220/110, 20V input, 45v at 100mA output, £1.50 each.

LARGE ELECTROLYTIC PACKS, contains range of large electrolytic capacitors, low and high voltage types, over 40 pieces, £30.00 per pack (plus 12½% VAT).

GLASS BEAD FEEDTHROUGH INSULATORS, solder-in type, overall dia., 5mm., pack of approx. 50 for 50p.

LARGE GLASS BEAD FEEDTHROUGH INSULATORS, as above but 8mm. dia. pack of approx. 50 for 70p.

Add 8% VAT (except where shown)

TERMS OF BUSINESS: CASH WITH ORDER. MINIMUM ORDER OF £2.00. ALL PRICES NOW INCLUDE POST, & PACKING (UK ONLY)

Please enclose stamped addressed envelope with all enquiries.

PLEASE ADD VAT AS SHOWN

IQ WAY RIBBON CABLE, DECIMAL CODED, 4 Metres for £1.25 + 8% VAT
IQ WAY HEAVY-DUTY RIBBON CABLE, DECIMAL CODED (ideal for PSU runs) 3 Metres for £1.50 + 8% VAT

ALL BELOW — ADD 12½% VAT

BSP AUTOCHROME RECORD DECKS with cue device, 31-45-78 RPM, for 7”, 10”, 12” records. Fitted with SEC12M Ceramic cartridge and styl. £2.50.

GARRARD AUTOCHROME RECORD DECKS, £3.00 with cue device, 33-45-78 RPM, £4.00, 12” records, fitted with K541B Ceramic cartridge and styl. £14.11.

TV LINEARITY COILS. Special offer 10 for £1.00.

TV SCAN COILS, B/W, to fit 110 degree tubes, £1.00.

BARGAIN PACK OF LOW VOLTAGE ELECTROLYTIC CAPACITORS. Up to 50v., working. Sectronic manufactures. Approx. 100, £1.00 per pack.

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

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

DIN 3-pin LINE SOCKETS, 16p each.

3 PIN DIN PLUGS, 15p each.

DIN 3-pin LINE SOCKETS, 15p each.

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

DIN 3-pin LINE SOCKETS, 16p each.

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

GARRARD AUTOCHROME RECORD DECKS with cue device, 31-45-78 RPM, for 7”, 10”, 12” records. Fitted with SEC12M Ceramic cartridge and styl. £2.50.

GARRARD AUTOCHROME RECORD DECKS, £3.00 with cue device, 33-45-78 RPM, £4.00, 12” records, fitted with K541B Ceramic cartridge and styl. £14.11.

TV LINEARITY COILS. Special offer 10 for £1.00.

TV SCAN COILS, B/W, to fit 110 degree tubes, £1.00.

BARGAIN PACK OF LOW VOLTAGE ELECTROLYTIC CAPACITORS. Up to 50v., working. Sectronic manufactures. Approx. 100, £1.00 per pack.

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

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

DIN 3-pin LINE SOCKETS, 16p each.

3 PIN DIN PLUGS, 15p each.

ELECTROLYTICS

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

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

ELECTROLYTICS, 220uf, 50v., 5 for 50p.

ELECTROLYTICS, 1000uf, 30v., 3 for £3.50.

ELECTROLYTICS, 5000uf, 50v., 5 for £3.50.

ELECTROLYTICS, 500uf, 30v., 3 for £3.50.

ELECTROLYTICS, 5000uf, 50v., 5 for £3.50.

ELECTROLYTICS, 500uf, 30v., 3 for £3.50.

ELECTROLYTICS, 5000uf, 50v., 5 for £3.50.

ELECTROLYTICS, 500uf, 30v., 3 for £3.50.

ELECTROLYTICS, 5000uf, 50v., 5 for £3.50.

MULLARD ELC1043/05 VARICAP TV TUNERS, each.

CELESTION 8” x 5” EPILETICAL SPEAKERS, 20 ohm, 3 watts rates, £1.50 each.