40p

The SHORT WAVE Magazine

VOL. XXXVII DECEMBER 1979 NUMBER 10

WATERS & STANTON ELECTRONICS

TRIO HAS COME TO THE SOUTH EAST

TRIO

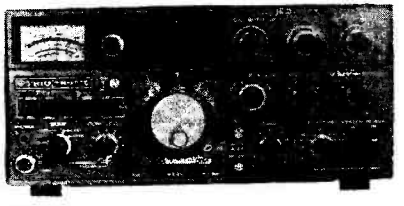
. . . We wish our customers and trade friends a Happy Xmas and Prosperous New Year

ALL PRICES INCLUDE 15% VAT

TRIO TS120V £408
TS120S £495

SOLID STATE RIG RELIABLE AT LAST

Up until now there has been a natural reluctance to accept solid state HF rigs as anything but a second rig or mobile unit with dubious reliability of the PA devices. Now at last the new TS120 series gives you 80-10 metre coverage at either 10 watts output or 100 watts output. Digital readout and variable selectivity are just two features that put them in a class above any other solid state rig we know of (apart from the TS180S) — even those costing nearly £1,000. The TS120 will put to sheme many of the older valve PA designs and can confidently be regarded as a good reliable base or mobile station — and no tune-up means instant QSY from band to band at the flick of a switch.



TRIO TS820S £832

THE DX OPERATOR'S EXECUTIVE RIG

The Trio TS820S must be the HF operator's dream come true. Many superlatives have been used to describe it and all are justly deserved. It's the transceiver that you'll hear from about every corner of the World with its distinctive, clean, crisp audio. A most effective RF processor ensures a remarkable improvement in readability under QRM conditions without any degradation of quality and RF negative feedback produces just about the cleanest signal you'll find anywhere. 160-10 metres, 200 watts PEP input and 0.2uv for 10db S-N all add up to an enviable package. Add to this the digital readout display and unique selectivity obtained by "bandpass tuning" of the IF section produces a transceiver that is today's DX operator's No. 1 choice. For further information or credit terms, just drop us an SAE.

NEW **TRIO TS770 £775**

If you're a VHF or UHF enthusiast, this must be the transceiver for you. The Trio TS770 is the ultimate, all-in-one station for 144-146 and 432-440MHz operation. A complete "state of the art" package, embodying many unique features, including digital readout, dial braking, dual speed tuning, dual VFO control, split frequency working, electronic band changing, eight memory channels, scanning of 1MHz segments or the eight memory channels, 100kHz search switch for CW/SSB, frequency lock switch, plus all the more usual features that you have come to accept as standard from Trio. The net result is a one package station that costs little more than 2 metre base station plus 70cms transverter — but it is a lot more flexible. No wonder everybody has been waiting for this one — it's simply the ultimate!

NEW **TRIO R-1000 £275**

At last the Trio R1000 has been announced — a real pupose-built receiver for the serious short wave listener. 200kHz to 30MHz in 30 bands. This receiver has many features that are not available on other models and, of course, has the technical backing of the world's largest manufacturers of amateur communications equipment. Features include: 1kHz digital readout and separate analogue dial, large high quality speaker, digital 12 hour clock — AM and PM, three separate filters for razor sharp selectivity, noise blanker (try finding this on any other receiver!), automatic preselector tuning via the 1MHz band switch, three-stage attenuator, dimmer control, tone control, timer circuit, and all this in a dimunutive package measuring 12½ × 4½ × 8⅜ in. Trio have now solved the problem of choosing a receiver — there is no choice — it's got to be Trio!

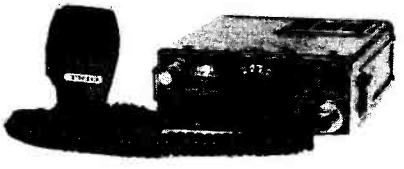
STOP PRESS!

Have you seen the new Trio TR7400? — it will cost you approx. £235 but at that price you get the ultimate that is available from Japan.

TRIO TR7625 £273

THE MOBILE RIG WITH 80 CHANNELS

The TR7625 is the complete 25 watt mobile package for 2 metres. The whole of the band, 144-146MHz is covered using a coaxial type switch and enabling any frequency in 5kHz steps to be selected. A bright LED display gives true frequency readout and power output can be switched down to 5 watts. A memory switch enables one to also programme into the transceiver one priority channel. A lowered powered 10 watt model is also available designated TR7600. Of particular interest to many operators will be the microprocessor that is available as an extra at £74. This plugs into the rear of the transceiver and gives up to six memory channels that may be scanned, touch pad frequency selection, multiple scanning and lock-on busy or empty channels. Quite a unit!



TRIO TR2300 £199

THE IDEAL STARTER RIG!

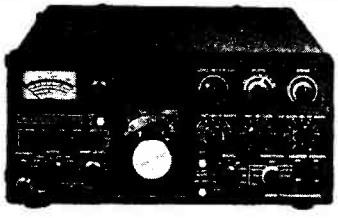
The TR2300 is a remarkable package which combines all the advantages of a portable station with those of a mobile transceiver. In many ways it's the ideal "starter rig" in amateur radio. Full band coverage from 144-146mHz in 80 x 25kHz channels plus 600kHz repeater shift and 1750Hz automatic tone-burst complete its versatility.
The dial is directly calibrated in frequency and has illumination for night use. The transmitter is exceptionally clean with an output power in excess of 1 watt. Receiver sensitivity is every bit as good as the best mobile rigs and either internal batteries or an external DC source may be used. Fits easily into a suit case or on the corner of a desk and makes a really compact mobile rig. Price includes carrying case, shoulder strap, battery charger, external DC cord and, of course, the Waters & Stanton 12 month warranty. An absolute bargain — we even sell them to our staff!

STEPHENS-JAMES LTD.

47 WARRINGTON ROAD, LEIGH, LANCS. WN7 3EA

TELEPHONE (0942) 676790

G3MCN



R820 RECEIVER

*** * THE ULTIMATE IN RECEIVERS * ***

Frequency coverage 160-10m plus SW Broadcast Bands. All modes CW-USB-LSB-RTTY. Digital Readout. Noise Blanker. Fully variable I.F. Bandwidth, plus Bandpass tuning, plus rejection notch filter. **£790·00**

The new TR-7600 is a high performance 2m FM Transceiver with memory, designed to permit multi-channel (400 channel) operation. Featuring the ability of repeater operation. This transceiver brings you all the convenience and versatility in both mobile and fixed station operation.

The TR-7600 has provision for connection of optional remote control unit (with built-in microcomputer) for added versatility. **£247.00**

TRIO TS120 TRANSCEIVER

ALL SOLID STATE HF BAND TRANSCEIVER

Freq. 3·5-30 MHz Amateur Bands and WWV, I.F. Shift System, Noise Blanker, Vox, Single conversion system using PLL circuit. Digital display dial.

TS120V	10 watts PEP	£408·00
TS 120S	200 watts PEP	£495·00

TR2300

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

£199.00

TRIO

R820 Receiver	£790·00
TS820 Transceiver	£710·00
Digital readout for TS820	£122·67
VFO820	£123·70
DS1A 12v. DC Inverter	£42·93
SP820 Speaker	£38·83
SM220 Monitorscope	£246·00
TL922 Linear Amplifier	£797·50
TS520S Transceiver	£541·78
VFO520S	£103·25
SP520 Speaker	£17·90
DG5 Digital readout for TS520S	£119·60
TS120V 80–10m. Mobile Transceiver	£408·00
PS–20 AC power supply for TS120V	£52·14
MB100 Mobile mounting bracket	£17·00
TS700S 2m. All mode digital transceiver	£548·98
SP70 Speaker	£20·45
TR7010 2m. SSB/CW Mobile 10 watt	£193·20
PS6 Power supply	£59·29
TR2300 2m. Portable Transceiver	£199·00
TRIO R1000 Receiver	£298.00
PB15 Battery Pack	£20·25
TR8300 70cm. FM Mobile Transceiver	£190·00
TR3200 70cm. Portable Transceiver	£190·00
HS5 Headphones	£23·52
HS4 Headphones	£10·73
MC50 Desk Microphones	£27·60
MC30S Hand microphone 50K	£13·29

Crystals and accessories in stock

TS180S

TS180s. HF Transceiver. An all solid state Transceiver with Digital Frequency Control. A rig that has the facilities that DXer, Contest operator or any Amateur would desire for maximum flexibility on the 160 through 10 metre bands. Up to 200 watt PEP input. No tune Final amplifier.

With digital readout. **£825·00**

JAYBEAM

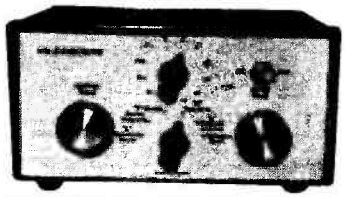
5Y/2M 5 element yagi	£8·86
8y/2M 8 Element yagi	£11·50
10Y/2M 10 element	£25·13
PBM/14/2m. 14 element Parabeam	£35·78
5XY/2m. 5 element crossed yagi	£18·40
8XY/2m. 8 element crossed yagi	£23·00
10XY/2m. 10 element crossed yagi	£30·48
Q4/2m. 4 element Quad	£19·08
Q6/2m. element Quad	£25·30
D5/2m. 5 over 5 slot fed yagi	£15·86
D8/2m. 8 over 8 slot fed yagi	£21·16
UGP/2m. ground plane	£7·96
MBM48/70cms. Multibeam	£25·06
MBM88/70cms. Multibeam	£33·35
TAS ⅛" 2m. Whip mobile	£14·37
C5/m. Colinear	£35·65
C8/70cm. Colinear	£45·42
D15/1296 23cm. Antenna	£26·90

Carriage on Antennas £3.00

RECEIVERS AND TRANSCEIVERS

(Inc. VAT and Postage)

SR9 Tunable 144–146 MHz FM Receiver	£46.00
AMR217B Scanner Receiver. AC or DC operation	£113·50
R512 Aircraft Band Scanning Receiver	£135·00
AR240. 800 Channel Hand Held 2m. FM Transceiver	£168.00
HC 1400 2m Transceiver	£255·00
Regency Digital Flight Scan Synthesised Aircraft Band Receiver	£230.00
F.D.K. TM563 Scanning 2m Receiver	£109.00
Sky Ace handheld Aircraft band receiver	
Yaesu FRG7 Receiver	£214.00
Yaesu FRG7000 Receiver	£275.00



The Mk. 2 Multituner was designed by us to many requests who found our Mk. 1 the finest they had ever used but required a wider frequency range. This covers 550 kHz to 30 MHz. The circuitry gives 50 switchable, tunable positions to match any antenna over 5 metres in length to practically all communication receivers. Our "Multituners" are designed and manufactured by ourselves and have been exported to over 50 Countries. Many operators use them for QRP Transmitting also. See the February edition 1977 of the "Short Wave Magazine" or send SAE for details.

£26.50 inc. VAT and postage

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.

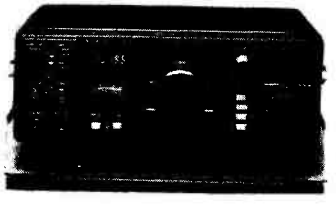
ACCESS and BARCLAYCARD facilities,
Instant HP service

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 5 p.m. Saturday.

No parking problems. Turn at the Greyhound Motel on the A580 (East Lancs.) Road. S.A.E. with all enquiries. 25p will bring you latest information and prices, credited to your first purchase over £5. Postage carriage extra.

ALL OUR PRICES INCLUDE VAT



TRIO R1000

NEW ANTENNA MODELS

H.S. HF5 Vertical 10–80m.	£41·40
HF R. Ground Plane Kit	£23·00
GDX 2 Discone Antenna 50-460 MHz	£36·80

BANTEX

Bantex Magnetic Base Mount	£10.40
¼" glass fibre Whip	£8.44
¼" stainless steel Whip	£9.40
UHF stainless steel Whip	£8.63
Standard base mount	£2.70

ROTATORS

AR30	£47·16
AR40	£54·73
CD44	£109·25
AR22	£49·46
KR400	£98·13
DR7500	£108·10

CABLE

UR43	24p metre
UR67	82p
300 ohm Ribbon	11p metre
75 ohm low loss	20p

SRX-30
Solid state Receiver 550 kHz–30 MHz £175·00

TEK
5D Multi Band Trapped Dipole 80–40–20–15–10 metres. 50 ohm feed. 23 metres in length. This is complete, not a kit. High quality Traps and wire. 2kW PEP rating
PRICE (inc. VAT) £50·00

Accessories

2 way Antenna Switch 50 ohm-200 watt	£6·00
3 way Antenna switch SWL push button type	£4.60
3 way Antenna Switch 2 kW PEP 0-500 MHz	£9.50
4 way Antenna Switch 50 ohm 200 watt PEP	£10.50
6 way Antenna Switch 2 kW PEP 0-30 MHz	£17.50
Single Meter SWR Wall type	£10.87
Single Meter SWR Desk type	£11.00
Twin Meter SWR Desk type	£13.55
Hansen FS-301 Through Line Wattmeter	£40.10
DL20 20 watt 50 ohm Dummy Load	£6.30
DL50 50 watt 50 ohm Dummy Load	£7.50
DL120 100 watt 50 ohm Dummy Load	£12.50
DL-1000 1 kW Dummy Load 50 ohm	£31.00
Morse Keys Lightweight	£3.25
Nye King Morse Keys	£10.15
HyMound HK708	£10.50
Katsumi EK 150 Electronic Keyer	£79.00
Katsumi MK1024 Electronic Keyer, with memory	£135.00
DX-008 Programmable Frequency Counter	£116.25
Antenna Gutter Mounts	£3.55
HP3A High Pass Filter	£3.25
Twin Keying Paddle. Chrome plated with heavy base. Precision Unit	£26.50

Full Range of Microwave Modules Converters, Transverters, Linears, etc.

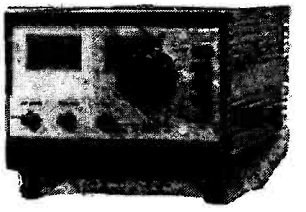
Hy Gain

12AVQ 3 band Vertical	£43.12
14AVT/WB 4 band Vertical	£60.37
18AVT WB 5 band Vertical	£87.40

A5P and Diawa 144MHz anfd 70 cms Antennas in stock.

Mini Products

C4X 3 band Vertical	£48.00
HQ1 Mini Beam	£96.00



ARAC 102 receiver, 28–30 MHz. 144–146 MHz. AM–SSB–FM–CW Price £106.50

S.T.E. Prices include VAT and postage

Arac 170 10m. and 70 cm. Receiver	£129·00
AA1 Audio Module for AR10	£4·10
AD4 FM Discriminator	£5·00
AL8 Linear Amplifier	£27·60
AG10 Tone Generator	£4·50
ATAL 2m. AM-FM Tx	£129·00

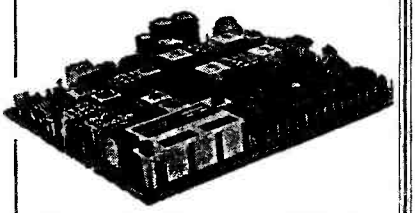
G-WHIP

Tribander Helical 10–15–20m.	£23·00
LF Coils for Tribander	£6·55
LF Telescopic Whip Section	£2·99
Basemount standard type	£4·20
Multimobile 78, 10–15–20m.	£26·45
MM Coils	£6·55
MM Telescopic whip section	£2·59
Flexiwhip basic 10 metre section	£16·10
Basemount standard	£4·20
Ball type Basemount	£5·75
Coils for Flexiwhip	£6·55
Base thread adaptor USA/G Whip	68p
Extendarod 40"	£10·93

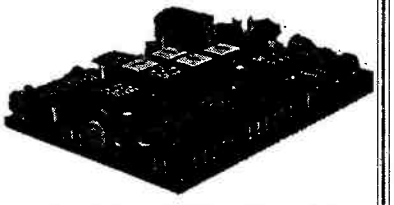
Drake

TV3300 Low Pass Filter	£18.40
TR7 Transceiver and AC psu	£1021.00
MN7 ATU/RF Wattmeter	£126.50
DL1000 Dummy Load	£32.00

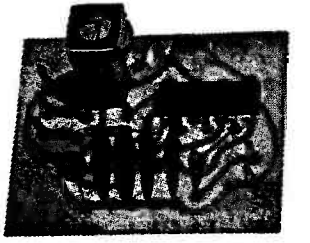
Standard C8800
2m Transceiver 10 Watt FM digital tuning — remote control multi-mode scanning — £252



AR20. 12 channel FM receiver 144-146 MHz. Input impedance 50–75 ohm. AM-FM modes. Sensitivity 0·2uV AF output 3 watts. 12v. DC operation. **Price £50.00**



AT23. 12 Channel FM 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

TECHNICAL ASSOCIATES

Rx Band Pass Filter. 9 I.C's. 1 watt output* 8 switched positions of filters* High pass 2·5 kHz–2–00 kHz–1·5 kHz–200 Hz–110 Hz–80 Hz* Ideal for increased selectivity with FRG7, SXR30, ETC ... **Price £30·45**

New "Multifilter"
Simple to install between receiver and speaker This unit contains band pass filter — peak and notch filter.

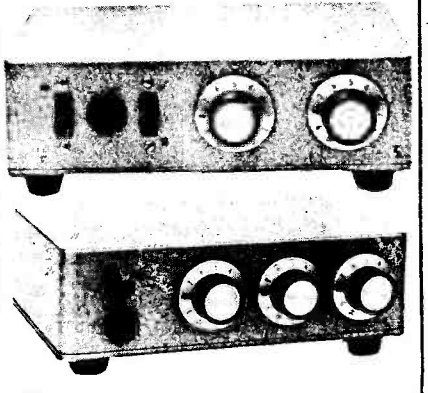
Pre-Selector. Coverage 1·6 MHz to 31 MHz* Three switched bands* Type 1 with antenna changeover relay for Transceiver op **Price £30·45**

Type 2 for SWL without relay **Price £27·25**

Crystal Calibrator. Seven ranges down to 1 kHz. Selected from front panel. Complete with antenna. ... ... **Price £22·80**

Some Models in New Type Cabinets

These prices include VAT and postage.



Solid State Stabilised Power Supplies
Maximum ratings quoted. Prices include postage.

Model 122 12·6V 2·5A	£15.55
Model 125 10-15V 5amp	£28.00
Model 153S 4-20V 3 amp Dual Meter	£29.35
Model 156S 4-15V 5 amp Twin Meter	£35.00
Model 1210S 4-20V 10 amp Twin Meter	£85.00
Model 1210SV 4-20V 10 amp Digital Readout	£110.00
Model 153SV 4-20V 3 amp Digital Readout	£38.00
Model 1220/1 13·5V 20 amp	£90.00
Model 1220/2 13·5V 12 amp	£80.00

Mod. 1210 S

Merry Christmas to all our customers

STEPHENS-JAMES LTD.

47 WARRINGTON ROAD, LEIGH, LANCS. WN7 3EA

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AT THE LEICESTER EXHIBITION

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ADVERTISERS' INDEX

SHORT WAVE MAGAZINE

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CONTENTS

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

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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.

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FOR THE RADIO AMATEUR AND AMATEUR RADIO

The SHORT-WAVE Magazine

EDITORIAL

Economics

With effect from the January 1980 issue, cover price of *Short Wave Magazine* will be 45p, and the annual direct subscription rate will be £6.50 (2nd class post). The new subscription rate takes into account the forthcoming (January) increase in postal charges, but subscribers should note that, as always, we shall be subsidising the postal costs by not passing them on in full. Also as before, current subscribers will not, of course, pay the new rate until their sub. falls due for renewal. Single copies by first-class post will cost 60p.

As many readers will be aware, this is the first increase in cover price since October 1977 — and inflationary pressures affect *S.W.M.* as much as anyone else: indeed if our service to readers had been as it should have been over the past months, we would have felt justified in increasing the price some time ago. Perhaps delays have some benefit after all!

The long national Christmas holiday means that the January issue is not due to appear until January 4th.

This *is* the season of good cheer (in spite of many indications to the contrary), and so may we take this opportunity to wish all our Readers, Advertisers and Trade friends a very Happy Christmas and a Peaceful and Prosperous New Year.

VHF BANDS

NORMAN FITCH, G3FPK

Contest News

Results: As readers will recall, the rules for the 144 MHz contest on Sept. 1/2 were not published so there was considerable confusion among the participants. After all, the radial ring scoring system was adopted and, on this basis, the winners of the Multi-operator section were the GW8BHH/P team who notched up 8995 points. 2nd place went to G4BWG/P with 7902 pts. and G4BPO/P came in 3rd with 7636 pts. In the Single-operator part, Geoff Brown, GJ4ICD, was clear winner with 5951 pts. and Ian Offer, G4FDX, was 2nd with 5039 pts. G8NEY/P came 3rd with 4006 pts.

On Sept. 16, the RSGB Region 1 VHF Contest took place. In the Multi-operator section, the winners were the Liverpool and District RS who will receive the G3SSM Shield. Our regular contributor Arthur Breese, GD2HDZ, won the Single-operator part and will receive the G2CIP Shield. G8NQP was the leading scorer outside Region 1.

Some 60 stations took part in the 1979 10 GHz. Cumulative Contest and there were 22 entries. There was a tie for first place between G3IW/P, the Vectis Wireless Group — G3RSU and G3WXC — and the G3YGF/P station, with G8RHI as second op. G3ZME/P, the Telford and District ARS station, came 3rd. The leading overseas station was F6DLA/P. Thanks to the *GB2RS News Service* for the foregoing.

Coming events: Miracles apart, the 144 MHz Fixed Contest will be history by the time this appears. It is scheduled for 0800-1700 GMT on Dec. 2 and is a two-section Single-operator and Multi-operator affair. The next event will be the 70 MHz CW contest on Jan. 20.

Beaconry

GB3LDN on 2304.05 MHz is now operational from locator AL41a. After a considerable absence, GB3IOW on 1296.90 MHz, is once again perking away from the Isle of Wight. Reception reports of microwave beacons may be sent to Charles Suckling, G3WDG (*QTHR*).

The Satellite Scene

A small possé of AMSAT-UK officers attended the AMSAT Board of Directors and Annual General meetings in Washington, D.C., in early October. These were Dr. Arthur Gee, G2UK; Pat Gowen, G3IOR, and Martin Sweeting, G3YJO. In the B.o.D. election, the following were successful: Jan King, W3GEY; Perry Klein, W3PK; William Webster, Jr., WB2TNC, and John Browning, W6SP. Subsequently W3PK was elected President and W6SP, Chairman of the Board. At the B.o.D. meeting, G3IOR was presented with the first European satellite *DXCC* certificate. Pat now has 105 countries confirmed out of 114 worked. Effective January 1, AMSAT dues are going up to $16 per annum.

AMSAT-UK members will be aware of the so-called agreement between the British group and AMSAT HQ in Washington and its later rejection by the Committee. Counter proposals have been made to AMSAT for streamlining worldwide satellite matters. AMSAT-UK President Pat Gowen, G3IOR, has resigned but remains a member of the AMSAT B.o.D. AMSAT-UK's quarterly journal, *Oscar News,* will continue under the editorship of the Secretary, Ron Broadbent, G3AAJ. It is understood that AMSAT's quarterly *Newsletter* is to be replaced by a commercially printed magazine called *Orbit* which will carry advertising.

The *Phase III* project is going well and the launch could be in May or July. The latest orbit information to hand is: *apogee* 34,385 kms., *perigee* 1,500 kms., *period* 628 mins. The satellite will be launched from an *ARIANE* vehicle from the European Space Agency's site at Kourou in French Guiana.

Initially, the satellite will be put in a "transfer" orbit for about two weeks. Then a small, solid fuel "kick motor" will be fired to achieve the desired orbit which will have an inclination of about 57°. The uplink band will be centred on 435.215 MHz and the inverted downlink on 145.900 MHz. The general communications bandwidth is 124 kHz with a further 28 kHz at either end for special service channels and beacons. AMSAT suggests that one kilowatt *e.r.p.* will suffice at *apogee* and that the strength of the 2m. downlink signals will be some 7 dB weaker than *Oscar 7* in Mode "B".

According to a "Late News Flash" in *Oscar News,* No. 27, NASA has now approved the launch of our own UOSAT with the SME experiment in mid-1981. The orbit would be a circular one of 530 kms altitude with an inclination of 97.52° and sun synchronous.

Oscar 7 is still working off its solar cells and its operating schedule is currently Mode "A" on odd *Julian* days and Mode "B" on even ones. (December 1 is *Julian* day 335.) The beacon on 435.1 MHz approximately was transmitting telemetry data at good strength in mid-October. Mode "A" reception is often rather poor due to the high MUF's as we reach the maximum of sunspot cycle No. 21. The reason is that, because *0-7* rotates well above the F_2 layer, the 10m. signals relayed by it are reflected upwards into space. Of course some of the signal penetrates the F_2 layer but obviously the received strength will be much less than it was a few years ago when the band was "dead".

Another problem is that, because the 10 m. band is frequently open, worldwide, the weak satellite signals are having to compete with all the harmonics, intruders and terrestrial amateur stuff. However, the other side of the coin is that, from time-to-time, Mode "A" signals can be received when the satellite is way below the horizon thus offering the opportunity of really long distance QSO's.

Oscar 8 is working well although Mode "A" reception suffers as with *0-7.* As for orbit predictions, in round figures, *0-8* crosses the Equator some 20 mins *earlier* and 5° further *East* than shown in the AMSAT-UK calendar issued earlier this year. It is quite likely that the present high solar flare activity will have a further effect on the orbit. The best way to keep in touch is to listen to the *GB2RS* Sunday news bulletins or the AMSAT net on

3780 kHz from 1015 on Sunday mornings.

The problem of predicting satellite behaviour is a very complicated one. The essential information comprises knowing the orbit inclination, the eccentricity and the anomalistic period which is the number of revolutions per day. Such information is obtained by radar and visual observation. Other factors affecting the orbit of low-orbit satellites in particular, include atmospheric and ionospheric drag, the oblateness of the Earth and the variations in the value of the gravitational constant.

NASA provides "Two line orbital elements" for all satellites and examples were published in *Oscar News* No. 27. For *0-8*, these indicate a decrease in the period of about half a second between Jan. 18 and Aug. 10. Quite small but, if the Jan. 10 period had been used to generate predictions, by Aug. 10 they would have been about 24 *minutes* out. Thus it would seem that, when dealing with satellites at altitudes of less than 600 miles, anyone seeking to publish predictions on an annual basis is wasting his time. To illustrate this point, Greg Roberts, ZS1BI, who is a professional astronomer, using all the *NASA* data, reckons he is within 2 mins when predicting just 2-3 months ahead.

Six Metres

The 50 MHz band really came to life on Oct. 20. Between 1227 and 1500, the trans-Atlantic path is reckoned to have been at its best since 1957. On the previous day, when the *solar flux* was 242 units, VE1AVX was heard. On the 20th, Brian Bower, G3COJ (Bucks.) operating on 10m., worked 25 6m. stations on the American eastern seaboard, including a couple of VE's.

Angus McKenzie, G3OSS (London), enjoyed the opening on Nov. 4 and completed 20 cross-band QSO's. Signals peaked some 15 mins after the start of the event and VE1ASJ was reckoned to be S9-plus 30 dB! G4BPY (Staffs.) is reported to have heard both South African and Costa Rican 6 m. beacons since Oct. 21. It appears that most VE provinces and most W call areas have been worked from Europe. Reception of a beacon on 50.39 MHz from French Guiana, FY7, has been mentioned.

James Whittle, G3EKP (Lancs.), reports a successful cross-band QSO on Oct. 28 at 1500 with VE1BXC/P who was S9. James heard several others including a VP9 and mentions hearing trans-Atlantic stations calling EI2W the previous week. For those readers wishing to get in on the cross-band act, the 10 m. QRG is 28.885 MHz with the suggestion that people spread out a little as the QRM gets rough.

"At last! U.S.A. television on channel A2 video, 55.25 MHz today; very strong from 1400-1500 . . ." is how Mike Allmark (Leeds) starts his letter dated Nov. 7. He also heard some TV sound on 59.75 MHz. Using a TV set with a 3 MHz bandwidth and AM sound, MIke heard VE1AVX, N5AF, W5RVR, KV4CI, W5HY, WA5HNK, WB4VKY, K5EFW, W5EUB and WB6OKK. He also mentions the enormous signal from VE1AVX and several others. The F_2 TV reception has been excellent from

THREE BAND ANNUAL VHF TABLE
January to December 1979

Station	FOUR METRES Counties	FOUR METRES Countries	TWO METRES Counties	TWO METRES Countries	70 CENTIMETRES Counties	70 CENTIMETRES Countries	TOTAL Points
GD2HDZ	49	5	68	14	45	6	187
G2AXI	51	6	60	15	44	7	183
G3SPJ	36	5	58	12	36	6	153
G3F1J	49	5	56	12	20	4	146
G3CO	41	4	47	10	22	4	128
G8LHT	—	—	70	19	28	7	124
G8OPR	—	—	69	14	33	6	122
G4ERX	45	5	30	8	26	6	120
G3KPU	—	—	61	12	38	6	117
G3BW	—	—	52	18	39	6	115
G4AEZ	23	3	48	14	22	4	114
G3PBV	14	3	54	12	22	5	110
G8KGF	—	—	57	15	33	3	108
GI8EWM	—	—	69	8	25	6	108
G4BYP	32	4	40	9	14	2	101
G4ERG	—	—	67	29	—	—	96
G8GML	—	—	63	17	5	7	92
G3FPK	—	—	73	19	—	—	92
G8KAX	—	—	47	9	28	7	91
G8LEF	—	—	46	7	30	8	91
GM4COK	3	2	58	22	1	1	87
G8IFT	—	—	47	28	8	3	86
G4IGO	—	—	63	22	—	—	85
GM4CXP	12	3	42	15	4	3	79
G4DEZ	—	—	57	20	—	—	77
G8ITS	—	—	40	6	25	4	75
G8JJR	—	—	53	13	—	—	66
G4FBK	—	—	49	16	—	—	65
G4GHA	—	—	44	18	—	—	62
G4HAO	—	—	48	6	—	—	54
G8PRG	—	—	44	9	—	—	53
G4FKI	27	4	6	1	7	2	47
G8JGK	—	—	37	10	—	—	47
G4GXT	—	—	38	7	—	—	45

mid-October with regular copy from Russian ch. R1 video on 49.75 MHz and possibly from China, too. The Russian stuff comes in from sunrise to 1400; the U.S.A., Central American and Caribbean stations from 1200 to sunset. At 0835 on Nov. 5, Mike saw sync. pulses on Ch. A0 video — 46.25 MHz — from Australian TV, and reports a few openings on Ch. E2 — 48.25 MHz — which he suggests may be from Malaysia.

Writing from Brussels on Nov. 3, Jean-Louis Delport reports reception on Oct. 30 VE1AVX, K3SXA/MM, W2UPH, VE1BXC, VE1QZ and WB3XUR on CW and SSB between 1354 and 1502. The following day WA0EXN was copied on CW at 1339. On Nov. 2, the list includes KV4FZ, KP4EOR, HC1JX, XE1FE and a repeater ??1CTG on 50.075 MHz, F3. The gear chez-Delfont comprises a 50 MHz Rx with 20 dB. preamp. The aerial is a simple vertical.

John Baker, GW3MHW (Dyfed), is another who has caught the 6 m. bug. He has been altering an old, valve-type 4 m. converter and, after some initial breakthrough problems, now has a nice, 0.1 microvolt sensitivity set up. John has had crossband QSO's with VE1AXV, WB2CUS, W2UTH, K1BXC and K1ICM. His "m.o." is to find a clear QRG around 28,880 kHz, tune on 6m. between 50.080 and 50.150 MHz and announce on 10 m. a QRG in the 6 m. band on which he will listen for calls. In a later note, John says that the W's prefer to use 50.125 MHz up for crossband work, leaving lower QRG's for those working in-band.

Four Metres

James Whittle, G3EKP, writes that he is QRV on 4m. on Sunday mornings around 70.2 MHz using SSB from a converted 6m. SSB transverter. So point your beams to Lancashire. During the Fixed Contest on Oct. 21, Brian Oughton, G4AEZ (Enfield), added 12 more counties, best DX being GD2HDZ. From Hainault (Essex), David Thorpe, G4FKI, has been mostly on 4m. lately thus notching up a respectable score for the table. The Telford lads' earlier foray into Wales enabled him to work all the six counties activated. Alan Scott, G4BYP (Cheshire), added four more English counties in the recent contest: G3XBY (Warks.); G4ERX (Essex); G3PUO (Lancs.) and G2BDQ (Tyne and Wear).

From the Isle of Man, Arthur Breese, GD2HDZ, added Wilts. and Essex during the Contest, thanks to G8IL and G3MXH respectively. On the trans-Atlantic theme again, GW3MHW reminds us that there are stations in the U.S.A. and Canada equipped for 4 m. reception. W3XO, WB8NWY and VE1ASJ are mentioned. A suggested 10 m. talk-back QRG is 28,890 to 28,895 kHz, should the MUF rise to such dizzy heights *via* the F_2 layer. John continues to fly the 4 m. flag from Dyfed and wonders if a "Four metre evening" can be arranged? How about every Friday from, say, 2000, chaps?

GW3MHW has some observations on 4 m. aerials. He reports disappointing results with a 3-ele. half-wave *Quad* which he fed at a high impedance point *via* a tuned circuit. John now proposes to try two stacked 6-ele. *Yagis*. Concerning *baluns*, he has measured a 1 dB. gain on reception by using a quarter-wave coaxial *balun* on a 6-ele. *Yagi*. A 6-ele. *Yagi* produced a 3 dB. gain over a 3-ele. one. These tests are done using the 9th harmonic of a 7,800 kHz, two milliwatt oscillator into a Band I TV aerial a quarter of a mile away. Relative gains are checked with a *Marconi* dB. meter on the end of the Rx with the AVC off.

Two Metres

Welcome to José M$_a$ Gené, EA3LL, from Reus (Tarragona) in Spain. He is QRV on SSB meteor scatter from AB56b and, during the recent *Orionids* shower — Oct. 20/21 — had four skeds. only one of which, that with OK1KRA (HK), was completed. He heard nothing on the 20th from G3POI, nor from OZ2GZ or DF1OH on th 21st. Although the weather was very bad at the time, with fog and rain, José reports, ". . . terrific tropo. conditions to Italy . . ." but complains about the lack of activity. However, his tally included 6 F's in AE, AD, CD and BD squares; 5 IS0's in EA and EZ; 2 FC's in EB and 19 I's in EE, FC, FD, GB, GC and HB squares all at distances of 750-1,000 kms. Band 2 FM was, ". . . completely full of Italian stations . . ." and on the 20th, a YU, possibly, was heard near 90 MHz. EA3LL will be on SSB during the *Geminids* on Dec. 14.

Things have been very quiet at John Hunter's station, G3IMV, in Bucks. However, MS skeds with YU1EU on Nov. 6, and YU7NWN on the 11th were completed. One with UP2BCK on the 4th was not quite completed as John did not get the "UP" part of the call. He has many MS skeds. lined up for the *Geminids* and notes the gratifying number of "U" stations now on the mode. John had a go in the European CW contest on Nov. 3/4 and worked 28 stations in DL, F, ON and PA on the Saturday, but did not bother with the RSGB event on the Sunday. Conditions were flat but he did work F79WARC!.

G4BYP complains, "The emergence of my antenna system into the open air has coincided with a spell of particularly flat conditions, so I don't know if any advantage has been gained". Pete Etheridge, G4ERG (Hull), has notched up his 29th country for 1979 thanks to an MS sked. with DK6AS/EA6 (CA). He is still looking for EI to make it 30 for the year. Jon Dougherty, G4FUT (Tyne and Wear), was in on the "Scottish type" *Ar* on Oct. 6, during which he worked LA3JA (ET29j); SM7GWU (HS75c); and PA0AOU (DN63g), between 1520 and 1615. The only beacon heard was SK4MP1 at Sla at 1600 but John mentions that these Scottish-type affairs can be extensive over to the East.

Jon Stow, G8LFJ (Essex), has been preoccupied with his tower project, planning application for which now appears to have been granted. A couple of new squares have been added recently: F6APE (ZH) and F6GEV (ZG). Jon now has his 80 watts amplifier going again and used it to work the ZG chap. He was dismayed to find he had all but missed a spectacular opening. George Gullis, G8MFJ (Wilts.), was on for the Oct. 19 lift and worked a couple of French portables in CH square.

"Reading your column, I am truly amazed by the amount of DX being worked by other people. I am becoming quite convinced that the Manx fairies have erected some sort of impenetrable iron curtain round the island!" Thus bemoans GD2HDZ. Well, Arthur, why not join the MS gang like your good friend and rival, G3BW?

When he was in London recently, your scribe had a long QSO with Barry Titmarsh, GM8SAU. In a few weeks,

he should be a GM4 after taking the Morse test at the local Coastguard station. Every Saturday, from 1400-2000 local time, whatever the weather, Barry is out portable from WR square running 200 watts to either two 10-ele. or two 8-ele. *Yagis*. He also has four 8-over-8 slot fed beams. He carefully monitors 144.240 and 144.260 MHz listening for meteor pings to assess possible activity before calling "CQ" On a few occasions, the band has been wide open but nobody has been listening.

Barry is building an amplifier similar to the *Tempo* 6N2, but using a pair of 4CX250B's in push-pull in a "Plumber's delight" design. He has promised to send along some photos of the earlier St. Kilda operation and advises that he has beacons for 2 m. and 70 cm. ready to operate from the island (VR18g) as soon as calls and QRG's can be allocated.

Now that he has retired, J. R. Dimmick (I.O.W.), has returned to his old hobby, and to the *Short Wave Magazine*. He has just bought an *ARAC* 102 2 m. Rx and is getting good results. He is puzzled by references to "S" channels. Well, the U.K. 2 m. Band Plan lists 145.250 MHz as S10, with others at 25 kHz intervals up to S23, which is 145.575 MHz. Repeater channels are labelled R0 to R7 corresponding to input frequencies of 145.000 MHz at 25 kHz intervals, to 145.175 MHz. The output frequencies on which users' signals are relayed, or repeated, are 600 kHz higher; *i.e.* from 145.600 to 145.775 MHz.

QTH LOCATOR SQUARES TABLE

Station	23 cm.	70 cm.	2 m.	Total
G3JXN	34	70	93	197
G3COJ	24	66	85	175
G8LEF	22	62	101	185
G8HVY	12	73	130	215
GD2HDZ	12	37	74	123
G8GML	11	74	122	207
G3SPJ	10	36	71	117
G8IFT	7	18	68	93
G30HC	4	33	104	141
G8LHT	3	37	94	134
G3BW	3	25	108	136
G4AEZ	3	29	61	93
G2AXI	2	53	93	148
G4IJW	1	30	108	139
G4ERX	1	32	69	102
GJ3RAX	1	24	67	92
G3POI	—	—	278	278
I4EAT	—	25	238	263
G3IMV	—	—	198	198
DK3UZ	—	—	195	195
GJ4ICD	—	48	145	193
9H1CD	—	13	178	191
G3CHN	—	—	181	181
G3SEK	—	—	179	179
9H1BT	—	11	163	174
G4CMV	—	30	140	170
GM4CXP	—	25	134	159
G3FPK	—	—	157	157
GJ8KNV	—	34	115	149
G4BWG	—	29	118	147
GM4COK	—	12	135	147
EA3LL	—	15	124	139
G4ERG	—	—	138	138
G8ATK	—	38	93	131
G3VYF	—	—	131	131
G4HYD	—	40	83	123
G4IGO	—	—	112	112
G4AWU	—	1	105	106
G3KPU	—	21	84	105
G8IXG	—	—	103	103
G8KGF	—	16	85	101
G4FBK	—	5	94	99
GM8NCM	—	12	84	96
G8LGL	—	12	84	96
G4IJE	—	—	95	95
G3FIJ	—	27	66	93
G8KPL	—	7	84	91
G8KAX	—	29	61	90
G4GEE	—	28	60	88
G6UW	—	—	88	88
GI8EWM	—	22	63	85
G8JAG	—	7	78	85
G8OPR	—	15	68	83
G8JJR	—	—	80	80
G8KSP	—	2	76	78
G8LFJ	—	—	78	78
G8MFJ	—	11	65	76
G8ITS	—	16	56	72
G4GET	—	—	71	71
G8KUC	—	7	60	67
G4DEZ	—	—	67	67
G4GHA	—	—	63	63
G3PBV	—	12	48	60
G4GSA	—	1	50	51
G8JGK	—	—	45	45
G4GXT	—	—	43	43
G8PRG	—	—	30	30

Starting Date January 1, 1975. No satellite or repeater QSO's. "Band of the Month" 23m.

Seventy Centimetres

G3PBV, Dave Sellars (Devon), is quite pleased with what he worked in the contest weekend of Oct. 6/7 in poor conditions. He netted eight counties and five squares but complains that too few people seem to beam down his way. With his 10 watts, he worked 18 stations and heard another 20 or so, including ON6CB and PA0MAR. Dave took part in the first leg of the *Cumulatives* on Oct. 28 and the conditions were poor but perked up towards the end. Best DX was G8PUB/P in Surrey. An S9, meteor-like burst was copied from G3OUL in Liverpool and G3DY (Peterborough) and G3JXN (London) were consistent but weak.

G4AEZ added five 1979 counties in the contest: G8PMH/P (Lincs.); G4CCC/P (Wilts.); G3PIA (Berks.); G3LCH/P (Staffs.) and G8EDG/P (W. Midlands).

Congratulations to GD2HDZ who has managed to work at least one Continental station this year on the band: F1ELL/P, during the contest. GM8SAU plans to have 400 watts on the band 'ere long to a couple of 88-ele. *Multibeams* from WR44. He has a pair of *Eimac* SK-620 UHF bases for the amplifier and is bound to be a very sought-after station.

Sign Off

Well, that wraps it up for 1979. Thanks to all those many readers at home and overseas who have contributed to the feature. Please send all your news and claims for January by December 5 and then have a Happy Christmas. The absolute deadline for the February issue is Jan. 2 so please make sure you get your final annual table score in. Everything to: "VHF Bands," SHORT WAVE MAGAZINE, 34 High Street, WELWYN, Herts., AL6 9EQ. *73 de G3FPK.*

ANTENNAS — THE WEAK LINK PART X

SOME COMMON ANTENNA TYPES

A. P. ASHTON, G3XAP

THIS section of the series is not intended to be an exhaustive list of all antenna types — rather it is a resumé of the more common types, together with theoretical lengths, methods of feeding and tuning, and general hints on construction and erection. It is stressed that general antenna books contain details of many more variations on the theme — if the devices covered here do not "fit your bill", further reading is strongly recommended.

The Half Wave Dipole

As the name implies, this device is a half-wave antenna, split at its centre and fed at that point. It should be recognised that it is not possible to measure out the exact length of wire required to resonate on the required frequency, attach the feeder and erect the device — and then guarantee that it will actually be resonant. There are many reasons why this is so, and these include the influence of its height above ground, the ratio of the length to the diameter of the wire used, the proximity of other metallic structures, the type of end insulators used and the method of attaching them to the antenna, the actual material used for the construction of the antenna, proximity of the feeder, whether the antenna is in one plane or whether it is bent in any way or departs from the true horizontal line, etc.

However, it is still necessary to have an idea of the likely length required, and for this reason, Table 1 is included — the figures quoted taking into account the influencing factors mentioned above for the average site. For anyone who is content to be reasonably close, these figures may be taken as the actual length of the antenna between the two end insulators; however, those like the author will construct an antenna somewhat longer than the figures quoted, measure its resonant frequency (see a previous article on Measurements) and adjust the length accordingly. By noting the change in frequency after reducing the length by a measured amount, it is possible to resonate the antenna with only one further length adjustment.

The lengths given in Table 1 are derived from the formula L (feet) = 468÷f (MHz); e.g. for 3.60 MHz, L = 468÷3.60 = 130.0 feet. Also from the Table we get a good guide as to the change in length required to move the resonant frequency by a given amount — to move the resonant frequency by 100 kHz requires an adjustment of approximately 13 feet on 160 metres, 3.5 feet on 80 metres, one foot on 40 metres, 3 inches on 20 metres, and 1½ inches on 15 metres. On 10 metres a change in length of 3 inches will bring about a change in resonant frequency of about 500 kHz! Note that the adjustment lengths refer to the overall length of the antenna: a change of 100 kHz on 160 metres would require removal of approximately 6½ feet from each half of the antenna.

TABLE 1

f (MHz)	L (feet)
1.80	260.0
1.85	253.0
1.90	246.3
1.95	240.0
2.00	234.0
3.50	133.7
3.55	131.8
3.60	130.0
3.65	128.2
3.70	126.5
3.75	124.8
3.80	123.2
7.00	66.9
7.05	66.4
7.10	65.9
14.00	33.43
14.10	33.19
14.20	33.00
14.30	32.73
21.00	22.29
21.10	22.18
21.20	22.08
21.30	21.97
21.40	21.87
28.00	16.71
28.40	16.48
28.80	16.25
29.20	16.03
29.60	15.81

Table 1. Length of half-wave dipole antenna, derived from the formula: L(feet) = 468÷f (MHz).

If it is intended to erect the dipole in the inverted-V configuration, the required antenna length will be somewhat different to the figures quoted in Table 1, the reasons being (*a*) the antenna is no longer in one plane, this causing interaction between the two halves of the antenna, (*b*) the ends are brought down closer to the ground, thus altering the ground effect, and (*c*) there will be a supporting structure near the feed-point, and the poximity of this will "detune" the antenna. A suitable length for inverted-V dipoles can be found from the formula L (feet) = 464÷f (MHz); e.g. 3.60 MHz, L = 464÷3.60 = 128.9 feet.

Many people have wondered why the inverted-V dipole is so popular. Basically, there are three main reasons why this configuration is often used: (*a*) only one high support point is required compared with two for the horizontal version, (*b*) the overall length required to erect the device is somewhat shorter with an inverted-V, and it is further shortened by being in a "V" configuration, and (*c*) the angle of radiation appears to be lower, especially when the antenna is mounted at low heights.

Regarding the overall space required, Fig. 1 shows that for 3.60 MHz a horizontal dipole requires a span of 130 feet, whereas with an inverted-V with its apex at 40 feet and its ends 10 feet above ground, the span required is only 114 feet — a significant saving, especially in suburban locations.

Multi-Band Dipoles

For multi-band operation, the multi-band dipole offers a good compromise, and there are two basic approaches — the "trapped" dipole and the "parallel fed" dipole.

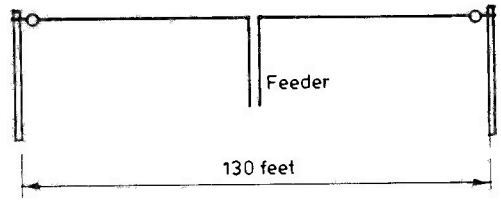

Fig. 1a

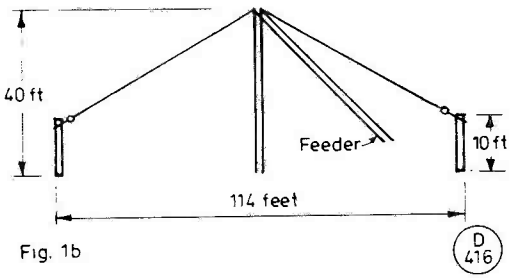

Fig. 1b

Fig. 1. (*a*) A horizontal dipole for 3.6 MHz; (*b*) An inverted-vee dipole for 3.6 MHz — note the space-saving over the horizontal dipole, with the need for only one high support point.

Trapped Dipoles: Fig. 2a shows the basic configuration of a trapped dipole, the design for this device being credited to W3DZZ. The dimensions of the antenna are such that lengths 'A' resonate on 7.05 MHz, so that when operating on or near this frequency the antenna operates as a pure half-wave dipole. The traps are also resonant on this frequency so they offer a very high impedance and virtually become insulators. (Due to the presence of the traps, however, lengths 'A' are not exactly the same as with a single-band 7.05 MHz dipole.) When the antenna is operated on 3.5 MHz, the traps offer a low impedance and hence lengths 'A' and 'B', plus the inductance in the trap coils, become effective. By adjusting length 'B' we can make the antenna resonant on 3.5 MHz without affecting the 7 MHz resonance. Note that the overall length of the antenna is shorter than for a single band 3.5 MHz dipole.

Fig. 2b shows the principle of 3.5 MHz operation, and as the traps are low impedance at this frequency they can be represented by the notation of inductance only. On 10, 15 and 20 metres the antenna operates as a harmonic dipole — the effect of the traps being to make it 3/2λ on 20 metres, 5/2λ on 15 metres and 7/2λ on 10 metres, the antenna offering a low impedance at the feed-point on each of these bands. In practice, however, this is a real compromise and trapped dipoles are rarely exactly resonant on these three bands. It should also be realised that if the traps are to be home made, the ratio of inductance to capacitance used to resonate them on 7.05 MHz will affect the resonant frequencies in the 10, 15 and 20 metre bands. However, if 75-ohm twin-feeder is used, and a good antenna matching unit is used between the end of the feeder and the transmitter, efficient operation can be achieved and the antenna will be found to be effective on all five bands, 80-10 metres.

Traps are relatively easy to construct using high voltage disc ceramic capacitors and the coils should present

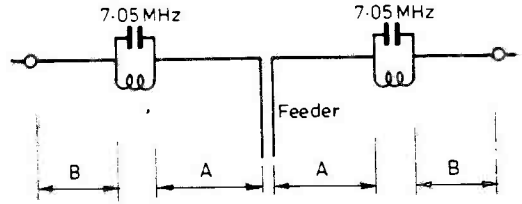

Fig. 2a

Fig. 2b

Fig. 2. (*a*) The W3DZZ trapped dipole; A = 32 feet, B = 22 feet, capacitor = 60 pF, inductance = 8.5 μH (approximately 15 turns of 16 s.w.g. copper wire, 1½ inch diameter, spaced one wire-diameter apart). (*b*) The trapped dipole operating on 3.5 MHz; as the traps are not resonant (at the frequency of operation) they can be considered as contributing inductance only, and the antenna behaves as an inductively loaded 3.5 MHz dipole.

absolutely no problems. The coils can be wound on 1½ inch diameter PVC tubing and the completed device is conveniently housed in a length of 2 inch diameter PVC tubing, with discs cut from plastic being cemented on the end to waterproof the trap. Fig. 3 shows the construction used at G3XAP in which 47pF disc ceramic capacitors were used; however, the use of these instead of 60pF as specifield by W3DZZ does tend to make the antenna somewhat less efficient on the HF bands as the resonant frequencies are not quite as close to 14, 21 and 28 MHz. It is

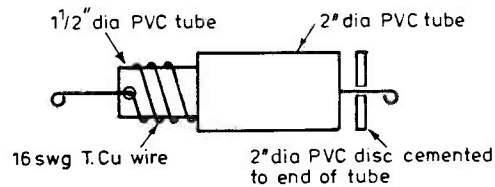

Fig. 3a

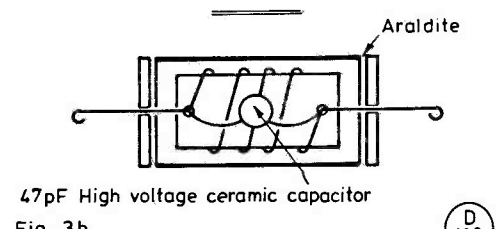

Fig. 3b

Fig. 3. (*a*) Construction of traps for trapped dipole: note that one end of the trap is shown 'cut away' for clarity — the capacitor is located inside the 1.5 inch diameter tubing and soldered between the ends of the coil; (*b*) Showing location of capacitor and tubing: note that the capacitor is soldered to the ends of the coil and its leads pass through the small holes in the 1.5 inch diameter tubing; thus the tubing takes the strain when the antenna is erected — not the capacitor.

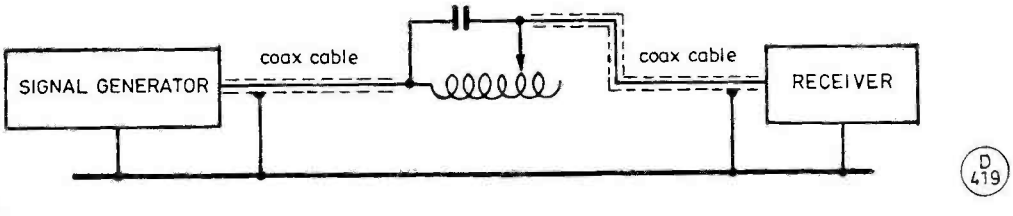

Fig. 4

Fig. 4. Tuning the trap: the signal generator and receiver are tuned to 7.05 MHz and the capacitor tapped along the coil until a deep null is obtained on the receiver S-meter.

most important that traps should be resonated on 7.05 MHz and this may be easily done using the arrangement shown in Fig. 4 — the capacitor being "tapped" along the coil until a null in the received signal is indicated on the receiver 'S' meter (a very deep null *can* be found). The point at which the capacitor is "tapped" is noted, and the coil cut accordingly; during final assembly the procedure should be repeated as some slight adjustment will almost certainly be required just prior to cementing up the trap. For anyone not having access to a signal generator, a "net" signal from a transmitter may be used, or a stable signal "off the air" may be used — this latter technique has been used at G3XAP with surprisingly good results.

If possible the length of twin feeder used should be around 75-80 feet, or feeder resonances can cause problems with loading the transmitter, although in most cases a good antenna matching unit will overcome any such problems.

Parallel Fed Dipoles: These consist of dipoles cut for each band required and simply fed with the same feeder. Some authors have suggested that they should be 'fanned out', but at G3XAP they have been used with the wires (insulated) taped together and no ill effects noted. The construction is shown in Fig. 5 and it will be seen that insulators are used on the lowest frequency (longest) antenna only, the shorter antennas being supported by taping them to the longer antennas. Again, the lengths quoted in Table 1 will not be accurate for antennas of this type; at G3XAP it has been found that slightly longer lengths are required. Each antenna will require resonating, starting with the highest frequency and working through to the lowest.

In practice the dipoles appear to function as effectively as single-band antennas, and on all bands they offer a very good match to 75-ohm twin feeder. It should be noted that as there is a half-wave dipole on each band, the radiation pattern will be the classic 'figure-of-eight' on each band; with the harmonic action of a trapped dipole on 20, 15 and 10 metres the patterns will be different. This will not necessarily be a disadvantage with the trapped dipole, but could in some cases give a null in a favoured direction: with a simple half-wave dipole we know exactly where the nulls should be! Again, an antenna matching unit should be used at the transmitter end of the feeder, as with any multi-band antenna, harmonics will radiate efficiently if they are allowed to reach the antenna — a matching unit will attenuate all *spurii* and hence improve the situation. Finally, whilst considering multi-band dipoles, it is common practice to use a 7 MHz dipole on 21 MHz, the assumption being that it is then operating on its third harmonic. As was stated in an earlier article, a 7 MHz antenna used on its third harmonic will resonate at a frequency somewhat higher than 21 MHz and the antenna is, therefore not resonant inside this amateur band. Although this practice does work to some extent, the antenna will not be as efficient as one cut specifically for 21 MHz and, owing to the reactance that will be present, problems may be found with transmitter loading with some feeder lengths.

Construction and Erection of Dipoles

Most dipoles for the frequencies 1.8 to 30 MHz are made from wire — their lengths tending to dictate this, although some amateurs do construct them with aluminium tubing for the three higher bands and rotate them in order to put the best possible signal into the required area. However, we will confine this discussion to wire antennas.

The first question to be answered is "is expensive, heavy gauge, bare copper wire necessary for wire antennas?". The short answer is that insulated wire is suitable, but the complete answer is not quite that simple. The advantage of hard-drawn copper wire is that it does not stretch unduly under tension, so after tuning the antenna, it may be left erected in the knowledge that it will stay resonant. However, with a fairly heavy gauge PVC insulated wire, stretching is not too much of a problem and the author is inclined to feel that too much emphasis has been put on this point. The insulated wire can be tensioned prior to tuning the antenna, and after erection, the wire tension does not have to be too great — after all, we only tension it in order to try to arrive at a 'straight wire', and even that is not too important a parameter! Wire antennas constructed of fairly light gauge insulated wire have been used for periods of years at G3XAP with no appreciable "detuning" due to stretching.

A dipole centre-piece of good quality should be used, and the two wires and feeder should be attached to it in such a

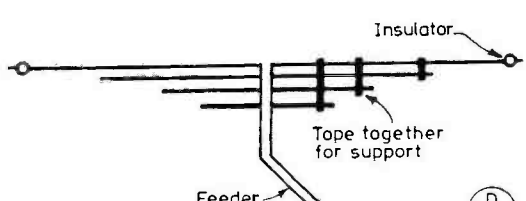

Fig. 5

Fig. 5. Parallel-fed half-wave dipoles. The separate antennas are supported by taping them together at the ends of the wires; more stability is obtained if the wires are also taped at several additional points along their length.

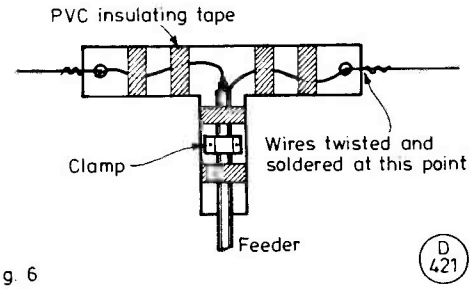

Fig. 6

Fig. 6. A typical dipole centre-piece. The clamp may be fitted for extra strength, and is simply a small strip of aluminium sheet bent over the feeder and secured with nuts and bolts (ensure there are no sharp edges to cut into the feeder).

way that the feeder does not receive too much stress owing to the antenna's tension, i.e. the two halves of the dipole should be firmly anchored to the centre-piece. A suitable centre-piece is shown in Fig. 6. After twisting the ends of the wires plus the feeder wires together, they should be soldered and, preferably, taped up with good quality PVC insulating tape; the feeder can also be taped to the centre-piece as shown in Fig. 6. The centre-pieces used at G3XAP are 'home-brewed', being cut from sheet plastic and drilled as appropriate. The device must be strong however, as the full tension of the dipole is attempting to pull it in two!

The insulators used at the ends of the dipole must also be strong for the same reason, although if insulated wire is used for the antenna, the insulation properties of the device are not too important. Insulators are readily availalbe, and little need be said about them here. Erection of a dipole is straightforward, but probably the best approach is to use a pully and halyard arrangement in order that the antenna may be raised and lowered with ease. Also remember that if an inverted-V dipole is erected with a metal mast as its centre support point, there is a danger of the bare wire of the antenna (if used) touching the mast and hence detuning the device; this is easily overcome with suitable application of insulating tape, preferably applied to both antenna and mast. It should also be remembered that with any method of construction and erection, there is no point in trying to apply too much tension to the wire — a little sag does no harm to the operation of the antenna, but over-tensioning can lead to serious stretching *and* a short mechanical life.

The feeder should, as far as possible, be run away from the antenna at right angles to it — i.e. with a horizontal dipole it will ideally drop vertically beneath the antenna for a distance before being led to the transmitter/receiver. Ideally the feeder should run at right angles from the antenna for *at least* a quarter-wave, but in practice this is not always possible, especially on the lower frequencies. It is good practice, however, to have as long a run in this direction as possible prior to bending the feeder towards the shack.

Vertical Dipoles

It is also possible to erect a half-wave dipole in the vertical plane, the advantages being omni-directional radiation plus a lower angle of radiation than with a horizontal dipole mounted at the same kind of height. The angle of radition from a 21 MHz vertical dipole mounted just clear of the ground (highest point, therefore, approximately 22 feet) will be lower than that from a horizontal 21 MHz dipole mounted 22 feet above ground.

The author does not understand why vertical dipoles for 20, 15 and 10 metres are not popular as the angle of radiation achieved in practice is very low indeed, making these devices very good for DX working, but believes that it is possibly due to the fact that it is difficult to erect them clear of other conducting structures. However, they can be suspended from the branches of trees or taped to wooden posts or, better still, they can be constructed of aluminium tubing, mounted on an insulated ground post and guyed with very light nylon line. The two halves of the dipole can be isolated from each other by a short length of PVC tubing. Such a dipole, constructed for 21 MHz at G3XAP performed extremely well and was only dismantled when a full-sized quad was erected!

If twin-feeder is used for a vertical dipole antenna, it should be brought out horizontally, *see* Fig. 7a, but if the antenna is constructed of tubing of sufficiently large

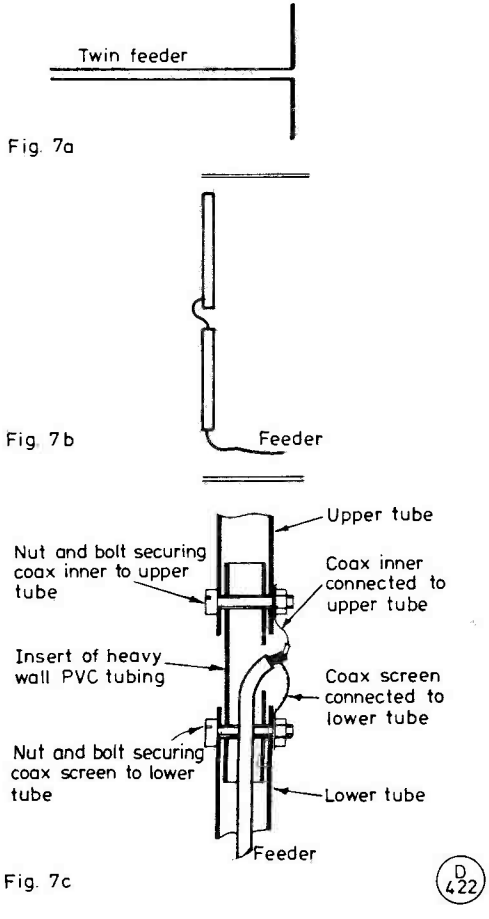

Fig. 7. (*a*) Vertical dipole fed with twin feeder; (*b*) 'Coaxial dipole': feeder is run up inside lower half of dipole to perform balun action; (*c*) Close-up of centre-section of coaxial dipole.

internal diameter, a coaxial feeder can be run up the inside of the lower tube, this tube then acting as a balun — Fig. 7b. (This antenna is often called a "coaxial dipole".) Fig. 7c shows the construction of the antenna and the attachment of the feeder in more detail.

The G5RV Multi-Band Dipole

Devised by Louis Varney,G5RV, this antenna is an 80-10 metre device which offers a reasonably good match into 75-ohm feeder on all bands. This is achieved by use of a length of high impedance open wire feeder which acts as an impedance matching section. The antenna is shown in Fig. 8 and it will be noted that the overall span required is 102 feet if the antenna is mounted horizontally, and somewhat less if used in the inverted-V configuration. As an absolutely perfect match is not obtained on every band, a matching unit should be used at the transmitter end of the 75-ohm section of feeder. (In any case, as explained earlier, such a matching unit is imperative with multi-band antennas for reduction of harmonic radiation.) The G5RV antenna has found great favour among UK amateurs over the years and does perform well on all bands.

The Quarter-Wave Vertical

This antenna is commonly known by the name "ground plane", but in fact this is a misnomer as the term ground plane refers to the "artificial" ground provided for some verticals which consists of a number of quarter-wave radials — any base-fed vertical antenna can be mounted over such a ground plane. The actual length of a resonant quarter-wave vertical antenna depends on such factors as the material from which it is made, the method used for supporting it, the earth system used, etc. So, like the dipole, the actual length should be determind by measurement if a "no compromise" device is required, but Table 2 gives the theoretical lengths required for the average antenna. The figures are derived from the formula L (feet) = 234÷f (MHz); e.g. for 14.25 MHz, L = 234÷14.25 = 16.41 feet. No figures have been quoted for 160 and 80 metres as the lengths required put such antennas beyond the resources of most of our ranks!

TABLE 2

f (MHz)	L (feet)
7.00	33.4
7.05	33.2
7.10	33.0
14.00	16.71
14.10	16.60
14.20	16.48
14.30	16.36
21.00	11.14
21.10	11.09
21.20	11.04
21.30	11.00
21.40	10.93
28.00	8.36
28.40	8.24
28.80	8.13
29.20	8.01
29.60	7.91

Table 2. Length of quarter-wave vertical antenna, derived from the formula: L(feet) = 234÷f (MHz).

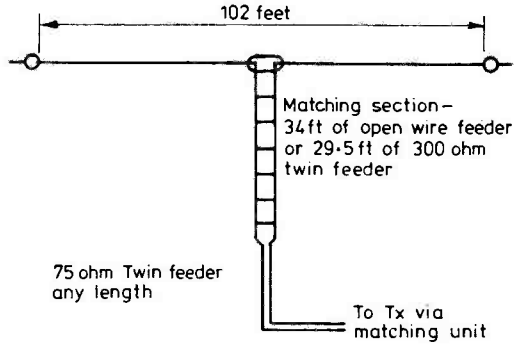

Fig. 8 G5RV 80–10 metre Multi-band dipole aerial.

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For the quarter-wave vertical to be both efficient (in terms of electrical efficiency) and effective (in terms of radiation at low angles), it *must* be erected above an efficient earth system. The purpose of the earth is twofold: for electrical efficiency we must provide a "return circuit" for the current flowing in the antenna itself, and, secondly we must provide a reflective mat for reflection of energy which has been radiated downwards from the antenna. *Failure to provide these two requirements results in poor efficiency and high radiation angles.* Good electrical efficiency can be obtained by the use of a few quarter-wave radials, resonant at the frequency of operation, and this aspect is, therefore, simply dealt with. A good reflective earth is not so simple to provide and much of the criticism that has been directed towards vertical antennas has been due to ignorance of the actual requirements regarding ground systems and the true importance of ground reflection effects. The hard truth of the matter is that even moist soil absorbs more energy than it reflects, whilst the three or four radials generally employed with quarter-wave verticals mounted at some distance above the earth also reflect very little energy, and largely serve only to ensure good electrical efficiency! These comments should not be construed as a condemnation of vertical antennas (in fact the author uses them regularly) but rather as an indication of the fact that vertical antennas are capable of performing far better than most of us permit them to.

The author favours ground mounting of vertical quarter-wave antennas as opposed to elevated mounting, as tests carried out at G3XAP on 28 MHz verticals have shown conclusively that ground mounted antennas give better results with DX working. (Both antennas used four resonant radials.) The conclusion drawn here is that even the poor reflective properties of average soil are preferable to those of four radials alone. The obvious exceptions to the rule favouring ground mounting are when such practice would lead to severe screening of the antenna by its surroundings and when an antenna can be mounted at an extremely high point, and hence can be fairly free from ground effects.

A quarter-wave vertical is easily mounted on a ground post which can also double as a pivot when raising the antenna into position — this becomes important when 40 metre verticals are envisaged! Fig. 9 shows a suitable

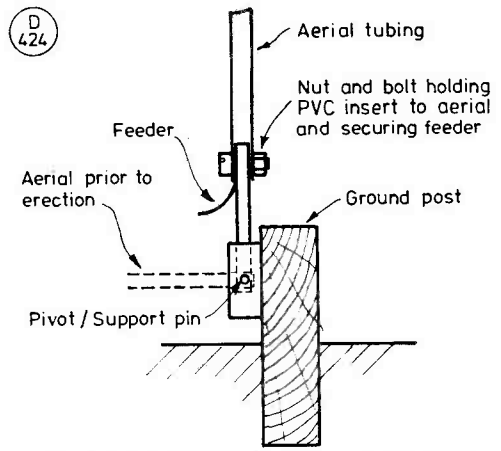

Fig. 9a Method of mounting a base-fed vertical aerial (Side view).

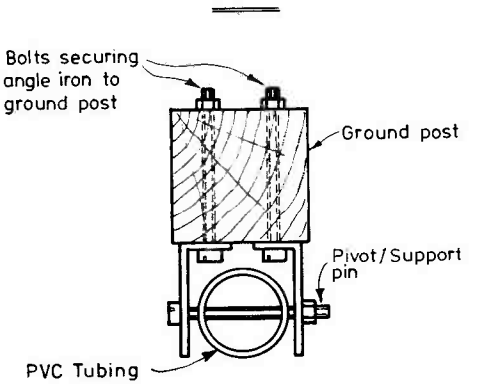

Fig. 9b Method of mounting a base-fed vertical aerial (Top view).

arrangement and is the method used at G3XAP. A short section of PVC tubing is fastened to the bottom of the antenna tubing and a steel bolt holds this to angle iron which is firmly bolted to the ground post. The use of thin nylon guy ropes is recommended, but if a self-supporting structure is required, the ground post must be extended and the antenna fastened to it at a somewhat elevated point (in addition to the fastening at the pivot point); this can be done in the same manner as with the pivot pin, but note that the antenna must be insulated from the ground post — a piece of PVC tubing could be inserted through the antenna tubing to prevent the securing bolt from making contact with the antenna itself. It is suggested that a minimum of four quarter-wave radials should be installed, with as many more as possible — preferably much longer than a quarter-wave in length — to enhance ground reflection effects, as this will lead to lower radiation angles.

The quarter-wave radials should be made from insulated wire with their ends taped over with insulating tape, and buried one or two inches below th surface of the ground. (They can be left on top, but this can prove to be hazardous as well as inconvenient.) Any radials additional to the

TABLE 3

f (MHz)	L (feet)
7.00	34.3
7.05	34.0
7.10	33.8
14.00	17.1
14.10	17.0
14.20	16.9
14.30	16.8
21.00	11.43
21.10	11.37
21.20	11.32
21.30	11.27
21.40	11.22
28.00	8.57
28.40	8.45
28.80	8.33
29.20	8.22
29.60	8.11

Table 3. Length of ground-mounted radials (*see* text), derived from the formula: L(feet) = 240÷f (MHz).

resonant ones can be of bare wire if desired as detuning by contact with the ground obviously does not apply to them. Table 3 gives suitable lengths for insulated radials either laid on the ground or buried just beneath it — the lengths are not correct, however, for radials used with elevated antennas. Again, the perfectionist will "tune" the radials — they can either be 'grid dipped' through a single turn loop connecting opposite radials together, or through a loop connected between a single radial and a ground spike driven into the ground directly at the base of the vertical. The ends of the radials obviously should not be buried until the tuning is complete.

Matching the feed-point impedance to a coaxial feeder is straightforward, although at 7 MHz the loss involved by direct connection to 50-ohm feeder is very small. Typical feed impedances of quarter-wave verticals are around the 25 to 35 ohms mark, so connection of 50 ohm feeder will lead to SWRs of between 1.4:1 and 2:1. Use of a quarter-wave of 50-ohm feeder will give "inverted" impedances of around 70 to 100 ohms and subsequent connection of 75-ohm coaxial feeder to this 'transformer' will give SWRs of between 1:1 and 1.35:1, and although this technique was discussed in the article on "Impedance Matching", the details are reproduced in Fig. 10. The simplest method of matching is to extend the length of the antenna until the antenna's feed impedance reaches 50 ohms — the reactance

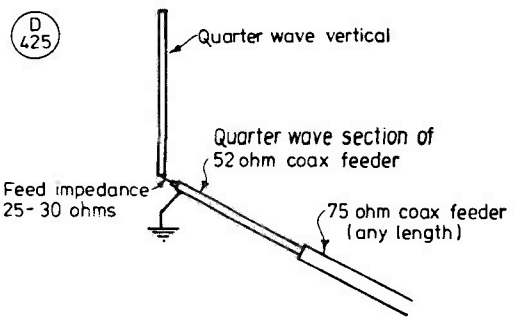

Fig. 10 Impedance matching by means of a "coaxial transformer"

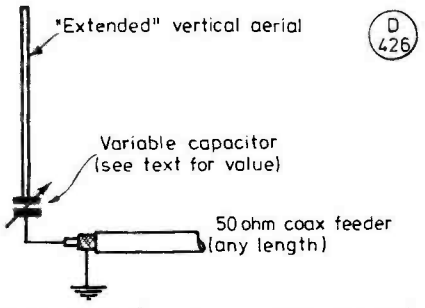

Fig. 11 The "extended" quarter wave vertical aerial

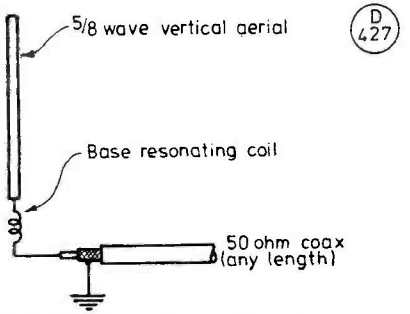

Fig. 12 Feeding a 5/8 wave vertical aerial

introduced being cancelled out by insertion of a variable capacitor, *see* Fig. 11. After resonating the device, the actual value of capacitance can be measured and the variable capacitor replaced with a high voltage fixed capacitor.

The length of antenna required for the "extended" vertical can be determined by multiplying the length given in Table 2 by 1.133; e.g. for 14.2 MHz the length will be $16.48 \times 1.133 = 18.67$ feet. The approximate value of capacitance required to resonate the antenna will vary from one device to another, but typical values are: 7 MHz, 200 pF; 14 MHz, 100 pF; 21 MHz, 75 pF and 50 pF for 28 MHz. The comments made regarding earth systems apply equally to this "extended" quarter-wave vertical.

Five-Eighth Wave Verticals

As the length of a vertical antenna is increased, so its angle of radiation decreases — until a length of 5/8 wavelengths is reached, beyond which length lobes of energy at very high angles begin to appear. *For a given site, and with a given ground system, the angle of radiation from a 5/8-wave vertical antenna will be lower than from any other simple base-fed vertical device.* Because the antenna is not resonant, this antenna will be reactive and the simplest method of tuning it is to insert a coil at its base in order to bring its electrical length up to ¾-wavelength, when its base feed impedance will be close to 50 ohms and there will be no reactance — Fig. 12. Actual lengths of 5/8-wave verticals are given in Table 4, but as the antenna will be resonated by the loading coil, these lengths are not critical — hence lengths for the upper and lower limits of the band only are given. Also, as these devices are physically large, details are quoted only for the 10, 15 and 20 metre bands.

Actual requirements for the resonating coils vary considerably from one antenna to another, but the following figures should meet most requirements. All coils should be about 1½ to 2 inches in diameter, either air-spaced or wound on PVC tubing, turns being spaced one wire diameter; 16 *swg* tinned copper wire is suitable and a tap should be made every turn to enable tappings to be adjusted to fine limits — a tap every half turn is better, especially on 28 MHz. For 14 MHz up to 40 turns may be required, and on 21 MHz 30 turns; whilst 20 turns should suffice for just about any 28 MHz device. Again, all comments made regarding earth systems apply to the 5/8-wave vertical.

TABLE 4

f (MHz)	L (feet)
14.00	41.8
14.35	40.8
21.00	27.9
21.45	27.3
28.00	20.9
29.70	19.7

Table 4. Length of 5/8-wave vertical antenna, derived from the formula: L(feet) = 585÷f (MHz).

Inverted-L Antennas

In the above discussion on verticals we have several times mentioned the restriction of height, and this factor makes verticals for the lower frequencies too large for most of us to contemplate.

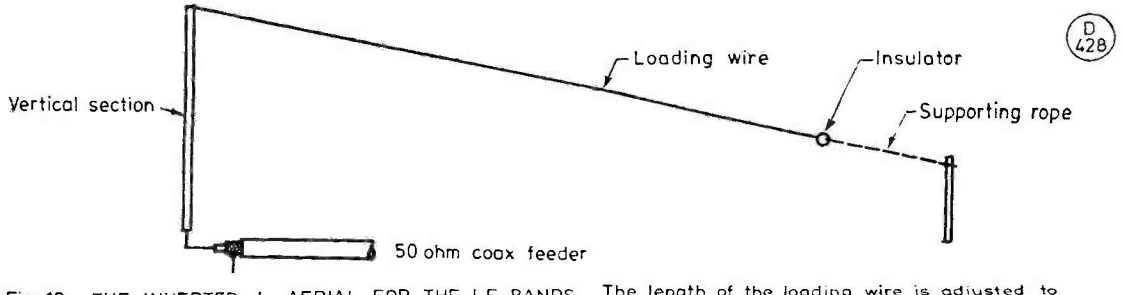

Fig. 13 THE INVERTED L AERIAL FOR THE LF BANDS The length of the loading wire is adjusted to give resonance at the required frequency

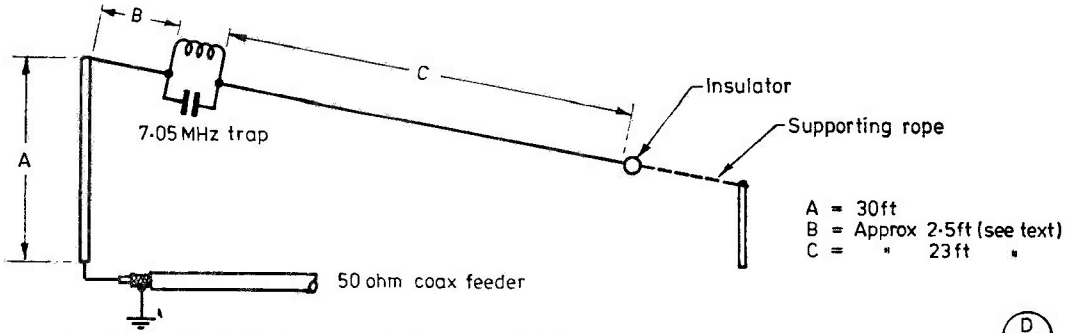

Fig. 14 THE G3XAP TRAPPED INVERTED L MULTI-BAND AERIAL

One solution to this problem is to get as much vertical height as possible and then "make up for the missing length" by continuing the antenna with a wire running horizontally or even sloping downwards, *see* Fig. 13. Because the antenna is bent, there is interaction between the vertical and horizontal sections and the total length of the antenna will need increasing, i.e. an invert-L antenna made to resonate on any frequency will be longer than a simple quarter-wave vertical made to resonate on the same frequency. The actual increase in length required will vary with each individual antenna, but increases of 3% to 7% are common. It should be realised that as the angle of radiation is determined by the *physical* length of the vertical section, then a 5/8-wave inverted-L will *not* have a lower angle of radiation than a ¼-wave inverted-L if the vertical sections of the two antennas are the same length.

The Trapped Inverted-L

This device works on the same principle as the W3DZZ trapped dipole discussed earlier and the trap is identical to those already described. With the dimensions given in Fig. 14 the device will prove useful for DX working on 80, 40, 20 and 15 metres; on 10 metres the physical length of the vertical section is over ¾ wavelengths so there is considerable radiation at high angles. On 80 metres the vertical section is a little under 1/8-wave (but, even so, W6 has been worked from G3XAP with 150 watts CW input). The length between the top of the vertical and the trap should be adjusted to resonate the antenna on 7 MHz, after which the wire between the trap and the insulator should be adjusted to establish 3.5 MHz resonance.

As with the W3DZZ dipole, an exact match will not be obtained on 20, 15 and 10 metres, although the device is usable with coaxial feeder provided SWRs of below about 4:1 are present (a matching unit must, of course, be used at the transmitter end of the feeder). Adjustment of the "outer wire" affects the HF bands more critically than it affects 80 metres, and at G3XAP it was found that by sacrificing the match on 80 metres slightly, a good compromise length could be found which gave an acceptable match on all bands. The actual SWRs found at G3XAP were: 3.5 MHz, 1.7:1; 3.8 MHz, 2.2:1; 7 MHz, 1.2:1; 14 MHz, 3.1:1; 21 MHz, 1.2:1; 28 MHz, 2.7:1; and 29 MHz, 3.3:1.

Before this final adjustment was made (i.e. after resonating on 7 and 3.5 MHz), the SWRs were below 1.3:1 on 80, 40 and 15 metres, 3:1 on 10 metres and about 5.5:1 on 20 metres — the 20 metre figure being deemed unacceptable. A good compromise earth system would be four radials for 80 metres and one each for the other bands; alternatively four radials for 40 metres and one each for the other bands. It should be pointed out that as used at G3XAP the trapped inverted-L had over 70 radials with at least four resonant radials per band from 80 to 10 metres, plus eight resonant radials for 1.825 MHz!

to be continued

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A three-part article on the construction of a QRP Transceiver begins in next month's issue of "Short Wave Magazine"

THE RABBIT PATCH, PART I

LOW COST DECADE RESISTANCE BOX

BY "BUCK"

THIS series describes how, from a position of virtually no knowledge, the author approached the problem of building himself a Communications Receiver of the very latest design. We feel that there are many with the same ambition who start from a similar position, and it is primarily to them that this series is aimed. The satisfaction to be found not only by saving a large sum of money, but by the sheer acquisition of knowledge and expertise is enormous. — Ed.

"Overture and Beginners, please"

"How much?", I asked, when he'd finished praising the smug-looking black box on the bench between us. He looked me straight in the face with engaging candour. "I like you", he said, "and I'd like to see you off to a good start to your DX-ing, so let's say £300, shall we?" "Let's say it by all means", I replied, "but don't let's do anything else. Good afternoon to you". Walking away, I wondered whether his asking price for the shortwave receiver would have been higher, or lower, if he hadn't liked me.

Later that evening I came to the conclusion that I would either have to give up the idea of amateur radio altogether, or build my own communications receiver. Seemed a pretty tall order at that, because I didn't know hay from a bulls' foot, as the saying goes. I took my problems to a friendly enthusiast who was delighted to help. The first session lasted nearly five hours during which I understood about one word in four (and they were mainly of the 'but' or 'of course' variety). I took my headache and my problems back home and nursed them.

A long time later I'd worked out that to stand any chance of success in pulling myself up by my own bootstraps there were seven guidelines that would have to be closely followed:—

1. *Reading:* I would read everything on the subject I could lay my hands on. No matter whether I understood it or not — I'd read it. After a while little drops of information would join up with others and make bigger drops, like rain on a window-pane — but not so quickly! In this respect helpful librarians at the local library would be able to arrange long-term lendings on technical books for study purposes, as well as obtaining special books on request. But *buying* books would be limited to those whose value to the venture had become established. Catalogues of electronic and radio equipment would be sources of technical information, descriptions, values, performance figures, tables of guages, metric equivalents, and so on, *ad nauseam*.

2. *Concentration of Effort:* The field of activity open to enthusiasts is a wide one: too wide for any chance of 'an advance on a broad front'. By restricting the initial attention to certain well-defined areas heartening progress would be made fairly quickly, and temptations to wander down attractive-looking side paths more readily resisted. My choice eventually settled on dry-cell powered receiving equipment, together with associated Test Equipment. The test equipment to be of sufficient variety and standards of accuracy to allow the receiving equipment to be constructed, maintained and improved by subsequent experiment and modification. What happened afterwards though, would be anybody's guess.

3. *Confidence Building:* We are told that one picture is worth a thousand words, and one action is worth a hundred pictures. Although the reading programme would be essential, only successful construction would breed confidence. Building the test equipment would be action enough; the efficiency of the finished items would depend upon improving performance at all levels — my own included.

4. *Progression:* Obviously work would have to be from things known to things unknown; and from things simple to things complex. This automatically established that the test equipment, or quite a bit of it, would need to be built before the main receiver project. Not that this would be a bad thing: practice in planning and assembling circuits would be obtained, as well as a necessary increase in theoretical knowledge.

5. *Cost:* No difficulty in establishing the objective under this heading — the lower the cost the better. However, low-cost shouldn't mean 'no-cost'; nor should it mean a cheap, shoddy, botch-up. Cost could be reduced by avoiding fancy frills, and concentrating on functional efficiency, by an intelligent approach to the choice of materials, and by developing a spirit of observant ingenuity and experimentation in material selection and in construction. Especially important would be the need to keep construction methods within the range of existing skills; skills that would obviously grow with practice.

6. *Operating Experience:* Experience in operating would be an essential factor in establishing the proper level of informed criticism in matters such as equipment performance, facility of control and effectiveness of design of any receiver. This is a "Catch 22" position: operating experience is necessary before an adequate receiver can be built upon which to acquire operating experience. One solution to this problem would be to take a standard broadcast receiver (BC Rx) and to modify it by the addition of appropriate circuits constructed in a self-contained (modular) form until the performance came close to the ultimate requirement. The construction of the final receiver could then be undertaken with greater confidence, and the modified BC Rx kept as a stand-by unit.

7. *Patience:* Probably the most difficult of guidelines to follow, but of undoubted importance. Old saws such as "the longest way round is the shortest way home" are of little weight when there is a burning desire to listen on the bands. Temptations to "skip this step, and let's get on with it" would need to be counter-balanced by the realisation that there are no short-cuts to experience. The best that can be achieved is a reduction of time-wasting diversions during the acquisition of expertise. To that end, each step in the programme would be planned to lead directly towards the home-construction of a high performance Communications Receiver of the latest design (and planned to bring about the realisation of that goal as speedily as consistent with a chance of success).

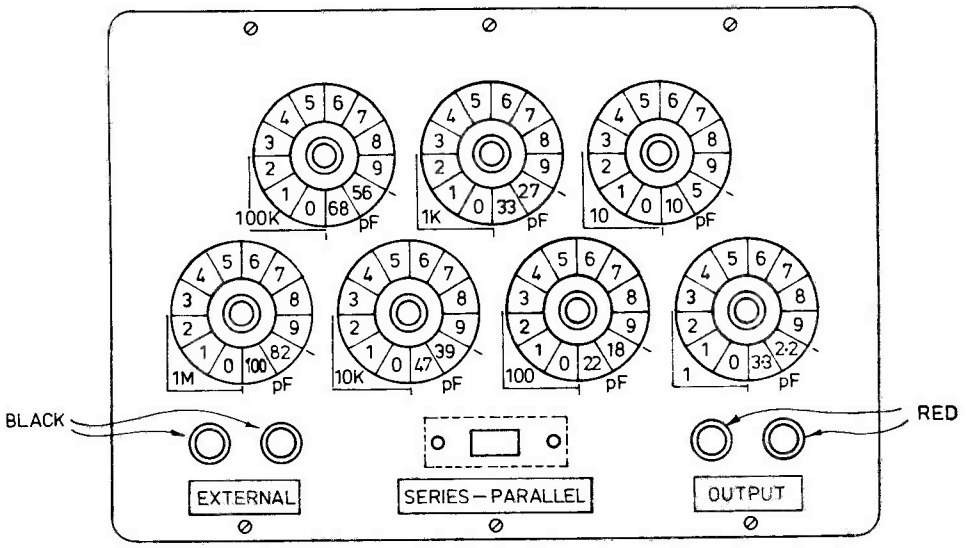

Fig. 1 Front panel detail (knobs omitted for sake of clarity).

Now the overture has played itself out, the cast is waiting in the wings, the curtain is up and the show begins.

Description

"The measure of a man's Resistance
is a measure of his ability"
Anon

The Decade Resistance Box comes first in the series because of the useful part it plays in building up further items of equipment. Consisting of 7 rotary switches, 63 ½-watt resistors, a slide switch and four terminal posts, the box allows any value of resistance to be selected between 1 ohm and 9,999,999 ohms, in 1-ohm steps. The selected resistance appears between one pair of terminals. The slide switch allows for another circuit or component connected between the second pair of terminal posts to be placed in series or in parallel with the first output. For example, with the box selection set to 10,000 ohms, and a separate resistor also of 10,000 ohms connected between the external terminals, the output terminals will provide 20,000 ohms ($R_t = R_1 + R_2$), with the switch in the 'Series' position; but only 5,000 ohms ($R_t = R_1 \times R_2 / R_1 + R_2$), with the switch set to 'Parallel'. For normal use, *i.e.* when only the output from the box itself is required, the switch is left in the 'Parallel' position; switching to 'Series' with nothing connected across the external terminals acts as a convenient 'On/Off' switch if required.

Because of the need for accuracy when using the box for calibration, or in designing other pieces of equipment, resistors having a tolerance of plus or minus 2% were chosen for all values except 1 ohm (here the tolerance is plus or minus 5%). Thus, if value 10 ohms is selected, the output will be between 9.8 and 10.2 ohms; whereas with value 9 ohms selected, the output will lie between 8.55 and 9.45 ohms. In any event, the standard of accuracy is more than adequate to meet the needs of any experimental work to be undertaken during the venture.

The resistor network for each value takes up ten of the twelve positions on a standard single pole rotary switch. The two vacant positions (nos: 11 and 12) were used in the prototype to provide low value capacitor values as an extra facility. The fourteen capacitors chosen were in the range from 2.2 to 100 micro-microfarads (picofarads). (The latter value of 100 picofarads (pF) is the starting point of the range chosen for the Capacity Substitution Box to be described later.) With low value capacitors the effects of wiring and switching within the box itself significantly alter the value appearing at the output terminal. For this reason, once all the components have been soldered into position and the rest of the work completed, each capacitor should be measured at the output terminals by means of the RC(L) Bridge (also to be described later), and the actual value inscribed on the legend around the appropriate switch. Although this facility has been included in the layout of the front panel shown in Fig. 1, its inclusion is a matter of personal choice.

Materials

The materials required fall into three categories: Essential, Optional and Free Choice. The items in the Essential and the Optional sections need no comment. The items in the Free Choice section require enlarging upon. When it comes to putting cases around equipment there are certain requirements to be met, amongst which are: durability, rigidity, protection against unwanted oscillations (screening) where necessary, appearance, ease of working the materials concerned, availability, cost. The present day emphasis on pre-formed plastic, pressed steel, etc., really benefits the suppliers more than it benefits the users. There is nothing wrong with the use of $\frac{1}{8}$" (3 mm) hardboard, or its equivalent, and $\frac{1}{4}$" or $\frac{3}{8}$" (6 or 9 mm) timber for cases up to about 14" × 9" × 6" (356 × 229 × 152 mm), depending upon the amount to be cut-out of the front panel for dials, switches, etc., and the amount of circuitry

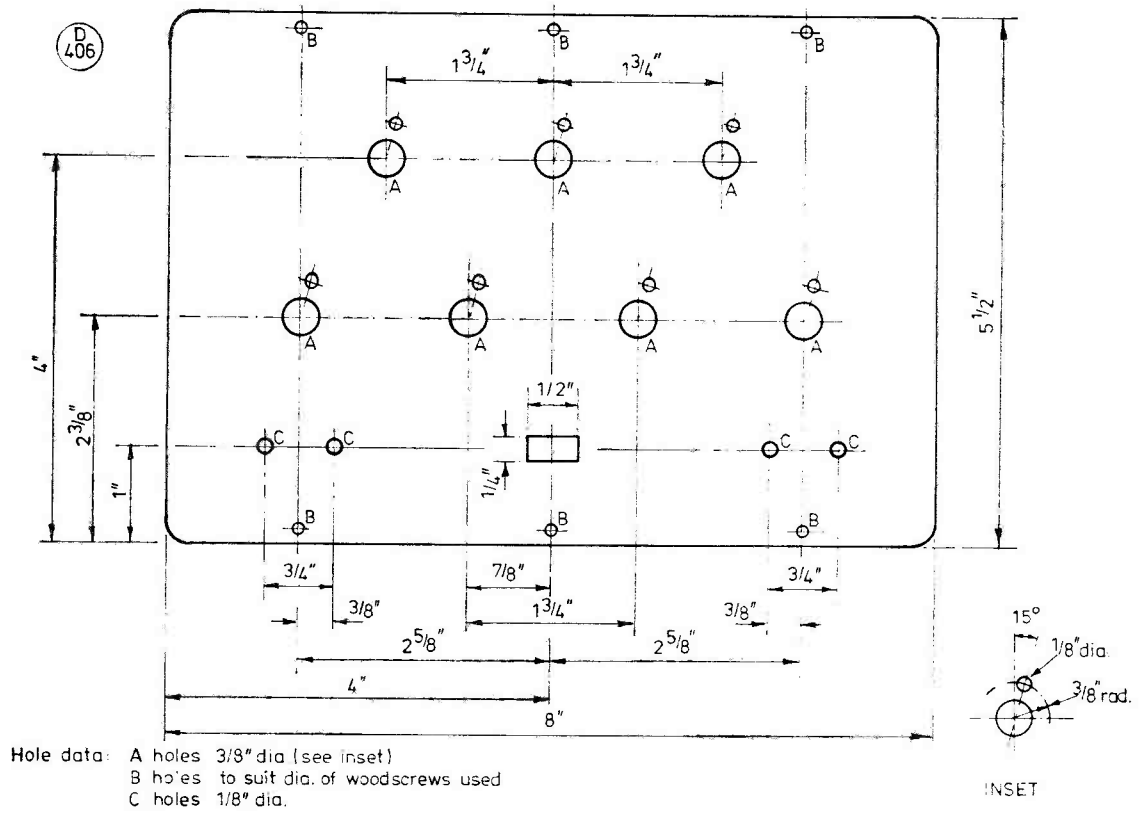

Fig. 2. Front panel dimensions.

to be accommodated inside. Certainly the present unit will come out well if these materials are used. Anything else of a similar nature could be used if available; fibre-glass or laminate off-cuts for example, providing the thickness is suitable. But, if this type of material is used for the sides as well as the panels, some sort of re-inforcement will be needed in the corners. In any case, there is no need to buy either hardboard or timber; there is plenty of both available for the taking in supermarkets or similar suppliers. If you are stuck for a backing-piece, the type of cardboard used for the larger calendars will do nicely, given a coat of dark stain and two coats of varnish back and front. There really are a great number of practical, good-looking, easily-worked alternatives to the brushed aluminium front and the pressed steel body; and many of these alternatives are available from the discarded detritus of an over-indulgent society.

For the wiring, insulated single wire is better than stranded because it is easier to manipulate. There is no need to use flexible wiring anyway, because there will be no movement between components once they are connected (if there is, then you have problems!). Look around you before dashing off to buy a coil of wire; it is only 2 or 3 feet at the most that will be needed, and there must be something that would do, somewhere. The nuts and bolts shouldn't be too difficult to dredge up, either.

Cost

Working on March, 1979 prices the whole thing shouldn't cost more than £8 to £9; or £7 if the capacitors are left out this time round — they can always be added later. A point worth mentioning is the 20% discount, or so, that some firms offer on components bought in ten's. Buying ten 2% resistors of a value, and having a useful spare for, say, 40p is preferable to buying 9 resistors of the same value for, say, 45p. The total cost for the unit compares well with one commercial kit on offer at £45 which, although using 1-watt resistors of ½% tolerance, only goes up to 999,999 ohms and has no switching facility. Coming down-market, there is a kit on offer for £16, but this only provides 36 fixed resistors between 15 ohms and 10 megohms having a 10% tolerance and, again, no switching facility.

Construction

This part of the job doesn't take up much time. The long pieces of timber are pinned and glued to the short pieces forming a hollow rectangle measuring 8" × 5½" (202 × 139 mm), overall. The back is pinned on (glued as well if it makes you feel happier), with, in the case of hardboard, either the plain or the dimpled side outwards. Now drill the six screw-holes in the top and bottom edges of the front

panel-to-be, as shown in Fig. 2. Screw the blank front panel into position, plain side out for preference because of the labelling to be done later on. You now have an enclosed box which will be quite sturdy enough to withstand a determined assault on the hardboard edges and external corners with a *Surform* or block plane, or sandpaper, or whatever, as you smooth down the exterior to a flush fitting. Round-off the corner edges, working from a long side towards a short side in each case until it looks right; when it looks right, it *is* right.

Remove the front panel: paint or stain the remainder of the box and put aside to dry. Mark out and drill the front panel to the dimensions shown in Fig. 2 for switch and terminal positions.

The small locating-pin holes shown in the 1 o'clock position to each rotary switch need a little explanation. The twelve switching positions are spaced out at 30° intervals around the circumference of the body of the switch. When the spindle is rotated fully anti-clockwise it will come to rest at the end of its travel with the flat down one side facing a locating pin: in this position the No. 1 tag is selected. Rotated fully clockwise the flat will face the 12 o'clock position with the locating pin at 1 o'clock: in this position the No. 12 tag is selected. Now the tags on the back of the switch may be numbered, or they may not; if they aren't, they will have to be marked by a method to be discussed later. In some cases — but not all — the locating pin comes between tags Nos. 1 and 12. The knobs to be used are secured by a grub-screw located in the tail of the pointer. With the switch set to the No. 1 position the knob will be fastened to the spindle in such a way that it will point 180° away from the locating pin. When set at zero the knobs should all be arranged to point in the same direction for the sake of convenience, efficiency and appearance. For similar reasons the choice of the 7 o'clock position for switch zero seems inevitable. Therefore the locating-pin position needs to be at 15° from the vertical — which is the centre of the first 30° section in the top right-hand quadrant. Since there are seven positions to mark out, it pays to make a template (grease-proof paper from the kitchen does well here): the vertical and horizontal lines on the template are overlaid on the panel front with the centre of the template coincident with the marked centre of the switch. The locating-pin position is pricked out and then pencilled in before drilling.

Cutting the rectangular hole for the slide switch might prove to be awkward. If you have a ¼" and a ½" firmer chisel, then four swipes with a mallet and you're home and dry. Otherwise it means drilling out two ¼" holes side by side and squaring-off with a file, or using a fretsaw or *Abrafile*.

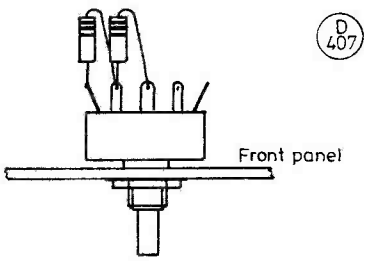

Fig. 3. Side view of switch with two resistors in position.

Table of Values

Resistance Box

R1-R9 = 1 ohm (S1)	C1 = 2.2 pF	S1
R10-R18 = 10 ohm (S2)	C2 = 3.3 pF	
R19-R27 = 100 ohm (S3)	C3 = 5 pF	S2
R28-R36 = 1K (S4)	C4 = 10 pF	
R37-R45 = 10K (S5)	C5 = 18 pF	S3
R46-R54 = 100K (S6)	C6 = 22 pF	
R55-R63 = 1M (S7)	C7 = 27 pF	S4
	C8 = 33 pF	
S1-S7 = s/pole, 12-way rotary	C9 = 39 pF	S5
S8 = d/pole, double-throw slide	C10 = 47 pF	
	C11 = 56 pF	S6
Two 4mm. Red terminal posts	C12 = 68 pF	
Two 4mm. Black terminal posts	C13 = 82 pF	S7
	C14 = 100 pF	

All resistors ½-watt metal oxide ±2%.
All capacitors close-tolerance silver mica: ±1% for 50 pF and above, ±5% for values below 50 pF.

The fixing holes for the slide switch are best positioned by using the switch itself as a template for the first hole, and as a drilling jig for the second. But, *do* make sure that the knob is free to reach the end of its travel in both directions before finally fixing it in position. If hardboard, or some similar insulating material, is used for the front panel there will be no need to use the feed-through facility provided by the body-construction of the terminal post, which entails a $\frac{5}{16}$in. dia. hole. It will be sufficient to drill ⅛" holes and to secure the terminals by means of their threaded sections. After the front panel has been drilled and painted or stained, turn it over and mark on the reverse side the identity of each hole as shown in Fig. 4. This is to be a guide when wiring-up, because you will then be working back-to-front, and unpicking work to correct mistakes can be a heartbreaking chore.

Before beginning the assembly some sort of Continuity Tester will have to be made. For this, a torch battery, a suitable bulb and holder, and some wire, should be joined in such fashion as will allow the bulb to light up when two ends of wire are brought together: a crude, but effective, device for checking work as it progresses (make sure the connections are firm enough to make good contact). Use *Sellotape*, or something similar, to hold the bits together. Mount it roughly on a piece of scrap hardboard or plywood (or even cardboard if you feel like it). But *don't* poke about inside transistor radios with it; if you do, you might find the semi-conductors have come out on strike. Later on we shall have made something a bit more sophisticated, but until then this lash-up will serve.

Turning to the components, first sort out the resistors by their colour code and put them in separate containers, to avoid any chance of error. If you are including the capacitors in the job, sort these out next and put them, in pairs, with their appropriate heap of resistors. The lowest valued pair going with the 1 ohm resistors, and so on. Testing the components for value and continuity is a bit beyond our means — at the moment. If bought new, though, it is a pretty safe assumption that all will be well — but not 100% certain.

Test the terminals for continuity through the post. You think nothing can go wrong with a shaft of threaded metal passing through a plastic body? You'd be surprised! In these mass-production times, all things are possible. Test

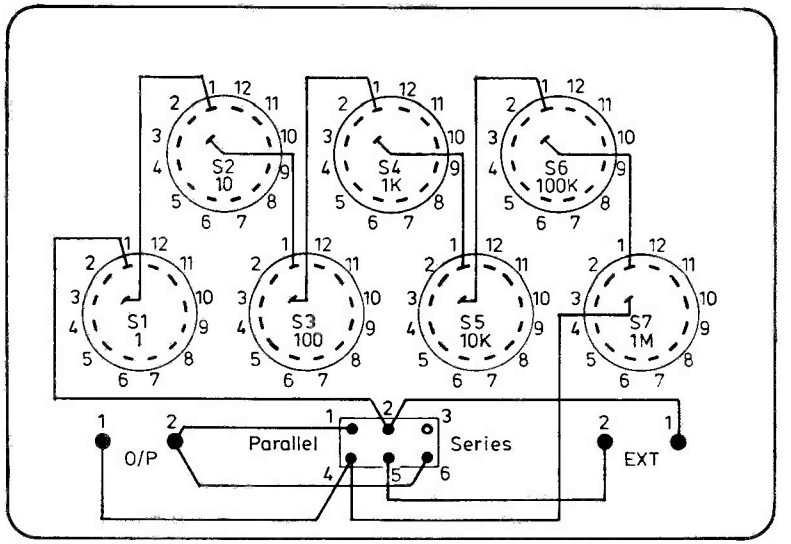

Fig. 4. Wiring on reverse side of front panel.

the slide switch by connecting one lead of the Tester to a central tag and touching the other lead to the remaining 5 tags in turn. The bulb should light up at one position only; and pushing the switch knob over should change the light-up position to the other end of that line of tags. Repeat the process for the other side of the switch.

Deal with the rotary switches one by one. First remove the securing nut and washer; underneath there will be a metal collar sunk into a recess round the spindle. Prise this collar out and put it into the junk-box. Its purpose is to limit the switch positions from 2 to 11 according to the slot into which the lug is put. Leaving the collar in would mean that something less than twelve positions could be selected. Now connect one lead of the Tester to the centre tag and rotate the spindle fully anti-clockwise. Check the position of the flat on the spindle in relation to the locating-pin. Check whether the tags are numbered. If they are, touch the floating lead of the Tester to tag No. 1; the bulb should light up. Turn the spindle one click at a time and move the floating lead round the other tags in turn. The bulb should light when the lead is touched to the selected tag — but nowhere else. If the tags are not numbered, then with the spindle fully anti-clockwise, move the floating lead round the tags until the bulb lights up; this will be the No. 1 tag. Put a blob of paint at the base of the tag. If desired, mark the number of each successive tag on the side of the switch by any reasonably permanent means. When the continuity test is completed, take the tags between thumb and forefinger and — gently — manipulate them until they are all leaning slightly outwards. The bases of the tags are set in from the edge of the switch casing by about one sixteenth of an inch; if the tops of the tags are bent until they are in line with the outside edge of the casing, the splay will be about right. Lastly, shorten the spindle by cutting with a hacksaw blade, leaving $\frac{1}{2}$" (12 mm) projecting. Complete the whole process for each switch.

The seven rotary switches, the slide switch and the four terminal posts can now be mounted securely on the panel. When fixing the terminal posts pass the threaded portion through the hole in the panel, put the flat metal washer on the back of the panel, followed by the securing nut. Then put on the 4 BA solder terminal (if used), and secure with the second (locking) nut. If solder tags are not being used, a second flat metal washer should be put between the securing nut and the locking nut. The wire should be wound clockwise round the post between the securing nut and second washer so that tightening the locking nut will tend to bind the wire more tightly round the post. With all components mounted, the next step is to wire-up and solder.

If soldering is new to you, take your time, and get a bit of practice in beforehand. The soldering iron, if you have to get one, should be rated between 15 and 25 watts — but no higher. The bit size should be three-thirty seconds or one eighth of an inch (2.5 or 3 mm) — but not bigger. Fancy doo-dahs, exchangeable bits and other so-called 'necessities' can be ignored. With an eye to future working with semi-conductors, you might consider a 12-volt DC

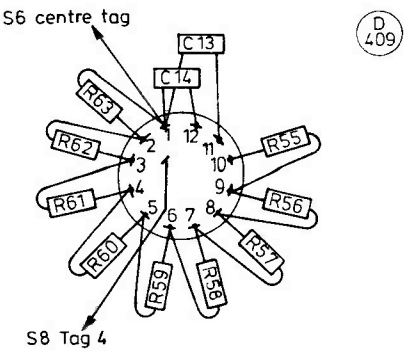

Fig. 5. Wiring for switch 7 (components shown at right angles to casing for clarity).

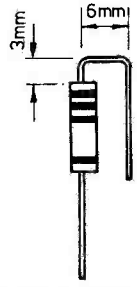

Fig. 6. Resistor lead forming

iron working off a car battery that can be trickle-charged to top-up. The system works well. For practice, an old-established 'teething-ring' for would-be solderers calls for 13 or 14 copper or brass panel pins, ½" or ¾" (12 or 18 mm) long, some lenths of wire of different guages, and an odd scrap of timber not less than 2" (50 mm) square. Knock a pin about ¼" (6 mm) into the wood somewhere near the middle; knock in the other pins to a similar depth to form a rough circle about 1" (25 mm) in diameter, with the pins spaced by about ¼" (6 mm). Now join all the pins together by soldering separate lengths of wire to the tops of the pins. The finished *objet d'art* looks like a spoked wheel — or should do. When you have completed that, and the wires can't be tugged apart using moderate effort, you are a 'Solderer' for all practical intents and purposes. There is one further test piece before you can qualify for the 'Solderer First-Class' badge, but we'll come to that in due course. Use resin-cored solder, 60% tin and 40% lead, of 18 or 22 *s.w.g.* Keep the iron hot enough (but not too hot), clean enough by frequent wiping on a damp cloth; and remember that practice makes perfect.

Now start the wiring between the components. Follow the wiring plan in Fig. 4 and begin with the slide switch. Run the wire between two positions that are to be joined and cut to length; trim the insulation for about ¼" (6 mm), off each end, lightly crimp the bare wire round the tag and solder-up with just enough solder to make a firm joint and not a dirty great blob. If two leads go to the same place, put both ends on before soldering that tag. (When a joint is soldered, make a check mark on the wiring diagram; get into the habit now, and save grey hairs and tears tomorrow.)

With all the joints checked off, test the wiring so far. Join one lead of the Tester to each of the red output terminals, and with the slide switch in the 'Parallel' position, the bulb should light. Putting the switch to 'Series' should put the light out. Joining the two external terminals together with a length of wire should make the bulb light up again. If this programme doesn't materialise, check that the wiring has been put where the diagram says it is to go; check that the solder joints are as good as they pretend to be, and that none of them are coyly concealing a 'dry' state. Use the Tester over each section in turn until the fault is detected.

With the bugs, if any, out of the wiring the resistors and capacitors can be soldered into place on the rotary switches. Fig. 5 shows the wiring pattern for switch No. 7; all the other switches are wired in the same way, only the values being different. The resistors are mounted vertically onto the switch tags, Fig. 5, so the leads must be preformed to the shape shown in Fig. 6. Use taper-nose pliers, if you have them; if you haven't, then find something that can be used as a former to bend the wire round. Be careful not to fracture the end of the resistor as you bend the lead.

The capacitor leads don't need pre-forming because their shape allows them to be fitted into their respective positions without much trouble. Begin with Switch 7, the 1 megohm range. Starting at tag No. 10, slip the bent lead of a 1 megohm resistor through the tag from the inside; at the same time slip the straight lead through tag No. 9 from the inside and gently push down until the end of the straight lead touches the panel. Now take a second 1 megohm resistor and slip the bent lead through tag No. 9 from the inside, and the straight lead through tag No. 8 from the inside; gently push down until the end of the straight lead touches the panel. The splay of the tags and the springiness of the leads will combine to hold the resistors in place firmly enough to prevent them toppling over. With two resistors in position, solder tags Nos 10 and 9 — but not tag No. 8 because there's another lead to go in their first. Work steadily round the tags, soldering up each time two resistors have been put into place. The ninth, and last, resistor will end on tag No. 1, which already has the inter-switch wiring soldered to it. If the capacitors are being mounted, connect them after the resistors have been soldered in. The largest value of the pair to tags Nos. 12 and 1; and the smallest value to tags Nos. 11 and 1. When all the soldering has been done on a switch, go round the case with a pair of side-cutters and carefully cut off the surplus lengths of lead.

Work from right to left (unless you are left-handed), along the row of four switches in the order S7, S5, S3, and S1. When that row is finished, do the other three switches, S6, S4, and S2. With the last switch soldered, the box is ready to finalise. Testing the outputs will have to wait until a bit more equipment has been made, but given a careful approach, there shouldn't be any snags.

Having screwed the front panel into place, there remains only the labelling and varnishing (for label protection), and the box is complete. The labelling can be by any means to hand and inclination. (A full-sized drawing of the switch legend is given in Fig. 7.) Once again, because this needs to be repeated seven times, using a template to mark out the 30° radials helps to speed the work and establish the accuracy. Use whatever adhesive there is to hand that will bond the material of the label to the material of the panel. But, whatever else may or may not be done, *do* run a test piece to ensure that paper, ink and varnish will agree with each other — they don't always.

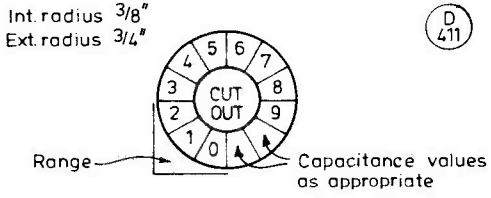

Fig. 7. Switch legend.

to be continued

CLUBS ROUNDUP

By "Club Secretary"

BY the time this comes to be read, MCC will be all over again, and of course some will be pleased with their club's performance, while others will be bemoaning their ill luck, or conditions, or that all the others used over-power, or whatever. Human nature is the same no matter what the activity!

The Mail

We are coming to the conclusion that it was not a good idea of ours to accept 'serial' entries, with all the work they entail at this end, to save each club a few coppers in postage and a bit of club scribe's time. The reason for saying this is simply that if a report appears each month for a few issues we find that we aren't getting an up-date. This is where we run into trouble — a change of Hq address, or of Hon Sec, or of meeting dates; along comes a potential newcomer to the ranks and we give him the gen as our records tell it, cross-checked as far as we may. If it turns out wrong, the chap (or maybe YL!) has a wasted journey and probably writes us a 'rhubarb' and we have no defence save to say *the club has failed to keep us up-dated.* Now, that gives a very bad impression of the club indeed. So, in future we are only going to accept series entries for three months, and then only when we have a telephone number, not necessarily for publication, which can be rung during the evening when a bit of research is needed. So — be warned!

This month we kick off with **R.A.I.B.C.**, and make mention of their work among invalid and blind amateurs, and SWLs. One group that they take an interest in is the Cardiac Spare Parts Club; full members are qualified by having undergone heart surgery, but associate members are wanted to help in fund-raising activities in support of research in this area. The address for communications is: Cardiac Spare Parts Club, c/o National Westminster Bank Limited, 2 High Street, Olney, Bucks. MK46 4BB. As for R.A.I.B.C. itself, details from the Hon Sec at the address in the Panel.

W.A.C.R.A.L. are the initials of a large international group of amateurs who are practising Christians, of any denomination; again details are to be had from the Hon. Sec. — *see* Panel for his QTH.

Ipswich is one of the few centres of amateur radio activity in the large area of East Anglia. We notice that a change of Hq is being sought, and as we have had their letter since three days after last month's deadline, we feel a call to the Hon Sec is in order if contemplating a first visit. However, assuming nothing has changed, Handford House, Ranelagh Road, Ipswich is the place, and is on the corner of Ranelagh Road and the A12; the second and last Wednesdays of each month in term-time will find them.

It is a pleasure to find the **I.R.T.S.** *Newsletter* turning up regularly again after their long absence due to the postal strike in EI. A nice 'homely' sort of newsletter which tells much about the members and their doings: next time we see one it will, we guess, be fairly well filled with details on the second EI/GI Ballymascanlon Convention — let us hope it is as successful as last year's one.

Next we have **B.A.T.C.** with their coverage of all the various facets of amateur television, including slow-scan. However, in a letter to the editor, one member wants 100% SSTV coverage, but we can't see the multitude of other amateur TV interests wearing that! Perhaps the answer is to form a separate sub-section of the group for the slowscan fans, or even a separate club (albeit the latter would break the united front).

Now to **Bournemouth** where the absence of Hon Sec, by the death of G4EMN, has been filled by G4HFQ who is at the address in the Panel. However, we do feel that the newsletter may be wrong in talking about "apathy" in the club; all they are feeling is 'successful' — G4EMN was so dynamic that we feel sure he could have turned a group of battery hens into a success by sheer personality! Give the new crew a chance, and accept the slightly 'steadier' rate of things! Anyhow, it's the first and the third Fridays in the month, at the Dolphin Hotel, Holdenhurst Road, and doubtless by the time you are able to read this they will have something set up.

Deadlines for "Clubs" for the next three months—

(January issue—November 30th)
February issue—January 4th
March issue—January 25th
April issue—February 29th

Please be sure to note these dates!

Membership is on a very rapid upswing at **Cheshunt,** with an increase of 60% over last year. They have managed an RAE class, probably the only one for miles round, at Turnford East Herts College, which enrolled 28 members — so it looked as though more growth is on the cards. They are operational every Wednesday evening at Church Room Church Lane, Wormley and for December we see a Junk Sale on 5th, a Natter on 12th, Social evening with YLs and XYLs on 19th, and a skipped date on 26th.

At **Scunthorpe** there is a change of Hon Sec — *see* Panel. Formally, they foregather at Grange Farm Hobbies Centre, Franklin Crescent every Tuesday, for talks, films, and all the other things the committee may fix up, but in addition the Hq is open every evening with Thursday evenings set apart for those who may want RAE or Morse tuition with a QRT around eleven for the late birds.

At **Bishops Stortford** we find the gang in the committee room of the British Legion Club at the top of Windmill, although if you arrive before eight you will almost certainly hear amateur-radio type conversation in the bar and maybe an agitated Hon Sec prising them out! All this on the third Monday in each month.

Edgware next, where they have the second and fourth Thursdays at the Watling Community Centre, 145 Orange Hill Road; on the "in-between" Thursdays there is a slowish Morse class, and on Mondays slow Morse to the test speed, these being on 1.875 MHz and 144.175 MHz. For December 13, they have a bumper pre-Christmas Junk Sale, and January 10 is the all-important AGM.

Now **East London RSGB,** and for December 16 they have the Annual Business Meeting and Junk Sale — the

Names and Addresses of Club Secretaries reporting in this issue:

ACTON, BRENTFORD & CHISWICK: W. G. Dyer, G3GEH, 188 Gunnersbury Avenue, London W3 8LB. *(01-992 3778)*
ADDISCOMBE: P. J. Hart, G3SJX, 42 Gravel Hill, Croydon, Surrey CR0 5BD. *(01-656 9054)*
BARKING: A. Sammons, G8IZN, 80 Lyndhurst Gardens, Barking, Essex IG11 5BZ. *(01-594 2471*
B.A.R.T.G.: J. P. G. Jones, GW3IGG, Heywood, 40 Lower Quay Road, Hook, Haverfordwest, Dyfed SA62 4LR
B.A.T.C.: M. Cox, G8HUA, 13 Dane Close, Broughton, Brigg, South Humberside
BISHOPS STORTFORD: T. E. White, G8LXB, 79 Elmbridge, Old Harlow, Essex
BOURNEMOUTH: G. R. Freeth, G4HFG, 9 South Avenue, New Milton, Hants. BH25 6EY. *(New Milton 618092).*
CAMBRIDGE: D. Wilcox, G2FKS, 19 Cavendish Avenue, Cambridge CB1 4UP. *(Cambridge (0223) 47220)*
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CORNISH: S. T. S. Evans, G3VGO, Glengormley, Carnon Downs, Truro, Cornwall. *(Devoran 864255)*
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CRAY VALLEY: P. J. Clarke, G4FUG, 42 Shooters Hill Road, London SE3. *(01-858 3703)*
CRYSTAL PALACE: G. M. C. Stone, G3FZL, 11 Liphook Crescent, London SE23 3BN. *(01-699 6940)*
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HELENSBURGH: A. McCudden, GM4DLU, Cruachan 1 Balloch Road, Balloch G83 8SR. *(Alexandria 56118)*
HEREFORD: S. Jesson, G4CNY, 181 Kings Acre Road, Hereford. *(Hereford 3237)*
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I.R.T.S.: J. Ryan, E16DG, 23 Dollymount Grove, Clontarf, Dublin 3
KIDDERMINSTER: R. Manton, G4ILQ, 7 Osborne Close, Offmore Farm Estate, Kidderminster, Worcs. DY10 3YY. *(Kidderminster 4930)*
MELTON MOWBRAY: R. Winters, G3NVK, 32 Redwood Avenue, Melton Mowbray, Leics. LE13 1TZ. *(Melton Mowbray 3369)*
MIDLAND: N. Gutteridge, G8BHE, 68 Max Road, Quinton, Birmingham B32 2AN. *(021-422 9787).*
MILTON KEYNES: W. Backhouse, G4HZI, 46 Tattenhow Lane, Bletchley, Milton Keynes. *(0908 77479)*
NOTTINGHAM: M. C. Shaw, G4EKW, 50 White Road, Nottingham NG5 1JR.
R.A.I.B.C.: Mrs. F. Woolley, G3LWY, 9 Rannoch Court, Adelaide Road, Surbiton, KT6 4TE.
SCUNTHORPE: J. A. Sheardown, G8TIY, 5 Winteringham Lane, West Halton, Scunthorpe, South Humberside DN15 9AX. *(0724 732438)*
SOUTHGATE: J. Fitch, G8EWG, 16 Kent Drive, Cockfosters EN4 0AP. *(01-440 7353)*
SURREY: R. Howells, G4FFY, 7 Betchworth Close, Sutton, Surrey SM1 4NR. *(01-642 9871)*
SUTTON & CHEAM: G. Brind, G4CMU, 26 Grange Meadow, Banstead.
VERULAM; A. Clarke, G8MAE, 24 Kiln Ground, Hemel Hempstead, Herts. HP3 8EZ. *(Hemel Hempstead (0442) 64751)*
WEST KENT: B. P. Castle, G4DYF, 6 Pinewood Avenue, Sevenoaks, Kent TN14 5AF. *(0732 56708)*
W.A.C.R.A.L. L. Colley, G3AGX, Micasa, 13 Ferry Road, Wawne, Near Hull, Yorks. HU7 5XU

general form with this group is to get together on Sunday afternoons at 3 p.m. at Wanstead House, 21 The Green, Wanstead. We might add that this unusual day and time has been successful for the group for many years.

Down West now, to **Cornish,** at the SWEB Clubroom, Pool, Camborne, on the first Thursday of each month. This venue is at the SWEB place on the more northerly side of the main road through Camborne-Pool, and the entrance is down the side-road on the westerly side of the site. We believe it possible they may have some arrangements for dealing with 'waifs and strays', but if you've never attended we do recommend you to bother the Hon. Sec. for details, or to quarter the area in daylight! But — all that being said, the gang made a member of our staff *very* welcome indeed and the number who actually turned up was nothing short of amazing to one used to seeing 30 for a special occasion — this group packs some 65 people into the hall, and has the technical resources available to keep them entertained from among their own membership, in the main.

At **Hereford** the venue is the Civil Defence Hq at Gaol Street on the first and third Friday in each month, and in the years since we have been doing this piece we have seen them grow from a tiny group into the tower of strength they now are. On December 7, they have Power Measurement to be dealt with by G3NPA and G8DRG, while 21st is set aside for a Christmas Raffle and Quiz.

It's a Christmas Party at **Surrey** for December 5, and the place to the best of our knowledge will be the usual *T.S. Terra Nova* at 34 The Waldrons, South Croydon.

We would very much like to visit the **Milton Keynes** gang on December 10, at Lovat Hall, Newport Pagnell, when they have a talk on Advanced Meteorology. So few of us take any account of the weather forecasts or sniff the air in the morning and decide to pull the beam down a few feet before going to work, against the storm the skies tell us will strike before we return!

Barking seem to be suffering a rather odd problem in that they can't "get out" with their HF-band transmitter to the DX they would like — we wonder if this is more due to their operating times than the location, which we would have thought to be well above average. As to details of the group, they have something going almost every evening in the week at Westbury Recreation Centre, Westbury School, Ripple Road, Barking, Essex. More details from the Hon. Sec. — *see* Panel.

Cambridge we last heard of many moons ago, and since then there seems to have been a change of Hq and of Hon. Sec. — *see* Panel. The "new" venue — they've probably been using it for years! — is at the Air Training Corps Hq, 730 Newmarket Road, Cambridge, where they foregather on Friday evenings. Looking at December we note on the first Friday a Beginners and New Members evening, and in general terms the story is one of alternating informals with a lecture/demonstration or suchlike activity.

It's a long time also since we heard from **Kidderminster,** but G4ILQ the Hon Sec writes to repair the deficiency. They now have a place on every alternate Tuesday evening from 8 p.m. at the Aggborough Recreation Centre, Hoo Road, Kidderminster. Some thirty members make a secure basis and they are very much out to attract new members; we have it that the programme will have plenty of variety and the odd social function as well.

Friday December 21 is the date for the next **Melton**

Mowbray affair, at the St. John's Ambulance Hall, Asfordby Hill. We gather they will have a Junk Sale, put G4FOX on the air *and* present the G3FDF Memorial Trophy to its winner. Looking ahead, we see they have a Quiz Evening, a construction trophy, and various lectures and demonstrations.

On to **Sutton & Cheam,** where their alternate venue seems to have changed from 'Rays' to Banstead Institute, and there has been some adjustment made to the overall programme. However we do know that December 7 is down for Sutton College of Liberal Arts, and at the time of their newsletter the subject was still pending.

Now to **Guildford:** they are in session on December 14, with a talk and demonstration by G3IEE, on the interesting things that were used in war-time — or at least some of them! It would take a month to discuss them all! This group is one of the few to have a meeting on the period of the Christmas break — they have a Christmas Natter and some nice warm NFD films. As for the Hq, they have the Model Engineers' place in Stoke Park. More details from the Hon. Sec. at the address in the Panel.

North of the Thames now to **Southgate** who are based on the Scout Hut, Wilson Street, which lies off Winchmore Hill Green. There was a picture in the October issue of *S.W.M.* which showed them in comfortable surroundings listening to a talk — as always, on the second Thursday of the month.

We are a bit short on information about **Reigate,** they having had to cope with the death of their chairman G3JDN, who will be sorely missed in the area, and almost at the same time the resignation of two active committee members by force of other duties. However, for the regular reporters we have a little red box from which we can extract a card and tell you that they will be at the Conservative and Constitutional Club, Warwick Road, Redhill, on the third Tuesday in each month. By the time this comes to be read, they will have had an Extraordinary General meeting at which we hope they will sort out the problems. Meantime, if you get to meet up with any of the members, you could pass the word that we'd like the name and address of the Hon. Sec. for the records!

It rather looks as though **Addiscombe** have been exploring the district in search of good booze, as we hear they have moved from the Spread Eagle to the lounge bar of the "Prince of Denmark", which lies some 300 yards north of the old venue and is 125 Portland Road. They get together as usual at 9.15 on Tuesdays. We might remind readers that this group is very much contest orientated and they don't mind climbing hills or going long walks if it helps them towards collecting the silverware!

Now **B.A.R.T.G.** and the mutual interest here is of course RTTY. At the time of writing the AGM is due in less than a week so for the moment we have to leave the name and address of the present incumbent in the Panel although we realise he will not be holding the office by the time we are in print. GW3IGG, we feel sure, will not mind this just once, if only to maintain the continuity of the service; and we are equally sure that he will ensure we get to know of his successor, for our records.

Right up north and across the Border now, to **Helensburgh** and their meetings on the first and third Wednesdays at East Clyde Street School; they have only been in existence for a couple of years and are looking for more members as they gradually improve their facilities — they now have a club shack which can be open on most evenings, and this is being equipped for a start with VHF FM gear. That is not to say they don't do anything else, as Hon. Sec. GM4DLU tells us they have talks, films and all sqrts of things in the pipeline.

Crawley are, as ever, in their Hq at Trinity United Reformed Church Hall, Ifield, on the fourth Wednesday; in addition they have informal gatherings at each others homes. More details can be obtained from the Hon. Sec. — *see* Panel.

At **Verulam** they are now based on the Jubilee Hall in Catherine Street, St. Albans. The routine is to have the main meeting here on the fourth Thursday of the month, at which the tone will be more formal, with talk, films or whatever; in addition they have an informal date on the second Thursday, which in winter time is at the R.A.F. Association Club in Victoria Street.

The "weekly meetings" groups are the ones who stand to be disrupted by holidays, particularly this evergrowing Christmas/New Year effort. Thus it comes about that **Nottingham** miss their December 27 date, replacing it with an "on the air" round-table for those who can make the quick escape up to the shack without detection. December 6 is down for a Forum, and on 13th they have a talk by G4EAN; this leaves December 20 open for an Activity Night. All start at 7.30, and are held at the Sherwood Community Centre, Woodthorpe House, Mansfield Road.

At **Cray Valley** the dates are December 6th and 20th; the former is down for an introduction to Computers by G8KDC and G8OWR, and the latter is a Natter session. Both will as usual be held in the Christchurch Centre, High Street, Eltham, 7.30 for 8 p.m.

Over to **Crystal Palace** now, and the familiar duplicator of G3FZL is back in action; it says that the gang get together at Emmanuel Church Hall, Barry Road, London SE22 at 8 p.m. on the third Saturday evening in each month. As for the programme, at the time of writing there was some uncertainty about the details, but no doubt the Hon. Sec. will be able to tell you if you drop him a line at the address in the Panel.

On we go now to **West Kent** who have a programme clear through to May, based on the Adult Education Centre, Monson Road, Tunbridge Wells. December 7 sees G3XPX giving a talk on modernising old receivers — a subject well worth attention. In addition, there are alternate Tuesdays for the informals at the Drill Hall, Victoria Road throughout the year.

Last, but by no means least, in the pile we have **Acton, Brentford & Chiswick,** where December 18 will see a discussion on HF aerials. The venue as always will be the Chiswick Trades & Social Club, 66 High Road Chiswick, the kick-off being at 7.30.

Deadlines

We have sorted out most of our problems, so if you stick to the dates given in the 'box' in the body of this piece, you won't go far wrong, provided your allow *lots* of time for it to arrive! Send all your reports, letters, up-dates etc. to, as always, "Club Secretary", SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ.

Cheers, have a good Christmas and a Happy New Year. *CU in 1980!*

"YOU MUST BE ONE OF THOSE RECIPROCALS . . ."

OR THE TALE OF A TWO-LETTER CALL

JACK HUM, G5UM

HE was the owner of a nice and shiny new G8T — callsign; and when his "CQ" on 2 m. FM was answered by a chap with an old and battered G5-plus-2 call he showed signs of being noticeably nonplussed if not positively perplexed.

"Did you say G5EM? That's a strange call" he said when he came back.

"No, OM, the callsign is G5UM, U for Uncle, or University, or Utrecht or even Uniform — though I don't much like uniformity. And the letter E isn't used in callsigns like this one."

It took him barely a few seconds to cotton on and to proceed with the usual conventions such as "the name" and "the rig" and the description of a notorious vertically polarized antenna he was using, but never a word about where he was located, which in the ears of his listener was the most important thing of all. But this emerged after a couple of requests. He was 15 miles away.

Soon his curiosity persuaded him to ask:

"Now that callsign of yours . . . you must be one of those reciprocals. Are you American or Dutch or something?" Any moment his listener was expecting him to welcome G5UM to these shores and not to forget that we drive on the left.

This was the point where an explanation became necessary of the difference between these new fangled reciprocal callsigns in the G5-plus-3 block and those old fangled pre-war ones which are in the G5-plus-2 block. The G8T-man possessed no callbook, and even if he had, the distinction might have remained unclear to him.

Had he, asked the Old Fangler, ever heard any other two-letter calls on the 2 m. band? W-e-l-l, yes he thought he had, but he tended to treat them with some suspicion: he was not keen so early in his amateur radio life to receive a Pink Ticket from Higher Authority for working a pirate.

Right, then, would he like a nice cosy fireside chat during which all this callsign stuff could be explained? He said yes he would: but upon being asked to select a nice cosy frequency for the purpose he disclosed that he ". . . only had S20, S21 and all the repeaters". Not, in the ears of the Old Fangled G5-plus-2 quite the area where a necessarily long explanation could be put over in reasonable privacy free from the QRM layers deep that characterizes these frequencies. Did he not have a converter and a tunable communications receiver on which he could perhaps listen elsewhere on the band and get out from under? Yes, he believed he had: it was with other metal objects under the bed, and it had been there since his short wave listener days. Could he pull it out and — laughable phrase, for so often so true — fire it up? He though he could and promised to call back on S21 when he had investigated. Within five minutes up he came on 145.525 MHz (yes, S21 in case you didn't know) to announce eagerly that ". . . it still works and I can tune for you wherever you like to go on the band . . . I've even got a separate aerial for it, so I can listen for you on one aerial and continue to transmit back to you on the existing one."

He would still be stuck on S21-transmit, but this didn't matter, because from now on he wouldn't be doing much talking but a lot of listening. And this is what the Old Fangler had to say to him:

In the beginning way back at the dawn of amateur radio in the UK, in the days when the UK was called "Great Britain" (yes, as recently as the Nineteen Twenties), three blocks of callsigns were issued by the All Powerful (known then as the GPO). These callsigns, allocated in fairly random sequence, could have been either Two's, Five's or Sixes followed by two letters, *e.g.* 2XK, 5UM or 6NB. What, no G prefix? No, not ordinarily: you needed to get a special dispensation from on high before you were allowed to use the national prefix. Believe it or not, similar callsigns were issued to the British Broadcasting Company before it became a Corporation in 1927. It was not unusual to hear amateur telephony on the 440 metre allocation cheek by jowl with such famous callsigns as 2LO London, or 5IT Birmingham or 2ZY Manchester.

By 1936 the callsigns in the 2,5 and 6 block had been used up. Then came the G8-plus-2 block.

"What, G8 plus two?" came the anguished cry on S21.

"Yes, indeed, G8 plus two letters. And they all seemed to be rich people. They could afford to use imported American gear and phone on forty — *and* the G prefix!"

This seemed to be the opportunity to tell G8T-- that nowadays you didn't often dare to use a G8-plus-two letter callsign in a VHF contest. Always there was someone wanting to ask you what the third digit was. "Surely it must be G8LM-something, mustn't it?" No, it wasn't — but precious contest seconds were wasted saving so.

Right, G8-plus-two in 1936, then. What next? Why, G3-plus-two in 1938 and G4-plus-two in 1939 (not all of this block was issued before W.W.II intervened).

"That's clear enough" came the voice on S21: "But tell me about those strange G2-plus-three-letter callsigns like G2HJD or G2AOK which I've heard on 2 m. Why wasn't the series completed?" An awkward question, necessitating a description of that strange licence called The Artificial Aerial which existed pre-war. You were given a callsign but you were not allowed to transmit except into what *they* called an Artificial Aerial and what *we* would call a dummy load. It was all supposed to give the aspiring radio amateur some experience in adjusting equipment off-air before he was allowed on-air. When the war was over these same calls were issued to their original holders with permission for full on-air operation.

Our G8T-- friend on S21 made a trenchant comment at this point: "Pity the artificial aerial regulation isn't with us today, judging by some of the dirty signals one hears around."

Whether someone objected to this viewpoint or whether it was sheer coincidence was not clear, but S21 suddenly became full of S9 signals from two dozen mobiles, half of them hurrying north on the M1 and the other half south on the A6, or so it seemed.

Said Old Fangler: "Do you have a beam antenna? If you do it would exclude most of that crud." No, New Fangler got

all the pleasure he needed from amateur communication from his Notorious Vertical and his 20-mile service area.

"Patience, Mercutio" (or words to that effect), and in due course as the layers of mobiles moved into the distance communication was restored, with plenty of quick breaks to ascertain if others needed either frequency being used for this split-frequency contact. They didn't seem to: perhaps they were absorbed in what was being said! Newcomer G8T-- appeared to be. And then came the moment Old Fangler had been waiting for.

"I didn't catch the handle" said the voice on S21. Smothering the temptation to reply "I didn't throw it" or "It's on the side of the transmitter" the Old Fangler said he understood his QSO-partner required his name. Well, it was in the callbook but he'd give it all the same, which in accordance with the politeness which should infuse every contact he did, adding something which he could *not* smother: "Y'know, if you and I met face to face you wouldn't ask what my handle was: you'd ask for my name . . and electronic communication is as near face to face talk as you can get."

Friend G8T-- genially took the point. He will probably never use that alien word "handle" again!

"Must go" said Old Fangler: "The wife has just switched on the bed heater."

"Wait a minute" said the voice on S21: "You said right at the start that the letter E was never allocated to old callsign blocks like yours. Why not? You hear it often enough these days."

Answer: once there was a superstition that the smallest digit in the Morse Code, the letter E, would be lost in the noise of those pre-war receivers. Hence it was avoided in the allocation of UK callsigns. When the brand new G3A-- series was initiated in 1946 the letter E was included. Some of the early holders of callsigns carrying E tell of the pain and anguish they suffered when older timers went back to them and said "Dirty pirate! We know the Post Office has *never* issued callsigns with E in them" But they had!

"Electric bed heater running hot . . . must go."

"Cheers and beers" said G8T-- (he will grow out of that one, too). "I'll tie up the ribbons." Which he did.

"Diddly dah dee dah." This final sign-off by Old Fangler may have been lost on the newcomer: but he'll learn — swiftly. Most G8 men do.

BOOK REVIEW

"AMATEUR RADIO OPERATING MANUAL"

ONCE in a while, a really first class publication turns up for review, and the RSGB's newest title *Amateur Radio Operating Manual* fits into this category. It is packed with a great deal of very useful, up to date information for both the newcomer and old-timer.

The first brief chapter, "The Amateur Service," discusses how the AR service fits into the overall ITU scene. It includes a map showing the three IARU regions followed by a table listing the worldwide frequency allocations from 1.6 MHz through 24 GHz and how the numerous amateur bands are shared with other services.

In Chapter 2, "Setting up a Station," mention is made of the enormous range and cost of equipment and includes the very sound advice, "First make sure the equipment is really necessary at all!" It also advises, "watch for the technology trap," querying whether it really is necessary to have the very latest equipment when older, secondhand gear might do the job just as well at half the cost. This section covers such items as choosing a site or room for the shack, acoustics, comfort, power, layout, security, safety, insurance and hints for blind operators.

The third chapter, "Operating Practices and Procedures," is primarily aimed at the newcomer and includes examples of CW QSO's illustrating the use of the common abbreviations. The author has a dig at those 'phone operators who use CW Q-code signals in normal conversation, and suggests the use of plain English instead of clichés and jargon.

"DX" is the title of Chapter 4, the longest one, running to 48 pages. It is a superb treatise covering all aspects of propagation from LF through UHF and from Top Band through MS work on VHF. In the LF/HF section, what can be expected to be heard at various times of the day on each band is copiously analyzed in the text and amplified by numerous maps and tables. In the VHF/UHF section, items covered include the QTH locator system, band plans, beacon frequencies, MS procedure, with a list of the principle showers, and a table showing amateur allocations above 70 MHz for all Region 1. From this latter, one would conclude that neither Portugal nor the Ivory Coast have any allocation; however, this cannot be since this reviewer knows there are many 2m. repeaters in the former and has worked both CT and TU stations on the band.

The fifth chapter is called, "Contests," and deals with the matter of adequate preparation, operating techniques, contest strategy and ideas for check logs. Analyses of a 1976 7 MHz and a 1977 NFD club contest entries are included.

Chapter 6 is a short one devoted to "Mobile, Portable and Repeaters," and includes the inevitable lists of 2m. and 70 cm. "channels," and all the UK VHF and UHF repeaters. The next chapter on "Amateur Satellites" is based upon a March 1977 *Short Wave Magazine* article by this reviewer, later up-dated by AMSAT-UK. It includes information on the now-defunct Russian *RS-1* and *RS-2* satellites, and look-up tables for *Oscar 8*.

The next two, short chapters are devoted respectively to RTTY and SS/TV. Even so, the basics of the systems are concisely covered. The final chapter, "Special Event Stations," is a welcome inclusion. Such stations are the means by which the majority of the general public is likely to encounter Amateur Radio and radio amateurs, so the notes in this section on the neat and safe assembly and

efficient operation by presentable people are timely, bearing in mind the public relations opportunity they offer.

One quarter of this manual is devoted to five, excellent appendices, the first of which contains maps showing the European QTH Locator squares, very detailed maps of all parts of the world with all the countries and prefixes, and the ITU and "CQ" zone maps. Appendix 2 is the longest and a mine of "real pukka gen!" All the countries are listed in alphabetical order, followed by ITU callsign allocation, callsign system with maps of call areas, notes of national and reciprocal licensing, and the addresses of national societies and licensing administrations. The mysteries of the USSR and USA call areas and systems are meticulously explained.

The third appendix is a callsign list, alpha-numerically presented from A2 (Botswana) through 9Y4 (Trinidad and Tobago) and gives the ITU and "CQ" zone numbers and beam azimuths from London. Appendix 4 is a "DXCC" countries list referred to the maps in Appendix 1. The last appendix is devoted to "Worldwide Legal Time" and includes the dates of daylight saving time (DST) in many cases. The last page is a short index.

The editor, R. J. Eckersley, G4FTJ, is to be congratulated on compiling a superb manual from the contributions of 34 listed amateurs, plus several groups and clubs. Each chapter is thoroughly bibliographed. The book runs to 190 pages in 9¾ × 7¼ inch format, and must be enthusiastically recommended to all amateurs. Priced at £4.70 including post/packing, it is obtainable from *S.W.M's* Publications Department at 34 High Street, WELWYN, Herts. AL6 9EQ.

N.A.S.F.

COMMUNICATION and DX NEWS

E. P. Essery, G3KFE

AT the moment this comes to be written, outside lies the wreckage of what used to be a reasonable aerial system, plus quite a lot of copper wire scattered around the neighbouring properties. Luckily, your scribe's neighbours are a pretty reasonable lot: not like the amateur who received his 14 MHz dipole back through the letterbox, with both the feeder and the elements neatly cut into 12-inch lengths and bundled together! The rest of the locals laughed mightily but the victim was Not Amused.

As we come to this piece again, the bands have been doing their seasonal thing and yet we hear the odd note of discontent — peak of the cycle though we may be going through — some people are just never satisfied! Anyway, were it all that easy, I guess we would mostly give up and go to VHF and repeaters.

Here and There

And everywhere, it would seem from the notes on DX-peditions we receive. Lloyd and Iris Colvin are out and about again, not to mention various lesser expeditions. We rather go on the Texas effort: WD5ICY was QRV on CW from Telegraph, while WD5IKY was operating SSB from Telephone! We have already mentioned G4EZI, up to 176 countries/YL, and we now hear that G3WW has his 100-up confirmed on two-way SSTV. Again, lots of the calls we used to hear at the last peak, who disappeared from the DX scene in this country, are now back — G3XTJ, G3GIQ, to mention but two, while to hear Lloyd and Iris on from J3ABV — Iris working G3HTA on Eighty among others — is a sure sign that things are humming along nicely.

Your Conductor's own small effort, intended to coincide with the beginning of WARC '79 and encourage some activity, came near to fruition, even if it wasn't *quite* a success. There were several problems, not the least of which was the matter of power from the old *Onan* generator.

But if nothing else the difficulties made for a laugh; and, we suppose, in this industrialised "civilisation" we have made ourselves, a laugh is the most valuable thing in the world.

On the other hand, perhaps the amateur's most un-wanted possession is an *alter ego* using his callsign. Nick, G2NJ seems to have grown one which prowls round the CW-end of 7 MHz, sending *slow* Morse, and calling himself Bill. Odd, isn't it, that so many phoneys come on using CW; in general they think — or seem to think — that there is less chance of detection. Optimists! As the masses go to SSB so the *cognoscenti* left on CW all know each other without even hearing the callsign.

Contests

On the day we are due to come out there begins the ARRL Top Band CW contest, carrying on through to 1600 on December 3. Don't forget, if you aren't a regular on Top Band DX, that the normal rule is to work split-frequency, with the DX in the "window" of 1825-1830 KHz, and listening around the bottom of the band. This one is possibly useful for some, but gather that contacts described as DX-DX don't count, only QSOs with W/VE, at the rate of 5 points per ARRL section (74 sections just for the record). Exchange RST and section or country. And, don't forget, that some of the DX lives up in the 1990 KHz area and listens where we normally do, and it's the sort of DX that might — just might — sneak in a QSO that gives no points but a new 160 country!

Then there is the *CQ* WW WPX 160 contest, on January 25-27, which will be scored as in previous years. W1WY and the gang at *CQ* have taken a look at the rules — just the same problem as we have with MCC — looking for ways to give a balance which will null out all territorial advantage. There

'jist ain't no sich thing' on Top Band no-how, whether you talk MCC, or CW Top Band contesting on the world-wide scale of the *CQ* affair. The band is the problem, by its very nature never equal to all, and even sticking to the same rules formula for several years will still show widely varying results from year to year simply on conditions. What *is* important is to have an effective aerial, and it has to be said that the usual G station aerial for the band doesn't quite meet the case!

The Mail

Perhaps we should firstly look at 28 MHz, and G3NOF (Yeovil) found it open from 0700 to 2230, which isn't bad all things considered! Early morning gave with the VK/ZL/JA up till noon on the long path, North Americans from 1000 to 2000, with the KL7s notable at 1000 and KH6s around 1900. SSB was used to work C5AAP, HH2MC, HH2T, HM1QD, HI8XWP, K1CO/PJ7, K7LR in Idaho, KH6BOG, KL7IRT, KV4FZ, N1GL/VP9, N2RM/6Y5, UF6VAG, VE5, VE6, VE7, several VKs, VP2EEG, VP2E, VP2KC, VP2MBA, VP2VFX, W7XA in Arizona, W8TN/6YS, ZS3LK and 9J2BO.

Next we have G2HKU (Sheppey) who sadly reports the death of Ross Coleman, G3ABJ; Ross was a ZL by birth who also held ZL3NW — a good friend who will be much missed. Turning to his band activities, G2HKU refers to CW with VE6PN, N4TO, W0RNA, W7XJ (Nevada), W7TC (Oregon) and ZL3GQ.

G3AOS (Hale Barns) reports on the activities of his station during the Jamboree-on-the-Air; he operated /A at the Hq of the 1st Hale Barns Scout group, Shay Lane, and set up gear for the event as follows: TS-820S into a TL-922 linear into a Mustang triband beam atop a 50-foot tower; plus a KW-2000A on Eighty operated into a multiband trap dipole at 50 feet; *plus* an Icom 210 on 144 MHz. This fine set-up resulted in some 150 contacts, of which some 30 were Scout groups in U.K. and 16 with Scout groups overseas. Looking at the latter, we find IT9FTT (Noto), CT5REL (56 Lumior, Lisbon), CT5ECM (471 Cantansede), HB9S (the World Scout Bureau), PA53ALJ/J, PA0EJM, PA0FW/J (Eindhoven), CX9CO (Montevideo), ZE1JUM (Umtali), ZD7JAM (1st King Scouts, St. Helena), SK0HS, (Haessel Sea Scouts), SK6XAD (Haessel), SK7CQ/7 (Teckmatorp), LA7SW (Moss), LA3JAM (Harstad), LA3RH (2nd Harstad), 5W1BZ (Apia), 3D2WR (Suva), ZL1AIU (Whakatee), ZD8JAM (Ascenscion Is. Scouts), K2BSA (Boy Scouts of America, Princeton), 6Y5LA, (Jamaica), 6Y5RA (Kingston), and VE3BSA (17th St. Catherine, Niagara Falls). The reports in to the station, which was signing GB3HBS were quite pleasing so all the work put into it was far from wasted; in total some 49 countries were worked, including G, GW, GM, GI, GD, YV, VK2, VK4, UA0, JA, ZS6, CX, ZE, VP9, UK7, VS6, HM0, A4X, VQ9, I, 5W1, 3D2, PY, F, XE, HP, 5T5, CE, LU, HK, EI, DM2, and DL. Geoff finishes with thanks to the RSGB and the Scout authorities for their co-operation, but it sounds to us as if the brunt of it all fell on G3AOS in putting together such a superb station for JOTA. Congratulations to G3AOS and all concerned for a magnificent show.

G3PKS (Wells), apart from bewailing his loss of CW ears with age, seems to have had his fair share of fun; October 11 and a quick listen between 1430 and 1442 showed beacons DL0IGI, N4RD, GB3SX, 5B4CY, VP9BA, and A9XC in Bahrain, with VE3TEN heard the following morning. JA, W, PY, VK and such-like were all in there for the asking and the band remained open until late evening. For an example, between 1730 and 1930z on October 19, Jack worked WA7HWZ, N7AOS, W6HHG, on CW, followed by a swap to SSB to raise WD0CQA and KA1AQN, with very reasonable reports from all stations. The final one was 3E6CND heard calling CQ around 1753-1758 on October 10, not raised, and slipping quietly into the mud at the end. "Who, what, and where?" asks G3PKS. A look at the latest issue of Geoff Watts' *DX Prefix List,* hot from his presses shows 3E as being a possible prefix from Panama, so it was probably some special-event if genuine, or maybe a pirate.

We have a nice long letter from G4BUE (Upper Beeding). Chris seems to have been shifting a few extra hours chasing those 'villains', which reduced his airtime; but QRP on Ten yielded SSB with VP8SB, CX4BA, 3B8CF, VP8QG, VP2ML, FP8HL, VE1CR/1 (Sable), C6ACY, CV0A, HH2T, and HH2MC, K1CO/PJ7, HI8XWP, VP2E, XE2MX, 9Y4FRC, VP2MBA, and LU7M — nothing about five watts input and mostly down in the 1-watt region. CW at 5 watts accounted for 3C1AA, 1 watt for ZD8KM, and half a watt for C5ACB. Chris now has overall a score of 280C, and on QRP there are 94 *confirmed* at 1 watt, some 128 having been actually worked QRP as compared with the full-power total of 280 worked.

Top Band

Seems from reports to be getting quite a bit of attention from the 'chasers, who have been attracted no doubt by the new countries which have been heard of late. For example we hear that G3IGW has worked some 50 Russian stations, and in the contests and such the band has been as lively as of old; in the *CQ* Contest just gone PA0HIP rolled up a multiplier of 44, which sounds quite believable; and we hear from a G8 of a club station claiming "50 countries" — we find it hard to credit this latter, but it could just possibly be.

G3PKS mentions he has been trying his hand at Top Band as well as Ten, and, of course, started with the local net of G3TWO, G4FWL, G4ASK, and GW3UTE; this was followed by a nice chat with GW4GTE in Clwyd. A little later again there was the WAB net, and G4ENT, G3NCK/A, G4EZP, G3XLZ, G4ENG, G3YKP, and G3KLT — a very pleasant evening indeed.

G2HKU also mentions the band; he noted the extra activity brought about by the new countries in the *CQ* Contest, mentioning that he found, on SSB, UP2BEQ, UP2BEL, UQ2BGU, PA0PN, DK9WB/P/LX, DK8NG, OK1MGW, VP2KC, DJ6TK, DJ6QT, DL0UE, OH3VV, plus some CW to OK1HAS, SP7ICE, UT5BN, PA50LVB, and DJ1IJ.

Eighty

Often the haunt of QRP stations, both CW and SSB; and there is certainly a lot going on the band about which we never hear, more's the pity. G4BUE and his low-power managed CT3BZ and VE1CR/1 on Sable Island — this last has worked on 28, 21, 14, and 3.5 MHz but never even a sniff of him on Forty despite some careful searching.

We have already mentioned the effort G3AOS and the crew put on in

JOTA; Geoff does not separate any part of his list to Eighty, but no doubt that old KW-2000A is now recovering it's breath after a dose of hard work!

G3PKS notes the local nets and mid-day working, and adds the comment that if one is prepared to spend late or early hours, then there is DX to be had.

The QRP rig at G2HKU was used on the band for a couple of quick QSOs, namely those with SM6EHY and K6DC/DL (bet that caused a snort when the suffix was copied!)

Forty

This is the band of the specialists, who have the receiving gear to cope with the unwanted megawatts and rhombics pointing our way over the top of the microvolt we want; and yet it has always had a charm of it's own for one prepared to take a bit of trouble over getting things right, both technically and in the operating sense. One feels, for example that the use of arrays of phased verticals is a ploy that has been much neglected, in that it gives a bit of gain, but more important has a good front-to-back ratio. Since even with a single ground-plane one is going to want, usually, some 20dB of attenuation before hitting the receiver, some of this could be used on receive to pad off the aerials and so give them near-perfect characteristics directionally — while removing the pads on transmit by way of a relay contact.

G3PKS mentions a net of Bristol stations who foregather around 1130 (clock) on Mondays, and reports exchanged have been excellent out to 100 miles or so: Clwyd, Exeter, London, and even the 20 miles over the Mendips from Wells into Bristol. Just after daybreak, there have been VK, ZL, and JA stations to be heard, but all, alas were in QSO.

Twenty

Where it all — mostly, anyway! — happens. The general synopsis is that the band has been open to some place or other right round the clock, and the big signals have been very tempting at times. The only snag with such good band conditions is that it is very hard to sneak in and grab a bit of choice DX before the mob notices — the whole world can hear him and you're just one among many. All good fun, nonetheless.

G2HKU seems to have had quite a few on the band, with ZL1VN, ZL3FV, ZL3RS, ZL3SE, and ZL1NW all on SSB, while the keyer got in among ZL3IS, FK8DD, FC0FHK, KB6G, WA7YHP/SF (Nevada), HC1GC, VE3AJA, PY2BAU, JA3API, and LU5DYV.

For the G3PKS watts it was a CW affair, with solid copy to VK2IS and VK4UG both at about 0730z, not to mention SM0FUI, VN4S, W9YPO, AF8T, WA3DFC, AU3UH, and CT2QN in the Azores. A QSO with our old friend Jesse, G4GOF, also pleased Jack; Jesse's nine watts to G5RV being enough to warrant an exchange of reports of 599 both ways.

'CDXN' deadlines for the next three months—

January issue—December 6th
February issue—January 10th
March issue—January 31st

Please be sure to note these dates.

It is most unusual for G3NOF to be enthusiastic in his comments on the month's band conditions, but this time has really pleased him; VK/ZL from 0600-1000 on the long path, with a few Pacific stations in among them, and at the same time there have been openings to USA, East Coast at this time, and at others West Coast stations. During the day, the odd short skip G at S9 was noted. Thus the log shows SSB with C6ACY, CT2AK, GD3KHE, GU2FZC, HK0EFU (San Andres. Is.) HI8XWP, KL7H, N1GL/VP9, N2RM/6Y5, P29JS, TI2CF, UK1PAA (Franz Josef Land), VE7s, VKs, VP2KC, W7OK (Nevada), ZK2VE (country no. 335 on Phone for G3NOF), 4U1ITU, and 9L1CA.

Now to G4BUE, who seems to have had a QRP contact on SSB but otherwise used the big rig. The QRP one was UA1PAL on Franz Josef, while the high-powered stuff went to VP8VN (S. Georgia), 3B9CF, VK0PK (McQuarie Is.) and 3C0AB.

21 MHz

A nice band this, at any time: none of the noise of 14 MHz and the LF bands, and more predictable than 28 MHz. However, some people prefer the excitement, and maybe that's why G2HKU mentions only his CW QSO with PY4ABF.

Another "one little peep" exponent was G3PKS; his little peep made two QSOs on the key, with OH7XU and VE3IDW.

Now we turn to G3NOF, and Don reckons the band was like Ten only more so; opening time at around 0700, and carrying through till the small hours. Long path VK/ZL/JA contacts have dominated the mornings from the opening, changing over to the short path around 0900 and staying until 1300. North Americans have been noted from 1000 right on through to the small hours again. Not a lot has been heard from Africa, or Asia for that matter, though some KH6 openings were noted around 1700. Don booked in to his log AJ6A, C5AAP, D4CBC, DK5BD/ST, KH0BKX, HI8GGL, HI8XDJ, HI8XWP, HP2XSG, JW2CF, K1CO/PJ7, KL7D, KL7IRT, N7RP, N7RR (Idaho), N1GL/VP9, NL7C, S7BTF, VE7s, VKs, VP2KAC, VP2KC, VP9IJ, VS6DO, VY1BR (Yukon), WB2GTW/6Y5, W7s assorted, WB4LRB/8R1, WB7TRE, ZF2BP, ZLs, ZS3LK, 3C1AA, 4U1ITU, and 9Y4FRC.

The beam at G4BUE seems to have been accepting 21 MHz RF quite frequently; QRP SSB yielded 3V8ONU, OK3TAB/D2A, VP2ML, all with one watt input, EA9FJ (5 watts), 5T5AY also with five, and HS1ABD, VP2KC, XE2D, N2RM/6Y5, H31LR, (HP1XOJ in disguise!), TD4NX; and with the CW there came JAs, VK7BC, KL7IVX, 9J2BO, G3VZT/KH6, and C5AAP all at five watts or less. There seems little doubt that the 5-watt level, well operated, is quite capable of working the 100 countries, either on CW, SSB or mixed-modes; it would be of interest to compare the results, side-by-side, as between G4BUE's signal on the beam and a ground-plane or such. The problem so many people find in working DX has, the writer is sure, little to do with power and much more to do with aerials; but above all, the basic 'nous' of the chap in the driving seat.

Finis

That's it for this time, and when next we meet it will be 1980; so to you all, wherever you may be, a Merry Christmas, and a Very Happy New Year — not to mention lots of DX! Address your letters, to arrive by the date in the 'box', to "CDXN", SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ.

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