

The

# SHORT WAVE

Magazine

VOL. XXXVII

MAY 1979

NUMBER 3

## The Ultimate Receiver

# R820



### LOWE ELECTRONICS

119 Cavendish Rd., Matlock, Derbyshire. Tel. Matlock (0629) 2430 or 2817

# LOWE ELECTRONICS LTD



# TRIO

## TRIO PRICE LIST

Model	Description	Price inc. VAT £	Carr. £
TL922	2Kw linear 160-10m.	780.00	3.50
MC50	Desk microphone dual impedance	27.00	1.06
MC35S	Fist microphone 50 K	13.00	.44
MC30S	Fist microphone 500 ohm	13.00	.44
LF30A	HF low pass filter	18.50	.67
TS700S	2m. all mode digital transceiver	537.00	3.50
SP70	Speaker	20.00	.86
VFO700S	External VFO	90.00	3.50
TS770	2m./70cm. all mode dual bander	t.b.a.	
TR7500	2m. synthesised mobile	235.00	3.50
TR7600	2m. synthesised mobile/fixd	265.00	3.50
RM76	Microprocessor control unit	73.00	.86
TR7400A	25W. 800 channel 2m. FM	336.00	3.50
PS6	AC PSU for 7500/7600	58.00	3.50
TR2300	2m. synthesised portable	195.00	3.50
VB2300	10W. PA	58.00	.86
MB2	Mobile mount	18.50	.86
RA1	Rubber antenna	6.75	.36
TR8300	23 channel 70cm. mobile	245.00	3.50
TR3200	12 channel 70cm. portable	186.00	3.50
MB1A	Mobile mount	9.00	.86
PB10	Pack of 10 Nicads	9.72	.36
PB15	Sealed Nicad pack	19.00	.36
TR7010	2m. SSB mobile	189.00	3.50
TS820S	160-10m. transceiver digital	814.00	3.50
TS820	160-10m. transceiver	695.00	3.50
DG1	Digital display	120.00	.86
SP820	Speaker	38.00	1.16
VFO820	External VFO	121.00	3.50
YG88C	8 pole CW filter	37.00	.36
DS1A	12v. inverter	42.00	.86
R820	The ultimate receiver	773.00	3.50
YG455C	500 Hz CW filter	60.00	.36
YG455CN	250 Hz CW filter	67.50	.36
TS520S	160-10m. transceiver	530.00	3.50
SP520	Speaker	17.50	1.06
VFO520S	External VFO	101.00	3.50
YG3395C	8 pole CW filter	39.00	.36
DG5	Digital display/counter	117.00	1.06
DK520	Conversion for older TS520	10.50	.67
TS120V	80-10m. mobile transceiver	399.00	3.50
PS20	AC power supply	51.00	3.50
MB100	Mobile mount	16.50	.67
YK88C	500 Hz CW filter	28.50	.36
SPI20	External speaker	25.00	1.06
VFO120	External VFO	91.00	3.50
AT120	Antenna tuner (100W.)	67.50	1.06
AT200	160-10m. antenna tuner	93.00	1.06
SM220	Station monitor scope	231.00	3.50
BS5	Band scanner (520)	46.50	.44
BS8	Band scanner (820)	46.50	.44

HEAD OFFICE : 119 CAVENDISH ROAD, MATLOCK, DERBYSHIRE. Tuesday-Saturday 9 a.m.-5.30 p.m.  
Telephone : 0629 2817 or 2430 9 a.m.-9 p.m. Telex 377482.

# LOWE ELECTRONICS LTD

## PRICES ARE DOWN

Model		Price inc. VAT £	Carr. £	Model		Price inc. VAT £	Carr. £
R300	General coverage receiver	185.00	3.50	SWR3	Single meter SWR bridge	9.50	.67
HS5	De luxe headphones	23.00	.67	SWR25	Twin meter SWR bridge	11.99	.67
HS4	Communications headphones	10.50	.67	SW110	SWR/power 0-200W.	32.40	.86
				FS301	Thru-line power meter	36.72	.86
				CN620	New and unique power/SWR meter 1.8-150 MHz. 0-1 Kw.	49.50	.86

### AND SOME OTHER FAVOURITE ITEMS

SRX30	General coverage receiver	175.00	3.50
NRD505	Professional monitor receiver	1800.00	3.50
LS707	70cm. all mode transceiver	595.00	3.50
R707PS	12v. PSU	72.00	3.50
HCI400	36W. 2m. mobile FM	255.00	3.50
LD201	Remote readout for HCI400	26.00	.44
LM200	Remote control microphone	20.00	.44

SB-2M	1W portable 2m. SSB	165.00	3.50
-------	---------------------	--------	------

AR240	2m. FM synthesised handheld	195.00	3.50
-------	-----------------------------	--------	------

SR9	2m. FM monitor receiver	45.00	.86
-----	-------------------------	-------	-----

FS10	2m. FM pocket scanner 10 channels	81.00	.86
------	--------------------------------------	-------	-----

API2	Airband pocket computer receiver 12 channel	87.75	.86
------	--	-------	-----

R512	8 channel airband scanner	135.00	3.50
------	---------------------------	--------	------

### All Microwave Modules in stock

### All Jaybeams in stock

AR40	Antenna rotator	53.44	3.50
------	-----------------	-------	------

FU200	For VHF/UHF beams	39.50	3.50
-------	-------------------	-------	------

DR7500	De luxe up to 3 element tribander	105.75	3.50
--------	--------------------------------------	--------	------

DR7600	De luxe up to 2 element 40m.	150.75	3.50
--------	------------------------------	--------	------

All rotator prices include controller and both upper and lower mast clamps.

### All Hy Gain in stock

### Full range of plugs and sockets in stock

### Station Accessories

CL22	SWL antenna tuner 1.8-30 MHz	15.75	.66
CL65	500w. PEP antenna tuner	54.00	.44
CS201	2 way coax switch DC —200 MHz	11.25	.44
CS401	4 way coax switch DC —200 MHz	38.88	.44
CX3A	3 way coax switch DC —30 MHz	5.24	.44
RH301	Stereo/mono headphones	6.00	.67
DL20	50 ohm 20W. dummy load	5.67	.24
ME221	20 K/V station multimeter	15.48	.67
FBB-9A	1.5-40 MHz 1:1 balun	11.25	.67
FC5M	5 digit 50 MHz counter	38.88	.28
RA144	2 metre preamp	8.85	.15
HS-F1	2 metre helical. PL259 fitting	3.85	.20
Tool kit	8 piece in fitted case	7.97	.67
Chassis punch set with reamer		8.10	.67

\* NEW \* 5 band 80-10m. vertical antenna HF5 which works like a dream. Self supporting and easy to tune.

PRICE—£40.50 inc. VAT—compare it to ANY other vertical

### AGENTS :

John—G3JYG. 16 Harvard Road, Ringmer, Lewes, Sussex. Telephone : Ringmer 812071.  
Sim—GM3SAN. 19 Ellismuir Road, Baillieston, Nr. Glasgow. Telephone : 041-771 0364.



## THE 'REMOTABLE' 2m RIG

# IC-280



# £245

inc VAT

**25kHz SPACING OVER THE WHOLE BAND:  
3 MEMORIES: LED READOUT:  
BUT MOST IMPORTANT—ICOM QUALITY**

Icom's new 2 meter mobile has a detachable microprocessor controlled head, easy to read LED's and a new style meter set in a brushed aluminium front panel.

The 280E comes as one radio which can be mounted in the normal manner but as an option the entire front one third of the radio detached and can be mounted in that small location in the car (such as the glove pocket) where other sets are just too large to fit, while the main body tucks neatly out of sight several feet away—such as under the passenger's seat. No longer do you have to mount a radio in a position where it is poised all ready to smash your right kneecap should you have an accident!

With the microprocessor head the IC-280E can store three frequencies of your choice, which are selected by a four position front panel switch. These frequencies are retained in the 280E's memory for as

long as power is applied to the radio. Even when power is turned off at the front panel switch the programmed memories are maintained; and the 600 kHz repeater shift is always retained.

It goes without saying that the usual high quality engineering for which Icom are renowned is found in the 280E. There are no nasty shortcuts to try to keep the price down to the detriment of performance.

It includes the latest innovations in large signal handling FET front ends for excellent intermodulation performance and good sensitivity at the same time. The IF filters are crystal monolithics in the first IF and ceramic in the second, providing narrow band capacity for today and tomorrow's crowded operating condition. Modular PA construction with broad band tuning provides full rated power across the full 2 metre band.

FROM **THANET ELECTRONICS** OF COURSE

# THANET ELECTRONICS

## PRICE LIST . MAY 1979

All prices include VAT—Where there is a delivery charge it is shown in brackets

### ICom Transceivers

IC-M25. 25w. Marine	£350.00
IC-215 with 12 ch.	£159.00
IC-240. 10w. mobile	£189.00
IC-280E	£245.00
IC211E	£542.00
RM3	£99.00
IC-245E	£399.00
IC-202S	£199.00
IC-402	£288.00

### Accessories

IC-30L 10w. Linear 70cm.	£59.00
IC-3PE PSU	£59.00
Crystals—pair	£5.00 (10p)
Set of Nicads for 215	£22.00 (£1.00)
IC-SM2 Desk mic.	£26.00
Mains charger for nicads	£12.00 (50p)
Heavy duty case	£7.50 (50p)
ICHPI Headphones	£24.00
HM3 Hand mic	£12.00
Remote cable 280	£17.00
FAI Flex Antenna	£6.00
240 Channelizer	£36.00

### Antennas

<i>J Beam</i>	
C5/2M	£34.88 (£2.00)
5Y/2M	£8.66 (£1.25)
8Y/2M	£11.25 (£1.25)
8XY/2M	£22.50 (£1.75)
10XY/2M	£29.81 (£2.00)
PMH/2C	£5.85 (£1.00)
Q4/2M	£18.68 (£1.50)
Q6/2M	£24.75 (£2.00)
PMH2/2M	£7.71 (£1.00)
C8/70cm.	£44.44 (£2.00)
MBM48/70cm.	£24.53 (£2.00)
12XY/70cm.	£33.53 (£2.00)
TAS 5/8...	£12.50 (£1.50)

### A.S.P.

ASP 201	£2.90 (£1.00)
ASP 629	£10.00 (£1.50)
ASP 667	£19.00 (£1.00)
ASP 2009	£9.00 (£1.50)
ASP 677	£15.00 (£1.50)
Magnetic bases	£8.50 (£1.00)

### Monitor RX

DAIWA FM Marine	£59.00 (66p)
CUNA 2M	£59.00 (66p)
SN-10 Marine or amateur with nicads	£54.00 (66p)

### Yaesu Musen

FRG7	£210.00
FRG7D	£270.00
FT101E	£579.00
FT227R	£239.60

### Yaesu Musen (continued)

CPU-2500R	£328.30
FT901DM	£960.00
FT7	£299.00
FT202R	£99.00
FT7B	£421.87

### FDK

Multi 700E	£229.00
Palm II	£139.00
Multi UII	£299.00

### PSUs

PX 401	£23.22 (£1.00)
Belsonic 3A	£16.50 (£1.00)
Belsonic 1A	£10.11 (75p)

### Microwave Modules

MMT432/285	£133.88
MMT432/144R	£169.88
MMT144/28	£88.88
MMC144/2-4, 4-6, 28-30	£20.25
MMC144/10LO	£22.50
MMC28/144 (Ten on your rig!)	£20.25
MMC432/144 or 28 converter	£27.00
MMC1296/144 or 28 converter	£31.50
MMD050/500	£69.00
MML144/100 100w. Linear 2M	£139.50
MML432/100 100w. Linear 70cm.	£247.50
MMA28 10M preamp	£14.63

### Keys

BK 100 semi automatic bug key	£19.90 (25p)
HK 706 Hand Key	£11.00 (25p)
MK 704 Manipulator key	£12.00 (25p)

### SWR/Power Meters

PM2001 VHF PM2000 HF	£48.60 (66p)
3 Function Power	£11.88 (25p)
SWR 25 dual meter up to 150 MHz	£11.50 (25p)
UH 74 Power and SWR to 150 MHz	£15.39 (25p)

### Rotators

AR40 VHF—small H.F. beam	£51.75 (£1.00)
Stolle 2030 VHF only	£54.00 (£1.00)
KR400 1/4 Ton heavy duty	£96.00 (£1.00)
RZ100 Alignment bearing	£11.25 (25p)

### Hand Portables

AR240	£195.00
-------	---------

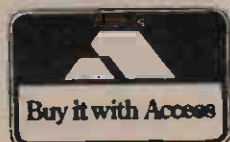
### Scanning Monitor Receivers

SM-10 with nicads	£54.00 (66p)
External DC adaptor	£9.00 (15p)
Crystals	£1.90 (10p)

(Please state amateur or marine)

### Microphones

TW32 Desk mic.	£25.00 (50p)
DH18 Hand mic.	£4.99 (25p)
CH229 Hand Mic.	£15.00 (25p)
DH233 Hand mic.	£9.00 (25p)



ANSAFONE SERVICE AVAILABLE WHEN CLOSED

143 RECVLVER ROAD,  
HERNE BAY, KENT

(02273) 63859 (2 lines)  
Telex : 965179





As supplied



Fitted with Channelizer

## IC-240 FOR SAFETY AND SATISFACTION

Now there is a mod kit for 80 Channels!

There is now a modification list available from Herne Bay which enables your IC-240 to give you a choice of 80 channels selected by means of thumb-wheel switches at the front. The Channel selected is displayed as a channel number which is illuminated from behind providing a readout which is easily readable in both dark and brilliant sunlight conditions. The kit, which can be easily fitted in an evening, costs £36 inc. VAT and postage and is called the 240-channelizer.

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

You get a choice of 22 channels with all the UK and European repeater channels plus all the commonly used simplex channels already wired on the programmable matrix board. The dial is marked in channel numbers with 7 spare positions marked A to G for you to programme with any other channels you choose on the now standard 25 kHz channel spacing. Should 12½ kHz spacing arrive (and for your sake we hope it won't) it will be very easy to modify the IC-240 to cover the in-between half channels, making 44 in all. To change channel you just turn the dial to the channel you want, with easy to feel click stops, and that's all. No 5 kHz button to get all confused about! Repeat shift for normal or true reverse repeat and high or low power are selected by easy to feel toggle switches and the access tone is automatically introduced on duplex.

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

Have you ever thought just how ideal the IC-240 is to use in conjunction with that excellent transverter the Microwave Modules MMT 432/144R to provide you with a reasonably priced, yet sensitive 70cm. system? The channel markings on the 240 simply become the correct SU or RB numbers on 70cm. and with the addition of a coaxial relay, a few diodes and a little care it is possible to produce a two band system with the transverter controlled from the IC-240 switching. By doing without the low power position on the 240 the transverter can be switched in or out and Duplex, Reverse Duplex or Simplex selected from the 240. You can then have the transverter mounted away from the 240 out of sight. The total cost for excellent coverage of both bands is thus about £360—which is much cheaper than separates and an excellent way of being able to use the many 70cm. repeaters now in operation throughout the country.

IC240 £189.00 inc. VAT. 240 Channelizer kit £36.00 inc. VAT. 240 fitted with Channelizer £234 inv. VAT.

**SO—WHY GO FOR ANYTHING MORE EXPENSIVE ?**

For details leave your name and address or callsign on our Ansafone (02273 63850) during the evening when calls are cheap

YOUR SOLE AUTHORISED UK IMPORTER FOR ICOM

# THANET ELECTRONICS

143 Reculver Road, Beltinge, Herne Bay, Kent (02273 63859)



HP TERMS AVAILABLE



HP TERMS AVAILABLE

# SOMMERKAMP



**SOMMERKAMP TS 280 FM. 80 Channel 50 Watt Mobiltransceiver.** Europe's best-seller on the 2m. market, covering 144-146 in 25 kHz steps, with automatic repeater shift (R0-R9), digital readout, RF+S-meter, sensible PA protection circuit, electronic RX-TX switching, tone call and powerful 50 Watt signal—for short distance or repeater QSO switchable to 2 Watt.

**SOMMERKAMP TS 206 AT. 6 Channel 2 Watt Handtransceiver.** Frequency range 144-146 MHz, IF 10.7 MHz with X-tal filter, MOSFET's in RF- and Mixer stage, electronic RX-TX switching, relative TX indication and battery control meter. Only 9mA battery drain on "Stand-by."

**SOMMERKAMP TS 206 MT** identical, but marine version with channels 6 and 16. Frequency range: 156-163 MHz. 163-173 MHz special order only.



**SOMMERKAMP TS 310 DX. 10m. Mobiltransceiver.** 18 Watt with SSB (USB+LSB), AM, CW modes. From 28 MHz 80 channels in 10 kHz steps, with +6 kHz RX/TX Clarifier, separate RX Clarifier, digital display, SWR, S- and RF indication, volume control from the microphone.



**SOMMERKAMP TS 780 DX. 120 Channel 170 Watt Mobiltransceiver.** Our new 10m. amateur transceiver for 10m. DX amateurs, covering frequency range 28.0-28.40, 28.5-28.9, 29.1-29.5 MHz, all modes: SSB (USB+LSB), AM, FM, CW. 170 Watt Signal switchable to 2 Watt, separate RX clarifier and RX/TX Clarifier (VXO), SWR, RF and S-indication, scanner, sensible PA protection circuit. Accessory: remote control microphone with all major functions and digital channel display.

Dealers inquiries welcome:

For distribution of our amateur, marine and commercial transceiver programme we are looking for reliable agents in U.K. For information write to:

**SOMMERKAMP ELECTRONIC SAS**

Postbox 176

6903 LUGANO/SWITZERLAND TX 79314



# AMATEUR ELECTRONICS UK

## AEUK — Your number one

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



Plus ex-stock delivery of the fabulous new FT-101Z and FT-101ZD, the latest HF band transceivers from Yaesu Musen.

Never before has the radio amateur been offered such sophisticated equipment at such realistic prices—just study the condensed specification below and you'll find features and versatility only available on much more expensive rigs—call, phone or write (please see facing page) for full details.

### FT-101ZD SERIES HIGH PERFORMANCE TRANSCEIVER

#### FULL COVERAGE

Full band coverage is provided on the FT-101ZD: 160 through 10 metres, plus WWV/JJY reception on 5 MHz. Teamed with the FTV901R transverter, operation can be extended to 50, 144, and 430 MHz from your desk top.

#### CLEAN OUTPUT SIGNAL

With today's crowded bands, we all have the responsibility to keep our transmitted signal free of spurious radiation. YAESU engineers have included RF negative feedback, for a clean output signal.

#### STATE OF THE ART NOISE BLANKER

The all-new noise blanker is extraordinarily helpful in reducing the level of impulse noise. The blanking level may be adjusted from the front panel.

#### RF SPEECH PROCESSOR

A high-performance RF speech processor is built into every FT-101ZD, providing an increase in your average talk power of approximately 6 dB. The processor level can be adjusted from the front panel, for optimum signal enhancement.

#### WORLD-WIDE POWER CAPABILITY

The FT-101ZD has provision for operation from a variety of AC voltages, from 100 to 234 volts. When you're travelling, you'll never need a heavy, bulky transformer for operation with your FT-101ZD. A DC-DC converter is an available option, for mobile operation. The FT-101ZD is small enough to qualify as carry-on baggage on most airlines, and is equipped with a strong, side mounted handle for ease of carrying.

#### VARIABLE IF BANDWIDTH

Using two 8-pole crystal filters with superior shape factors, the FT-101ZD variable bandwidth system is a valuable tool on today's crowded bands. With the turn of a dial, high-pitched SSB "buckshot," or unwanted CW signals, can be eliminated from the IF passband.

Compare for yourself: other systems, such as "IF shift," use a single filter in the IF; though you can move away from one interfering signal, you may move into more QRM. The YAESU design actually varies the bandwidth, eliminating the QRM.

Other manufacturers would have you spend hundreds of pounds on different filters for 2.1 kHz, 1.8 kHz, 1.5 kHz, 800 Hz, 500 Hz, etc. With the FT-101ZD, you have continuously variable bandwidth—from 2.4 kHz down to 300 Hz.

#### DIGITAL PLUS ANALOG READOUT

The FT-101ZD features digital plus analog frequency readout. The display features big, bright LED digits, for maximum readability. For extra savings, the economy model FT-101Z gives you the same precision analog display, at a significantly reduced cost. You can add the digital display later, if you wish.

#### INTERFACE WITH 901 SERIES COMPONENTS

Your FT-101ZD may be used with all of the exciting FT-901DM series accessories. The FV-901DM synthesised, scanning VFO provides storage and recall of up to 40 frequencies, in addition to its 3-speed scanner and auto scan function. SAE for full information on available accessories.

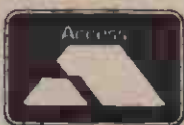
### HOW TO REACH US (EASY PRIVATE PARKING ON OUR 70ft. FORECOURT)

**FROM SOUTH AND EAST.** We are located approximately two miles from Junction 5 of the M6 from which follow signposts to Birmingham. Within  $\frac{1}{4}$  mile turn right at Clock Garage and proceed towards city. After one mile look for traffic lights at Fox & Goose and immediately over the lights take minor left fork into Alum Rock Road. We are located one mile from this point.

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

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

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



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





# AMATEUR ELECTRONICS UK

## source for **YAESU MUSEN**

Typically, Yaesu have not overlooked that very important group of operators—the dedicated SWL's by providing the Super-Value-For-Money FRG-7 and the Ultra Sophisticated FRG-7000 General Coverage Receivers.



Here's a 10-1 winning offer if you'd like the latest Yaesu catalogue. Just send us four 9p stamps (36p) and we'll send you Yaesu's latest fully illustrated brochure together with our Credit Voucher for £3.60 against your eventual purchase. A couple of stamps will bring you the FT-1012, Atlas or Swan leaflets or our current used equipment list.

## NEW! ADVANCED TECHNOLOGY from **SWAN ELECTRONICS**



### 100 WATTS MINIMUM OUT!

← **100MX**—The de-luxe Mobile Rig with all the extras

Solid state HF transceiver. 100 watt PEP and CW output, 80m.-10m. Broadband design featuring noise blanker, VOX, 25 kHz calibrator, CW sidetone, semi-break in CW, RIT, built-in speaker. Ultra stable PTO frequency source. Operates directly on 11 to 15v. DC, USB, LSB, CW operation. 9 MHz 8 pole crystal IF filter. 4W Audio O/P.

**UNBEATABLE PERFORMANCE—UNBEATABLE VALUE £459 Plus VAT**  
**THIS IS THE RIG FOR THE MAN WHO INSISTS ON THE BEST**



AS DIRECT IMPORTERS AND MAIN AGENTS WE OFFER THE FAMOUS ATLAS 210X and 215X TOGETHER WITH ALL ACCESSORIES FROM STOCK.

- BRANCH : AMATEUR ELECTRONICS, UK—COASTAL CLIFTONVILLE, KENT, KEN McINNES, G3FTE, THANET (0843) 291297, 9 a.m.—10.30 p.m.
- BRANCH : AMATEUR ELECTRONICS UK—SCOTLAND, 287 MAIN STREET, WISHAW, LANARKSHIRE, GORDON McCALLUM, GM3UCI, TELEPHONE WISHAW 71382. (EVENINGS CARLUKE 70914)
- AGENT : WALES & WEST—ROSS CLARE, GW3NWS, CAERLEON, NEWPORT, (CAERLEON 422232)—ONLY 20 MINUTES OVER THE SEVERN BRIDGE.



**508-514 ALUM ROCK ROAD**  
**BIRMINGHAM 8**

**021-327 1497**  
**Telex 337045 6313**

# STEPHENS-JAMES LTD.

47 WARRINGTON ROAD, LEIGH, LANCs WN7 3EA TELEPHONE (0942) 676790

## G3MCN



### R820 RECEIVER

#### THE ULTIMATE IN RECEIVERS

All bands 160-10m Amateur Band plus Broadcast Bands. All modes AM-CW-USB-LSB-RTTY. Digital readout; fully variable I.F. Bandwidth plus bandpass tuning; Rejection Notch; Automatic or Manual choice of selectivity £773.00.



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.  
£25.00 inc. VAT and postage



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

Yaesu FRG7000 Receiver ... £367.00  
Yaesu SP10IB Speaker ... £19.68

#### ACCESSORIES

- 2 way Antenna switch 50 ohm 200W. PEP £4.95
  - 3 way Antenna switch SWL type ... £4.50
  - 3 way Antenna switch 2KW PEP 0-500 MHz ... £8.50
  - 3 way Antenna switch 150 watts 0-30 MHz £5.50
  - 4 way Antenna switch 50 ohm 200 watts PEP ... £10.00
  - 6 way Antenna switch 1 KW PEP 0-30 MHz ... £16.55
  - Single Meter SWR 50 ohms Wall type £10.00
  - Single Meter SWR desk type ... £10.50
  - Twin Meter SWR desk type 3-150 MHz 50 ohm ... £12.50
  - Twin Meter Model 500 3-500 MHz 50 or 75 ohm ... £45.00
  - Dummy Load Wattmeter DL150 3-500 MHz ... £50.00
  - Standard Type Morse Keys ... £3.00
  - Hy Mound Morse Keys with heavy base £10.25
  - Nye King 003 Morse Keys ... £10.00
  - Twin Keying paddle. Chrome plated heavy base ... £26.00
  - EK150 Katsumi 240v. AC or 12v. DC £70.25
  - MK1024 Keyer with 1024 bit memory £140.00
  - HP3A High Pass Filters ... £3.00
  - FS301 Through Line Wattmeter 3-5 to 30 MHz ... £37.50
  - FBB-9A Balun 50 ohm 1-1 1-5 to 40 MHz £12.00
  - DL 120 120 Watt Dummy Load 50 ohm 0-500 MHz ... £20.00
  - Daiwai MA41 2m. 1/4 wave gutter mounting whip ... £12.00
  - Gutter Clamp for most whips ... £3.50
  - Plastic Antenna Insulators ... 25p
  - PL250 Plugs 50p, SO239 Sockets 45p, PL239 75p.
  - Cable Reducers ... 16p
- ALL OUR ACCESSORY PRICES INCLUDE VAT AND POSTAGE**

#### RECEIVERS AND TRANSCEIVERS

- (Inc. VAT and Postage)
- SR9 Tunable 144-146 MHz FM Receiver £59.00
- AMR217B Scanner Receiver. AC or DC operation ... £113.50
- SB-144 MHz SSB Portable Transceiver £157.00
- R512 Aircraft Band Scanning Receiver £135.00
- AR240, 800 Channel Hand Held 2m. FM Transceiver ... £195.00
- HC 1400 2m Transceiver ... £255.00

#### SECONDHAND EQUIPMENT

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

#### TRIO

- R820 Receiver ... £773.00
- T5820 Transceiver ... £695.00
- Digital readout for TS820 ... £120.00
- VFO820 ... £121.00
- DS1A 12v. DC Inverter ... £42.00
- SP820 Speaker ... £38.00
- SM220 Monitorscope ... £231.00
- TL922 Linear Amplifier ... £780.00
- T5520S Transceiver ... £530.00
- VFO520S ... £101.00
- SP520 Speaker ... £17.50
- DG5 Digital readout for TS520S ... £117.00
- TS120V 80-10m. Mobile Transceiver ... £399.00
- PS-20 AC power supply for TS120V ... £51.00
- MB100 Mobile mounting bracket ... £16.50
- T5700S 2m. All mode digital transceiver £537.00
- SP70 Speaker ... £20.00
- TR7010 2m. SSB/CW Mobile 10 watt £189.00
- TR7400A 2m. 30 watt Mobile Transceiver ... £336.00
- TR7500 2m. FM Transceiver ... £235.00
- PS6 Power supply ... £58.00
- TR2300 2m. Portable Transceiver ... £195.00
- PB15 Battery Pack ... £15.00
- PS1200 Power supply ... £19.55
- TR8300 70cm. FM Mobile Transceiver £245.00
- TR3200 70cm. Portable Transceiver ... £186.00
- R300 General coverage Receiver ... £185.00
- HS5 Headphones ... £23.00
- HS4 Headphones ... £10.50
- MC50 Desk Microphones ... £27.00
- MC30S Hand microphone 50K ... £13.00
- Crystals and accessories in stock

#### ANTENNA SPECIALISTS

- ASPR332 1/4" Gutter Whip ... £8.50
- ASP201 1/4 wave Whip ... £3.26
- ASP677 2m. Whip ... £16.75
- ASP2009 Standard Whip antenna ... £10.20
- K220 Magnetic Mount ... £8.50
- K220A Magnetic Mount ... £8.50

#### DRAKE

- SSR-1 Solid State Receiver ... £175.00
- TV3300 Low Pass Filter ... £18.00
- TR7 Transceiver and AC PSU ... £999.00
- MS7 Speaker ... £24.75
- MN7 ATU/RF Wattmeter ... £123.75
- R4C Receiver ... £495.00
- DL-1000 Dummy Load ... £29.50

#### HY-GAIN

- 12AVQ 3 Band Vertical ... £42.18
- 14AVT/WB 4 Band Vertical ... £59.06
- 18AVT/WB B Band Vertical ... £85.50
- BN86 Balun ... £15.19

#### MICROWAVE MODULES

- MMC70 4m. Converter ... £20.25
- MMC144/28 LO 2m. Converter ... £22.50
- MMC32/28 70cm. Converter ... £27.00
- MMC1296/28 23cm. Converter ... £31.50
- MMC1296/144 23cm. Converter ... £31.50
- MMV1296 23cm. Tripler ... £33.75
- MMD050 50 MHz Counter ... £66.96
- MMD500P Prescaler ... £27.00
- MMD500P 500 MHz Counter ... £85.32
- MMT432/28 70cm. Transverter ... £133.88
- MMT432/144 70cm. Transverter ... £169.88
- MMT144/28 2m. Transverter ... £88.87

#### F.D.K.

- TM56B 2m. Monitor Receiver ... £105.00
- Palm 2 Hand Held Transceiver ... £139.00
- 700E 2m. 25 watt Transceiver ... £229.00

#### G-WHIP

- Tribander Helical 10-15-20m. ... £21.15
- LF Coils for Tribander ... £6.17
- LF Telescopic Whip Section ... £2.75
- Basemount standard type ... £3.37
- Multimobile 78, 10-15-20m. ... £21.08
- MM Coils ... £5.91
- MM Telescopic whip section ... £2.25
- Flexiwhip basic 10 metre section ... £14.65
- Basemount standard ... £3.82
- Ball type Basemount ... £5.35
- Coils for Flexiwhip ... £6.20
- Base thread adaptor USA/G Whip ... 68p
- Extendarod 40" ... £9.56

#### NEW ANTENNA MODELS

- H.S. HF5 Vertical 10-80m. ... £40.50
- HF R. Ground Plane Kit ... £22.50
- GDX 2 Discone Antenna 50-460 MHz £36.00

#### N.E.C.

- CQ-R700 General coverage Receiver £220.00

#### ROTATORS

- AR30 ... £46.13
- AR40 ... £53.54
- CD44 ... £106.87
- AR22 ... £48.38
- KR400 ... £96.00
- DR7500 ... £105.00

#### CABLE

- UR43 18p metre
- UR67 65p
- 300 ohm Ribbon
- 10p metre
- 75 ohm low loss 18p

#### JAYBEAM

- 5Y/2M 5 element yagi ... £8.67
- 8Y/2M 8 Element yagi ... £11.25
- 10Y/2M 10 element ... £24.58
- PBM/14/2m. 14 element Parabeam £35.00
- 5XY/2m. 5 element crossed yagi ... £18.00
- 8XY/2m. 8 element crossed yagi ... £22.50
- 10XY/2m. 10 element crossed yagi ... £29.81
- Q4/2m. 4 element Quad ... £18.67
- Q6/2m. element Quad ... £24.75
- D5/2m. 5 over 5 slot fed yagi ... £15.52
- D8/2m. 8 over 8 slot fed yagi ... £20.70
- UGP/2m. ground plane ... £7.79
- MBM48/70cms. Multibeam ... £24.52
- MBM88/70cms. Multibeam ... £32.62
- TAS 1/2" 2m. Whip mobile ... £14.06
- C5/m. Colinear... £34.87
- C8/70cm. Colinear ... £44.43
- D15/1296 23cm. Antenna ... £26.32

#### SRX-30

Solid state Receiver 550 kHz-30 MHz £175.00

#### TEK

SD 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

#### BANTEX

- Bantex Magnetic Base Mount ... £10.40
- 1/2" glass fibre Whip ... £8.44
- 1/2" stainless steel Whip ... £9.40
- UHF stainless steel Whip ... £8.63
- Standard base mount ... £2.70

S.T.E. Prices include VAT and postage

Arac 170 10m. and 70 cm.  
Receiver ... .. £127.00  
AA1 Audio Module for AR10 ... £4.10  
AD4 FM Discriminator ... £5.00

ALB Linear Amplifier ... .. £27.00  
AG10 Tone Generator... .. £4.50  
ATAL 2m. AM-FM Tx ... .. £127.00

The finest value for money on the market.



**FDK MULTI-700E**



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



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

★ **ALDA 103** ★ 80-40-20 metres  
★ The latest Solid State Transceiver ★  
Quality engineering gives you all these convenient features:  
BROAD BAND POWER AMPLIFIER ★ SSB 250 watts PEP Nomina ★ CW 250 watts DC  
Maximum ★ BUILT-IN CW MONITOR ★ 6 POLE CRYSTAL FILTER ★ SEMI BREAK-  
IN CW ★ R.I.T. DUAL SPEED VERNIER DIAL ★ MODULAR PLUG IN CIRCUIT  
BOARDS ★ BUILT-IN SPEAKER ★ 13.5 V DC input at 15 AMPS ★  
Send S.A.E. for full specifications.



We are now importing these direct from the USA and can offer them at £360 inc. VAT

**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 £29.75

Printed Circuit Module. Including rotary  
switch ... .. Price £17.25

RX Peak and Notch Filter. Goes between  
RX and speaker\* All I.C.'s\* By-pass switch\*  
Notch width control for optimum width of  
notch ... .. Price £29.75

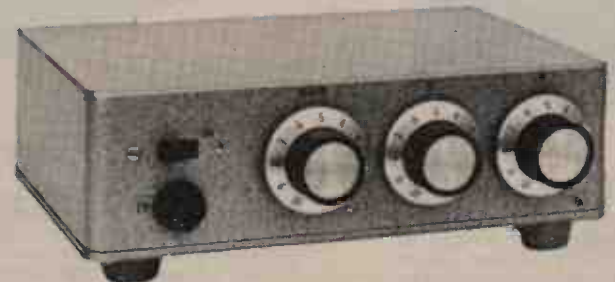
Printed Circuit Module. Including all pots  
and switch ... .. Price £17.25

Pre-Selector. Coverage 1.6 MHz to 31 MHz\*  
Three switched bands\* Type 1 with antenna  
changeover relay for Transceiver op  
Price £29.75

Type 2 for SWL without relay Price £26.65

Crystal Calibrator. Seven ranges down to  
1 kHz. Selected from front panel. Complete  
with antenna. ... .. Price £21.85

VHF Tunable Pre-amp ... Price £22.50



Some Models in New Type Cabinets

These prices include VAT and postage.



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



**Solid State Stabilised Power Supplies**  
Model 122 0-15v 2.5Amp ... .. £13.53  
Model 122S 12.6v 2.5Amp ... .. £18.00  
Models 125 12v 5Amp ... .. £24.00  
Model 153S Dual meter 0-20v 4Amp ... £26.73  
Model 156S Twin meter 0-15v 6Amp ... £33.35  
Model 1210S Twin meter 0-20v 10Amp £80.00

Further range of models up to 20 amp available  
shortly.

**STEPHENS-JAMES LTD.**

**47 WARRINGTON ROAD, LEIGH, LANCs. WN7 3EA**

telephone 0942 - 676790

# WATERS & STANTON ELECTRONICS

## SHORT WAVE LISTENERS . . . OUR RECEIVERS ARE BETTER — WHY?

In choosing a receiver you'll want to be sure that you're making the right choice. There's quite a few to choose from but do not fall into the trap of thinking that a receiver produced by any of the large domestic hi-fi manufacturers and purporting to be a "true short wave or communications receiver" is necessarily a sound investment! We've been in the communications business long enough to know the good ones from the rest. Listed below are the ones we can recommend as best buys.

All are produced by acknowledged leaders in the communications field and all will give you hours of satisfactory and enjoyable listening, whether it be amateur or broadcast stations you wish to monitor.

But, to make sure you really are getting the best value for money, it's no good purchasing a sealed box. All the receivers listed below have travelled many thousands of miles and are produced on a production line where final alignment time is limited. That's why we test each receiver carefully before selling it. Our tests involve the use of several thousand pounds worth of instrumentation and it's because of this that we can guarantee you that a receiver purchased from us is quite likely to be better than a similar model purchased elsewhere.

Don't therefore take risks with your hard earned cash. Our advice is free and so are our pre-delivery checks—we can deliver anywhere in the U.K. and can quote competitive H.P. terms and accept telephoned orders against Access or Barclaycard—so if it's a receiver you want, come to Waters & Stanton Electronics, one of the largest amateur radio outlets in the U.K.!

### LOWE SRX 30



The SRX30 is designed as a budget priced receiver that outperforms many receivers costing 3 times as much. Featuring the Barlow Wadley loop, it will enable you to explore the exciting world of short wave radio—amateurs, broadcast, aircraft, shipping, etc. This is a completely self-contained package, having all the features necessary for complete and reliable coverage of the frequency range 0.5 MHz to 30 MHz.

**£175 inc. VAT & delivery**

### YAESU FRG7



The FRG7 is one of the best known receivers. Many thousands have been sold and for value for money it's hard to beat. Based on the Barlow Wadley loop, this sensitive receiver is able to cope with today's crowded air waves. SSB/CW/AM—all are copied perfectly—the receiver has thirty 1 MHz bands with excellent bandspread, operates from 230 volts or 12 volts and built-in speaker—frequency coverage is 0.5 MHz to 30 MHz.

**£210 inc. VAT & delivery**

Dear Sirs,  
Concerning the FRG7 Yaesu receiver which I purchased from your shop in Hockley—it is super, absolutely fantastic; for instance all I have is twelve feet of 50 ohm coaxial cable thrown over my roof and I can pick up all the hams in every American state, Russia and the rest of the world hams "literally at my fingertips." I am more than pleased; also I might add I have had about 12 SW receivers and for value for money the FRG7 has no equal.  
S. R. A. LUNN, Southend-on-Sea.

### YAESU FRG 7000



**£367 inc. VAT and Delivery**

The FRG7000 is based on the successful FRG7 design with a host of features that make it a deluxe receiver for the really serious short wave listener. Digital readout, electronic clock and timer, superb selectivity all go to make up the receiver that everyone aspires to own. Frequency coverage is 0.2 MHz to 30 MHz and the clear digital readout makes it one of the easiest receivers to use.

#### SWL AERIALS

We are often asked what is the best aerial for general listening. With a good receiver the answer is simply a wire of between 50 and 100ft. long and preferably outside. A simple ATU will improve the match between receiver and antenna. There's no magic aerial system that will turn a poor receiver into a good receiver—beware of exaggerated claims—we'd rather sell you a length of wire and some free advice than kid you into thinking that the 'XYZ' wonder aerial will enable you to hear stations you've never heard before. If you really want an aerial that is purpose designed for the SWL and gives good performance on the amateur bands, we can recommend the Mosley RD5 dipole—70ft. long and fed with coax. To improve on this you will have to follow the normal accepted antenna theory as used by transmitting amateurs and here reading of the several textbooks on aerial design and theory are recommended.

### FDK TM 56B



**£104 inc. VAT and Delivery**

The TM56B is a highly sensitive VHF monitor receiver for listening to the popular 2 metre FM transmissions from amateurs throughout the U.K. Hear your local amateurs transmitting from their cars, or from home or through one of the many repeaters sited around the country. 230 volt AC or 12 volt DC operation is possible and a built-in auto-scan circuit monitors 4 priority channels. The receiver is supplied with xtals for the 10 most popular channels in the U.K. Extra crystals are stocked at £2.45 each.

PETER WATERS G3OJV

# WATERS & STANTON ELECTRONICS

## MAIL ORDER!

Yes, we do run one of the most efficient services in the UK. Just look at our stock ! Either send us your cheque or PO adding carriage if shown in brackets, or telephone your Barclaycard or Access number. We'll get the goods to you by the quickest route. Heavy items by Securicor and smaller packages by parcel post. All sent at our risk and, of course, guaranteed. It pays to deal with an established company like ours—try us and see.

### YAESU

FRG7 General Cov. Receiver	£210.00 (N/C)
FRG7000 Digital de luxe receiver	£367.00 (N/C)
FT1012 160-10m. transceiver	£562.00 (N/C)
FT1012D Digital Transceiver	£646.00 (N/C)
SP101 Matching speaker	£21.25 (N/C)
YO100 Monitor scope	£156.00 (N/C)
FT301 Solid State transceiver	£579.00 (N/C)
FP301 Matching PSU	£110.00 (N/C)
FT901DE 160-10m. digital transceiver	£785.00 (N/C)
FT901DM 160-10m. digital transceiver	£960.00 (N/C)
FT7 80-10m. 10w. transceiver	£299.00 (N/C)
FT7B 80-10 50w. transceiver	£421.75 (N/C)
FP12 12 amp PSU	£72.75 (N/C)
FT202R 2m. hand-held (3 ch's)	£99.00 (N/C)
NC1 AC charging hod.	£18.50 (N/C)
YM24 Ext. mic/speaker	£16.25 (N/C)
FT227Rx 2m. 10w. transceiver	£239.50 (N/C)
FT225RD 2m. All modes digital	£599.00 (N/C)
FL2100B 1200w. 80-10m. linear	£349.00 (N/C)
YD846 microphone (h'head)	£8.40 (N/C)
YD844A microphone (desk type)	£21.90 (N/C)
FR101D 160-2m receiver	£590.00 (N/C)

### ICOM (NOTE NEW PRICES !)

IC215E 2m. FM 3w. 12 chs.	£159.00 (N/C)
IC2025 2m. SSB 3w. portable	£199.00 (N/C)
IC240 2m. 22 chs. 10w.	£179.00 (N/C)
IC280E 2m. FM 80 chs. 10w.	£245.00 (N/C)
IC211E 2m. All mode transceiver	£559.00 (N/C)

### MICROWAVE MODULES

MMT 432/28-S transverter	£133.80 (N/C)
MMT 432/144-R transverter	£169.80 (N/C)
MMT 144/28 transverter	£88.80 (N/C)
MMC 144/2.4 ; 4-6 or 28-30 IF	£20.25 (N/C)
MMC 144/28 LO converter	£22.50 (N/C)
MMC 70/28 converter	£20.25 (N/C)
MMC 70/28 LO converter	£22.50 (N/C)
MMC 432/28 converter	£29.90 (N/C)
MMC 432/144 converter	£29.90 (N/C)
MMC 1296/144 or 28 converter	£31.50 (N/C)
MMC 28/144 10m. up converter	£20.25 (N/C)
MMD 050/500 MHz counter	£69.00 (N/C)
MMA 144 2m. pre-amp	£14.60 (N/C)
MMD 500P 50 MHz pre-scaler	£27.00 (N/C)
MMV 1296 varactor tripler	£33.75 (N/C)
MML 144/100w. linear amplifier	£139.50 (N/C)
MML 432/100w. linear amplifier	£247.50 (N/C)
MML 144/25w. linear amplifier	£44.00 (N/C)

### SEM

Europa "C" 2 metre transverter	£112.50 (1.00)
CPS10 AC PSU	£56.25 (1.00)
2m. converters	£20.25 (N/C)
70cms. converters	£22.50 (N/C)
*2m. pre-amp	£12.50 (N/C)
*2m. auto switching pre-amp	£19.00 (N/C)
*70cms. auto switching pre-amp.	£21.95 (N/C)
2m. PA3 pre-amp	£6.80 (N/C)
70cm. PA3 pre-amp	£9.00 (N/C)
2m. 48 watt linear/pre-amp	£59.60 (0.75)
* fitted SO 239 sockets	
HF auto pre-amp 2-40 MHz	£14.63 (N/C)
HF pre-amp 2-40 MHz	£10.69 (N/C)
HF Z-MATCH ATU 80-10m.	£39.40 (1.00)

### VHF MONITOR Rx's

TM56B 12v./240 AC auto scan 10 chs.	£104.00 (N/C)
TM56B Marine model	£113.00 (N/C)
SR9 12v. DC Amateur model	£59.00 (N/C)
Extra xtals	£2.40 (N/C)

### DRAKE

One only SPR4 almost new	£299.00
--------------------------	---------

### FDK

Multi 2700 2m. All mode	£449.00 (N/C)
Multi 800D 2m. 25 watts	£289.00 (N/C)
Multi 700E 2m. 25 watts	£229.00 (N/C)
Multi Palm II 2m. hand-held special package	£139.95 (N/C)
Multi U11 70cms. Autoscan	£299.00 (N/C)
M-11/Q16 xtals £4.90 Palm II xtals £2.90	
Multi-Palmsizer 2m. synthesised 40 channel hand-held	£149.00 (N/C)

### DENTRON

MLA 2500 160-10m. 2Kw linear	£695.00 (N/C)
MT3000A 3Kw 160-10m. tuner	£275.00 (N/C)
MT2000A 3Kw 160-10m. tuner	£175.00 (N/C)
160-10AT Supertuner 1Kw.	£99.00 (N/C)
JR Monitor 160-10m. tuner 300w.	£59.00 (N/C)
W-2 160-10m. PEP/SWR meter	£59.00 (N/C)
160-10m. "open-wire" doublet	£22.00 (N/C)
1Kw. 80-10m. linear 240v.	
GLA 1000 (March/April)	£289.00 (N/C)

### AR

AR240 Synthesised hand-portable	£195.00 (N/C)
---------------------------------	---------------

### MIZUHO

2m. SSB 1 watt portable	£165.00 (N/C)
Extra xtals	£3.00

### NAIGAI

2200 2m. 500w. PIP linear	£481.00 (N/C)
---------------------------	---------------

### ADONIS MICROPHONES

AM802G Compressor—3 outputs	£59.00 (N/C)
AM502G Compressor—1 output	£39.00 (N/C)

### ASP MOBILE ANTENNAS

201-2m. 1/4 wave	£2.95 (1.00)
2009-2m. 5/8th wave	£7.95 (1.00)
677-2m. 5/8th wave de luxe	£14.75 (1.00)
462-70cms. colinear	£7.95 (1.00)
667-70cms. colinear de luxe	£17.50 (1.00)
Magnetic base and cable	£8.50 (1.00)
"No-hole" boot mounts	£3.50 (0.50)

### HF ANTENNAS

HQ-1 20-15-10m. mini-quad	£94.50 (2.50)
C4 20-15-10m. vertical	£47.00 (2.00)
Mosley 20-15-10m. mini-beam 600w.	£89.00 (2.00)
Mosley 2Kw. version	£120.00 (2.00)

TA32 600 watts 20-15-10m.	£72.00 (2.00)
TA33 600 watts 20-15-10m.	£106.00 (2.50)
Mustang 2Kw. 20-15-10m.	£132.00 (2.50)
Hv-gain 12 AVQ 20-15-10m.	£42.20 (2.00)
Hy-gain 14 AVQ 40-10m.	£59.00 (2.00)
Hy-gain 18 AVT/VVB 80-10m.	£85.50 (2.25)
Mosley TD3JR 20-15-10m. dipole	£25.80 (1.00)
Mosley RD5 SWL ham dipole	£30.35 (1.00)
EL-40X 80-40 Mini dipole	£39.00 (1.00)
HF5 5 band vertical	£49.00 (1.00)

### VHF ANTENNAS (JAYBEAM)

4Y/4M 4 el. yagi	£14.65 (2.00)
C5/2M 5dB colinear	£34.90 (2.00)
5Y/2M 5 el. yagi	£8.65 (1.25)
8Y/2M 8 el. yagi	£11.25 (1.50)
10Y/2M 10 el. yagi	£24.20 (2.00)
PBM10/2M 10 el. parabeam	£29.25 (2.00)
PBM14/2M 14 el. parabeam	£35.55 (2.50)
5XY/2M X'd 5 el.	£18.00 (1.50)
8XY/2M X'd 8 el.	£22.50 (2.00)
10XY/2M X'd 10 el.	£29.80 (2.00)
Q4/2M 4 el. quad	£18.70 (1.50)
Q6/2M 6 el. quad	£24.75 (2.00)
D5/2M 5 over 5	£15.50 (1.50)
D8/2M 8 over 8	£20.70 (2.00)
SVMK vertical Kit	£5.65 (1.00)
UGP/2 Ground plane	£8.00 (1.00)
HO/2M 2m. halo	£3.60 (0.50)
HM/2M Above with 24" mast	£4.40 (0.75)
C8/70cm. 8dB colinear	£44.45 (2.50)
D8/70cm. 8 over 8	£17.45 (1.50)
PBM18/70 18 el. parabeam	£21.00 (1.50)
MBM/48 70 el. Multibeam	£24.50 (2.00)
MBM88/70 88 el. Multibeam	£32.65 (2.00)
8XY/70 8 el. X'd yagi	£27.10 (1.50)
12XY/70 12 el. X'd yagi	£33.50 (2.00)
D15/1296 15 over 15	£26.35 (1.50)

### ACCESSORIES

9502 rotator	£50.00 (1.75)
KR400 rotator	£95.00 (2.00)
AR40 rotator	£53.40 (1.50)
Stolle 2030 rotator	£54.00 (1.50)
Stolle 2010 rotator	£48.95 (1.50)
Stolle 2050	£38.00 (1.50)
CDE44 rotator	£106.75 (2.00)
HAM-M Mk. III rotator	£156.00 (2.00)
Shure 444 microphone	£25.95 (0.75)
Shure 201 microphone	£11.25 (0.50)
Shure 526T microphone	£31.50 (0.75)
Hand morse key	£9.50 (0.50)
EK121 Electronic "Bug"	£29.95 (0.75)
50 ohm balun	£10.95 (0.50)
UR67 per metre	£0.58 (0.02)
UR43 per metre	£0.21 (0.01)
5 core cable per metre	£0.28 (0.01)
HP3A high pass filter	£2.95 (N/C)
Drake low pass filter	£18.00 (0.50)
TV1 ferrite rings	£0.30 (0.08)
Plastic antenna insulators	£0.25 (0.05)
Twin SWR metres 3-150 MHz	£12.50 (0.50)

### HILOMAST LTD.

PNAM-1 Telescopes to 9m.	£239.00 (14.00)
PNAM-2 Telescopes to 14 1/2m.	£293.00 (15.00)

SAE for details

All prices include VAT  
Carrier costs shown in brackets

**THE COMPLETE HAM RADIO CENTRE**

PHONE ORDERS      ACCESS      BARCLAYCARD      MAIL ORDER      RETAIL CALLERS

31 SPA ROAD, HOCKLEY, ESSEX      Telephone (03704) 6835      Telex 897406

AGENTS: G3PWJ (03844) 77778 G3WRA (0432) 67864 G8NMMU (0272) 669454

# RADIO SHACK LTD for



DRAKE TR-7 solid state continuous coverage synthesized hf system

- DRAKE TRANSCEIVERS & ACCESSORIES** inc. VAT
- TR-7. Transceiver with DR-7 general coverage/digital readout board fitted ... £864.00
  - PS-7. 120/240v. Power Supply for TR-7 ... £135.00
  - RV-7. Remote VFO for TR-7 ... £119.00
  - MS-7. Matching speaker for TR-7 ... £24.75
  - NB-7. Noise Blanker for TR-7 ... £55.80
  - FA-7. Fan for TR-7 ... £18.00
  - AUX-7. Range prog. board for TR-7 ... £28.80
  - RRM-7. Range receive module for TR-7 ... £3.60
  - RTM-7. Range transceiver for TR-7 ... £3.60
  - SL-300. CW Filter for TR-7 (300 kHz) ... £39.60
  - SL-500. CW Filter for TR-7 (500 kHz) ... £39.60
  - SL-1800. SSB/RTTY Filter for TR-7 (1.8 kHz) ... £39.60
  - SL-6000. AM Filter for TR-7 (6.0 kHz) ... £39.60
  - MMK-7. Mobile mounting kit for TR-7 ... tba
  - MN-7. ATU/RF wattmeter. 160-10m. 250w. ... £123.75
  - WH-7. HF wattmeter/VSWR bridge ... £59.40
  - TR-4CW(RIT). Transceiver—SSB, CW, with R.I.T. ... £504.00
  - AC-4. 115/240v. PSU for TR-4CW/T-4XC ... £108.00
  - 34-PNB. Plug-in Noise Blanker for TR-4CW ... £72.00
  - DC-4. 12v. PSU for TR-4CW/T-4XC/R-4C ... £96.75
  - RV-4C. Remote VFO for TR-4CW ... £105.75
  - UV-3E. 144-432 MHz FM Transceiver ... £495.00
  - PS-3. AC Power Supply for UV-3E ... £69.75
  - UMK-3. Remote Trunk Kit for UV-3E ... £54.00
- DRAKE TRANSMITTER & ACCESSORIES**
- T-4XC. Transmitter—SSB ... £495.00
- DRAKE ADDITIONAL ACCESSORIES**
- TV 42 LP. Low Pass Filter 100w. ... £10.13
  - TV 3300 LP. Low Pass Filter 2 kW ... £18.00
  - RP-500. Receiver Protector ... £63.00
  - 7072. Hand mic. for TR-4CW/T-4CX ... £13.50
  - 7073. Hand mic. for UV-3E/TR-7 ... £13.50
  - 7077. Desk mic. for UV-3E/TR-7 ... £24.75
  - DL-1000. Dummy Load ... £29.70
  - RCS-4. Remote control Antenna switch ... £83.25
  - B-1000. Balun 4 : 1 for use with MN-4C only ... £18.00
  - Fixed frequency crystals ... £7.88
  - Spare operating manuals ... £3.00
- The R. L. Drake Company are no longer making the following items; however, we still have a few of each—please check our stock position before ordering:*
- FF-1. Crystal Control for TR-4CW ... £38.25
  - A-10. 10 watt 2m. Amplifier ... £45.00
  - WV-4. RF Wattmeter 20-200 MHz ... £64.80

- DRAKE RECEIVERS & ACCESSORIES** inc. VAT
- R-4C. Receiver—SSB, AM, SW, RTTY ... £495.00
  - FL 250. Filter for R-4C (.250 kHz) ... £40.50
  - FL500. Filter for R-4C (.500 kHz) ... £40.50
  - FL 1500. Filter for R-4C (1.5 kHz) ... £40.50
  - FL4000. Filter for R-4C (4.0 kHz) ... £40.50
  - FL 6000. Filter for R-4C (6.0 kHz) ... £4.50
  - 4-NB. Noise Blanker for R-4C ... £48.00
  - MS-4. Matching spkr. for R-4C/T-4XC/TR-4CW ... £24.75
  - Crystals. Accessory crystals for R-4C ... £4.50
  - SPR-4. Receiver—general purpose ... £450.00
  - DC Power Cord for SPR-4 ... £4.05
  - Crystals. Accessory crystals for SPR-4 ... £4.50
  - DSR-2. Digital Receiver ... £2,750.00
  - SSR-1. Receiver—general purpose ... £175.00

WE ARE SITUATED just around the corner from WEST HAMPSTEAD UNDERGROUND STATION which is on the BAKERLOO LINE. A few minutes walk away is WEST HAMPSTEAD MIDLAND REGION STATION and WEST END LANE on the BROAD STREET LINE. We are on the following BUS ROUTES 28: 59: 159: C 11.

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

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

- HUSTLER ANTENNAS**
- MO 1/2. Foldover masts ... £13.84
  - BM-1. Bumper mount ... £10.35
  - C-32. Ball mount ... £5.05
  - C-29. Stainless steel spring ... £7.75
  - RM-10. 10m. Resonator ... £9.34
  - RM-15. 15m. Resonator ... £10.17
  - RM-20. 20m. Resonator ... £11.14
  - RM-40. 40m. Resonator ... £13.84
  - RM-80. 80m. Resonator ... £14.73
  - SF-2. 2m. 5/8 whip ... £9.00
  - DCL. Discone VHF/UHF 40-700 MHz 50' coax ... £20.47
  - DCX. Discone VHF/UHF 40-700 MHz ... £13.84
  - CG-144. 2m. Colinear ... £25.25
  - CGT-144. 2m. Colinear with mount ... £36.00
  - G6-144A. 2m. Colinear for base station use ... £51.75
  - 4 BTV. 10-40m. Vertica ... £75.15
  - RM-80S. 80m. High power Resonator ... £19.00
  - QD-1. Quick-disconnect ... £10.23
  - 510S. Top section only of QD-1 ... £7.88
  - HLM. Trunk-lip mount with coax ... £12.57

- TELEX COMMUNICATIONS INC.** inc. VAT
- Lightweight Headphones 3.2-20 ohms**
- HGC-91. Underchin 1.5 oz. with foam earpads ... £8.08
  - HMC-2. Underchin 1.5 oz. with plastic eartips ... £9.00
  - HT2-2. 1.6 oz. Twin Receiver headphone ... £14.40
- Dual Muff Headphones**
- C-610. 3.2-20 ohms Dual Receiver Magnetic ... £6.75
  - SWL-610. 2000 ohms. Dual Receiver Magnetic ... £7.99
  - C-1210. 3.2-20 ohms Dynamic foam padded ... £18.45
  - C-1320. 3.2-20 ohms TELEX's finest Boom Microphone Headsets (headphones as above) ... £25.65
  - CM-610. As C-610 with high Z Ceramic microphone ... £29.70
  - CM-1210. As C-1210 ... £38.25
  - CM-1320. As C-1320 ... £47.25
  - CM-1320S. As CM-1320 with Single headphone ... £36.90
- (all the above headsets fitted ptt switch)
- Microphones (hand-held battery powered)**
- ProCom I. Electret High Output ... £11.70
  - ProCom II. Electret Variable Gain ... £17.55
  - CB-73R. Dynamic Noise-cancelling (relay switch) ... £23.40
  - CB-73S. As above with 6-wire universal lead ... £24.75

- HAL COMMUNICATIONS CORP.**
- Electronic TTY System**
- DS-3000. KSR version 3.X (ASCII/Baudot/Morse) ... £1,134.00
  - DS-3000. KSR version 2.X (ASCII/Baudot) ... £855.36
  - ST-6000. Demodulator/Keyer with 'scope ... £432.00
  - ST-5000. Demodulator/Keyer ... £194.40
  - RVD-1005. Visual Display Unit (Baudot) ... £285.12
  - DKB-2010. Dual mode keyboard with 128 key buffer memory ... £345.60

Telephone 01-624 7174 with your ACCESS or BARCLAYCARD number for immediate DESPATCH

# RADIO SHACK for

	inc. VAT
<b>TEN-TEC</b>	
509. ARGONAUT 5W. SSB/CW Transceiver 3-5-30 ...	£247-50
540. TRITON 1v. 200W. SSB/CW Transceiver 3-5-30 ...	£495-00
544 Digital. TRITON 1v. 200W. SSB/CW Transceiver 3-5-30 ...	£618-75
545. OMNI-A Analogue Transceiver ...	£652-50
546. OMNI-D Digital Transceiver ...	£765-00
570. CENTURY 21. 70W. CW Transceiver 3-5-29 MHz ...	£220-50
574 Digital. CENTURY D ...	£281-25
405. Linear Amp. 100W. 3-5-30 MHz 210/E (1A). 115/230v. AC/13v. DC PSU for Argonaut ...	£27-00
251/E (9A). 115/230v. AC/13v. DC PSU for Argonaut 405 ...	£67-50
262G/E (18A). 115/230v. AC/13v. DC PSU for Tritons ...	£108-00
247. Tuner ...	£49-50
277. Tuner/SWR ...	£58-50
212. Crystal 29-0-29.5 MHz for Tritons ...	£4-50
213. Crystal 29-5-30.0 MHz for Tritons ...	£4-50
240. Converter 160m. for Tritons ...	£72-00
241. Crystal Oscillator for Tritons ...	£22-50
242. Remote VFO for Tritons ...	£119-25
245. CW filter for Tritons ...	£19-80
249. Noise Blanking for Tritons ...	£19-80
276. Crystal Calibrator for Century 21 KR-1A. Dual paddle assembly ...	£27-00
KR-5A. Single-paddle keyer. 6-14v. DC ...	£31-50
KR-50. Ultramatic keyer dual paddle 117v. AC/6-14v. DC ...	£85-50

<b>AMECO Equipment</b>	
OCMK. Code practice oscillator kit ...	£12-38
OCMW. Code practice oscillator kit wired ...	£16-20
PLF-2. FET Receiver preamp. ...	£47-25
PT-2. FET Transceiver preamp. 10-160m. ...	£67-50
<b>Morse Code Courses</b>	
101-33. Senior Code Course. 33r.p.m. Record ...	£5-40
101-T. Senior Code Course. Cassette ...	£6-48
103-33. Advanced Code Course. 33 r.p.m. Record ...	£2-80
103-T. Advanced Code Course. Cassette ...	£3-78
105-33. Gen. class supplementary course 33 r.p.m. ...	£2-80
<b>Publications</b>	
3-01. Radio Electronics Made Simple ...	£2-00
102-01. Amateur Radio Theory Course ...	£3-50
23-01. Novice Class Theory Course ...	£2-50

<b>PHILIPS</b>	
AAC-4000. Language-trainer, comprising Cassette Recorder and headphone with microphone attached ...	£129-60
AAC. Language courses for use with the AAC-4000 trainer above. Courses are available in FRENCH/GERMAN/RUSSIAN/SPANISH/ITALIAN/PORTUGUESE and ENGLISH. There are four parts to a full course. Parts 1, 2, 3 (each part) ...	£36-72
Part 4 ...	£41-04
(Send LARGE s.a.e. for brochure please)	

<b>CDE ROTATORS</b>	
AR-20 ...	£38-81
AR-22L ...	£48-38
AR-30 ...	£46-13
AR-40 ...	£53-44
CD-44 ...	£106-88
HAM-3 ...	£156-38
BIG-TALK ...	£89-44
TAIL-TWISTER ...	£241-88

<b>HY-GAIN ANTENNAS</b>		inc. VAT
18HT. 6-80m. Vertical Tower ...	£253-12	
12AVW. 10-20m. Trapped Vertical ...	£42-18	
14AVQ/WB. 10-40m. Trapped Vertical ...	£59-06	
18AVT/WB. 10-80m. Trapped Vertical ...	£85-50	
18V. 10-80m. Vertical ...	£31-28	
TH6DXX. 6 element beam for 10/15/20 ...	£230-62	
TH3MK3. 3 element beam for 10/15/20 ...	£176-62	
TH3JR. 3 element beam for 10/15/20 ...	£127-68	
TH2MK3. 2 element beam for 10/15/20 ...	£123-46	
HY-QUAD. 2 element quad for 10/15/20 ...	£190-12	
DB 10-15A. 10 and 15m. beam ...	£129-38	
204BA. 4 element 20m. beam ...	£174-38	
203BA. 3 element 20m. beam ...	£132-19	
153BA. 3 element 15m. beam ...	£70-58	
103BA. 3 element 10m. beam ...	£57-38	
402BA. 2 element 40m. beam ...	£177-75	
511. Heavy duty spring ...	£11-59	
499. Flush body mount ...	£8-83	
417. De luxe spring ...	£4-50	
492. Miniature spring ...	£22-84	
LA-1. Lightning arrestor ...	£3-71	
LA-2. In-line Lightning arrestor ...	£15-19	
BN-86. Ferrite balun ...	...	

<b>BEARCAT</b>	
Digital Programmable VHF/UHF Search & Scanning Receivers freq. coverage 32-50 MHz, 146-174, 420-512 MHz, 12v. DC 240v. AC 210, 10 channels ...	£199-80
250 50 ch. count and time ...	£249-75

<b>ASTATIC MICROPHONES</b>	
T-UG9-D104. Golden Eagle gold-plated transistorised ...	£69-75
T-UPG-D104. Silver Eagle chrome-plated transistorised ...	£49-50
UG8-D104. The famous Crystal D104	£31-50
T-UG9-D104. Transistorised amplified D104 grip t-t ...	£40-50
T-UP9-D104. Transistorised amplified p.t.t. (grey or black) ...	£45-00
525 DL6. Dynamic Hand Microphone. 400 Z ...	£12-15
400. Dynamic Hand Microphone. "Buckeye" ...	£5-85
565 M6. Hand Microphone FET amplified. "Mariner" ...	£31-50
D104-M. Hand Microphone D104 FET amp. 4-wire ...	£24-30
D104-M6. Hand Microphone D104 FET amp. 6-wire ...	£28-35
555 4-wire. Hand Mic. noise-cancelling "Trucker" ...	£21-60
557 6-wire. Hand Mic. noise-cancelling "Trucker" ...	£26-10
531. Hand Mic. mobile. High Z ...	£7-65
539. Hand Mic. mobile, noise-cancelling ...	£7-65
1104C. Desk Microphone FET amplified ...	£36-00

<b>ATLAS</b>	
210X. 10-80m. SSB Transceiver ...	£495-00
215X. 15-160m. SSB Transceiver ...	£495-00
220-CS. Console & AC power supply ...	£129-37
DMK. De luxe mobile mount ...	£40-50
DCC. DC Cable ...	£9-84
MBK. Mobile Bracket Kit ...	£4-50
MT-1. Mobile Antenna Match Transformer ...	£18-00
PC-120. Plug-In Noise Blanking ...	£42-75
10 X. Crystal Oscillator ...	£45-00
DD-6C. Digital Dial ...	£180-00
VX-5. VOX accessory ...	£38-25
DL-300. Dummy Load ...	£11-81

<b>TRIO EQUIPMENT</b>		inc. VAT
TS 820S. 160-10m. Transceiver. 200W PEP (with digital readout) ...	£899-00	
TS 520S. 1-8-28 MHz SSB Tcvt. 200W. PEP ...	£575-00	
TL 922. HF Linear. 2 kW. 160-10m. TS 120V. 80-10m. Transceiver. 20W. PEP ...	£826-00	
TS 700S. 2m. all mode Transceiver digital readout ...	£435-00	
TR 7010. 2m. SSB/CW mobile transceiver. 10W. ...	£637-00	
TR 7400A. 2m. FM mobile transceiver. 30W. 800 ch. ...	£189-00	
TR 7500. 2m. FM mobile transceiver. 10w. ...	£365-00	
TR 2300. 2m. FM portable transceiver	£235-00	
TR 8300. 70cm. FM mobile transceiver 4 ch. fitted ...	£210-00	
TR 3200. 70cm. FM transceiver fitted 3 ch. ...	£267-00	
R300. General coverage Receiver ...	£198-00	
We have listed a few Trio items—but we stock the whole range.		

<b>VHF MOBILE WHIPS</b>		inc. VAT
B5. BANTEX 2m. 5/8 fibreglass whip	£6-70	
MAGNETIC MOUNT for above ...	£10-37	
BD. Boot Mount ...	£6-48	
BC. Single-hole Body Mount ...	£3-89	
MA-41. DAIWA 2m. 1/2 wave gutter-mounting ...	£10-12	
AS-GM. ASAHI gutter mount ...	£2-80	
ESSE-8U. CALLETTI 2m. 5/8 whip standard mt ...	£12-00	
CALLETTI 2m. 5/8 whip gutter-mt.	£12-00	
GP-8V. CALLETTI 2m. Ground Plane 4 radials ...	£13-90	
TAS. JAYBEAM 2m. 5/8 whip with 4m. coax ...	£13-59	

<b>JAYBEAM ANTENNAS</b>		inc. VAT
4Y/4M. 4 element folded dipole yagi ...	£14-85	
C5/2M. 5dB glass fibre colinear ...	£35-42	
5Y/2M. 5 element folded dipole yagi ...	£8-67	
8Y/2M. 8 element folded dipole yagi ...	£11-25	
10Y/2M. 10 element folded dipole yagi ...	£24-58	
PBM 10/2M. 10 element Parabeam ...	£29-72	
PBM 14/2M. 14 element Parabeam ...	£36-12	
8XY/2M. Crossed 8 element yagi ...	£22-50	
10XY/2M. Crossed 10 element yagi ...	£30-28	

<b>MICROWAVE MODULES</b>		inc. VAT
<b>Transverters</b>		
MMT 432/28-S. 70cm. Transverter ...	£133-88	
MMT 432/144-R. 70cm. Transverter ...	£69-88	
MMT 144/28. 2m. Transverter ...	£88-88	
<b>Converters</b>		
MMC 144/any I.F. 2m. Converter ...	£20-25	
MMC 144/28 LO. 2m. Converter ...	£22-50	
MMC 70/28. 4m. Converter ...	£20-25	
MMC 70/28 LO. 4m. Converter ...	£22-50	
MMC 432/28 or 144. 70cm. Converter ...	£27-00	
MMC 1296/28. 23cm. Converter ...	£31-50	
MMC 435/51 ...	£29-90	
MMC 432/28S or 144. 70cm. Converter	£29-90	
<b>Frequency Counter</b>		
MMD 050/500. 500 MHz Counter ...	£69-00	
<b>Various</b>		
MMA 144. 2m. Preamp ...	£14-63	
MMD 500P. 500 MHz Prescaler ...	£27-00	
MMV 1296. 70-23 cm. Varactor Tripler ...	£33-75	
MMP 12/3. 12v. 3 amp mains power supply ...	£56-25	

<b>DECCA COMMUNICATIONS</b>		inc. VAT
KW 107. Supermatch A.T.U. ...	£121-50	
KW 109. High power version of 107 ...	£132-75	
DC PSU. For 2000A/B/E ...	£106-88	
E-Z Match. 10-80m. A.T.U. (mk. 2) ...	£45-00	
Dummy Load 52 ohms ...	£30-93	
Antenna Switch 3-way ...	£9-00	
Balun mk. 2. 1:1 ...	£10-12	

<b>RMS WINDOW ANTENNA MOUNTS</b>		inc. VAT
CBWM-50T. For windows up to 42" ...	£7-56	
WEX-1. Additional 18" extension ...	£1-73	
WEX-2. Additional 30" extension ...	£2-05	

<b>PRESTEL</b>		inc. VAT
MC-20. Field Strength Meter VHF/UHF ...	£216-00	

CARRIAGE EXTRA all items  
Brochures etc. 15p stamps

SECURICOR

DRAKE SALES SERVICE

HIRE  
PURCHASE



## Radio Shack Ltd

188 BROADHURST GARDENS, LONDON NW6 3AY

Just around the corner from West Hampstead Underground Station

Telephone : 01-624 7174

Cables : Radio Shack, London NW6. Telex : 23718 Radack G. Giro Account No. 588 7151

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





# South Midlands

TWENTY-ONE YEARS OF

## "UNICOM 21"

KEMPTON MANOR — SUNBURY-ON-THAMES — JUNE 22/23

SMC Ltd's 21st ANNIVERSARY EXPOSITION AND SYMPOSIUM ON COMMUNICATIONS

As part of our 21st celebrations, join us for our unique two day event at the purpose designed conference centre at Kempton Manor. Covering for the Amateur, Friday evening and all day Saturday. Active demonstrations by leading Manufacturers within our field, coupled with high grade lectures by guest speakers.

- ★ Exhibition Opens : 6.00 p.m. Friday—Lectures 6.30 p.m.  
10.00 a.m. Saturday—Lectures 10.30 a.m.
- ★ Lectures include : 'V MOS Applications' — 'Amateur T.V.' — 'W.A.R.C. 79' —  
'FM v. SSB Bandwidths' — 'Single chip frequency synthesisers' —  
'DC Receivers' — 'Working more DX'.
- ★ Active Demonstrations by : SMC — Strumech — Ascot — Microwave Modules.  
With experts available to discuss your needs and problems.
- ★ Exhibitors include : R.S.G.B. — RAYNET — BARTG — Radio Communications —  
Practical Wireless.
- ★ Admission by programme, which will include FREE entry to the £500 equipment draw and  
redeemable vouchers which could save you £50 on subsequent purchases from SMC.
- ★ Full Bar and Buffet facilities available throughout 'Unicom 21'
- ★ 'Talk-in' on S22 via GB3SMC to the 1000 place car park.

Programmes may be obtained from your Club Secretary, SMC HQ at Totton or at the door.  
Commercial customers contact SMC HQ for details of closed sessions.

### SOUTH MIDLANDS COMMUNICATIONS LIMITED

HEAD OFFICE (MAIL ORDERS)  
OSBORNEROAD, TOTTON  
SOUTHAMPTON SO4 4DN  
Hours of business 9-5.30; Monday - Saturday



Head Office, Showrooms

Cables : Aerial Southampton  
Telex : 477351 SMCOMM G  
Tel : Totton (04216) 7333 (3 lines)

#### AGENTS STOCK AND SALES

G3ZUL	Brian	Stourbridge	(03843)	5917
GM3ZBE	Alex	Aberdeen	(065183)	328
GM8GEC	Jack	Edinburgh	(031665)	2420
G13WWY	Mervyn	Tandragee	(0762)	840656
GW3TMP	Howarth	Pontyboekin	(035287)	846/324
GW4GSW	Alan	Swansea	(0792)	24140



# Communications Ltd

PROFESSIONAL EXPERIENCE



## WHY BUY YOUR YAESU FROM SMC?

The two year guarantee? The free Securicor service? The security of dealing directly with the largest authorised importer? The spacious, very well equipped, ably staffed test and service facility? The knowledge that we carry tens of thousands of pounds of spare parts? Our discreet "Instant" H.P.? Our personal export documentation scheme? Our in person or over the 'phone, time saving, credit card acceptance? Our honest advice and fair evaluation of part exchange equipments' worth? Our in depth interest and knowledge of most facets of our common hobby? Whatever the reason; heartfelt thanks to all our customers for making us, SMC, the biggest, and we sincerely hope, the very best in the business.



## THE FT7B

THE MAXIMUM PERFORMANCE FOR THOSE ON THE MOVE

With the HF bands in such fine condition, mobile operation is most tempting. Yaesu are proud to announce a brother to the FT7—the FT7B.

All basic functions of the famous FT7 are retained. The combination of Mosfet RF and Schottky diode mixer is complemented with a 20dB attenuator. Selectable side-bands remain, now supplemented with AM. The semi-break-in with side tone CW facility is of course retained but for reception, an audio peak filter is a big plus. 80–10m. as before, but 10 metres is expanded to be capable of the full 2 MHz operation. An Analogue scale, to 1 kHz, plus an optional digital readout unit that can be conveniently sited above the transceiver, on the dash or the steering column. Powers FT7; 10W. out or 100W. out with the FL110 linear (sited anywhere in the car), FT7B 50W out (A3j-A1 100W. PIP A3 (F2, F3) 25W. in).

FT7B Transceiver 100W PIP ...	£375 (+ 12½%)	FL110 Linear 200W PIP ...	£130 (+ 12½%)
YC7B Readout remote dig ...	£61 (+ 8%)	FPI2 PSU 12A DC 12v. ...	£67 (+ 8%)

### SMC (Jack Tweedy) LTD

Roger Baines, G3YBO  
79 Chatsworth Road,  
Chesterfield, Derby  
Tel.: Chesterfield (0246) 3498;  
9–5 Tuesday–Saturday

### NORTHERN (Leeds) BRANCH

Colin Thomas, G3PSM  
257 Otley Road  
Leeds 16, Yorkshire  
Tel: Leeds (0532) 782326  
9–5 Monday–Wednesday & Friday–Saturday

### SMC (Jack Tweedy) LTD

Jack Tweedy, G3ZY  
Ham Shack, Roughton Lane,  
Woodhall Spa, Lincs.  
Tel.: Woodhall Spa (0526) 52793  
9–5 Tuesday–Saturday (+ appoint.)





# TOMORROW'S TECHNOLOGY TODAY



## THE FT101ZD Digital & Analogue Readout FT101Z Analogue Readout Version ARE HERE NOW!

Any new piece of equipment from Yaesu is worthy of note, one good enough to be called a '101' in line with the world's most popular amateur transceiver, is an event of the decade. The 'Z' series is a base station design at its best, a no compromise, go anywhere (AC PSU included, DC inverter option) unit of the highest quality. The FT101ZD is an all new design using today's technology backed by a proud tradition.

For further details of this exciting new unit please contact any of our authorised sales outlets, for a free colour brochure.

- ★ Variable IF bandwidth 2.4 kHz down to 300Hz
- ★ Digital plus analogue frequency display
- ★ RF speech processor—adjustable level
- ★ Wide receiver dynamic range, with sensitivity
- ★ Superb noise blanker—adjustable threshold
- ★ Vox built-in and front panel adjustable
- ★ Semi-break with sidetone for slick CW
- ★ 6146B pa's with negative feedback. 180W PIP
- ★ 160-10 metres plus WWV auxiliary band
- ★ Attenuator 0-10-20 dB front panel switch
- ★ AGC: Slow-fast-off, front panel switchable
- ★ Clarifier (RIT) switchable on Tx, Rx or both
- ★ Selectable CW fixed bandwidths CW-W or CW-N

A full list of matching accessories is available to complement the FT101ZD. In the illustration below (looking from left to right) we have: the FTV901 transverter (covering 4m., 2 and 70, with repeater shift etc. etc.) the FV901DM External VFO, (with 40 memory channels  $\pm 50$ Hz stability AWU!!!) auto and manual scanning, the FT101ZD itself, the YO901 monitor scope, which in addition to AF, IF, and RF monitoring offers panoramic (spectrum analyser) facilities. The FC901 Antenna Tuner/Power/SWR meter, and the SP901P external speaker with phone patch (Normal speaker SP901 available).



WRITE FOR FREE YAESU CATALOGUE, SMC STOCK PRICE LIST, ETC.

## SOUTH MIDLANDS COMMUNICATIONS LIMITED



S.M. HOUSE, OSBORNE ROAD  
TOTTON, SOUTHAMPTON  
HAMPSHIRE SO4 4DN



CABLES: AERIAL  
SOUTHAMPTON  
TEL: TOTTON (04216) 7333  
TELEX: 477351 SMCOMM G



ADVERTISERS' INDEX

	Page
Amateur Electronics UK ...	134, 135
Amateur Radio Exchange	178
Amateur Radio Shop ...	185
Ashley Dukes ... ..	190
J. Birkett ... ..	146
Bredhurst Electronics ...	180
British National Radio and Electronics School ...	183
B. Brookes Electronics ...	191
Cambridge Kits ... ..	192
Catronics Ltd. ... ..	188
C.B. Electronics ... ..	184
Colomor Electronics Ltd....	190
Crayford Electronics ...	192
Dart Stationery ... ..	190
Datong Electronics Ltd. ...	187
G2DYM Aerials ... ..	192
G3HSC (Rhythm Morse Courses) ... ..	190
Heathkit ... ..	146
D. P. Hobbs Ltd. ... ..	186
Johns Radio ... ..	192
K.W. Communications Ltd.	183
Lowe Electronics <i>front cover, inside front cover,</i>	<i>129</i>
M.H. Electronics ... ..	190
Microwave Modules Ltd....	181
M.R.S. Communications Ltd.	185
Wm. Munro (Invergordon) Ltd. ... ..	186
Partridge Electronics Ltd....	189
P.M. Electronics Services ...	179
Quart Slab Marketing Ltd.	182
Radio Shack Ltd. ... ..	140, 141
R.T. & I. Electronics Ltd....	184
SEM ... ..	177
Small Advertisements ...	187-190
Sommerkamp Electronics SAS	133
South Midland Communications Ltd. ... ..	142, 143, 144
Spacemark Ltd. ... ..	186
Stephens-James Ltd. ...	136, 137
S.W.M. Publications <i>Inside back cover, back cover,</i>	<i>181, 191</i>
T. & J. Electronics ... ..	142
Thanet Electronics	130, 131, 132
T.M.P. Electronics ... ..	191
Uppington Tele/Radio (Bristol) Ltd. ... ..	192
Reg Ward & Co. Ltd. ...	186
Waters & Stanton Electronics ... ..	138, 139
Geoff Watts ... ..	192
W. H. Westlake ... ..	192

# SHORT WAVE MAGAZINE

(GB3SWM)

ISSN: 0037-4261

Vol. XXXVII

MAY, 1979

No. 427

## CONTENTS

	Page
Editorial— <i>Planning Permission</i> .....	147
Communication and DX News, <i>by E. P. Essery, G3KFE</i> .....	148
A Field-Effect Transistor Transmitter for Twenty Metres, <i>by Peter Lumb, G3IRM</i> .....	151
"SWL"— <i>Listener Feature</i> .....	153
Antennas— <i>The Weak Link, Part VIII,</i> <i>by A. P. Ashton, G3XAP</i> .....	157
Clubs Roundup .....	163
The Other Man's Station .....	166
How to Put Up an Aerial Mast, <i>by Philip Maynard</i> .....	167
Toroids in HF Application, Part II, <i>by N. H. Sedgwick, G8WV</i> .....	168
VHF Bands, <i>by N. A. S. Fitch, G3FPK</i> .....	173

Editor: PAUL ESSERY, G3KFE/G3SWM

Advertising: Charles Forsyth

*Published at 34 High Street, Welwyn, Herts., AL6 9EQ, on the last Friday of  
the month, dated the month following. Telephone: 04-3871 5206 & 5207*

Annual Subscription:

*Home: £5.50, 12 issues, post paid  
Overseas: £5.50 (\$10.00 U.S.), post free surface mail*

Editorial Address: Short Wave Magazine, 34 High Street, Welwyn,  
Herts. AL6 9EQ, England.

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

## AUTHORS' MSS

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

© Short Wave Magazine Ltd.

E. & O. E.

VAT Reg. No. 239 4864 25

145

**New** Heathkit electronic test equipment course.

- Section 1. Analogue and digital meters.
- Section 2. Oscilloscopes.
- Section 3. Frequency generation and measurement.
- Section 4. Special measuring instruments.

This new Heathkit self-instruction course is designed to give you a complete understanding of modern test equipment.

Each section contains audio/visual materials, text, and parts for 'hands on' experiments using the optional Heathkit experimenter trainer.

And Heathkit make it so easy. You learn at your own pace, in your own home.

Full details are available in the Heathkit catalogue together with the full range of Heathkit electronics courses—AC electronics, DC electronics, digital techniques, microprocessors, and many more.

Send for your copy now.

There are Heathkit Electronics Centres at 233 Tottenham Court Road, London (01-636 7349) and at Bristol Road, Gloucester (0452 29451): Registered in England, No. 606177.

**Soldering  
Iron offer  
FREE**



**VF 2031**

Hand-held 2M FM transceiver with nickel cadmium battery pack and 120/240V AC recharger. Optional carry case, external microphone and tone burst encoder.



**SW 717**

4-band shortwave receiver with full 550KHz to 30 MHz coverage. Slide rule tuning. Built-in AM rod antenna and connection for external antenna.



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

Name \_\_\_\_\_ SWM/5/79

Address \_\_\_\_\_

N.B. If you are already on the Heathkit mailing list you will automatically receive a copy of the latest Heathkit catalogue without having to use this coupon.

When you receive your catalogue you will get details of this free offer.



# HEATHKIT

HEATH  
Schlumberger

## J. BIRKETT *Radio Component Suppliers*

25 THE STRAIT . LINCOLN . LN2 1JF

Telephone: 20767

- SPECIAL LOW NOISE VHF STRIPLINE FET. 2N 4417 at £2.20.
- 2 GHz NPN STRIPLINE TRANSISTOR at £1 each.
- X BAND GUNN DIODES. CXY 11A at £3.
- X BAND GENERAL PURPOSE GUNN DIODES at £1.65.
- MINIATURE VARIABLE CAPACITORS. 25 x 25 x 25pf at 75p.
- R.F. TRANSISTORS. 2N 5179 at 50p, 2N 5180 at 50p, AF 239 at 50p, BF 362 at 25p, BFY 90 at 50p, BF 274 at 10p, MPS 6514 at 10p.
- GENERAL PURPOSE TRANSISTORS. BC 107, BC 108, BC 109, BC 177, ME 0404, BF 324, BF 177. All at 10p each. 6 for 50p.
- MIKE INSERTS. Type YA 8548 at 50p each.
- VERNITRON FM4 10.7 MHz FILTERS at 50p, 3 for £1.
- FERRITE BEADS. FX 1115 at 15p doz.
- SEMI-AIRSPACED TRIMMERS. 2 to 9pf, 3 to 35pf, 6 to 45pf, 6 to 60pf, 0 to 125pf, 8 to 140pf. All at 15p each.
- LED's TIL 209 at 6 for 50p, 2" Red at 15p, Green at 18p.
- DL 707 SEVEN SEGMENT LED's at 70p each.
- MBD 102 HOT CARRIER DIODES at 60p each.
- 1uf 25v.w. ELECTROLYTIC CAPACITORS at 6 for 25p.
- VHF TETFER TRIMMERS. 10pf at 18p each.
- RCA IF-RF AMPLIFIER I.C. No Data at 50p each.
- ELECTRONIC ATTENUATOR I.C. MC 3340 with data at 50p.
- MOTOROLA I.F. AMPLIFIER I.C. 400 kHz to 50 MHz MC 1350P with data at 50p.
- 10.7 MHz CRYSTAL FILTERS. B.W. ±7.5 kHz at £5 each.
- FETS. 40673T at 33p, 4 for £1.10, 2N 3819T at 20p, 6 for 75p, BF 244 at 25p, BF 256 at 25p, J310 at 20p, MFE 131 at 50p, E111 at 12p, E112 at 10p, E113 at 12p.
- 3/16" COIL FORMERS with core at 6 for 25p.
- HIGH VOLTAGE RECTIFIER ASSEMBLY. 6KV 1 amp at £1.20.
- VHF POWER TRANSISTORS. PT 4544 175 MHz 12 volt 10 watt at £3, 2N 5591 175 MHz 13 volt 25 watt at £5.50, TRW TP 1028 at £4.50.
- DIVIDE BY 2 300 MHz COUNTERS with data at 65p.
- DIVIDE BY 4 150MHz COUNTERS with data at 65p.
- BAW 62 HIGH SPEED DIODES at 12 for 35p.
- TRANSFORMERS. 240 volt Input. Type 1. 24 volt Tapped at 14 volt 1 amp at £1.30 (P & P 25p), Type 2. 22-0-22 volt 500mA at 60p (P & P 25p), Type 3. 45 volt 6 amp at £4.50 (P & P 95p), Type 4. 20 volt 1 amp Twice 10 volt 1 amp Twice at £4.50 (P & P 95p), Type 5. 45 volt 2amp 45 volt 500mA at £3.50 (P & P 85p).

FM TUNER FRONT END. 88 to 108 MHz with conversion details for 2 metres at £3.

MULLARD 10.7 MHz PLUS 455 kHz I.F. MODULE at £4.  
BF 679 STRIPLINE 1000 MHz PNP TRANSISTOR at 25p.

600 MHz 8 DIGIT FREQUENCY COUNTERS. Mains Power Input 100-240 volt A.C. D.C. Power Input 9-16 volts. Sensitivity 10-25 M volt. Range 1 Hz to 600 MHz.



HFC 600 Price: £115 inc. VAT

Please add 20p for post and packing unless otherwise stated, on U.K orders under £2. Overseas postage at cost.

*The*  
**SHORT WAVE**  
*Magazine*

EDITORIAL

***Planning Permission***

There was recently a proposal by the Metropolitan County of Greater Manchester in a Private Bill, to bar boat-owners from keeping their boats on their own property, in their own gardens. This follows similar bills by Cheshire CC, County of Merseyside, West Midlands CC, and West Yorkshire CC, all of which had the offending clause dropped after strenuous action by the RYA (the national boating organisation). What it boils down to is that, since every County Council will shortly have to promote a private, consolidating Bill, the RYA will have the possibility of some 35 times more protests, despite the Lords deletion of the offending clause.

So, what has this to do with Amateur Radio? Just that any one of those Private Bills may contain a clause which might in some way further restrict our right to the enjoyment of our transmitting licences. It is an interesting point that up to now, you have been able to keep a boat in your front or back garden without any planning permission, while at the same time you have been required to obtain planning permission for your aerial and mast if it is a "permanent" structure. It seems to us that a guyed aerial mast with a beam on top is *not* a permanent structure; therefore if the RYA can persuade the Lords to delete a clause requiring permission to keep a boat, then by the same token we should be able to put up aerials without let or hindrance, as part of the use of a home.

*Edwards*  
*3KFE.*

# COMMUNICATION and DX NEWS

*E. P. Essery, G3KFE*

ALL sorts of interesting things seem to have been happening of late; we only wish a few more of the organisers would feed in some sort of early-warning to the hoped-for customers. The experts at DX-peditions do, of course, but a distressingly large number seem to contrive to let everyone know after it's all over, and then to have a moan about co-operation from the amateur radio magazines. It must be realised that once the material has gone off to the printer there is just no way in which we can stop the works without completely upsetting the appletart. Thus, *DXNS* or *WCDXB* which come out weekly, often are the only indicators of the short-notice merchants. On the other hand, it must also be said that often the effort is not a DX-pedition at all, but a work activity undertaken at short notice, and a rig packed in the luggage.

## Here and There

We hear that in addition to YI1BGD, there is now another YI station, who signs YI4SC—QSL via YI1BGD, Box 5864, Baghdad.

If you are sitting around hopefully awaiting the appearance of a big 1S1DX signal from Spratly, you may well be in for a disappointment. We hear rumours that they will be going to Amboyna Cay instead: apparently they tried for Spratly but were turned back by a Vietnamese gunboat. But one thing we haven't heard is their signal, nor yet the signals of the pile-up calling them! Admittedly, the aerial system here is in a mess after the winter, and it has not been possible to get on the air at suitable times; but one would have expected to hear some sort of ruckus going on.

Another one to be noted among those *not* audible is A6XB, who is believed to have had his gear confiscated. On the other hand, PA0GWK/A6 is about, being worked in U.K. around 1730-ish zulu time.

To return to the matter of Spratly, there is another rumour going the rounds which says that VK2BJL and the gang aren't going to be at Spratly until April 28—though to be fair that seems to be just another spot

of discouragement put about by a non-DX type.

For those of us who usually run full power, the tale of G4BUE might be of interest; he has made it over to W1HR with just 15 milliwatts, and with the five watts managed a score of 395000 points in the WPX effort, from some 700 QSOs. Some going with such a low power level, admittedly with a beam, even though the latter is only at 35 feet.

We have a letter from DL9GJ with details of a world activity by radio amateurs who are associated in one way or another with Air Traffic Control operations. They have a net, usually on 14277 KHz, but sometimes they are about on 21373 or 28540 KHz. If you would like to know more, the U.K. representative is E. Bradshaw, 6 Longlands Park, Ayr, KA7 4RJ, or you can work DL9GJ (who is also ON8AA, PA0GJA and F0AAJ) when he is on the /M gear, between 0630-0700, 1100 and 1200, and 1615 to 1645 (all GMT). The preferred band is Twenty, but it is not unusual to find him on 21 or 28 MHz if the propagation is right for him at the noon or afternoon sessions.

## Top Band

Various bits and pieces of interest on this band, of which the first is that EA6, EA8, EA9, and the common-or-garden EAs all have Top Band permission, and that they have appeared on the band wearing their ED prefixes.

G3PKS (Wells) seems to have spread his range of operations a little, as he operated /A from St. Mary Cray and managed a QSO with Yorkshire to fill in one of the remaining "wanted" ones. There was also some chatting with the locals around the Wells QTH.

Just to remind us that there is another continent, G2HKU (Sheppey), mentions his SSB QSOs with K1PBW, YU3EF, DF0DX, PA0PN, ED5HM, SP3ADZ, indicating also how many new countries have come on to the band in the last year or so. Turning to CW we find W1BB, K2GNC, DL9RY, and DK6AS/LX.

Next comes the W1BB *Spring Bulletin*, and on the covering letter we notice that Stew is hoping to meet G6CJ of aerial fame; the latter is doing his talk several times over there during his trip, and is attending the FOC meeting in New England.

Turning to the Bulletin, one notes how, despite the conditions being down, doubtless due to the high sunspot count, there has emerged a new type of operation on the band, by the "super-station" types—W1BB is thinking of a long ragchew on SSB between G3SZA, K1PBW, and ZL2BT. Such stations as these, plus ZS6DW, N1AAR, W8LRL, W6SE and so on, are rolling back all the barriers to good and solid contacts. W7TB, lying 1500 feet down in the bottom of an Arizonan canyon managed to snag EI8H and DJ8WL, for example—the sort of QSOs where W1BB is sitting and just not hearing the DX end! On the receiving side (which in the urban places is the limiting factor) we notice that G3LIQ is running a receiving loop with 5-foot sides, all-same the ARRL *Handbook*, with which he has heard VK and W1BB, among others. PA0HIP makes a good point when he writes to W1BB that DHJ and OSN are not necessarily good indicators of conditions, in that both are liable to spend much time at low power, of the order of a few hundred milliwatts. One of the super aerials is that owned by WA0ZHH, who has four 130-foot towers arranged on a half-wave square, with a fifth one smack in the middle so that he has choice of 8 ways to radiate. He now reckons, with some experience of the system, that the towers should be half-wave high!

For W1BB, the year has been marked by a couple of jokes against himself: first one is the matter of transceive operation with the Drake "twins", when one just looks at the knobs, sees them apparently on the right frequency but doesn't note the beast is on transceive—the result of course being the rather startling sound of W1BB transmitting in the DX-window! The other one was the

case when some local louts managed to bar the shack door while Stew was working some DX. The bar was a piece of two-by-four, secured with several loops of No. 12 house-wiring cable. No other way out, so Stew had to give K1PBW a shout, ask Ernie to alert the local Law to come and get him out!

### Eighty

While, like Top Band, Eighty in general terms has been rather down in terms of real DX, there is still quite a bit happening. Lots of rag-chewing on SSB, the odd AM station in the CW end (shoot that man, sergeant!) and of course the QRP experts, who are mostly on CW, around the middle of the day. Even in the cold of March, G2NJ (Peterborough) found G2CAS/P near Wetherby, and G5NX/P in the Lake District. Conditions through the month weren't all that good anyway, with a high noise level, but the "regulars" of course were able to notice and make use of the quiet times. The biggest QRP signal heard after dark was GI3LFH who was a 589 to Nick, when he tGI was using five watts.

Another, and slightly different approach to the game is that practiced by G5NX and G2NJ—the former driving and using VHF, while G2NJ sat in the back with the Uniden, bashing out CW non-stop to a queue of signals.

G3PKS dismisses the band as being not of any great interest, although he does indicate the odd opening into OH/LA/YU during the mid-afternoons, even though he did not feel moved to do anything about them.

Just one contact is mentioned by G2HKU, Ted having connected with W2FC on CW.

### Forty

This is a band you either love or hate; and if you like it, you are likely to have shifted elsewhere to get a few hours in while the sunspots are doing their thing higher up in frequency! Seriously, though, if you can work DX on this band during the normal evening hours, you will be able to sit back and congratulate yourself on knowing how to drive a receiver on the one hand, and how to copy through QRM on the other!

On the plus side, there is the thought that you aren't so likely to have TVI on 7 MHz. G3PKS mentions it as being another spot for European QSOs on CW or SSB, but he does mention his contact with K1BX, who held G5AHV at one time, and one with VE7CM in BERU.

Looking at the letter from G2HKU we note he has given it a whirl with CW to K1RH, K2GGN, K4PQL all going into the log.

As for the writer, there has been quite enough hassle in other directions to keep him quiet, but on occasion the bandswitch dial was twisted down to that area, the CW filter switched in, and a careful search nearly always showed some DX at least; but we didn't bother to press the key, due to the thought of all the QRM which seemed to be waiting to pounce on any QSO to DX.

### Oddments

A separate letter from G4BUE (Upper Beeding) shows some interesting points apart from the ones already mentioned, which were at second-hand, though correct. Chris mentions his Argonaut has been modified so that he can take it right down to ten milliwatts input. At this low level, East Coast Ws were being worked on Ten, about which more anon. What is so interesting about this is that the measured power output at this level of input (10 milliamps at one volt) showed an output, as measured on a 'scope, of a very low efficiency indeed, with some 576 microwatts emerging from the aerial socket! Of course, there will be some difference between doing such a measurement in the lab. and doing the same on the aerial: for instance, the microwatts must go down the feeder to the aerial, which therefore gets less RF. To work Ws with this sort of power must be something of a first. What has also emerged is the way in which the Argonaut PA stage likes to have about the right voltage and current for best efficiency at any given input; for a one-watt input, the best output is obtained by using 4.25 volts at some 235 mA, as an example.

Still with G4BUE, let him now put on his QRP Club hat, and discuss the winter QRP contest put on by the AGCW-DL gang. The first six places went to: G4BUE, OK1DKW, G8PG, GM3OXX/A, DJ6FO, and G3DNF

—all but DJ6FO being G-QRP club members! Other members in the list included G3NEO at 14th, G4GIE at 20th, G4EJN 26th, G4AYS 28th, these all being from a total entry of 46 in Class A. What a fine showing from U.K. in a contest—and a pleasant change; congratulations to all.

G3PPR (Sherborne) says the school club have now got their Quad up in the air, and it is doing well despite being rather hemmed-in by buildings, not to mention it staying in one piece during the Force 9 gales. It is of interest to note that the tuning of the stub on the Quad is quite important, a change of three inches at the stub in the position of the shorting bar being enough to make a six-fold difference.

To make a complete change of tack, there have been various tales of BY stations on the air; BY1AA, saying his name was Pyng at a Peking address turned out to be a phoney, and we suspect that the BY1AR reported to the SWL column may have been somewhat similar; on the other hand, what does one make of the report that HB9APN, Lambert, is at the Swiss embassy in Peking, and was putting a signal out in the phone bands, as HB9APN/A/BY, or HB9APN/BY according to other reports? The signal is being heard in the W6 country, and the reports of its validity come from HB7MQ, who is understood to have at one time been DX editor of the Swiss national society magazine. One wonders...

### Ten Metres

Has most definitely been doing its thing. G3PKS says that he "leaned heavily" to cause a report to come from G3OTK from up the road. It seems Richard has been on Two metres for a long time until rumours reached him of the goings-on on 28 MHz. Thus, he built a transverter to bring his Icom-IC202 on to Ten with some 0.4 watt p.e.p. of SSB to a 2N3553, with which he managed to reach western U.S.A. on the key and the Eastern Seaboard on SSB, but it was tough going. A linear was therefore next on the list, and this uses a power FET, (the Siliconix VMP-1) to give some ten watts p.e.p. to the dipole. It is even more of interest to G3PKS that when he is operating a few KHz away, G3OTK

doesn't have any problems but just goes serenely working the DX. On SSB there were A4XGY, WA1SQB/HC8, 7X2BK, HI8IH, and FG0DYM/FS7, while the CW dealt with ZF1SV, LU6FAD, OH3XX/OHO, ZE3JO, HK0BKX, HI8IH, not to mention G3PKS several times!

G3PKS himself reckons the band was quite unpredictable, varying from moribund to world-wide. BERU gave with VE3KZ, VE2AEJ/3, VE3DDU, VE3IXE, VE3FAC, and VE3BGA; others in date order included EA3AVV, W4BIZ, ZB2CJ, UA4PNT, LZ1QY/MM in the Gulf of Guinea, WD4JBR, GM3MHG, UB5MKG, and RA4AKC. The latter was followed by UB5MMR, and a CQ DX call on an apparently empty band, which set up quite a wolf-pack among which one could hear a JH2 and a UL7; but Rod chose WA6CLK, who commented that to hear a G was a bit of a surprise as it was at least 2 hours before Gs were normally to be found. A lucky dip just before his letter was written managed a reply from ZD8TM first call through all the wolf-pack.

It seems to have been pretty well all CW for G2KHU, who mentions KØFX (Colorado), AFØQ in Minnesota, W7IR for Arizona, KØUK in Colorado, K7NO, N4AR, K4VAA, VE6APN, and N6BT.

It is a combined 21/28 MHz report from G4BUE, with his five watts to an Argonaut in the CQ WWWPX SSB 'Test', with which some 700 QSOs were made: all W call areas, all JA, UL7s, UA9, UAØ, WL7AAG, ZL1AJU, AX6CT, VK4NPX, HL9KE, 9L1CA, EL2AV, UI8LAG, TF3YH, FG0DYM/FS, VO2CW, W1BIH/PJ2, WA7UWE/C6A, CT3BX, YV5CVE, CK7WG, KP4Q, HI8MOG, HI3XEA, UJ8JCR, KL7IRT, HI8XDJ, AL7J, KL7HR, PY2EE, ZX2XB, AP2KS, 8P6BT, OX3FG, VP1KG, and YY4YC.

G3PPR reckons the band was very good when they got there but they usually looked at 21 MHz to see how the Pestilence of Poltava was getting on, and stayed there; however, when they did finally arrive on Ten they were spoken to by all W call areas, while FG7TD and KL7RA were Gotaways, the latter under a huge pile-up and protesting that there were "plenty of Alaskan stations about" and failing completely to get rid of the callers.

G4EAN (Nottingham) stuck to working all the Ws, with such as W7AO, WD9INX, N2ABS, N4BKX, not to mention K1BK/M1.

We almost forgot to mention G2BJY (Walsall), who, along with everyone else, dislikes the current U.S. callsign allocation business as being very confusing to the rest of the world. Geoff managed HA7KTK and HA7NC to complete the clutch for the Danube Bend award, and also keyed with LU7HI, PY2JN, SV1IS, UA9s, UI8IZ, KF4O, WA7VZI, 9H1R, and 4X4FW.

**'CDXN' deadlines for the next three months—**

June/July issue—June 7th

August issue—July 5th

September issue—August 2nd

October issue—Sept. 6th

*Please be sure to note these dates.*

**Fifteen Metres**

Still with G2BJY, Geoff notes "lots of U.S.A. stations with weird prefixes," plus a lot of JAs and their variants, VO2CW in Labrador, 4Z4TZ, ZL1AXN, while the Commonwealth contest came up with all VE call areas but VE8, VO1KO, ZL3GQ and 9H1CH.

Just a couple from G4EAN, who seems to have spent too much time clearing up the shack—WB3DEJ and K1BDP.

G3PPR notes N1AAR, running a Sterba curtain array, and solid QSOs with W1-6, the contact with W6OCU being Rod's first Californian, VE1-3, several JAs, AJ4L and AB5A about which last two G3PPR enquires "can someone explain the excitement produced by these gentlemen?" On a totally different tack G3PPR was showing 3.5 MHz to some fifth-form chaps who rapidly got bored and asked "please can we speak to Japan"—quick flip of the switches to 21 MHz and Quad, and JA4SHD in Hiroshima obliged!

G2HKU wanted to make sure his HW-8 batteries weren't too flat, so he keyed with SM5CBC before hurrying off to other places.

G3PKS had a few short spells in BERU, to a total of about 1½ hours, from which VE3BC, VE3CXL, VE3ETV, ZL2LA, VE3BFF,

VK2GT, VE1AIH, VE3BQL, VE1EP, VE1BP, VE2KZ, VE3IAE, VE3DAO, and VU2GO were picked; outside the contest, came VE3DMC, PY3FMC, P29EJ, EA5CV, and some small fry. Jack felt conditions were not at their best on several days.

Now 14 MHz, where most people leave the bandswitch most of the time. Whenever G3KFE switched on, which it must be admitted wasn't very often, there seemed to be something doing, if only you could hear it all under the TV timebases and other noises.

For G3PKS time was severely restricted by a holiday, a spell of flu of the "three weeks and wish I were dead" variety, and most of all temperatures like—6 degrees in the shack! However, there was about an hour in BERU, which gave with VE3MXE, VE2FYR, VE3KZ, VE5RG, VE3DAP, VE2CBM, VK2BAT, ZL1AXM, ZL3KR, and 9H1CH. Out of the contest an addition was VK4ALB in Brisbane who was hitting the S-Meter needle to S7 on the morning of April 4.

G2HKU seems to have had a bit of a ball on 14 MHz; on SSB we note W6CNR, W6TT, ZL1VN, ZL1QQ, ZL1AAE, ZL3FV, ZL3RS, and ZL3SE, while CW took care of VE3GCS, VK3BZ, UK6ACQ, WB4BNH, UJ8JAS, K5JZN/Ø, VE3KZ, VE5RG, VK3MR, WB7QYI (Oregon), LU9EBS, and ZB2EO.

Just one contact was the form for G4EAN who came up to grab VP2MBU on SSB.

**Finally**

That is about it for this time, with quite a lot of mail known to be still in the pipeline, and the mails becoming ever worse—DXNS was posted by RSGB from Watford at 1000 on April 4, first class, and arrived here the day after West Coast DX Bulletin of the same date; four days for first class mail as an average is worse than we have ever known, and it does seem to be spreading from London, as the main blockage, to be all over the place. The English Disease again.

However, no good crying about it, we must keep on; deadline dates are in the 'box' in the piece, and the address "CDXN", SHORT WAVE MAGAZINE, 34 High Street, WELWYN, Herts. AL6 9EQ.



# A FIELD-EFFECT TRANSISTOR TRANSMITTER FOR TWENTY METRES

PETER LUMB, G3IRM

UNTIL recently field effect transistors have been low power devices. A few attempts have been made to produce unipolar transistors for higher power uses but these have only been in the one watt class. However, several firms are now making high power field effect transistors and one, in particular, has published designs for RF use. As usual, though, these designs are for VHF.

This article describes the writer's attempt to make an all-FET transmitter running about twenty watts input for CW on twenty metres; there is, of course, no reason why the design should not be varied to suit other bands.

## Circuit Description

In order to simplify the design and ensure good stability together with clean drive, a crystal oscillator was used but variable frequency excitation can be substituted if desired. As the circuit was intended solely to give power field effect transistors a try, it was kept as simple as possible and a higher power variable frequency version is now under construction. The oscillator transistor is a *Siliconix* J310 which is obtainable quite cheaply and works well in the circuit. A tuned buffer (or doubler) stage follows and another J310 can be used provided a small heat sink is added; a better transistor is a 2N4861 and this is to be preferred. Both stages are keyed by breaking the source leads. It will be seen from the diagram that the oscillator is fed from a 12-volt stabilised line and the buffer from the full PA voltage supply. If a second J310 is used as a buffer it should be connected to 12 volts omitting the 68-ohm decoupling resistor; though this will, naturally, result in reduced drive to the driver transistor.

The driver and PA transistors are VMOS devices by *Siliconix*. Field effect transistors manufactured by the planar technique are horizontal devices and the current carrying capacity is limited; VMOS transistors, on the other hand, use diffused channels and vertical current flow to obtain higher power capabilities. Transistors are now available with breakdown voltages of 400 and others have current carrying capacities of over 10 amps. There is quite a range available but they can be divided into two types—those incorporating a protective Zener diode at the gate and those without. For RF applications unprotected devices are more useful but care must be taken to ground the gate lead when connections are made or desoldered. *Siliconix* made one VMOS FET specially for RF applications—the VMP4—but this is expensive and need only be used at higher frequencies. For the DX bands most other types are suitable.

Power Mosfets are somewhat similar to valves in that they are voltage operated, but differ from valves as they operate in reverse. A valve draws maximum current at zero bias and requires a negative bias supply to reduce the anode current; the mosfet, on the other hand, draws no current at zero bias and requires a positive bias

(or drive) to produce drain current. The bias can be obtained from the same power supply as the drain. Thus devices are self-protecting if drive is removed.

The transfer characteristic of a typical VMOS device is shown in Fig. 1 and it will be seen that at gate-to-source voltages above about 3 volts, the characteristic is very straight implying excellent linear amplification. At a gate voltage of 8 volts drain currents over 1.5 amps can be expected.

Each of the two main groups (protected and unprotected) can be obtained with drain-source voltages of 35, 60 and 90 but for experimental CW purposes it is necessary to select a transistor with a maximum drain-source rating of twice the supply voltage. Most VMOS transistors have a maximum drain current capability of 2 amps, but some are higher. The two devices used in this circuit have 60 volt breakdown ratings. The driver transistor is a VN66AK in a TO39 case and it must be provided with a heat sink; the PA transistor is a VN66AJ which needs a TO3 heat sink.

## Impedances and Matching

The input impedance of a VMOS transistor is many millions of ohms in parallel with a capacity of about 33pF. In numerical terms it varies from 200 ohms at 2 MHz, to 60 ohms at 60 MHz—which is considerably higher than can be expected with bipolar transistors. To couple the driver to the preceding buffer stage a simple link coupling is used with an anti-parasitic bead at the gate lead. VMOS devices can be operated with negative, zero, or positive bias and Class-C is obtained by simply returning the gate to earth. For experimental purposes provision has been made to add a little positive bias fed into the cold end of the link coil; with the high gate resistance of a VMOS transistor low resistance bias sources are unnecessary and a simple divider from a stabilised voltage is all that is needed. This stabilised voltage through another divider is used to bias the PA stage as required. The output circuit for the driver is matched to about 50-80 ohms and the trimmer capacitor can be used to adjust the tuning. (Remember, voltage is needed for drive, not power). The load on the driver is the 100 ohm resistor in parallel with the PA input which was estimated to be somewhere between 100 and 200 ohms: hence the matching circuit used. Should it be desired to change to other bands all the necessary calcula-

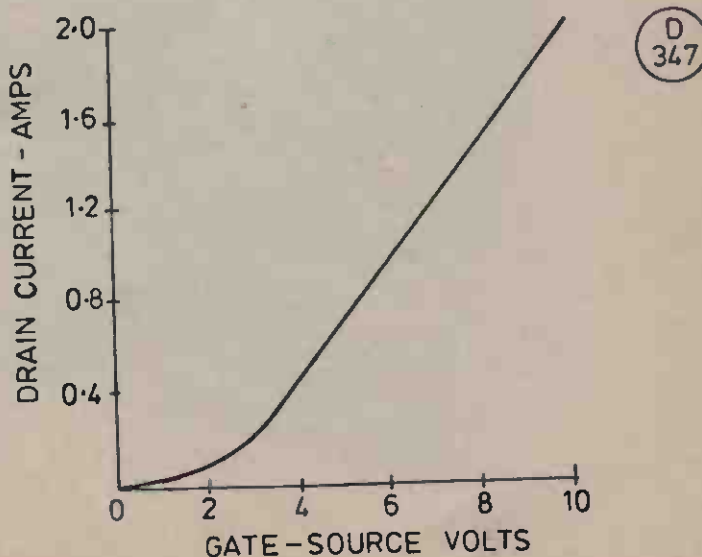


Fig.1 VMOS TRANSFER CHARACTERISTIC

tions can be found in Application Note AN267 entitled "Matching Network Designs with Computer Solutions," published by *Motorola Semiconductor Products Inc.* An alternative source can be found in either "Solid State Design for the Radio Amateur" or "Electronics Data Book," both published by the *American Radio Relay League*. The same calculations can be used to match the output transistor to 50 ohms and a similar network can be used.

#### Adjustments

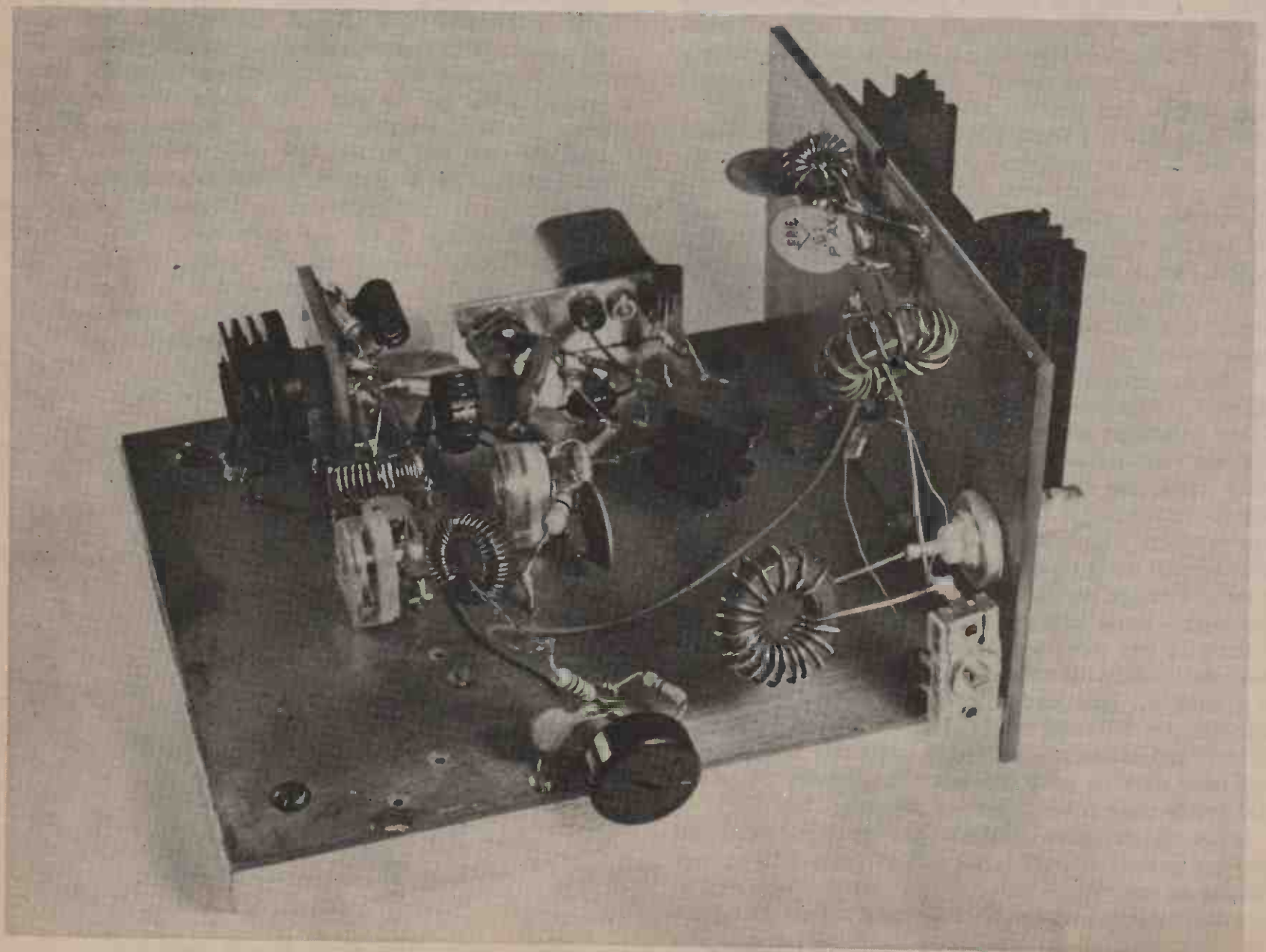
To line up the transmitter it is only necessary to use a 50-ohm load with a suitable monitoring RF probe or output meter. With supplies to the driver and PA disconnected, key the oscillator and buffer stages and listen for the output on a receiver. Set the two bias resistors at zero volts and temporarily disconnect at point 'X' and connect the dummy load and probe to the output of the driver; add a 1 amp. meter in the drain lead to the driver and tune C15 for maximum output. Remove the load and probe and reconnect point 'X'. Transfer the load and probe to the PA and connect a 2 amp. meter in the PA supply lead; tune C22 for maximum output and re-trim C15. (This procedure is not really necessary, but it at least proves all is well and shows what is happening). It is now possible to increase the bias slightly on the driver, watching the drain current

### Table of Values

Fig. 2

C1, C7 = 0.1 $\mu$ F	R1 = 82K
C2, C4 = 220 pF	R2, R9 = 100R
C3 = 82 pF	R3 = 150R
C5 = 39 pF	R4 = 33K
C6, C15 = 60 pF max.	R5, R6 = 68R
C8, C12,	R7, R8 = 470R
C17, C19 = 2.2 $\mu$ F	R10 = 270R
C9, C11,	RV1,
C13, C14,	RV2 = 470R
C16, C18,	TR1 = J310 Siliconix
C20 = 0.01 $\mu$ F	TR2 = 2N4861 Texas
C10 = 22 pF	TR3 = VN66AK
C21 = 68 pF	Siliconix
C22 = 140 pF max.	TR4 = VN66AJ
ZD1 = 12 volt Zener	Siliconix
ZD2 = 9.1 volt Zener	FB = Ferrite bead
L1 = 1 mH choke	
L2 = 15 turns on T50-2 with 3 turn link	
L3 = 6 hole ferrite bead, single wire passed through each hole	
L4 = 40 turns on T50-2	
L5 = 35 turns on T50-2	
L6 = 15 turns on FT37-61	
L7 = 17 turns on T68-2	
L8 = 19 turns on T68-2	

Note: C10 and C11 connect direct from L3 to ground.  
C18 and C19 connect direct from L6 to ground.



The G3IRM FET transmitter



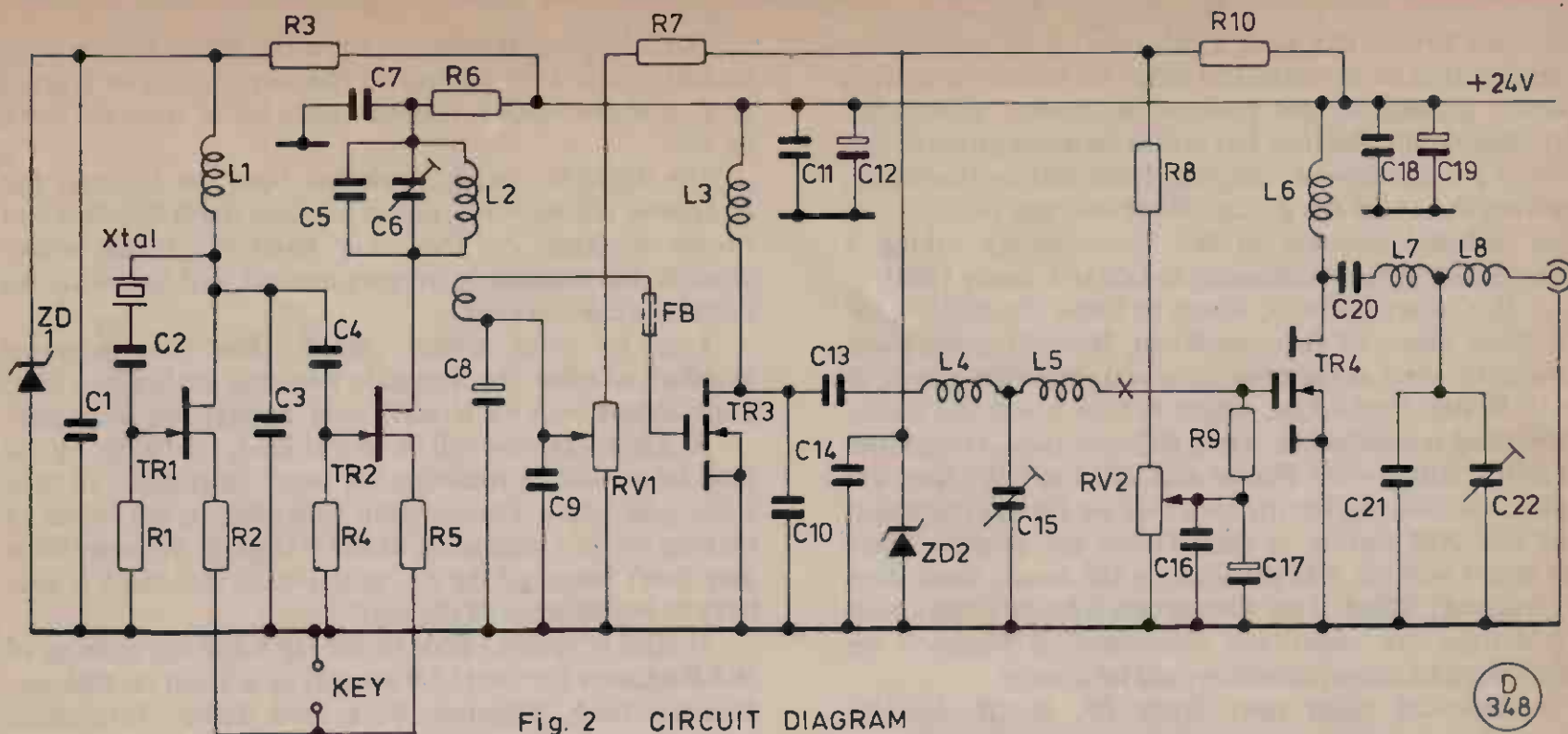


Fig. 2 CIRCUIT DIAGRAM

and noting the effect on the output. Repeat with the PA bias supply and retune the capacitors if necessary for maximum output. By setting the bias to a suitable-value Class-AB linear, amplification of SSB (or CW) signals can be obtained. Adaptation to SSB has not been tried but should present no serious problems.

**Final Notes**

A few notes on the advantages of VMOS transistors may be mentioned. VMOS transistors do not suffer from thermal runaway or secondary breakdown, and there is no minority carrier storage time. Any SWR can be handled from open to short circuits at any phase. Try this with a bipolar transistor if you dare! Any class of operation is possible—A, AB, C or switching Class-D. If more power is needed VMOS transistors

can be connected in parallel without current hogging and ballasting resistors are not needed; capacitances are, of course, increased.

The photograph shows the method of construction used which will be found suitable for temporary breadboards at HF. (It must be mentioned that the writer's constructional projects normally are of a higher standard than one might guess from the prototypes!). The board consists of a piece of plywood covered with printed circuit board, copper side upwards; all earth connections are soldered down to the copper and insulated points are made by drilling a small hole through the board and into the plywood. If the hole is countersunk to remove the copper, 'Veropins' can be pushed in to form insulated points.

• • • SWL • • •

SHORT WAVE LISTENER FEATURE

By Justin Cooper

THE main topic this time round must be the U.S.A. prefix allocations. To be fair, the Americans themselves are quite happy with the system now in use, though it looks to the rest of the world as though prefixes are being granted at random. Let us try and clarify the picture. All the possible U.S.A. calls have an initial letter W, K, N or A. Previously a second letter, and maybe even the number, would indicate a station from part of the American 'empire' without any doubt. What has happened is that instead of regarding such places as the U.S. Virgin Islands as requiring distinctive callsigns, the American authorities have lumped them all in with the mainland with the calls being dished out along lines defined by the licence level, whether General, Novice, Technician, Advanced, Extra or whatever. At least, that's what *seems* to be the situation!

All this naturally brings up the whole question of the continuance in its present form of the HPX Ladder. At the moment, the feeling is that we should go on with it, and sticking to the existing Rules exactly; so if you are the proud possessor of, say, a KH6 in your log, claim it as such regardless of whether it is in what used to be known as KH6 or is a plain Californian Kilowatt. If we give it a whirl, we can see how it goes, and make a firm decision as to whether to scrap HPX, alter the Rules, or go at it as we have always done.

**The Mail**

A. Oakley (Blackburn) is a bit hot under the collar because after he had done 3-4 weeks at the local RAE class, County Hall came into the act and stopped them all on the basis that they would not allow anyone on to a course under the age of fifteen, regardless of the fact that

that same person can hold a call (and so by implication accepting that he can take the exam for which he needs a course!) granted by the national authority. About the only consolation Andrew has is that he is not alone in this—there are regulations, differing from county-to-county, covering the 14-16 age group. Were this not enough, one finds different colleges in the same county taking a different line without bothering to talk to County Hall!

*I. D. Calvert (Shipley)* wants to know the address for *DX News Sheet*: 62 Belmore Road, Norwich is the place to write to—and at the same time you can order a copy of Geoff Watts' *Prefix List*, which is well worth the effort, and indeed is invaluable. On a different tack, Ian queries the HPX Rules—200 Phone and 200 for CW; they are separate tables. As for the idea that we should require at least one AM station in each Phone list up-date, there just aren't enough AM stations on the bands these days to go round! Mind, if an AM station is heard (Amplitude Modulation, we mean, not /Aeronautical Mobile!) we would want to know, as such would be a rarity.

A technical point next, from *Dr. W. B. Jamison (Larne, Co. Antrim)* who wonders about the use of coax feeders to a dipole. Theoretically it is a bit naughty; either you come down from the dipole in low-impedance balanced feeder and fit a balun where the feeder goes into the (unbalanced) connection to the receiver or, better, fit the balun at the feedpoint of the dipole and come down in coax. Practically, there doesn't seem to be a lot in it for a receiving amateur. Years ago, old J.C. used to have a job which took him out on to an antenna test range quite frequently, and he recalls doing some measurements on UHF aerial designs: there was no distortion of gain or polar diagram that could be pinned down at all—any variations were within the variations one would expect from high-grade lab. test gear.

*H. A. Londesborough (Swanland)* is over the 1000 mark both on Phone and CW; and it is of interest in that we wonder a bit about his HV2VO heard on 21 MHz on March 24, the more so since none of the usual grapevine outlets mention anything of that nature.

*G. F. Green (Middlesbrough)* sends in his first list, and we note he has dredged up a remarkably large number of AM stations and then comments that there is a dearth of them about! The fewer the better, we say, at least on the HF bands, as any OT will tell you what a band-full of AM carriers was like!

Thanks to the high sunspot count *J. Fitzgerald (Gt. Missenden)* has been enjoying the DX on Ten and bemoaning the lack of activity on the 3.5 MHz Phone segment where he usually lurks. John will be taking over the equivalent spot to this in the ISWL publication—best of luck from us all, and we hope he gets lots of support.

Another one with a double-entry letter is *D. W. Waddell (Herne Bay)* who now is near the 1000 in CW, and at the top of the 1979 Table to boot. The lad's been working on it, obviously!

We do occasionally slip up—and it's nice to find someone who blames it on his own dilatoriness when the mistake was in fact at this end! In the Jan./Feb. issue, we took him in at 902—but since we acknowledged receipt of his letter in the final paragraph, we should have shown him 938. Probably the result of a strayed paper-clip, but annoying none the less, for *D. Taylor (Harborne)*.

*B. F. Hughes (Worcester)* has a thumping 76 points to add to the 1694 already in the bag, thanks to a good session at the ARRL contest and a bit of time off work as well.

On the other hand, work has been the bugbear for *P. Leather (Camberley)*, not to mention the RAE class and Morse practice; on the other hand the bitter winter weather has assisted by staying around well into what we hopefully call "Spring".

Like so many others, *D. G. Sim (Southampton)* wonders whether the Stateside licensing authorities have gone beserk—we've already said enough on that one!

*K. Steele (Derby)* will be in YU-land, probably, by the time he should be receiving his issue; he reckons to take some gear and a Tavasu whip with him, in the hopes of making contact with some of the YU gang. We only hope they don't impound the rig on arrival so that the YU lads have to bail him out of the jug!

*D. Hill (Crawley)* adds to his HPX-ing the chasing of WAB squares for the HAB award; he is short on Orkney, Western Isles, Alderney, Sark, and Scilly. Interesting point about Scilly—G3UUZ is on there when he's not on the Bishop Rock lighthouse being televised (and giving out a unique WAB square from the Rock, at that!), G5BIU is still licensed from an address in Hugh Town, and G3RPC is up on Telegraph—see if you can see his quad from the sea, near the station end of the Decca aerials. We might add that old G3KFE and G3UUZ have both noted that, not far from the G3UUZ residence, up on the Garrison, there is a point where no less than four WAB squares adjoin, and it seems not impossible to get power to that same spot. We also note that David has a CW offering in the ladder—he comments that SWL participation in a contest shows up how much he needs to make up before he actually gets to punching the key for himself.

*S. B. Harris* sends in an up-date of some 96 prefixes to a previous list which we don't have trace of in the file; Stuart says he has made a change of gear, in anticipation of passing RAE and Morse, to an FT-101EE. At the moment this is "sniffing the air" from an ATU and ended wire, but a 14AVQ is going up soon, plus a dipole for Eighty.

*D. Brooks* and his XYL, *Judith (Loughborough)* both took the Morse at Trusthorpe the day before writing, and both passed, so we should hear their callsigns next time. A good effort by both, and showing just how easy it all is once one sets the mind seriously to it. On a different tack, they now have a set of G3HSC Morse records and an ex-R.A.F. key to dispose of, gratis, to someone seriously studying for a G4 ticket. Contact them direct at 28 Avon Vale South, Loughborough.

Nice to hear again from *S. Foster (Metheringham)*,

## ANNUAL HPX LADDER

Starting Date, January 1, 1979

SWL	PREFIXES	SWL	PREFIXES
D. W. Waddell (Herne Bay)	499	C. Stevens (Spondon)	253
S. B. Harris (Coventry)	369	R. Miller (Chelmsford)	209
G. F. Green (M'brough)	271		

200 Prefixes must have been heard, since January 1, 1979, for an entry to be made. See also HPX Rules.

who seems to have spent quite a bit of time at the receiver, to collect up some 52 new prefixes, and his all-time countries score to 310, by way of Desecheo, Mayotte (FH80M) and, earlier, 4U1UN and STØRK. Listening is mainly late evening, with the occasional 0600-0700 session.

*B. Shepherd (Staines)* has modified his FRG-7 to the Toko filter, and reckons the effort well worth while, as the scoring rate immediately showed. Thus, by adding the rarer ones heard before the FRG-7 came on the scene (some dating back to the fifties) an ATPW score now adorns the Table. On a different tack, Briant recalls that prior to the attack on the U.S. Embassy in Iran in mid-February, he heard a station calling itself "Cactus Pete" trying to contact "Lucky Debonair" as to the proposal to "land a communications satellite in the grounds of the embassy in Tehran." This was around 14345 KHz and in the afternoon. Clearly one might deduce that these two odd names were involved in the attack, since this was before the event, and equally clearly they seem to think radio amateurs in general are dim enough not to perceive the import of such traffic. They might not have rumbled it then, but they certainly do now, and we strongly suggest that if anyone hears such traffic they note (or, preferably record) the details and pass them immediately to the local police who will know how to deal with it. One can understand someone turning a blind eye to piracy, but turning a blind eye to terrorism and murder is not feasible.

Yet another one to be upset by the comic prefix scheme now being used in U.S.A. is *M. Shaw (Huddersfield)*. One would guess that, having read thus far, Malcolm is in no doubt about J. C.'s view of that!

*E. W. Robinson (Bury St. Edmunds)* sends in his 47th entry to the Table, and indicates some degree of annoyance that he heard 601FG operating from Somalia; one of these "list" jobs, and 601FG was just calling stations and giving their reports, without once actually mentioning his own callsign; so—no claim! We agree, and most DX operators and SWLs dislike "list" efforts, but one has to admit that it does make life a little easier for the chap at the sharp-end. But we see no reason why he should reciprocate by breaking the conditions of his licence!

The letters from *D. C. Casson (Reading)* could almost justify a column to themselves. We think, to start, that we have sorted out the tangle at this end with the HPX. Among the prefixes, Derek mentions his pleasure at hearing VS6EZ—as he was describing his place near the China Fleet Club it brought back memories of R.N. service in 1946-7. We seem to recall that the China Fleet Club has also been Hq address for the Hong Kong amateur radio club since then; and we ended up wondering whether Derek is a member of the R.N. ARS—he ought to be!

*R. Miller (Chelmsford)* returns to the fray with an entry for the Annual. We were rather amused at his description of sitting at 199: almost netting a BY call which disappeared under heavy QRM, then tuning across to find who the offender was and find JA3CQI working a French station—both ends audible and the 200 up in an unexpected way!

Thinking on about BY2AR who disappeared before definite identification mentioned in the last paragraph,

## HPX LADDER

(All-Time Post War)

SWL	PREFIXES	SWL	PREFIXES
<i>PHONE ONLY</i>		<i>PHONE ONLY</i>	
K. Kyezor (Brandon)	2043	D. J. Byers (London N7)	758
B. Hughes (Worcester)	1770	M. Ribton (Oxted)	731
S. Foster (Lincoln)	1744	D. Hill (Crawley)	707
R. Shilvock (Kingswinford)	1650	K. Kniveton (Kingswinford)	706
J. Fitzgerald		A. Twelves (Rhos-on-Sea)	698
(Gt. Missenden)	1610	L. Stockwell (Grays)	670
R. Carter (Blackburn)	1510	P. Leather (Camberley)	669
E. W. Robinson		D. A. Robinson (Felixstowe)	646
(Bury St. Edmunds)	1465	G. Brazil (Dublin)	635
M. J. Quentin		R. Jacobs (Margate)	617
(Wotton-u-Edge)	1416	D. G. Sim (Southampton)	599
M. C. P. Bennett (Datchet)	1385	D. Casson (Reading)	561
H. A. Londesborough		T. Anderson (Stroud)	549
(Swanland)	1381	B. Shepherd (Staines)	531
J. H. Sparkes (Trowbridge)	1164	R. C. Mackay	
H. M. Graham (Harefield)	1105	(New Romney)	516
M. Rodgers (Harwood)	1046	Mrs. J. Brooks	
D. Taylor (Harborne)	942	(Loughborough)	500
P. L. Shakespeare (Foulness)	927	<i>CW ONLY</i>	
M. Law (Chesterfield)	918	H. A. Londesborough	
K. A. Burch (Plymouth)	911	(Swanland)	1140
B. T. Mackness (Dagenham)	881	D. W. Waddell (Herne Bay)	963
D. Brooks (Loughborough)	837	J. H. Rosling (Bakewell)	750
K. Linge (Willingham)	835	H. Scott (Wetherby)	674
M. Shaw (Huddersfield)	804	P. L. Shakespeare (Foulness)	671
R. Towlson (Nottingham)	764	K. Kniveton (Kingswinford)	310
J. A. Nicol (South Croyley)	761	D. L. Hill (Crawley)	298

Minimum score for an entry: 500 for Phone, 200 for CW to be heard. Listings include only recent claims, and are in accordance with HPX Rules. A 'nil' return is permissible to hold a place.

raises an interesting question in that the QRM was also from the same area as a real BY would have been: and with the amateur radio noises being made by those in authority in China that might just have been a genuine BY and hence the first such for many years.

Another hang-up on the Ladder is noted by the top scorer *K. Kyezor* who is now installed at *Brandon* in Suffolk, where he finds the signals are adequate from most easterly directions out to the Far East, but a lack of much activity from South America reaching his aerial—which we find a bit surprising in view of the flat countryside which we would have thought would give a clean take-off in pretty well any direction.

*J. Timms* is now residing on the eighth floor of a block of flats not far from the *Barking* club Hq; this has a fine take-off from north-east round to west, and the move is the result of the lad getting himself "hitched". Congratulations to John and his XYL from us all.

Perhaps the first correspondent to this column to mention it—*M. Law (Chesterfield)*—not only managed to hear YI1BGD but also got a card back. On a different tack Mike questions "V2XO" which we reckon to be a phoney or a mis-hearing.

*T. Anderson (Stroud)* is still suffering from QRM from TV sets around the place. Some are worse than others, and the relative orientation of aeriels and feeders is important. Some consideration to the earth for the SWL rig is worth while too, in that it is not impossible for the QRM to be coupled to the earth leg of the house mains. Now, if any of the earth to the SWL rig is common lead, then that common section will have resistance, and hence voltage drop across it when any current flows; hence if for "currents" we say "TV timebase harmonics", we can see that the earth connection to the communications receiver is going to carry the QRM signal up to the input terminals.

The problem is alleviated by using a suitable aerial which doesn't need an earth for its operation, while the safety earth to the receiver can then be treated to make sure none of the QRM can get to the input terminals. This can be a choke-type device, but it is imperative that the resistance of the choke be very low to DC, lest the additional R be enough (added to what is already present) to inhibit the blowing of a fuse should an earth fault appear on the receiver. If one talks of 13 amp fuses, a reasonable fault current to ensure reliable blowing would be 26 amperes, which implies a *total earth resistance* (fault, plus resistance of wire, plus actual earth resistance, plus resistance of fuse, plus resistance of any choke used) of 9 ohms; and that leaves no room for manoeuvre at all. A typical station RF earth may be 30 or more ohms if it is a six-foot stake on its own with a 14/0076 wire lead to the ATU in a ground-floor shack, which is no use at all for safety. If one is going to dispense with the house mains earth to the receiver you've got to spend a lot of time getting wire down into the ground to bring it to a low enough level. And it should be checked to see that it is capable of fuse-blowing reliably before one places faith in it. On the other hand the performance of the aerial may be much improved.

J. Stott (Penistone) is at the starting-gate with a "Direx" receiver by G3RJV which we ran some time ago. Past experience was with a kit, from which the component board and various bits were identifiable, but in this case there is a bag of bits to be identified. Well, we might start with the resistor colour coding. Look at the resistor so that the colour bands are nearest the left hand end: there will be seen three, four or five coloured bands, of which the first two give the first two significant figures, the third band the 'multiplier', the fourth the tolerance, and the fifth will give an indication of the other characteristics (or be missing). The fourth will also on occasion be absent, in which case the tolerance on the resistance is  $\pm 20$  per cent. Now the colours are representing numbers as follows: black = 0, brown = 1, red = 2, orange = 3, yellow = 4, green = 5, blue = 6, violet = 7, grey = 8, white = 9. The fourth band may show as silver or gold, respectively 10 and 5 per cent; closer tolerances of 2 per cent and 1 per cent are shown by giving the fourth band the standard colour of red or brown respectively. Thus a 47K resistor will be yellow, violet, orange, and if it is of 10 per cent tolerance it will be endowed with a fourth band of silver colour. From the example, the function of the third band is a multiplier—the orange band says there are three zeros after the first two significant figures. A code using the same colour-to-number significance is also on occasion to be seen on capacitors, using four, five or six coloured dots. If no tolerance is shown on an item in the circuit/component list, the widest may be assumed to be suitable—although since the semiconductor came on the scene with its built-in self-destruct habit, (plus the availability of more stable non-wirewound types), it is often the case that one can find closer tolerances costing no more.

As to where the "beehive" capacitors go, this can be deduced from a look at the circuit diagram and a bit of inductive reasoning, the more so if you accept that you are going to mount your IC's direct to the board; clearly all your bits go on the non-copper side if you are using the strip board, and as far as possible all on one side if one

uses the non-copper stuff. This leaves a variable capacitor mounted to the box, and a scrap of board with most of, if not all, the rest of the bits mounted on it, saving the switches, S1 and S2 and the volume control RV1. One may go a bit further and have S1 as part of the RV1, but whichever way you do it these will be front-panel mounted items. Your bit of board can be mounted to the box with nuts and bolts (with suitable spacers of course, which can usually be found lying around the garage floor!), or if you are crude like J.C. the board is just held in place with a bit of *Blu-tack!* (The current invention in the shack is stuck to its case in the latter way, and the 'spacers' no more than matchsticks, at least until we get it "perking" as we want).

No wonder we mentioned earlier we couldn't find the first list from S. B. Harris—it was attached to the back of the letter from R. Barker (*Workshop*) by a misplaced paper-clip! Ron B. is ever more convinced of the improvement he has made in his RFG-7 by the modification he wrote up in July 1978 in these pages, and he would like a CW filter now—but there is a matter of RAE and Morse to be tackled meantime!

Does anyone know of a paperback or leaflet on crystal sets, wonders J. Waters, who lives at 33 Quarn Drive, Kedleston Road, Allestree, Derby DE3 2NR, and is an OAP wishing to do some experimentation with them. Contact him direct if you can help.

M. Ribton (*Oxted*) is attacking the QSL-ing game with a vengeance, having some 2500 cards to use up, but of course he has noted the snag that arises with the DX station quoting a QSL Manager who wants SAE/IRC—either you spend out on IRCs and an addressed envelope, or you find a dealer in foreign stamps with a list of what stamps are needed for the return trip from each country, so you can stamp the SAE correctly. Either way it is an expensive game, and only justifiable where a country is heard or worked which is really rare, in the sense of having no resident amateur population. In practice the return *via* the Bureau is about 65 per cent, although slow; the Editor recently got one for a QSO in 1968 from the Bureau, doubtless some DX station belatedly catching up on the chores.

L. Stockwell (*Grays*) is like to many others in hoping all is back under control again—we tell more directly by listening to the cuss-words coming through the wall!!

Work is an annoyance to an SWL says K. Linge (*Willington*) in the covering letter to his HPX list, and we couldn't agree more. However, we must admit that there are times when it is more interesting to read all your letters instead of fighting through a pile-up!

Finally, three letters which contained just an HPX list—these were from M. Rodgers (*Harwood*); a first one from C. Stevens (*Spondon*), and J. H. Sparkes of *Trowbridge*.

#### Deadline

Thanks to you all for so many interesting letters to mull over, and we look forward to hearing from you again by May 25, addressed as ever to "SWL", SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ. And, to be sure of reaching us in time, we recommend you get it into the post *early*. For mail going through London, it seems the service is slower now than it was 120 years ago! *Bcnu*.

# ANTENNAS—THE WEAK LINK, PART VIII

## TEST INSTRUMENTS

A. P. ASHTON, G3XAP

**I**n the earlier parts of this series we discussed the resonant antenna with its matched feeder, and looked at the method of efficiently transferring power from the transmitter to the feeder, and from the feeder to the antenna. We used terms such as 'resonant frequency', 'feed impedance' and 'standing wave ratio' and what affected these parameters. It is obvious that in order to achieve a matched system, we must be able to measure these parameters and to interpret the results. Indiscriminate use of test instruments can give rise to misleading results, and to emphasise this fact and demonstrate the possible outcome, it is proposed to commence this discussion with two examples taken from early G3XAP notebooks:—

1. An 80 metre dipole was erected at a height of 35ft. with a feeder of 75-ohm coaxial cable. The antenna was 'pruned' a few feet at a time until the SWR bridge (situated at the transmitter end of the feeder) gave a minimum reading of 1.04 : 1 at 3550 kHz.

2. A quarter wave vertical antenna was erected, and adjusted in length until a SWR of 1.10 : 1 was obtained at the desired frequency of 14050 kHz. The feeder was 50 ohm-coaxial cable.

Neither antenna appeared to function well in spite of the virtual absence of any reflected power, so the resonant frequencies were determined with a GDO. The 80 metre dipole was found to resonate around 3900 kHz whilst the vertical was resonant at about 14450 kHz. Unfortunately it was not possible to measure the apparent SWRs at the resonant frequencies of the two antennas, as this would have meant radiating 'out of band' signals in both cases. The two antennas were adjusted in length with the use of the GDO to resonate them on the desired frequencies of 3550 and 14050 kHz respectively, and the SWRs were checked at these frequencies. The measured SWRs were 1.75 : 1 for the dipole and 1.90 : 1 for the vertical—suggesting feed impedances of 43 ohms (75/1.75) and 26 ohms (50/1.90) respectively. These devices were used with these levels of SWR, and the improvement in performance was immediate on both bands.

At a much later date the two antennas were checked with a noise bridge and the results obtained were 39 ohms at a resonant frequency of 3580 kHz for the dipole, whilst the vertical gave 23 ohms at 14030 kHz. These figures not only confirm the resonant frequencies, but also show the inherent error in either the SWR bridge or the noise bridge. However, agreement in feed impedance results of around 10 per cent for the two methods of measurement is quite acceptable for amateur purposes.

The fallacy in the original method of trimming the antennas until the SWR bridge gave a very low reverse reading (*i.e.* low SWR) is quite simply that these devices are only reliable when used in conjunction with a resonant

antenna. The presence of reactance can distort SWR readings badly, as was seen in the examples above.

Hopefully the reader will now understand why readings obtained with test instruments will only be meaningful if all the conditions governing the use of the device have been met. (An antenna at or near resonance in the case of the SWR bridge). During the discussion on each instrument its limitations will be indicated, together with any precautions that need to be taken in order to obtain useful results. The devices are not listed in any order of priority or importance.

### The Field Strength Meter

This simple device, shown in Fig. 1, measures relative levels of RF radiation. The radiation picked up on its associated 'pick-up' antenna is rectified, the magnitude of the rectified current being indicated by the meter. The author uses this device in its simplest form—that is, with a simple untuned input (tunable devices are available which enable the pick-up antenna to be tuned to the frequency of the radiation which is being measured). The advantage of this is that by tuning the device to harmonics of the transmitter, a rough idea of the level of harmonic radiation can be obtained (or the level of any *spuri* for that matter). It should be recognised, however, that the response of the meter is frequency conscious—*i.e.* a reading of exactly half scale on 3.5 MHz, for example, does not indicate the same power radiated as an identical scale reading on, say, 14 MHz.

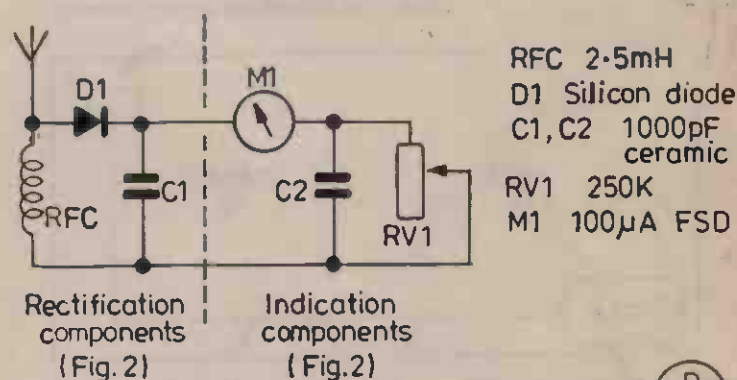


Fig. 1 The Field Strength Meter

D  
328

The field strength meter is a useful device if used correctly, but there are pitfalls. Firstly, the pick-up antenna should be located at least one wavelength from the antenna being investigated, and ideally should be similarly remote from both the feeder and the transmitter. Many amateurs have a field strength meter and whip antenna located in the shack, and they tune the transmitter plus antenna matching unit for maximum field strength indication. This practice can give rise to meaningless results—for example we could be simply tuning the matching unit in such a way that its coil is acting as an antenna; the radiation from it is probably close enough to the field strength meter to completely override any radiation reaching it from the true transmitting antenna!

Similarly, if a horizontal antenna is being adjusted to give maximum radiated power, and the field strength is being picked up on a vertical pick-up antenna, it is possible that radiation from the feeder (if it is suspended vertically from the antenna) can override horizontally

polarised radiation from the antenna itself. A further source of trouble concerns the fact that if the end of an antenna is trimmed in the process of adjustment, the point of maximum current (*i.e.* maximum radiation) is moved toward the feed point (current antinodes are a quarter-wave from the end of the antenna). If the field strength meter's pick-up antenna is poorly located, this point of 'maximum radiation' could be moving closer to it, giving the possibly erroneous impression that more power is being radiated from the transmitting antenna!

The field strength meter is, therefore, not ideally suited to the purpose of monitoring radiated field strength if the antenna's length is being adjusted but, for a given antenna, it is a very useful device when adjusting such items as antenna matching units, etc. The most important point to bear in mind when monitoring radiation from an antenna is the placement of the pick-up antenna in relation to the transmitting antenna, the feeder, the transmitter, and in some cases radials used with verticals.

Obviously, on bands such as 160, 80 and 40 metres, it is rarely possible to mount the pick-up antenna a wavelength away from the antenna, so location must be closer and a compromise exists. At G3XAP the pick-up antenna (untuned) is located at the furthest corner of the garden from the shack (and hence feeders), and a buried cable carries the rectified DC into the shack where the meter and potentiometers are located, *see* Fig. 2.

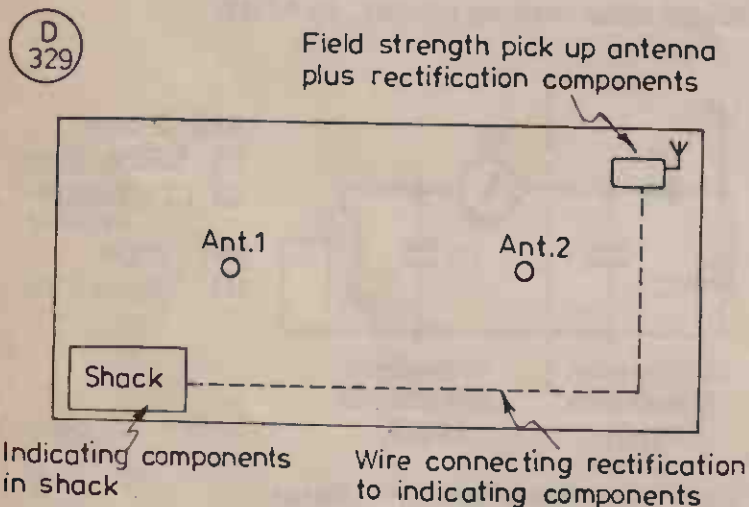


Fig. 2 Location of F S. Meter components at G3XAP

The meter used is a 6in. by 2in. device with a  $50\mu\text{A}$  movement which gives adequate indication—even with 9 watts input on 1.8 MHz. Less sensitive meters can be used with simple DC amplifiers—Fig. 3. It should be noted that if it is intended to mount a remote pick-up antenna and connect it to a field strength meter in the shack with coaxial cable, then unless the pick-up antenna is resonant and matched to the coaxial cable, standing waves will be present and the outside surface of the cable will act as a pick-up antenna itself! In order to ensure that the pick-up antenna at G3XAP has the correct polarisation, the device used is "three-dimensional", with two horizontal rods at  $90^\circ$  to each other and a vertical rod—all three rods being connected together at the point of entry into the box holding the rectification components (Fig. 4).

The device is used almost solely as a check that the transmitting antenna in use is radiating as it should, and for the adjustment of antenna matching units, and

has proven invaluable as an ever-present monitor to show that all is as it should be.

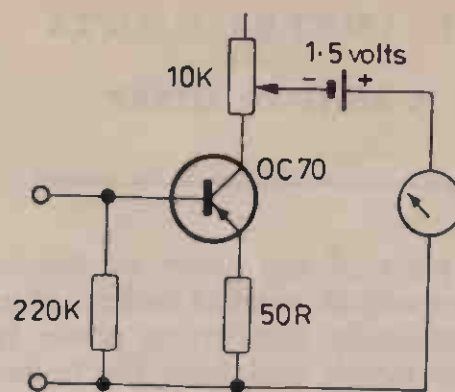


Fig. 3 Simple amplifier for increasing sensitivity of Field Strength Meter

### The Grid Dip Oscillator

It is not proposed to provide a circuit diagram for this device as numerous examples have appeared in just about every magazine concerned with Amateur Radio—including of course, *Short Wave Magazine*. The author has found the fully portable transistorised devices to be invaluable for antenna work—the mains lead associated with the older valve models being rather impractical.

Basically the instrument relies on the fact that if a source of RF energy is coupled to a tuned circuit, the circuit will draw energy from the source when the source is tuned to the circuit's resonant frequency. An antenna can be considered as an electrical circuit—it displays inductance and capacitance and, therefore, has a resonant frequency. Hence if we couple a GDO to it, it will draw energy from the GDO when the latter is tuned to the antenna's resonant frequency—this being indicated by a "dip" on the GDO's meter. (The device as originally designed had this meter in the grid of the valve: hence the name *Grid Dip Oscillator*). There have been statements made in amateur radio circles to the effect that a GDO does not work with some antennas, *e.g.* the cubical quad. However, the author has checked the resonant frequencies of numerous antenna types with a GDO, and has not encountered any problems, and therefore feels that the absence of a "dip" probably results from the instrument has not being suitably coupled to the antenna in question.

Coupling the GDO to the antenna is a very important point: too loose coupling results in a very shallow dip that can be easily missed, whilst too tight coupling causes erratic dips—with critical tuning of the device—and can result in "pulling" the GDO's frequency. The

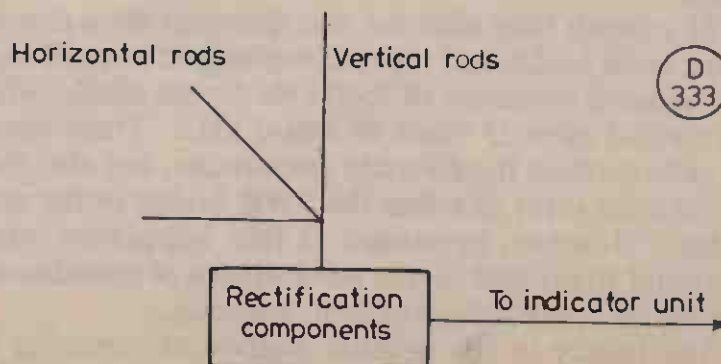


Fig. 4 The "3-Dimensional" pick up antenna used at G3XAP



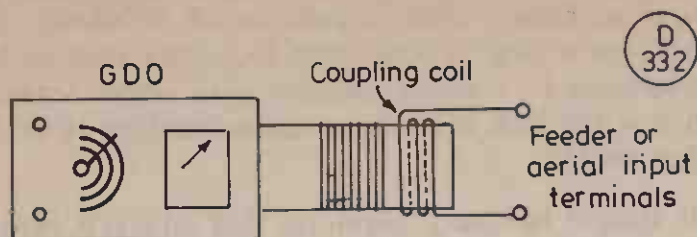


Fig. 5 Coupling GDO to the antenna or feeder

frequency reading on the GDO itself should not be relied on for accurate results—the RF from the GDO should be monitored on a receiver, and the frequency determined from the receiver's calibration. It should be noted that few GDOs have "backlash free" tuning mechanisms and a measurement should be repeated three, or preferably four or five times, and the average result determined (it is unlikely that repeat measurements will give identical results). An example of readings obtained at G3XAP on a 7 MHz vertical antenna is: 7022, 7028, 7009, 7027 and 7019 kHz. The 7009 kHz result was regarded as being anomalous, the average of the other four readings being taken as the resonant frequency, that is 7024 kHz.

The most accurate results are obtained by coupling to the antenna at the feed point, but although this technique is simple with base-fed verticals, it can be very difficult in the case of, say, a dipole erected 50ft. from the ground. It is possible to couple the GDO to the input end of the feeder and obtain a dip in this manner, but there are dangers in this approach, as the feeder itself can show resonances at or near the frequency of interest, and such dips can mask the antenna's resonance. The practice used at G3XAP is to install the feeder on its own and note the frequencies at which dips occur—these can then be recognised as being caused by the feeder when the test is repeated with the antenna in position. Readers will doubtless query how it is possible to have a feeder mounted without an antenna to "hang it on". In the case of dipoles the author uses polythene rope as a 'synthetic' antenna, attaches the feeder to it and pulls the 'antenna' plus feeder into position. It has often been found (especially on the higher frequencies) that the feeder will dip very close to the frequency that the antenna is designed for—in such cases the feeder's length should be altered, because in addition to masking the antenna's dip, such 'line resonances' can cause severe problems with coupling the transmitter to the feeder.

The actual coupling of the GDO to the antenna or feeder is easily achieved by using a coupling coil, this consisting of one or two turns of wire, the ends of which are temporarily connected to the feeder/antenna. The coil's diameter should be such that the GDO coil will just fit inside it (Fig. 5). It should be noted that with measurements made at the antenna itself, the presence of this inductance across the input terminals of the antenna will 'detune' the antenna to a lower frequency, and a single turn coil with very short leads should be used. At the lower frequencies, the error caused will obviously be much smaller, but even here very large coupling coils can give rise to significant errors, so multi-turn coils must be avoided. Such errors do not occur if the antenna is dipped 'through the feeder'.

It will be found helpful to place the GDO on a suitable, steady object whilst measurements are being made: slight movements of the device whilst tuning it can give rise to sudden, erratic movements of the meter needle, causing confusion. The GDO should first be tuned with its coil right inside the coupling coil (as shown in Fig. 5) in order to find the approximate frequency of the dip. The GDO coil should then be withdrawn slightly and the dip again found—this process being repeated until the dip from full scale deflection on the meter is about 10 to 15 per cent, thus ensuring that the GDO is not being 'pulled' by the antenna.

SWR Bridge

This device is probably the best-known piece of antenna test equipment, but is also one of the most mis-used. It relies on the fact that if a feeder is not correctly matched to the antenna, not all of the power put into the feeder is radiated by the antenna—some of it is reflected back down the feeder towards the transmitter. The percentage of power which is thus reflected increases as the degree of mismatch increases.

Most SWR bridges consist of a 'sampling line' which is placed parallel to the feeder enabling a current to be induced into it from the feeder itself. Diodes are used to rectify this current and, since current can only flow through a diode in one direction, by suitable orientation of the diode's anode and cathode, we can rectify either the forward current induced from the feeder, or the reverse current. As with the GDO, there are so many circuits available for SWR bridges that it is not proposed to include one here; however, there is another type of bridge available, namely the Resistance SWR bridge, the circuit of which is shown in Fig. 6, and it will be noted that in this instrument the whole of the power in the feeder passes through the resistor  $R_x$ . Clearly, excessive power will result in an increase in temperature

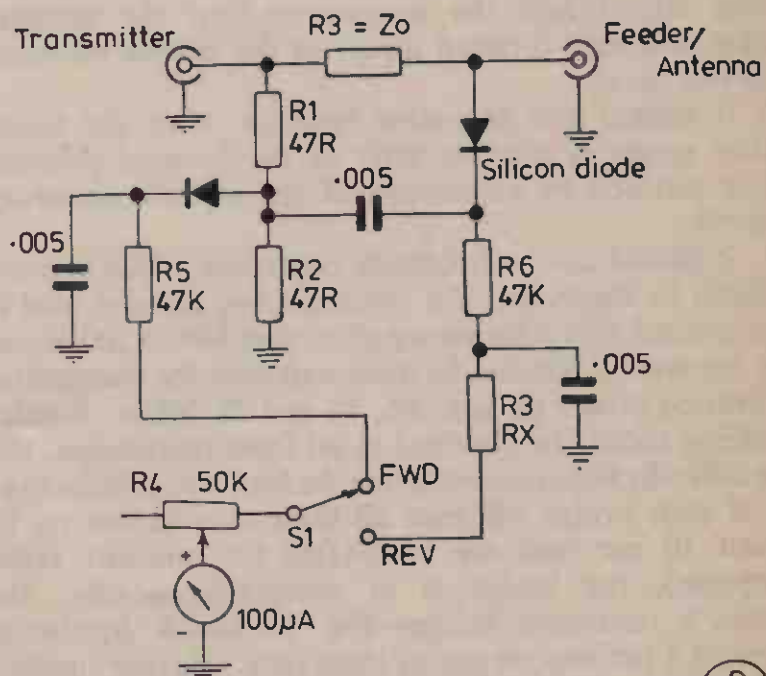


Fig. 6 The Resistance SWR Bridge

Fig. 6  $R_x$  is a small 'correction' resistor; bridge meter should give same forward and reverse readings if power is applied with no feeder/antenna connected to output socket.

(In the G3XAP bridge,  $R_x = 470$  ohms)

of this component, followed by a consequent change in its resistance. However, the author has found that by using very low power, a very sensitive meter and a large wattage resistor,  $R_x$ , the results obtained from this device appear to be more accurate than from the more common 'coupled line' type of bridge.

The method of usage of either type of bridge is to insert it in the feeder, switch on the transmitter and adjust the sensitivity of the instrument to enable forward and reverse currents to be read from the meter. The calculation of SWR from these readings is from the formula:

$$\frac{I_F + I_R}{I_F - I_R}$$

where  $I_F$  is the meter reading in the forward position, and  $I_R$  is the reflected current reading.

By adjusting the sensitivity of the instrument and/or the transmitter's power output to give full-scale deflection with the instrument in the 'forward' position, the scale can be directly calibrated in SWR—this value being read off the scale with the instrument switched to the 'reverse' position. Most commercially built instruments have scales calibrated in this manner, although a great many of them are highly inaccurate (both commercial and home-brew!) when it comes to reading true SWR values greater than 1 : 1. Even simple devices will show the absence of reflected power when a feeder is perfectly matched, but few devices are accurate in any other condition, and over-emphasis of results should be avoided. It is common practice to quote SWRs to two decimal places (the author is guilty of this) but it is debatable whether even the first decimal place is accurate!

Checking the accuracy of a bridge is simple as it should comply with the following conditions:—

(a) It should give the same readings if the input and output are reversed—*i.e.* put the feeder into the transmitter socket and the transmitter into the antenna socket and read forward power in the reverse position, and *vice versa*.

(b) It should give the same readings when the transmitter power is altered: FSD in the forward position being restored by adjustment of the meter's sensitivity control.

(c) It should not be frequency conscious. This is more difficult to check, but if a non-inductive dummy load is constructed with a resistance of around 100 to 200 ohms, the apparent SWR can be measured with the transmitter delivering power at, say, 3.5, 14 and 28 MHz. Similar readings should be obtained at all three frequencies, but the difficulty lies in ensuring that the load is non-inductive!

If your bridge will pass all three tests (errors up to about 10 per cent are acceptable for amateur radio purposes), the bridge is of acceptable quality; the author's resistance bridge—Fig. 6—has a maximum error of 4 per cent on any of these tests. Having checked the accuracy of the device the next step is to consider how it should be used. The two examples quoted earlier show the most common *mistake* made with SWR bridges, as they are inherently inaccurate in a non-resistive feed situation (*i.e.* non-resonant antenna); from our study of antennas so far, we should not expect a 3.5 MHz dipole at 35ft. to have a feed impedance of

75 ohms, and we should not expect a quarter-wave vertical to have a feed impedance of 50 ohms. (The author was wrong in both cases to assume that an SWR approaching 1 : 1 was attainable with either antenna—such was the lack of antenna understanding at G3XAP at that time!).

It should be clear, therefore, that an SWR bridge is not a suitable instrument for establishing resonance in most cases—its true purpose is to give an idea of the degree of mismatch present when we connect a feeder to an antenna which is at or near to resonance, and also as an aid in adjusting antenna matching units. Provided that the antenna is resonant, the author will accept an SWR of up to about 2.5 : 1, but will not accept an indicated SWR of 2.5 : 1 with a reactive system. (Indeed, in working VK6MD on 1.8 MHz CW with 9 watts DC input, the antenna was resonant, but the SWR on the feeder was well over 2 : 1!).

Having resonated our antenna and checked the SWR on the feeder, we can now calculate the feed impedance from the formula:—

$$\text{Antenna Feed Impedance} = \text{SWR} \times \text{Feeder Characteristic Impedance}$$

or

$$\text{Antenna Feed Impedance} = \frac{\text{Feeder Characteristic Impedance}}{\text{SWR}}$$

SWR

Hence we have two possible answers and although it is sometimes possible to deduce which one is correct, this is not always the case. It is useful, however, to know which is correct, because we may be deciding upon using some form of impedance matching device such as an 'L' network. There are various forms of impedance measuring equipment available, but the author has found the 'Antennascope' to be the most versatile.

### The Antennascope

The circuit for the antennascope is shown in Fig. 7, and this instrument relies on the fact that when the potentiometer is adjusted to give the same resistance as the feed impedance of the antenna under test, the bridge is in a balanced state and the meter will read zero. How-

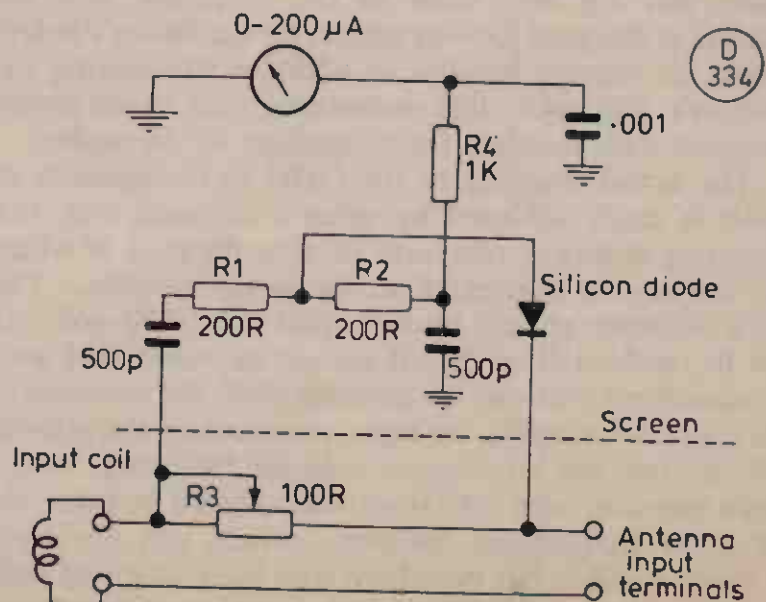


Fig. 7 The Antennascope

ever, a complete null will only occur when the source of excitation is at the resonant frequency of the antenna, *i.e.* there is a purely resistive load. A GDO is normally used as the source of excitation, and the method of usage is as follows:

- (a) Connect the test clips to the antenna's input terminals.
- (b) Insert the GDO coil into the input coil.
- (c) Tune the GDO for a dip.
- (d) Adjust the antennoscope's potentiometer for a null on the antennoscope meter.
- (e) If the null is not quite at zero, repeat (c) and (d) until the best null is obtained.

We have now measured both the resonant frequency of the antenna and its feed impedance. In cases where the feed point of the antenna cannot be reached, a length of feeder that is an exact multiple of a half-wave can be connected to the antenna's feed point and the antennoscope's test clips connected to the other end of the feeder. (For a balanced antenna, 300 ohm twin feeder is best suited for this purpose). The potentiometer  $R_3$  must be a high quality carbon device, and is the 'weak link' in the instrument—just about every potentiometer displays both inductance and capacitance, and this tends to limit the upper frequency at which the bridge is useful. (The one finally used by the author is actually a 150 ohm device of unknown origin). The method of testing the instrument is to clip carbon resistors of known value between the test clips and check the antennoscope readings with the GDO tuned to, say, 3.5 and 30 MHz. If a non-inductive resistor is used, the meter should give a complete null at the same setting of the potentiometer at both frequencies—serious differences (above 10 per cent) indicating a frequency-conscious potentiometer.

#### Other Measurements

With a good quality example of each of the four test instruments discussed above, we are in a position to carry out just about any measurement that may be necessary in order to resonate our antenna and match it to its feeder—the obvious exception being the measurement of actual values of reactance. With a matched system it is possible to switch from the dummy load to the antenna, or from one antenna to another with absolutely no re-adjustment of the transmitter at all. If this can be done, the indications are that all is as it should be, but it gives added confidence when it is possible to use two different instruments and get virtually identical results. The last antenna to be adjusted at G3XAP was an inverted-L for 80 metres, and the following results were obtained:—

- (a) Resonant frequency with GDO: 3.520 MHz.
- (b) SWR at 3.520 MHz: 1.5 : 1 (50 ohm bridge and feeder).
- (c) Feed Impedance calculated from SWR: 33 ohms.
- (d) Feed Impedance with Noise Bridge: 30 ohms.
- (e) Resonant frequency with Noise Bridge: 3.530 MHz.
- (f) Feed Impedance with Antennascope: 34 ohms.

The antenna consisted of 40ft. of vertical tubing with an approximately 30ft. top section and had four resonant quarter-wave radials. The first QSO was with a W8 station, a 589 report being received with 150 watts DC input.

In spite of the above results, there are other measure-

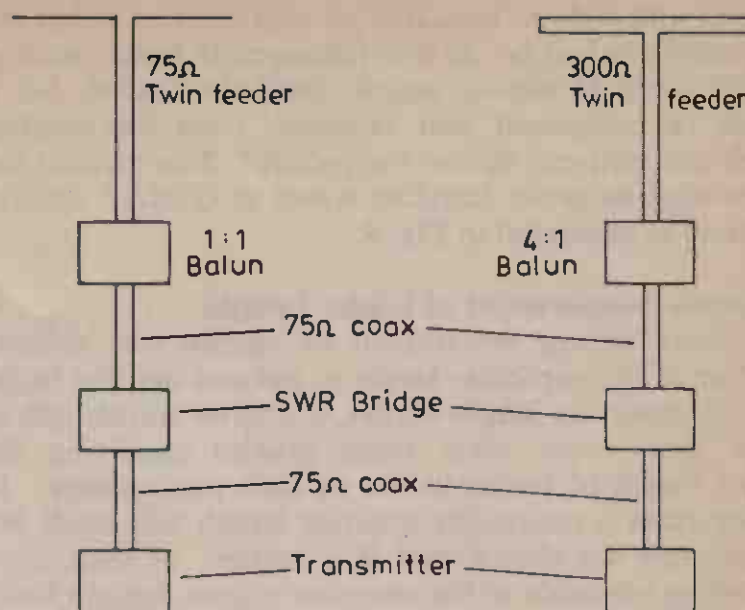


Fig. 8 Measurement of Standing Wave Ratio on twin feeders

D  
335

ments which it is useful to be able to carry out, and these include the detection of standing waves on twin feeders, the accurate measurement of quarter and half-wave-lengths of feeders for impedance matching applications and the detection and measurement of feeder losses.

#### Standing Waves on Balanced Feeders

If the antenna is resonant, and the feeder is either 75 or 300 ohm, the measurement of SWR is simply achieved by inserting either a 1 : 1 or a 4 : 1 balun in the feeder, hence enabling us to connect a 75 ohm coaxial feeder in which we insert out 75 ohm SWR bridge, *see* Fig. 8. (Details of suitable baluns were given in *Part VII* of this series). However, it should be realised that such measurements are less accurate than in the simple case of the antenna fed directly with coaxial cable because (a) twin feeders always carry currents induced onto them by radiation from the antenna itself—these currents can pass through the balun and seriously effect the operation of the SWR bridge, and (b) no balun is perfect—*i.e.* the ratio of forward to reverse current can be altered by the action of these devices, but this is likely to be troublesome only with relatively high standing wave ratios. However, the absence of reflected current as seen by the bridge can indicate a good match, whereas the numerical value of SWRs above 1 : 1 can be prone to large errors.

With open-wire lines, the situation is somewhat more complex as a balun of some other ratio will be necessary to match into either 50 or 75 ohm coaxial cable. However, as explained in the article on feeders, the presence of standing waves on open-wire feeders causes very small losses even with very high levels of SWR. Standing waves can be detected by running a small neon tube along one of the feeder conductors while the feeder/antenna is receiving power from the transmitter: if the distance of the neon from the feeder is kept constant, the presence of standing waves will cause the brightness of the neon to vary as it is moved along the feeder—points of maximum brightness occurring every half wave-length along the line.

A more elegant method is to use a Field Strength

Meter with a short, insulated pick-up antenna which can accurately be laid on the wire (comparison meter readings being taken at various points along the feeder), but it must be recognised that radiation from the antenna itself can seriously distort the picture! This method has been used to detect standing waves at G3XAP and the method is illustrated in Fig. 9.

#### Accurate Measurement of Feeder Lengths

Many writers are content to assume the Velocity Factor of the particular feeder in use and use this factor to determine the length of, say, a quarter wavelength of that feeder—one often reads articles specifying the exact length of feeder to use in such applications. In many cases a reasonably accurate length will result but experience has shown that if a number of such compromises are made in the complete system, we can finish up with a far from efficient set-up! Fortunately, it is simple to cut quarter wavelengths of feeder (and multiples thereof) by use of our GDO. A section of feeder rather longer than a quarter wavelength should be cut and suspended from a convenient support to keep it clear of influencing metallic objects. The two conductors at the

lower end of the feeder should be temporarily connected together through a one-turn coil and the GDO coupled to this coil. The GDO can now be tuned for a dip as described earlier, and the feeder length adjusted until the dip occurs at the desired frequency—the feeder is now a quarter wave long *at the frequency of the dip*. Other lengths can now be determined by measurement of the physical length of the quarter wave section.

#### Measurement of Feeder Losses

The loss in a feeder at a particular frequency can be determined by use of the SWR bridge. Let us assume that we wish to use a certain length of coaxial feeder to feed an antenna for 28 MHz, for example. If we short-out the two conductors at one end of the feeder and connect a transmitter to the other end, the SWR on the feeder should be infinite because the feed impedance of the 'antenna' (dead short) at its end is zero (Fig. 10). If we measure the SWR on the feeder in this condition, the reflected power should be identical to the forward power, assuming that the feeder has no losses. Obviously if the feeder has losses, not all of the power supplied to it will return to the transmitter, and from the SWR measured

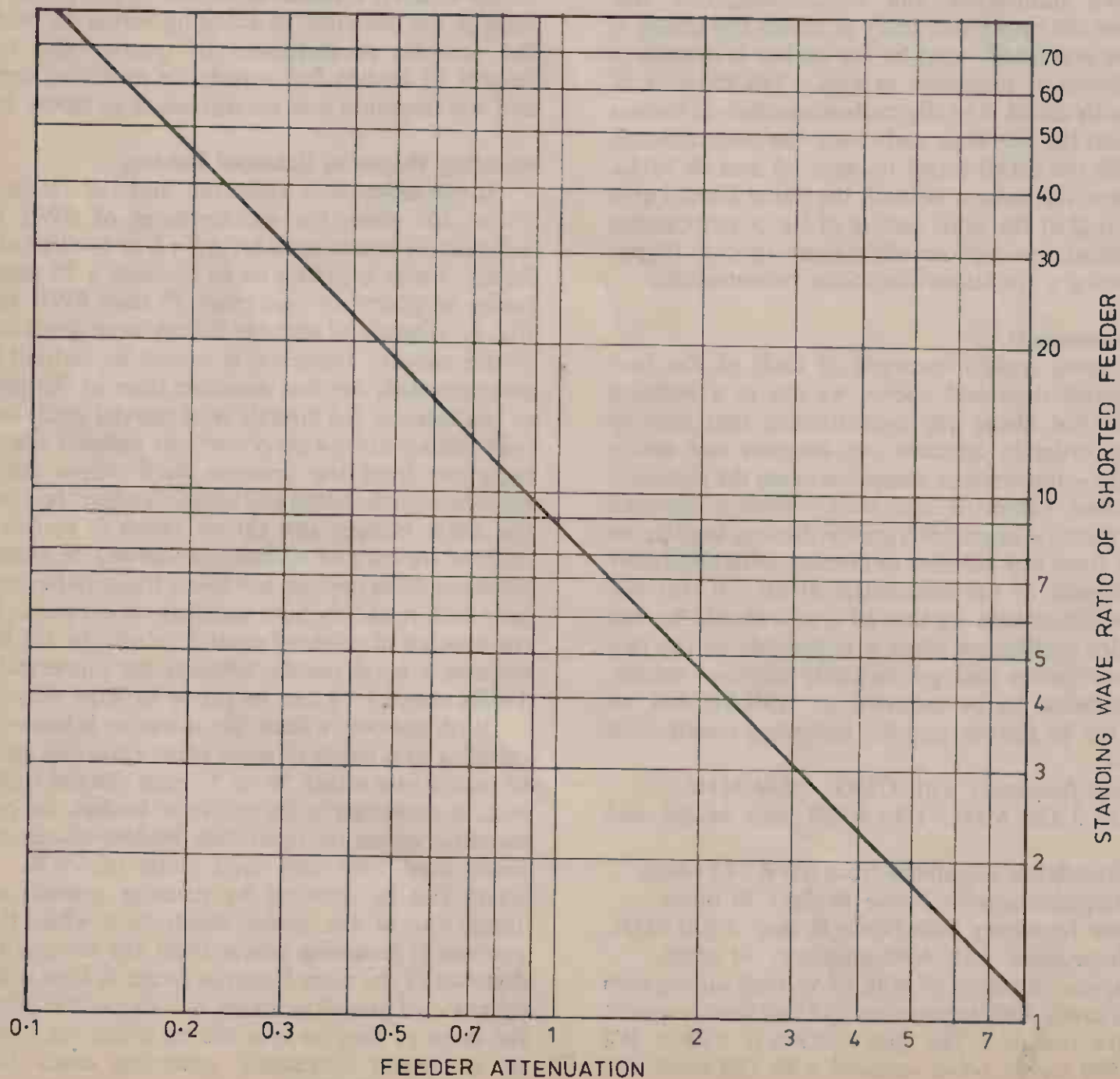


Fig.11 GRAPH FOR COMPUTING FEEDER ATTENUATION AFTER MEASUREMENT OF SWR ON SHORTED FEEDER

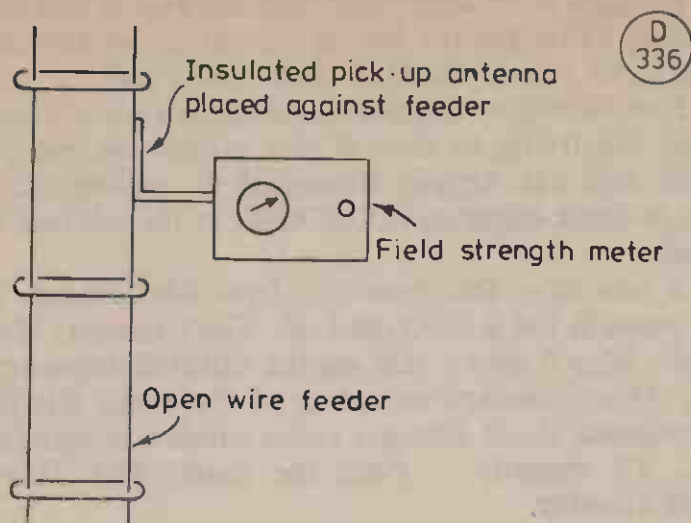


Fig. 9 Detection of Standing Waves on Open wire feeders

in the test we can determine the feeder loss by reference to Fig. 11. *Needless to say, the transmitter should be run at very low power for this test or the PA stage could be damaged.*

It should be realised from the comments made earlier on SWR bridges that the average bridge may give erroneous results, and so again the author must advise the use of a resistance-type bridge rather than the more common 'coupled line' type if accurate results are required. (Regular users of 28 MHz and the VHF bands may have an unpleasant shock if they subject their feeders to this test!). Note that the attenuation figure determined by this test only applies when the SWR is 1 : 1; the presence of standing waves will increase the losses—the higher the SWR, the higher the total losses.

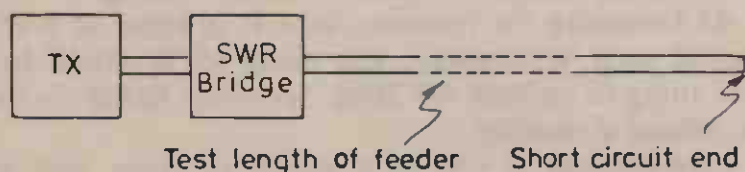


Fig. 10 System for measuring Attenuation of coaxial feeders

### Summary

Only when an operator has made measurements with reliable instruments can he be assured that his system is operating efficiently. The peace of mind that results from operating such a matched system has to be experienced to be appreciated. In the very first section of *Part I* of this series we said that we would not operate a receiver which we had just constructed without testing and aligning it, and the same should be true of our antenna. The instruments described above enable us to tune and align our antenna system, and the improvement in performance that can result from such an exercise can be very great indeed. We are now in a position to be able to build and tune our own antenna system, and the next article will therefore deal with planning, construction, erection and tuning.

*to be continued*

## CLUBS ROUNDUP

### By "Club Secretary"

Every month the pile gets fatter! Let's start at Acton, Brentford & Chiswick; a General Discussion, on Tuesday May 15, at Chiswick Trades & Social Club, 66 High Road, Chiswick, London W4.

Addiscombe are a mainly contest group; they are at the Spread Eagle, Portland Road, South Norwood, on Tuesdays starting around 2115.

AMSAT-UK is the British arm of the worldwide organisation which defines and creates OSCAR—details from the Hon. Sec., see Panel.

A.R.M.S. is the one for the /M enthusiasts, in whatever part of the world they may be—details from the Hon. Sec. at the address in the Panel.

Next we head for Ashford, in Kent, where the Hq. address is Top of Hart Hill, near Charing, where the group foregather every Tuesday evening.

For Barking the venue is Westbury Recreation Centre, Westbury School, Ripple Road, Barking; we understand that they are there regularly on Thursdays, but that there is also a Morse class on Tuesdays at the same place.

B.A.R.T.G.: here the basic qualification is to have a teleprinter in the shack and tied to the receiver, or the station if you have a transmitting ticket.

Yet another of the nationals now; this time its B.A.T.C., who are the amateur television chaps, be they fast-scan or slow-scan types, B/W or colour. Details are available from the Hon. Sec.—see Panel.

Bishops Stortford seem to be on the upswing now, with attendances on the third Monday in each month rising and a programme fairly well settled for the year. The venue is the British Legion Club at the top of Windhill.

Bournemouth may be found on the first and third Fridays in each month at the Dolphin Hotel, Holdenhurst Road, Bournemouth.

For all the details of the British Rail group, we must refer you to the Hon. Sec.—see Panel.

At Bury we find them at the Mosses Community Centre, Cecil Street, Bury on the second Tuesday every month.

Another group where things seem to be on the upswing is at Cheltenham; the Old Bakery, Chester Walk, at the rear of the Public Library, Thursday May 3, and Friday May 18.

Chester have just had their AGM at which G3EWZ, who served them well as chairman for year, was elected President. They have a wide-ranging programme in the pot for the Tuesday evening sessions at Chester YMCA. However, remember that they miss the first Tuesday in each month.

Cheshunt can be found at Cheshunt Church Room, Church Lane, Wormley, every Wednesday.

It is the first Tuesday and the third Thursday in each month for Chichester, and their Hq. is at Room 34A, Lancastrian Wing, Chichester High School for Boys, in Basin Road.

On we go to Chiltern, where there will be a meeting on the last Wednesday of May at the John Hawkins furniture factory, Victoria Street, High Wycombe; this is off West Wycombe Road which is a part of the A40. There are noises in the current newsletter about a club shack which may indicate a change is in view, or it may be in addition to the regular formal sessions.

The Liberal Club, 20 Gladstone Road, is home to the Chippingham lads; they are booked in for every Tuesday evening.

Down away in the West Country, we find Camborne and then Pool, where the SWEB Clubroom is home to the Cornish group—and we never cease to be amazed at the sort of attendances recorded there.

Now Crawley, where you have to find Trinity Church Hall, Ifield, on the second and fourth Wednesday. If you intend to look them up, we suggest you contact the Hon. Sec. first, as we believe one of the meetings is held in members' homes.

Cray Valley are booked to meet in Christchurch Centre, High Street, Eltham on the first and third Thursdays of each month; normally a talk or whatever on the first date, and a natter on the other one.

Crystal Palace have a "main" meeting at Emmanuel Church Hall, Barry Road, London SE22 on the third Saturday evening each month. In addition, there is a gathering at the home of one or other of the members on the first Tuesday evening each month.

Although the programme is nominally the first and third Fridays at the Scout Hut in Broomhill Road, Dartford, check with the Hon. Sec. of Dartford Heath D/F first, lest you arrive and find they are off on a hunt.

119 Green Lane is the address of the Derby club Hq., and they are there, on the top floor, every Wednesday evening, and usually with something interesting to do.

May 10 and 24 it is at Edware; on the former date G3GC and G3SJE explain contest operating techniques, and the other meeting is for the constructors contest. As for the venue, Watling Community Centre it is, at 145 Orange Hill Road, Burnt Oak.

Exeter provide us with a doubt as to the venue, which we think to be the Community Centre, St. David's Hill on the second Monday. We could also do with an up-date as to who is now doing the chores of Hon. Sec. Our contact is in the Panel.

Next we come to the G-QRP Club, and clearly the reverend gentleman who started this one is a real whiz-kid, with a membership of upwards of 400 and the QRP game of low-power operating turned almost into a cult. Mostly we think the attraction is in the 'doing it the hard way' line, also the club newsletter, which always seems to have something of interest to build—sometimes a little gadget, sometimes a full-blown transmitter or transceiver. All the details from the Hon. Sec., see Panel.

Every time we type out the address of the Hereford group we get a shudder down the spine—Civil Defence Hq., Gaol Street. Find this very successful gang on the first and third Friday evenings.

Should you be in the EI part of Ireland, you can get to know most of what goes on by getting into contact with IRTS Region 1; we understand they are based on 91 Lower Baggot Street, but we recommend getting in touch with the Hon. Sec. first if you are not near to Dublin. His address will be found in the Panel.

Loughor is Swansea way, and the Hq. is at Loughor Boating Club; for the rest of the details on this one we must refer you to the Hon. Sec.—see Panel.

Last month we mentioned Lough as a place where the locals are trying to form a new group—we mention it again, and ask anyone interested to contact the chap who is spark-plugging it, G8OOW, at the address in the Panel.

A new Hon. Sec. reports in from Maidenhead, where the venue is the Red Cross Hall, The Crescent, Maidenhead. May 3 sees a talk on the GB3HR repeater, and May 15 a videotape recording of the Brian Rix/RSGB programme about amateur radio which was radiated by BBC TV recently. Note the dates: first Thursday, third Tuesday.

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

*(June/July issue—May 25th)*

August issue—June 29th

September issue—July 27th

October issue—August 31st

*Please be sure to note these dates!*

Melton Mowbray meet at the St. John Ambulance Hall, Asfordby Hill, Melton Mowbray on the third Friday in each month with a full programme of events mapped out.

The scribe at Milton Keynes is organised—he has some blank sheets pre-printed with the vital data, and with a space for the current activity. Thus, we see that on May 14 they will be at Lovat Hall, Newport Pagnell for a talk on Radio and TV Interference.

The British Sub-Aqua Club, Mountain, Queensbury provide the venue for Northern Heights, where the Halifax gang foregather every Tuesday evening.

At Ormskirk the members take it in turns to host a meeting each Wednesday; this being so, it would be a good thing to contact the Hon. Sec.—see Panel—before you attend a meeting.

Peterborough is one of a group of clubs who are co-operating to improve the programme for all (clubs in March, Peterborough, Spalding and Stamford; we hope this effort will increase the amateur radio population of East Anglia quite a bit. Back to Peterborough; they have the third Friday at the Scout Hut, Occupation Road, Peterborough.

If you know of anyone who is handicapped or blind, and would be interested in SWL or license, you would be doing them a favour by getting them into R.A.I.B.C.; and while we are at it we could add that we would like to see every reader in U.K. becoming at least a supporter by way of a sub! Details from the Hon. Sec.—see Panel.

Reigate next; they live at the Constitutional Centre, Warwick Road, Redhill on the third Tuesday each month.

If you served in the Royal Navy or its reserves, or the merchant navy, or a foreign navy, you are eligible for one or another grade of membership of the Royal Navy club. Contact the Hon. Sec. for details, and if you are near London don't forget there is a regular group based on HMS Belfast opposite the Tower.

Saltash have their base, we believe, on Burraton

Toc H, but we feel it would be best for you to contact the Hon. Sec.—see Panel—to find out the current state of play.

No such doubt about Silverthorn: they are to be found every Friday at Friday Hill House, Simmons Lane, Chingford, London E4.

Back to the Midlands now and Solihull. They foregather on the third Tuesday in the month at Manor House, High Street, Solihull.

Just up the road, as it were, is South Birmingham, where the venue is Hampstead House, Fairfax Road, West Heath. The 'official' meeting is on the first Wednesday in the month, but in addition they are on the air from the club every Thursday evening, and on every Friday there is an open evening. There are also club nets on Top Band, Two metres and 70 cms. On Two metres

there are also slow Morse transmissions made for an hour on Sunday mornings and Thursday evenings.

Southdown usually send us in a pre-printed form with all the gen on it; the fact that it doesn't seem to have arrived this time probably means it's sitting in some London sorting office. However, we can tell you that they are based on Chaseley Home, South Cliff, Eastbourne, on the first Monday of each month.

Our letter from Southgate tells us that the place to look for is the Scout Hut, Wilson Street, Winchmore Hill—and if you can find Winchmore Hill Green, you aren't a hundred miles away! They are booked for the second Thursday of each month.

Our next port of call is Stevenage. The base here is the Senior Staff canteen, British Aerospace Dynamics Gunnels Wood Road, Stevenage. The club bookings

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

- ACTON, BRENTFORD & CHISWICK: W. G. Dyer, G3GEH, 188 Gunnersbury Avenue, Acton, London W3 8LB. (01-992 3778.)
- ADDISCOMBE: P. J. Hart, G3SIX, 42 Gravel Hill, Croydon. (01-656 9054.)
- AMSAT-UK: R. Broadbent, G3AAJ, 94 Herongate Road, Wanstead Park, London E12 5EQ.
- A.R.M.S.: N. A. S. Fitch, G3FPK, 40 Eskdale Gardens, Purley, Surrey CR2 1EZ.
- ASHFORD: J. Clarke, G3TIS, Yeomans Cottage, The Street, Brook, Ashford, Kent. (Wye 812888.)
- BARKING: A. Sammons, G8IZN, 80 Lyndhurst Gardens, Barking, Essex IG11 5BZ.
- 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. D. Cole, G4EMN, 3A Cavendish Road, Bournemouth BH1 1QX. (Bournemouth (0202) 20027.)
- BRITISH RAIL: R. V. New, 29 Little Dock Lane, Plymouth, Devon PL5 2LZ.
- BURY: E. R. Thirkell, G4FQE, 59 Oulder Hill Drive, Bamford, Rochdale.
- CHELTENHAM: G. Cratchley, G8MZV, 47 Golden Miller Road, Prestbury. (Cheltenham 43891.)
- CHESTER: D. Cutts. (Address wanted). (Gresford 3344.)
- CHESHUNT: R. E. Chastell, G8LNM, 4 Fairley Way, Cheshunt, Herts. EN7 6LG. (Waltham Cross 35393.)
- CHICHESTER: T. M. Allem, G4ETU, 2 Hillside, West Stoke, Chichester PO18 9BL. (West Ashling 463.)
- CHILTERN: N. C. Ambridge, G4FRL, 53 The Avenue, Chinnor, Oxon OX9 4PE. (Kingston Blount 52006.)
- CHIPPENHAM: P. J. Tuck, 178 St. Edith's Marsh, Bromham, Chippenham, Wilts. SN15 2DJ.
- CORNISH: S. T. S. Evans, G3VGO, "Glengormley," Carnon Downs, Truro. (Devoran 864255.)
- CRAWLEY: A. V. Davis, G3MGL, 41 Gainsborough Road, Crawley, West Sussex RH10 5LD. (Crawley 20986.)
- CRAY VALLEY: P. J. Clark, 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 0940.)
- DARTFORD HEATH D/F: A. R. Burchmore, G4BWV, 49 School Lane, Horton Kirby, Dartford, Kent DA4 9DQ.
- DERBY: Mrs. J. Shardlow, G4EYM, 19 Portreath Drive, Darley Abbey, Derby DE3 2BJ. (0332-56875.)
- EDGWARE: D. L. Lisney, G3MNO, 119 Draycott Avenue, Kenton, Harrow HA3 0DA. (01-907 1237.)
- EXETER: Mrs. M. Jefford, 29 Dukes Road, Budleigh Salterton, Devon EX9 6QL.
- G-QRP: Rev. G. C. Dobbs, G3RJV, "Willowdene," Central Avenue, Stapleford, Nottingham. (Sandiacre 394790.)
- HEREFORD: S. Jesson, G4CNY, 181 Kings Acre Road, Hereford. (Hereford 3237.)
- IRTS (Region 1): J. Ryan, 23 Dollymount Grove, Clontarf, Dublin 3.
- LOUGHOR: T. Griffin-Thomas, 77 Castle Street, Loughor, Nr. Swansea, W. Glamorgan. (Swansea (0792) 893392.)
- LOUTH: R. D. Wilson, G800W, 112 Ugate, Louth, Lincs. (Louth 2220.)
- MAIDENHEAD: J. Patrick, G3TWG, Bedford Lodge, Camden Place, Bourne End, Bucks. (Bourne End (06285) 25275.)
- MAIDSTONE YMCA: G. A. Hastie, 79 Rochester Crescent, Hoo, Rochester, Kent ME3 9JJ. (Medway 251387.)
- MELTON MOWBRAY: R. Winters, G3NVK, 32 Redwood Avenue, Melton Mowbray, Leics. LE13 1TZ. (Melton Mowbray 3369.)
- MILTON KEYNES: W. Backhouse, G8POU, 46 Tattenhoe Lane, Bletchley, Milton Keynes, Bucks.
- NORTHERN HEIGHTS: L. Cobb, G3UI, 27 Moorlands Crescent, Cousin Lane, Halifax, W. Yorks. (Halifax 60574.)
- ORMSKIRK: P. J. Kay, G4GCB, 24 Laurel Avenue, Burscough, Ormskirk, Lancs. (Burscough 892416.)
- PETERBOROUGH: L. Critchley, G3EEL, 36 Waterloo Road, Peterborough, Cambs.
- R.A.I.B.C.: Mrs. F. Woolley, G3LWY, 9 Rannoch Court, Adelaide Road, Surbiton KT6 4TE.
- REIGATE: F. Mundy, G3XSZ, Westview, rear of Manor Farm, off Reigate Road, Hookwood, Surrey. (Horley 73878.)
- ROYAL NAVY: M. Puttick, G3LIK, 21 Sandyfield Crescent, Cowplain, Portsmouth, Hants. PO8 8SQ.
- SALTASH: J. K. Reynolds, 47 Lulworth Drive, Roborough, Plymouth. (Plymouth 771135.)
- SILVERTHORN: C. J. Hoare, G4AJA, 41 Lynton Road, South Chingford, London E4 9EA. (01-529 2282.)
- SOLIHULL: R. A. Hancock, G4BBT, 80 Ulleries Road, Solihull, West Midlands.
- SOUTH BIRMINGHAM: Mrs. G. Apperley, G4GZI, 35 Denise Drive, Harborne, Birmingham 17.
- SOUTHDOWN: B. Chuter, G8CVV, 15 Coopers Hill, Willingdon, Eastbourne, East Sussex BN20 9JG.
- SOUTHGATE: J. Fitch, G8EWG, 16 Kent Drive, Cockfosters, EN4 0AP. (01-440 7353.)
- STEVENAGE: T. J. Tugwell, G8KMV, 11 The Dell, Stevenage, Herts.
- STOURBRIDGE: S. Shacklock, G4IP, 12 St. Peters Road, Stourbridge, W. Midlands DY9 0TY.
- SURREY: R. Howells, G4FFY, 7 Betchworth Close, Sutton, Surrey SM1 4NR. (01-642 9871.)
- SUTTON & CHEAM: J. Korndorffer, G2DMR, 19 Park Road, Banstead, Surrey. (01-225 8729.)
- SWANSEA: P. Jones, GW4GRI, 27 Gorwydd Road, Gowerton, West Glamorgan. (Swansea 873986.)
- THAMES VALLEY: R. Blasdell, G3ZNV, 92 Bridge Road, Chessington, Surrey KT9 2ET.
- VERULAM: A. Clarke, G8MAE, 24 Kiln Ground, Hemel Hempstead, Herts. HP3 8EZ. (Hemel Hempstead (0442) 64751.)
- WACRAL: L. Colley, G3AGX, Micasa, 13 Ferry Road, Wawne, Nr. Hull, Yorks. HU7 5XU.
- WEST KENT: B. P. Castle, 6 Pinewood Avenue, Sevenoaks, Kent TN14 5AF. (0732-56708.)
- WOLVERHAMPTON: J. Cook, G8EDG, 75 Windmill Lane, Castlecroft, Wolverhampton WV3 8HN.
- WORCESTER: M. Tittensor, G4EKG, 16 Durcott Road, Evesham, Worcs. WR11 6EQ. (Evesham (0386) 41105.)
- WIRRAL (West Kirby): M. McIntosh, G8NMG, 8 Brancote Gardens, Bromborough, Wirral.
- YEOVIL: D. L. McLean, G3NOF, 9 Cedar Grove, Yeovil.
- YORK: K. R. Cass, G8WVO, 4 Heworth Village, York.

are for the first and third Thursdays.

If we read the Worcester group newsletter aright, there will be no meeting in May—which leads us to think it would be a good idea to confirm that with the Hon. Sec. in case they have fixed up some alternative.

Neachells Cottage, Stockwell End, Tettenhall, is the Hq. of the Wolverhampton gang, and it is here they will be found on Monday evenings.

At the West Kirby end of the Wirral peninsula there lives a club called Wirral (West Kirby); they are at the Sports Concourse, West Kirby, on the second and fourth Wednesdays.

Yeovil have an unusual sort of address, namely Hut 101, Houndstone Camp, Yeovil, every Thursday. For more details, contact the Hon. Sec.—see Panel.

A humorous touch appears in the letter from York, where it is mentioned that there is to be a Junk Sale and a home-brew night, the two events to be kept separate 'for obvious reasons'! The gang are at the United Services Club, 61 Micklegate, York, every Friday evening except for the third one in each month.

Now for Surrey where the routine is to get together on the first and third Wednesdays, at T.S. Terra Nova, 34 The Waldrons, South Croydon.

A puzzle for us with the Sutton & Cheam data—they forget to mention which meeting goes where! However, if past form is anything to go by, Friday, May 18 will see the talk on RTTY at Sutton College of Liberal Arts, while May 30 sees a talk on the FT901 and the ICOM 701, given by the proud owners, G3MES and G8DF, which we guess to be at Rays Social Club. However, check with the Hon. Sec. first about the venues.

Another Swansea group now; this one is at Sketty Park Sports & Social Club, Aneurin Way, Sketty Park, Swansea, on alternate Tuesdays.

Zooming back to the London area, we come to Thames Valley, at Giggs Hill Green Library, Thames Ditton, and note in addition that there is a booking for the first Tuesday in each month.

It seems odd not to see the signature of G4DUS at the bottom of the letter from Verulam; and more so in that we have to refer you to the Hon. Sec. for the details about May 24's talk on Microphones by Adrian Bilton. The difficulty arises from the fact that they hope to be in their new Hq., Gardenfields Centre, St. Catherine Street, St. Albans by then—but hope and certainty aren't always the same thing! As for informals, from May to September these are at Salisbury Hall, London Colney.

The group we used to know as WAMRAC has changed its name to WACRAL, indicating that the Methodist-only approach has changed and become inter-denominational. Details from the Hon. Sec.—see Panel.

### Finale

We've got to the bottom again; deadline dates are in the 'box' in the body of the piece; the address, as ever, is "Club Secretary," SHORT WAVE MAGAZINE, 34 High Street, WELWYN, HERTS. AL6 9EQ.

## OTHER MAN'S STATION—GJ80RH

OUR subject this time is Geoff Brown, GJ80RH, "Lemnos," Longueville Road, St. Saviour, Jersey, Channel Isles. First licensed on February 10 1978, Geoff has his shack in his workshop, which is also the focus of his own business as a colour television engineer, causing him to be in there and monitoring for up to 18 hours daily. Some 78 countries are confirmed by way of Oscar 7 and 8, aerials being a 14-ele. Parabeam for 144 MHz, 12XY for Seventycems, and suitable aiming gear.



On the equipment side there is, at top left in the picture, a 4CX250B Linear at 500 watts input, which can be built in two hours, and next to it its PSU, which takes a little longer(!); power meter, 20-amp 12 volts DC PSU and a video converter complete the top row, while below there are, again from the left, a TS-700, JR-500S, Liner-430, and a Sony TV for video reception. Geoff is interested in meteor-scatter, and a regular contributor to our VHF Bands column; anyone wanting a sked with him can reach him at the QTH given here, or by phoning him—0534 (Jersey) 26788.

So, there it is; a new chum with a very definite idea of what he is up to, and where he is going—long may he enjoy it all.

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



## HOW TO PUT UP AN AERIAL MAST

PHILIP MAYNARD

AT this time of year the various forces of nature gather together and inspire us to put up aerial masts. The lower frequency bands become more attractive, the frost has seen off the garden plants, the gardener has done a first pruning of his or her fine thorny roses, and generally the ritual war dance of mast erection is relatively easy.

This is where the temptation arises to lay in a dozen or two bottles of beer and to ask three or four well-built friends to come round at the weekend and help with the mast. Resist this temptation, at least until you have read what follows here and done a bit of thinking. Let me explain.

The usual basic form of guyed mast is a thin stalk kept straight by four sets of guys, each set consisting of three guy lines radiating from one ground anchor or peg. Now we all know that the great strength of the amateur is that he can cut corners where the pro dare not:

D  
302

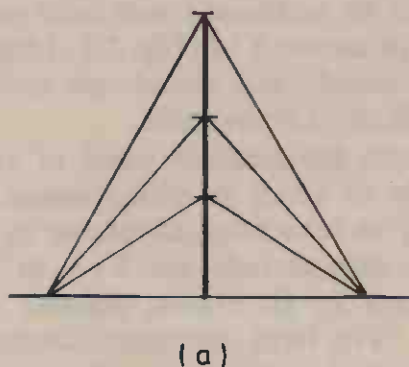


Fig. 1

accordingly it seems natural to reduce the number of guys, to use only three anchor points instead of four, and to try to put the thing up with the aid of several amateur helpers each with a handful of guy ropes. This way you need a mast stout enough not to be bent up or strained during erection, far heavier than would be needed in actual use. It's chance or good luck whether all goes well; for masts much over thirty feet it is pure murder.

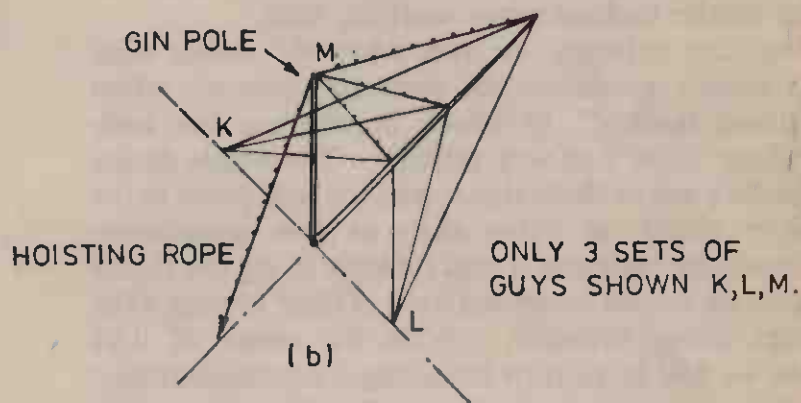
Instead of this, keep to the basic multi-guy mast and consider how it is put up in the formal way—using a gin pole.

Imagine you already have the mast assembly, Fig. 1a. Lay it down flat with the base of the mast at its final site and the mast lying close by one of the guy anchors,

Fig. 1b. Two complete sets of guys, (K, L) are laid out at the sides of the recumbent mast, attached to the mast and to their guy anchors. Note the length between the mast base and a guy anchor and put up the gin pole of approximately that length, first having fixed one set of guys from the mast to the end of the gin pole.

One need only pull on a rope from the top of that pole (the lower end of the pole preferably being fixed to the bottom of the mast, of course) and the whole assembly of mast and guys will rise from the ground and come up to the vertical. Stop before it gets completely vertical and make sure that its fourth set of guys (N) are of about the right length and firmly fixed to mast and ground anchor. Then pull the gin pole right down to the ground, the mast coming up vertical, and transfer guys from the end of the gin pole to their anchor. A leisurely stroll around to adjust the guy lengths and the job is done. Take away the gin pole (note that it is really only two clothes props lashed together, or the like) and return it to its normal duties.

If it should happen that the mast isn't just a vertical radiator and you find after it's up that you've forgotten to hitch a pulley and halliards to the top end, no matter. Replace the gin pole, if already removed, and in a dignified



manner let the mast down again in the same way. When the guy lengths are correct you can raise and lower the mast with no trouble at all.

If on the other hand the mast carries, or is a vertical radiator, note that although it is quite easy to lash good, varnished bamboo canes together to attain a 33-foot upright wire—easy to load with a large, low-loss inductor at ground level (repeat, at ground level)—you still have to dig in a load of earth wires or perhaps cover the landscape with wire netting if you are to avoid relatively low aerial efficiency.

To put up the mast is only the first step, and many a sufferer has run out of steam after a terrific struggle. Consider therefore the advantages of the easy way, detailed above.

## TOROIDS IN HF APPLICATION

### Part II

N. H. SEDGWICK, G8WV

IT is accepted practice to make the characteristic impedance of transmission lines in radio frequency service equal to the impedance of the source from which the power is being drawn, and equal to the impedance of the load to which the power is being conveyed. Fig. 1 is a simple graph illustrating that in any circuit optimum power transfer takes place when the load resistance ( $R_L$ ) is equal to the source resistance ( $R_g$ ). In the transmission of RF power from source to load, the radio technician is concerned to observe the "standing wave ratio", since mismatch into the load will cause power to be reflected back to the source, increasing the power dissipation at the source and causing "hot spots" along the transmission line arising from the standing wave, which could exceed the voltage or current rating of the cable. A reflectometer in the line enables the reflected power to be directly measured, and the use of such an instrument is recommended, since not only does it provide the means for initial setting-up of the matching into the load, but it monitors it thereafter, displays the forward power during tuning, immediately indicates an aerial fault, and will show up carrier leakage when working SSB.

In the days between the wars when RF cables were not too readily available, the amateur fraternity often used "tuned feeders", in which application the well-known Zepp aerial was very popular. The whole device used standing waves throughout, and the feed point at the transmitter could be either high or low impedance. Losses could be high and it was difficult to rig the feeder inside a room, and to insert any kind of filter to stop VHF harmonics being radiated. With the onset of TVI problems we had to turn to travelling-wave transmission lines, and amateurs adopted coaxial cable with a pre-

ference for the 75-ohm variety, since this matched the load impedance imposed by the popular dipole. The unbalanced line had the advantage that it simplified the Low Pass Filter for prevention of TVI, but as balanced aeri- als were becoming popular the need for an unbalance-to-balance conversion arose.

The so-called 'balun' made of just wire (Fig. 2a) allowed a 300 ohms balanced load to be fed by an unbalanced 75-ohm cable by virtue of its fixed impedance transformation of 4:1, provided the length of the balun was set at least to one quarter-wavelength at the lowest frequency used. The folded dipole provided the 300 ohms load and "four-to-one" became so much a part of unbalance-to-balance conversion that plenty of amateurs still regard the integration of the two functions as one of Nature's unalterable fixtures.

To make the wire balun more compact it was found that the wires could be coiled, and then a remarkable reduction in size came along with the R.H. Minns ferrite-loaded balun, which is contained in a box measuring  $9\frac{3}{8} \times 3\frac{1}{2} \times 1\frac{5}{8}$  inches, and handles 500 watts, from 1 to 30 MHz. This has the same configuration as the standard wire balun but the two arms are each sleeved with several short ferrite tubes (Fig. 2b), which so raise the inductance of the wires that the arms are only six inches or so long. R. H. Minns has extended the method to produce a 600 ohms line balun, which he does by putting an additional wire onto one arm, so making the transformation 9:1 (Fig. 2c). Ideally this gives a 67:600 ohms match, but would not seriously mismatch if fed with 52 or 75 ohms cable.

From the amateur point of view the advent of RF toroids in aerial matching seems to have been treated merely as something adaptable to baluns. Designs seem to be offered only for 1:1 or 4:1 baluns. In his brochure R. H. Minns, defining the expression 'balun' says: "The term *matching transformer* is generic and is usually to be preferred." How right he is! The original balun as shown in Fig. 2a has a fixed impedance ratio

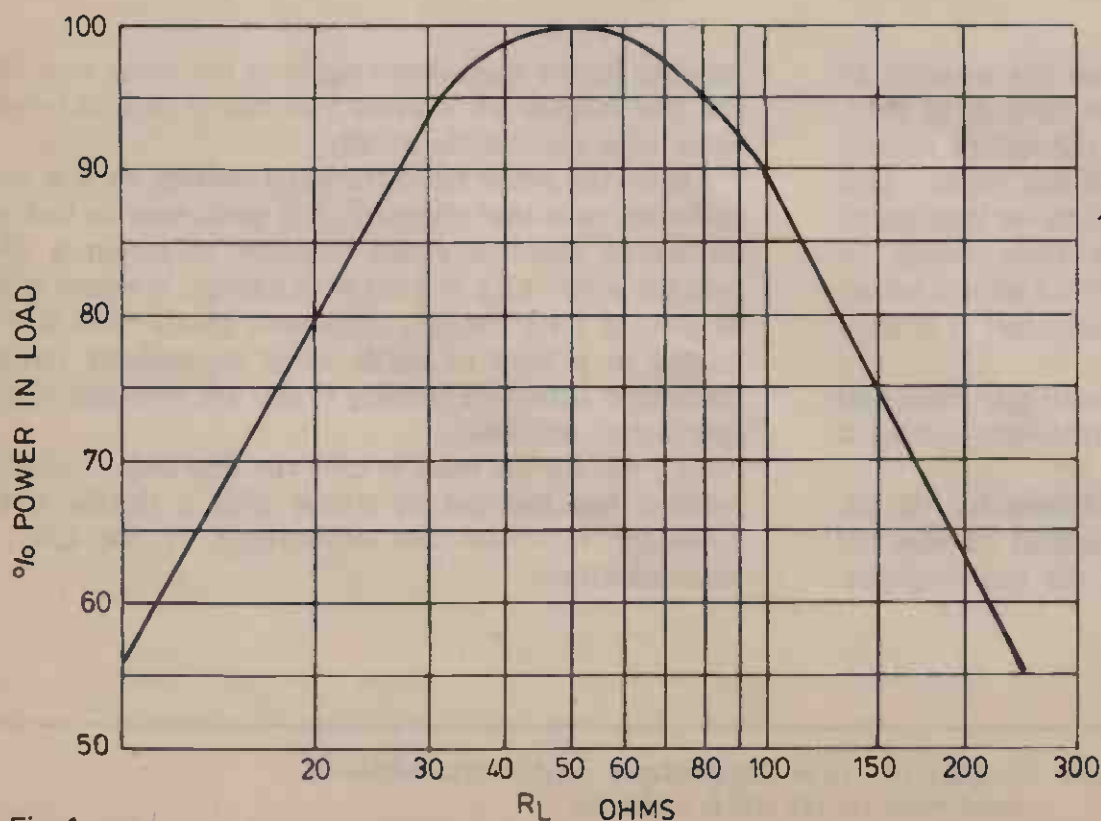
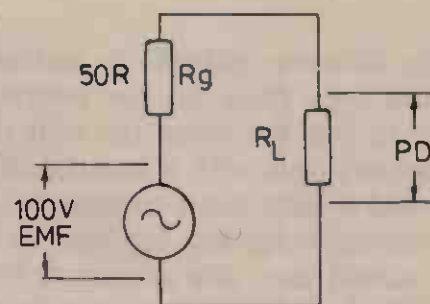
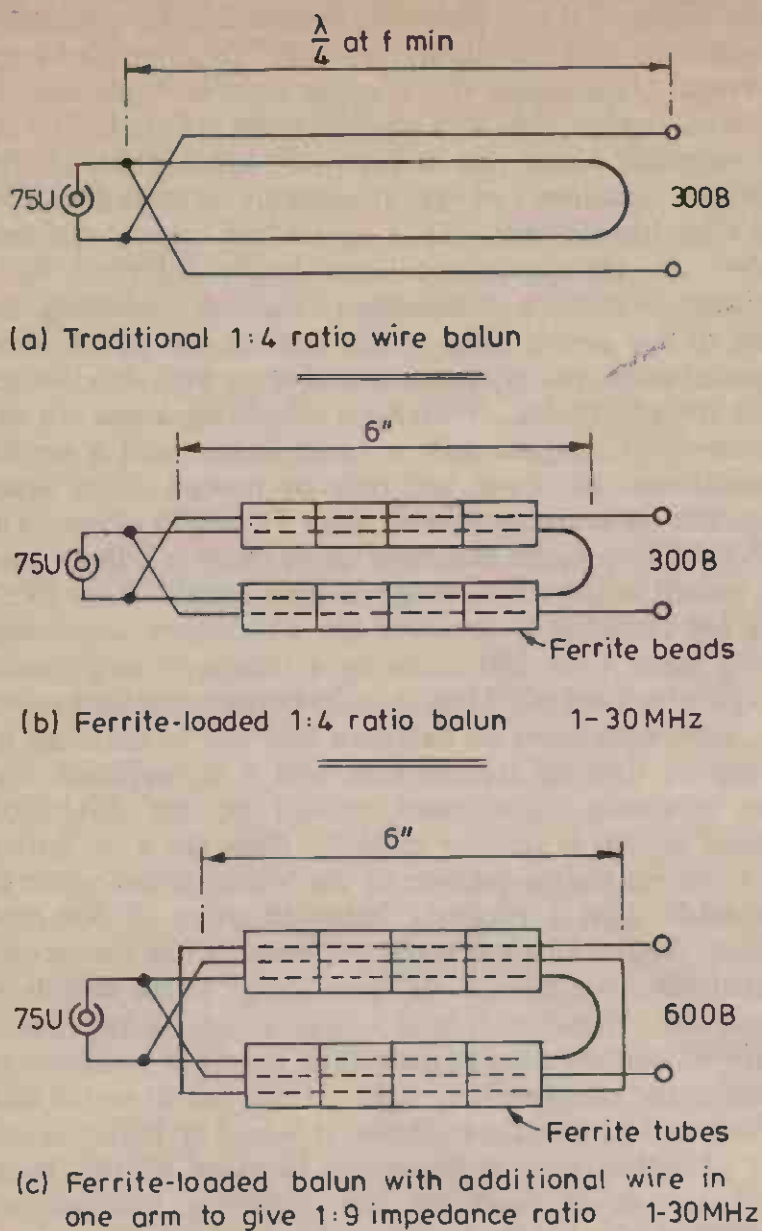


Fig. 1



$$\frac{R_L}{R_L + R_g} \times \text{EMF} = \text{PD}$$

$$\frac{\text{PD}^2}{R_L} = \text{Watts in load}$$



D  
343

Fig. 2

which cannot be varied, but the toroidal transformer can be tapped or given primary and secondary windings within a wide range of practical limits. The so-called 1 : 1 balun using a toroid cannot be duplicated in the traditional balun configuration, and the perpetuation of the term to describe transformers simply creates an impression that toroids can only be used for balance-to-unbalance conversion.

**Windings.** The "Radio Communication Handbook", 4th Edition, in its specification for a toroidal balun specifies use of 0.110 x 0.060in. enamelled copper wire, which is not the sort of thing every amateur will keep in a kitchen drawer together with a reel of insulating tape and a card of fuse wire! *TMP Electronic Supplies* send a small coil of 16 s.w.g. enamelled copper wire with their balun kit. At G8WV, flat-twin electrical cable with 1.5mm. solid conductor is stripped of its outer coating and the red and black insulated wires used for the windings. When available winding length and number of turns require smaller wire, 23 s.w.g. PVC insulated wire from multi-core telephone cable is used.

**Bifilar Winding.** A 'bifilar winding' is two wires wound on simultaneously, side by side; it is generally intended that they should be so spaced that the required number of turns fills the whole winding length of the toroid. The

finish of one wire is then joined to the start of the other, putting the two windings in series, and one has in effect a centre-tapped winding which goes twice round the toroid, having a number of turns equal to twice the number of bifilar turns. Fig. 3 shows a bifilar winding early in the process and Fig. 4 shows one completed. As it stands this becomes the inevitable '75 ohms unbalanced to 300 ohms balanced' toroid transformer, shown in schematic form in Fig. 5. The object of the bifilar winding is to keep the coupling between the two halves of the centre-tapped winding very tight, rather like interleaving of windings in audio transformers; this keeps the leakage reactances on each side of the circuit low, which is very necessary if the transformer is going to have a good wide-band performance and realise the advantages offered by toroids. It is best to *push* the two wires through the toroid as shown in Fig. 3, keeping the turn held in position on the core whilst the remaining slack wire is pulled through. The wire should be cut to a little more than is actually needed for the winding before starting, and this can be accurately measured by winding on a piece of string and cutting it to length (pushing the tips of the wires through the toroid first when putting on a turn always results in the slack wire becoming bent and possibly kinked). The use of insulated wire with different colours for each of the bifilar wires helps to identify them when tapping a completed winding or putting the two wires in series. Before starting the winding, a clove-hitch with long free ends is tied on the core, and the loose ends are used to secure start and finish of the winding. For large cores twine is used, and thread for smaller ones; in both cases it is waxed by dipping in melted beeswax, as this helps to hold it in position when tying off.

**Balance-to-Unbalance Transformers (Baluns).** It is usual practice to denote winding application by the letters 'U' and 'B' following a numeral which is the matching impedance in ohms. Thus a 300 ohms balanced to 75 ohms unbalanced transformer is succinctly described as '300B-75U'. The same transformer could equally be '200B-50U', but in common practice there is a dearth of RF devices requiring a 200B match!

Balun functions likely to be required are:—

1. Feeding a 50 ohms multi-band trap aerial with 50 ohms coaxial cable, viz 50U-50B.
2. Feeding a 75 ohms dipole aerial with a 75 ohms coaxial cable, viz 75U-75B.



Fig. 3.



Fig. 4.

- 3 Feeding a 300 ohms folded dipole with a 75 ohms coaxial cable, viz 75U-300B.
4. Joining a 600 ohms open-wire external transmission line to an internal 75 ohms coaxial cable, or feeding a 600 ohms wide-band cage dipole or rhombic with a 75 ohms coaxial cable, viz 75U-600B.

The so-called 1 : 1 balun toroidal transformer will meet the first two requirements; this is shown in Fig. 6, and is in fact a trifilar winding. Requirement 3 is met either by the open-wire or coiled 4 : 1 balun, or the R.H. Minns ferrite loaded balun, or the toroidal balun shown in Fig. 5 using a bifilar winding. Requirement 4 is rather unlikely in amateur service, but is best catered for by the Minns ferrite loaded balun with 9 : 1 impedance transformation (Fig. 2c) if it does arise.

The point that seems to be missed in amateur thinking is that the toroidal HF transformer offers much improved flexibility in respect of transmitter output, LP filter, transmission line, reflectometer, and aerials. When an amateur equips his station he decides on the characteristic impedance of his coaxial cable feeding the aerial, or it can be decided for him by his choice of aerial. For example, the popular Mosley TA-33Jr. three-band Yagi trap beam calls for 50 ohms matching, and whilst it is undoubtedly a 'balanced' aerial the suppliers suggest it should be fed directly with an unbalanced 50 ohms cable. Use of a toroidal balance-to-unbalance transformer sorts out that side of the problem, but one is still left with the requirement for a 50 ohms cable which will impose itself on the reflectometer, LP filter, and transmitter output circuit, so making these devices unsuitable for using with an alternative dipole aerial—which calls for them all to be 75 ohms impedance.

*Exploiting the Flexibility of HF Transformers.* At the aerial farm, toroidal HF transformers can be used in the actual aerial feed points to transform the load impedances of the various aerials to one standard impedance throughout the system, so ensuring that the equipment in the shack will serve all the aerials without worrying about

impedances. If one insists on combining the unbalance-to-balance and impedance matching functions into one toroidal transformer the possible combinations become limited, but the iron dust toroidal cores are cheap and the transformer losses can be kept very low indeed, so that the two functions can very reasonably be served each by its own transformer. Thus we should have at the feed point an unbalance-to-balance balun followed by a balance-to-balance transformer, together matching the line to the aerial. The writer favours use of 75 ohms coaxial cable, mainly because it goes so well with dipoles and folded dipoles. With such aerials we know we can achieve our purpose with a single balun, and a second transformer in circuit will only be needed if the aerial matches an impedance other than 75 or 300 ohms. The TA33JR trap aerial matching to 50 ohms is a likely one, as indeed is the whole range of trap aerials. Less likely are log-periodics in amateur use which look like something more than 100 ohms as a rule, and single-band Yagis which are often less than 20 ohms at the feed point.

Such aerials are all balanced and can be matched by a second toroidal transformer, and it is suggested that the balancing transformer should be the 75U-300B design as this is simpler to make than the 1 : 1 balun, and enables the connection to the second transformer to be made with a properly balanced piece of 300-ohm ribbon feeder, which is quite important since the second transformer will need to be up in the air in the middle of the aerial. However, it is as well to avoid big impedance ratio transformations as these raise practical problems in keeping the coupling very tight. If one has to match into a Yagi at 15 ohms for example, it would be better to use a 1 : 1 balun for the balancing function as this gives 5 : 1 step-down ratio for the matching transformer, instead of 20 : 1 if the balun used is 1 : 4 ratio.

Incidentally, published literature on toroidal transformers for external service gives emphasis on coating the finished article with some sticky compound to protect it from the weather and, as a by-product of the process,

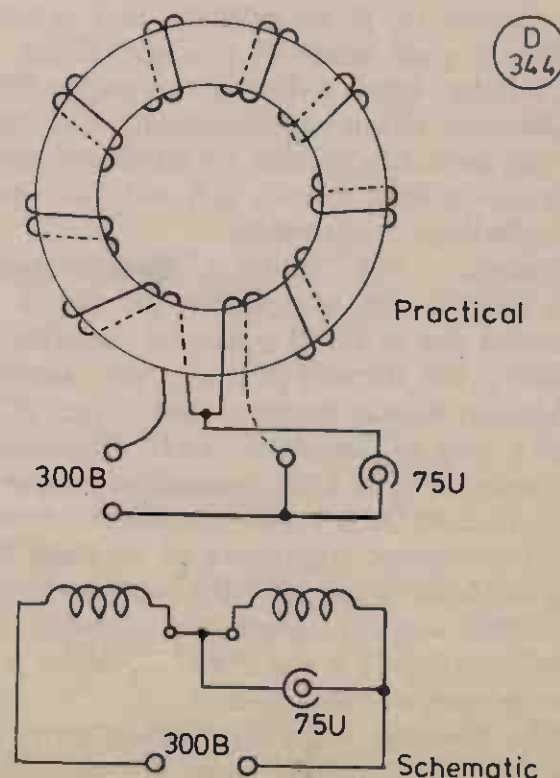


Fig. 5 Bifilar-wound toroidal balun 75U-300B

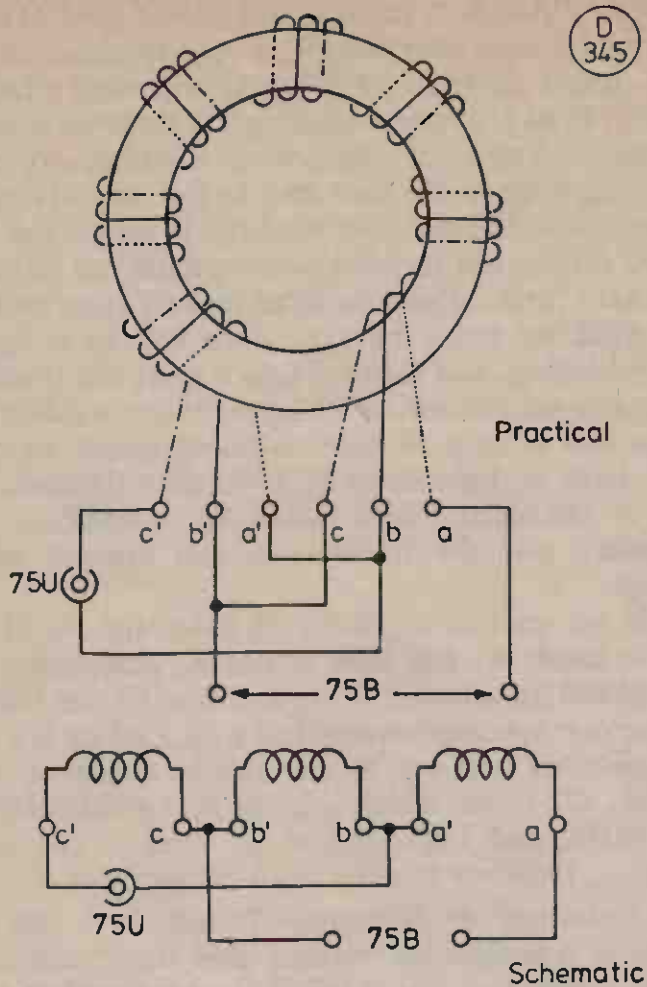


Fig.6 Trifilar-wound toroidal balun 75U-75B

make the core irrecoverable if one wishes to salvage it for a change in plan. There are lots of cheap moulded plastic boxes of suitable size on the market these days, and an edging of *Cementone* joint sealing compound around the lid before it is screwed on tightly will seal and protect the transformer inside against all the weather we are likely to get!

**Transformer Design.** At this stage it would be as well to run through actual design procedures for a number of types. We need to know the application specification telling us:—

- (a) Peak power to be handled.
- (b) Maximum and minimum frequencies to be served,  $f_{max}$  and  $f_{min}$ .
- (c) Input and output style, balance and unbalance.
- (d) Input and output impedance,  $Z_{in}$  and  $Z_{out}$ .

About (a), the size of the core used is determined by this, but the information available about core ratings is indeterminate: *TMP* give a rule-of-thumb suggestion for iron powder cores that halving the size quarters the power handling capacity. (Since the core sizes are stated in outside diameters one assumes the expression "halving the size" means "halving the diameter"!). T200 cores are offered for the amateur aerial matching needs and are mentioned as capable of 1kW in the absence of standing waves. The safe answer is to see if the core gets hot and go bigger if it does, which means that it needs bench checking on full power before putting it in its box and sealing it up. Watch peak power on SSB as core saturation on peaks is quite possible, and will lead to envelope distortion and all the splatter that goes with it.

Regarding (b), minimum frequency determines the number of turns which should be seen by a given circuit

impedance. The inductive reactance  $X_L$  of the winding is right across the circuit impedance  $Z_o$ ; both quantities are stated in ohms, and  $X_L$  at  $f_{min}$  should be at least  $3Z_o$ . If  $X_L = Z_o$  the transformer response will be 3 dB down (which is half the power gone!), and if  $X_L = 2Z_o$  the response will still be 1 dB down approximately.  $X_L$  will increase with the number of turns but these should be no more than strictly necessary, for more turns mean more copper loss and more self-capacity, which will affect the high frequency end of the range. However, provided the core material is right, it is normal expectation for a single transformer to cover a frequency spectrum of more than eight octaves, so if we design for  $X_L = 3Z_o$  at  $f_{min}$  it will surely meet any amateur requirement without fussing about dielectric constants of wire insulation or the wire size or cross-sectional shape to reduce the winding self-capacity.

The input and output style specified in (c) (U or B) is no trouble provided they are both the same style. It is just a question of whether one regards one end (U) or the middle (B) of the winding as the "cold" point which can be earthed. If there is a U-to-B requirement, one is into 'balun' techniques and unless the impedance ratio is 1 : 1 or 4 : 1 the writer's advice is to tackle the U-to-B and  $Z_{in}$  to  $Z_{out}$  as two separate problems to be solved with two separate transformers. That is not to say it is impossible to use a single transformer to do both functions, but it can be very difficult in practice and the amateur is liable to end up with a degree of unbalance at the high frequency end and a bigger insertion loss than he would get using separate transformers.

The input and output impedances given in (d) set the impedance ratio  $\frac{Z_{out}}{Z_{in}}$  and hence the turns ratio

$$\frac{n_2}{n_1} = \sqrt{\frac{Z_{out}}{Z_{in}}}$$

**Worked Examples.** Let us proceed to work out some actual transformers, using some of the formulae given in *Part I* as well as this part, and make a start with the following specifications:—

- 1. Peak power = 400 watts.
- 2.  $F_{min} = 3.5$  MHz,  $F_{max} = 30$  MHz.
- 3. Style = B to B.

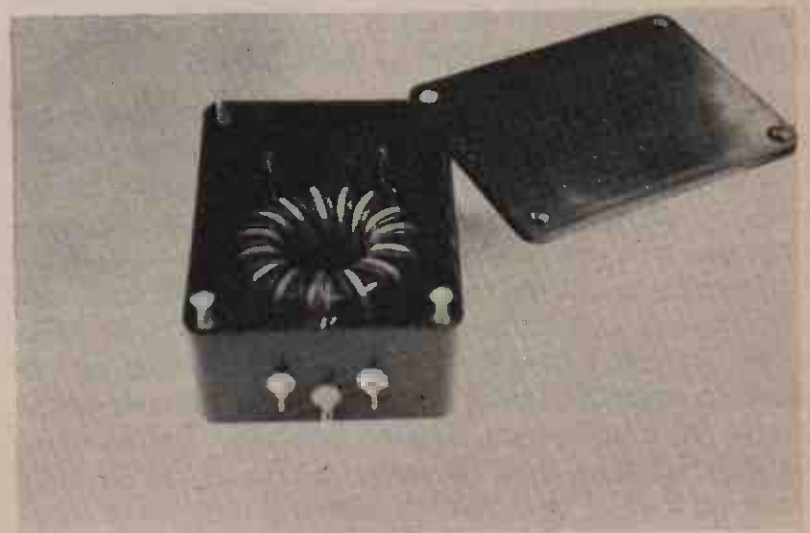


Fig. 7.

4.  $Z_{in} = 50$  ohms,  $Z_{out} = 300$  ohms.

From the specification we determine:—

$$\text{Impedance ratio } \frac{Z_{out}}{Z_{in}} = \frac{300}{50} = 6, \text{ so turns ratio} = \sqrt{6} = 2.45.$$

We make  $X_L = 3Z_{out} = 3 \times 300 = 900$  ohms at  $f_{min}$ ,  
which is 3.5 MHz; and  $X_L = 2\pi fL$ , so  $\frac{900}{6.28 \times 3.5}$   
 $= L = 41$  microHenries

Peak power is 400 watts and we should leave some in hand in our core rating for we are sure to run into an SWR of anything up to 2 : 1 with such a big frequency range. So we choose the 1 kW rated T-200-2 iron dust core, which is listed as requiring 100 turns to make 120 microHenries. We need 41 microHenries, so the number of turns is:—

$$n_2 = \sqrt{\frac{41}{120}} \times 100 = 58.45 \text{ turns.}$$

We round this figure up to an exact even number as it is a balanced winding, which gives us 60 turns.

The number of turns for the 50 ohms circuit,  $n_1$ , is:—

$$\frac{n_2}{2.45} = \frac{60}{2.45} = 24.48 \text{ turns.}$$

Once again we need an even whole number, so we reduce that to 24 and then check to see how our impedance match has reacted to the practical changes:—

$$\sqrt{\frac{n_1}{n_2}} = \sqrt{\frac{24}{60}} = 0.16 = \frac{Z_{in}}{Z_{out}}$$

Thus  $0.16 \times 300 = Z_{in} = 48$  ohms, giving us a mismatch of 4%, from specification, which will have negligible effect on the power transfer, and is entirely acceptable.

To keep the transformer nicely balanced we put on 30 bifilar turns, joining the two windings in series to give the 60 total turns. Now we need 24 turns for the 50 ohms connection, we we count off 12 turns from each side of the centre tap (which is the junction of the two windings) and place our taps at those points.

It is rather doubtful that an amateur will need a transformer covering such a big frequency range because it is of necessity part of the aerial, and aerials which present a constant resistive load over an 8 : 1 frequency range are well out of amateur scope! A more probable requirement would be to design a transformer to match a feeder into a three-band aerial serving 14-21-28 MHz bands. In such a case  $f_{min}$  becomes 14 MHz and we can afford to make  $X_L$  rather larger than  $3Z_o$  because of the greatly reduced frequency range involved. Let us make the  $Z_{out}$  winding total 40 turns, giving an  $X_L$  of 1688 ohms, or  $5.6Z_{out}$ ; the 50-ohm taps will then be 16 turns apart, or 8 turns each side of centre. This should make an excellent transformer.

*The 1 : 1 Balun.* A requirement to feed a 3.5 MHz dipole with a 75 ohms coaxial cable is very possible. In this case we should use the 1 : 1 balun arrangement which Fig. 6 shows to have a trifilar winding (*i.e.* three wires wound on simultaneously), of which two windings are in series looking both to the load and to the line. Thus our  $X_L$  concerns once again two windings in series, but since we have three wires to wind on we should not be too lavish with the turns. This time let us make a guess on the basis of what we know by experience will be a reasonably easy winding, and then see how it suits our specification. Suppose we put on an 18 turns trifilar winding? Then  $Z_{out}$  will offer a 36 turns winding which we calculate will have an inductance of 15.55 microHenries, and an  $X_L$  of 342 ohms, which makes  $X_L = 4.56Z_{out}$ . This is excellent and the transformer can proceed with that design.

If we want to use the 1 : 1 balun for 14, 21 and 28 MHz bands we can look at our  $X_L$  calculation for the 300B-50B transformer above and note  $X_L$  was 1688 ohms. Since our new requirement has a  $Z_{out}$  which is a quarter of the other one, our  $X_L$  can also be quartered and that equals 422 ohms, which is given by 4.8 microHenries at 14 MHz, and requires just 20 turns. The complete winding therefore consists of 10 trifilar turns.

*An Unbalance to Unbalance Transformer.* At G8WV there is a top-loaded vertical steel mast used as a 3.5 MHz aerial, and this is fed at the base against an earth of buried radial wires. The feed impedance is 37.5 ohms, and a 75U-37.5U transformer fixed right at the insulated base of the mast provides the match to a 75-ohm coaxial cable. The transformer is arranged inside a die-cast aluminium box mounted on a strip of steel cemented into the mast base; all screws passing through the box have been sealed in with *Araldite* and it has worked happily for five years ever since the original installation—without being opened.

The transformer is 2 : 1 impedance ratio and so is 1.414 : 1 turns ratio. It is, in fact, an auto transformer with the 37.5 ohms tap at the 0.707 point along the winding from the earthed end. The calculation for a 75 ohms winding at 3.5 MHz already been done in the 1 : 1 balun above, and it came to 36 turns. A turns ratio of 34 : 24 works out to 1.416 : 1 and is as close as one can get in complete turns to the ideal. 34 turns gives an inductance of 13.87 microHenries, and  $X_L$  of 305 ohms at 3.5 MHz—so that  $X_L$  will be  $4Z_{out}$ .

It is still desirable to interleave the turns to give very close coupling between them although the transformer is for unbalanced service. This can be done by putting on a 12 turns trifilar winding and then joining all three windings in series. Make one free end the earth connection and remove two turns from the opposite end, so reducing the total winding to 34 turns; the 37.5 ohms tap is then the second join of the windings from the earthed end.

Readers should now have got the idea of how to design their own transformers for any sort of service—within the limitation imposed by self-capacity that terminating impedances should be low and in any case, not exceeding 600 ohms. Testing of these transformers at their working power level and applications other than aerial matching remain to be dealt with.

*to be continued*

# VHF BANDS

NORMAN FITCH, G3FPK

## More World Records

**H**ISTORY was made on March 20, 1979 when George Vernardakis, SV1AB, and Costas Fimerellis, SV1DH, in the Athens region both positively identified the ZE2JV *seventy centimetre* beacon in Salisbury, Rhodesia, at 1816 GMT. That such reception over a path in excess of 6250 kms. is possible is truly astonishing. It is reminiscent of the pioneering days of short wave radio communication when the "experts" pronounced that the high frequencies would be useless for long distance circuits. Fortunately, radio amateurs proved otherwise.

It was logical that these dedicated amateurs in Greece and Rhodesia should attempt the impossible, following their many successful contacts over this path on 2m. It is a fitting tribute to their patience that they have now proved that it is possible to propagate UHF signals over such a long path without resorting to *e.r.p.*'s of the "Pave Paws" type.

Shortly afterwards, the world record distance for a 2m. QSO was convincingly shattered when contacts between Italy and Namibia took place. These were on March 30 and 31, the participants being Fausto Minardi, I4EAT, from Firenze, and ZS3B in Windhoek. The distance would be about 7450 kms. depending upon the exact latitude and longitude of the African station.

Naturally, there has been much speculation amongst propagation experts concerning just what mode can sustain such long distance communication at VHF and now UHF. An important clue is the *auroral* sound of the signals. SV1AB and SV1DH reported this phenomenon on 70 cms. and noticed a *Doppler*

shift. Another clue is that at ZE2JV, the aerial array, consisting of two 8-ele. *Quagis* side-by-side, was elevated at 20°. At the time the *MUF* was high and the "A" indices above 30. In the 2m. QSO's the *solar flux* readings were 190 and 212, and the "A" figures 12 and 17 on March 30 and 31 respectively.

From this, it is suggested that this is another form of *auroral* type propagation requiring high *solar flux* and disturbed magnetic conditions. As the peak of sunspot cycle no. 21 is predicted for the end of this year, it would seem that the next autumnal and vernal equinoxes would offer prime times for further propagation studies.

In a letter dated March 13 which arrived on the 27th, Martin Harrison, G3USF, from Keele University, sent an account of the various TEP goings-on from which it appears that ZS6DN on 2m. was received in western Greece by SV8JE on Feb. 16. Paul Galea, 9H1BT, in Malta has also been testing with ZS3B on 2m. without results and TU2GK in the Ivory Coast has skeds with Greece. Pierre Pasteur, HB9QQ, no doubt spurred on by I4EAT's success, is QRV for TEP tests on 144.150 MHz daily 1800-1805 GMT.

On March 10, ZS6DN's 2m. signal was received in Athens at 24 dB. over the noise, suggesting that a 10 watt station could have made a contact! It seems that high *e.r.p.* is not essential for TEP contacts though it undoubtedly helps.

G3USF writes that these continuing tests are to establish diurnal/seasonal patterns and to permit comparison with solar-geophysical data; to see if the TEP zone can be extended even further north and south; to compare the time delay on 28 MHz and 144 MHz by means of simultaneous pulsed transmissions, and to check the angle of arrival and polarisation of signals.

Your scribe feels that, with some of the ambitious aerial arrays now in use, coupled with really low noise receiving systems, it is by no means impossible that the ZE and ZS beacons could be received in parts of the British Isles, such as the Channel Islands and south-east England. This view is shared by the RSGB's VHF Committee which has proposed that 144.130 MHz be monitored daily around 1800 GMT

just in case ZS6DN is heard. The note would be an *auroral*-sounding one but perhaps not quite so rough as we are accustomed to with temperate zone *Ar*. As mentioned earlier, the equinoxes would afford the most like opportunities for such reception.

## Awards News

The first of our new QTHCC—QTH Squares Century Club—awards have been issued. G3FPK's claim for Number 1 for the basic 100 confirmations, plus the "125" sticker, was processed by Paul Essery, G3KFE. No. 2 has been issued to Bryn Llewellyn, G4DEZ, from Didcot in Oxfordshire (ZL34a). His collection included a nicely assorted quantity of tropo., *auroral*, *E*'s and MS cards. Bryn's present gear comprises *Trio* separates, *Micro-wave Modules* transverter and *Nag* 144XL linear, with a pair of bayed 16-ele. *Tonna* aeriels.

No. 3 award went to John Hunter, G3IMV, from Bletchley, Bucks. (ZL07h). John is a fine CW operator so it was not surprising that 73 per cent of the QSO's were for A1 mode, including 11 MS ones. The station at G3IMV ends up with a home-built, single 4CX250B amplifier, the earlier 10-ele. *Parabeam* having been replaced recently by a 16-ele. *Tonna*. For full details of the QTHCC award, send a stamped and addressed envelope to the Awards Dept. (QTHCC) at the QTH at the end of this feature.

It is nearly a year since the last 70 cm. VHFCC certificate was issued so it is a pleasure to record that No. 25 was sent to Tony Oakley, G8IWA, from Beverley, North Humberside, on April 1. Tony is now G4HYD and readers may not have realised that he was the Captain Tony Oakley whose company first salvaged and then had to scuttle the infamous oil tanker *Christos Bitas*—hope that's the right spelling—earlier this year. The first equipment used was a home-brew, solid-state, low-level job from a *VHF Communications* design, followed by a couple of *QQV02-6* amplifier stages. About a year ago, a *Micro-wave Modules* transverter was obtained. This, with its stabilised power supply, is mounted on top of a 60ft. *Versatower* in a watertight box. Tony reports that the improve-

ment in performance, "... is quite amazing ... and well worth the effort." The drive source is a *Trio* TS-700 and the aerial an 88-ele. *Multibeam*.

Three more 2m. VHFCC certificates have been won this month. No. 310 went to Jim Rabbitts, G8LFB, from Luton, Beds. Up to September, 1978, vertically polarised FM from a *Pye* Cambridge was the mode which brought in 39 countries and 5 countries confirmed. After that, Jim, "... succumbed to SSB ..." and now uses a *Belcom* Liner-2 into a 16-ele. *Tonna* which combination has pushed the countries total to 9.

C. Shearer, G8LVG, currently operating from Chelmsford, Essex, received No. 311. When first licensed in August 1976, operation was as GM8LVG from Lossiemouth (YR24a) using a *Yaesu* FT-101E/*Europa B* set up with a 10-ele. *Yagi*. The move to Chelmsford was due to employment requirements and the station now comprises a *Yaesu* FT-221R and 16-ele. *Tonna*. In his first week of operating from Essex, G8LVG worked ten times as many stations as did GM8LVG in *two* years. A linear amplifier is under construction and CW lessons are progressing with a view to HF band operation soon.

Award No. 312 goes to one of our youngest readers, Bob Mackean, G4HAO, from Liverpool, who applied before his 17th birthday. Licensed as G8LYH in August 1976 at 14 years of age, Bob's first venture onto 2m. was with a *Liner-2* and *halo* aerial. A few weeks later a *Telford* TC-10 and *ARAC* 102 were bought using an indoor 8-ele. *Yagi*. A year later a *Liner-2* was purchased and the aerial put up outside in Jan. 1978. In April, 1978, he passed the CW test first go. The present set-up comprises an *Icom* IC-202 and amplifier and Bob hopes to get going on the HF bands soon.

#### Satellite News

Ron Broadbent, G3AAJ, remains the Secretary of AMSAT-UK and editor of the quarterly journal, *Oscar News* following the organisation's A.G.M., which was attended by 22 members. Pat Gowen, G3IOR, was elected the President and Dr. Arthur Gee, G2UK, the Chairman. The AMSAT-UK orbital

prediction calendar is now available for £2.15, post free, and includes predictions up to March 1980. The format is very good as data for *Oscars* 7 and 8 and the two Russian *Sputniks*, *RS-1* and *RS-2* are given side-by-side for each day.

Nothing seems to have been heard of either Russian satellite for some weeks now so it would seem these

#### QTH LOCATOR SQUARES TABLE

Station	23 cm.	70 cm.	2 m.	Total
G3POI	—	—	265	265
I4EAT	—	25	217	242
G3SEK	—	—	179	179
G3IMV	—	—	175	175
G3CHN	—	—	167	167
G3FPK	—	—	154	154
G4DEZ	—	—	150	150
G4CMV	—	30	140	170
9H1BT	—	—	138	138
GM4CXP	—	25	133	158
9H1CD	—	13	127	140
G8HVY	—	17	119	190
G4BWG	—	29	118	147
G3XCS	—	21	111	132
G8BKR	1	30	108	139
G8GML	11	63	106	180
GM4COK	—	9	106	115
G8LEF	22	61	101	184
G3OHC	4	33	101	138
G8HHI	—	30	101	131
GJ8ORH	—	30	99	129
G4AWU	—	—	94	94
G8KSS	—	—	93	93
G4BAH	—	32	92	124
G2AXI	2	52	91	145
G3BW	3	25	91	119
G4FBK	—	5	90	95
G4FCD	—	22	89	111
G3JXN	26	66	88	180
G8ATK	—	38	88	126
G6UW	—	—	85	85
G3KPU	—	20	84	104
GM8NCM	—	12	84	96
G4HYD	—	40	83	123
9H1C	—	—	83	83
GJ8KNV	—	26	82	108

G4ERG	—	—	82	82
G3COJ	23	66	80	169
G8LHT	3	34	80	117
G8KGF	—	5	80	85
G8JHX	—	—	80	80
G8JJR	—	—	79	79
G8KPL	—	7	74	81
G8LGL	—	1	74	75
G8JAG	—	7	73	80
G8KSP	—	2	72	74
G4GET	—	—	70	70
G4DKX	5	30	68	103
GD2HDZ	11	34	67	112
G4ERX	1	29	67	97
GJ8AAZ	1	24	67	92
G3FIJ	—	27	65	92
G3SPJ	5	21	63	89
G8GII	—	22	63	85
G8KLN	—	1	62	63
G4CIK	—	—	62	62
G4AEZ	3	28	61	92
GI8EWM	—	18	61	79
G4GCQ	—	—	61	61
G8KUC	—	7	60	67
GD3YEO	—	8	59	67
G8JEF	—	—	58	58
GW4FJK	—	—	57	57
G4GEE	—	27	56	83
G8ITS	—	16	56	72
OZ9IY	—	—	53	53
G8IFT	7	18	49	74
G8MFJ	—	9	48	57
G4GSA	—	1	48	49
G4GXT	—	—	43	43
G4EYL	—	—	41	41
G8JGK	—	—	41	41
G8EOP	8	36	38	82
G8PRG	—	—	15	15

Starting Date January 1, 1975. No satellite or repeater QSO's. "Band of the Month" 2m.

have not proved very successful. It seems a feeble excuse for them to infer that the high-power merchants have caused all the problems. They knew all about this from AMSAT so it seems surprising that, with all their alleged expertise, they were not able to produce something better.



Greg Roberts, ZS1BI, who works at an observatory in Cape Province, has made some visual sightings of *RS-1* and *RS-2* and calculates the following data for orbit 1864 for each object on March 31 as:—for *RS-1*, 0042.24s at 120.1°W. and for *RS-2*, 0129.06s at 131.8°W. The respective periods are 120.38930189 and 120.41453121 mins. The times are UT (GMT).

*Oscar 8's* orbit has been slowed down by ion flux density caused by the recent high levels of solar flux. It is proposed to give corrections on the first Sunday of the month net. *O-7*, *RS-1* and *RS-2*, being in higher orbits, seem less affected.

In spite of earlier fears that *O-7* was about "done for," it is still giving excellent service in Mode "A" and lately, quite satisfactory service in Mode "B" even though the telemetry is garbage. Both AMSAT birds are now being effectively commanded from the University of Surrey's control station.

Progress on the British amateur satellite being built at the UOS is good. The main framework has been built and the side panels fitted. All the solar cells have been selected and the best ones chosen. A name for this project has yet to be chosen and ideas should be sent to G3YJO at the UOS in Guildford. The launch date for the first *Phase 3* AMSAT transponder is now given as March 5 1980. It could spend up to the first 50 days in an *O-7* type, circular orbit so that the precise moment of firing the kick motor which will put it into the desired highly elliptical orbit can be calculated.

AMSAT-UK HQ now has two large polar projection "maps," correctly known as Admiralty Plotting Charts. One is 48 x 48ins., the other being 28 x 20ins., both at £1.25 post free. You will have to draw in the continents yourself though. For full information on AMSAT-UK, send an *s.a.e.* to The Secretary, 92 Herongate Road, London E12 5EQ. One late item is that in future, the "Newsletter" from AMSAT in the U.S.A. will be sent to ordinary members direct *via* surface mail which can take anything up to ten weeks.

## THREE BAND ANNUAL VHF TABLE

January to December 1979

Station	FOUR METRES		TWO METRES		70 CENTIMETRES		TOTAL Points
	Counties	Countries	Counties	Countries	Counties	Countries	
G4DEZ	—	—	56	17	—	—	73
G3FPK	—	—	60	11	—	—	71
G2AXI	13	1	35	6	13	2	70
G4ERG	—	—	55	15	—	—	70
G3FLJ	13	1	35	8	11	1	69
G8LHT	—	—	35	4	17	2	58
GM4CXP	3	2	33	12	1	1	52
G4GXT	—	—	38	7	—	—	45
G18EWM	2	1	33	6	—	—	42
G4HAO	—	—	36	6	—	—	42
GD2HDZ	2	2	9	2	20	2	37
G4FKI	3	1	6	1	2	1	14

## Repeater Notes

GB3FC, the Fylde Coast UHF relay on RB2, was scheduled to become fully operative on April 12. On April 1, the Llandulas UHF repeater on RB4 suffered severe storm damage so will be QRT for some time. Anyone interested in helping should contact G3LEQ. According to a news item on GB2RS the same day, the Brighton VHF relay, GB3SR on R3 was taken out of service on March 21 but no date for its recommissioning was known. The deliberate interference to GB3LO continues. In common with many other radio amateurs, your scribe is amazed that the Home Office allows this abuse to go on. If any other licensee broadcast the obscenities and rubbish that emanates from this station, he would be closed down very quickly.

## Beacon News

The Wrotham beacon Tx has now been fully tested by its keeper, G3COJ, and has been perking away satisfactorily on its new frequency, 144.925 MHz, at his home. It will be re-commissioned as soon as final Home Office approval is received. The Angus beacon, GB3ANG, on 144.975 MHz was taken out of service at noon on April 6 for a re-build and will be off until further notice. GB3SUT has been re-built

by Roger Taylor, G4BEL, and "soak tested" at his home. At the time of editing, it is ready to be sent to G3BA for re-installation.

## Six Metres

*S.w.l.* Jean-Louis Delpont from Brussels reports reception of four South African 50 MHz beacons on March 6 and 9. On the 6th, from 1422 to 1559 GMT, ZS6's VHF (50.04); PW (50.0265 FSK); XJ (50.0214 FSK) and LN (50.050). 'VHF and 'LN are on A1 and all were 599. On the 9th, ZS6PW was received from 1355 for 95 mins. subject to slow QSB from S2-S9, likewise ZS6LN for 33 mins. from 1357. ZS6VHF was copied at S2 between 1434 and 1500. Jean-Louis uses a ground plane aerial and 10 dB. pre-amp. into a superhet Rx with a digital frequency counter.

G3USF heard ZS6LN and ZS6PW at 1410 on March 3 and reports G3COJ (Bucks.) having worked 'LN at 1435. Martin heard these two signals at the same time on the 6th and between 1610 and 1627, 'LN, 'PW and 'XJ. G3FXB also heard the beacons at 1410 and worked several ZS's around 1620 to 1635, including '6XJ and '6AUB. On March 12, ZS6PW was heard in New Jersey by WB2MAI at 1515. During early March the ZS beacons

were heard in DL, EA, F, HB, PA, SV and 9H1. Of course, the British QSO's referred to were cross-band, with the G's on 10m. A new world record distance on 6m. was established recently by LU8AHW in Argentina and HL9TG in South Korea. East coast VK stations have been working into KL7 and Jimmy Bruzon, ZB2BL, has been having trouble with QRM from Japan when trying to work into Brazil!

### Two Metres

The long spell of mediocre tropo. conditions continues with no big lifts to cause any excitement. On March 25, the Barking Club's contest created a lot of activity in flat conditions. There was some confusion concerning counties as it seems the organisers intended one's *postal* address should be given rather than the actual county. *E.g.*: Romford, *Essex* although that town is now in Greater London. John Lemay, G8KAX, operating -/P, notched up 2184 pts. Peter Skolar (Highgate) managed 81 QSO's and 1377 pts. in a very interrupted session and George Zitterstein, G8ITS, from his Barbican balcony made 59 QSO's worth 1275 pts. Bryn Llewellyn, G4DEZ (Oxon.), lost a couple of hours when one of his *Tonna* aerials worked loose on its stub mast but nevertheless managed 89 contacts and 1177 pts.

On the *auroral* scene, Derrick Dance, GM4CXP (YP37c), caught the one on March 29 and kicked off with OY5NS (WW77f) at 1555 GMT, the QTF being 10°. Others worked included SMØBYC (IT70b) described as "a half QSO," LA3WU (CU47d), PA3AES and PAØSGL both in CM square, the QTF's being between 50 and 60 degrees. Fade-out was after 1900 and between 1710 and 1720, GM3YOR (YQ65f) and G6WR (YO33g) were worked on 4m. The OY QSO was a new country and square and GM4CXP was all the more pleased as he was just using an IC-202 at the time.

Your scribe was alerted to the March 29 affair at 1700 but only heard and worked G's and GM's. By 1815, *Ar* signals had gone. On April 3/4 there occurred an extensive, two-phase event, the first of which was missed by G3FPK. Jon Dougherty, G4FUT (ZO14h) did

well, however, his best DX being UC2ABN (NN18e) at 2315, a QRB of 1866 kms. During the first session, from 1700—1815, four LA's, two G's and one GM were worked at QTF's 50°. The first QSO in phase 2 was at 2244 with LA3JA, followed by OZ10F (EQ78b), SM4FXR (HT57g). From Jon's list, the best DX contacts are; DM2DQG (FM79h) at 2342, SM6CEN (FR40b) at 2345, SM6DHD (GR26g) at 2359 and SM6EHY (GR13g) at 0116, at which time he went to bed with the event still in progress but no new calls being heard. One rather interesting observation is that the received *Ar* signals were some 5 kHz *higher* than the transmitted signals.

Jon caught a brief *Ar* on April 5 from 1741-1755 when it faded out. In this DK5LA, GM4BYF and GM3YOR were worked at QTF 50° and in this one the received signals were 2 kHz *lower* than the transmitted ones.

Your scribe had been working up to midnight on April 3 and switched on by chance to discover the *Ar* in full spate. At 2327, OZ10F was heard calling UA3LBO (QO21h) but nothing was heard from the Russian. The best DX heard was UQ2IV in KQ square, called at 0003. Things seemed to be fading at 0040 with G4CJG only S2, so G3FPK was closed down.

### Random Jottings

The long delays with the post through London, coupled with our publishing hiccups, have resulted in no reports of the 1296 and 432 MHz contests on April 7/8. With very little spare time these days, your scribe has not been able to be so active "on the wireless" to gather reports that way, either.

G4FUT, whose UC2 QSO brings his *Ar* score to 21 countries, infers that we are dropping our VHFCC award. This is *not* the case since it is well appreciated that collecting 100 confirmations is a great challenge for many poorer-sited stations.

G4HYD (ex-G8IWA) is putting the finishing touches to his high-level 23 cm. transverter destined for masthead mounting. Tony also mentioned that VHF repeater GB3HS on R2 serving Hull and district, became fully QRV at midday on March 4, "... about 20 feet from my office desk."

### Deadlines

Please send all your news, claims and comments for the June/July issue by June 7th, and for August by July 5th. As usual, everything to:—"VHF Bands," SHORT WAVE MAGAZINE, 34 High Street, WELWYN, Herts., AL6 9EQ. 73 de G3FPK.

Subscription rate to  
Short Wave Magazine  
is £5.50  
for a year of twelve  
issues, post paid

SHORT WAVE MAGAZINE, LTD.  
34 HIGH STREET,  
WELWYN, HERTS AL6 9EQ

# SEM

P.O. BOX 6, CASTLETOWN, ISLE OF MAN Tel. MAROWN (0624) 851277



★ Our products usually have about three years before similar units appear on the market.

All I can say is:

COMPARE THE PERFORMANCE  
COMPARE THE QUALITY  
COMPARE THE PRICE

## SEM EQUIPMENT FOR THE 80's IS NOW READY

The Sentinel 2 metre pre-amplifier circuit was designed in 1969 using the then up to the minute technology of FETs. The soundness of the design is proved by steadily increasing sales for a decade, now being higher than ever. Different FETs have been used to keep up with lower noise figures and higher reliability. Then the r.f. switching and protection circuits were incorporated to produce the "AUTO" units. Another original idea, first on the market and an immediate success.

Over the past year we have developed a new range of Sentinel 70cm. and 2 metre pre-amps ready for the 1980s. You can buy them now.

## INCREASE YOUR 2 METRE RANGE

Our Sentinel range of pre-amplifiers use a J. FET rather than the usual MOSFET because they give a lower noise figure. They are selected for a 1dB noise figure. We also stock these units on Marine Band and Satellite Band on other frequencies to order.

## SENTINEL AUTO 2 METRE PRE-AMPLIFIER

Connects straight into transceiver aerial feeder and the r.f. switching looks after the change over. Gain is 18dB. Any transmit mode. £17.35\* Ex stock. 70cms. version is £20.256 Ex stock.

## SENTINEL STANDARD PRE-AMPLIFIERS

Same as above but without the automatic R.F. switching. 2 metres is £10.85\* 70cms. is £13.50\*. BOTH IN STOCK.

## THE ORIGINAL PA3 PRE-AMPLIFIER

Size 1 cu. inch to fit inside your transceiver. Gain 18dB. N.F. 2dB. Price £6.80 Ex stock. PA3/70. 70 cms. version £9.00 Ex Stock.

## SENTINEL 2 METRE POWER AMPLIFIER/ PRE-AMPLIFIER

The transmit amplifier now uses the latest type of internally matched, mismatched, protected transistor, which provides four times power gain i.e. 12W. IN, 48W. OUT. It uses an ultra linear circuit for use on all modes. The receive pre-amplifier is the same as the Sentinel above. The package is completed with an r.f. switch with time delay for all mode use, which can be operated by the transceiver. Size : 6" x 2" front panel, 4½" deep. Price : £59.62. Ex stock. Without pre-amp, £49.50 Ex stock. Yes, they do work fine with FT221s and TS700s.

## SENTINEL H.F. WIDEBAND PRE-AMPLIFIERS

2-40 MHz. 15dB gain. Ideal units for pepping up receivers on 15 and 10, for OSCAR reception and as an ACTIVE AERIAL.

## SENTINEL STANDARD H.F. PRE-AMPLIFIERS.

Performance as above, £9.00\* Ex stock.

## SENTINEL AUTO H.F. PRE-AMPLIFIERS

Same performance as above with a change over relay operated by your transceiver relay for direct connection in your aerial co-ax, £12.946 Ex stock.

NEW! SEM Forward/Reflected power meter designed for the British power levels. F.S.D. 500W. ¼ scale 100W. 1/10 scale 1W. 1-30 MHz. The pick up unit with two SO239s is 2" x 1½" and connects in the aerial lead. The meter unit is a separate box 6¾" x 3¾" panel, 2¾" deep, which you can put in any convenient position, £28.50 Ex stock.

## SEM Z MATCH

The updated unit uses much more reliable slow motion drives, which make adjustment and resetting easy. It will match aerials fo 15-5000 ohms, to your equipment. BALANCED or UNBALANCED at up to 1kW. SO239 and 4mm. terminals for co-ax or wire aerials, £39.44 Ex stock.

The most popular 2 metre transverter :

## SEM EUROPA C 2 METRE TRANSVERTER

200W. INPUT. 2dB Noise figure. Plugs straight into Yaesu equipment for any mode 2 metre operation, £112.50. Repeater shift if required for F.M. £12.50 Ex stock.

CPS10 Power Supply for use with any other equipment, £56.25 Ex stock.

## SENTINEL MOSFET 2 METRE CONVERTERS

I.F.s : 28-30 MHz, 4-6 MHz, 2-4 MHz. N.F. 2dB. Gain 30dB, £20.25. Satellite and Marine Band also in stock.

SENTINEL X 2 METRE CONVERTER—Same as above with A.C. power supply, £24.75 Ex stock.

SEM 70. 70cms. to 2 metre converter. Price : £20.25 Ex stock. SENTINEL 70. 70cms. to 10 metres converter. Price : £22.50 Ex stock.

SENTINEL TOP BAND CONVERTER. Price : £20.25 Ex stock.

\*SO239 sockets available on these units at an extra cost of £1.69. Circuits and instructions provided with equipment. All prices include VAT and delivery. For more details of any of our equipment, please ring or write. 12 months guarantee. To order : C.W.O. or credit card. Just phone your credit card number for same day service.

**The Shop with  
the Smile!**

# AMATEUR RADIO EXCHANGE



PROPRIETORS: BRENDA APTAKER, BERNARD GODFREY (G4AOG)

You've read all the advertisements and you've chosen the new rig you **NEED** to buy. Before you decide **WHERE** to buy it, be sure to phone

**01-579 5311**

Discuss your requirements with us. Come in and try the equipment. That way you'll know what you're investing in really is right for you. So... buying, selling or just browsing... come to the shop where they **CARE**. And have a cup of Brenda's coffee as well! Or see us on our Stand at the major Summer Rallies.

## YAESU-MUSEN

CPU2500R 25W 2m. Transceiver  
CPU2500RK 25W 2m. Transceiver  
CPU2500RS 10W 2m. Transceiver  
CPU2500RKS 10W 2m. Transceiver  
FT-202R hand-held 1W Transceiver  
FRG-7 General Coverage Receiver  
FRG-7000 Digital General Coverage Receiver  
FR-101 Series 160-2m. Receiver  
FT-101E Transceiver 160-10m.  
FT-101Z Transceiver 160-10m.  
FT-101ZD Transceiver 160-10m. (digital readout)

FT-200 Transceiver 160-10m.  
FT-227R Transceiver 2m. with 1 MHz scan  
FT-901 Series (all models)  
FT-7 10W mobile HF Transceiver  
FT-7B 100W PEP HF Transceiver  
FP-12 10 amp Power Supply for above  
FL-110 Linear for above  
FP-4 AC Power Supply 12v. out  
FT-225 Series 2m. FM/AM/SSB Transceiver  
FT-301 Series HF Transceiver  
FL-2100B HF Linear Amplifier

Plus all other YAESU Products

## ICOM

IC-215 portable 2m. FM Transceiver  
IC-202 portable SSB 2m. Transceiver  
IC-402 70cm. portable SSB Transceiver  
IC-240 synthesised 2m. FM Transceiver  
IC-280E synthesised 2m. FM Transceiver digital plus memories  
IC-701 HF Transceiver  
IC-245E FM/SSB 2m. Transceiver  
IC-211E All mode 2m. synthesised Transceiver  
IC-RM3 Remote control micro processor keypad

## FDK

Multi 800D and 700E 25W FM synthesised 2m. transceivers  
Quartz 16 2m. FM transceiver  
Multi Ull 70cm. transceiver  
TM56B 2m. monitor receiver with scan

## KW

E-Z Match  
107 Antenna Tuning System  
109 Antenna Matching System (high power)  
Dummy Load

## MICROWAVE MODULES and QM 70

Full range of converters, transverters, counters, pre-scalers, linear amplifiers, etc.

**A.S.P., BANTEX, G-WHIP, HY-GAIN, JAYBEAM, MOSLEY, PANORAMA**

Antennas, beams, whips, rotators, etc.

## SPECIAL FOR ALL FRG-7 OWNERS

Modification kits for narrow-band SSB filter now available, complete with simple step-by-step instructions, £15.00 inc. P. & P.

PHONE FOR DETAILS OF  
CURRENT STOCKS AND PRICES  
NEW AND SECONDHAND

**CLOSED WEDNESDAY, BUT USE OUR 24-HOUR ANSAFONE SERVICE**

Easy terms  
up to 2 years



Credit sales  
by telephone



Instant HP for  
licensed amateurs

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

**2 NORTHFIELD ROAD, EALING, LONDON, W13 9SY . Tel. 01-579 5311**

# P.M. ELECTRONIC SERVICES

## PROFESSIONAL COMPLETE CRYSTAL SERVICE AMATEUR

VAT—PRICES EXCLUDE VAT, FOR YOUR CONVENIENCE THE VAT INCLUSIVE PRICE IS SHOWN IN BRACKETS—OVERSEAS ORDERS (Inc. Eire and Channel isles) NO VAT CHARGEABLE

### 2M TX & RX CRYSTAL AVAILABILITY AND PRICE CHART

CRYSTAL FREQUENCY RANGE USE (Tx or Rx) and HOLDER	4 MHz-TX-HC6/U	6 MHz-TX-HC25/U	8 MHz-TX-HC6/U	10 MHz-RX-HC6/U	11 MHz-RX-HC6/U	12 MHz-TX-HC25/U	14 MHz-RX-HC25/U	18 MHz-TX-HC25/U	36 MHz-TX-HC6 & 25/U	44 MHz-RX-HC6/U	44 MHz-RX-HC25/U	48 MHz-TX-HC6 & 25/U	52 MHz-RX-HC25/U	72 MHz-TX-HC25/U
144-4 (433.2) ...	b	e	b	e	e	b	e	e	e	e	e	e	e	e
144-480 ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
144-800 ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
144-850 ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-000/R0T ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-025/RIT ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-050/R2T ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-075/R3T ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-100/R4T ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-125/R5T ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-150/R6T ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-175/R7T ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-200/R8T ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-300/S12 ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-350/S14 ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-400/S16 ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-425/S17 ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-450/S18 ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-475/S19 ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-500/S20 ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-525/S21 ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-550/S22 ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-575/S23 ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-600/R0R ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-625/R1R ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-650/R2R ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-675/R3R ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-700/R4R ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-725/R5R ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-750/R6R ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-775/R7R ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-800/R8R ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145-950/S38 ...	e	e	e	e	e	e	e	e	e	e	e	e	e	e

PRICES : (a) £1.95 (£2.19) ; (b) £2.32 (£2.61) ; (c) £2.80 (£3.15) ; (d) and (e) £3.92 (£4.41).

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

N.B. Frequencies as listed above but in alternative holders and/or non stock loads are available as per code (e).

ORDERING. When ordering please quote (1) Channel ; (2) Crystal frequency ; (3) Holder ; (4) Circuit conditions (load in pf). If you cannot give these, please give make and model of equipment and channel or output frequency required and we will advise if we have details.

#### JAPANESE AND AMERICAN EQUIPMENT

We can supply crystals for YAESU (FT2F, FT2 Auto, FT224), most of the ICOM range and the TRIO-KENWOOD range. We can also supply from stock crystals for the HEATHKIT HW202 and HW17A.

YAESU FT221 CRYSTALS NOW IN STOCK, ALL AT £2.80 (£3.15). All popular channels—For repeater use advise xtal frequency required as earlier models have different shift xtals to later FT221R. We can also supply the crystal to give NORMAL "tune to RX" working (as FT221R).

#### MODULAR COMMUNICATIONS SYSTEMS

For the RTTY enthusiast we can recommend and supply the "MCS" range of products. This includes terminal units, AFS keyers, magnet drivers for TTL interface, telegraph distortion measuring adaptor, RTTY audio processor, power units, etc., etc. For the CW man we have the "MCS" CW filter which give three stages of active filtering. Please send S.A.E. for full details of the "MCS" range.

#### MICROCOMPUTER DIVISION

We are now suppliers of popular Z80 based microcomputer systems including "DYNABYTE" and "North Star HORIZON" together with a full range of VDUs and line printers. We can supply either as basic units or as complete working systems with software for the small business user.

CRYSTALS FOR NEW BRITISH 70CM CHANNELS  
Due to the much higher multiplication involved (3 times that on 2m.) all our stock 70cm. crystals are now to much closer tolerances than our standard amateur range.

We are stocking the following channels RB0 (434.60/432.00), RB2 (434.66/433.05), RB4 (434.70/433.10), RB6 (434.75/433.15), SU8 (433.20), RB10 (434.85/433.25), RB14 (434.95/433.35), SU18 (433.45) and SU20 (433.50)—TX and RX for use with : PYE UHF Westminster (W15U), UHF Cambridge (U10B), Pocketfone (PFI) and STORNO CQL/CQM 662 all at £2.32 (£2.61). For the U450L Base Station we have the Tx crystals for all the above channels. The RX crystals for the U450L Base Station, together with the TX and RX crystals for the remaining 5U channels (SU12-433.30-RTTY, SU16-433.40 and SU22-433.55) for all the above equipments are available at £3.92 (£4.41) to Amateur Spec, or £4.64 (£5.22) to same spec. as stock items. Delivery approx. 4/5 weeks.

#### 4M. CRYSTALS FOR 70.26 MHz—HC6/U

TX 8.7825 MHz and RX 6.7466 MHz or 29.780 MHz £2.32 (£2.61).

10.245 MHz "ALTERNATIVE" IF CRYSTALS £2.32 (£2.61). For use in Pye and other equipment with 10.7 MHz and 455 kHz IF's to get rid of the "birdy" just above 145.0 MHz in HC6/U, HC18/U and HC25/U.

CRYSTAL SOCKETS—HC6/U, HC13/U and HC25/U (Low loss) 16p each (18p) + 10p P & P per order (P & P free if ordered with crystals).

#### CONVERTER/TRANSVERTER CRYSTALS — HC18/U

All at £3.00 (£3.37), 38.6666 MHz (144/28), 42 MHz (70/28), 58 MHz (144/28), 70 MHz (144/4), 71 MHz (144/2), 95 MHz (342/52), 96 MHz (1,296/432/144), 101 MHz (432/28), 101.50 MHz (434/28), 105.6666 MHz (1,296/28) and 116 MHz (144/28).

#### CRYSTALS MANUFACTURED TO YOUR SPECIFIC REQUIREMENTS

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

**A Low frequency fundamentals in HC13/u or HC6/u**  
Adj. tol. ± 50ppm. Temp. tol. ± 100ppm 0 to +70°C.  
6.0 to 19.999 kHz £28.12 (£31.63) 80 to 99.999 kHz £7.30 (£8.21)  
20 to 29.999 kHz £17.75 (£19.97) 100 to 149.99 kHz £6.68 (£7.51)  
30 to 59.999 kHz £15.51 (£17.45) 150 to 499.99 kHz £6.20 (£6.97)  
60 to 79.999 kHz £12.41 (£13.19) 500 to 799.99 kHz £7.30 (£8.21)

**B Mid frequency fundamentals in HC6/u, HC18/u or HC25/u**  
Adj. tol. ± 20ppm. Temp. tol. ± 30ppm. —10 to +70°C.  
0800 to 999.9 kHz £9.50 (£10.64) \*4.0 to 5.999 MHz £4.24 (£4.77)  
\*0.1-0 to 1.499 MHz £8.40 (£9.45) \*6.0 to 20.99 MHz £3.92 (£4.41)  
\*0.15 to 2.599 MHz £4.24 (£4.77) \*21 to 24.99 MHz £6.48 (£7.29)  
\*0.2-6 to 5.999 MHz £3.92 (£4.41) 25 to 27.99 MHz £8.88 (£9.99)  
\*3.4 to 3.999 MHz £4.96 (£5.58) 28 to 30 MHz £9.68 (£10.89)

**C High frequency overtones in HC6/u, HC18/u or HC25/u**  
Adj. tol. ± 20ppm. Temp. tol. ± 30ppm. —10 to +70°C.  
\*15-20.99 MHz (30/T) £4.24 (£4.77) \*105-125 MHz (50/T) £5.84 (£6.57)  
\*21-63 MHz (30/T) £3.92 (£4.41) 125-180 MHz £6.48 (£7.29)  
\*60-62.99 MHz (50/T) £4.88 (£5.49) 180-250 MHz £10.64 (£11.86)  
\*63-105 MHz (50/T) £4.48 (£5.04)

Delivery \* Normally 4/6 weeks (express available), all other frequencies 6/8 weeks. Holders : Low frequencies HC13/u or HC6/u dependent on frequency. Mid and High frequencies are available in HC6/u, HC18/u or HC25/u unless marked Ø only available in HC6/u or ± only available in HC18/u and HC25/u. HC17/u (replacement for FT243) and HC33/u (wire end HC6/u) available as per HC6/u above at 25p (28p) extra on HC6/u price. Unless otherwise specified, fundamentals will be supplied to 30pf circuit conditions and overtones to series resonance.

TEST EQUIPMENT FREQUENCY STANDARD CRYSTALS  
100 kHz in HC13/U and 455 kHz in HC6/U, £2.95 (£3.19).  
1 MHz and 5 MHz in HC6/U and 10 MHz and 10.7 MHz in HC6/U and HC25/U, £2.80 (£3.02).

#### BURNS ELECTRONICS

We are the Northern Appointed Agents for BURNS KITS etc. and can supply many of their products from stock.

#### ANZAC MD-108 DOUBLE BALANCED MIXER

5-500 MHz supplied with full details for only £5.95 (£6.43).

#### CRYSTALS FOR PROFESSIONAL USE

We can supply crystals to most commercial and MIL specifications, with an express service for that urgent order. Please send S.A.E. for details or telephone between 4.30—7 p.m. and ask for Mr. Norcliffe.

CRYSTALS FOR LARGE QUANTITY COMMERCIAL USERS  
We can supply crystals for commercial use, e.g. TV or computer crystals, etc., at very competitive prices. Please let us know your requirements.

#### EXPRESS SERVICES

Many types made to order crystals are available on our EXPRESS SERVICE with a delivery of three days on our class "A" service. Telephone or Telex for details.

TERMS : CASH WITH ORDER—MAIL ORDER ONLY—S.A.E. WITH ALL ENQUIRIES—PRICES INCLUDE P. & P. (BRITISH ISLES) EXCEPT WHERE STATED—OVERSEAS CHARGED AT COST.

2 ALEXANDER DRIVE, HESWALL, WIRRAL, MERSEYSIDE L61 6XT  
Tel : 051-342 4443. Cables : CRYSTAL BIRKENHEAD. Telex : 627371

# BREDHURST ELECTRONICS

## FULL TIME RETAIL PREMISES NOW OPEN

### FDK

Multi 700E 2M FM synthesised	... £229.00
Multi 800D FM with memory	... £289.00
DD800 Remote display for above	... £19.95
Multi U11 70cm. FM with 10 channels	£249.00
Multi 2700 All mode 2m. with Oscar	... £449.00
Palm 2 2M Hand Held with nicads	... £139.00
TM56B 2M Scanning monitor RX	... £105.00

### ICOM

IC215E Hand Held 2M FM	... £179.00
IC240 Mobile synthesised FM	... £189.00
IC280E Mobile 2M HP controlled	... £245.00
IC245E Mobile/fixed 2M all mode	... £399.00
IC202S Hand Held 2M SSB	... £199.00
IC211E Fixed 2M all mode	... £542.00
IC402 Hand Held 70cm. SSB	... £288.00
IC701 HF all mode	... £855.00
IC701PS Power supply for above	... £144.00

### YAESU MUSEN

FT227R Synthesised 2M FM	... £239.00
FT202R Hand Held 2M FM	... £99.00
FT7 HF mobile SSB 10w. out	... £299.00
FT7B HF mobile 5SB 50W. out	... £421.00
FP4 12v. DC PSU	... £39.50
FT200B HF fixed station	... £395.00
FT301 HF fixed all solid state	... £579.00
FT901DM The ultimate HF transceiver	... £960.00
FRG7 HF general coverage RX	... £210.00
FRG7000 HF gen. cov. digital readout RX	... £367.00
FT101Z all mode transceiver	... £562.00
FT101ZD Digital version	... £647.00

### DENTRON

GLA 1000 1KW linear	... £289.00
MT3000 3KW HF ATU	... £275.00
MT2000 2KW HF ATU	... £175.00
160AT 1KW HF ATU	... £99.50
JR Monitor 300W. HF ATU	... £59.95
W2 Direct reading 2KW Wattmeter	£69.00

### MIZUHO

SB2M Hand Held 2M SSB	... £165.00
Nicads	... £10.00

### AOR

AR240 800 channel synthesised 2M Hand Held	... (£1) £195.00
--	------------------

### SHURE

201 Hand mic.	... (50p) £11.25
444 Desk mic.	... (50p) £32.50

### NAIGAI

NAG 144 2M Linear 500W. PEP in	... £481.00
--------------------------------	-------------

### MINI PRODUCTS

HQ1 Minibeam 10/15/20M	... (£3) £98.50
C4 Vertical 10/5/20M no radials	... (£3) £44.50

### SAGANT

EL40X De luxe 80/40M dipole	... (£1) £39.95
-----------------------------	-----------------

### HY-GAIN

12AVQ 10/15/20M vertical	... (£2) £42.18
14AVQ 10/15/20/40M vertical	... (£2) £59.06
18AVQ 10/15/20/40/80M vertical	... (£2.50) £85.50

### SOTA

EDL 144S 2M Linear 100W. out	... (£3) £144.00
EDL 432P 70cm. 50W. Linear	... (£3) £152.00

### JAYBEAM

C5/2M 5dB glass fibre collinear	... (£2) £35.00
5Y/2M 5 ele. Yagi	... (£1) £8.66
8Y/2M 8 ele. yagi	... (£1) £12.50
10Y/2M 10 ele. yagi	... (£1.50) £24.18
PBM14/2M 14 ele. parabeam	... (£2) £35.55
5XY/2M 5 ele. crossed yagi	... (£1.50) £18.00
8XY/2M 8 ele. crossed yagi	... (£2) £22.50
10XY/2M 10 ele. crossed yagi	... (£2) £29.81
Q4/2M 4 ele. cubical quad	... (£1.50) £18.68
Q6/2M 6 ele. cubical quad	... (£2) £24.75
UGP/2M Ground Plane	... (£1) £7.98
MM/2M Halo with 2ft. mast	... (75p) £4.39
C8/70cm. 8dB glass fibre collinear	... (£2) £44.43
MBM 48/70cm. 48 ele. yagi	... (£2) £24.53
MBM 88/70cm. 88 ele. yagi	... (£2) £32.62
8XY/70cm. 8 ele. crossed yagi	... (£2) £27.11
W21 21" stand off wall bracket	... (£2) £11.48
DL Double chimney lashing kit	... (£1) £9.23

### LOWE ELECTRONICS

SRX 30 General coverage receiver	... (£2) £175.00
----------------------------------	------------------

### DAIWA

SR9 VHF FM Monitor receiver	... (£1) £59.00
-----------------------------	-----------------

### MICROWAVE MODULES

MMC 70 4M conv.	... £20.25
MMC 144/28LO 2M conv. local OSC o/p	... £22.50
MMC 144/ 2M conv. any IF	... £20.25
MMC 432/28 70cm. conv.	... £29.90
MMC 432/144 70cm. conv. 144 out	... £29.90
MMC 1296/28 23cm. conv.	... £31.40
MMT 432/28 70cm. transverter to 10m.	£133.00
MMT 43L/144R 70cm. transverter to 2m.	... £170.00
MMT 144/28 2M transverter to 10m.	... £89.00
MMA 144 2M pre amp	... £14.63
MML 432/100 100W. 70cm. linear	... £247.00
MML 144/100 100W. 2M linear	... £139.50
MMD 050/500 500 MHz counter	... £69.00
MMC 28/144 10M to 2m. conv.	... £20.25
MMA 28 10M pre amp	... £15.00

### WATERS & STANTON

HP3A TVI High pass filter	... (20p) £2.95
---------------------------	-----------------

### WESTERN ELECTRONICS

PM 2000 PEP reading wattmeter	... (£1) £50.63
ASW1 3-way coax switch	... (75p) £10.12
DX5V All band HF vertical ant.	... £59.00

### ROTATORS

AR30 Light VHF beams	... (£2) £46.13
AR40 Large VHF beams	... (£2) £53.54
CD44 Medium HF beams	... (£2) £106.87
HAM 11 HF beams	... (£2) £145.13
9502 Large VHF 3 wire control	... (£2) £50.62
KR400 Medium HF 3 wire control	... (£2) £95.63

### ADONIS

AM502 Desk mic. with compressor	... (75p) £39.95
AM802 De luxe desk mic. with compressor	... (75p) £59.95

### ANTENNA SPECIALISTS

ASP 201 2M 1/4 A	... (75) £2.95
ASP 2009 Economy 2M 1/4 A	... (75p) £8.95
ASP 677 2M 3dB 1/4 A	... (75p) £14.95
ASPE667 70cm. 6dB collinear	... (75p) £19.02
ASPE 462 3dB collinear	... (75p) £7.50
Magnetic Mounts for all above	... (75p) £8.50

### BELL SONIC

13.8v. 3A DC Power Supply fully protected	... (80p) £18.30
---	------------------

Carriage free except where shown in brackets. All prices include VAT. Send SAE for literature on any of the above. Same day mail order despatch—or just phone your credit card number.

Extensive stocks of second hand equipment—please call for current details.

### PART EXCHANGE WELCOME

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

**REGAL HOUSE  
PENHILL ROAD  
LANCING  
WEST SUSSEX**

Tel.: LANCING (09063) 63119

Full demonstration facilities. Callers and browsers welcome.

24 hour answering service. Open : Monday to Saturday 9-5.

G3OQT

BARCLAYCARD — ACCESS — HP

G3VXJ



# MICROWAVE MODULES LTD

## Get on 10 metres and join the fun!! with our new MMT28/144 TRANSVERTER



This solid state transverter, MMT28/144, is intended for use with a 144 MHz transceiver to produce a high reliability transceive capability at 28 MHz. When used in conjunction with such a transceiver, this transverter will allow any 144 MHz SSB, FM, AM or CW equipment to be used at 28 MHz.

The inclusion of an RF vox network minimises the necessary connections to the drive source, and will automatically switch the transverter into the transmit mode when 144 MHz drive is applied.

The incorporation of a low noise receive converter and a low distortion transmit mixer makes the unit ideal for all types of communication, particularly where a high degree of stability, sensitivity and linearity are of prime importance.

The unit is housed in a highly durable black diecast case and all circuitry is constructed on high quality glass-fibre printed circuit board. The high power linear amplifier stages are housed in a separate internal compartment, thus ensuring excellent electrical and thermal stability.

### SPECIFICATION

#### GENERAL

Frequency coverage	: 28-30 MHz
Input frequency range	: 144-146 MHz
DC power requirements	: 11-13.8 volts 12.5 volts nominal
Current consumption	: 300mA quiescent 2.1 Amps peak
R.F. connectors	: 50 ohm BNC sockets
Power connector	: 5 pin DIN socket
Size	: 187 x 120 x 53mm. (7 1/4 x 4 1/2 x 2 1/8")
Weight	: 900 grams (2 lbs.)

#### RECEIVE SECTION

Overall converter gain	: 30 dB typical
Overall converter noise figure	: 2 dB maximum
Input impedance	: 50 ohm
IF output impedance	: 50 ohm

#### TRANSMIT SECTION

Input impedance	: 50 ohm
Input modes	: SSB, FM, AM or CW
Input required for full output	: 300mW or 10 watts with supplied 15 dB attenuator
Power output	: 10 watts continuous rating
Output impedance	: 50 ohm
Relative 116 MHz output	: Better than -65 dB
Other spurious outputs	: Better than -50 dB

#### LOCAL OSCILLATOR

Local oscillator frequency	: 116 MHz
Maximum frequency error at 28 MHz	: ± 1 kHz
Typical drift at 28 MHz	: 1 kHz/hour
Frequency sensitivity over range 11-13 volts	: 50 Hz

PRICE : £88.88 inc. VAT

Any further information on the above product and others from our extensive range may be obtained by contacting our sales department, who will be only too pleased to help.

ALL MICROWAVE MODULES PRODUCTS ARE FULLY GUARANTEED FOR 12 MONTHS

**MICROWAVE MODULES**  
BROOKFIELD DRIVE, AINTREE, LIVERPOOL L9 7AN, ENGLAND  
Telephone: 051-523 4011 Telex 628608 MICRO G

### S.W.M. "DX ZONE MAP" 8th EDITION !!

In four colours, on durable paper for wall mounting, 33 1/2 in. wide by 24 1/2 in. deep. Giving essential DX information—bearing and distance of all parts of the world relative to the U.K., the Zone areas into which the world is divided for Amateur Radio purposes, with major prefixes listed separately. Distance scale in miles and kilometres. Time scale in GMT. Marking of Lat./Long. close enough for accurate plotting. Hundreds of place names, mainly the unusual ones, and most of the rare islands.

Price £2.25

including postage and special packing in postal tube to avoid damage in transit.

Publications Dept.

Short Wave Magazine Ltd., 34 High Street,  
Welwyn, Herts. AL6 9EQ. Tel: Welwyn (043871) 5206/7

### BUTTERWORTH TITLES NOW IN STOCK . . .

#### The Practical Aerial Handbook, 2nd Edition

by Gordon J. King

232 pages (Soft Cover) £6.20 inc. post

#### Foundations of Wireless and Electronics, 9th Edition

by M. G. Scroggie

521 pages (Soft Cover) £4.50 inc post

#### Radio and Electronic Laboratory Handbook, 8th Edition

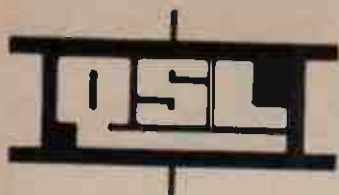
by M. G. Scroggie

614 pages (Hard Cover) £8.75 inc. post

Available from Publication Dept.

Short Wave Magazine Ltd.

34 High Street, Welwyn Herts., AL6 9EQ



FOR QUALITY CRYSTALS—AT COMPETITIVE PRICES  
POPULAR FREQUENCIES IN STOCK  
MADE TO ORDER 10kHz to 225MHz

QSL leads the field in supplying crystals world wide to major communications companies, broadcasting authorities and posts and telecommunications administrations. As a result we can supply the amateur with a high quality, competitively priced product over a frequency range from 10 kHz to 225 MHz. Get the power of the professionals in crystal supply behind you!

**2 METRE STOCK CRYSTALS.** Price £1.85 for one crystal.  
£17.5/crystal when two or more purchased.

	HC6/U 30pF TX	HC6/U 30pF TX	HC25/U 25pF and 40pF TX	HC25/U 20pF and 30pF RX	HC25/U 25pF and 20pF TX	HC6 & 25/U SR RX
RZ	4-0277	8-0555	12-0833	14-9888	18-1250	44-9666
R1	4-0284	8-0569	12-0854	14-9916	18-1281	44-9750
R2	4-0291	8-0583	12-0875	14-9944	18-1312	44-9833
R3	4-0298	8-0597	12-0895	14-9972	18-1343	44-9916
R4	4-0305	8-0611	12-0916	15-0000	18-1375	45-0000
R5	4-0312	8-0625	12-0937	15-0027	18-1406	45-0083
R6	4-0319	8-0638	12-0958	15-0055	18-1437	45-0166
R7	4-0326	8-0652	12-0979	15-0083	18-1468	45-0250
S20	4-0416	8-0833	12-1250	14-9777	18-1875	44-9333
S21	4-0423	8-0847	12-1270	14-9805	18-1906	44-9416
S22	4-0430	8-0861	12-1291	14-9833	18-1937	44-9500
S23	4-0437	8-0875	12-1312	14-9861	18-1968	44-9583

All Repeater Channels for FT221 in stock plus Yaesu FT2FB FT2 Auto, FT224, Trio 2200 and Icom IC22A, 215 series crystals for R0 to R7, S20 to S23. Also in stock 4 and 8 MHz TX in HC6/U for 145.8 MHz. Icom crystals TX and RX for 145.25 MHz (S10) and TX for 145.25 MHz (S10) and TX for 145.6 MHz (RR0), 44 MHz RX crystals in HC6 and HC25 for 145.8 and 145 (RR0) and HC6 only for 145.475 MHz (S19). Other crystals in stock—send sae for details.

**2 METRE MADE TO ORDER CRYSTALS at £2.50** (No discounts)

This service is designed specifically for those customers who require an odd S channel or Raenet crystal and covers most ex-commercial and Japanese equipments. TX 4 to 4.06 MHz, 6 to 6.084 MHz, 8 to 8.12 MHz, 12 to 12.17 MHz and 18 to 18.25 MHz. RX 10.25 to 10.4 MHz, 11.1 to 11.28 MHz, 14.81 to 15.04 MHz, 44.43 to 45.1 MHz and 51.56 MHz to 52.24 MHz. Delivery 6 to 8 weeks. Holders HC6, HC18 or HC25/U. When ordering please give crystals load capacity and holder. Specify equipment in which crystals are to be used.

**4 METRE CRYSTALS** for 70.26 MHz in HC6/U at £2.25. TX 8-78250 MHz. RX 6-7466 or 29-78 MHz in stock.

**70 Cm CRYSTALS.** Crystals held in stock for Pye Pocketfone PFI for SU8 (433.2 MHz) and all UK repeater channels RB0, 2, 4, 6, 10 and 14 at £4.50 a pair or TX only £2.25, RX only £2.50. Also 8-0222 and 12-0333 in HC6/U for SU8 at £1.85. We can supply crystals in 6 to 8 weeks for any frequency within the 70cm, amateur band for Pye, W15U, U10B, U450L and FDK Multi U11 at £2.50 per crystal.

**CONVERTER CRYSTALS** in HC18/U at £2.85. In stock. 38-666, 42-000, 70-000, 96-000, 101-000, 105-666 and 116-000 MHz in stock.

**tone BURST AND I.F. CRYSTALS** in HC18/U at £2.25 in stock. 7-168 MHz for 1750 kHz and 10-245 MHz for 10.7 MHz IF's.

**FREQUENCY STANDARDS** (8% VAT) in stock. 455 kHz, 1 MHz, 5 MHz, 10 MHz in HC6/U. Price £2.75, 10.7 MHz in HC18/U. Price £2.75, 100 kHz in HC13/U Price £2.50 (special offer).

**PRICES ARE EX VAT. PLEASE ADD 12½% UNLESS OTHERWISE STATED.**

FORMERLY C&C ELECTRONICS

**QuartSlab**

MARKETING LTD

P.O. Box 73

Summit House

London SE18 3LR

Telephone: 01-690 4889 24Hr Ansafone: Erith(03224)30830

Telex: 912881 CWUKTX-G (Attention QUARTSLAB)

Cables: QUARTSLAB London SE18

**MADE TO ORDER CRYSTALS SINGLE UNIT PRICING**

	Price Group	Adjustment Tolerance ppm	Frequency Ranges	Price and Delivery		
				A	B	
Fundamentals	1	200 (total)	10 to 19.999 kHz	—	£23.00	
	2	200 (total)	20 to 29.999 kHz	—	£16.50	
	3	200 (total)	30 to 99.999 kHz	—	£10.50	
	4	200 (total)	100 to 999.999 kHz	—	£6.00	
	5	50	1.00 to 1.499 MHz	£5.90	£5.50	
	6	10	1.50 to 1.999 MHz	£3.90	£3.50	
	7	10	2.00 to 2.599 MHz	£3.50	£3.10	
	8	10	2.60 to 3.999 MHz	£3.40	£3.00	
	9	10	4.00 to 20.999 MHz	£3.35	£2.95	
	10	10	21.00 to 24.000 MHz	£3.70	£3.30	
	3rd OVT	11	10	21.00 to 59.999 MHz	£3.35	£2.95
	5th OVT	12	10	60.00 to 104.999 MHz	£3.35	£3.00
		13	10	105.00 to 119.999 MHz	£5.00	£4.85
	5th, 7th & 9th OVT	14	20	120.00 to 149.999 MHz	—	£6.00
		15	20	150.00 to 225.000 MHz	—	£7.50

Unless otherwise requested fundamentals will be supplied with 30pF load capacity and overtones for series resonance operation.

**HOLDERS**—Please specify when ordering—10 to 200 kHz HC13/U, 170 kHz to 170 MHz HC6 or HC33/U, 4 to 225 MHz, HC18 and HC25.

**DELIVERY** Column A 3 to 4 weeks, Column B 6 to 8 weeks.

**DISCOUNTS.** 5% mixed frequency discount for 5 or more crystals at B delivery. Price on application for 10 or more crystals to same frequency and specification. Special rates for bulk purchase schemes including **FREE** supply of crystals used in UK repeaters.

**EMERGENCY SERVICE SURCHARGES** (to be added to A delivery prices). 4 working days £8, 6 working days £6, 8 working days £4, 13 working days £3 (maximum of 5 crystals on 4 day delivery).

**CRYSTAL SOCKETS** HC6/U and HC25/U 16p

**MINIMUM ORDER CHARGE** £1.50.

**COMMERCIAL USERS.** Crystals can be supplied for MPU, industrial control, etc. in the range 4-21 MHz fundamental and 3rd OVT 18 to 60 MHz at £1.15 for 100 off. This is only a limited example of our capabilities. Please enquire about other quantities, frequency ranges, watch and sub-carrier crystals. We can supply crystals for marine and land mobile radio telephone use. Send for details.

**TERMS.** Cash with order, cheques and postal orders payable to QSL Ltd. All prices include postage to UK and Irish addresses.

**OVERSEAS DISTRIBUTORS**

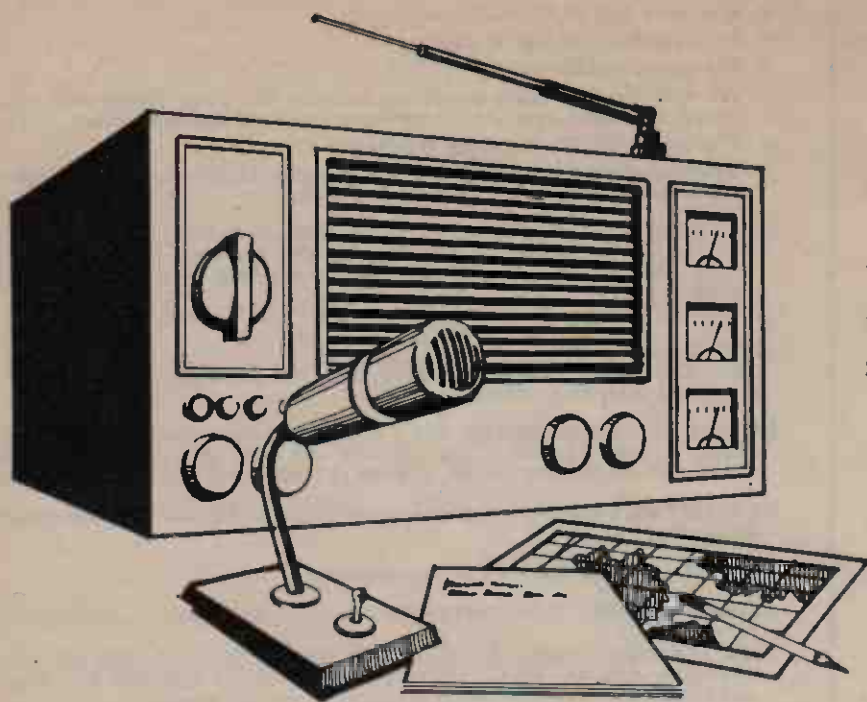
West Germany, Austria and Benelux countries—SSB Electronic, Karl Arnold Str 23,5860 Iserlohn, West Germany.

Denmark—Asbjorn Jorgensen, Aabrinken 1, Tapdrup, DK800, Denmark.

Portugal—Sorubal SARM, Rua General Pimenta de Castro, 15-81, Lisboa 5.

(Enquiries invited from companies in other countries).





# We'll put you on the air.

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

**Free!**

Brochure without obligation to:

SWE 5/79

## British National Radio & Electronic School

P.O. Box 156, Jersey, Channel Islands.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

Block caps please

# Optimum Performance with KW Ancillaries



**DECCA-KW E-ZEE MATCH**  
Antenna Tuner 10-90 metres, matches 50/75 ohm input to co-ax fed antenna's, also twin feeder and single wire systems.



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

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



**DECCA-KW ANTENNA SWITCH.** Selects up to 3 Antennas. Low-insertion loss up to 200 MHz. 1kW p.e.p. rating.

**DECCA-KW BALUN Mk. II**  
The Decca-KW Balun is broadband—3 to 30 MHz, rated up to 2 KW p.e.p. 1:1 Ratio 50 ohms "unbalanced" feed to "balanced" output. Waterproof moulded case. Suitable for Dipole and Beam Antenna.



Other KW Favourites—Decca KW Dummy Load. KW Traps (original and the best); KW Trap Dipoles; Stockist for HY-Gain beams and Verticals; CDR Rotators; Shure Microphones, etc. Write or phone for catalogue..

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

**SERVING RADIO AMATEURS WORLD-WIDE**

# R. T. & I. ELECTRONICS LTD.

where equipment is fully overhauled

EDDYSTONE EB35 Receiver ... ..	£100.00	(£3.00)
EDDYSTONE EC10 Mk. 2 Receiver ... ..	£140.00	(£3.00)
HAMMARLUND HQ145X G.C. Receiver ... ..	£150.00	(£4.00)
TRIO 9R-59DS G.C. Receiver ... ..	£65.00	(£4.00)
TRIO TS-510 Transceiver, PSU & Ext. V.F.O. ... ..	£250.00	(£5.00)
EDDYSTONE 770R. VHF Receiver 19-165 MHz AM/FM ... ..	£180.00	(£5.00)
EDDYSTONE 990S. UHF Receiver 230-970 MHz AM/FM ... ..	P.O.A.	
G.E.C. RC410R G.C. Receiver 2-31 MHz ... ..	P.O.A.	
G.E.C. RC411R G.C. Receiver 15-30 MHz ... ..	P.O.A.	
YAESU MUSEN FRG-7. G.C. Receiver ... ..	£150.00	(£4.00)
YAESU MUSEN FRG-7. Digital fitted 2m. Conv. ... ..	£200.00	(£4.00)

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

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

NEW DIGITAL AVOMETER TYPE DA116 in stock — £106.90

Send for details.

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

S. G. BROWN'S HEADPHONES. Type "F" 120 ohm, 4000 ohm, £14.50 (£1.00); Rubber Earpads for same, £1.32 per pr. (40p); Standard Jack plugs, £24p (12p).

### SINCLAIR DIGITAL MULTIMETERS

DM2 ... ..	£55.00	(£1.20)
PDM35 ... ..	£29.95	(65p)
Mains adaptor for either model ... ..	£3.00	(70p)
Carrying case for DM2 ... ..	£5.00	(70p)

YAESU MUSEN FRG-7 Receiver in stock ... ..	£187.00	(£3.00)
YAESU MUSEN FRG-7 Digital in stock ... ..	£228.00	(£3.00)
YAESU MUSEN FRG-7000 Receiver ... ..	£324.00	(£4.00)

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

NOTE: 12½% VAT must be added to all prices, new and secondhand, except Test Equipment which is 8% inc. carr. and packing.

Carriage for England, Scotland and Wales shown in brackets. Terms: C.W.O., Approved Monthly Accounts, Hire Purchase and Part Exchange. Special facilities for export.

HOURS—9.30 a.m.—5.30 p.m. MON.—FRI. CLOSED SATURDAYS

At R.T. & I.

- ★ We have full H.P. facilities.
- ★ Part exchanges are a pleasure.
- ★ We purchase for cash.
- ★ We offer a first-class overhaul service for your electronic equipment, whether you are an amateur or professional user.
- ★ We have EASY Packing facilities.
- ★ We welcome your enquiries for specific items which although not advertised, may very well be in stock.

PARTRIDGE "JOYSTICK." New improved VFA, £21.95. JOY-MATCH IIIIB, £21.95. LO-Z500, £28.00. JOYMATCH A.T.U. Kit, £9.50. A.T.U. Kit assembled, £11.25. Artificial earth and bandswitch, £9.50.

Note—Partridge prices include postage, packing and VAT.

### TRIO EQUIPMENT.

New Trio R-300 Receiver, in stock, £164.00 (£3.00). All Bands with xtal calibrator.

SHURE MICROPHONES, 526,T £30.80 (£1.00); 444, £25.40 (£1.00); 401A, £13.00 (£1.00); 202, £12.00 (£1.00); 201, £11.40 (£1.00); 414A, £19.50 (£1.00); 414B, £19.50 (£1.00). Full details on request.

KEYNOTES, piano key mains connector units, £4.25 (40p). Trade enquiries welcome.

VALVES. Please state your requirements.

ADVANCE TEST EQUIPMENT—we are agents—your enquiries please.

TMK METERS : Model TP10S, £15.70. Model 500TU-B, £28.90. Model TW20CB, £34.40. Model TP5SN, £18.50. Model 700, £59.50. Post on any Meter, £1.50. Also in stock Leather cases for above.

We also supply PHILLIPS & LABGEAR COLOUR TV TEST EQUIPMENT, including Colour Bar Generators. Cross Hatch Generators. Degaussing Coils, Oscilloscopes, CRT Testers, Transistor Testers, etc., etc.

KW EQUIPMENT : KW103, £23.00 (£1.50); K W107, £108.00 (£1.50); KWE-Z MATCH, £40.00 (£1.50); KW109, £118.00 (£1.50); KW Balun, £8.50 (£1.00); KW Antenna Switch, £10.50 (£1.00); KW Dummy Load, £28.00 (£1.20), etc.

# R. T. & I. ELECTRONICS LTD.

Ashville Old Hall, Ashville Road, London E11 4DX Tel. 01-539 4986

NEAREST STATION: LEYTONSTONE (Central line)

# C.B. ELECTRONICS

UNIT 3, 771 ORMSKIRK ROAD, PEMBERTON, WIGAN, WN5 8AT

Telephone : Wigan (0942) 216567

THE BEST IN THE NORTH-WEST

**HOW TO FIND US :—**From M6 junction 26 follow signs for Wigan A577 at first traffic lights (T junction) turn right towards Wigan. At next traffic lights you are there, BUT turn left and 10 yards further turn right by telephone kiosk. Premises are slightly to your right. Plenty of parking space. Mileage from motorway ½ mile. From Wigan follow the A577 Skelmersdale to traffic lights at Fleet Street, Pemberton (Ye Olde White Swan on your left). Turn right then 10 yards right again. By Co-op. Mileage from Wigan 2½ miles.

YAESU FT901DM ... ..	£959.62	FRI01's FT225R ... ..	£444.37	Multi 2700 ... ..	£489.00	PTT mics. ... ..	£4.50
FT101E ... ..	£579.37	FT225RD ... ..	£548.33	TM56 ... ..	£104.00	WESTERN ANT SW. 5w ... ..	£10.50
FT101Z ... ..	£562.50	FT227R ... ..	£601.87	Rotators CDE AR30 ... ..	£46.00	Power meter HF ... ..	£48.62
FT101ZD ... ..	£646.87	FT202R ... ..	£239.62	CDE AR40 ... ..	£53.00	Power meter VHF ... ..	£48.62
FL2100B ... ..	£349.87	CPU250R ... ..	£99.00	CDE CD44 ... ..	£107.00	ASP Antennas 2009 5/8 wave ... ..	£9.72
FT200 ... ..	£394.87	CPU2500RK ... ..	£328.50	EMOTATOR 103LBX ... ..	£95.62	201 1/4 wave ... ..	£3.13
FP200 ... ..	£77.62	CPU2500RS ... ..	£346.50	502CX ... ..	£145.12	677 5/8 wave ... ..	£14.95
FT301 ... ..	£579.37	CPU2500RKS ... ..	£318.37	1102 ... ..	£208.00	462 5/8 wave ... ..	£7.56
FP301 ... ..	£110.25	FL110 Linear ... ..	£335.25	Morse Key ... ..	£2.95	Magnetic Base ... ..	£8.50
FT7B ... ..	£421.87	F.D.K. Multi 800 ... ..	£146.25	Morse Key Ny King ... ..	£9.75	Boot mount ... ..	£3.50
FC301 ... ..	£121.50	700E ... ..	£289.00	High Pass Filter ... ..	£2.95	SWR Bridges Single meter ... ..	£11.50
FRG7 ... ..	£210.37	Multi UII ... ..	£229.00	Headphones ... ..	£4.50	Twin meters ... ..	£14.50
FRI01D ... ..	£590.62		£249.00				
FL101 ... ..	£489.32						

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

WANTED : RECEIVERS & TRANSCEIVERS HF or VHF

PART EXCHANGES WELCOME

S.A.E. ALL ENQUIRIES

H.P. AND CREDIT TERMS

**We are moving on the 1st March NEW ADDRESS**

# THE AMATEUR RADIO SHOP

4, CROSS CHURCH STREET,  
HUDDERSFIELD. TEL. 0484 20774.

Agents for YAESU ; J BEAMS ; ASP ; AEC ; SEM ; G WHIPS, etc.

**COMPONENTS :** WE HAVE VAST SUPPLIES OF TRANSISTORS ; IC's ; PLUGS ; SOCKETS ; CAP's and RESISTORS. UHF PLUGS, etc.

**SECONDHAND :** USUALLY A GOOD STOCK, S.A.E. FOR LIST.

**XTALS :** 3000 MIXED STOCK, S.A.E. FOR LIST.

<b>SWR IND. :</b>	Single Meter ... ..	£9.75	Twin Meter ... ..	£14.00
	Low Pass Filter ... ..	£4.75	Antenna Switch, 150w. handling	£6.25
	Morse Keys : Standard key ...	£1.25	Power Supply Units 2.75 amp. 12v.	£16.50
	High Speed ...	£3.00	Portable Masts 16ft. 4 sections ...	£6.00*
	Mics. Hand held P.T.T. 50k. ...	£3.75	Yaesu 4 pin Mic plus and socket pr.	£1.00
	Mics. Hand held P.T.T. 600Ω ...	£4.75	Headphones. 2k. imp. mono ...	£3.75

\* Carriage on this item £1.00 extra

**WANTED ! WANTED ! — SECONDHAND GEAR**

**NEW HOURS :** 9 a.m. to 5.30 p.m. MONDAY TO SATURDAY. LATE NIGHT THURSDAY UNTIL 8 p.m.

ALAN  
GW3YSA

BOB  
GW8HEZ

JOHN  
GW30XU

## M.R.S. COMMUNICATIONS LTD

is established to provide a better service to Amateurs  
in Wales and the West

OUR STAR SERVICE INCLUDES

- ★ TRIO and other equipment in conjunction with  
Lowe Electronics Ltd. of Matlock
- ★ J BEAM aerials for VHF-UHF
- ★ MICROWAVE MODULES equipment
- ★ COMPONENTS for the Homebrewer
- ★ FULL SERVICING facilities on any make
- ★ EXPERT ADVICE on all amateur matters
- ★ Good used equipment always available

Located ½ mile from Junction 32 on M4. Customer parking for 15 cars

CALL AT  
76-78 Park Road, Whitchurch,  
Cardiff.

Open 9 a.m. to 6 p.m. Mon. to Sat.

OR PHONE  
Cardiff 616936 (STD 0222)  
Between 9 a.m. and 9 p.m.

Communicate with the TRIO

## WILLIAM MUNRO (INVERGORDON) LIMITED

Telephone :  
0349-852351

100, High Street,  
INVERGORDON  
Ross-shire IV18 0DN

Telex :  
75265

**NEC**

**NEC**

**CQ-P-2200E** 2M FM Portable Transceiver. 3 Channels  
£179 inc. VAT and Delivery.

Additional Channels from our Xtal  
Stock £3 each.

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

Full Spec. and prices available on request.

### SPECIAL MAY OFFERS MICROWAVE MODULES

MMT 144-28 £79

MMT 432-28S £120      MMP /123 £40

Inclusive VAT and Postage

## REG. WARD & CO. LTD.

(G8CA)  
(G2BSW)

### YAESU

FT901D ... ..	£737.50	FT225R ... ..	£487.50
FT301D ... ..	£585.00	CPU2500RK ... ..	£308.00
FP301 ... ..	£98.00	FT227RA ... ..	£229.00
FT101E ... ..	£515.00	FT227R ... ..	£213.00
FT200B/FP200 ... ..	£420.00		
FT7B ... ..	£375.00	<b>FT202R ... ..</b>	<b>£88.00</b>
<b>FT7 ... ..</b>	<b>£265.78</b>		
FL2100B ... ..	£311.00	FP12 ... ..	£67.50
FL110 ... ..	£130.00	FP4 ... ..	£35.00
FR101DD ... ..	£615.00	YC601 ... ..	£113.00
FR101D ... ..	£525.00	SP101B ... ..	£19.00
FR101S ... ..	£395.00	YD148 ... ..	£18.50
FRG7000 ... ..	£327.00	YD844 ... ..	£18.00
FRG7D ... ..	£240.00	YD846 ... ..	£7.50
FRG7 ... ..	£187.00		
YO100 ... ..	*£145.00		
YC500J ... ..	*£168.50	<b>SHURE</b>	
YPI50 ... ..	*£58.50	444 ... ..	£28.20
FC301 ... ..	£108.00	201 ... ..	£12.60

\* Add 8% to these—others 12½% VAT.

VALVES. Most types kept. All valves for Yaesu  
in stock, valves for K.W. also.

S.E.M. Equipment. Most items held.

K.W. Ancillary equipment.

Agents for G2DYM antennas.

J Beam. 2m. antennas. Ascot antennas.

Aerial wire, insulators, co-ax cable, twin feeder

WIGHTRAPS. CO-AX SWITCHES

H.P. available.

Carriage extra.

Please check prices and availability before ordering.

ACCESS / BARCLAYCARD.

**GEORGE STREET, AXMINSTER, DEVON**

Telephone Axminster 33163

## G4DSG D. P. HOBBS Ltd. G3HEO

FDK Multi 700E. P.L.L. digital readout 2 metre Transceiver £229.00  
YAESU FT223 2 metre FM Transceiver 3 channels fitted ... £155.94  
YAESU FT202R "Handie" portable 2 metre Transceiver

Special Price £99.00

YAESU FT7. 10-80m. HF Transceiver Special Price £299.00

YAESU FRG7. P.L.L. 5-30 MHz Receiver ... £210.00

SMC HF12A12. 2 metre Monitor Receiver, fitted 12 chan. £78.69

LOWE SRX30. P.L.L. 5-30 MHz Receiver ... £175.00

SP9 2 metre VFO Monitor Receiver ... £58.50

QM70. 144/PA/10/40 2 metre Linear Amp, £54 or £59 with

Rx Preamp.

QM70 "BUCCANEER" 28-2 metre Linear Transverter

15 watt ... £87.78

QM70 "COUGAR" 2 metre-70cm. FM Transverter.

2 only ... £45.00

DL20 150 MHz Dummy Load PL259, 15 watt max. ... £6.90

New range of British made Transformers :

3-0-3v. 300mA ... £1.78 + 25p P & P

6-0-6v. 1 amp ... £1.78 + 30p P & P

9-0-9v. 1 amp ... £2.03 + 70p P & P

12-0-12v. 75A. ... £2.03 + 70p P & P

15-0-15v. 1.2A. ... £2.84 + 85p P & P

0-12-15-20-24-30v. 2 amp. ... £4.54 + £1.00 P & P

50 watt auto 110-240v. ... £5.20 + £1.00 P & P

100 watt auto 110-240v. ... £5.70 + £1.15 P & P

Also in Stock: JAYBEAM & BANTEX AERIALS, MICROWAVE

MODULES EQUIPMENT, DENCO COILS, TRANSISTORS, I.C.'s,

BERNARDS & RSGB BOOKS.

METAL DETECTORS now in Stock. Altek from ... £13.75

Whites/Savo from ... £29.95

SEND S.A.E. FOR FREE SURPLUS VALVE AND COMPONENT LIST

Prices include VAT ACCESS, BARCLAYCARD

11 KING STREET, LUTON, BEDS. Tel : 20907

Open 9 a.m.-5.30 p.m. Mon.-Sat. Closed all day Wed.

ALSO VISIT

D. P. HOBBS NORWICH LTD.

13 St. Benedicts Street, Norwich, Norfolk. Tel : 615786

Open 9 a.m.-5.30 p.m. Mon.-Sat. Closed all day Thurs.

## SAMSON ETM-3C C-MOS KEYS

1 µA battery drain—Why switch off ?

- Self-completing dots/dashes/spaces. ● Can be used either as normal electronic keyer or as an iambic mode squeeze keyer.
- 8-50 wpm. ● Constant 3:1 dash-dot ratio. ● 6 C-MOS ICs and 4 transistors. ● Plug-in PCB. ● Long battery life—typically 1 µA drain when idling—Built-in battery holder for 4 x 1.5v. batteries (but will work over 3-10v. range). ● PCB has both a reed relay (250v., 0.5 amp., 25w. max.) and a switching transistor (300v., 30 mA max.)—either keying method can be used. ● Has the well-known fully-adjustable Samson precision twin keying lever assembly. ● Operate/Tune button. ● Sidetone oscillator. ● Grey case 4" x 2" x 6". ETM-3C, £63.88.

**ETM-4C MEMORY KEYS:** Has ETM-3C features plus 4 memories of 22 characters each (or 2 of 44). Erase/Rewrite memories as needed—Send CQ's etc. by pressing a button.

**BUILT FOR DEPENDABLE MARINE AND COMMERCIAL SERVICE**

### JUNKER PRECISION HAND KEY

A superbly engineered straight key used for many years by professionals afloat and ashore. With this key you can't help but send good morse. Free-standing—no screwing down. Front and back contacts—fully-adjustable gaps/tension. Key-click filter. Hinged grey cover, £36.54

### BAUER KEYING PADDLE

Single-paddle unit on 1½" x 2" base for home-built EI-bugs. Adjustable gaps/tensions, £11.66.

### 88 mH TOROIDS

For CW, RTTY, SSTV and other filters, 99p each.

All prices post paid UK and include 12½% VAT.

Please send stamp with enquiries.

## SPACEMARK LTD.

THORNFIELD HOUSE, DELAMER ROAD

ALTRINCHAM, CHESHIRE

(Tel: 061-928 8458)

## ("SITUATIONS" AND "TRADE")

15p per word, minimum charge £1.80. No series discount. All charges payable with order. Insertions of radio interest only accepted. Add 50 per cent for Bold Face (Heavy Type). Box Numbers 35p extra. No responsibility accepted for transcription errors. Replies to Box Numbers should be addressed to the Short Wave Magazine, Ltd., 34 High Street, Welwyn, Herts., AL6 9EQ.

## TRADE

Amazing in Lancaster! Window full of brand new and guaranteed used communication receivers. Open Fridays and Saturdays.—Electronic Emporium, Rosemary Lane, Lancaster.

Bristol has an Amateur Radio supplier: FDK Palm II, Multi U-11, Multi 700E, Multi 2700; Revco aerials; secondhand equipment available.—Ring 0272-669454, or 0272-633647 after hours.

Wanted: Surplus crystals, in quantity if possible. Please state details of quantity and sizes.—Box No. 5682, Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts. AL6 9EQ.

Radio Amateur Examination City & Guilds. Pass this important Examination and obtain your G8 Licence with an RRC Home-Study Course. For details of this and other Courses (GCE, professional examinations, etc.) write or phone: The Rapid Results College, Dept. JV/1, Tuition House, London SW19 4DS. Careers Advisory Service, 01-947 7272 or ring 01-946 1102 for Prospectus. (24-hr. Recordacall).

Dart Stationery presents Reception Report Letters for the Dx-er. Professionally styled letters, printed in two colours, on high-quality paper, and made into pads of 100 letters for tidy storage: 1 pad, £2.10; 2-plus pads, £1.80 per pad. All prices include post/packing. Every order received carries a 10-day return of money guarantee if not completely satisfied. Mail orders only, please. Please send cheque or P.O. payable to Dart Stationery, 20 Bromley Road, London E17 4PS.

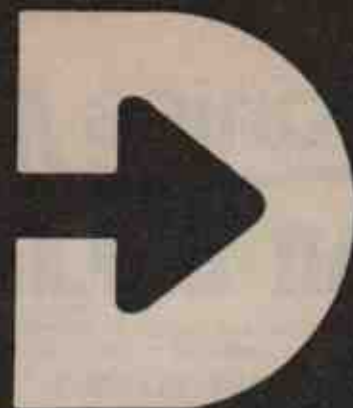
QS Lcards. Sample pack and price list forwarded on receipt of 20p stamp.—Derwent Press, 69 Langstone Drive, Exmouth, Devon EX8 4HZ.

Valves, new and boxed: 6146B, 6JM6, 6HF5, 6JS6/C, 6JB6/A, 6KD6, 6LQ6, 66ES, 8950 and many other types. S.a.e. for list.—Wilson, 20 Croft Gate, Harwood, Bolton, Lancs. (Tel: Bolton 54165.)

Good second-hand equipment always wanted. Come to AMATEUR RADIO EXCHANGE for the best deal.—2 Northfield Road, Ealing, London W13 9SY. (Tel: 01-579 5311.)

Coax cables at trade prices: UR43, UR67, UR76, UR57 and UR70. Also mains and multicores. S.a.e. for lists.—W. H. Westlake, Clawton, Holsworthy, Devon.

Why and FT-101? 1.5 times competitions power output, RF speech clipping (G3LLL or Yaesu), plus-in 2m. transverters with repeater shift, NBFM attachments, modification data and our service. Also try us for G-Whip, FT-7, FRG-7, SRX-30, etc. S.E.M. Europa and Converters, SWR bridges, mics., co-ax., RSGB Books, and super CW filters for FR-101, FR-301, TS-520 and TS-820. Telephone your Access/Barclay Card number.—Holdings of Blackburn Ltd., 39/41 Mincing Lane, Blackburn. (Tel: 0254-59595/6.)



## DATONG ELECTRONICS LIMITED

# Morse Tutor

SPECIALLY DEVELOPED TO GIVE MORSE  
RECEPTION PRACTICE ANYWHERE AND  
AT ANYTIME



The revolutionary new way to practice morse code reception. The DATONG Morse Tutor gives you an unlimited supply of precision morse at the turn of a switch, PLUS built-in oscillator for sending practice.

Now, you can practice receiving morse whenever, and wherever, you like. The DATONG MORSE TUTOR sends a continuous stream of precision morse in five character groups which never repeat. For optimum learning efficiency it has a calibrated variable speech control plus a separately variable delay facility between characters.

It delivers letters only, numbers only, or mixed letters and numbers. It comes with a built-in tone oscillator for sending practice (key required), built-in loudspeaker, and also a separate earpiece for private listening.

Learn morse, the easy, convenient and self-pacing way with the DATONG D70 Morse Tutor. Supplied complete with battery and including postage for only £37.00 plus VAT giving a total of £41.62.

DATONG ELECTRONICS LTD.  
DEPT. S.W.5

Spence Mills, Mill Lane, Bramley,  
Leeds LS13 3HE, England.  
Telephone: (0532) 552461



# Catronics *NEW*

## 10 WATT 2M P.A. KIT

A 10 watt output version of our famous 40 watt 2M P.A. Kit is now available, for boosting the output of 1-2 watt 2M FM transmitters.

### 12 VOLT SUPPLY AUTO T/R SWITCHING

Complete with cabinet and full instructions.  
Kit price £18.00 inc. VAT + 65p post.  
Also available **READY-BUILT** at £28.00.

## 40 WATT P.A. KIT

Still available at £19.50 + 65p post.  
Requires 12 volt supply and 10 watts drive.  
Also available **READY-BUILT** at £29.50

## Brilliant New 200 MHz FREQUENCY METER KIT

In addition to Catronics popular 250 MHz and 500 MHz counters we have produced a new 200 MHz counter Kit specially for home constructors.

Our new KF200 counter, although small, is a no-compromise design. It offers:

- ★ A full 8 digit LED display
- ★ A frequency range of 10Hz to 200 MHz
- ★ An accuracy of 10Hz at 30 MHz, 50Hz at 150 MHz in normal home environments
- ★ 5/6 volt operation from batteries or mains PSU
- ★ Power consumption of only 1W maximum
- ★ A crystal oscillator at 5 MHz which doesn't need any special setting up equipment
- ★ Small size 4" x 4" x 5/8". ★ Uses only 4 i.c.s.
- ★ Assembly time of about 2 hours
- ★ Full illustrated assembly instructions

**COMPLETE PCB Module Kit £68.00**  
+50p Post and Pkg

## CATRONICS SUPER SERVICE FOR MICROWAVE MODULES CONVERTERS etc.

Large stocks of the following available for immediate delivery:  
2m. Converters with 28-30 MHz O/P, £20.25. Local oscillator output version for transverter use, £22.50. 2-4 MHz and 4-6 MHz O/P also in stock, £20.25. 2m. Mosfet Preamplifier giving 18dB gain, £14.62. 70cm. units: Converters with 144-146 MHz O/P, £29.90 and 28-30 MHz O/P, £29.90. 23cm. units: Converters with 144-146 MHz O/P, £31.50 and 28-30 MHz O/P, £31.50. Varactor Tripler with 14W max. O/P, £33.75. SSB Transverter for operation with 28-30 MHz equipment. 10W. O/P on 70cm., MMT432/28/S, £133.88. 144 MHz input, £149.62. 2m. Transverter also available, £88.87. New model MMT432/144-R with repeater shift, £169.88.  
70cm. 100W LINEAR, £247.50

All Microwave Modules prices include post and pkg.

**ALL PRICES INCLUDE VAT**

**Catronics LTD.**

At rates valid on May 15.

**COMMUNICATIONS HOUSE** (Dept. 915)  
20 WALLINGTON SQUARE,  
WALLINGTON, SURREY, SM6 8RG  
Telephone: 01-669 6700

### READERS' ADVERTISEMENTS

8p per word, minimum charge £1.20, payable with order. Add 25 per cent for Bold Face (Heavy Type). Please write clearly, using full punctuation and recognised abbreviations. No responsibility accepted for transcription errors. Box Numbers 35p extra. Replies to Box Numbers should be addressed to the Short Wave Magazine, Ltd., 34 High Street, Welwyn, Herts., AL6 9EQ.

### READERS

For sale: Drake R4-C with noise blanker and MS-4 speaker, £450. Yaesu FT-221R, £325. Stolle 2010 rotator, £35. Jaybeam 2m. 4-ele quad, £15. Jaybeam 2m. ground-plane, £5. SWR meter, wallmounted, £10. All equipment in brand new condition; buyers inspect and collect, or pay carriage.—Burgess, 20 Park View, Cheadle Heath, Stockport, Cheshire. (Tel: 061-428 7640.)

Selling: Codar CR-70A Mk. II, very good condition, £35 or near offer.—Ring 07073-26704.

Offering: AR88LF, RL85 (28/84 MHz) receivers, operational. Valves: 810's, ACT6's, DET5's and DET25's, unused.—G5RM, QTHR (Bromley).

Sale: FRG-7, new and boxed, £180.—Condon, 33 Kimbolton Green, Borehamwood, Herts.

Wanted: 6 kHz mechanical filter for Collins 51J-4 (part no. 526-9009-00). Other spares also considered.—Langer, Moss Side Lane, Moore, Warrington, Cheshire.

Sale: Pye Westminster, FM, 10 crystal-controlled channels on two-metres, tone-burst, £100. Or exchange, W-H-Y?—Ring Power, Fillongley 40147.

For sale: Lowe SRX-30 receiver, bought Dec. 1978, boxed, as new, £130.—Ring Swaffield, 021-355 1665.

Sale: FT-101E, nearly new, with tuner, FV-101B, mic. etc., £510 or very near offer.—Ring Holland, G3GHS, 01-399 6293.

For sale: AR88LF, full working order, shabby exterior, £50 or best offer. No. 88 Set with PSU (two complete units), with handbook, full working order, needs telephone handsets, £30 or best offer. No. 62 Set, A1 interior, damaged front panel, ideal for spares or to rebuild, £5.—Ring Viscount Lowther, Hackthorpe 392 (Cumbria).

Sale: Taylor 62A AM/FM signal generator, as new, £75. CT-212 signal generator in working order. Salford EHT probe, as new, £5. National DR-48 Rx, as new, boxed, £225.—King, 226 Harrowdene Gardens, Teddington, Middx. (Tel: 01-943 2342.)

Selling: Marine band crystals: 9.13125, 9.12500, 9.31250, 9.30625, 9.30937 MHz, £2 each. VCR-139 3-in. CRT, £5. Bench oscilloscope, £60. Transistor/diode tester, £25. Type 51 waveform generator, £10. Hudson VHF amp., £10. UHF radio/Tx tester, £10. Collins transmitter, £50. Jason FM tuner unit, £10. Racal/BCC Type 715 VHF receiver, £25. Carriage extra, s.a.e. with enquiries.—Hayward, "Sunnyfields", Lighthouse Road, St. Margaret's Bay, Dover, Kent.

Wanted: German W.W.II military radio equipment. Does anyone have such equipment for sale, or know of someone who has? Good prices offered by collector. Also WS-62 wanted.—Box No. 5687, Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts. AL6 9EQ.

**For sale:** Receivers: Yaesu FR-101D, £300; Eddystone 730/4, £80; Sanyo RP8700, £50. Atlas vertical antenna, £15. No offers.—Ring Doidge, Munderfield 608 (Herefordshire).

**For sale:** TR-7500, 80 channels, as new, hardly used, £175. Standard 146A, S20, S21, S22, R6, with charger etc., £75. Both are surplus to requirements and must be sold; both 'or near offer'. (N. Wales).—Box No. 5688, Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts. AL6 9EQ.

**Sale:** Eddystone 730/1A receiver. Rack mounting unit, 19-in. TV monitor. B.41 and CR-100 for scrap.—Ring Wailes, Brownhills 4465 (Staffs.).

**Sale:** Sony CF950S portable cassette/radio, VHF/MW, 3 SW bands, with Joystick VFA, as new, £135 or near offer.—Ring Smith-Cox, Wootton Bassett 2145 (Wilts.).

**Selling:** Decca/K.W. E-Zee match, £25. Codar CR-70A Mk. II with speaker, £25.—Ring Ward, G4EOI, 01-648 6117.

**Sale:** Sony ICF-7800, mint, £60. Toshiba IC-737, LW/MW/FM, 6 SW bandspreads, mint, £35.—Steel, 21 Stumperlowe Crescent Road, Sheffield S10 3PQ.

**Wanted:** Back numbers of "Short Wave Magazine", "T & R Bulletin", "RSGB Bulletin" and "Radio Communications".—Stanton, 54 Monks Road, Exeter, Devon.

**Sale:** Trio TS-700G, £325. Heathkit DX-100U transmitter, CW/AM, 150 watts, £40. 14-ele Parabeam, 12 weeks old, £15.—Ring Rabjohns, G3YBG, Exeter 74607.

**Wanted:** BC-348 or BC-342 receiver. Also interested in other surplus sets and manuals.—Ring Baynes, 01-949 2317.

**Wanted:** Heathkit SB-401 Tx, any condition. Details and price please.—Tranter, G4FBT, QTHR. (Tel: Walsall 613410.)

**Offering:** Sony CR-230B 23-band receiver, excellent condition, with manual, £220 or near offer.—Ring Obee, Peterborough 222547, evenings.

**Wanted:** Europa 4-metre transverter, or similar. Details and price please. (London).—Box No. 5689, Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts. AL6 9EQ.

**Selling:** Radar Rx, £5. Pair of synchro-transmitters (Mk. VIII) 50v., 50 Hz, £5. R.1155 with S-meter, internal 12v. PSU and handbook, £35. 10-watt valve modulator, £4. Type W.1117 wavemeter, £5. No. 1 Mk. II RF oscillator, 455, 465, 475 kHz (heavy), £24. R.1481, AM, 80-100 MHz, with handbook, good condition, £25. Klystron, 100mW., £2. 70 back numbers of "Practical Wireless" and "Practical Electronics", £5. Other items available.—Ring Gill, Shrewsbury 54425.

**Sale:** K.W. Atlanta with power pack and external VFO, £175.—Ring 0905-427667.

**Sale:** Grundig Satellit 2100, 16 months old and in excellent condition, with SSB unit, £40. Buyer collects.

# Can YOUR Antenna do all this?

*A small selection from our huge file of testimonial letters on the JOYSTICK VARIABLE FREQUENCY ANTENNA (0.5-30. MHz).*

Carl V. Guest, Mount Vernon, Ohio, writes—"I set the Joystick antenna on the floor of my operating room which is at street level. On 40 metre CW I worked out to a distance of 700 miles in the afternoon."

"CQ" Magazine—"If you are high enough the antenna will operate (especially at 15-20) as well as the well-known 3-element beam with which we compared it. The tests were 'operational, not theoretical!'. We find that if we can hear 'em we can work em'—and in most cases with a 100 watts input."

K6MDJ—"Early results are astounding. I've been using a trap dipole for 40-20-15. This JOYSTICK out-performs the dipole 2 x 1."

## JOYSTICK ANTENNAS

<b>SYSTEM 'A'</b>	200w. p.e.p. OR for the SWL	<b>£41.00</b>
<b>SYSTEM 'J'</b>	500w. p.e.p. Improved 'Q' on receive	<b>£47.95</b>

## "PACKAGE DEALS"

### COMPLETE RADIO STATIONS FOR ANY LOCATION

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

<b>PACKAGE No. 1</b>	<b>£222.00</b>
Features R.300 Rx.	
<b>PACKAGE No. 2</b>	<b>£237.45</b>
Features FRG7 Rx.	
<b>PACKAGE No. 3</b>	<b>£212.45</b>
Features SRX 30 Rx.	
<b>PACKAGE No. 4</b>	<b>£402.00</b>
Our "Rolls" — Rx. FRG 7000	

## RECEIVERS ONLY

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



Just telephone  
your  
card number



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

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

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



## MORSE CODE RECEIVING AND SENDING

### Receiving:

**CASSETTE A** For Amateur Radio examination preparation. Speed slowly increasing from 1-12 w.p.m.

**CASSETTE B** For Professional examination preparation. Computer produced morse from 12-24 w.p.m. Including international procedure signs and symbols and their incorporation into messages.

### Sending:

Morse Key and Buzzer Unit for sending practice and own Tape preparation. Phone output.

Prices: each cassette, including booklets, £4.50  
Morse key and buzzer unit, £4.50

Prices include postage, etc.

**M H ELECTRONICS**  
12 LONGSHORE WAY, MILTON,  
PORTSMOUTH, PO4 8LS

(Suffolk).—Box No. 5690, Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts. AL6 9EQ.

Sale: Yaesu FR-101D with matching speaker, 160-2m., SW bands, mint condition, £385.—Ring Brown, Maiden head (0628) 27513 anytime.

Wanted: Any suitcase-type transceivers. WS-19 Mk. I, Mk. II or Mk. III; WS-62; Wireless Sender No. 53.—Ring Taylor, G3UCT, Fleet (02514) 6998.

Wanted: HQ-1 mini quad, must be in good condition and with instructions.—Trickey, G4DCX, QTHR. (Tel: 0272-671409 after 6 p.m.).

For sale: Lafayette HA-700 communications receiver, coverage 150 kHz to 30 MHz, bandwidth, BFO. Offers? Prefer buyer collects.—Box No. 5691, Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts. AL6 9EQ.

Shack clearance: CSE 160m. matching Tx/Rx, solid-state, complete with mic., cables and manual, £50. "G2DAF" SSB Tx, 160-10m., with PSU's, £50. BCC 4m. Tx/Rx, dashmounted, 5-channel, with all accessories including mobile mount, manual, £30. Pye Rangers, low-band, £5 each. Solid State Modules 2m. converter, 4-6 MHz IF, £10. Sanwa transistor tester, as new and hardly used, £10. Buyers arrange carriage.—Ring Berry, G4GMU, Colne (0282) 864877.

For sale: Heathkit HW-32A 20-metre SSB transceiver, £100. Buyer collects.—Ring Kirk, Nottingham 257396.

Shack clearance: Pye Pocketfone PF-70, crystallised for RB6, complete with helical aerial and leather case, £70. Lowe SRX-30 communications receiver, very little used, £145. Creed 7B teleprinter without keyboard, complete with CV-89 converter and power supply, works very well, set for 50 bauds, £40. A.E.C. SWR bridge with twin meters, £10. Sinclair PDM-35 pocket DVM, in good order, £20. Radio Shack Ltd. sound level meter, as new, £15.—Ring Gorman, Mold 57498.

Wanted: Collins 312B-5 speaker consol and external PTO for delivery in UK. Details and price please.—Otter, 9J2BO, Box 208, Kitwe, Zambia.

For sale: Walkie-Talkies: Pair of Tokai TC-506 transceivers, 5-watt, 6-channel, with call signal, at present on 27.035 MHz, convertible to 10 metres (28 MHz), unused, £60 each.—Ring Birkett, 0872-862575.

Sale: FT-101E as new, complete and boxed, £450. Delivery may be possible.—Ring Barnes, 051-722 7809 12.30-1 p.m.

Selling: KW-201 Rx, coverage extended to include entire 15m. and 10m. bands, in good condition, £110 or near offer.—Ring Glenn, Wickford 67995 (Essex).

Selling: Yaesu FR-101DD, as new, still under guarantee, with matching speaker. Drake SPR-4, with matching speaker, calibrator, 35 crystals, as new, £400. Accoustical quad, 3 units, VHF, mono, old but excellent quality, £50. Carriage paid.—Cameron, Coombe Cottage, Pitchcombe, Stroud, Glos.

Selling: Racal RA-17 Mk. II, very good condition, £230 or near offer. Marconi TF-801D/1 signal generator, very good condition, £150 or near offer.—Ring Betts, Watford 28566 ext. 298 daytime.

## DART STATIONERY

Presents For the Amateur

Large variety of personalised QSL CARDS—see catalogue or prices.  
LOG BOOKS ... .. £2.00 each

### For the DX'er

Personalised QSL CARDS.  
RECEPTION REPORT LETTERS. Professionally styled letters printed in two colours and supplied in pads of 100 letters.  
1 Pad £1.80 2 + Pads £1.60 each

Loose Leaf LOG BOOKS with 100 sheets ... .. £2.50

### For the CB'er

Personalised QSL CARDS  
CATALOGUES available containing complete range of radio stationery  
Price 45p.

EVERY ORDER CARRIES A MONEY BACK ASSURANCE  
IF NOT COMPLETELY SATISFIED  
MAIL ORDERS ONLY PLEASE

Please send cheques or P.O. payable to:—

## DART STATIONERY

20 Bromley Road, London E17 4PS, ENGLAND. Tel.: 01-539 5412

## HONDA GENERATORS AT KEENEST PRICES!



300-4000 Watts AC, 6-24 Volts DC. incl THE NEW E3500-115/230V AC and 12V DC and THE VERY QUIET EM300.

**MICROWAVE COOKERY BOOK**  
£2.25 INC. POSTAGE

LEADING MAKES OF MICROWAVE OVENS FROM £199 INC VAT.

KEENEST PRICES Include U.K. delivery. Open Tues - Sat 10.30-1.30, 2.30-6.30 (AnsaFone out of hours)

**Ashley Dukes** Farncombe St, Farncombe, Godalming (Tel 23279) Surrey.

## MORSE MADE EASY BY THE RHYTHM METHOD!

**FACT NOT FICTION** NO, TAPE WON'T WORK AS WELL  
If you start RIGHT you will be reading amateur and commercial Morse within a month. (Most students take about three weeks). That's why after 25 YEARS we still use three scientifically prepared 3-speed records with which you cannot fail to learn the MORSE RHYTHM automatically, it's as easy as learning a tune. 18 w.p.m. in 4 weeks guaranteed. Complete course comprising 2 x 12" + 1 x 7" 3-speed records + books. £5.50 inc.p.p. (overseas + £1). Dtls. only s.a.e. or ring Stan Bennett (G3HSC) 01-660 2896. Ex RAF keys £2.70. (Box 14) 45 GREEN LANE, PURLEY, SURREY

## ALL VALVES & TRANSISTORS

Call or phone our  
Mr. Stephan for a quotation  
01-749 3934

We are one of the largest stockists of valves etc. in the U.K.

**COLOMOR ELECTRONICS LTD** 170 GOLDHAWK ROAD LONDON W12



# ANNOUNCING

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

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

BUILT IN AN ULTRA MODERN CASE, FRONT AND BACK PANELS BEING BLACK WITH WHITE LETTERING. DIMENSIONS 84 x 304 x 210.

## Just a Reminder

OF OUR POPULAR FDU7's FREQUENCY DISPLAY UNIT FOR THE FRG7, WHICH FITS IN PLACE OF THE kHz DIAL. ALSO THE FDU3 FOR THE SSRI AND SRX30 WHICH IS NOW SUPPLIED IN AN ALUMINIUM CASE, FOR TOP OF THE RECEIVER USE.

ALL SUPPLIED WITH FULL FITTING INSTRUCTIONS C.W.O. CHEQUE OR ACCESS ACCEPTED

	PRICE	
MB6/R (RECEIVE ONLY)	£77.96	Inclusive of
MB6/RT (AFSK/FSK)	£83.25	Postage
FDU7 (DISPLAY UNIT FOR FRG7)	£44.77	and VAT
FDU3 (FOR SSRI & SRX 30)	£44.77	

## B. BROOKES ELECTRONICS

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

U.K. DISTRIBUTORS  
TO BE ANNOUNCED

INTERNATIONAL DISTRIBUTORS  
"INTERMEDIARY" (INTERNATIONAL TRADE)  
P.O. BOX 5599  
1007, AN. AMSTERDAM, HOLLAND

# T.M.P.

## ELECTRONIC SUPPLIES

YAESU MUSEN EQUIPMENT AVAILABLE OFF THE SHELF WITH SMC 2 YEAR GUARANTEE AND FREE SECURICOR CARRIAGE, PLUS ALL THE OTHER WELL KNOWN NAMES, HY-GAIN, CDE, JAY-BEAM, LEADER, SHURE, CUSH CRAFT, BANTEX, ETC. ALL SALES HAVE THE PERSONAL ATTENTION OF GW3TMP.

AMIDON TOROIDAL CORES AVAILABLE FROM STOCK, SEND SAE FOR PRICES  
SECONDHAND EQUIPMENT ALWAYS AVAILABLE, ENQUIRE FOR PRESENT STOCKS

W2AU QUAD SPIDERS ... ..	£26.81
W2AU BALUNS 1:1 and 4:1 with built-in Lightning Arrester ... ..	£14.06
HANSEN SWR/POWER METERS. Switched 20, 200 and 1KW ... ..	£36.72
SIGMA KRF-2000 SWR/POWER METERS. 0-200w. and 0-2KW ... ..	£20.52
NYE-VIKING MORSE KEYS. 114-312-004 ... ..	£9.25
114-322-003 ... ..	£9.75
MOUNTING BASES FOR ABOVE KEYS ... ..	£1.12
NYE-VIKING LOW PASS FILTERS. 2-30 MHz 5dB less, 2KW rating ... ..	£18.00
HI-MOUND MORSE KEYS HK-708 ... ..	£9.45
EXTENSION SPEAKERS 10½ x 7½ x 3½ IN TEAK CABINETS	
4 OHMS ... ..	£12.00
CL-22 SWL ATU ... ..	£15.75
FC-5M DIGITAL FREQUENCY COUNTER, 455 kHz offset, 50 MHz ... ..	£38.88
BALUN KITS, TOROIDAL TYPE LF ... ..	£4.02
HF ... ..	£5.15

ALL PRICES INCLUDE VAT AND POSTAGE  
Coax, Plugs, Sockets, Reducers, Insulators, H/D Copper in stock.

BRITANNIA STORES, LEESWOOD, MOLD, CLWYD  
CH7 4SD, N. WALES

Open Daily 9.30-5 p.m. Early Closing Tuesday and Saturday 1 p.m.  
TEL.: PONTYBODKIN 846 (035 287)

# 1979 CALL BOOK— U.S. LISTINGS

In this issue . . .

- \*374,487 U.S. licensed radio amateurs
- \* Repeater Stations
- \* SSTV Directory
- \* Zip codes and licence class on all listings
- \* Stop press—late QTH's
- \* ARRL Countries list
- \* International postal information
- \* Census of Amateur Radio licences of the World
- \* Plus many other features

1,069 pages **£9.70** inc. postage

Order from:

Publications Dept.,  
SHORT WAVE MAGAZINE LTD.,  
34 High Street, Welwyn,  
Herts, AL6 9EQ

# 1979 CALL BOOK— DX LISTINGS

(i.e. all amateur call-signs outside the U.S.A.)

In this issue . . .

- \* 295,398 licensed radio amateurs
- \* 84,822 changes in listings
- \* QSL Managers around the world
- \* Radio Amateur Prefixes of the World, with Map
- \* ARRL Countries list
- \* Great Circle bearings
- \* Standard Time charts
- \* World-wide QSL Bureaux
- \* Plus much, much more!

900 pages **£9.10** inc. postage

Order from :

Publications Dept.,  
SHORT WAVE MAGAZINE LTD.,  
34 High Street, Welwyn,  
Herts., AL6 9EQ

**HAM BAND AERIALS GALORE**

Telescoping 18 gauge Aluminium Tubing supplied at most attractive prices.

<b>GALORE 10 METRES</b> Tube dia : 1 1/8" reducing to 7/8"	<i>P R P</i>
One Half wave element ... ..	£6.00 £1.00
2 Half wave elements ... ..	£11.50 £2.00
3 Half wave elements ... ..	£17.00 £3.00
1/2 wave vertical ... ..	£3.35 £1.00

<b>GALORE 15 METRES</b> Tube dia : 1 1/8" to 3/4"	
One Half wave element ... ..	£7.00 £1.00
2 Half wave elements ... ..	£13.50 £2.00
3 Half wave elements ... ..	£20.00 £3.00
1/2 wave vertical ... ..	£4.30 £1.00

<b>SLIMLINE RANGE</b> Tube dia : 7/8" to 1"	
Ideal Rotary for indoor or outdoors	
10 metre Half wave ... ..	£4.40 £1.00
15 metre Half wave ... ..	£4.80 £1.00
Made up with 3' 6" sections	

Use the superb 2BAR Gamma Match for all off centre fed dipoles  
 Standard open Type ... .. £2.45 £1.00  
 Enclosed with PL239 Connector ... .. £4.27 £1.00

Add VAT at 12 1/2% to combined prices above  
**UPPINGTON TELE-RADIO (BRISTOL) LTD.**  
 12-14 PENNYWELL ROAD, BRISTOL BS5 0TJ

**MAY OFFERS FROM G8MWW**

**UR76 COAX.** 50 ohm. Stranded conductor, 17p per m., post 2 1/2p per m.  
**UR43 COAX.** 50 ohm. Single conductor, 16p per m., post 2 1/2p per m.  
**UR95 COAX.** 50 ohm. Miniature nylon, 5p per m., post 1p per m.  
**UR70 COAX.** 75 ohm. Stranded conductor, 16p per m., post 2 1/2p per m.  
**UR57 COAX.** 75 ohm. Single conductor, low loss, 35p per m., post 4p per m.  
**UR67 COAX.** 50 ohm. Stranded, low loss, 45p per m., post 4p per m.  
**300 ohm TWIN RIBBON** ... .. 9p per m., post 1 1/2p per m.  
**8 CORE SCREENED**, up to 18m. coils at 12p per m., post 2 1/2p per m.  
**20 CORE SCREENED**, up to 9m. coils at 18p per m., post 4 1/2p per m.  
 100m. Mixed stranded equipment wire for ... .. £1.00, post 24p  
 30m. P.T.F.E. Stranded equipment wire for ... .. 60p, post 15p  
**U.H.F. low loss 75 ohm TV COAX** at 16p per m., post 2p per m.  
 120 Mixed carbon film resistors. 7 x 40 values for £1.20, post 35p  
 100 Mixed Erie ceramic capacitors. 5 x 20 values, 1-5-43pf for £1.00, post 15p

**HC25U** Crystal sockets ... .. 12p each, post 7p any qty.  
**SRB** Miniature 12 volt soldering irons ... .. £4.00, post 35p  
**R.S.** In line Fuse connectors. Nylon for 1" fuses, 20p each, post 7p any qty.

**NOW LOCAL STOCKIST FOR JAYBEAM RANGE OF AERIALS**  
 S.A.E. for full lists of Cables/Revco Products/Xtals, etc.  
 Visiting **BARRY/LONGLEAT/PLYMOUTH**, etc. Rallies  
**W. H. WESTLAKE, CLAWTON, HOLSWORTHY, DEVON**

**WHAT ARE THE WILD WAVES SAYING?**

**G2DYM ANTI-TVI TRAP DIPOLES**

S.W.L.-ing or Tx-ing at 250 watt P.E.P. ... £41.00  
 500 watt Tx-ing or "Hi-Q" for S.W.L.-ing ... £47.95 (all prices  
 2 Kilowatt "THE BIG ONE" ... .. £56.25 include VAT  
 10-160 metres Aerial Matching Unit 500 and P & P)  
 watt & S.W.L.-ing ... .. £18.25  
 2 K.W. model ... .. £24.50

**"MARBELL" MAYDAY S.O.S. SUCCESS**

Full story, copy photographs, etc., as shown on BBC Nationwide, new 8 page aerial guide full details the of the G2DYM "Mayday Cracker" anti-TVI aerial used: 10" x 8", 16p SAE 3 x 9p stamps.

**G2DYM, UPLOWMAN, TIVERTON, DEVON**

**CRAYFORD ELECTRONICS**

G8AYN G81WX

**NEW ITEMS NOW IN STOCK**

**JAYBEAM** TB3 3 ele, 20/15/10m. beam ... .. £151.88  
 VR3 20/15/10 trap vertical ... .. (£5) £38.25  
**MICROWAVE MODULES** MML144/25 ... .. (FOC) £44.00  
 2m. PA 25w. O/P for 3w. I/P with Rx preamp, fully auto-switched.  
**MICROWAVE MODULES** MMT28/144 ... .. (FOC) £  
 10m. down transverter 10WO/P  
**CATRONICS** CT100 Mk. II series. RTTY terminal units  
 CT103 (£2) £98.50  
**HONEST** 50 MHz 5 digit counter with 455 kHz offset facility ... .. (36p) £38.88  
 Prices inc. VAT but carriage extra in brackets  
 ACCESS SAE all enquiries BARCLAYCARD  
**6 LOVELACE CLOSE, WEST KINGSDOWN, SEVENOAKS,**  
**KENT TN15 6DJ** 24 hour Answer Service 047485 2577

**T & J ELECTRONIC COMPONENTS**

**Special Offers :**

**DIODE PACK (1) :** Unmarked, untested mostly silicon, some germanium. Pack of 200 (approx.), 65p.

**DIODE PACK (2) :** Tested selection of useful general purpose diodes. Contains 25 x 1N914, 10 x 1N4002, 5 x BY127, £1.50.

**RESISTOR PACK :** Five 1/4W ±10% resistors of each value in the E12 series from 10Ω to 1M. Total of 305. Guaranteed, £3.25.

**CAPACITOR PACK :** Tested selection of useful capacitors. Contains 5 x 1μF, 5 x 4.7μF, 15 x 10μF, 3 x 100μF. Guaranteed, £1.50.

All prices includes VAT and postage. Many other components in stock. Send 10p for full list.

**98 Burrow Road, Chigwell, Essex, IG7 4HB**

**RADIO AMATEUR PREFIX-COUNTRY-ZONE LIST**

published by GEOFF WATTS

Editor of "DX News-Sheet" since 1962

The List you have always needed, the list that gives you everything, and all on one line ! For each country :-

- a. its DXCC "status"
- b. the normal prefix
- c. the special prefixes
- d. the ITU callsign block allocation
- e. the continent
- f. the "CQ" Zone No.
- g. the ITU Zone No.

Full information on Antarctic stations, USSR Klub-stations, obsolete prefixes used during the past 5 years, and much more, and the List can be kept always up-to-date because ample space has been provided for adding every new prefix, each new ITU allocation, etc. Everything arranged alphabetically and numerically in order of prefix. Ideal for Contest operators and SWL's.

Tell your Club-members about it. Order a gift copy for that overseas friend 15 pages. Price 45p (UK) or sent overseas (air-mail) for \$1 or 5 IRCs (55p)

GEOFF WATTS

62 BELMORE ROAD, NORWICH, NR7 0PU, ENGLAND

**RACAL EQUIPMENT ALL WITH FULL MANUALS**

RECEIVERS RA17 FULLY CHECKED AND TESTED. RACK MOUNTING WITH DUST COVERS, £225.00. NEW LOUVRED METAL CASE, £25.00. RA98A. NEW AND BOXED S.S.B. AND I.S.B. CONVERTER, £100.00. MA.197B (A.T.U.) SELECTOR PROTECTOR, £35.00. MATCHING NEW LOUVRED CASE, £15.00. TAPE READERS TYPE 6S/5 AND 6S/6 NEW OR USED, £5.00 TO £15.00. REPERFORATOR 7TR/3 NEW WITH SPARES, £15.00. USED £10.00. REDIFON TELEPRINTER TERMINAL UNIT. TYPE TT11 FULLY TRANSISTORISED 600 OHMS AUDIO INPUT. POWER INPUT 100-125 VOLTS OR 200-250 VOLTS A.C. CONTAINS INTERNAL POWER SUPPLY FOR TELEPRINTER MAGNET COILS. SPEED 0-100 BAUDS + UNIT MADE TO OPERATE CREED 75 TELEPRINTER. CIRCUIT INCLUDED, £25.00. TESTED. ALL ITEMS EX. WORKS. CARRIAGE EXTRA. S.A.E. ALL ENQUIRIES, PHONE FOR APPOINTMENT FOR DEMONSTRATION OF ANY ITEM.

**JOHNS RADIO**

424 BRADFORD ROAD, BATLEY, YORKS.  
 Tel: 0924 478159 (9.30 a.m. to 1 p.m.)

**ANTENNA FAULTY?**

**LOSING DX?** Check resonance and radiation resistance FAST with an Antenna Noise Bridge, 2-1000 ohms 1-30 MHz (20-200 ohms 30-150 MHz), £9.80.

**RARE DX UNDER QRM?** DIG it OUT with a Tunable Audio Notch Filter, speaker amplifier, £8.90, MORE DX.

**CLOBBERED?** Speech Compressor only £8.60.

**MISSING RARE DX?** Get on their frequency with a Crystal Calibrator, 1 MHz, 100, 25 kHz markers to vhf, £13.80.

Each easy-assembly kit includes all parts, printed circuit, case, postage etc., money back assurance so SEND off NOW.

**CAMBRIDGE KITS** 45 (SS) Old School Lane, Milton, Cambridge

# Have you got all these ARRL titles on your shelf? . . . .

Solid State Design for the Radio Amateur	... ..	£5.00
Electronics Data Book	... ..	£3.25
Antenna Book, 13th edition	... ..	£3.60
Understanding Amateur Radio	... ..	£3.65
A Course in Radio Fundamentals	... ..	£2.80
FM and Repeaters for the Radio Amateur	... ..	£2.90
Radio Amateur Handbook 1979 (soft cover)	... ..	£7.35
Radio Amateur Handbook 1979 (hard cover)	... ..	£10.20
Specialised Communications Techniques for the Radio Amateur	... ..	£2.85
Hints and Kinks	... ..	£2.85
Single Sideband for the Radio Amateur	... ..	£2.95
VHF Manual	... ..	£3.20
Learning to Work with Integrated Circuits	... ..	£1.65
Getting to Know OSCAR from the Ground Up	... ..	£2.30
Radio Frequency Interference (new title)	... ..	£2.15
Ham Radio Operating Guide (new title)	... ..	£2.75
Solid State Basics for the Radio Amateur (new title)	... ..	£3.30

(all prices include post/packing)

Available from **SHORT WAVE MAGAZINE**

Publications Dept.,

34 HIGH STREET, WELWYN, HERTS., AL6 9EQ. Telephone: Welwyn 5206/7

SIMPLE, LOW-COST

## WIRE ANTENNAS

by William Orr, W6SAI

This excellent and thoroughly recommended handbook, is the publication on the practical approach to building aerials. After starting with aerial fundamentals there are discussions and descriptions of ground-plane, end-fed, DX dipole, vertical and wire beam antennas, plus coverage on a universal HF antenna system and working DX with an "invisible aerial"; the SWR meter and coaxial cable also have chapters to themselves.

The whole book is presented in an authoritative immensely clear, readable and enjoyable manner with the emphasis on the practical throughout—to the extent that even the chap who can hardly strip a piece of co-ax need not feel at all left out! Just as practical for the SWL, too!

192 pages **£3.15** inc. post

Order from:

Publications Dept.

**SHORT WAVE MAGAZINE LTD.**

34 High Street, Welwyn, Herts. AL6 9EQ.

## BETTER SHORT WAVE RECEPTION

by William I. Orr W6SAI and Stuart D. Cowan W2LX  
New 4th Edition

In the latest edition of this excellent work for all those who own (or intend to own) a radio receiver, these two well-known and respected writers have produced chapters covering: the radio spectrum and what you can actually hear world-wide; the tuning of a shortwave receiver; the business of buying a receiver, both new and secondhand; a description of the SW Rx in non-technical terms, together with receiver adjustment and alignment; DX-ing above 30 MHz; a description of the VHF receiver; building and adjusting efficient aerials; reception techniques.

Thoroughly readable and "digestible," this book is without doubt a very valuable addition to the bookshelf of any SWL.

160 pages **£3.15** inc. post

Order from:

Publications Dept.,

**SHORT WAVE MAGAZINE LTD.,**

34 High Street, Welwyn, Herts., AL6 9EQ

# Technical Books and Manuals

(ENGLISH AND AMERICAN)

## AERIAL INFORMATION

Antenna Handbook (Orr and Cowan)	£4.15
Practical Aerial Handbook, 2nd Edition (King)	£6.20
Beam Antenna Handbook	£3.10
Cubical Quad Antennae, 2nd Edition	£3.10
Simple Low Cost Wire Antennas, by Orr	£3.15
73 Vertical Beam and Triangle Antennas (E. M. Noll)	£3.75
73 Dipole and Long-Wire Antennas (E. M. Noll)	£3.75
Antenna Book (ARRL) 13th Edition	£3.60

## BOOKS FOR THE BEGINNER

"Short Wave Magazine" R.A.E. Questions and Answers, 1972-1976	£1.50
Solid State Short Wave Receivers for Beginners (R. A. Penfold)	£1.10
Beginners Guide to Radio (8th Edition)	£3.05
Beginners Guide to Electronics	£2.60
Course in Radio Fundamentals, ARRL	£2.80
Guide to Amateur Radio (17th Edition) (RSGB)	£1.70
Ham Radio (A Beginners Guide) by R. H. Warring	£3.33
Morse Code for the Radio Amateur (RSGB)	50p
Radio Amateur Examination Manual (RSGB)	O/S
Simple Short Wave Receivers (Data)	£1.05
Understanding Amateur Radio (ARRL)	£3.65

## GENERAL

Radio Circuits Using IC's	£1.50
Projects In Radio and Electronics (Newnes)	£2.55
How to Make Walkie-Talkies (Rayer)	O/S
50 (FET) Field Effect Transistor Projects, by F. G. Rayer	£1.40
Amateur Radio Awards (RSGB)	O/S
How to Build Advanced Short Wave Receivers (Pentoid)	£1.35
Better Short Wave Reception, New 4th Edition	£3.15
FM & Repeaters for the Radio Amateur (ARRL)	£2.90
Easyblinder (to hold 12 copies of "Short Wave Magazine" together)	O/S
Oscar—Amateur Radio Satellites	£4.20
Test Equipment for the Radio Amateur (RSGB)	£4.40
World Radio & T.V. Handbook 1979 Edition	£9.15
World DX Guide	£5.35
Radio Stations Guide	£1.70
Long Distance Television Reception (TV-DX) for the Enthusiast	£1.70
Solid State Basics for the Radio Amateur (ARRL)	£3.30

## HANDBOOKS AND MANUALS

Radio Communication Handbook, Vol.1 (5th Edition), RSGB	£9.30
Radio Communication Handbook, Vol. II (5th Edition), RSGB	£8.05

TVI Manual (2nd Edn.), RSGB	£1.55
Surplus Conversion Handbook	O/S
Teleprinter Handbook (RSGB)	£8.83
Radio and Electronic Laboratory Handbook, 8th Edition (Scroggie)	£8.75
Amateur Radio DX Handbook	O/S
RTTY Handbook (73 Magazine)	£3.65
Radio Amateur Operators Handbook	O/P
Slow Scan Television Handbook	O/S
Specialized Communications Techniques for the Radio Amateur (ARRL)	£2.85
Working with the Oscilloscope	£1.90
Radio Amateur Handbook 1979 (ARRL), soft cover	£7.35
Radio Amateur Handbook 1979 (ARRL), hard cover	£10.20
Shortwave Listener's Handbook	£3.25
Learning to Work with Integrated Circuits (ARRL)	£1.65
Weather Satellite Handbook	O/S
Single Sideband for the Radio Amateur (ARRL)	£2.95

## USEFUL REFERENCE BOOKS

Solid State Design for the Radio Amateur (ARRL)	£5.00
Foundations of Wireless and Electronics, 9th Edition (Scroggie)	£4.50
Amateur Radio Techniques, 6th Edition (RSGB)	£3.95
U.K. Call Book 1979 (RSGB)	£3.20
Hints and Kinks (ARRL)	£2.85
Radio Data Reference Book RSGB	£3.60
NBFM Manual (RSGB)	O/S
Electronics Data Book (ARRL)	£3.25
Getting to Know OSCAR from the Ground Up (ARRL)	£2.30
ARRL Ham Radio Operating Guide	£2.75
Radio Frequency Interference (ARRL)	£2.15

## VALVE AND TRANSISTOR MANUALS

Towers' International Transistor Selector, (New Revised Edition)	£5.15
Service Valve and Semiconductor Equivalents	55p
Radio Valve and Semiconductor Data (10th Ed.)	£2.86

## VHF PUBLICATIONS

VHF Handbook, Wm. 1 Orr	£3.95
VHF Manual (ARRL)	£3.20
VHF/UHF Manual (RSGB), 3rd Ed.	£6.70

O/P (Out of print)

O/S (Out of stock)

THE ABOVE PRICES INCLUDE POSTAGE AND PACKING

Many of these titles are American in origin

(terms C.W.O.)

(prices are subject to alteration without notice)

Available from

SHORT WAVE MAGAZINE

Publications Dept.

34 High Street, Welwyn, Herts. AL6 9EQ - Welwyn (043871) 5206/7

(Counter Service. 9.30-5.00. Mon. to Fri.)

(GIRO A/C. No. 547 6151)

Printed by The Courier Printing Co. Ltd., Tunbridge Wells for the Proprietors and Publishers, The Short Wave Magazine Ltd., 34 High Street, Welwyn, Herts., AL6 9EQ. The *Short Wave Magazine* is obtainable abroad through the following: Continental Publishers & Distributors, Ltd., William Dawson & Son Ltd.; AUSTRALIA AND NEW ZEALAND — Gordon & Gotch, Ltd.; AMERICA—International News Company, 131 Varick Street, NEW YORK. Registered for transmission to Canada by Magazine Post. May 1979