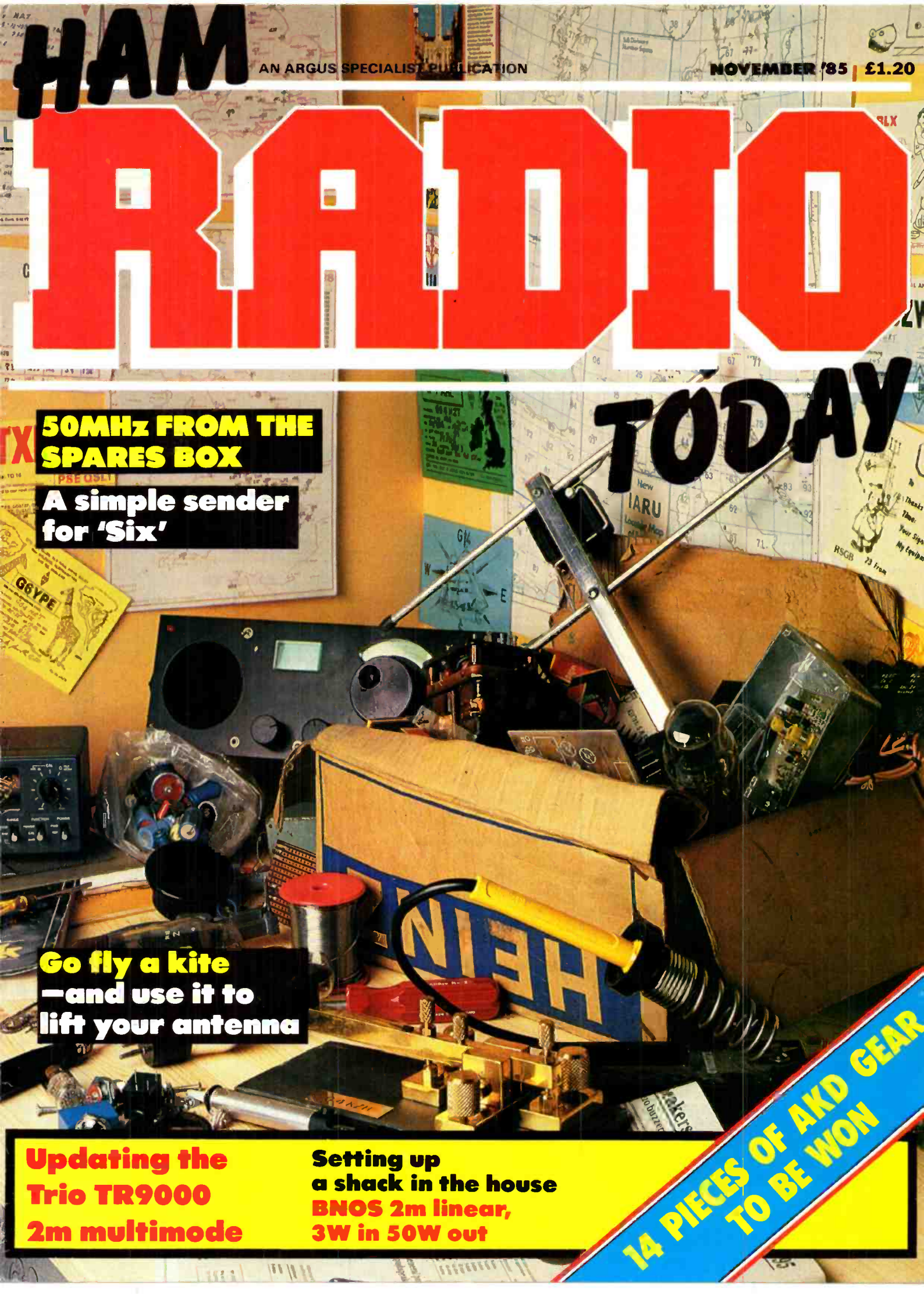
AN ARGUS SPECIALIST PUBLICATION

NOVEMBER '85 | £1.20

HAM RADIO TODAY



50MHz FROM THE SPARES BOX

A simple sender for 'Six'

Go fly a kite —and use it to lift your antenna

Updating the Trio TR9000 2m multimode

Setting up a shack in the house

BNOS 2m linear, 3W in 50W out

14 PIECES OF AKD GEAR TO BE WON

Amcomm of London

CALL NOW FOR THE LATEST PRICES

FAST MAIL ORDER AT LOWEST PRICES

01-422 9585 FOR FAST DELIVERY

Yaesu

FT1 HF Transceiver	P.O.A.
FT980 HF Transceiver	P.O.A.
SP980 Speaker	75.00
FT77 Mobile HF Transceiver	459.00
FP700 PSU	170.00
FC700 Tuner	111.00
FMU77 FM Board for FT77	28.35
FT757GX HF Transceiver	769.00
FC757 Auto A.T.U.	279.00
FP757HD Heavy Duty PSU	189.00
FP757GX Switched Mode PSU	179.00
FT290 2m M/Mode Port/Transceiver..	STAR BUY 299.00
FT290 With Mutek front end fitted..	STAR BUY 329.00
MMB11 Mobile Bracket	31.45
NC11 Charger	11.50
CSC1 Carrying Case	5.00
YHA15 2m Helical	7.65
YHA44D 70cm ½wave	9.95
YM49 Speaker Mike	20.30
FT230 2m 25w FM	269.00
FT730 70cm 10w. FM	239.00
MMB15 Mobile Bracket	14.55
FT203R NEW 2m H/Held/C/W FNB3	175.00
FT209R NEW 2m H/Held/C/W FNB3	219.00
FT208 2m H/Held	189.00
MMB10 Mobile Bracket	8.80
NC9C Charger	9.60
NC8 Base/station Charger	64.00
PA3 Car Adaptor/Charger	18.00
FNB2 Spare Battery Pack	24.90
YM24A Speaker Mike	23.75
FT726R 2m Base Station	775.00
430/726 70cm Module for above	270.00
MH1B8 Hand 600 8pin mic	17.65
MD1B8 Desk 600 8pin mic	74.75
MF1A3B Boom mobile mic	19.95
YH77 Lightweight phones	14.95
YH55 Padded phones	14.95
YH1 L/weight Mobile H/set-Boom mic	15.70
SB1 PTT Switch Box 208/708	17.25
SB2 PTT Switch Box 290/790	17.25
QTR24D World Time Clock	34.50
FF501DX Low Pass Filter	31.45
YP150 Wattmeter/Dummy Load 150W	97.75
NEW MODELS	
FRG8800 HF Receiver	470.00
FRV8800 Convertor 118-175 for above	80.00
FT703 70cm H/Held	215.00
FT709 70cm H/Held	239.00
FT270R 2m 25W F.M.	315.00
FT270RH 2m 45W F.M.	365.00
FT2700R 2m/70cm/25W/25W	479.00
FRG 9600 60-900Mhz Scanner	429.00
FL 7000 500w HF solid state linear	P.O.A.
Icom 735 New HF Transceiver	P.O.A.

AR 2001 Receiver 25/500 MHz
£329:00 inc VAT
add £3:50 carriage
Includes Mains Supply Unit

ANTENNA COUPLERS

THP HC200 1.8-30MHz 20w pep	82:95
THP HC400L 1.8-30MHz 350w pep	149:00
THP HC2000 1.8-30MHz 2.5kw pep	T.B.A.
AMTECH 300B 1.8-30MHz 300w pep ★	STAR BUY ★ 54:00
ICOM IC AT500 AUTOMATIC	399:00
ICOM IC AT1000 AUTOMATIC	Phone
YAESU FC 757 AUTOMATIC	245:00
YAESU FC 102 WARC 2Kw	Phone
WELZ AC38 1.8 300MHz	73:95

VAT included. Amtech 300B 1.50 others £6 Securicor.

Icom

IC751 HF Transceiver	1239.00
IC745 HF Transceiver	898.00
PS15 P.S. Unit	135.00
PS30 Systems p.s.u. 25A	259.00
SM6 Base microphone for 751/745	36.50
IC290D 2m 25w M/Mode	469.00
IC290E 10w M/Mode Mobile	399.00
IC271E 2m 25w M/Mode Base Stn.	699.00
IC271H 100W version of above	889.00
IC25H 2m 45w FM	359.00
IC27E 25W FM mobile	359.00
IC45E 70c 10w FM	345.00
IC47E 25w 70cm FM mobile	449.00
ICBU1 B/U Supply for 25/45/290	24.50
ICR70 General Coverage Receiver	599.00
ICR71 General Coverage Receiver	699.00
IC02E 2m H/Held	259.00
IC2E 2m H/Held	199.00
ML1 2m 10w Linear	69.00
IC4E 70cm H/Held	259.00
IC04E 70cm handheld	269.00
BC30 Base Charger	56.35
HM9 Speaker mic	18.55
IC3 Carry Case	5.50
ICBP3 Std Battery Pack	27.50
BP5 High Power Battery Pack	52.80
CP1 Car Charging Lead	5.50
DC1 12v Adaptor	13.75

Aerial Rotators

9502B 3 core Light Duty	69.50
AR40 5 core Medium Duty	115.00
KR400 Med/H Duty	109.95
KR500 6 core Elevation	139.95
KR400RC 6 core Medium Duty	132.50
CD45 8 core Heavy Duty	189.95
KR600RC 8 core Heavy Duty	189.50
HAM1V 8 core Heavier Duty	299.00
T2X 8 core Very Heavy Duty	365.00
Hirschman 250 ★ STAR BUY ★	49.50

EMOTO – all models POA

SWR/POWER METERS

WELZ SP200 1Kw	89:00
WELZ SP300 1Kw	129:00
WELZ SP400 150w	89:00
WELZ SP15M 200w	49:00
WELZ SP250 2Kw	65:00
TOYO TM1X 3.5 150MHz 120w	18:80
TOYO T430 145/430MHz thru line watt meter 120w	44:65
TOYO T435 145/435MHz thru line watt meter 200w	49:35

VAT included. Add £2 per item carriage.

VHF LINEAR AMPLIFIERS

THP HL30V 0.5-3w in 30w out	45:00
THP HL82V 10w in 85w out	144:50
THP HL110V 10w in 110w out	204:00
THP HL160V 10w in 160w out	244:52
THP HL160V 25w in 160w out	209:73
MML 144/30LS	
MML 144/50S	
MML 144/100S	
MML 144/100HS	
MML 144/100LS	
MML 144/200S	

UHF LINEAR AMPLIFIERS

MML 432/30L	145:00
MML 432/50	145:00
MML 432/100	299:00
THP HL20U 1-3w in 20w out	82:00
THP HL45U 10w in 45w out	152:77
THP HL9OU 10w in 90w out	268:59
ALINCO ELH250C	114:95

B.N.O.S. complete range also in stock.
VAT included. Add £2 per item carriage.

★ NEW ★
YAESU FRG 9600
ALL MODE VHF/UHF SCANNER

★ £429.00 ★

60-905MHz, Wide and Narrow AM/FM with 5, 10, 12½, 25 and 100 steps on FM + 1KH/100Hz AM and 1KHz/100Hz SSB and much, much more including optional interface unit for computers and video IF unit for TV reception. Call or Write.
Call or write now for Prices and Literature

HEIL ACCESSORIES

HEIL HC3 Microphone Element	22:85
HEIL HC5 Microphone Element (Icom SM5/6)	25:40
HEIL HM 5 Desk Microphone (300Hz-3KHz) cardoid fwd	59:00
HEIL MM5 Hand Held Mic with HC3 Capsule	37.00
HEIL SS2 SPEAKER ... see page 10	65:00
HEIL EQ300 Mic Equaliser	65:00
HEIL BM10 8OZ HEADSET/BOOM MIC	65.00

Carriage and VAT included

TELEGRAPH ACCESSORIES

Hi Mound Keys	
HK 708 Hand Key with base	14:95
HK 707 Hand Key with base and dust cover	15:48
HK 706 Hand Key with base and dust cover	16:60
HK 702 Key with marble base and dust cover	29:65
MK 704 Dual lever paddle, no base	14:00
MK 705 Dual lever paddle marble base	25:65
COK-2 Practice oscillator	8:99
KENPRO Iambic Electronic Keyer KP100	79:00
KENPRO Iambic Memory Keyer	169:00
Bencher	
BY1 Squeeze Key, Black base	53.95
BY2 Squeeze Key, Chrome base	69.95
Auto CW/RTTY	
Tono 9100E	799.00
Tono 9000E Reader/Sender	P.O.A.
Tono 550 Reader	299.00
Tono 5000E	899.00

VAT included. Add £1 carriage per item.

UNADILLA/REYCO

The world's finest Traps precision moulded coil forms, all stainless hardware, aluminium tube, irridite finish, absolutely weather proof.
KW 10 resonant at 28.675
KW 15 resonant at 21.275 } £12.99 inc VAT and Carr
KW 20 resonant at 14.175

VHF CONVERTERS ★ Star Buy ★

The following frequencies from any HF Receiver.
FRV 7700 A 118-150MHz
B 118-130, 140-150, 50-59MHz
C 140-170MHz
D 118-130, 140-150, 70-80MHz
E 140-150, 150-160, 118-130MHz
F 150-180, 180-170, 118-130MHz
All Models £59.00 inc VAT and Carr

Prices may be subject to change due to currency fluctuations

E.&.O.E.

CLOSED MONDAY
HOURS: 10:00 – 5:30
SAT. 10:00 – 5:00

Goods normally despatched by return.

Amcomm SERVICES LTD., 194 NORTHOLT ROAD, SOUTH HARROW, MIDDX. HA2 0EN. ENGLAND. (Opp. South Harrow Underground Station) TEL: 01-422 9585. TELEX: 24263

HAM RADIO TODAY

CONTENTS

VOLUME THREE NO. 11 NOVEMBER 1985

Design by
Argus Design Ltd
Published by:
Argus Specialist Publications Ltd.,
1,Golden Square,
London W1R 3AB.
Telephone: 01-437 0626
Distributed by:
SM Distribution Ltd.
Printed by:
The Garden City Press Ltd.
Subscription Rate
UK £17.00
O/Seas Sur: £18.50
USA Sur: $25.00
O/Seas Air: £33.50
Ham Radio Today,
Subscriptions Dept,
Infonet Ltd,
Times House,
179 The Marlowes,
Hemel Hempstead,
Herts HP1 1BB
Tel: (0442) 48432

ABC

REGULAR COLUMNS

CONSTRUCTION

FEATURES

REVIEWS

Thanet El

ICOM ICOM

IC-735, The Complete HF Radio

This new HF transceiver from ICOM is compact enough to make mobile or portable use a possibility. The IC-735 covers all Amateur frequencies from 1.8MHz to 30MHz including the three new bands 10, 18 and 24MHz. Modes include SSB, CW, AM and FM, all circuits are solid-state and output is approximately 100 watts.

Tuning ranges from 100kHz to 30MHz, made continuous by using a high-side IF and a CPU control system. RTTY operation is also possible. Dynamic range is 105dB with a 70.451 MHz first IF circuit. The direct feed mixer rejects spurious response and gives higher sensitivity and wider dynamic range. Pass-band tuning and a sharp IF notch filter provide clear reception even under duress. Preamp is 10dB and attenuator 20dB.

The new IC-735 from ICOM is easy to operate and versatile, it has various scanning functions, comprehensive LCD and 12 memories. Computer remote control is possible via the RS-232C jack.

Options include: the AT-150 automatic antenna tuner and shown here the PS-55 AC power supply and SM-8 desk mic.

Please contact Thanet Electronics or your local ICOM dealer for even more information on this latest HF transceiver – the IC-735.

IC-3200E Dual-band

A new exciting set is the ICOM IC-3200E FM Dual-band transceiver (144-430/440 MHz).

The IC-3200E employs a function key for low-priority operations to simplify the front panel. LCD display is easy to read in bright places, showing frequency, VFO A/B, memory channel duplex mode and S/RF meter information.

Other features include a 10 channel memory able to store operating frequencies, Simplex or Duplex. A memory lock-out function allows the memory scan to skip programmed channels when not required. The IC-3200E has a built-in duplexer and can operate on one antenna for both VHF and UHF. Options include: IC-PS45 DC, power supply, HS-15 mobile mic, SM6 and SM8 desk mics, SP-10 external speaker and UT-23 speech synthesizer.

Contact us regarding 50MHz equipment for new issued band!

lectronics

ICOM ICOM

IC-505, 50MHz A New Dimension for the U.K.

At last, permits are now available in the U.K. for the 50MHz (FM) band. If you wish to use this less crowded amateur frequency the IC-505 SSB CW portable transceiver has already gained an excellent reputation world-wide.

The IC-505 features microprocessor frequency control, dual VFO's and 6-channel memories with memory scan. LCD ensures clear visibility even in sunlight. The 505 accepts a standard dry-cell pack, rechargeable nicad battery pack (BP10) or 13.8V external power supply.

Standard accessory circuits such as split switch, noise blanker, squelch and CW break-in are incorporated in the 505.

Other accessories available include the EX-248 FM unit, BC-15 charger unit and the LC-10 carrying case.

All these features make the IC-505 a great transceiver that will enable you to operate on the 50MHz band, after all the rest of the world does!

Authorised Icom dealers in the UK

Alyntronics, Newcastle, 0632-761002.
Amateur Radio Exchange, London (Ealing), 01-992 5765.
Amcomm, London (S. Harrow), 01-422 9585.
A.R.E. Comms. Earlstown, Merseyside, 0952-29881.
Arrow Electronics Ltd., Chelmsford, Essex, 0245-381673/26.
Beamrite, Cardiff, 0222-486884.
Booth Holding (Bath) Ltd., Bristol, 02217-2402.
Bredhurst Electronics Ltd., W. Sussex, 0444-400786.
Dressler (UK) Ltd., London (Leyton), 01-558 0854.
D.W. Electronics, Widnes, Cheshire, 051-420 2559.
Hobbytronics, Knutsford, Cheshire, 0565-4040. Until 10pm daily.
Photo Acoustics Ltd., Buckinghamshire, 0908-610625.
Radcomm Electronics, Co Cork, Ireland, 01035321-632725.
Radio Shack Ltd., London NW6, 01-624 7174.
Ray Withers Comms. Warley, West Midlands, 021-421 8201.
Scotcomms, Edinburgh, 031-657 2430.
Tyrone Amateur Electronics, Co. Tyrone, N. Ireland, 0662-2043.
Reg Ward & Co. Ltd., S.W. England, 0279-34918.
Waters & Stanton Electronics, Hockley, Essex, 0702-206835.

Listed here are authorised dealers who can demonstrate ICOM equipment all year round. This list covers most areas of the U.K., but if you have difficulty finding a dealer near you, contact Thanet Electronics and we will be able to help you.

You can get what you want just by picking up the telephone. Our mail-order dept. offers you: free, same-day despatch whenever possible, instant credit, interest-free H.P., telephone Barclaycard and Access facility and 24 hour answering service.

Please note that we have a retail branch at 95, Mortimer Street, Herne Bay, Kent. Tel: 369464. Give it a visit, BCNU.

IC-271 & 471

ICOM can introduce you to a whole new world via the world-communications satellite OSCAR. Did you know that you can Tx to OSCAR on the 430-440 MHz IC-471 and Rx on the 2m IC-271.

By making simple modifications, you can track the VFO's of the Rx and Tx either normally or reverse. This is unique to these ICOM rigs and therefore very useful for OSCAR 10 communications. Digital A.F.C. can also be provided for UOSAT etc. This will give automatic tracking of the receiver with digital readout of the doppler shift. The easy modifications needed to give you this unique communications opportunity are published in the December '84 issue of OSCAR NEWS. Back issues of OSCAR NEWS can be obtained from AMSAT (UK), LONDON E12 5EQ.

This range includes the IC-271E-25W, 271H-100W and the 70cm versions IC-471E-25W and 471H-75W r.f. output. The 271E has an optional switchable front-end pre-amp. The 271H can use the pre-amp AG-25, with the 471E and 471H using the AG35 mast-head pre-amp. Other options include internal switch-mode PSU's: the 271E and 471E use the PS25 and the 271H and 471H use the PS35.

Also available are the SM6 desk microphone and a speech synthesizer that announces the displayed frequency, what more could you ask for?

Cellnet British TELECOM Approved Dealer & Wholesaler for Cellnet Carphones

ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet Electronics

Dept HR, Herne Bay, Kent
Tel: (0227) 363859

COMPETITION

AKD wavemeters, pre-amps and filters galore to be won!

In this month's competition there is a quantity of quality to be won. John Armstrong, of AKD has provided HRT with over £100 worth of goodies for you RF hungry readers. The first correct entry out of the editor's panama hat will receive a WA1 VHF/UHF wavemeter and a GPA1 high gain RF switched 2m pre-amp, whilst the second and third entries will receive a WA1 wavemeter and a GPA1 pre-amp respectively. Finally, there are ten runners up prizes of superb AKD TVI filters to be won. Enter this month's competition and keep *your* operating clean from interference.

So you really know about RF interference?

1. When a certain metal becomes oxidised it forms diode type junctions and these can generate harmonics if they are within an RF field. Which of the following metals exhibit this property?

A brass B steel C aluminium

2. If you have a transmitter connected to a half wave dipole, which harmonic is the hardest to remove?

D second E third F fifth

3. The operation of a cavity wavemeter closely resembles which of the following simple musical instruments?

G caliope H recorder I tin whistle

4. Imagine you are equidistant between two TV stations of roughly equal power, one using horizontal polarisation and the other vertical, and you are using a vertical antenna for transmission. Assuming your neighbour has aerials suitable to receive both TV stations which of their signals is less likely to suffer interference from you?

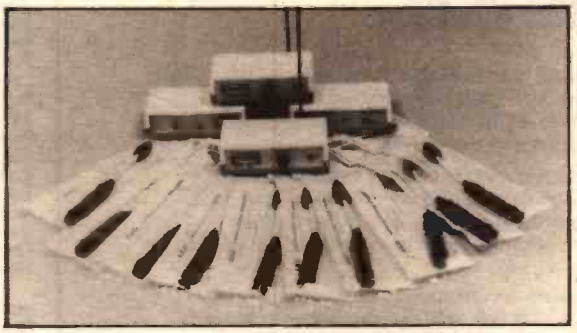
J vertically polarised K horizontally polarised L both will suffer similarly.

5. You are using an end fed wire antenna on all bands and suffer TVI on some of them. Pieces of wire cut to an appropriate length for each band you are suffering interference on can be connected together and attached to the chassis of your ATU. These will form an artificial earth and help cure this problem. How long should each of these pieces of wire be?

M full wave N half wave O quarter wave.

6. In a case where the addition of a linear amplifier to a transceiver decreases the interference caused to a TV set, is this because the linear amplifier . . .

Puses valves Q doesn't get as hot as the transceiver R is more frequency selective than the Tx/Rx PA.



The AKD wavemeter WA1 features

★ 120 to 420MHz frequency range in two bands.
★ varicap tuned and very sensitive.

The AKD pre amplifier GPA1 features

★ low noise with 18dB gain.
★ will switch 25W RF and has SO239 IP/OP.

How To Enter

Look at the questions nearby. Each question has a number of possible answers. Choose which you think are the correct answers and write them in sequence on the coupon below.

IMPORTANT: write your choice of the order on the back of the envelope in addition to the coupon. Send your entry to AKD Competition, Ham Radio Today, No 1 Golden Square, London W1R 3AB. Closing date is first post on 30th October '85.

Complete the coupon fully and clearly — if you are one of the winners, this will be used as a label.

You may enter as many times as you like, but each entry must be on an official coupon — not a copy — and sealed in a separate envelope.

The Rules

Entries will not be accepted from employees of Argus Specialist Publications Ltd, Armstrong Kirkwood Development or Garden City Press. This restriction also applies to employees families and agents of the companies. The 'How To Enter' section forms part of the rules.

NAME . . . . . .

ADDRESS . . . . . .

. . . . . .

. . . . . Post Code . . . . . .

Your choice of question answers ie B, D, etc . . . . . .

. . . . . .

DEWSBURY ELECTRONICS

G4CLX

IF IT'S TRIO IT MUST BE **DEWSBURY**

A FULL RANGE ALWAYS IN STOCK

FRG 8800 £475

TRIO R600 £299

APPROVED TRIO DEALER

TRIO R2000 £479

NRD 515 £965

APPROVED TRIO DEALER

IC — R 71E £699

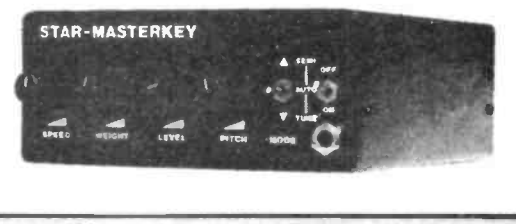
NEW PRODUCT NEWS

IF YOU'RE THINKING ABOUT CW YOU MUST READ THIS!

★ Iambic Keyer ★ Dash/Dot Memory
★ Keying Speed 1 — 55 wpm
★ Built In Side Tone Oscillator And Speaker ★ Headphone Socket
★ Variable Weight Control ★ Side Tone Volume And Pitch Control
★ Switchable Automatic/Semi Automatic Keying/Tune Control ★ Operation From Internal Batteries Or 9 — 15v. External Supply ★ Low Current Drain
★ British Made
★ Selectable Positive or Negative Keying
5 YEAR GUARANTEE
Only £49.95 + £3.00 P&P To Include External Power Leads And Plugs.

POCOMOTOR AFR2000
RTTY ALL MODE DECODER
AFR8000 with built-in display now available.
Write for details.

(Now with CW option) From £425



STAR MASTER — KEYER

Stockists of DAIWA — MET ANTENNAS — MUTEK — WOOD & DOUGLAS — TASCO TELEREADERS — MICROWAVE MODULES — ICS AMTOR — AEA PRODUCTS — DRAE

Dewsbury Electronics, 176 Lower High Street, Stourbridge, West Midlands.
Telephone: Stourbridge (0384) 390063/371228
Telex: 337675 TELPES G

VISA

Access

Instant finance available subject to status. Written details on request.

LETTERS

CLASS B AND CW

Sir, Since April Fools Day this year, every Class 'B' licence holder has had the opportunity to use morse code with certain constraints. These are:-
1) Operation restricted to the 'all mode' section of the band in use.
2) Callsign to be announced using phone at the beginning and end of transmission.
3) NO OPERATION in the CW only part of the bands.

This experiment has been in operation for nearly four months and I have reservations as to its value. It is plain to me that some class B ops cannot follow these instructions, but this may be due to the RSGB having provided ambiguous information at the outset. I make these points:
i) Where is the all mode section of the 2m band? Surely it is from 144.500 to 144.800MHz. Most Class B CW I have heard has been between 144.150 and 144.400, in the SSB and CW part of the band. As FM is not supposed to be used here, it cannot be all mode.
ii) Why are Class B's using CW in the CW only section, surely they read the leaflet that came with the licence variation? I called CQ on 144.050 in June and was answered by G1_____ who could not send coherent morse. On Tuesday 23rd June I heard G1M____ working G4N____ on 144.057.

The objective of the experiment was to increase self training with a view to assisting persons taking the BT morse test. However, about half the B's I have heard are using their iambic keyers — when I took the morse test a 'straight' key was used.

Nearly all of my radio operation is on 2m, mostly on CW and I worked very hard, travelled 100 miles and paid £15 to gain my class A licence and the privileges that go with it — unlike most *not* to work HF.

This may all sound like sour grapes, but I support discipline in amateur radio because without it, the bands will be in ruins. I recommend that the experiment dies a natural death on 31.3.86.

J L Palfrey, G4XEN

Over 6000 licence variations have been issued by the RSGB since the experiment started which may go some way to providing an explanation for the 'misdemeanours' you have heard on 2m. But please do not pass judgement on the first few months of a new experiment, wait and see how many of these class B's get their ticket and become good CW operators. . .

CRYSTAL OSCILLATORS AGAIN

Sir, Messrs Poole, G3YWX, and Green, G1NAK, both confuse harmonics with overtones. The harmonic is the *exact* multiple of the fundamental and both valve circuits are fundamental oscillators producing a harmonic output. G3YWX's transistor circuit is one in which the crystal is forced into an overtone mode (which must be an odd number) and its frequency is nearly but not exactly a multiple of the fundamental.

It is in fact physically vibrating at, say, the third overtone and the effect of the electrodes is such that there is a small difference in frequency between the third overtone and the third harmonic of the fundamental. I could go on but I won't!

G1NAK is, of course, correct to remind us of the difference in frequency between the series and the parallel resonances.

Finally, on another topic, please stop printing interesting text on dark grey paper. It is difficult for some of us not-so-young ones to read!

Dick Biddulph, G8DPS.

Well, I hope you all understood thoroughly what all this means and I shall expect an essay from each of you explaining it to me! I was born with a silicon chip in my mouth. . . But seriously, apologies for the unfortunate printing mistake we hope it won't happen again.

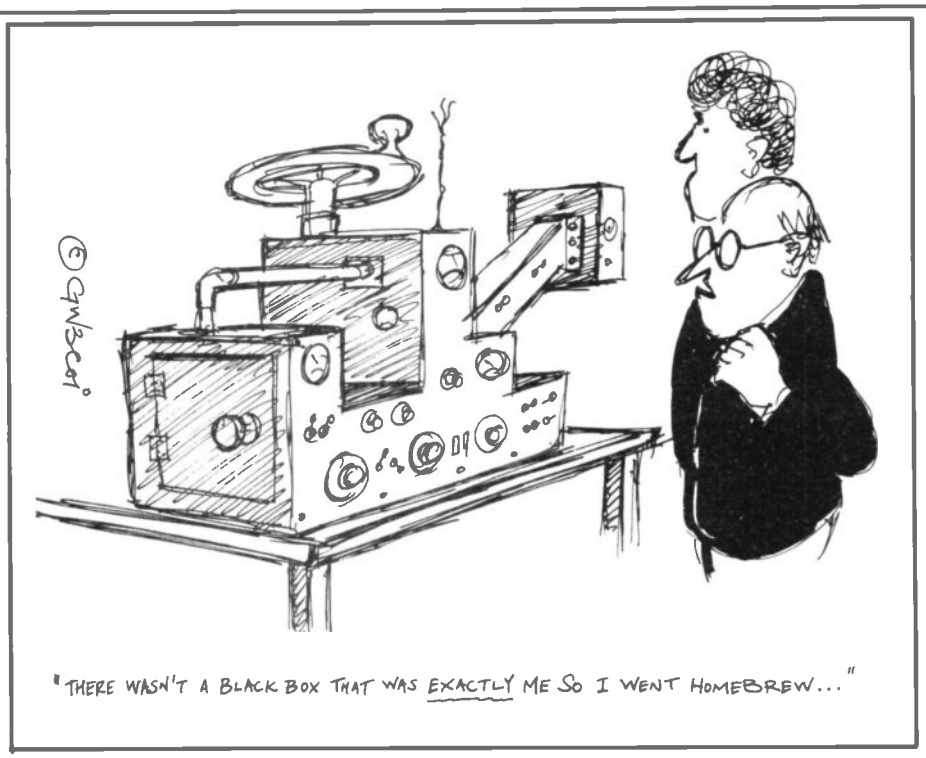
LAST WORDS ON KITS?

Sir, I feel it necessary to add some comments re G8ZRYs letter in August HRT concerning the cost of kits. The statement that someone could go out and buy a handheld for the price of the Micron, while true, is somewhat out of context to say the least. On the assumption that the person concerned is looking for an HF CW rig and not a 2 metre handheld then he has the choice of building it himself from scratch, buying a second hand rig, or going for something new, either kit or ready built. If he builds it himself then providing he has the necessary know-how and patience, the sky is the limit in terms of complexity — as is the resulting level of debugging and frustration involved. Many of the inexperienced youngsters G8ZRY refers to will probably never finish the project, and be put off home construction for the rest of his life. Hopefully, a kit will result in a working end-product.

The purchase of a second-hand or new 'ready-to-go' rig is not really a relevant factor — either you want to learn something and build it yourself or you want to be an appliance operator! I have no objection to appliance operators — I use commercial gear myself and over the years have gone through a variety of rigs for 2m. I have also had my hands on most of the modern rigs via review samples — but I still prefer building my own gear and passing the results on.

As to price, about the only way to evaluate this is to look at the competition. The Micron does not have any direct competition in ready built form in this country as a dedicated 6 band CW rig. The only comparable kit rig is the Heathkit HW-9, and with only 4 bands and no digital readout or internal ATU, it currently costs £299.95. The Micron comparable option costs £171.15 and you can't (easily) add the Micron options to the HW-9.

G8ZRY should also bear in mind that when you purchase a kit, you aren't just buying the parts. You are paying in part for development and consequent removal of frustration on the constructors part, the overheads that tend to come with a business, stock-holding, bad-debts, equipment, advertising, and back-up. Money has to be found for things such as prototype cases — a production case might cost £10 whereas several goes at a prototype might cost up to 20 times this. There is far more back-up needed with a kit that someone else builds than ever needed with a ready-built transceiver purely because of



human error. If the average constructor costed his time at his normal hourly earnings rate into a project he would find that his home-built project had cost him a lot more than he ever bargained for.

It is probable (nay, statistically 99% certain) that there is far more money to be made in fields other than amateur radio. However, I do enjoy building, writing, hearing G4JST/G3WPO designs on the air despite the complexities of getting them there in the first place, and a very occasionally finding the time to actually get on the air and work them. It is always a pleasure to hear a newcomer, on HF for the first time, using a DSB80 or whatever — far more inspiring to me than hearing a newcomer on 2m using an FT290 or what have you.

Tony Bailey, G3WPO
WPO COMMUNICATIONS.

Sir, I am writing to you in the hope of getting the last word on the matter of home construction and especially kits from WPO.

What is amateur radio? Amateur radio is experimental communication between people with an interest in radio and constructing. Comments such as Omega costs too much (£648) and commercial black boxes are available cheaper are as may be but I would sooner get a 5 and 9 report on homebrew than a black box. Although Omega may be expensive, look at faults and repairs — it is much easier to get a £3 — £4 chip for Omega than try and get hold of a chip for a black box. People should be able to service and repair their own equipment as our licence requirements ask for knowledge of radio circuits and principles of operation.

My other comments are regarding G8ZRY, comments on youngsters and cost of kits in relation to commercial equipment. Finance firms will not look at unemployed youngsters and the disabled like myself for hire purchase. However, I have been building Omega for two years now and it is near completion. I can manage, as I am sure most can, a couple of pounds a week for bits and pieces. I am not technically advanced in radio design so I am grateful to people like Tony Bailey and HRT who understand the need for good projects.

I ask all of you, to think about home construction again, and at least think well it's British made!

A W Sharp, G4WDB.

SCRUFFY SHACK!

Sir, I have read with interest G6LPZ's article "From Shed To Shack" and agree with many of the thoughts and ideas raised. However, in my view the article was marred by the scruffy and unkempt appearance of the "finished" shack — or were they in fact "before" photographs.

Of course I'm not naive enough to imagine for a moment that everybody's shack is immaculate (like mine!) with a place for everything etc, but the idea would have had more impact with a neat and tidy presentation of the finished job. (Scruffy shack, scruffy operator?)

David A Jenkins, ZB2HR

Having visited many shacks, I would tend to disagree that a scruffy shack makes a scruffy operator or vice versa rather a busy operator. The photographs of G6LPZ's shack were 'after' shots, in fact, well after conversion.

A REPLY TO G4AJJ's OPINION

Sir, I am sure that your readers, are more astute than Mr G Smith, G4AJJ, imagines and realise that, since he resigned from Council after a difference of opinion, he would attempt to show the Society in as unfavourable a light as possible. I would like to make the following observations as a member for over 40 years, an amateur operator for almost the same length of time, and a former office worker with a large company for 30 years.

Admittedly there are problems over lack of space and the ever-increasing work-load in a growing organisation, but I cannot see why G4AJJ should describe these as "conflicts". The Society did what any business concern would do, namely obtain suitable larger premises and a computer. What is wrong with this?

Referring now to committee, I have a copy of what G4AJJ calls the "rule book", and there seems nothing new in the Chairman reporting direct to Council. In fact, when later in his article he complains of committees by-passing Council, Mr Smith admits that a recommendation would normally be made to Council. He really cannot have it both ways!

It is true that committee members do not necessarily have to be RSGB members, but they must be approved by Council (p18 para 2) and I would have thought that it is a wise move to obtain the benefit of all expert knowledge on a particular subject.

Mr Smith is incorrect when he states that there is no requirement for each committee to have a member of Council as a member of it. In fact each committee shall have at least one Council member, and preferably at least two (p18 para 3).

I cannot understand G4AJJ's assertion that the flow of information is one way — perhaps he reads a different 'Radcom' to mine.

When he speaks of decline in membership and 50% of the licensed amateurs, Mr Smith is falling into his own psychological trap. If one peruses the Callbook it will be seen that, in addition to the older callsigns, there are (in round figures) 7,000 G8/three letter and 11,000 G6/three letter licences still in force. For Mr Smith's mathematics to be correct we must be certain that all of these amateurs are active on a day-to-day basis, and not

just renewing their licences as a matter of expediency.

G4 AJJ must be a nervous type, he calls a necessary reduction in ORMs and other expenditure as a panic measure — I call it wise economy.

The only point where I agree with your correspondent is when he refers to the decline in operating standards. I regret that the Society, in its official journal and by other means, does not do a lot more to instruct the beginner in our hobby.

Once again we read of an "Open" Society. What is meant by this? Is it suggested that each member receives a verbatim record of every Council and committee meeting, so that they can say "yay or nay". What nonsense! If the Council elections and AGM are anything to go by, only a tiny percentage of the membership would respond anyway. Perhaps this suggests that the vast majority of the members are either satisfied or apathetic. If so, should not those minorities who always seem the most vociferous, once they have exercised their freedom of speech, hold their peace?

Personally I am glad to hear that Council meetings are often heated affairs. No doubt Mr Smith would prefer them to be held by a bunch of "yes-men" to whom he could impart some of his strange ideas.

I was at last year's AGM/EGM, and cannot accept that it was a heated affair. Admittedly at one point a small number of people attempted to disrupt matters, but they were very soon shouted down by those more responsible members present.

What system of election would Mr Smith prefer? Can we have some facts rather than woolley phrases?

Surely the average member, at election time, chooses the members most likely to be in sympathy with him? I just do not understand what Mr Smith means in his suggested idea No.2. Regarding finances, I feel confident that these are being continually reviewed. If G4 AJJ feels that management and the auditors are inefficient, why does he not come out in the open and say so?

Finally, it is easy to criticise, but much much harder to formulate ideas and then put them into practice.

S B Rickwood

ON THE LIGHTER SIDE

Sir, Can I give you a slight chuckle from a few odd scraps of conversation I have heard on the air?

"My antenna is loose so all the work is being done by the car roof."
"My 'S' meter gives a flicker when you cough so your cough is overdeving."
"My microwave oven has a transmitter but I can't get it to work with the door open, any ideas on why?"
"The grid is there to stop sprogs leaving the anode."
"I always work QRP, just 10W into a 19 ele boomer."
"I don't like computer morse 'cos it sends faster than I can type."
"I never smoke when I'm driving except when I'm going fast. It calms my nerves."
"She thought I was going to become a monk when I went to the convention, now she thinks I'm going to Monti Carlo for the rally."

Tom Lambert, G4 VBL.

If you say or hear something amusing on the air, please let us know. After all, we all say strange things sometimes. . .

Please address correspondence to:
Ham Radio Today,
1, Golden Square,
LONDON W1R 3AB.

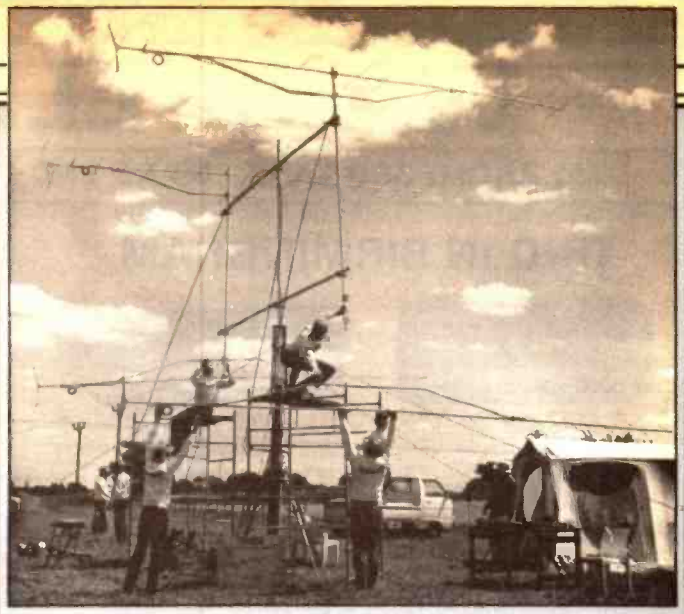
RADIO TODAY

Radio Amateurs In Space

More amateur radio contacts can be made with astronauts in space this month (October). West German astronauts Dr Erst Messerschmid, DD6CF, and Dr Reinhard Furrer, DG2KM, will be aboard Space Shuttle Challenger, D1 mission, and will operate DP0SL for five of the seven day flight. The main focus of activity is intended to be Europe although if conditions permit contacts with other parts of the world will be made. A QSL card will be sent to all amateurs achieving contact even if they only work the unattended station in which the equipment will send out a CQ call and wait (and record) for one minute.

The equipment to be used is a specially built VHF/UHF transceiver by Bosch and has an RF output power of 10W and a sensitivity of 0.45 microvolts for S+N/N of 12dB. DP0SL will be operating on 145.575MHz and will listen, unless under pile up conditions, on 437.175MHz.

Further information can be obtained from the news broadcasts on DF0VR and DF0LRK or from DARC, PO Box 1155, D-3507 Baunatal, West Germany.



The antennas to be used included four 19 ele MET antennas fed by Heliax. An impressive array on a clear day.

Washed Out Heineken DXpedition

Despite the famous lager's claim to be able to refresh the parts others cannot reach, the West Kent ARS attempt to cross the pond on 2m was rained off.

Even the scheduled use of the QE2 as a floating radio link had to be abandoned because of the rain and gale force winds. However, some of the intrepid members of the club have moved to the Aran Islands to continue their efforts from the dry comfort of a stone cottage.

New Receiver from Philips

A new general coverage receiver designed to compete with the best from Japan has emerged from the Dutch Philips stable. It offers the shortwave listener continuous tuning across the long, medium and short wave bands (150kHz to 29.999MHz) plus the VHF FM band (87.5 to 108MHz) using modes AM, FM and SSB with a choice of wide and narrow bandwidth.

In addition to the general coverage facility, the D2999 has eleven preset bands from 11 to 120m, selectable by buttons on the front panel. It also has 16 programmable memories for your favourite bands, and three tuning speeds. Two speakers are built into the case — a 3" in the front panel and a 7" into the top.

The D2999 therefore offers the shortwave enthusiast general coverage facilities and a VHF FM radio, and costs £499. Further details are available from Dressler, phone 01 558 0854.

Cirkit Catalogue With WPO Kits

A new catalogue has just been published by Cirkit, the component, kit and increasingly, product retailer for the electronics hobbyist. Included in this new issue, for the first time is a range of the best selling kits from the WPO Communications range. Cirkit and Tony Bailey of WPO have reached an agreement whereby Cirkit will market and distribute, eventually, all the WPO range. Thus enabling Tony to concentrate on further product development, writing new specs and as he says "continuing communications on the air."

Until January, WPO will continue processing orders except those for the DSB and DSB2 series, the Minisynth (both HF and 2m), 2m Tx, Rx and Tx/Rx, audio CW filter and audio speech processor. These are included in the catalogue along with peripherals for the Amstrad, Weller soldering irons and Xcelite products.

The catalogue contains 128 pages and is on sale at larger newsagents priced at £1.15.

IBA Tests Radio Data Systems in London

IBA engineers have been transmitting additional data using sub carriers on the LBC VHF FM broadcasts on 97.3MHz. The tests which were carried out over four weeks in August, appear to have been noticed by very few listeners.

Two systems were under investigation, the first is the Radio Data System (RDS) which has been endorsed by the European Broadcasting Union. The aim of RDS is to provide new facilities for listeners such as channel identification and automatic receiver switching. The necessary decoders would have to be incorporated into domestic and car radios. A similar system is in use in West Germany which enables motorists listening to their car radios to receive urgent traffic information. The second system is intended to provide a data channel and be available on something like a subscription basis or special interest users.

Summit Tunnel Walk Aided by RAYNET

Photo courtesy of Todmorden News and Advertiser (Geoff Baron).

On Saturday 17th August, Todmorden Raynet Group provided communications on a sponsored walk with a difference. The differece was that 6000 walkers were walking a mere 2885 yards but some 350 feet below ground. The walk was through the Summit railway tunnel between Todmorden and Littleborough on the Leeds/Manchester line. The tunnel achieved notoriety when on December 20th 1984, a freight train carrying petrol became derailed half way along its length and exploded.

17 members from Todmorden, Leeds and Greater Manchester East Raynet groups were present and provided liaison between St John's Ambulance, Todmorden Round Table (the walk organisers) and British Rail. The group used 70cm actually in the tunnel with one member at either end, a member in the middle relaying messages and a controller monitoring progress. Overland communications were held using 2m.

The exercise was considered by all to be an outstanding success especially since VHF and UHF had been thought to be impossible as the tunnel is some 26 feet lower at the Yorkshire end.

Special Event Stations and Exhibitions

● GB4URC will be operating on HF and 2m on 12th October as a sponsored special event station starting at 10am and finishing at 4pm. Further details are available from G0CCI on 0206 396610.

● **The Electronics Hobbies Exhibition organised by Hornsea ARC will be taking place on Sunday 20th October at the Floral Hall, in Hornsea. The concept behind this exhibition is to get away from the 'rally' and the organisers have invited nearby clubs to set up stands illustrating the various aspects of amateur radio. The clubs involved are Scarborough, Leconfield, Grimsby, Goole, Scunthorpe and Hull, with Hornsea providing a talk in on 2m (S22) and 70cm. There will also be a selected number of trade stands and a cafe. Parking is available outside the Floral Hall and nearby and the exhibition opens at 11am.**

● October 25th and 26th GB4OWW (One World Week) will be operating on HF, 2m SSB and FM and 432MHz. The aim is to spread the message of the Marlborough Brandt Group and hopefully, conditions permitting, make contact with The Gambia. Special QSL cards will be available for all contacts.

● **Also on the 25th and 26th October is the National Amateur Radio and Electronics Exhibition at the Granby Halls, Leicester. There will be a star raffle (!) and an extensive bring and buy if last year is anything to go by and of course you'll be able to come and see us on stand 57. The exhibition starts at 10am on both days and further details are available from Frank, G4PDZ, on 0533 553293.**

Poetry Corner

MOBILE FROM GREAT ORME'S HEAD

Our hobby is tough on Young Dah-dit,
'Cause while Dad and Mum are on air
Nobody cooks any dinners,
And she's run out of clean clothes to wear.

We discussed our neglect of Young Dah-dit
And told her, "Get up, have a wash!
We'll take tuna-fish butties to Great Orme's Head
And peanuts and 'pure' orange squash."

So he fitted the radio into the car,
Supplied linear amp with some plugs,
Mag-mounted the aerial on to the roof,
While we brought the grub and some mugs!

Well, it bucketed down with Wx
And fair bristled with loud QRN;
But once you've decided DX-ing to go
There's no turning back home again.

"Remember the mike needs handling with care,
You set it up while I drive;
Turn up the volume to hear who is there
On Megahertz One Forty-Five!"

On leaving our Colwyn Bay QTH
Our screen wipes were both working hard,
And we made our first radio contact
On Llandudno's long promenade.

We snaked our way up, round the hairpin bends,
Our transmitting came to a stop,
'Til we parked ourselves at the summit cafe,
To transceive with the world from on top.

I switched on the mike, in my ham-handed way,
The button went in and it stuck;
It wouldn't come out, however I tried,
And I helplessly cried, "Just my luck!"

There are words you can't say or your callsign's revoked
(And not proper for Young Dah-dit's ears);
He tried not to say them, but looked cross instead,
And I struggled to hold back the tears.

So the integral mike was all that we had,
But we managed to use it instead;
From England and Ireland, Scotland and Wales
They DX-ed us on Great Orme's Head!

The mist was now lifting, the raining had stopped;
Young Dah-dit asked please could she leave;
And she left us alone with our radio set
To beamingly speak and receive.

We busily worked as the time slipped away,
'Til breathless and red in the face,
With hustle and bustle and bundles of bounce,
Young Dah-dit returned back to base.

"I've been over exploring the cafe
'Cause this radio's quite boring to me;
I've spent all my money on bubbly gum,
So can we go home for our tea?"

73 and 88 from
Valerie, GW1OIM and Nigel, GW1OIL
(and young Dah Dit).

Free Gift with Two Tigers!

If you buy a pair of Tiger LY9, LY10 or LY13 Yagi 2m antennas from Ant Products of Pontefract, they will supply you with a power divider/splitter free of charge. The company who are manufacturers of the Silver 70 and Tiger range of amateur radio antennas, have appointed three distributors J Birkett in Lincoln, Castle Electronics of Nottingham and Ward in Birmingham.

Full details of the special offer and the Ant range of products can be found in their latest catalogue obtainable from Ant Products, All Saints Industrial Estate, Baghill Lane, Pontefract (phone 0977 85274). Please send 50p to cover postage and mark the envelope HRT.

If you want to build a tribander aerial, you may find these 10 and 15m traps very handy. G2DYM have designed them with 6" aluminium tube at both ends for use on trap verticals and triband dipoles. They cost £10 each (plus £1 post and packing) and are available from G2DYM. Uplowman, Tiverton, Devon (phone 039 86215).

The AOR AR2002 now has a frequency range of 25 to 550MHz and 800 to 1300MHz. This monitor receiver also has an improved keyboard which apparently makes operation much easier. As can be seen from the photo, a front panel knob is provided for frequency stepping in addition to the up/down buttons and an LED strip gives an indication of signal strength. The AOR AR2002 costs £375 and further details are available from Lowe Electronics on 0629 2817.

Repeater News

The Repeater Management Group has approved the move of GB3SR presently sited on the Datsun building to the top of Truleigh Hill to the north of Shoreham. From its new site, it is hoped better coastal coverage towards Portsmouth should be achieved.

The Farnborough group responsible for running GB3FN, have put in an application for a 23cm repeater or beacon and have requested the callsign GB3FM.

Two alterations have taken place within the RMG. Chris Young, G4CCC, will take responsibility for the repeaters in the South and West and Mick Senior, G4EFO, will succeed Chris as vice chairman.

R WITHERS

584 HAGLEY ROAD WEST, OLDBURY, QUINTON, B68 0BS BIRMINGHAM. M5 JUNCT 3

Tel: 021 421 8201 (24hr answerphone)

Telex: 334303 G TXAGWM

COMMUNICATIONS

BIRMINGHAMS MAJOR INDEPENDENT SERVING THE UK

RWC RANGE OF PRODUCTS

10 Mtr MOD BOARD

PRICE **£22.50** + £1.00 post free packing. Kit now available at £17.50

This is a complete modification board designed to fit all CB radios that incorporate the SANYO LC7137 series of synthesizer chip, the unit comprises of a small pcb with six microchips and fits almost all current **legal (CB 27/81) radios**, the unit is supplied with **full fitting instructions and can be fitted easily by most enthusiasts**, with the current upsurge in interest in this band demand has been high as this means that over 90% of current CB radios can now be used on 10 mtr amateur band. See other ads for more information. Over 300 sold in 2 months! Complete radios available & other kits.

RAYCOM MODULAR RF AMPLIFIERS

A complete range of linear and fm amplifiers for use with VHF hand portables and multimode portables such as the YAESU FT290R. Power output from 15W to 45W depending on model, (eight are available). All units feature Mitsubishi or Toshiba power modules as used in the majority of mobile and base radio transceivers. Two versions are also available for business radio applications.

PRICE from £39.50 for the 15W vhf model + £2.00 post

VHF UNITS (144–149MHz)

	ORDER CODE	PRICE
45 FM/CW	V45F	£62.30
35 FM/CW/SSB/AM	V35L	£59.50
25 FM/CW	V25F	£48.50
15 FM/CW/SSB/AM	V15L	£49.50
15 FM/CW	V15F	£39.50

SEE US AT THE LEICESTER SHOW FOR UNBELIEVABLE DEALS ON YAESU and KENWOOD EQUIPMENT

AUTHORISED ICOM DEALER

ANNOUNCING THE SUPER YAESU FT757GX— MOD BOARD UNIT from Raycom

- The modification serves two major purposes
- (1) To improve VFO tuning and eliminate 'TUNING GLITCH'
- (2) To increase tuning speed from 5khz per dial revolution to 50khz per dial revolution (selectable on the 500khz step switch)
- UK price is £29.50 for the built and tested pcb with complete fitting instructions and £39.50 plus carriage for a unit factory fitted and tested. Instant fitting service available. Phone now.

A.R.M. MULTI P6 ANTENNA

Probably the most versatile Antenna ever designed

PRICE **£39.25** + £2.50 carriage

This is one of the most exciting new products to be launched by RWC and is the result of many months of development by Antenna Research Manufacture based in Devon. The antenna has been designed to meet the growing popularity in multimode portable and mobile operation and **is capable of being used on both vhf and uhf in both horizontal and vertical polorization** modes, both portable and mobile. The antenna has the facility of being used as both omni-directional modes as well as having capability of DF function. No ground-plane or radials are required and the antenna **can therefore be used in a variety of applications on frequencies between 140–450mhz.** Colinear elements **£4.75.**

★ **SEE THE REVIEWS** ★ or SAE LEAFLETS

£1000.00 instant credit available for licensed amateurs. Details upon request. Call now!

HP/PERSONAL LOANS AVAILABLE (written details upon request)

RWC CREDITCARD

We also sell and service Cellular Radio, and PMR (Business) radio equipment.

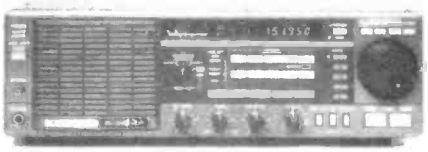
CALL THE REST, then . . .
CALL THE BEST . . .

Western your **"SINGLE SOURCE"** for KENWOOD & YAESU

RECEIVERS: FACTORY FRESH STOCK JUST IN!

R-600

R-1000



R-2000

NOTE! THIS IS A CURRENT MODEL — WE STOCK THE MODELS OTHERS DON'T WANT TO

DESCRIPTIONS:-

R-600

The R-600 is a high performance general coverage communcations receiver covering 150 kHz for 30 MHz in 30 bands. Use of PLL synethesized circuitry provides highly accurate frequency control with maximum ease of operation. Use of the latest technology assures the ultimate in shor wave listening enjoyment on all covered frequencies, whether using AM, SSB, or CW modes of operation. The compact size of the R-600 allows the user the maximum flexibility in placement of the radio, and the front mounted speaker permits the radio to be located between shelves without degration of audio quality.

R-1000

The R-1000 is a high class general coverage receiver covering 30 brands from 200 kHz - 30 MHz with a PLL syunthesizer that incorporates a variety of KENWOOD's sophisticated electronic technology acquired over many years. Both a digital display readout (1 kHz step) and analog dial are provided for more convenient operation. The R-1000 also boasts a quartz digital clock with timer, three IF filters, RF ATT and TONE control, etc, to enhance receiving conditions for each mode. Due consideration has been given to innovative design and compactness, making the R-1000 indispensable for Amateur radio operators, professionals, BCL's and SWL's, etc.

R-2000

The R-2000 provides outstanding performance through use of microprocessor controlled operating functions, allowing maximum flexibility and ease of operation throughout its operating range. An all mode receiver, it covers 150 kHz — 30 MHz in 30 bands, on SSB, CW, AM and FM. Key features include digital VFO's. ten memories that store frequency, band, and mode information, memory scan, programmable band scan, digital display with 24 hour dual clock, plus timer, and a host of other features to enhance the excitement of listening stations around the world.

PRICES: R-600, £290. R-1000, £360. R-2000, £455.
STATION ACCESSORIES. "MODULATE THE SHACK LIGHTS"!!
2Kw H.F. LINEAR AMPLIFIER, KENWOOD TL-922, £1100

AGENTS:-
NORTHERN IRELAND
Tom & Norma Greer, Drumbo, 023126 645

ACCESS - VISA CARDS ACCEPTED - HPARRANGED (WRITTEN QUOTATIONS ON REQUEST)
ALL LISTED PRICES INCLUDE VAT AT 15% AND CARRIAGE

Western Electronics (UK) ltd FAIRFIELD ESTATE, LOUTH, LINCS, LN11 0JH
Tel: Louth (0507) 604955 Telex: 56121 WEST G
OPEN HOURS: 09.00 - 12.00, 13.00 - 17.00 Mon - Fri; SATURDAYS:- BY APPOINTMENT.

BUY THIS MONTH YAESU FT/FP/FC757 ONLY £1150!

Go fly a KITE ANTENNA

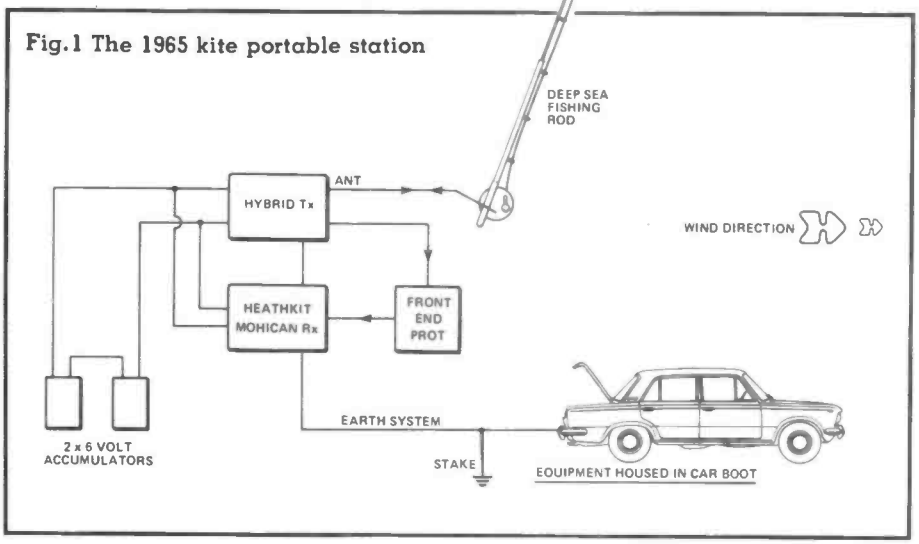


Fig.1 The 1965 kite portable station

Throw all caution to the wind, and let a kite lift your signal! Mike Grierson, G3TSO, explains all...

On a cold clear Sunday afternoon in the winter of 1965, a small group of newly licensed radio amateurs gathered together and set out on a portable expedition into the Northamptonshire countryside. This had to be a joint venture, as no one individual owned enough equipment to mount the operation solo.

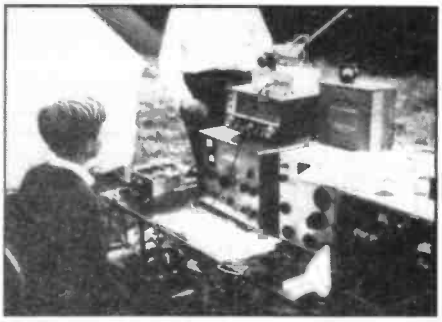
Twenty years ago, portable operating was quite a formidable task; most of the equipment was large, heavy and full of valves which, by modern standards, consumed enormous amounts of power. It was not uncommon for a portable transmitter receiver combination capable of running 10W DC input on AM, to require up to 20A from a 12V source. I can even remember one system that consumed no less than 16A on receive alone! Valve heaters provided a steady drain on the batteries, whilst rotary DC-to-DC converters were the major and inefficient(!) source of high tension supplies.

The equipment used on our portable expeditions was then somewhat revolutionary. It comprised of a Heathkit Mohican all transistor receiver, which blew its front end everytime the transmitter was switched on — until we modified it! The transmitter was a homebrew 'hybrid', designed and built by the author. This used only three valves and featured a transistor modulator and a transistor DC-to-DC converter; a pair of ex WD accumulators provided the power supplies and 600 feet of wire, a medium sized kite and — wait for it — a 'deep sea' fishing rod made up the aerial arrangements. Of course, a car was essential to transport the party and all the heavy equipment to the expedition site.

A short drive into the nearby countryside revealed a number of suitable locations for kite-born antenna 'flying'. At first sight any open space would appear suitable, but there are a number of very important considerations to be taken into account. When launching a kite antenna, a considerable amount of space is required. The site should be well away from all overhead power cables (at least a half mile) and far enough from major and minor roads, such that when the kite and antenna plummet earthwards out of control, it will not do any damage or cause injury to either the operators or members of the public. I can recall several anxious moments listening to the gentle purr of a Lambretta coming down an otherwise deserted country lane, as 600 feet of antenna floated gently earthwards. The antenna did cross the road but fortunately for all, the rider was not garotted. On another occasion, I remember being evicted by an irate policeman from a superb site and what we had assumed to be a disused airfield — unfortunately this was still used by a local flying farmer.

Fishing For Signals!

Kite flying can be an absorbing pastime in its own right, just trying to keep one airborne for half an hour can be something of a challenge. Add to that the complication of trying to tune up an antenna which is constantly changing its dimensions and orientation and you have some idea of what kite antenna portable operation is all about. In practice, with a group of operators and a little organisation, very successful operation is possible



G3TZJ working the homebrew 'hybrid' transmitter in 1965.

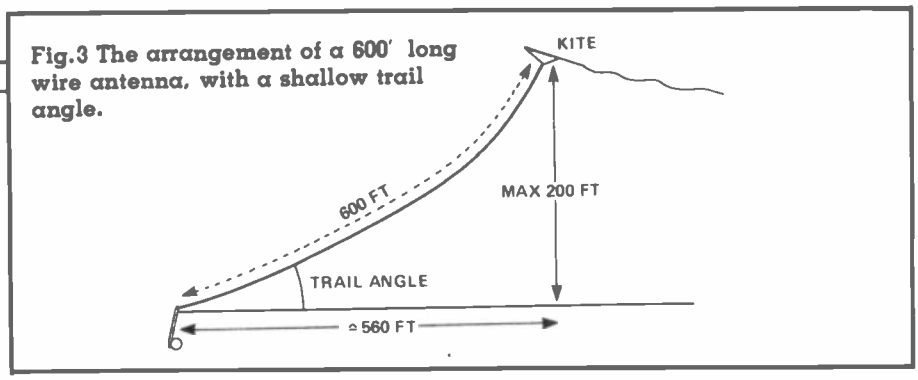


Fig.3 The arrangement of a 600' long wire antenna, with a shallow trail angle.

for long periods of time. The single operator will have to work like the proverbial one armed wallpaper hanger.

The kite used on many successful portable expeditions was a commercial design, bought from a seaside model shop. It was hexagonal, measuring some 4 feet across and was constructed of a plastic material stretched onto a wooden frame. This proved to be an excellent design, capable of very stable flight in very light winds and also possessed of the ability to remain airborne for long periods whilst tethered to a tree or other similiar mooring point.

The antenna wire doubled as the kite line and was attached to the kite via a 'fishermans swivel' (available from all good tackle shops), which allowed the kite to rotate without twisting the line. The antenna wire was rescued from a dinghy emergency radio and had been specially adapted for operation with the kite. It comprised of a fine copper braid with a strong nylon inner line providing strength, light weight and good conductivity. A reel is required to store the wire and allow it to be paid out and recovered in an orderly fashion. David, G3TSN, found an old deep sea fishing rod and reel in his cupboard which was ideal for the job. The antenna wire was wound onto the reel and fed up through the eyelets to the end of the rod where it was attached to the kite. The fishing rod proved to be an excellent launch vehicle and one airborne, the kite would pull out the line by releasing the trigger brake on the reel. The winding handle provided a rapid wind-in system for recovering the wire when in top gear. I must admit we got some very strange looks from passers-by, standing in the middle of the countryside, miles from any water with a fishing rod and line! The kite was normally too far away for the casual observer to notice.

Attachment to the transmitter was simple; a 'flying lead' *(how appropriate — Ed.)* with crocodile clips was connected directly between the antenna wire and the transmitter antenna socket — no aerial tuners or SWR meters were ever used. The flexibility of the transmitter pi-tank circuit, combined with aerial length adjustment was all that was required. The PA current would be dipped and the antenna loaded; if it would not load, simply pulling the trigger on the fishing rod sent another length of wire skywards and completed the loading operation. A final adjustment of the PA tune resonated the PA and we were on the air. This delightfully simple approach was characteristic of methods of matching antennas 20 years ago but probably terrifies rig owners with solid state PAs.

Antenna lengths varied from as little as 150 feet to a maximum of 600 feet, which was the most that could be launched into a moderate breeze. Whilst the antenna wire was fairly strong it did break ocasionally, allowing the kite and a length of wire to set off across country, followed hotfoot by a retrieval party. Fortunately kites do not usually stay airborne for long once the line is broken, but even with this in mind may well depart with a long length of wire attached, so beware the power lines. On one memorable portable expedition to Derbyshire, the line broke at least three times in one afternoon. Unfortunately, we were operating from an isolated hill top overlooking Dovedale and the long trip to the valley floor and back with the kite became a little tedious after the first time.

The transmitter used was capable of operating on any 4 of the 6 amateur bands but was primarily used on 80 metres, with secondary operation on 160 and 40 metres. With a DC input power of some 7—10W on AM, and an antenna of approximately 600 ft (or 2¼ wavelengths) long we found no difficulty in competing with home based stations running the full 150 watts. Once established on a band, we attracted a number of fairly large pile-ups and achieved some very satisfying QSOs and reports — interspersed with the occasional collapsing antenna. It was amazing how quickly we could finish a QSO when the antenna was seen drifting earthwards — and perhaps equally amazing the number of QSOs that continued with the antenna on the ground!

Many of the lessons learned 20 years ago are still relevant to kite flying operation today. Modern equipment is more portable and power consumption is much less; however, modern equipment design may have made the actual operation much more complicated especially when it comes to matching the transmitter to the antenna.

Choosing Your Kite

In recent years the aerobatic or stunt, kite has become a common sight in this country and is readily available in shops, but unfortunately it is not suitable for amateur radio purposes. It is designed to be aerodynamically unstable and normally requires two control lines in order to fly it successfully. For our purposes, the aerodynamically stable design of the traditional kite is essential. The hexagonal design has a greater surface area than the conventional shaped kite and should produce more life as a result. This will enable the kite to perform

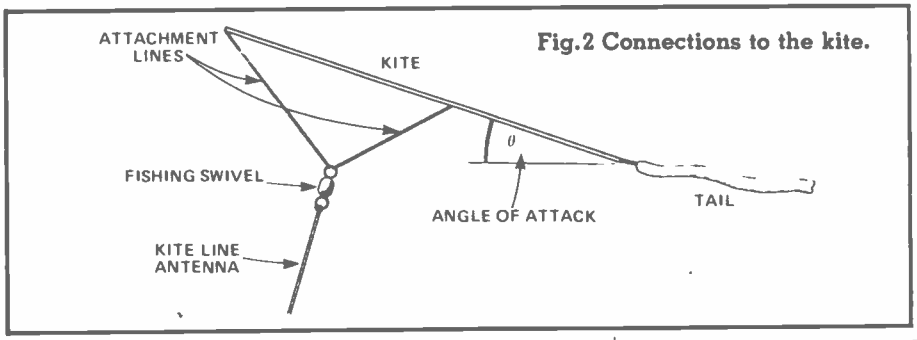


Fig.2 Connections to the kite.

better in lower wind speeds. The hex' kite could be launched in surface winds of as low as 3 to 4 knots and possess excellent stability once properly trimmed for flight.

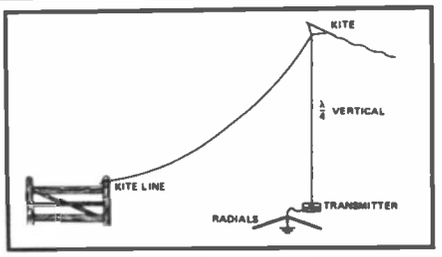
The box kite, once readily available in sea-side towns, is another excellent stable design and was made for use with the emergency radios mentioned earlier. If one of these ex-WD kites can be found, it is ideal for portable operation and is of splendid construction. The only possible drawback is that it usually requires typically 8 knots of wind to successfully launch a kite of this design(!) but once airborne, is capable of staying aloft for some considerable time.

There are two adjustments that can be made to trim a kite for optimum performance. The angle of attack — that is the angle between the kite and the airflow — can be adjusted by varying the length of one of the attachment strings **(See Fig. 2).** Increasing the angle of attack increases the lift and also the stalling speed, making the kite very susceptible to a sudden drop in wind speed. The optimum angle should be determined experimentally; once fixed, this will seldom need to be changed. The second adjustment is to the tail of the kite. This is not just a pretty streamer, but a device to aid stability particularly in strong and squally conditions. The tail length required will vary, with wind speed and again the optimum length determined experimentally. A box-kite is seldom used with a tail.

It should be mentioned, at this stage, that there is a maximum height at which a kite can legally be flown in this country — 200 feet above ground level except when within half a mile of an active airfield, where the limit is 50 feet. In practice, a 600 ft long wire will not normally exceed 200ft in height when flown from a kite due to the rather shallow trail angle **(Fig. 3)** caused by the weight of the wire.

The Antenna Wire

Perhaps the most important aspect of kite borne antenna operations is the antenna wire itself. This should be light in weight, strong (the pull on a kite can be considerable), a good conductor and of the type that does not twist and tangle easily. Without a doubt, the



'surplus' braided wire with a strong nylon inner is the best type yet found by the author. This was made in large quantities and can occasionally be found in emporium that sell 'surplus' equipment. My supply was on a yellow wooden drum, fitted inside a dinghy emergency radio. These radios were colloquially known as 'Gibson Girls' after the New Yorker magazine's drawings of scantily clad females in the 1920's. The radios were operated by a hand generator and gripped by the operator between the knees. The 'Gibson Girl' remained a part of aircraft emergency equipment right up until the middle sixties.

Another equally important point to be able to control the antenna wire, and whilst not everyone will have a deep sea fishing rod, some form of drum with a winding mechanism is required. A mechanical stop or brake is essential to prevent the kite from pulling out more wire than required; not forgetting a means of fixing the kite to a convenient anchoring point — unless you are happy to hold it all afternoon! The use of fly leads with crocodile clips makes connections — and equally disconnection should it be necessary — to transmitting equipment easy.

Flying and Operating

Once a suitable kite has been found and air tested for optimum stability, an attempt can be made at launching an antenna. Although I prefer the simple approach of using the kite line as the antenna, there are other possibilities, such as suspending a vertical antenna from the kite line. Once your selected antenna is in the air supported by your kite, it will be necessary to tie it off to a suitable anchor point such as a tree, fence post, car door handle or whatever takes your fancy. This is usually the greatest test of the suitability of your particular kite, will it still fly without you pulling in the line?

Some form of earth system will be required for the antenna and take various forms — from 'long wire' type counterpoises to a simple earth stake or the car body itself. Ancillary matching equipment will need to include an SWR bridge and some form of aerial tuner. Most commercial ATU designs are not suited to long wire operation and a simple homebrew 'L-match' arrangement is ideal. Try to keep your antenna length to an odd number of quarter waves on the band(s) in use and any matching problems will be minimised.

If the idea of going into a field with that expensive new 'solid state' transceiver and connecting it to an antenna as dubious as a kite wire doesn't appeal to you, there are still enormous possibilities for QRP operation. Even the low power output from a modern transceiver could be used to drive a simple homebrew QRP PA stage running 1 or 2 watts of SSB. Another factor in favour of QRP operation, is that 100W into a very long wire antenna can produce a potentially RF 'hot' antenna, ATU and transmitter, particularly if you don't keep the length of the antenna to an odd number of quarter waves. If you have children around, the use of low power is very strongly recommended.

As a final word of warning, when handling long lengths of wire attached to a kite, beware of static build-up or some nasty shocks can result. As a general rule, don't fly a kite antenna on a day when there are active thunderstorms in the vicinity and watch out for static build-ups particularly when there are rapidly growing cumulous type clouds about. A receiver covering the 160m band will give a good indication of static activity.

I am sure that there must be a large number of amateurs who have contemplated launching an antenna with a kite, but in reality there are probably very few who have actually got around to putting these thoughts into practice. In 20 years of amateur operating, I doubt that I have heard more than half a dozen stations using a kite antenna. Operation is not quite as simple as it may appear, but with a little thought and planning, successful operation is very feasible. Radio with kite antennas is an *excellent* way of taking the hobby out of the shack and into the open air with a few friends.

Cirkit & WPO COMMUNICATIONS

are pleased to announced that Cirkit Distribution will now be responsible for the Marketing & Distribution of many of the kits currently available from WPO Communications. Listed below are all the kits currently available from both sources – please order from the correct address!

FROM CIRKIT

DSB80 – QRP CW/DSB transceiver for 80 or 160m. High sensitivity receiver, 2W CW or PEP Tx output. Complete kit of parts with all hardware, pcb, components and 5 digit DFM. Stock No 41-02502 **£85.00**

DSB2 – QRP CW DSB transceiver for either 160, 80, 30 or 20m with Minisynth PLL VFO and on-board Active Filter. Complete with punched case and all hardware, pcb's and components for DSB2 and Minisynth.

Stock No 41-02605 (160m)	**£91.50**	41-02606 (80m)	**£91.50**
41-02607 (30m)	**£91.50**	41-02608 (20m)	**£91.50**
DSB2 DFM for 20 and 30m		41-02604	**£36.00**

MINISYNTH VFO – miniature PLL synthesised VFO for 20,30,80 or 160m (direct conversion) or 10, 20 and 160m (10.7MHz i.f.). High level output for direct drive of DBM's (SBL1 etc) 800Hz offset for CW. Kit includes pcb and all components. **£31 each.** Please state I.f./ Band.

2 METRE TALKBOX – The popular alternative to high priced 2m 'Black Boxes'. RX – 6 channel low noise design with 3 chamber helical filter, sensitivity better than 0.25uV for 10dB quieting. TX – 1W o/p into 50 ohms with dedicated speech processor ic. Complete kits with pcb's and all components (no xtals). Stock No 41-02802 **£69.95**

VHF MINISYNTH – PLL VFO offering full coverage of the 2 metre band, with 600kHz offsets for Repeater use etc, on Tx and Rx depending on xtals installed. Complete with kit pcb and all components (no xtals). Stock No 41-02803 **£38.50**

ACTIVE FILTER – SSB/CW filter to enhance performance of the DSB80 or any other receiver. 11 poles of filtering in 7 selectable positions. Kit includes pcb and all components. Stock No 41-02900 **£18.25**

SPEECH PROCESSOR – Audio speech processor with VOGAD, clipping and filtering circuits to enhance the copy of your signal. Suitable for FM, AM, SSB or CB. Kit includes pcb and all components. Stock No 41-02901 **£13.90**

Prices include VAT. Post & packing 60p per order. Full details of these and all other Cirkit kits in the AUTUMN 85 Catalogue price £1.15.

NEW CATALOGUE OUT NOW!

FROM WPO

micron

£241 FOR 6 BANDS/ INTERNAL ATU/ DIGITAL DISPLAY

Join the world of QRP

Our latest transceiver kit with 6 band operation (80, 40, 30, 20, 15 & 10) fast becoming a best seller. Sensitive receiver with AGC, S Meter, IRT, 3 position LC filter and lots of other features. Tx has fully shaped and variable RF output from 8W down to mW. High grade pcb's, screen printed with component placings and comprehensive step-by-step manual designed for the newcomer. Available as a complete Transceiver Kit with custom Case/Hardware, INTERNAL ATU, Power/SWR metering and Digital Display at **£241** inc. Or, the basic 6 band pcb kit is **£145,** with case at **£182.50,** with options of Display at **£38.50** and Internal ATU at **£37.00.** Brochure available (s.a.e. please).

ALPHA – our 40W+ SSB/CW Monoband Transceiver for 160 or 20m. Usable as a Mobile or Base rig, it comes complete with all components, Case/hardware, Digital Display and comprehensive instructions at **£179.95** inc.

MICRON MATCH ATU – developed from the MICRON ATU, complete with case, connectors and suitable for up to 20W or SWL. Transmatch type. **£39.95** inc.

OTHER KITS – RF Broadband preamp 1.8-30MHz, **£15.** Talking Frequency Meter for Blind ops at **£179.** UNIVERSAL MORSE MEMORY (see PW Review) at **£52.45** (either std or MS version available). For more details of all kits please send 40p in stamps. Allow up to 28 days for delivery. Export a pleasure.

CIRKIT DISTRIBUTION LTD.,
PARK LANE, BROXBOURNE, HERTS. EN10 7NQ.
TEL: 0992 444111 TELEX: 22478

UK DESIGN AND MANUFACTURE

20 FARNHAM AVENUE, HASSOCKS G3WPO
WEST SUSSEX BN6 8NS MAIL ORDER ONLY

BARCLAYCARD VISA

24hr Ansaphone 07918 6149

Tune in with Cirkit

70cm Preamplifier

As featured in this issue of HRT this high performance pre-amp offers an increase in receiver sensitivity and a corresponding extension of the useful communication range.
The completed unit is sufficiently compact to be built into virtually any existing receiver and does not require the use of any test when setting up.

Specification

-3dB Bandwidth	425-445MHz
Noise figure	<2dB
Gain (min)	13dB
1dB compression point	-3dBm
Supply voltage	8-14V
I/P - O/P impedance	50R
Dimensions	50 x 10 x 17mm

Stock no. 41-01506 Price **£4.78**

Weather Satellite RX

6 channel, VHF weather satellite RX for the 136-138MHz band. Low noise MOSFET front-end, PLL detector and audio amp.
Stock no. 40-02300 Price **£42.52**

FET DIP Oscillator

The ever popular dip oscillator from G3WPO. Covering 1.6-215MHz in 5 ranges with wavemeter, audio output and meter indication. Complete kit with punched case.
Stock no. 40-16215 Price **£21.60**

23cm Converter

Low noise converter for the 23cm converter with IF output at either 2m or 10m.
10m Stock no. 40-23028 Price **£21.20**
2m Stock no. 40-23144 Price **£21.20**

70cm Converter

Low noise 455-144MHz amateur band converter.
Stock no. 40-01405 Price **£23.00**

2m Pre-amp

Miniature low-noise MOSFET pre-amp for the 2m amateur band.
Stock no. 41-01307 Price **£4.13**

2m Converter

Low noise 144MHz-28MHz amateur band converter.
Stock no. 41-01306 Price **£19.26**

70cm Power Amplifier

10W, FM, 70cm PA with auto RF switching.
Stock no. 41-01505 Price **£38.00**

These are just a few of over 100 kits we hold in stock.

Please add 15% VAT to all advertised prices and 60p post and packaging.
Please call in to one of our shops or send for our catalogue to see the complete range of kits and components.

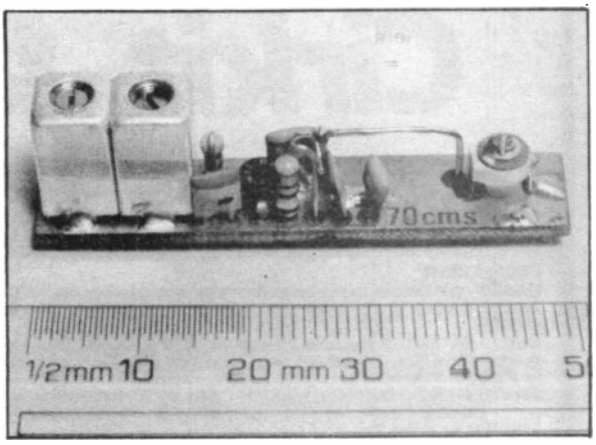
200 North Service Road, BRENTWOOD Essex CM14 4SG
53 Burrfields Road PORTSMOUTH Hampshire PO3 5EB
Park Lane BROXBOURNE Herts EN10 7NQ

Cirkit Distribution

Park Lane, Broxbourne, Herts, EN10 7NQ Telephone (0992) 444111 Telex 22478

NEW AUTUMN '85 CATALOGUE OUT NOW £1.15

Cirkit 70cm Preamp



This high performance preamp offers increased receiver sensitivity and a corresponding extension of the useful communication range. The completed unit is sufficiently compact to be built into virtually any existing receiver and no test gear is needed when setting up.

The performance is at least as good as that of any commercially available preamp in spite of its remarkably small dimensions. It is built on a double sided PCB measuring 50 x 10mm and has a gain of 13dB with a bandwidth of 20MHz and a noise figure of less than 2dB.

The Circuit's Secrets

The preamp is designed around a single BFR91 transistor, which has a very low noise figure and high margin of stability at 432MHz. The transistor is used in the common emitter mode and biased at a collector current of 5mA via R1 and R2. At this bias level, the BFR91 has input impedances that are very close to 50 ohms.

This compact preamp from Cirkit has an excellent performance of 13dB gain over a bandwidth of 20MHz and a noise figure of less than 2dB!

C4 and C5 decouple the supply line. The inductively tapped L1 and C1 input network provides a virtually loss free match between the antenna and Q1. It also gives plenty of out of band rejection particularly of 2m signals. Q1 output is DC blocked by C3 and fed into a Toko helical resonator, F1, which is tuned by brass slugs and provides a 50 ohm output. This resonator gives excellent out of band rejection as illustrated by spectrum analyser photography. The overall gain of the preamp is about 13dB, as shown in **Fig. 1** and the 3dB

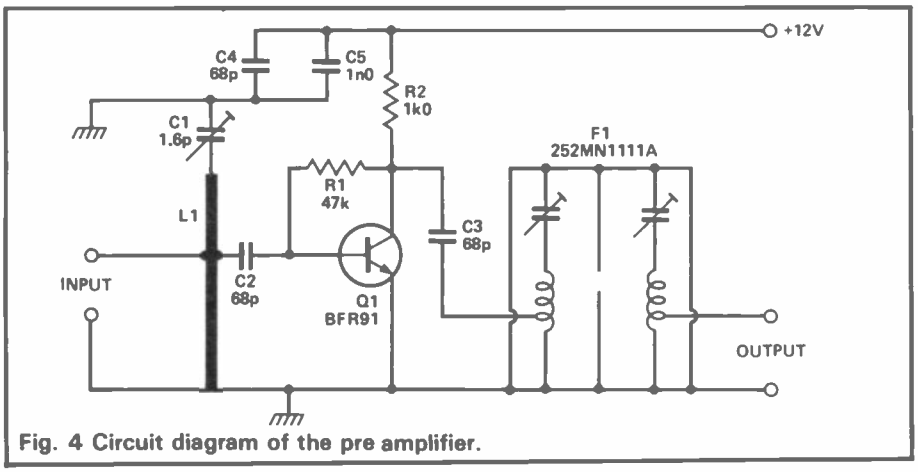


Fig. 4 Circuit diagram of the pre amplifier.

Fig. 1 The overall gain can be seen to be 13dB at 435MHz. The vertical scale is 10dB per division, horizontal scale 5MHz per division centred on 435MHz. 0dB gain is set to −40dB on the spectrum analyser.

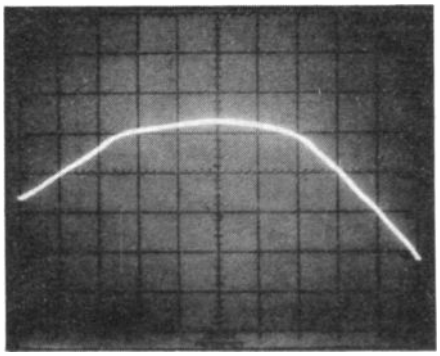


Fig. 2 A 3dB bandwidth of 20MHz when the vertical scale is set to 2dB per division but retaining horizontal scale.

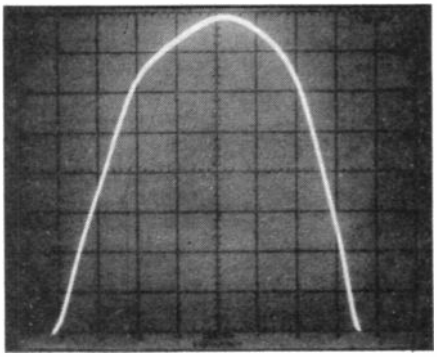


Fig. 3 The out of band rejection on a scan of 0 to 1GHz. The scale is centred on 500MHz with each division being 100MHz. Vertical scale is 10dB per division. The ultimate rejection is in excess of 35dB.

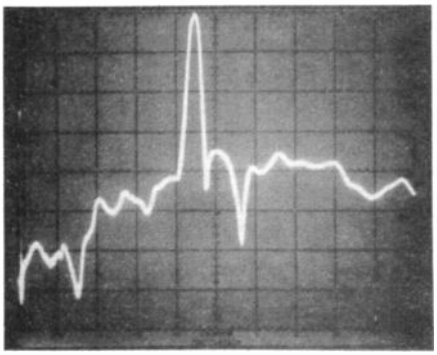


Fig. 5 Component overlay, o = solder to both sides, . = solder to underside.

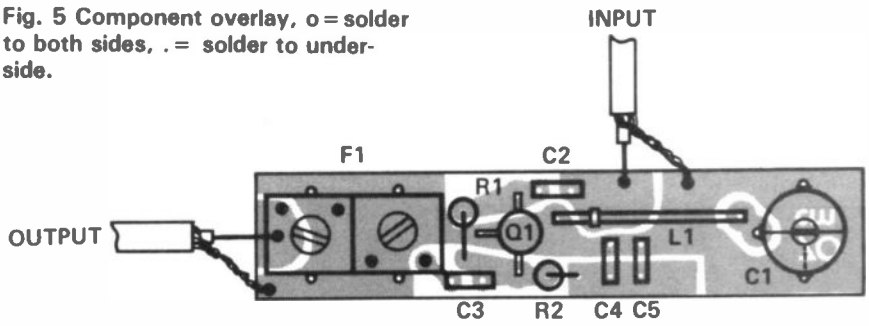


Fig. 6 Top PCB foil pattern.

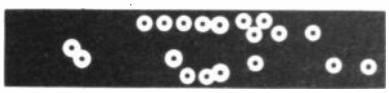


Fig. 7 Bottom PCB foil pattern.

bandwidth of 20MHz can be seen in **Fig. 2**. The out of band rejection, as illustrated in **Fig. 3**, is in excess of 35dB.

Construction

Referring to the component overlay (**Fig. 5**) the suggested order of construction is as follows:

1. Fit Q1 and solder the middle lead (the emitter) both to the top and bottom track on the PCB.

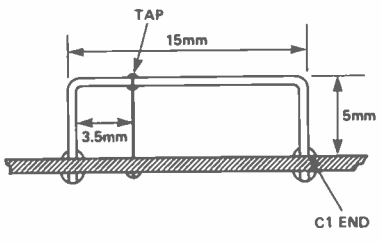


Fig. 8 Construction details of L1.

2. Fit the helical resonator and solder all four of its can legs to both planes.
3. Use the 20 swg silver plated wire to construct L1 as shown in **Fig. 6** and solder to the board. Note that the ground end is soldered to both planes.
4. Fit the remaining components noting that two pins of C1, the variable trimmer, have connections to both planes. If a 5mm ceramic trimmer is used, the earth end is soldered to the top plane, the bottom plane is then connected to this by two short wires inserted in the remaining holes and soldered both sides.

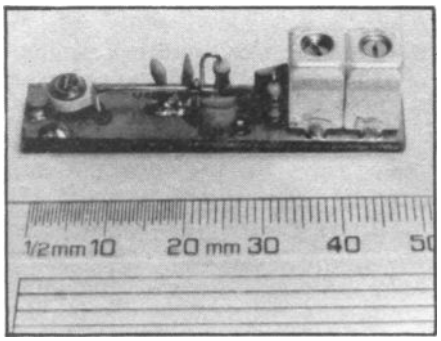
Testing and Installation

Connect the preamp between the aerial changeover relay on the equipment and the receiver front end. The input and output connections are as shown on Fig.5. Ensure that the input coax comes from the aerial and the output coax goes to the receiver.

Preset the trimmer to the middle of its range and connect the supply to the preamp. If all is well it will be drawing approximately 5mA. Tune to a weak, noisy signal and adjust C1 for minimum background noise. Do not tune for maximum signal strength meter reading as this will not reproduce the minimum noise figure and hence the maximum signal-to-noise ratio from weak signals. Do not attempt to adjust the helical resonator as it is supplied pre-aligned.

Specification

3dB bandwidth	425-445 MHz
Noise figure	less than 2dB
Gain	13dB (min)
1dB compression	−3dBm (0.5mW)
Supply voltage	8-12V (12V nom)
Input/Output impedance	50 ohms
Dimensions	50 × 10 × 17mm



Component List

RESISTORS

R1	47k
R2'	1k

CAPACITORS

C1	1-6F trimmer
C3,4,5	68p ceramic
C5	1n ceramic

INDUCTORS

L1	15 × 5mm 20 seg silver plated wire

MISCELLANEOUS

Q1	BFR91
F1	252MN1111A

A double sided PCB measuring 50 × 10mm.

(TOP VIEW)

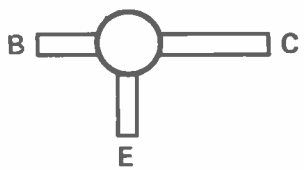


Fig. 9 Base connections for the BFR91.

Rubbish Tips

Alcoholic Insulators

Do you want an insulator that could cost next to nothing and is one of the most efficient in all weathers? Well Peter MacKrell, G3AEP, has just the thing...

Insulators are an important part of the antenna system. With the ubiquitous half-wave dipole, for instance, the highest voltages appear at the ends attached to the support and it is obviously not good practice to allow some of the transmitter power or weak received signals to 'leak' away via inefficient insulators.

A strip of perspex with holes drilled for fixing the aerial and supporting cable would probably be adequate for dry weather, but once covered in moisture — be it rain or early morning dew — its insulating properties become considerably degraded. For this reason, more efficient insulators are designed with a ribbed surface which effectively increases the length of the leakage path, or alternatively have surplus material cut away to minimise the area covered by moisture. These ribbed and 'chain-link' insulators are usually illustrated in radio handbooks, but are not always easy to find at an economical price with only limited 'government surplus'.

Cheap substitute insulators (or expensive depending on your taste) can be made from the plastic binders used to hold cans of beer in packs of four. First purchase the requisite number of packs of beer or lager to meet your immediate and future requirements — plus a few to cover accidents, birthdays, etc. Fold as shown in **Fig. 2** and hooking a finger through each of the double loops, pull hard until it clicks into shape. This forms an efficient skeleton insulator with very little surface area to hold moisture and the open construction permits rapid drying by the wind. They are light and surprisingly strong (try testing to distortion by pulling even harder) but additional strength can be had simply enough, if needed, by folding two or three together.

If you are concerned about the financial outlay, you suffer from total abstinence or you don't happen to like beer or lager, your local off-licence will be happy to *give* you the binders, as their waste-boxes are usually overflowing with them!

If you need a base insulator for a vertical antenna, the old trick of partially embedding a bottle in the ground and sitting the mast over the neck can be effective. Beer bottles of suitable strength are much rarer in these days of cans, so you may possibly have to resort to Champagne or milk!

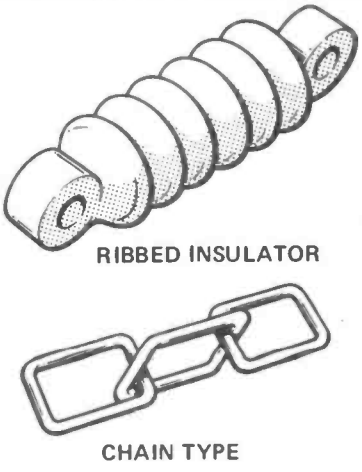


Fig. 1 Efficient but expensive insulators.

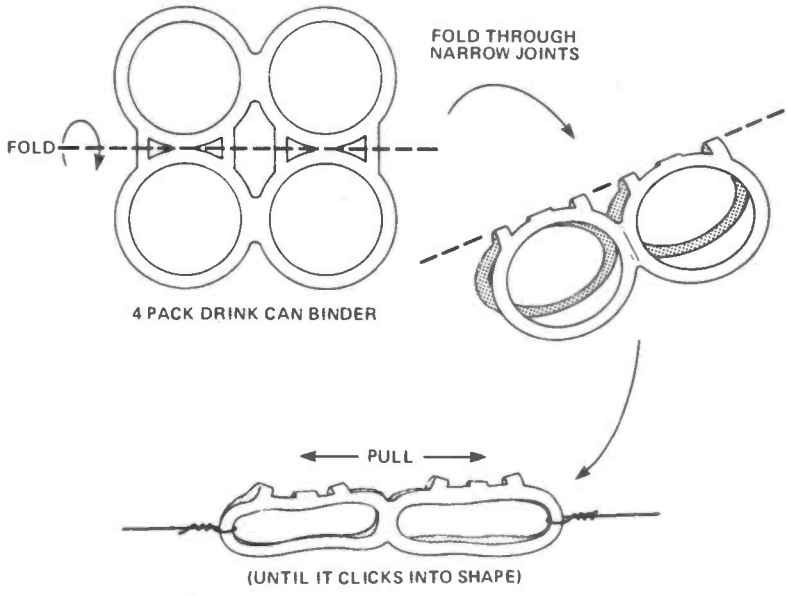


Fig. 2 How to make your alcoholic insulators.

Working QRP

Interested in building the Micron, but unsure of what QRP will be like? Rev. George Dobbs, G3RJV, a seasoned QRP operator will set you at your ease and offers a few tips!

There are those who seem to assume that operating with low power on the HF bands is like spitting into the wind — a pursuit for masochists or those who cannot afford to buy proper radio equipment. The recent growth in interest in low power equipment and operating on the HF bands has served to show that none of the above is true. For some it is the David and Goliath challenge; for some the pleasure is in using home built equipment in the bands; for some there is the moral conviction that only the minimum amount of power ought to be used to achieve communication, and for all there is the pleasure of something achieved with very little. W9SCH has called QRP operators "the sportsmen of amateur radio".

Recently several kits — not least of which the *Micron* featured in this magazine (May, June and July '85) — and practical articles on building QRP equipment have enabled a wider group of radio amateurs to venture onto the HF bands with low power equipment. Some have been licensed for many years but the majority appear to be relatively recent licensees. So if you have just acquired some low power radio equipment or are thinking of trying QRP, this little article is for you. QRP operating is fun but it can be frustrating without a little prior knowledge and some ideas about QRP operating techniques.

What Is QRP?

We all know that QRP is the morse code Q group for 'Reduce Power' which has simply come to mean the use of low power transmission in amateur radio communication. What is low power? Well, in a real sense, compared with commercial stations, all amateur radio stations are low powered. Power is relative. In fact not so long ago the QRP ARCI, the chief QRP organisation in the USA, defined its limit for QRP as 100 watts of RF output!

The rising interest in QRP gave birth to the World QRP Federation (WQF) which is a linking of major QRP clubs throughout the world. Early in the history of the WQF, they set about defining what is low power operation in terms which could apply in award achievements and contests. The final figure evolved was 5W RF output or 10 watts DC input and this has now become the internationally agreed limitation for QRP operation. Some groups have their own arrangements; the G QRP Club uses a lower power restriction for all its awards and events, setting the level at 5 watts DC input or 3 watts RF output.

What can be achieved at this sort of power level? Well, oddly enough, almost everything that the average operator can achieve at normal power levels. The achievements of QRP DXers are amazing and it would take the whole magazine, not simply one short article, to chronicle the exploits of "the best of 'em".

It is important to remember that power is less of a factor in effective radio communication than many imagine. The station will be weaker but in theoretical 'S' point terms the reduction is not so great as one might assume. Taking 1 'S' point to be a 6dB change, a power ratio/dB chart shows that 6dB is a four times power change. So in theory, power has to be increased *fourfold* to give a single 'S' point advantage. A station using 5W can expect to be about two points down on a station using 100W. So increasing signal strength takes a lot of extra power and the difference between a QRP station and an average station is less than expected.

". . . often use open wire feeders."

Power Is Precious

The QRP operator often does rather better than the theoretical disadvantage outlined above. This is almost certainly due to the fact that a QRP station tends to be run at greater efficiency. Because only a few watts are at the disposal of the operator, these become a precious few watts and all the known steps to ensure better dissipation of this power become important. The average radio amateur can often be very careless about correct use of the RF energy at his or her disposal. A good QRP operator ensures that the maximum amount of power is radiated. They seek ideas on matching, become

"It is essential to know where you are"

experts on ATU circuits and often use open wire feeders. Beginners in QRP operating are urged to read up on effective radiation of RF power. There is plenty of reading on this subject.

Going On The Bands

The first thing to remember is that the QRP operator cannot be a bully. He has to substitute the heavy handed approach with one of skill and cunning. An essential starting point is to know the equipment. Even if the station is a simple one, learn how to use it. This might seem a simple and obvious statement to make, but a casual listen on most bands these days seems to show that a lot of operators have failed to master their stations.

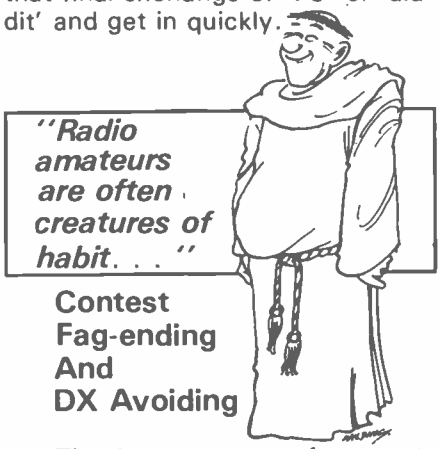
It is essential to know 'where you are'. Good netting is the key to slick operating. Being able to produce a signal quickly at the frequency on which the other station is listening will produce QSOs. This is especially important in the case of the simpler direct conversion transceivers or with separate transmitters and receivers. It is worth having practice runs across the bench with another receiver or transceiver using a dummy load to learn what the station sounds and looks like when accurately netted to another signal. With practice even the simplest direct conversion transceiver, without receiver offset tuning, can be made to net accurately upon the frequency of the other station.

The temptation, and perhaps the norm these days, is to switch on, find a more or less clear patch in the band and begin to call CQ — usually on the frequency that I am using! The best technique is to read the band before you use the band. Listen for some time before attempting any communication. Apart from being good practice, it is also good manners. Find out who is on the band. Who is working whom. What stations are working people relatively close to you and what reports these local stations are receiving.

Avoid calling "CQ". Any excursion along a band may reveal a dozen stations calling CQ at any one time, had half of them listened, there would be 6 QSOs rather than 12 CQs. Try an easy one to begin; a nice beefy station who seems to be working local stations or not calling for DX or a specific country. Return with a snappy two by two call: "XXXX de GXXXX K" twice. It does no harm in some cases to indicate that low power is being used; although in the UK using '/QRP' as a suffix is *illegal*, but oddly enough 'de G3RJV (space) QRP' is legal and sometimes useful.

On answering a CQ call, you now have the first complete over. Keep it brief in case the other station has difficulty in copying. Report the essentials: RST report, QTH, and name twice; three times if you wish to be pedantic. Avoid saying the station is QRP in the first over, it can be worth at least 2 'S' points in the report!

Tailending is a useful method of gaining contacts for the QRP station. This is quickly calling in after an existing QSO to work one of the stations. Choose which one you wish to work and net onto the frequency of the other one so that when you make the call the required station should be listening. Tailending requires a quick and concise calling technique. Wait until the QSO is just ended, remember that final exchange of '73' or 'did-dit' and get in quickly.



Contest Fag-ending And DX Avoiding

The latter stages of contests are good places to gain some interesting and worthy contacts. By the end of most major contests many of the stations are desperate for extra points and will be listening out for anyone they haven't worked. Check up on the contest rules and procedures. Are you a valid station for working to gain points? What sort of exchange is required — usually just a report in RST and a serial number. This exercise can be quite interesting as it shows which of the big contest stations have a good set up and which are alligators (all mouth and no ears!). The disadvantage is that all one can expect in the way of a QSO is a standard 599 report (usually in the 5NN form) and little, if any, comment on the effectiveness of the QRP signal.

When a more exotic DX station appears on the band, usually the DX chasers gather like wasps round a jam pot. This can be an advantage to the QRP station. Unless the rare one is really coveted, leave him and half of the radio amateur world that are calling him, alone. Wander off along the band and check some other frequencies. Quite often there is some very worthy stuff there waiting to be worked with the pressure eased with the hordes gathered around the unusual station. If you miss a good catch try again at a similar time the next night or the next week. Radio amateurs are often creatures of habit with their operating times governed by working or domestic arrangements.

Prop And MUF

Propagation is a complex subject for which I have no great claim to knowledge. There are many books and guides in the radio press. A useful rule of thumb is to use the highest frequency band which is open on which the station can operate. Do not be fooled by quiet band conditions. Although the band may be dead, some of the quiet spells which accompany changes in band conditions are the best for long range working with low power. Changes in MUF (minimum usable frequency) can be very dynamic and only experience and giving it a try can really test out what the band conditions are really like at any particular time. A good working guide can be found in the RSGB publication Amateur Radio Operating Manual.

QRP operating is fun as well as a challenge. Be patient; be cunning; try to win contacts; do not be afraid to send slow morse and above all do not think QRP. Forget about the power limitation and give it a try, timidity does not help. One of the best types of QRP QSO is a two way QRP contact so try the odd CQ call or listening on the international QRP frequencies (3560, 7030, 14060, 21060 and 28060 kHz). Expect people to give compliments "fb sigs fer QRP" etc, and enjoy the praise. It's worth it.

WOOD B DOUGLAS

* 1250DC50 DOWNCONVERTER — THE MARKET LEADER *

Specification:

Input frequency range	: 1240-1325 MHz
Intermediate frequency	: 50MHz nominal
Local oscillator injection	: 1190-1325 MHz
Conversion gain	: >25 dB; 30 dB typical
First RF stage	: MGF 1100 Ga As FET
Mixer type	: Discrete Schottky ring
Post mixer processing	: SL560c amplifier
Operating voltage	: 11.5 - 14.0 Volts
Operating current	: 80 mA nominal
Internal stabilisation	: 8.5V; 5.5V rails
External connections	: AFC input Supply Input Tuning voltage input 8.5V rail output
RF connections	: BNC

* NEW PRODUCTS FOR FM TV*

VP/D1 Pre-Emphasis/De-emphasis (CCIR)
Improve your video quality with this low-cost add-on board. May be wired for transmit or receive use. Includes amplification to compensate for attenuation of CCIR network.

SCT2 Transmit Sound Modulator
Generates FM sound sub-carrier which is then combined with composite video to drive UFM01. Requires 350mV RMS AF input. Specify 5.5MHz or 6.0MHz.

SCR2 Receive Sound Demodulator
Takes FM sub-carrier for VIDIF board and provides two squelched audio inputs, 600 ohm and 8 ohm, independently adjustable. Specify 5.5MHz or 6.0MHz.

Package Prices		Kit
1. 500mW TV Transit	(7QFM05T4 + TVM1 + BPF433)	40.00
2. 500mW TV Transceive	(As 1 above plus TV1P2 + PSI 433)	65.00
3. 10W TV Transmit	(As 1 above plus 70FM10 + BDX35)	75.00
4. 10W TV Transceive	(As 2 above plus 70FM10 + BDX35)	100.00
5. 70cms 500mW FM Transceive	(70T4 + 70R5 + SSR1 + BPF)	80.00
6. 70cms 10W FM Transceive	(As 5 above plus 70FM10)	115.00
7. 2M Linear/Pre-amp 10W	(144PA4/S + 144LIN10B)	45.00
8. 2M Linear/Pre-amp 25W	(144PA4/S + 144LIN25B)	48.00
2M Linear/Pre-amp 25W	)144PA4/S + 144LIN25C)	51.00
9. 70cms Synthesized 10W Transceive	(R5+SY+AX+MOD+SSR+70FM10)	165.00
10. Synthesised 10w Transceive		£125.00
11. 2M Crystal Controlled 10W Transceive	(R5+SY+SY2T+SSR+144FM10A)	95.00
12. 70cms Linear/Pre-amp	(70LIN+70PA2/S)	47.00
13. 24cms FMTV Receive, video out (Kit)	(VIDIF, 1250DC50 Boxed)	105.00
14. 24cms FMTV Receive, video out (Ass)	(VIDIF, 1250DC50 Boxed)	120.00
15. 24cms FMTV Receive, CH 36 out (Kit)	VIDIF, TVMOD1, 1250DC50 Boxed)	110.00
16. 24cms FMTV Receive, CH 36 out (Ass)	VIDIF, TVMOD1, 1250DC50 Boxed)	126.00
17. 24cms FMTV Transmit (Kit)	UFM01, 70LIN3/LT, 70FM10, WDV400/1200 Boxed)	140.00
18. 24cms FMTV Transmit (Ass)	(UFM01, 70LIHN3/LT, WDV400/1200 Boxed)	170.00

FM TV MODULES

		Ass	Kit
50mW 420MHz Source (Video Input)	UFM01	30.10	22.75
50MHz I.f. Processor	VIDIF	58.20	40.90
Varactor Multiplier (Boxed)	WDX400/1200	63.95	40.90
1250MHz Downconverter (50MHz I.f.) (Boxed)	1250DC50	69.95	—
1250MHz Masthead Pre-amplifier	1250PA2/S	T.B.C.	—
Transmit Sound Modulator	SCT-2	8.00	—
Receive Sound De-Modulator	SCR-2	11.75	—
Pre-emphasis/De-emphasis	VP/DI	T.B.C.	—
AM TV Products			
Receiver Converter (Ch 36 Output)	TVUP2	28.75	23.95
Pattern Generator (Mains PSU)	TVPG1	48.50	39.40
TV Modulator (For Transmission)	TVM1	10.35	8.05
Ch 36 Modulator (For TV Injection)	TVMOD1	10.15	5.75

Details of these and other products are included in our 1985 catalogue. This will be posted to you on receipt of an A5 stamped self addressed envelope. Kits are usually available by return of post but please allow 28 days for any unforseen shortages. Place your order by post or by telephone using your credit card. Please include £1.00 to cover order handling and postage.
Our products are kits or assembled kits consisting of circuit board and all components to mount on the board. We do not include external hardware such as boxes, connectors, etc. If your purchase does not work when assembled then apart from being surprised we will offer to service the module for a small charge depending on the complexity of the project. So please remember . . .

ANYONE CAN SELL A KIT . . . REPUTATION SELLS OURS
UNIT 13, YOUNGS INDUSTRIAL ESTATE
ALDERMASTON, READING RG7 4PQ
TEL: (073 56) 71444 TX: WUDDUG G

Buy it with Access

BARCLAYCARD VISA

KW TEN-TEC CORSAIR II

NO FRILLS, "GIMMICKS", OR UNUSED FACILITIES — FOR THE SERIOUS PHONE/CW OPERATOR WHO WANTS THE LOWEST NOISE, CLEANEST AND MOST SELECTIVE AMATEUR hf TRANSCEIVER ON THE WORLD MARKET.

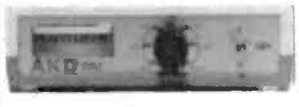
Other KW-TEN TEC winners
The ARGOSY II phone/cw transceiver
The CENTURY 22 cw only transceiver
WRITE OR PHONE FOR DETAILS

KW TEN-TEC LTD
Vanguard Works, Jenkins Dale, Chatham, Kent, ME4 5RT
Tel: 0634 815173

AKD

Armstrong Kirkwood Developments

The name for wavemeters, pre-amps and rf filters



VHF/UHF ABSORBPTION WAVEMETER
Covers 120-450 MHz. Extremely sensitive. Low profile. Requires PP3 battery ..... Only £24.95

2MTR PRE-AMP
18db of gain. Fail safe circuit. Min. 25 watts through power. S0239 connectors
..... Only £24.95

Both products carry a 2 year no quibble guarantee.

ALSO AVAILABLE FROM MOST LEADING AMATEUR RADIO DEALERS
Prices include VAT, postage & packing.
(Prop.) J.W. ARMSTRONG
10 Willow Green, Graham Park Estate, London, NW9. Tel: 01-205 4704

BECOME A RADIO AMATEUR

Train now for the Radio Amateur Licence examination. No previous knowledge needed, only a few hours per week of home study for 3 to 6 months. Post coupon now for details or tel. 062 67 6114(24 hr service)

British National Radio & Electronics School P.O.Box 7, Teignmouth, Devon, TQ14 OHS

FREE brochure without obligation from:—
CACC
British National Radio & Electronics School
P.O. Box 7, TEIGNMOUTH, DEVON, TQ14 OHS

Name .....
Address .....
.....
HRT 11 BLOCK CAPS PLEASE

An Effective Ferrite Loop Antenna

Whether you are a short wave listener, or a licensed amateur, you'll be amazed at what you can hear with this simple 8" rod antenna for 160 and 80m, designed by Richard Marris, G2BZQ.

Ferrite rod aerials have been in use for some time now, in medium and long wave transistor radios and even some valved sets. They are somewhat more unusual when used on the short wave bands. This particular design is intended for reception of both 160 and 80m amateur bands, using a communications receiver, although it actually has a continuous tunable frequency range of approximately 1.6 to 4MHz.

Having lived in apartments for many years, I have considerable experience of having to use indoor aerials despite metal window frames; pipes behind walls, floors and ceilings; and, of course, electrical wiring. This antenna avoids these problems for the amateur or short wave listener who doesn't want to drape long wire aerials around his/her flat. It can also be used for portable operation with a communications receiver or a general coverage receiver. It is a relatively novel design that will excite the interest in any listener willing to examine what DX can be heard with a ferrite loop antenna only 8" long. Furthermore, because of its simple design, it is ideal for experimentation.

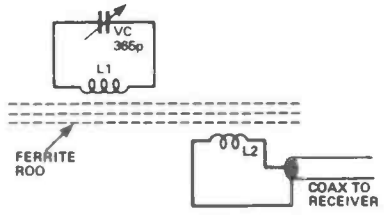


Fig 1. The LC/VC tuning combination with L2 as coupling coil

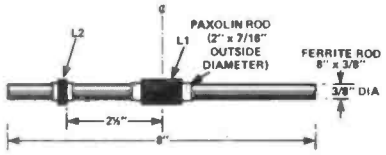


Fig. 2 Assembling the ferrite rod and coils.

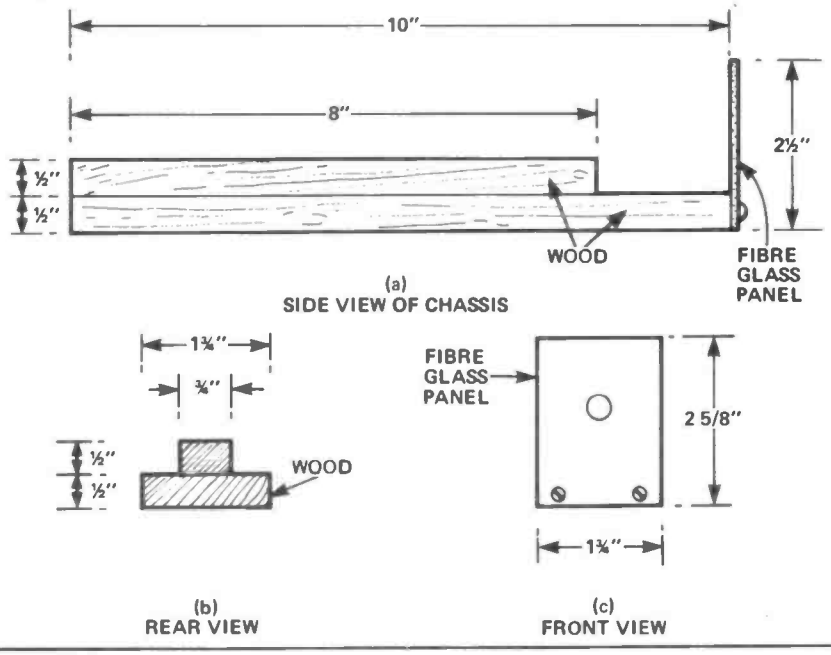
Antenna Assembly

The antenna consists of a ferrite rod 8" long with a diameter of 3/8". The antenna coil, L1, is wound round the rod and is connected to a variable capacitor, VC, as shown in **Fig. 1**. This is coupled to the receiver via a coax cable, by means of the coupling coil, L2. The variable capacitor is adjusted to bring the whole circuit into resonance at the desired frequency.

The ferrite loop winding assembly is shown in **Fig. 2**. L1 consists of 30 turns of 26swg enamelled copper wire wound onto a 7/16" (outside diameter) paxolin tube, which is 2" long. The spacing between turns should be approximately one wire diameter with the winding length coming to about an inch. Fix the coil to the tube with some glue or small piece of masking tape. The tube should then be put over the rod and eventually the coil will be fixed dead centre on the rod for maximum sensitivity.

Initially, L1 was coupled to the

Fig. 3 Plan of the chassis and front panel.



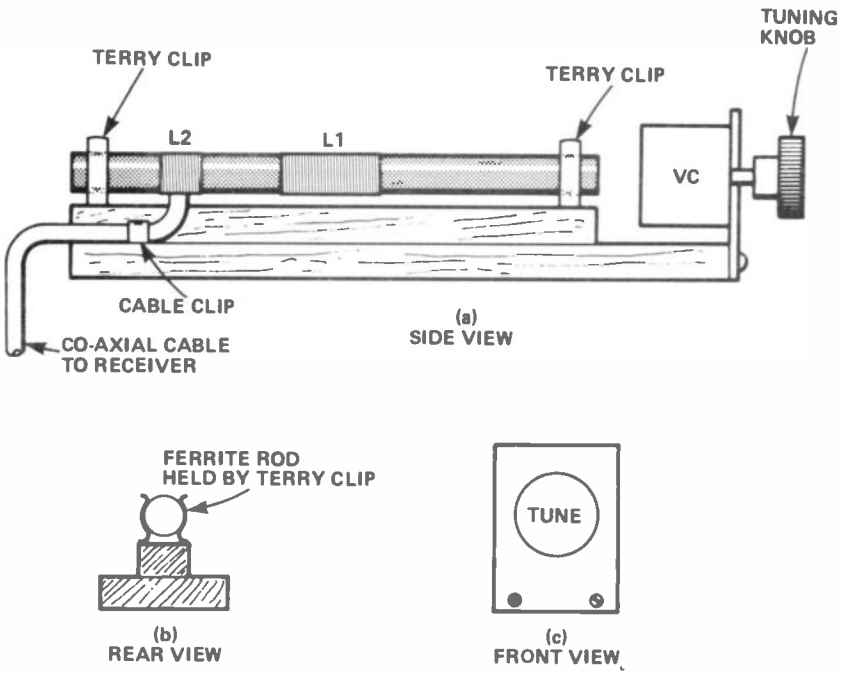


Fig. 4 The completed antenna. The tuning knob can be of any type as long as it fits the variable capacitor.

receiver with a coil of a few turns around the centre of L1. But the result of this was most disappointing. Following further experiments the arrangement, as illustrated in Fig. 2, was settled upon. L2 is made up of 16 turns of 36swg enamelled copper wire closely wound — so that the coil length is 1/8" — on a piece of 7/16" former. L2 is then put on the ferrite rod, I found the optimum position of L2 relative to L1 to be 2 ½" from centre to centre.

Chassis Construction

The chassis and panel assembly is detailed in **Fig. 3** and consists of a long narrow wooden chassis onto which the rod is supported with Terry clips. The small fibre glass panel, at one end, is to support the tuning capacitor, VC.

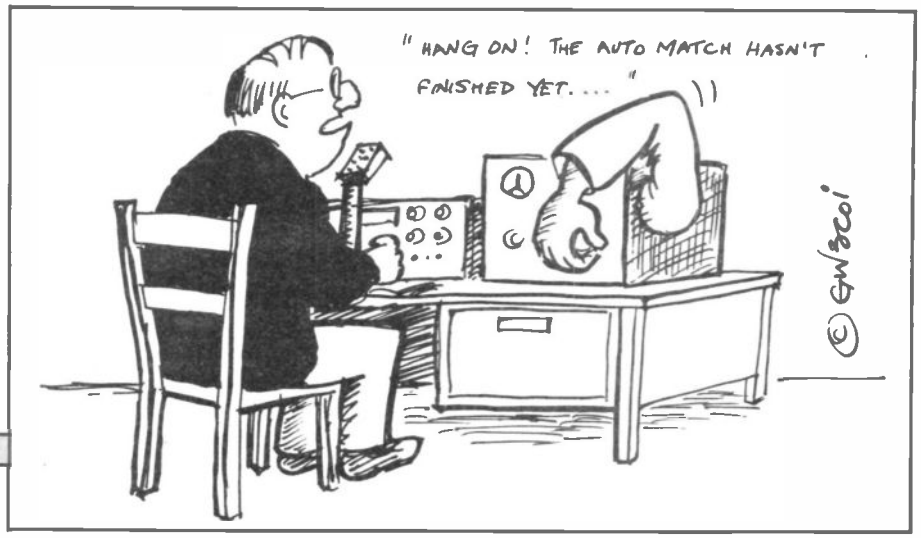
The chassis is made up of a wooden baseboard with dimensions 10" × 1¾" × ½" and a wooden support of size 8" × 3/4" × ½". Cement the two pieces together with epoxy adhesive and fix the fibre glass panel (which is 2 ½" high by 1¾" wide) to the chassis end with two wood screws. Screw a Terry clip to each end of the rod support.

The variable capacitor is mounted onto the panel and the tuning knob fixed onto the other side. The ferrite rod/coil assembly is clipped into the Terry clips and the ends of L1 are soldered to the capacitor. Adjust the coils L1 and L2 to the exact position and cement them to the ferrite rod. Also add some epoxy adhesive to the ferrite rod where it fits into the Terry clips. Solder a length of coaxial cable to the ends of the coupling coil, L2, and secure the cable to the wooden chassis with a cable clip.

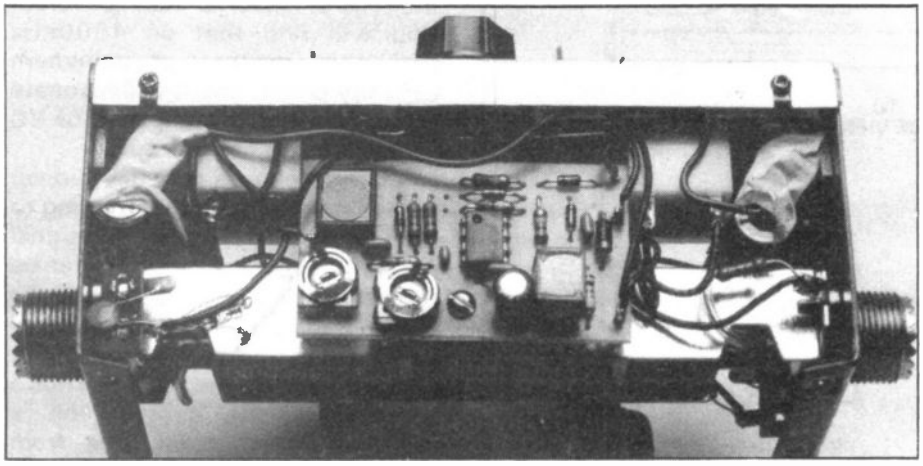
To test the ferrite loop antenna, simply plug the coaxial cable into the back of the communications receiver at the AE coaxial socket and take the following steps. Tune the receiver to 3500kHz and adjust the capacitor to maximum signal on a convenient station. Repeat at 3800kHz and again at 4000kHz. This ensures that the antenna can resonate over the whole 80m band, plus a piece at the top (3800-4000kHz) occupied by US stations. Repeat this process at 1800 and 2000kHz, to ensure that the 160m band is fully covered. You will find that on 4000kHz resonance occurs at minimum capacity on VC and it will resonate at 1800kHz with the plates of VC approximately half meshed.

The antenna is very directional, a good point to note when trying to reduce QRM. Maximum signal strength occurs when the ferrite rod assembly is broadside onto the received station. Maximum null appears when the end of the rod is pointed towards the station. Thus a rotation of 90 degrees on a selected station takes one from maximum signal to complete nulling out in most cases. Used in this way, the antenna is very effective for eliminating or reducing QRM from unwanted stations. With the selectivity gained by resonance as well, the chances of eliminating unwanted stations are much improved.

Bearing in mind that the antenna is being used indoors, it should be located away from mains wiring and a working TV set — both of which radiate spurious noise. The antenna is most effective with a receiver with good RF amplifying stage(s). If you have a less efficient receiver, an RF pre-amp between the antenna and the receiver will improve results. The received signal is not as strong when received with the ferrite loop antenna as compared to a wire antenna. But the signal although weaker, will be cleaner and clearer and probably more readable.



Power Meter Add-on For SSB Signals



Want to know your output power when working SSB and like me, you can't whistle? Well, Jack Darby, G4TVC, reviews a possible alternative.

Although I have a rather good through line watt meter for VHF/UHF, a model T-435, the HF side of my operations has always been a bit 'hit and miss' as far as output power is concerned. When the opportunity of a PEP power conversion module came my way, I decided to improve the situation. The object to be given a new lease of life was an 'el cheapo' SWR25. The 'SWR and RF power meter' as it calls itself, is about the least expensive available and was an early 11m operations acquisition. This was now to be transformed into a much improved and therefore useful instrument.

The AA Peak Envelope Power conversion module, designed and built by John Fielden, GW4NAH and Bob Lloyd, is a small single sided PCB measuring 55mm by 30mm and containing one integrated circuit of unknown type and 20 other components. The module is supplied assembled and tested and the appropriate zero potentiometer is sealed. Only 4 connections need to be made and the two pages of operation and connection instructions are more than adequate.

Because the unit requires a supply of 3-15 volts at about 1mA it is necessary to fit a small battery pack into the meter. In my case, I opted for four of the AAA size cells in series giving 6 volts. Some insulating tape was put round the batteries to prevent shorting to the case. The SWR25 measures 124mm×51mm×55mm and is probably the smallest SWR meter that can accommodate the module and its battery.

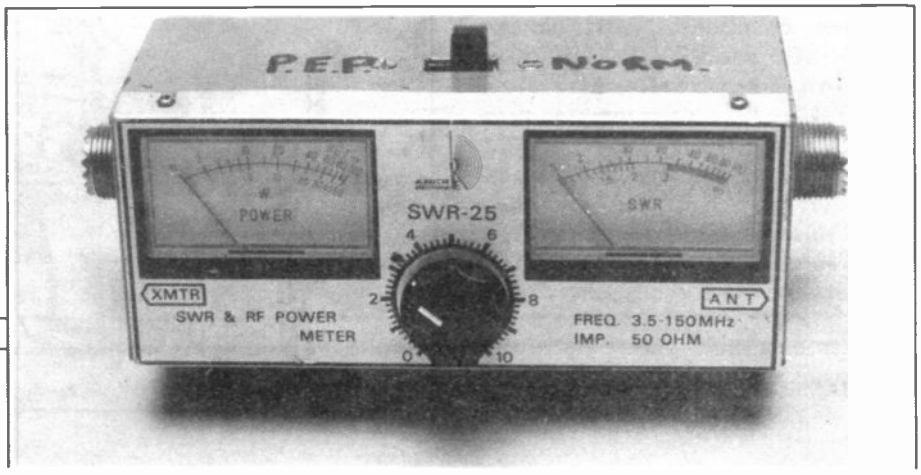
The PCB was fitted to the meter unit using the spacer and screws provided. A DPDT slide switch was fitted in the case of the meter to switch the battery supply on and connect the module in circuit. This enabled me to use the meter in its original form. The instructions explain how to adjust the module: a simple tweak of the 'coarse' and 'fine' pots was all that was needed.

In use, the meter now reads the Tx output power on SSB in a similar manner to, say, FM. If one is operating on SSB with an ordinary meter and wishes to see the Tx output power, you have to whistle, which produces a constant reading. It may not be a true reading of output power but it is a good guide. With the PEP module switched in circuit, the meter has a steady reading during modulation. By adjusting the calibration potentiometer, the steady reading on SSB can be made the same as the power reading of a constant carrier, ie FM. This means one can get away from the expression, "my output power is about (whistle, look at meter) 100 watts"!!

When the meter modifications were complete, I borrowed a calibrated HF power meter and noted the settings of the SWR25 front panel control on the various bands used. These settings were written on the back of the case for future reference.

So now my dust gathering 'SWAR' meter of yesteryear has a new operational mode. It was put to good use on VHF NFD on the 4m club station. Although not calibrated, it provided a confident indication that the linear was still working, needing only a quick glance during a normal speech 'over' to check the power was going out okay.

Priced at £12 plus 60p p and p, the PEP module almost doubles the original 1979 price of the SWR25, but to buy a similar reading meter would cost at least £50. The PEP conversion module is available only from Amateur Accessories Ltd., Church Street, Glan Conwy, Colwyn Bay, Clwyd, LL28 5LS.

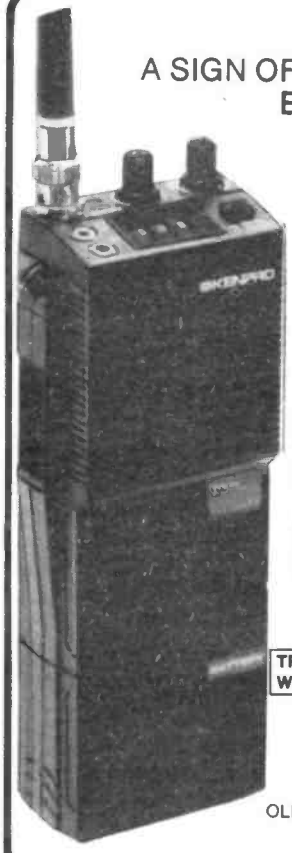


HI-TEC WORLDWIDE

Specialist Communications Distributors

A SIGN OF TECHNICAL EXCELLENCE

KENPRO



ARE YOU PAYING TOO MUCH?

Ensure quality, reliability service back-up, without the need to pay the usual high price of other similar products.
KENPRO has the answers, and for a limited period our special introductory price includes a **FREE CHARGER.**

KT200EE VHF Transceiver. 140-150MHz — £169 + £5.00 p&p
KT400EE UHF Transceiver. 430-440MHz — £189 + £5.00 p&p
Standard accessories, nicad pack — flexible antenna — ear phone — hand strap — belt suspender.
Full UK specification, tone-repeater shift-ect.

Optional accessories

KTSMI speaker mic.	£19.50
KTBMC mobile charger lead	£4.50
KTLC leather case	£5.50
KTBP(H) Hi-power ni-cad pack (3w)	£33.00

TRADE ENQUIRIES WELCOME

Instant Finance/HP/Personal Loan
Written details upon request.

584 HAGLEY RD WEST,
OLDBURY, QUINTON, BIRMINGHAM B68 0BS
TELEX: 334303G - TXAGWM
Tel: 021-421 6001

SEE US AT THE LEICESTER SHOW

ALTRON

CHOICE OF PROFESSIONALS

COMPACT LATTICE TOWERS and SLIMLINE TUBULAR MASTS

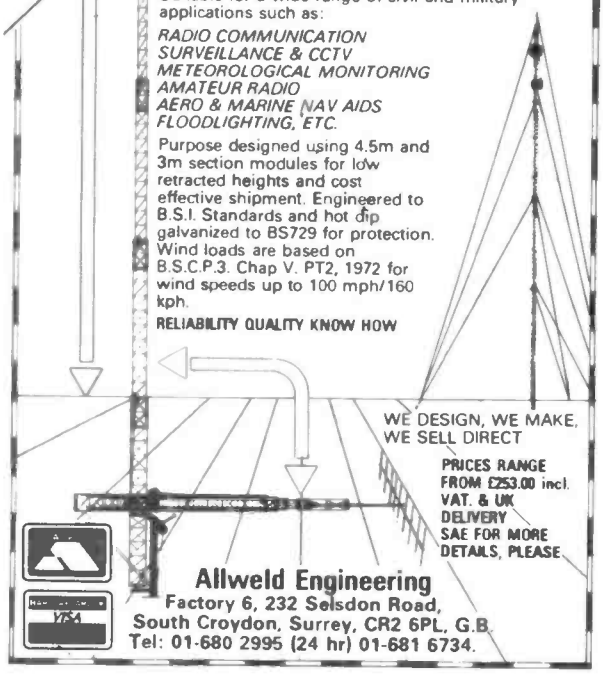
TELESCOPIC—TILTOVER, FIXED—MOBILE FROM 6m UP TO 36m

Suitable for a wide range of civil and military applications such as:

RADIO COMMUNICATION
SURVEILLANCE & CCTV
METEOROLOGICAL MONITORING
AMATEUR RADIO
AERO & MARINE NAV AIDS
FLOODLIGHTING, ETC.

Purpose designed using 4.5m and 3m section modules for low retracted heights and cost effective shipment. Engineered to B.S.I. Standards and hot dip galvanized to BS729 for protection. Wind loads are based on B.S.C.P.3. Chap V. PT2, 1972 for wind speeds up to 100 mph/160 kph.

RELIABILITY QUALITY KNOW HOW



WE DESIGN, WE MAKE, WE SELL DIRECT

PRICES RANGE FROM £253.00 incl. VAT. & UK DELIVERY SAE FOR MORE DETAILS, PLEASE

Allweld Engineering
Factory 6, 232 Selsdon Road, South Croydon, Surrey, CR2 6PL, G.B.
Tel: 01-680 2995 (24 hr) 01-681 6734.

SPECTRUM COMMUNICATIONS

MANUFACTURERS OF RADIO EQUIPMENT AND KITS

6 METRE EQUIPMENT

RECEIVE CONVERTERS, 2 or 10 metre IF, gain over 26dB, NF less than 2.5dB, buffered LO output, 10-15V negative earth operation, reverse supply protected.
Types RC6-10, RC6-2 **PCB kit £16.00, Boxed kit £22.25, Boxed built £31.00.**
TRANSMIT CONVERTER, 10 metre IF, 20mW-1W Input, 500mW RF output, takes LO drive from RC6-10, includes AE and IF switching, 12-14 volt negative earth operation at less than 200mA.
Type TC6-10 **PCB kit £15.50, PCB built £24.50.**
TRANSCEIVE CONVERTER, 10 metre IF, with combined functions of TC6-10 & RC6-10, includes AE switching but has separate IF's.
Type TRC6-10 **PCB kit £39.00, PCB built £54.00, Boxed kit £53.00.**
TRANSMIT AMPLIFIER, 500mW input 20W output, multimode, 13.5V negative earth operation at 3A, very low spurious and harmonic output e.g. 2nd harm – 60db typical.
Type TA6U2 **PCB kit £38.75, PCB built £45.75, Boxed kit £42.00**
PLUS ALSO switched & unswitched preamps and a single stage 25W linear. **SEND SAE** for data on these or our other products.

VAT & P&P INCLUSIVE PRICES
Delivery within 14 days subject to availability. 24hr answering service

UNIT B6, MARABOUT INDUSTRIAL ESTATE, DORCHESTER, DORSET. TEL 0305 62250

REG WARD & CO LTD
1 Western Parade
Axminster Devon EX13 5NY

South Wests Largest Amateur Radio Dealer

AUTHORISED YAESU

APPROVED TRIO DEALER

Offical Agents Yaesu, Trio, Icom, FDK.
:Complete range stocked:
:Full demonstration facilities:
:Mail/Phone orders on all items:
:Barclaycard, Access, Instant Credit:

Ancillary equipment: Adonis, AKD, AOR, Bencher, BNOS, Datong, Diawa, Drae, Hansen, Hinound, JIL, Kempro, Microwave Modules, Mutek, SEM, Snare, TAU, Tolcyo Hypower, Tono, Toyo, Welz, Wood & Douglas
Aerials by: G. Whip, Hygain, Jaybean, Mini Products, Rexco, TET, Tonna.

New complete range Wood & Douglas Kits
TAU Tuner SPC 3000

ICOM FDK

Cables, plugs, sockets, insulators, etc.
Opening hours: Tues-Sat 9.5.30 (lunch 1-2) Closed Mondays

Tel: Axminster (0297) 34918

QUARTZ CRYSTALS

STOCK CRYSTALS

CRYSTALS FOR 2 METRES
HC25 £2.15 FOR ONE CRYSTAL £1.96 WHEN 2 OR MORE PURCHASED
HC6 £2.15 FOR ONE CRYSTAL £2.05 WHEN 2 OR MORE PURCHASED

TX CRYSTALS	RS CRYSTALS	CHANNELS IN STOCK
HC6/U 8MHZ 30PF	44 MHZ SERIES RES	R0 TO R7,S11, S20 TO S23
HC25/U 12MHZ 30 & 40PF	44 MHZ SERIES RES	R0 TO R7 S8, TO S23 & S32
HC25/U 18 MHZ 25 & 20PF	14/15 MHZ 20 & 30 PF	R0 TO R7 S8, TO S23 & S32
HC25	SCANNER XTLS (NOT SR9)	R0 TO R7 S8, TO S23 & S32

full list available on request please send SAE.

4 METRE CRYSTALS FOR 70.26 IN HC6/U AT £2.40 each
TX 8.78250 RS 29.78000
70CM CRYSTALS £5.00/pr or £2.50 each
For Pye PF1 PF2 & PF70 series Wood & Douglas and FDK MULTI U11
SUB(433.2) SU20 RB0 RB2 RB4 RB6 RB10 RB11 RB13 RB14 RB15.
ALSO for MULTI U11 ONLY SU12 SU16 SU18
CONVERTER CRYSTALS IN HC18/U AT £2.85 each.
22.000, 38.666, 42.000, 70.000, 96.000, 116.000, 101.500, 116.000
FREQUENCY STANDARDS £2.75 each
HC6/U 1000kHz 3.50 MHz 5.00 MHz 10.000 MHz 10.700 MHz
HC18/U 10000kHz 7.00 MHz 10.70 MHz 48.00 MHz 100.00 MHz
Also HC6/U455 kHz £3.25 each
TONEBURST, I.F. & MPU CRYSTALS IN HC18 £2.25 EACH
7.168 MHZ (For 1750 HZ Tone), 10.245 (for 10.7 I.F.)
3.2768 5.0688 14.3180 15.00000
YAESU CRYSTALS for FT101's FT901 & etc £4.00 each
Many available ex stock (A list is available on request pse send S.A.E.)

MADE TO ORDER CRYSTALS

FUNDAMENTALS

FREQUENCY RANGE		PRICE
5 TO	50 kHZ	£21.00
50 TO	150 kHZ	£11.00
150 TO	500 kHZ	£7.80
160 TO	999 kHZ	£11.90
1 TO	1.5 MHZ	£10.75
1.5 TO	2.0 MHZ	£5.10
2.0 TO	6.0 MHZ	£4.75
6 TO	21 MHZ	£4.55
21 TO	25 MHZ	£6.50

DELIVERY

OVERTONES

	FREQUENCY RANGE			PRICE
3rd OVT	21.00	TO 65.00	MHZ	£4.55
5th OVT	60.00	TO 110.0	MHZ	£5.10
5th OVT	110.00	TO 125.0	MHZ	£7.40
7th OVT	125.00	TO 175.0	MHZ	£10.00
	2.0 TO	175.0 MHZ	2 TO 3	weeks
	5 TO	999.9 kHz	6 to 8	weeks
	1 TO	1.499 MHz	3 to 4	weeks

Unless otherwise requested fundamentals will be supplied for 30pf load capacitance and overtones for series resonant operation.
HOLDERS: — PLEASE SPECIFY WHEN ORDERING — else HC25/U supplied for XTLS above 3 MHz HC13/U 6-200 kHz HC6/U & HC33/U 170 KHz-175 MHz HC18/U & HC25/U 2-175 MHZ
DISCOUNTS: Price on application for 10+ units to same frequency/spec. or bulk purchases of mixed frequencies. We supply **FREE** xtals for use in U.K. repeaters.
COMMERCIAL CRYSTALS: available on fast delivery and at competitive prices. Please send for list stating interests.
EMERGENCY SERVICE: for XTALS 1 to 125 MHz. Add the surcharge for each XTAL. Days refer to working days. 4 days +£12, 6 days +£7, 8 days +£5, 13 days +£3.
CRYSTAL SOCKETS HC25 £0.20 ea. HC6 £0.25 ea. MINIMUM ORDER CHARGE £1.50 unless ordered with crystals
TERMS: Cash with order post Inc. to U.K. & Ireland. Cheques & P.O.'s to QSL LTD.
A stamped addressed envelope with ALL enquiries please.

QSL

P.O. Box 19
Erith
Kent DA8 1LH

ALL PRICES ARE EX VAT PLEASE ADD 15%

Telephone: 01-318-4419 24Hr Ansafone: Dartford (0322) 330830
Telex: 8817271 GECOMS-G (Attention QUARTSLAB)

RADIO Tomorrow

Your at-a-glance guide to what's happening around the clubs, on the air and in general radio-wise.

1 Oct
E Lancashire ARC: *The Welshpool and Llanfair Light Railway.*
Reading DARC: *Improving Your DX on 2m by Ken Willis, G8VR.*
Worksop ARS: *Space Shuttle video.*
Wolverhampton ARS: AGM.
Bury RS: informal.
Fylde ARS: *Propagation — Principles and factors.*
Chichester DARC: bring along a computer evening.

2 Oct
Three Counties ARC: *VHF Repeaters by Farnham VHF Group.*
Wirral ARS: surplus equipment sale.
Cheshunt DARC: *Lightening Protection with Peter Tingey.*
Fareham DARC: natter nite on the air.
Havering DARC: business meeting.
Telford DARS: natter night.
Mirfield RC: meets every Wednesday at the Community Centre, Yockleton Road, Lea, Birmingham.
Braintree ARS: planning JOTA.
Hornsea ARC: *The RSGB video show.*

3 Oct
Abergavenny and Nevill Hall ARC: meets every Thursday at Pen-y-Fal Hospital, above male ward 2.
Shefford DARS: *Understanding SWR Measurements by G3WRJ.*
Crawley ARC: Quiz vs Mid Sussex ARS.

4 Oct
W Kent ARS: meeting.
Coventry ARS: AGM.
Radio Society of Harrow: G2UV prize 'talk challenge'.
Maltby ARS: mobile operation — G4SRX.

5 Oct
Meirion ARS: talk by G3CSG.

7 Oct
Horndean DARC: AGM.
Basingstoke ARC: AGM.
Alyn and Deeside ARS: drink and waffle.
Worcester DARC: Dewsbury Electronics visit.
Todmorden DARS: construction tips at the start of the construction contest.
Derwentside ARC: meets every Monday at 7.30pm at Consett Assoc. FC, Bellevue Park, Consett. Interested visitors are welcome to drop in.
Welwyn Hatfield ARC: *Radio Controlled Model Aircraft by G0AII.*
Braintree DARS: planning JOTA.
Southdown ARS: junk sale.

8 Oct
Bury RS: *Club Construction Contest and George Dobbs, G3RJV on QRP Operation.*
Wolverhampton ARS: discussion night.
Chester DRS: surplus equipment sale.

9 Oct
Exmouth ARC: meeting.
Cheshunt DARC: natter nite.
Fareham DARC: Davtrend talk and demonstration.
Havering DARC: informal;
Telford DARS: video/film night.
Hornsea ARC: open night.

10 Oct
Preston ARS: *Worked All Britain with G4PLB.*
Shefford DARS: *Interference Forum chaired by G3UFB from RSGB EMC committee.*

11 Oct
Bromsgrove DARC: main meeting.
Coventry ARS: night on the air.
Radio Society of Harrow: activity night on 80m.
Dunstable Downs RC: open evening and demonstration.
Farnborough DRS: film night by G4MBZ.
Maltby ARS: *Propagation HF and VHF open forum.*

12 Oct
GB4URC sponsored special event station will be operating from 10am to 4pm on HF and 144MHz. Further details from G0CCI on 0206 396610.

13 Oct
RSGB 21/28MHz phone contest 0700-1900GMT.

14 Oct
Alyn and Deeside ARS: talk and practical demonstration and members workshop with G80JQ.

15 Oct
Midland ARS: AGM.
Dartford Heath DFC: pre hunt meeting.
Reading DARC: junk sale.
Bury RS: informal.
Fylde ARS: *Further Thoughts on Propagation.*
Wolverhampton ARS: *Clandestine Radio as a POW by G3BA.*
Chester DRS: *Underground Communications.*
Biggin Hill ARC: *Cellular Radio by Richard Owen of British Telecom.*

16 Oct
Three Counties ARC: *Interference by G4JXO.*
Wirral ARS: AGM.
Fareham DARC: natter nite on the air.
Havering DARC: constructors cup competition.
Telford DARS: *SSB Generation by G4AZV.*
Braintree ARS: club construction contest.
Hornsea ARC: ELHOEX '85 preparation.
Kingston DARS: meeting at 'Alfriston', 3 Berrylands Road, Surbiton.

17 Oct
Shefford DARS: *Amateur Radio Computer Programs.*

	Chichester DARC: junk sale.
18 Oct	Sutton and Cheam RS: *Propagation by G2FKZ.*
	Worksop ARS: quiz vs Maltby.
	Maltby ARS: quiz vs Worksop.
	W Kent ARS: meeting.
	Coventry ARS: quiz.
	Radio Society of Harrow: Making Electricity.
19-20 Oct	**Jamboree on the air.**
20 Oct	Dartford Heath DFC: DF hunt.
	ELHOEX '85 organised by Hornsea ARC and other clubs at Floral Hall, Hornsea. Further details from G4NIP on 0262 673635.
	RSGB 21MHz CW contest 0700-1900 GMT.
21 Oct	Alyn and Deeside ARS: drink and waffle.
	Todmorden DARS: surplus equipment sale.
	Welwyn Hatfield ARC: RSGB video show.
	Braintree DARS: construction contest.
22 Oct	Bury RS: informal.
	Wolverhampton ARS: members slide and film show.
	Chester DRS: *Marine Radio Licence and Operation by G3TZO and G4JHF.*
23 Oct	Exmouth ARC: meeting.
	Fareham DARC: *A Better Way with End Fed Aerials by G3CCB.*
	Havering DARC: informal.
	Worcester DARC: informal.
	Telford DARS: HF activity night.
	Hornsea ARC: ELHOEX '85 post mortem.
	Farnborough DRS: surplus equipment sale.
24 Oct	Preston ARS: *Secret Listeners video.*
	Greater Peterborough ARC: *The Sharp End of Broadcasting by G4HPE.*
	Shefford DARS: *Satellite TV by G8AFN.*
25-26 Oct	**Leicester Amateur Radio and Electronics Exhibition, Granby Halls, Leicester. 10am to 6pm. Enquiries to G4PDZ.**
25 Oct	Coventry ARS: night on the air.
	Radio Society of Harrow: activity night on 20m.
	Dunstable Downs RC: *Improving your DX on 2m by G8VR.*
	Hornsea ARC: AGM.
	Maltby ARS: junk sale.
27 Oct	Wolverhampton ARS: DF hunt.
	RSGB 70MHz fixed station contest from 1000 to 1500 GMT.
28 Oct	Alyn and Deeside ARS: meeting.
29 Oct	E Lancashire ARC: informal.
	Reading DARC: *24cm TV Repeaters by G3VZV of BATC and the RMG.*
	Worksop ARS: quiz vs Maltby.
	Maltby ARS: quiz vs Worksop.
	Bury RS: informal.
	Wolverhampton ARS: night on the air and discussion.
	Chester DRS: hot pot supper.
30 Oct	Three Counties ARC: HF and VHF stations on the air.
	Fareham DARC: natter nite on the air.
	Havering DARC: *OSCAR Satellites by G3RWL.*
	Telford DARS: natter night.
31 Oct	Shefford DARS: *Getting Going on 10GHz by G8OFA.*
1 Nov	W Kent ARS: club expedition video and slide show.
	Coventry ARS: film show.
	Radio Society of Harrow: *Astronomy for Amateurs by G4ZES.*
	Clifton ARS: club meeting.
	Maltby ARS: amateur radio open forum.
4 Nov	Horndean DARC: *Constructional Techniques by G4JXO.*
	Basingstoke ARC: constructors competition.
	Alyn and Deeside ARS: bonfire and bar-b-que drink and waffle.
	Worcester DARC: *AMSAT by G4BBR.*
	Chester DRS: quiz vs Ellesmere Port club.
	Derwentside ARC: meets every Monday at Consett Assoc. Football Club, Bellevue Park, Consett starting at 7.30pm.
	Welwyn Hatfield ARC: informal and workshop night.
	Southdown ARS: *Weather Satellites by G8FCD.*
	Todmorden DARS: BT talk.
5 Nov	E Lancashire ARC: home construction night.
	Dartford Heath DFC: pre-hunt meeting.
	Bury RS: informal.
	Chichester DARC: club meeting.
	Wolverhampton ARS: natter night and night on the air.
6 Oct	Wirral ARS: Chairman's night.
	Exmouth ARC: meeting.
	Fareham DARC: *Circular Polarisation for VHF/UHF by G6XHR.*
	Telford DARS: *Microwaves by G8MWR.*
	Mirfield RC: meets every Wednesday at the Community Centre, Yockleton Road, Birmingham.
7 Nov	Preston ARS: *Trams by Anthony Stevenson.*
	Meirion ARS: *'Eye of the Wind' Maritime Venture by Rod James of Fairbourne.*
	Shefford DARS: *UOSAT Update by G4PSO.*
8 Nov	Bromsgrove DARC: meeting.
	Coventry ARS: sausage and mash supper.
	Radio Society of Harrow: activity night on top band.
	Clifton ARS: club meeting.
	Dunstable Downs RC: *Receiver Design by G3OSS.*
	Maltby ARS: *Smoke Detectors by G4BVV.*
10 Nov	Dartford Heath DFC: DF hunt.
12 Nov	Reading DARC: *Smith Charts and the Radio Amateur by G3RZP.*
	Worksop ARS: *Ham Radio in the Early Days by G3AUZ.*
	Bury RS: talk by regional rep of the RSGB.
	Chester DRS: *Radio Astronomy by Dr Spencer from Jodrell Bank.*
	Wolverhampton ARS: discussion night.
13 Nov	Three Counties ARC: *Victorian Microwaves by G3SSI.*
	Fareham DARC: natter night on the air.
	Farnborough DRS: AGM
	Telford DARS: *Medium Wave DXing by G6PZZ.*
14 Nov	Shefford DARS: *Static — The Shocking Truth by G6RHL.*
15 Nov	W Kent ARS: surplus equipment sale.

	Radio Society of Harrow: *BBC World Service.*
	Clifton ARS: club meeting.
	Maltby ARS: three in a row mini lectures.
18 Nov	Alyn and Deeside ARS: drink and waffle.
	Welwyn Hatfield ARC: projects evening.
	Todmorden DARS: chat night.
19 Nov	Midland ARS: surplus equipment sale.
	Chester DRS: *RAYNET and CARES.*
	Wolverhampton ARS: *Aerial Circus and Secret Listeners videos.*
20 Nov	Wirral ARS: debate.
	Exmouth ARC: meeting.
	Fareham DARC: *A Commercial Receiver by G4ITF.*
	Worcester DARC: informal.
	Kingston DARS: meeting at 'Alfriston', 3 Berrylands Road, Surbiton.
	Telford DARS: *Sweden by G3IMP and activity night — Project 90 by G6XUF.*
21 Nov	Preston ARS: *Motor Sport by G4PLB.*
	Shefford DARS: natter night.
	Chichester DARC: meeting.
22 Nov	Radio Society of Harrow: activity night.
	Clifton ARS: club meeting.
	Maltby ARS: video.
24 Nov	Wolverhampton ARS: 144MHz DF hunt.
	W Manchester RC: Winter Rally, Pembroke Halls, Walkden, Worsley.
25 Nov	E Lancashire ARC: informal.
	Reading DARC: constructional contest.
	Worksop ARS: memorial cup night.
	Chester DRS: meeting.
	Wolverhampton ARS: night on the air.
27 Nov	Three Counties ARC: *Amateur Radio Awards by G3JFF.*
	Fareham DARC: natter night on the air.
	Farnborough DRS: Chairman's evening.
28 Nov	Greater Peterborough ARC: *Electromagnetic Compatibility by G3HCQ.*
	Shefford DARS: *Software Protection by G8PTP.*
29 Nov	W Kent ARS: meeting.
	Radio Society of Harrow: junk sale.
	Clifton ARS: club meeting.
	Maltby ARS: *Meteor Scatter by G6OYL.*

Will club secretaries please note that the deadline for the January segment of Radio Tomorrow (covering radio activities from 1st December to 1st February '86) is 24th October.

Contacts

Abergavenny & NH ARC	GW4XQH	0873 4655
Alyn and Deeside ARS	GW4RKX	0244 660066
Barking RES	R. Woodberry	01 594 4009
Bath DARC	G4UMN	Frome 63939
Basingstoke ARC	Dave	07356 5185
Biggin Hill ARC	G0AMP	0689 57848
Braintree DARS	J. Roberts	0376 44857
Brighton DARS	Peter	0273 607737
Bristol ARC	G4YOC	Bitton 4116
Bury RS	Bryan	0282 24254
Cambridge DARC	D. Wilcox	0954 50597
Cheshunt DARC	Roger Frisby	0992 464795
Chester DRS	Alan	0244 40055
Chichester DARC	C. Bryan	0243 789587
Clifton ARS	Mr Hinton	01 301 1864
Coventry ARS	R. Tew	0203 73999
Dartford Heath DFC	Pete	0322 844467
Denby Dale DARC	G3SDY	0484 602905
Donegal ARC	EI3BOB	074 57155
Droitwich DARC	G4HFP	0299 33818
Dudley ARC	John	0384 278300
Dunstable Downs RC	Phill Morris	0582 607623
East Kent RS	Stuart	0227 68913
East Lancashire ARC	Stuart	0254 887385
Edgware DARS	John	01 306 4342
Exeter ARS	Roger Tipper	0392 68065
Fareham DARC	Brian	0329 234904
Farnborough DRS	Mr Taylor	0252 837581
Fylde RS	PRO	0253 737680
Galashiels DARS	GM3DAR	0896 56027
G. Peterborough ARC	Frank	0733 231848
Halifax DARS	D Moss	0422 202306
Harrow RS	Dave Atkins	0923 779942
Hastings ERC	Dave Shirley	0424 420608
Haverhill DARS	Rob Proctor	0787 281359
Hazelrigg ARC	G1HDV	274 2413
Hornsea ARC	Norman	0262 73635
Horsham ARC	Pete Head	0403 64580
Inverness ARC	Brian	0463 242463
Kidderminster DARS	Tony	0562 751584
Leighton Linslade RC	Pete Brazier	052 523 270
Loughborough ARC	Philip	0509 412043
Loughton DARS	G6FWT	01-508 7190
Maidenhead DARC	John	0628 28463
Maltby ARS	Ian Abel	0709 814911
Medway ARTS	Tony	0634 578647
Midland ARS	G8BHE	021382 0086
Mid Sussex ARS	G1FRF	0791 82937
Mid Ulster ARC	DF Campbell	0762 42620
Mid Warwickshire ARS	G4TIL	Southam 4765
N. Cornwall ARS	J. West	0288 4916
N. Staffs ARS	G6MLI	0782 332657
N. Wakefield RC	S. Thompson	0532 536633
Newbury DARS	G3VOW	0635 43048
Nunsfield HCA ARG	G4PZY	Derby 767994
Preston ARS	George	0772 718175
Oswestry DARC	Brian	0691 831023
Reading DARC	Chris	Reading 471761
Rhyl DARC	GW1AKT	Nantglyn 469
Shefford DRS	G4PSO	Hitchin 57946
S. Bristol ARS	Len Baker	0272 834282
S. Lakeland ARS	Dave	0229 54982
S. Manchester ARC	Dave Holland	061 973 1837
Southdown ARS	P. Henly	0323 763123
Stockton DARS	John Walker	0642 582578
Stowmarket DARS	M. Goodrum	0449 676288
St. Helens DARC	A. Riley	051 430 9227
Swale ARC	B. Hancock	0795 873147
Telford DARS	Tom Crosbie	0952 597506
Three Counties ARC	R. Hodgson	0428 77368
Tiverton (SW) ARC	G. Draper	03634 235
Todmorden DARS	Mr Gamble	070 681 2494
V White Horse ARS	Ian White	Abingdon 31559
Verulam ARC	Secretary	St Albans 59318
Wakefield DRS	G8PBE	0924 378727
Welland Valley ARS	J. Day	0858 32109
Welwyn Hatfield ARC	Dave	07073 26138
West Kent ARS	PRO	0892 32877
Westmorland RS	G. Chapman	0539 28491
Willenhall ARS	G4LWI	0902 782036
Wirral ARS	Cedric	051 625 7311
Wirral DARC	Gerry Scott	051 630 1393
Wolverhampton ARS	Keith	0902 24870
Worcester DARC	D. Batchelor	0905 641733
Worksop ARS	G4ZUN	Worksop 486614
Worthing DARC	Roy	0903 690415
308 ARC (Surbiton)	Dave Davis	01 399 5487

★ ★ THE LEICESTER ★ ★
AMATEUR RADIO
SHOW COMMITTEE

★ ★ ★ ★

PRESENT THE
NATIONAL
AMATEUR RADIO AND ELECTRONICS
EXHIBITION

CW TESTS

CW TESTS

AT THE
GRANBY HALLS
LEICESTER

BRING & BUY

STAR RAFFLE

ON
FRIDAY & SATURDAY
OCTOBER 25th & 26th
1985
10.00 am - 6.00 pm

Enquiries to Frank G4PDZ on 0533 553293

LETTERS

THE RSGB REPLIES

Sir, While I appreciate your providing this space for RSGB to reply to the letter from Mr Crosland, G6JNS, in the October 1985 issue, I nevertheless find it rather a sad duty.

May I comment on some direct quotations from his letter?

1 "I agree that Ian Abel should join (RSGB) but Council will not let him". "Council will not let him" is pure invention! Mr Abel has not even applied to rejoin the Society, so how on earth can Mr Crosland know with such certainty how Council will react? It clearly did not object to Mr Abel when he asked on the previous occasion to join the Society. Indeed, I cannot recall Council ever exercising its right, under RSGB Article 16, not to accept a person as a member.

2 "The Society is now dominated by a few members of the Council". I am not sure how the majority (14 or 15?) of Council members would respond to the suggestion that they are dominated by a few (3 or 4?) — rather angrily I would expect. However it is a fact of life that in any organisation, voluntary or otherwise, some are able to play a greater role than others: different people have different things to offer, but in the end the success of any organisation is a combination of the talents of a great number of people.

3 "All attempts to get any changes made within the Society are blocked." Where has Mr Crosland been! The Society has made a most remarkable number of changes in every aspect of its operation, and is actively pursuing many others. Considerable changes have been necessary in administration, staffing levels and Committees alone, to cope with an increase in membership of some 75% in seven years, and a four-fold increase in income during the same period. The Society has now computerised many of its activities and in 1983 there were significant changes to the status and authority of Committee Chairmen to permit Committees to take a more active role in advising Council on specialist matters. The methods of liaison with the Licensing Authority and book production have changed, and services to members considerably expanded to mention but a few areas of change.

Nevertheless if Mr Crosland or anyone else has got any well-researched ideas for improving amateur radio in any of its many aspects, no doubt Council would be delighted to add them to the list of changes to be made.

4 "The election of the 1985 President has been done in a very questionable manner."
This scurrilous suggestion by Mr Crosland has about as much authority as the rest of his points — and is even more unpleasant. As he gives no details to justify his assertions, it is difficult to comment. However, if he does not believe the Council Proceedings, and as he was not present at the Council meetings, presumably he must have been advised by some of those present at the meetings. Since the accuracy of Council minutes is checked by all on Council, and Council Proceedings are derived directly from these minutes, Mr Crosland appears to suffer from communication difficulties.

5 "The report of the Council meetings (were) severely edited to hide this."
Perhaps your readers would care to judge the facts for themselves.

On Page 1035 of the December 1984 issue of Radio Communication there was an account of some 250 words of part of the 28 July 1985 Council meeting which made the position quite clear. The 1985 Presidency was *not* on the Agenda for the 28 July 1985 meeting, but was raised by a member of Council. Quoting from the report in *Radio Communication* — "The President (1984) assured Council that this (the question of the 1985 President) was an item on the Supplementary Agenda for 11 August (the next Council meeting)" and that "the matter of the 1985 Presidency was not on the Agenda for this meeting (28 July 1985)".

Although the President, as Chairman of the meeting, did permit further discussion on the topic, as was his right, the President put into effect RSGB Article 68 which reads — "If at any meeting of the Council business be introduced of which notice has not been given either at the previous meeting or in the Notice calling the meeting, any member present shall be entitled to require that no vote or decision shall be taken on such business until the next meeting of Council". This was done, and a report was published on Page 1036 of the December 1984 issue of *Radio Communication*. Both of the meetings reported above were conducted correctly, in good faith, and in compliance with the Society's Articles of Association.

6 "I proposed a vote of no confidence in the AGM and Council . . . because of the very questionable way in which the 1985 President was elected . . . which the President refused to allow any discussion on . . . in clear contravention of the various Companies Acts".
I would make two comments at this stage:

(a) The Companies Act are clear in the way in which business may or may not be raised at a Company AGM. Mr Crosland is only displaying his obvious ignorance of the Acts of which he seems to be suggesting he is expert.
(b) The Companies Acts are also clear on the nature of the business that may be raised: Mr Crosland clearly does not understand that either.

7 "After the meeting was suspended in uproar, the General Manager agreed that the situation was unsatisfactory . . . ."
The meeting was *not* suspended in uproar. Firstly, it was adjourned for some ten minutes to allow the President of IARU Region 1, Mr Louis van de Nadort, PAOLOU, to make a presentation on behalf of IARU Region 1, as he had to leave the meeting to catch a plane to return to the Netherlands. Secondly, a tea break was taken after the Annual General Meeting had concluded its business. It was during this break that Mr Crosland spoke, quite informally, to the General Manager, who at that time expressed his wish to see an advisory note circulated to RSGB members for the benefit of those who were not present at the AGM (see 8).

8 "Guidance to members on how items could be raised (at the Annual General Meeting) . . . (would be published) in April or May *RadCom* . . . the minutes will not be published until October in an attempt to prevent any motions being put in time for the 1985 AGM."
It must be emphasised that the information required was actually given at the AGM itself and the accuracy of the advice given was confirmed to Mr Crosland personally, in writing, some 9 days after the RSGB AGM in December 1984, after consultation with Solicitors. The advisory note to members was delayed simply to incorporate the changes to be made to the Companies Act in 1985. These only became

available on 1 July 1985, after which it was necessary to have the final text of the RSGB advice cleared by the Society's legal advisors. The advice note entitled 'The annual meeting of the Society' was circulated to all members of the RSGB with the September 1985 issue of the Society's journal and its availability was announced at the earliest possible moment via GB2RS on 18 August 1985. The notice includes the time-table for members to formally raise business at the 1985 AGM. One questions if this is a good illustration of "the under-handed way in which the Society's affairs are conducted."

9 "Most of the Society's sub-committees are dominated by a small number of Council members who force their views on the membership as a whole."
See reply to 2. Are these the same few Council members who dominate Council? If so, theirs is a remarkable performance, especially in influencing committees of which they are not members.

10 "A proposal will soon be put to members that the President should be elected for three years instead of one."
More gobbledegook! A change along these lines, although speculated upon from time to time, has never been discussed formally, let alone by Council. Note, however, that RSGB seems almost unique in appointing presidents for one year only: there are advantages and disadvantages in extending the present one-year period. If, in the future, it becomes apparent that an extension would be an advantage, is this such an evil thing as Mr Crosland seems to imply?

11 "The Society must . . . allow an infusion of new committee and Council members to revitalise the Society . . ."
As mentioned above in 2, it is the combined talents of a great many people that make up the Society. Our Council and its committees are made up from a wide range of people; some young, some older, some more experienced than others. The Society works well despite its complex structure because of that essential mix of the enthusiasm of the young, blended with the wisdom and experience of older members. It also works because, over the past five years the Society has been able to build in some continuity. Mr Crosland has not been a member long enough to remember the problems which the Society faced in the past when continuity was lacking. The picture painted by Mr Crosland of a stagnant, moribund organisation is way off beam; perhaps it is a vote catcher.

May I make some suggestions to Mr Crosland and his associates?
(a) Sack your present sources of information and start dealing with real facts.
(b) Come up with positive constructive criticism or, better still, properly researched proposals which will provide some evidence that they have done their homework and know what they are talking about.
(c) Cut out this mean-minded criticism — which does nothing to enhance amateur radio.
(d) Stop inventing problems where none exist: we already have plenty of real ones to cope with.
(e) Above all, let the RSGB get on with the many positive aspects of amateur radio, such as the Class B Morse experiment, seeking new allocations, such as 50MHz, improving membership services and safeguarding our most precious assets — the amateur bands. Surely we should be doing this rather than wasting the members' money responding to third-rate political games.

David Evans,
RSGB General Manager/Secretary.

Practicalities

An engineer was once defined as someone who could make something useful with only the parts to hand. This idea really sums up what amateur radio used to be about; especially in the days when commercially made amateur equipment was quite rare —

Do you have problems with hifi breakthrough, or want to safeguard your equipment from failures in its power supply? If so, Ian Poole, G3YWX, has some answers.

everything had to be 'homebrewed' or government surplus equipment modified. Nowadays, with all the high tech, purpose-built amateur equipment available, one wonders about the place for the 'engineering' approach.

Whilst most of us (including myself) do not have the time for building all our radio equipment there are still many excellent opportunities for building the smaller or less complicated pieces. It was not so long ago that I first ventured onto 80m with a two valve, crystal oscillator controlled, CW only transmitter running about 10 watts, which used components solely from the junk box. I can still remember the excitement of the first contact using this transmitter and the sense of achievement when I contacted my first station outside the UK. The enjoyment was that much more because I had built the equipment.

However, today's equipment is considerably more complicated, what with phase locked loops, digital readouts and so on and so forth. Nevertheless there is still plenty of scope for building a QRP transmitter or a simple two valve job like mine. One can also buy second hand equipment to modify or take advantage of some of the kits which are becoming more popular. Then, of course, there are still some of the ancillary pieces of equipment like SWR bridges, power supplies and the like to build. So the 'engineering' or DIY factor in amateur radio still has every opportunity of staying alive!

Overcoming Hifi Breakthrough

Some months ago I described a small high pass filter for curing TVI. Fortunately for those affected by TVI, it is often easily cured by just placing the filter in the TV aerial lead. A far more difficult problem to solve is that of 'hifi I' for audio frequency interference (AFI). Today's modern hifi systems are often easily affected by stray pickup on the various interconnecting leads. With most of the current hifi systems being stereo the speakers are often placed apart and away from the amplifier thus necessitating long speaker leads.

These leads can act as magnificent aerials especially if they happen to be approximately a quarter wave length on an amateur band, for example on 10 or 15 metres. The RF is picked up on these leads, enters the amplifier appearing at its output. It is often carried back to earlier stages of the amplifier along the negative feedback line. After being rectified by any slight non-linearity in one of these stages and then amplified, it appears at the output in a most disturbing fashion for any unsuspecting neighbour.

The cure for this in some of the less severe cases is just to place 0.01F capacitor across the output of the amplifier. This approach was quite successful on my amplifier in removing Radio Moscow which I heard one day even with the amplifier switched off.

However, in the more severe cases it may be necessary to place a small inductor in series with the output lead together with capacitors to ground. A suitable inductor can be made by winding just a few turns around a piece of ferrite from the aerial of a discarded transistor radio. The wire used should be such that no appreciable resistance is added into the lead otherwise the performance of the speaker system may be impaired.

PCB Heatsinks

Very often one comes across a need to mount a component on a small heatsink. For example I needed a small heatsink to dissipate some heat from a voltage regulator in a power supply. Whilst it would not be dissipating enough heat to warrant a large external sink I thought some form of heat sink would be advisable as more of a precaution.

The simplest way round the problem was to actually physically mount the regulator on the PCB copper and use that to dissipate the heat. Mounting

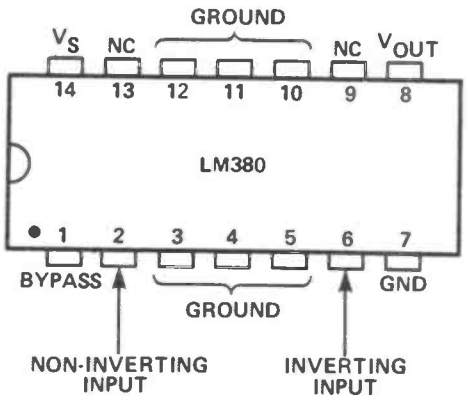
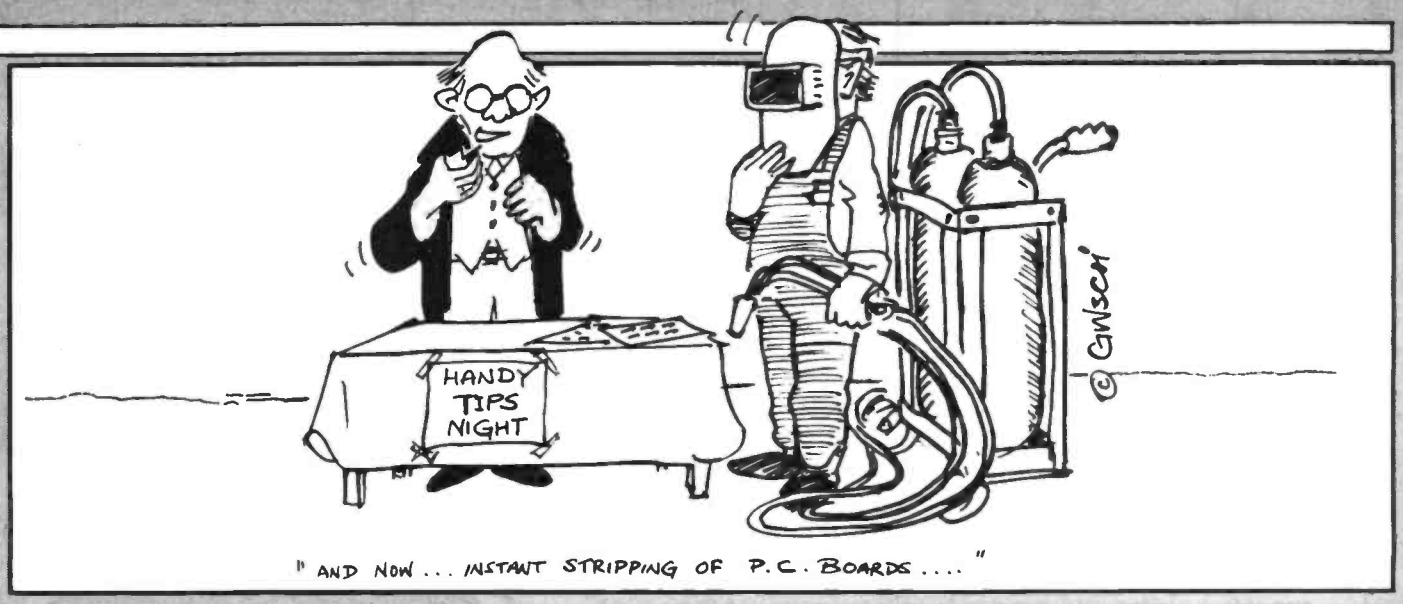


Fig. 1 The pin connections for the 14 pin LM380. Pins 3, 4, 5, 10, 11 and 12 are used to conduct some heat to the PCB.



the regulator in this fashion saved using a small purpose made heatsink and enabled the regulator to be mechanically fixed. Whilst it may seem slightly extravagant I used a double sided board in this case for two reasons. It enabled all the components to be mounted on the same side of the board and as large an area as possible for heat dissipation.

Some time after I first used this idea for a heatsink I was looking at an application sheet for an LM380 audio amplifier. I found that six of the pins on the 14-pin package are grounded so that they can transfer heat onto the PCB copper. Thus saving the use of a more elaborate heatsink in certain applications.

There are obviously certain limitations to this method of using the board as a heatsink. One has to ensure that there is sufficient copper area on the board to dissipate the heat adequately without the temperature rising too far. However, for many low power applications it does provide a neat, efficient and cost effective approach to the provision of a heatsink.

Overvoltage Protection

Back in the days when valves were used widely, power supplies were somewhat simpler — they were normally only smoothed and it was unusual to find a regulated supply in the way many are today. The most that was used was a fairly simple stabilising arrangement using a series resistor and a stabiliser valve such as an OA2 or VR150. Nowadays, semiconductors are used almost universal and fully regulated supplies are not only commonplace but also easy to build with the variety of cheap regulator chips available.

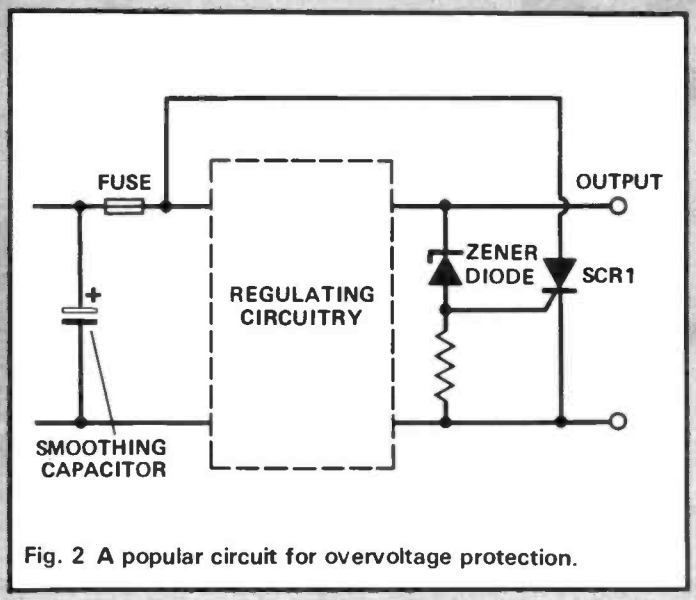


Fig. 2 A popular circuit for overvoltage protection.

Although things appear much easier on the surface there are a few problems which are introduced and have to be noted. Despite the high reliability of these regulators which often include several inbuilt safety features, there is still a small but finite chance of them failing in such a manner that the regulated voltage may rise. For example, if the series controlled element fails and becomes short circuited, the full smoothed, pre-regulated voltage will be applied to the power supply load. As this voltage will be several volts higher than the normal regulated output serious damage could be caused to the equipment being supplied by the power supply.

In order to prevent 'over voltage' failures damaging equipment it is wise to incorporate some overvoltage protection into the power supply. Although several schemes have been developed to overcome this problem, there is one which has become more widely used than the others and it is shown in Fig. 2. Under normal operating conditions, the zener reverse voltage is not exceeded, no current flows through it and the SCR gate voltage remains at OV. Therefore the protection circuitry has no effect on the operation of the power supply. If the circuit develops a fault and the output voltage rises above the zener voltage; then it will begin to conduct, the SCR gate voltage will rise. The SCR will turn on, shorting the input to the regulator to ground and blowing the fuse. Therefore the valve of the zener should be chosen so that its breakdown voltage occurs at the point where the protection circuitry should operate.

Although this method of protection may seem rather crude it does prove to be quick, reliable and effective. In addition to this it only requires the use of a fuse, zener diode, resistor and thyristor and because of this, it has found widespread use.

A.R.E. COMM

WILL BE AT THE CENTRE

Of all the Amateur Radio Exhibitions, Leicester attracts more visitors than most from all parts of the country. We, therefore, intend to have a display worthy of their visit.

Brenda & Bernie have recently returned from Japan with new and interesting equipment to tell you about so come and see what's new in amateur radio.

Of course, we will have all the latest from ICOM, YAESU & KENWOOD-TRIO all at prices that will be hard to beat anywhere...

So spend a day or two at Leicester and we will be delighted to meet you once again.

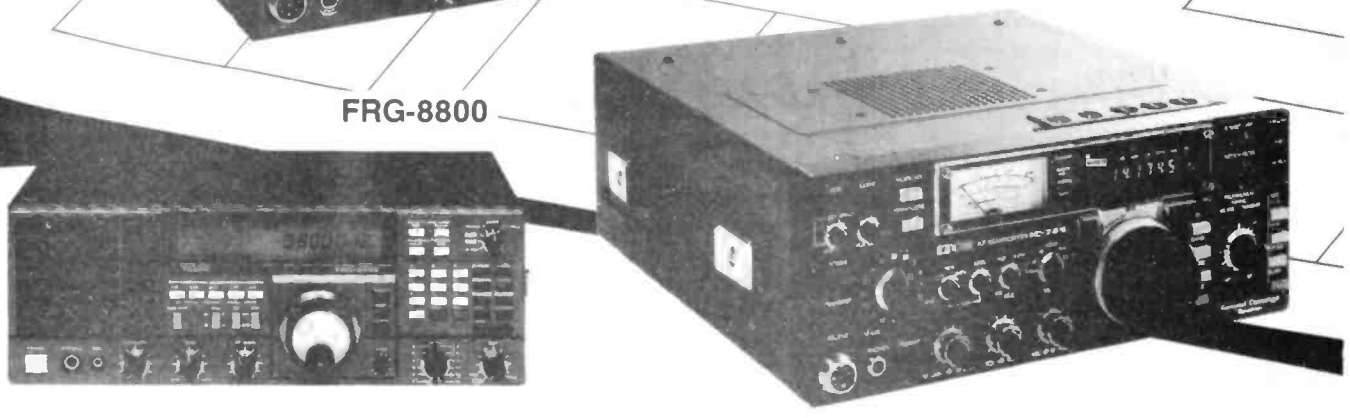
FT-2700RH

A.R.E. COMMUNICATIONS STAND 41

FT-757GX

IC-745

FRG-8800



UNICATIONS LTD

38 BRIDGE STREET, EARLESTOWN, NEWTON LE WILLOWS, MERSEYSIDE
TEL: 09252-29881

OF THE LEICESTER SHOW

SPECIAL OFFERS AT LEICESTER

- We will be offering special prices on most equipment.
- We shall have the new FT690–the new 6 metre version of the FT290–at a very special price.
- We will have a large selection of second-hand equipment at low prices.

A Simple Sender for 'Six'

Itching to get on 'six'? If you're in luck, you might find most of the parts for this transmitter in your spares box! Design by Jack Hum, G5UM.

With the steady decline in 405 line TV, large numbers of 405 line transmitters became available. That, coupled with the recent announcement promising radio amateurs the band 50-50.5MHz, provided the impetus to this design. There is, of course, a small number of amateurs already licensed to use 50MHz, but this will be greatly increased with the new allocation.

In an article called 'A Plain Man's Guide to 6m', published in July '84 HRT, a high performance MOSFET converter was described which any enthusiast could build with the minimum of tools. The converter design only went as far as receiving the signal, but represented the starting point for entry on to the new band. This article offers, as the converter design did, a cheap and cheerful approach to 'six' by means of a basic transmitter capable of improvement and development as experience of the new band is gained. The design can be adapted to suit particular circumstances: use what items are already available in the spares box and feel free to vary the offered design and layout.

The unusual aspects of this design is its use of valves in all of its stages. A lot of market research went into this design; people interested in 'six' were asked if they would accept a design using valves when even 'hot devices' find little favour these days. The answer was an emphatic "Yes", especially if the design could include simplicity and 'visibility in construction'. Many semiconductor projects are considered decidedly intimidating in their increasing complexity and invisibility. Heartened by these comments, the untidy mock-up was revamped into the present design.

Docile Design

One of the advantages a 50MHz valve transmitter design has over a semiconductor one is its inherent docility. It will withstand degrees of abuse that would render transistor design instantly unserviceable. On the other side though, is the fact that valve designs run hot. Another disadvantage is that valve circuitry calls for a substantial power supply to be used. But then so do semiconductor transmitter designs that may demand several amps of highly stabilised, low voltage DC from a sophisticated and expensive PSU.

In this valve sender for six, the power supply requirements are very simple and probably less expensive than for a comparable 15W transistor transmitter. The transmitter itself poses no problems of oscillator design, for it utilises a VXO. There are no problems of power amplifier stability: the final stage is the self-neutralised QQV03/20A twin tetrode. Another minor but practical design point is that the low tension supply at 12.6 volts provides heater current for the valves, a rectified DC supply for the three relays in the system *and* DC for the MOSFET converter. In practice, the converter will probably be sited alongside the 'Simple Sender' or even in a common cabinet.

Fig. 1 shows the basic four stage line-up of the Simple Sender. The first stage is the variable frequency oscillator (VXO) starting at 12.5MHz. A doubler is the second stage, accepting 12.5MHz in and obliging with 25MHz out. This is capacitively coupled to the third stage, a doubler from 25MHz to 50MHz which in turn offers its output inductively coupled to the grids of the twin tetrode output stage — out comes 50MHz from the anodes!

The heater configuration of the QQV03/20A allows the valve to be placed across either a 6.3 volt or a 12.6 volt heater line. In this transmitter, it is connected in the 12.6 volt mode — taking half the current that it would do if in the 6.3 mode. The two doubler stages which precede it are represented by well-tried VHF beam tetrode, the 5763, connected with heaters in series across the 12.6V line.

The transmitter is CW only since band occupants should

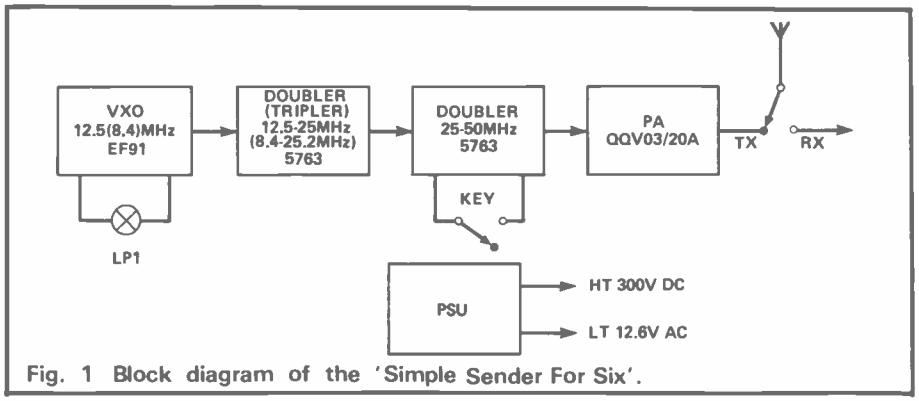
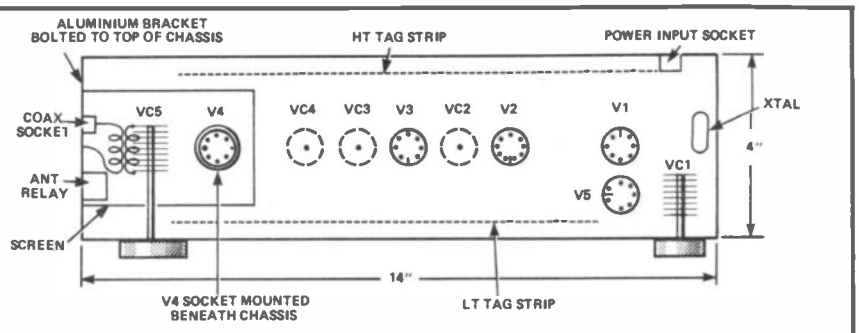


Fig. 1 Block diagram of the 'Simple Sender For Six'.



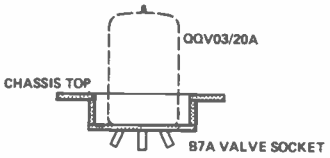


Fig. 2 Chassis constructional details. You will need ¾" holes for V1, 2, 3 and 5 (if used) valve bases, and a 1⅞" hole for V4 (the socket for this is actually recessed, see small diagram and main text). You will need to check the hole sizes actually needed for the variable capacitors on the actual ones you are going to use. Note orientation of valve bases.

theoretically be able to read morse code. In fact, since the band was opened for restricted use, much cross mode operating, ie telegraphy to SSB, has been the norm. As an aside, 6m is notable for its potential for meteorscatter working for which CW is a must. However, meteorscatter requires rather more output than that provided by the modest few watts produced by this sender.

In the case of the oscillator stage, a 6.3V dial light is placed in series with its 6.3V heater connection to go across the 12.6 volt rail. This bulb will take an overvoltage at switch-on and appear to be extra bright: it will gradually dim when it settles to its 6.3 volt rating as the EF91 heater warms up. The EF91 is but one of many high impedance RF amplifier receiving valves all with identical characteristics. Another is the 6F12, yet another the 6AM6, as any book of valve characteristics will reveal. In other words, you don't have to use an EF91: if something similar happens to be to hand, try it! The heater connections are dealt with early in the article, because if the heaters don't come on after wiring up the valve systems, nothing will function.

Starting Point

No wiring can be done until there is a chassis which should measure 14" long by 4" wide by 2½" deep. Your supplier will probably bend one up for you while you wait. Unless you have adequate facilities at home, ask if he will pierce the large holes to take the valve sockets (as per the drilling plan in **Fig.2**) for you. There will be other minor drilling jobs for the constructor to do as the transmitter takes shape. Remember, if the holes drilled are not precisely accurate, you can always file them out. (But it's rather more difficult to make them smaller! — Ed.).

The next stage is to mount the four valves sockets, ensuring that the output pins of one valve mates with the input pins of the next. The correct positioning of the sockets is shown in **Fig. 3**. However, the B7A socket may need further explanation. Looking at a QQV03/20A valve, you will see an electrode supporting ring low down inside the glass envelope. When the valve is plugged into its socket, this ring must come flush with the top surface of the chassis. The socket is therefore recessed below chassis-deck level by means of four ½" spacers, as in Fig. 2.

Before wiring up the connections to the heaters, fit two long tagstrips next to opposite walls of the chassis. One tagstrip will be used for the LT connections, the 12.6 volt supply for the heaters, and the other will be for the HT (high voltage, to newcomers to 'bottles'!) supply for each valve.

The external HT and LT supplies are introduced to the Simple Sender from a companion PSU which will be described in the next part. They terminate in a small socket mounted preferably at the end of the chassis shown in Fig.2 and well clear of the final PA stage. It has been known for RF to percolate into supply leads from power amplifiers positioned too close to them. The type of socket used here depends on what the constructor has available and whether the transmitter is to have two HT runs (one for the driver valves, the other for the PA) or only one, to feed the lot.

Variable Crystal Oscillator

The VXO is a conventional design with a couple of G5UM additives. It starts with crystals in the 12.5MHz area whose frequencies are to be multiplied four times in the succeeding stages to offer 50MHz to the input of the power amplifier. If 8.4MHz crystals are to be used these are multiplied six times to reach 50MHz. The purpose of a VXO is to 'pull' the crystal frequency away from its marked value. A 12.5MHz crystal may be pulled by 5 or 6kHz from its fundamental frequency, which, multiplied by four, means a swing of 0.2 to 24kHz at 6m. But an 8.4MHz crystal varied by the same amount at its fundamental frequency will provide a swing of 30kHz or more in the 6m band. Some crystals pull better

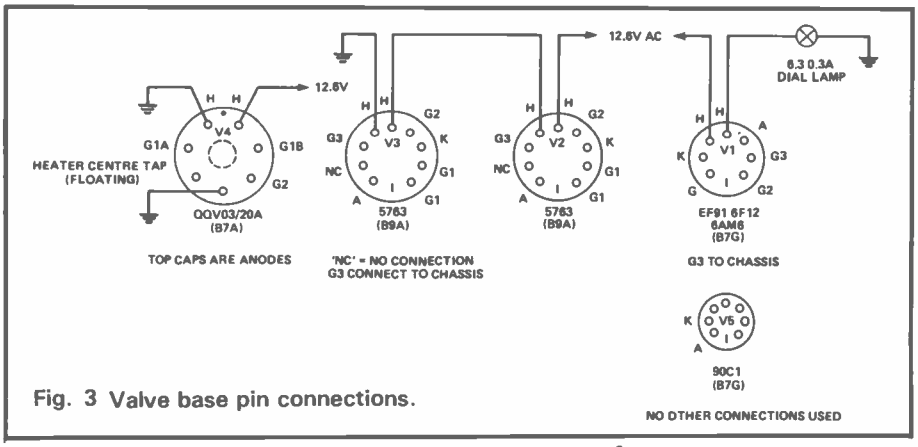
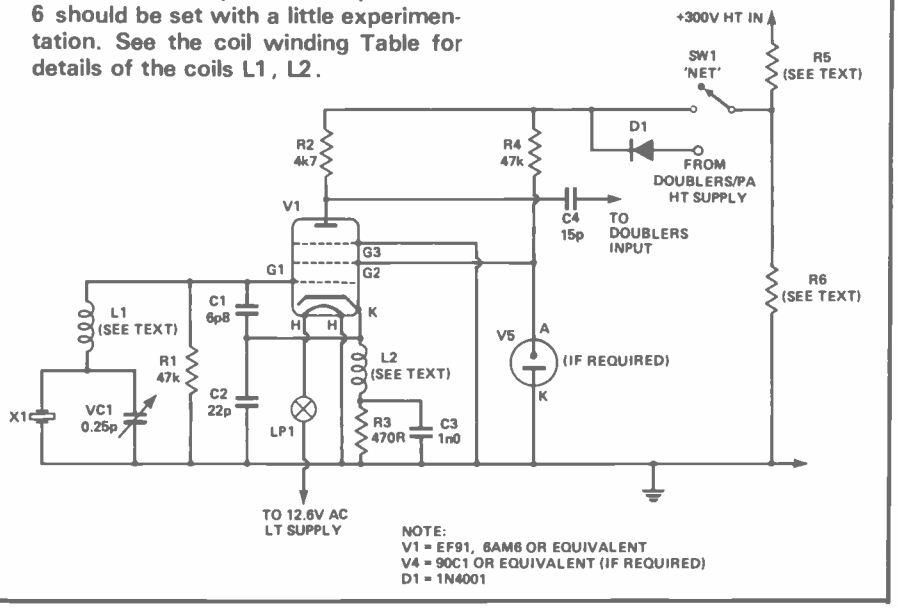


Fig. 3 Valve base pin connections.

Fig. 4 Circuit diagram of the VXO. V5 need be used only if necessary. R5 and 6 should be set with a little experimentation. See the coil winding Table for details of the coils L1, L2.



than others.

In a practical case a 12.5MHz crystal specially made by Quartslab was found, after multiplication four times, to give a swing from 50.12MHz down as low as 50.04MHz, which does not reach much of the upper part of the band. An odd ITT crystal which turned up in the spares box with a marked value of 12.6MHz gave a variation between 50.41 down to 50.36MHz. A word of warning when testing the 'pull' provided by crystal types: beware of the wartime FT243! It has a reputation for very low 'pullability'.

How this frequency flexibility is applied to the Simple Sender can be seen in **Fig.4**. An inductor in series with the crystal and resonating at its marked frequency is tuned by an associated variable capacitor. The Colpitts configuration of the VXO — where the cathode is lifted above base-line by an RF choke and connected across the capacitance divider C1/2 — provides the assistance needed to start the crystal.

In some designs of VXO an output inductor is inserted in the anode circuit. In practice this provides a marginal increase in output and in the drive applied to the next stage. But it also introduces the hazard of VXO self-oscillation which is readily detectable if the crystal is removed, only to show that the transmitter is blithely firing away without benefit of controlled drive. In the past, designers have regarded it as 'unsanitary' to tune the output stage of a high gain pentode to the same frequency as its input — unless one were intentionally building a VFO. Self oscillation, or instability will lurk unless elaborate neutralising procedures are adopted. This explains why the VXO here employs aperiodic (untuned) output. By this means output can be only at the fundamental frequency of the crystal and nowhere else.

No inductor in the output of the VXO valve, then: but what of that inductor and associated variable capacitor in the input? These are the essential components that provide variation of the crystal frequency. Remarkably, the value of the capacitor is not critical: a two-section 25pF variable with sections in parallel proved effective. The value of the inductor is more critical. Although most constructors will wish to adhere to the usual recommendation of 25 turns on a ½" former, they would do well to try a few more or a few less turns which might increase the 'pullability' of the particular crystal used.

Netting

Somebody once said that the greatest invention in radio was the switch that turned the darned thing off. One would hardly go so far as that to describe an important switch related to the VXO; for this particular switch "turns the darned thing *on*". The netting switch enables the operator to park the transmitter's frequency on that of a wanted, received station without actually transmitting.

The switch is turned to Net and a reduced voltage is applied to the VXO anode while the remaining three stages of the transmitter remain turned off. Obviously, if these stages are not drawing current from the PSU the HT line voltage will soar. It is undesirable that this full voltage be applied to the VXO all on its own, so a voltage dropping network is provided to maintain the potential of the VXO anode at a reasonable level.

In this context a little experimentation will pay off. Listen to the VXO signal in an adjacent receiver or converter and increase the values of the voltage dropping network until that signal settles at about strength 6 (a higher level than that may make netting difficult on weaker incoming signals). Meanwhile ensure that the VXO frequency does not change unduly when the other three stages are activated. If it does, fit a small stabiliser such as a 90C1 from the pentode's screen down to chassis. Many an itinerant crystal oscillator has been tamed by this simple expedient of stabilising its screen supply.

Should a 90C1 (or an equivalent) be needed, an additional B7G valve socket hole must be provided on the chassis close to the VXO valve. You may find it advisable to have this socket punched out when the chassis metal is ordered in the first place.

The Multiplier Stages

With variable frequency output from the VXO stage now on stream the next question is: how may this be multiplied up to the terminal frequency in the 50MHz band? Answer: via a couple of 5763 multiplier stages: the first accepting the 12.5MHz VXO output, doubling it to 25MHz and passing it on to the second, which doubles again to 50.1MHz. 5763 bottles were used here, but any pentode you happen to have will do, even the 6V6 will operate on 6m (as it did when we last had six!).

However, to choose a high gain RF pentode as one of the multiplier stages in this transmitter may be

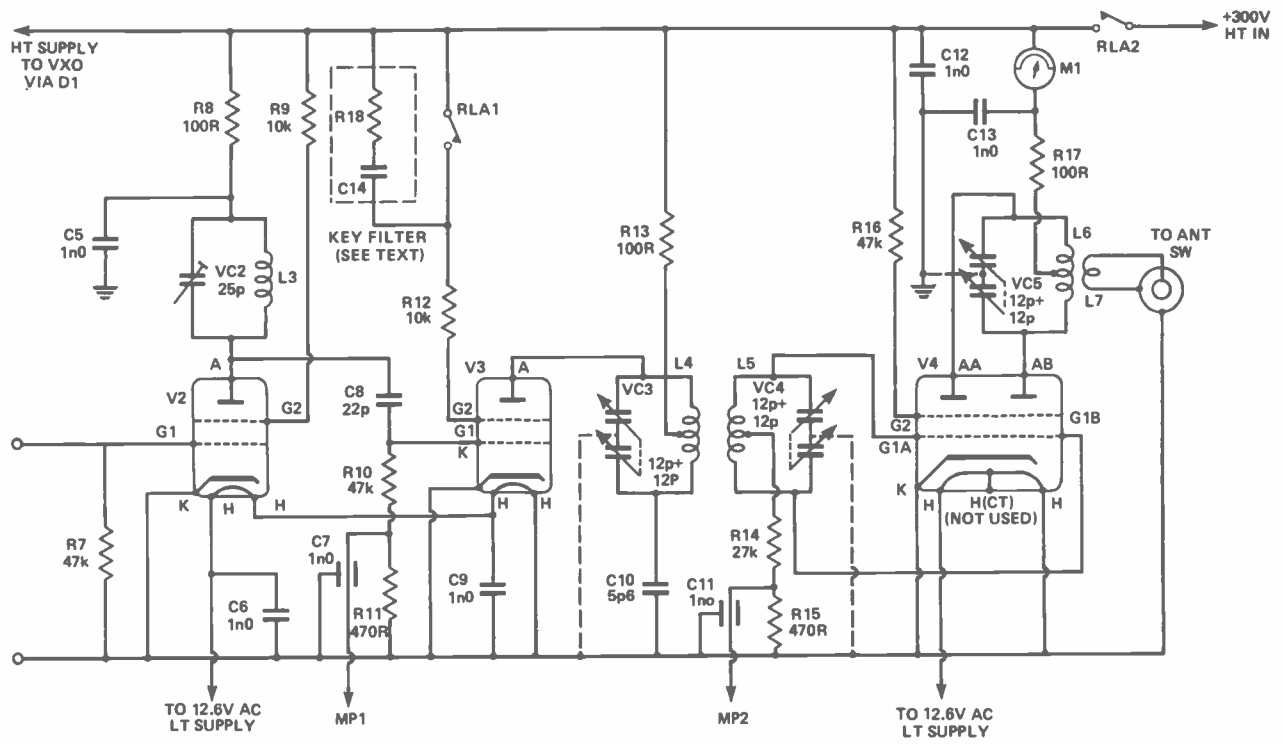


Fig. 5 Circuit diagram of the doublers and the PA. See coil winding Table for details of L3, 4, 5, 6, 7.

courting disappointment. Try other types of pentode that can be accommodated in the B9G socket required by the 5763. But make sure that the heaters of the two multiplier stages have the same heater ratings as they have to be supplied from the 12.6V LT line.

The positioning of the components for V2 and V3 is suggested by the chassis layout shown at Fig 2. Obviously, all HT feeds should be taken to that HT tagstrip and done in red wiring for ease of identification. All LT feeds should be taken to the LT tagstrip on the opposite chassis wall and done in black wiring. Connections to earthing tags may be in brown wiring.

Studying the circuit detail of these two stages the constructor will note, among other things: the provision of RF by-pass capacitors on the heater feed to each valve (never assume heaters are dead to RF); a metering point at MP1, which can be the lug protruding from the 1000pF feedthrough capacitor; and CW keying in the screen-grid lead to the second 5763.

Many designs of valve transmitter in the past have advocated cathode keying and blithely ignored the fact that this method breaks the added currents of anode, screen and cathode, causing sparking at the keying relay contacts and key-thumps to local listeners. To key a screen-grid lead is to break only a few milliamps. Key clicks are reduced to a minimum by the thump filter (KF in Fig. 5) which consists of no more than a 220 ohm resistor in series with a 10 nanofarad fixed capacitor. It is worth experimenting with these values to get the best keying. Keying via a relay is of course to keep HT off the key itself — and off the operator's fingers! The relay feed comes from the 12.6 volt DC supply.

Studying the circuit detail further, you may wonder why the anode coil of V3 is not grounded like the cold end of the V2 anode inductor (via C6). The answer is that V3 must present a balanced output to interface with the balanced input of the twin tetrode power amplifier. The small value capacitor, C12, is the balancing capacitor. Its purpose is to hold both ends of L4 at equal RF potential. A trimmer capacitor may be used if you wish to adjust it during alignment to extract the last ounce of efficiency from the sender.

Identical with L4 is the PA input inductor, L5. The two should be positioned in close proximity to ensure adequate transfer of RF from one to the other. When winding these coils make sure they are wound in the same sense: if one is wound clockwise, wind the other clockwise! Each of these 50MHz centre-tapped inductors is tuned by a balanced trimmer of around 12+12pF value or whatever happens to be to at hand somewhere near this value. The rotor of each may be grounded to the chassis if this improves drive indicated at MP2.

Final Stage, The PA

The foregoing inductors L4 and L5 are to be positioned below the chassis and their ends soldered securely to the lugs of the associated variable capacitors. However, output inductor L6 is mounted *above* chassis so that it does not electrically 'see' its fellow input inductor. Because the QQV03/20A valve embodies internal neutralisation, any instability caused by output 'seeing' input is unlikely to occur. All the same, make doubly sure by having the metal solidity of the chassis deck between them.

To ensure stability at all times, it is worth providing an aluminium screen above the chassis around the final valve to extend level with

its anode pins. These pins are linked to the lugs of C16 with aluminium or copper braid, which could well be a couple of inches recovered from a discarded piece of coaxial cable. Several styles of top connector for the 3/20 and 6/40 range of valves are available from suppliers. Select a pair that look like giving good heat conduction, remembering that they will encounter 8W of heater dissipation beneath them as well as the exuberant amounts of RF which the 3/20A will offer. Fix a solder tag to the 6BA hole to be found on most top connectors and solder it to the two-inch length of metal braid to go to the lugs of C16.

Because the 3/20 produces plenty of RF energy at the low frequency of 50MHz (it is, after all, good at 600MHz) users will want to send all this energy to the aerial pick up coil, L7, thrust into the centre of the PA tank coil, L6. One end of L7 is to be soldered to the centre pin of the coaxial output socket bolted to the centre of a right-angle bracket at the chassis end (see Fig. 2). The other end of L7 is grounded to a solder tag secured under one of the fixing bolts of the coaxial socket.

Socket It To 'Em

Something else to observe about the circuitry of V4 is that no screen-grid by-pass capacitor is specified. This is an accordance with the maker's data sheets. Indeed, by-pass capacitors are omitted also from the two-driver stages, as will be seem from Fig. 5. They should be added (value 1nF 300V) only if they are seen to produce increased drive to the final stage as indicated on a low reading milliammeter connected at MP2. C18 a by-pass capacitor to keep RF away from the anode current milliammeter, M.

The coaxial output socket could be a standard RMA (Belling Lee) pattern since it is cheap and cheerful and has many decades of use in television receivers at 50MHz. From this coax socket a Belling Lee style coaxial plug terminated with no more than a few inches of coaxial cable conveys the RF to the aerial changeover relay. This, if you are lucky, may have Belling Lee terminations — several patterns of relay do. If, however, it is equipped with solder points you will need to make three RF connections to it (apart from the DC supply). With a DC continuity meter, check which of the three lead-outs is transmit. This is easily done by pressing the solenoid lever and noting which way the internal contacts jump. On most commercial RF relays the centre pin is intended to go to aerial and those on either side of it to transmitter and to receiver.

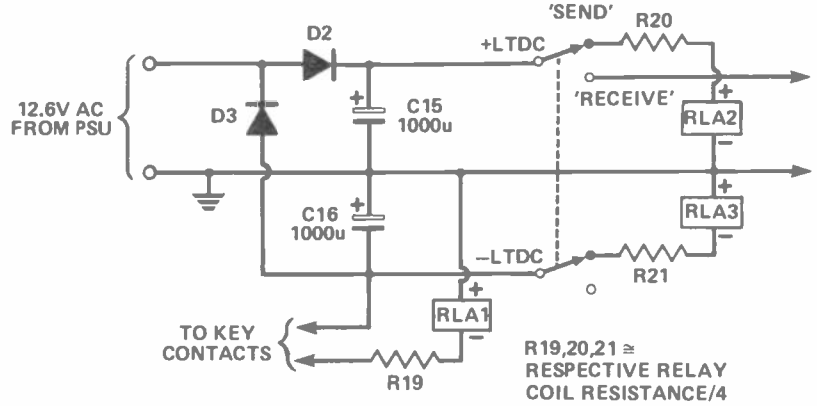
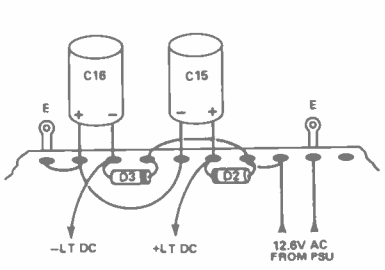
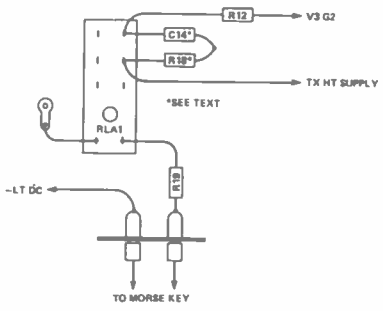


Fig. 6 Circuit diagram of the LT DC supply and the relay coil connections. Note that the exact relay coil connections can be varied.

In making connections to such relays it is important to maintain RF continuity as shown in **Fig. 8**. The braids of the three incoming coaxial leads are bonded to the chassis and to each other, and their inners soldered to the relay lead-outs. No





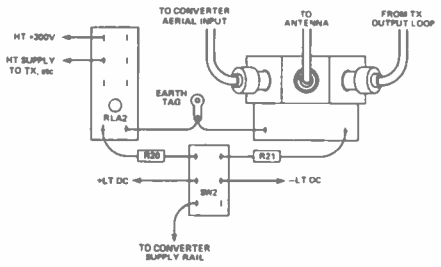


Fig. 7 Connections to the LT DC supplies and the relays. Note that the relay connections will vary according to type. (for the two standard relays, the drawings are for DPCO types which, although these are more than is needed, are quite common in spares boxes!).

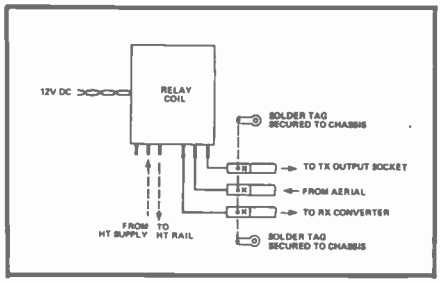


Fig. 8 Alternative antenna relay connections; if this type is used, the need for RLA2 is removed, as this relay can accommodate both sets of switching.

more than half an inch of inner conductor should protrude from each coaxial line. Conveniently, the aerial relay may be positioned on the right-angle bracket at the end of the transmitter chassis. There is no disadvantage with it being further away as long as those coaxial terminations to it are sound and made as specified.

Another method of aerial changeover which dispenses altogether with a relay is shown at **Fig. 9**. It utilises a double section Yaxley switch one of whose sections changes aerial to transmit or receive and the other conveys DC to the main breaker on 'transmit'. Even at 144MHz this has been found to be effective. At the low frequency of 50MHz it is virtually loss-free so long as the bonding of the coaxial leads is meticulously performed.

RL2 is the keying relay. Its 12V DC supply may be drawn from either of the rectifier lines shown in **Fig. 6**. Before deciding which of them to use, measure the voltage they offer on load to make sure there is enough surplus voltage to operate the keying relay as well as the other services.

The Front Panel

To make a neatly finished job add a front panel that is bolted to the chassis shown at Fig. 2. This panel may be a standard 19-inch rack-and-panel type, or if you prefer it may be cut to come flush with the ends of the 14" chassis. A suggested layout is shown in **Fig. 10**.

This part has set out the mechanical and electrical layout of the 'Simple Sender for Six'. The next part will describe how to commission the transmitter and give

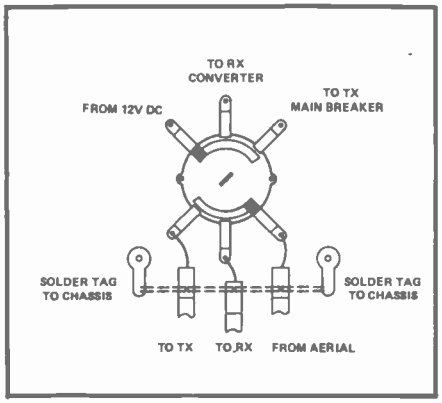


Fig. 9 How the homely Yaxley-type switch can be employed. This replaces both RLA2 and 3.

details of a suitable mains power supply unit and an indispensable device called an RF sucker. Even though it is still unknown who will be allowed to use the new band, this design can be adapted to the 70MHz band simply by changing coil and crystal values.

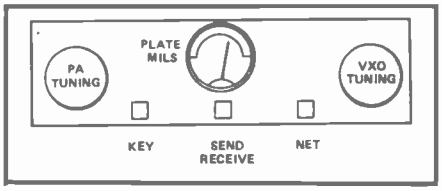


Fig. 10 Suggested front panel lay-out.

Coil Winding Details

L1 35 turns of 30 SWG DCC (double cotton covered) close wound on ½ inch former.

L2 100 turns of 30 SWG DCC close wound or hank-wound 1/8 inch dowel (not critical).

L3 12 turns of 18 SWG enamelled wire close spaced on ½ inch dowel to give ½ inch internal diameter (remove dowel after winding).

L4 20 turns 18 SWG enamelled wire close spaced on ½ inch dowel to give ½ inch internal diameter air spaced (remove dowel after winding).

L5 as L4, positioned close to L4 to provide close inductive coupling to L4.

L6 as L4, mounted above chassis.

L7 2 turns 24 SWG DCC or enamelled wire inserted into the centre of L6. One end terminated in the coaxial socket inner, the other end to a solder tag on bolt securing coax socket to chassis.

Components List

RESISTORS

R1,7,10	47k
R2	4k7 5W vitreous
R3	47k * 1W
R4	470R ½W
R5	2k2 * 5W vitreous
R6	27k * 2W
R8,13	100R 2W
R9,12	10k 1W
R11,15	470R
R14	27k
R16	47k 5W vitreous
R17	100R 5W vitreous

All resistors 0.25W 5% if not marked otherwise.

CAPACITORS

C1	6p8
C2	22p
C3,6,9	1n0 (feedthrough may be used)
C4	15p 500V
C5,12,13	1n0 500V
C7,11	1n0 feed-through
C8	22p 500V
C10	5p6 500V
C11,12	1000uF 25V electrolytic
VC1	25p variable (exact value not critical)
VC2	25p variable
VC3,4,5	12p+12p split stator or butterfly capacitor

VALVES

V1	EF91, 5AM6 or equivalent
V2,3	5763
V4	QQV03/20A
V5	90C1 or equivalent, if required

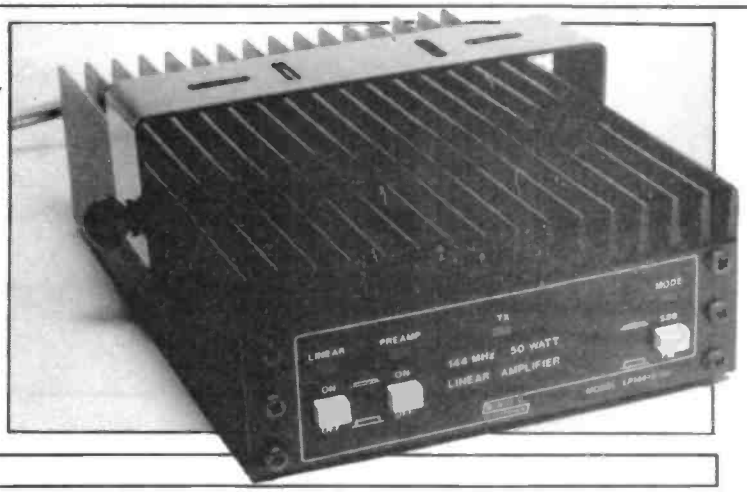
MISCELLANEOUS

M1	0-150mA DC moving coil meter
RLA1,2	12V single pole make (300V DC contacts)
RLA3	12V single pole change over coaxial relay
S1	single pole switch, 300V DC contacts
S2	double pole change over switch
LP1	6V3 300mA panel-mounting light

coax socket; valve bases; former for L1; wire for all coils; tagstrips; metalwork for chassis and front panel; coax and straight wire for interconnections, etc; socket for supply;

* Indicates component values which may require some experimentation.

'Allo John, Got a '290?



Fed up with the output power of your 2m rig? Well, this review of the BNOS LP144-3-50 by Chris Lorek, G4HCL, may provide a solution and improve your receive sensitivity too.

Many newcomers to amateur radio start life on 2m; very often on a limited budget, but prefering equipment with as much initial flexibility as possible, knowing that in the future they can improve and expand as their interests and finances allow. Manufacturers have certainly not ignored this fact witness the emergence of rigs such as the Yaesu FT290, Standard C5800, and so on. These are transportable — sometimes described as 'electronic handbags' — rigs offering use for base station, mobile, or climb-up-the-nearest hill-for-a-bit-of-DX portable operation. They have, of course, proved extremely popular. The natural progression from the ownership of an FT290 is the thought "How can I improve on it?"

The usual limitations are low power output, typically two or three watts, and often a receive sensitivity that perhaps could be improved on. The alternative to trading in the rig for a purpose designed base station or mobile is to buy one of the many 'add-on' boxes such as the BNOS amplifier/preamp reviewed here. These add-on's retain the flexibility of the rig as a portable but give the capability of better performance when a hefty 13.8V supply is available.

It must be said though that this is an ideal viewpoint and there are catches. When using a rig designed for low power, adding an amplifier will not necessarily clean up your signal. If your rig is slightly overdriven on SSB you may be able to get away with it on 3 watts, but coupled to a 50 watt amp you will soon get complaints from amateurs on adjacent frequencies. Overdriving the amplifier will add to the problem.

If your receive side is a bit deaf, a preamp of say 20dB gain and low noise figure will almost certainly give you a more sensitive set-up, but it will make your strong signal rejection abysmal. To take an example: an amateur living about 200 metres from my home decided her FT290 could do with a preamp when used from home. My suggestion of a mast mounted, switchable affair was not financially viable, so I was entrusted with the job popping a BF981 amp inside the rig. Yes, it made a difference, although it would have been better if it could have been made switchable. The problem is now, when I come up with full power she has a few problems! You pays your money and takes your choice.

What Does It Offer?

The designers of this power amp/preamp must have done their homework, as the concept of their product is in my eyes almost ideal. The unit is based on an extruded alloy with bottom and end plates to make up the housing which offers good heat dissipation at a low manufacturing cost. It measures 48mm high by 122mm wide by 178mm deep and as well as rubber feet for base use, a tiltable mounting bracket is provided for mounting under the dash board. Unfortunately the screw holes for the bracket do not allow the amplifier to be mounted with the bracket beneath the amplifier and with the heat dissipating fins away from the mounting surface, by far the best position in practice. Three high visability yellow switches on the front panel control power amp, preamp, and SSB/FM functions, with LED indicators above them, A further LED shows Tx mode.

There are two BNC sockets on the rear of the unit for the RF connections. This means the average user will probably have to change the leads from his rig which have the ubiquitous PL259 connectors. This incurs extra expense and is time consuming but the better performance is worth it. The instruction leaflet states that specific lead lengths must be used between rig and amplifier (more on this later). I think it would have been better to have a flying coax lead for the RF input to be built in by the manufacturer. An ample length of DC cable is wired in with a fuse fitted in the positive lead.

The amplifier is provided with RF sensing so it may be automatically switched in when the user transmits. This may be overridden if prefered by hard wiring a plug provided to a 3.5mm jack socket on the back of the amplifier.

A simple photocopied instruction leaflet is provided, which suffers from one or two mistakes for example, ever heard of a noise FACTOR 1.5dB. . . ?). No circuit diagram is included and the underside of the amplifier has a seal with dire warnings printed on it to

Manufacturers Specifications

Linear Amplifier

Frequency range	144 to 148MHz
Class of operation	Class AB1
Input impedance	50 ohm unbalanced
Minimum input power	500mW RMS
Maximum input power	5W RMS
Recommended input power	3W RMS
Output impedance	50 ohm unbalanced
Output power (maximum)	50W RMS +/– 0.5dB
Insertion loss (straight through mode)	1.5dB +/– 0.5dB
Power requirements	13.8V DC, 5.5A +/–15%

Pre-amplifier

Frequency range	144 to 148MHz
Receive gain	12dB typical
Noise Factor	better than 1.5dB
Input impedance	50 ohm unbalanced
Output impedance	50 ohm unbalanced
Power requirements	13.8V DC, 100mA +/– 15%

discourage user adjustment. This, I think, is a pity as the SSB 'hang time' for instance cannot be changed if required.

Internal Construction

Ignoring the dire warnings — it was for review after all — the covers were removed and revealed a very high standard of assembly quality. A Motorola MRF247 transistor is used in a stripline circuit for the linear amplifier. Examination of the manufacturer's data on this device shows it to be run well within its ratings of up to 100W out, and giving the capability of extremely good linearity. All adjustable components had a dab of sealant to secure them, and also has the effect of showing if someone had been twiddling with them. The connectors were even silver plated — well done BNOS! The receive preamp featured the now almost standard BF981 dual gate MOSFET.

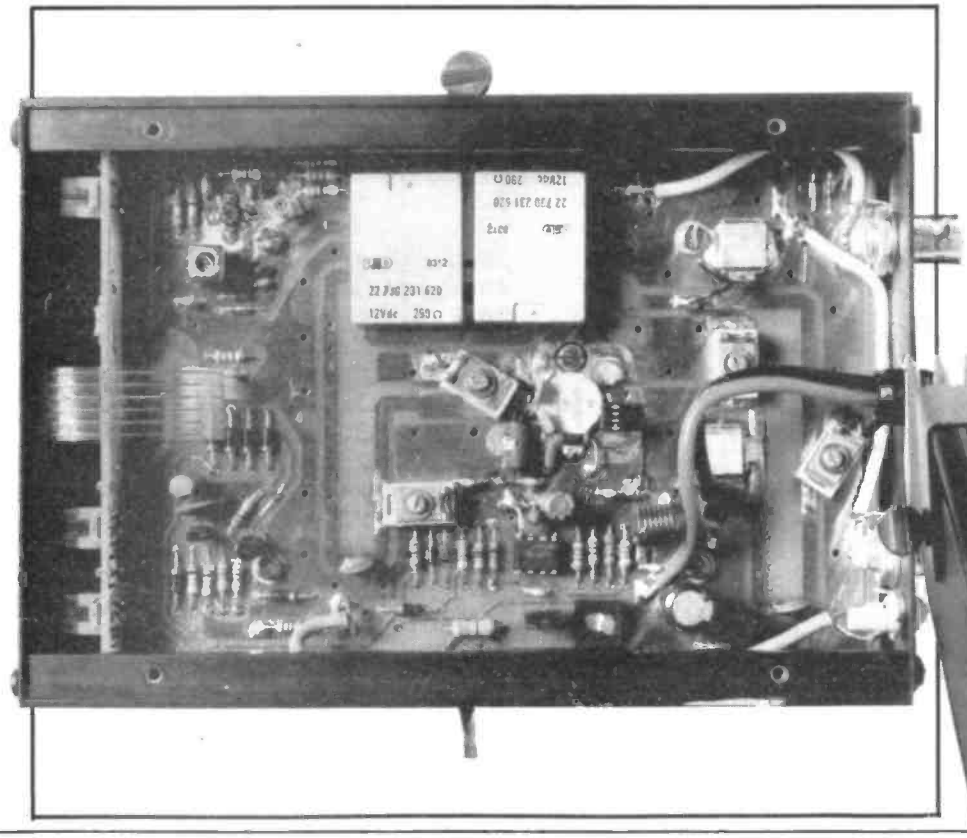
Technically oriented amateurs may like to consult Motorola Application Note AN-791 which is available from their sales offices. This gives full constructional details, including PCB layout, for the MRF247 used in a stripline linear amplifier, RF switched, for 145 MHz!

Technical Results

The first amplifier tested was 'off the shelf' from an amateur radio dealer, just like the average amateur would obtain one. To be honest, the performance was awful with low output power and bad 'splattering' of signal. When a wider frequency sweep test was carried out the linear amplifier worked reasonably on 139MHz which suggests incorrect tuning, although all trimmer seals were intact. BNOS were contacted but could offer no explanation. However they were extremely helpful and quickly despatched another amplifier for measurement, which arrived a few days later very well packaged, in exchange for the faulty amplifier.

In Use

The amplifier was found to be extremely easy to use both in a mobile and base station environment. The clear switches coupled with LED indicators made nighttime use less hazardous when mobile than would be the case with

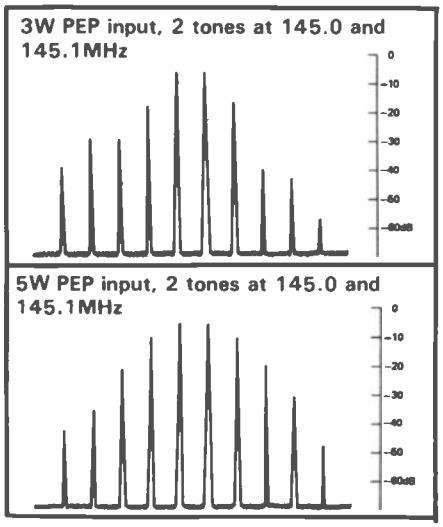


fiddly little controls as found on much equipment. No reports of excessive 'spreading' on SSB were received as confirmed by the laboratory results. It would have been useful to have been able to alter the SSB hang time, especially for contest work, but then the serious operator would undoubtedly use hard wired switching which is thankfully provided for. Unfortunately, the supplied 3.5mm jack plug would not fit the socket on the rear of the amplifier, it was a fraction too wide. No problems were encountered with other plugs though.

The instruction sheet specified certain lengths of input lead as being necessary, which suggested to me that the input matching was not up to scratch. However, no problems were encountered in practice and this was again confirmed by the laboratory results. I am surprised lead lengths are even mentioned, as a well designed amplifier should not require them.

Measured hang time, as supplied, was 510mS on SSB and 210mS on FM. The time delay on FM, before receive capability was restored, came as a surprise but only caused the occasional problem when the odd idiot "Break" merchant called in immediately after drop of one's carrier to try to get in. Round this part of the country we completely ignore these operators any way (as our licence tells us to. They should call in with their callsign and message) but this slight delay may trouble some users. There was virtually no delay when hard switched.

First amplifier and its intermodulation distortion.



First Amplifier

Straight through insertion loss: 0.7dB.
Preamp gain: 12.0dB, to within 1dB over 144-146MHz.
Noise figures: 1.45dB.

Linear Amplifier on 145MHz and 13.8V DC supply.

Input (watts)	Output (watts)
0.5	9.2
1.0	19.5
1.5	23.0
2.0	26.5
2.5	27.5
3.0	28.0
3.5	31.5
4.0	34.0
4.5	34.5
5.0	34.5

Intermodulation distortion
Two input frequencies 145 and 145.1MHz, output levels quoted as dB below output PEP level.

PEP input	3rd order	5th order	7th order	9th order
1.5W	−35/27dB	−41/51dB	−49/62dB	−53/65dB
3.0W	−18/16dB	−29/40dB	−29/43dB	−39/57dB
5.0W	−11/11dB	−22/20dB	−36/31dB	−43/48dB

Output level over larger frequency range
In watts RMS and with supply voltage 13.8V, 50 ohm resistive input/output.

Input power: Freq. MHz	1W	2W	3W	4W	5W
130	11.0	22.5	30.0	46.0	52.0
131	12.0	24.0	32.0	46.5	53.5
132	13.0	26.5	34.5	47.5	54.0
133	14.5	28.5	37.5	48.0	54.5
134	16.5	31.5	40.0	48.5	54.5
135	17.5	34.0	42.5	49.0	55.5
136	19.0	36.0	45.0	49.5	56.0
137	20.5	37.5	46.5	50.5	56.5
138	21.5	39.5	48.0	51.5	56.5
139	22.5	39.0	47.5	52.5	57.0
140	23.0	39.0	47.5	52.5	57.0
141	23.5	38.5	46.5	52.5	57.0
142	23.0	37.5	45.0	52.5	56.0
143	22.5	34.5	41.5	48.0	51.0
144	21.0	29.5	34.5	39.5	41.5
145	19.5	26.5	28.0	34.0	34.5
146	19.5	26.5	28.0	33.5	34.5
147	19.5	27.0	29.5	35.0	35.5
148	19.5	27.5	30.0	35.0	36.5
149	20.0	27.5	30.0	35.0	36.5
150	19.5	27.0	29.5	34.5	36.0
151	19.5	27.0	29.5	34.0	35.5
152	19.5	26.5	29.0	33.5	35.0
153	19.5	26.0	28.5	32.5	32.5
154	19.0	25.5	28.5	31.5	32.0
155	18.5	25.5	28.0	31.0	31.0
156	18.5	24.5	27.5	30.5	30.5
157	17.5	24.0	26.5	29.5	29.5
158	17.0	23.5	26.0	29.0	29.0
159	16.0	22.5	25.0	27.5	28.5
160	15.5	22.0	24.5	27.0	28.0

Second Amplifier

The second amplifier was tested and was found to operate considerably better, and closer tests were performed.

Straight through insertion loss: 0.7dB.

Preamp
Gain: 144MHz 13.5dB, 145MHz 14.5dB, 146MHz 14.0dB
Noise Fig: 144MHz 1.45dB, 145MHz 1.4dB, 146MHz 1.45dB
1dB Compression point: 28mV RMS.

Linear amplifier using 13.8V DC Supply, current drawn and RMS power output into 50 ohm resistive load.

Input RMS	144MHz	145MHz	146MHz
0.5W	8.75W/2.35A	8.75W/2.35A	9.0W/2.3A
1.0W	19.25W/3.35A	19.5W/3.35A	**19.75W/3.3A**
1.5W	29.0W/4.1A	29.5W/4.0A	29.75W/3.95A
2.0W	37.5W/4.65A	37.5W/4.6A	37.5W/4.5A
3.0W	47.0W/5.20A	46.5W/5.05A	45.5W/4.9A
3.5W	50.0W/5.4A	49.5W/5.25A	48.5W/5.15A
4.0W	53.0W/5.65A	52.5W/5.5A	51.5W/5.35A
4.5W	54.0W/5.75A	53.5W/5.65A	52.5W/5.5A
5.0W	56.5W/6.0A	55.5W/5.9A	54.5W/5.75A

Output power with variation of supply voltage

3W RMS input, 145MHz.

Supply Voltage	Output Power RMS	DC Current Drawn
10.8V	32.0W	4.15A
11.0V	32.5W	4.25A
11.5V	35.0W	4.35A
12.0V	37.0W	4.50A
12.5V	39.5W	4.60A
13.0V	41.5W	4.65A
13.5V	43.5W	4.85A
14.0V	46.0W	4.95A
14.5V	47.5W	5.10A
15.0V	49.5W	5.20A
15.5V	51.5W	5.30A

Intermodulation distortion

Two input freqs. 145 and 145.1MHz, output levels quoted as dB below PEP output level.

PEP input	3rd order	5th order	7th order	9th order
1W	−44/35dB	−39/48dB	−46/49dB	−52/52dB
3W	−28/22dB	−38/41dB	−42/49dB	−50/48dB
5W	−23/19dB	−43/32dB	−39/44dB	−44/52dB

Input VSWR: less than 1.3:1 over 144/146MHz.

Harmonics and Spurii: 2nd harmonic −54dB, 3rd harmonic −61dB, all others less than −100dB.

RF vox switching sensitivity: 42mW RMS.

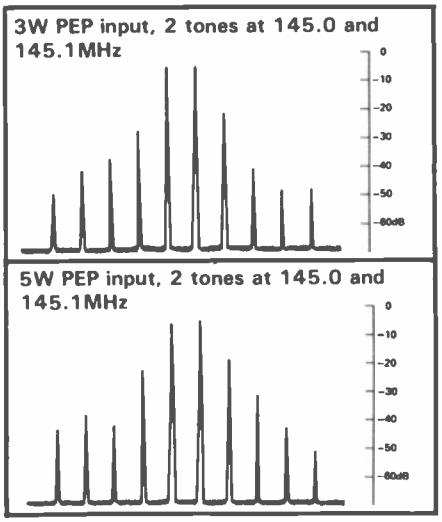
Conclusions

In all, a reasonable piece of British made equipment, which should be high on a shopping list when looking for the next step up from a few watts and a 'deaf' receiver. The switchable facility of the preamp is a feature well worth having, enabling it to be used only when beneficial. The gain of 14dB is a sensible compromise between sensitivity improvement and strong signal degradation.

The amplifier I feel is a little misleading in it's specification, quoting 50W output maximum but with a recommended input of 3W, the type number of LP144-3-50 suggests also 50W from 3W. From both measurements and from the transistor manufacturer's typical specifications this will not normally be realised. However, within its capabilities, it performs admirably. As regards the case of the differing performance of the two samples, one at random and one destined for review, it certainly concerns me that such a unit could be for sale. It would be unfair to pass judgement as there is always the odd one that gets through, I must let you decide. In communication with BNOS, I was informed that all units are aligned using a spectrum analyser to ensure correct operation, and I gained an impression of professionalism and helpfulness, so hopefully this was just an odd problem.

My thanks go to BNOS Electronics for their help and speedy supply of the final evaluation amplifier.

Second amplifier and its intermodulation distortion.



FROM POLAR DAY TO POLAR NIGHT

Following on from John Heys' 'The Vital Link' (HRT April '85), Tony Smith, G4FAI, describes the events leading up to the famous radio contact between Soviet Arctic and American Antarctic expeditions in January 1930.

Nowadays, polar expeditions take it for granted that short-wave radio can provide them with good communications for their everyday work; maintaining contact with ships, aircraft, outlying parties and the rest of the world. Such facilities were not always available; in the 1920's radio communication for these purposes was very much in the experimental stage.

Ernst Krenkel in later life.

The Moscow Connection

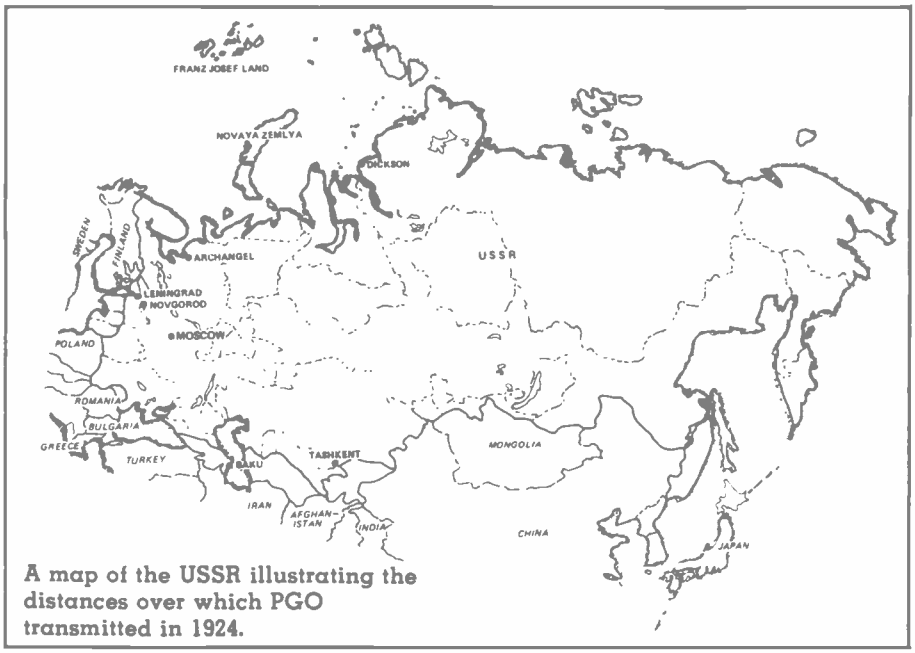
In 1926, a young Muscovite, Ernst Krenkel, told the Nizhny Novgorod radio laboratory that he was to be the radio operator for a year on the island of Noyava Zemlya, which straddles the Barents and Kara Seas. He persuaded them to loan him a 300 watt transmitter and receiver for short-wave experiments in the Arctic. Krenkel's story was not entirely accurate but, having been promised the equipment, he made haste to Leningrad, where the Arctic expedition was being recruited. Since he had served as their radio operator on a previous expedition in 1924, he was made welcome. The expedition organisers were keen to have the experimental station. So Krenkel returned to the radio laboratory, this time in an official capacity, and collected the new equipment.

The expedition was the relief party for the Matochkin Shar polar station which used a 5kW spark transmitter for its 'official' transmissions. This was powered by a motor in a separate room which required an attendant mechanic and supplies of compressed air to get the motor started. By contrast, the short-wave equipment Krenkel took with him, required a fraction of the power. It could work from batteries and offered a potentially greater range that no-one at that time knew.

Krenkel had recently obtained a radio amateur call sign and so chose to make his first calls from the Arctic to other amateurs. The experimental station had no official call, so Krenkel invented one — PGO meaning 'Polar Geophysical Laboratory'.

Initially, few stations replied to Krenkel's transmissions, although to his great amazement, a faint signal was heard but he could only copy half its callsign. He tried repeatedly and without success to contact the station. Eventually using the 'official' frequencies, he contacted an amateur radio magazine who traced the station to Baku, on the coast of the Caspian Sea in Azerbaydzhan, *some 3500km to the south!*

PGO was soon working other amateur stations in the Soviet Union and throughout Europe, with details of each contact being carefully recorded for the laboratory. Operators on another expedition based at Dikson on the Kara Sea coast, built a 10 watt transmitter and two way communication between the two Arctic stations became commonplace. Another transmitter was built at the expedition's head-



A map of the USSR illustrating the distances over which PGO transmitted in 1924.

Admiral Byrd's South Pole flight had its base station at Little America.

Admiral Richard E Byrd.

quarters at Archangel and traffic was then transmitted by short-waves directly instead of working through an intermediate station with the old spark transmitter.

The Nizhny Novorod laboratory had already successfully made contact to the south-east — Tashkent in Uzbekistan — and the far east — Vadivostok on the Sea of Japan coast — using short waves. Now Krenkel's experiments were proving the value of short waves in the Arctic. The benefits short wave radio was to provide — in faster traffic handling over greater distances and significant fuel savings — would make it indispensible for polar exploration.

Moving North

In 1929, preparations began for a 7 man expedition to Franz Josef Land, with Ernst Krenkel as its radio operator. The expedition transmitted its first radio signals, as the then most northerly station in the world, to Novaya Zemlya on 31st August.

On January 12th, 1930, with all the official traffic for the day completed, Krenkel re-tuned his 250 watt transmitter to the 40 meter amateur band, "CQ CQ de RPX". He listened intently to his home-made three valve receiver as he wrote the call of the station replying to him — WFA — repeated several times, followed by an invitation to transmit.

As Krenkel keyed with his right hand, he hastily leafed through an international station list with his left, trying to identify the caller. The "W" signified it was American, but the absence of a number showed he was not an amateur. He was definitely land based, as all maritime stations had four letters in their calls. He sent, in English, "This is the Soviet polar station at Quiet Bay on are you?"

Back came the reply over his headphones, "This is the base station of Admiral Byrd's Antarctic expedition. We can congratulate each other on a world record for long distance radio communication!"

The American Connection

The station calling was located in Little America, which today is the major United States base in the Antarctic. Admiral Byrd had successfully flown over the North Pole in 1926, and had mounted this new expedition in 1929 with the intention of making a similar flight over the South Pole. Financed by public subscription, the expedition cost of $1 million. Four ships took 82 men and over 500 tons of supplies to the Bay of Whales to build Little America.

In his preparations, Byrd paid considerable attention to his radio requirements. The ships at sea, the dog teams on the ice, aircraft in flight, long distance stations in America and New Zealand, all were to be kept in touch by radio. The opportunity was also to be taken to study radio-magnetic conditions in the Southern hemisphere, especially the "mysterious heaviside layer" which, as Byrd put it, "does queer things to radio".

Five radio engineers were on the expedition, under the control of Malcolm Hanson who was assigned from the US Navy Department. Some of the equipment taken had to be rebuilt, and much of it was specially designed and constructed by the engineers. In total, 24 transmitters and 31 receivers were used. The expedition's three aircraft had emergency radios for use in case of a forced landing, plus radio compasses and a directional radio beacon.

Even the dog-sledges had specially designed 7.5 watt sets sturdy enough to withstand the pounding of sledging, yet light in weight. The dog drivers were taught how to use them and developed into quite competent operators.

The main station, WFA, ran 700 watts. Its antenna was supported by three iron towers, each 65 feet high, and its power came from a petrol engine converted to kerosene to save aviation fuel. There were very few days when they could not maintain regular schedules with New York and New Zealand. They contacted the Graf Zeppelin on its flight round the world and the University of Michigan's station in Greenland.

In all, they transmitted over two million words. It is hardly surprising that Byrd recorded, "The radio...has ended the isolation of this ice cap...its help is priceless. But...it is going to destroy all peace of mind, which is half the attraction of the polar regions. Our external difficulties must always be with us..."

Making Contact

When RPX called CQ, it was from the Arctic night and an outside temperature of −30 degrees C. WFA replied from the height of the Antarctic summer, with 2 degrees C and round-the-clock sunshine.

The operators exchanged greetings and details of each other's expedition, first in English, then in German. The contact lasted about 90 minutes and they agreed to try again the next day. This was also successful, and lasted about an hour, but no further contacts were achieved after this.

Just over a month later, on February 18th, Byrd's expedition left Little America, and the last radio message was transmitted from station WFA.

In the Arctic, the party in Franz Josef Land continued their lonely duties until the following summer when they were relieved by a new group. Ernst Krenkel was destined for a distinguished career on both Arctic and the Antarctic expeditions. He also became the most famous Soviet radio amateur.

Revisiting the TR9000 2m Multimode

I was fed up. I was cold, wet, miserable and frightened. I had also cut my hand and torn a good coat. Why? Well, I 'owed' a friend a favour, his Mark Three Cortina had a broken indicator switch and he knew that there was a good car breakers yard near my house. He had asked me to get him a switch, and so I had ended up removing one from a snow covered wreck that was precariously perched on top of two other cars. Every turn of the screwdriver seemed to rock the car and my fright was compounded by the yard dog which seemed to hate humans in general and me in particular.

Hugh Allison, G3XSE, explains that this model is certainly worth a second glance even if you do see it in a dilapidated state in a breakers yard!

Having removed the required switch, I was clambering down to ground level when my torch illuminated the snow filled interior of the badly smashed up Triumph 2000 at the bottom of the pile. Something caught my eye, and I was just going to open the glassless door of the car when the yard owner turned up. He had probably been summoned by my yelling at his hound.

"Hell of a smash up," he said, "poor sod pulled out to overtake with a juggernaut coming the other way. Wot you looking at?" I explained that I was wondering what the grey box jammed between the glove box and the engine was. "Radio or something," he said, "you can have it for a fiver".

"Three."

"Four is it mate".

"If you help me get it out".

Thus, with the aid of a crowbar(!) I became the owner of what must be the cheapest TR9000 ever legally bought. Somehow I wasn't cold or wet anymore.

On The Workbench

The rig looked terrible. The front panel was covered in brake fluid, oil and another substance I'd rather not mention. The case was so badly smashed up that the mobile mount was imbedded into

the metalwork of the case and I had to remove it with a cold chisel and a hammer. After all, it seemed only suitable for spares.

With the covers off, the interior looked like a field of corn trampled by elephants. Resistors, connectors, everything was bent over higgled-pigaldy, but the PCBs seemed undamaged. Out of interest I straightened all the components out so that they were not touching each other and applied 12 volts. It worked perfectly!

Now there had to be a reason for the editor printing the above true story. Well, consider this — if you can subject a rig to a massive impact, crush it, stand it in a field in winter, cover it with snow and other unmentionable substances, remove it with a crow bar, have it opened it with a hammer and chisel then get it working by just straightening the components, then you have a well designed and engineered product. I have also found when servicing an awful lot of amateur equipment that it is very rare for TR9000s to end up on the shelf. Even when they do it's often a boring, simple repair.

The Rig

'Multi-mode' means FM, SSB both upper and lower and CW. There is no facility for AM coverage in the whole of 2m which extends to 148MHz for use overseas. FM mode can be selected in two tuning rates, 25kHz which has been ideal for channel stepping up till now and 100Hz steps for oddball frequencies. If you have been fine tuning the rig on FM and then change over to 25kHz steps, the rig will automatically select the nearest 'S' channel. It will then step up or down from there after you have turned the VFO knob one 'notch'. A very convenient means of tuning.

SSB tuning is only in 100Hz steps, although there is an IRT (Independent Receive Tune) control. In practice, I found that the 100Hz step is sufficient, and produces reasonably natural audio within the limitations of my slightly bent internal speaker! Frequency is excellent, but I have noted on several TR9000s that the actual frequency tends to go low with respect to the displayed frequency over the years. This is typically −50Hz a year which I think is nothing to worry about.

The rig has two VFOs which enables you to leave VFO A on, say, the SSB end of the band and VFO B on the FM end. However, the VFO A/B facility does not remember modes, a feature now found on more modern rigs.

The scanning system involves pushing the 'up' button on the mic to move the rig up one step (either 100Hz or 25kHz on FM). Hold the button down and the rig does a few steps slowly then speeds up until it fair whizzes up the band. A bleep is emitted while this happens. I noted an interesting feature when scanning the SSB end of the band using FM 25kHz steps. If you go from, say, 144.3 to 144.325MHz and there is an SSB station on 144.210; although there is no indication of the station on either channel, as the rig 'comes in' on 144.325 the VCO settles and you hear a distinctive 'plop' noise that isn't there when there is no inter channel station. This effect only happens on fairly strong stations ie S6 and above but it does provide an unusual and quick assessment of activity on the SSB end of the band.

The memory system also has no facility for changing modes. You simply dial up the frequency you wish remembered then hit the memory load button and a bleep is emitted. When you want the channel back, you touch the memory recall button. One position of the memory number switch is programmed so that you can dial up non standard Tx/Rx frequency splits, useful for 70cm transverting. The memory is volatile ie you remove the power and the memory dies, although there is provision to power up only the memory if required.

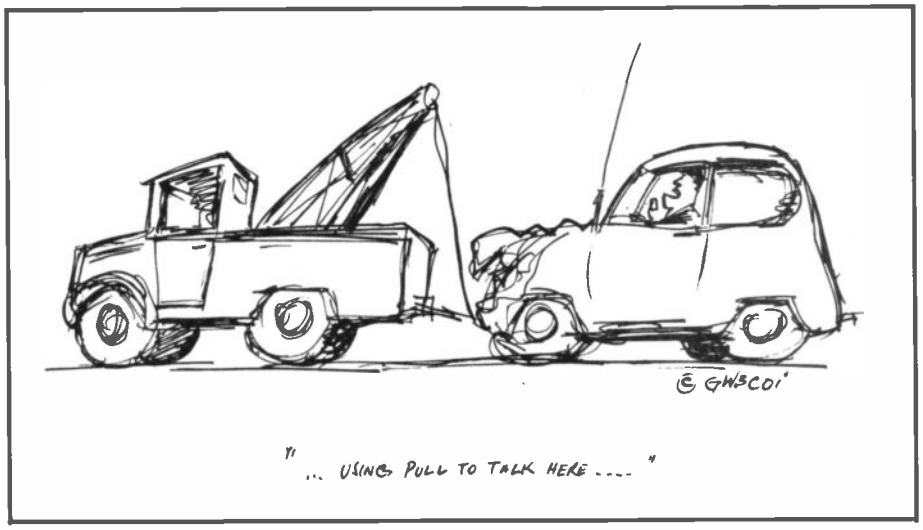
Performance

I would judge the TR9000's performance to be good but not outstanding by today's standards. The receiver is not as sensitive as the newer machines but acceptable. Trio brought out the TR9130 with an improved receiver. My battered TR9000 replaced an aged FT220 which suffered badly from cross modulation. If a local (250 yards away) amateur came up on FM the rig went dead over the whole band. With the TR9000 I have never suffered this problem.

On transmit the rig is remarkably clean. There are no spurious emissions greater than 60 dB down on carrier on the spectrum analyser, and inter modulation products are also well down. I use my homebrew 2 × 4CX250 B linear on the end of the TR9000 and receive no complaints from local amateurs. Audio reports are consistently good, which is interesting since I found an egg cup full of oil inside the mic when I got the rig!

Shortcomings

You canot change frequency when transmitting. To change frequency you have to go back to receive, increment the frequency and return to transmit mode. This is about as useful as a chocolate soldering iron when working through 'Oscar'! It is possible to modify the rig so that you can change frequency on transmit, but I



would suggest you get it done at a dealers. This is unusual advice to come from me but the rig is really shoe-horned in. There isn't room to swing an AVO probe around inside the case — never mind swinging a cat. Most amateurs tend to add more faults than they take out when attempting repairs or modifications.

The other shortcoming of the rig concerns CW operation: there is no break-in. You have to hold the Push To Talk (PTT) on the mic down with one hand whilst operating the key with the other. This isn't too handy if you are a 'proper' CW operator. (These 'proper' CW operators are usually drinking a can of beer at the same time.) There are two solutions to this little problem, either buy a mic plug from Lowe Electronics which costs about £1 and normally in stock and wire up an external transmit switch to it — perhaps a footswitch. Alternatively, build up a little circuit to do this for you. Whilst planning this article I wanted to describe details of the circuit I use to hold the rig on transmit when using the key. However, the American CQ magazine went and published a circuit so close to mine that it is embarrassing. I suggest you get a December '84 copy of 'CQ' if you want to build this little add-on.

Stock Faults

I've had several TR9000s to repair that have all suffered the following fault. The symptoms are low power output on FM and reports of frequency modulation on SSB. The meter lights dim when going over to FM transmit — a pointer often overlooked by the owner. All that has happened is that the 12 volt power in plug/socket on the back of the rig has become slightly resistive. Sometimes just undoing the plug and pushing it back in can effect a cure. Sometimes a dose of 'electrolube' is needed and, once, a minor operation with a pin.

Second-hand Prices

These rigs command fairly high second-hand prices since they are, rightly so, well cherished by their owners. Since there are no valves there is nothing to wear out. Barring really major accidents — I've seen one survive an accidental connection to a 24 volt lorry battery though this is not recommended — the rig should perform 'as new'. The following prices refer to private sales. Trade sales normally carry a guarantee so will cost more.

Be prepared to pay £200 for an abused rig that's a bit tatty and comprises only mic and rig and up to about £250 for a boxed 'virgin' with mobile mount, handbook etc. I've seen the odd TR9000 privately advertised at £300 but it hasn't sold. It's interesting to note that the TR9000 started off new at about £300 and ended up costing £350 before withdrawal. If an amateur had bought a TR9000 new for £300 and kept it in immaculate condition, he could reasonably expect £250 for it today. Not a bad rate of depreciation for several years happy operating, but not quite such a bargain as my £4 example!

A Beginner's Guide to DX

If Martin Atherton, G3ZAY, has whet your appetite with his descriptions of rare DX locations and expeditions, you may want some tips on how to track down and work these exotic stations.

DXing for many people is a most rewarding activity. Apart from competitive considerations of awards and contests, the thrill of pushing a signal around the world and making contact with a missionary on a Pacific atoll or a guerrilla in the Burmese jungle — is ample reward for the hours of patient band-scanning required.

The art of DXing boils down to two fairly complicated skills: finding the DX stations and then working them! The better your equipment, the easier these tasks become; but it is not necessary to have linear amplifiers and beams to work many DX stations. To a large extent experience and skill can substitute for power and antenna gain.

Another key factor is time. Working DX is very easy if you can spend 24 hours a day on the air but for an operator with a family and/or a job, this is clearly impossible. The best way to overcome this problem is to obtain as much information as you can. The more help you have from news-sheets listing DX stations' favourite operating times and frequencies, from telephone alerting systems, and from DX nets where stations gather at a particular time each day, the less time you need to spend monitoring the bands.

How to Spot the Unusual

Experienced operators have an almost uncanny ability to latch on quickly to exotic DX stations even when the bands appear to be filled with routine QSOs. How do they do it?

Spotting the unusual is what the game is all about, and usually all that's required is a brisk tune across the band. The DXpeditions announce themselves either through the pile-up of stations calling them or their quick-fire style: . . .'OH2BH 59''. . . ''Roger. QRZ?''. . . ''DJ9ZB 59''. . . ''QSL.QRZ?''. . . When this sort of thing is heard, a short wait on the frequency usually pays dividends. And so:. . . ''QSL. This is the Tango Three Zero Yankee Yankee listening 5 to 10kHz up. QRZ?''. Western Kiribati in the South Pacific and a nice piece of DX.

Certain frequencies are more popular with DXpeditions than others and should therefore be checked first. On SSB the most commonly used are 28595, 21295, 14195 and the 80/160m DX windows which are listed in **Table 1**. CW expeditions tend to prefer 5 or 25kHz up from the lower edge of each band. In general, the extremities of the bands are avoided by DX stations wishing to work all-comers and are the home of special interest or particular national groups. As an example, the section 14100-14120 is the home of French speaking stations and will only be of interest when searching for the elusive FO, FM, FR, FT, etc callsigns.

The various net frequencies should also be checked but as these change fairly often you will have to listen regularly to build up a current list. Around breakfast time, two popular frequencies are 14220 for the group controlled by Jim Smith, P29JS/VK9NS, and 7085 from 0700 for ZL2AAG's Pacific DX net.

The DX stations operating on a regular basis tend not to favour the quick-fire technique and are therefore much harder to spot. Some have favourite frequencies or times which are reported in the DX news sources, others give themselves away by the content of their conversations which you catch as brief fragments when tuning across the band. For example:. . .''Just taking the XYL down to the supermarket''. . . ''Might get around to cutting the grass today''. . .''Supply ship is due in two months''. . . Hold it! He must be somewhere interesting.

Background information often helps in the process of interpreting these conversational fragments.

Table 1 Some LF DX Windows

	Frequencies	Countries	Notes
	3775-3800	General purpose	IARU band plan, SSB (VK 3794-3800) (JA 3793-3802)
80	3695-3700	VK, S America	Informal, SSB
	3635-3650	Soviet Union	IARU band plan, SSB
	3500-3510	General purpose	IARU band plan, CW
	1825-1830	All except N America	Informal but long established CW/SSB
160	1850-1860	Soviet Union	Informal, recent, CW
	1907½-1912½	Japan	Informal, CW/SSB

"..WHOSE TURN IS IT TO CAUSE THE NEXT PILE UP ?..."

Thus the experienced operator would pause if he heard on 20 metres one Sunday morning, "Betty and the kids are doing fine" because Tom Christian (VR6TC) is often active on Sundays and his XYL's name is Betty. This background information can be picked up by intensive listening and reading the various information sheets and columns. In this country the best source of regular reliable information is the RSGB's weekly DX News Sheet edited by Brendan McCartney, G4DYO.

Another useful tip is to remember that American and Australian stations tend to be numerous when a band is open to them. Thus if you hear only one station on a band with a W or VK accent there's a good chance he's operating from somewhere more unusual than his home QTH. Similarly the signal strengths and quality (flutter, etc) of stations from the same part of the world tend to be broadly similar. Thus any one that is weaker or stronger than the pack or somehow sounds different is well worth investigating.

Working The Unusual

The essence of working a DX station is to get your frequency and timing right. First check where he is listening — is it co-channel or somewhere else in the band? If he is announcing a listening range, say 5 to 10 kHz up, is there a pattern to the way he covers the range? Does he work stations on just one frequency within it, does he start listening at the top and tune down, or does he (as some do) actually listen outside his announced range? This monitoring process is easier with a separate VFO but don't despair if you haven't got one — it is possible to race up and down the band with one VFO. If you announce "transceive" at the end of each call, the DX station will allow you a little longer before he comes back to you.

Timing is a matter of assessing the operator at the other end. Some will only take callers who wait for a "QRZ?", others welcome intelligent 'tail-ending'. This is a technique of dropping in your callsign just as the previous station is signing with the DX operator. It can be very effective if your signal is not going to be one of the outstanding ones in the general pile-up. A word of warning, don't ever try it if the DX station has not yet got the previous operator's full callsign.

General advice on timing is to keep calls short, to give the DX station's call as few times as possible — after all its your call you're trying to get across — and never give your call more than two or three times before going over to receive.

For a much more detailed treatment of all these topics and more, the reader is referred to W9KNI's work "The Complete DXer" available from the RSGB and many radio dealers.

80 and 160m — The Special DXing Cases

Many operators view the two lowest bands as being suitable only for local QSOs and club nets, yet at the right times and seasons, both these bands can support propagation to anywhere in the world. Anything the 20m band can do they can do too, though openings are much shorter and much less frequent. During mid-winter 80m can open up to almost anywhere in the Pacific basin from 1500 onwards and the period from mid-December to mid-January can yield astonishing DX.

LF DXing is one of the great amateur radio traditions.

Table 2 Some Restricted 160m Allocations

Country	Allocation	Notes
Andorra	1810-1875	Phone allowed only in 1825-1875
Argentina	1800-1850	1800-1810 is CW only
Australia	1800-1866	Phone 1825-1866
	1874-1875	
Austria	1810-1850	SSB allowed only 1832-1835
Bahamas	1800-1825	
	1975-2000	
Bermuda	1800-1825	
	1875-1900	
Bolivia	1800-1850	
Brazil	1800-1850	
Denmark	1830-1850	
Djibouti	1810-1850	
E Germany	1810-1950	1800-1900 CW, 1900-1950 CW/SSB
W Germany	1815-1835	SSB only allowed 1832-1835
	1850-1890	CW only
Finland	1820-1845	
	1915-1955	
France	1830-1850	
Greece	1830-1835	
Japan	1907½-1912½	
Luxembourg	1830-1850	
Netherlands	1825-1835	
New Guinea	1800-1866	
	1874-2000	
New Zealand	1803-1857	
	1863-1950	
Norway	1802-1850	
Poland	1750-1800	
	1810-1930	Up to 10W except 1830-1850
Portugal	1830-1850	CW and RTTY up to 60W only
Russia	1850-1950	Phone only allowed 1875-1950
San Marino	1830-1850	
Senegal	1810-1850	
Sth Africa	1810-1850	
Spain	1830-1850	
Sweden	1830-1845	10W CW only
Switzerland	1810-1850	
Syria	1830-1850	

The following countries are believed to have no 160m allocations at present: Bangladesh, Belgium, Belize, Chile, Fiji, Hungary, Italy, Lebanon, Liberia, Monaco, Morocco, Philippines, Romania, Sierra Leone and Turkey.

Remember Marconi and his trans-Atlantic tests? Chasing new countries, setting up skeds, etc, on LF is really getting back to the roots of the hobby. It is also very hard work! On LF everything is difficult. Openings tend to occur in the middle of the night or at the crack of dawn, so operators have to be prepared to do without sleep. Atmospheric noise levels are high. The ionosphere often absorbs as much RF as it reflects. Efficient antennas are several times larger than most suburban gardens, *and* need Eiffel Tower sized supports. And worst of all, the bands are full of S9 + 40 local signals.

The last of these problems is one of the easiest to overcome, and over the years has been tackled by the establishment of a number of "DX windows". These are parts of the bands, set aside by international agreement or convention, for the exclusive use of stations making DX QSOs. Some are enshrined in the International Amateur Radio Union (IARU) band plans. Others have developed accidentally when countries have made only a very restricted frequency allocation available to their amateurs. All rely on the goodwill and common sense of operators around the world to make them work.

A frequent question that people ask about these windows is "What constitutes DX?". The IARU band plan talks about inter-continental QSOs, yet Gibraltar to Morocco could hardly be called DX even though it meets the formal requirement. Furthermore, the path from Europe to the east coast of the USA on 80m is so easy that it cannot really qualify. Californian and Alaskan operators often complain that they can never work Europe because the windows are full of W1s and W2s rag-chewing trans-Atlantically with people they've spoken to hundreds of times before. There is no easy answer to the question. People who have been on the bands for a while tend to say that DX is whatever you haven't yet worked!

80m 'Geography'

The main phone window on 80m lies between 3775 and 3800 kHz. Before the 1984 Region 1 IARU conference at Cefalu it covered only 10 kHz (3790-3800) but delegates agreed to a significant expansion. The window was becoming over-crowded as a result of declining HF conditions and the popularity of five band operating awards.

It is important to note that the Australians are only allowed to operate between 3794 and 3800, and the Japanese between 3793 and 3802. Thus, when these countries are coming through, QSOs with them should have priority in the top 7 kHz.

Because of its narrowness, this 80m phone window has long been the home of some of the worst types of list and net operations. DX stations cannot work co-channel without assistance because the immense pile-ups jam the frequency and prevent them being heard by the stations they call. On the rare occasions that they try it, they usually find that QSOs are spaced 5 minutes apart — 4 minutes waiting for the pile-up to die down and 1 minute exchanging information.

The normal remedy of split frequency operation has until now been hindered by the lack of spectrum in the window. Hopefully, the

extra space released by the Cefalu decision will encourage more DX stations to go solo and dispense with the assistance of list-masters and net controllers.

Moving down the band, the next window — an informal one — is between 3695 and 3700 kHz and was used for QSOs with VKs before their allocation at the top of the band was made. It is still used occasionally by those South American countries whose allocations do not extend to the upper window. It can become very active during contests or when conditions are particularly good. The last of the phone windows is the Russian one, from 3635 to 3650 kHz at the top of their phone band. Stations from the various Asiatic republics (UM8, UJ8, UH8, etc) are to be found on most evenings. The general rule on 80m is that countries whose allocations do not include 3775-3800 use the top 5 to 15kHz of their phone band for inter-continental QSOs.

160m 'Geography'

Whereas the 80m windows are available for use by stations at both ends of DX QSOs, the situation is different on 160. Co-channel DX QSOs take place all over the band, because of the patchwork of frequency allocations in different countries as illustrated in **Table 2**, but the main DX windows are intended for split frequency working.

The most important window is 1825-1830kHz and is a 'no-go' area for Americans and Canadians. Stations outside North America transmit inside the window and listen on a frequency of their choice outside it. This ensures that the Ws and VEs, with their powerful linears chewing up each other's receivers, have a part of the band where they can actually hear very weak signals.

The Russian window — an informal and recent development — is 1850-1860, and similar procedures apply. Russian stations transmit in the window and, as far as possible, listen outside it, though Europeans tend to work them co-channel. Theoretically, this should be a CW window as the Russian phone allocation only extends down to 1875kHz, but in practice phone stations do seem to turn up in it.

Like all the DX windows these are entirely voluntary arrangements, but the CQ Magazine top band contests specifically forbid transceive QSOs in the Russian and American ones. It is likely that any that take place will not be counted for contest points, and regular 'offenders' may be disqualified.

Another informal top band window is made up of the entire Japanese allocation — 1907.5 to 1912.5. European operators should transmit at the bottom of the band (say around 1820-1830) and keep the window clear so that the weak oriental signals can be heard. Not all do, however, and particularly in eastern Europe where the JAs are much louder, co-channel QSOs are common. JAs can often be heard in England during spring, autumn, and winter evenings; at their sunrise.

General Considerations on LF

Since most of the DX windows are relatively narrow and the available number of channels is usually considerably smaller than the number of listening operators, it follows that many of the normal rules of operating behaviour cannot be applied within them if sanity and good humour are to prevail. On SSB in particular, the concept of "I was here first so its my channel" has to be discarded straight away. If, after very careful listening, someone decides to call CQ DX and gets a response, he will usually stand by after the QSO to see if any others want to have a try, rather than carrying straight on with another CQ. Failure to do this results in unpopularity at both ends of the path.

Another problem with the "I was here first. . ." approach is that as the band opens it is quite common for operators to find that there are other stations on 'their' channel. Last winter the author heard American, Japanese, and Spanish stations all calling CQ DX on the same 80m frequency and refusing to work each other because each had decided that it was his frequency and the others were interlopers!

Propagation on the LF bands may vary greatly over quite short distances; as little as one hundred miles can make all the difference between Q5 and negative copy. During December 1984 there were several afternoons on 80 metres when DL stations could be heard giving 57 reports to W6s on the long path though ONs and PAOs could hear nothing at all. It follows that CQ DX calls by any one station, or by a group of stations in the same area, should be fairly infrequent in case they are not in a zone of good propagation.

Whereas normal advice is to spend at least 20 minutes listening for every minute calling CQ, in the windows the ratio should be nearer 100:1. Too often it is possible to hear Europeans for whom the band is not open, persistently calling CQ DX at the same time as DX stations underneath them are calling CQ Europe. Some of these Europeans, thinking the band is completely dead, even go on to start local QSOs in order to bemoan the poor propagation!

While on the subject of local QSOs, common sense dictates that there can be no objection to the DX windows being used for these at times when long distance propagation is impossible. To determine such times, a good rule of thumb is to treat the LF bands as having DX capability from two hours before sunset until two hours after sunrise, except during December and January when they may be open right around the clock. These periods may seem to be overgenerous, but remember that the test is "Are the bands open to DX at a QTH sufficiently close to suffer QRM from me?" and not just "Are they open at my QTH?". As an example, continental stations in the evenings will be working DX one or two hours earlier than UK stations and will not appreciate UK QSOs on top of them.

The windows that are exclusive to one country do not, of course, need to be protected during daylight hours in that country. In particular, the JA top band window can safely be used for local QSOs once the sun has risen in Japan.

There is plenty of space on the bands for DXers and rag-chewers if we use them intelligently. Let's all enjoy whichever aspect of DXing takes our fancy, and use whatever tools or techniques we are comfortable with. And remember, when things get fraught at the top end of 80 metres, it's only a hobby!

Metre Wave

As thousands of passes from the December Radio Amateurs' Examination poured out from the technical colleges of Britain – and as the Licensing Authority readied itself to process the flood of applications from people wishing to transmit – a significant moment occurred in the history of the UK Class B licence: the half-way mark along the G1 series, represented by the G1M___ callsigns, had been reached. How significant? A look back over Class B history will help our assessment.

At the end of February '85, the G1 licences issued reached the halfway point of the series. Jack Hum, G5UM, assesses the significance of the continuing growth in those taking to the VHF/UHF bands.

It was as long ago as 1964 that the Class B licence was invented and a quite new callsign structure was adopted for it, the 'G8-plus-three' sequence. The licence permitted operation *only* on the metre-wave allocations, quite a new thing in British ham radio experience. Indeed, for the first four years of its life, the Class B ticket was '70cm and down': not until 1968 was it extended to take in 2m.

Few observers at that time could have foreseen this new quasi technician-class licence would prove to be so enormously popular that the G8 + 3 series, from G8AAA to G8ZZZ, was to become exhausted in sixteen years(!) nor that the process was to continue as the G6 + 3 succeeded the "Gee Eights" early in 1981. By then, the number of Class B licensees had proliferated so dramatically that the whole of this latest callsign block was used up in something like four years, to be succeeded in turn by the "Gee One" series.

It was not long before the number of Class B licensees overtook the older established Class A. The crossover point occurred at the start of 1984 when the official statistics showed that there were more than 26,000 current Class B permits, nearly two thousand more than the Class A category. The trend continues. The take-up of Class A permits is slow: that of Class B is like an avalanche.

The cause of this phenomenon? Very largely the arrival of ex-CB operators in huge numbers on to the amateur metre-wave bands, where the RF lifestyle is akin to what they had known on 27MHz.

Is this trend for the good of amateur radio or is it detrimental? Some observers say one thing, others say another. What many observers will tell you is that few of today's new hams appear to have served an apprenticeship of years of short-wave listening – the customary training ground for yesterday's hams. This probably matters little: in my experience, assimilation into ham radio customs and operating techniques is generally swift.

This assimilation is going on all the time as the new thousands flood on to (mainly) 2m, large numbers of them becoming new readers of *Ham Radio Today*. The purpose of the present article is to attempt to speed up that assimilation process in some small way.

Antennas Again

There are two primary areas where the newcomer may welcome some advice both from his fellows on the air and in the amateur radio media. One of them concerns aerials, the other operating procedures.

In the excitement of securing the coveted callsign and of getting on the 2m air for the first time, the newcomer understandably opts for the simplest and perhaps cheapest aerial system which will enable him (or these days, often her) to get talking. Almost certainly the newcomer will settle for a vertical omni-directional device to provide the facility to converse with the locals on FM and to access whatever

THE LANGUAGE SWITCH

CB-speak		Ham-speak
"You are Radio 5"	=	"You are readability 5"
"I can hear you in the back of the set"	=	"Your signals are low level or even weak".
"The personal"	=	"The name here is. . ."
"My radio"	=	"My transceiver" (or rig). A radio is a thing which dispenses music from the corner of the living room or car.
"On this side"	=	"Here"
"Break break"	=	Callsign only need be uttered if you wish to access a repeater or a frequency channel

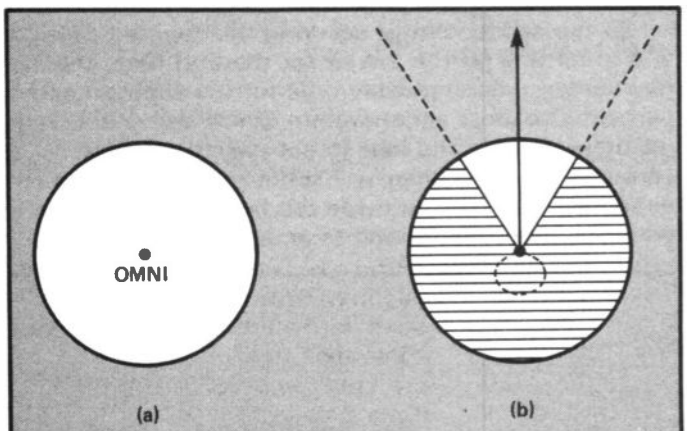
– and there are a few other equivalents . . .

repeaters are within range. Omnis are easy, that's why.

It does not take the new licensee long to discover the inherent danger of this approach, which is that, operated under these self imposed conditions, amateur radio will come to seem little different in terms of range from CB – and it may have been precisely to escape these limitations that the enthusiast made the decision to go in for the RAE and "become a ham". Something else they will soon discover is that often when a clear channel is sought there isn't one because several hundred operators within range are all operating simplex – and most of them are audible to our newcomer-friend because of their "squirt in all directions" aerial systems.

In no time at all, the newcomer will realise that this all pervading condition could be abated if some of those several hundred put their signals only in the direction they wanted them to go and not all around the district. And recognising that for maximum effective use of his *own* RF he should do the same, he will resolve to visit without delay one of the emporia who advertise in *Ham Radio Today* and to buy himself a beam antenna. This device – maybe nothing more than a 5-element Yagi available on the market in great profusion – once installed will at least abate the QRM he/she causes to others who don't want to hear him, and will greatly reduce the QRM he/she hears from them in turn.

After unwrapping their new acquisition they will sit down with a pair of compasses and a sheet of paper to plot its stated beam width, an operation of but a few minutes which will help prove to them how they had been wasting their hard-won RF energy in profligate radiation in all directions from that anti-social omni-vertical.



How a directional aerial helps put your signal where you want it to go, and reduces interference to your locals. In circle "A" the omni-directional aerial radiates in all directions. Every VHF operator within the circle can in theory hear your signals: the objective is that only the wanted station should do so. Circle "B" shows how this may be achieved by the use of a directive antenna. The majority of stations within the shaded area will detect a greatly reduced signal. Those along the aerial's line of shoot (the unshaded area) will receive a much enhanced signal because the transmitted RF energy is being directed on to the required target.

Even the best of directional aerials radiate a small amount of energy off backs and sides: the rear lobes are indicated in the diagram. For close range work such as local nets these subsidiary lobes help sustain communication even when the beam is not pointing at the target.

It will also soon become apparent how fortunate they are to be able to put up such a directional antenna at all. I hope they will have sympathy for the many unfortunates, who, by the accident of location, are unable to erect an outside antenna of any kind. Many flat dwellers can do no more than erect the simplest of antennas in often confined spaces.

To the operator more fortunately placed, the directional aerial's merits will become evident after a few hours of use. No longer will they be accused of being anti-social because they block those S-channels which other people are trying to use. No longer will his signal be weak and watery in the next county because most of it is not getting to the next county at all, but is wastefully 'clobbering the locals'.

Certainly there may be problems in arranging suitable rotating facilities for the newly acquired beam, but human ingenuity has a habit of swiftly finding answers. Hand rotation is better than none!

Talking To Friends

On the 'metre-wave' air you are talking to kindred spirits, people with similiar interests. In doing so, you are also exposing your callsign to hundreds of listeners beyond your manor. What emanates from you tells other people the kind of person you are.

To head off any reputation for being 'a long winded gasbag and someone to avoid' it is a good plan to tailor what you say, as though you were talking to a friend face to face or over the telephone. In a normal conversation, courtesy would prevent you from dominating the proceedings by talking in a monologue and thus failing to allow your companion to comment. The same thought should be present when you are talking into a microphone.

If it is important to keep simplex conversations 'natural', this is doubly so when talking via repeaters. Always there are others waiting to follow *your* repeater exchange, so 'keep it short' is a wise axiom.

Finally, in the context of talking to friends and harking back to the opening of this piece on the 'CB to ham radio' transition, it is noticeable when one listens on the 2m band (and to a lesser extent on 70cm) that a sizeable proportion of ex-CBers wish not to disclose their former RF lifestyle but are readily identifiable as ex-CBers from the phrases they use. Many others, however, appear not to mind. Although they have become hams, they continue to see value in the CB facility and continue to use it.

To those who seek to switch from 'CB language' to 'ham language', a few suggestions are offered in the accompanying panel. It can be argued that because communication is what amateur radio is all about, it matters little if you *do* retain CB parlance when you come on to 2m. Others would argue that CB language is alien to amateur radio and should be dropped when the ham ticket is initiated. Here, as in so many other aspects of amateur radio, it is for the individual to decide.

And so – this is where we came in – welcome to all the G1M____ and G1N____ readers who have helped to push the tide of Class B allocations beyond the half-way mark. It won't be long before the Gee Five plus Threes are here!

Shack Tactics

If your shed is already occupied, Ian Poole, G3YWX, has a few ideas on where to put the 'shack' and how to set it up.

One important decision which faces every active radio amateur or short wave listener fairly early on is where to locate the shack and how best to plan it. Time and thought put into planning the station before it is set up will pay dividends later by making operating easier. It is possible to set up a shack in many different areas of the house and since I first became interested in amateur radio, I have put my equipment in a variety of different places. One example was a small VHF station which was housed in a chest of drawers. The equipment was normally hidden from view, but by lowering the front of one of the drawers which was hinged, the equipment could be operated.

Another station I used for a short while was located in a walk-in type cupboard. Again this could be shut off from the rest of the house but it had the drawback that feeders were difficult to get in and out without them going all around the house. Another shack was located in the loft which was fairly spacious but it did get very cold in winter and very hot in summer.

Shack Requirements

Different people will have their own ideas about the way they want their shack to be set out. Some people will want to use it primarily for operating, others want space set aside for constructing and some will want a shack which will provide facilities to accommodate both. Therefore, ideas of what is wanted will vary according to what the shack is to be used for and each person's preferences. Hard and fast rules about the 'ideal' shack are difficult to lay down except to say that it is worth taking some time to decide what exactly is wanted from the shack.

Despite this variation there are still a number of common points which should be considered when setting up any shack. Initial features that should be looked for include the size of the room and whether there is room for expansion. Power sources and accessibility for feeders should also be considered. I also required several other features and points when setting up my various shacks.

One of the first points was whether it would be possible to shut the shack off from the rest of the family. If the radio equipment is located in one of the living areas, not only will it invariably lead to comments about the noise but it is also wise not to leave the equipment open to others – especially if they are young. This is particularly important with young children as their fingers seem to get everywhere!

Hidden But Accessible

Even though the shack should be shut away it is nice to have it relatively accessible so that it is easy to go there. I often just want to spend a few minutes in the shack to see if there is any sporadic E on 2m or find out if 15m is open. If the shack is difficult to get to there is a tendency not to use it and miss the sporadic E or the rare DX.

Another factor which is worth looking into is cable access. Although coax lines can be run around the house without too much difficulty, they can be unsightly. In view of this, a shack with ample access to the outside world is needed. This factor becomes even more important if open wire feeders are to be used at some time or another because they are not appreciated when run around houses.

Size is another important feature. If my shack is anything to go by, the actual operating space for the equipment only takes up a small amount of the shack. The remainder is taken up by components, equipment which may come in useful, books and all the rest of the 'junk' which goes along with most amateur stations. Therefore, the shack needs to be large enough to accommodate both the equipment and the 'junk', as well as leaving some space to get in!

After deciding the shack's re-

quirements, the next stage is to look at what is available. Unfortunately the various places which are available seldom live up to what one would like. Therefore you have to be quite ingenious to make the best out of what is available. There are several possibilities which can be investigated. Obviously the ideal situation would be to be able to take over a spare room and have ample space for the operating table, a constructional area, cupboards and bookshelves, but very few of us are in this situation. Therefore places like large cupboards, lofts and the backs of garages should be looked at.

Although I have seen a few examples of cupboards convented into shacks, including one of my own, they do tend to be fairly small and lack sufficient storage space. A loft can also be converted quite successfully into a shack, but it may require a lot of work to prepare it. A loft ladder may have to be installed, a floor laid and roof lined which can be fairly costly. Also the joists must be checked to ensure that they will take the weight without cracking the ceilings. The other drawback is the temperature extremes which will be experienced. However, a loft will usually provide considerably more room than many other places in the house and it can be shut off from the rest of the family.

In addition to these places, I have heard of people using the backs of garages and sheds such as the one described in the August '85 HRT. One's imagination and ingenuity provide the limit of where a shack can be set up. In order to outline the problems and how to overcome them, it is worth looking at two examples of where I have set up a shack — one in a cupboard and one in a loft.

The Cupboard Shack

Siting a shack in a large cupboard may not be ideal because the useable space is limited. However, if some thought is put into its planning, making the best use of the available space, this can be quite an acceptable solution. In fact the shack I used for some time was actually situated in a cupboard that measured about three feet square.

A sturdy table top was constructed out of block board covered with formica and battened to the wall. A small gap was left between the back of the table and the wall for cables to be passed behind the equipment. In addition to this, sufficient space was left for a chair when the door was closed. This meant a chair could be kept in the shack all the time — one did not have to be filched every time the equipment was to be used.

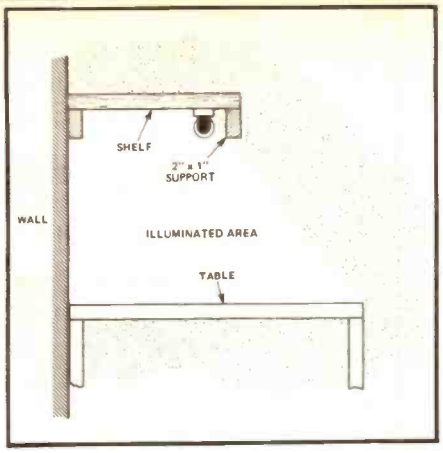


Fig. 1 Strip light mounted under a shelf using the shelf support as a shade.

In order to make maximum use of the available space, plenty of shelves were put up to accommodate all the books and other paraphernalia. Although these shelves were all above the table, some may be carefully positioned underneath so that they don't interfere with any leg space.

Lighting is an important feature in any shack, especially if any construction work is envisaged. I installed a small filament strip light under the lowest shelf which illuminated the work area, but was shaded from direct view by the shelf support as shown in **Fig. 1**. An angle poise lamp was also used and together these lights provided all the necessary lighting. It is worth noting, that fluorescent lights should be avoided because they produce a considerable amount of RF interference well up into the microwave region.

Although this type of shack is bound to be small, it can be quite adequate for a number of situations. Equipment will have to be kept small (pity about the AR88!) and the shack must be kept well organised if it is to be successful.

For many people one of the most logical places to set up a shack will be in the loft. It has several advantages being reasonably easy to convert into a shack and separate from the rest of the house. Amateur radio will tend to remain in the shack, which the rest of the family will appreciate, and is usually fairly accessible. However, there are a few disadvantages which should be considered before embarking on a massive conversion programme. Probably the first and most obvious question to ask is whether the loft timbers will stand the weight of all the equipment and people who may go up there. If there is any doubt over this, it is worth chatting up a friendly builder or surveyor for his opinion. The expenses of converting the loft should also be thought about. A floor will have to be put down, a loft ladder will be required and power may have to be put in. Remember a loft will suffer large variations in temperature. Despite these disadvantages a loft can still be the most convenient place for a shack.

Attic Tactic

If you decide to use the loft, the first essential purchase is one of the specially made loft ladders which can be bought at most of the large DIY stores. These ladders are easily fitted and usually the hardest part of the job is modifying the trap door so that it hinges down rather than being put in place from above. Ensure there is sufficient room in the loft for storing the ladder when it is not in use — there may be a beam or wall where the ladder folds down.

The next stage is to lay the floor. You can use ordinary floor boards, or you can use high density flooring grade chipboard. This produces a neat finish and can be cut to fit around any beams, pipes and chimneys. However, the low density chipboard available in many DIY shops for shelving and furniture is *not* suitable.

With the floor complete, the inside of the roof timbers can be lined with hardboard. This is particularly useful in older houses where roofing felt has not been used. It helps reduce the temperature extremes, reduces the amount of dust blown in from outside and improves the appearance of the shack. When fitting the hardboard, it should be well supported to stop it drooping and warping with time. Screws should be used about every foot

along the length of the roof timbers and the hardboard cut so that edges coincide with a timber — ensuring that the edges of the hardboard are supported.

Having finished the woodwork the mains supply can be installed. Although there will probably be a lighting ring main in the loft, this should only be used for lighting. The proper 30A ring main which supplies the 13A sockets should be used to supply the equipment. If a separate spur does have to be taken up into the loft, this should have a switch downstairs so that the mains can be isolated and checked without having to go into the loft itself.

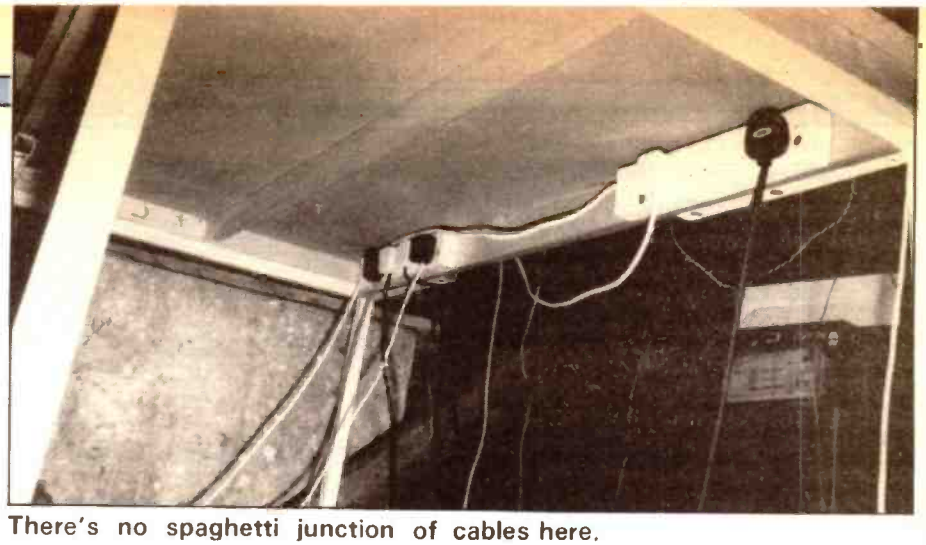
Finally, the station itself can be arranged. If at all possible, try to locate it over a supporting wall to minimise the possibility of ceiling cracks.

Construction of a Table

Wherever the shack is located, whether it is in a loft, a spare room, shed or anywhere else some form of table will always be required. Scout about the second hand or surplus office furniture shops for an old, sturdy desk or table but they are not always easy to come by or may not suit the requirements. Remember if the shack is in the loft it may be possible to get it in there. The alternative is to build your own. This may seem like a daunting task to someone like myself, whose woodwork is nothing to boast about, but it can easily be kept within one's capabilities if the design is made simple and only basic woodwork techniques are used. This last factor was vital when I set about building mine.

The basic design of the table incorporated a table top made from medium density chipboard — blockboard or plywood is just as suitable but a little more expensive. The length will probably depend on the space available and the equipment to be placed on it. The depth should be sufficient to provide a space of about three inches behind the equipment for wires and connectors and fifteen inches or so in front of it for work space so that log books, mics, morse keys and constructional projects have ample room.

This table top was supported by a framework of 2" by 1" to prevent any tendency to sag with the heavy equipment remaining on the table for long periods of time. This extra support is particularly necessary if chipboard is used and it was fixed to the table top using countersunk screws through the top and into the framework beneath. Although this does leave holes in the top, these can easily be filled and the whole top was covered with formica to give a good work surface.



There's no spaghetti junction of cables here.

In addition to providing support for the table top, the framework enabled the legs to be attached more easily. I was fortunate to pick up some legs which had probably been used in an office table and with one set of legs for each end they provided a cheap solution. If you can't get hold of anything like these, use wood, dexion or so forth, provided that it was firm.

Finally, wiring can become very messy so I decided to use the four socket mains distribution blocks. Two or more of these can easily be mounted under the back of the table on the wooden framework. Power leads from the different pieces of equipment are connected into these and a single cable is taken to the mains outlet. In this way, the table can easily be isolated if required and some semblance of order can be kept in the wiring.

Equipment Layout

Whilst ideas for the design of the shack and table are being formulated it is well worth giving some thought to the layout of the equipment so that the whole station will come together properly. The layout of the equipment is important and determining the best position for each unit will make using the station easier and more enjoyable. It will also ensure more efficient operating — particularly important if any contest operation is envisaged.

The main transceiver or receiver should be placed in the middle of the table so that the dial can be easily seen. The tuning control should be a few inches above the table top enabling the equipment to be tuned whilst keeping most of one's arm on the table — thus reducing arm ache! If a separate transmitter is used, place it to the left of the receiver so that the microphone can be held in the left hand, leaving the right hand free for filling in the log book or making notes — or vice versa if you are left handed. If the station does not use a separate transmitter then this space could be used for a linear or second receiver. If a morse key is used, this should be conveniently placed and have a sufficiently long lead so that it can be neatly routed around the log book and equipment. This will then leave space to one side of the main station receiver or transceiver for another station.

The narrower shelf above can be used for ancilliary equipment such as aerial tuning units and SWR bridges. Keep the SWR bridge in easy view to monitor the reflected power during transmissions so that if there is an aerial fault this can be seen quickly. The wall space above the shelf can be used for useful maps like QTH locators or Great circle maps. It is very advantageous to have them easily visible so that they can be referred to at a glance.

General Safety

It is probably true to say that safety standards in the shack have improved over the past few years.

This is partly as a result of an increased awareness of the hazards, partly to the voltages in equipment being much lower. It is also due to the fact that much more commercially made equipment is bought now which has to comply with certain safety standards before it can be imported. However, there are several general safety precautions which can easily be incorporated into a shack, especially if they are introduced at the planning stage. Some of these precautions have already been mentioned, but are summarised here.

1. Ensure that all equipment is properly earthed and the mains earth is intact.
2. Incorporate a mains on/off switch which is easily accessible, and also make the rest of the family aware of where it is located.
3. Use an earth leakage or residual current circuit breaker to give protection against electrical fires or serious electric shocks.
4. Keep radiated RF away from inhabited areas of the house. Although it is unlikely any harm could be caused with low powers and non directional aerials, it is possible to cause harm when high powers or directional aerials are used. As it is difficult to assess actual field strengths at a particular place, it is safer to keep all RF at a distance.
5. Keep any equipment enclosed in its cabinet if it carries high voltages or high power levels so that injury from electric shock or radiated RF may be avoided.

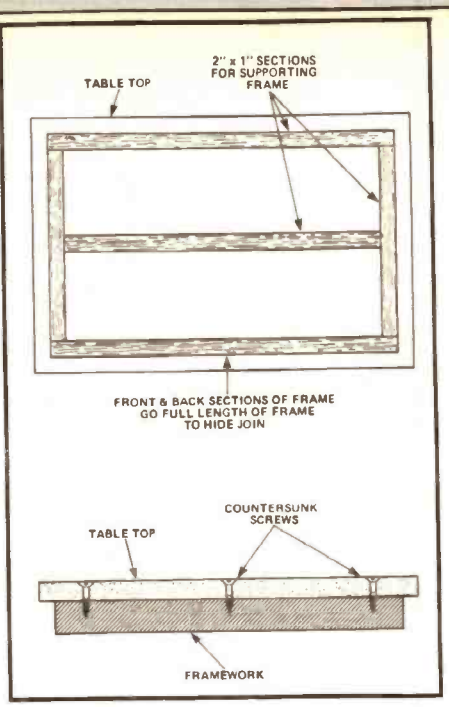


Fig. 2 A worm's eye view of the underside of my operating table illustrating the supporting frame.

These ideas represent only a few of the ways for keeping the shack safe. An awareness of possible dangers will enable most of them to be overcome and the shack to become a safer place both for you and any visitor.

As there are only a very few people who are fortunate enough to be able to spare a large room in their house for a shack, most of us will need to apply a little native cunning and ingenuity in order to make the best use of the space available. Having done this, the shack will be easier and more pleasant to use for construction and operating. Ideas put forward here should be used as a starting point or at least provide some food for thought when planning out a new shack or just updating an existing one.

Free Readers' ADS!

EXCHANGE

SWAP Spectrum computer with interface one, two microdrives, two joysticks, speech synthesiser, music synthesiser, cassette recorder for either an HF receiver or 2m/70cm transceiver cash also considered. Phone 01 992 7210 (David) after 5pm.

EXCHANGE Eddystone EC-10 GC receiver for good VHF scanner or receiver above must be VHF not FM 70Hz-500MHz. Friends phone no. 051 521 7794 ask for Eddie. BFO, upper lower filter AGC dial. Phone Jack RF AF gain.

EXCHANGE Grundig yacht boy 700 receiver digital analogue SSB wide, narrow immaculate. For telereader or codemaster CWR610E unit, must be in first class condition. Borthwick, 92 Lingle Road, Selkirk, Selkirkshire.

FOR SALE

BC348 RX with built-in mains supply £25. TCS Rx with power supply and speaker £25. AT5 Tx with codar mains power supply £30. G4FUY QTHR phone Reading 733633.

FT901 DM £500. FV901 DM £95. Y0901 with bandscope £125. FC901 £65. SP901P £40. Recently 'tweaked' by SMC. New condition. G3AAG Hants 0730 892143.

FDK multi 750E; FDK expander 430; CDE antenna rotator; RCS 32 meg freq counter; SEM power supply and pre-amp plus amp (2M); Trio JR-310 Rx; Heathkit scope, multimeter RF sig gen, 2m Tx-Rx offers. Phone 0604 582390.

10 FM, Icom ICB 1050 fully converted, plus AKD 10/25/L 25 watt linear in mint cond, for a classic set up. £55 ono and get HAM-MASTER 4500 compression mike free! Ring G0ANC on 01 247 6097 (day).

COMPLETE 2 metre station Icom 211E, MuTek board, matching speaker, addonis desk mic, RTTY TV Scarab program/interface for Spectrum, 10 amp PSU Hirschman rotor and bearing, power splitter, 2 9ele Xbeams, co-lin antenna excellent condition £500 — 01 803 5235.

NEWBURY VDU terminal £275; Racal modem model NH, £220; Telecom Eagle answer machine £25; Oric 48K home computer boxed as new £45; Cobra hand held 40 chan 4 watt mobile £20; would consider part ex for multi channel transceiver. Frank 0924 464452 (West Yorks).

TEXTRONIX 545A with high gain pre-amp 1MV-50V/CM £150 ono. Heathkit RA1, matching speaker, xtal calibrator £45. SSB filters XF9-B equiv 90dB off band attenuation with three crystal pilots for USB LSB CW £40. Telephone 01 648 1978.

OMEGA tcvr, part built. Specified case, IF, synthesiser, all bands, audio filter, preselector and displat built. QRP PA faulty. Tx/Rx switch kit. Miscellaneous extras. Cost £350+. Sell for £200. Bon (0270) 841168.

VALVES. About 80 assorted new, boxed radio and TV valves. £10 to clear. Phone Mike G4JXX on 021 773 8139 after 6pm.

COMMUNICATIONS receiver DX302 10kHz-30MHZ digital readout. USB/LSB/AM /CW 240V 12V or batteries as new with box and manual £130 ono. Battle, E. Sussex, tel 04246 4723.

SHACK CLEARING. Realistic DX300 communication receiver, digital 10kHz-

30MHz xcon'd with manual. MT-1 morse tutor & manual & data sheets. Transformer 'Partridge' 390.0.390 6.5V 5.0V GT reg. horn ex-alarm on board with diodes. Lot £150 good buy. Buyer collect. Brentwood G8ZRY 0277 226953.

DAIWA Search Nine two metre receiver £50. CB rigs two £35 and £25 FM legal 27/81 portable TV £65. Portable CB £35 music centre £50. Base station box £8. SWR £3. Phone 01 674 0513 Mike or 01 946 2967 Jane.

FOR SALE Tandy realistic DX-100L receiver. Range, 0.15MHz to 30MHz supply, 240V AC or 12V DC as new, £55. Edwards, 32 Lorne St, Wrexham, Clwyd.

FOR SALE Hygain 5 all frequencies £110, Yaesu FT101 complete aerial power meter mic etc £225. Phone 0283 221870. Wanted Belcom or Sommerkamp including 26T30 ? MHz. Phone 0283 221870.

FOR SALE Turner JM+2U power mic £20 Altia power echo mic £15. Audioline 341 27MHz FM transceiver £30. JVC P100 portable TV/Radio £60. ZX81 & case & keyboard 16K RAM £30. Ferguson cassette tape recorder £15. All above ovno. Telephone (0772) 634194 to 8pm.

ICOM IC240 sell for £85 or WHY? Also 30● telescopic mast (SMC) Telomast 1 year old, cost £55 offers? Ring (0222) 862607.

HALLICRAFTERS S27 VHF Rx 27.3 to 14.3 MHz works well AM FM SSB CW ex US Navy with manual £75. Barry Stone G6SRE Ashford Kent 25991.

YAESU FT101Z fan, mic, handbook. Mint condition. Original packing £325. Tel 0272 624864.

CW the easy way; PNP comms black box interface connects Dragon 32 and any rig for CW Tx/Rx. New with CW cartridge, RTTY tape. £35. 2M 4 ele quad one week old £20, old rotator works well want SSB/CW. Crawley 515711.

BURNDEPT BE471 3ch UHF handheld xtalled RB0 SU8 RB15 3 NiCads, charger mobile mount, £125. Pye Cambridge 6 channel 2 metres FM complete £45.

Realistic PRO 2008 scanner 144-174 410-512 68-88 FM boxed £100. WS31 40-49MHz, user manual, handset £35. McKay 71 Coopers Lane, Bramley, Basingstoke.

TRIO R2000 HF receiver mint condition as new cost £480 accept £375 ono. May exchange for Yaesu FT7B with cash adjustment. Must be mint, tel Irvine 217611.

FDK 700 EX 25W FM mobile in original box. Two 5/8 mobile whips, one with mag mount. 2M 2 element beam. 1 amp regulated power supply. Dual SWR — power meter 2m slim jim. £210 ono. Phone Wolverhampton 0902 737090.

TR 9000 Belcom 80W valve linear QKD pre-amp redifon PSU 15amp 17E Tonna Hirschman rotor scan mic. For sale £450. 01 941 3731.

YAESU FT270 RH fully synthesised, 2 meter FM transceiver. 45W high power 5W low. As new, 3 months old. Very little use £280 ono. Also Kenwood world clock model HC-10 £25. Tel Stoke-on-Trent (0782) 328561.

REALISTIC PRO-2002 50-channel programmable scanner receiver bands covered VHF-Lo VHF-Air ham VHF-Hi UHF-Lo UHF-Hi excellent condition complete with base mobile whip antennas, mains operation or 12V DC. Telephone 021 474 2429 £150 ono.

MINIMETER multi-Q valved Q-multiplier built in mains PSU; HRO bandspread coils; joystick VFA plus SWL/QRP joymatch ATU offers? Ring Smarden (Kent) 448 after 7.30 pm.

KW 2000A with QRP facility, mains PSU, desk microphone, Daiwa active filter, £220 the lot. Phone Geoff (0373) 812274.

SHARPE radio cassette EF525 twin deck 6 mths old £100 or exchange best 2m Tx/Rx or 80m SSB/CW Tx/Rx. Write with details, Chris, 188 Trehafrew, Newtown, Powys SY16 1QB.

FT757GX £500; automatic ATU £200; 902 ATU £100 possible exchange for 934 set any make, 934 Colinear 943 SWP, 934 preamp, 200W linear amplifier £100; FT power supply 20A £125; mint/boxed condition. Tel 557982 Paignton.

IC02E with case and spare battery pack original packing £220 ono. Telephone Keith evenings and weekends only on 0656 56516.

SALE Trio 9R59DS gen cov Rxs, revalved, realigned, choice two ideal beginners. Any reasonable offer or WHO 045387 3263 evenings John.

2M FM Trio 2400 handheld transceiver. Complete with charger, speaker, mic and leather case £130. Please write Pete Lomax 43 Whittington Hill, Old Whittington, Chesterfield, Derbyshire. All enquiries will be answered.

FOR SALE Ham multimode II 28-30MHz converted vgc £150 ono. Also LCL 40ch 10M FM as new unused only £35. Telephone 0624 815889 office hours only.

TOTSUKO TR2100M SSB CW mobile/portable 10W, absolutely as new unused, original packing offers or exchange for oscilloscope WHY. Shure 401B microphone new, original packing £15. Alumast by Western Electronics, base, rotor mounting plate, cost £400, unused £250. Phone Hayle 754369.

FT101E with FM; UK CB; unmarked all mode transceiver £400. Sommerkamp 788 DX CC all digital readout, scan, SWR, original packing £250. FT101 ZD very little use £500. Totsuko 2M SSB/CW portable, mobile, NiCads, case, unused. Offers. Phone Hayle 754369.

FOR SALE Sommerkamp FT7B HF Tx/Rx 80-10 metres. Complete with mobile mount, mic and handbook £295 ono. G4ANW 0730 61859.

SX-200N scanning receiver (26-514MHz) plus handbook, workshop manual, tape recorder, control relay and "UHF" co-ax adapter £195. G8LQM Tel: Luton (0582) 31075.

YAESU 290, mobile mount, batteries, charger, as new £250. Daiwa 30 watt linear £40. CN620A SWR meter £45. Headset and mike £25. Two power supplies. Jaybeam six element quad £25. Colinear £25. HF5 with radials £45. Phone Stone (Staffs) 818193.

SELLING vintage books: Admiralty Handbook of Wireless Telegraphy vols 1&2, 1938 edition, 1940 reprint. Wireless Direction Finding, Keen, 4th edition, 1947. The Elements of Radio Communication, Brown and Gardiner, 2nd edition, 1946 reprint. G4HKN, QTHR. Telephone Todmorden 6165.

MICROWAVE MODULES 10 metre pre-amp, MMA 28 £10. KW202 rx, KW204 tx, (160 metres to 10 metres, 100 watts CW/SSB) and KW107 Supermatch, £290. Trio R600 receiver, £150. Microwave modules 70cm linear amplifier, MML 432/50, £75. Tel 0926 498388.

FOR SALE or swop. Racal RA17 receiver with manual £165 ono. Yamaha TC800GL stereo recorder with leather case £135 ono. Yamaha m/coil cartridge MCI's new £45 ono or will swop all three for Icom R70 or Trio 2000 or 1000 or similar receiver. Buyer to collect. Basingstoke 882 825.

WESTOWER 42 ft free standing tower framed base plate type. Telescopic and tiltover. Buyer arranges collection £250. Tel 0621 815054.

FOR SALE Kenwood TS430S 150kHz-30MHz used Rx only £620. Kenwood power supply PS430 £70. ATU AT250 £200. Kenwood mic and Yaesu lightweight headphones CW radio all boxed vgc paid £1,120 will accept £850 ono for the lot. Phone 01 310 1717.

VERTICAL ANT GP5 80-10 never used £40. Wanted 4CX250B's and or bases. Eddowes, G3NOH 01 997 4756 QTHR.

IC271E, new, boxed, never used £550. Also matching 20amp PSU all new £650 together or swop for FT757 Ex or take IC251E with MuTek board in part exchange, TR9130 or similar. G6NQN, 42 Tregundy Road, Perranporth, Cornwall TR6 0EF.

YAESU FT221R multimode, 2 meter base station. Superb condition no mods, £295. Wanted changeover relay for SB102, 4-pole 2-way, 100 VDC. Also 6146B's, and HF linear 1.8MHz-30MHz ap-

prox 100W output. £80 max. Phone Dave, G4JXK. Fareham 230737.

PHILIPS Pal colour TV pattern generator, UHF/VHF excellent condition, cost £350, sell for £95 or exchange for 2m transceiver. Phone Stirling 64161.

COMMODORE MPS-801 printer. Suit CBM 64 or VIC-20 12 months old, little used. New ribbon cartridge £100. Tel George G6RIL 0709 816334.

SINCLAIR Microvision adaptor, unused. ARE airband receiver Rotel 230 CB transceiver new. Datong morse tutor. All in good condition £200 the lot. 103 Westfield Road, Ealing, London.

FOR SALE extremely old receiver, valves, super-het 200-2000 metres new valves, but needs attention. Still in original walnut case. Have got original valves. Rx is pilot little Maestro. Adam, Old School House, Poslingford, Nr Clare, Suffolk CO10 8QY. Can rail within 20 miles. Open to good offers.

SEM TRANZMATCH ATU 160-10m £40. Microwave modules ATV converter £20 both in good condition. Phone 0670 815587 (Northumberland).

TRIO JR310 amateur bands rx £70. Eddystone 840C comms rx 100kHz 30MHz £65. OKI microline 80A dot matrix printer, centronics i/face £90. Pair large Kefkit hifi loudspeakers, professionally built, as Kef concerto 100W RMS 8ohm £90. G4DML 0376 27568.

AT 32 Altron 32ft telescopic tiltover lattice tower unused with base ground socket 2 post, winch and all fittings £300. Buyer arranges collection. Phone 04468 261.

MARCONI TF1064A VHF UHF sig gen £55. Pye IF generator £15. Both working. Advance digital VOM with manual not working £15. Pye Westminster W15U complete xtaled SU20 SU8 £80. Buyer to collect phone George GI4SJQ 0762 334648 after 5.30pm.

TRIO TR3200 70cm transceiver 12 channel (10 fitted) C/W NiCads, charger, carrying case etc. Orig packing excellent cond. £115. Will Datapost anywhere UK. G8RFE QTHR Tel 0533 834542.

FOR SALE Bearcat 220 FB 20 channels 30MHz 512.45MHz in box with manual, excellent. £130. Phone 01 228 4835.

CR100 working order £45; b&w 14" portable TV £35; Creed 75 teleprinter, high speed paper tape reader, homebrew HF PA chassis, pocketphone charging unit — offers? 0225 743295.

PALM IV seven channels £80; DNT/FM modified new £50; Lunar 2M-30/160 £100; HF600D 600MHz counter £85; telequipment D1011 £200; DX200 scanner £150; Revtec 934MHz not working offers. Write 11 Greatcroft, Firs Road, Winterslow, Salisbury SP5 1SN or phone Ron 0980 862489 evenings.

SALE Sommerkamp FT7B 50W mobile/base HF Tx/Rx. Complete with manual, microphone, mobile mount, headphones, homebrew ATU/SWR unit, commercial half size G5RV aerial and interconnecting leads. Just connect to 12 volt PSY or car battery £280. Phone G4ANW 0730 61859 soon.

MARINE VHF radio telephone Rediphone Sealand 66 navy type 1202 fully synthesised 24/240 AC cost new about £5000 vgc exchange for R/C aircraft or helicopter or HF transceiver or anything interesting in radio. Ring 0492 514568 (Colwyn Bay).

SWAN Astro 150 240 watts input, mint, new October 1983, with 30 amp PSU. Never used mobile complete mobile mount workshop manual. No mods. £450 ono. Would exchange for base HF rig similar value Trio preferred WHY 061 624 2808.

REALISTIC DX200 5 band communications receiver covers longwave shortwave ham and CB as new £65. Phone 0376 26490.

SELLING: Linear Yaesu FL110 (200 watts) for 160-10m. Price: 75 British pounds. TRS-80 Pocket computer with manual (291 pages). Price: 60 British pounds. Ring: Belgium 03/480 41 51 or PO Box 135 Lier 2500. Goods will be sent C.O.D.

FOR SALE 1.5kva 240V generator. Spike and RF free petrol engine, ideal field event. Little used hence sale £250. Buyer collects. Phone Keith G0CGB Dartford 70073.

TRIO TS510 Rx/Tx plus PS 510 PSU £190. Bremi BRL200 linear £40; HRO plus original PSU £60. Collectors item HRO MX plus 697 PSU original wrapping unused, valves, coilpacks original manual £120. HRO coilpacks £4. PSU 0-500V £20. Tel St Albans 39333.

ALTAI DM-313P power dynamic microphone with switchable roger beep 1 month old £10 post paid. Satellite limpet magnetic antenna mount, extra strong magnets fitted. Ideal for vinyl roof vehicles £15 p.paid. 3-PL259 back-to-back 4-PL259 base mountings £14 p.paid. 205 Moss Lane, Burscough, Ormkirk, Lancs.

FOR SALE Trio 2m multimode 9130 nice condition £350. Tel Welwyn Garden City 328831.

SINCLAIR 48K Spectrum, with Sanyo tape recorder both boxed as new. Also tons of mags and software including simple morse tutor. Bargain £75 no offers. Tel Leics (0533) 896868 (Rob).

SILENT KEY G2CLP lattice towr motor emotator control £175 3 element tri band thunderbird £130. Ft101ZDFM Mk3 £450 FDK multi 3000 FM/SSB £350. SWR/power meter £15 4x6SJ6C £10 lists available. Contact G3FWA/G3XKB Bedford 48272/870526 QTHR.

YAESU FT707 complete line, inc FT707TX/RX, FP707 PSU, FC707ATU, FT707 VFO. All in original cartons, superb condition. £700 ono buyer collects. Tel N'pton (0604) 409655 Rod evenings.

COBRA 148 GTL DX with Zetagi B300PS amplifier, 75 to 400 watts, run off 12V, for sale or px for HF VHF transceiver WHY? Tel Shrewsbury 67087.

DX302 digital communications receiver mains/battery. Telescopic aerial and instruction booklet. Mint condition, cost £290 accept 190 ono. Tel Bournemouth (0202) 572877.

AR88 LF RECEIVER for sale. In working Order with handbook. £38 Phone 0703 865625 or write Mr Stevens, 4 Southern Gardens Totton, Southampton, Hants G4EOR.

FOR SALE JIL SX400 VHF UHF scanning receiver professional model 25-520 MHz. Reason for sale owner changing to HF band. /=400 ovno KL Philips 3 Linden Court, Frithville Gardens, London W12 7JJ Tel 01 743 0811.

FOR SALE Belcom linear 2 pre-amp fitted vgc £75. Homebrew robot 400 slowscan-fastscan-slowscan converter boxed but required power supply £150 ono. Carriage extra or buyer collects. Telephone Atherton (0942) 891140.

TANDY CB handheld model TRC100S, 40 channel, 4 watt, 4 months old, cost £130, £55 post paid. AF Sephton, 16 Bloemfontein Avenue, Shepherds Bush, London W12 7BL 01 749 1454.

YAESU FT102, FC102, FTV107R, all filters fitted AM/FM board, SP102, the lot going for a song only 6 months old £895. Telephone Ballymena, Northern Ireland, 0266 40173 anytime. No time wasters please.

HAM CONCORDE II mint condition £90 Zetagi tran 2 match £25. BV131 mains linear £40. B 300 PS portable linear. 3-30MHz £70. K40 mike. £12. Zetagi match box £10. Modec 176 matcher SWR/power meter £10. Barrie Cartledge, Oysterber Farm, Lancaster. LA2 7ET. Tel 0468 61567.

DATONG 2m converter complete with power supply unit receiver tuning 28-30MHz £28. Yaesu FRV 7700D converter £40. Both complete with details and post paid, letters only please. Mr FW Moore, 76 High Street, Ide, Exeter, Devon EX2 9RW.

FOR SALE Icom IC 720A general coverage; IC SP3 ext SP; Yaesu FP707 power supply; Yaesu FT101ZD AM, USB, LSB, CW; FC902 ATU; SP 901P phone patel speaker; 6 x 6 mega mobile antennas. (0861) 522795. Good reason for sale.

STAG 357 AM USB/LSB Altai power mike both as new, perfect condition £55. Also 26-30MHz 25 watt linear amp £13. Tel Huddersfield (0484) 25982 ask for Joel.

SONY ICF2001 communications receiver with power supply £85. "Harry Moss" CB £25. Commtron CB legal FM and AM 40 and AM plus 40 £35. Two metre receiver £50. Handheld two metre transceiver £80. Jane Barton, 124 Dora Road, Wimbledon SW9 01 946 2967.

YAESU FT480R 2m multimode, boxed, absolutely perfect, £295. Microwave modules MML100S linear with preamp and SEM 12A PSU, £140 together. Ham Concorde £70. CP100W linear 25-30MHz with preamp, £40. Going HF! Paul, G4XTA. Tel 09313 359 (Cumbria) can arrange delivery.

YAESU FT-980 general coverage HF Tx/Rx one year old, as new, Curtis keyer, 300Hz CW filter, 9KHz FM filter. Full break-in, suitable for Amtor, recently re-aligned by importer, manual, service manual, boxed. £1145 ono Bruce G4WVX QTHR. Tel 06286 64415.

FOR SALE Trio TH41E, speaker mike, 13.8 volt to 8 volt converter, very good condition £175 telephone Stevenage (0438) 359428.

FOR SALE Icom IC-04E 70cms hand-held. Excellent condition, complete with Ni-Cad pack, charger, ¼ wave, plugs and documentation. Boxed. £235 ono. Phone: Colchester (0206) 396372.

PRO-30 HAND HELD realistic scanner with Ni-Cads Universal charger in box £190. Phone 01-228 4835.

ICOM power supply IC-3PE 13.8V 3A. Built in speaker and transceiver mounting fixture 7 months old. Boxed £40. 3M photo copier. Good as new £30. Buyer collects or pays postage. Tel Mike (0704) Burscough Nr, Ormskirk 892088.

MICRONTA digital multimeter model 22-189 £30 ono as new, BBC ROMs Printmaster £25. Graphics ROM £25. View 2-1 £40. Watford Prestel ROM £15. Also one Ferguson 3T07 tape recorder £12 ono. Phone Rugby (0788) 812940 after 7pm ask for Dave.

SELL VTVM $30. HV probe $20. Autek audio filter $170. Maplin audio processor $70. Musicolour 3 channel 2500W/channel $100. 16 x 4116 ICs $24 valves etc. Send SAE or 2 IRCs for list. Mr Rout, 3/137 Champion Street, Christchurch, New Zealand.

DATONG DC 144/28 two metre converter input and output gain. Fully adjustable. £25 ono. Datong RFA Wideband pre-amplifier 2-200 MHz. Works well from HF to 2 metres. £20. SEM Visa 80 metre receiver £20. Phone 01 590 5490 ask for Martin.

FOR SALE Omega transceiver boards, CIFPU, complete VFO, audio filter, LP filter, CXO board, PA, notch filter, preselector, all built to high standard. Just needs final adjustment and casing to give a cheap 10W CW rig (all bands). £300 ono. Tel G4PLM Coalville (0530 812102).

TRIO 2200GX all xtals, NiCads, carry case, original box and manual, A1 condition, £75 — 0952 57670.

FOR SALE Yaesu FT757GX, FC757AT automatic ATU FP757 switch mode power supply £775. Middleton, 49 Wolseley Road, Stafford.

RIO TS 780 all mode dual band VHF/UHF transceiver. Little used. £690 ono. FDK 2 metre 750E multimode transceiver with 70cm 430 expander £390 ono. Perfect condition. DJ Gray, telephone Nottingham 264533 home.

AIR RIFLE .22 Weirauch, tuned with 4x32 ASL scope. Cost £165. New never used. Sell or PX fpr HF/UHF radio. WHY? Tel Shrewsbury 67087.

FOR SALE vintage receiver Philips type PCR LW MW SW original condition working order £35 ono. Or would exchange for anything to do with 2 metre. Phone Gerry, Fakenham 701 436.

FOR SALE Bremi BRG27 pre-amp, new £15. Starduster antenna £15. Postage extra. Phone Michael, Radlett 4172.

ASR33 ASCII PRINTER and keyboard with full service manuals. Offers to Tony Leeming, Tel 0608 811102.

YAESU FT902DM + FC902 + speaker SSB CW FSK AM FM 100 watts all HF bands DC-DC power unit fan + mic £600. Yaesu FT480R + mobile mount a YM40 mic £240 or exchange above for FT757GX + ATV: Alvin, Ashtead, Surrey 77945 (24 hr answerphone).

YAESU FRG7700 rx plus FRT7700 for sale £250 or swap for HF transceiver of similar value. Telephone (0406) 362610 Lincs anytime Les G4ZID QTHR.

SALE SEM transmatch ATU 160-10 metres with E21-tune vp facility absolutely as new £90; have purchased automatic ATU G3MIN QTHR Shoreham Sussex (07917) 3552.

FOR SALE 9 ele Tonna £10 for 2m 19ele Tonna £12 for 432MHz or both £20 ono. Phone 02773 4386 (Essex) G4OJN QTHR.

TOTSUKO TR2100M 2m SSB portable covers 144-144.4MHz 10W output £80. Telephone G8GSB Fillongley 0676 42036.

TRIO TS780 2m/70cm, duo bander in mint condition with original box and manual £675 ono. G1HBR 01 856 6917.

TANDY TRS-80 mod-1 level-2. 48K, upper/lower case, twin 40-track tandon drives, two cassette recorders, 80 micro magazines, all manuals, and lots of software — including basic instruction course, assembler/editor, sublogic flight simulator, games £300. Tel: (024 026) 2718.

FOR SALE Icom IC215 13ch fitted with NiCads excellent condition £90 wanted manual or circuit diagram for Halicrafters SX24 receiver also Philips N1500 video borrow or buy. Expenses paid tel Lowestoft 741283.

YAESU FLDX400/FRDX400 complete with machine speaker (FR Dx 400 with 2m converter) £240 ono. 04203 7533 after 7pm.

TRIO TR310 amateur band receiver £90. Kenwood UHF FM 8300 transceiver all even repeaters channelled plus three simplex £90. Pair pocketphones sub plus nightcall charger also three spare receivers — John G6UGU QTHR telephone 0302 841530.

FT290R mint condition, boxed unmodified £275 ono. BNOS linear LPM 144-3-100 6 weeks old, 4 hours use, boxed £150. Realistic DX-302 digital frequency readout 10kHz-30MHz excellent condition with ATU £120. Phone Mick G1IUC Leyland 424878. After 6pm.

OPEN university electronics course (TS282) all course books plus generatorscope, a combined oscilloscope/ function generator/power supply, used for experiments. Good condition £60. Other science, technology courses available. SAE details, Greenough, G8BEQ, 2 Bexley Close, Glossop, Derbeyshire. Phone 04574 5468.

YAESU FT726R 2m base station in mint condition as new, boxed 2 module fitted £650. Tele 0600 860297 GW0BRG.

ICOM 745 including FM board AT500 auto ATU £900, Tono 50000 RTTY AMTOR terminal with built-in screen £600 ono. Phone Clive 01 834 7296.

YAESU FT101ZD complete with fan, mic, DC PSU, low pass filter £375 tel: 05255-2207 (Bedfordshire).

CR100 handbook £3 (original) AR88D instruction book (copy) £2. After 6pm (0434) 603085.

ZX81 open to offers or part exchange for ham receiver including 6K RAM and printer — 2 rolls of paper. 1 game included, all in original boxes as new, tel: 061 682 5533 after 6pm.

2M RECEIVER, Daiwa SR9, 144-146MHz VFO, and 11 crystal controlable channels; S19, S20, S21, R2, R5 fitted. VGC £50 telephone: (0474) 26036.

SONY ICF 2001 receiver, frequency coverage 150-29,999kHz, 76-108MHz. Local normal or Dx filter, 6 memory presets scan or manual keyboard tuning (computer controlled). LED display external sockets for aerial etc. AC power adaptor included £120 ono. Telephone Walsall (0922) 614141.

FOR SALE Yaesu FT7 HF mobile base transceiver in

good condition with BNOS 6 amp PSU £200. Tel John G4YDM QTHR 091 4162606.

YAESU FT230R 25W mobile £200 nice rig. Met 14 element 2m £24 3 months old. Jaybeam C8 70cm colinear MkII save £20 sell for £73 brand new unboxed. 01 540 3959.

FOR SALE Trio R2000 VHF unit 100kHz 30 MHz 118-174 MHz all mode 10 mems £400. Including SW preselector. Ferrograph series 6 stereo RR ¼ track few spools £70, demos. Also Spurcabs' booksheet £2. Armstrong stereo AMP £10 pair not working. Call 53 Maple Road SE20.

TRIO TR-9130 2m multi-mode sparingly used, and in good condition £275. Vic-20 starter pack, 16K ram, joystick, Sargon II chess cartridge, PSU £65. Tel Keith; 01-205 9172.

YAESU FT230 one month old, only used on Rx, boxed as new £200 ono. Tel (0723) 364149.

YAESU FT290R NiCads, charger, etc £220 ono. Also FT790R (70cm) same accessories but £189 or part ex for FT230 or FT209R. Also have Sony C6UB video. New heads fitted £170 or swap for why, as above. Tel Chris 0782 46570.

STACKING FRAME Tonna, for four non element aerials 144MHz, new, still in box, £25. New Tonna four way power splitter 144MHz £25. Datong D75 processor as new £35. Telephone 0782 394666 (Stoke).

MARCONI CR100 communications receiver £30 ono. Free to buyer above R1155 receiver no power supply but works ok if supply fitted. Fair condition. John telephone "The Lizard" 290711 after 6pm. Would exchange above for smaller Rx or why.

LOOK no reply to my ad, June HRT. Have C1FPU, synthesised VFO, audio filter, 8w tx board, preselector, notch filter, output filter board, logic board. All as per HRT articles. Just need final alignment and casing. Offers? Swop Micron? G4PCM (0530) 812102.

YAESU 101ZD transceiver. Fitted with FM board and fan. Excellent condition £400. Also Yaesu 2 metre hand held, model 208, complete with base charger £150 the pair. Phone evenings 0277 823434 Brentwood Essex.

MULLARD 5" double trace CRT D13/27GH with base screen mount and graticule £5. 6x ECF82 £3. Wearite 'P' coils PA4 PHF4 PO4 PHF5 PO5 PA3 PHF2 £3. Crossover unit 3 ohms £1. 01-452 7618 postage extra.

SEALINE 56 channel VHF marine R/T 25 watts, dual watch, simplex semi-duplex £210. Also CTVR-40 40 channel 46MHz R/T 5 watts, convertable to 50MHz. No details mint £125. Tel Fred Greene on (0246) 211254.

BBC COMPUTER software, boxed originals. Also view ROM includes morse tutor and RAE maths. Teacher clearing desk to buy school disk drive. SAE Artingstoll, 9 North Hill Green, Romford RM3 9AN.

ICOM 251E 2m base station, dealer fitted MuTek board all modes, scanning memories. Excellent for satellite reception as new manual, mic, restrictions at new QTH. Prompt sale £450. John G6BGY, Clevedon 871039.

TRIO R2000 100kC 30MHz 114-174MHz all mode memory 10 VFZO's preselector 2m PA3 preamp £380 ono vgc. Perfect radio for SWL KDK 2025 FM mobile 2m TXR 25W £100 KDK 2m mobile 25W offers 2m MM converter £25 30MHz 27MHz to MW converter £15 call 53 Maple Road SE20.

LINEAR HF 2X4CX350 H/B 500W £35 buyer collect Spectrum 48K wanted. 2m converter wanted. GW3COI Abersoch 2675.

CREED 444 45/50 baud with ST5 TPU (including autoprint); complete RTTY outfit, £75; 100K BBC half height drive, cream metal case, boxed as new with cables £80; Sony CDP-101 compact disc player with four discs £300. G4IAC QTHR tel 06755-2745.

2-MTR BEAM For sale. 19 ele Yagi (144.19/T) absolutely as new never been assembled. Genuine reason for sale cost £55, sell at £40. G4XIO. Tel: Hailsham (East Sussex 0323) 846016.

SELL OR EXCHANGE Scopex 4DIO 'scope vgc £60. LVL 100K disk drive (mint) suit BBC micro £140. Casio MT65 music keyboard £130. Wanted UHF multimode (eg FT790R) Mutek board for IC251. HF receiver (ICR70 R2000 FRG7700 etc) G6FGP 0207 561212.

SELL OR EXCHANGE Apple II computer, 48K, disk drive, Anadex DP9000 printer £650. Wanted HF transceiver IC720, FT757 etc. Dave G6FGP 0207 56121 evenings.

TR9000; 2M MULTIMODE; good condition, boxed, £280 ono. Moving to HF. 17 Clifton Lane, Rotherham, South Yorkshire, S65 2AA.

PYE POCKETPHONES PF1 nighcall etc £30. Philips N1501 £35. G3PLX Mk2 £80. 300/300 baud modem £30. Transtel printer (Baudot) £55. Creed 75 (115V) £5 G4VFT tel Horndean (0705) 591853.

COMMUNICATIONS RECEIVER RCA AR88D, makers handbook, 2 spare new wave change switches, function switch, 35 spare octal valves, loop aerial (needs attention), various old WRTVH's £70. Buyer collects. Ring Dennis, Reading 475103.

SEAGULL OUTBOARD. Long shaft 2½ HP sale £65. Or exchange communication rx, to 28MHz or reflector telescope or 9.5mm projector and camera. Robins G8BSK 290 Priory Road, St Denys, Southampton SO2 1LS.

TRIO STATION scope SM220 new boxed bargain £200. Plus Trio adaptor HF/VHF. Thru-line watt meter VHF/UHF 5 to 120w tono £15. Advanced 77B Rms millivolt meter .001 to 300V −60 to +50 dBm £10. SSM HD4 144MHz low/noise preamp £7. B/N BBC B with 100K disc & green screen video £500. 0473 85526.

YEASU FT726 dual bander with extras immaculate £800 Icom R70 receiver FM unit and additional filters £425. Sommerkamp FT1G absolutely every extra fitted, all above very little use and as new. GW3VVC QTHR. Phone 0248 714655 evenings.

FOR SALE Cossor double beam oscilloscope model 1049 complete with manual £50. Or will exchange for 2m gear. G1KXV tel 061 775 7813.

SINGLE PADDLE morse key new unused, heavy black polished steel base, highly polished brass fittings. Silver and brass contacts. Nice piece of equipment to adorn any shack. £25 & £2 p&p (UK) Gordon Crowhurst G4ZPY 41 Mill Dam Lane, Burscough, Ormskirk, Lancs L40 7TG. 0704 894299.

FT290R with NiCads and MuTek mod BNOS 100W linear with preamp 12V 5A PSU. 8 element Jaybeam crossed Yagi, rotator, and 21ft aluminium pole. Complete 2m outfit 10 months old £450. Telephone Brighton 0273 733568.

YAESU FT-230R 2m FM transceiver (25 watts). Good as new £175. Microwave modules linear MML 144/25 £25. Adonis mobile headset £5. Contact Steve or Andy on Walsall 612451.

AR88D RECEIVER with original manual, spare valves. £55. Tel 0929 471 351. (Dorset).

HOKUSHIN HF5 trap vertical antenna plus radial kit £50. Diawa search 9 £39 tel 0494 786935.

FOR SALE 444 teleprinter veru good condition, no terminal unit £30. 104 Everill Gate Lane, Broomhill, Wombwell, Nr Barnsley, Yorks.

10 FM? Join the fun with the classic Icom ICB1050 with the AKD 10/25L 25W linear to make an ideal set up. Also Ham-master 4500 base mike £65, the lot or £55 without mike. G0ANC 01 247 6097 day time (ono).

FLDX500 80-10m HF Tx 240W PEP £90. Burndept B473 handheld fitted S17, S22, R5, no Tx xtals, CCT and batteries included £50. RA17 Rx with CCT £120. Rollercoaster coil £5. Swop any above for 2m SZSB/FM gear. W15FM 15W 50M 4CH £50. Ben G4BXD 021 525 9772.

FOR SALE Tandy DX200 comms receiver mint £45. Heathkit RA-1 receiver 160m to 10m £20 both carriage extra. Tel Blandford Forum (0258) 53930.

AVANTI PDL-II antenna 11 metre quad with instruction book, good condition £45. Rotator £25. Big Jim 27 CB vertical £20. Phone 0778 422795.

Free Readers' ADS!

Buy, sell or exchange your gear through our free service to readers

CONDITIONS

1. These advertisements are offered as a free service to readers who are not engaged in buying or selling the same equipment or services on a commercial basis. Readers who are should contact our advertising department who will be pleased to help.
2. Advertisements will be inserted as and when space becomes available.
3. The insertion of advertisements will be on a first-come, first-served basis, subject to condition (2). As a result, it will not be possible to guarantee the insertion of a particular advertisement into any particular issue of the magazine.
4. Readers should either write out their advertisement in BLOCK CAPITALS or type it, underlining any words that are to appear in **bold**.
5. The magazine cannot accept any responsibility for printers' errors in the advertisements; however, we will do our best to ensure that legibly written advertisements are reproduced correctly. In the event of a gross error, at the Editor's discretion, a corrected version of the advertisement will be printed (at the advertiser's request) at the earliest issue in which space is available.
6. The magazine or its publishers will not accept responsibility for the contents of the advertisements, and by acceptance of these conditions, the advertiser undertakes to indemnify the publisher against any legal action arising out of the contents of the advertisement.
7. The magazine reserves the right to refuse to accept or to delete sections of advertisements where this is judged necessary.
8. Advertisements are accepted in good faith; however, the publisher cannot be held responsible for any untruths or misrepresentations in the advertisement, nor for the activities of advertisers or respondents.
9. Advertisers must fill in their names, addresses and (if available) telephone number in the space provided, and sign the form to indicate acceptance of these conditions (forms returned without a signature will not be used).
10. All that is to be reproduced in the advertisement should be entered into the space provided on the form printed in the magazine – note that a **photocopy is not acceptable**. All advertisements must give either a telephone number and/or address for respondents to contact, and this must be included in the wording of the advertisement.
11. Advertisements must be 40 words or less in length (telephone numbers normally count as two words, exchange or exchange code plus number).

Name . . . . . .

Address . . . . . .

. . . . . .

. . . . . .

I accept the conditions above.

Signature . . . . . .

Send this form to: Free Readers Ads, Ham Radio Today, 1 Golden Square, London, W1R 3AB

ENTER YOUR ADVERTISEMENT HERE:

Lineage:
35p per word (minimum 15 words)
Semi Display: (minimum 2 cms)
£7.00 per single column centimetre
Ring for information on series bookings/discounts
All advertisements in this section must be prepaid.
Advertisements are accepted subject to the terms and conditions printed on the advertisement rate card (available on request)

01-437 0669
EXT 323
Send your requirements to:
Caroline Faulkner
ASP Ltd.,
1 Golden Square,
London W1

EQUIPMENT

USED AMATEUR EQUIPMENT?

I BUY, SELL & EXCHANGE!

SELLING? I pay the BEST POSSIBLE PRICES for clean used equipment!!

BUYING? I have the BEST SELECTION of TOP QUALITY USED EQUIPMENT AVAILABLE!!

Whether buying or selling phone Dave, anytime, for a deal you've been looking for on
HORNCHURCH (040 24) 57722 ANYTIME,
or send SAE for latest list to:

G4TNY AMATEUR RADIO
132 Albany Road, Hornchurch, Essex RN12 4AQ.

AMATEUR RADIO EQUIPMENT bought, sold, exchanged. List of available items sent on request. Ring R&S Radio 0305-786930.

COURSES

COURSES - RADIO AMATEURS EXAMINATION City & Guilds. Pass this important examination and obtain your licence, with any RRC Home Study Course. For details of this and other courses (GCE, professional examination, etc.) write or phone — THE RAPID RESULTS COLLEGE, Dept JN4, Tuition House, London SW19 4DS. Tel: 01-947 7272 (9am-5pm) or use our 24 hr Recordacall Service 01-946 1102 quoting Dept. JN4.

RIG DOCTOR

POWER SUPPLY REPAIRS
We offer a fast repair service on most makes of D.C. power supplies in the 1 to 30 amp range, crowbar circuits, etc. also fitted.
For full details please ring
0536 743496

KITES

KITES for portable aerials. Hand-made of ripstop-nylon. Many signs from £9.95. S.A.E. for catalogue. D.I. KITES, 20 Embsay Rd., Lower Stanwick, Southampton. Tel: 04895 3026.

ALPHA KEY

ALPHA GOLD

Precison engineered keys for the connoisseur. Twin paddle, Single paddle, and the new Straight Key. Now even better value.

CAVITY WAVEMETERS
One Wavemeter to cover 144MHz to over 2500MHz. Now with improved pickup and frequency readout.

10 GHz WAVEMETER KITS
A pre machined cavity block to make a 10 GHz wavemeter using your own micrometer.

Send large SAE for full information to:
Paul Sergent
6 Gurney Close, Costessey
Norwich (0603) 747782

SERVICES

SINCLAIR (48K + 16K) Spectrum ZX81 (16K). Logger designed for amateur radio operator. Holds 720 logs (48K). All the legal requirements and niceties, full search and update. Price on cassette £5.50 each, cheques and P.O.'s to: Martello Computer Services, "Freepost Reading RG6 1BR".

ANTENNAS

G2VF DIY loop Antennas for H.F. long and medium wave bands. SAE for details: Rylands, HRT, 39, Parkside Ave., Southampton SO1 9AF.

CARDS/STICKERS

HIGH CLASS QSL CARDS. Competitive prices, free artwork. SAE for samples stating ham or breaker to: J.S. Coates, 57 Worrall Street, Morley, Leeds LS27 0PJ.

PLASTIC / MEMBERSHIP / CARDS, laminated cards, lapel badges, all made to your specification. **KARDLINE,** P.O. BOX 206, Wootton Bassett SN4 7EZ. Tel: 0793 853406.

QSL CARDS. Gloss or tinted cards. SAE for samples to TWROG Press, Dept HRT. Penypont, Gillilydan, Blaenau, Ffestiniog, Gwynedd, LL41 4EP.

MOBILE MICS

HEATHERLITE MOBILE MICS
Made to help you drive safely
Reasonably priced to suit your rig, head/neck band, electret mic, control box, variable mic gain, scanning buttons, plug fitted — superb quality. Priced from £20.50 inc.
FULLY GUARANTEED
Ring for Details —
Heather G8SAV (0401) 50921

ALARMS

BURGLAR Alarm Equipment. Please visit our 2,000 sq. ft. showrooms or write or phone for your free catalogue. C.W.A.S. Ltd., 100 Rooley Avenue, Bradford BD6 1DB. Telephone 0274 731532.

MORSE TUTOR

For Spectrum/QL/BBC:-
WD Morse Tutor
(cassette £4, microdrive/£5.25" disc £6)
From absolute beginner to beyond RYA and Amateur Radio receiving. Adjust pitch. Set speed to your test level (4-18 wpm). Learn from single characters, via groups with wide spaces to random sentences; decrease spacing to normal. Write down what you hear, then CHECK on Screen or Printer (or speech for Spectrum fitted with Currah Micro-speech). Also own message, random figures, letters or mixed. Punctuation in own message or single characters. Discs may be 40 or 80-track (SPDOS for Spectrum. Price includes postage in Europe, £1 extra outside.
WD Software, Hilltop, St Mary, Jersey.
Tel: (0534) 81392

MORSE (SPECTRUM 48K) Randomly generated letters and/or numbers at users requested speeds spacing visual and audible presentation, £5.50 cassette or SAE for details: Educational Software, 20 Beaufront Rd., Camberley GU15 1NF.

MISCELLANEOUS

HEATHKIT U.K. spares and service centre. CEDAR ELECTRONICS, Unit 12, Station Drive, Bredon, Tewkesbury, Glos. Tel: 0684 73127.

WANTED

TURN YOUR SURPLUS transistors, IC's etc into cash. Contact Coles Harding & Co., 103 South Brink, Wisbech, Cambs. Tel: 0945 584188. Immediate settlement.

COMPONENTS

RESISTORS, CAPACITORS. 1,000 mixed carbon film ⅛W, ¼W, ½W, 2%, 5%, 10% resistors £2.95 + 50p P&P. SAE for details to: D.J. Hooker, Romney Marsh, Electronics, Clark Road, Greatstone, New Romney, Kent TN28 8PB.

VINTAGE REPAIRS/SERVICE

VINTAGE RADIOS repaired — restored — over 200 Radios Stocked! 1922-1960. RADIO VINTAGE, 250 Seabrook Rd., Seabrook, Hythe, Kent CT21 5RQ.

KITS

TRUTONE MODULES
For serious repeater users
Toneburst and timer module combined on one board. For operating a transceiver with any 2 metre F.M. repeater in the UK. Accurately times transmission providing both visible and audible warnings at end of pre-determined period when user is about to time-out through repeater. SAE for details. Price £12.50. Timeout or toneburst board supplied separately at £7.50 each. *All prices inc P&P.*
TRUTONE MODULES, 56 Norman Rd., Saltford, Bristol BS18 3BH.

CLASSIFIED ADVERTISING TERMS & CONDITIONS

Our terms for new advertisers (semi-display and lineage) are strictly pro-forma payments until satisfactory reference can be taken up (excluding recognised advertising agencies). Cheques and PO's should be crossed and made payable to:
ARGUS SPECIALIST PUBLICATIONS LTD.,
and send together with the advertisement to:
THE CLASSIFIED DEPT., L/H, NO: 1 GOLDEN SQUARE, LONDON, W1R 3AB.
There are no reimbursements for cancellations. Advertisements arriving too late for a particular issue will be inserted in the following issue unless accompanied by instructions to the contrary.
All advertising sales are subject to Government regulations concerning VAT. Advertisers are responsible for complying with the various legal requirements in force eg: The Trade Description Act, Sex Discrimination Act & The Business Advertisements (Disclosure) Order 1977.
FULL TERMS & CONDITIONS OF ADVERTISING AVAILABLE ON REQUEST.

RTTY

RTTY - CW - AMTOR
Now on the Dragon
Complete set of Programs & Hardware

to convert your DRAGON 32/64 into a complete communications terminal.

Morse transceive
Program (Cassette) £10.75
Interface (Module) £17.50

RTTY
Program (Cassette) £12.00
Terminal unit of modules £39.00

AMTOR
Program (Cassette) £39.00
Clock/Switch Module £18.00

Programs also available in Cartridge. Hardware available in kit or fully boxed form.

For full details send 2x 17p stamps to:-

PNP Communications (HT)
62 Lewes Avenue, Newhaven
East Sussex BN9 9SB
Tel: (0273) 514465
Prices include postage but not VAT

BBC MICRO SOFTWARE RTTY/CW Transceive. Send/Receive Morse tutor. Super locator. Sun/Moon Prediction. Multifile. Disc menu/ Catalogue. Utilities. TV info. Please send two SAE/IRC for details: BLT SOFTWARE, 1 Wavel Garth, Sandal Magna, Wakefield WF2 6JP.

BOOKS AND PUBLICATIONS

SERVICE MANUALS
Ham Concorde 2, Ham multimode 2, Ham Jumbo 2, Ham Viking, Ham Puma, Cobra 148 GTL DX, PC 879 and PB010. Colt 1600 DX, Tristar 777, York 863, York 861.

All above at £6.00 + £1.00 p&p each.
Other, rigs and spare parts available.
10m conversion for FMCB rigs £30 + £1.50 p&p
Details on request.

CBT
1 Prince of Wales Road, Swansea. (Tel: (0792) 463821.

BUSINESS OPPORTUNITIES

MULTIPLY your income/profits working for yourself with the breakthrough ENTREPRENEUR ASSOCIATION, part-time or full-time. Send SAE for valuable free details: Atlantic Press, Dept P6(1), 9 Cork Street, Mayfair, London W1.

(G3WHO) BBC RTTY and AMTOR (as reviewed in Ham August) Software. SAE or phone for details to: 10 Appleby Close, Gt Alne, Alcester, Warks, B49 6HJ. Tel: (078) 981 377.

SOFTWARE

RTTY and CW TRANSCEIVE with NO TERMINAL UNIT

This fantastic program interfaces direct with your rig, slashing the cost of previous systems. Split screen, type ahead, all the usual features and more. Tape and kit for the very simple interface, including PCB and User Port Connector, for only £20. Ready-made interface available. Fro CBM64, BBC-B and VIC20 (+ at least 8k). CW-only version for SPECTRUM £10.

And these superb programs CBM64, VIC20, BBC-B ELECTRON, SPECTRUM.

LOCATOR QTH or Maidenhead locator or lat/long. Distances, headings, contest points, converts between locator and lat/long. Tape £6.

LOGBOOK Date, band, mode, call and remarks. Instant callsign search. Screen/printer output. VIC20 needs at least 8k expansion. Tape £6.

MORSE TUTOR Britain's best. Learn fast in easy stages from absolute beginner to over 40 wpm. Join the hundreds who have succeeded with this program. Tape and full learning guide £6. **For ZX81-16k also.**

RAE MATHS All the practice and testing you need. Tape and comprehensive reference sheet detailing all you need to know £8. VIC20 needs expansion (any). **For ZX81-16k also.** Don't let matsh make you fail. PASS with this program.

All programs are very easy to use and come with full instructions.
Prices include VAT and p&p by return 1st Class by return. Add £1 per tape if outside UK or Ireland.

technical software (HRT)
Fron, Upper Llandwrog, Caernarfon, Gwynedd LL54 7RF. Tel: 0286 881886

DRAGON/TRS80C
A range of high quality radio software available on tape or ROM cartridge.
RTTY Tape £12. Morst Tutor £6.50
CW Transceive £10.75
ROM Cartridge for RTTY, ASCII CW and AMTOR £59
CBM64 — RTTY — Tape £11, Disk £14
CBM64 — CW Tx/Rx Tape £10, Disk £12
ATOM — RTTY — UTILITY ROM £16
All programs feature split-screen, type-ahead operation. State callsign (if any).
SAE for details:
GROSVENOR SOFTWARE (HRT)
2 Beacon Close, Seaford,
Sussex BN25 2JZ. Tel: (0323) 893378

AMPROM The ultimate amateur Radio Communications ROM for the BBC Micro. This ROM is BEEBCOM compatible (Micronet May 1985) with many NEW features, including error-free disk file transfers over air. EMPROM £18. SAE for details. STATZ callsign with order. CTP Software, 107A Shacklewell Lane, London E8 2EB.

ANTENNAS

R WITHERS COMMUNICATIONS
SERVICE ENGINEER/ MANAGER

.... to work in a busy department servicing both Amateur and Commercial radio equipment, technical training essential and exerience in this field will be an advantage. A working knowledge of modern solid state RF circuits will be expected. The position offers up to **£10,000 p.a.** for the right person who will be working for an expanding company using modern test facilities and technology.

The position open to both male/female applicants, will appeal to those who like hard work and a challenge.

Write with detals of experience, or telephone:

Ray Withers
R. WITHERS COMMUNICATIONS
584 Hagley Road West,
Oldbury, Warley B68 0BS

Tel: 021-421-8201/2 (24hr Answering)

TIGER ANTENNAS
FORGET THE REST BUY THE BEST

To Radio users both amateur and professional Tiger antennas represents an excellent range of antennas on the market today.
We use high quality (high strength materials produced to our own specifications. All our products are designed and engineered to give maximum performance both electrically and mechanically. Special attention has been given to reducing wind loading and still maintaining a very strong and durable antenna.
We guarantee Tiger and silver 70 range against electrical and mechanical defect for 2 years.

	Model	Gain	Price inc VAT. £s
Tiger	144 Colinear	6dB Gain	33.95
Tiger	LY13 LONG YAGI	15dB Gain	39.50
Tiger	LY10 LONG YAGI	13dB Gain	32.00
Tiger	LY9 LONG YAGI	12dB Gain	24.60
Tiger	LY6 LONG YAGI	9dB Gain	15.50
Tiger	LY4 LONG YAGI	7dB Gain	11.70
Tiger	LY13 LONG YAGI	15dB Gain	39.50
Tiger	SUPER SLIM JIM 144 or 432 MHz		7.50
Tiger	Discone 500 wideband Antenna		5.95
SILVER 70	BEAM 14EL	16dB Gain	31.50
TIGER LY9/	432 BEAM	1dB Gain	15.95
HF BALUM	TRANSFOMER	500W1-30 MHz	17.00

SPECIAL OFFER
A POWER SPLITTER FREE WITH ANY PAIR OF **LY9/10/A S70's.**
UK P&P Securicor £6.60. Allow 14 days for delivery

UK STOCKISTS

APW Electronics
Cleveland 0642 670434
Barnsley Aerial Centre
Barnsley 0226 245520
J Birkett
Lincoln 0522 20767
Alyntronics
Newcastle Upon Tyne 0632 761002
Stephens James
Lancashire 0942 676790
RW Pollock & Co
Bradford 0274 729223
Robinsons TV
Leeds 0532 633836
RAS
Nottingham 0602 280267
Ward Electronics
Birmingham 021-328 6070
Erover Ltd
Maldon, Essex 0621 891755
Clan Communications
Glasgow 0475 41378
Alan Hooker
Doncaster 0302 25690
Hessle Communications
Hessle (Hull) 0482 648602
Frank Godfrey
Worksop Notts 0909 472829
Glenbond Ltd
Cheshire 061-941 3057
Castle Electronics
Nottingham 0602 606999/ 812523
Collins Communication
Cambridge 022366041
MGR Services
Berkenhead 051-653-3457
OX Amateur Radio
Warwickshire 0926 312421

OVERSEAS DISTRIBUTION (SOLE EUROPEAN AGENT) WITRONICS, NANOVESTRAAT 153, B.1890, OPWIJK, BELGIUM. TEl: 052357226
P.O. Box 116, Scunthorpe, South Humberside DN15 8EG. Tel: (0724) 851975

EMPORIUM GUIDE

W. MIDLANDS

HEWARD'S HOME STORES LTD.
(Est. 1963)
822/4 Kingstanding Rd., Birmingham B44 9RT.
Tel: 021-354 2083
G4RJM with 38 years in The Radio Trade
Ham Equipment urgently wanted!
Open: Mon-Sat 9-6

W. MIDLANDS

DEWSBURY ELECTRONICS
RXs. from YAESU, JRC, ICOM.
Stockists of microwave modules, B.N.O.S., M.E.T., GAMMA, DATONG, ICS, TASCO.
Open Mon-Sat, 9-30-5.15
176 Lower High Street
Stourbridge (0384) 390063

CHESHIRE

GLENBOND (VIDEOTEL) LTD
25, Stamford Street, Altrincham, Cheshire, WA14 1EX
Tel: 061-941 3057 Telex: 666387
Standard 2m and 70cm — Jaybeam — Ant Antennae — Antiference — Weitz — Sinclair Computer Spares — Revco
Colin G1 1ZD *Gavin G1 1ZL*
YOUR RADIO SOLD ON COMMISSION BASIS

W. MIDLANDS

WARD ELECTRONICS
DIAWA, LOWE PRODUCTS, COMMODORE COMPUTERS, HOKUSHIN, I.C.S. AMTOR/RTTY EQUIPMENT, RSGB BOOKS
G3LIV PCB'S FOR SSTV/RTTY FOR RADIO ENTHUSIASTS
422 Bromford Lane, Ward End
Birmingham B8 2RX
Tel: 021-328 6070 (Closed Monday)

NORFOLK

D.P. HOBBS (Norwich) Ltd
13 St. Benedicts Street, Norwich
Tel: 615786
Open Mon-Sat 9-5.30
Closed Thurs
Stockists of:
YAESU, FDK, ICOM, JAYBEAM
& Electronic Component Specialists

DW ELECTRONICS G3 XCF
Amateur Radio Supplies
71 Victoria Rd, Widnes
Tel: 051-420 2559
Open Mon-Sat 9.30-6 (closed all day Thurs)
We supply YAESU, ICOM, Tonna, Jaybeam, Microwave Modules, Datongs etc

KENT

Thanet ELECTRONICS
95 Mortimer St, Herne Bay
Tel: (0227) 369464
Open Mon-Sat 9-5.30pm
except Thursday 9-1pm

LONDON

TAR AERIALS AND COMMUNICATIONS
Specialists in Aerial Components, Lashings & Masts
Dealers in Jaybeam, Icom, Yaesu and others. Visit the
THE COMMUNICATIONS CENTRE
KING WILLIAM STREET, AMBLECOTE
STOURBRIDGE, WEST MIDLANDS, DY4 4CY
TEL: 0384 390944

PROTEL AERIALS AND COMMUNICATIONS
Manufacturers and suppliers of aerials and accessories, DXTV equipment and aerials also other specialist aerials. Large range of bracketry and masts also available.
295-297 Ballards Lane, N12. Tel: 01-445 4441
TRADE ENQUIRIES WELCOME
Details on request.

SCARAB SYSTEMS
AMATEUR RADIO SOFTWARE
ICOM STOCKISTS
39 Stafford Street, Gillingham 0634- 570441
please see main advertisement

CENTRE ELECTRONICS
354 Stockfield Road, Yardley, Birmingham B25 8JP
Specialist in the sale and service of Ex Government and Vintage Radio and Test Equipment.
(Many spares in stock).
Telephone enquiries to 0676 32560
Special delivery service
Shop open Thursdays, Fridays and Saturdays

DRESSLER UK LTD
191 Francis Rd., Leyton, E10
Open 9-5.30 Monday-Friday 10-5 Saturday
Authorised dealers for:
Dressler, Yaesu, Icom, Standard, Trio/Kenwood, Datong, SCM, Microwave Modules, Tonna
Tel: 01-558 0845/556-1415 Telex: 8953609

SURREY

R. WITHERS COMMUNICATIONS
584 Hagley Road West
Oldbury, Warley B68 0BS
(Quinton B'Ham) Tel: 021-421 8201/2/3
Opening hours 9.00-5.30pm. Late nights Thurs-Fri.
For all your communication requirements send SAE for latest used list and latest info.

BONEX LTD
RF component specialists Toko coil & inductors "available at show"
102 Churchfield Road
London W3 6DH
Tel: 01-992 7748

GUILDFORD COMMUNICATIONS
34 Aldershot Rd., Guildford
Open Mon-Fri 8am-6.30pm
Sat 8am-5.30pm
Secondhand wanted
ASDEN
TOTSUKO
0483-574434

EMPORIUM GUIDE

NOTTINGHAMSHIRE

R.A.S. (NOTTINGHAM)
P. Owen G8JUS
3 FARNDON GREEN, WOLLATON PARK
NOTTINGHAM. Tel: 0802 280267
FDK *Open: Tues-Fri 10-5.30. Sat 9-5* TONNA
YAESU: FDK: ICOM: TONNA
HALBAR: WELZ: ANTENNAS & OWN GW5 H.F.

WALES

BEAMRITE
Amateur Radio and CB stockists, TV aerials, telephone and computer accessories
2-5.30pm
Weds closed after 1.00pm
19 Broadway Roath, Cardiff
Tel: (0222) 486884 or 460266

SCOTLAND

ICOM
SCOTCOMMS
OPEN TUES-FRIDAY 10am-12.30pm. 2pm-5pm
SAT: 9am-1pm. 2pm-4pm. CLOSED MONDAY
25 Morton Street, Edinburgh 15
Tel: 031-657-2430

MIDDLESEX

AMCOMM
Authorised Icom dealer
OPEN 10am - 5.30pm TUES-SAT. CLOSED MONDAY
NORTHOLT RD., S. HARROW
MIDDLESEX
TEL: 01-422 0985

WARWICKSHIRE

"Amateur Electronics UK"
AJH ELECTRONICS (G8AQN)
Est. since 1967
Stockists of Yaesu, CB equipment, telephones and radio telephones.
Open Mon - Fri 9.30-5.30pm
Closed Weds afternoon.
151A Bilton Rd., Rugby CV22 7AJ

DEVON

AGRIMOTORS
Merton CB & Radio Centre
Merton Garage & Post Office, Merton.
Nr. Oakhampton EX20 3DZ.
Open 6 days 9-6
(Sundays by appointment)
Specialists in 934MHz
Suppliers of all 27MHz and 934MHz equipment

AVON

Booth Holdings Bath
6 GOLF CLUB LANE, SALTFORD, BRISTOL
Tel: 02217 2402
Open: Tues-Sat 9am - 9pm
Close Mondays

NOTTINGHAMSHIRE

SP ELECTRONICS
48 Limby Road
Huckhall, Nottingham
Tel: (0602) 640377
Open Monday-Saturday 8.30-5.30

LANCASHIRE

AMATEUR ELECTRONICS U.K./HOLDINGS

G3LLL

Yaesu, Tet, Jaybeam, Frequency Counters, Drae, Datong, FT101 Experts, Repairs, 6JS6C, 12BY7A, 6KD6, RF Clipper, Double Balanced Mixer, Warc Kit etc. S.A.E. List. 15 min. Junc. 31 M6. Free parking.
45 Johnston Street
Blackburn BB2 1EF
(0254) 56595
CLOSED THURSDAYS

HANTS

FANRBOROUGH COMMUNICATIONS
97 Osborne Rd., North Camp,
Farnborough. Tel (0252-518009)
Open: 6 days 10-6
Yaesu, Icom, FDKs, Mosley aerials, Jaybeams.
G Whips

DURHAM

Ian Fisher Communications of Stanhope CB Works, Bondisle Way, Stanhope, Bishop Auckland, Co Durham DL13 QTY. Tel: (0388) 528464
Distributors of 934 MHz equipment. We carry a full range of 934 MHz aerials, the **COMMTEL** Scanner transmitter/receiver, the **UNIACE 400**, coaxial cable, moulding the **ROH100 cable**, plus cordless telephones, all at *very* competitive prices.
Open: Mon-Sat 10.30am-6.00pm

HAM RADIO TODAY
CLASSIFIED ADVERTISEMENT — ORDER FORM

IF YOU HAVE SOMETHING TO SELL
DON'T TURN THE PAGE — TURN TO US!

RATES OF CHARGE: 35p per word (minimum of 15 words)
semi-display £7.00 per single column cm
ADVERTISERS PLEASE ADD 15% VAT

Or Debit my Access/Barclaycard
(Delete as necessary)

Advertise nationally in these columnds over 60,0000 readers for only 35p per word (minimum charge 15 words). Simply print your message in the coupon and send with your cheque or postal order made payable to Argus Specialist Publications Ltd. to:

CLASSIFIED DEPT. HAM RADIO TODAY
1 Golden Square, London W1R 3AB.
Tel: 01-437-0699.
Please indicate classification required.

Name .....
Address .....
.....
.....
Tel. No (Day) .....

BARCLAYCARD VISA or debit my Access/Barclaycard (delete as necessary) Access

HAM RADIO TODAY — NOVEMBER 1985
ADVERTISERS INDEX

Don't forget, when calling an advertiser, mention Ham Radio Today — it helps them and us.

73's Dave Gadsden, G4NXV, Advertisement Manager

MICROWAVE MODULES LTD

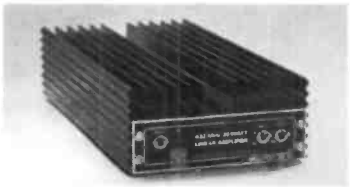
WE HAVE THE POWER

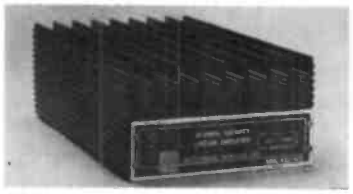
2 METER LINEAR AMPLIFIERS

PRODUCT	INPUT POWER	OUTPUT POWER	PRICE INC VAT
MML 144/30-LS	1 or 3W	30W	£82.90
MML 144/50-s	10W	50W	£92.00
MML 144/100-S	10W	100W	£149.95
MML 144/100-HS	25W	100W	£149.95
MML 144/100-LS	1 or 3W	100W	£169.95
MML 144/200-S	3, 10 or 25W	200W	£299.00

all output powers are ± 1dB.

TO MAKE YOUR SIGNAL HEARD





70 CMS LINEAR AMPLIFIERS

PRODUCT	INPUT POWER	OUTPUT POWER	PRICE INC VAT
MML 432/30-L	1 or 3W	30W	£145.00
MML 432/50	10W	50W	£129.95
MML 432/100	10W	100W	£299.00
* THE RF VOX CAN BE OVERRIDDEN AND HARDWIRED			

all our power amplifiers are fitted with receiver pre-amplifiers with the exception of MML 432/100.

YOU HAVE THE POWER TO BUY THE BEST

A FURTHER SELECTION FROM OUR RANGE

TRANSVERTERS	MMT144/28	- 2m Linear transverter, 10m Input, 10w Output	109.95
	MMT144/28-R	- 2m linear transverter, 10m input, 25w output	215.00
	MMT432/144-R	- 70cm linear transverter, 2m Input, 10w output	199.00
	MMT1295/144	- 23cm linear transverter, 2m input, 2w output	235.00
	MMX1268/144	- 1268 MHz Satellite Up-Converter, 2w output	159.95
RECEIVE CONVERTERS	MMC50/28-S	- 6m to 10m down converter	34.90
	MMC144/28	- 2m to 10m down converter	32.90
	MMC144/28HP	- 2m to 10m high performance down converter	47.90
	MMC432/28-S	- 70cm to 10m down converter	39.90
	MMC432/144-S	- 70cm to 2m down converter	39.90
	MMK1296/144	23cm to 2m down converter, GaAsFET preamp	129.95
	MMK1691/137.5	- 1691 MHz Meteosat converter	145.00
RECEIVE PREAMPS	MMG144V	- 2m RF switched GaAsFET preamp. 100w capacity	37.90
	MMG1296	- 23cm GaAsFET low noise preamp	75.00
	MMG1691	- 1691 MHz Meteosat GaAsFET preamp	113.00
MICROPROCESSOR CONTROLLED PRODUCTS	MM2001	- RTTY to TV converter	189.00
	MM4001KB	- RTTY transceiver with keyboard	299.00
	MMS1	- THE MORSETALKER - Speaking Morse Tutor	115.00
	MMS2	- Advanced Morse Trainer	169.00
FREQUENCY COUNTER	MMD050/500	- 500 MHz digital frequency meter	89.00
	MMD1500P	- 1500 MHz - 10 prescaler	97.75
	MMDP1	- Frequency counter amplifier	14.90
AMATEUR TELEVISION	MMC435/600	- 70cm ATV converter, UHF Output	29.90
	MTV435	- 70cm ATV 20 watt transmitter	179.95

COME AND SEE OUR RANGE OF PRODUCTS AT THE LEICESTER SHOW. MICK G4EFO AND THE RALLY TEAM WILL BE PLEASED TO SEE YOU.

PRICES INCLUDE VAT BUT NOT POST & PACKAGE

MICROWAVE MODULES! THE CONNOISSEURS CHOICE.

ACCESS VISA WELCOME

MICROWAVE MODULES Ltd
BROOKFIELD DRIVE, AINTREE, LIVERPOOL L9 7AN, ENGLAND
Telephone: 051-523 4011. Telex. 628608 MICRO G
CALLERS ARE WELCOME, PLEASE TELEPHONE FIRST

HOURS:
MONDAY-FRIDAY
9-12.30, 1-5.00
E & O.E.

YOUR ONE SOURCE FOR RADIO

ARROW

ELECTRONICS LIMITED
5, The Street,
Hatfield Peverel,
Chelmsford, Essex

THE NAME YOU CAN TRUST FOR PRICE & AFTER SALES SERVICE

FOR IMMEDIATE DESPATCH
phone with your Access, Eurocard, Mastercharge or Visa number to
0245 (Chelmsford) 381673 or 381626.
Telex 995801 (ref: A5)

OVER 500 LINES AT UNBEATABLE PRICES

IT WILL PAY YOU TO PAY US A VISIT!

THIS MONTH'S SPECIALS AND AT LEICESTER SHOW 25th & 26th OCTOBER

The Cost Cutters

The ultimate MINI handheld for 2M TH21E from TRIO Only £169.95

"SHOW STOPPER" KDK2033 25 watt 2m FM MOBILE Absolute Snip Excellent quality ~~£229.00~~

STAR BARGAIN * A BRAND NEW 2M FM QUALITY HAND-HELD FOR ONLY £149.00. Call ARROW or visit the STAND

FT757GX THE complete HF transceiver from YAESU £699.00 incl. FREE Microphone.

FT270R New model 25 Watt 2m FM mini. £256.00 OR 45 Watt Model FT270RH £299.00

CLEARANCE SPECIAL FEW ONLY FC102 1 KW ATU's & SP102 SPEAKERS Please call ARROW or visit STAND.

FT730R 70cm BARGAIN FM Mobile ONLY £199.00

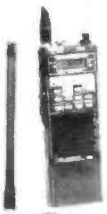
FT290R Yaesu's famous portable allmode £299.00

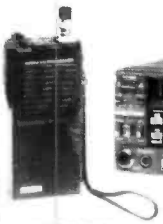
TRIO TS430S HF Transceiver now only £719.00

INTEREST FREE FINANCE
Yes, you really can spread the cost of your new rig over 6, 9 or 12 months and ARROW pays the interest charges for you
Three schemes: 20% deposit, balance over 6 monthly payments
1/3rd deposit, balance over 9 monthly payments
50% deposit, balance over 12 monthly payments
And remember, you pay no more than the normal RR price!!
Just call us and we will send agreement for your new gear same day!!!

APPROVED TRIO DEALER

ARROW ARE fully franchised dealers for TRIO and are now fully stocked with all the latest models





Rotators stocked include the new Daiwa multi-torque with up to 4 motors possible.
Also the full Daiwa range at competitive prices, Kenpro from KR2000RC to KR250 inc KR500 Elevation type

Send us an SAE for details of the new TET beams with 40 metre band 11 & the minibeams with the same gain as fullsize

AUTHORISED YAESU

One of the country's largest Yaesu stockists you can see all the new models at ARROW plus get the very best deals – take advantage of our Interest Free Credit or call us for a really keen price – Nobody does it better!!!

DAIWA produce a marvellous range of PSUs – see the variable volt PS300 or the Cross needle SWR bridges. New 2M RTU/SWR meter. And some of the best HF tuning units around.

"Bencher" Paddles stocked and "Vibroplex", Hi-Mound see and try a key or paddle at the ARROW shops. BNOS make some of the finest British made PSUs we have seen and the Linears are superb with 5 year warranty

AUTHORISED ICOM DEALER

AR2001 Receiver 25/500MHz

IC751, IC745, R71, R70, IC271E, IC471E, IC2E, IC4E, IC02E, IC04E, all stocked with accessory ranges – Call us for price

WELZ full range stocked

Come and see the new Trix-tower at Chelmsford, 30 or 40ft folds down really low, tilt or wall mounted. Keen prices

Our normal despatch is *one or two days* (as thousands of satisfied customers will tell you). Subject to manufacturers supplies being available. CARRIAGE FREE on all orders of £300 value and over (UK Mainland only)
Access and Barclaycard accepted. Save time – phone over your order with your Access or Barclaycard number. Express delivery can be arranged on all items for a total charge of £7.50. Please phone for details. This offer applies to UK Mainland only.
N.B. The F.O.C. carriage offer does *not* apply when Express Delivery is requested.

Hatfield Peverel showrooms which are just off the A12 trunk road, are open 9-5pm Mon, Tues, Weds, Fri, Sat. Closed all day Thursdays. Approach by road via M25 & A12. By rail to BR Hatfield Peverel (3 mins from shop). We will taxi you back to rail station with heavy equipment. Buses from Chelmsford and Colchester pass the door. Free parking in our own car park. Local repeater GB3DA R5.

Scottish customers welcome at ARROW ELECTRONICS (SCOTLAND) 51 Hyndland Street, Partick, Glasgow. Tel: 041-339 6445 ask for Bill GM0ARO.
Parking free outside the shop, which is near the Clyde Tunnel and Kelvin Museum.
Open six days (closed Sunday) 9-5.30

At ARROW ELECTRONICS (MIDLANDS) Tel: 0858 62827 you will find Alan G4TZY who will be pleased to assist you. Alan lives at 33 Fairway, Market Harborough, Leics, but please telephone first.

At ARROW ELECTRONICS (WALES) John Lewis GW8UZL waits to talk to you in English or Welsh! John is an expert on Satellite work & knows all the wrinkles on FT726R etc.
Tel: 0248 714657
14 Carreg-y-gad
Llanfair-p-g
Anglesey
N. Wales