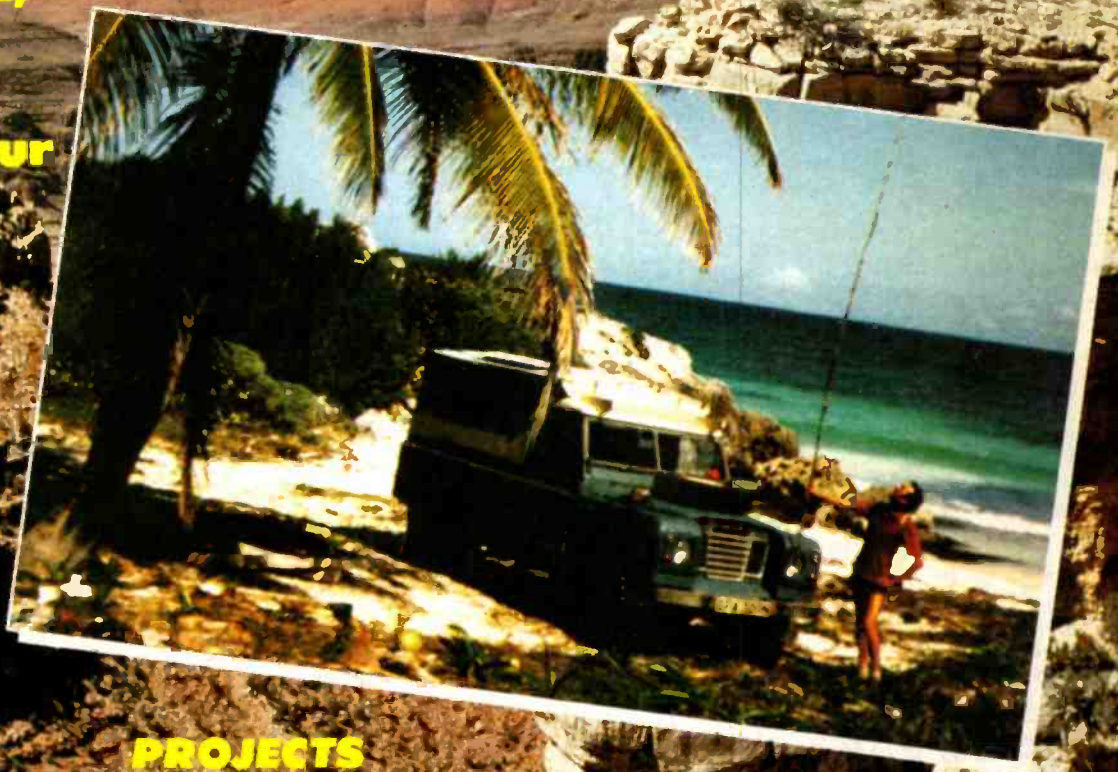
HAM RADIO TODAY
AN ARGUS SPECIALIST PUBLICATION
JANUARY 1986 £1.20

Travels With Myrtle In North America

Roger, G3UPK, and Mary and their 87000 mile tour



PROJECTS

A 2m 80W SSB Linear

Cheap and Simple 10 and 15m Converters

The Trio TS830S — The Ultimate In Selectivity?

FREE INSIDE World Prefix Map

DEWSBURY ELECTRONICS

ICOM

IC751	HF Transceiver	1299.00
IC745	HF Transceiver	899.00
IC735	New HF Transceiver	849.00
PS15	P.S. Unit	145.00
PS30	Systems p.s.u. 25A	297.85
SM6	Base microphone for 751/745	40.25
IC290D	2m 25w M/Mode	479.00
IC290E	Low Multi-Mode Mobile	449.00
IC271E	2m 25w M/Mode Base Stn.	729.00
IC271H	100W version of above	899.00
IC25H	2m 45w FM	359.00
IC27E	25W FM mobile	379.00
IC45E	70c 10w FM	345.00
IC47E	25w 70cm FM mobile	469.00
ICBU1	B/U Supply for 25/45/290	29.90
ICR70	General Coverage Receiver	629.00
ICR71	General Coverage Receiver	729.00
IC02E	2m H/Held	269.00
IC2E	2m H/Held	199.00
ML1	2m 10w Linear	79.35
IC4E	70cm H/Held	259.00
IC04E	70cm handheld	279.00
BC35	Base Charger	62.10
HM9	Speaker mic	18.56
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

MUTEK

SLNA 50	50MHz Switched preamp	44.90
SLNA 144s	144MHz Low noise switched preamp	39.95
SLNA 145sb	Preamp intended for 290	29.90
GLNA 432e	70cm Mast head preamp	149.90
RPCB 144ub	Front end FT221/225	79.90
RPCB 251ub	Front end IC251/211	84.90
BBA 500u	20-5000MHz Preamp	34.90
GFBA 144e	2m Mast head preamp	149.90
SBLA 144e	2m Mast head preamp	89.90
RPCB 271ub	Front end for IC271	89.90
TVHF 230c	2M-FM Transverter	334.90
LBPF 144v	Bandpass Filter	22.40
LBPF 432u	Bandpass Filter	22.40
TVVF 50c	6M Converter	199.90
GLNA 433e	70cm Pre-amp	79.90
TVVF 144a	2M Transverter	239.90

MET ANTENNAS

70cms		
432-5B	5 Ele	16.95
432-19T/ATV	19 Ele	35.60
432-17X	17 Ele Crossed	49.17
432-17T	17 Ele Long	39.20
2M		
144-5	5 Ele	19.55
144-7T	7 Ele	24.15
144-8T	8 Ele Long	31.26
144-14T	14 Ele	46.71
144-19T	19 Ele	55.88
144-6X	6 Ele Crossed	39.75
144-GP	Ground Plane	14.41
4M		
70/3	3 Ele	30.12
70/5	5 Ele	45.74

SWR/POWER METERS

WELZ		
SP45	130-470MHz PWR/SWR	69.00
SP10X	1.8-150MHz PWR/SWR	34.00
SP200	1.8-160MHz PWR/SWR	89.00
SP250	1.8-60MHz PWR/SWR	65.00
SP300	1.8-500MHz PWR/SWR	129.00
SP350	1.8-500MHz PWR/SWR	79.00
SP400	130-500MHz PWR/SWR	89.00

DAIWA

CN410M	3.5-150 Mhz mobile cross needle	48.00
CN460M	140-150 Mhz mobile cross needle	52.00
CN520	1.8-60 Mhz mini cross needle	39.00
CN500	1.8-60 Mhz cross needle	19.50
CN620A	1.8-150 Mhz cross pointer. Up to 1KW	2.10
CN630	140-450 Mhz cross pointer. Up to 200W	66.21
CN650	1.2-2.5 Ghz cross pointer. Up to 20W	98.11
CNW419	1.8-30 Mhz 200W tuning unit	129.50
CNW919	2M Power meter and antenna tuning-unit	159.64
CNW518	3-30 Mhz 8 band hi power tuner	104.99
CL680	1.8-30 Mhz 200W general coverage ATU	233.09

ICS

We now have in stock the full range of ICS RTTY/ASCII/AMTOR/CW products and the remarkable ALM-203E. This keypad operated handheld 2M transceiver has a host of features yet costs much the same as limited facility thumbwheel units – just **£209.00.**

TRIO

TS940	HF General Cov	1695.00
TS940S	9 Band TX General Cov RX	1695.00
TS930S	General Cov RX	1295.00
TS830S	160-10m Transceiver 9 Bands	832.75
AT230	All Band ATU/Power Meter	157.99
SP230	External Speaker Unit	47.73
TS530S	160m-10m Transceiver	698.00
TS430S	160m-10m Transceiver	720.00
PS430	Matching Power Supply	138.00
SP430	Matching Speaker	39.50
MB430	Mobile Mounting Bracket	13.17
FM430	FM Board for TS430	45.00
TS130S	8 Band 200W Pep Transceiver	633.06
SP120	Base Station External Speaker	30.74
AT130	100W Antenna Tuner	108.62
MC50	Dual Impedance Desk Microphone	36.19
MC35S	Fist Microphone 50K ohm IMP	17.01
LF30A	HF Low Pass Filter 1kW	24.68
TR7930	2M FM Mobile	329.00
TR9130	2M Multimode	499.00
TW4000A	2M/70cm mobile	522.00
TM201A	2M 25W mobile	296.00
TM401A	7cms FM 12W	316.00
TR2500	2M FM Synthesised Handheld	258.00
TR3500	70cm Handheld	270.00
TR2600	New 2M FM Synthesised Handheld	275.00
ST2	Base Stand	60.36
SC4	Soft Case	15.92
SMC25	Speaker Mike	18.66
PB25	Spare Battery Pack	29.10
MS1	Mobile Stand	37.31
R600	Gen. Cov. Receiver	299.52
R2000	Synthesiser 200KHz-30MHz Receiver	479.47
HC10	Digital Station World Time Clock	78.99
HS5	Deluxe Headphones	26.88
SP40	Mobile External Speaker	16.46
TH21E/41E	2M/70cm Mini-Handhelds	170.00/199.00
TM211E/411E	2M/70cm FM Mobiles	365.00/399.00
TS711E/811E	2M/70cm base stations	768.00/895.00
TR3600	70CM Handheld	292.00

ROTATORS

MR750E	Multitorque, round controller	193.00
MR750PE	Round and preset controller	217.64
MR300E	High speed VHF rotator	193.00
MR750U	Additional motor unit	64.64
MR300U	Additional motor unit	64.64
DR7600X	Heavy duty. Preset control	189.37
KS065	Deluxe bearing	27.30
KR500	Elevation rotator (not Daiwa)	144.90

CW/RTTY/TOR

Tono 9000E	Reader/Sender	P.O.A.
Tono 550	Reader	329.00
HI-MOUND MORSE KEYS		
HK702	Straight keyer marble base	30.95
HK703	Straight keyer	29.35
HK704	Straight keyer	19.95
HK705	Straight keyer	15.49
HK706	Straight keyer	16.96
HK708	Straight keyer	14.95
HK802	Straight solid brass	86.30
HK808	Straight keyer	39.95
MK704	Twin paddle keyer	13.50
MK705	Twin paddle keyer marble base	25.65
VIBROPLEX		
Vibroplex Iambic Standard		63.98
Brass Racer		54.59
Vibrokeyer Standard		63.98
Original Vibroplex Standard		70.54
The Presentation		129.62
MISC		
AFR8000	TOR/RTTY/CW Decoder	684.57
AFR2010	TOR/RTTY/CW Decoder	496.80
AFR2000	TOR/RTTY/ASCII Decoder	427.00
AFR1000	Low cost version of above	P.O.A.
Video module for above		85.00
CW module for AFR2000		124.00
Telereader	CWR610E CW/RTTY/ASCII	195.00
STAR		
MASTERKEY	Electronic Iambic keyer	49.95
Junkers	Straight key	45.00
GW Morse Keys		34.99

YAESU

FT690	6m Multimode	269.00
FT980	HF Transceiver	1450.00
SP980	Speaker	78.95
FT77	Mobile HF Transceiver	479.00
FP700	PSU	150.00
FC700	Tuner	105.00
FT77s	10w. version	449.00
FMU77	FM Board for FT77	28.35
FL2050	Linear Amplifier	115.00
FT290	2m M/Mode Port/Transceiver	315.00
FT290	With Mutek front end fitted	345.00
FL2010	Linear Amplifier	69.00
MMB11	Mobile Bracket	30.00
NC11	Charger	11.50
CSC1	Carrying Case	5.00
YHA15	2m Helical	7.65
YHA44D	70cm ½wave	9.95
YM49	Speaker Mike	20.20
MMB15	Mobile Bracket	14.55
FT203R	NEW 2m H/Held/C/W FNB3	195.00
FT209R	NEW 2m H/Held/C/W FNB3	239.00
MMB10	Mobile Bracket	8.80
NC9C	Charger	9.60
NC8	Base/station Charger	64.80
PA3	Car Adaptor/Charger	18.00
FNB2	Spare Battery Pack	27.02
YM24A	Speaker Mike	23.75
FT726R	2m Base Station	775.00
430/726	70cm Module for above	255.00
FRT7700RX	A.T.U.	49.85
MH1B8	Hand 600 8pin mic	15.70
MD1B8	Desk 600 8pin mic	64.80
MF1A3B	Boom mobile mic	18.00
YH77	Lightweight phones	14.95
YH55	Padded phones	15.35
YH1	L/weight Mobile H/set-Boom mic	14.95
SB1	PTT Switch Box 208/708	15.70
SB2	PTT Switch Box 290/790	13.80
SB10	PTT Switch Box 270/2700	14.95
QTR24D	World Time Clock	33.35
FF501DX	Low Pass Filter	29.90
NEW MODELS		
FRG8800	HF Receiver	475.00
FRV8800	Convertor 118-175 for above	80.00
FT703R	70cm H/Held	235.00
FT709R	70cm H/Held	259.00
FT270R	2m 25W F.M.	315.00
FT270RH	2m 45W F.M.	365.00
FT2700R	2m/70cm/25W/25W	499.00
FRG9600	60-905MHz Scanning RX	449.00

BNOS

POWER SUPPLIES				
6 amp		58.00	25 amp	148.00
12 amp		99.00	40 amp	296.00
LINEARS				
LPM 144-1-100	2m, 1W in, 100W out, preamp			181.00
LPM 144-3-100	2m, 3W in, 100W out, preamp			181.00
LPM 144-10-100	2m, 10W in, 100W out, preamp			157.00
LPM 144-25-160	2m, 25W in, 160W out, preamp			217.00
LPM 144-3-180	2m, 3W in, 180W out, preamp			247.00
LPM 144-10-180	2m, 10W in, 180W out, preamp			247.00
LP 144-3-50	2MN 50W out, preamp			108.00
LP 144-10-50	2M 10W in, preamp			108.00
LPM 432-1-50	70cm, 1W in, 50W out, preamp			235.00
LPM 432-3-50	70cm, 3W in, 50W out, preamp			235.00
LPM 432-10-50	70cm, 10W in, 50W out, preamp			195.00
LPM 432-10-100	70cm, 10W in, 100W out, preamp			335.00

Miscellaneous

DRAE	Wavemeter	27.50
L30	30W Dummy load	8.05
L100	100W Dummy load	35.20
L200	200W Dummy load	42.55
CT300	300W Dummy load	69.00
DRAE	2m Pre-set A.T.U.	14.50
TOKYO HI-POWER		
HC200	10-80 HF Tuner	82.50
HC400	10-160 HF Tuner	176.00
SWITCHES		
Sigma	2 way 'n' Skts	19.95
Welz	2 way SO239	22.95
Welz	2 way 'n' Skts	41.90
Drae	3 way SO239	15.40
Drae	3 way 'n' Skts	19.90

SPECIAL OFFER FOR THE FESTIVE SEASON

The STAR MASTERKEY has proved to be extremely popular with our customers and now, for the Christmas period only, we will be giving one away to every customer who buys a new h.f. transceiver from us. This is a limited period offer but it applies to any h.f. transceiver thay you buy.

Wishing you a Merry Christmas and a happy New Year – Tony G4CLX

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HAM RADIO TODAY

VOLUME FOUR No. 1 JANUARY 1986

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YAESU ANTENNAS

M150-GSX	2m ¼ / whip	7.35
RSL-435S	70cm ⅝ over ⅝ / whip	28.50
RSM-4M	Mag mount for above	16.95
MICROWAVE MODULES		
MML144/30LS	inc preamp (1/3w l/p)	82.90
MML144/50S	inc preamp, switchable	92.00
ML144/100S	inc preamp (10w l/p)	149.95
MML144/100HS	inc preamp (25w l/p)	149.95
MML144/100LS	inc preamp (1/3w l/p)	169.95
MML144/200S	inc preamp (3/10/25 l/p)	299.00
MML432/30L	inc preamp (1/3w l/p)	145.00
MML432/50	inc preamp (10w l/p)	129.95
MML432/100	linear (10w l/p)	299.00
B.N.O.S.		
LPM 144-1-100	2m, 1W in, 100W out, preamp	181.00
LPM 144-3-100	2m, 3W in, 100W out, preamp	181.00
LPM 144-10-100	2m, 10W in, 100W out, preamp	197.00
LPM 144-25-160	2m, 25W in, 160W out, preamp	217.00
LPM 144-3-180	2m, 3W in, 180W out, preamp	247.00
LPM 144-10-180	2m, 10W in, 180W out, preamp	247.00
LP 144-3-50	2MN, 50W out, preamp	108.00
LP 144-10-50	2M, 10W out, preamp	108.00
LPM 432-1-50	70cm, 1W in, 50W out, preamp	197.00
LPM 432-3-50	70cm, 3W in, 50W out, preamp	197.00
LPM 432-10-50	70cm, 10W in, 50W out, preamp	167.00

FRG-8800 **£475**

TOKYO HY POWER

ATU's		
HC-200	HF bands ATU 200W PEP	82.95
HC-400L	HF bands ATU 350W PEP	175.75
LINEARS VHF		
HL-30V	30W 2m linear 0.5-3W input	45.00
HL-35V	VHF linear 0.5-5W (3W in 30W out)	69.95
HL-82V	85W 2m linear 10W input	144.49
HL-110V	110W 2m linear	199.00
HL-160V	160W 2m linear 10W input	244.52
HL-160V25	160W 2m linear 25W input	209.75
LINEAR UHF		
HL-20U	20W 70cm linear	82.90
HL-30U	30W 70cm linear	119.00
HL-60U	60W 70cm linear 10W input	198.99
HL-120U	120W 70cm linear 10W input	356.85
PREAMPS		
HRA-2	2m mast head pre-amp	94.99
HRA-7	70cm mast head pre-amp	103.29

MET ANTENNAS

NOW IN STOCK

70cms		
432-5B	5 Ele	16.95
432-19T/ATV	19 Ele	35.60
432-17X	17 Ele Crossed	49.17
432-17T	17 Ele Long	39.20
2M		
144-5	5 Ele	19.55
144-7T	7 Ele	24.15
144-8T	8 Ele Long	31.26
144-14T	14 Ele	46.71
144-19T	19 Ele	55.88
144-6X	6 Ele Crossed	39.75
144-GP	Ground Plane	14.41
4M		
70/3	3 Ele	30.12
70/5	5 Ele	45.74
POWER SPLITTERS		
70cms	2 Way	19.55
	4 Way	23.00
2M	2 Way	25.50
	4 Way	28.75

We would like to thank

all those people that have supported us during the past year and to wish all HRT readers a Joyful Christmas and a Healthy and Peaceful New Year

DATONG PRODUCTS

PC1	Gen. Cov. Con	137.40
VLF	Very low frequency conv.	29.90
FL2	Multi-mode audio filter	89.70
FL3	Audio filter for receivers	129.00
ASP/P	r.f. speech clipper for Trio	82.80
ASP/A	r.f. speech clipper for Yaesu	82.80
ASP	As above with 6 pin conn	89.70
D75	Manual RF speech clipper	56.35
D70	Morse Tutor	56.35
MK	Keyboard morse sender	137.40
RFA	RF switched pre-amp	33.90
AD270-MPU	Active dipole with mains p.s.u.	51.75
AD370-MPU	Active dipole with mains p.s.u.	69.00
MPU	Mains power unit	6.90
DC144/28	2m converter	39.67
PTS1	Tone squelch unit	45.00
ANF	Automatic notch filter	67.85
SRB2	Auto Woodpecker blanker	85.25

DATONG

T30	30 Watt 3.5-500 MHz dummy load	8.05
T100	100 Watt 3.5-500 MHz dummy load	35.20
T200	200 Watt 3.5-500 MHz dummy load	42.55
BL40X	50 ohm-50 ohm 1-1 Balun 1kw pep	16.90
BL50A	50 ohm-50 ohm 1-1 Balun 4kw (pep) 2kw (cw)	19.84
SA450N	2 way antenna switch, 'N' connectors	18.40
SA450M	2 way antenna switch SO239 connectors	14.49
YM1X	3.5-150 MHz 120 Watt SWR/PWR meter	21.49
Insulators		
AE/EGG	Ceramic egg insulator	0.40
AE/DOG	Ceramic dog bone insulator	0.60
TOYO		
T430	144/432 120W	44.65
T435	144/432 200W	49.35
HI-MOUND MORSE KEYS		
HK702	Up down keyer marble base	30.95
HK703	Up down keyer	29.35
HK704	Up down keyer	19.95
HK705	Up down keyer	15.49
HK706	Up down keyer	16.96
HK708	Up down keyer	14.95
HK802	Up down solid brass	86.31
HK803	Up down brass	82.64
HK808	Up down keyer	39.95
MK704	Twin paddle keyer	13.50
MK705	Twin paddle keyer marble base	25.65
KENPRO		
KP100	Squeeze CMOS 230/13.8v	82.50
KP200	Memory 4096 Multi channel	169.50

COMING SOON

★ FT 770 70cm Mobile ★

All the features of the FT 270 but on 70cms

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COMPETITION

Win aerials for mobile, fixed and portable use on the UHF, VHF and HF bands!

Are you radiating into a piece of wet string? Why waste those valuable watts? Poor inefficient aerials lead to poor weak signals and can be the cause of RFI, BCI or TVI. Anyone who wants their signal to be heard knows that the first requirement is for a good effective antenna. In this month's competition we have aerials for HF, VHF and UHF to be won.

So read on and anSWeR the following mind boggling questions — you could be one of the lucky winners. . .

1. The HB9CV antenna is named after the Swiss amateur who designed it:

A True B False

2. Its 'E' plane radiation pattern is

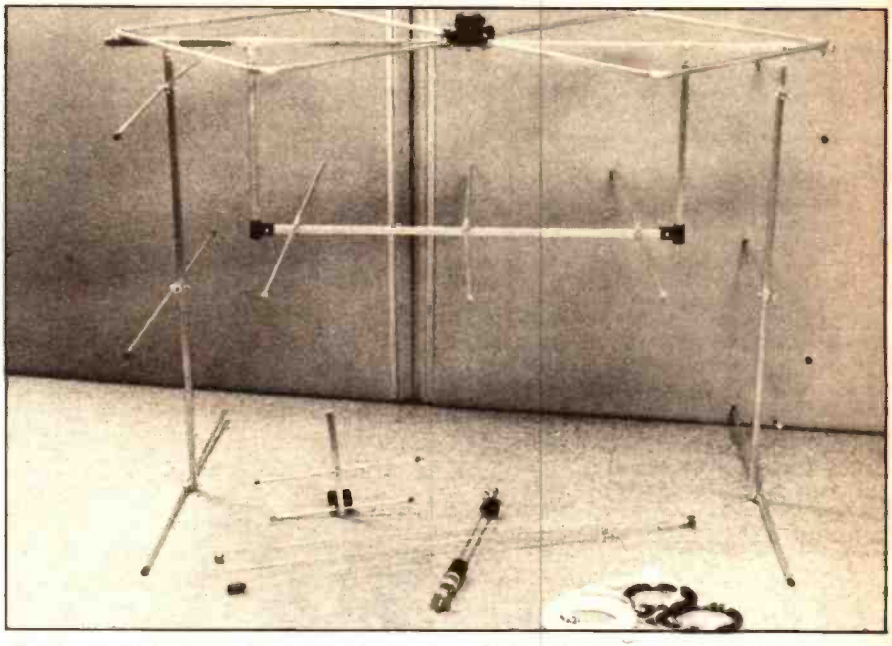
C omni directional D cardioid
E bidirectional.

3. You have a half wave vertical dipole on 2m, spaced ½ wave from a 2" diameter mast. The dipole faces due north from the mast. Maximum radiation is

F due north G east and west
H omnidirectional I due south

4. The radiation pattern from a G5RV type of antenna varies depending on the band you are operating on:

J True K False



5. Your transmission line has a loss of 15dB and does not have an aerial attached. When a VSWR bridge is inserted at the transmitter end and power is applied, the reading will be approximately:

L 1.25:1 M 15:1 N infinity

6. You have an aerial with a quoted gain of 6dB. Your transmitter runs 25 watts output when correctly terminated. Assuming no feeder or connection losses what is the ERP you would expect from your antenna system?

O 200 W P 50W Q 100W

WHAT YOU CAN WIN

1st. Multi P6 mobile antenna for 2m and 70cm from R Withers Communications and is valued at approximately £40.
2nd. The QD double quad 2m antenna for base station use from Halbar antennas valued at about £20.
3rd. A half size G5RV HF antenna for 10, 15, 20, 40 and 80m from AE UK Ltd valued at £16.50.
4th. An HB9CV for 70cm an ideal aerial for portable use and fox hunting valued at £9.50.

Complete fully and clearly, if you are the winner, this will be used as a label. Post to Antenna Competition, Ham Radio Today, 1 Golden Square, London, W1R 3AB. The closing date is first post on 12th January 1986.

NAME . . . . . .
ADDRESS . . . . . .
. . . . . .
. . . . . post code . . . . . .
Your choice of question answers ie B D Q etc . . . . .
. . . . . .

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 Antenna Competition, Ham Radio Today, 1 Golden Square, London, W1R 3AB. Closing date is first post 12th January '86.

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 ASP Ltd, the above companies 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.

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NEW FT690R 6m Portables £229.00!

IC271E 10 watt 2m All mode base Stations £599.00

FT730R 70cm BARGAIN FM Mobile ONLY £199.00

FT290R Yaesu's famous portable allmode £299.00

TRIO TS711E 2m All mode Base Stations £695.00!!

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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
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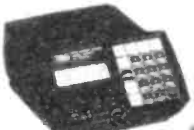
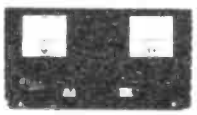


NEW AOR2002 Send for details



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LETTERS

CLASS B MORSE — NO LONELY ROAD TO HF

Sir, In reply to J Palfrey's letter regarding class B and CW operation I would like to make the following comments.

1. OK, so we had to do it the hard way, no option to practice on the air, it didn't make us any better. In fact with the option of being able to use CW 'live' with a critical ear on the other end, surely it enables the class B to iron out his/her mistakes. After all we had to make the big jump which could not have been very pleasant for the CW op.
2. CW operation on 2m during the last year or two has certainly increased, one only has to listen to confirm that and I live in a terrible VHF take off.
3. The business of 'all mode section'. The general feeling I have found is that the class B's who want to use CW find it very hard to find any class A's prepared to work them — more's the pity.
3. What about those B class licensees who have passed their CW but waiting for special calls and still wishing to keep their CW? Who are they going to find in the all mode section?

Personally, and I suppose the powers that be will pounce on me, I'm only to willing to help and try improve CW from those who want to learn, whatever part of the band. Yet again I agree that standards should be retained. It was a shame that the some sort of calling frequency for this type of operation wasn't allocated. I've always thought 144.100-150 could have been used with identification of calls allowed on phone, after all very few CW ops go that far up the band.

Like Mr Palfrey, I enjoy CW very much and encourage those who choose to use the mode to also enjoy it. It's no wonder operators are put off by this sort of attitude and opt to drop the mode once they've got through the test.

CW is not a passport to HF, it's the opening of a thoroughly enjoyable form of communication and should be encouraged not deterred.

I am a CW operator and have had so much fun in the 21 months I've had my G4, I only wish to pass on some of my very novice opinions.

Sue Frost, G4WGY

P.S. Unlike the gentleman who stirred me to put pen to paper, I hope the variation carries on after the experimental period I wouldn't like to tread that lonely road again.

Sir, Further to the letter by Mr Palfrey, G4XEN, in the November '85 issue. I would like to defend the class B CW experiment.

The actual variation document contains only five conditions. These are:

1. This variation shall remain in force, so long as your licence remains current, for the period 1 April 1985 to 31 March 1986 unless it is withdrawn by subsequent notice given by the Secretary of State for Trade and Industry.
2. Morse transmissions may only be made from your station address and no other location.
3. This notice should be kept with your current licence and must be made available for inspection whilst the variation remains valid.
4. A breech of any of these conditions may result in this facility having to be withdrawn.
5. Save for the terms laid down in this notice, under no circumstances is operation permitted except under and in accordance with the terms set out in your amateur licence.

The other document issued with the variation is headed "Notes for the guidance of holders of amateur radio licence (B) when using morse code" and are only suggestions.

Since 1st April 1985, I have made contact with 57 different stations using CW. I have also made contact with several of these stations on quite a few occasions. However, it is possible to call CQ for up to an hour at a time without getting any replies. This may be the reason that Mr Palfrey has has class B operators in the CW only section. This seems to be due to a lack of understanding by the majority of class A CW operators who have not seen the variation and do not know about the recommendations which were made with it.

I use 144.155MHz with SSB identification. I do not think that I am wrong in using this frequency. It is outside the 'forbidden' CW only section and it is out of the way of the many FM net frequencies in the all mode section. A lot of class B stations have joined me on this part of band because they have been blotted out by local FM stations who, unknowingly, spread over them.

Whilst we are talking about putting oneself out for the class A ticket. I travelled from Birmingham to Highbridge twice last year, at a cost of £15 each time plus travelling expenses. On each occasion, I failed on the sending part of this test although I had done a years course at night school and practiced at several class A friends' houses.

In June of this year I went to Elveston Castle Rally and passed the morse test. The experience of using CW 'live' for three months and the advantage that I could practice whenever I wanted to gave me the confidence to have another go.

Several of the class B CW operators who I regularly work have now passed the morse test but still use the variations and their new keyers while they wait for their new callsigns.

I hope that the experiment continues after 31/3/86 and is extended to all class B licence holders. The number of new G0 stations who now have a better idea of CW practices and procedures is increasing. The days when a new class A operator could be identified by his faltering first steps on 144.050MHz is passing. Also CW is no longer seen as a 'chore' or some 'magical mode' is being dispelled as class B operators use and enjoy CW whilst they are getting their speed up for the test.

Dave Ackrill, G6 VMQ.

P.S. "The VHF Committee has been considering several letters on the subject of calling frequencies for class B morse, and suggests that 144.155MHz is a good choice for the 144MHz band." Quoted from the 4-2-70 column by G8VR on p789 October 1985 Radio Communication.

LIGHTER SIDE

Sir, On a 2m net: "Can someone tell me the exact length of a dipole on 20m? I need it for JOTA — I'm doing the aerials." My only thought: What RAE?

Andy Sillence, G4MYS

CRYSTAL OSCILLATORS — THE FINAL WORD

Sir, I would like to thank both Mr Green, G1NAK, and Mr Biddulph, G8DPS, for their useful comments in conjunction with the overtone oscillator circuit which appeared in Practicalities (July '85). In fact, the point I was trying to make was that crystals can have several modes of oscillation, fundamental and overtone being but two. Although they are cut for a particular mode it is still possible to excite unwanted ones. Therefore it is wise to make the feedback selective so that the crystal can only oscillate in the correct mode and on the correct frequency.

Ian Poole, G3YWX

RENEGGING ON PLANNING PERMISSION

Sir, This is an unfortunate story, the conclusion of which you may be able to change with the help from your readership.

What has happened? I thought I was one of the lucky ones with permanent planning permission for my tower. However, Southampton Planning Committee have now chosen to attempt to issue a discontinuation order with a view to the tower removal. The grounds for the order are based on TVI although the cause of the problem has nothing to do with radio and I believe the TVI is minimal. The story is singularly unfortunate when one considers the future implications of the Council's action — if they are successful nobody — amateur or commercial users — are safe. The planning permission would not be worth the paper it is written on.

I am asking you to ask your readers to write to Southampton Council Planning Committee (Civic Centre, Southampton) and express their views. Meanwhile, I continue to fight the Council on legal grounds. Your assistance would be greatly appreciated.

Richard Diamond
Commercial Director
South Midlands Communications Ltd.

AMATEUR RADIO — HOMEBREW?

Sir, A W Sharp, G4WDB, in his letter in the November '85 issue raised the question "What is Amateur Radio?"

I offer a part answer. Amateur radio is about struggling to pass the RAE and CW test; working your first station; working your first CW DX station; spending all weekend building a project only to find the last component is missing and then waiting all week for the component to arrive. It is about finding out what it was that went 'bang!'; putting up aerials in a force 10 gale; working portable in the rain on a hilltop; trying to track a satellite, and building test gear. It is going to a rally and finally meeting the face behind the voice/fist; working your first QRP contact on a rig you built yourself; branching out into computing RTTY, SSTV, VHF or microwaves and so on.

Altogether, amateur radio is what you are prepared to put into it. If that is all homebrew or all ready made gear, you'll only get out what you put in. In my opinion, those who boast about having the very latest rig from _____' don't really know what they're looking for in the hobby.

I endorse the comments regarding finance firms not taking a second look at unemployed or handicapped people, but you don't need vast amounts to have fun within the hobby. Kits may not be the cheapest either (DIY design is), but with a kit, the bugs have or should have been ironed out.

To anyone in doubt, put your commercial gear away and try a homebrew transceiver by way of a change, at least afterwards you could be able to argue "tried it, not my scene!"

Basil Spencer, G4YNM.

RESPONSIBLE FOR WHAT?

Sir, I was also at the AGM/EGM (1984) of the RSGB as was your correspondent Mr S B Rickwood. I was disappointed at the poor way the meeting was handled from the chair. A lot of points were (a) not answered and (b) not allowed to be raised.

The meeting started at 2pm and finished at 7.05pm (with, I admit, two short breaks), the reason for the 7.05 finish was that the building had to be vacated, otherwise the meeting may have gone on for another five hours.

Two final points, if as Mr Rickwood suggests "responsible" members "shouted down" other members trying to make a contrary point, then he has a very individual view of responsibility. Surely responsible people listen to all viewpoints and then decide; not as it would appear to hold fixed views and then deny others the right to air theirs.

Lastly, it was sad to read Mr Evans' reply to Mr Crosland's letter. This level of personal attack serves no one well, least of all Mr Evans and by implication the RSGB. To lower the level of debate to this strata serves to point out that those in authority within our society must be getting rattled by the groundswell welling up against them.

Keith S Killigrew, G6DZH

Having tried to contact Mr Rickwood, we have found that the address he supplied does not exist. We must ask that all our correspondents provide full and accurate addresses otherwise their letters will not be considered for publication.

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

COMING IN HAM RADIO TODAY IN 1986

For those of you browsing through HRT by the fireside, fattened with festive goodies but with your wallet as light as a feather, we bring you tidings of great joy.

The editorial staff's collective resolution for the New Year is to demonstrate that amateur radio can be cheap, good fun.

Ok so you're bored with two metres, morse code gives you earache and 10 and 15m are dead anyway. You'd like a TS940S but you already have one mortgage and the bank manager hates your guts. You could almost go QRT and start collecting whisky bottle labels instead...

Don't despair. Bear with us.

Starting next month is a new series on modifying surplus PMR equipment for the VHF and UHF bands. First up for the soldering iron is the Pye Pocketphone, closely followed by the Westminster. Both nice simple stuff. A wise person could pick them both up at a mobile rally for under 30 sobs all in. Eh, Arfur?

We will also be looking at buying HF SSB gear on the cheap. The LF bands are in great shape and you could be on 80-10m for under £150, make that £50 if you like CW. Easy, if you know what to buy.

Coming soon, Tony Bailey, G3WPO, goes back to his roots and produces some transmitters and receivers with absolute simplicity, novelty and cheapness as the watchwords; tempered by his age old knowledge of the black art of RF design. Ka-powww!

We are proud of our reputation for making new or 'difficult' subjects crystal clear. The author of our famed E-M-E series, Dr Charles Suckling, G3WDG, will be showing that you don't need a BSc and an arc welder to enjoy the microwave bands. Also on the agenda is an exploration of the link between VHF and propagation and the weather plus a look at 'advanced' satellite working.

Transverters from 28MHz to 6, 4 and 2m, QSL cards, 934MHz, updating the FT101ZD... We won't bore you or force you and your family into the workhouse, although we will be reviewing the TS940S...

Have a happy New Year,

Steve Ireland, G3ZZD,
Julie Darby, G1CKF,
Dave Bradshaw, G1HRT.

HAM RADIO TODAY NEXT MONTH

TRANSVERTERS GALORE
Convert from HF to 4 or 6m with this state-of-the-art design by G3WPO

A Mini Hula Antenna for 2m

Louis Varney, G5RV, tells 'The Marconi Story'

AND

The Pye Pocketphone Phoenix
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3 only YAESU FT726 with 2m band	**£649**	3 only KENWOOD TS411E 70cms	**£319**
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5 only YAESU FT270 25w 2m transceiver	**£252**	2 only ICOM IC3200 duo-bander	**£395**
3 only YAESU FT270 45w 2m transceiver	**£290**	2 only MUTEK 2-6m TRANSVERTERS	**£169**

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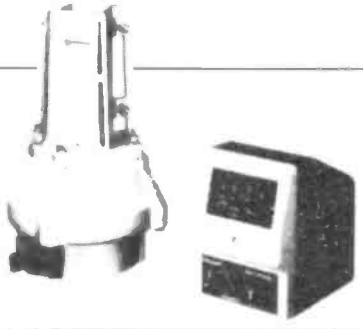

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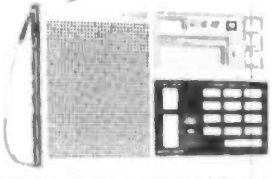

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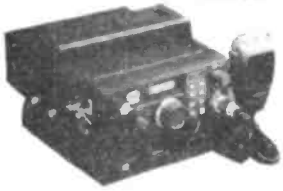

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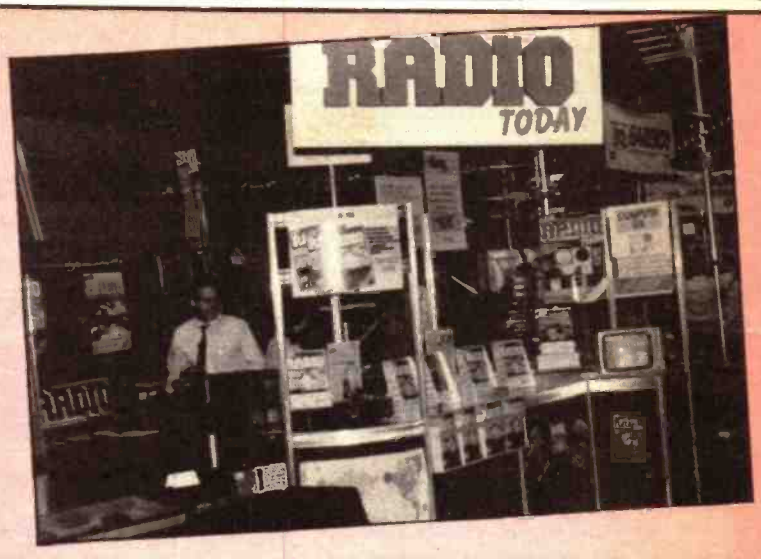
RADIO TODAY

Ray Withers stands proudly? with his pink ticket.

Just some of the many recently produced models that were on display at the show.



Three Return To Leicester

The Leicester show held on 25 and 26th October was yet another success. The HRT Radioshow comprising of Julie, G1CKF, Dave, G4NXV, and Trevor, G6LPZ, returned for a second year. Trevor Butler, G6LPZ, reports on the show and an interesting 'minor' drama.

The Leicester Amateur Radio Show has become "the show of the year" claim the organising committee and this claim is widely supported by the traders. In excess of 7000 people, yet another increase on last year, visited the Granby Halls over the two days and certainly took the opportunity to obtain the bargains on offer.

The HRT stand was inundated with prospective buyers of the 'Computa DX' program for the BBC, which was displayed on the stand. This Grey Line DX predictor created a lot of interest and we hope it will soon be available for other home micros. Also on display and proving a rival for enthusiasts' attention was the Icom IC735 HF transceiver kindly loaned by Thanet Electronics.

The show began with the initial influx of bargain hunters on the Friday and started for one trader with a 'pink ticket'. An unhappy and rather disgruntled Ray Withers from Birmingham explained that he had been approached by two men who identified themselves as representatives of the Department of Trade and Industry's Radio Investigation Service. They had reason to believe that his company was displaying some equipment which may be operated on a frequency for which he was not licensed to operate. Mr Withers explained to HRT tht this was in fact a piece of equipment, model number CTI FM 24 and described as a stereo FM private studio for community radio use, incorporating a six channel mixer with a low power FM broadcast band transmitter working on 88-108MHz.

"It's about the size of a cassette deck" continued Ray Withers, "and would prove exciting in the recently anounced field of community radio."

The Department of Trade have powers of seizure under the 1984 Telecommuniations Act, although any offences being considered are most likely to

Over 7000 people visited the show over the two days.

reflect the Wireless Telegraphy Act, amended in 1984. A spokeswoman at the DTI has informed us that the unit is still being held pending further enquiries and that solicitors are investigating the circumstances to decide whether or not there is a case.

The confiscated equipment was, she said, an FM stereo transmitter on 102MHz, and that it was illegal to import, make or sell such a radio because it could cause interference to other radio users.

It is perhaps surprising to note that in Japan they are used as toys and considered to be harmless according to a Japanese trade official. They are capable of producing only a few milli-watts, being just a free running oscillator using a transistor designed for audio use to 80MHz with an estimated collector current of 150mA. At the time of seizure it was seen to be running into a 50 ohm dummy load and operating on a frequency of 102.1MHz with wide band FM output.

Mr Withers was given a pink receipt for the equipment and is currently waiting to hear from the DTI. In the meantime it will be interesting to see if other traders become more careful about displaying new equipment, and also whether the RIS intend to visit other amateur radio rallies in a similar manner.

After the events of Friday, Saturday might have seemed dull by comparison. However, as usual the crowds were bigger with many travelling a couple of hundred miles. The crush did not seem to deter them though with all the traders reporting good sales.

The show next year will be held on October 24th and 25th at the same venue. As Frank Elliott, organising committee member and exhibitor explained, it would be possibly to fill a site twice the size of the existing one but the atmosphere might be lost and the show would go the way of the previous Leicester Show. Leicester was always the traders show operated by the Amateur Radio Retailers Association and until it moved to a new venue and lost support was a popular date in the calendar of many amateurs. The present exhibition is run by a committee made up of representatives of the Leicester Repeater Group and the Leicester Amateur Radio Society who share the proceeds of the event.

The War Goes On

The RSGB have published an "initial response" to the proposals put forward by Mr Lundegard, G3GJW, Mr Smith, G4AJJ, and Mr Crosland, G6JNS, reported in Radio Today, December '85. The letter is addressed to all members of the Society although some 6000 were distributed through affiliated clubs and societies, and is signed by 1985 President Mrs Joan Heathershaw, G4CHH.

The letter questions whether the three proposers for an EGM to change the Society have any special qualification for this. It goes on to criticise the proposals in general as being existing practice, some new not very good suggestions and some tired old ideas that have already been rejected.

Mrs Heathershaw recommends members to look carefully at documents of this type since they give no indication of the pros and cons of the changes. She says "members should not commit themselves.... until they have heard further from the Society."

Apparently, the proxy forms accompanying the EGM proposals were "not prepared with the authority of the RSGB" and that official forms will be issued later "if necessary".

The letter ends with the following statement "The Society is particularly concerned that a high proportion of valuable HQ and volunteer effort is being diverted away from progressing amateur radio.... Is this what members really want?"

AKD Competition Winners

The first prize winner of our AKD competition run in the November '85 issue is Mr Hilton-Jones of Wendlebury who wins a VHF/UHF wavemeter and a 2m preamp. Mr L Case wins the second prize of a VHF/UHF wavemeter and Mr A Elcoate of Basildon wins the third prize of a 2m preamp. The ten runners up who will each receive a TVI filter are Mr B Court of Brighton, Mr A Papps of Llandrindod Wells, Mr A Adams of Rayleigh, Rev J Morris of Clemonger, Mr P Westbury of Bournemouth, Mr J Quash of Grimsby, Mr G McCutcheon of Ballyskeagh, Mr M Brown of Slough, Mr M Element of Shrewsbury and Mr J Stacey of South Molton.

Congratulations to you all!

PEP Conversion Module

In the November '85 issue, we published a review of a PEP conversion module in an article entitled 'Power Meter Add-on for SSB Signals'. Unfortunately, the company who supplied us with the module has gone out of business. However, sole rights to produce the module were bought by GW Morse Keys of Rhyl who are now selling it at a price of £9.99.

GW Morse Keys have just brought out a new model of their now famous solid brass key. This model is aimed at contesters and CW enthusiasts who prefer a slightly lighter key, although it is still mounted on a slate base. The key costs £34.99 plus £2 postage and packing. Further details on both these products are available from GW Morse Keys, 4 Owen Close, Rhyl, Clwyd (phone 0745 54763).

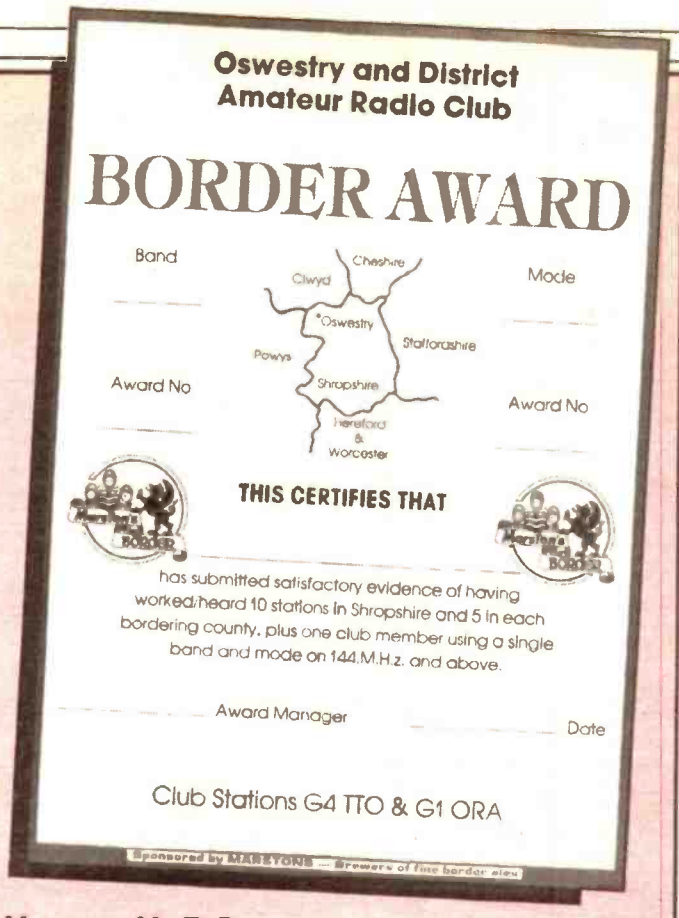
St. Albans Rally

The first St Albans (Verulam) Christmas Rally will be held on 1st December at St Albans City Hall. It starts at 11am and will have club and trade stands, a bring and buy stall and refreshments. Talk in activities will be available on 2m and 70cm and entrance is only 50p. Further details from Hilary, on St Albans 59318.

Border Award for VHF/UHF

Oswestry DARC have announced a "Border" award for working — or in the case of an SWL hearing — 10 Shropshire stations and 5 in each border county (Clwyd, Cheshire, Staffordshire, Hereford and Worcester and Powys) plus one club member. All contacts must be on one band and only one mode and should be made after 31st December 1985.

Club events using callsigns G4TTO and G1ORA or special event callsigns as yet unknown are eligible for the award along with any mobile or portable stations in the appropriate counties. To obtain your award, send your 'Counties List' of stations worked or heard (including band, mode, date, QTH) which should be certified correct by two licensed operators or SWLs, with £1.75 to Oswestry DARC Awards Manager, Mr T Parsons, G6XPO, 90 Castle Street, Oswestry, Salop, who can supply further information, if required, on receipt of an SAE.



Active Antenna from Dressler

Dressler have produced an active antenna with a frequency range of 50-650MHz and a typical gain over that range of 17dB. Called the ARA500, it claims also to be able to operate up to 950MHz with a gain of 10dB. The antenna is apparently unique in design and operation and "the only one of its kind available today". It costs £99 and is available from Dressler UK, 191 Francis road, Leyton E10 (phone 01-558 9854).

Satellite Summary

University of Surrey Spacecraft Control Centre has informed us that the Russian RS satellites have been brought back into service. RS5 and RS7 are working well with RS7 doing what they call 'robot duty' recently. RS8 seems to be having trouble at the moment apparently from its recent series of eclipses.

Repeater News

Seven proposed UHF repeaters have been submitted to the DTI. They are GB3HL, West London, on RB3; GB3BV, Hemel Hempstead, on RB1; GB3GH in Gloucester on RB5; GB3DD, Dundee using RB10; GB3WJ in Scunthorpe on RB5; GB3RE, Chatham, using RB11 and GB3GM, West Glasgow, on RB12 operating RTTY and data modes. However, the franchises for repeaters on channels RB1, 3, and 5 will not be released until negotiations with the Scandinavian authorities regarding mutual non-interference/co-existence are complete.

A separate batch of 24cm TV repeaters has also been submitted, consisting of GB3HV, High Wycombe, on RMT3 (FM with 1248MHz in and 1308MHz out); GB3PV in Cambridge, RMT2 (FM); GB3SX, Hastings, on RMT1 (AM); GB3GT in Glasgow on RMT2 (FM); and GB3AF, Durham, on RMT2 (FM). GB3UD, the Potteries TV repeater is now on the air on RMT2 (FM video), input on 1249MHz and output on 1318.5MHz with sound 6MHz higher. The site is Mow Cop, about 1000 feet above sea level. If you have any reports on the repeater's operation G6UKP would be pleased to hear them.

The Repeater Management Group has announced that due to financial constraints, the proposed open meeting to be held in South Wales has been postponed until next year. A proposed UHF repeater coverage booklet has also been dropped because the time and effort required would result in hold ups in more pressing matters. The RMG has recently been reviewing its structure and apart from some changing of seats on the committee, they are proposing to have twenty regional representatives elected by the respective repeater groups who will correspond with their "Repeater Managers" on the committee.

The insides of the SPC300 and SPC3000 antenna tuning units manufactured and sold by Cap Co Electronics Ltd. The basic design is similar to those produced by the now defunct Tau Systems, although these units have had various technical and mechanical improvements made to them, including changing the eight metal tie bars for Acetole which reduces the inductance. Although the SPC300 is now smaller, it is still capable of handling up to 1kW. The SPC300 is priced at £164 inc VAT and the SPC3000 £214 both in complete form. Cap Co Electronics are based at 63 Hallcroft, Birch Green, Skelmersdale, Lancashire (phone 0695 27948).

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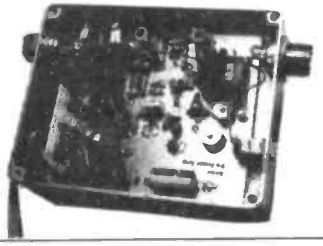

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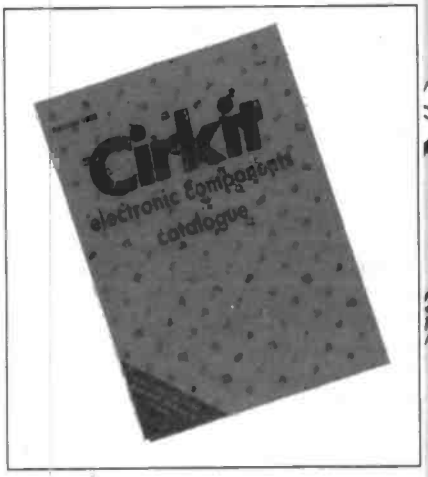

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Pom On A Pushbike

Remember 'Antarctic DXing' with VP8ANT (August '84 HRT)? Well from there, Richard Newstead, G3CWI, decided to take a holiday and cycle across Australia with an IC2E for company...

'And now for something completely different.' The old Monty Python phrase came to mind as I thought about a long holiday and a complete change of climate after 2½ years in Antarctica as VP8ANT. A cycling trip seemed like a good idea. I would get some exercise and keep the costs down, but where? The answer came in the middle of a pile-up when the band opened to VK. Australia, of course! Coonawarra, Murrumbidgee, Wagga Wagga, the QTHs rolled out of the speaker until I could smell the gum trees. Flat, hot, plenty of things to see, and locals who speak English (well nearly). Just the place for a little bike ride, or even, as I had plenty of time, a trans-continental one — the full 5000kms from Perth to Sydney.

Six months later, in March 1984, I set out from Perth on a sturdy touring bike; equipped with an IC2E two metre hand-held, modified to cover the extra 2MHz (146-148MHz) available in VK, and a lightweight tent for roadside camping. Getting a licence in Australia was a breeze. After a quick visit to the local office of the Department of Communications I was QRV on the Perth repeater, as VK6ARN, explaining my plans to the locals.

When they had stopped laughing, one of them, a Wireless Institute of Australia newsreader, asked for an interview. Australian amateur newsreaders seem to have much more freedom than the RSGB's GB2RS people are allowed and they quite frequently broadcast recorded interviews with radio 'celebrities'. The 'pom on a push bike' was clearly going to fill the joke-of-the-month slot, but I was determined to have the last laugh by completing the journey.

A Warm-up Trip

Before heading off into the desert, I set off on a warm-up trip to Albany, a town on the south coast about 400km from Perth. The first day was a nightmare — it rained non-stop. The new bike developed a puncture after only a couple of miles and the rig's antenna dropped out of a pannier, forcing me to re-trace my wheel-tracks until I eventually spotted it lying in the mud.

Averaging 60 miles per day an early stop was at Busselton a town covered by a forest of antennas. Nearly every house had a 100 foot mast supporting a VHF TV array. A quick call on 2m yielded the explanation that the nearest TV station was back in Perth, a 200km sea path, so all TV owners had to become DXers if they wanted to see anything.

Albany has a special place in the record books as a high proportion of VHF, UHF, and microwave distance records are held by amateurs living there. The reason is the 1500km sea path into South Australia across the Great Australian Bight, which ensured that the very first QSO made by one of the locals on 23cm was a world record!

VK6HD's QTH — A Top-Banders Pilgrimage

Back in Perth again and considerably fitter, I was ready to set out into the desert. But first I had to pay a trip — a pilgrimage really — to the QTH of Mick Bazley, VK6HD. Mick is world famous for his 160m activities and over many years has hardly missed an opening to Europe. That Australia is not considered very rare by European top-band DXers is entirely due to his efforts.

He lives inland from Perth, on top of a 1000 foot escarpment. This, along with the fact that he listens without fail every day explains his success on 160. When I called round, Mick was using a dipole at about 85 feet and we had quite a chat about aerials for the band — he has a large plot of land and is keen to experiment. Many of his experiences on 160 proved to be similar to mine when I was active from Antarctica. We had both spent many hours listening to Euro-

peans calling CQ who proved to be completely unable to hear our frantic responses. This seems to be a feature of remote quiet QTHs in the southern hemisphere.

From Mick's QTH, I headed out towards Kalgoorlie over 650km of wheatfields, scrub and desert, covering about 150km a day. I had been told to look out for VK6GD's QTH on the way, but the only directions given were: "You can't miss it. Just keep going for 200km and you'll see his callsign on a gatepost". Sure enough, it appeared early on the second day and as I had started at dawn (the Australian dawn chorus is impossible to sleep through with only canvas walls) I was promptly invited in for breakfast and a rag-chew.

The remainder of the desert ride to Kalgoorlie became distinctly uncomfortable as the landscape became more and more desolate. I'd been expecting the heat; but was totally unprepared for the swarms of biting flies that would often give chase down the road for many kilometres before abandoning plans to eat me alive.

Camping also turned out to be a hazardous business not only because the softest ground had usually been colonised by bull ants which had a fearsome bite even through thick layers. At night there seemed to be a serious risk of being jumped on by passing kangaroos. Lying on the ground, a continuous thud, thud, thud could be heard as the creatures moved about. I just had to hope that they had good night vision, but then again, if they *could* see well, they might resent this obstruction and try to kick it down.

Maybe the locals back in Perth had been right all the time, perhaps I was mad to try cycling across the Nullarbor. After a few more days, I decided to cheat and take a train across the worst part of the desert as far as Port Augusta and then continue by bike through the Lofty Mountains to Adelaide.

Adelaide and Melbourne

Telecom Australia's Wireless and Telecommunications Museum, housing a magnificent collection of early amateur and professional radio equipment, is one of Adelaide's main attractions. But for the touring amateur another must is a visit to the local radio club. Its QTH inside an eight storey water tower topped by an HF beam 150 feet above ground was one of the best I'd ever seen anywhere in the world; yet for some reason the membership was declining. Some people don't know when they're well off! Perhaps the most interesting encounter with a local during my stay was with Clarry, VK5KL, as I had attempted innumerable unsuccessful 160m skeds with him during my spell in the Antarctic.

From Adelaide, I pressed on to Melbourne where the zoo presented one of the strangest sights I'd seen for a while. The parrots' cage was fully equipped with a wide range of microwave dishes all beaming straight into the wire mesh enclosure. What on earth could it be for? Freshly cooked parrot? "Our parrotburgers are squawking fresh"..."Wings its way to the table"... Or perhaps a new repeater system? All was revealed by an explanatory notice around the corner. It seemed that whereas microwave systems in most countries are only threatened by the weather; in Australia they are regarded as a dietary delicacy by the local birds. No self-respecting parrot down under is satisfied unless he finishes off his meal with a piece of crunchy waveguide. In an attempt to control this problem, Telecom Australia was presenting the birds with a wide variety of materials to find the ones they liked least. Oh well, I suppose there had to be a reasonable explanation.

The final leg of the journey was up through Canberra to Sydney, an area extremely well covered by 2m repeaters. One in particular, at Bega, had a range of about 200 miles. Its position in the centre of a narrow inhabited strip between the sea and the Great Dividing Range meant that with no need for inland coverage it could use very directional beams up and down the coast. Arrival in Sydney was notable for the first appearance on two metres of jammed repeaters. Very reminiscent of home, and appropriately so as my adventure was just about over. It wouldn't do to get too used to the uncrowded, unhurried, nature of the 2m band down under.

To the numerous Australian amateurs who rag-chewed with me while I was on the move; to pick-up drivers who gave me a lift up many mountain roads; and to the kangaroos who ignored my tent out in the bush; thank you for the experience of a life-time.

HAM RADIO TODAY EDITORIAL

An open New Year's card to David Evans, General Manager, RSGB.

Dear David,

Last year you devoted two editorials in Radio Communication warning members that they should consider very carefully who they nominate (August '85) and vote for (November '85) for members of Council at the 1985 AGM.

I understand your concern for the well being of the Society, but find your tone rather patronising and feel that you are missing the point.

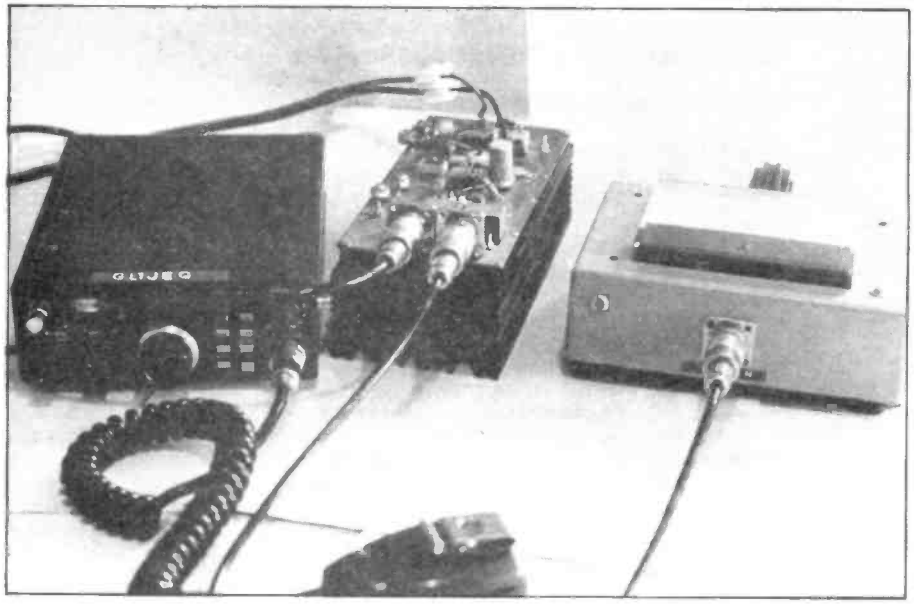
The point of what? Of G4AJJ's resignation from the Council, of talk of holding an EGM to suggest radical changes to the Society's method of operation and leaflets being distributed at mobile rallies throughout the summer to this effect. If you have been listening around on the amateur bands, particularly 2m where the newly licensed generally go, you would realise that this is not merely 'smoke' - the fire has been burning for some time now. Between 1981 and 1984, the membership of the Society grew by over 20% (Rad Com average circulation 29 080 in 1981, 35 405 in 1984). Those new members came into the hobby on the crest of the CB and computing boom and are now well established on the bands. The attitude of many amateurs and the RSGB toward CB was very negative and many of those members - some who still retain a CB rig in the shack, perhaps converted to 10m these days, remember and resent this. These few members do not trust many of the current Council members who are 'tainted' with the old attitudes and faceless to the majority of them. They are concerned that Council members are familiar with them and their aspirations, not just 'the tasks which the RSGB faces', big though those may be.

Many older licensed 'active' amateurs like myself have lost faith in the ability of many Council members to truly reflect or even conceive of the desires of the membership because of their inability to understand or represent these 'new' members.

Happy New Year and thanks for your hard work last year,

Steve Ireland, G3ZZD,
Member RSGB.

A 2m SSB Linear



If you have a 2m multimode rig with only 1-3 watts out, this amplifier design from Geoff Pike, GI1JEQ, offers up to 80 watts on SSB.

I suppose that many new licensees to VHF, like myself, either acquire an FM mobile or multimode rig. Most of the popular multimodes tend to compromise on RF power output because of the cost and limited space. The Yaesu FT290R is an example with only 2-2½ watts of RF available.

It is not long before you discover that DX with only 2-2½W and a 9 or 14 element beam rarely exists unless you live on a mountain top. However for local work, this power level is more than adequate. So for most of us in average VHF locations with relatively low power outputs but able to hear distant stations or beacons it is then necessary to increase the ERP of the station.

For most people 9 or 14 element beams are the limit, the lucky few with room for stacked 17 element beams are in the minority. So an amplifier of some description is needed to increase station ERP levels.

Most of my 2 metres operation is on SSB; so the amplifier requirements were for about 70-80W but only for the reduced duty cycle inherent in SSB operation. This amplifier is primarily intended for SSB operation and so not for 100% of the duty cycle in RTTY or FM. However, with suitable caution, it can be used for these higher duty cycles.

Transistors vs Valves

Although valves are the undisputed generators of RF power and semiconductors for high power VHF use are very expensive, it was thought that using transistors would be more practical, especially if a PSU is already available. This was the position in my case — not everyone is at home with 2kV power supplies — a typical power level needed for a QQV06/40 valve in SSB service.

It should also be remembered that if you price out a valve design, for a similar power output, the cost involved can be quite surprising. Over two thirds of the cost of this amplifier is made up of the VHF power transistors, so some care should be exercised during the tune up procedure. The total cost of this amp should not exceed £1 per watt which compares favourably with commercially available units.

VHF power transistors are available from a variety of sources including Motorola, Thomson-CSF and Solid State Scientific. The choice of the MRF247 — a linear version of the MRF245 — for the output transistor, and a 2N6082 driver was made on the basis of ready availability including information on their specification. It is, however, possible that some of the Thomson-CSF transistors eg the SD1416 could be substituted for the MRF247 — it may also be marginally cheaper.

Motorola specify minimum gains for the 2N6082 of 6.2dB (4.2 times) and 7.0dB for the MRF247 (5.0 times). This is a total of 13.2dB or a 21 times power gain — in theory this is the worst possible gain. With an average FT290R (2 watts output), this amplifier will improve it by 2 x 21 = 42 watts. In practice, the real lower limit is about 65 watts — more typically 75 watts — which implies an overall gain of about 16dB (x40).

It cannot be stressed enough that many factors will affect the stage gains in the amplifier including the capacitor types, board earthing and output relays. My two versions gave 65 and 80 watts

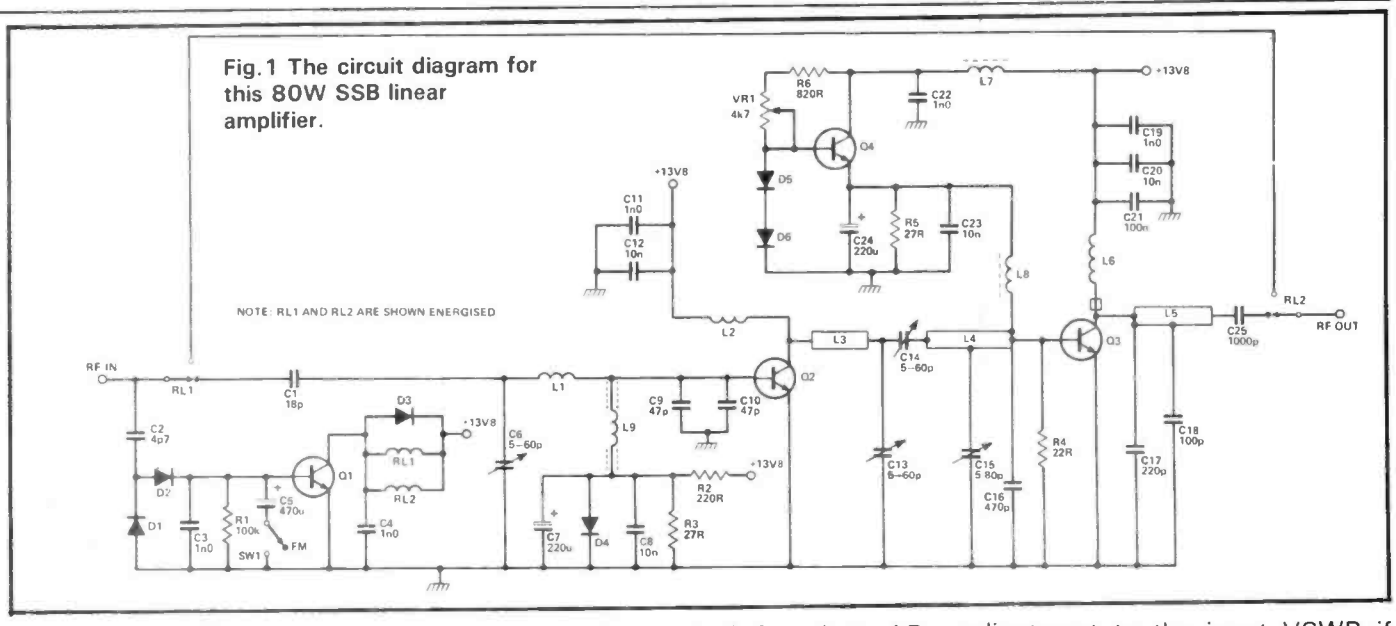


Fig.1 The circuit diagram for this 80W SSB linear amplifier.

respectively. The driver stage, rated at 25W output, showed a stage again of about 8½dB. An overall deviation of about +/-1dB should be expected.

Finally, care should be taken to not run the amplifier at more than 80 watts, especially on 100% duty cycle operations.

The Circuit

This is best described in two halves, the driver, 2N6082, and the output stage MRF247 (see **Fig.1**).

The driver stage consists of a single stud mounting device the 2N6082, which is rated 25W with a minimum gain of 6.2dB at 175MHz, 8dB being typical at 145MHz. This stage brings the 2W input level up to a maximum of about 14W for driving the MRF247. The input from RL1 to the 2N6082 (Q2) is impedance matched via C1,C6,L1,C9,C10. The impedance at 140MHz is 1.29+j 1.3 ohms which means it is inductive in nature. This is cancelled by an equal and opposite capacitive reactance made up from C9 and C10. This should leave the input impedance purely resistive over the 2m band.

Impedance transformation to 50+j0 ohms is accomplished by the C1,C5,L1 network. C1 is fixed in value to make tuning easier, and although this compromises the network Q slightly, the input SWR on the prototypes was less than 1.5:1.

As the transistor is required for SSB operation, a small standing current is required for class AB operation. As the input power is less than 3W a simple diode/capacitor/resistor combination is used. R2 sets the approximate bias current, but adjusting R3 will give a measure of fine adjustment. The bias is set for 25mA on the collector of Q2. The bias network is RF decoupled from Q2 base via a choke L9 made from two ferrite beads and a low resistance ¼W resistor. Further RF decoupling is provided by C8, and audio decoupling via C7, which prevents current sag with voice peaks.

L2 is wound with silver plated copper wire and decouples the output RF from the supply rail. C11 and C12 provide further decoupling and are fitted beneath the PCB with the shortest possible lead length.

The output network L3, C14 and C13 form another L,C,C impedance matching network to transform the output impedance to approximately 50 ohms before driving the input network of Q3. The output impedance of Q2, like its input impedance, varies with power and is inductively reactive at 145MHz. This inductive reactance is not formally cancelled before impedance matching into 50 ohms. L3 is an airline inductor etched on the top copper foil, with the bottom ground plane removed. These are not micro-strips, they are an accurate way to form low value inductors with a good degree of repeatability. The calculated value for L3 was 25nH and although the input coil L1 is 20nH, it was convenient in terms of layout to wind this coil. This also offers some adjustment to the input VSWR if needed.

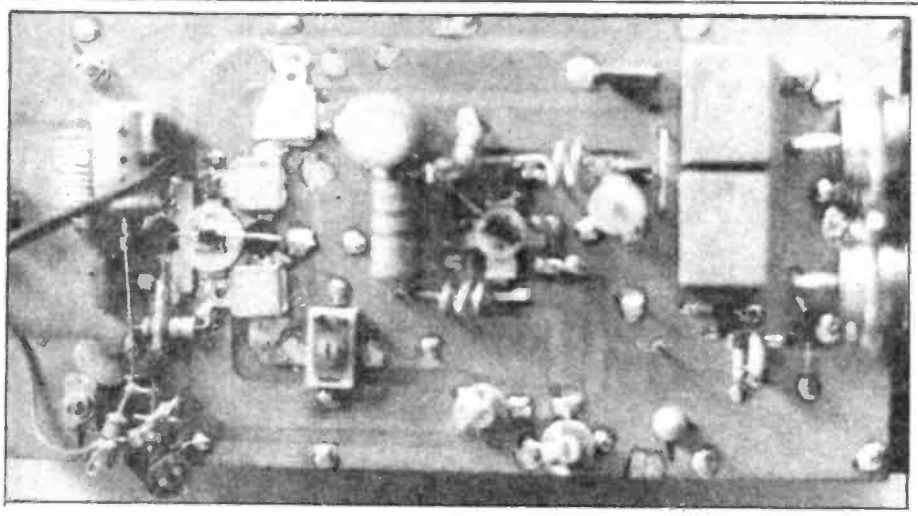
The Output Stage

The MRF247 has a minimum gain of 7.0dB at 175MHz which is approximately a 5 times power gain when driven from the driver stage it should produce some 14 x 5 = 70 watts output.

The input is approximately at 50 ohms which is matched to the input of the transistor by a "T" network consisting of L4 and C15 — the input impedance at 150MHz is 0.55+j1.13 ohms. The series inductive part is cancelled by C16, a mica wrapped capacitor with a low parasitic inductance, the value of which varies depending on how it is mounted on the PCB. Mica wrapped capacitors should be mounted value side uppermost, and should be used because of the high circulating RF currents. Silver mica and ceramic types will tend to over heat and change values, or sometimes explode if used in place of the wrapped mica variety.

L4 is another airline inductor and is tuned with a mica compression trimmer which is located approximately 40mm from C16 on L4.L6 is a self supporting RFC in conjunction with a PC inductor which is decoupled from the supply lines via C19-21. The output of the MRF247 is matched into the load via L5 and C18 and with inductive output reactance cancelled using C17, another mica wrapped capacitor.

The position of C18 can be varied slightly on L5 to peak up the output power. However, the posi-



tion indicated on the layout should be about correct, The RF output is DC isolated by C25 first before passing to RL2. The bias network for the output transistor was originally a diode/resistor system as used for Q2, but as the power drive to the output stage was increased, the bias finally went negative which dropped the transistor out of class AB and deep into class C. This tendency to turn itself off with increasing power was reduced by using an emitter follower bias stage Q4. The output impedance of this configuration is very low and any further tendencies for the bias to go -ve has been eliminated.

Bias current is adjusted by means of VR1 and D5 and D6 provide thermal compensation. D6 is physically on top of Q3 and is smeared with heatsink compound. The bias current is set at 80mA and with Q3 cold, L7 and C22 decouple any RF from the supply lines. L8, a six hole ferrite sleeve, with C23 isolates RF from Q3 reaching the bias network. C24 a 220 uF electrolytic provides a low audio impedance path and also prevents sag in the bias current during voice peaks.

T/R Changeover

A small amount of RF is taken via C2 to the voltage doubler, D1, D2, D3, which in turn operates common emitter stage Q1, a BC108. SSB hang time delay is controlled mainly by C5 although this can be S.O.T. if a different delay is needed. D3 removes back EMF from Q1 and C4 decouples RF from Q1's collector. Direct PTT operation is possible by a suitable connection to this stage. The small DC voltage that is available on FT290s on Tx may switch this stage.

In the receive position, RL1 and RL2 are connected together by PC link of 20swg wire. RL1 passes the little input needed but RL2 passes all the output power and is also part of the output network. Due to the dielectric losses within the relay, overheating can occur on full power on FM and eventually this will lead to failure of the coil. Full power operation on FM is therefore not advised, nor should the output relay be substituted unless the position of C18 is changed to suit it.

It is suggested that a suitable bandpass or lowpass filter is fitted in the feeder for adequate harmonic suppression. However in practice no harmonic problems have occurred with these amplifiers in their present form.

No Receive Preamp

Probably noticed by its absence I have not included a preamp in this design because I think it is in the wrong place to do any good. It would also involve extra relay switching and expense — money better spent on a good masthead mounting unit.

Heatsinking and Power Supplies

It cannot be stressed enough that a good power supply is needed to run this sort of amplifier correctly. A minimum requirement is 15A at 13.8V either from a regulated mains PSU or a float charged battery in good condition. You should also monitor the collector current when tuning up and whilst in use. Some form of over voltage shut down or audible warning is suggested as a rise in supply voltage could be catastrophic. Normal current consumption will be somewhat dependent on antenna SWR but should not exceed 11-12A at 80W. It is worth noting that a 1V drop in the power supply voltage at 80W will reduce the available power output by 10 watts, if the supply falls to about 10V then only 40W can be expected.

The heatsink required for this amplifier is expensive to buy but cheap to make. The thermal resistance calculations indicate that a heatsink with an RO of 0.5°C/W should be used. This is greater than calculated but does give some margin of safety in case of operation in relatively warm environments. The device dissipation is given by: Pd = DCin + RFin-RFout. So, Pd = 152 + 14 – 80 = 85W.

Defining operating parameters:
Tj = max junction temperature (150°C);
Ta = ambient temperature (30°C);
Rd = dissipated power (85W);
ROj – a = (150-30)/85 equalling 1.41°C/W, which also equals (Tj-Ta)/Pd.

The thermal resistance of the heatsink ROs-a which equals (ROj-c-ROc-s)
where ROja = thermal resistance junction to ambient; ROj-c = thermal resistance junction to case; ROc-s = thermal resistance case to heatsink.

ROj-c is 0.7°C/W from the data sheet and it is assumed that the value of ROc-s is of the region of 0.08-0.1°C/W, although this is dependent on the heatsink compound and heatsink flatness in the region of the transistor mounting flange. So, ROs-a = ROj-a-(ROc-s) which equals 1.41-(0.7 + 0.1) = 0.61°CW. Thus a heatsink of 0.5° CW thermal resistance should more than adequately prevent the junction temperature of 15°C being exceeded up to a 30°C ambient temperature.

In the second part of this article, Geoff will describe the construction and tuning up procedure.

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Access

Looking at the Trio TR7010

This is a popular 2m rig available increasingly on the second hand markets. Here Stephen Dyke, G3ROZ, fills in the essential details the handbook leaves out.

First published in the South Essex ARS newsletter 'EARS'.

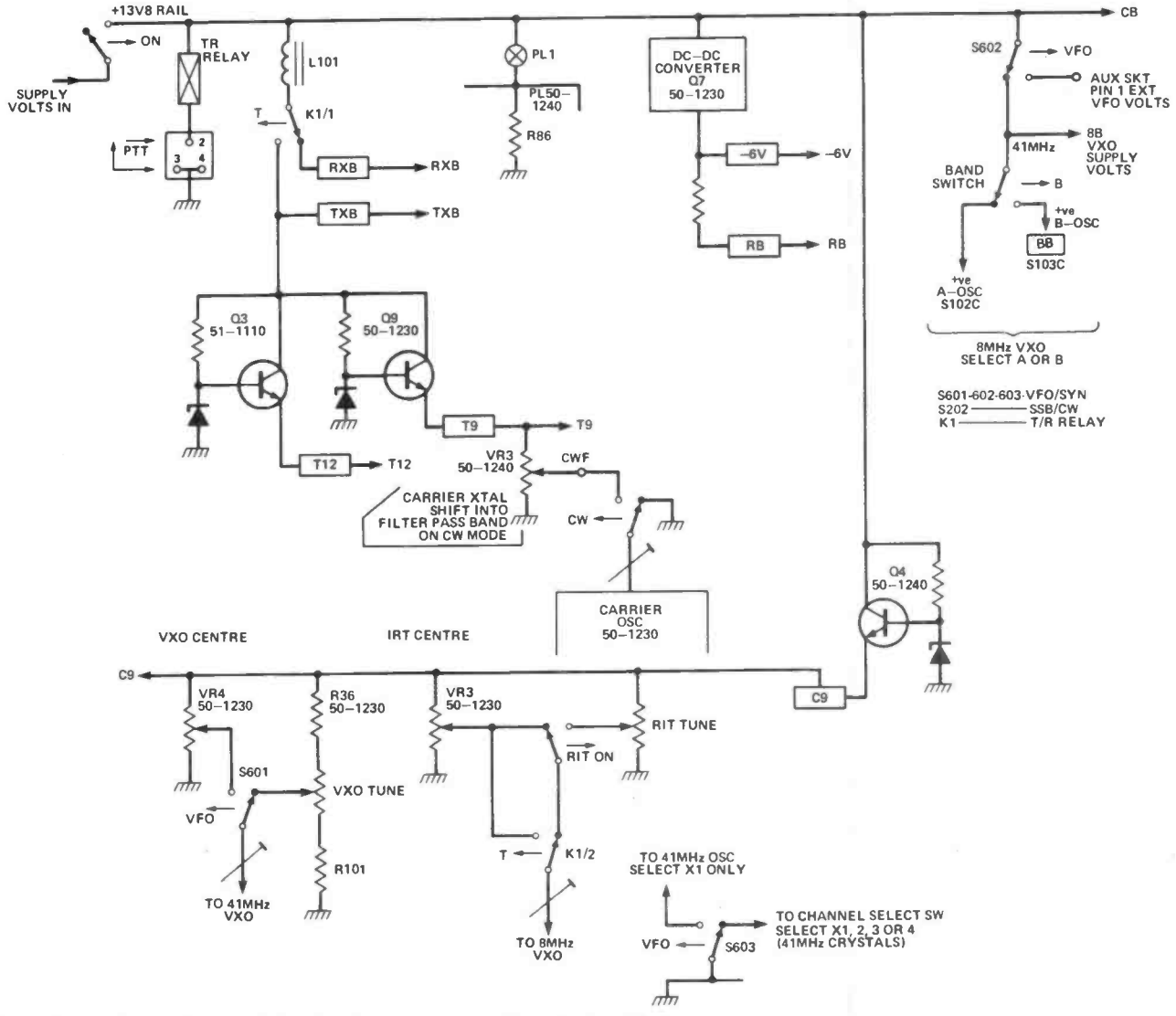
The Trio 7010 2 metre SSB transceiver can now be bought for about £70-£100 second-hand and is a very good buy. To be honest, I doubt if I would swap mine for any mobile rig made today. Fitted with the 3SK88 pre-amp I find, power for power, anything that hears me I can hear; but what I have with the 7010 that, I suspect modern rigs *don't* have is an 'S' meter that moves precisely 6dB per point over the range. This makes it a very handy measuring receiver for use in the shack! If Trio always pay such attention to detail it is a pity that more of their products do not fall into my specification price range — but time will cure that...

What's It Got

The rig is virtually an up-market "Liner 2" type of design, where up-market means the bandpass filters are included after the mixers — and multi-pole ones at that — to produce a cleaner VHF output.

CH	XTL.41.	3×41	XTL.8.	3×41+×8	BAND "A" +10.6985	XTL.8.	3×41+×8	BAND "B" +10.6985
1	41.7005	125.1015		133.5015	144.200		133.6015	144.3000
2	.7002	.1066	8.40	.5066	.2051	8.50	.6066	.3051
3	.7038	.1114		.5114	.2099		.6114	.3099
4	.7055	.1165		.5165	.2150		.6165	.315
5	.7005	.1015		.5215	.2200		.6215	.32
6	.7022	.1066	8.42	.5266	.2251	8.52	.6266	.3251
7	.7038	.1114		.5314	.2299		.6314	.3299
8	.7055	.1165		.5365	.235		.6365	.335
9	.7005	.1015		.5415	.24		.6415	.34
10	.7022	.1066	8.44	.5466	.2451	8.54	.6466	.3451
11	.7038	.1114		.5514	.2499		.6514	.3499
12	.7055	.1165		.5565	.255		.6565	.355
13	.7005	.1015		.5615	.26		.6615	.36
14	.7022	.1066	8.46	.5666	.2651	8.56	.6666	.3651
15	.7038	.1114		.5714	.2699		.6714	.3699
16	.7055	.1165		.5765	.275		.6765	.375
17	.7005	.1015		.5815	.28		.6815	.38
18	.7022	.1066	8.48	.5866	.2851	8.58	.6866	.3851
19	.7038	.1114		.5914	.2899		.6914	.3899
20	.7055	.1165		.5965	.295		.6965	.395
A	.7005	.1015			X		X	X
B	.7022	.1066	SPARE	YOUR	X	SPARE	YOUR	X
C	.7038	.1144		CHOICE	X		CHOICE	X
D	.7055	.1165			X		X	X
VFO	.7005	.1015 Plus 8MHz VFO external						

By plugging a crystal in the spare position an extra four channels are produced on that band. An 8MHz signal generator at the VFO input produced Tx output within a 1dB power difference over the range 143.50 to 145.5MHz, so coverage from 144-146 would seem practical with a little re- tweaking.



How the various rails are derived, where and how they tie in with the controls of the VXOs on CW and SSB.

Unlike the Liner 2, the rig has a local oscillator derived by crystal mixing, to directly heterodyne (beating with) the 10.7MHz transceiver IF to 144MHz.

The 7010 comes with the typical postage stamp size circuit diagram, a block diagram with no numbers on it — making relationship with the circuit a difficult task for the newcomer — and no technical description whatsoever! The purpose of this article is, therefore, to explain the operation, mixing technique used and how the various boards are interconnected.

The rig covers two bands of twenty 5kHz spaced channels with a +/– 2½kHz offset VFO control. The VXO runs at typically 41.7 MHz. Its third harmonic is selected and mixed with another VXO running at typically 8.4MHz.

NAME	DESCRIPTION	ORIGIN
CB	13.5V always. Filtered DC rail	T/R relay via L101
RXB	13.5V Rx DC rail	T/R relay
TXB	13.5V Tx DC rail	T/R relay
C9	9V always. DC rail	50-1240, Q4
-6	Neg. 6V always. DC rail	50-1230, Q7
T12	12V Tx DC rail	51-1110, Q3
T9	9V Tx DC rail	50-1230, Q9
RB	Neg. 6V with additional filtering.	50-1230, R30

SIGNALS TO/FROM BOARD X50-1240

HET.	Local osc. output, 133.5MHz. 55-1080, Q2.
OUT	144MHz to 3rd Tx RF AMP. 45-1040, Q1.
PL.	Panel lamp earth return (via R86) Lamp PL 1.
SP.	Rx loudspeaker out to speaker via ext. Speaker jack and link on 55.1080.
AFI	Rx audio in from volume control wiper.
CWF.	Freq. shifts volts out. Moves carrier into filter passband on CW. 50-1230-D8 via CW switch.
ON AIR.	Volts to light ON AIR LED out. Function of rail T9.
CWE.	Ground via key on CW, ground always SSB also to 50-1230, Q4.
BIA.	ALC volts input, from 51-1110 where it is called ALC.
TXI.	Tx input 10.7MHz, from 55-1080, D3 where it is called TXO.
VFO	8MHz external VFO in, from aux. socket, pin 1.

RIT	Independent Rx tune input from T/R relay.
BD.	"B" band indicator LED volts out to B band LED.
BB.	"B" band indicator, LED volts in from bandswitch.
B1-B6	"B" band crystals to Channel selector switch.
A1-A6	"A" band crystals to Channel selector switch.
8B	8MHz osc. HT supply via VFO-syn. switch.
VXO	VXO tune volts in to 41MHz osc. via VFO-syn. switch.
1-4	41MHz crystals out to Channel selector switch.

SIGNALS TO/FROM 51-1110

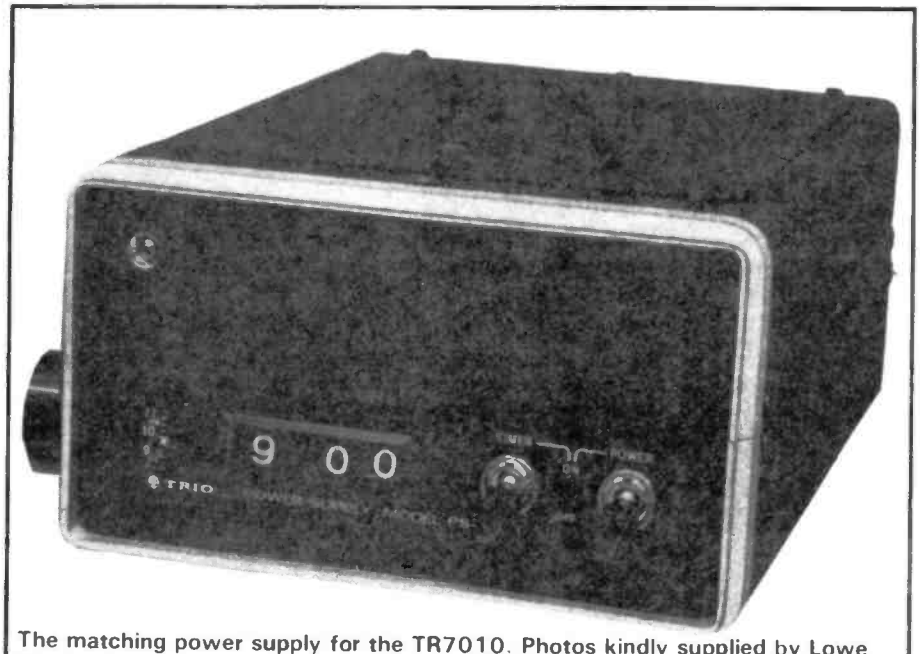
RXA	Rx ant. out to 55-1080 where it is called "ant".
RFM	RF level meter volts out to 55-1089 D9.
ALC	See BIA list X50-1240.
PRO	Unacceptable SWR volts out to 50-1230. Q8 via VR5.

SIGNALS TO/FROM 50-1230

RF3	Neg. 6V to RF gain pot. via R32.
RF1	Pos. 9V to RF gain pot. via R31. function of C9 rail.
VX1	VXO pot. input bolts, derived from C9 via R36.
RIT	8MHz VXO centering in "RIT OFF" position. DC volts out adj. with VR3.
VXO	41MHz VXO centering in "VXO" mode. DC volts out adj. with VR4.
CAR	10.7MHz carrier out to Rx product detector. D16-19, 55-1080.
CWB	Unbalance the Tx bal. mod. in CW mode on Tx. Function of T9 rail via SSB/CW switch.
MIC	Microphone input from mic. hack. Grounded on CW by SSB/CW switch.

SIGNALS TO/FROM 55-1080

AFO	Rx audio out to vol. control.
SM	S meter output volts via D8 to S meter.
RF2	RF gain control volts from pot. wiper.
NB	Ground for noise blanker on.
ANT	See RXA. 55-1110 listing.



The matching power supply for the TR7010. Photos kindly supplied by Lowe Electronics.

Four crystals are used in the 41.7MHz VXO, as the channel switch is rotated they are selected X1,X2,X3,X4, continuously in rotation. The "VXO control" for this oscillator is effective on both Tx and Rx and is hence the main VXO. For each rotation of 41.7MHz crystals a different 8.4MHz crystal is selected. The VXO control for this is effective on Rx only and is hence the IRT (Incremental Receiver Tuning) control.

The complete mixing system is shown in **Table 1** where the actual frequencies printed on the crystals have been used. As seen, this gives a 5kHz +/− 0.1kHz channel spacing, but in reality the trimmers in the crystal oscillators would be set to give the required 5kHz spacing with no error. By selecting 8MHz crystals an extra four channels per band is possible, labelled A,B,C,D, which can put the rig anywhere within the range 144-145MHz. For the record, I found the 8MHz VFO produced a 1dB power difference in Tx output over the range 143.5 to 145.5, so coverage of 144 to 146MHz seems very possible with some 're-tweaking.'

Function of Boards

The TR7010 is made on five boards with power supply, transmit and receive functions spread about them with gay abandon; all of which makes it virtually a nonsense to try and say: "this board does the job!" However, board X50-1240-00 contains the complete crystal mix system: the Tx mixer 10.7 to 144MHz, the Tx 10.7MHz RF stages and Tx first 144MHz RF stages. The Rx audio stages are also on this board. X55-1080-00 is actually a receiver board containing virtually all the Rx RF, IF and noise-blanker circuitry together with the product detector. In effect, the aerial goes in and received audio comes out. X50-1230-00 is mainly a 'Tx board' containing the carrier oscillator, balanced modulator, microphone amplifier and CW change-over. It also contains a small DC-DC converter providing some negative bias to the receiver and the VXO centering presets for the main VXO and IRT VXO. The remaining two boards contain the Tx power amplifier chain and ALC system.

Interconnections and Rails

There is a lot of interconnecting wire, each line has its own code some of which describe themselves adequately others don't. None are described in the handbook. In general power rails always have the same code ie a TXO (Tx out) line from one board is designated TXI (Tx in) when it reaches its destination.

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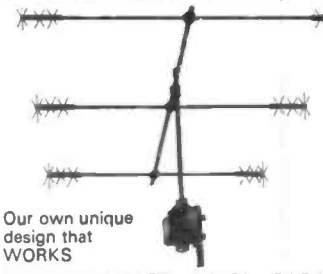

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Side Null Db	25	25	20
VSWR (typical)	1.1:1	1.1:1	1.1:1
Weight	7.5lb	12lb	12lb
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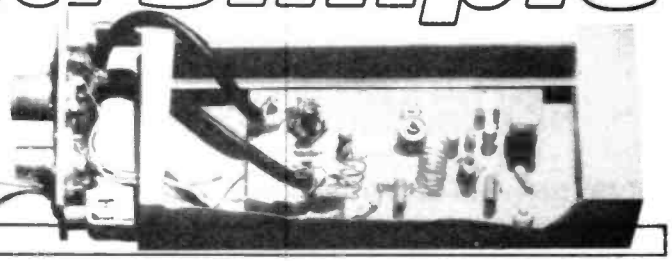
Cheap and Simple Converters for 10 and 15m



Want to listen to 28 and 21MHz when 2m is dead? Well, Michael Monteil's, G6WDK, design has a sensitivity as good as your 2m rig.

If you are tired of sitting for hours in front of your Japanese 2m multimode transceiver without hearing anybody, don't stop monitoring 144.300. Instead build this converter for those times when 2m is 'dead' and 10m is swarming with activity. The whole project can be built very cheaply and assembled in an evening. You'll be surprised how many stations from the most exotic places can be heard with such a simple device.

The Circuit

The idea of mixing an HF signal with a VHF local oscillator to obtain an IF of 144MHz is not new and has been used in many 'up-converter' circuits as in **Fig.1** However, in most cases the device used in the mixer stage is a balanced mixer (MD108, SBL-1 or equivalent), whereas a MOSFET transistor can provide the same function at a much lower cost.

In **Fig. 2**, Q1 acts as an oscillator on 38.666MHz in a very conventional, but sure-fire, circuit. Reaction (positive feedback) is introduced by C2, the 15pF capacitor. Q2 is the tripler, providing a 116MHz signal for the mixer stage. A common-base circuit arrangement was chosen here for its reliability in providing a clean and stable tripled signal. Q3 acts as a mixer, adding the two RF signals present on each gate – 28MHz on G1 and 116MHz on G2. L4 is tuned on 144MHz. Note that there is no RF stage in the converter

One advantage of using the 38.666MHz crystal is that there is an exact correlation between the frequencies received and the frequencies read on the transceiver readout. Thus 28.000 corresponds to 144.000, 29.300 to 145.300 (the FM portion of the band).

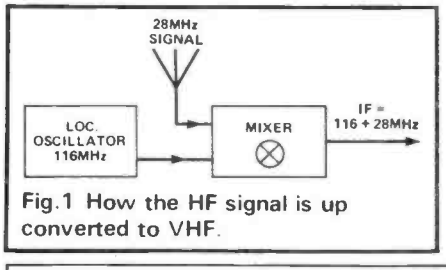


Fig.1 How the HF signal is up converted to VHF.

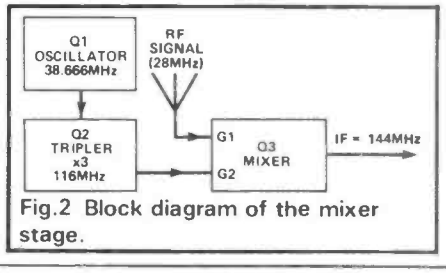


Fig.2 Block diagram of the mixer stage.

Construction

The converter is built onto a small (95mm x 50mm) fibre glass printed circuit board etched as shown in **Fig.4**. The first step is to fit and solder all the components except Q3 as in **Fig.5**. Do not forget to fit and solder the crystal. Before connecting the power to the PCB check carefully that the transistors have been positioned correctly, that no mistake has been made in the resistors and capacitors values. Also check for dry joints or solder bridges. Do not forget the 1000 ohm resistor soldered under the PCB on the copper side. Once all the checks are completed, the next step is to connect a power supply to the board.

The whole unit was housed in a small metal box bought for £1 at an amateur radio rally. An SO239 socket is used for the 28MHz input and a BNC socket for the 144MHz output. The converter works well from any stabilized voltage between 9 and 12 volts.

Alignment Procedure

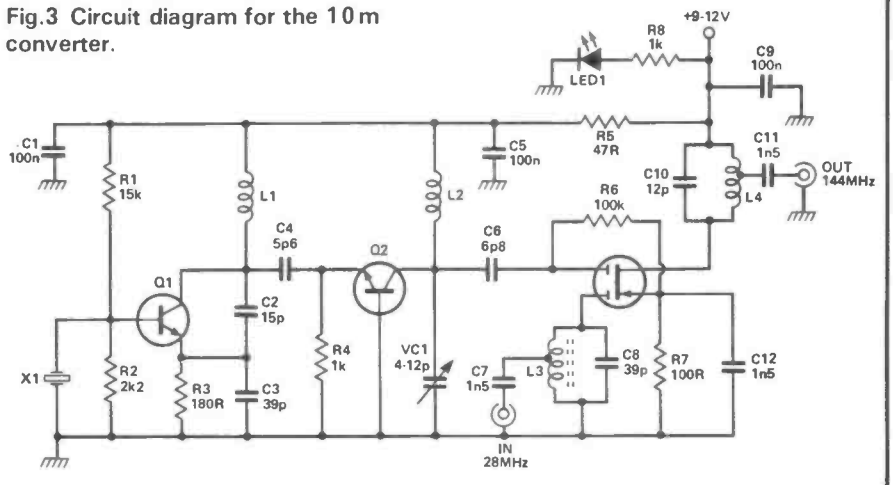
A grid dip oscillator or digital frequency meter will be very useful for the alignment of the converter. An RF generator providing a 28MHz signal can also be used for the final adjustments, but this is not compulsory. Alternatively, a friend with a 10m transceiver can provide the required signal.

With the GDO or DFM check that there is a 38.666MHz signal on the collector of Q1 and 116MHz on the collector of Q2. It may be necessary to adjust somewhat the variable capacitor VC1, in series with L2 to get a stable 116MHz signal. Check with the GDO that L3 actually resonates on a frequency somewhere between 28 and 30MHz, adjusting the core if necessary. Now you can fit and solder Q3, the MOSFET transistor, always bearing in mind that these little 'bugs' can be very sensitive to excessive static charges. As a precaution, I always disconnect the soldering iron before soldering a MOSFET transistor or a CMOS IC.

The converter is now ready to work. Connect the power supply to the board and the output of the converter to the aerial socket of your 2m transceiver through a small length of RG58U cable. Don't forget to disable the PTT switch of the microphone, since any RF getting into the converter by accident would damage the mixer!

Switch the transceiver on first, then the converter. There should be an increase in the receiver noise. Now, with the help of an RF generator on the 10m band or of a small 'beacon', adjust the core of L3 for maximum signal on the

Fig.3 Circuit diagram for the 10m converter.



receiver. The final step consists in connecting the converter to a 10m aerial and tune for an amateur signal on the band.

What Can Be Heard

The sensitivity of the converter used with an Icom IC202 2m transceiver has not been measured. However, judging from the number of stations received and the strength of their signals, it can be said to be very good, at least as good as the sensitivity of the IC202 alone. Strong stations on 2m have never caused any problem. With an IF of 144MHz, the image frequency is not a problem.

In three months of monitoring the 10m band, more than 150 stations have been logged, in 54 different DXCC countries. The station was composed of an IC202, the converter, and a dipole antenna at a mere 6 feet above the ground. Many African and South American radio amateurs have been heard (including 3X4, 5N2, ZS3, ZS6, FH8, FR7, CP8, PY5) together with more 'local' (European) ones G, F, DL, SM, EA. Not too bad for a project which can be built in one evening.

Why Not Try 15 As Well?

With the number of openings on 10m getting smaller, it was decided to build a similar converter for the 15m band. The converter follows the same design as before with only a few components requiring changes. The new coil winding details are given in **Table 2**. The crystal is now a 41MHz which gives 123MHz after tripling which when subtracted from the 144MHz input leaves 21MHz. I use a 40.9602MHz crystal found in the junk box which enables reception of 21.110MHz and upwards (unfortunately, cutting out the CW section).

Within minutes of switching the power supply on, stations came booming in with a pile of YC (Indonesia) callsigns and heaps of African and S American stations.

Table 1 Coil Winding Data for the 10m version

L1	13 turns 0.5mm enamelled copper wire, 5mm internal diameter closely wound on 5mm (3/16") former.
L2	6 turns 1mm enamelled copper wire, 8mm internal diameter self supporting; length of coil: 15mm.
L3	11 turns 0.5mm enamelled copper wire, 5mm internal diameter closely wound on 5mm (3/16") former, slug tuned; tap at 2 turns from ground end for C7.
L4	3 turns 1mm enamelled copper wire, 8mm internal diameter self supporting; tap at 1 turn from +supply end for C11; length of coil: 10mm.

Table 2 Coil winding data for the 15m version

L1	9 turns 0.5mm enamelled copper wire, 5mm internal diameter closely wound on 5mm (3/16") former.
L2	8 turns 1mm enamelled copper wire, 6mm internal diameter self supporting; length of coil: 12mm.
L3	17 turns 0.5mm enamelled copper wire, 5mm internal diameter closely wound on 5mm (3/16") former, slug tuned; tap at 4 turns from ground end for C7.
L4	as for 10m version

Fig.4 The foil pattern for both the 10 and 15m converters.

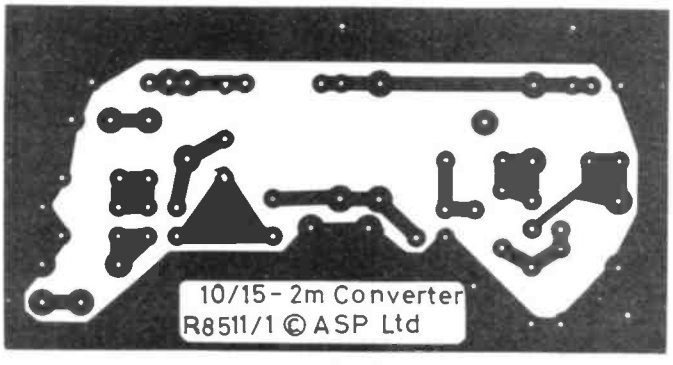


Fig.5 The component overlay for the 10m converter.

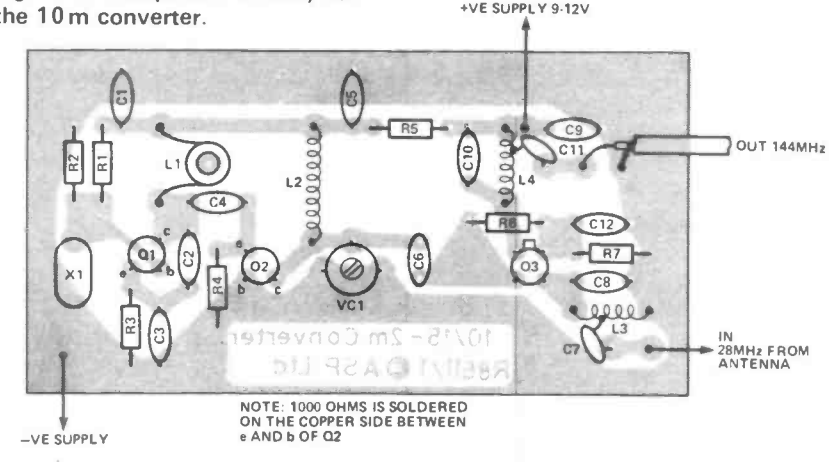
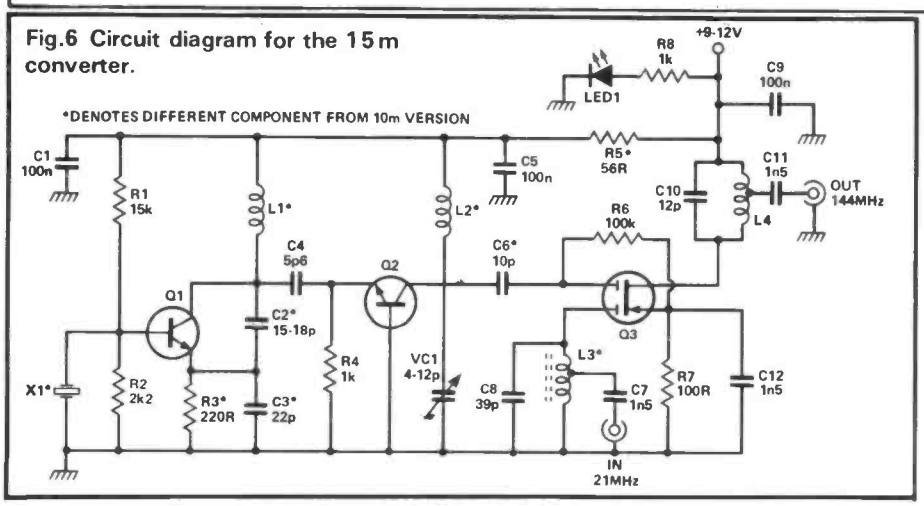
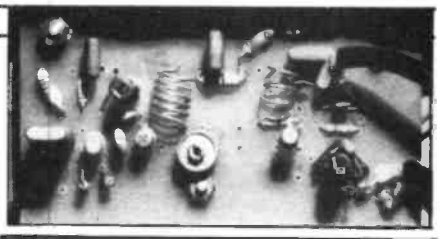


Fig.6 Circuit diagram for the 15m converter.





What You Need For Your Converter

CAPACITORS

C1, 5, 9	0.01uF cer disc
C2	15pF cer disc
C3	39pF cer disc
C4	5.6pF cer disc
C6	6.8pF cer disc
C7, 11	1500pF cer disc
C8	39pF mica
C10	12pF mica
C12	15n small size cer
VC1	3-12pF trimmer from Maplin (WL69A)

RESISTORS

R1	15k ohms
R2	2k2 ohms
R3	180 ohms
R4, 8	1k ohms
R5	47 ohms
R6	100 ohms
R7	1k5 ohms

SEMICONDUCTORS

Q1 2N222 NPN silicon general purpose.
Q2 2N2369 NPN silicon VHF transverter.
Q3 40673 MOSFET or equivalent.

MISCELLANEOUS

90 x 45mm PCB; X1 a third out 38.666MHz crystal; HC25 or HC18 case; one red LED.

And For The 15m Version (differing from those previously specified)

C2	15-18pF cer disc
C3	22pF cer disc
C6	10pF cer disc
R3	220 ohms
R6	100 ohms
X1	41MHz crystal.

Some Component Suppliers

J Birkett 25 The Strait, Loncoln, for the coil former, MOSFET and VHF transverter. Quartzlab PO Box 19 Erith Kent, for the crystals.

All the components are quite easy to find and available 'off the shelf' from most radio parts retailers, unlike balanced mixers. The only expensive component is the 38.666MHz crystal. I salvaged one I had used in an unused 2m converter. For Q3, I have used one of the cheap equivalents sold by J Birkett which works just as well as a 'real' 40673. Substitutes could also be used for Q2 and Q1 since almost any VHF small signal NPN silicon transistor should work — but this has not been tried.

Rubbish Tips

A Tidy Tip

GW4KEV has a tidy tip for all those home constructors who have problems putting things away after they've used them...

For years now one of my main problems when embarking on a major home brew project is the gradual but relentless build up of all manner of tools, bits and pieces in the immediate work area. This results in extreme cases to the entire bench covered with screwdrivers of all shapes and sizes, drills, allen keys, pliers, sidecutters; bits of solder, odd resistors and condensers used for test purposes and not returned from whence they came on.

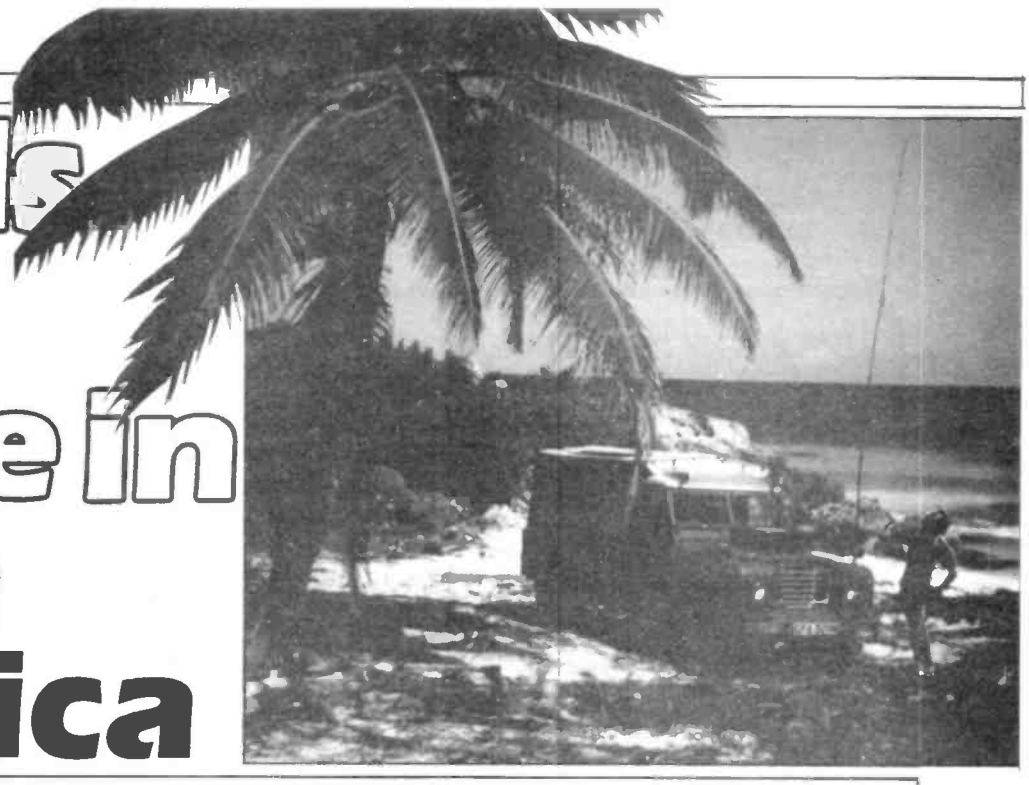
Eventually the work becomes rather unpleasant as you rummage among this debris to find the ferrite slug that fell out of an IFT the previous evening. After some time spent sifting through bits of bent 'ali', bits of wire, and the rest, you begin to wonder if the ferrite slug existed at all.

Well I have now cracked the problem and the bench with a bit of discipline can once again be a source of pleasure. The answer lies in those disposable 2-litre lemonade bottles. If you take one of those bottles and poke a hole in the side about two inches above the black base and then cut around the bottle you finish up with two parts, the bottom half of which makes an excellent receptacle for bits and pieces on the bench. I did wonder at first if there would be enough rigidity for things like pliers and screwdrivers but I was pleasantly surprised to find them quite adequate for the job.

I now have about ten of these at the back of the bench and I even have one or two that aren't dedicated but contain any items that are temporarily removed from a unit being worked on.

There are two fringe benefits that I only became aware of later, one being that the black base of these bottles have a very slight taper at the bottom, making them stackable. The final fringe benefit is in the garage or the garden, how often have you turned the house upside down for that funnel that you distinctly remember buying last year . .

Travels with Myrtle in North America



Remember 'This is PY1ZFX/M...'? Well, Roger Crofts, G3UPK, and Mary Carpenter took to the road again in 'Myrtle' to finish their 87,000 mile trip around the Americas.

Readers may remember G3UPK's Trans South American journey in July '84 (This is PY1ZFX/M...) Roger and his girlfriend, Mary Carpenter, were attempting to travel in their Land Rover, 'Myrtle' from the tip of South America, just outside the Antarctic, to the wilderness of Northern Alaska, inside the Arctic Circle. Due to unexpected work commitments, they were forced to break their journey in Miami, G3UPK ending up in Cameroon, West Africa...

Shortly after the article was published, which was very popular with readers, I received a postcard from Roger and Mary to say that they had recommenced their journey. In October '84 they sailed down the St Lawrence River from Montreal, their marathon journey over. Some months later this article arrived on my desk.

Once again, the article has been written by Mary, the radio spectator rather than Roger, the radio amateur. The quality of writing and the tale Mary has to tell, make the emphasis on travel rather than radio acceptable for me, and I hope for you, too. **G3ZZD.**

The bright city lights of Miami welcomed us to the USA. Our beach front hotel in the Latin Quarter was found for us by a friendly taxi driver, who claimed it was cheaper and safer in this area. Even so, the streets downtown were deserted and there were, as we were later told, "only a mere 2 to 3 murders on an average night"! In a way, we felt we were still in South America because Spanish is so widely spoken in Miami.

The 87,000 mile adventure around North and South America.

We were relieved when the cargo ship with Myrtle, our Land Rover camper van, arrived from Ecuador. We headed south on the Overseas Highway to Key West, where a large sign proclaimed 'The southernmost point in USA' — they must have forgotten about Hawaii when they put that up! Twenty metres was still open to Europe and, with Myrtle parked on the beach, Roger was getting 59 reports from G-land. Several transistor radios amongst the sunbathers were also getting S9 signals! Luckily, CB got the blame. After Florida, the propagation conditions on 20m changed and we seldom heard Europe, let alone worked it!

The Deep South

Crossing the state border into Georgia was like entering another country. Gone was the opulent wealth and tourist appeal of Florida, now there were cotton plantations, negroes, creoles (half French, half negro) and depression. We chose the back roads rather than the interstate highways, with their deserted motels and filling stations, marking what was once the main road. At night, we camped in swampy forests with their characteristic 'peaty' odour, which

permeated the Georgia lowlands.

Our route lay over the southern end of the Appalachian Mountain range and being Autumn, if the weatherman says a cool change is coming, he means a drop of 30-40 degrees F! We moved on into Tennesee and the heart of the Bible Belt. You will never find a bar or licenced supermarket in many parts of this state, but have no difficulties in locating the well signposted local Baptist or Methodist church. Even in some of the 'wet' counties, liquor is only sold through 'dog windows'! (a kind of variation on a kitchen service hatch, found in walls and boarded shop fronts). Unbelievably, in one dry county, we found the Jack Daniel Whisky distillery, but we couldn't sample the product. The Civil War raged for about 120 years in these parts and many Southerners still literally and metaphorically fly the Rebel flag.

Crossing the muddy Mississippi River at Memphis, we drove through Arkansas to Texas. We declined the invitation to visit 'Southfork' ('Dallas'!), instead spending 2 days in Houston trying to find a BL dealer. The fuel pump needed a new diaphram, the first spot of car trouble since leaving the UK. Most dealers and mechanics advised us to dump Myrtle by the road and buy a Ford!

The view from the top of the Pyramid of the Moon, Teotihuacan, Mexico.

Two early morning visitors to the camp at Lake Peten Itza, Guatemala.

We made do until Mexico with an electric pump hooked in.

Down Mexico Way

We were a bit apprehensive about driving down to Mexico, few people had a good word to say about it. One American we contacted on the air thought we were going to New Mexico and refused to be corrected. However, fifty miles inside the border, we found what seemed the *real* Mexico — a colourful and sun drenched land which was both surprisingly pleasant and cheap. We drove down the Gulf of Mexico to the Yucatan peninsular, home of the Mayan Indians. We visited many of their temples and ruins throughout the jungle and then spent Christmas camping on the Caribbean coast, somewhat reluctantly leaving this paradise.

We eventually drove down to Belize and immediately noticed the British influence at the Customs office. The British Army is still stationed in Belize, formerly British Honduras, to discourage an invasion from Guatemala which claims Belize. It was reassuring to pass the Army Land Rovers zipping around the countryside as we enjoyed chats, over a bottle of Belikan beer, with home-sick soldiers in bars along the road.

We crossed over to Guatemala and travelled as far as Tikal to see the biggest and best of the Mayan ruins, set in lush, steamy rain forest. We had to be careful after dark with many of the Civilian National Defence checking papers and vehicles. We returned to the USA via Belize, Acapulco and the Sonora desert, heading for the 'Wild West' and a piece of old London.

At Lake Havasu, the Americans have reconstructed the old London Bridge across the man-made river and built an English village around it, including an authentic oak beamed pub serving Watneys beer! (*Oh no! — Ed*). We drove the 20 miles of the Grand Canyon, mainly for the amazing view straight down to the Colorado River below, and then across Nevada and into Las Vegas, where we managed to stay without gambling away our money. In Death Valley, California, poor Myrtle laboured under scorching 114 degrees F. It was a lot cooler on the coast and on Mount Lassen one evening in June, we were caught in a blizzard!

On a hillside in Oregon, Roger made contact with England, the first time since Florida, with the help of a new 1kW linear amplifier — which also warmed us a little on cold nights!

North to Alaska

We travelled up through Washington state and crossed into Canada and Vancouver; joining the start of the Alaska Highway (known as the Alcan) at Dawson Creek, which rapidly turned into a gravel, dirt road. One evening while camping in a forest, we had a close encounter of the grizzly (bear) kind.

We finally arrived in Alaska on July 5th. Fishermen and campers from the 'lower 48' states were a common sight around the many lakes and salmon streams. Unfortunately, it rained nearly all the two weeks we were there and the mosquitoes were voracious. The record stands at 68 mosquitoes killed in one slap!

Returning to the Yukon and Dawson City, with its dirt streets and boarded sidewalks reminiscent of the Klondike Goldrush, we headed up the Dempster Highway through scenery very similar to the Scottish Highlands. From there we took a daytrip — by plane — to an Eskimo town on the Arctic Ocean and were told that the previous month there had been solid ice in this area and the next it would return.

Travelling south on the Cassier Highway, the weather gradually warmed up, although we missed the nightless days.

By mid August we were in the cowboy country of Montana and Wyoming. Visiting Yellowstone National Park, we waited half an hour for the geyser, Old Faithful, to erupt. The National Parks are the best thing about North America with some incredible scenery. The petty rules strictly enforced by gun toting rangers is the only thing to spoil it.

Close encounters of the furry kind with the inhabitants of Prairie dog town, Devil's Tower, Wyoming.

In Contact Again

At Devil's Tower, Wyoming, Roger made a rather poor contact with Frank, G4HBI and Eddie, G4KHG, our regular contacts on the South American leg, the first time since Florida. Going through the Black Hills of Dakota, Sioux Indian country, Roger transmitted from as many rare counties as possible. Heading south into New England, fittingly perhaps, Frank and Eddie came through loud and clear.

We set sail for the UK in early October, sailing down the St Lawrence River, leaving behind a grey and rainy Montreal. We had finally come to the end of our 2 ½ year adventure of exploring the American continent from North to South.

Sideswipes

Radio Society Going Bust

By William, G8 QRM

The RSGB has crossed the abyss. It happened when the first licence application went through the Society to the DTI. The RSGB becomes by that action, an agent of the licencing authority.

Repeater applications go via the Society; if you wanted a 'fifty meg' ticket you applied to them. This was licensing by the fit of the face for the favoured few, accompanied by the usual sung excuses.

There is no power without responsibility — unless you run a knocking-shop — no power without accountability, or be held to account.

What goes on behind the doors of the smoke-filled committee room? A representative democracy? A secret society? Or worse a closed bretheren, disguised as a democratic organisation, continually changing the rules to keep out the uninitiated?

Too many of us love our chains of office, chairmanships, seats on committees — means without ends and power without personal responsibility — to ever give them up without a bitter struggle. Anyway, no one else could do it quite as well. So we 'up' the entry fee, change the rules, this ensures continuity! Then, of course, such an experienced committee is fit to take on more responsibility.

That's the way it goes.

For the RSGB to have anything at all to do with licences is wrong. You can't run with the hare and hunt with the hounds.

Where will it all end? Will the RSGB set the exam, issue the licences and make membership of the Society compulsory for all amateurs? Much as membership of the engineers guild — that upmarket closed shop — the I.E.E. is effectively compulsory at in-

teresting levels of engineering.

There will probably be some very frank discussion — we call this a flaming row in the trade — as the new generation of radio amateurs become the majority.

The RSGB is old, a treasured antique, much like the AR 88. It must not be perverted for the sake of power. What started as a friendly, respected, technical talking shop is going to turn into a cockfight and we will be left with nothing but a handful of bloody feathers. What are we going to do about it?

Practicalities

I thought it would be useful this month to start with a couple of ideas for improving the over-all finish and safety of the wiring on projects. With a little extra effort and expense, it is possible to tidy up those untidy clusters of wires which so often tend to grow as a unit nears completion.

This month, Ian Poole, G3YWX, offers a few useful tips on homebrewing and how to check that your speech processor doesn't equal distortion.

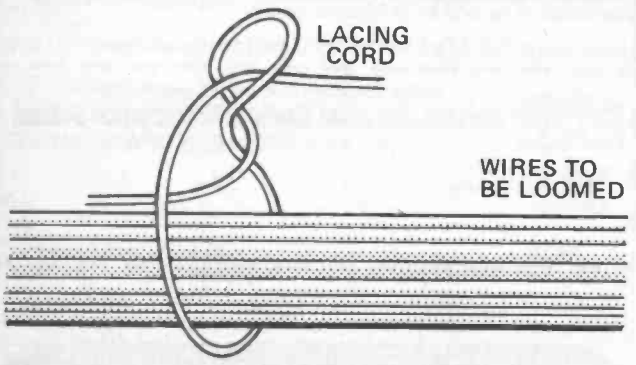


Fig. 1 How to make your project look neat and professional. Collect up as much of the lose wiring as possible into a 'trunk' and lace up with thin lacing cord available from most electronic suppliers. The basic idea of lacing is to loop the cord round the bundle of wires and make a knot with top piece of cord.

If the wires run together in groups they can be gathered together into a neat loom using lacing cord. Even though many other forms of cord can be used, proper lacing cord is ideal as it does not cut into the insulation on the wires themselves. Fig.1 illustrates how lacing is done, it is quite easy once you have the hang of it. Normally the knots or loops round the wire should be spaced about an inch apart but this depends largely upon how much control the wires require. When starting and finishing each length of lacing, it is well worth tying two knots on top of each other to prevent it slipping and coming apart. In order to make the lacing easier it is well worth cutting off approximately the right length of lacing cord, and as a rough guide it should be about three times as long as the length to be laced.

One other wiring aid, seldom used in amateur projects, is sleeving. This involves covering exposed terminals and soldered joints and is particularly useful where there could be exposed terminals on components carrying high voltages such as mains transformers. Sleeves are also very useful when wiring to multi pin connectors where the wires could easily bend slightly causing shorts between pins. Sleeving comes in various sizes and the more usual form is made of rubber so that it will stretch slightly when covering the terminal keeping it in place.

Both lacing cord and sleeving are available from many electronic components retailers quite cheaply. It is well worth the extra outlay and time tidying up a project and will also prevent an accidental shock from touching an exposed terminal.

Aerial Wire

It is probably not generally realised how much copper wire can stretch if it is placed under tension. Being a very ductile metal it can elongate quite considerably when a length of aerial wire is pulled taut. For example, a length of multi-stranded PVC covered wire may extend by as much as five or ten percent when held under sufficient tension to keep the aerial from sagging; especially if it is for the lower frequency bands where longer lengths and hence tensions are required.

This wire elongation will correspondingly decrease the resonant frequency of the aerial. If the aerial is centre fed with no tuning unit at the feed point this will cause the SWR to rise over a period of time affecting any 'fine tuning' that may have been carried out. The solution to the problem is to use only sufficient tension on the aerial to reduce the sag to an acceptable level. Also, use a low enough gauge of hard drawn copper wire which will elongate much less than other varieties of copper wire.

Safety Precautions

One item which does not often feature strongly in amateur home brewed equipment is that of safety. It is, however, something which is particularly important in view of the high voltages which are often present in many pieces of equipment. Whatever the equipment, precautions should always be taken to ensure that everything is as safe as it can be made in order to prevent not only oneself but also any friends or family from getting a rather unwelcome and unpleasant shock.

Home brewed equipment can quite easily be made much safer by just bearing a few simple points in mind. For example any live connection should be sleeved using rubber or heat shrink sleeving which is available from many components stockists and units should be housed in boxes or cabinets to prevent access to any terminals which cannot be adequately protected. Cabinets and metalwork in general should be securely grounded to the mains earth in order to prevent anything becoming live if there is a short from the mains to the metalwork.

In addition to this the safety of a piece of

equipment, whether it is home or commercially made, is not totally dependent upon the equipment itself, but also on the way connecting cables are wired up. For example a very large percentage of mains plugs are wired up carelessly: the earth connection being left off, the cable grip not tightened or unsleeved wire showing outside the terminals. All of these represent a potential hazard and in certain circumstances could make the metalwork of the equipment become live.

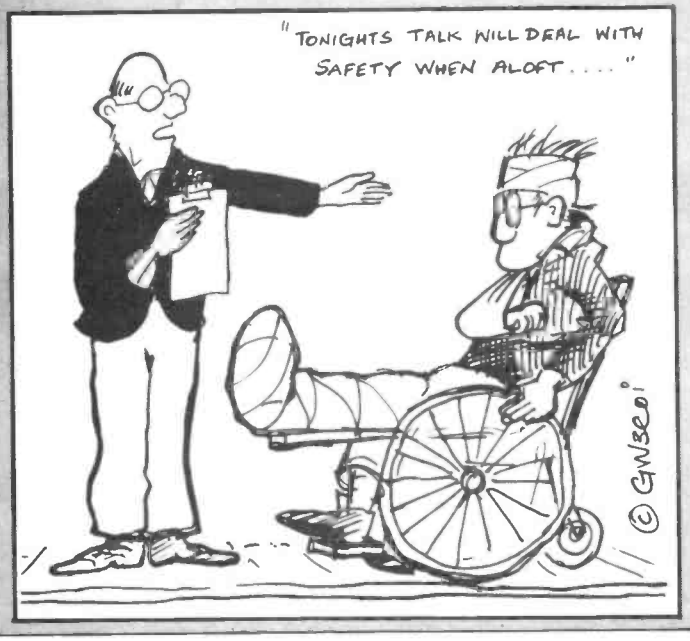
Although a few examples of methods to improve safety have been outlined it is wise to develop an awareness of possible hazards, and then to apply common sense to overcome them. Unfortunately this does require a certain amount of extra time and effort, but when considering some of the potential hazards which are present to people is this investment not worth it?

Speech Processing and Distortion

One often hears discussions over the air questioning the necessity for speech processing. Some people say they never use any form of processing because it introduces too much distortion, others say they would never be without it. Not only is there a wide variety of views but also just as wide a spectrum of the qualities of transmitted audio. Some sound is heavily processed and unpleasant to listen to, others are much easier whilst still retaining a high level of audio.

When used correctly, speech processing can be invaluable, giving a very useful amount of gain without making the signal sound unpleasant. However, there are several ways in which unnecessary distortion can be introduced. Two common ways in which this can happen are by over driving the audio input of the transmitter, or by RF being picked up on the microphone input lead.

When experimenting with a speech processor it is worth testing it first by connecting its output to a tape-recorder so that its output can be monitored and any necessary adjustments made. Then it can be



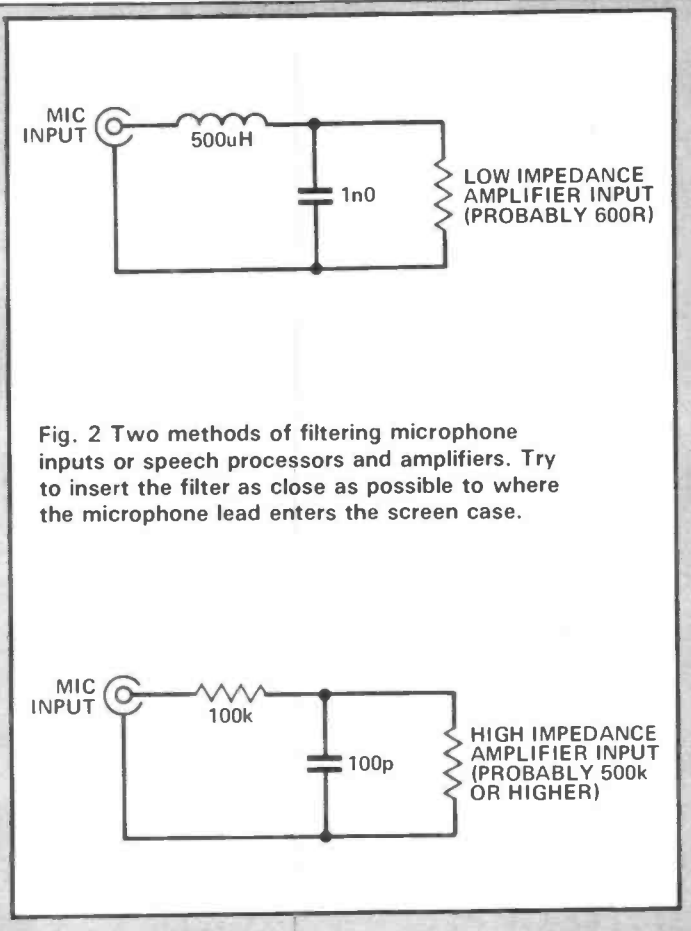


Fig. 2 Two methods of filtering microphone inputs or speech processors and amplifiers. Try to insert the filter as close as possible to where the microphone lead enters the screen case.

connected to the transmitter which at this stage should have its output fed into a suitably screened dummy load to prevent any RF from being radiated. The transmitter output should be monitored in a receiver and the output of the processor adjusted so that the received audio sounds acceptable, and also the transmitter is running within its limits. Finally the processor should be tried with the transmitter feeding the aerial and any signs of distortion noted.

A transmitter will be far more susceptible to RF being fed back into the audio stages when a speech processor is used because the audio gain has been greatly increased. Therefore, even a small amount of RF pickup might cause instability where previously there was no problem. There are two basic ways in which the problem can be overcome. The first one is to filter out any RF which is picked up on the microphone lead. Unfortunately the design of any filter will vary depending on the circuit impedance but one of the two suggestions outlined in Fig.2 should solve the problem. In addition to this any supply rails should be decoupled and 0.01uF capacitor should be adequate for this. The second solution is to remove the RF from the shack by ensuring the aerial is sufficiently far away not to cause any problems. Not only will this idea enable the equipment to operate more satisfactorily but it will also reduce any health hazards that may have been present from the high RF levels in the shack.

If care is taken when using speech processors and clipping levels are not excessive — especially when using audio frequency clipping — then the transmitted signal should remain clean and intelligible.

IC-R7000

IVE AT CHRISTMAS THE NEW YEAR

Listed here are just some of the 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.

A sophisticated scanning system provides instant access to most used frequencies. By depressing the Auto-M switch. The IC-R7000 automatically memorises frequencies in use, while the unit is in the scan mode. This allows you to recall frequencies that were in use. Scanning systems include, memory selected frequency ranges or priority channels scanning speed is adjustable. Narrow/wide filter selection. Five tuning speeds: 10Hz, 1.0KHz, 5KHz, 10KHz, 12.5KHz and 25KHz.

All functions, including memory channel readout are clearly shown on dual-colour fluorescent display with dimmer switch. The IC-R7000 has dial-lock, noise blanker, S-meter & Attenuator. Options include RC-12 infra-red remote controller and a voice synthesizer. Range extender also available.

For a more detailed specification of the competitively priced IC-R7000 contact your authorised ICOM dealer or telephone us direct on **0800 521145**, our **FREE Linkline** service for Amateurs and SWL's.

Alyntronics, Newcastle, 0632-761002.
Amateur Radio Exchange, London (Ealing), 01-992 5765.
Amcomm, London (S. Harrow), 01-422 9585.
A.R.E. Comms, Earlestown, Merseyside, 09252-29881.
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.
Poole Logic, Poole, Dorset, 0202 683093.
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.

ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet Electronics
Dept HR, Herne Bay, Kent
Tel (0227) 363859

Clandestine Operation in the Middle East

Living and working in the Middle East is quite an experience, but operating an illegal amateur radio station as well led 'Sheridan McQuire' into some interesting situations and conversations.

Forty years ago, I suddenly found myself projected back into civilian life, having spent six years helping the RAF to dispose of 'Mr Hitler & Co'. The return to professional life was disappointing — a general air of depression was much in evidence — a legacy of the 'messing about' experienced during the war.

Having lost six years seniority, and needing to 'catch up' on one's professional status, I decided to look for a post overseas. An RAF advertisement offered a civilian post in the East — at Changi in Singapore. I applied and in due course, was called for interview at their establishment at Waterloo Bridge House.

I was shown into the office of a rather intimidating young woman. After a very shaky start, we developed a degree of mutual confidence, and were eventually negotiating under the 'old pals Act'. She indicated that the Changi post was rather minor and a much larger project was coming up in the Middle East. I asked if my wife could also be offered employment, mentioning her special qualificiation. She could hardly hand over the application form quickly enough.

In early January I sailed from Southampton with a bevy of similar employees on a Furness-Withy liner (a troopship in disguise!). We sailed for 12 days via Gibraltar, Malta and one or two other spots.

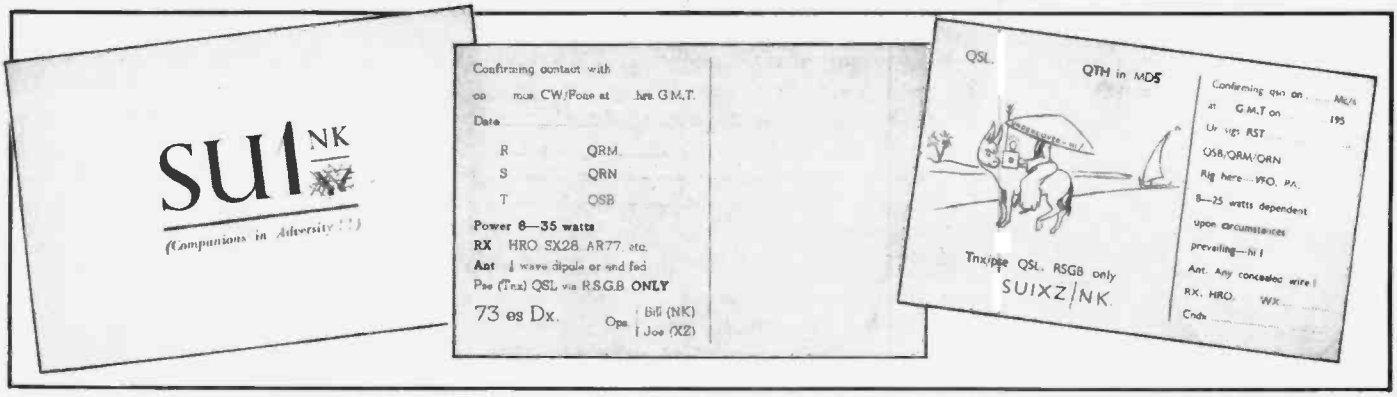
Having set the scene, I should explain that as soon as our appointment was confirmed, I set to work to build, test and pack a complete amateur radio station to take with me. The transmitter was a simple CO/PA job (6AG7-807) complete with high level AM modulator (later another Tx was built with the latest all band Tank circuit which was used for both driver and PA stages, eventually ganged to give one knob control) and appropriate power pack — built for the job and giving plenty of output on 7, 14, 21 and 28MHz. Reception was catered for by an RCA AR77E. This gear, together with copious spares of all sorts, was packed into very sturdy crates with rope handles.

. . . A troop ship in disguise!

Settling In

On reaching our destination, I was provided with a room in the Officer's Quarters since I was a civilian with 'officer status'. I proceeded to unpack my gear and set it up on a table under the window. I ran out a wire some 50 feet long and about 10 feet high — the far end supported by a convenient palm tree. I unpacked the receiver and connected up. In those years 'Ten' was wide open and I immediately heard some of the club members back home! After a day or so, I set up the transmitter and one afternoon hearing G4ZU, called him using a callsign appropriate to the area. We were in touch most days and lots of my clubmates in the UK also made contact.

Within weeks, I was notified that my wife and family were due to travel out and I had to find somewhere for us to live. Prospecting in the neighbouring town which had a very large European quarter, I came across a construction site for a block of flats. It was in a very pleasant spot overlooking a public park. I enquired in a local shop and eventually ran the owner to ground. He took me around the site — they were being built on a lavish scale. I was



interested in a third floor flat and I could choose which one I wanted from three. Having agreed a rent of £30 per week (which thanks to a generous overseas allowance, I was able to afford), we parted with mutual expressions of satisfaction.

Once settled in our new flat, I began unpacking my radio gear and assessing the facilities. The building was triangular with the various apartments making the sides and a central well providing light to all the flats. On the floor above there were two small flats and a door leading on to a large flat roof surrounded by a four foot parapet. The roof was used for drying the laundry and had a number of wires at shoulder height. I sought the owner's permission to erect aerials on the flat floor. I had discovered that he owned ocean going ships, held a Masters ticket and was a qualified radio operator. He readily granted permission providing that the aerials should be inconspicous. He had heard about amateur radio when visiting the USA and I think he realised that I wouldn't just be listening.

'Pirates' Where?

However, I intended to do things legally if possible, so I placed a request with HQ Signals Section for the issue of an amateur licence. After two weeks, I was called in to see the 'Boss' of the Sigs Section. He quickly came to the point, "I have tried to get you a licence, but they won't consider granting one even with the most limited facilities!" He paused then went on quietly, "if the matter ever arises I shall deny all knowledge of this next conversation, you understand?" He continued "well, the Navy here are not looking for 'pirates' (meaning in the radio sense), the Army are not looking for pirates, the RAF are certainly not looking for pirates and the locals haven't got anything to look with!"

On returning to my office I phoned several people who had expressed a desire to get on the air asking them to meet me in my office at lunch time. When they had all arrived, I produced an exercise book, explained what had transpired and proceeded to issue callsigns entering only first names. In the ensuing years some two dozen partakers were entered.

The aerial set up which I devised for the flat consisted of a 40m dipole suspended about 10' above the flat floor. It was broken in the middle of each leg by an insulator, a pigtail with a croc clip at each of these points so that operation could be 7, 14 or 21MHz. Lack of rain for several years meant that this arrangement was unlikely to be impaired. 28MHz operation was catered for with a dipole made with 300 ohm ribbon. The feeders for both these aerials were draped down the well to the flat.

The XYL was highly apprehensive of trouble with the local authorities so to quieten her fears, the transmitter was returned to the crate. This did not preclude transmission though, as I had built a tiny CO/PA (EF91/6AG7) CW outfit which gave a few watts out on the four bands. This was fed into the aerials with a torch bulb as current indicator. This, of course, flashed as I keyed, I explained to the XYL that I was practising my Morse!

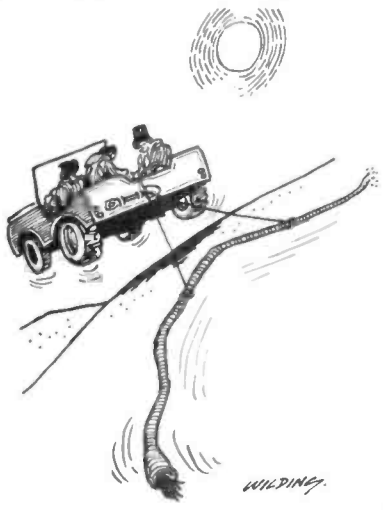
With that station, I worked worldwide, the unusual callsign contributing largely to this with frequent pile-ups each time any one of us opened up on the air. With one of the Met. forecasters who was also an amateur I devised a joint QSL card with our lists of contacts being handled by the late G4AU who had volunteered as QSL manager.

I soon found a radio repair shop in the town run by an elderly Greek. I started buying bits and pieces from him and over a few months, got onto good terms with him and was invited into his 'workshop'. He was entirely self taught and a lack of precise instrumentation was obvious. Prominent on the wall was a large mains driven bell but minus its gong. I queried its use and the old chap explained that it was for alignment. Having switched the device on and turned on a radio on the bench, a healthy buzz came from the speaker. With a screwdriver, he adjusted all the 'screws' (his term for trimmers!) for 'biggest' noise.

The local electricity supply company had an imposing shop in the main street. It was presided over by a Hungarian gentleman. One day I noticed at the back of one of his showcases what appeared to be some sort of electrical instrument. It turned out to be a superb Hickok signal generator with built in V.T.VM and other facilities. Nobody used it or knew how to, since the Americans had left it behind in the power station. Having checked that it was 230V and, with permission, I plugged it into the mains. It lit up and appeared to be okay. We switched on one of the displayed radios — a quick tweak on the Sig Genny and an enormous signal blared out. The manager looked at me quizzically, "you now how to use this?" We soon agreed that I would repair radios for British Services families, at the proper price, of course. He gave me the Hickok as a gift which when I arrived home caused my XYL to say "I know, you've found a junk shop out here of all places!"

Cable Removals Ltd.

In the area where we were located there were two Army bases situated some fifteen miles apart, and joined by a good tarmac road. Alongside the road was buried a



. . . off over the sand dunes dragging the severed cable behind it.

multi-pair telephone cable which the local 'natives' regarded as a source of easily obtained income. At regular intervals they dug up the cable at two points some hundreds of yards apart and a jeep was attached to the cable by a hawser. At a given signal the cable was cut and the jeep drove off over the sand dunes dragging the severed cable behind it. At a safe distance, the cable was rolled up and dumped in the jeep for sale in the nearest big town.

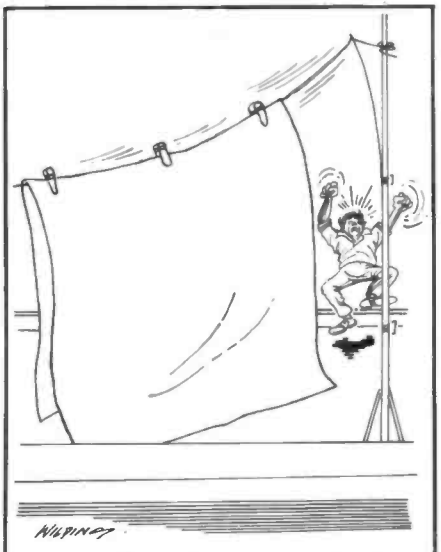
The Services attempted to stop this repeated theft by having two jeeps, one at each base, which hurtled down the road with heavily armed crews as soon as the line was cut. They never caught them but there were some phenomenal avoidances when they met at speed!

The Major in charge of this operation knew of my amateur activities. One evening he called me over and took me up to his room where he had something he thought I would be interested in. It turned out to be the greater part of a Hallicrafters SX28 communication receiver which they had dug up whilst searching for the end of the telephone cable. It was complete — including metal valve — except for the audio end and the power supply which someone had removed to make an amplifier. I took the receiver and after a few discreet enquiries was in possession of all the needed replacement parts.

Clearing out the sand was a long business involving paraffin, elbow grease, profanity and considerable effort. But eventually the receiver was pristine and worked perfectly first time. Another problem apart from the sand developed with my ribbon dipole — it would not draw and in no way could I persuade it to accept power. I went up on to the roof to find that our laundry woman had pegged out some of her washing along the 300 ohm feeder. Net result, much of the folded dipole had opened out under the weight and I now had a very fine delta match that didn't match anything.

On The Air

About this time the BERU (British Empire Radio Union) contest came along; I couldn't face 24 hours of operating but I did put in some 14-15 hours of listening and logging. I sent my log in as a check log and was astonished to get a letter from one of the contest committee. He wrote saying the most appreciated parts of my log were my grossly candid comments as to the 'fist', note and general procedure of some of the contacts. Some months later, I learnt via the RSGB's "Bulletin" that I had run third in the receiving section of the contest and that without trying!



. . . our laundry woman had pegged out washing along the 300 ohm feeder.

The plethora of American forces station in Europe made life on the air very difficult at times. One had only to show one's nose on 20m to be buried under a load of X--- callsigns. None of them seemed to have the slightest compunction about cutting each other up or seemed to be using less than a BC610 running at least one kilowatt. It eventually got through to most of them that unless definitely called, they were not welcome.

As mentioned before, I was sometimes called upon to service various radios for Service people. On one occasion, an Army officer bought round a Philips domestic radio which had a broken dial drive cord. He was from the Royal Signals and his eyes lit up at the sight of the SX28 on my desk. He recognised it as a Super Skyrider and commented that they couldn't get anything out of theirs. On hearing mine work, we agreed that something must be wrong and that he would bring it round.

Two days later, I handed him his radio duly repaired. He had a Trooper carry up the receiver which I surveyed with amazement. Carefully, I pointed out that on the front panel it said Super Skyrider S27 and that although this was a communications receiver, it covered 30-150MHz on VHF — it would not receive anything on ordinary HF wavelengths. Since I already had an AR77E and the SX28, I offered to swap his S27 for my SX28. Swiftly, he called upon the unfortunate Trooper to remove my SX28 — in case I changed my mind.

The S27 required a thorough clean up and a couple of new Acorn valves, but it was soon in full working order. True, there was very little to listen to at that time, but on Armistice Sunday 1950, we sat having lunch and listened to the Cenotaph ceremony direct on the BBC TV sound channel of 43MHz.

Clandestine Awareness

Throughout my amateur operation, there was the ever present awareness that these were strictly 'sub rosa'. This was illustrated one afternoon when a commotion on the staircase made me think that the Secret Police had found out about my operations. My immediate impulse was to hide the gear, or maybe throw it from the window to the courtyard below. The 'natives' appeared to be heading for my neighbour and I soon found out that his flat was on fire. Eventually, it was put out, with the help of a rather inept local fire

brigade, but it was a long time before my pulse returned to normal.

Shortly after this the whole family returned on 'inter-town leave' although we had proved so successful in our professional capacity that Air Ministry wished to retain us for a further three years. After six weeks we were due to return but the XYL had to go into dock for a hearing operation.

We had hardly got back and resumed work when trouble blew up and the Flag of Revolution was raised. We were penned in the flat for several days but were not short of food for our landlord, being a prominent permanent resident, had no difficulty in organising supplies! During this period I kept a 20m sked each day with G4AU at 18.00 hrs, passing news of the XYL's progress to us, and our news back to her! This sked became so well known, and so many amateurs joined in that eventually the hospital had to ask Allan, G4AU, if he could arrange that only one person made the daily enquiry about my wife, as their switchboard was getting overloaded at that hour.

Eventually conditions got so dangerous that the Air Force decided to bring all personnel living in the town, into the RAF compound. Accordingly, I had to pack up our entire home into crates and we were moved under armed guard. Once established there the sked was taken over by my Met. colleague who kept up the contact daily till he could inform my wife that we had sailed for home.

So ended a very exciting and interesting period of operating clandestinely.

If you haven't already guessed where 'Sheridan' was posted, he was based at a town known as 'Ish', to the forces, Ismailia, to others, in the then British protected Suez Canal zone.

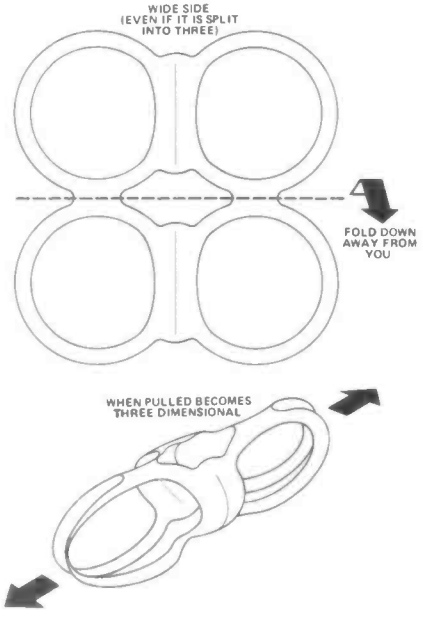
Addendum

Beam Splitter for an Oscilloscope (September '85 p 38)

On Figs 3 and 4, the circuit diagrams for boards A and B, the chips IC1 and IC3 have been incorrectly numbered. Pins 1 and 8 of both chips should be connected via C3 on Fig. 3 and C9 on Fig. 4 both of which are 47pF capacitors. Pin 5 is left unconnected.

The Multimate Keyer (August '85 p30)

Apparently some readers have experienced problems getting hold of the makers of the PCB, Microtanic. They can be obtained on 01 299 1419 and still have adequate stocks which currently retail at £24.50 each.



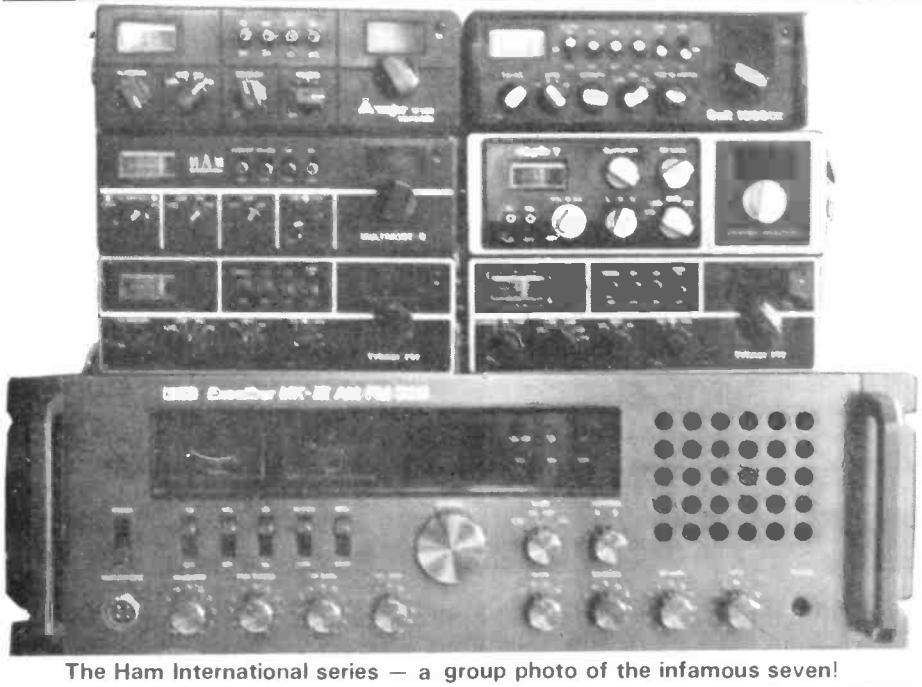
Rubbish Tips - Alcoholic Insulators (November '85 p22)

Unfortunately, our technical illustrator may have been partaking of a little of what the binders used to hold when he was drawing Fig. 2, since the binder should be folded in the opposite direction as shown nearby.

A Cheap 25' Telescopic Wooden Tower (December '85 p34)

Fig. 3 , the front view of the bottom section was wrongly drawn in that the spacers should be screwed on the opposite side to that indicated. Also the pivotal hole must be 2" up from the bottom of the timber.

Converting Ham Internationals To 10m PART 2



The Ham International series — a group photo of the infamous seven!

In this second and final part, Roger Alban, GW3SPA, describes how this series of CB rigs can be modified with the aid of an EPROM.

Binary addition can also be used to extend the frequency range of the rig. Using the channel frequency relationship shown in Table 3 (see December '85 HRT), channel 30 on the high band corresponds to the FM calling frequency of 29.6MHz. The required binary code for channel 30 will be 81 (from Table 6, Dec HRT) and the switch logic code is 29 (from Table 5, Dec HRT). Therefore the binary adder will be required to add binary 52 to the programme code.

When the rig is switched to mid band, the working frequency will be 29.20MHz. The required binary number will now be 121 (see Table 7). To obtain the new binary values on the PLL chip programme lines, using the same switch logic code, the binary adder must add binary 92 to the original binary value.

Finally, with the rig switched to low band, channel 30 corresponds to a working frequency of 28.80MHz and from Table 8, the new binary value can be seen to be 161. The binary adder will need to add binary 132 to the original binary value to obtain the required binary value. Therefore, as we switch from one band to another, the binary value on the B inputs to the binary adder will have to be changed.

Table 9 shows the binary codes required on the B inputs together with the corresponding logic levels. Note that B0 and B1 remain at logic level 0 and B2 at logic level 1. The remaining B inputs must have their logic levels changed from band to band in some way. Using the binary adder circuit diagram (Fig.5 Dec HRT) and Fig.6, reconnect the B inputs, to obtain the required logic levels. Using diode switching, B3-7 are connected to the band switch, SW1 which is also connected to Vdd to prevent feedback reaching the other B inputs.

This technique for changing the logic codes on the B inputs uses only 6 diodes. The diode matrix is built on a separate piece of Veroboard and wired to the band change switch on the front panel of the rig and to the Veroboard containing the two binary adder chips with ribbon cable. The rig will of course need to be retuned as described in the first part.

This binary addition method of modification is cheaper than the three crystal approach because one of the original crystals is being used. However, there are disadvantages in the two methods so far described. Firstly, on looking closely at Table 3 you will see that some frequencies on the upper channels of the lower bands are repeated on the lower channels of the upper bands. For example, channel 40 on

CHANNEL	P8	P7	P6	P5	P4	P3	P2	P1	P0	BINARY NUMBER
CHAN 1	0	1	0	0	1	1	0	1	1	155
CHAN 30	0	0	1	1	1	1	0	0	1	121
CHAN 40	0	0	1	1	0	1	1	1	1	111

Table 7 The required programme code for mid band.

CHANNEL	P8	P7	P6	P5	P4	P3	P2	P1	P0	BINARY NUMBER
CHAN 1	0	1	0	0	0	0	0	1	1	195
CHAN 30	0	1	0	1	0	0	0	0	1	161
CHAN 40	0	1	0	0	1	0	1	1	1	151

Table 8 The required programme code for low band.

BAND	B7	B6	B5	B4	B3	B2	B1	B0	BINARY NUMBER
HIGH	0	0	1	1	0	1	0	0	52
MID	0	1	0	1	1	1	0	0	92
LOW	1	0	0	0	0	1	0	0	132

Table 9 The required 'B' input logic codes for multi band use.

low has the same operating frequency as channel 4 on mid band. This can be overcome by adjusting either the band crystal frequency or the divide by N number but it will result in certain frequencies being lost.

Another disadvantage is that the logic code produced by the channel switch is designed to FCC frequency specification (ie frequencies are missed and there is a strange jump back between two of the upper channels). This non sequential code would have to be intercepted before it reached the PLL programme lines and converted to an acceptable logic code which will increment the operating frequency in sequential 10kHz steps.

The Solution — An EPROM

The device that can easily generate a new logic code is a suitably programmed ultra violet Erasable electrically Programmed Read Only Memory (EPROM). This memory device can store the required logic codes in various address locations, which can be selected by applying separate logic levels on the address lines of the EPROM. The address logic levels can be produced by the existing channel control and band change switches as different programme levels will be required for each band. The memory output of the EPROM can be fed directly to the programme lines of the PLL chip.

The contents of the memory can be so arranged that it will ensure that the logic output produced by the various non sequential addresses will be sequential. The EPROM can be programmed at home using an inexpensive manual 'programmer', inputting eight bits of data at a time using a series of switches connected to a power supply. The author can supply a readily 'blown' EPROM at a modest cost for those who do not wish to do this, see the box at the end of the article.

The INTEL 2716

The EPROM chosen for this application is the 2716 because it only requires a single 5 volt supply. Other EPROMs require a minimum of two different operating voltages, one of which is normally in excess of 12 volts. The 2716 draws an operating current of approximately 100mA and therefore a separate stabilised voltage supply is needed to drive the 2716 from the 13.8 volt supply.

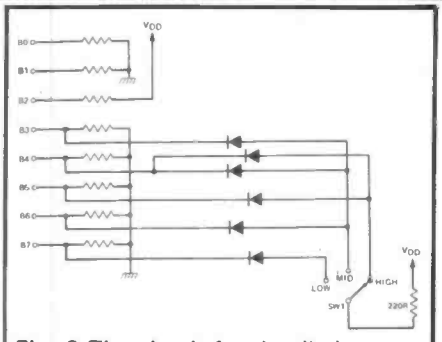


Fig. 6 The circuit for the diode switching which provides the required logic code for the B inputs for each band.

Fig.7 shows how the 2716 EPROM is inserted between the channel switch and the PLL chip programme lines. The programme lines from the channel select switch P0-5 are connected to the 2716 address inputs A0-5. The 4.7k ohm pull down resistors are also connected to the address line inputs to ensure that they are maintained at logic level 0 when the channel switch has no output on any of its programme lines.

Address lines A6, A7 and A8 are connected to the band switch to alter the input address of the 2716 between each individual band. Repeater shift is taken from the rig's transmit line which is +9V on transmit and 0V on receive. A 4.7V zener diode ensures that the logic level fed to address input A9 is held below 5V when the repeater switch is closed on transmit. Address line A10 is not used and its input is grounded to ensure that it remains at logic level 0.

The outputs from the 2716 are fed directly to the input programme lines of the PLL chip as shown. You will observe that programme line P8 is not required and is grounded to remain at logic level 0. Pins 18 and 20 on the 2716 are only used when the 2716 is being programmed so they are also grounded.

The 2716 is fed from a stabilised 5V supply produced by a TIP 3055 pass transistor and a 5.6V zener diode. The pass transistor is attached to the side of the rig via a mica washer. The stabilised 5V supply is also fed to the centre wiper of the band and channel select switches. Previously, these two switches have been fed from the 9V chip supply. You will have to locate the 9V supply wires and disconnect them before connecting

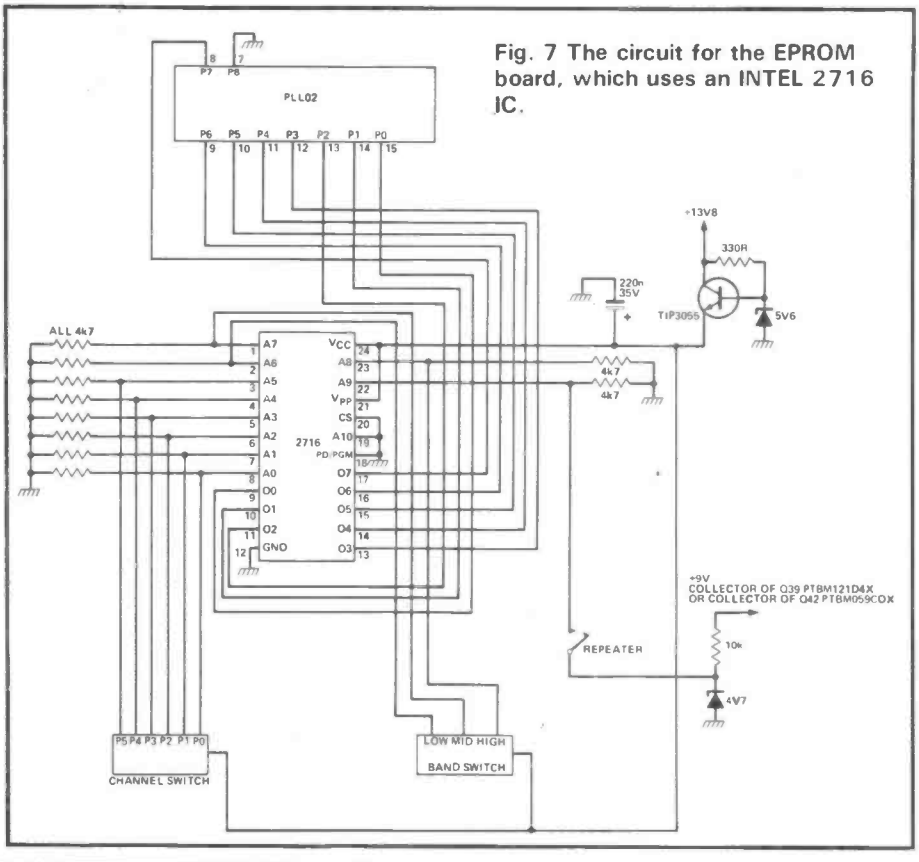


Fig. 7 The circuit for the EPROM board, which uses an INTEL 2716 IC.

up the 5V supply.

The original band crystals were switched by feeding the 9V supply to the crystal oscillator, where diode switching selected the required operating crystal. The contents of the EPROM memory have been selected to operate with the 20.555MHz crystal operating at 20.5525MHz. Therefore, the two other crystals will not be required, and the 9V supply should now be permanently connected to the 20.5525MHz crystal. On high band, a front panel lamp is switched on using the 9V supply through the band switch. If you want to retain this facility, you will have to change the value of R179 from 150 ohms down to 100 ohms since the band switch is now being fed with only 5V.

The 2716 contains 2k of memory which is more than enough to supply the various logic levels required for each of the 40 channels on the three operating bands. Therefore, additional information can be stored increasing the facilities offered by the rig such as having repeater shift.

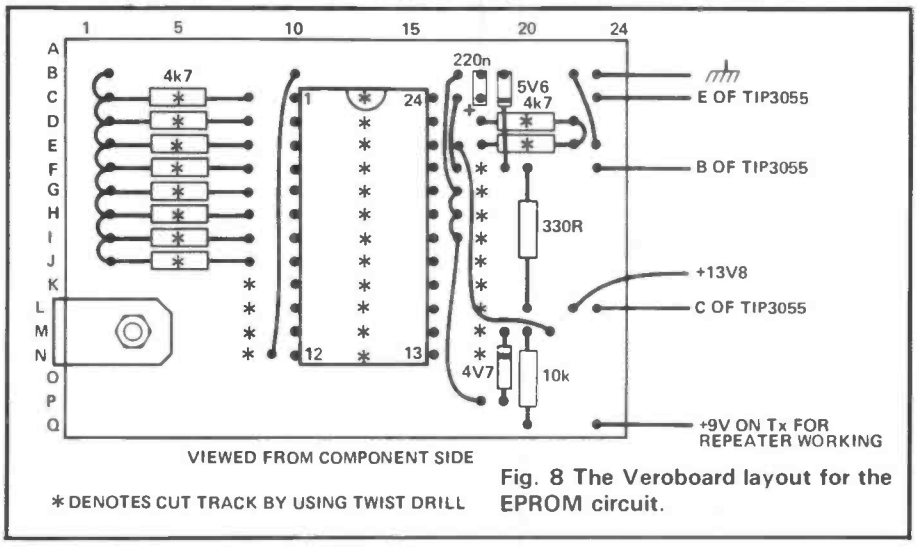


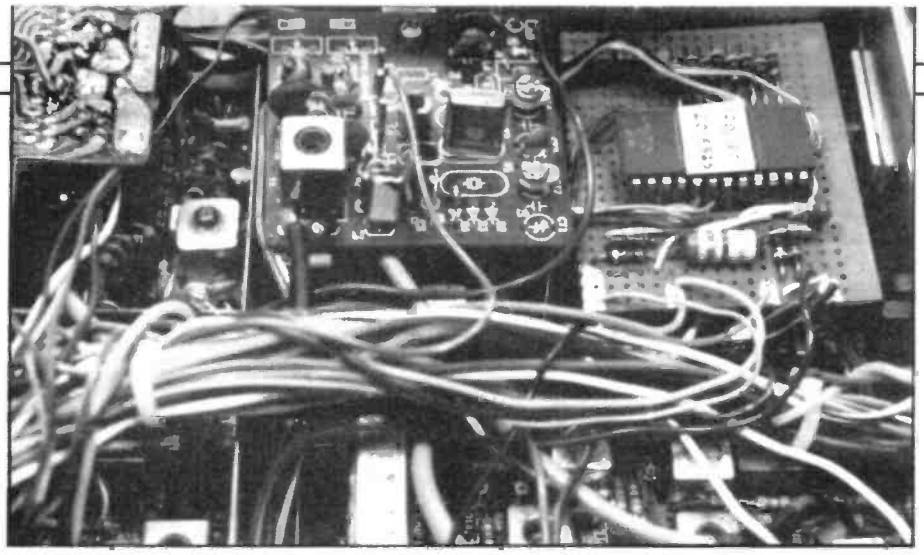
Fig. 8 The Veroboard layout for the EPROM circuit.

Repeater Shift

To work through a 10m repeater the transmitter frequency should be 100kHz below the receiver frequency. This can be done by changing the 2716 address lines so that under transmit conditions, the divide by N number is suitably different. When the repeater facility is not required, the

Table 10 The EPROM memory address/data codes needed if you want to blow your own EPROM and have a Ham International 120 channel rig.

	LOW BAND		MID BAND		HIGH BAND		LOW BAND REPEATER		MID BAND REPEATER		HIGH BAND REPEATER	
CHANNEL	ADDRESS	DATA	ADDRESS	DATA	ADDRESS	DATA	ADDRESS	DATA	ADDRESS	DATA	ADDRESS	DATA
1	07F	BE	0BF	96	13F	6E	27F	C8	2BF	A0	33F	78
2	07E	BD	0BE	95	13E	6D	27E	C7	2BE	9F	33E	77
3	07D	BC	0BD	94	13D	6C	27D	C6	2BD	9E	33D	76
4	07B	BB	0BB	93	13B	6B	27B	C5	2BB	9D	33B	75
5	07A	BA	0BA	92	13A	6A	27A	C4	2BA	9C	33A	74
6	079	B9	0B9	91	139	69	279	C3	2B9	9B	339	73
7	078	B8	0B8	90	138	68	278	C2	2B8	9A	338	72
8	076	B7	0B6	8F	136	67	276	C1	2B6	99	336	71
9	075	B6	0B5	8E	135	66	275	C0	2B5	98	335	70
10	074	B5	0B4	8D	134	65	274	BF	2B4	97	334	6F
11	073	B4	0B3	8C	133	64	273	BE	2B3	96	333	6E
12	071	B3	0B1	8B	131	63	271	BD	2B1	95	331	6D
13	070	B2	0B0	8A	130	62	270	BC	2B0	94	330	6C
14	06F	B1	0AF	89	12F	61	26F	BB	2AF	93	32F	6B
15	06E	B0	0AE	88	12E	60	26E	BA	2AE	92	32E	6A
16	06C	AF	0AC	87	12C	5F	26C	B9	2AC	91	32C	69
17	06B	AE	0AB	86	12B	5E	26B	B8	2AB	90	32B	68
18	06A	AD	0AA	85	12A	5D	26A	B7	2AA	BF	32A	67
19	069	AC	0A9	84	129	5C	269	B6	2A9	8E	329	66
20	067	AB	0A7	83	127	5B	267	B5	2A7	8D	327	65
21	066	AA	0A6	82	126	5A	266	B4	2A6	8C	326	64
22	065	A9	0A5	81	125	59	265	B3	2A5	8B	325	63
23	062	A8	0A2	80	122	58	262	B2	2A2	8A	322	62
24	064	A7	0A4	7F	124	57	264	B1	2A4	89	324	61
25	063	A6	0A3	7E	123	56	263	B0	2A3	88	323	60
26	061	A5	0A1	7D	121	55	261	AF	2A1	87	321	5F
27	060	A4	0A0	7C	120	54	260	AE	2A0	86	320	5E
28	05F	A3	09F	7B	11F	53	25F	AD	29F	85	31F	5D
29	05E	A2	09E	7A	11E	52	25E	AC	29E	84	31E	5C
30	05D	A1	09D	79	11D	51	25D	AB	29D	83	31D	5B
31	05C	A0	09C	78	11C	50	25C	AA	29C	82	31C	5A
32	05B	9F	09B	77	11B	4F	25B	A9	29B	81	31B	59
33	05A	9E	09A	76	11A	4E	25A	A8	29A	80	31A	58
34	059	9D	099	75	119	4D	259	A7	299	7F	319	57
35	058	9C	098	74	118	4C	258	A6	298	7F	318	56
36	057	9B	097	73	117	4B	257	A5	297	7D	317	55
37	056	9A	096	72	116	4A	256	A4	296	7C	316	54
38	055	99	095	71	115	49	255	A3	295	7B	315	53
39	054	98	094	70	114	48	254	A2	294	7A	314	52
40	053	97	093	6F	113	47	253	A1	293	79	313	51



The Marco 747 with its new VCO board and the EPROM.

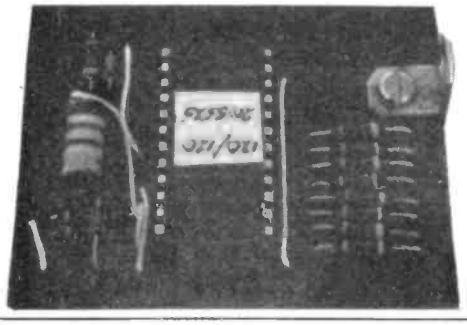
repeater switch is open circuited and address line A9 remains at logic level 0. The noise blanker switch on the front panel was selected to become the repeater switch. The noise blanker wires were disconnected and open circuited to ensure that it operates continuously.

The EPROM Board

The EPROM circuit is built on Veroboard and the component layout is shown in **Fig.8**. The cable connections from the board to the channel and band switches are made with ribbon cable. A right angle bracket was made so that the Veroboard could be attached to the metal chassis of the rig. It is wise to insert the EPROM in a socket only after all the soldering has been completed and a voltage check of the various pins of the IC holder carried out to ensure that there are no crossed wires and that the stabilised voltage regulator is working correctly.

For those of you who are thinking of modifying a Ham International 120 channel rig using an EPROM, the required address and data contents is shown in **Table 10**. The information has been displayed in hex decimal form for convenience. The total cost of the EPROM modification will be approximately £10 with the advantage that the operating frequency of the rig will now stay in step with the channel selected. Also there will be no gaps in the frequency coverage of the set. The new operating frequency of the rig for each channel is in **Table 11**. The EPROM approach also offers the flexibility of being able to introduce the repeater shift facility at no extra cost.

The completed EPROM board showing the chip and the companion eight 4k7 resistors.



And Finally . . .

When modifying CB sets for use on 10m, the minimum amount of test gear is essential to carry out the necessary tuning adjustments; to ensure that the performance of the modified equipment is not impaired; and unwanted spurious signals radiated. The test equipment required must include a digital frequency meter, RF voltmeter or good oscilloscope, and a digital voltmeter.

The three methods described enable the enthusiastic owner of the Ham International series of CB rigs to choose one that suits his own capabilities. Furthermore, I have so far identified seven different models containing the PCBs listed in Table 1 (see Dec HRT). There must be many other models containing these boards yet to be discovered. It is worthwhile removing the lid from the unknown CB to inspect the PCB number to establish the true identity of the rig.

Little has been said here concerning the Colt 1600DX which is listed earlier. This model has a band crystal oscillator similar to the PT0S110AOX PCB, but containing four band crystals. The 20.55MHz can be successfully pulled down to 20.5525MHz using the method described. The band oscillator circuit forms part of the main PCB for the rig. The components contained within the VCO plastic block have been altered in value to permit the rig to cover four consecutive groups of 40 channels between 26.515MHz and 28.305MHz. However, if you wish to convert the rig for use on 10m, you will have to replace the original VCO tuned circuit for the circuit shown in Fig.3 and tune the other circuits as described.

CHANNEL	LOW	MID	HIGH
1	28.51	28.91	29.31
2	28.52	28.92	29.32
3	28.53	28.93	29.33
4	28.54	28.94	29.34
5	28.55	28.95	29.35
6	28.56	28.96	29.36
7	28.57	28.97	29.37
8	28.58	28.98	29.38
9	28.59	28.99	29.39
10	28.60	29.00	29.40
11	28.61	29.01	29.41
12	28.62	29.02	29.42
13	28.63	29.03	29.43
14	28.64	29.04	29.44
15	28.65	29.05	29.45
16	28.66	29.06	29.46
17	28.67	29.07	29.47
18	28.68	29.08	29.48
19	28.69	29.09	29.49
20	28.70	29.10	29.50
21	28.71	29.11	29.51
22	28.72	29.12	29.52
23	28.73	29.13	29.53
24	28.74	29.14	29.54
25	28.75	29.15	29.55
26	28.76	29.16	29.56
27	28.77	29.17	29.57
28	28.78	29.18	29.58
29	28.79	29.19	29.59
30	28.80	29.20	29.60
31	28.81	29.21	29.61
32	28.82	29.22	29.62
33	28.83	29.23	29.63
34	28.84	29.24	29.64
35	28.85	29.25	29.65
36	28.86	29.26	29.66
37	28.87	29.27	29.67
38	28.88	29.28	29.68
39	28.89	29.29	29.69
40	28.90	29.30	29.70

Table 11 The revised channel/frequency allocation after modification with the EPROM.

The EPROM is available at a cost of £8.50 including recorded delivery. When ordering, please make your cheque or postal order out to C B Alban and write your name and address clearly. Post your order to Roger Alban, Ham Radio Today, 1 Golden Square, London W1R 3AB. Please allow 28 days for delivery.

The Trio TS830S

The Ultimate In Selectivity?

The Trio TS830S is the big brother of the 530S, both still on sale but not exactly new — the 830S was introduced around the second half of 1980 and so is 5 years old now. So, why is it a) still on the market and b) such a popular choice for competitive work amongst CW fans?

Why is this five year old rig still one of the most popular among top contesters? Tony Bailey, G3WPO, investigates the secret, of the 830S.

Dewsbury Electronics kindly lent a secondhand version of the 830S for review, some 8 months old, and fitted with two of the optional CW filters which are available. Being a secondhand model, but with a known history, would also be interesting as it might show up any faults which can develop after a while.

In comparison with many modern rigs the 830 does not look particularly dated even allowing for its lack of keypads etc. It also bears a close resemblance to the FT101Z, both in appearance and layout! It is still very presentable and has many facilities that you expect to find nowadays, but lacks any memories in its basic form, or facilities for AM and FM. So lets have a look at it in the same manner as a normal review with some observations against current rigs as we go along.

Facilities

The 830S is a mains driven transceiver and covers all amateur bands currently available from 1.8MHz through the newer WARC bands up to 30MHz (30.078 on this one), using 500kHz segments in conjunction with a separate band switch. A front panel button provides the odd 500kHz segments of 28.5 and 29.5MHz separately. One of the more unusual features of the rig — unusual compared with current rigs — is that the VFO is analogue, tuning 5.5 — 6MHz (the TenTec Corsair is the only other rig reviewed recently which uses this once standard method, nearly everything else using digital synthesis). The rest of the frequency determining circuitry then goes over to PLL techniques with six separate VCOs employed, operating 8.83MHz above the signal frequency. These are mixed with various other oscillators to arrive at the wanted frequency, after dividing down to the 1-4MHz region for reference purposes.

The basic receive section is dual conversion with the first IF at 8.83MHz, and second at 455kHz. Most recent receivers have direct mixer feeds to improve the dynamic range, with the RF stage in the form of a switchable pre-amp. However, the RF amplification used on the 830S uses a 3SK73 MOSFET, with delayed AGC applied to improve the strong signal handling and blocking performance. The first mixer uses a pair of push-pull 2SK125 JFETS (still in use in many recent rigs) followed by IF amplification; then, a ceramic roof-

Measurements

RF sensitivity on SSB (for 10dB S/N + N) using an SSB filter max bandwidth (2.4kHz)

1.8MHz	0.10uV
3.6MHz	0.12uV
7.05MHz	0.13uV
14.2MHz	0.11uV
21.2MHz	0.10uV
29MHz	0.12uV

Dynamic range — two tone 14.2MHz: 91dB.

Power Output on CW into 50 ohms

1.9MHz	115W
3.5MHz	120W
7.05MHz	113W
10.1MHz	115W
14.2MHz	120W
18.4MHz	115W
21.2MHz	118W
24.8MHz	115W
28MHz	110W
29.7MHz	106W

S meter on SSB, 14.2MHz (increase in dB per S point)

S1	—
S2	1dB
S3	1dB
S4	2dB
S5	3dB
S6	4dB
S7	5dB
S8	7dB
S9	7dB
S9 + 10dB	10dB
S9 + 20dB	11dB
S9 + 40dB	21dB
	(S9 was 52uV)

Attenuator:

1.8MHz	21dB
14.2MHz	20dB
29MHz	18dB

ing filter with noise blanker, and thence onto the main IF selectivity at 8.83MHz with a crystal filter(s). The second mixer takes everything down to 455kHz, with more selectivity available at this frequency from further IF filters — a notch filter is also used at 455kHz.

The 830S Secret . . .

With two sets of IF filters available with similar bandwidths, variable bandwidth tuning and IF shift can be implemented. Both of these are provided with IF filters enabling the overall bandwidth of the receive section to be altered continuously. This is done by shifting the frequency of the second conversion oscillator — the passband of one filter moves relative to the other narrowing the bandwidth. For the IF shift, the first conversion oscillator is moved together with the 'BFO' an equal amount, which results in the relative centre position of the IF shifting without changing the bandwidth. This can be used to good effect to shift the overall passband away from any interference while still retaining the wanted signal within the passband.

This facility combined with the VBT (and optional narrower filters) makes a formidable weapon in the battle against QRM — one reason why the 830S is popular for contests. Many of the recent receivers cannot equal these facilities, usually only providing the VBT part.

On transmit, the 830S uses a pair of 6146B's as the output stage with front panel loading and tuning (plate) controls — the driver is a 12BY7 — all still freely available of course. Having a valve PA does have some advantage — often considered 'old-hat' by many — the linearity and intermodulation products are generally better than an equivalent power output solid-state amplifier. Also, the ability to tune the pi-network output gives more versatility with antennas when operating into the mismatches that a solid state PA often cannot tolerate.

Other Facilities

As mentioned earlier, the 830S is limited to SSB and CW operation, with no optional extras in the way of AM or FM adaptors. For CW operation, two further narrowband CW filters can be fitted, one at 8.83MHz and one at 455kHz. These can either have 500Hz or 250Hz (−6dB) bandwidths. The review model had a 500Hz 455kHz filter fitted.

A number of other optional accessories are available including VFO-230 remote VFO + memories which is digitally synthesised. I was not able to evaluate this but I believe it may have some effect (perhaps deleterious) on the receiver's performance. Also available are an antenna tuner, AT230, plus metering; a linear, TL922 (2 off 3-500Z); a monitor, SM220; a DC-DC converter, DS2, for 12V operation plus other less useful accessories such as a station clock.

VOX is fitted as standard, with adjustable gain and delay, and works well with a quiet changeover. Metering facilities are 'S' units on receive, and either ALC, final input current, RF output (relative), compressor level (calibrated to 20dB), and plate voltage, all via a front panel switch. Microphone gain and carrier injection (for tuning and CW — also can be used as a CW power control) come as a dual concentric pair of controls, as do the AF and RF gains. The IF shift and VBT controls have indent stops for their nominal positions, these being concentric with the notch and tone controls. RIT is available (switchable use on either Rx, Tx or both via pushbuttons) and has a range of +/− 2.5kHz - a useful range and rather better than a lot of other rigs which tend to be restricted with this facility.

The Audio Gain Control

As well as a fast and slow setting, the AGC can also be switched off completely. This is a useful thing to be able to do when a very strong signal is close to or within the pass band of the filter and you are listening to a weak signal. Under these conditions, the wanted signal will be affected by the AGC developed from the strong signal — with the AGC off this problem disappears.

A noise blanker comes as standard and works well on most forms of interference including the woodpeckers. It does tend to degrade the strong signal handling when advanced past about three-quarter travel, but effective blanking normally occurs prior to this point. It is especially effective with single pulse woodpeckers but not so good with multiple types. Then again, not many other rigs can deal with this type effectively either.

Frequency display is via a 6 digit green fluorescent type, with 100Hz resolution and the RIT offset is correctly shown when in use — often not so on other rigs. The main tuning dial also has an analogue scale around its outside, backlit, and calibrated at 10kHz in-

tervals. This is pleasant to use and can be spun rapidly over about 100kHz at a time for fast moves around a band. A 25kHz crystal calibrator is also provided, which is activated by turning the mic gain fully anti-clockwise.

The remaining front panel controls are the RF attenuator a transmit monitor, which enables you to listen to the quality of your transmitted SSB; a fix channel switch for one crystal controlled channel on each band; a manual Tx/Rx switch and the processor (compressor) level plus on/off — this part of the circuit uses an RF type processor rather than just audio processing. There are also two rocker type switches one for the mains on/off; the other heaters on/off for conserving the PA bottles current and filament life while receiving only.

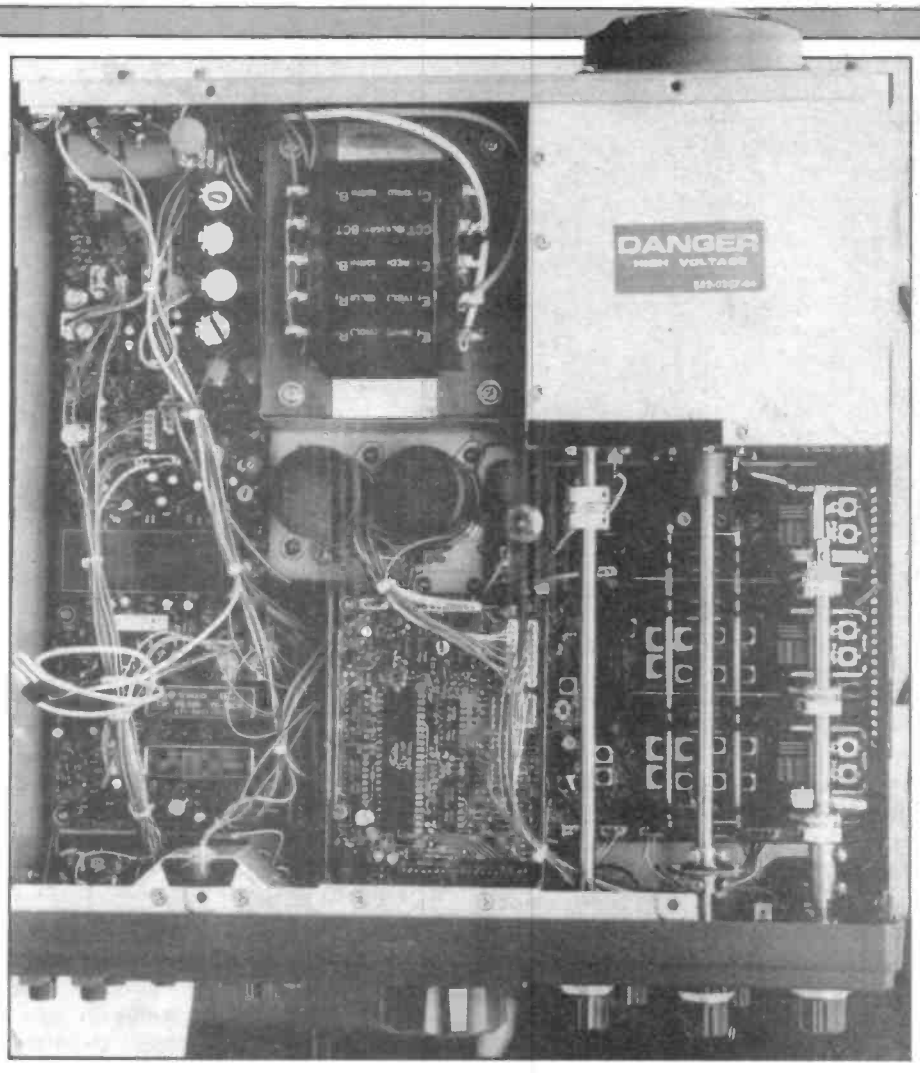
Up The Rear

Antenna input is via a standard UHF (SO239) socket, although a separate receiver only input is provided for use with a transverter for which RF drive is also provided. The key goes in via a standard jack. Note that this has −65V across it when the key is up — a point worth bearing in mind when contemplating using a solid state keyer.

Other connectors are two IF outputs for narrow and wide band signal monitoring, external VFO (an optional accessory), and an accessory output. This has such things as receiver audio, ALC, and linear switching on it. Also on the rear is the cooling fan for the PA — you can hear this running when in operation but it isn't too obtrusive after a while.

In Use

No microphone was supplied with the rig, nor does one come as standard when new. So the rig was used with either a Shure 444 or Yaesu UD-844 desk mic — the former performed the best as the desk mic tended to be rather toppy. Antennas were either a full size G5RV fed via a transmatch, or various dipoles. An HQ1 is normally also available for the higher bands but suffered in the winter gales and is now only an HQ0.5!

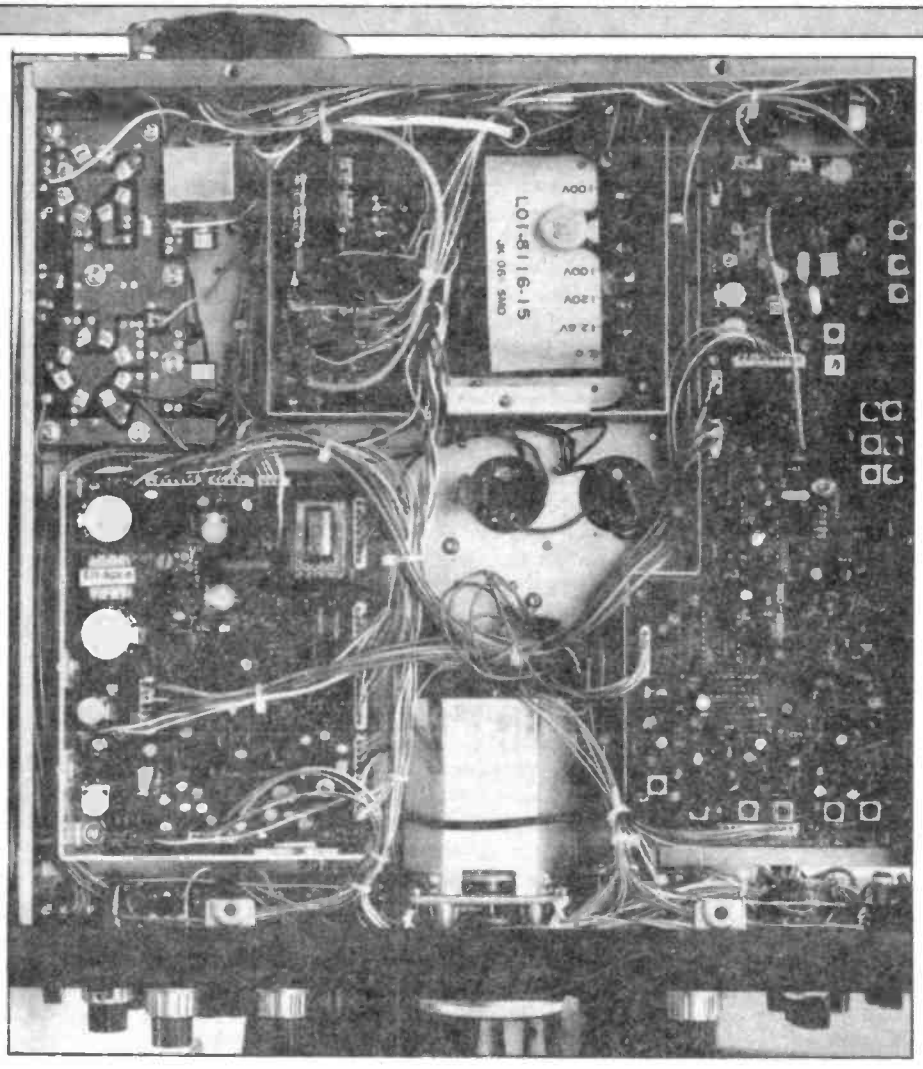


On SSB, no adverse reports were received from any station, although locals preferred not to have the processor in circuit. For DX working, about 10dB of processing indicated on the scale seemed about right and was very effective in getting through under poor conditions. Setting up the PA was no problem on the lower bands but the settings on 20m and above tended to be fairly critical. Also, the neutralisation wasn't particularly good — especially on 10m — so the well tried procedure of tuning for maximum 'smoke' was the order of the day rather than trying for a dip. This seems a common problem with the 830S as I have noted it before when helping test another one locally. It can almost certainly be improved by careful attention to neutralising on 10m.

For those unfamiliar with the term 'neutralising', (ie those brought up on solid state PA's) it refers to the need to provide some properly phased feedback between the input and output circuits of the PA stage to prevent oscillation. Although the anode-grid capacitance is reduced to a very small value by the interposed screen grid, most PA valves are very sensitive to feedback so that even this small amount may be sufficient to cause oscillation.

On CW, the 830S uses semi break-in keying with the VOX circuit controlling the transmit-receive return delay. No problem was experienced with this operation although attempting anything close to break-in delay returns tended to be rather noisy. The power could be reduced to well under 1W (on CW only) so the rig would be suitable for QRP operation, and was used for many contacts at this sort of power.

In fact with one Stateside station, the QSO was started at the 100W o/p level, and reduced down to 200mW, still obtaining solid copy from the other end. I have no doubt that even lower powers would have been possible had it not been for the antics of another station who put an end to the QSO. One point, you do have to be



careful with the PA when tuning up — the manual warns you to avoid this for periods longer than 10 seconds as damage to the valves may result. Transmitting a carrier continously for periods longer than this resulted in the RF output dropping off rapidly.

As a receiver, there is little to fault it on. Stability from cold is excellent, considering that it has a free running VFO, and is equal to anything else I have come across. The VBT and IF shift systems are invaluable, as already described, and make the 830S especially nice to use on CW. With the aid of these two facilities and a narrow filter there is very little you cannot copy one way or another, except a dead zero-beat station.

With the narrow filter, the VBT is of little use as the bandwidth narrows far too rapidly but this is not in fact a problem. I am tempted to say that for almost all use, including contests, the narrow filter can be emulated with the VBT control for all practical purposes — the response was measured as around 330Hz at −6dB in the narrowest position. The skirt response will, of course, be a lot worse than with a 'pukka' narrow filter. However, many people like to be able to hear at least something of what is going on around the frequency when on CW and the narrow VBT setting provides this admirably. The notch filter worked well. Being fairly narrow, it was useful on SSB as well as CW and a useful addition to the VBT and IF shift controls.

With a good dynamic range (91dB), the receiver was virtually free of unwanted intermodulation products, except on 40m when the attenuator had to go in a few times to clean things up. The overall receiver audio 'feel' is clean and you can tell straight away that you are unlikely to be listening to a digitally synthesised rig — this phenomena is more obvious if you are a CW addict rather than SSB. Plenty of audio output is available and is clean sounding with little apparent distortion at even high levels.

Sensitivity was well within spec. and more than adequate on all the LF bands. The S meter functions much more accurately than many — the unofficial standard is 50uV for S9 with 6dB per S point — this example was very close to the S9 level, and surprisingly accurate from S5 upwards, although not to be believed at low readings. Receive sproggies are few and far between. There are some sproggies but none move the S meter or look like being any problem.

The 830S operating manual runs to some 38 pages and is comprehensive, including some alignment details and full circuit and block diagrams.

Conclusions

Even after some years on the market, the Trio TS830S can still easily hold its own with many more modern rigs, and deservedly retains great popularity with contest workers due to its excellent signal processing abilities. If for nothing else, the VBT and IF shift controls almost make it worth buying for the receiver performance only. It is worth noting that the TS530S is still available, having been re-introduced after demands from would-be users, and is basically the 830S less the VBT/shift facilities (latest versions of the 530S do have the notch filter which was missing originally). The difference in price is about £130 but I consider the loss of these facilities not worth trying to save the money involved.

I found the 830S very easy to use, with all the most-used controls to hand when required — no complicated banks of pushbuttons to master or a rude 'beep' emitted everytime anything was used on the front panel. Although not boasting lots of memories, computer control or many of the other 'essential' bells and whistles of the marketing boys, this transceiver is certainly very well worth considering for anyone interested in CW and SSB only. It costs at around £700 new or you can obtain a good secondhand model at a saving. If buying a secondhand version it is worth taking a power output meter with you to check the RF output — the PA valves may have been mistreated and could have to be replaced.

OPINION

In the October '85 issue, we published a brief letter from Peter Crosland, G6JNS, which called for changes in the RSGB. We were then asked by Mr David Evans, General Manager and Secretary of the Society, to publish a reply to this letter, which duly appeared in the November issue. The text of Mr Evans' letter is clearly very critical of Mr Crosland and his views. This opinion and Mr Evans letter have been edited. Mr Crosland has supplied us with copies of the letters he mentions. The views expressed here are not necessarily those of the magazine.

Readers may care to speculate as to why the RSGB General Manager should make a bitter personal attack on me in the November '85 issue. I shall confine myself to setting the record straight.

First, I would like to clarify the matter of my sources. These include a number of RSGB officials, Council members and HQ staff — some have agreed to be named others have not. I believe that my sources are accurate since in most cases I have cross checked facts.

It is disturbing to hear that no check is made on applicant's suitability for membership. Ian Abel was a member of the society, but he resigned after being told by a Council member that his continued membership would not be welcomed. I have proposed Ian for membership although I now understand his application has been referred to the next Council meeting.

The committee structure is clearly undemocratic since appointments are made by committee chairmen and members have an indefinite tenure. A chairman will, of course, choose members who share his views and so the self perpetuating system continues. The chairmen will also be under pressure to ensure that only people who will toe the party line are selected.

If one looks at the membership of the various committees one finds the same names occur regularly eg one Council member serves on eight committees, the editorial board and is Microwave Manager. One person cannot do all these jobs effectively and be in full time employment however hard they might try. Finally, the Finance and Staff committee effectively dominates the running of the Society.

What is perhaps more disturbing is how the rules are ignored if they get in the way of Council's wishes. Last October, two nominations were made for local RSGB representative in the Worcester area. The Society's rules provide for an election but this did not take place, despite repeated requests to HQ. The post went to the sitting tenant.

Another example is the matter of reduced and waived subscriptions. The constitution prior to the 1984 AGM permitted subscriptions to be waived by unanimous vote of Council. An attempt was made to bypass this and when a Council member objected he was severely criticised. Subsequently, an EGM was called to change the rules. Council members produced several hundred proxy votes to force the proposals through despite the mood of the meeting being clearly against it. Whilst this was undoubtedly quite legal it was of dubious morality.

To: Mr R G Barret, GW8HEZ, then President RSGB.
From: Mr G R Smith, G4AJJ, then Council member.
Date: 8th September, 1984
Subject: 1985 RSGB President

"In particular the minutes do not in any way report what actually took place regarding election of the 1985 President."

As to changing the Society, the Council and its committees should be more accountable to the membership. In particular, there should be a limit to the length of time anyone should serve on committees so that there is a regular influx of new people to prevent them becoming moribund. I have made numerous suggestions for changes and regret to say that these have met with a very negative response.

The questionable way in which the 1985 President was elected can be proven. I have a copy of the letter to the 1985 President dated 8/9/84 in which G4AJJ sets out the details of how the minutes of the Council meetings on 28th July and 11th August differed materially from what actually took place. He has never received a reply to this letter. Since no denial or comment has emanated, the conclusion must be that it is substantially correct.

The minutes of the 1984 AGM published in September Rad Com do not accurately report the vote of no confidence I proposed. In a letter (2/10/85) Ms Noman of the RSGB states that since the motion of no confidence was not relevant, the fact that it was proposed did not need to be recorded! If staff are prepared to censor AGM minutes, it would seem reasonable to assume they are capable of censoring Council Proceedings.

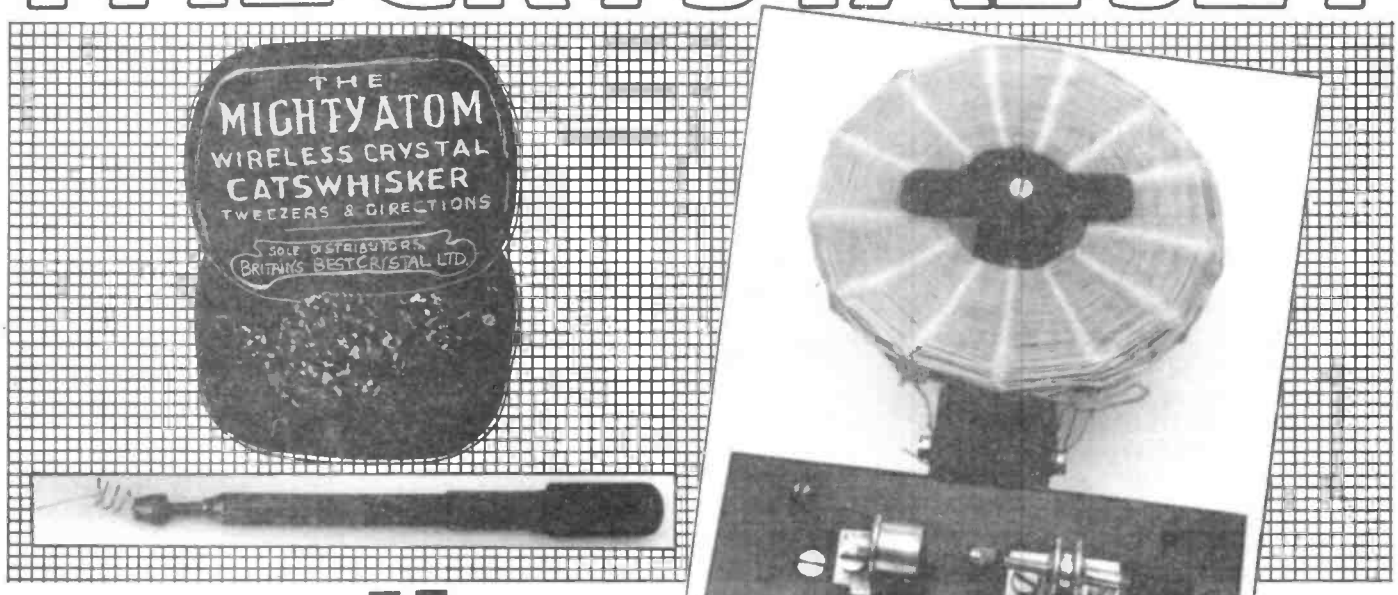
Shortly before the AGM, G4KCC gave me a copy of a letter to the Secretary asking for certain items to be put on the agenda. However, the Secretary stated that no other items had been submitted for the 'other business' part of the agenda. I challenged him and, in view of his unsatisfactory answers, proposed a vote of no confidence. The President refused to allow any further discussion and the furore broke out. The meeting was suspended to allow for a presentation and at this point, I discussed with Mr Evans, what business could be raised. He agreed to clarify this but it took nearly nine months to publish this information. I took professional legal advice, not being an expert in Company law and was told the two motions of no confidence were quite in order.

As for Rad Com, there have been instances recently, where no note or explanation has been offered regarding the resignation of members from posts. I am assured that 'Council Proceedings' was written by the editor and not drawn from the Minutes. Having read many 'Minutes' my comments about these are based on the comparison. Detailed minutes of ARRL board meetings are published in QST, surely RSGB members have a similar right to know?

I have read every Rad Com since 1970 to gain an insight in to the workings of the Society in recent times. I hold amateur licenses in six countries and belong to three other national societies. I regret to say that they are all much more open and forward looking than the RSGB. My letter can hardly a vote catcher since I am not contemplating standing as candidate in any elections.

I believe that a strong Society is vital for the well being of amateur radio in the UK. The current trend in membership is steadily downwards when the large increase in licensees is taken into account. It was recently announced in Council Proceedings that 2/3 of the RSGB membership is licensed. Simple arithmetic shows that this is about 43% of UK licensees. In the USA a similar situation exists within the ARRL. They have launched a campaign to boost membership and the number of licensees. Council have been urged repeatedly to start a membership drive but nothing has happened. It is essential that this be done so that the Society may retain its creditibility with the licensing authority. The DTI has already stated that it welcomes input from other amateur radio organisations. . .

THE CRYSTAL SET



– radio for the people

Left. Famed 'The Mighty Atom' crystal with accompanying 'cats whisker'. Right. Ediswan crystal set.

To a generation that is fast losing the transistor as a discrete component, the days of the valve seem long gone. Indeed, valve theory is no longer taught in many schools and colleges — it's called progress.

The humble 'crystal set' was the first popular 'wireless' receiver and has a fascinating history. Tim Wander, G6GUX, of the Vintage Wireless Society, turned the clock back for HRT.

It is of course the valve that shaped the course of radio design and development; but in the early days of wireless, a valve presented many problems to the untechnical listener. The crystal set receiver first became popular due to its low cost, for it needed no batteries to work, and its simplicity meant it could be operated by old and young alike. The equivalent valve sets were not only expensive and bulky but also needed their accumulators regularly recharging at the local bicycle shop or garage. Valves frequently needed replacing and were extremely expensive.

Consequently, during the early 1920's as the radio manufacturing industry first found its feet, the number of crystal set users outnumbered valve sets by about four to one. The sets could be bought from the most unlikely sources, including sweet shops and chemists. Even motor firms like Chase Motors of Newcastle and A J Stevens branched off into producing complete sets. But most parts came from the major manufacturers such as Marconi's and Burdept. During the first months of its life in 1922, the magazine 'Popular Wireless Weekly' carried over sixty different manufacturers advertising crystal sets.

It was home assembly however that quickly became the most popular and cheapest way to own a crystal set. Consequently the quality of crystal sets could vary from simple homebuilt plywood cigar boxes, to the work of master crafts men from the top furniture factories.

The 'Cats Whisker'

The basis of the crystal set is the crystal detector. This exploits the phenomenon that some metallic crystals and mineral ores allow current to flow in one direction only (or more readily in one direction only) when a thin wire contact, known as a cat's whisker, is brought into contact with it. The cat's whisker was, however, sometimes omitted and replaced with another crystal. This twin crystal combination — known as the 'Perikon' consisted of copper pyrites in conjunction with zincite. This was a popular and reliable

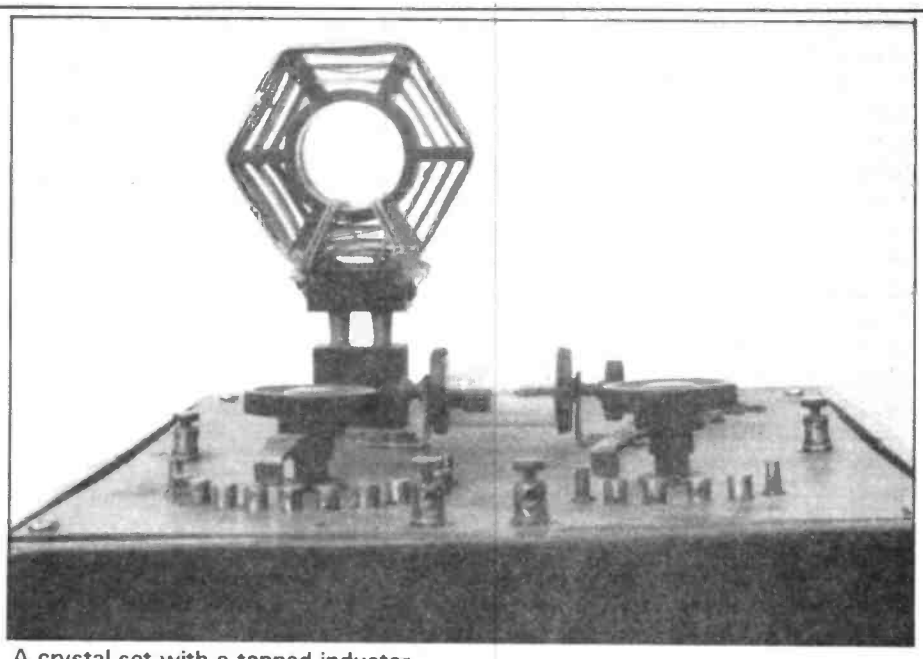
crystal combination being extremely stable, the major defect of the wire contact crystal detector being instability. The crystal set listener of the twenties frequently found it necessary to readjust or 'tickle' the cat's whisker, as it would lose its point contact at the slightest vibration.

Many crystals demonstrate rectifying properties but require whiskers of different materials to function. Perhaps the most common crystal in regular use was Galena, an ore of lead which requires a contact of brass or copper. The early 1920's saw synthetic or artificially treated galena marketed under many trade names, mostly ending in '-ite'. Other crystals, such as molybenite which needed a flat silver strip, silicon a gold or steel whisker or an iron pyrite, with a gold point, provided the best diode function. Of them all, the carborundum and steel crystal detector was considered the best. This type required a 4.5V dry cell connected across the crystal and contact to work — thus defeating the simplicity, reliability and 'something for nothing' aspects of the crystal set.

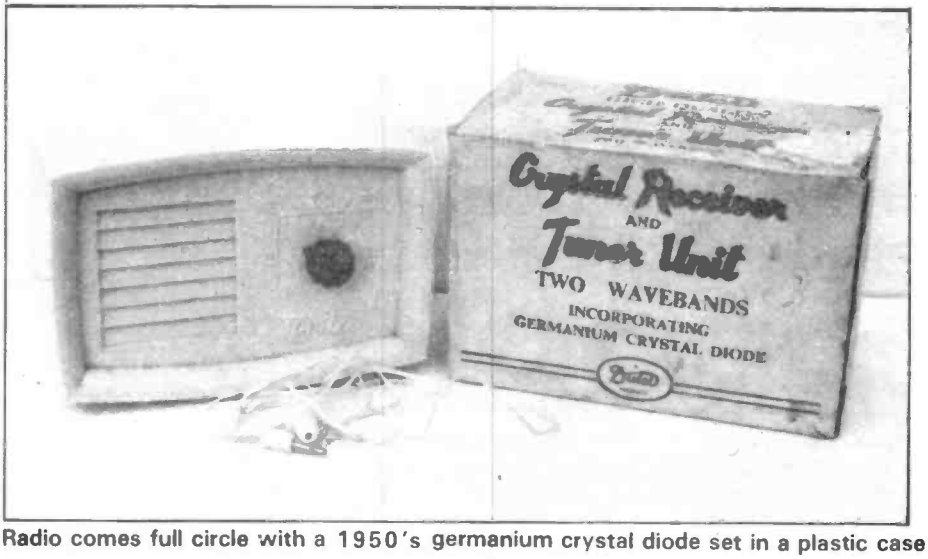
It is fascinating to observe that in Newnes Wireless Constructors Encyclopaedia (1933) by F J Camm, it states that "The exact manner in which these crystals function is not yet definitely ascertained, some holding that a form of thermo action takes place, others that the effect is purely electrical". It would be over 20 years before the solid state diode and transistor became fact, years later before semiconductor theory became common knowledge.

Yet the future was being glimpsed even then. "Wireless" by P J Risdon mentions an 'invention' by

The BTH twin crystal set.



A crystal set with a tapped inductor.



Radio comes full circle with a 1950's germanium crystal diode set in a plastic case.

M Lossev, of Nijni-Novgorod, who discovered that in addition to rectifying properties, certain crystal combinations would function as amplifiers within a limited range.

"Several combinations have been found to possess this property, more especially zincite used in conjunction with a steel point. It must not, of course, be supposed that the crystal itself magnifies — it merely serves, as a valve functions, to impress fluctuations in received oscillations on an electric current. A battery is therefore essential, to provide a source of electrical energy. Instead, however, of having to employ a high-tension battery, a low-tension battery of a few volts is all that is necessary. The further development of this discovery may revolutionize broadcast reception, for the small first cost of a crystal, as compared with that of a valve, and the advantage of low-tension as against high-tension batteries, must instantly appeal to everybody interested in the art of wireless."

Tickling The Whisker

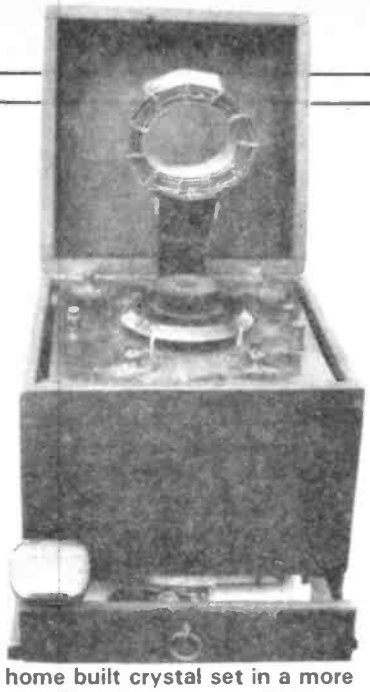
Operating a crystal set was a simple matter. The listeners licence permitted up to 100 feet aerial wire which gave — with a good earth — reception of stations within a range of some 20 miles. The operator just adjusted, or 'tickled' the whisker, into the position which produced a loud click in the headphones. The programme was then tuned in by rotating the tuning knob and the cat's whisker was then further adjusted to obtain the loudest sound. However, one rarely gets something for nothing, only one person at a time could listen in on headphones, as the received signal

was inadequate to drive a horn speaker.

There were three secrets to successful crystal sets: one was the actual crystal mounting. The best form of crystal holder is a 'cup' in which three screws are used to lock the crystal and provide contact. However some crystals were actually soldered in using 'Woods' metal. This has an extremely low fusing point and consists of 2 parts of lead, 1 part of tin, 4 parts of bismuth, and 1 part of cadmium, but must be treated with care being very toxic. When using crystals they should be handled with a pair of tweezers, for the slightest trace of greasiness upsets their sensitivity. Another point is that after a crystal has been in use for some time its rectification properties get weaker, because of slight oxidisation of the surface of the crystal itself. In such a case the crystal can be revived by cracking it in half, and using the newly exposed surfaces for 'searching' for the signal.

To obtain satisfactory reception, crystal sets need efficient aerials. There are several important points to be noted when erecting an aerial for a crystal set, obvious to any amateur, but not to the crystal set users of the 1920's. The aerial must be suspended as high as possible and not screened by tall buildings or obstructions. The aerial itself and the lead-in from the aerial must be adequately insulated, with porcelain or plastic insulators that do not permit the aerial or lead-in to touch the building, tree, or post from which they are suspended. The lead-in should be brought into the house through an insulated rod. It is also important to use insulated copper wire, either single or multi-stranded, for both the aerial and the lead-in.

It may seem obvious that any radio set, however simple, requires an aerial of some type, less obvious is the crystal sets' requirement for a good earth connection. A 3 foot length of half inch galvanised iron pipe driven vertically into the ground until only 3" are showing connected to the earth wire is the standard method. It is important to see that the surrounding ground is kept damp, if necessary by occasionally pouring water down the open end of the pipe, but despite rumours to the contrary, talking to it won't make it grow. An alternative earth is a cold water pipe coming from a rising main. Simply file very lightly the pipe at the back of the tap and wind the copper wire earth lead-in round the filed part. The joint is then wrapped with insulating tape. In no circumstances should a gas pipe be used for an earth.



A home built crystal set in a more stylish-than-the-average cigar box.

Fig.1 The variometer circuit.

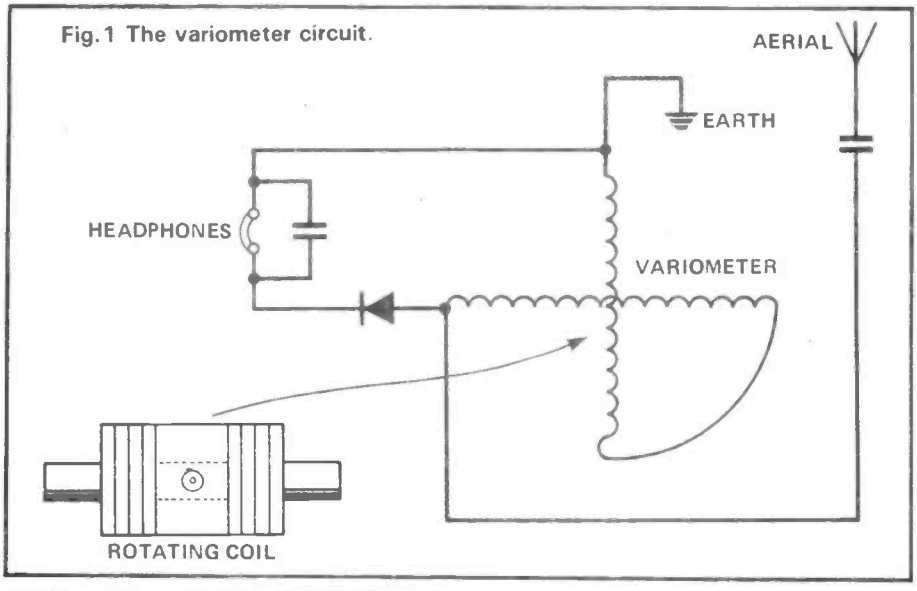
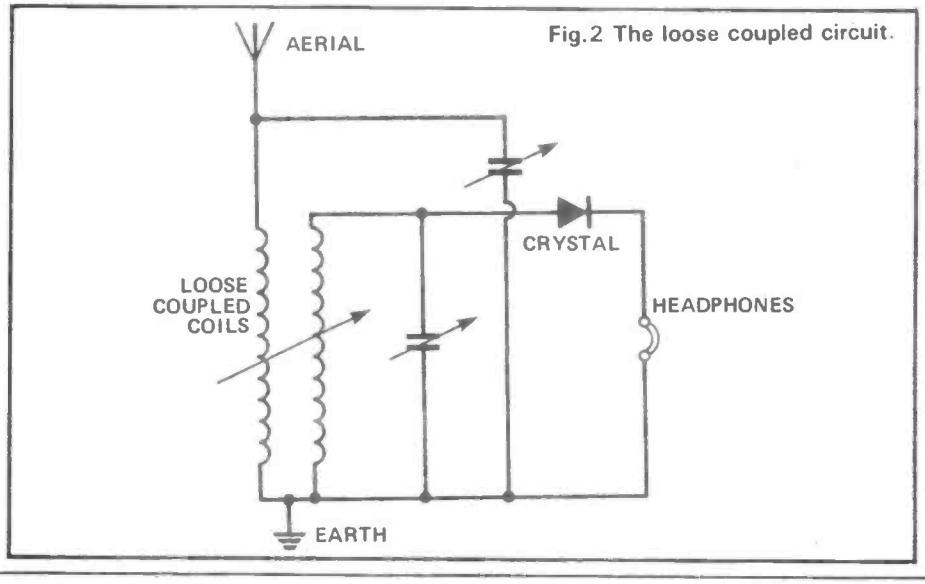


Fig.2 The loose coupled circuit.



Tuning Circuits

The four basic aerial tuning circuits were the slide coil circuit, the tapped inductance circuit, the variometer, and the loose coupled circuit.

The circuit favoured by many manufacturers in the early 1920s was the variometer (**Fig.1**) which consists of two series-connected coils with one coil capable of rotating within the other. As they are rotated with a current flowing through them, their magnetic fields either assist or resist one another. This variable magnetic field is known as a variable inductance. In the loose coupled circuit (**Fig.2**) the two coils are mounted in a twin coil

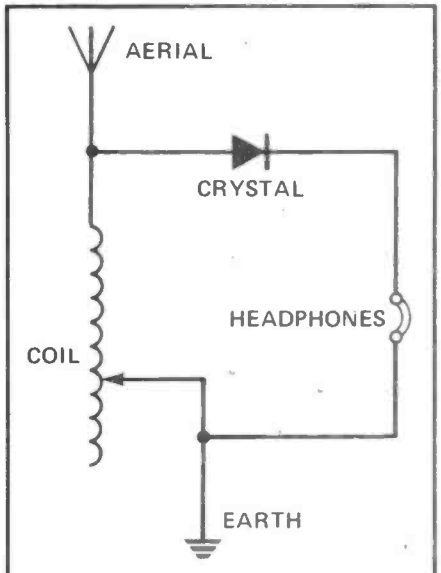


Fig.3 The slide coil circuit.

holder, one being fixed and the other movable. As in the variometer circuit, the movement of the coils towards, or away, from each other either assisted, or resisted, the magnetic fields and acted as a variable inductance.

The simplest form of tuning was the slide coil circuit (**Fig.3**) — in effect a standard rheostat with wire coiled around a cardboard tube with a slider making contact — but this was not particularly efficient as much of the coil was never used. The fourth type of tuning was the tapped inductive (**Fig.4**) where the coil is tapped off at regular intervals. But like many pieces of technology the crystal set had reached its limits of design and development.

The weak signals generated by a crystal set were usually only strong enough to entertain the lone listener wearing a single pair of headphones. But family entertainment could be provided by using crystal set amplifiers, to boost the volume to a point where it could drive a loudspeaker.

Crystal Amplifier

However, moderately loud signals were required before the amplifier would function. If the signals could still be heard with the headphones held a foot from the ear, then the crystal set could drive an amplifier with a loudspeaker of between 1500 and 4000 ohms. In the early 1920s S G Brown Ltd introduced three crystal set amplifiers which were designed to produce sufficient power, without using expensive and unreliable amplifying valves. This increased volume was attained by a circuit using a differential microphone, a reed and a magnet, a mechanism that made Brown's 'A type' headphones world famous.

Their Microphone Amplifier, produced in 1921 and a more powerful version, the Crystal Amplifier, of 1923, enabled the listener living within a twelve-mile radius of one of the BBC's main stations to get loudspeaker reproduction, loud enough to make family listening comfortable. These amplifiers were powered by a six volt battery which would last for many months due to the very low current consumption. Not only cheap to run, they were simple to operate: their input terminals were connected to the headphone terminals of the crystal set and their output terminals were connected to a loudspeaker. Only an initial adjustment was necessary in order to get them working. Of course, a cheaper form of crystal amplifier was to lay the headphones in a biscuit tin to reflect the feeble signals, providing a basic, if 'tinny' diaphragm.

In 1924 S G Brown Ltd brought out their Crystavox amplifier, a microphone amplifier built into the loudspeaker box. This gave listeners in 1925 to the new Daventry high power station 5XX 'perfect loud speaker reproduction' up to 75 miles. But even these add-on's could not prevent the crystal set becoming a cul-de-sac in radio history, for times were changing.

The End Of An Era

The main drawback with owning a crystal set was that it was unselective. It could not separate two or more stations broadcasting on wavelengths which were close together, and it was this failing which ultimately led to the crystal set's downfall.

Until 1926 the BBC in London had been broadcasting on one wavelength only, 360 metres from their 2LO station, the pioneering Writtle Station 2MT (400m) having closed down in February 1922. But during that year, they began experiments using an alternative wavelength differing from 2LO's by only about 100 metres. The battery-powered valve sets were able to separate these two different wavelengths but the crystal sets could not: listeners heard the two different programmes simultaneously — making either station unintelligible. The results of these wavelength experiments were otherwise successful and the BBC soon established two stations offering separate programmes.

Almost overnight the crystal set became obsolete, its seven year reign was over. Set makers quickly went out of business, returned to their old trade, or moved with the times for the age of the valve had arrived. It would be over 40 years before a small rectifying crystal of germanium, later silicon, came to replace the glowing 'bottles'; radio had come full circle.

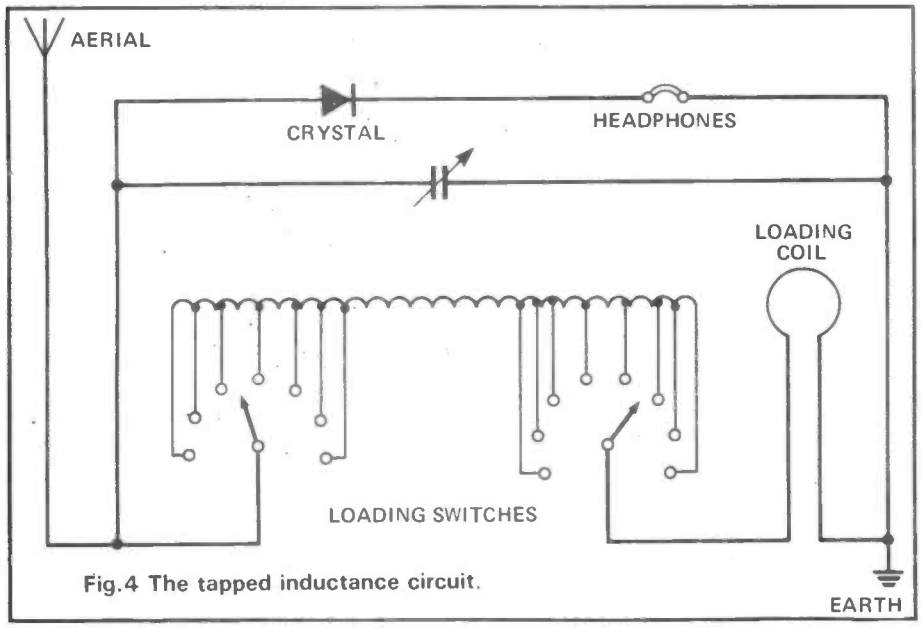


Fig.4 The tapped inductance circuit.

RADIO Tomorrow

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

2 Dec
Basingstoke ARC: *First Aid and Crime Prevention at the Forest Ring Community Centre, Sycamore Way, Winklebury.*
Alyn and Deeside ARS: drink and waffle.
Worcester DARC: *Resonance by G3LBS.*
Derwentside ARC: meets every Monday from 7.30pm at the Consett AFC, Bellevue Park, Consett.
Welwyn Hatfield ARC: AGM.
Southdown ARS: *Proposed ATV Repeater for E Sussex.*
Todmorden DARS: Seasonal social.
Morecambe Bay ARS: morse class.
Braintree DARS: video evening.
Borehamwood and Elstree ARS: meeting for people with a serious interest in amateur radio, at the Organ Hall CLub, Bairstow Close, Borehamwood.

3 Dec
E Lancashire ARC: AGM.
Dartford Heath DFC: pre hunt meeting.
Chichester DARC: meeting.
Bury RS: informal.
Wolverhampton ARS: junk and surplus sale.
Rugby ATS: *Leicestershire Repeater Group talk.*
Verulam ARC: meeting at the RAF Assoc HQ, New Kent Road, St Albans.
Fylde ARS: equipment construction competition.

4 Dec
Wirral ARS: Christmas party.
Exmouth ARC: meeting.
Fareham DARC: *Video and Electronics by G4XJT.*
Telford DARS: natter night.
White Rose ARS: junk sale.
Denby Dale DARS: noggin and natter night.
Cheshunt DARC: natter night.
S E Kent (YMCA) ARC: natter night.
Mirfield RC: club evening every Wednesday at the Mirfield Community Centre, Yockleton Road, Lea Village.

5 Dec
Preston ARS: *Talk by G3KCC.*
Meirion ARS: Christmas dinner at the Dolserau Hall Hotel, Dolgellau.
Shefford DARS: junk sale.
Abergavenny and Nevill Hall ARC: meets every Thursday.
Pontefact DARS: *Bridges by G4ISU.*

6 Dec
W Kent ARS: club annual dinner.
Radio Society of Harrow: activity night on 80m.
Maltby ARS: computer night.
Maidstone YMCA Sportscentre ARS: construction contest.
Clifton ARS: meeting.
Cheshunt DARC. Christmas diner.
S Manchester RC: meets every Friday in the Norris Road Community Centre, Sale at 8pm.
Dunstable Downs RC. constructors contest.

7 Dec
Three Counties ARC: Christmas party.

8 Dec
Dartford Heath DFC: DF hunt.
Leeds DARS: Annual Christmas Rally at the Civic Hall, Pudsey. Doors open at 11am and admission is free. There will be dealer stands, bring and buy, tombola and refreshments. Talk in on S22.

9 Dec
Morecambe Bay ARS: visit to police wireless workshop at Hutton.

10 Dec
Chester DRS: construction contest.
Reading DARC: AGM.
Worksop ARS: club quiz night.
Bury RS: AGM.
Wolverhampton ARS: committee meeting.
Dorking DRS: informal.

11 Dec
Three Counties ARC: quiz night.
Fareham DARC: natter night on the air.
Farnborough DRS: Christmas social.
Telford DARS: club project — building a GDO.
White Rose ARS: AFS briefing.
Cheshunt DARC: video evening.
S E Kent (YMCA) ARC: *Microwaves by G8FEZ.*
Crawley ARC: Christmas supper.

12 Dec
Shefford DRS: constructors contest.
Greater Peterborough ARC: social evening venue to be announced.
Conwy ARC: *talk by the N Wales Police Crime Prevention Officer. The club meets every 2nd and 4th Thursday at Green Lawns Hotel, Bay View Road, Colwyn Bay.*

13 Dec
W Kent ARS: meeting.
Radio Society of Harrow: *Alarms by G4DPB.*
Maltby ARS: Christmas junk sale.
Wimbledon DARS: meeting at St. Johns Ambulance HQ, 124 Kingston Road Raynes Park
Maidstone YMCA Sportscentre ARS: natter night.
Ayr ARG: RSGB video films.
Clifton ARS: meeting.
Amateur Radio and Computing Club: meeting at the Crown Pub, Bishops Waltham, Hants, starting at 8pm.
Dunstable Downs RC: Christmas party.

14 Dec
Basingstoke ARC: Christmas social.

16 Dec
Alyn and Deeside ARS: Christmas party.
Welwyn Hatfield ARC: informal workshop night.

Todmorden DARS: chat night.
Morcambe Bay ARS: hot pot supper.
Braintree DARS: Christmas party.

17 Dec Chester DRS: Christmas buffet.
Dartford Heath DFC. EGM.
Reading DARC: Christmas social evening.
Biggin Hill ARC: junk sale.
Bury RS: informal.
Wolverhampton ARS: social evening.
Rugby ATS: Christmas meeting.
Verulam ARC: AGM followed by an informal social evening.
Fylde ARS: hot pot supper.

18 Dec Wirral ARS: no meeting!
Exmouth ARC: meeting.
Fareham DARC: *The GDO and Its Use by G4ITF.*
Kingston DARS. meeting at Alfriston, 3 Berrylands Road, Surbiton.
Telford DARS: club project.
White Rose ARS: natter night.
BT (Readng) RC: meeting.
Cheshunt DARS: social evening.
S E Kent (YMCA) ARC: Christmas social.
Hastings ERC: Christmas social.

19 Dec Shefford DRS: social evening.
Chichester DARC: annual Christmas social evening.
Pontefract DARS: Christmas party.

20 Dec Worksop ARS: Christmas disco.
Radio Society of Harrow: grand Christmas activity night all bands.
Telford DARS: Christmas social.
Maltby ARS: social.
Maidstone YMCA Sportscentre ARS: social evening.
Clifton ARS: meeting.

28 Dec Sheford DARS: Chairman's social evening and presentation of awards.

1 Jan Cheshunt DARC. natter night.
S E Kent (YMCA) ARC: natter night.

2 Jan Pontefract DARS: AGM.
Telford DARS: open meeting.

3 Jan Clifton ARS: club meetng.
S Manchester RC: meets every Friday in the Norris Road Community Centre, Sale at 8pm.
Dunstable Downs RC: The IDIOTS construction contest

6 Jan Welland Valley ARS: meet every Monday at Welland Park Community College Market Harborough.
Borehamwood and Elstree ARC: meeting at the Organ Hall Club, Bairstow Close, Borehamwood.
Basingstoke ARC: *23cm Operation by G3NNG.*
Southdown ARS: meeting.
Welwyn Hatfield ARC: demonstration of RTTY systems.
Todmorden DARS: judging the construction contest.

7 Jan Rugby ATS: RSGB region rep Glen Ross, G8MWR.
Fylde ARS: AGM.
Chester DRS: AGM.
Dartford Heath DFC. pre hunt meeting.

8 Jan White Rose ARS: test gear night.
S E Kent (YMCA) ARC: quiz for the G2CJC Trophy.
Denby Dale and Pie Hall ARS: AGM.
Mirfield RC: meets every Wednesday at the Community Centre, Yockleton Road, Birmingham
Farnborough DRS: *Off the Cuff film night by G4MBZ.*
Three Counties ARC: *Computer Basic*

9 Jan Conwy ARC: meeting.

10 Jan Ayr ARG: natter night.
Clifton ARS: club meeting.
Amateur Radio and Computing Club: meeting at the Crown pub, Bishops Waltham.
Radio Society of Harrow: activity night.
Wimbledon DARS: meeting at 124 Kingston Rd, Raynes Park.

14 Jan Dorking DRS: informal.
Chester DRS: construction contest winners talk.

15 Jan White Rose ARS: natter night.
S E Kent (YMCA) ARC: natter night.
Hastings ERC: *Aerials.*
Telford DARS: meeting.

BT (Reading) RC: meeting.

16 Jan Pontefract DARS: junk sale.

17 Jan Clifton ARS: meeting.
Fylde ARS: AGM.
Radio Society of Harrow: film show.
Dunstable Downs RC: junk sale.

20 Jan Welwyn Hatfield ARC: top band activity night.
Todmorden DARS: informal chat.

21 Jan Fylde ARS: informal and morse class.
Chester DRS: meeting.

22 Jan White Rose ARS: *Amateur Radio in Japan by JY9WR/G4ATZ.*
S E Kent (YMCA) ARC: *Amateur Television by G3ZYZ.*
Farnborough DRS: *constructional contest winner G8ATK.*
Three Counties ARC: *Beekeeping by GOBUZ.*
Telford DARS: *SSTV by G4IUT.*

23 Jan Conwy ARC: meeting.

24 Jan Ayr ARG: homebrew competition.
Clifton ARS: club meeting.
Radio Society of Harrow: activity night on 15m.

28 Jan Dorking DRS: AGM.
Chester DRS: *WOORE lecture and Satellite Communications videos.*

29 Jan White Rose ARS: natter night.
Rugby ATS: visit to BTI Radio Station, Rugby.
S E Kent (YMCA) ARC: *films by G3VSU.*
Darenth Valley RS: *Talk by Chris Ridley of KW Ten-TEC of Chatham. The club meets in the Crockenhill Village Hall near Swanley.*
Telford DARS: *Test Equipment by G6UDX.*

31 Jan Clifton ARS: meeting.
Radio Society of Harrow: *Contests For All by G4JNZ.*
Dunstable Downs RC: film show.

Will club secretaries please note that the deadline for the March segment of Radio Tomorrow (covering radio activities from 1st February 1986 to 1st April) is 18th December

Contacts

Abergavenny & NH ARC	GW4XQH	0873 4655
Alyn and Deeside ARS	GW4RKX	0244 660066
Alateur Radio/Computer Club	Trevor	04895 81032
Axe Vale ARC	Bob	029 74 5282
Barking RES	R. Woodberry	01 594 4009
Bath DARC	G4UMN	Frome 63939
Basingstoke ARC	Dave	07356 5185
Biggin Hill ARC	GOAMP	0689 57848
Borehamwood Elstree ARS	Tony	01 207 3809
Braintree RS	J. Roberts	0376 44857
Brighton DARS	Peter	0273 607737
Bristol ARC	G4YOC	Bitton 4116
Bristol (Shirehampton) ARC	Ron Ford	0272 770504
BT (Reading) ARC	G4MUT	0734 693766
Bury RS	G1PKO	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	RA Hinton	01 301 1864
Conwy ARC	G4VVW	0492 636376
Coventry ARS	R. Tew	0203 73999
Darenth Valley RC	G1NMX	Orpington 26951
Dartford Heath DFC	Pete	0322 844467
Denby Dale DARC	G3SDY	0484 602905
Derwentside ARC	G1AAJ	0207 520477
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
Hornsea ARC	Norman	0262 73635
Horsham ARC	Pete Head	0403 64580
Inverness ARC	Brian	0463 242463
Kidderminster DARS	Tony	0562 751584
Kingston DARS	G3ODH	Epsom 26005
Leighton Linslade RC	Pete Brazier	052 523 270
Loughborough ARC	Philip	0509 412043
Loughton DARS	G6FWT	01-508 7190
Maidenhead DARC	John	0628 28463
Maidstone YMCA S/C ARS	G4AYD	0622 29462
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
Morecombe Bay ARS	G3PER	Heysham 52659
N. Cornwall RS	J. West	0288 4916
N. Staffs ARS	G6MLI	0782 332657
N. Wakefield RC	S. Thompson	0532 536633
Newbury DARS	G3VOW	0635 43048
Oswestry DARC	Brian	0691 831023
Pontefract DARS	G0AAO	0977 43101
Preston ARS	George	0772 718175
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
S. E. Kent (YMCA) ARC	John	0304 211638
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	Keith, GOBTU	0730 66489
Tiverton (SW) RC	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
WACRAL	G4NPM	0795 873147
Wakefield DRS	G8PBE	0924 378727
Welland Valley ARS	J. Day	0858 32109
Welwyn Hatfield ARC	Dave	07073 26138
West Kent ARS	B. Guinnessy	0892 32877
Westmorland RS	G. Chapman	0539 28491
White Rose ARS	G4YEK	0423 884481
Willenhall ARS	G4LWI	0902 782036
Wimbledon DARS	G3DWW	01 540 2180
Wirral ARS	Cedric	051 625 7311
Wirral DARC	Gerry Scott	051 630 1393
Wolverhampton ARS	Keith	0902 24870
Worcester DARC	D. Batchelor	0905 641733
Worthing DARC	Roy	0903 690415
308 ARC (Surbiton)	Dave Davis	01 399 5487

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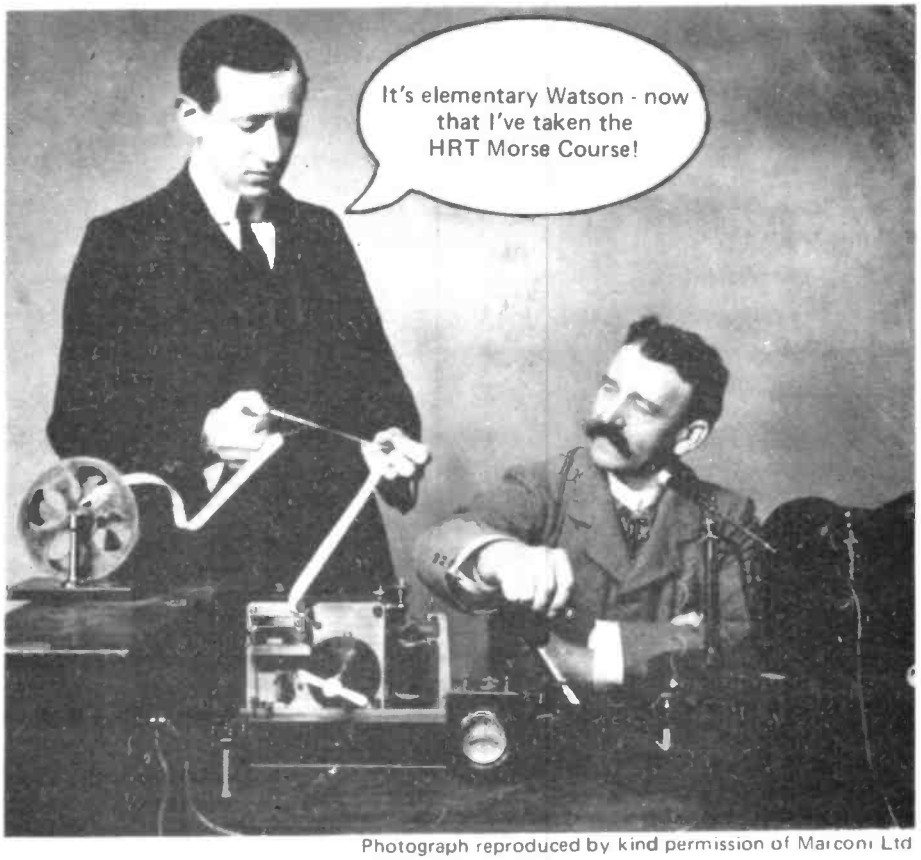

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A Simple Sender for 'Six'

Licences for 6m are coming soon and the 'Simple Sender' is the cheap and fun way to get going on the band. In part 2, Jack Hum, G5UM, describes the construction of suitable power supply and how to put the transmitter on the air with a minimum of fuss.

The construction of the 'Simple Sender' transmitter for six was detailed here in Nov '85. In this article, I shall describe the construction of a power supply unit for it and how to get the transmitter going 'on air' with the minimum of test equipment.

Remembering that the 'do it yourself' ethic was strongly advocated in the previous article, I will assume that experimentally minded readers of HRT will probably already possess in their spare boxes suitable components to build up a power supply unit for the 'Sender' or if not, can obtain them at a radio club 'junk sale'. What follows, then, is primarily a guide to those who enjoy the 'use what I've got' approach to PSU construction. Basic to any PSU is the mains transformer within it. In selecting a suitable transformer for the Sender, the current drawn by the heaters of the four valves suitable in the transmitter must be calculated. In time honoured fashion, I shall refer to the heater supply as the 'LT'.

Dial light and VXO valve:	0.3A
Two 5763 multipliers:	0.75A
QQV03/20A PA final:	0.65A
Total:	1.7A

from a 12.6V heater rail.

So the first requirement in the transformer specification must be a winding that can deliver 12.6V at 1.7A, or two 6.3V windings which may be connected in series with one another to produce the needful 12.6V. (Make sure the two windings are connected in phase! If this is not so, instead of measuring 12.6V across them an AC voltmeter will indicate OV).

The second requirement can be expressed: ''What HT do I require?'' and this is up to the constructor, depending upon the DC input they propose to apply to the sender (never more than 50W by licence regulation). Examples are: Transformer No. 1 delivering 300-0-300V AC from its secondary gave an on-load DC voltage of 300 at 180mA, or 15W DC input to the PA. Transformer No. 2 delivering 240-0-240V AC from its secondary was found to provide 240V DC under 'transmitter on' conditions, or 10W DC input to the final PA. Transformers delivering larger peak-to-peak secondary voltages will of course deliver higher DC levels to the transmitter stages, eg, a unit that provides 450-0-450V AC could be the source of around a 25W DC input to the transmitter final stage. Using a transformer with a 250V centre tapped secondary (250-0-250) is probably the best idea as there is very little to be gained in signal strength by increasing from 10 to 25W.

Warning No 1: If the PSU you eventually build turns out to deliver more than 300V DC you should insert a small resistor (say, 250 ohms 2 watt) in the anode feed to each of the driver valves to limit their HT levels to no more than 300V.

Warning No 2: Remember that with a valve transmitter you are working with potentially lethal voltages (even 240 volts can kill — and does, many times a year, where due care is not taken). Two safety precautions in the present design of PSU are a miniature neon indicator connected across the HT supply through a resistor of suitable value for the voltage used to remind you when the PSU is switched on; and secondly, a 'master' switch, to turn off the HT line completely, *always to be used if a hand is placed within the transmitter itself!*

Simple Circuitry

So much for the preliminaries. The circuitry of the PSU unit is of well tried design. Mains power to the PSU at **Fig.1** is provided via a three-conductor wandering lead of the kind familiar in any domestic electrical appliance. Within the PSU cabinet, the three conductors of the mains lead are terminated at a 3-way connector block (IB) mounted at the rear of the box (**Fig.3**). The yellow-green conductor of the mains lead must be firmly earthed to the PSU chassis at this

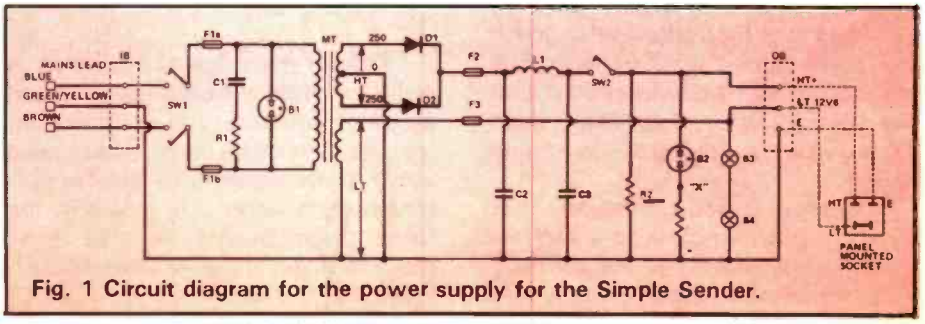

Fig. 1 Circuit diagram for the power supply for the Simple Sender.

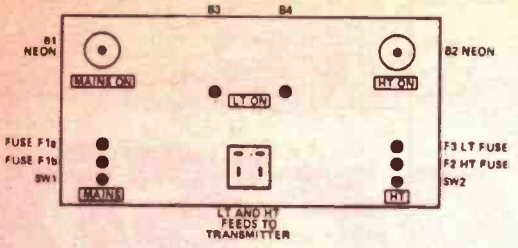

Fig. 2 Front panel layout. Control functions shown within the rectangle area should be added in Dymo tape or stencilled.

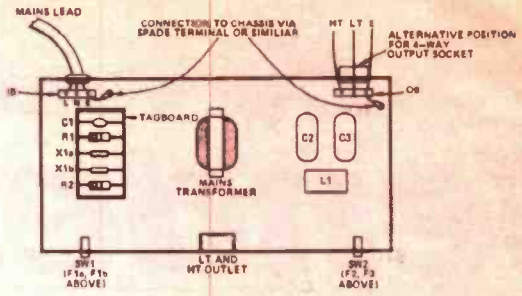

Fig. 3 Top view showing the tagboard for the smaller components.

point. Two conductors connect the live and neutral mains wires, going into IB to the 'master' power switch SW1 on the front panel (suggested layout **Figs. 2** and **3**). After that, the incoming 230V AC supply reaches the input to the mains transformer via the fuses F1A and F1B.

The network formed by C1 and R1 across the transformer primary winding reduces the effect of incoming 'thumps' from the public mains supply (eg, other people switching things on and off) and outgoing thumps from the PSU itself (eg, when the transmitter is switched on or off, or CW-keyed), helping to ensure a clean signal and minimising mains borne 'transient' interference.

The function of each of the secondary windings of the transformer is obvious from the diagram at Fig. 1. The HT winding supplies a full-wave rectifier made up of D1 and D2, leading to a conventional 'smoothing' filter of high-value high-voltage capacitors plus iron-cored choke, to get rid of any AC ripple left on the HT. The switch SW2 cuts the HT on those occasions when physical adjustments need to be made to the companion transmitter. Warning that the HT is ON is provided by the neon bulb B2. A resistor may need to be added at Point X, its value to be decided by experimentation. Those who go for higher voltage outputs will need to insert a larger value of resistors at X than those who go for the lower values of HT voltage. The resistor should be selected so that the neon B2 will remain alight even when the transmitter is being keyed.

Across the 12.6V line, two 6.3V 'cycle lamp' type bulbs are connected in series to indicate that the transmitter heater supply and its associated relay system are operational.

Finally, OB on Fig.3 indicates the output connector block to which HT, LT and earth are wired. From this block the constructor will make his own preferred arrangements about how to take the power away to the companion transmitter. This could be via a 4-way miniature socket mounted on the front panel. Alternatively, a three-conductor terminal block and wandering lead similar to the mains input one may be used. Keep the lead reasonably short to minimise any voltage drop along the LT line. If a wandering lead is employed, this must be terminated in a female-type socket — not a male-type plug with exposed pins and consequent ability to apply high voltage to inadvertent fingers handling it,having forgotten to switch SW2 to off first!

The high wattage bleeder resistor across the HT supply gives to the latter a degree of stabilisation. Stabilisation of voltage is less important with a high voltage system powering a valve transmitter than with a low voltage system powering a transistor one. The thermionic buff will argue that this is one of the many advantages of using valve circuits in spite of the inevitable comments he will hear that they are 'old fashioned!' *(They are certainly more tolerant than semiconductor circuits — Ed.)*

'Firing Up'

One of the magical moments in radio is when a home constructed piece of equipment is switched on for the first time, and when, in a valve transmitter, the anode current registered on the meter in the final stage begins to rise (less magical if this doesn't stop rising!). From the earliest days of amateur radio the Americans had a word for it: 'Firing up the rig', another term deriving from railroad lore, like '73', as explained here a few months back.

The constructor, having built the Simple Sender and now its equally simple PSU, the time has come to connect the two. First, we must check that the PSU is giving out both HT and LT with a multimeter switched to the appropriate ranges. Remember the HT will be DC but the LT is AC!

Stage 1: Interconnect PSU with transmitter by means of the wandering lead already referred to, first having ensured the master and HT switches are both off.

Stage 2: Press the 'Mains On' master switch to ignite the heaters of the four valves in the transmitter. If they fail to light, check the low voltage 12.6V line with your multimeter switched to AC voltage.

Stage 3: is to apply HT to the transmitter. With heaters alight and a 12.55MHz crystal plugged in to the VXO input socket, connect your multimeter switched to the 10mA DC scale between the feedthrough point at the base of R1 and the chassis of the transmitter. This will indicate drive from the VXO into the first multiplier when the HT switch is turned on. Just in case no drive appears, it is prudent to remove the PA valve temporarily restoring it as soon as drive to both multipliers has been obtained (after switching off, of course). It is an expensive valve and in the absence of drive into its grids can be easily damaged. Now press SW2, the HT main breaker. The milliammeter should show a small reading if the VXO crystal is oscillating. Next, transfer the meter lead connected to the feedthrough point to the input of the second doubler at the junction of R10 and R11. A small

reading should be obtained here. Adjust C7, the anode tuning of the first multiplier, until the meter reading increases to a maximum. You are now applying drive to the second multiplier, at 25MHz. This should now be doubled to 50MHz within the valve.

Stage 4: Restore the QQV03/20A into its socket. Connect the multimeter still set to 10mA to the metering point R14/15. Rotate C13 in the second multiplier anode circuit until the meter is reading a maximum — this is maximum 50MHz drive into the twin grids of the final stage. *But how do you know this is 50MHz*? Remember that the 12.55MHz crystal in the VXO is quite capable of producing harmonics other than the wanted one. There is a simple device to ensure that this cannot happen and it is so important that the next section of this article will now be devoted to describing it.

'The RF Sucker'

Many devices for determining the frequency of RF signals are available on the amateur market. These wavemeters provide meter readings of the strength and frequency of an RF source. Some were reviewed by G3ZZD here last February. They are invaluable tools to have about the shack. They are generally what might be termed *active* devices.

It is purely a G5UM personal preference to use passive rather than active 'absorption' type wavemeters. There is, he argues, always a faint chance that an active wavemeter will detect not just the wanted signal but unwanted ones as well. A passive wavemeter cannot do this: it detects nothing! What it does is to effect a deflection in the meter readings of a transmitter or grid dip oscillator when it is placed in the vicinity of one of the coils of that device and tuned to the *same* frequency.

The passive wavemeter used on VHF for many years at G5UM is shown at **Fig.4A**. It consists of no more than 7½ inches of 16 swg wire wound round a ½-inch dowel to make a 4-turn close-spaced inductor, to be connected across any small 'Jackson' type variable capacitor which happens to be to hand in the spares box. The one pressed into this service at G5UM has seven moving and six fixed plates close spaced. If you can only find a larger version, some of the moving plates can be removed to reduce them to seven with long nosed pliers.

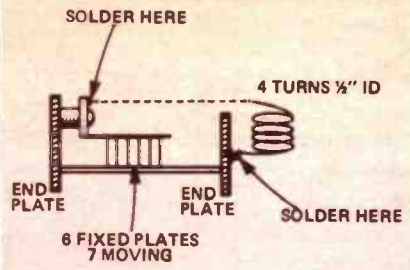

Fig. 4A 'The RF Sucker' or passive absorption wavemeter which is based on a variable capacitor and a probe coil.

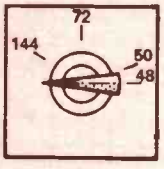

Fig. 4B the front panel of the G5UM RF Sucker. It will 'draw' RF from the inductors of a transmitter at the calibration points shown and is valid for 2m, 4m and 6m.

If the constructor follows these actual-size dimensions, they should find that the calibration of the RF sucker is as **Fig.4B**. They should check that this is the case by taking the wavemeter along to the QTH of a neighbouring amateur to try it out on an existing grid dip oscillator or transmitter to confirm where the actual calibration points occur under operational conditions. Ask around at your local radio club if you have difficulties.

Stage 5: With the aid of the RF Sucker you are now confident that the frequency of the input being applied to the 3/20A final stage is 50MHz, the input or 'drive' indicated by a milliamp or two registering on a `multimeter into switched to DC mA and connected between the junction of R14/15 (MP1) and earth. You are now at the dip and draw stage, ie, you tune the final's output capacitor until the PA anode current on M1 dips and you then gently ease the insulated pick-up coil L7 into the centre of the PA anode coil *with an insulated screwdriver*. The anode current of the final will rise, and the SWR bridge, terminated in a 75 ohm dummy load, which you have plugged in to the coaxial output socket of the Simple Sender will indicate RF. Finally, make a slight readjustment of the tank coil's associated capacitor for maximum RF output on the SWR bridge.

In performing these operations remember that the tank coil is at high voltage. Be ready to cut the HT with SW2 if need be, especially if things go wrong and there are burning smells!

It is now time, assuming you have received your 50MHz licence, to transfer the transmitter output to a 6 metre beam antenna. (For construction details of a suitable design see HRT February 1983). When this is done, a small readjustment of the PA anode tuning capacitor will be required for maximum RF into the antenna, as indicated on your SWR bridge.

Operating Techniques

Little need be said about the operating technique to be followed when the Simple Sender for six is ready to transmit. Readers with transmitting experience will already know that there are two parts to the formula of setting up a QSO on a VHF amateur band. One is to tune around that band in search of a CQ call, and to identify the location of the calling station by a quick flick through the Callbook to enable your antenna to be pointed in the right direction. The second part of the formula is to ensure your exact transmitter frequency is the same as that of the incoming signal before giving the other person a call when the 'Pse K' request occurs.

The 50MHz operator — using possibly the Extrapolator converter of HRT July '84 and feeding its IF into your station HF receiver — will tune above and below the 6 metre calling frequency of 50.1MHz, with perhaps a check on the GB3NHQ beacon if this is within range. When a wanted station is detected, the NET switch of the sender is pressed and the VXO capacitor rotated until the VXO signal heard in the receiver is zero-beat with the incoming one. When the wanted station goes over, simply press the 'Tx/Rx' switch and call him on the morse key. No

matter whether the wanted station is on SSB or CW, he *should* be able to read your morse!

And so occurs that unique moment when the sender built entirely with one's own hands, assisted by engaged brain, produces the first QSO on 6m.

Why Not Try 'Four'!

It is only realistic to recognise that what has been offered above (and earlier) in the way of a 6 metre sender and companion PSU is still of academic interest to the majority who do not have permission to operate on six. When this time comes, I hope the Simple Sender will be built in hundreds by the readers of HRT who look for something safe and simple, shorn of the high tech trimmings that put many of today's published constructional designs out of court for all but the professionals with mountains of test gear at their disposal.

Although there is still a wait for the time when six becomes available to the majority of Class A operators, the present design can be very easily adapted for the 70MHz band.

* *QQV03-20A valves as used in the PA and cheaply available at radio junk shops or sales. These were used in the majority of Pye and Storno radiotelephones manufactured in the 1960s and came onto the surplus market during the 70s. Don't spend your hard earned cash on a new one!* **G3ZZD**

Your PSU Shopping List

RESISTORS	
R1	1.5k 10W vitraeous.
R2	47k 10W vitraeous.
CAPACITORS	
C1	0.4uF 500V.
C2	16uF 750V electrolytic.
C3	24uF 750V electrolytic.
MISCELLANEOUS	
T1	230V primary, 250-0-250 centre tapped secondary (HT) or greater plus 12.6V 'heater' winding capable of 2A (LT).
L1	smoothing choke, iron cored, around 5 Henrys.
SW1	double pole single throw 'toggle', 250V.
SW2	single pole single throw, capable of switching chosen HT.
F1A,1B	13A panel mounting holder.
F2,3	3A panel mounting holder.
D1,2	BY100, DD2068, 1N4007 or similar.
B1	250V panel mounting neon.
B2	250V panel mounting neon (different colour lens to B1) with appropriate dropper resistor for the chosen HT. Start with 250 ohms and work up.
B3,4	6.3V panel mounting bulbs connected in series.
IB	Belling Lee L744 type 3-way chassis mounting terminal mounting block.
OB	as per IB.

3-core mains lead and plug to suit. Sheet aluminium to form chassis.

Metre wave

To take a look into the seething cauldron of radio activity, otherwise known as the metre-wave scene in Britain, is to be convinced that it is here the action lies. In any year more experimentation, more discovery, more sheer invention occurs here than anywhere else in the amateur radio spectrum.

As 1985 draws to a close, Jack Hum, G5UM, assesses the events that have made it a highly radio active year.

Certainly 1985 was no exception, so much has been happening it is difficult to spotlight the most important trends.

Yet the observer of "metre-wave in '85" must reach the conclusion that its highlights, alliteratively, have been 'Six', CW and 'Seventycems'.

A Brand New Band

Six first then, if only for the sheer excitement of the allocation of the British amateur of a new band, an event given the added importance of a Parliamentary announcement. To a handful of old timers, 50MHz was nothing new. They remembered the allocation they enjoyed for a few brief months in 1948 before television restarted after the war. Since then the band began to intrigue increasing numbers of amateurs culminating in the issue of 50MHz permits to a hundred of them in November of 1984.

Although we are waiting for the great news that permission to use the band has been extended still further, expectations for 1986 are of a great increase in activity on Six. No doubt this will be assisted by the building of cheap and cheerful equipment, perhaps our own high gain converter (July '84) and the Simple Sender (Nov, Jan '85).

This is the kind of the run-of-the-mill activity for which 50MHz offers scope. It also offers dramatic openings of the kind which occurred in the early Summer of 1985. Just the right propagation conditions occurred for cross-Atlantic communication on Six (a few hints having been dropped on the next band down, 10m). Experienced 6m operators decided to lie in wait for their band to open to the States. They succeeded in getting across in considerable numbers. Much of the rest of the year was spent discussing the propagation mechanism that made such contacts possible and whether it is all likely to happen again in the near future.

50.000 to 50.100MHz	Beacons
50.100 to 50.425MHz	Narrow band modes (CW, SSB, RTTY)
50.425 to 50.50MHz	All modes (FM spot frequencies 50.450 and 50.475MHz)

A provisional bandplan for 6m

The initial allocation at 6m gave a 2MHz spectrum of 50 to 52MHz. The official announcement reduced this to ½MHz, 50 to 50.5MHz. Any truncation is regrettable and alarming; but realists recognised that a 2MHz span at Six was too wide for the potential occupancy. The half-meg width — remarkably comparable with the 4m band — was likely to be enough for all, hoping that all of it will in due time be filled with signals (which cannot be said of Four and the alarming emptiness it exhibits above 70.26MHz).

Enthusiasts for Six — deterred by the size of antenna required as they contemplate beams almost ten feet square — may decide that a simple dipole will be adequate to give them the nationwide communication on low power CW. It will also enable regular cross-mode contacts with SSB users who, as Class A operators, should be able to decypher the morse code, even though experience has shown that some of them can't! There is a valid case for using unity-gain dipoles at 6m if only to facilitate getting going on the band quickly and simply.

This reference to telegaphy brings me to the second big metre-wave event of 1985, the variation of licence for class B operators that allowed them to use the A1A mode.

A1 for 'B's

Much discussion occurred in the amateur radio media in 1985 about the possible introduction of a novice licence for those unable to pass the already too easy Radio Amateurs Examination. This had much less practical value than the concept of extending the VHF only class B licence to embrace the A1A mode. Although only about a fifth of the current class B licensees applied for the variation of licence, these 6000 soon made their presence felt, particularly on 2m, by the excellence of their operating and their willingness to learn. Their adoption of 144.150MHz as a meeting place for like-minded brass pounders no doubt spread the delight in discovering just what telegraphy could do for them in widening their electronic horizons.

Eightstone reel for prospective morsemen and women

1. When sending CQ on metre-wave identify your county by using the 3-letter county code, eg, LEC for Leicestershire, to enable listening stations to turn beams on to your bearing.
2. Upon establishing contact suggest immediate QSY.
3. If you are not in The Callbook give location in your first sentence: leave "the name" until last because it is of much less importance.
4. Always send at the speed of the incoming signal.
5. When working an operator new to telegraphy persuade the use of abbreviations, dissuade spelling of complete words.
6. Never send "R" unless complete text has been copied.
7. For swift exchanges terminate overs in "BK", but
8. Never forget to identify regularly, including signing your call three times when terminating: you never know who's listening and may be trying to winkle out your callsign.

It will remain to be seen how many decide to take up the class A option (having passed the morse test). They will have to exchange the signal-to-noise ratio they enjoyed on the metre-waves for the noise-to-signal ratio and the formula QSOs they are likely to experience at HF. Many will doubtless conclude that CW at metre-wave will give them all the fulfilment they need.

Both of these events were made possible by the existence of a strong national society well versed in the patient lobbying and admin work. This is inevitable when dealing with authorities whose inbuilt characteristic is caution and a propensity to say "No" or at least to temporize. Much time, money and effort are expended in persuading concessions out of Governmental agencies. It is expenditure that benefits the British amateur fraternity as a whole and not solely the members of the national society.

The Third Times Factor

Most newly licensed class B operators choose 144-146MHz for the good reason that it guarantees contacts at virtually any time of the day. To the individual who has graduated from Citizens' Band, it provides voice communication roughly comparable with what he was familiar with back on 27MHz. All of which aggravates the QRM problem on Two, more especially from those operators who fail to appreciate the signal-enhancing advantages of directional aerials and persist in sticking with those anti-social omnis. To invite them to get away from the 2m pressure by trying the wide open spaces of 70cm is to evoke the reaction all too often that ". . . seventies doesn't get very far, does it". One wonders what "duff gen" emanates from RAE courses to persuade people to harbour such erroneous beliefs.

Closed minds can often be opened if the "three times" argument is deployed: 70cm represents three times the frequency of 2m, aerials may be made three times as large electrically (equivalent to putting a power amplifier on the end of the transmitter without the complexity or cost); such aerials are three times less visible to neighbours than a similar size of antenna at 2m, and anyway 70cm is three times more interesting! Argue this "three times" factor with the doubter and you will find more often than not that you have a convert to the next band up.

Nevertheless, thousands of class B people have either not heard this argument or fail to be convinced of the logic of getting away from Two and trying Seventy for a refreshing change. It was to break down this state of mind that Monday's 70cm activity night was initiated last April. Planned to continue for a year, it has worked as expected. Hundreds of operators have invested in gear for the band, to find a whole new pleasurable vista opened before them, plus an infinity of uncluttered FM channels available, by contrast with the few on Two.

Other Ingredients

To dip further into that seething cauldron is to withdraw any number of electronic ingredients that provoke animated discussion and experimentation in a metre-wave context. Microwaves and repeaters are but two of them. Let us look at microwaves first.

Improving techniques on 1.3GHz suggest it could be on a par with 432MHz instead of remaining the latter's poor relation. Power levels at 23cm and antenna sizes are at a stage unheard of a dozen years ago when an apologetic 1W might be persuaded to trickle out of the last stage. Now 10W is routine, and much more than that at many stations.

The consequences of this improvement are incentives to operators to try the higher microwave allocations of 2.3 and 3.4GHz (not forgetting 10GHz, popular with portables for a while now); and to work for the national society's microwave proficiency awards, on which there has been quite a run over the past year.

As for repeaters: if anything is likely to provoke animated discussion these certainly do! Significent groups of VHF operators will have nothing to do with them, appalled by what they say they hear passing through them. But many more accept repeaters as "the best thing that every happened to assist mobile operation," which is after all what they are for. At the risk of boring HRT readers with what has been said here before, "the repeater concept represents the biggest example of collective technical effort ever to have been put forth by the British amateur radio movement." Like atomic fission, repeaters can't be disinvented: it's the way they are used that is all important.

The UK voice repeater chain, now extending over most of the country, has only a limited number of frequencies assigned to it. Co-channel and siting arrangements require national co-ordination often of disparate and highly individualistic repeater groups, a 'love job' needing all the patience and tact which the members of the Repeater Management Group can bring to it. Fittingly, the Group's chairman, G3XDV, is currently holder of the RSGB's Founder's Trophy for services rendered.

Another prestigious trophy, the Wortley Talbot, was awarded for good work done on the repeater front. It has been held throughout 1985 by G4MQS, whose expertise in developing video, teletype and interlinked system repeaters plus microwave beacons, as well as maintaining two heavily accessed repeaters, GB3CF and GB3LE, has won the admiration of all who have "seen it happening". These forms of national recognition should help to still the dogmatic criticisms of any anti-repeater

addicts.

A trend which might have been expected to develop but didn't was operators' acceptance that contacts through repeaters are only substitutes for the real thing — meaning a direct QSO. Even today, not enough checking of inputs is done to establish if "real QSOs" instead of "by proxy" ones are possible. It must be said, that at 70cm, where many fixed stations use modest vertical beam aerials with enhanced ERP, direct contacts initiated by through-repeater exchanges developed considerably during 1985. If this trend is to spread to 2m, more use of simple beams at home sites is a "must".

Yet another significent advance on the repeater front has been the incidence of more exotic modes of through-repeater communication. Exotics include RTTY, video and, of course, the Sheffield SSB unit fathered by G3RKL, a pioneer these last several years in fostering advanced forms of metre-wave communication.

To close this conspectus of 1985 is to recognise that all too many activities have not been mentioned here — not a word about contests for example. But then, in a seething cauldron so much is going on that it would be foolhardy to attempt to turn out the entire contents. What may be said with confidence is that on the metre-wave scene *la meme chose* does not prevail for long. 1986 will undoubtedly be very different from 1985.

P.S.

Your G5UM has left until the very end a highly significant feature of 1985 because he wants to return to it in detail in a subsequent Metre Wave. The Class B licence "came of age" during the year. The concept having been launched in 1964. Today, nearly 30,000 licences later, it is a major influence upon metre-wave activity in Britain. But more, as we say, anon.

Free Readers' ADS!

FOR SALE

SUPERSTAR 360FM many mods legal stamp etc etc £125. Ham international concorde three £150. Zetagi mobile linear B300 £65. CTE speedy linear mains £45. Various power mikes from £7 Alcom half wave twig £7. Reading 411501.

YAESU FT757GX, with FC700 ATU, all immac £725 ono. G4ZYW not QTHR. Tel Steve 0885 83428. After 6pm.

FOR SALE Grundig Satalilt 3400 150kHz to 30MHz receiver built in frequency counter superb radio cost over £400 new £195. Wanted FT790R or similar maybe a transverter. Brian Barwick G1ESG 100 Westwood, Golcar, Huddersfield HD7 4JY not QTHR.

CB OUTFIT mobile transceiver power supply skylab aerial down lead all unused new £55 the lot. Also classic guitar Cuenco with case £185, Fisher 01 398 0305.

MARCONI Atlanta VLF-HF 15kHz-28MHz large bandspread. Xtal-cal fine tuning variable passband wide, narrow, very narrow. Phone output £60. Muirhead decade oscillator D890A contains small CRT excellent condition with manuals £50. Marconi TP373C bridge working £25. Methven G1IPC 0293 27187 (Crawley).

CANNON computer system twin 5" disk drive printer office type system no books or parts matching working and in mint condition offers or swap for HF gear. WHY? Tel Paul 01 961 4659 any time.

YAESU FRV7700D converter includes 2 metre and air bands. Post paid £30. Datong 2 metre converter complete with 12 volt supply unit £32 post paid. Letters only please to Mr Moore, 7/6 High Street, Ide, Exeter EX2 9RW.

SALE Trio transverter TS520 with AC/DC power supply and manual in vg condition price £300. Also Trio 9R59DS general coverage comm receiver with manual in good condition price £25. Contact GM4EQY QTHR.

FOR SALE Icom 290E multimode transceiver 10 watt output £250, MML144/50S 50 watt linear amplifier 10 watt input £60. KW202 amateur band receiver 160-10 metres £100. All in very good condition, G1HTZ telephone Horsham (0403) 67908.

FOR SALE Trio TR2300 2m FM portable trans. NiCads charger vgc £105. Tel 0305 786930 anytime.

YAESU 2100Z HF linear £425. Yaesu FT7 HF mobile transceiver 160M-10M C/W Daiwa meter £225. Yaesu FT301 transceiver 160M-10M C/W mobile brkt £295 Telephone 0462 813235 anytime.

IC02E spare battery pack soft leather case original packing £20 ono. Contact Keith GW4NBY evenings and weekends only on (0656) 56576.

FT707 no mods £340, Cobra 148GTLDX 3MHz coverage, frequency readout, scanning on mike. Ideal 10m multimode £130 with Yaesu mike. Zetagi B300P £55, FP757GX S/M PSU £85. Ring Jim (G4KGE) Ashtead 74558 (Surrey).

ICOM 290E 2mtr multimode transceiver 18 months old £280. MML14/50S linear amp 12 months old £68 or will exchange for FT290R and Mutek & MML 133/30S linear and cash or straight swap for FT290R and Mutek

and MML 144/100LS. Ring Terry (G4OXD) (0462) 35248 after 6pm.

FOR SALE TCS 13 receiver handbook £30. Grundig satellite 12 bands receiver handbook £70. "19" set mint two power supplies variometer handbook £40. Buyer collects and tests. Would exchange any of above for R210 receiver and power supply. Ring Hawick 0450 75089 Scotland.

FOR SALE 1.5KVA 240V generator RF and spike free ideal for field event petrol engine little used hence sale £250. Buyer collects. Phone Keith G0CGB Dartford 70073.

YAESU FRG9600 VHF/UHF receiver 60-905MHz all mode as new in box with Yaesu power pack 1¾ years guarantee left with main agents £350 — Donald, 25 Setley Gardens, Bournemouth (0202) 520020.

ANDREW LDF4-50 Heliax coaxial cable 70 feet long with N type connectors tested H100 connector £55 ono buyer collects, 1 Ceri Road, Rhoose, Barry CF6 9HF South Glamorgan.

TRIO 21 HE plus spkr/mike small chip from case hence £130 also Datong morse tutor £35. G3TPI Loughboro 261032.

THE ULTIMATE rig! Trio 4000A dual bander CW duplexer and unused M4000 dual band mobile antenna. 18 months old never used and brand new condition £375. Would deliver reasonable distance Manchester but would prefer buyer collect. G4FKZ 061 624 2808.

FT290R 2M multimode, complete with case, Nicads, charger, BNOS 50 watt linear and preamp, 12V PSU boxed as brand new, brought only 4 months ago for £450, receipts available, used twice only. First £350 cash secures. Tele 0935 815616 (Sherborne, Dorset).

KW202 Rx for sale good condition £80 ono. Tel (0723) 365043.

YAESU FT1 with all options and recently upgraded PLL unit together with SP102 loudspeaker, FC902 ATU, dummy load and telereader RTTY decoder power supply/VDU. Pristine condition offers around £1100 please, staged payments possible. Ring Dan Arbib tel London 01 937 6124.

FT207R hand held £120, TR3200 mobile/portable £110, TR2200G mobile/portable £65. TR7100 xtalled mobile £60, station scope SMC £80, Eddystone S640 HF £40 pocketphone 70 three channel not converted £20. John Waterlooville 0705 261399.

RACAL RA17 good order £250 sait MR1411 good order digital readout £375 hammarlund SP400SX including PSU/spkr good order £175 all worthwhile general coverage receivers marine xtal controlled trx 2182MHz £95 (handheld) two PSUs mains 300DC 6.3AC and 12V £20 each (Purley) 01 660 0794.

YAESU FRG7700 with memory as brand new (cost £450) £290 ono or exchange for quality self contained Rx any examination. E Lane, 19 Smugglers Way, Birchington, Kent. Tel Thanet (Kent) 45561.

FOR SALE SX200N scanner as new in original box little used complete aerial and instruction book current price £335. Sell £200. Also SEM 10kHz to 2 meter £10 phone Peel I.O.M. 2821.

TRIO 310 amateur band receiver 160 to 10 plus 30M not 18 & 24. Fitted separate oscillator coils all bands stabilized oscillator, switchable ant and ant coupling £95 cash only. Daylight hours audio filter. 35/37 Brighouse, Denholme Road, opposite Raggalds Inn, Queensbury, Bradford BD13 1NA.

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DAIWA SR-9 2M receiver VFO 144-146, 11 crystal controlled channel R2,R5, S19,S20,S21, fitted very good condition ideal for RAE student £50 ono. Maxcom 7E portable (hand held), CB radio, 40 channels, 4 or 2W, and Nicads, charger, carrying case, mobile ant, (mag mount) very good condition £40 ono G1OFL. Tel Gravesend (0474) 326036.

TRIO TS180S with CW filter £449; AT180 £80; PS30 £85; Sp180 £35; R600 £249; TR)800 £149; all excellent condition with manuals and original boxes. Genuine reason for sale, going maritime mobile so require TS430S or similar. G3UZI Horsham 66327.

FOR SALE Yaesu FRG 7000 250kHz 30MHz Rx mint condition digital frequency display, manual plus audio filter £150. Ray 041 631 3570 (Glasgow).

MURPHY AP100335 communications receiver requires power pack £25 — Mr Moulder, Rainham 22994.

COBRA 148GTL 26065 to 27991 FM AM USB LSB CW low and high PWR switch £150. Tel Oxford (0865) 880997.

TRISTAR 747 ideal rig for 10m mobile 12W pep 4W AM/FM micro mods ATV converter 435/600 Yaesu 11m £25 SSB filter 901/902 £15. Tele 0924 495916 Martyn G4SUI.

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RTTY ONLY	Supplied unboxed but fully tested and fitted with leads	£6.00
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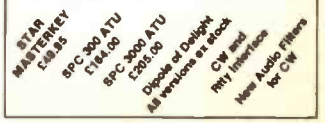

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MICROWAVE MODULES LTD

MERRY CHRISTMAS

Seasons Greetings to all Our Customers and Retailers with Best Wishes for a Prosperous and Peaceful New Year.

Perhaps Santa Claus can give you some help in selecting your Christmas presents, or maybe you would like to choose from our products listed below. In either case we're sure that any of our retailers would be pleased to gift wrap it for you.

SANTA CLAUS' SELECTION FROM THE FAIRY GROTTO:

LINEAR AMPLIFIERS:			
	MML 144/30-LS	2m 30 watt linear/preamp, 1 or 3w input, switchable	82.90
	MML 144/50-S	2m 50 watt linear/preamp, 10w input switchable	92.00
	MML 144/100-S	2m 100 watt linear/preamp, 10w input switchable	149.95
	MML 144/100-HS	2m 100 watt linear/preamp, 25w input, switchable	149.95
	MML 144/100-LS	2m 100 watt linear/preamp, 1 or 3w input, switchable	169.95
	MML 144/200-S	2m 200 watt linear/preamp, 3, 10, 25w input, switchable	299.00
	MML 432/50	70cm 50 watt linear/preamp, 10w input	129.95
	MML 432/100	70cm 100 watt linear, 10w input	299.00
TRANSVERTERS	MMT 144/28	2m Linear transverter, 10m input, 10w output	129.95
	MMT144/28-R	2m linear transverter, 10m input, 25w output	215.00
	MMT 1296/144	23cm linear transverter, 2m input, 2w output	235.00
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 Metostat 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	95.75
AMATEUR TELEVISION	MMC435/600	70cm ATV converter, UHF Output	29.90
	MTV435	70cm ATV 20 watt transmitter	179.95

PRICES INCLUDE VAT BUT NOT POST & PACKAGE

PRICES CORRECT AS AT 31 DEC. 1985

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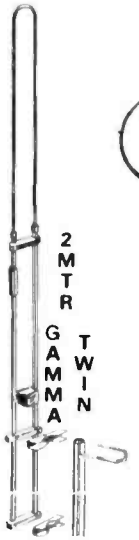


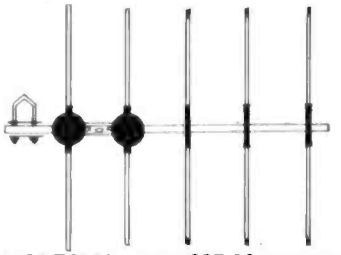
BASED ON THE 'SLIM JIM'
AN INEXPENSIVE 2 MTR BASE AERIAL – **£8.95 + £2.50 P&P**

OUR BEST SELLER

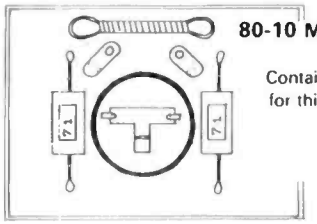
½ SIZE — 40-10 MTRS **£14.25** + £1.80 P&P

FULL SIZE — 80-10 MTRS **£16.25** + 1.80 P&P

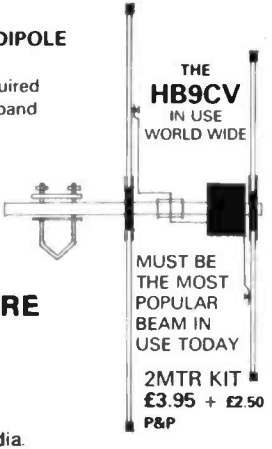
THE G5RV MULTIBAND DIPOLE



ZL SPECIAL TYPE ANTENNAS
12ELE **£25.00** P&P £3.50
7ELE **£14.25** P&P £3.00
5ELE **£10.50** P&P £2.50



80-10 METRE TRAP DIPOLE KIT
Contains all that's required for this popular multiband dipole
£24.95
+ £1.75 P&P



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MUST BE THE MOST POPULAR BEAM IN USE TODAY

2MTR KIT **£3.95** + £2.50 P&P

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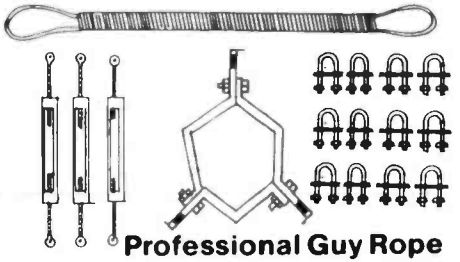

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Contents
1 x 3 way guy ring
6 x thimbles
12 x wire rope grips
3 x turnbuckles
30 metres wire rope

A. Standard 7 x .56mm strands
B. Heavy duty 7 x 1mm strands
Standard **£8.95**
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150' coils 1.6mm dia.
Hard drawn £7.95
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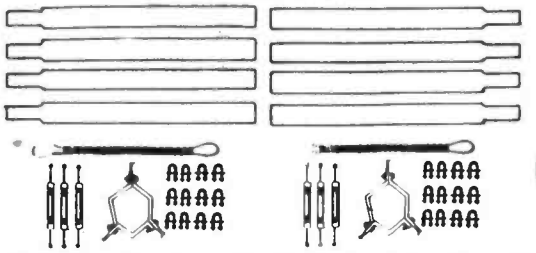
CERAMIC EGG INSULATORS
£3.00 for 6
inc P&P

MASTS A LARGE SELECTION ALWAYS IN STOCK

THE 'TAR 40' MAST



Professional Guy Rope Kits

Professional Guy Rope Kits

CONTENTS
8 sections 2" dia. x 5' Aluminium sections.
2 TAR Guy Rope Kits.
1 Base Plate

ONLY £55.00 +£5 carriage

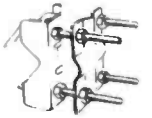
★ SPECIAL OFFER ★

A four section 1½" dia. aluminium mast only **£12.95** + £2.50 P&P

1¼" dia. steel sections
3 sections 6' long
18' in total
ONLY **£6.00**
+ £2.50 P&P

BASE PLATES
9" SQUARE to fit 1½" or 2" MAST
£3.50 P&P £2.50

MAST CLAMPS



2" Universal
£2 each + £1 P&P

MASTS AND AERIAL BRACKETS. YOU NAME IT WE EITHER MAKE IT OR STOCK IT. OUR CATALOGUE LISTS THEM ALL.

Our Products are too numerous to list. Send £1.00 refundable against any purchase for our Catalogue listing our entire range including:
* ALL PARTS AND COMPONENTS FOR THE D.I.Y. ANTENNA CONSTRUCTOR.
* COMPREHENSIVE RANGE OF OUR MASTS, BRACKETS AND LASHING EQUIPMENT.

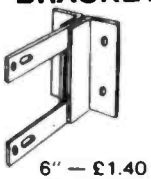
UNISON AR250

SPECIFICATIONS

INPUT VOLTAGE	240 VOLT AC 40VA maximum
MOTOR	18 VAC
ROTATION	360° + 5°/-0° with mechanical stop
ROTATION TIME	50/60Hz 65 seconds
ROTATION TORQUE	220kg-cm (192 lb-in) minimums
MAST SIZE	28-44 mm (1-1/8"-1-3/4") diameter
VERTICAL LOAD	45kg (99 lbs) maximum
CABLE	3 core
WEIGHT	4 kg (88 lbs)

£39.95 P&P £4.50

STAND OFF BRACKETS



6" — £1.40 each
9" — £1.80 each
P&P £1.00

JOINTING SLEEVE

Joins 2 x 2" dia. masts
£3.50 + £2 P&P

GUY RINGS

3 way £1.75 each
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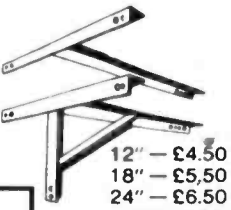
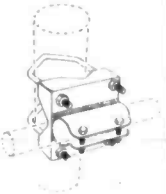


12" — £4.50 per pair
18" — £5,50 per pair
24" — £6.50 per pair
P&P £2.50 per pair



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