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APRIL 1982

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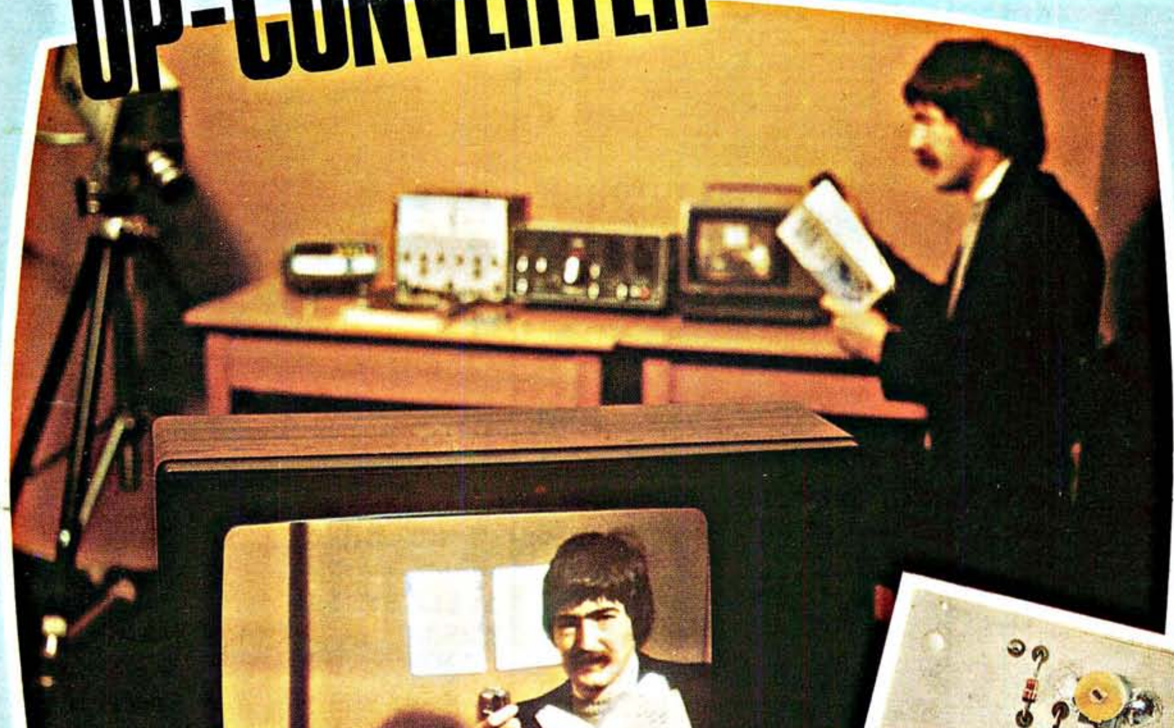

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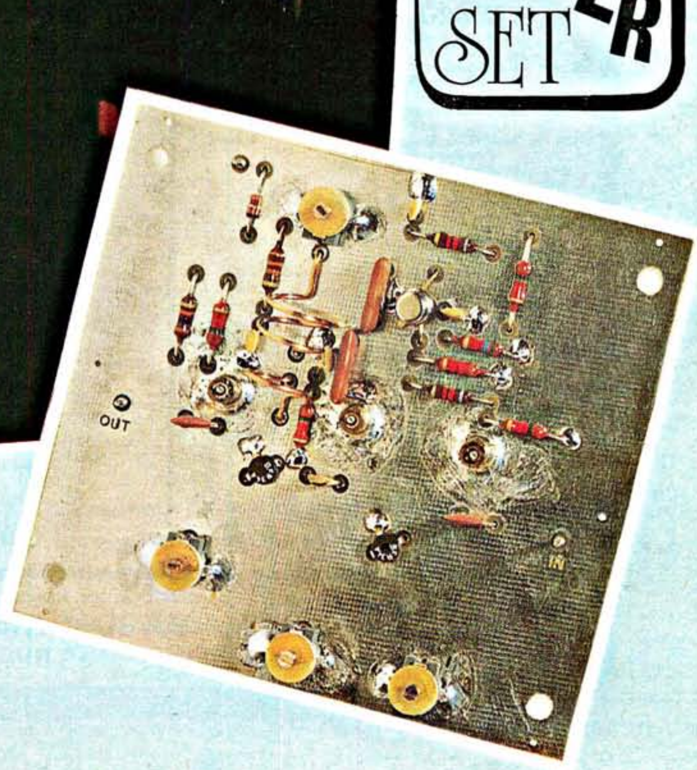

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TRIO

		£	Carr.
TS830S	160-10m Transceiver 9 Bands	694.00	(—)
VFO230	Digital V.F.O. with Memories	215.00	(2.00)
AT230	All Band ATU/Power Meter	119.00	(2.00)
SP230	External Speaker Unit	34.96	(1.50)
DFC230	Dig. Frequency Remote Controller	179.00	(1.50)
YK88C	500Hz CW Filter	29.60	(0.50)
YK88CN	270Hz CW Filter	32.66	(0.50)
TS130S	8 Band 200W Pep Transceiver	525.00	(—)
TS130V	8 Band 20W Pep Transceiver	445.00	(—)
VFO120	External V.F.O.	85.00	(1.50)
TL120	200W Pep Linear for TS120V	144.00	(1.50)
MB100	Mobile Mount for TS130/120	17.00	(1.50)
SP120	Base Station External Speaker	23.00	(1.50)
AT130	100W Antenna Tuner	79.00	(1.50)
PS20	AC Power Supply – TS130V	49.45	(2.50)
PS30	AC Power Supply – TS130S	88.50	(5.00)
MA5	5 Band Mobile Aerial System	86.00	(5.00)
MC50	Dual Impeadance Desk Microphone	25.76	(1.50)
MC35S	Fist Microphone 50K ohm IMP	13.80	(0.75)
MC30S	Fist Microphone 500 ohm IMP	13.80	(0.75)
LF30A	HF Low Pass Filter 1kW	17.90	(0.75)
TR9000	2M Synthesised Multimode	371.00	(—)
BO9	Base Plinth for TR9000	34.90	(1.50)
TR7800	2M Synthesised FM Mobile 25W	284.00	(—)
TR7730	2M Synthesised FM Compact Mobile 25W	247.00	(—)
TR2300	2M Synthesised FM Portable	166.00	(—)
VB2300	10W Amplifier for TR2300	58.00	(1.50)
MB2	Mobile Mount for TR2300	17.71	(1.50)
RA1	Flexible Rubber Antenna for TR2300	6.90	(0.50)
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PB25	Spare Battery Pack	22.30	(0.75)
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PS10	Base Station Power Supply for 8400	64.00	(2.00)
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ICOM

IC730	HF Mobile Transceiver 8 Band	586.00	(—)
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IC25E	2M Synthesised Compact 25W Mobile	259.00	(—)
IC290E	2M Multimode Mobile	366.00	(—)
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IC BC30	230V AC Base Charger and Hod	39.00	(1.50)
IC BC25	230V AC Trickle Charger	4.25	(0.75)
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IC BP2	6V Nicad Pack for IC2E	22.00	(1.00)
IC BP3	9V Nicad Pack for IC2E	17.70	(1.00)
IC BP4	Empty Case for 6×AA Nicads	5.80	(0.75)
IC BP5	11.5V Nicad Pack for IC2E	30.50	(1.00)
IC DC1	12V Adaptor Pack for IC2E	8.40	(0.75)
IC ML1	10W Booster	49.00	(1.00)

TV INTERFERENCE AIDS

Ferrite Rings 1½" dia. per pair	0.80	(0.20)
Toroid Filter TV Down Lead	2.00	(0.50)
Low Pass Filter LP30 100W	3.95	(0.50)
Trio Low Pass Filter LF30A 1kW	17.90	(0.75)
Yaesu Low Pass Filter FF501DX 1kW	23.00	(0.75)
HP4A High Pass Filter TV Down Lead	5.95	(—)

ANTENNA BITS

H1-Q Balun 1:1 5kW pep (PL259 Fitting)	9.95	(0.75)
T Piece Polyprop Dipole Centre	1.00	(0.20)
Ceramic Strain Insulators	0.40	(0.10)
Small Egg Insulators	0.40	(0.10)
Large Egg Insulators	0.50	(0.10)
75 ohm Twin Feeder – Light Duty-Per Meter	0.16	(0.02)
300 ohm Twin Feeder – Per Meter	0.14	(0.02)
URM67 Low Loss 50 ohm Coax-Per Meter	0.60	(0.20)
UR76 50 ohm Coax-Per Meter	0.25	(0.05)

Please send total postage indicated. Any excess will be refunded.

MICROWAVE MODULES

MMT144/28	2M Transverter for HF Rig	99.00	(—)
MMT432/28S	70cm Transverter for HF Rig	149.00	(—)
MMT432/144R	70cm Transverter for 2M Rig	184.00	(—)
MMT70/28	4M Transverter for HF Rig	115.00	(—)
MMT70/144	4M Transverter for 2M Rig	115.00	(—)
MMT1296/144	23cm Transverter for 2M Rig	184.00	(—)
MML144/25	2M 25W Linear Amp (3W I/P)	59.00	(—)
MML144/40	2M 40W Linear Amp (10W I/P)	77.00	(—)
MML144/100S	2M 100W Linear Amp (10W I/P)	129.00	(—)
MML432/20	70cm 20W Linear Amp (3W I/P)	77.00	(—)
MML432/50	70cm/50W Linear Amp	119.00	(—)
MML432/100	70cm 10/100W Linear Amp	228.64	(—)
MM2000	RTTY to TV Converter	169.00	(—)
MM4000	RTTY Transceiver	269.00	(—)
MMC50/28	6M Converter to HF Rig	27.90	(—)
MMC70/28	4M Converter to HF Rig	27.90	(—)
MMC144/28	2M Converter to HF Rig	27.90	(—)
MMC432/28S	70cm Converter to HF Rig	34.90	(—)
MMC432/144S	70cm Converter to 2M Rig	34.90	(—)
MMC435/600	70cm ATV Converter	27.90	(—)
MMK1296/144	23cm Converter to 2M Rig	59.80	(—)
MMD050/500	500MHz Dig. Frequency Meter	69.00	(—)
MMD600P	600MHz Prescaler	23.00	(—)
MMDP1	Frequency Counter Probe	11.50	(—)
MMA28	10M Preamp	14.95	(—)
MMA144V	2M RF Switched Preamp	34.90	(—)
MMF144	2M Band Pass Filter	9.90	(—)
MMF432	70cm Band Pass Filter	9.90	(—)
MMS1	The Morse Talker	115.00	(—)

DATONG PRODUCTS

PC1	Gen. Coverage Converter HF on 2M Rig	120.75	(—)
VLF	Very Low Frequency Converter	25.30	(—)
FL1	Frequency Agile Audio Filter	67.85	(—)
FL2	Multi-mode Audio Filter	89.70	(—)
ASP/B	Auto RF Speech Clipper (Trio Plug)	79.35	(—)
ASP/A	Auto RF Speech Clippers (Yaesu Plug)	79.35	(—)
D75	Manually controlled RF Speech Clipper	56.35	(—)
RFC/M	RF Speech Clipper Module	26.45	(—)
D70	Morse Tutor	49.45	(—)
AD270	Indoor Active Dipole Antenna	37.95	(—)
AD370	Outdoor Active Dipole Antenna	51.75	(—)
MPU1	Mains Power Unit	6.90	(—)

D70 MORSE TUTOR

£49.45

MORSE EQUIPMENT

MK704	Squeeze Paddle	10.50	(0.50)
HK707	Up/Down Key	10.50	(0.50)
HK704	Deluxe Up/Down Key	14.50	(0.50)
EKM1A	Practise Oscillator	8.75	(0.50)
EK121	Elbug	29.95	(0.50)
EKM12A	Matching Side Tone Monitor	10.95	(0.50)
EK150	Electronic Keyer	74.00	(—)

ROTATORS

KR250	Kenpro Lightweight 1-1½" mast	44.95	(2.00)
Hirschman	RO250 VHF Rotor	49.95	(2.00)
9502B	Colorotor (Med. VHF)	49.95	(2.00)
KR400RC	Kenpro – inc lower clamps	99.95	(2.50)
KR600RC	Kenpro – inc lower clamps	139.95	(3.00)

DESK MICROPHONES

SHURE 444D Dual Impeadance	33.00	(1.50)
SHURE 526T Mk II Power Microphone	46.00	(1.50)
ADONIS AM502 Compression Mic 1 O/P	39.00	(—)
ADONIS AM601 Compression Mic+Meter 1 O/P	49.00	(—)
ADONIS AM 802 Compression Mic+Meter 3 O/P	59.00	(—)

MOBILE SAFETY MICROPHONES

ADONIS AM 202S Clip-on	20.95	(—)
ADONIS AM 202F Swan Neck +Up/Down Buttons	30.00	(—)
ADONIS AM 202H Head Band+Up/Down Buttons	30.95	(—)

HAND MICROPHONES

T.A. 600 Fist Mic.	4.95	(0.50)
Power Mic. Wide Impeadance	9.95	(0.75)
TRIO MC30/35 600/50K IMP	13.80	(0.75)
YAESU YE7A/YD846 600/50K IMP	5.75	(0.75)
SHURE 201 High IMP. Quality Mic.	14.50	(0.75)

TEST EQUIPMENT

Drae VHF Wavemeter 130-450MHz	24.95	(—)
FXI Wavemeter 250MHz MAX	33.00	(0.75)
DM81 Trio Dip Meter	60.00	(0.75)
MMD50/500 Dig. Frequency meter (500MHz)	69.00	(—)

Co-AXIAL SWITCH

5 Way Rotary (H.F.)	10.95	(0.50)
2 Way Diecast (V.H.F.)	10.00	(0.50)
2 Way Toggle (V.H.F.)	6.50	(0.50)

HELIAL ANTENNAS

2M BNC or PL259 (state which required)	4.50	(0.50)
2M Thread for TR2300 or FT290R (state which)	4.50	(0.50)
70cm BNC	4.50	(0.30)

YAESU

FT902DM	160-10m 9 Band Transceiver	885.00	(—)
FC902	All Band A.T.U.	135.00	(1.50)
SP901	External Speaker	31.00	(1.50)
FT101Z	160-10m 9 Band Transceiver (FM)	590.00	(—)
FT101ZD	160-10m 9 Band Transceiver (FM) Digital R.O.	665.00	(—)
DCT101Z	DC/DC Power Pack	42.55	(1.50)
FAN101Z	Cooling Fan for 101Z/ZD	13.80	(0.75)
FT707	8 Band Transceiver 200W Pep	569.00	(—)
FT707S	8 Band Transceiver 20W pep	485.00	(—)
FP707	Matching Power Supply	125.00	(5.00)
FTV707R(2)	Transverter – 2M	198.00	(—)
FV707DM	Digital V.F.O.	186.00	(—)
FC707	Matching A.T.U./Power Meter	85.00	(1.00)
MR7	Metal Rack for FT707	15.70	(1.00)
MMB2	Mobile Mounting Bracket for FT707	16.10	(1.00)
FRG7	General Coverage Receiver	189.00	(—)
FRG7700	200KHz-30MHz Gen. Coverage Receiver	329.00	(—)
FRG7700M	As above but with Memories	409.00	(—)
FRT7700	Antenna Tuning Unit	37.00	(1.00)
FT208R	2M FM Synthesised Handheld	209.00	(—)
FT290R	2M Portable Synthesised Multi-mode	249.00	(—)
FT708R	70cm FM Synthesised Handheld	219.00	(—)
NC7	Base Trickle Charger	26.88	(1.30)
NC8	Base Fast/Trickle Charger	44.10	(1.50)
NC9C	Compact Trickle Charger	8.00	(0.75)
FBA2	Battery Sleeve for use with NC7/8	3.05	(0.50)
FNB2	Spare Battery Pack	17.25	(0.75)
PA3	12V DC Adaptor	13.40	(0.75)
FT480R	2M Synthesised Multimode	379.00	(—)
FT780R	70cm Synthesised Multimode (1.6MHz Shift)	459.00	(—)
FP80	Matching 230V AC Power Supply	63.00	(1.50)
FT290R	2M Portable Synthesised Multimode	249.00	(—)
MMB11	Mobile Mounting Bracket	22.25	(1.00)
CSC1	Soft Carrying Case	3.45	(0.75)
NC11C	240V AC Trickle Charger	8.00	(0.75)
FL2010	Matching 10W Linear	64.40	(1.20)
Nicads	2.2 AMP HR Nicads Each	2.50	(—)
FL2100Z	160-10m 1200 Watt Linear	425.00	(5.00)
FF501DX	H.F. Low Pass Filter 1kW	23.00	(0.75)
FSP1	Mobile External Speaker 8 ohm 6W	9.95	(0.75)
YH55	Headphones 8 ohm	10.00	(0.75)
YH77	Lightweight Headphones 8 ohm	10.00	(0.75)
QTR24D	World Clock (Quartz)	28.00	(0.75)
YM24A	Speaker/Mic 207/208/708	16.85	(0.75)
YD148	Stand Microphone Dual IMP 4 Pin Plug	21.10	(1.50)
YM34	As 148 but 8 Pin Plug	21.45	(1.50)
YM38	As 34 but up/down Scan Buttons	24.90	(1.50)

FDK VHF/UHF EQUIPMENT

Multi 700EX	2M FM Synthesised 25W Mobile	199.00	(—)
Multi 750E	2M Multimode Mobile	289.00	(—)
Expander	70cm Transverter for M750E	219.00	(—)

STANDARD VHF/UHF

C78	70cm FM Portable	219.00	(—)
CPB78	10W Matching Linear	67.50	(1.50)
C58	2M Multimode Portable	239.00	(—)
CPB58	25W Matching Linear	79.50	(1.50)
CM8	Mobile Bracket	19.95	(1.00)
CL8	Soft Carrying Case	6.95	(0.75)
C12/230	Charger	7.59	(0.75)

DRAE PRODUCTS

Power supplies

4 AMP	27.95 (1.50)	12 AMP	69.00 (2.00)
6 AMP	44.95 (2.00)	24 AMP	99.00 (3.00)

Morse tutor – available shortly £46.90 (1.00)

WELZ SP15M

£29.00

SWR – POWER METER

Model 110	H.F./2M Calibrated Power Reading	11.50	(0.50)
SWR25	H.F./2M Twin Meter	11.50	(0.50)
UH74	2M/70	14.30	(0.50)
WELZ SP15M	H.F./2M 200W	29.00	(0.75)
WELZ SP200	H.F./2M	59.00	(0.75)
WELZ SP300	H.F./2M/70	79.00	(0.75)
WELZ SP400	2M/70	59.00	(0.75)
DAIWA SW110A	H.F/2M	35.00	(—)
DAIWA CN620A	H.F/2M Cross Pointers	52.80	(—)
DAIWA CN630	2M/70 Cross Pointers	71.00	(—)

DUMMY LOADS

DL30	PL259	30W MAX	5.00	(0.50)
DL60	PL259	60W MAX	8.80	(0.70)
DL60	N TYPE	60W MAX	16.50	(0.70)
DL600	SO239	600W MAX	29.95	(1.50)
DL1000	SO239	1000W MAX	39.95	(1.50)

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Practical Wireless

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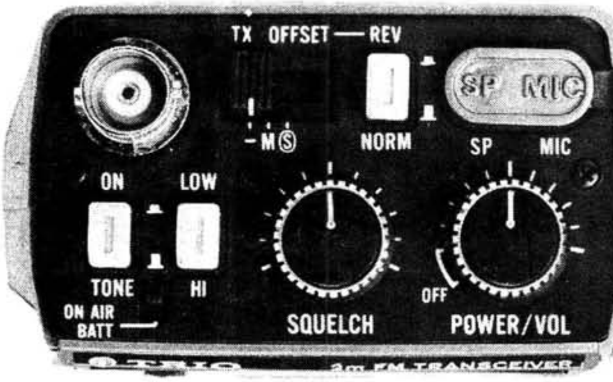
contents

OUR SPECIAL OFFER THIS MONTH
Set of four tweezers
(see page 37)

NEW VHF



The TR-2500 is a compact 2 meter FM handheld transceiver featuring an LCD readout, 10 channel memory, lithium battery memory back-up, memory scan, programmable automatic band-scan and Hi/Lo power switch.

TR-2500 FEATURES:
● Extremely compact size and light weight 66 W × 168 H × 40 D, mm, 540 g, with Ni-Cd pack. ● LCD digital frequency readout, with memory channel and function indication. ● Ten channel memory, includes "MO" memory, for non-standard split frequencies. ● Lithium battery memory back-up, built-in, saves memory when Ni-Cd pack discharged. ● Memory scan, stops on busy channels, skips channels in which no data is stored. ● UP/DOWN manual scan in 5 KHz steps. ● 2.5 W or 300mW RF output. (HI/LOW power switch.) ● Programmable automatic band scan allows upper and lower frequency limits and scan steps of 5 KHz and larger (5, 10, 15, 20, 25, 30 KHz . . . etc) to be programmed. ● Repeater reverse operation. ● Optional power source, MS-1 mobile or ST-2 AC charger/power supply allows operation while charging. (Automatic drop-in connections.) ● Battery condition indicator. ● Two lock switches for keyboard and transmit. ● Flexible rubberized antenna with BNC connector. ● 400 mAH heavy-duty Ni-Cd battery pack. ● AC charger.

OPTIONAL ACCESSORIES:
● ST-2 Base station power supply and quick charger (approx. 1 hr.) ● MS-1 13.8 VDC mobile stand/charger/power supply. ● SMC-25 Speaker microphone. ● PB-25 Extra Ni-Cd battery pack, 400 mAH, heavy-duty.

TR 2500 hand held 2 metre transceiver.

TR 2500 £207.00 inc VAT

Securicor Carriage £5.00

NEW UHF VHF

For the VHF and UHF enthusiast Trio produced the 770 range of equipment. Now, with the production of the TS780, the dual bander has come of age, giving the two band multimode facilities of the original concept, plus a wealth of additional operating facilities. Trio have again produced a rig which others cannot even copy.

- Full coverage of 2 metre and 70 cm band. 144.00 to 146.00 430 to 440.
- All modes. Upper sideband. Lower sideband CW and FM. Also a position with which you will not be familiar FM CH. This gives the VFO a mechanical click stop feel and increments of 12.5 or 5 KHz. Ideal for 2 metre and 70 cm simplex working.
- Free running VFO with 2 speeds of frequency coverage, slow in 20 Hz steps, fast in 200 Hz steps. Add to the VFO a friction brake and ease of fine tuning is the result.
- Band scan in either 0.5, 1, 3, 5, or 10 MHz widths.
- Memory scan. The rig can be instructed to scan either the 2 metre or the 70 cm frequencies in the memories or to scan the total content.
- IF shift to move the receiver pass band without changing the receive frequency and give greater operability under crowded band conditions.
- Full repeater shift facility for either 2 metres or 70 cm repeaters plus tone access and reverse repeater switches.
- Up down microphone supplied as standard.
- 13.8 V DC or 240 V AC 50/60 Hz operation.

TS 780 dual bander

TS 780 £748.00 inc VAT

Securicor Carriage £5.00

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Goods are normally despatched by return.

TRIO *pacesetter in amateur radio*

HF

We've handled a lot of equipment in our time as radio amateurs but the TS830S really took us by storm. As you will hear if you listen on the air, it's reputation is high all round the world. We think the TS830S is exactly right for the operator who has carefully considered all the features necessary for top performance, put aside all the gimmickry and found the TS830S.

This rig offers you all band coverage; true frequency readout on all modes; variable bandwidth *and* passband tuning; rugged, reliable 6146B valves in the PA; top quality both in construction and design; and, above all, the Trio reputation for giving you the best equipment at a reasonable price. Thousands of happy users worldwide will confirm that if you want total satisfaction, try the TS830S. Send for comprehensive details today.

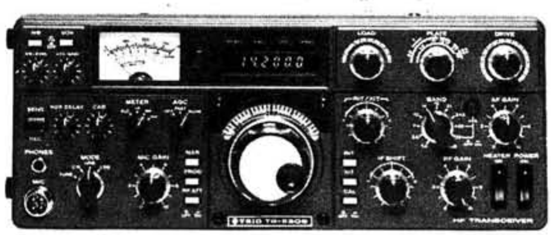
TS 830S

£694.30 inc VAT Securicor Carriage £5.00

A recent addition to the Trio HF range, and proving amazingly popular is the new TS530S. Designed as a "little brother" to the TS830S, the TS530 uses the same PLL system, same RF boards, same readout system and many other features of the 830 but without the variable bandwidth facility. You do, of course, have the famous Trio I.F. shift system for dodging the QRM.

We really believe that the TS530S is the finest mid-price HF base station transceiver on the market and we would like the opportunity to prove it to you. Why not call us, or call in person to see and try out this super rig.

If you like to read lists of features, how about 160-10 metres including new bands: passband tuning on all modes: 6146B PA tubes for low intermod: low power tune up: digital readout shows true frequency at all times: VOX built in: CW sidetone: speech processor: noise blanker: etc. etc.



TS 530S

£534.98 inc VAT Securicor Carriage £5.00

For the keen mobile/portable enthusiast, the "no-tune" solid state transceiver has proved irresistible, and the Trio TS130S is probably the best of the bunch. When the original TS120 was introduced, there were gasps of amazement at Trio's achievement in making a first class HF rig in such a small size. With the advent of the TS130S, the mobile rig really comes to maturity. Imagine an 8 band transceiver with digital readout, I.F. shift, vox, speech processor, single conversion PLL derived transmitter and receiver, 100W output, red hot receiver – and all in a package you can carry on the palm of one hand. It's really a staggering thought.

The unquestioned excellence of Trio design and manufacture shows in every aspect of the TS130S – why not see it and try it for yourself.

TS 130S.V

£525.09 inc VAT Securicor Carriage £5.00

The R-600 is a high performance, general coverage communications receiver covering 150 kHz to 30 MHz in 30 bands, at an affordable price. Use of PLL synthesized circuitry provides high accuracy of frequency with maximum ease of operation. ● 150 KHz to 30 MHz continuous coverage, AM, SSB, or CW. ● 30 bands, each 1 MHz wide, for easier tuning. ● Five digit frequency display, with 1 KHz resolution. ● 6 kHz IF filter for AM (wide), and 2.7 kHz filters for SSB, CW and AM (narrow). ● Up-conversion PLL circuit, for improved sensitivity, selectivity and stability. ● Communications type noise blanker eliminates "pulse-type" noise. ● RF Attenuator allows 20 dB attenuation of strong signals. ● Tone control. ● Front mounted speaker. ● "S" meter, with 1 to 5 SIMPO scale, plus standard scale. ● Coaxial, and wire antenna terminals for 2 MHz to 30 MHz Wire terminals for 150 KHz to 2 MHz. ● 100, 120, 220, and 240 VAC, 50/60 Hz. Selector switch on rear panel, or 13.8 VDC operation. ● Other features include carrying handle, headphone jack, and record jack.

R600

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PS30	AC power supply for TS180S	£88.50	(£4.50)
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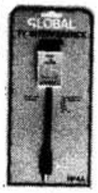

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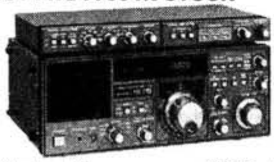

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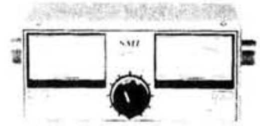

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Fully Synthesized – Covering 144 – 145.995 in 400 5KHz steps. (430-439.999 4E).

Power Output – 1.5W with the 9v rechargeable battery pack as supplied – but lower or higher output available with the optional 6v or 12v packs.

BNC Antenna Output Socket – 50 ohms for connecting to another antenna or use the Rubber Duck supplied (flexible ¼ λ whip – 4E)

Send/Battery Indicator – Lights during transmit but when battery power falls below 6v it does not light, indicating the need for a recharge.

Frequency Selection – by thumbwheel switches, indicating the frequency. + 5KHz switch – adds 5KHz to the indicated frequency.

Duplex Simplex Switch – gives simplex or plus 600KHz or minus 600KHz transmit (+ 1.6MHz and listen input on 4E).

Hi-Low Switch – reduces power output from 1.5W to 150mW reducing battery drain.

External Microphone Jack – If you do not wish to use the built-in electret condenser mic. an optional microphone/speaker with PTT control can be used. Useful for pocket operation.

External Speaker Jack – for speaker or earphone. This little beauty is supplied ready to go complete with nicad battery pack, charger, rubber duck.

A full range of accessories in stock.

		£ p
ICMLI	10W mobile booster for IC2E	49.00
BP5	11 volt battery pack	30.50
BP4	Empty battery case for for 6 x AA cells	5.80
BP3	Standard battery pack	17.70
BP2	6 volt pack	22.00
BC30	Base charger for above	39.00
BC25	Mains charger as supplied	4.25
DC1	12 volt adapter pack	8.40
HM9	Speaker/microphone	12.00
CP1	Mobile charging lead	3.20
ICI/2/3	cases	3.60 each

All prices include VAT

The IC4E is going to revolutionise 70cm!

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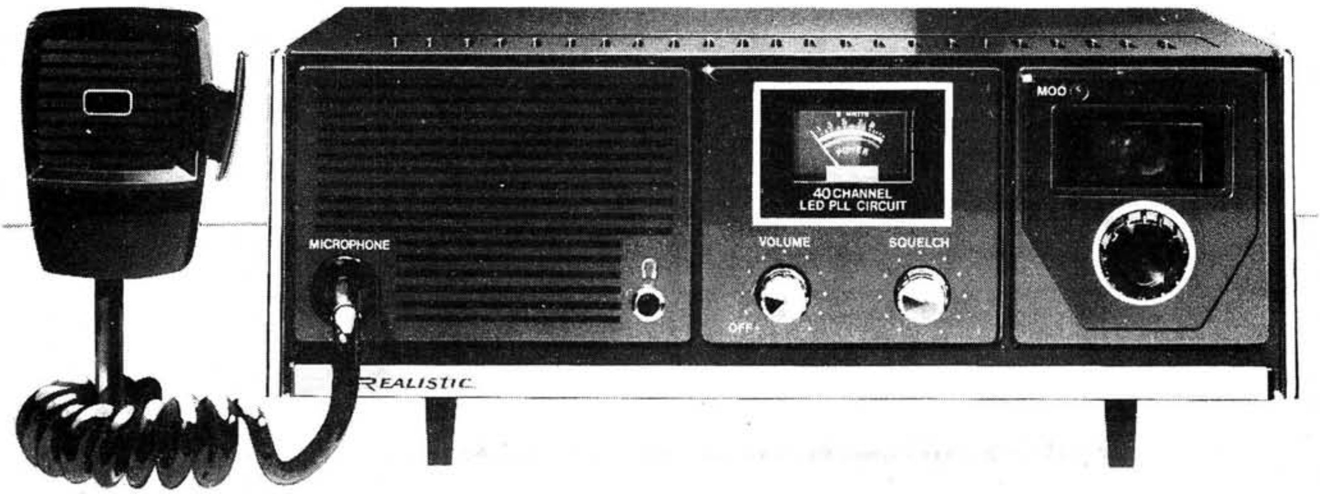

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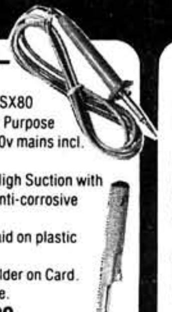

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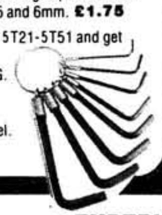

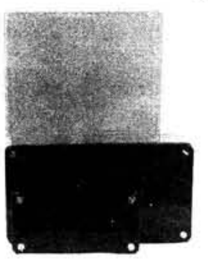

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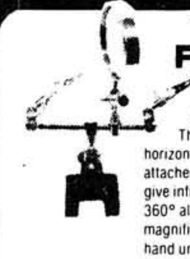

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Maximum Ratings:
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comment...

De~metrication

NO! Sorry, old-timers, we're not going back to feet and inches in *Practical Wireless*. What we are going to do, but gradually to get you used to it, is to stop using wavelength to refer to radio signals. This is in line with moves being made or at least recommended elsewhere, and makes a lot of sense with the fast-spreading use of digital frequency readouts on receivers and rigs.

An analogue receiver dial calibrated in metres becomes very difficult to read on the shorter wavelengths. Remember, for example, broadcast stations are spaced 9 or 10kHz apart throughout the long, medium and short wave bands, but this corresponds to a difference of around 70 metres on the long wave band, yet only 0·007 metres (7mm) on the 13 metre broadcast band!

I know that beginners, in particular, get confused over metric descriptions of antennas. Is a "20 metre antenna" one designed to operate most efficiently on the 14MHz (20m) amateur band, or one made from a piece of wire 20 metres long?

Beginning with this issue, we shall refer to bands by their frequency, followed by the wavelength name in brackets. For example: "the 3·5MHz (80m) amateur band". In time, we shall drop the wavelength equivalent.

★ ★ ★ ★ ★ ★

We were recently taken to task by a reader for using the term QRA to describe the European amateur locator squares system, rather than the more technically correct code QTH. In the official Q-code, QRA means "The name of my station is . . ." and QTH means "My position is . . .". I had always felt that this was just one of those Q-codes that the amateur fraternity had taken and adapted for its own use, and it did not worry me particularly even as an ex-professional c.w. operator. However, I find that a decision was taken at an IARU conference some years ago to drop the name QRA, given to the system by its original inventor, in favour of QTH. This we shall do from now onwards, and I hope it won't confuse you.

Incidentally, on the subject of confusing abbreviations, I notice that the use of "CQ TEST" by amateurs meaning "CQ CONTEST" is becoming almost universal on c.w. Since the word "TEST" has its own special relevance in radio experimentation, this seems to me a highly confusing practice. I suppose it's too late to persuade people to stop it?

Geoff Arnold

services

QUERIES

While we will always try to assist readers in difficulties with a *Practical Wireless* project, we cannot offer advice on modifications to our designs, nor on commercial radio, TV or electronic equipment. Please address your letters to the **Editor, "Practical Wireless", Westover House, West Quay Road, Poole, Dorset BH15 1JG,** giving a clear description of the problem and enclosing a stamped self-addressed envelope. Only one project per letter please.

Components for our projects are usually available from advertisers. For more difficult items, a source will be suggested in the "Buying Guide" box included in each constructional article.

PROJECT COST

The approximate cost quoted in each constructional article includes the box or case used for the prototype. For some projects the type of case may be critical; if so this will be mentioned in the Buying Guide.

CONSTRUCTION RATING

Each constructional project will in future be given a rating, to guide readers as to its complexity:

Beginner

A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently. Generally this category will be used for simple projects, but sometimes for more complicated ones of wide appeal. In this case, construction and wiring will be dealt with in some detail.

Intermediate

A project likely to appeal to a wide range of constructors, and requiring only basic test equipment to complete any tests and adjustments. A fair degree of experience in building electronic or radio projects is assumed.

Advanced

A project likely to appeal to an experienced constructor, and often requiring access to workshop facilities and test equipment for construction, testing and alignment. Constructional information will generally be limited to the more critical aspects of the project. Definitely not recommended for a beginner to tackle on his own.

SUBSCRIPTIONS

Subscriptions are available to both home and overseas addresses at £13.00 per annum, from **"Practical Wireless" Subscription Department, Room 2613, King's Reach Tower, Stamford Street, London SE1 9LS.** Airmail rates for overseas subscriptions can be quoted on request.

BACK NUMBERS AND BINDERS

Limited stocks of some recent issues of *PW* are available at 95p each, including post and packing to addresses at home and overseas.

Binders are available (Price £4.60 to UK addresses and overseas, including post and packing) each accommodating one volume of *PW*. Please state the year and volume number for which the binder is required.

Send your orders to **Post Sales Department, IPC Magazines Ltd., Lavington House, 25 Lavington Street, London SE1 0PF.** All prices include VAT where appropriate.

Please make cheques, postal orders, etc., payable to IPC Magazines Limited.

John THORNTON-LAWRENCE GW3JGA

High Definition Fast Scan Television Transmission has been available to the UK Amateur since 1952. Until a few years ago only about 200 stations were licensed for this mode of transmission (with a G6 three letter /T call sign) and of these only about 60 or so were regularly on the air.

The inclusion of High Definition Amateur TV in the new Amateur Sound licence in 1977 and the availability of closed circuit TV cameras and commercially made ATV transmitters, has increased interest and activity dramatically in the last year or so.

There are now several hundred UK amateur stations equipped to transmit ATV and of these a good proportion are regularly transmitting and receiving live pictures.

Most ATV stations transmit the 625-line vision signal on the 432–440MHz (70cm) amateur band and the accompanying sound on the 144MHz (2m) band. The ATV calling channel is 144·750MHz and after establishing contact the accompanying sound and talk-back is usually transferred to one of the locally used 144MHz band f.m. simplex channels, e.g. S13–S19.

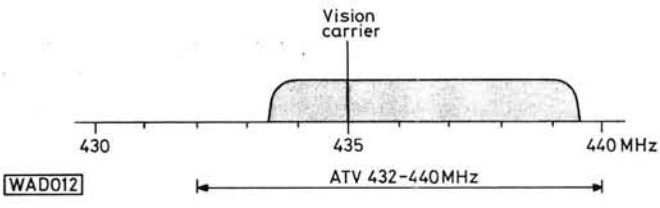


Fig. 1(a): Restricted bandwidth transmission, monochrome with sound on 144MHz (2m) band

Some stations transmit a combined vision and sound signal with 6MHz spacing as in UK television broadcasting where the sound and vision are tuned-in together.

The majority of stations transmit monochrome pictures, but with the availability of low-cost colour cameras, usually purchased as a package deal with the domestic video recorder, an increasing number are able to transmit in colour.

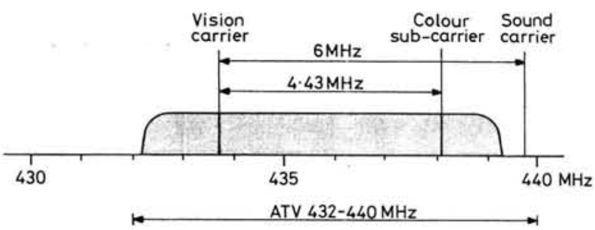


Fig. 1(b): Full bandwidth transmission, colour and sound

The up-converter to be described was designed to be a readily reproducible unit for prospective ATV viewers to build. It receives ATV transmissions in the 432MHz band and converts these up to approximately 605MHz (TV Channel 37) for viewing on an unmodified domestic u.h.f. TV receiver.

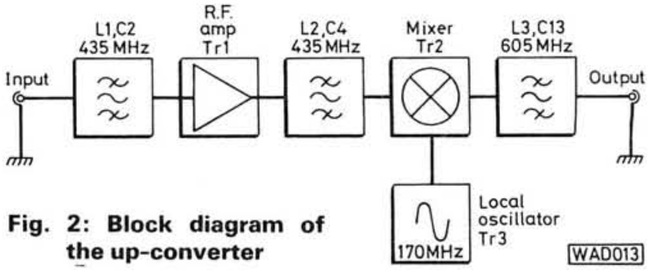


Fig. 2: Block diagram of the up-converter

The converter uses a double-sided p.c.b. with "stripline" tuned circuits and matching flat T pack transistors.

Referring to the block diagram Fig. 2, the circuit consists of an r.f. amplifier stage followed by a mixer stage with its associated local oscillator.

The local oscillator frequency chosen is 170MHz which mixes with the incoming signal, of nominally 435MHz, to produce sum and difference frequencies of 605MHz and 265MHz. The 265MHz signal is then filtered out, leaving the 605MHz signal to pass to the TV receiver, tuned to Channel 37.

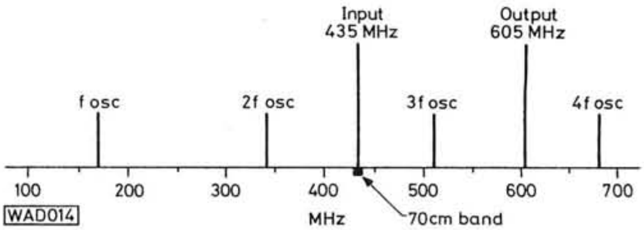


Fig. 3: Frequency spectrum showing oscillator and signal frequencies

In receivers and converters where the local oscillator is below the signal frequency, it is important that the oscillator harmonic frequencies do not fall on, or near, the incoming and outgoing signal frequencies, as interference may result. It can be seen from the frequency graph in Fig. 3 that all the oscillator harmonics are well clear of the signal frequencies and no problems of this kind should arise. The full circuit diagram is shown in Fig. 4.

RF Amplifier

The r.f. amplifier stage, Tr1, employs a BFR34A transistor connected in common emitter configuration. Signals from the antenna are coupled to the input tuned circuit L1, C2 via C1. The base of Tr1 is connected to a tapping point on L1 and is fed with bias voltage from R2 and R1.

The collector of Tr1 is connected to the tuned circuit L2, C4 and supplied with d.c. through R3. Decoupling for the "cold" end of L1 and L2 is provided by the feed-through capacitors C3 and C5 respectively.

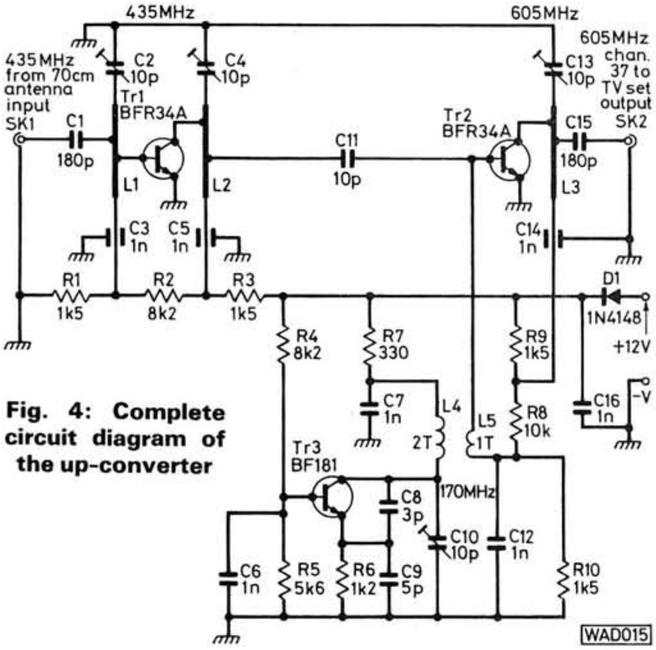


Fig. 4: Complete circuit diagram of the up-converter

Mixer Stage

The mixer stage transistor Tr2 is also operated in the common emitter mode with both signal and local oscillator applied to the base. The output of the r.f. amplifier stage is capacitively coupled through C11 and the local oscillator is inductively coupled by the oscillator coupling coil L5. This is a very convenient arrangement as C11 and L5 form a high-pass filter for signal frequencies and a low-pass filter for the local oscillator frequency.

The collector of Tr2 is connected to the output resonant circuit L3, C13 which is tuned to 605MHz. The output is capacitively coupled from a tapping point on L3 via C15 to the u.h.f. TV receiver. Decoupling for the "cold" end of L3 is provided by C14 and the supply voltage and biasing are provided by R9, R8 and R10, with decoupling of L5 by C12.

Local Oscillator

Because the ATV transmission is a broad-band signal and the TV receiver usually has automatic frequency control, the stability of the local oscillator is not particularly important. However, it is important that the oscillator is adjusted to the correct frequency of 170MHz for reasons mentioned previously.

The local oscillator consists of Tr3, a BF181, in a common base Colpitts circuit. The capacitive feedback tap to the emitter is taken from the junction of C8 and C9. These two capacitors together with C10 and L4 form the oscillator tuned circuit. Base biasing for Tr3 is provided by R4, R5 and decoupling is by C6. Components R7 and C7 provide a d.c. feed and decoupling for the collector circuit.

★ components

Resistors
¼W 5% Carbon film

330Ω	1	R7
1·2kΩ	1	R6
1·5kΩ	4	R1, 3, 9, 10
5·6kΩ	1	R5
8·2kΩ	2	R2, 4
10kΩ	1	R8

Capacitors
Ceramic disc

1nF	4	C6, 7, 12, 16

Sub-min ceramic plate

10pF	1	C11
180pF	2	C1, 15

Ceramic feed-through

1nF	3	C3, 5, 14

Silver mica

3·3pF	1	C8
5pF	1	C9

Miniature polypropylene trimmer

2-10pF (DAU or RS125-648)	4	C2, 4, 10, 13

Semiconductors
Transistors

BFR34A	2	Tr1, 2
BF181	1	Tr3

Diode

1N 4148	1	D1

Miscellaneous
Tinned copper wire 20, 22 s.w.g.; Glassfibre p.c.b.; Belling Lee surface socket; 50Ω b.n.c. socket; Diecast box 114 × 89 × 55mm.

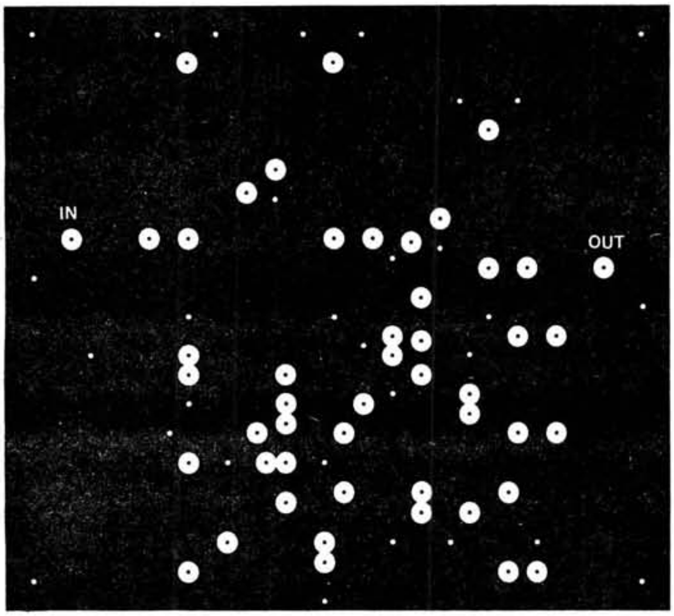
CONSTRUCTION RATING Intermediate

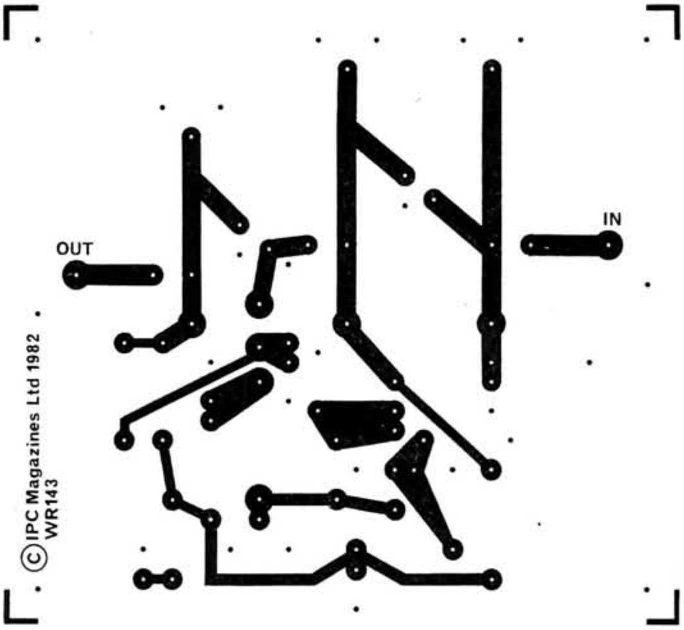
BUYING GUIDE

All components required for this project are readily available from advertisers in *PW.*

APPROXIMATE COST £10·50

Diode D1 is the "idiot diode" which prevents damage to the transistors should the 12 volt supply be accidentally connected the wrong way round!





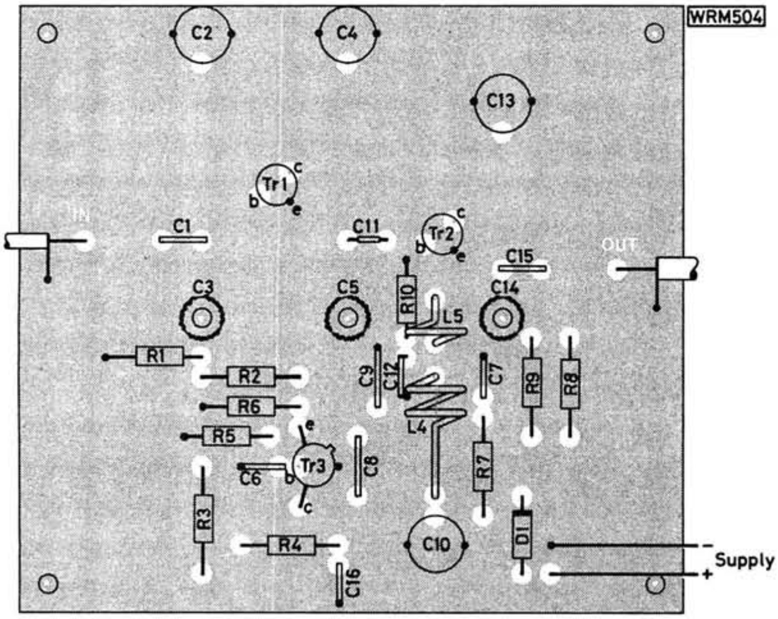


Fig. 5: (Above left) component side p.c.b. ground plane pattern

Fig. 6: (Above) track pattern layout. *Good quality glassfibre board must be used*

Fig. 7: (Left) component layout of the up-converter circuit board

Construction

The up-converter is constructed using a glassfibre double-sided printed circuit board. The stripline inductors L1, L2 and L3 and all the usual interconnecting tracks are printed on one side of the board and the other side is left completely covered with copper to form a ground plane. All the components are mounted on this side of the board.

Because the up-converter operates at u.h.f. it is important that the correct types of components are used and that lead lengths are kept as short as possible. The constructional information that follows is more detailed than usual and if followed carefully should provide problem-free first time operation.

The best sequence for fitting the components is: resistors, diode, disc capacitors, feed-through capacitors, trimmers, coils and finally transistors.

When fitting the resistors, it is convenient to fit them in numerical order R1–R10. Where the wire end of a resistor appears through an *isolated* pad, that end should be soldered to earth on the ground plane (component) side of the board, as shown in Fig. 9. The same method applies to disc capacitors and C9 where one end is to be earthed to the ground plane.

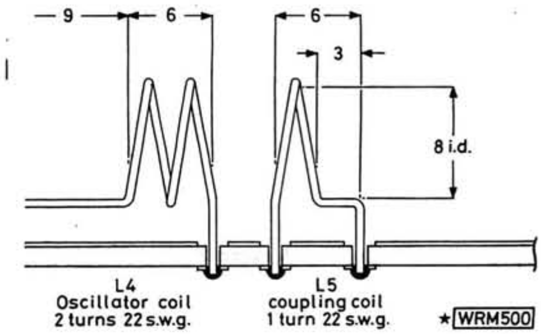


Fig. 8: Details of the wound components, L4 and L5, and their mounting

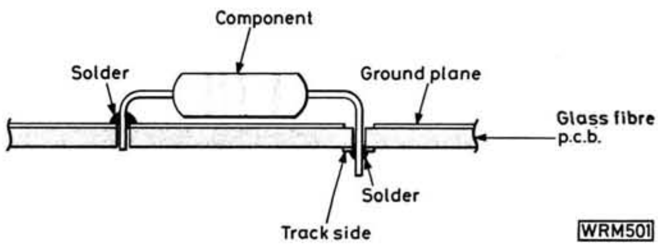


Fig. 9: The correct method of mounting components on the p.c.b.

Feed-through Capacitors

Feed-through capacitors C3, C5 and C14 are fitted from the ground plane side of the board, but are mounted "upside down", with the insulated part of the stem projecting through the hole to the track side of the board as shown in Fig. 10.

It is useful to lay the board over a small tobacco tin or box so that you can solder the feed-through capacitors in place without the board wobbling about. After fitting the three feed-through capacitors the board should be turned over with the track side on top.

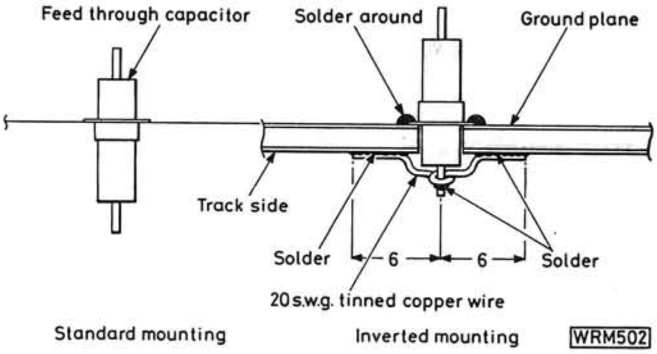


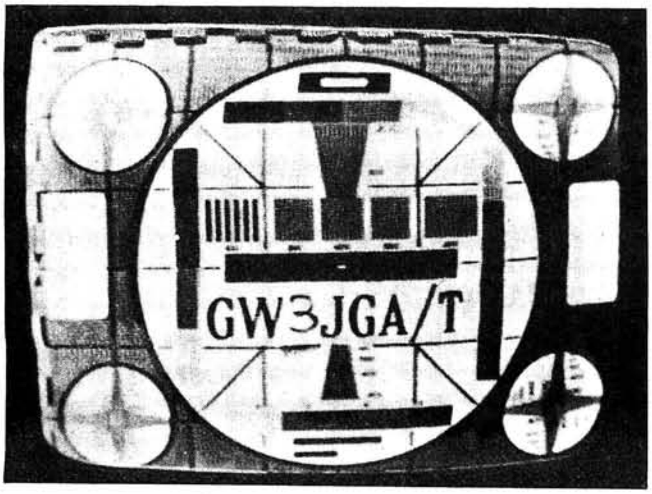
Fig. 10: (Above) Feed-through capacitor mounting details. The photograph opposite shows the three stages of linking to the strip lines

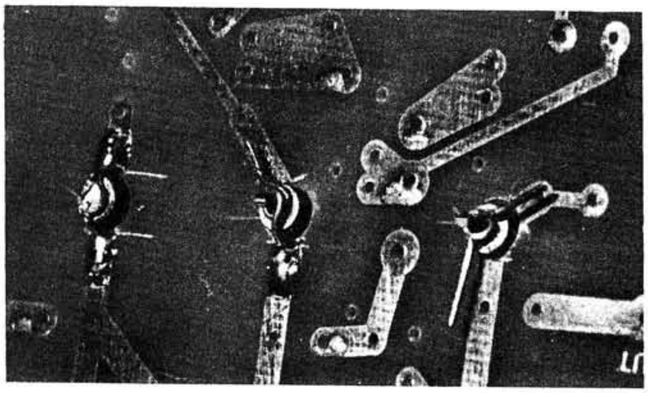
The connection from the centre of the feed-through capacitor to the track, shown in Fig. 10, is best done by taking a short length of 20 s.w.g. tinned copper wire and bending it with one turn around the centre conductor of the feed-through capacitor, then laying it on top of the track each side of the capacitor, pushing it down flat and soldering it at the three points of contact. The solder should then be made to run along the wire thus making a continuous joint. The solder must **not** make contact with the **sleeve** of the feed-through capacitor.

Be fairly generous with the solder but do not apply the soldering iron longer than is necessary or the tracks may become detached from the board.

Check for short circuits across the capacitors. Typical readings to the ground plane are: C3 1·4kΩ, C5 4·4kΩ, C4 4·6kΩ.

When fitting the trimmer capacitors, it is best to have the ground plane uppermost and insert the trimmers from the top. The two earth tags are then soldered, at the same time making sure that the trimmer is fully seated. The board is then turned over and the live connection of the trimmer soldered to the track/stripline circuit.





Oscillator Coils

The coils are the next items to fit. These are wound on an 8mm mandrel (an ordinary round pencil or drill shank will do), using 20 s.w.g. tinned copper wire. The wire should be pre-stretched by clamping one end of a 600mm length in a vice and pulling the other until it stretches slightly.

The coils should be mounted about 2·5mm above the ground plane. A wooden match is a useful jig for fixing the height of the bottom of the coils above the surface of the board. Use an 8mm drill or pencil to align the axis of the coils whilst soldering in position.

Transistors

Finally the transistors. Note the orientation of the stripline transistors (BFR34A) as shown in the component view of the board. The BF181 should have its case lead soldered to the ground plane.

The p.c.b. is provided with four mounting holes at the corners and may be fitted in a suitable metal box or on a baseplate. In either case it should be spaced away from the metal surface by at least 6mm by means of suitable spacers or pillars.

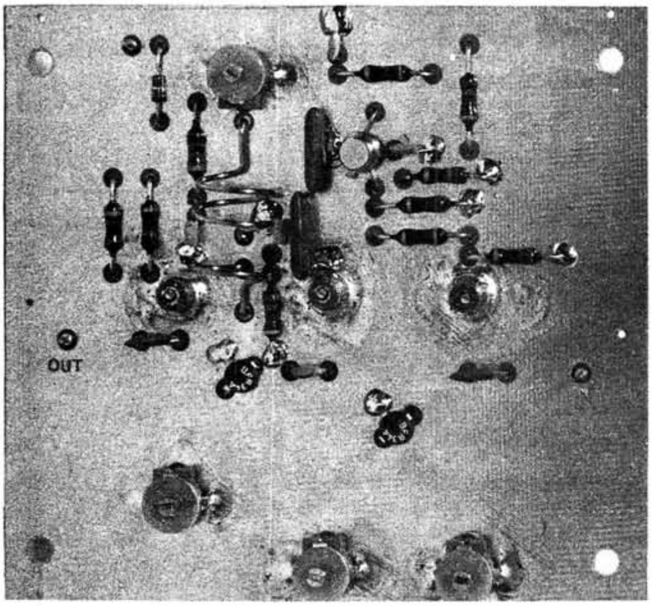
Testing

1) *Supply Current:* Connect the completed up-converter to a 12V supply, observing polarity, and include a current meter in the positive supply lead. The meter should indicate 13mA approx. Remove the meter from the supply lead.

2) *Setting the local oscillator frequency (170MHz):* An absorption wavemeter or dip oscillator is required. Connect a 432MHz antenna to the converter INPUT and a TV receiver to the OUTPUT. Measure the voltage at the base of Tr3 across C6. Voltage = 3·3 volts approx. Check that the oscillator is running by placing the fingers across the oscillator coil and noting that the voltage on Tr3 base, varies. Closely couple the wavemeter to the oscillator coil and tune the wavemeter, noting at which position there is a change in the voltage on Tr3 base. Adjust C10 until the frequency of the local oscillator is 170MHz, as detected by the absorption wavemeter.

3) *Alignment:* Tune the TV receiver to Channel 37 and adjust C13 for maximum noise (snow) on the screen. Using a signal source or off-air signal (435MHz approx) adjust C4 and C2 for maximum signal. Readjust the receiver tuning, then C13, C4 and C2 for best performance.

Note: Without an antenna connected, the r.f. amplifier stage may become unstable. Tuning adjustments should only be made with a 432MHz antenna, signal generator, or 50/75Ω resistor connected to the antenna input. The re-aligned output of a TV game can provide a good test signal.



Receiving Amateur TV Signals

The usual way of finding out about ATV activity in your area is by "earwigging" on the 144MHz band, particularly the ATV calling channel and the local "net" channel. Alternatively, enquiries at your local Amateur Radio club should prove fruitful.

If there is a local amateur transmitting ATV who lives just down the road or up to 2 km or so line-of-sight, then a simple Yagi antenna may be adequate. However, for good results the received signal must be very strong. An "S9" signal on phone will give a lockable but noisy picture on vision. The signal needs to be about 20–30dB (× 20 voltage) stronger than "S9" for good results. This usually means having an efficient beam antenna such as the JayBeam MBM48/70, a popular ATV antenna which also looks like the domestic version!

The antenna should be mounted clear of the rooftop and beamed onto the transmitting station. The transmitting station should also be beaming in your direction to give noise-free pictures.

Reporting ATV Signals

The British Amateur Television Club (BATC) publish a pictorial reporting card for ATV signals in the range 0 to 5. These are shown in Table 1.

TABLE 1

5	Excellent	No noise visible
4	Good	Slight noise visible
3	Fairly Good	Noticeable noise
2	Passable	High noise level
1	Limited Use	Objectionable noise
0	Not Usable	Picture lost in noise

As a guide, a good noise-free "4–5" picture can be received over a path of 8–25km line-of-sight, with both stations using MBM48/70 antennas or similar, and a transmitter power output of 10W peak. *PW*'s Ron Ham will look forward to your reports and pictures.

The BATC also publish a quarterly journal *CQ-TV*, which gives details of ATV equipment, stations, contests, exhibitions and other activities.

The BATC Membership Secretary is Mr B. Summers, 13 Church Street, Gainsborough, Lincs. Tel. 0427 3940. ●

SPECIAL PRODUCT REPORT

sabtronics 8610B

FREQUENCY COUNTER KIT

It's been quite some time since *PW* had the opportunity to review a constructional kit and so it was a pleasant change to receive the subject of this review from Sabtronics. What made it even more interesting was the ready built version also supplied, allowing direct comparisons to be made with our own constructional efforts.

Depending on your vintage the initial vision conjured up by a device capable of measuring frequencies of up to 600MHz with a resolution of 10Hz, might resemble something like a hundredweight of steel-plated orange box—the reality in this case is fortunately very different.

General Description

The Sabtronics 8610B frequency counter is a lightweight, fully portable battery operated, 9-digit instrument suitable for workshop or site use. Housed in a durable moulded grey plastics enclosure the complete set of operating controls, display and driving circuitry are mounted on and behind the coloured front panel.

The 9mm high red l.e.d. display occupies half of the 190mm wide front panel and is accompanied by slide switches to select ON/OFF, 10, 100 or 600MHz RANGE and 0·1, 1 and 10s GATE TIME. A rotary potentiometer allows adjustments to be made to either of the two independent inputs. Input A has an impedance of 1MΩ and covers the range 10Hz to 100MHz, whilst input B has an impedance of 50Ω and covers from 10MHz to 600MHz. Maximum input drive levels are quoted as 400V and 3V peak-to-peak, respectively. Both inputs use standard 50Ω BNC surface mounted sockets. The front panel features are completed by the inclusion of a 2mm diameter red l.e.d. which pulses in sympathy with the GATE TIME interval.

Operating Theory

The 8610B makes full use of the latest techniques of large scale integration (l.s.i.) to achieve an amazingly low component count with attendant increase in reliability. A total of five i.c.s are used, including two on the "piggy-back" 600MHz prescaler board and a further eight discrete transistor devices.

Initially ignoring the 600MHz prescaler section, input signals introduced via the 10Hz to 100MHz A input are amplified by a discrete semiconductor stage formed by Q1, a 2N5486 f.e.t., and Q2 a 2N5771. The amplified signal is presented next to i.c. Z1 containing three cascaded e.c.l. (emitter coupled logic) amplifier stages, all biased into the linear region. Positive feedback at the output of the last stage, when reflected through the gain of the preceding stages and including the input stage, results in approximately a 5mV hysteresis in the input triggering levels to aid noise rejection.

The by now considerably amplified signal undergoes translation to t.t.l. level before passing to i.c. Z2, which divides the signal by a factor of 10, presenting a maximum signal frequency of 10MHz to the counter i.c. Z3. This 28-pin package has three principal functions:

(1) An internal oscillator utilises the crystal connected between pins 25 and 26 to create a 10MHz signal which is internally counted to give periods of 0·1, 1 or 10s, depending on GATE TIME selected via the front panel.

(2) Signals introduced via pin 28 are counted and the number of cycles within the GATE TIME period selected are stored internally.

(3) Each digit within this sum is successively examined and the digit drive pin appropriate to that digit grounded, the value of that digit is then converted to the seven segment display format and output. A count that exceeds the eight digits stored is detected and the condition identified by a decimal point output appearing on the l.e.d. display within the ninth position from the r.h. side.

A three terminal i.c. Z4 regulates externally applied 9 volt d.c. from the optional mains supply to charge the NiCad battery pack, which is also optional. The internal battery pod may also be equipped with 4 R14 (SP11) $1\frac{1}{2}$V dry cells.

If the RANGE switch is set to the 600MHz position the 50Ω B input is a.c. coupled to a signal frequency i.c. preamplifier, on the separate prescaler p.c.b. A subsequent i.c. stage performs a divide by 20 function thus presenting a maximum frequency of 50MHz to the main counter chip prescaler.

Building the Kit

The complete model 8610B kit arrives in an adequately packaged box that contains all the necessary components, p.c.b.s and instruction manual, with the exception of batteries. A comprehensive three page component check list is incorporated within the 20 page assembly manual.

From the outset Sabtronics wisely do not assume that the constructor has anything beyond a basic working knowledge of electronic construction techniques. The first two pages of the manual detail the requirements for satisfactory assembly, covering the topics of good soldering and component lead pre-forming, all accompanied by clear explanatory diagrams. For those unsure of the colour coding system and markings of resistors and capacitors the detailed check list literally spells these out leaving the constructor in no doubt about component identification.

Assembly instructions and further detail diagrams account for the balance of the manual; a step-by-step approach, together with "tick-off" boxes, allows a visual double check of assembly progress to be made. Both the main 190 × 60mm, and piggy-back 60 × 40mm, p.c.b.s are marked to indicate component locations.

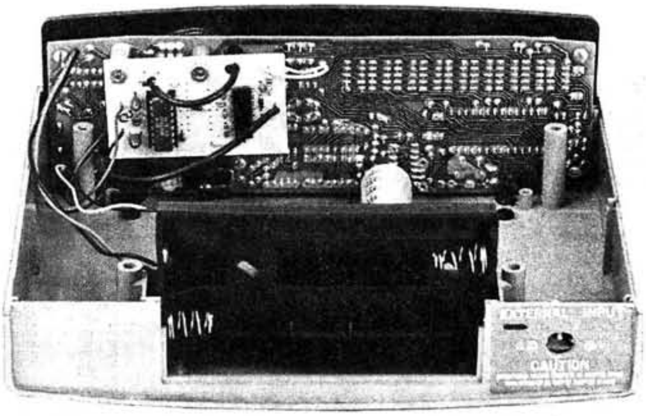
During my assembly of the kit, following the provided instructions, I encountered three items which could have caused problems for the novice constructor. The first concerned the fitting of sockets to the main p.c.b. Unfortunately the instruction to do this appeared on the page after the instruction to fit the i.c.s themselves! There **was** an addendum stapled to the inside cover of the manual but having read this some time before, I of course promptly forgot it. My fingers are still crossed hoping that I will never need to replace Z1, 2 and 3.

The second problem concerned a capacitor marked C11 on the 600MHz prescaler board—after a fair bit of "Sherlock Holmes" this device turns out to be a link wire. Nearly got me that time, because as usual I studied the circuit diagram, which makes the situation very clear, last.

Finally the potentially most serious problem which concerned an inoffensive instruction to install an insulated jumper wire between selector switches SW2 and 3 to retain a coaxial feeder run. What the assembly manual note really meant was use a *non-conductive* link between the switches

★ specification

Frequency range:	10Hz–600MHz in 3 ranges
Input impedance:	Input A–1MΩ/100pF Input B–50Ω nominal
Sensitivity:	10Hz–100MHz–15mV r.m.s. 100–600MHz–20mV r.m.s.
Input protection:	400V peak-to-peak at 10Hz reducing with frequency to 3V at 600MHz
Gate times:	0·1, 1 and 10s, switch selectable
Display:	9-digit 9mm l.e.d. with auto decimal point, leading zero suppressed
Maximum resolution:	0·1Hz on 10MHz range 1Hz on 100MHz range 10Hz on 600MHz range, all with 10s gate times
Time base:	Frequency 10MHz Temperature stability ±1 p.p.m., 0°–40°C Setability ±2 p.p.m. Ageing rate <5p.p.m./year
Measurement accuracy:	1Hz ± 1 digit + time base error
Supply requirements:	4·8–6·5V d.c. at 300mA from 4 R14 (SP11) cells or optional a.c. adaptor/charger
Dimensions:	203 × 165 × 76mm
Weight:	0·59kg excluding batteries



to form a cable tie. Constructors who read in the same way as I do will be able to restore the shorted power input to the counter, without any lasting effects, by not fitting this link.

As a result of correspondence with the manufacturers I have since been assured by the President of Sabtronics International, Mr Gul. M. Sabadia, that all future assembly manuals will embody the lessons learned by me the hard way. These points having been cleared up no problems of construction should occur.

At the conclusion of my constructional efforts it was encouraging to find no missing, or extra, components. So I passed to the final phase, calibration. A separate 16 page operator's manual is supplied with the kit providing *full* specification details, operating theory and suggestions, calibration and trouble-shooting, once again accompanied by clear illustrations and circuit diagrams.

The calibration consists of two simple stages, the first of which requires a d.c. voltmeter covering the 0–3V range in order to set the quoted bias level to the e.c.l. amplifiers. The second adjustment concerns the alignment of the 10MHz GATE TIME oscillator. An ideal way of setting this oscillator would be to inject an accurate signal of a known frequency, preferably between 3 and 50MHz, and adjust the oscillator trimmer until the correct reading is obtained on the display. Alternatively the manual suggests using the technique of zero beating the 10MHz oscillator with that of a received standard frequency transmission of the same frequency, i.e. MSF, WWV etc. The trimmer is adjusted until the loosely coupled output of the 10MHz gate oscillator equals that of the received signal. This adjustment can be made after assembly by inserting a suitable trim tool through a small front panel hole provided for the purpose. With the freshly assembled kit when first switched on the readout was found to be within 400Hz of actual frequency, requiring very little effort to adjust precisely.

Making due allowances for individual constructor's ability it should be a reasonably straightforward task to assemble and test the frequency counter in 6 to 7 hours of steady work. The completed kit performed in all respects in a manner identical to the ready built version, providing a very useful addition to the workshop armoury. Using a standard λ/4 144MHz (2-metre) rubber duck antenna on input B, at maximum sensitivity setting, the output frequency of an IC-2E could be read at a range of 7 metres.

John M. Fell

Our thanks for the review samples go to the sole UK and Eire importers of the Sabtronics test equipment range, **Black Star Ltd., 9A Crown Street, St. Ives, Cambs PE17 4EB. Tel 0480 62440.**

The 8610B kit currently costs £84 and the ready built version £99, both prices excluding VAT. Full details of the Sabtronics range of test equipment are available from the above address.

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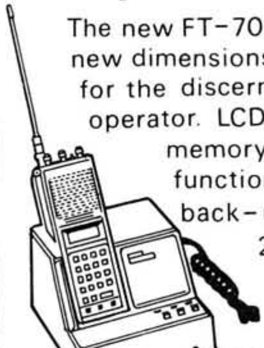

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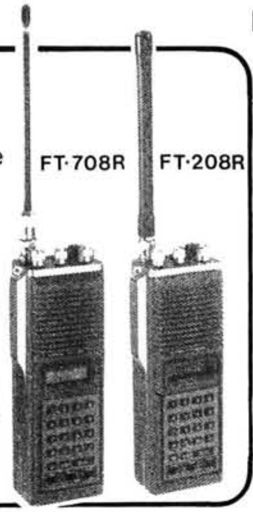

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MODS

IMPORTANT—The ideas presented here are suggestions only, and as they are untried by this magazine, we cannot accept responsibility for any resultant damage, however caused. Before alterations are attempted, care should be taken to ensure that any guarantee is not invalidated, and it should also be borne in mind that modifications usually have an adverse effect on resale prices. In cases where specialist skills or equipment are needed, most dealers will undertake the work for a reasonable fee.

Roger Hall G8TNT(Sam)

No. 15

This *Mods* column has been running for over a year and I am now receiving a number of letters from readers who want information on previous issues. Requests such as "Have you ever printed a reverse repeater mod for the Trio TR-2400?" or "When did you publish the extended frequency mod for the Icom IC-2E?" have convinced me that it is time to publish a complete index to the Mods column.

No. 1

This appeared in the November 1980 issue and it contained two mods for **Trio TR-2400.** The first described a very simple way to extend the frequency range and the second showed how to run the set from an external power supply.

No. 2

This article appeared in the December 1980 issue. The first part described how to make a simple "Up-Down" unit out of a matchbox and two pushbutton switches. The rest of the article showed how the **Yaesu FT-480** can be modified for semi-reverse repeater (listen input) and automatic tone burst.

No. 3

This appeared in the January 1981 issue. The first mod showed how to extend the frequency range of the **Trio TR-2400** without opening the case or doing any soldering. The other mod showed how to alter the bandwidth filters inside the **Trio R-1000.**

No. 4

This appeared in March 1981 and the first mod showed how to extend the frequency range of the **Cambridge Kit's Low Frequency Counter.** The second described how to modify the **Trio TS-520** to allow the heaters to be turned off when the set is being used for receiving only. The last idea in this article was for a cheap replacement microphone for the **Trio TR-2400.**

No. 5

This article appeared in the April 1981 issue and it contained two mods. The first showed another way to alter the bandwidth of the **Trio R-1000.** The second was a full reverse repeater mod for the **Standard C-8800.** A *Kindly Note* for Mods 5 appeared in May 1981.

No. 6

This appeared in the May 1981 issue and the entire article was devoted to the **Trio TR-2300.** The first mod for this set was for reverse repeater and the other two described alternative uses for the spare l.e.d. One mod used it to indicate the presence of a battery charging current and the other made it light whenever the toneburst is switched on.

No. 7

Four mods for the **Icom IC-2E** were described in the June 1981 issue. The first two were for using the set in conjunction with external power supplies. Another gave details of semi-reverse repeater and the last one showed how to extend the frequency range to cover either 4 or 10MHz.

No. 8

The August issue contained three mods. One showed how to make the a.g.c. on the **Trio R-1000** switchable. Another described an easy way to make the HI/LO switch on the **Trio TR-9000** effective on s.s.b. as well as on f.m. The last was a tip about using the auto-clarifier on the **Yaesu FT-480R.**

No. 9

This appeared in the September 1981 issue and it contained two mods. The first tip was for a type of switch to use in conjunction with the **Icom IC-2E** mod that appeared in the June issue. The second showed how to add a Hi/Lo power switch to the **Trio TR-2400** so that the batteries can be made to last longer.

No. 10

This appeared in the October 1981 issue. The first idea was a novel use for the plastic tweezers that were given away with the December 1980 issue of *PW*. The second mod was for reverse repeater for the **Trio TS-770E** and the article concluded with some hints on using an external power supply with the **Icom IC-2E.**

No. 11

This appeared in the December 1981 issue. The article was devoted to the **Yaesu CPU-2500RK.** Semi-reverse repeater and extending the frequency range were the two mods described.

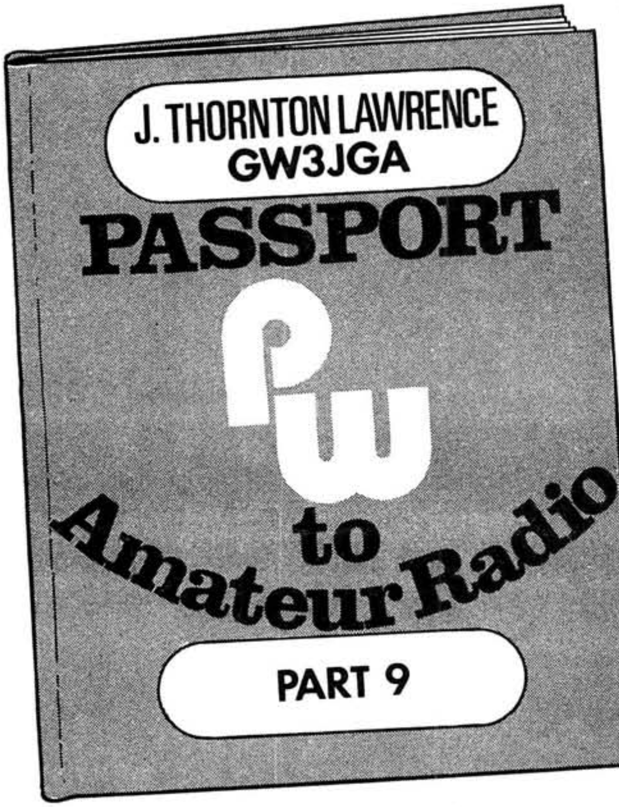
No. 12

This article appeared in the January 1982 issue and it contained two mods for the **Trio TR-9000.** The first showed how to fit a small rechargeable battery to provide memory back-up when the set is disconnected from the power supply and the second was for semi-reverse repeater.

No. 13

This article appeared in the February 1982 issue and it contained another two mods for the **Trio TR-9000.** The first showed how memory scan could be achieved and the second showed how to extend the frequency range and

continued on page 36▶▶▶



This month we will be looking at the subjects of radio waves and their propagation.

Radio Waves

A radio wave is a form of electromagnetic radiation which in free space travels at the speed of light, i.e. 300 000 000 metres per second (300×10^6 m/sec).

The relationship between frequency (f) and wavelength (λ, Greek letter Lambda) is given by the expression,

$$\lambda \text{ (metres)} = \frac{\text{Velocity of propagation (m/sec)}}{\text{f (hertz)}}$$

by inserting the velocity constant of 300×10^6 metres per second we then have

$$\lambda \text{ (metres)} = \frac{300 \times 10^6}{\text{f (hertz)}}$$

For example: what is the length of a radio wave having a frequency of 2MHz?

$$= \frac{300 \times 10^6}{2 \times 10^6} = 150 \text{ metres}$$

Conversely, given the wavelength, we can determine the frequency. If a radio signal has a wavelength of 3 metres, what is its frequency?

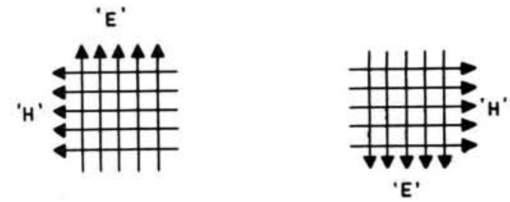
$$f = \frac{300 \times 10^6}{3} = 100\text{MHz}$$

Propagation of Radio Waves

In the RAE question papers the City and Guilds still use the term aerial in place of antenna. Throughout this series we have used the term antenna but the alternative reference should be noted.

The radiation from an antenna moves outwards at a constant velocity, in concentric circles of increasing radii.

A radio wave may be visualised as having an electric field with an associated and inseparable magnetic field at right angles to it.



Electric & Magnetic Fields, Wave Approaching Observer

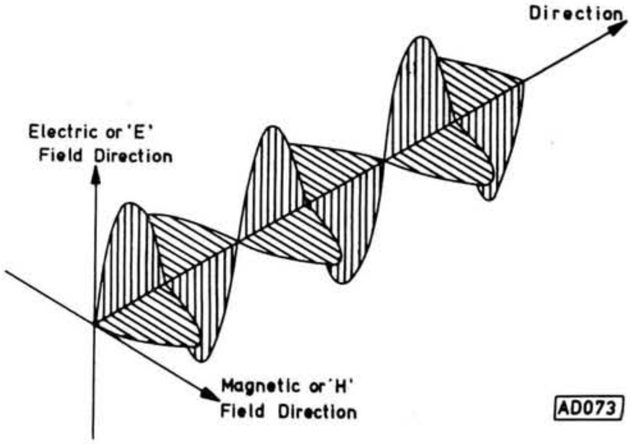


Fig. 80: Propagation of an electromagnetic wave

A diagrammatic representation of such a wave is shown in Fig. 80. The magnetic and electric fields are always in phase.

Radio waves may be reflected, refracted (bent) and absorbed just as in the case of light. Reflection, refraction and absorption of radio waves, in the range 1–70MHz, takes place in a region above the surface of the earth known as the **Ionosphere,** which extends from an altitude of about 100km to around 400km.

In the Ionosphere, air molecules are ionised due to the influence of ultra-violet radiation from the sun, that is, they break up into free electrons and positive ions. The ionised regions so formed have the property of reflecting radio waves and they play an essential part in long distance shortwave (h.f. bands) propagation.

The ionisation forms into layers which vary in height and density from day to night, as shown in Fig. 81, and also with the seasons.

F Layer

During the daytime the **F Layer** separates into the **F_1 and F_2 Layers.** At night and in mid-winter the two merge into the single F Layer again, but at a somewhat lower altitude. In the absence of sunlight, recombination of ions and electrons slowly takes place and in the F Layer ionisation is at a minimum just before dawn.

E Layer

The **E Layer** region remains at about the same altitude during both day and night, but the intensity of ionisation (and hence its reflective properties) increases with the presence of sunlight and is at a maximum around noon.

In the absence of sunlight, recombination commences fairly rapidly but a certain level of ionisation persists.

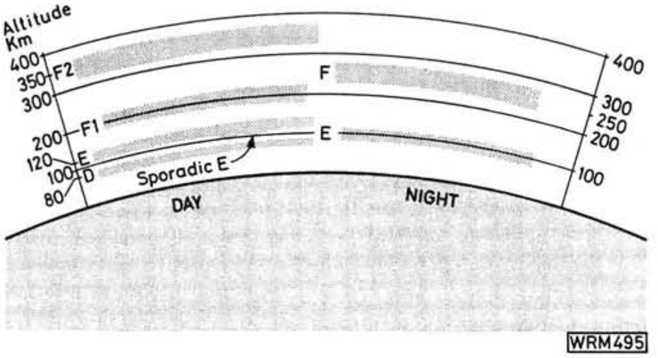


Fig. 81: The ionospheric layers

D Layer

The ionisation level in the **D Layer** is dependent on the "height" of the sun. This causes both absorption and reflection effects. The layer disappears at night time and the mechanism of formation and dispersal is not fully understood.

Reflection capabilities of the various layers depends not only on the intensity of the ionisation but also on the angle at which the wave arrives and its frequency. A higher frequency wave requires a greater degree of ionisation to cause reflection.

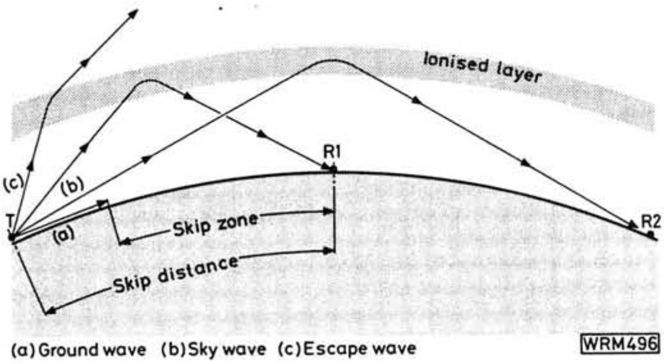


Fig. 82: Ionospheric propagation

Types of Propagated Waves

Reference Fig. 82.

(a). **Ground Wave.** The ground wave, as its name suggests, follows the earth's contour and is eventually attenuated to zero by absorption.

(b). **Sky Wave** (ionosphere wave). The sky wave is the part of the radiation leaving the transmitter which returns to earth again due to reflection (and some refraction) by an ionised layer.

(c). **Escape Wave.** For a given frequency, there is an associated maximum angle of transmission, above which the transmitted wave will no longer be reflected by the ionised layer in question, but will penetrate and continue beyond it; this is referred to as the escape wave. This angle is associated with the **Maximum Useable Frequency** (m.u.f.), which will be looked at later on.

Skip Zone and Skip Distance

Between the end of the ground wave and the point at which the sky wave returns to earth is a region known as the **Skip Zone.** Within this region the transmitter at T in Fig. 82 cannot be received.

The distance between T and the nearest point at which the sky wave is received is known as the **Skip Distance.**

Critical Frequency

At the lower frequencies, a signal directed vertically into the ionosphere will be reflected back to the transmission point.

However, if the frequency of this signal is progressively increased, a point is reached where reflection just fails to take place. The frequency at this point is known as the **Critical Frequency** (for the particular ionised layer under consideration).

Maximum Useable Frequency (m.u.f.)

It is often a requirement to transmit signals over a particular distance. Let us consider the path of wave (b) in Fig. 82 and imagine that we wish to transmit signals to a receiver at R1.

If the transmitter frequency is increased, wave (b) would penetrate the ionised layer, and wave (c) (Escape Wave) would not be reflected. For reflection to occur at the higher frequency, it would be necessary to lower the transmission angle, in which case the reflected wave would not return to earth at the desired receiving point, R1, but beyond it at R2.

Thus for a given transmission distance and a given ionised layer, there is a maximum frequency above which the transmitted wave will not be received.

The maximum frequency at which such reflection just takes place, with the wave still returning to earth at the required distance, is known as the Maximum Useable Frequency (m.u.f.).

The longest signal path for a particular layer is obtained when the wave leaves the earth and approaches the layer at the most oblique angle possible. This gives a range using the F2 Layer of about 4000km and for the E Layer, about 2500km.

If we consider a simple omni-directional antenna, the wave-front will move out from it like an expanding bubble. When we speak of a particular transmission angle we are referring to the behaviour of a part of the wave-front which is leaving the antenna in this way. At a given frequency, waves (a), (b) and (c) in Fig. 82 all exist simultaneously.

Fading

Propagation conditions are rarely, if ever, static and fluctuations of the received signal, commonly called **fading,** can be attributed to a variety of reasons. If the signal from the transmitter arrives at the receiver by more than one path, the relative phase variations can reinforce or cancel one another, causing rapid and severe fading. Polarisation of the radio wave may be changed by the propagation conditions resulting in an apparent reduction of strength. The signal may also be attenuated by varying degrees when reflected by an ionised layer, particularly when the frequency is near to the maximum useable frequency. At v.h.f. and u.h.f. fading may be attributed to varying atmospheric conditions, temperature and humidity etc.

Sunspots

Sunspots are regions of magnetic disturbance on the surface of the sun. Greatly increased ultra-violet and X-radiation are associated with sunspots which have a profound effect on the intensity of ionisation in the ionosphere.

Activity tends to reach a maximum at approximately 11 year intervals and as the level of ionisation follows this pattern, we experience exceptionally long-distance signal paths on the higher frequencies at these times.

Other cyclic variations are seasonal due to the earth's movement around the sun and the tilt of its axis and, to a lesser extent, due to the rotation of the sun every 27 days.

Severe sunspot disturbance causes rapid fluctuations of the ionised layers, the effect of which is to increase the m.u.f. at the same time often producing a radio fade out lasting from a few minutes to an hour or so.

Patches of intense ionisation sometimes occur in the E Layer, particularly in the summer, and these will reflect frequencies much higher than usual, 70MHz and beyond. This is called **"Sporadic E"** and is responsible for long distance propagation on the 70MHz (4-metre) band and sometimes the 144MHz (2-metre) band.

Tropospheric Propagation

The **troposphere** is the region which extends from the surface of the earth to a height of 10km. It is the atmospheric conditions (temperature and humidity) in the troposphere which affect the long distance propagation of v.h.f. and u.h.f. radio waves.

The refraction of v.h.f. and u.h.f. waves is caused by the varying dielectric constant, with altitude, of the air above the surface of the earth. This causes the waves to bend and follow the approximate curvature of the earth's surface.

Conditions of humidity at low altitudes together with increased temperature at higher altitudes (temperature inversion) provide conditions which cause the wave to be "ducted" for considerable distances with very little attenuation.

Propagation of the Amateur Bands

1·8MHz (160m).	Generally speaking this is a local working band, up to about 80km in daytime, with an increase in range up to several hundred kilometres at night.
3·5MHz (80m).	Daytime contacts can be made up to about 320km, night time distances vary considerably but can be up to several thousands of kilometres in the winter months.
7·00MHz (40m).	Much the same as 80m but varies considerably giving greater range during the daytime depending on the condition of the sunspot cycle. Good long distance (DX) band on winter nights and early mornings.
14MHz (20m).	Most consistent DX band, open during daytime at most times of the year, dawn and dusk being the most favourable times for long distance (over 8000 miles) contacts. There is practically always a skip zone on this band.
21MHz (15m).	Similar to 20m but more affected by the sunspot cycle. Best in Spring and late Autumn, up to the hours of darkness.
28MHz (10m).	Very much affected by ionospheric conditions. Excellent DX band in sunspot maximum years. Usually "dead" in sunspot minimum years except for "Sporadic E" propagation.
70MHz (4m).	Mainly a local working band, up to 160km but occasionally affected by "Sporadic E" when the range can exceed many hundreds of kilometres.
144MHz/432MHz (2m/70cm).	Ranges up to 160km can be achieved on these bands. Range is affected by local obstructions, hills etc. Greater distances up to several hundred kilometres can be achieved under unusual tropospheric conditions.
1296MHz (23cm).	Similar to 70cm but more affected by local terrain.

The other s.h.f. and microwave bands each have their own special characteristics and are affected by tropospheric conditions, rain etc.

Antennas, Transmission Lines and Matching

The subject of antennas is a complex one and in the space available we will confine our attention to the basic essentials. For further information please refer to the appropriate section in the RSGB *Radio Communication Handbook* or the *Radio Amateurs Examination Manual.*

Antennas

The fundamental antenna is a length of wire which is half of a wavelength long: this is known as the **half-wave dipole** and is shown in Fig. 83.

The antenna is said to be resonant at a specific frequency which is determined by its length. The distribution of voltage and current along the wire is known as **standing waves.**

The ratio of voltage to current varies along the conductor but at the centre of a resonant half-wave dipole it gives a convenient impedance of approximately 70Ω. If the antenna is broken here the r.f. power can be fed into the dipole at its resonant frequency.

The **full-wave** resonant antenna has, as might be expected, a standing wave pattern similar to two half-wave

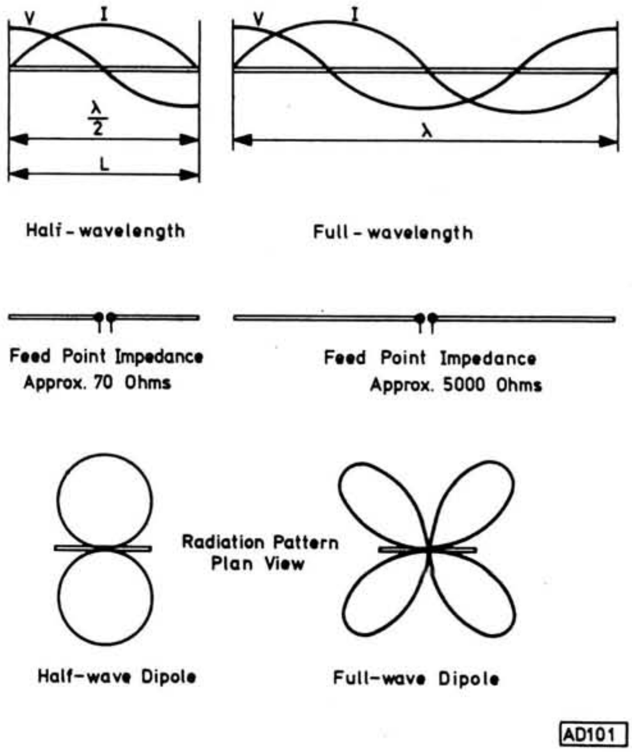


Fig. 83: Dipole characteristics

antennas joined end to end. The centre impedance in this instance is very high, inconveniently so in fact and special matching arrangements are called for, as we shall see later.

The radiation pattern of a half-wave dipole is in the form of a "doughnut" shape which in section becomes the characteristic figure "8" shape, as shown in Fig. 83.

In the full-wave resonant antenna, the radiation pattern of the two half-wave sections affect one another producing the four lobe shape shown.

Dipole Length

The length of a half wavelength in free space is given by:

$$L = \frac{300 \times 0{\cdot}5}{\text{Frequency (MHz)}} \text{ metres.}$$

However, in a practical antenna, due to (a) the capacitance effects at the ends, (b) the velocity of the radio wave being slower in the wire than in free space and (c) the effect of the wire diameter, it has been found that the actual antenna dimensions are about 5 per cent shorter than the calculated free space length, or free space length × 0·95.

For example, the length of a practical resonant half-wave dipole for 3·6MHz would be given by:

$$L = \frac{300 \times 0{\cdot}5 \times 0{\cdot}95}{3{\cdot}6\text{MHz}} = \frac{142{\cdot}5}{3{\cdot}6} = 39{\cdot}6 \text{ metres.}$$

The Vertical Antenna (Quarter Wave λ/4)

When looking at the radiation characteristics of a quarter-wave vertical antenna, it is necessary to take into consideration the reflection properties of the ground.

If we consider the ground as a mirror to the radiation from the antenna, it will be seen that the vertical antenna AB, in Fig. 84, has an image BC in the ground mirror (just as in optics).

Thus, radiation leaving the antenna from point D will travel by two paths in the direction E. One direct from D and the other from the ground reflection of D (the position F in the mirror image of the antenna in the ground mirror).

The radiation pattern is similar to the half-wave dipole but being in the vertical plane it is omnidirectional in the horizontal or plan view.

Vertical antennas fitted on the roofs of vehicles for v.h.f. and u.h.f. utilise the excellent reflective properties of the metal roof as ground.

$\frac{5}{8}\lambda$ Whip Antenna

The popular $\frac{5}{8}\lambda$ whip antenna for mobile use is in reality a $\frac{3}{4}\lambda$ antenna with the bottom made in the form of a loading coil. Taking into account the ground reflection, the antenna appears as three vertical half-waves with the feed point in the centre of the middle one. The impedance at this point matches conveniently into standard 50Ω coaxial feeder cable.

Directional Antennas

The pattern and direction of maximum radiation of an antenna can be modified by the addition of extra elements which may be **driven,** by feeding power to them or **parasitic** where no direct electrical connection is made.

The "Yagi" array, shown in Fig. 85, has a half-wave dipole with parasitic director and reflector elements. The lengths and spacings are chosen to give increased "gain" in the forward direction (as compared with a plain dipole).

One of the consequences of adding parasitic elements is that the dipole impedance becomes inconveniently low (about 20Ω) and to overcome this a folded dipole is often used. This has the effect of transforming the impedance up by a factor of four to give a value of around 80Ω, giving a reasonably good match to 75Ω feeder cable.

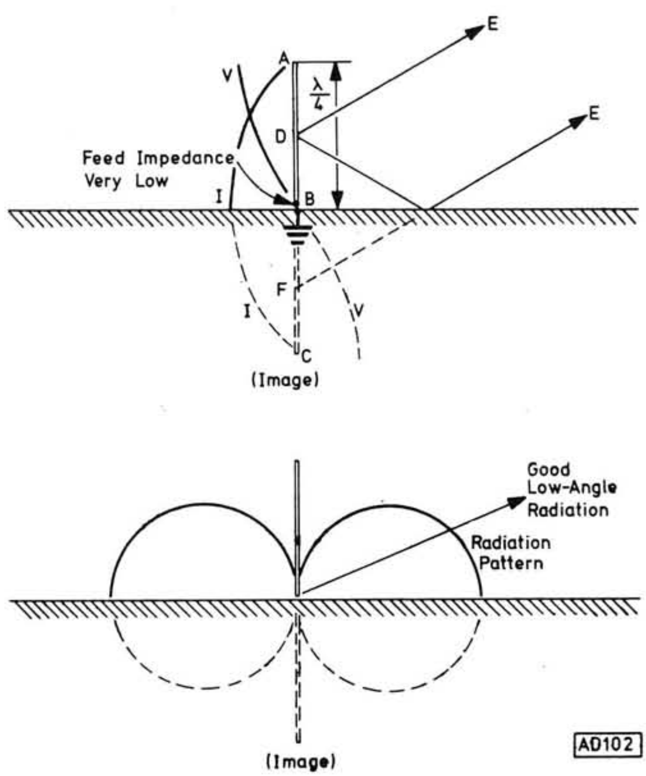


Fig. 84: The ¼ wave vertical antenna

Transmission Lines and Feeders

The source of r.f. power is quite often not the place where it is to be utilised. For convenience we need to have the transmitter indoors, in the "shack", but we need to site

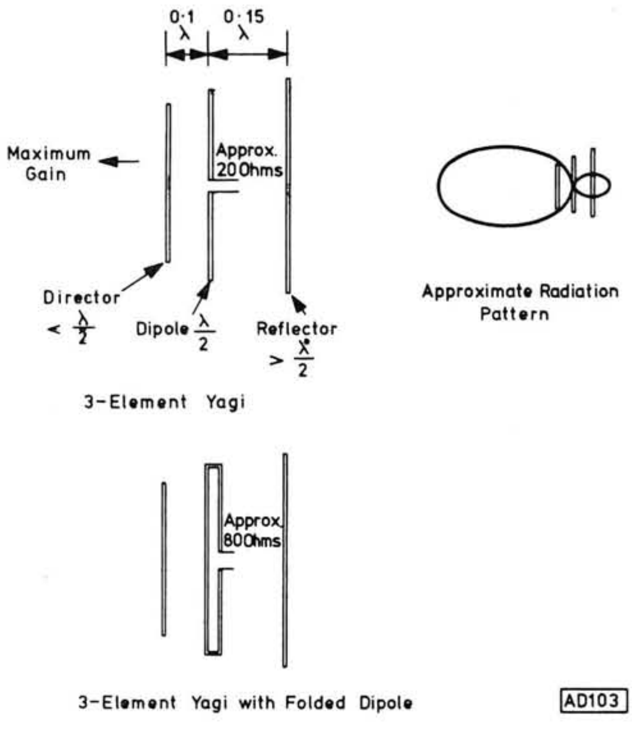


Fig. 85: Simple directional antenna arrays

the antenna as high and as far away from buildings as possible.

In some instances it is possible to bring the antenna directly to the transmitter but in most cases a **transmission line** or **feeder cable** is required.

Impedance Matching

For maximum power transfer from one circuit to another the input impedance of the circuit receiving the power must equal the output impedance of the circuit delivering it.

The output impedance of a transmitter valve amplifier is in the order of a few thousand ohms and of a typical transistor transmitter, about 5 ohms or less.

The antenna impedance can vary between about 20 ohms and several thousand ohms depending on the type and point of connection.

The impedance of the transmission line or coaxial feed cable, connecting the transmitter to the antenna, is defined by its physical construction. Usual values for coaxial cables are 50Ω or 75Ω and for twin transmission lines, 70Ω to 600Ω, depending on the method of manufacture.

Some form of matching arrangement is therefore required between the various sections of the complete system which conveys r.f. power from the transmitter output stage to the antenna. A typical example is shown in Fig. 86.

There are three basic types of lines or feeders.

(a) Single wire (which carries a true travelling wave).
(b) Coaxial feeder.
(c) Parallel wire line.

Single feeders (a) are not commonly used because they tend to act as radiators themselves.

In the coaxial type (b) the r.f. field is confined to the inside of the structure, whilst in parallel wires, the field is confined to the immediate vicinity of the conductors.

Characteristic Impedance (Zo)

A transmission line or feeder may be considered as consisting of a distributed inductance with associated distributed capacitance, as shown in Fig. 86. It is the relative value of inductance and capacitance which gives the transmission line a property known as **Characteristic Impedance** (Zo). When a transmission line is connected to or terminated with a pure resistance which is equal to its characteristic impedance a current travelling along the line does not see any change in conditions when it meets the load. In other words, a short transmission line terminated in a purely resistive load, equal to the characteristic impedance of the line, acts as though it were of infinite length.

Such a line is said to be **matched** and here power travels outwards from the r.f. source until it reaches the load where it is completely absorbed.

Let us look at what happens if the transmission line is terminated by its characteristic impedance and then by an impedance other than (Zo). This is shown diagrammatically in Fig. 87.

Where the line is terminated in its characteristic impedance (Zo) the voltage or current will have the same value at any point along it, shown in part (a).

If, however, it is terminated with an open circuit as shown in (b) or a short circuit as in (c) then standing waves are produced along the feeder as shown.

This is because the power is not being absorbed at the end of the line but is being reflected. The reflected wave adds to the incoming waves and produces a standing wave pattern along the line. These examples are extreme cases, but any mismatch produces a resulting standing wave pattern. The ratio of the maximum value of the standing wave to the minimum is known as the **standing wave ratio** (s.w.r.). Values will vary from unity (matched condition) to infinity (complete mis-termination).

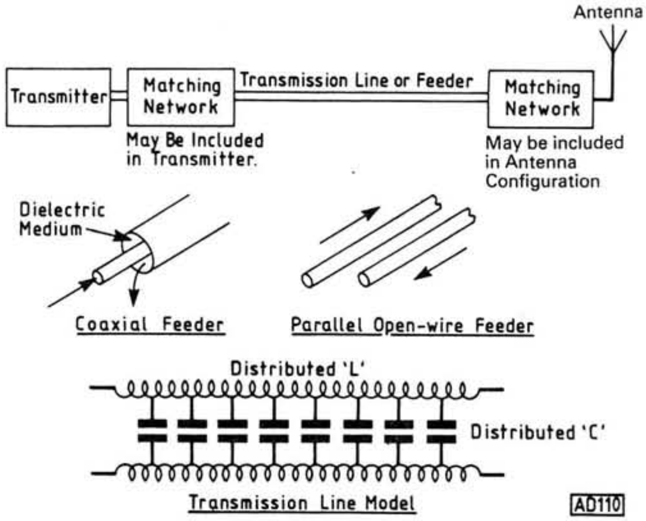


Fig. 86: Transmission lines

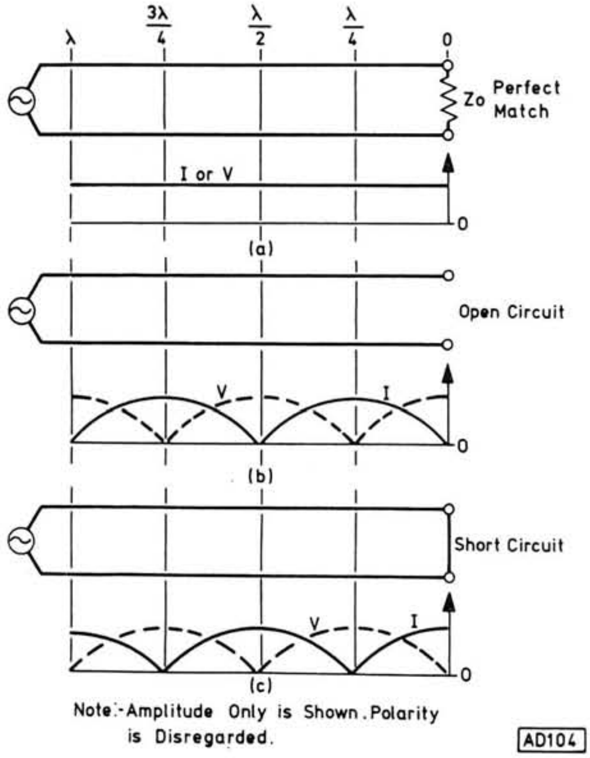


Fig. 87: Transmission line terminations

Standing Wave Ratio Meter

A useful device for looking at the s.w.r. in a coaxial feeder cable is shown in Fig. 88. Loops of wire (a) and (b) sample forward and reverse power passing through the centre conductor (c). The voltages developed in the coupling loops are rectified by D1 and D2 and the resultant d.c. output deflects the meter M1 thereby giving an indication of the forward and reverse (reflected) power.

The s.w.r. meter is particularly useful when making adjustments to the antenna matching and tuning. Constructional details for a v.h.f. unit were carried in the May 1978 issue of *PW*.

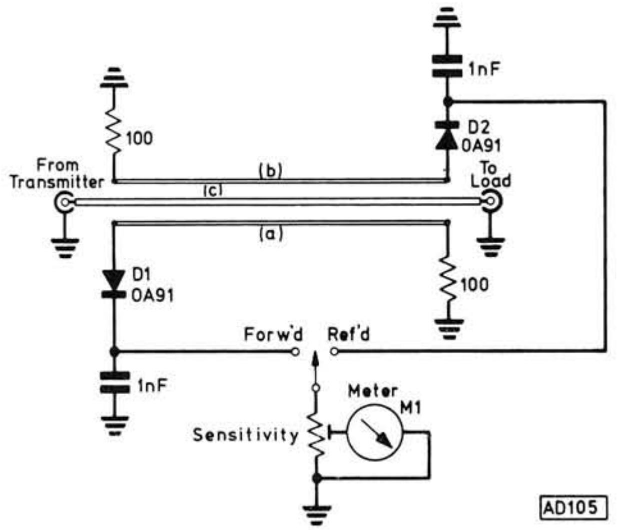


Fig. 88: A simple standing wave ratio meter

Matching

Most transmitter and antenna matching circuits are of the resonant type and are tuned to the operating frequency.

We have already described the "Pi" matching network for a valve output stage (*PW*, Feb. 1982, p55), shown again in Fig. 89(a). Also an "L" type matching network for a transistor output stage (*PW*, Feb. 1982, p54), shown again in Fig. 89(b). This configuration allows for more convenient component values when working at the low output impedance of the transistor stage.

In both circuits the impedance transformation is adjusted by the relative capacitances of C1 and C2, whilst maintaining resonance at the operating frequency.

It is usual in this instance to arrange for the transmitter matching network to provide an output impedance which matches the characteristic impedance of a readily available coaxial cable, e.g. 50Ω or 75Ω.

When the coaxial cable is operated with a low s.w.r., losses within it are also low, so it is very convenient to fit any necessary filters here.

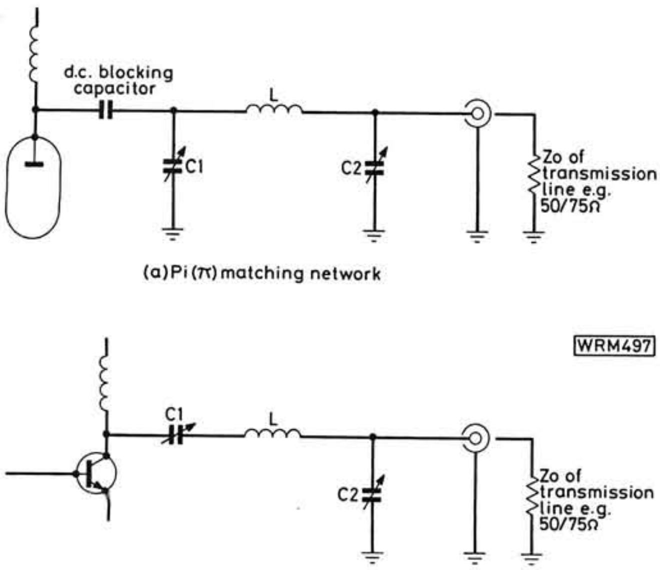


Fig. 89: Transmitter output matching networks

Some antennas, such as a dipole, have a characteristic impedance, at the feed point, which will match directly the characteristic impedance of the feeder cable and an antenna matching network is therefore unnecessary.

However, if a symmetrical or balanced antenna such as the dipole is fed by coaxial cable, a state of imbalance exists because one arm of the dipole is connected to the centre conductor whilst the other is connected to the outer shield. The currents flowing in the shield cannot be cancelled by those in the centre conductor which surrounds it.

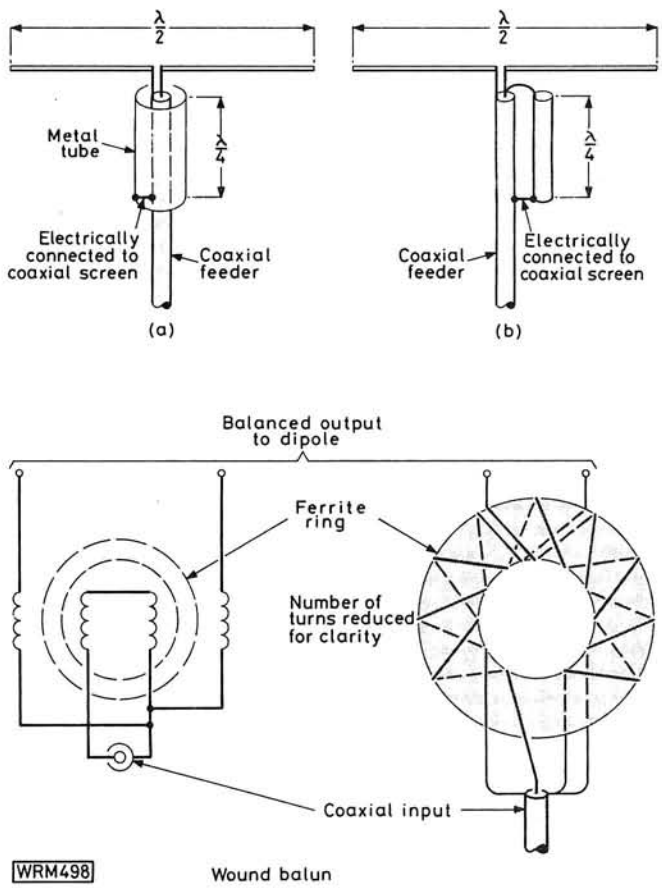


Fig. 90: Balun transformers

Balanced to Unbalanced Transformer (balun)

Diagrams of **balun transformers** are shown in Fig. 90. In (a) a quarter-wavelength coaxial sleeve surrounds the coaxial cable and in (b) a quarter-wavelength of rod, forming a "stub," balances the output to the antenna. For low frequencies, it is more convenient to wind the balun transformer onto a ferrite ring. This type of balun is less frequency conscious and may be used over a wide frequency range.

Quarter Wave Transformer

Where it is necessary to transform an antenna impedance to match a particular feeder cable, use can be made of a quarter-wave resonant line as shown in Fig. 91. Here, a full-wave antenna is to be fed in the centre (where the impedance is around 5000Ω) with twin feeder whose characteristic impedance is 72Ω. If the quarter-wave line is made to have the correct characteristic impedance then the antenna impedance is transformed down by the line to match that of the feeder.

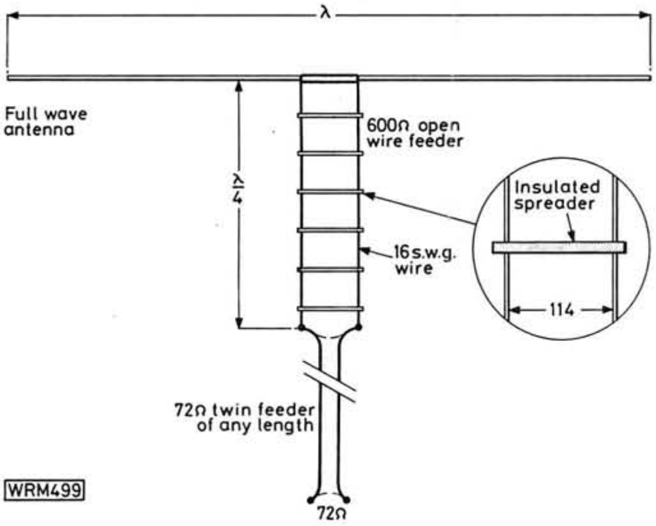


Fig. 91: A $\frac{1}{4}$ wave transformer

$$Z_m \text{ (matching line)} = \sqrt{Z_{antenna} \times Z_{line}}$$

$$= \sqrt{5000 \times 72}$$

$$= 600 \text{ ohms}$$

(An open-wire line of 16 s.w.g. conductors spaced 112mm apart would have a Zo of 600 ohms.)

Next month will be the final part of this series

Book List for the RAE

How to Become a Radio Amateur. Home Office. Free.
Essential reading, Licence Regulations, RAE Syllabus, Morse Test details, etc.

Radio Amateurs' Examination Manual. 9th Edition. G. L. Benbow G3WB. RSGB £2.20.
Course material for the RAE Syllabus. Sample questions.

A Guide to Amateur Radio. 18th Edition. Pat Hawker G3VA.
Background material for the prospective and licensed amateur, packed with useful information about equipment, operating, etc. RSGB £2.40.

Single Sideband for the Radio Amateur. ARRL.
Very readable, solid information on s.s.b. equipment, tests and measurements. RSGB £2.60.

Electronic Technology. 4th Edition. Edward Hughes. Longman.
Covers the syllabus of the ONC Course in Electrical Engineering. Excellent reference book for the basic electrical theory.

Radio Communications Handbook. James M. Bryant. Plessey.
Although primarily an applications book for Plessey Semiconductors there is plenty of general information on current trends in transmitter and receiver design and techniques.

Radio Communications Handbook. Vol. 1. RSGB £8.39.

Radio Communications Handbook. Vol. 2. RSGB £7.25.

MODS No. 15

▶▶▶*continued from page 29*

alter the channel spacing from $12\frac{1}{2}$/25kHz to any of the other permutations that are in use anywhere in the world. There was a mistake on p. 25 penultimate paragraph . . . "Soldered to pins 14 and 15 of **Q18** on the p.l.l. board.

No. 14

This appeared in the March 1982 issue and it contained two very unusual mods. They were both for extending the frequency coverage of **Bearcat receivers.** Both mods involved pressing assorted buttons in a seemingly meaningless sequence but on completion of the mod, both the Bearcat 220-FB and 250-FB can be made to cover an incredible range of frequencies.

If any of the above mods appeal to you, and you would like a copy of the issue that they originally appeared in, please write direct to our back numbers department at:— Post Sales Department, IPC Magazines Ltd, Lavington House, 25 Lavington Street, London SE1 0PF. Each issue costs 95 pence but that includes packing and delivery to anywhere in the world. Please make all cheques and postal orders payable to IPC Magazines Ltd.

I have started to receive letters asking for mods to CB rigs. Unfortunately, although it is possible to make these sets do some of the things that you are asking them to, it may not be entirely legal. CB rigs are designed and built to comply with some very stringent specifications and tampering with them will almost certainly mean that they no longer meet those specifications.

A legal CB mod that I am often asked for is conversion to the 28MHz (10m) band. Here again the news is not good. There are two types of set that could possibly be converted, the old American a.m. set and the new British f.m. one. The American ones can be sub-divided into two more categories: legally imported and illegally imported.

Radio Amateurs wishing to convert illegally imported a.m./s.s.b. rigs for use on the 28MHz amateur band can "legitimise" them by a payment of £5 to the Customs and Excise Authorities in lieu of the unpaid import duty and VAT.

The conversion of legal British specification rigs appears to be a little easier. There seems to be no legal reason why these sets can't be converted for **amateur** use on the 10-metre band. The problems start when you try to convert them. The majority of sets in this country use boards from the Cybernet Company in Japan and as far as I have been able to discover, it is not possible to convert them to 28MHz. They do not use the heterodyning principle to obtain their frequencies and this makes them very difficult to tinker with. I hope to explore this field a little more in future issues but until then I will just add that sets from the firm called DNT do use a system that looks as though it can be modified and so these are the sets that you should look at if you want a 10-metre f.m. mobile.

If you have any mods or tips that you would like to pass on or if you have any requests for mods, please write to R. S. Hall, Room 301, Hatfield House, Stamford Street, London SE1 9LS.

73s
Sam

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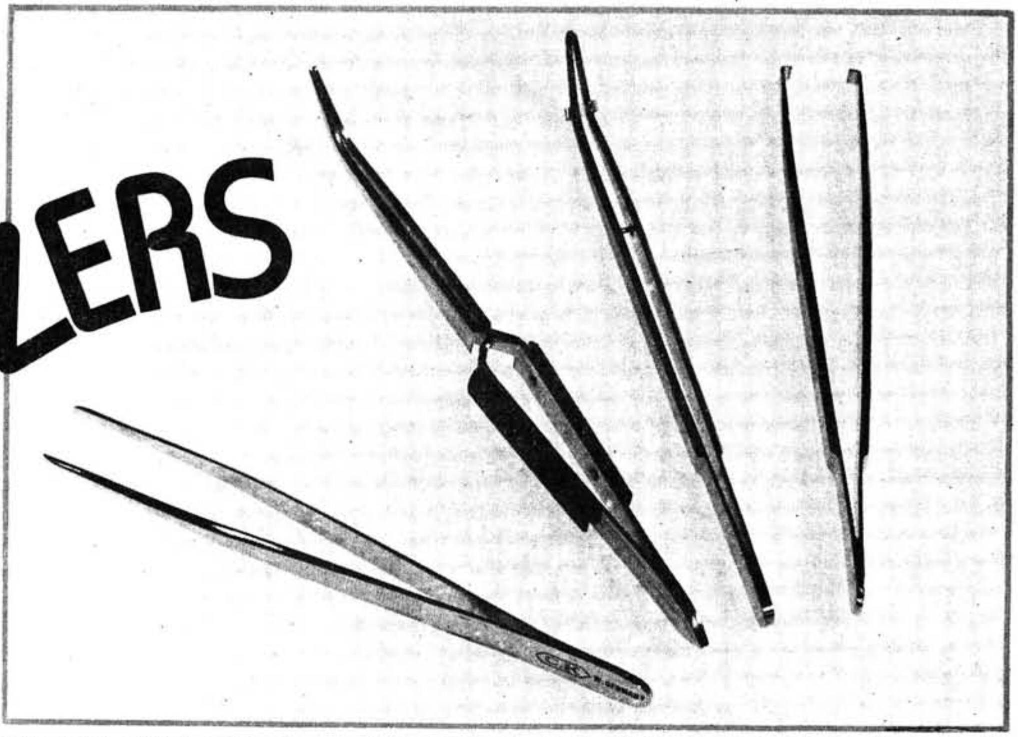

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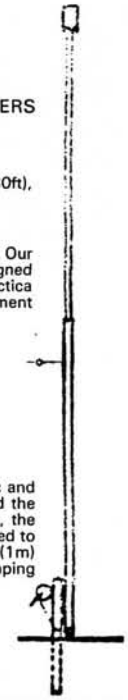

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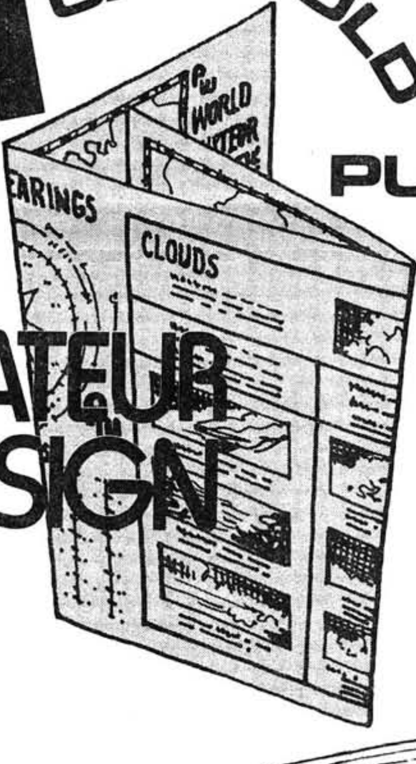

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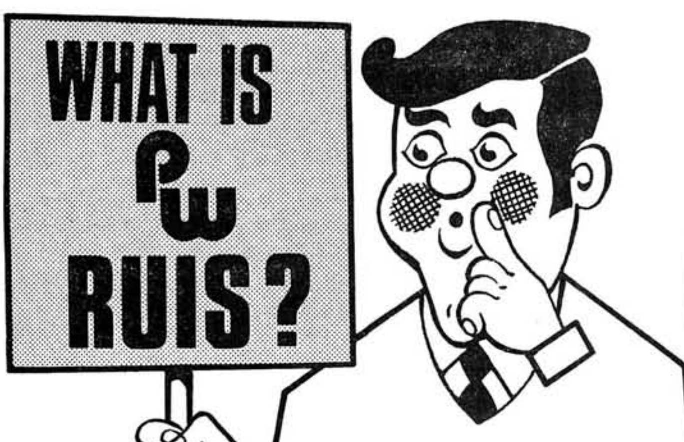

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NEWS NEWS NEWS

Repeater News

The following information has been received from Mike Dennison G3XDV, Chairman RSGB Repeater Working Group. The RWG are to hold an open meeting in Bristol later this year, details of the venue and date to be finalised. Since their last committee meeting, over a period of nine weeks, Mike has accumulated no less than 547 separate written items of repeater correspondence!

UHF Repeaters

GB3NN, North Norfolk, has been adopted by a new group following the departure of the original licence holder and his equipment. The repeater should be once again operational from a new site within two months.

The GB3WS saga encouraged two groups to apply for the vacant licence, withdrawn by the RSGB. As both groups have secured viable sites and presented comprehensive constructional details, the RWG have decided to withdraw the original licence completely and apply for two new repeaters within u.h.f. phase seven. It is thought that GB3BE (Bury St. Edmunds) will be on RB6 and the other machine at Sudbury on RB15.

GB3CR, located near Chester, has had a site change approved. GB3NT, off air for some months, is due to reappear from a new location.

Any would be repeater groups should note that the deadline for letters of intent for 2m v.h.f. repeaters must be with the RWG by 31 July and completed proposals by August 31 at the latest. Completed proposals for u.h.f. phase seven are required by March 26.

Phase 5 v.h.f. repeater applications should have reached the HO for consideration by the time you read this. Amongst these are GB3RD (Reading, Berks) R3, GB3OC (Orkney) R2.

SHF Repeaters

Three 1296MHz in-band ATV repeater licences are to be applied for and if approved by the HO are to be sited at Stoke-on-Trent GB3UD, Luton GB3TV, and Bath GB3UT.

The first UK 1296 repeater to become operational was GB3WX at Brighton. This occurred on December 9 1981 and it is reported that six fixed stations and two mobiles were operating from switch on. The repeater is currently beaming in a westerly direction and is workable mobile along a 20km coastal strip. Telemetry providing QTH and callsign identification is expected to be added to with the inclusion of weather data. A further two 1296MHz repeaters should be operating soon.

Finally, two proposals are being considered to allow 10GHz inputs to be provided in conjunction with existing u.h.f. repeaters, GB3IW and GB3LE. Both units are currently co-sited with existing 10GHz beacons.

Bill Corsham G2UV

Regrettably we learn of the death on 12 December, 1981 of Bill Corsham G2UV, known to many as "Uncle Vic".

Bill's interest in wireless started during the First World War when as a telegraph boy with the GPO, he joined the Signals Regiment of the Army.

First licensed in 1920, Bill was deeply involved in much of the pioneering work in the early days of amateur radio and has since been actively engaged in radio, right up to his death. Bill is also credited with generating the first known QSL card in Europe, and perhaps in the world.

Bill became a member of the RSGB in September 1922 and was elected a Vice President in 1973.

Other than service during both World Wars, Bill's working life was spent with the Post Office.

Bill Corsham will most certainly be missed by all who knew him.

G6JP

Bellevue

The final radio and electronics exhibition to be held at Bellevue Manchester by the Northern Radio Amateur Societies Association opens in the Lancaster Hall at 11a.m. on Sunday April 4. For further details, see their advertisement in this issue.

10GHz Cumulative Contests

The RSGB has organised a series of cumulative contests to run during the Spring and Summer of this year, on the following dates: 25 April, 16 May, 20, June, 11 July, 8 August and 19 September.

Each activity period runs between 0900 and 2100 GMT, with most activity being in the late morning and the afternoon. Talk back on 2m (144·330MHz) will be used as the initial calling frequency to establish contacts for further tests on the 10GHz band.

Any licensed amateur, particularly newcomers to the microwave field, will be most welcome to join in. Further information can be obtained from: G4KGC, QTHR, tel: (0327) 802100, or for members of the RSGB the information will be published in *Radio Communications.*

Also of interest to the new microwave operator/constructor is the *Microwave Newsletter,* which is distributed by the RSGB and costs £4.00 for ten issues per year.

Subscription enquiries should be clearly marked "Microwave Newsletter," and sent to: *The General Manager, RSGB, 35 Doughty Street, London WC1N 2AE.*

On the Move

TMP Electronic Supplies inform us that they have moved to new premises, they are brand-new and situated in an ideal radio location, with full demonstration facilities for their range of equipment which is mainly from the Yaesu stable.

To obtain a list of the products TMP carry, send an s.a.e. to their new premises at: *Unit 27, Pinfold Workshops, Pinfold Lane, Buckley, Clwyd, North Wales CH7 3PL. Tel: (0244) 549563.*

NEWS NEWS

Introduction to Amateur Radio & s.w. Listening

As a result of the success of this short course over the last two years, it has been decided to repeat it again at two centres in Nottingham immediately following the current RAE courses.

Commencing on 17 May 1982 at Hucknall College of Further Education and on 19 May at Arnold and Carlton College of Further Education, the course runs for six weeks excluding Spring Bank Holiday week.

The syllabus includes an outline of the RAE, some basic theory, receiver operation for the amateur and commercial bands and practical points concerning construction techniques and antennas. In short, a useful preliminary to the RAE.

Further information can be obtained from: *The Course Tutor, Alan Lake G4DVW, on Nottingham (0602) 382509, from Hucknall CFE (0602) 637316, or from Arnold and Carlton CFE (0602) 876503.*

Out of Thin Air—Please Note

In the "Directory of Aerial Suppliers" section of *Out of Thin Air* (page 78), the first entry, Aerialite Aerials Ltd., inform us that they no longer supply antennas from their premises at Chadderton, Lancashire.

However, their complete range of antenna products which includes complete antenna kits, brackets, clamps and general antenna hardware, is now obtainable from: *Antiference Ltd., Bicester Road, Aylesbury, Bucks. HP19 3BJ. Tel: (0296) 82511.*

University Courses

The University of Salford is once again running a four-day course in April 1982 on "Basic Electronics for Teachers" and a one-week course in July 1982 on "Electronic Applications for Teachers".

Both courses have been organised by Dr E. A. Flinn of the Department of Electrical Engineering, and further details are available from: *The Administrative Assistant (Short Courses), Room 110, Registrar's Department, University of Salford, Salford M5 4WT. Tel: 061-736 5843, ext. 449.*

Rallies and Events

The British Amateur Radio Teleprinter Group has organised two contests to be held in March and April 1982.

First, the BARTG Spring r.t.t.y. h.f. contest, which will run from 0200 GMT on Saturday 20 March until 0200 GMT on Monday 22 March.

This contest now attracts probably the most entries world-wide for any r.t.t.y. contest.

Further details from: *The h.f. Contest Manager, Ted Double G8CDW, 89 Linden Gardens, Enfield, Middlesex EN1 4DX.*

Second, the v.h.f./u.h.f. contest which will run from 1800 GMT on Saturday 3 April until 1200 GMT on Sunday 4 April. This new contest covers three bands 144, 432 and 1296MHz.

The contest will be scored as three separate sections for single, multi-operator and short wave listeners.

Further details from: *G8CDW or v.h.f./u.h.f. Contest Manager, Chris Plummer G8APB, 27a Thorn Lane, Four Marks, Nr Alton, Hampshire GU34 5XB.*

The White Rose Amateur Radio Society are holding their rally at the Leeds University Refectory on 21 March 1982.

Further details from: *G4DIZ or G3KWT, both QTHR.*

The Pontefract and District Amateur Radio Society will be holding their second "Components Fair" at the Carleton Community Centre, Pontefract on Sunday 14 March 1982. Opening at 1100 hrs, the main emphasis of the fair will be on home construction, along with all the usual attractions to interest the amateur radio enthusiast.

Further details from: *G4AAQ, QTHR. Tel: (0977) 791071.*

The Swansea Amateur Radio Society have their rally planned for Sunday 25 April at the Patti Pavilion, which is just one mile from Swansea City Centre on the Mumbles coast road (A4067). There will be all the usual rally attractions, starting at 1030 until 1700 hrs.

Further details from: *Roger Williams GW4HSH, QTHR. Tel: Swansea (0792) 404422.*

Tune In

Jackson Bros., manufacturers of high quality tuning capacitors and drives, inform us that they have four accredited retail stockists of their products. They are: *Bi-Pak, 3 Baldock Street, Ware, Herts. tel: (0920) 3182; Electrovalue Ltd., 28 St. Judes Road, Englefield Green, Egham, Surrey TW20 0HB. tel: (0784) 33603; Maplin Electronic Supplies Ltd. P.O. Box 3, Rayleigh, Essex SS6 8LR. tel: (0702) 554155; Watford Electronics, 33/35 Cardiff Road, Watford, Herts. tel: (0923) 40588.*

Readers who intend building *PW* projects which use Jackson Bros. components will be able to obtain them from these sources.

Market Report

"CB Radio—The Facts" is the title of a market report from: *Parade Direct Marketing, 127 Hagley Road, Edgbaston, Birmingham B16 8XT.*

Intended for businessmen considering exploiting the CB market, the report costs £19.50 inclusive, and comprises eleven typewritten pages.

Unfortunately, all of it except a halfpage "Update" was written before the UK CB specifications were finalised in mid-1981, and it contains several technically misleading statements.

Diary Dates for 1982

Following is a list of some of the planned Rallies and Events for 1982.

We will endeavour, through this column, to publish further details nearer the appropriate dates.

RSGB National VHF Convention on 20 March at Sandown Racecourse, Surrey.

RSGB National Amateur Radio Exhibition on 15, 16 and 17 April at the Alexandra Pavilion.

Drayton Manor Mobile Rally near Tamworth, Staffordshire on 25 April.

Lincoln Shortwave Club Hamfest on 9 May.

Welsh Mobile Rally and the Northern Mobile Rally on 23 May.

East Suffolk Wireless Revival on 30 May.

Royal Naval Amateur Radio Society Mobile Rally on 13 June at HMS Mercury.

RSGB HF Convention on 19 June in Oxford.

Denby Dale and District Amateur Radio Society Mobile Rally on 20 June.

Longleat Mobile Rally and the Rolls Royce Amateur Radio Society Mobile Rally on 27 June.

Worcester and District Amateur Radio Club Mobile Rally on 11 July.

RSGB National Mobile Rally on 1 August at Woburn and the BARTG Rally on 29 August.

As the pace of electronic development continues unabated so the level of sophistication of even the most unassuming hobbyist increases. Couple this with an increase in available leisure hours and more disposable income, and the need for secure and well thought out facilities as a prerequisite to hobby electronics and radio becomes almost self-evident.

"So what!" you might say "It's only my hobby after all". This is of course true (and indeed it is important not to lose sight of the "hobby" angle), but, nevertheless, safety in an area that includes, *per se*, potentially lethal voltage levels cannot be readily dismissed.

Even with the security of safety built around one, the need to protect valuable equipment from external forces both natural and criminal should not be ignored! Few of us will be able to order up a custom designed electronics lab to be built between the patio and swimming pool; but we can all make an effort to ensure the optimum return from funds available and the best use of existing resources. Time spent in planning and installing the basics of a workshop will be amply rewarded by increased enjoyment from the hobby for many years to come.

setting up a WORKSHOP

Jeff MAYNARD G4EJA

Not all readers will be able (or even willing) to embark on a workshop project of the style outlined below. But you should all take heed of the remarks about safety—when was the last time you checked the mains supply? Do you have adequate earthing? Can the supply to your bench be isolated? Where is your fire extinguisher?

Choosing a Location

The major limitation in siting a workshop/lab is likely to be the views of other members of the family! Taking a spare room full time or using the dining room table occasionally might seem like a poor choice to a working wife. But the use of a permanent base does have advantages beyond those to the user—if only that the door can be closed on the mess!

There are some stalwarts who continue to use the kitchen table for developing complex electronic gadgetry; but a serious effort to find a suitable location is worthwhile. So what are the choices open?

A garage is often the only spare space available (or at least available and having the family's blessing). An integral garage will usually be well equipped with lighting and power, perhaps even housing the main fuse board for the premises, and should be free from damp if not draughts. A separate garage may only have a light, and if so, will require a separate power feed from the appropriate ring main. More on power feeds later, but do use *mineral* insulated—Pyrotenax—type cable for external and/or underground routes.

From experience there are two main disadvantages with the use of a garage for electronic hobby work

—it can be very cold during the winter months, and is not easy to heat effectively

—dust tends to settle over the equipment, a problem exacerbated by the use of the bench for woodwork and so on.

These problems can be overcome by partitioning one end of the garage. Ideally this can be done as a permanent feature if space permits. A framework of 50 × 50mm timber will support a wall of fibreboard or similar material. If the wall is not possible, a curtain will provide some protection from dust and make heating easier.

The traditional ham 'shack' being a converted garden shed adjacent to the mulch heap is a consideration—but only just. The combined effects of cold and damp, with large resulting changes in humidity, can spell death to sensitive electronic equipment.

Even if you can provide environmental control a shed is not a very secure place to store valuable, and portable, electronic equipment.

A loft is a prime candidate in most households simply because it is available. Many modern houses have very shallow roofs or use factory made A-frames in the construction, both of which tend to limit space severely. If this is the case it may be necessary to consider a 'loft extension' of the type advertised in Sunday newspapers.

Whichever approach is adopted, or if sufficient space exists, the loft usually requires only access, a floor and walls. Access for a workshop must be improved from the traditional bedroom chair and strong arms. Sunday newspapers again provide sources of do-it-yourself loft ladders. Tongued and grooved floorboarding gives the best finish to the loft floor area but is rather expensive. Chipboard designed for flooring is cheaper but may require cutting up to get through the loft opening as it is sold in 8 × 4ft sheets. (Metrication has not yet got to chipboard.)

Walls can be of any convenient material such as fibreboard which also provides a ready made pin-board. A coat of white paint on all the walls and the roof will increase the illumination level from whatever bulbs are installed.

Do not forget your loft next time a new carpet is laid elsewhere in the house; the old carpet laid on the loft floor will add a touch of warmth and is easier on the feet.

The Spare Room

Perhaps the best choice for a workshop is a spare bedroom, or indeed any spare room, for obvious reasons. For equally obvious reasons this might be the most difficult space to acquire. If the main obstacle to you taking over the room vacated by your recently married daughter is your better half, then a good old British compromise might be an idea. If your wife is interested in sewing or pottery or anything that would benefit from a permanent home, why not suggest a joint workroom? With plenty of worktops and cupboard space, two activities can happily co-exist. Who knows—you might end up with a convert—or take up sewing yourself!

Furniture

The key item for any workshop or lab is a bench. The bigger the better of course, particularly in width, but all the various domestic problems already discussed will combine to restrict the size. Assuming that you will install the largest practical size, what are the other considerations? Height of worktop is the main one.

If you are to spend many hours sitting poring over multi-function breadboarding it is important that you are comfortable. For which reason it is worth finding a good chair—try the commercial salerooms selling off redundant office equipment. A desk is typically 710 to 760mm high and this is the approximate figure to aim for. However, unless you are buying a ready made desk or bench, it is worth experimenting with varying heights.

The Bench

Having determined a comfortable height the easiest method of producing a bench is to lay a piece of Melamine kitchen worktop over a wooden frame. In doing this, it is important to make a sound frame. Not only will you be leaning on the bench top later, but it could well be loaded with heavy and expensive equipment. Whether or not you incorporate cupboards into the framework depends very much on how much woodworking skill you have. If this is low then take a trip to MFI, or similar, warehouse and buy some bedside cupboards. These can be used both as supports and as storage.

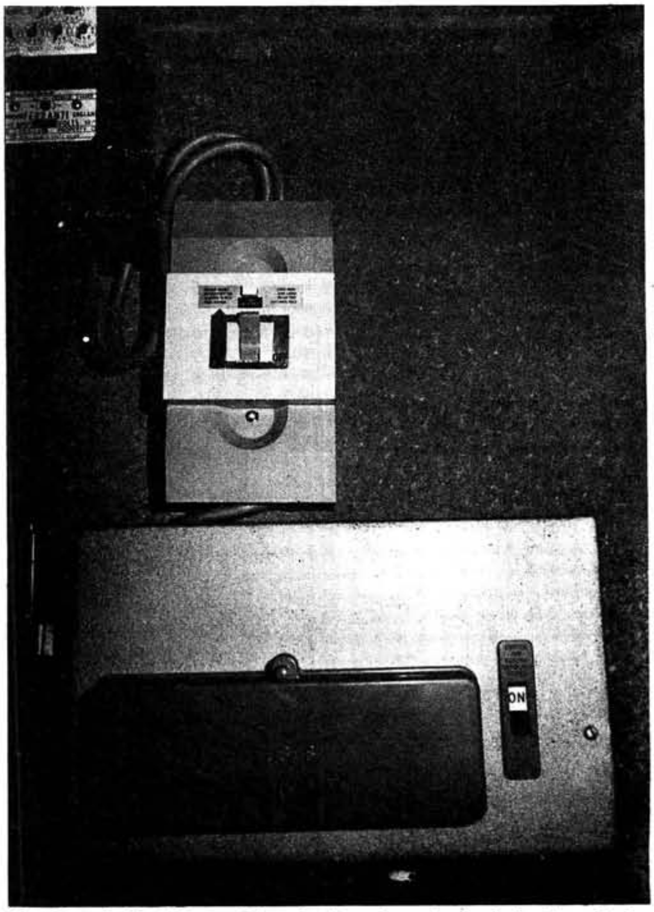
Beware of being too tempted to buy a desk. A dark coloured bench top is not conducive to safety and a clean white surface is much easier to keep tidy. A tidy worktop is a safer worktop.

Storage

Whether or not cupboards are installed under the main bench some form of storage is essential. Shelves gather dust but drawers and drawer units cost money. As ever, a trade off is necessary between what you would like and what you can afford.

It is sometimes better to keep certain tasks to areas of their own. When working with electronics this is particularly so with p.c.b. production and case fabrication. The chemicals associated with making p.c.b.s and the dust from cutting and filing p.c.b.s and metal cases should all be kept well away from the development bench. If there is insufficient room for two benches then make p.c.b.s in the garage or only when the current electronic project is cleared away. It is a good idea to acquire a vice and a drill stand that can be moved about. The multi-purpose type of vice with a bench clamp and a choice of heads is most useful.

Component storage becomes a problem with increasing stocks. There is nothing more annoying than not being able to find a particular i.c. that you remember buying only a week ago. Office equipment sale rooms again offer some useful bargains. A typist's drawer unit, designed to hold paper in drawers about 50mm deep, can often be picked up for about £5.00, particularly if scratched, and makes an ideal store for components. Drawers can be lined with polystyrene for i.c.s and transistors—but obviously not c.m.o.s. devices.



An Earth Leakage Circuit Breaker (e.l.c.b.) should be fitted between the meter and main consumer fuse box

Power

Before using any location as a permanent workshop consider the power supply arrangements.

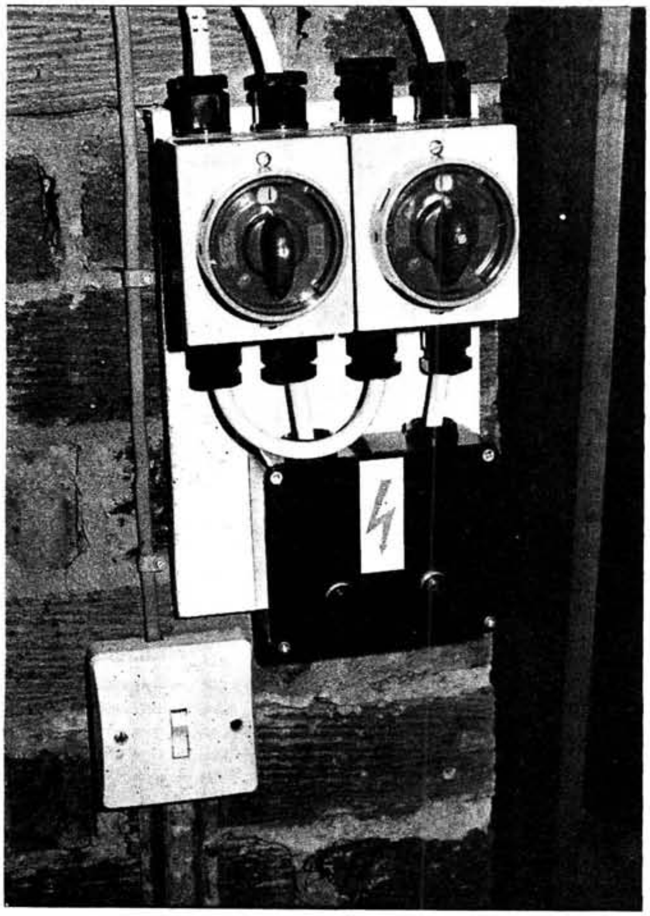
Attending a lecture on safety, a beginner asked the question "Do people often electrocute themselves?" To which the cynical lecturer replied "No, only once". He was of course making a very good point; electricity can and does kill.

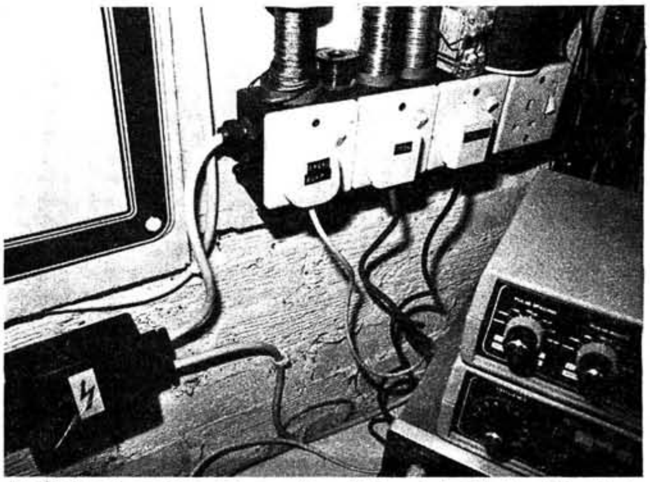
The work bench should have its own fused supply with an isolator prominently available. The installation of an e.l.c.b. (earth leakage circuit breaker) will provide a measure of protection. It will trip the supply within 30ms of a short from Live to Earth or Live to Neutral.

When working on mains powered equipment there are a number of points to remember—

—TV chassis are usually at mains potential
—the most common shock risk arises from inadvertent contact between an earthed chassis and mains voltage components
—do not use test equipment in such a position that leaning over the equipment under test is necessary
—do not use metal benches
—do not work on equipment from which the earth terminal is disconnected without the use of an isolating transformer
—use an unearthed low-voltage soldering iron
—discharge large storage capacitors

These points are discussed in much more detail, together with diagrams showing possible dangerous mains loops, in *"Safety in Electrical Testing"* published by the Radio, Electrical and Television Retailers Association, 57/61 Newington Causeway, London SE1 6BZ, price £1.50. If you are likely to be servicing mains powered equipment a copy of this leaflet is well worth reading.





Individual mains plugs should be labelled with their functions using Dymo Tape or similar system. You will need several socket outlets

The final point on electricity is to provide good lighting. If the workshop is in a loft make sure a torch is kept to hand. It can be difficult to find the ladder in the dark if you trip the e.l.c.b.!

Safety

A few other considerations beyond those already mentioned are worthwhile under the heading of safety. Any exposed metal (bench, chassis etc.) should be maintained at ground potential; if necessary run an earth wire to an outside ground stake. If you need to be earthed, when handling c.m.o.s. for example, a metal bracelet can be worn but this must only be connected to earth via a high value resistor (1MΩ). This will provide an earth leakage path to protect the c.m.o.s. but will not be a potential source of electrocution.

A rubber mat underfoot will ensure an electrically isolated environment if necessary.

Finally don't forget to keep a suitable fire extinguisher and/or fire blanket readily to hand. The aerosol type of extinguisher supplied for use in cars is ideal for this application.

Organisation

Even the constructor buying precisely from published parts lists will accumulate a selection of odd resistors and fuses and so on. The experimenter will need to build up a large stock of these passive and other, active, devices. Such a collection is of little use if a particular item cannot be found to complete the latest project. It always seems to be the small items, like resistors, that cause the trouble.

Spending time organising the workshop stocks is a worthwhile investment. Resistors, organised by E12 or E24 value, nuts and bolts, capacitors, transistors, fuses and other small items can be sorted into compartmented boxes bought or borrowed. Integrated circuits are best kept plugged into polystyrene sheets in a thin drawer. (But not c.m.o.s. which should be kept in the conducting foam or metal foil in which they should have been supplied.)

It would be a costly exercise to dash out and buy all the other 'useful' items one could think of. But buying each

◀ Isolators at the entrance to the author's shack control power to both the radio station and workbench. Neons are used to indicate live circuits

item, adhesives, insulating tape, Letraset, freezer aerosol, masking tape, solvent cleaner etc, etc, as it is needed soon builds up a good working stock.

Finally, think of reference material. Pin-out diagrams for integrated circuits and transistors are vital. Wallcharts for these are helpful but a manufacturer's data book will provide much more information. If these data books are considered too costly remember that many component catalogues including those from RS, Maplin and Electrovalue include some pin-out information and brief specifications of the devices offered.

Other reference works can be chosen according to the particular branch of the hobby to be pursued whether it be radio, power, computing and so on.

Tools

Again the decision on what tools to acquire will be influenced more by cost than by need. The absolute minimum includes—

soldering iron (low voltage)
assortment of screwdrivers
sidecutters and pliers

There is little doubt in the author's mind that a small selection of high quality (Swedish steel) tools is to be preferred to a large selection of inferior items.

Beyond the basic toolkit, one can acquire those items for which a particular need is felt, and the cash available.

These can include—

p.c.b. drill
multi-vice
specialist cutters
files

Some pieces of test gear are essential for any electronics or radio hobbyist. The two most useful, and mandatory, are a multimeter and a continuity tester. Digital multimeters (d.m.m.s) are now available at quite reasonable cost or can be built using l.s.i. chips and liquid crystal displays with low component count circuits. Analogue meters also have their place, particularly for obtaining a null or peak indication. If a d.m.m. is owned then a cheap low sensitivity analogue multimeter is sufficient. A continuity tester can be put together very quickly from a 555 timer and telephone earpiece (a circuit was given in the January 1982 issue of *Practical Wireless*). When starting to put together items such as this it is a good idea to standardise on plugs and sockets. A selection of connecting leads of different lengths with an assortment of terminations is useful.

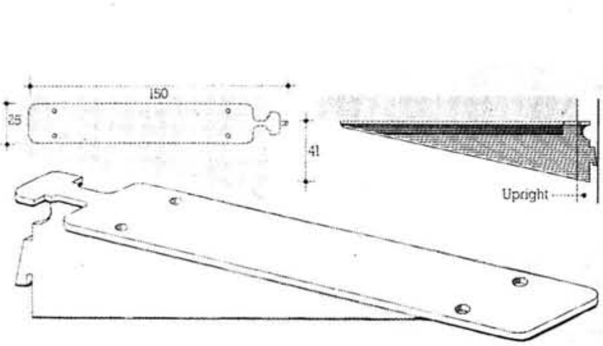
Bench power supplies, signal generators and pulse generators can all be put together from circuits in this and other magazines. An oscilloscope represents a much more advanced home construction project and is therefore most likely to be purchased. However the *PW* Purbeck has proved to be very useful. A 'scope is a valuable diagnostic tool for almost all branches of radio and electronics. When you decide to invest in one always go for the best possible—a minimum specification should be for a twin beam, 15MHz variety.

Enjoy Yourself

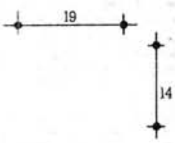
If you follow all the points mentioned in this article you will undoubtedly be in a better and safer position to enjoy your hobby.

Remember, though, it is not necessary to do everything at once. The author's set-up illustrated has been built up over a number of years. Please do remember, however, the safety aspects. After all *Practical Wireless* does not like to lose its readers . . . ●

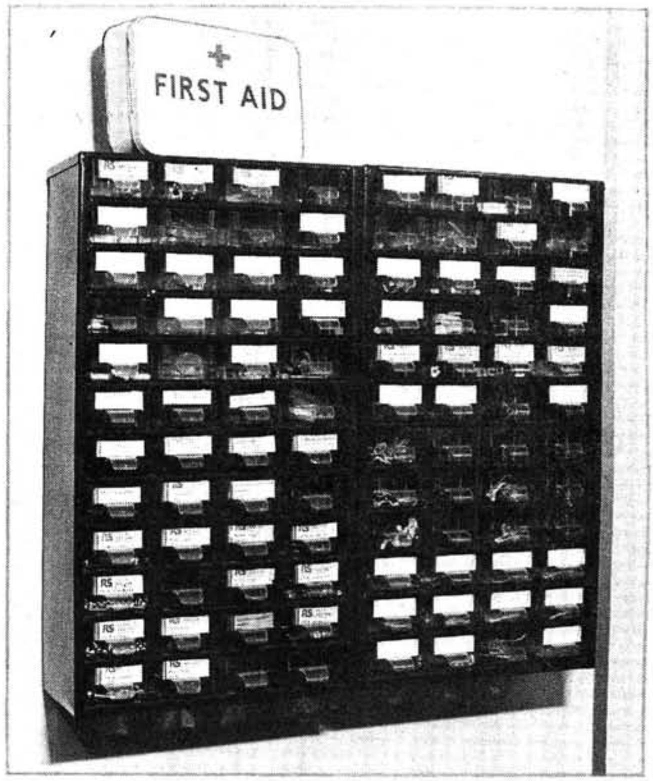
WORKSHOP ideas



Aluminium shelving brackets used in the workshop must be easily adjustable yet firmly fixed. Tebrax make a wide range of bracket systems which meet these requirements. Tebrax Ltd., 63 Borough High Street, London SE1 1NG. Tel: 01-407 4367



Clear plastics drawers housed in steel racks are available from many sources and provide excellent storage facilities for the workshop. These are fixed to the wall and have 48 drawers in each rack. Other combinations of drawer size are readily available. Don't forget the first aid kit



Lots of ideas for storage and other aspects of home workshops may be found in *Rooms for Recreation* by Euan Barty, published by the Design Council, 28 Haymarket, London SW1Y 4SU

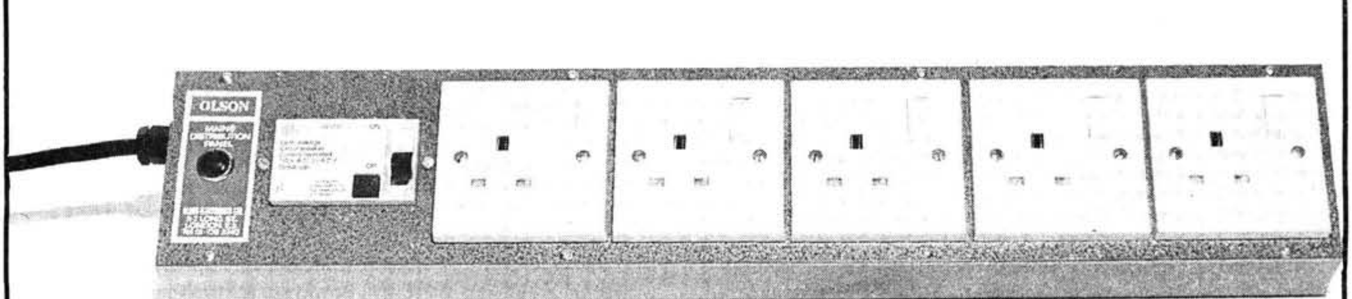
Screw-top glass jars, such as Horlicks is sold in, make ideal storage containers. Just fasten the metal lid to the underside of a shelf with two screws and you can store small components with no problems. Remember that the lid must be metal

WORKSHOP ideas

A few years ago Home Radio Ltd. marketed a very useful tabletop workbench. Unfortunately they no longer supply it but the idea is so good that we are reproducing the picture of it here and suggest that it could be very simply knocked up by the home constructor. Our full report on the original was published in *PW* September 1978

For those readers who hanker after making their own p.c.b.s or front panels Mega Electronics, Saffron Walden, make this u.v. light box and can supply all the necessary chemicals and materials

If you want a versatile open bin storage system then the Bankers Box will provide it. Supplied by Record Storage Systems, Doncaster Road, Kirk Sandall, Doncaster DN3 1HT, Tel: 0302 884566, these versatile containers are easily folded up from the flat card sheets supplied



This mains extension board by Olson Electronics Ltd, 5–7 Long Street, London E2, Tel: 01-739 2343 has five 13A socket outlets and is fitted with an earth leakage breaker to give added protection to the user in the event of a fault occurring

THE JVC 3040 UKC TV
MODIFYING

Roger BUNNEY

The JVC3040 UKC 5 inch TV receiver enjoys great popularity amongst the TV DX fraternity due to the coverage at both v.h.f. and u.h.f., with the facility of switching between the UK system I (6MHz sound/vision spacing) and the West European systems B/G (5·5MHz sound/vision spacing).

The front panel layout, with the two tuners having their channel calibration markings on circular scales, makes for an ease of operation but at this point perhaps the usefulness of the receiver, in its capacity for TV DX working, must be questioned. Of three small screen TV receivers tested over recent months for DX operation the JVC sadly came out by far the worst! The other two types tested were the Plustronics TVR5D and the National Panasonic TR5030G and are to be recommended in that order.

A sample 3040 UKC came into the author's possession for an extended period and several basic modifications were made to improve the DX performance, with the emphasis on simplicity. The areas in which the JVC seemed to be lacking concerned the very poor gain at v.h.f., combined with a lack of selectivity; the absence of a brightness control and the screw terminals provided at the rear for 300Ω ribbon antenna feeder. Both v.h.f. and u.h.f. inputs are of this format and are probably inefficient if correct matching transformers are not to hand!

Circuit Considerations

The circuit of the receiver is relatively simple and straightforward. The v.h.f. section comprises a three-transistor tuner (built on the main p.c.b.) feeding into a two-stage i.f. strip. At u.h.f. the two-transistor tuner feeds its i.f. output via two stages of the v.h.f. tuner section, the latter acting as an i.f. amplifier, prior to the main i.f. stage. The resulting system gain between the v.h.f. and u.h.f. bands differs dramatically; v.h.f. seemingly dead, with no noise (grain) on the screen, whilst at u.h.f. the screen is a mass of noise.

The output from the i.f. strip feeds via a video amplifier and output stage to the tube cathode, the contrast control being tapped across the video drive at high level. The contrast control is the only means of adjusting screen brightness, which of course directly affects the picture contrast level itself.

The a.g.c. reference is obtained from the video amplifier stage with a preset potentiometer, R133, available to determine gain control. An integrated circuit i.f. stage is used for the sound channel operating at 6MHz. When 5·5MHz intercarrier sound is required, an 11·5MHz oscillator is switched into circuit which beats with the 5·5MHz sound to produce a 6MHz sound difference signal which is then processed through the 6MHz sound i.f. strip.

The main complaint that has been noted by the author is the lack of gain, coupled with poor selectivity. The lack of gain is often compensated by the use of an antenna amplifier, ahead of the receiver, which tends to exaggerate the mediocre selectivity standard and on strong Sporadic E signals produces overloading, i.e. video buzz on sound. This is usually a result of operating the a.g.c. preset control at maximum gain setting which, with minimal control, will easily overload the v.h.f. r.f. amplifier stage.

Additional IF Stage

The first modification entailed fitting an extra i.f. stage prior to the two-stage i.f. strip. Unfortunately there is little space for extensive engineering work at this point, if minimal connection leads are to be maintained.

The prototype amplifier stage used a surplus i.c. which produced a gain of approximately 13dB. The T05 i.c. can is located on the underside of the chassis and fits in neatly between the screening shields of the tuner and i.f. areas.

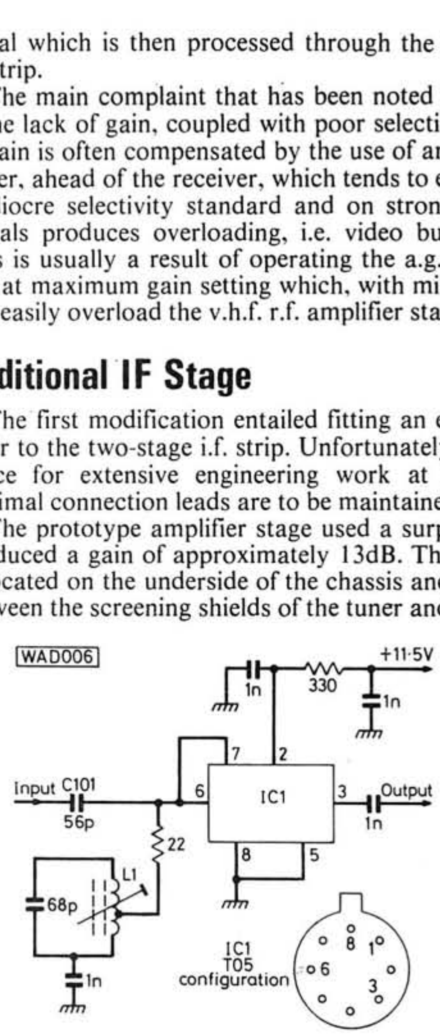


Fig. 1

In the circuit diagram of the modifications, shown in Fig. 1, C101, the existing coupling capacitor, is lifted at one end to connect into the extra stage. The output from the new stage is coupled into the lifted, and now vacant, C101 connection point. The result is a much livelier receiver with grain now present on the v.h.f. screen.

An alternative and higher gain stage, using a BFY90, is shown in Fig. 2. Although of course other *npn* devices could be used, the BFY90 should deliver up to 20dB gain.

Selectivity is obviously little improved which can result in, for example, a strong Ch. B3 405-line local BBC signal spreading over Ch. E4 and the sound "splatter" reaching down to Ch. E2. Incorporation of a simple tuned circuit gives a considerable improvement, cleaning up both video and sound splatter excesses.

The circuit shown in Fig. 2 is based on a sound rejector used in an RBM chassis but can be duplicated as indicated. Alignment is very simple; tune the receiver to a steady but weak u.h.f. station, connect the unit to the input circuit of the extra i.f. stage (which will probably result in an immediate drop of signal) and then align until the vision is seen to "peak up". The tuned circuit will introduce an insertion loss, albeit slight, but the improvement with the greatly improved selectivity is well worthwhile. The pass band is still sufficient to allow Band I 6MHz sound to pass adequately but, in my case with a strong "local" Ch. B3, prevent 56·75MHz spreading over Ch. E4 video (62·25MHz) and the splatter of B3 audio (53·25MHz) reaching to Ch. E2 video (48·25MHz). In Band III Ch. B11 video is prevented from spreading over a fringe Ch. B12 video (204·75MHz and 209·75MHz respectively). Obviously u.h.f. selectivity is improved, since the new i.f. stage is common, and it is simplicity to receive a fringe Ch. 23 signal (Crystal Palace) with the local Ch. 24 on the air (Rowridge).

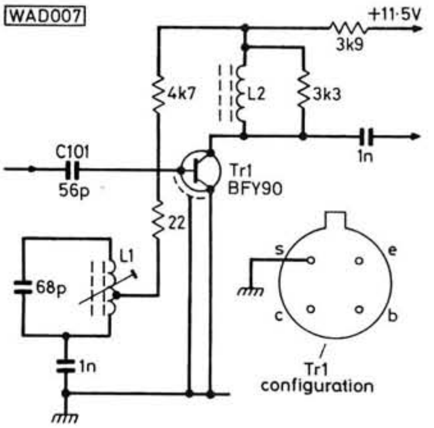


Fig. 2

The i.c. used in the i.f. stage was obtained as a "surplus radar amp" at nominal cost from **J. Birkett, 25 the Strait, Lincoln.** The additional tuned circuit is mounted in a "standing up" position adjacent to the metallic screens, but by the side of the p.c.b., which allows the cabinet shell to be fitted. The extra i.f. stage is not a.g.c.-controlled and so excessively high gain should be avoided.

Brightness Control

A brightness control was fitted to the rear of the chassis utilising the former 12V d.c. input jack hole position. Removal of the jack socket necessitates shorting out two p.c.b. connections formerly used by the socket connections; the one marked A, with an arrow, is connected to the first p.c.b. track in the direction of the arrow. A standard 100kΩlin. potentiometer is fitted in the former jack socket bracket and wired as shown in Fig. 3.

The cabinet access hole will need to be widened to allow the spindle passage, since the 100kΩ potentiometer is slightly offset relative to the original 12V jack position. Pin 5, on the tube base socket, will need to be cut to isolate same from the tube base p.c.b. and the wire from the 100kΩ potentiometer slider taken to the tube base socket pin itself; i.e. not to the p.c. tube base.

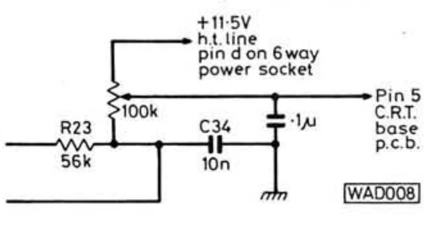


Fig. 3

Alternative Antenna Terminals

The final modification entails the removal of the 300Ω antenna connections and replacement with standard Belling Lee chassis-mounting sockets.

Examination of the p.c.b. antenna connection will show small soldered brackets which are at signal potential. Two of these are cut as shown in Fig. 4. and coaxial sockets actually soldered directly to these brackets.

The v.h.f. input is in fact unbalanced, despite the use of a 300Ω type fixing system; connection of the existing components to the inner of the new coaxial socket is simplicity itself. The complete 300Ω ribbon from the u.h.f. tuner input back to the socket connections is removed and replaced with low loss coaxial cable.

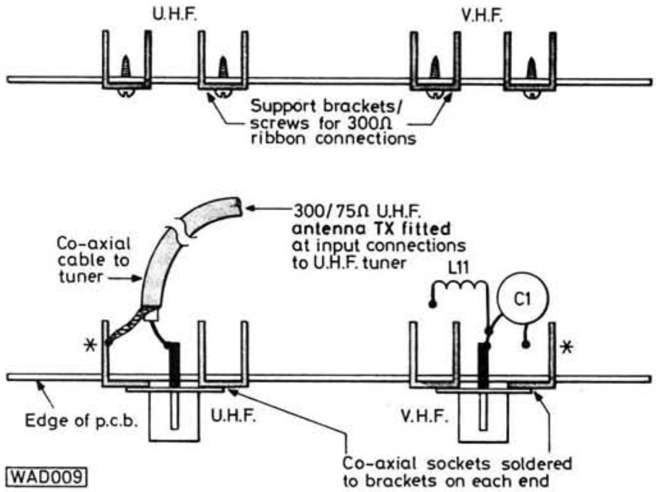


Fig. 4

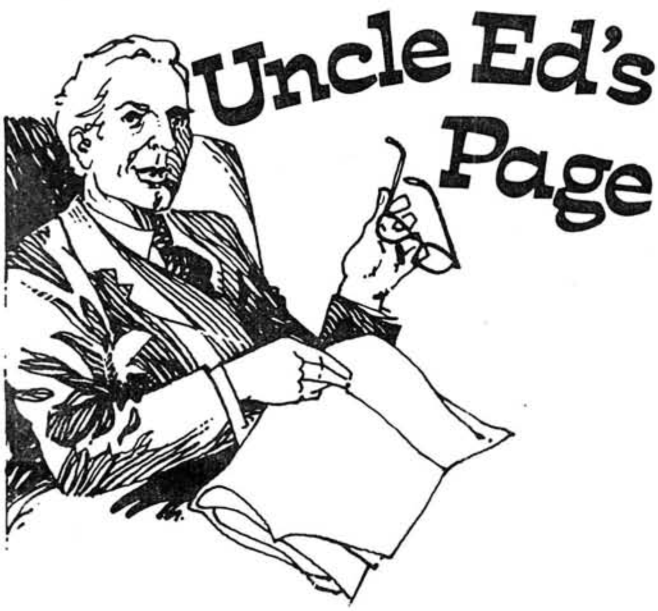
A 300/75Ω antenna transformer is fitted atop the u.h.f. tuner, the 300Ω terminations to the appropriate transformer connections and the 75Ω cable back to the new coaxial socket. Once completed the brackets, now supporting the u.h.f. socket, can be earthed on the p.c.b. directly to the nearest chassis track, which is adjacent to the bracket connections. Note: a 300/75Ω u.h.f. antenna transformer can be obtained from specialist antenna companies. Since the coaxial sockets protrude from the rear of the cabinet a degree of filing and enlargement to the existing antenna access holes is necessary!

That completes the simple modifications which will greatly add to the abilities of this receiver, particularly Band I reception.

Final Adjustments

Two final adjustments are necessary — that of resetting the 11·5V h.t. line, via the VOLTAGE ADJUST potentiometer, near to the earphone socket on the main p.c.b. It will be found that with the additional gain the a.g.c. preset must be reduced; previously, to maximise gain, the a.g.c. preset was set at maximum gain resulting in overloading on the stronger signals. It can now be reduced. Tune to a strong local u.h.f. transmission, set the preset at maximum and buzzing of the video will be heard on sound. Slowly reducing the preset by approximately 1/5th rotation, will clear the buzz. The point where the buzzing disappears is the correct operating setting.

The user should now have a TV receiver capable of a greatly improved performance on all bands, for DX use, whilst retaining the full facilities of domestic reception. ●



A monthly look at some aspect of the radio/electronics hobby that seems to bug the beginner, or occasionally a more advanced topic seen from an unusual angle.

METERS—1

You won't get very far in building or mending radio or electronic circuits without a means of measuring voltage or current. Although digital meters are getting ever cheaper and more common, the old-fashioned scale-and-pointer meter (or analogue meter, to give it its proper name) is not likely to disappear. Indeed, for some applications it is better than a digital one.

The most common types of analogue meter are the moving coil and moving iron (see any text-book with a section on electrical instruments for a description) where the deflection of the pointer or needle across the scale is proportional to the current flowing through a coil of wire inside the meter. Any such meter can be used to measure either voltage or current flow in an external circuit, but it's a current flow that actually moves the needle. Confused? Well, beginners often are, not helped by catalogues which list voltmeters and ammeters (short for ampere-meters—ones that measure current) as two completely different animals. Let's go back to a nice simple example to try to make things clearer, and I'll talk about a panel-mounting meter rather than a multimeter (one with several ranges reading volts, amps and ohms).

A typical panel meter might be quoted as having a 1 milliamp (1mA) movement. This means that if you pass a current of 1mA through it, the needle will go all the way over to the right-hand end of the scale, called **full-scale deflection** or **f.s.d.** The meter will have a certain d.c. resistance (not always straightforward to measure, but I'll come back to that later), which I'm going to say is 75Ω (again, fairly typical). From Ohm's Law, V = IR, so we can say that the voltage across the meter terminals at f.s.d. is:

$$\frac{1}{1000} \times 75 = 0{\cdot}075\text{V}$$

or more conveniently 75mV. 1mV (millivolt) equals one thousandth of a volt.

Now a meter which we can use to measure current up to 1mA and voltage up to 75mV has some uses, but not many as far as the average hobbyist is concerned. How can we make it read higher values?

First, let's suppose we want to measure a current of up to 10mA. If we could devise a circuit so that when 1mA passed through the meter, another 9mA could be passed through some other channel, we would have what we are looking for. And that's just what we do, by connecting a resistor (called a **shunt**, because it shunts some current away from the main line) across the meter terminals. What value should the shunt be? There are two basic ways of working it out—the simplest is to say that it has got to pass nine times as much current as the meter itself, so it must have one ninth the resistance; 75 ÷ 9 = 8·333Ω. The other way is that, knowing that the voltage across the meter is 75mV at f.s.d., the shunt must have a value that will pass 9mA when 75mV is applied across it. Again, from Ohm's Law:

$$R = \frac{V}{I} = \frac{75 \div 1000}{9 \div 1000} = \frac{75}{9} = 8{\cdot}33\Omega$$

If we wanted to measure currents up to 100mA, then our shunt must pass 99mA so its value would be 75 ÷ 99 = 0·7576Ω approximately. The idea is shown in Fig. 1. Note that shunts have low resistance values.

Fig. 1 WRM503

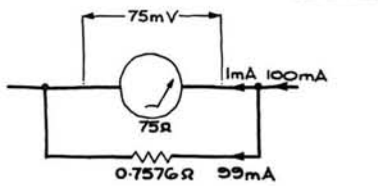
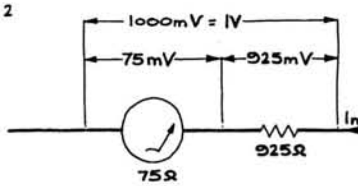


Fig. 2



If we wanted to measure up to 1 volt, then what we must do is to set up a circuit, containing the meter, so that when 1V is applied a current of 1mA will flow through it. You can work it out from Ohm's Law yet again, but if you're into radio and electronics you should know straight away, almost without thinking, that the total circuit resistance must be 1000Ω (1kΩ). We want all the 1mA to flow through the meter, so it must be a series circuit, so that the same current flows through every component. If we connect a resistor in series with the meter, as shown in Fig. 2, the "surplus" voltage will be dropped across it. That resistor, called a **multiplier** because it multiplies the full scale deflection voltage of the meter, must have a value which will drop 1000−75 = 925mV when 1mA flows through it, in other words 925Ω.

If we wanted to measure up to 10V, we would need a multiplier resistor of 9925Ω, to make up a total of 10 000Ω (10kΩ) with the meter resistance. Note that multipliers have high resistance values, compared with the meter anyway.

These last two examples should explain another term which you'll often find quoted in multimeter specifications, called **sensitivity** and stated in **ohms per volt** (Ω/V). Our meter is obviously 1000Ω/V (1kΩ/V), meaning that a current of 1mA flows at f.s.d. Other common sensitivities for multimeters are 5kΩ/V (0·2mA or 200μA f.s.d.), 10kΩ/V (100μA f.s.d.), 20kΩ/V (50μA f.s.d.) or even 100kΩ/V (10μA f.s.d.).

Next month, I'll talk about the effect the meter has on the circuit you connect it to, and how you can improve the accuracy of the measurements you make.

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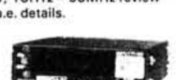

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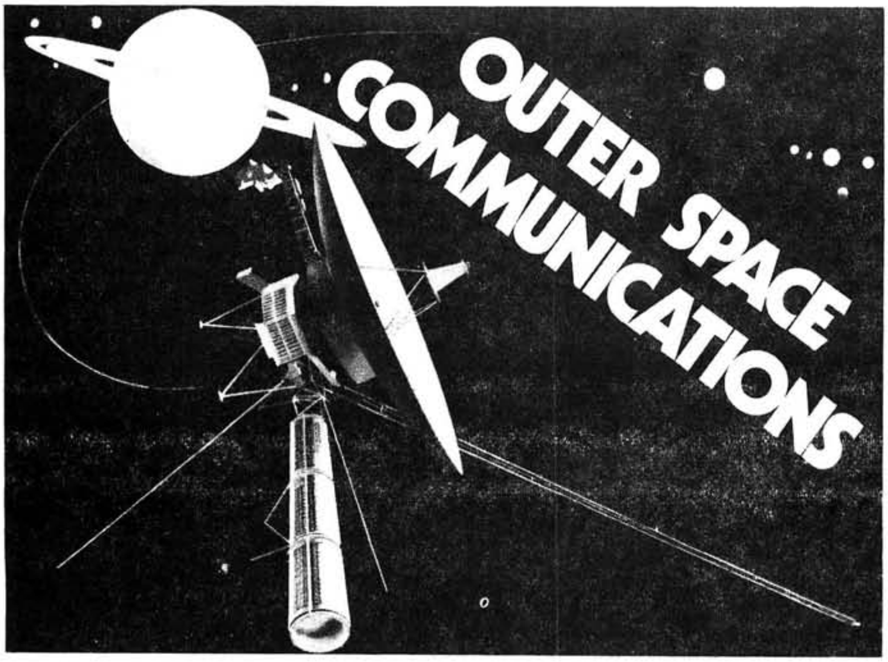


Brian DANCE

Perhaps the most difficult of all current communications problems is that of communicating with spacecraft in interplanetary space.

This article looks into the activities of the Deep Space Network, developed by the USA during the past twenty years, to provide the essential radio links between spacecraft and earth stations.

Deep Space Network

The Deep Space Network is used for three main purposes, namely:

1. The in-depth tracking of individual spacecraft to determine velocity, direction and distance from earth, enabling an accurate flight trajectory to be obtained.

Such information is provided by the use of an on-board radio transponder, replying to interrogation signals beamed from earth stations. The time delay of a relayed signal, introduced by the distance of the spacecraft from earth, provides a measure of the distance between them to an accuracy of a few metres.

In a similar way the Doppler Effect frequency shifts of transmitted signals are used to determine spacecraft velocity to an accuracy of 0·1mm per second.

By using large narrow-beamwidth antenna systems, peaked for maximum received signal strength, an accurate direction fix can be obtained.

2. The transmission of command or instruction signals to spacecraft.

Such signals could, for example, cause an on-board TV camera to focus on a specific object of interest or alternatively activate one of the gas jet thrust units, provided for in-flight corrections.

Command signals are normally "backed up" by the spacecraft's own computer memory to provide instructions at such times that the spacecraft is in the shadow of a celestial object, preventing direct radio contact.

3. The reception of telemetry data from spacecraft, comprising detailed information about the state of all on-board systems and components and including digitised TV images. Telemetry systems are also used to convey the vast amount of scientific measurements made by spacecraft during their voyages into outer space.

In addition to tracking, command and telemetry functions, the Deep Space Network possesses facilities for monitoring, recording and displaying the parameters necessary to verify configuration and validate the network.

Radio Science

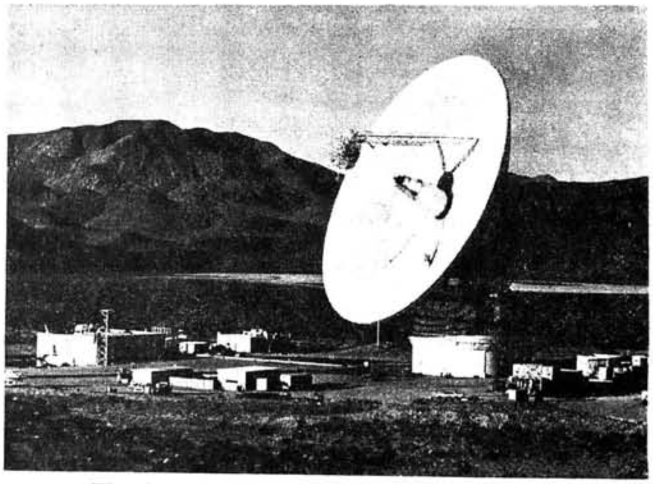
Recently a radio science system was incorporated into the network to measure phenomena associated with radio wave generation and propagation from spacecraft and radio astronomical sources.

Radio science work measures the effects to radio waves by such things as the solar corona, planetary atmospheres and inter-planetary charged particle regions. This work also includes investigations into the occultations of radio signals from spacecraft caused by planets, moons and the rings of Saturn. The celestial mechanics data provided by these studies is essential for the accurate determination of orbital calculations.

Network History

The origins of the Deep Space Network can be traced back to the Guggenheim Aeronautical laboratory at Pasadena in the mid-1930's.

During the early 1950's the then Jet Propulsion laboratory of the California Institute of Technology undertook work on the



The 64m Goldstone antenna in California

(Jet Propulsion Laboratory)

tracking and data recovery systems of US Army guided missiles, culminating in the creation of the Deep Space Network.

With the launch of *Explorer 1* in 1958 the US entered its space programme. Measurements taken by this satellite were relayed to a network of three ground stations and included the discovery of the Van Allen radiation belts surrounding the earth.

Following the creation of the National Aeronautics and Space Administration, NASA, during late 1958, the Jet Propulsion laboratory was appointed to manage all deep space communications.

The network has since provided communications facilities for all major space projects including the *Ranger, Surveyor* and Lunar Orbiter series, together with the *Mariner* missions to Mars and Venus.

More recently the network has been used by the *Pioneer* missions to Venus and is currently involved with the *Voyager* missions to Jupiter and the outer planets.

In addition to the support given to inter-planetary spacecraft, the Deep Space Network uses high-gain antennas for work in radio astronomy, including Pulsar and Quasar studies and the mapping of the surfaces of planets and the rings of Saturn.

Network Earth Stations

The Network employs huge, high-gain, parabolic antennas and very low noise receivers, positioned at three approximately 120° separated places around the earth. This distribution ensures that a spacecraft travelling beyond earth orbit is never out of view of all of the network stations, unless it is in the radio shadow of a large extra-terrestrial object.

Earth stations are located at Goldstone, California; Madrid, Spain and at Tidbinbilla, near Canberra in Australia.

Each earth station is equipped with an enormous 64m diameter parabolic dish antenna and at least two smaller 34 and 26m parabolic dishes. The larger 64m antennas are used when high data rates or very reliable communications are required, with the smaller, more economical, antennas used for lower data rates and less critical work.

The diameter of the smaller antennas at each of the three stations was initially 26m and only usable at S-band frequencies of between 2·1GHz and 2·3GHz. Recently, one of the 26m antennas at each of the three locations was converted to 34m diameter, providing greater gain. In addition, the improved antennas have been equipped to operate simultaneously in the S and 8·44GHz X-bands.

The X-band receiving capability is required to enable adequate data return rates from spacecraft in the regions of the outer planets to be achieved and to reduce the effects of interference which have become increasingly troublesome at S-band frequencies, due to the operation of other microwave equipment.

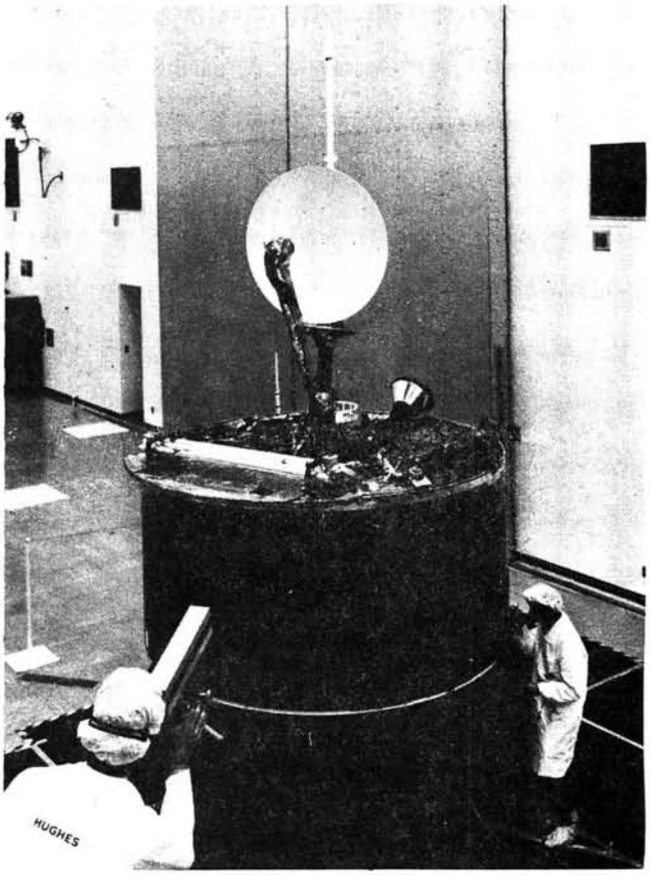
The 64m diameter sub-network has also been improved over the years, including the introduction of more powerful transmitters, etc. Although initially designed for the reception of only right-hand circularly polarised signals, in X-band, this sub-network has now been upgraded for selectable X-band polarisation. The network previously provided dual S-band polarisation facilities.

All stations are linked together by a special ground communications network which is a part of the larger NASCOM network which provides communications between all of NASA's stations.

Ground communications facilities used by the Deep Space Network include Intelsat communications satellite links and sub-oceanic cables, as well as terrestrial microwave links. Data received from a spacecraft is transmitted over high-speed data circuits. Wide bandwidth circuits may be employed to carry television pictures of planets and their moons from any deep space earth station to the control centre, at a rate of up to one complete picture in 48 seconds. In addition, range and velocity information about the spacecraft is transmitted from the receiving station to the control centre for navigational purposes.

Launch Communications

The Deep Space Network is not employed during the launching phase of any mission. Launches of spacecraft destined for inter-planetary work take place from Cape Canaveral, Florida and use the near-earth facilities of the US Air Force Eastern Test Range in the Atlantic, together with the down-range elements of the NASA Spaceflight Tracking and Data Network (STDN) at Merritt Island, Florida. Communications ships and instrumented jet aircraft may also be employed during the launching stage. The STDN system is essentially concerned with manned space flights and earth satellites, together with the launching phase of any spacecraft; it consists of sixteen stations located throughout the world.



The *Pioneer* Venus Orbiter probe. Data is returned to earth via the parabolic dish

(Hughes Aircraft Co.)

The Goddard Space Flight Centre located in Greenbelt, Maryland, operates the STDN network and the NASCOM network, which links all STDN and Deep Space Network stations to their control centres. The NASCOM network permits the transmission and reception of written messages, facsimile, voice, telemetry and commands by high speed wideband data lines.

The STDN system provides tracking and communications with the spacecraft during the launching phase, up until the time that the launching vehicle is jettisoned and the spacecraft has been put into its correct trajectory.

Space Frequencies

The standard frequency band used for deep space communications is the S-band. Up link frequencies from the earth stations to a spacecraft are at 2·1GHz and down links from the spacecraft at 2·3GHz.

Some spacecraft are also equipped with an 8·4GHz X-band transmitter. For example, *Mariner 10* carried an unmodulated, low power X-band transmitter which was used, in conjunction with the S-band signal, for dual frequency radio propagation experiments. *Voyagers 1* and *2* have both S- and X- band transmitters operating at relatively high power; the X-band downlink can transmit at 115kbits/second from Jupiter, at a distance of some $6{\cdot}88 \times 18^8$km in the case of *Voyager 1*, and $9{\cdot}27 \times 10^8$km in the case of *Voyager 2*.

Transmitter Power

The 64m deep space installation at Goldstone, California is equipped with a transmitter able to radiate an effective power level of up to 400kW towards a spacecraft. Earth stations at Madrid and Canberra have 100kW transmitters. Each of the 34 and 26m stations can be operated at a power level of 20kW, using klystrons to generate the radio frequency power. These very high power levels are, of course, obtained by the very high magnification factor provided by the huge, narrow beam width, antennas.

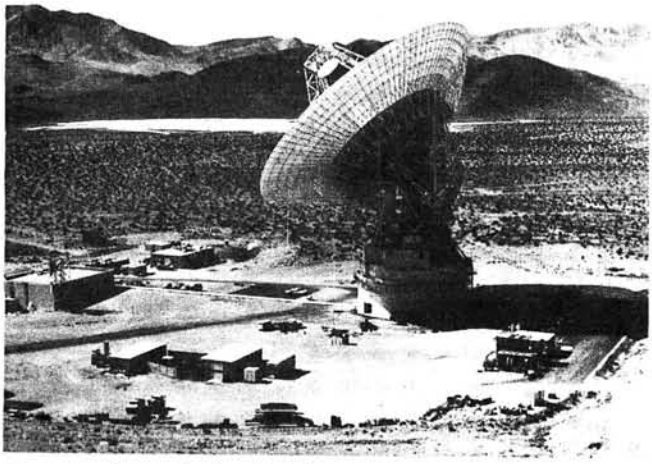
On-board spacecraft transmitters necessarily operate at much lower power levels. The *Viking* spacecraft, which went to Mars, employed transmitters with an output of about 30W, using power obtained from sunlight collected by solar panels. The *Viking* spacecraft which landed on the planet could transmit directly to earth or via the orbiting relay spacecraft.

The solar panels employed on the Venus *Pioneer* spacecraft provided over 200W of power. The individual probes of the multi-probe spacecraft which reached Venus in December 1978 were powered by batteries for the short period after they had separated from the main spacecraft and transmitted directly to the Deep Space Network earth stations using powers of between 10 and 40W. However, the data rates had to be relatively low owing to the simple, low gain antennas used by these probes. Low data rates were adequate, since no TV picture images were returned from the probes, but merely data on conditions in the Venusian atmosphere.

Both *Voyagers* had to be able to communicate with the earth stations over enormous distances, from regions of space in which the sunlight is much attenuated by their distance from the sun. Plutonium-238 radio isotope power generators were therefore chosen for these spacecraft. Each spacecraft had three such generators which initially provided 155W each, reducing to about 135W after five years, and 125W after ten years. Because of the overall system requirements, only a fraction of this power is available for use by the radio transmitters. Each *Voyager* spacecraft is equipped with a 3·7m diameter dish antenna which directs the beam towards the earth. This is the largest dish antenna yet used with any solar system exploration spacecraft. Phase locked loop receiver systems are used at the earth stations.

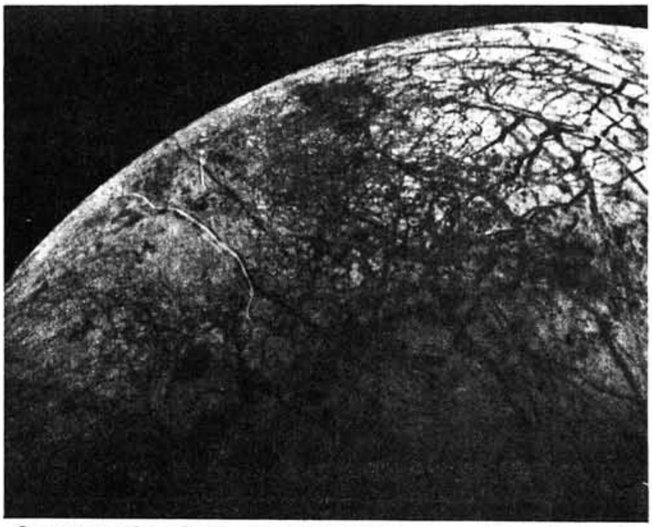
The *Voyager* spacecraft transmitted data at rates of up to 115200 bits/second from the vicinity of Jupiter when working in conjunction with a 64m earth station antenna, but at only about 640 bits/second from the same location when working with the 34 or 26m antennas.

Data rates are limited by errors introduced by noise. The use of a lower data rate enables a narrower bandwidth to be employed, reducing the noise levels and the probability of errors occurring. In other words, the wider you open the window, the greater the amount of dirt which flies in! A wider bandwidth will allow more noise to enter the system, but will also enable a greater data rate to be used, provided the signal is not lost in noise.



A rear view of the Goldstone antenna showing the 6·4m Cassegrainian sub-reflector

(Jet Propulsion Laboratory)



An example of the excellent image quality obtainable over vast distances. In this case the surface of Europa, one of the four moons of Jupiter, taken by *Voyager 2*

(Jet Propulsion Laboratory)

Errors of up to 1 bit in 30 have been found acceptable in the case of TV pictures transmitted by a spacecraft to the earth, since a small point of light in the wrong place is not an unacceptable error. However, the probability of an error being introduced into a command signal must be made extremely small or the spacecraft may be sent on an incorrect trajectory, with the result that a very expensive mission could be completely ruined.

64m Antennas

The first of the huge Deep Space Network 64m antennas was constructed at Goldstone, California; it became operational in 1967, followed six years later by a further two.

A 64m antenna collects over six times the signal obtained by a single 26m antenna, due to the much larger reflector area of the 64m antenna. Further improvements have been made to the 64m antenna systems which has resulted in these systems being able to receive signals some ten times weaker than the minimum required for adequate reception by the 26m systems. By comparison, the diameter of the best earth station antennas for Intelsat work is about 30m.

The signal strength from a distant spacecraft is essentially inversely proportional to the square of the distance of the spacecraft from the earth: the inverse square law. If a spacecraft at a certain distance produces a signal which is just adequate to be received satisfactorily by a 26m antenna, the same spacecraft will produce a satisfactory signal into a 64m antenna at three times the distance. This is the reason why the United States has invested in the huge 64m antennas, which have an overall height of about 73·2m when the antenna is in the horizontal position.

The parabolic reflecting surface must be shaped to a profile accuracy of about ±1mm, even at its edges, so that incoming signals of extremely low intensity are concentrated towards the focal point.

The surface area of the parabola is about 3483 square metres, with a total weight of 7 257 600kg. These complete structures must be able to operate in a wind of at least 80km/hour and withstand gales of 190km/hour when the dish is stowed in the horizontal position.

Each 64m antenna must be capable of pointing to anywhere in space at 10° or more above the horizon to an accuracy of a few thousandths of a degree. Motors, with a total power of some 300kW, are used to move the reflector, which can be completely rotated and moved from horizontal to vertical in three minutes.

The concluding part of this article examines antenna performance, control station facilities and future developments for outer space communications.

MOBILE RADIO ALARM

Stephen IBBS G4FAI

With the increasing number of thefts of radios, both commercial and amateur, from cars, there seems to be a need for a simple-to-build-and-install alarm to protect the valuable equipment. The unit described here requires no internal connection to the rig, and will, if triggered, operate an alarm, such as the car horn for about 1 minute. Longer or shorter alarm periods can easily be produced by altering the value of one resistor.

The Circuit

IC1a and b are connected as a monostable. Pin 1 is normally held low by the flying lead connected to the rig chassis/mounting bracket. If, however, this lead is disconnected R1 pulls the pin high and produces a 1s HIGH pulse at pin 4 which is inverted by IC1c to produce a negative-going pulse at pin 10 (which is normally HIGH). This triggers the monostable arrangement of IC2, causing the relay contacts to close for a time determined by R4 and C2.

With the component values given the alarm will sound for about 1 minute. By reducing the value of R4 the time will be reduced and vice versa. A reset facility is provided by S1 connected between pin 4 of IC2 and earth, to abort the alarm at any time.

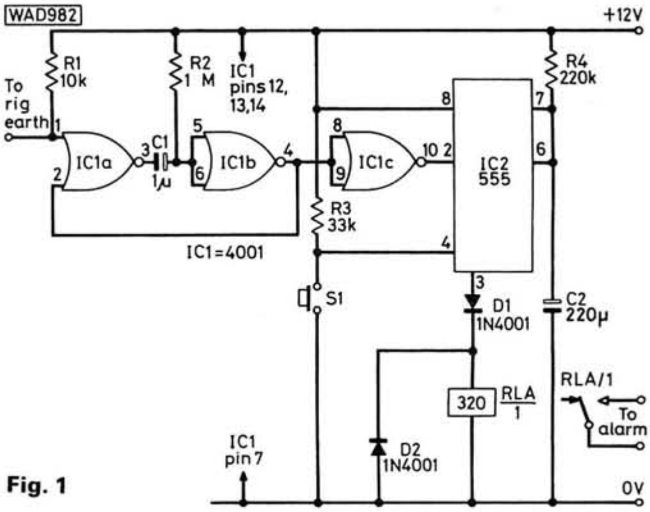
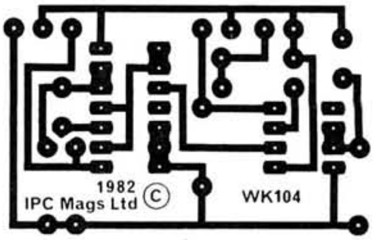
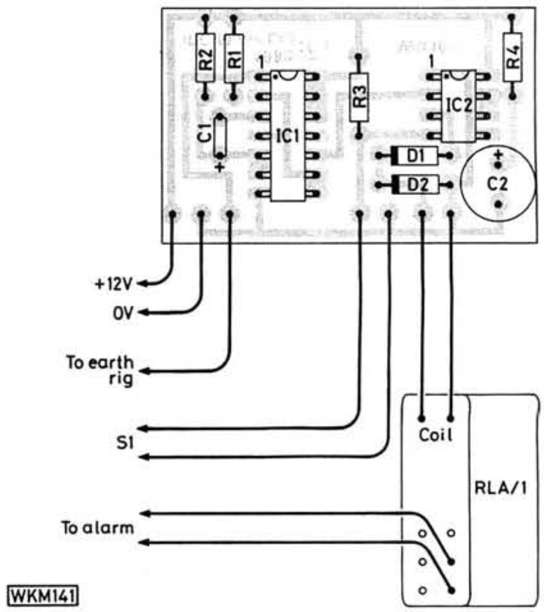
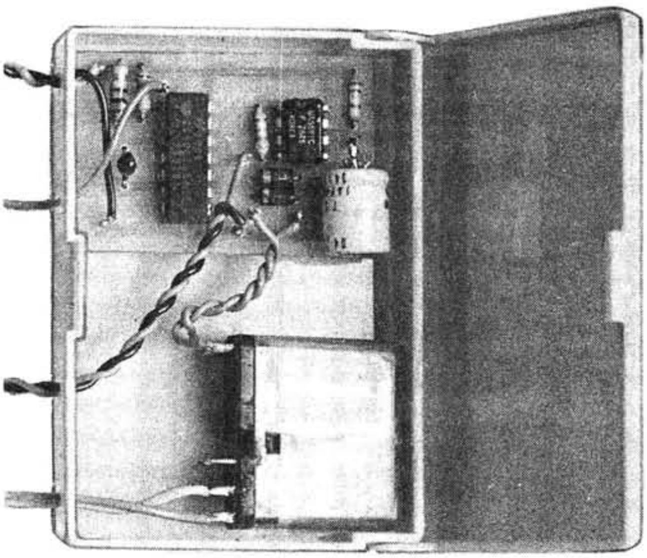


Fig. 1







The photograph above shows the author's prototype unit housed in a small plastics box.
Fig. 2: (Above right) the copper track pattern of the p.c.b. shown full size.
Fig. 3: (Right) the component placement drawing for the mobile radio alarm unit

★ components

Resistors		
¼W 5%		
10kΩ	1	R1
33kΩ	1	R3
220kΩ	1	R4
1MΩ	1	R2
Capacitors		
Tantalum		
1μF 16V	1	C1
Electrolytic p.c.b. mounting		
220μF 16V	1	C2
Semiconductors		
Diodes		
1N4001	2	D1,2
Integrated circuits		
4001	1	IC1
555	1	IC2
Miscellaneous		
Push to make switch; Relay 12V (see text); Printed circuit board.		

Construction

Constructors can use either Veroboard or a p.c.b., and a suggested design for the p.c.b. is given in Fig. 2. Check that the polarity of the diodes, capacitors and i.c.s are correct as shown in Fig. 2. A set of n.o. contacts from the relay are wired to the alarm. Make sure that the relay contacts and connecting wire can handle the quite high currents taken by the car horn.

Any small box can be used to house the project and S1 should obviously be hidden from view. The flying lead could either be trapped between the rig and its mounting bracket, or a separate socket on the rig could be provided; the author modified his TR7200G to accommodate a 3 pin power socket, and connected the flying lead terminal to earth inside the rig, so that removing the power lead automatically disconnected the flying lead from earth, triggering the alarm. ●

CONSTRUCTION RATING **Beginner**

BUYING GUIDE

All the components used in this project should be easily obtained from several of our advertisers. Any suitable 12V relay could be used and if thought necessary several sets of contacts could be paralleled to handle the high currents taken by the car horn.

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Valves Used in the Early Days, February 1982

On page 23 in the second paragraph it should read: "This, the S3, had the anode and grid contacts . . ." Not 53 as printed.

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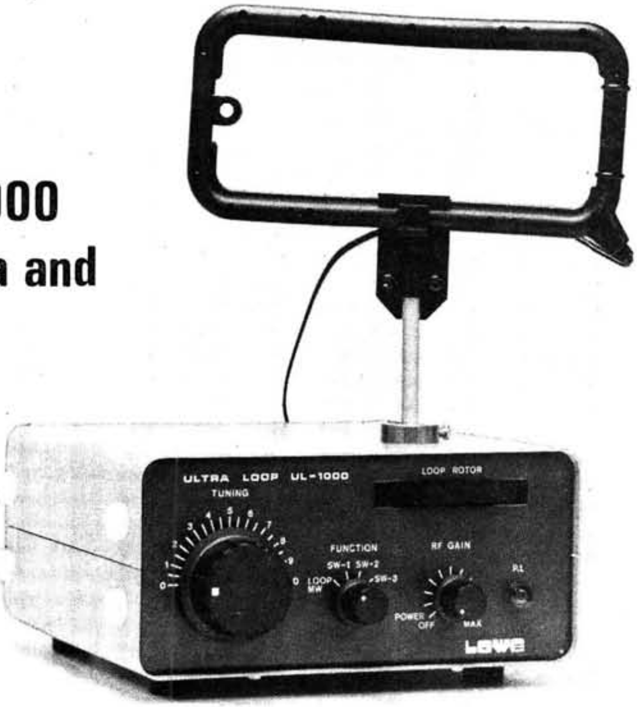
LOWE UL-1000 Loop Antenna and Pre-amplifier



The UL-1000 is a versatile receiving station accessory based on a variable gain, tuned pre-amplifier, and incorporating a small (140 × 70mm) medium-wave loop antenna.

Four antenna inputs are provided on the rear panel: coaxial socket (SO239) and terminals for a short-wave antenna; terminals for a medium-wave wire antenna; terminals for the medium-wave loop. From the s.w. input terminals, the incoming signal is routed via the AMP/PASS switch, which allows the amplifier to be by-passed if desired, to the high-Q input tuned circuits selected by the band-switch. The frequency ranges are:

SW1 1·6–4MHz
SW2 4–10MHz
SW3 10–30MHz.

The m.w. wire and loop terminals go directly to a separate input tuned circuit for the band 0·5–1·6MHz.

The input coils are resonated by the main TUNING control, and the signal fed to a variable-gain (10–20dB) amplifier using a dual-gate f.e.t. input stage and an f.e.t. source-follower. Switched connectors for m.w. and s.w. outputs allow the unit to feed receivers with separate or combined m.w./s.w. antenna input arrangements.

Power for the amplifer (3V 10mA) is taken from two internally-mounted R14/HP11 cells. Case dimensions are 67 × 152 × 146mm and the unit weighs approximately 1kg.

Results

The unit was tested in conjunction with the SRX30D receiver on all bands from 0·5–30MHz, and with a Shimizu SS-105S transceiver on the h.f. amateur bands.

On the m.w. broadcast band, using just the loop on a Sunday afternoon in early January, good "listenable" signals were obtained in south-east Dorset from ILR stations Devonair, Victory, Beacon, R. Trent and R. West, and BBC R. Solent and R. Bristol, plus S9 + 30 signals from our local Two Counties Radio. The recommended wire antenna length for medium-wave use with the UL-1000 is 1–4 metres, anything longer will overload the pre-amplifier. Using the minimum 1 metre length of wire, hung vertically from a shelf above the listening desk, cracking good signals were obtained right across the band.

The polar pattern of the loop is not a true figure-of-eight between about 1 and 1·5MHz, apparently due to "vertical effect". This is direct pick-up on the loop and its connecting wiring, which tends to act as a simple wire antenna, whose circular polar pattern combines with the figure-of-eight to produce a cardioid, having only one null instead of two. Reducing the length of the loop antenna twin feeder would probably help, but better still would be for the loop input tuned circuit to be re-engineered to make it balanced with respect to earth, so that the "vertical" pick-up is largely self-cancelling.

I found the loop-mounting friction screw, intended to make the loop stay on the compass bearing on which you set it, rather difficult to adjust. It either seemed to clamp the loop solid or else let it rotate to where its fancy took it.

Within about ±30kHz of strong local broadcast stations, the pre-amplifier gain needs to be kept down to avoid spreading the signal across adjacent channels, but this is only to be expected.

On the h.f. bands, performance was again good, though I found that above about 28MHz, the full pre-amplifier gain could not be used without it becoming unstable. Results using the 1 metre length of wire were compared with those from a roof-top HF5V trapped vertical, and were found to be roughly similar in strength, though with poorer signal-to-noise ratio.

The rear-panel input terminals are small, but the output terminals are even smaller. There is certainly room to fit more sensibly-sized output terminals, and I think this should be done.

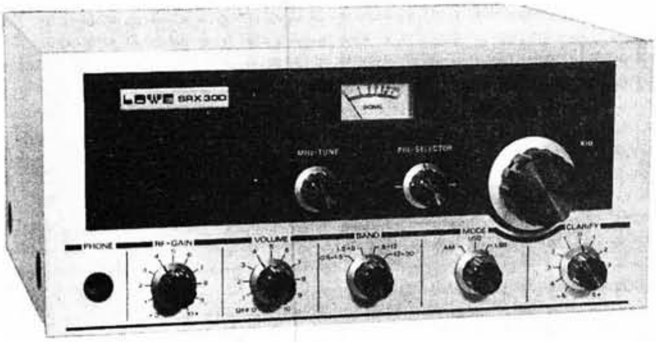
The six-page instruction booklet gives circuit description, instructions for connection and use covering various receiver configurations, circuit diagram and specification, and is very helpful.

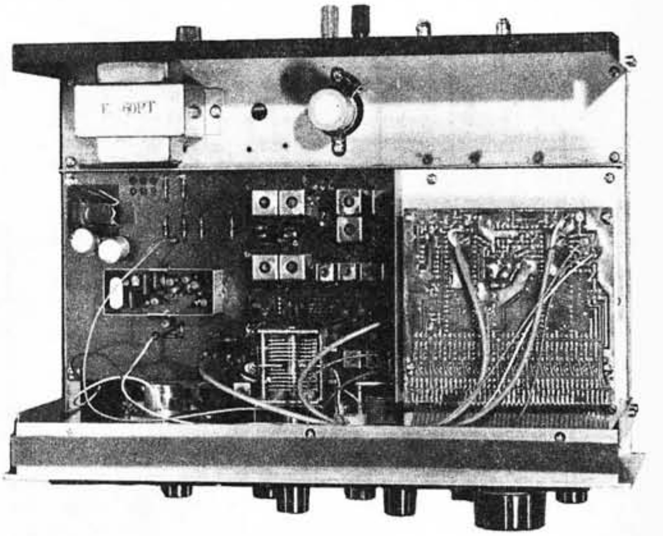
To a short-wave listener unable to put up a conventional antenna (a flat-dweller, for example), this little unit would appear to offer the scope for good results, perhaps using a short window-sill mounted whip antenna.

The Lowe UL-1000 is available, price £39.50 including VAT, from **Lowe Electronics,** to whom we offer our thanks for the loan of the review unit. See the SRX30D report for address and telephone numbers.

Geoff Arnold

LOWE SRX30D HF Communications Receiver





"A familiar name, but a whole new receiver behind it." So says the Lowe advert, and it's probably a fair statement. We reviewed the old SRX30 with analogue frequency readout, back in August 1979 and it came out as pretty good value for money.

The SRX30D has a virtually identical front panel layout, except that the analogue dial has been replaced by a 12·5mm-high, 5-digit green l.e.d. display. Inside, the circuitry has been largely redesigned. The triple-conversion Wadley Loop system is still used, but more modern devices have been adopted, for example Plessey Semiconductors SL1641 double-balanced mixer i.c.s are used in the three frequency-conversion stages.

Several criticisms of the earlier model have been taken note of and acted upon. The telescopic antenna at the back of the set has disappeared, making the new receiver easier to use with a loop antenna. The audio quality is considerably better, and the loudspeaker has lost its inclination to rattle. Separate i.f. filters, controlled by the MODE switch, are provided for a.m. and s.s.b./c.w., with −6dB bandwidths of 8kHz and 4kHz respectively. The CLARIFY (fine tune) control now has a very much smaller range—approximately ±1kHz at the h.f. end of each 1MHz band, falling to about ±350Hz at the l.f. end, making the final tuning-in of an s.s.b. signal very easy.

Results

Perhaps I should recap on the tuning control arrangements of a Wadley Loop receiver, for the benefit of those not familiar with them (a brief description of the Wadley Loop system appeared on page 56 of our July 1979 issue). A continuously-variable MHZ TUNE control selects the appropriate megahertz-wide band, and the KHZ control (main tuning) tunes across that megahertz span.

On the SRX30D, proper setting of the MHZ TUNE control is indicated by the MHz digits and decimal point on the display being more brightly lit. If the KHZ control is taken below 000 or above 999, an over-range condition is indicated by the three right-hand decimal points (otherwise unused) being lit up. Display brightness is a bit low for bright daytime use, but otherwise adequate.

Receiver input tuning is by means of a built-in pre-selector covering 0·5–30MHz in four switched bands, with a variable control to peak for maximum response. On the SRX30D this control is very sharp, and it is essential to adjust it carefully, otherwise you can get either poor signals or else interference from stations on other frequency bands. Although the pre-selector doesn't tune below about 500kHz, quite respectable results can be got down to the bottom end of the long-wave broadcast band (155kHz) with the PRE-SELECTOR knob set fully anti-clockwise on the 0·5–1·5MHz band, providing you connect a reasonably good antenna to the input terminals (50Ω unbalanced).

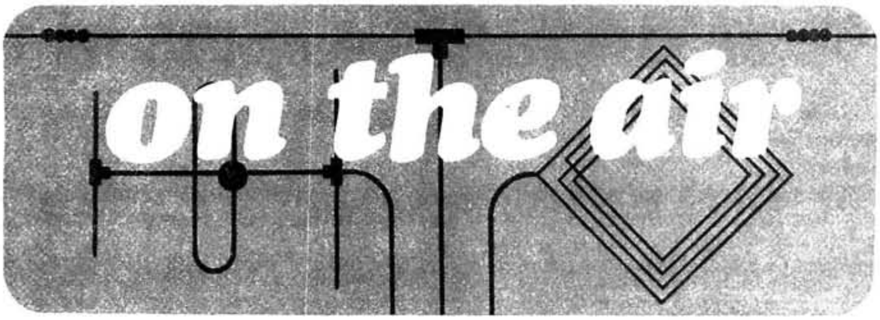
Sensitivity was good on all bands from the bottom of the medium-wave broadcast band up to 30MHz, both on listening tests and when checked in the lab. The claimed 10dB (S + N)/N ratio for an input of 0·3μV on s.s.b. and 1μV on a.m. was comfortably achieved.

The phone jack on the front panel can also be used to drive an external 8Ω loudspeaker. Rear panel jacks are provided for a recorder (60mV 5kΩ), and for muting from an associated transmitter. Power supply requirements are 100, 117 or 220V, 50–60Hz a.c. Cabinet dimensions are 140 × 325 × 230mm and weight 5kg.

The instruction book deals with controls, connections and operating, and gives the specification and circuit diagram. Though sufficient to teach a beginner how to "drive" the receiver, I think it deserves something better.

The Lowe SRX30D is available, price £215 including VAT, from **Lowe Electronics Ltd., Chesterfield Road, Matlock, Derbys DE4 5LE, telephone Matlock (0629) 2430/2817,** to whom we offer our thanks for the loan of the review receiver.

Geoff Arnold



Amateur Bands

by Eric Dowdeswell G4AR

Reports to: Eric Dowdeswell G4AR
Silver Firs, Leatherhead Road,
Ashtead, Surrey KT21 2TW.
Logs by bands in alphabetical order.

With the advent of CB radio came a spate of ads for filters of all kinds, often with one particular type of filter appearing under a number of different names, all calculated to induce the innocent public to buy them as a cure for any CB evil.

The illegal CB equipment using amplitude modulation (a.m.) caused the Post Office to receive many thousands of complaints every week of interference (QRM) to radios, TVs, audio equipment, paging systems and the like. The newly-introduced legal CB system using frequency modulation (f.m.) is reckoned to cause far less interference, perhaps only one fourth, as one would expect.

Charles Molloy took a brief look at filters in his *Medium Wave* column last month, but I would like to expand on this somewhat.

A filter, in general terms, is an electronic circuit usually comprising capacitance, inductance and resistance in a variety of combinations which, when introduced into a circuit, will modify the frequency characteristics of that circuit, often for some particular purpose.

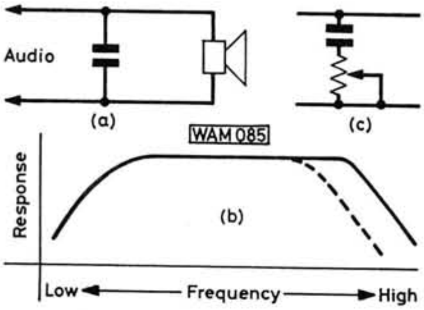


Fig. 1: (a) Capacitor connected across audio circuit to reduce response at high frequencies. (b) Response curve of audio amplifier is shown in solid line, modified to the dotted line when the capacitor is added. (c) Commonly used tone control circuit

Take the very simplest form of filter, a tone control, Fig. 1, where a capacitor is connected across the output of an audio amplifier to reduce the high frequency response. Assuming that the frequency response is fairly flat without the capacitor then, when it is added, it will present a parallel damping effect which will be highest at the higher frequencies, thus reducing the output of the amplifier, as shown in Fig. 1. The degree of reduction will depend upon the impedance of the capacitor at a particular frequency, the impedance decreasing with increasing frequency. (See standard reference books for formula.) In practice, in cheap radios and amplifiers the "tone control" may be no more than a variable resistor in series with the capacitor to vary the degree of cut in the h.f. response.

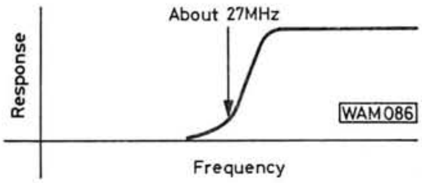


Fig. 2: Approximate response curve of a high-pass filter, in this case cutting off below about 27MHz

The many fancy-named CB filters are usually "high-pass" types designed so that all signals above the CB band around 27MHz are passed through to the TV or v.h.f. radio, Fig. 2, while CB signals and others below 27MHz are severely reduced, or attenuated, to use the proper terminology. In practice the band of frequencies over which the attenuation becomes effective is quite flat and not the sharp step as often depicted in ads.

In the low-pass filter the opposite effect is achieved, Fig. 3, frequencies above a certain point being attenuated. This characteristic is often encountered in TV interference (TVI) filters used by amateurs operating on the h.f. bands where harmonics or other spurious signals need to be attenuated above about 30MHz. Such filters are generally designed for use in the low-impedance antenna feeders, coaxial or flat twin.

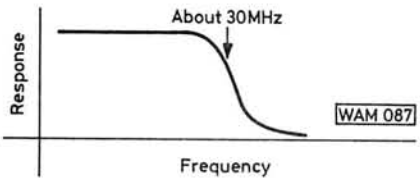


Fig. 3: This low-pass filter has roughly opposite characteristics to the high-pass filter of Fig. 2

Bandpass filters are, perhaps, the most interesting of filters, being widely used in receivers and transmitters. Their response is something like Fig. 4, the quality of the filter being determined by the slope of the "skirts" of the response curve. Ideally they should be vertical, as shown, but unobtainable in practice. These filters are essentially a combination of high- and low-pass filter characteristics, cutting off above and below two given frequencies.

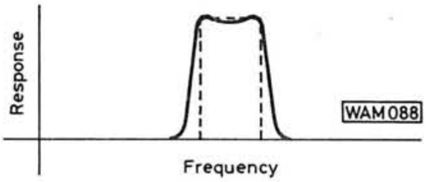


Fig. 4: Response of a bandpass filter, typically that of an i.f. filter. Ideal response is shown dotted

The bandpass filter is found in the i.f. stages of receivers, the pass bandwidth being chosen to suit the mode of signal being received. For s.s.b. this is around 2·7kHz, or 4 to 6kHz for broadcast a.m. signals, while for c.w. only a few tens of hertz will suffice. The sharper the skirts of the response curve the better the filter's ability to reject signals on adjacent channels. The cheaper communications receivers will necessarily have only one i.f. filter of about 4kHz bandwidth, a compromise for all three modes, with poor skirt attenuation. Good i.f. filters are expensive but well worthwhile in the end.

Response curves are normally shown as frequency against positive response on the two axes but where the attenuation characteristic is the important factor the curve may be inverted, Fig. 5. In some communications receivers the front end tuning may be replaced by fixed bandpass filters, one for each band, or with a 1MHz pass band for general coverage sets. Such filters may also be added externally to an existing receiver which may be lacking in the ability to reject unwanted (second channel) signals.

Bandpass filters are frequently used in inter-stage coupling circuits in transmitters to attenuate out-of-band signals that would otherwise be radiated by the p.a. stage.

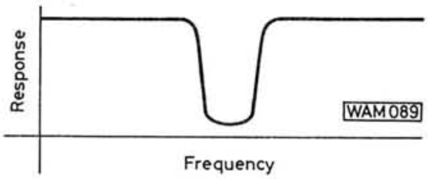


Fig. 5: Filter response curves are sometimes shown in this form

Finally, there are the audio filters with notch or peak facilities so often added at the end of receivers lacking in adjacent channel selectivity. A circuit with variable positive feedback has a tunable audio filter in the feedback loop thus maximising the gain at the frequency to which the audio circuit is tuned. This is the peak condition which can be reversed by a switch to become the notch position, Fig. 6, for attenuating interfering stations or whistles. The height of the peak or depth of the notch is determined by the feedback control.

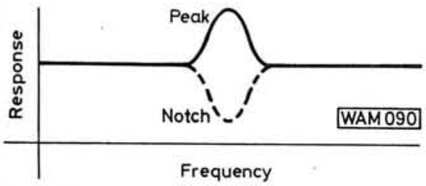


Fig. 6: Audio filters can be designed to give the option of peaking a particular audio frequency or rejecting it

The same idea is also used at i.f. frequencies, such as 455kHz, an external unit needing only to be connected to the i.f. wiring with a single lead and earth, thus avoiding interference to the set's wiring. More next month.

DXpedition *TO* the UK!

Members of the Surrey ARC from the town of Surrey, British Columbia, Canada, will be coming to London to operate a special events station GB2BC from British Columbia House from March 26 to April 1 on the occasion of the 110th anniversary of the establishment of BC House. Suitable equipment is being loaned by Bernard Godfrey of Amateur Radio Exchange and the event is being supported by the Sutton & Cheam RS with Ron McDonald G3DCZ of 60 Dudley Drive, Morden, Surrey SM4 4RJ acting as co-ordinator.

Any amateur able to offer to provide accommodation to one or more of our VE friends, possibly on an "at cost" basis, will be going a long way to reduce the cost of this unusual exercise. Offers to Ron please, in good time.

DX Matters

Suffering from cross modulation problems on his R-1000 **Rhys Thomas** managed to fit an r.f. gain control using the existing tone control, seemingly to good effect. Anyone interested in the mod can drop an s.a.e. to 46 Litchard Cross, Bridgend, Mid-Glam CF31 1NX for more details. However, second thoughts would be in order if the set is still under guarantee. Rhys has been using an active antenna in front of the R-1000 as well as a long wire and a.t.u. to find VO1FG, VO2CW, CT3BM, FM7CD and OX3CS on 3·5MHz (80m) band, plus AP2ZR, 7X4MD and 9H1BB on 7MHz, with PZ5RC on 21MHz and TU2JD on 28MHz (10m) for some good catches.

Stephen Pearson, who resides in Arundel, W. Sussex, is busy constructing an a.t.u. for his 20-metre long wire and BC348 receiver in between times when not taking part in amateur panto! Concentrating mostly on the 14MHz (20m) band the log has EA8ABG, CP5DB, A71AD, 9H4M on Gozo Island, VP2KT, Z21FW, ZD7CV and ZS3KC but JA0KRR did turn up on the 3·5MHz band.

New to the column, but not s.w.l.ing, is **D.R. Degg** of Stoke-on-Trent with his Realistic DX-300 and long wire but no a.t.u., yet. Part 1 of the RAE is done with but another go at Part 2 is imminent. On 28MHz it was HI8LC, TI2DF, V3ME in Belize, VP2MEQ, VP2VIC, with 9N1MM still going strong on 21MHz. On 14MHz St Lucia was represented by J6LLF while the redoubtable Colvins held forth from W6QL/8R1, appearing in most logs.

Hearing his first American station on the 1·8MHz (160m) band has made **David Warr** (Weymouth) resolve to put up a suitable long wire as soon as the winter blizzards permit. His FR-50B and W3DZZ-style antenna looked at the 28MHz band and found A4XJL, CP6CC, HR1MZM, J73RM, ST2SA said to be using only 10W, VS6CT, 8P6OV, 8R1J, and a good one on 21MHz in the shape of KG4GN who said to QSL via WB1GQQ.

Great news from **Stephen Littler** of Seaton, Devon, who is now G4NUU at 16 years of age, so he has a long amateur life in front of him! First venture will be a homebrew c.w. rig on 3·5MHz in conjunction with his FRG-7 although he admits that an FT-1 would not come amiss! Still, that is the best way to learn, by constructing and experimenting with one's own designs. Last receiving log from Stephen showed VP2MBA, VP2KAE, 8P6OR and HK5CKH on 7MHz, VU2LBD (on c.w.), 3X1Z in Guinea, YI1BGD on 14MHz, 7Q7LW and S85H (Transkei) on 21MHz plus 6T2II from the Sudan on 28MHz.

A note from **Mike Gater** G4ICC of 268 Main Road, New Duston, Northampton who has received a large number of cards for ZC4KC for QSOs in the African Safari Net on 21MHz between December 16 and 22 last. Mike says he is NOT the QSL manager for this station and wonders who is! He'd be glad to send on the cards.

No log from **Allan Stevens** this month from his QTH in Crowthorne, Berks, as a slipped disc prohibits his sitting at the receiver for any length of time. He keeps a watch but not long enough to chase any delectable DX. Half his time is spent on the v.h.f. bands, 144MHz (2m) to be precise, with the scanner making the going a bit easier. Commenting on the logging of ZS9BU on Gough Island in *PW* for November, **Ean Retief** ZS6UD points out that ZD9G is now being used for Gough Island and ZD9B for Tristan de Cunha. ZD9BU is a full time maritime mobile station and should therefore be ZD9BU/MM with cards to Ean or SARL QSL Bureau. Beacon ZD9GI on Gough should be taken there by ZD9BU/MM in February and will operate on 28·2125MHz continuously. Ean also mentions ZD9AB as being a pirate.

In Northchurch, Berkhamsted, Herts, **Jon Kempster** BRS45205 is thinking of swapping his FRG-7 for something like an FR-50B, while the latest antenna is a vertical for the 28MHz band complete with radials. As far as 7MHz DX is concerned Jon reckons all he hears with the FRG-7 is static. Well, it is in fairly well defined slots depending upon the BC stations but it is there and can be logged. Some DX captured on 28MHz included SV0AU, C6ANU, VP9DL, 8R1J, CO2OM, EA9JV, FG7XL, 8P6HZ and W6QL/8R1 of course. Only one of import on 21MHz was C53AP with QSLs to G3LZZ. On 14MHz it was HV3SJ for a comparatively rare one with cards to I0DUD, and A71AD in Doha, Qatar, POB 4747 to be precise.

First letter from 14-year-old **Richard Cooper** BRS47936 of Harwich, Essex who has stuck to the 7MHz band with his Trio 9R59DS and 20-metre wire, finding HI8ECS, 8P6OR (QSL K5MHZ), TG9EO, ZL4LZ, 3A2EE, VK9NS on Norfolk Island, and 6W8A, all on s.s.b. In Leeds **Basil Woodcock** put up a three-band dipole for the 14, 21 and 28MHz bands with a common feeder finding PJ3HM, ZD7BW, V3MS, YI1AS, HC8MD, 3B7CF, 3B9KCO, and VK9NYG all on 28MHz, with his FR-50B receiver. On 21MHz Basil caught FH8OM, FB8WG, FK8DH, VK9NND, 3X1Z, 3D6BP, TR8BJ, TN8AJ, 7P8BS, an excellent one in JT0LAS, and CR9AN, with some like TL8RC, V2AU, 4K1A; YI1BGD and KX6EM on 14MHz.

David Shute of Littlehampton, Sussex, decided to drop me a line on his activities with his second-hand FR-50B and 40-metre long wire. David is the son of the late G3GGN so with background and a dabble in "rubbish a.m. CB" he ought to go far especially as he is now studying for the RAE.

Three Worked All Britain contests still remain in 1982 on both the h.f. and v.h.f. bands. Major changes have been made in the rules designed to make the contests more attractive. Details of the contests and of the WAB Award itself are available from **Del Roberts** G4FQO, 12 Chestnut Avenue, Cranwell, near Sleaford, Lincs NG34 8HT.

Nothing fantastic was found on the new 10MHz band so far by **Dave Coggins** of Knutsford in Cheshire, but his 28MHz two-element beam did get hold of 9N1BMK in Katmandu, VK9YC and NYG in the Cocos-Keeling Islands, plus VS6CT, AP2P, CR9AN, V3ME (QSL G3OQO), 5H3BH and ZS3HL. On 7MHz HL1ADS was a good haul as was TI2JIC, VK2WC and YB0WR via the short path, ZL4PO/C on Chatham Island and 9X5SL. Caught on 3·5MHz was K0HA in rare Nebraska, 7X5AB and 8P6GG. Rig is an FRG-7700 with matching a.t.u. and W3EDP antenna for bands other than 14MHz.

Target of **John Hayes** of Edmonton, London, has been DF3NZ/ST2 on the 3·5MHz band, heard but not really copyable so far, but on 7MHz SV8IE was a rare one on the FRG-7700 and a.t.u. with a long wire attached, plus Datong FL2 audio filter. The 28MHz band threw up HL1QO, PZ5JR, VS6CT, 9Y4RG, CP6VL, JX6BAA and YB0DIA, while on 14MHz J3AJ was of interest as well as VP2VD and ZD7BW. Catch of the month for **Anne Edmondson** of Edinburgh was SP2BHZ/JW on Svalbard Island with cards to SM5DQC, on 14MHz s.s.b. with her Realistic DX-300 and indoor wire. New Year resolution for Anne is at least five hours' study a day for the RAE and as she says "I can't study and listen at the same time" so the DXing gets second place, and very wisely too, Anne!

Some c.w. loggings from **Jim Dunnett** of Prestatyn, Clwyd, make a pleasant change from all the s.s.b. stuff, on his SRX-30 plus direct conversion receiver, plus AR-88. No more Jim? Oh, yes, a Z-match a.t.u. and folded dipole for 14MHz and long wire for the other bands. So c.w. accounted for SV1DO and 7X2AR on 3·5MHz, FC0VQ on 7MHz, with GU4EON, OX3CS, VP8ANT and 9K2DR on the new 10MHz band, with FY7YE, KL7H, OY9J and VP8ANT again, ZB2J, 3B8DO and 9H1CH on 14MHz. M1C and OX3AA came up on 21MHz with now famous W6QL/8R1 on 28MHz. Only s.s.b. of note, on 14MHz, was BV2B with cards to POB 30547 Taipei, and FC9UC (QSL F5RV). The RTTY gear run by Jim is a Creed 7B printer and ST5 TU to find G4FLY and GM4JYZ who had lost no time getting on to 10MHz, then LX2BS, 3A2EE, 4X6CV and 9V1TK on 14MHz.

Most readers will have heard by now of the multiple launch of six Russian satellites, transmitting steady carriers on 29·310/320/330/340/360/400/410 and 29·460MHz. The purpose of the launching remains to be revealed.

The IARU has determined that the new 10MHz band shall be used for c.w. and RTTY only, with no allocation for telephony. With many hundreds of thousands of transceivers in service that can transmit on this new band using s.s.b. the chance of it remaining dedicated to c.w. and RTTY must be zero! Especially since it is all a gentleman's agreement anyway. Those seeking to identify the band will be able to locate an American beacon on 10·140MHz with the callsign KK2XJM and upper sideband ident on the hour + 2 minutes and every 10 minutes thereafter. Reports are requested and should be sent to R.P. Haviland W4MB, 2100 South Nova Road, Box 45, Daytona Beach, Florida 32019, USA.

Club Time

Conwy Valley ARC Guest speaker on March 11 will be Dr David Last of the University of Bangor, calculated to guarantee a full house. Otherwise it is the second Thursday at 7.45pm at Green Lawns Hotel, Bay View Road, Colwyn Bay says Norman Wright GW4KGI, Eleven, Bryn Derwen, Abergele, or 823674.

Medway ARTS Big year for this club with present President Bill Nutton G6NU still very active, founding the club way back in 1922, so it's 60th anniversary time. The celebratory MARTS Diamond Jubilee Award is available for h.f. or v.h.f. operation contacting club members and special event stations GB3MDJ and G8MDJ. Details of club and/or award from Ralph Axford G4LHV, 141 Nelson Road, Gillingham, Kent ME7 4LT.

East Cleveland ARC Recently formed, this club will be providing all the usual facilities, RAE courses, talks, instruction sessions and local visits. An invitation is extended to any amateur in the district to visit the club, meetings being held on Fridays at 7pm at the Literary Institute, Lord Street, Redcar, Cleveland. Ring K. W. Chattenton G4KIR on Guisborough 42114 for all the gen.

Silverthorn RC Every Friday, 7.30pm, Friday Hill House, Simmons Lane, Chingford, London E4. Club constructional projects are getting under way with ideas for suitable equipment invited, says club mag *Spurious*. Contact is C.J. Hoare G4AJA, 41 Lynton Road, Chingford, London E4 9EA or ring 01-529 2282.

Hastings Electronics & Radio Club Principal meetings third Wednesdays at the West Hill Community Centre, Hastings but more informally at the Club Room, 479 Bexhill Road, St Leonards-on-Sea where Monday night is computer night with social goings-on on Fridays. Ah, yes, it's junk auction night on March 17, but more from George North G2LL, 7 Fontwell Avenue, Little Common, Bexhill-on-Sea or try Cooden 4645.

Braintree & District ARS First and third Mondays at the B'tree Community Centre, Victoria Street with the one on the first generally on formal lines with lecture and the like at 8pm, with that on the third Monday at 7.30pm with emphasis on instruction, etc., for the junior members. Drop a line to Bob Willicombe at 355 Cressing Road, Braintree, Essex CM7 6PE if you'd like to go along.

Worcester & District ARC By the time that this appears the club will have moved to a new meeting place, the old one bursting at the seams. Only 100 yards away it is the Oddfellows Club, New Street, Worcester and double the size, with meetings on the first Monday, but note the April get-together is on Monday March 29, probably at the old venue but keep an ear open on GB2RS news bulletin. There is the annual constructors' contest open to other local clubs also. More from David Pritt G8TZE, 15 Paxhill Lane, Twyning, near Tewkesbury, Glos or T'bury 293890.

Acton, Brentford & Chiswick ARC It is the Commitee Room, Chiswick Town Hall, High Road, Chiswick, London W4 at 7.30 on the third Tuesday of the month. Forthcoming highlight is talk by G3CCD on April 20 on "A chip for speech processing". Contact hon sec G3GEH at 188 Gunnersbury Avenue, Acton, London W4 for details.

Watford RC Recent changes now mean meetings on first and third Wednesdays at 8.30 in the Small Hall, Christ Church, St Albans Road, Watford, Herts, while new sec is Roy Wollard G8RCK, 21 Garston Crescent, Garston, Watford or (09273) 72832. Construction Cup contest is held every four months with next adjudication on April 7.

Halifax & District ARS Big event is Jim Fish G4MH and a demo of equipment on April 6 which you will want to know about now. Normally first and third Tuesdays at the Claremont Liberal Club, Claremont Road, Halifax but Phillip Hey G4JHS, 79 Windermere Road, Bradford, W. Yorks has much more info on the club to divulge.

Mid Lanark RS Every Friday from 7.30 at the imposing Wrangholm Hall, Jerviston Street, New Stevenston, Motherwell, where club call is GM3PXK, with code classes and station operation, technical library, test equipment and p.c.b. manufacture facilities. That all! You may be in time for the technical film and slide show on March 5, or the AGM on the 19th. Gordon Hunter GM3ULP, 12 Airbles Drive, Motherwell, Strathclyde, is ready to help prospective members and visitors.

St Helens & District ARC Thursdays, 7.45pm, Conservative Club, Boundary Road, St Helens, Merseyside with code practice session for half an hour beforehand. May be too late for the sale of surplus equipment on March 4 but on the 11th there is a quiz and social evening when the Liverpool and District club will be entertained (What a good idea!). March 18 has G3XSN chatting on h.f. mobile DX working with Amateur Radio Exchange talking and demonstrating on the 25th. New sec for info is Paul Gaskell G4MWO, 131 Greenfield Road, St Helens or St H 25472.

Norfolk ARC Informal meetings and Morse code classes alternate with formal talks and lectures on Wednesdays at 7.45 at the Crome Community Centre, Telegraph Lane East, Norwich, like talk on TV by G4LUA on March 3, and Decca staff dealing with radio navigation on the 17th, while the 31st is surplus equipment sale time. Advance notice is given of the AGM on April 7 but in the meantime P. Gunther G8XBT, 6 Malvern Road, Norwich will answer all enquiries, or try N'wich 610247.

Verulam ARC Highlight in March will be audio expert Angus McKenzie G3OSS on the subject of the transmisssion and reception of speech, at 7.30 on March 23. Otherwise it is the fourth Tuesday at the Charles Morris Hall, Tyttenhanger Green near to St Albans but check first with publicity sec Peter Hildebrand G3VJO, "Hobbits", 31 Crouch Hall Gardens, Redbourn, St Albans, Herts or on Redbourn 2761. More informally the club meets at the RAFA Club on the second Tuesday of the month.

Edgware & District RS The AGM took place recently so the regular sec Howard Drury G4HMD, 39 Wemborough Road, Stanmore, Middx could be sitting back taking it easy by now, but I doubt it! So it continues to be second and fourth Thursdays, 8pm, at the Watling Community Centre, 145 Orange Hill Road, Burnt Oak, Edgware. A club net operates on 1875kHz on Mondays at 10pm, not to mention the slow Morse programme from G3ASR on Top Band and the 144MHz band (2m), while the OK to operate on 144MHz from the Centre seems to have been obtained. More from Howard at QTH shown or try 01-952 6462.

Chichester & District ARC Club net is on 145·275 (S11) every Wednesday at 7pm, but club meetings first and third Mondays at 7.30 at the Spitfire Social Club, Tangmere, and I might as well mention the AGM on April 5. Later that evening is the judging of the contest for home-brew equipment. Make a note of the Sussex Mobile Rally on July 18 in which the club will be participating. The club newsletter is worth having if only for the Uzu in Ammeland feature with items like: "Jeefaws", young newly-blooded warriors of the Klarsays tribe, or "Ripita", God of all the Jaits, and "O'Moffis" Celtic patron saint of all Ammes! Contact is S. Talbot G8FCX, 31 Pier Road, Littlehampton, W. Sussex, or L'hampton 5082.

Barry College of Further Education RS Every Thursday at 7.30 at the College Annexe, Weycock Cross, Barry with SSTV the subject on March 4 by GW3WBU. Third Thursdays are surplus gear sales time. Secretary John Shake GW3OKA, 3 Uplands Crescent, Llandough, S. Glam is also on (0222) 702455.

Leighton Linslade RC Clive Wood G8UGN, 2 Stivers Way, Harlington, Dunstable, Beds LU5 6PH "complains" that the club doubled its membership last year. Now it has introduced another good idea, family membership, so that the rest of the family can come along and join in the fun without feeling out of place. CBers, too, are welcomed at the Vandyke Community College, Vandyke Road, Leighton Buzzard on the second and third Mondays where code practice starts at around 7.15pm. Talk-in on Two is 145·275MHz via G4LLR, the club station.

Horndean & District ARC Sorry chaps, re boo-boo in January issue. The club meets on the second THURSDAY of the month at 7.30 at Merchiston Hall, Horndean, not Tuesdays. Intending visitors are asked to contact sec Dan Bernard G6GBM, c/o 33 Greenfield Crescent, Cowplain, Portsmouth, Hants, or on Horndean 593429.

Ipswich RC "Open to all interested in amateur radio and allied subjects" says club magazine *QUA* so that means you go along on the second or last Wednesday of the month around 8pm to the Rose and Crown, 77 Norwich Road, Ipswich where you will be most welcome, says Jack Tootill G4IFF, 76 Fircroft Road, Ipswich. March 10 is Spring clearance sale of members' equipment while on the 31st Graham Murchie G4FSG will talk on the amateur beacon service.

Crawley ARC Meetings generally held at the Ifield United Reformed Church but a call to David Hill G4IQM on Crawley 882641 will get you all the latest information.

Wolverhampton ARS Has club call G8TA and meets at the W'hampton Chamber of Commerce and Industry, 93 Tettenhall Road, W'hampton on Mondays, like March 8 when the club station will be on the air, or the 15th when it's club project night. Of interest in club newsletter is a telemetry decoder for the UOSAT signals, a subject on which little info has appeared so far. Hon Sec is John Cook G8EDG, 75 Windmill Lane, Castlecroft WV3 8HN or W'hampton 763617.

Caithness ARS Recently re-formed by GM4NHL and sec GM4MIM it meets second Wednesday of the month around 7.30 at the Loch Watten Hotel, Watten, Caithness. With some 30 licensed amateurs in the area it ought to go from strength to strength. Major project in co-operation with the lads on Orkney is a 144MHz repeater GB3OC on that island. Iain Morrison GM4MIM can be reached at 25 Argyle Square, Wick, Caithness KW1 5AL or (0955) 3960.

Farnborough & District RS Second and fourth Weds at the Railway Enthusiasts Club, Access Road (near to the M3 bridge), Hawley Lane, Farnborough, Hants. Constructional contests are rewarded with annual trophies for the winners from the 90-odd members. Ivor Ireland G4BJQ is waiting at 118 Mychett Road, Mychett, near Camberley, Surrey to fill you in, but it'll be quicker on F'borough 43036.

Edenbridge ARS Yet another recently formed group, meeting at 8pm on the second Wed in the conference room of the Women's Institute Hall, Station Road, Edenbridge, Kent. Jim G4ARZ, RSGB newsreader, also handles the club net at 8pm first Tuesdays on 144MHz f.m. channel S22. On March 9 a talk will show how easy it is to make p.c.b.s. In the meantime drop a line to K. M. Hawkins G3ZMC, 19 Forge Croft, Edenbridge, Kent.

Coventry ARS New sec is Dave Farn G4HRY, 14 Corfe Close, Clifford Park, C'try CV2 2JG who says the club meets every Friday at 8pm at the Baden Powell Scout HQ, St Nicholas Street, Radford, C'try. This year is the 50th for the club and special events will mark the occasion including an anniversary dinner. Old members with tales to tell should not hesitate to contact Dave.

The comment in the January column from the Southdown ARS that the RSGB never seemed to read the club's newsletter is countered by RSGB Region 8 Rep **Ken Crouch** G8KEN who wonders how he is supposed to publish details on the club if he never gets a copy of the newsletter! Come on, lads, get it together!

Endpieces

Don G4GXW of Leeds comments on the massive DX log from John East using just an HAC three-transistor receiver. Don has played around with similar sets and once got down to a single 2N3819 design on which he copied VK, ZL and W6 on 14MHz s.s.b. using just a 6-metre wire for an antenna. Lots of bandspread seemed to be the principal ingredient, plus very smooth regeneration, or reaction as we used to call it.

I do hope that not too many beams and other antennas were lost in our December and January snow, ice and blizzards. My own lovely 200 year-old cedar tree suffered badly from fallen branches so I hate to think what must have happened to some of those multi-band beams atop flimsy masts. Cheers 'til next month and don't forget to keep an eye on 10MHz.

Medium Wave Broadcast Band DX

by Charles Molloy G8BUS

Reports to: Charles Molloy G8BUS
132 Segars Lane, Southport PR8 3JG.

While experimenting with loop antennas, reader **David Hyams** of Finchley found he was picking up a lot of background electrical noise on the medium waves. He finally decided to remove the crocodile clips between the lead-in and loop and make a direct connection instead. "The background noise (to my amazement) disappeared completely. I am surprised that something as small as a crocodile clip could degrade the performance of the loop so much. I thought I should tell you this as a warning to other DXers," concludes David. Croc clips are great on test leads but should not be used as a substitute for a soldered joint or a switch. David's warning prompted me to get hold of an aerosol of switch cleaner which was sprayed at all plugs and sockets in my shack. The improvement was quite startling and I'd recommend it.

Long Wave Loops

David's experiments included a long-wave loop which consisted of 26 turns on the standard 1 metre square frame. "No spacing between turns—there just wasn't enough room." A standard 500pF variable gave coverage of the long-wave band. David now tried to convert the loop into a dual-purpose one covering both medium and long waves by tapping down to 7 turns on the main winding but he ran into problems owing to the lack of spacing. "The high self-capacitance caused by close winding made the tuning range rather small. What I would like is a way of adapting a medium-wave loop to cover the long-wave band using just one switch but without affecting the tuning range of the original medium-wave loop."

Two-band Loop

There are two ways in which a medium-wave loop can be made to resonate at a frequency lower than the

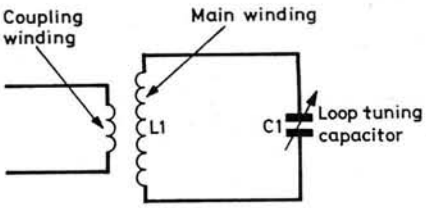


Fig. 1

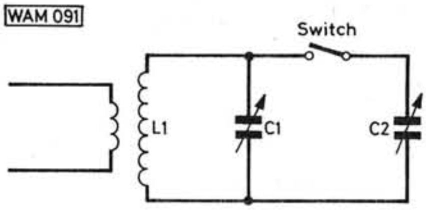


Fig. 2

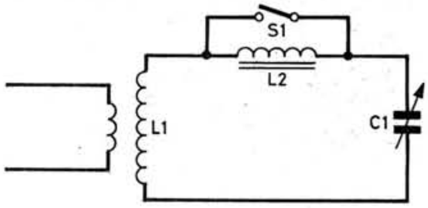


Fig. 3

normal 530kHz. Fig. 1 shows the electrical circuit of a loop antenna, L1 and C1 form a tuned circuit. In order to lower the resonant frequency we have to increase the inductance, or the capacitance, or both.

We can try increasing the capacitance as shown in Fig. 2. Capacitors in parallel are added together so the total value will now be C1 plus C2. With a value of 2000pF for C2, the range of my loop becomes 300kHz to 280kHz and if C2 is made 6700pF the loop resonates at 150kHz, the tuning control now having no effect at all. If you want to use the loop on a single frequency on the long waves then this method will do.

How about increasing the inductance? We can do this without disturbing the main winding simply by inserting a loading inductor as shown in Fig. 3. Inductors in series are added, so the total inductance is now L1 + L2. What sort of value should L2 have? I use a 2·5mH miniature choke made by Repanco and labelled CH1, but any value around 2mH or 3mH will do. It is easy to fit a loading inductor. Unsolder one of the two wires from the tuning capacitor C1 and in its place connect one lead from L2. Now join the other lead from L2 to the wire removed from C1 and, remembering David's warning, solder the joints. If you are a purist, you will now bend the choke leads so the winding lines up with the turns on the loop. L2 might just pick up some signal and spoil the null.

A simple ON/OFF switch across L2 completes the job and you now have your two-band loop. It covers the medium waves with S1 closed and the long waves when it is open. There is a snag, though. The signal pick-up of a loop is proportional to the number of turns in the main winding. The modified 7-turn m.w. loop will have only 7/26ths the pick-up of a 26-turn longwave loop of the same size—but then you cannot have everything. This is the price you pay for the convenience of having a single loop for both bands but it does give the opportunity to try the long waves without building a special loop.

DX Programmes

DX programmes are common enough on the short waves, varying widely in content from a list of "tips" to a magazine-type programme about DXing and related subjects. There are a few to be heard, in English, on the medium waves as well, in the UK. Tuesday is the peak night with *Sweden Calling DXers* on 1179kHz at approximately 1830 and again at 2300, while Alan Thompson's *DX Corner* comes over Cologne on 1269kHz at 1935. There are a number of others. Radio Berlin International can be picked up fortnightly on a Monday on 1359kHz at 1945, while on Wednesdays Radio Prague has its programme for radio amateurs and s.w.l.s at 2130 on 1287kHz. The BBC have a five-minute feature called *Waveguide,* which is on the World Service on 648kHz at 2155 on a Friday. *Waveguide* deals with listeners' enquiries about reception but often has items of general interest to s.w.l.s as well.

A recent addition to the above is *Radio World* from Belgium. It comes roaring in at my QTH on 1512kHz (198m) at 1925 on Sundays as part of *Brussels Calling*, which starts at 1900. At the moment this is a powerful signal which can be heard all over Europe, according to the station, but as the seasons advance this area will slowly creep into daylight at this hour and reception will deteriorate. Hopefully, the transmission times will change when both Belgium and the UK go on to summertime on March 29.

This may cease to be a rarity

Long Waves

It is seldom these days that one hears of new stations on the long waves, but two have appeared recently, both on 191kHz (1570m). An unlisted Bulgarian, carrying the first programme of the Home Service has been reported, location and power unknown. The Italian outlet at San Severo has also been heard on 191kHz. The dominant station on this channel is Motala in Sweden, which signs-off between 2100 and 2200, but it can be nulled out quite easily.

Europe No. 1 (Saarlouis) seems to have vacated 182kHz permanently for 185kHz, while Oranienburg in East Germany has moved the opposite way to 179kHz. This leaves 182kHz to the 1200kW broadcaster at Ankara in Turkey, which carries the Night Programme from 2300 to 0300 and starts up again at 0600 with Network 2, according to the *WRTH*. Tipaza in Algeria, though nominally on 254kHz, is actually on 251kHz (1195m) and it generally comes in well in the UK. There is a daily programme in English at 2100 which is a relay of the international service on the short waves.

The Voice of Peace

The final broacast from this "station" came on December 31. After being on the air for some six years on 1539kHz from international waters off the coast of Israel, the owner, Abe Nathan, made a moving farewell speech before the final sign-off. It was re-broadcast over *DX Corner* in Israeli Radio's overseas service on January 3, and it was from this source that I heard it. It came as a surprise and my tape recorder was not at the ready, as it usually is if I am DXing, so the opportunity passed and I missed it! The *Voice of Peace* has asked the Israeli Government for a licence to operate ashore and it is the intention to lift the ship out of the water and put it on blocks, somewhere south of Tel Aviv, as a symbol of Peace.

Events on the Band

The Dutch Language Network (Flemish) in Belgium, known as the BRT, is now relaying part of its international service during the evenings over the new 600kW transmitter on 1512kHz.

A recent QSL from Berlin

Brussels Calling, their English programme, is on the air on weekdays from 2000 to 2045 and again from 2200 to 2245, while on Sundays there is a single transmission from 1900 to 1945.

Sud Radio Andorra now seems to have left the air for good. It was on 819kHz with a power of 900kW but their programmes are now coming over the 100kW transmitter at Toulouse on 1161kHz which previously relayed the *France Inter* programme. Strasbourg is on the same channel with 200kW, which could lead to some interesting QRM problems unless directional antennas are used.

An interesting report comes from the Faroe Islands, which are located between the North of Scotland and Iceland. The local transmitter at Torshavn currently has a power of 5kW and since the frequency is shared with East Germany (100kW), Switzerland (500kW) and Algeria (600kW), this station shares the distinction with Gibraltar of being one of the two most difficult countries in Europe to pick up on the medium waves. Torshavn can be heard in parts of Scotland, but so far as I know Gibraltar has never been heard in any part of the UK.

At the time of writing, the authorities in the Faroes are considering a request by Trans World Radio to build a high-power station at Torshavn which would be used on a shared time basis by the Faroese government. Power at the outset is planned at 50kW to be increased later to 200kW.

Short Wave Broadcast Bands

by Charles Molloy G8BUS

Reports: as for medium wave DX, but please keep separate.

Two subjects crop up regularly in letters from readers. One concerns receivers, how they work, how to use them and how to choose one to meet one's needs and pocket. The other subject is about books and other sources of information about the hobby of listening to broadcasting stations on the short waves. It is with the second that we will concern ourselves this month, starting with three regular broadcasts that between them cover almost every aspect of the hobby. We will then look at a few publications that should meet most requirements.

Programmes for the SWL

Until recently this paragraph would have been headed "DX Programmes" but the wind of change has caused more than a flutter among a few of the major international broadcasters. There is now a move away from DX to programmes of more general appeal and there are three that I try not to miss. Two are a magazine type of programme while the third is an unscripted chat between a radio amateur and a station announcer.

Media Network

Produced and presented by Jonathan Marks, *Media Network* is Radio Netherland's successor to Radio Nederland's *DX Juke Box*. Jonathan describes his programme as a weekly communications magazine. It has regular reports from correspondents all over the world and recently there was a broadcast of a short computer program intended to investigate how well the readability survived transmission over the air. There has been a phone-in, live, with a world-wide response, while on the fifth Thursday of the month (when this occurs) there is the hilarious and satirical *Hitch Hikers Guide to DXing*.

Listen for *Media Network* on a Thursday at 0950 or 1350 on 5·995MHz and 6·045MHz both in the 49m band, on 9·895MHz (31m) and 11·93MHz (25m) when the transmissions are beamed to Europe. The African Service can be picked up in the evening at 1850 on 15·33MHz in the 19m band (Madagascar Relay), at 2050 on 17·695MHz (16m) from the Bonaire Relay. All times are in GMT. The address for a copy of the latest schedule is Radio Netherlands, English Section, PO Box 222, 1200 Hilversum JG, Holland.

Short Wave Listeners' Digest

Ian McFarland introduces and prepares the *SWL Digest* for Radio Canada International every week. The programme, which came first in a recent popularity poll, is part of *Sunday Weekend Magazine* starting at 1900 (GMT). A slightly longer version of *SWL Digest* can be heard on its own the night before, on RCI's African Service at 2135 (Saturdays). *SWL Digest* has a number of regular reporters who cover a variety of subjects such as the latest in receivers, what can be heard on the bands, etc. *Sunday Weekend Magazine* itself is worthy of attention covering all aspects of Canadian life including not so long ago a feature about Radio Tuk in the far north.

Listen for *SWL Digest* on Saturdays or Sundays on 15·325MHz (19m), on 17·875MHz (16m) and on Sundays only on 11·945MHz (25m). A programme schedule is available from RCI, PO Box 6000, Montreal, Canada, HRC 3A8.

The Two Bobs

The third programme comes from Switzerland. It is broadcast on the second and the fourth Saturday of the month and is called *The Swiss Short Wave Merry-Go-Round*. The two Bobs are Bob Thoman and Bob Zanotti who comment on points raised by listeners. "The two Bobs prove that there is more to international broadcasting than QSL cards" is SRI's own description of a feature which rather successfully gives simple but interesting replies to problems encountered by listeners. "You wouldn't send a reception report to your local TV station so why send one to us?" is one of their unscripted comments which led later, I felt, to a certain amount of back-tracking.

The Two Bobs are on 3·385MHz (75m), 6·165MHz (49m) and 9·535MHz (31m) at 1105, 1320, 1820 and again at 2150. All times are GMT which means they are an hour later by the clock during the summer. The address for a programme schedule, and perhaps a QSL, is Swiss Radio International, CH-3000 Berne 15, Switzerland.

World Radio and TV Handbook

By the time this appears in print the 1982 edition of the *WRTH* will have appeared. This 600-page handbook has been called the DXer's family bible or the DXer's telephone directory. Personally, I would call it indispensable—indispensable to the serious short wave listener or DXer. If you want to write to a station then the address will be found in the *WRTH*, which has a section for each country, listing frequencies on the long, medium, short and v.h.f. broadcast bands. Some schedule and programme information is included. There are also lists, in frequency order, covering world-wide broadcasters on the long, medium and short waves.

There is a separate section covering television and a third called *Listen to the World*. According to their full page "ad" in the January *PW*, this section in the 1982 edition will have in-depth tests on

A Pennant from Spain

latest s.w. receivers including some brand-new models, plus features of interest to listeners around the world. The *WRTH* can be ordered in bookshops in the UK under ISBN:0-902285-06-8 and is available trade, from Argus Books, 14 St James Road, Watford, Herts. The editorial office is at Soliljevej 44, 2650 Hvidovre, Denmark and the handbook is surely one of the more enlightened publications to come to us from that country. The UK price of the *WRTH* is £9.95.

DX Listeners Service

Run by West German DXer Bernd Friedwald, this non-profit making service produces two publications in English that are of interest to the s.w.l./DXer. The first is the *International Listeners Guide* which in the words of its editor is the Complete Directory of External Services in English. It comes out four times a year in March, May, September and November shortly after station schedules change. The main section, which is in time order, shows who is broadcasting in English at any moment. There is a list of world news bulletins, again in time order, and a list of DX programmes. A final section covers the main world services giving times and frequencies. An indication of the type of programme is also shown.

This remarkable little booklet, crammed with information, now has a permanent home on top of my s.w. logbook and I really don't know how I could do very much listening without it. The *ILG*, which comes out during the second week of the months mentioned, can be obtained from Bernd Friedwald, Merianstr 2, D-3588 Homberg, West Germany for an annual subscription of 10DM or £2.

The second publication from the same source is the *International Programme Guide*. This is a 32-page booklet giving a "Survey of Regular Programmes by External Services in English" from some 90 short wave stations including Indonesia, Ulan Bator, Senegal, Somali, to mention just a few. Frequencies are not quoted as they can be found in the *ILG* which comes out more frequently. A chart shows who is on the air at any time of the day. A copy of the current edition is available for 3DM or 1 US dollar, though a new edition is due out in the summer of 1982 at a price not yet determined. The address is the same as for the *ILG*, and IRCs are not accepted now for payment for either.

An Introduction to Radio DXing

This is the title of a recent paperback by R. A. Penfold and published by Babani which should meet the need for a moderately priced introduction to the hobby of DXing. It is in two sections. The first covers Amateur Band DXing and includes quite a lot of information about receivers. The second section on Broadcast Band DXing is devoted to the tropical, international short wave and v.h.f. bands as well as the medium and long waves. It includes circuits for a Crystal Calibrator, Medium Wave Loop Antenna, Active Ferrite Antenna and an Antenna Tuning Unit. QSLing and the SINPO Code are also mentioned. Catalogued as BP91 the book is available in bookshops in the UK or direct from the publisher Bernard Babani (publishing) Ltd, The Grampians, Shepherds Bush Road, London W6 7NF.

Request for Information

Old-timer **Ted Cook** decided, after reading *On The Air*, to return to the hobby and he unexpectedly got hold of a Lafayette 8-valve KT340 communications receiver which was not working. Ted managed to get it working though "not at A1 efficiency, the main snag is absence of any details of the set." Can anyone help? Replies direct to Ted please, who will refund any expense involved, at 36 Farm Road, Crombie, Fife.

VHF Bands

by Ron Ham BRS15744

Reports to: Ron Ham BRS15744
Faraday, Greyfriars, Storrington,
Sussex RH20 4HE.

The true friendship of amateur radio was prominent on all bands at Christmas and the New Year when greetings were exchanged, on all modes from a.m. to RTTY, between the fraternity from far and wide. This same spirit was once again seen in action during the severe ice and snow which swept the UK in December and January, when both fixed and mobile stations transmitted vital weather reports and information about the prevailing road conditions.

Solar

Although the sun was generally quiet at metre wavelengths between December 17 and January 18, both **Cmdr Henry Hatfield,** Sevenoaks and I recorded a few small bursts of solar radio noise at 136 and 143MHz respectively on December 28 and 31 and January 16, and a short-lived noise storm during the afternoon of the 17th. This is a marked drop in solar activity because during the same period last year we recorded 12 days of activity, including a severe noise storm, which was about the monthly average throughout 1981. Owing to the almost continual overcast skies, neither Henry nor **Ted Waring,** Bristol, could get a good look at the sun with their optical gear. Having monitored MSF on 60kHz for some months, Henry is now almost certain that there is no correlation between the fluctuations in its signal and radio or visual phenomena on the sun.

The 10m Band

Throughout the period December 17 to January 18, very strong signals from Canada and the USA were prominent almost every afternoon, but although the DX seemed a bit patchy during the early mornings, I did receive signals from Australia on 9 days and Japan on 6. The main Australian patch was from December 25 to 29 inclusive and the Japanese from January 3 to 6 inclusive. It is worth noting that on the days when signals were received from JA and VK, there was echoing on many European signals. Around 0915 on January 14 there were strong echoes on both sides of a QSO between VK and G. **Jon Kempster** BRS45205, Berkhamsted, has erected a ground-plane antenna for the 28MHz (10m) band and has been exploring the upper portion of the band, 29 to 29·7MHz where he heard the f.m. repeaters in the USA. Jon has also been improving his Morse by logging the callsigns of DX CQs when conditions were right. Although the band was relatively quiet at 0920 on January 11, I heard ZL4BO at about 54 working several G stations.

Having heard some of the 28MHz band DX on a Sanyo RP8880 and its own telescopic antenna, **A. A. Carswell,** Falkirk, has now added a Yaesu FRG-7700 and a Datong Active Antenna to his station. Mr Carswell is experimenting with different antennas because he has the problem of living on the 9th floor of a 14-storey block. **Harold Brodribb,** St Leonards-on-Sea, using his ex-RAF RL85 receiver reports that the highest daily frequency that he heard signals between December 19 and January 9 ranged from 35 to 45MHz. Harold also logged strong signals from Canadian amateurs on December 19 and a predominance of Europeans on the 29th.

10m Beacons

I added the comprehensive beacon logs from **J. F. Coulter,** Winchester, Henry Hatfield, **Arthur Swatton,** Westcliff-on-Sea and Ted Waring to my own daily observations and compiled the overall result illustrated in Fig. 1. In addition to the beacons listed there, Henry received signals from YV5AYV on January 1 and 2 and Ted, who has built a new receiver, heard EA7ATE on December 25 and 26.

The 6m Band

"During December, 50MHz (6m) band conditions have been very interesting" writes **Sam Faulkner,** Burton-on-Trent, who logged strong s.s.b. signals from Canada VO1, VE1, 2 and 3, the Caribbean, South America and the USA Ws 1, 2, 3, 4, 5, 7, 8 and 0. At 1230 on December 31, Sam heard 8P6KX and 8P6MH, both 59 plus on 50·116MHz, and copied the FY7THF beacon on 50·040MHz at 1130 on the 26th and 1150 on the 28th. "It was a great thrill to work New

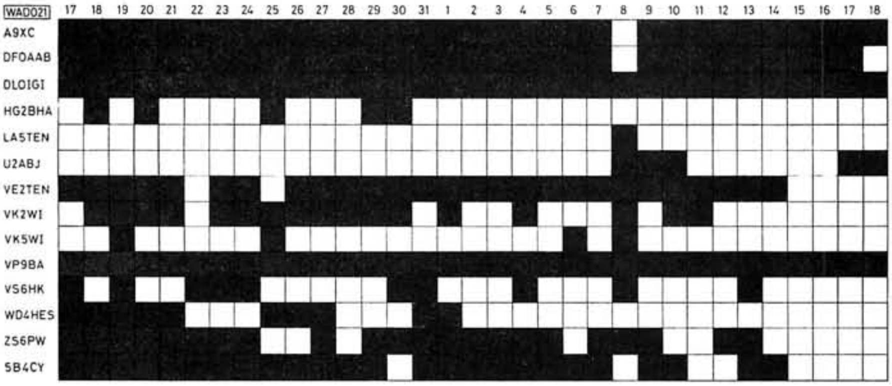


Fig. 1: Daily log of 10m beacons

Zealand on 50MHz" writes **Graham Rogers** VK6RO, Fig. 2, from Bunbury, West Australia, who contacted ZL1AKW at 0137 on January 1. Graham also received signals from the 50MHz beacons in Arthurton VK5KK 52·150MHz, Carnarvon VK6RTT 52·320MHz, Hamilton VK3RMV 52·425MHz and Kalgoorlie VK6RTU 52·350MHz on several days during December.

RTTY

"That's what I call a mate!", wrote **Phil Hodson** G8RBY, from Melton Mowbray on December 29, when he praised the efforts of **Ray Lowes** G8ZRR (now G4NJW) who took his RTTY gear to another location, 90 miles away, to give Phil a QSO and a new QTH square for 2m RTTY. Between December 17 and January 18, I copied 194 RTTY stations in 23 countries as listed in Fig. 2. Although the bulk of the RTTY signals I received were one-way and around 14·090MHz, I did copy 14 on 21MHz (15m) and 3 on 28MHz. These figures support the DX station who, at 0900 on January 16, complained about the lack of RTTY activity on the 21MHz and 28MHz bands. Among the interesting two-way QSOs I received were DL5TT and VK5XO at 0845 on December 19, LA6OJ and ON4UN at 0915 on the 26th, HB9GS and OE6KCG at 0958 on the 27th, DF6ZY and I0PAB and LX1JT and OZ9OU around 1400 on the 29th, I4HEQ and SM5BRG at 0915 and DL6QZ and F6FLH at 1346 on January 8, DF3DT and DL3IR at 0950 on the 10th, F6GJM and F9WM and DK3CU and F8XT around 0921 on the 16th and HB9SS and IV3TIQ at 1355 on the 17th. My own log analysis shows that 56 Italian, 53 German, 12 French, 11 Swiss and 8 Spanish stations were the main contributors to the 194 RTTY signals I copied.

One of my Bristol readers, **H. Winter** BRS40276, has purchased a Microwave Modules MM2000 RTTY to TV converter and I am looking forward to his reports. I think that another newcomer, a DL who had only been licensed for a month, summed it up at 0905 on December 21 when he keyed the words "having much fun in RTTY".

Sporadic-E

During a sporadic-E disturbance between 0900 and 1030 on December 20, I received strong f.m. signals from 14 east-European broadcast stations between 67 and 73MHz and, typical of sporadic-E, the signals began a rapid QSB (fade) toward the end of the event. Harold Brodribb counted 18 of these stations during another such event between 1000 and 1200 on December 31. Around 1030, Harold logged 8 French stations (stronger at times than the BBC locals) in Band II, which is rare at this time of the year.

Tropospheric

Apart from a few hours on December 19 and about 30 hours on January 6 and 7, the atmospheric pressure, measured at my QTH, remained below 30·0in (1015mb), at times down to 29·0in (982mb), from 0400 on December 19 to 1500 on January 12. It then rose rapidly to 30·4in (1029mb) and, true to form, a tropospheric opening occurred when the pressure began to fall around 1400 on the 13th. Jon Kempster spends a fair bit of time monitoring the 144MHz (2m) band repeater, GB3VA on R4 and was fascinated to hear the mobiles calling for traffic information during the bad weather. Jon saw the new year in by listening to the "New Year Net", controlled by G8IIR on GB3VA. **Alan Marwood** G8SSL, Nottingham, has a special interest in v.h.f./u.h.f. propagation and u.h.f. mobile, especially the 432MHz (70cm) band repeater network. Alan is operational on 144MHz f.m. and s.s.b. using an Icom 202 and a home-brew p.a. with the option of a 4CX250B linear, also 432MHz f.m. Since he was licensed in 1978, Alan has worked stations in the Scilly Isles and Cornwall by tropo, and last July/August worked a CN8 and two EAs via sporadic-E. Alan is looking for a 144MHz QSO in West Sussex for his counties list and is always pleased to receive s.w.l. reports on his signals.

Fig. 2: Graham Rogers VK6RO in his home shack

Band II

While the pressure was falling around 2330 on December 19, **John Williams,** Cheltenham, heard a medley of sounds between 91 and 92MHz after BBC Radio 3 had closed down. Around 1730 on January 3, **Simon Hamer,** Presteigne received 4 French stations and BBC Radio Sheffield and heard several brief bursts of signals from other European stations in Band II.

At 1925 on the 11th, Simon heard BBC Radio Solent and the ILR stations Chiltern and LBC. Between 1530 and close down on January 13, **Ian Kelly,** Reading received excellent signals from broadcast stations in Belgium and France and 10 editions of BBC Radio 2, 8 of them in stereo. Ian was up at 0530 on the 14th and before BBC Radios 3 and 4 came on he could hear stations in Belgium and France. "In those 30 or so hours" writes Ian, "I received 8 editions of *France-Inter,* 7 of *Culture* and 4 of *Musique".*

Colin Watson BRS46598, Cumbernauld, uses a stereo radio recorder and part of an old TV antenna for listening on Band II especially to Radio Forth and West Sound Radio, while in Co. Limerick, **John Collins** uses an Antiference FM28AT antenna at 6m a.g.l. to feed his receiver on a site some 76m a.s.l.

News Items

The Stevenage and District Amateur Radio Society are planning to hold a 144MHz f.m. contest between 1300 and 1700 GMT on Sunday April 11 in the f.m. segments of the Band (144·5–144·845MHz and 145·2–145·575MHz) excluding the RTTY frequencies of 144·6 and 145·3MHz. The object of the event is to encourage the use of f.m. for DX contacts as well as local QSOs. There are 3 classes of entry: Stations running up to 25 watts output, Stations running more than 25 watts output and Short Wave Listeners. Details from club secretary, Stephen Clarke G8LXY, 126 Putteridge Rd, Luton.

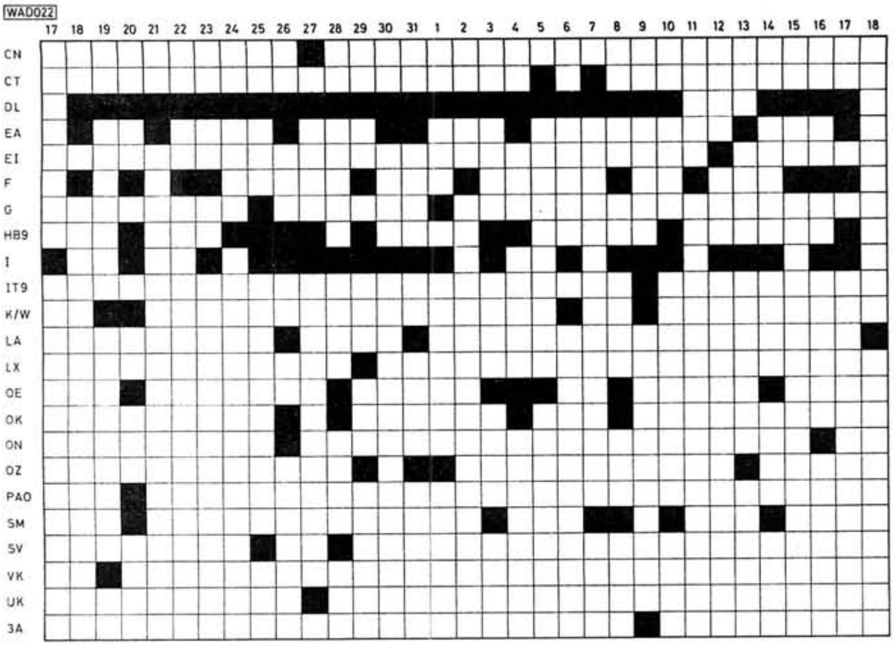


Fig. 3: Distribution of countries received on RTTY by the author

George Grzebieniak G6GCE, London, had a listen on 144MHz during the Quadrantids meteor shower and logged several bursts of signals from I1BEP, I5WGW, OE3OBC and YU3ZV. His longest burst was 35 seconds from the Austrian station.

David Wakefield G8RVK, has completed the construction of a 10GHz transmitter and is working on the receiver. David is grateful for the help he received with this project from his fellow Worthing club member, Ern Downer G8GKV.

At 0043 on January 7, I heard several stations working G4JGJ/MA, in Brighton Marina, via the Hampshire repeater GB3SN. (The /MA means a /MM moored in a UK port, harbour or estuary.)

I hope to be at the Chalk Pits Museum, Amberley, Sussex, on most Sundays and Bank Holidays during the 1982 season and will be pleased to meet any of our readers who visit the museum, which re-opens on April 3.

Congratulations to Phil *Hodson on* earning the No. 1 VHF/UHF Century Award from BARTG for working 100 different stations on RTTY.

TV

by Ron Ham BRS15744

Reports: as for VHF Bands, but please keep separate.

"Getting highly detailed reports of the freezing and flooding in Europe via the media" writes **Wenlock Burton,** who was not only sweltering at 40 degrees C in Australia, but still enjoying their sporadic-E season. Good luck to you Wenlock, our summer is still to come, I hope.

Sporadic-E

Between 0900 and 1000 on December 20, I saw a female singer on Ch. R1 followed at 0915 with a YL announcer, Fig. 1, and a digital clock showing 1215, 3 hours ahead of GMT which puts the source of the picture in the Moscow area. This was followed by a news or documentary programme and for a while the Ch. R1 sound came up on 56·25MHz. During the afternoon of December 27, **Hugh Cocks** received pictures from the UK on Chs. B1, 2 and 3, Belgium on Ch. E3 and Holland on Ch. E4, via sporadic-E, from a /A location in Portugal. **Harold Brodribb,** St Leonards-on-Sea, received synchronising pulses intermittently on Chs. R1, R2 and E3 between 0955 and 1410 on December 31 with a glimpse of a picture, of two men, on Ch. R1 around 1255. Harold again heard pulses on Ch. R1 on January 3. At 1010 on the 1st, I received a long burst of picture of an orchestra on Ch. R1 and at 1015 our familiar YL announcer, Fig. 1, appeared with her digital clock showing 1315. I noted strong bursts of test card from Poland on Ch. R1 around 0930 on December 17, 18, 22, 28, 30, and 31 and January 4, 6, 11, 12, 13, 14 and 18, bursts of the RS-KH test card from Czechoslovakia around 1430 on December 30 and 0915 on January 11 and from Russia at 0850 and Norway at 0900 on December 21. A variety of unidentifiable pictures appeared periodically on Chs. E2 and R1 on December 27 and 28 and January 3, 5, 7 and 11 and a very long burst of ice-skating at 0950 on the 17th.

Between 1600 and 1800 on December 23, **Brian Renforth,** Chippenham, received pictures from MTV Hungary with a modified version of the SZUNET caption on Ch. R1, and a strong test card, TV1 SVERIGE on Ch. E2 from Sweden at 1630 on January 7. At 11.30 on December 31, Brian saw a caption PRICAMO PRICO on Ch. E3 and asks if any readers can identify it.

"The sporadic-E season is only half-way through" writes **Graham Rogers** VK6RO, from Australia on January 10, who, along with his many achievements on the 50MHz (6m) amateur band, logged Australian TV sound on Ch. 0 51·750MHz from Sydney and Wagga, and New Zealand TV sound on Ch. 1 50·750MHz on several days between December 4 and January 10.

Down Under

From Lalor, Victoria, Australia, Wenlock Burton, Fig. 2, sends regular reports about sporadic-E and tropospheric openings in his part of the world, and I see from his December log that, like Graham, he received signals from New Zealand TV on Chs. 1 and 2, and between 1100 and 1200 on the 8th he received both channels on an indoor antenna. During December, Wenlock received pictures from stations in New South Wales, Queensland, Tasmania, Northern Territory and his home state of Victoria. The large TV receiver in Fig. 2 is a Philips P60 and the smaller a Philips P45, and Wenlock's amateur television converter for 579MHz can be seen on top of the P60.

Fig. 1: Announcer received by the author on Ch. R1

"What reception today", writes Wenlock on December 30, "TVQO Brisbane, New Zealand TV1 Ch. 1, Ch. 0 Sydney, SEQI Gympie, Queensland, ABSQI Southern Downs, Queensland, ABCNI Orange, New South Wales, ABQZ Brisbane and ABDQ3 Darling Downs, Queensland".

Tropospheric

Some co-channel patterning appeared on u.h.f. television pictures while the pressure was falling during the evening of December 19, after which there was no sign of a lift until the high pressure returned on January 12. At 1810 on January 13, I received strong pictures from the IBA transmitter at Lichfield on Ch. 8 and **Ken Smith** BRS20001, Horsham, received French television and reported much patterning on u.h.f. during the even-

Fig. 2: Wenlock Burton and his DXTV gear

ing. Like Brian Renforth around 0830 on the 14th, I received a strong colour caption complete with clock and knight and labelled ANGLIA COLOUR, from Anglia on Ch. 41, a colour test card, PTT-NED 1 which soon changed to NEDERLAND-1 on Ch. 29 and the same marked PTT-NED 2 on Ch. 32. Another caption with NEDERLAND scribed on top of what looked like a high building faded out at 0900 and a clock appeared briefly showing 1000, an hour ahead of GMT. At 0910 both HTV St. Hilary Ch. 7 and ATV Lichfield Ch. 8 were very strong with only a dipole feeding my receiver; however, by midday only the Lichfield signal was visible. "I was lucky to be near my JVC 3040 when the conditions improved on January 14" writes **Clive Grey,** Liverpool, who noticed that at lunchtime his usual 9 u.h.f. signals had increased to 25 which included BBC1 from Belmont, Sandy Heath and The Wrekin, and the IBA from Emley Moor and Sutton Coldfield. Clive uses a 5-element u.h.f. antenna and says "I think it's clear that anyone living in the North West can still enjoy DX during the winter months. Despite the unfavourable location with respect to the continent and being in the middle of Great Britain it is possible, given good conditions, to receive up to 6 different ITVs and there is the added attraction of seeing a completely different television service with programmes in English from the Irish republic". A good point of view Clive, this should give food for thought to other DXers in your area.

On the 13th, Brian Renforth received pictures from TDF France on several of their u.h.f. channels and despite the negative image picture he managed to identify a drama programme, Teletext pictures and a quiz called *LES INFDS*. He also saw a birthdays programme from Channel Television on Ch. 41 and *Look East* on Ch. 51 from the BBC at Sandy Heath. Brian's best DX came at 1600 when he received a test card, almost noise-free from TV2 SVERIGE on Ch. 30 and at 1625 came a caption of a painting of the sea with a clock on the top right and a number "2" on the bottom left. A blonde YL appeared at 1630 followed by a cartoon programme called *ALFONS ABERG*. **Ian Kelly,** Reading, received pictures from NOS NEDERLAND 2 at 2230 on the 13th and was no doubt amused to see a commercial for Birds Eye fish fingers come up from another station while he was watching *News at Ten* on Ch. 25.

Fig. 3: CBC News seen by Sam Faulkner

F2 TV

"Between 1250 and 1335 on December 11, I received a breakfast TV news programme from Canada and around 1300 I could see an OM and YL, Figs. 3 and 4, at the news desk then, a few minutes later an OM appeared with the I.D. CBC 7L to his left side" writes **Sam Faulkner,** Burton-on-Trent who again received pictures from stateside, although this time unidentifiable, on Ch. A2 55·25MHz at 1548 on the 12th. Sam saw a children's programme and news on Ch. A2 between 1350 and 1420 on the 13th, further signals at 1350 on the 27th and

Fig. 4: CBC News seen by Sam Faulkner

around 1330 on January 1. Hugh Cocks also received good pictures on Ch. A2 from Canada and the USA on one or two afternoons in early December. Following his reception of Arabic TV via "F2" last November, **David Appleyard,** Uppsala, Sweden sent a report to Radio and Colour Television Dubai who confirmed by letter, Fig. 5, from Lew Robertson, Head of Engineering, that David had received the Band I, Ch. 2 transmissions of the Arabic Service in Dubai and continued, "There have been many queries from your part of Europe especially the Northern part of Sweden and Finland regarding the reception of our channel 2 transmissions".

At 1300 on December 27, **Simon Hamer,** Presteigne, received a smeary picture on Ch. E2 or R1 of a woman and child behind a table which looked to Simon like a panel game and on the 29th, Brian Renforth heard a Moslem speaker for several minutes from Dubai on Ch. 2.

RADIO & COLOUR TELEVISION

Mr. David Appleyard,
Valthornsvagen 10,
S-752 50,
Uppsala,
Sweden.

22nd December 1981
LWR/als/FR3

Dear Mr. Appleyard,

Thank you for your letter of 7th November regarding your television reception.

We are pleased to confirm to y.. that the test cards and captions were in fact taken from our Band I, Channel 2 transmissions of our Arabic Service here in Dubai.

There have been many queries from your part of Europe especially the Northern part of Sweden and Finland regarding the reception of our channel 2 transmissions.

We are, of course, always interested in reports from outside our normal service area and appreciate your writing to us.

DRCTV wishes you many more happy hours of TV Dxing and take this opportunity to wish you a very happy Christmas and prosperous 1982.

Yours sincerely,

Lew Robertson,
Head of Engineering

rctv dubai

Fig. 5: Letter from RCTV Dubai

Amateur Television

David Wakefield G8RKV, hopes to get started on ATV and has been out with G4NGV during the British Amateur Television Club's cumulative contests and took part in several QSOs. A group of TV enthusiasts on the south coast are

Fig. 6: Richard Thurlow's QSL card

planning to install a 23cm ATV repeater in the Worthing area during the coming 18 months. More details are available from Martin Newell G8KOE, QTHR. Martin and Richard Poore G8LBN, gave an interesting talk on Video recording to the Chichester ARC on January 18 and demonstrated a Multibroadcast 8924 VCR feeding 2 GEC "Starline" receivers. Both Martin and Richard are television service engineers so I was not surprised when they said that their own ATV gear is mainly home-brewed.

SSTV

While on a visit to Bangkok, **Douglas Byrne** G3KPO, met **Brig. General Kamchai Chotikul** HS1WR, who is looking for Slow Scan Television contacts with stations in the UK. Kam sometimes has difficulty owing to QRM from stations in the USA but he runs a linear into a 5-element 20m Monoband antenna, 52 metres a.g.l. Readers interested should write to Kam, c/o HSAAA, Radio

Broadcasting Station, 51 Taharn Road, Bangsue, Bangkok, Thailand. During November, Sam Faulkner logged TR8WR in QSO with SP3LPL giving him another new SSTV country on 28MHz.

"New SSTV stations continue to appear on the permitted bands worldwide" writes **Richard Thurlow** G3WW, Fig. 6, from March (Cambs.) who, during 1981, made 94 first time two way QSOs in 24 countries compared with 189 in 27 countries in 1980 and adds, "A steady stream of colour SSTV pictures flows between the UK, USA, South Africa and Italy as well as within the UK itself". A fine write-up can be seen in the Jan/Feb edition of the American *A5* magazine about Richard and his 44 years in amateur radio, with a special emphasis on his work in the field of SSTV and as the author says "Richard can be found on both 14·230 and 28·680MHz or wherever SSTV signals can be monitored".

Equipment

"I have been s.w.l.ing for just under two years and would like to broaden my interests to include TVDX" writes **Martin Whittington** from Dartford who asked me about the Plustron TVR 5D receiver. I have one of these sets Martin and I am pleased with its appearance, performance, size and versatility. The receiver has two very smooth tuning dials, one for v.h.f. and u.h.f. TV, clearly marked in 3 bands, Chs. 2–4, 5–12, and 21–69 and the other for the long and medium wavebands and the v.h.f. broadcast band, 88–108MHz. A telescopic antenna for TV and v.h.f. radio, folds conveniently into the carrying handle mounted on top of the cabinet above the 5in screen and provision is made for an external antenna connection. This receiver is ideal for both the home station and taking out portable because it can operate from 9 internal batteries or a 12V car battery, as well as 240V a.c. A rechargeable power pack is also available.

My thanks to Messrs Nordmende, who sent me their 81/82 catalogue in which I see that their V100 and V200 Video recorders tune through Bands I, III and u.h.f. and should be useful for DXing.

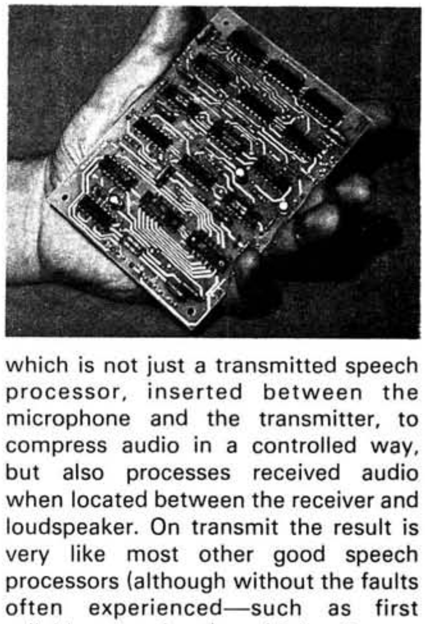
Ian Rennison, Horsham has added a JVC CX-610GB to his DXTV gear and is pleased with its performance.

Holiday DX

"I've just returned from a short holiday in Portugal and took the opportunity to see DX signals out there" writes Hugh Cocks from East Sussex on December 30. Hugh was located near Faro in the south and used a 5 metre long-wire antenna which fed a MOSFET pre-amp, a miniature varicap tuner box and a 1in Sinclair television receiver. "Trans-equatorial signals are nothing like we've ever seen here" says Hugh, who continues, "they are similar to viewing a local TV station in a fast-moving car, with rapid ghosting on a strong signal". Hugh's viewing took place between 1600 and 2300 daily from the 21st to the 26th inclusive. During this spell he received pictures from Ghana and Nigeria on Ch. E3 and Spain on Ch. E4, and saw the captions NTA (Nigerian Television Authority), NTA SOKOTO and NTA NETWORK PROGRAMME. In addition to Christmas carols, old American films and a Christmas message from the Chairman of the Freetown *(Sierra Leone)* Management Committee, Hugh saw news, jazz, African music and a checker-board test card.

PRODUCTION LINES

ALAN MARTIN G8ZPW



Morse Keyer with Memory

GVB Electronics have recently introduced their latest product, the KM4000 Keyer-Memory, an electronic Morse keyer with built-in memory.

The KM4000 is a highly versatile logic system designed specifically for the radio amateur, for use with almost any commercially available rig. The unit's capabilities are highly flexible, allowing it to be configured to the operator's specific requirements.

Major features include: dot and dash store; iambic or straight paddle operation; self completing dots and dashes; auto digit spaces; variable speed from 5 to 175 w.p.m.; auto power on reset sets memory to '0'; switch to write, auto sets memory to '0'; memory status l.e.d.s indication $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ full; auto stop when memory is full; override option on auto stop; sidetone oscillator; keyer override in read mode; 4k memory for good definition; low power consumption, typically 35 to 40mA.

Prices, which include VAT and carriage, are £44.95 for the ready-built and tested unit, and £9.62 for the double-sided, roller tinned p.c.b., which includes full, easy-to-follow assembly instructions.

The KM4000 is obtainable from: *GVB Electronics, 95 Old Worthing Road, East Preston, Littlehampton, West Sussex BN16 1DU. Tel: (09062) 70260.*

Speech Processor

As you may, or may not, be aware an acceptable dynamic range for telephony is in the order of 40dB. Much more than this is unnecessary and any less means that the speech will sound clipped, limited and unnatural. The human ear is best suited to listening to the human voice unadulterated, with little or no background noise.

To achieve these conditions, Evets Communications Ltd. have introduced their Audio Compandor—Model C1, which is not just a transmitted speech processor, inserted between the microphone and the transmitter, to compress audio in a controlled way, but also processes received audio when located between the receiver and loudspeaker. On transmit the result is very like most other good speech processors (although without the faults often experienced—such as first syllable overshoot); additionally, on receive the unit is capable of expanding previously compressed signals restoring them to their original dynamic range, effectively removing the background noise. This facility can produce dramatic improvements especially when resolving weak signals.

This unit is designed to be compatible with most amateur radio and CB transceivers, including those with up/down switching microphones, and is suitable for use on f.m., a.m. and s.s.b. modes (c.w. receive only).

The ECL Compandor—Model C1 costs £125 plus VAT which includes p&p to addresses within the UK, and is available from: *Evets Communications Ltd., 123-125 Green Lane, Derby DE1 1RZ. Tel: (0332) 363981.*

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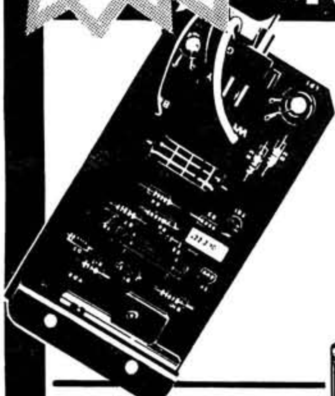

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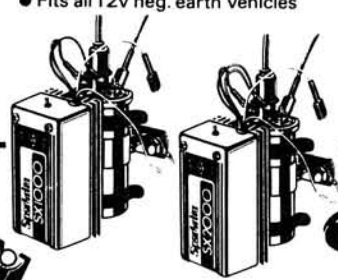

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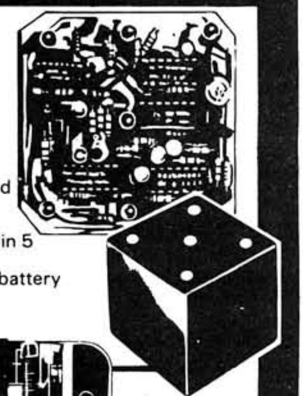

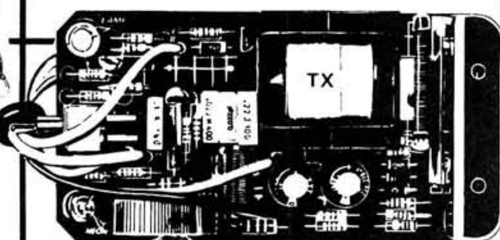

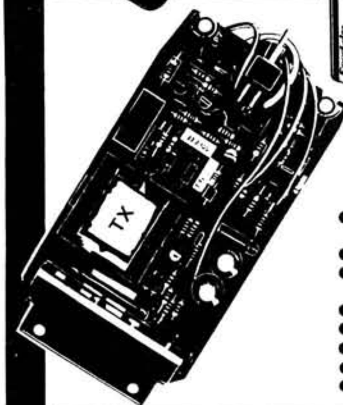

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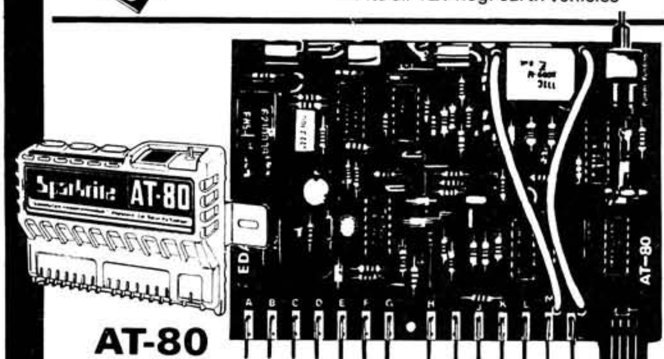

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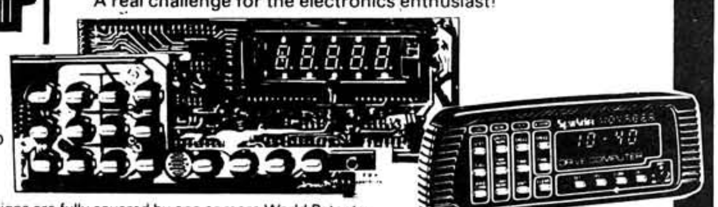

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Sinclair ZX81 Personal Comp
the heart of a system that grows with you.

1980 saw a genuine breakthrough – the Sinclair ZX80, world's first complete personal computer for under £100. Not surprisingly, over 50,000 were sold.

In March 1981, the Sinclair lead increased dramatically. For just £69.95 the Sinclair ZX81 offers even more advanced facilities at an even lower price. Initially, even we were surprised by the demand – over 50,000 in the first 3 months!

Today, the Sinclair ZX81 is the heart of a computer system. You can add 16-times more memory with the ZX RAM pack. The ZX Printer offers an unbeatable combination of performance and price. And the ZX Software library is growing every day.

Lower price: higher capability
With the ZX81, it's still very simple to teach yourself computing, but the ZX81 packs even greater working capability than the ZX80.

It uses the same micro-processor, but incorporates a new, more powerful 8K BASIC ROM – the 'trained intelligence' of the computer. This chip works in decimals, handles logs and trig, allows you to plot graphs, and builds up animated displays.

And the ZX81 incorporates other operation refinements – the facility to load and save named programs on cassette, for example, *and* to drive the new ZX Printer.

Every ZX81 comes with a comprehensive, specially-written manual – a complete course in BASIC programming, from first principles to complex programs.

Kit: £49.95

Higher specification, lower price – how's it done?
Quite simply, by design. The ZX80 reduced the chips in a working computer from 40 or so, to 21. The ZX81 reduces the 21 to 4!

The secret lies in a totally new master chip. Designed by Sinclair and custom-built in Britain, this unique chip replaces 18 chips from the ZX80!

New, improved specification
- Z80A micro-processor – new faster version of the famous Z80 chip, widely recognised as the best ever made.
- Unique 'one-touch' key word entry: the ZX81 eliminates a great deal of tiresome typing. Key words (RUN, LIST, PRINT, etc.) have their own single-key entry.
- Unique syntax-check and report codes identify programming errors immediately.
- Full range of mathematical and scientific functions accurate to eight decimal places.
- Graph-drawing and animated-display facilities.
- Multi-dimensional string and numerical arrays.
- Up to 26 FOR/NEXT loops.
- Randomise function – useful for games as well as serious applications.
- Cassette LOAD and SAVE with named programs.
- 1K-byte RAM expandable to 16K bytes with Sinclair RAM pack.
- Able to drive the new Sinclair printer.
- Advanced 4-chip design: micro-processor, ROM, RAM, plus master chip – unique, custom-built chip replacing 18 ZX80 chips.

Built: £69.95

Kit or built – it's up to you!
You'll be surprised how easy the ZX81 kit is to build: just four chips to assemble (plus, of course the other discrete components) – a few hours' work with a fine-tipped soldering iron. And you may already have a suitable mains adaptor – 600 mA at 9 V DC nominal unregulated (supplied with built version).

Kit and built versions come complete with all leads to connect to your TV (colour or black and white) and cassette recorder.

uter-

Available now- the ZX Printer for only £49.95

Designed exclusively for use with the ZX81 (and ZX80 with 8K BASIC ROM), the printer offers full alphanumerics *and* highly sophisticated graphics.

A special feature is COPY, which prints out exactly what is on the whole TV screen without the need for further intructions.

At last you can have a hard copy of your program listings – particularly useful when writing or editing programs.

And of course you can print out your results for permanent records or sending to a friend.

Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your computer – using a stackable connector so you *can* plug in a RAM pack as well. A roll of paper (65 ft long x 4 in wide) is supplied, along with full instructions.

16K-byte RAM pack for massive add-on memory.

Designed as a complete module to fit your Sinclair ZX80 or ZX81, the RAM pack simply plugs into the existing expansion port at the rear of the computer to multiply your data/program storage by 16!

Use it for long and complex programs or as a personal database. Yet it costs as little as half the price of competitive additional memory.

With the RAM pack, you can also run some of the more sophisticated ZX Software – the Business & Household management systems for example.

How to order your ZX81

BY PHONE – Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day.

BY FREEPOST – use the no-stamp-needed coupon below. You can pay by cheque, postal order, Access, Barclaycard or Trustcard.

EITHER WAY – please allow up to 28 days for delivery. And there's a 14-day money-back option. We want you to be satisfied beyond doubt – and we have no doubt that you will be.

To: Sinclair Research Ltd, FREEPOST , Camberley, Surrey, GU15 3BR. **Order**

Qty	Item	Code	Item price £	Total £
	Sinclair ZX81 Personal Computer kit(s). Price includes ZX81 BASIC manual, excludes mains adaptor.	12	49.95	
	Ready-assembled Sinclair ZX81 Personal Computer(s). Price includes ZX81 BASIC manual and mains adaptor.	11	69.95	
	Mains Adaptor(s) (600 mA at 9 V DC nominal unregulated).	10	8.95	
	16K-BYTE RAM pack.	18	49.95	
	Sinclair ZX Printer.	27	49.95	
	8K BASIC ROM to fit ZX80.	17	19.95	
	Post and Packing.			2.95

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sinclair ZX81

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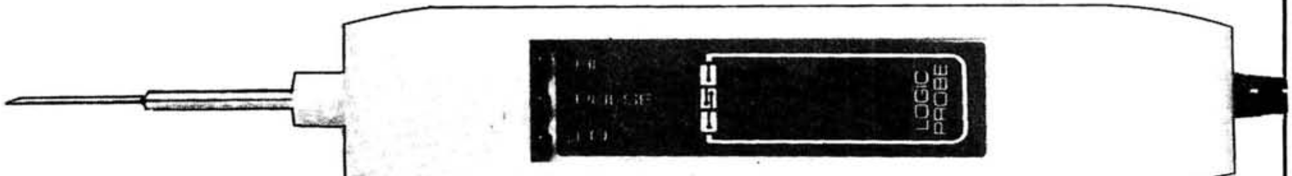

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GZ37	3.95
KT66	6.30
	9.20*
KT88	8.95
	13.80*
MH4	2.50
ML6	2.50
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PCC89	0.85
PCC189	1.05
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PCF82	0.70
PCF84	0.75
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PCF87	0.50
PCF200	1.80
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PCF802	0.85
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PCL82	0.95
PCL84	0.90
PCL86	1.05
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PL81	0.85
PL82	0.70
PL83	0.60
PL84	0.95
PL504	1.45
PL508	1.95
PL509	2.90
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PL802	3.20
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PY83	0.80
PY88	0.85
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PY801	0.80
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U27	1.15
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UBF89	0.70
UBL21	1.75
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UCC85	0.70
UCF80	1.30
UCH42	1.65
UCH81	0.75
UCL82	0.95
UF41	1.35
UF80	0.95
UF85	0.95
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UM84	0.70
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5Z3	1.50
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6AH6	1.15
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6AK8	0.80
6AL5	4.20
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6AQ4	3.40
6AQ5	1.00
6AQ5W	1.80
6AS6	1.15
6AT6	0.90
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6AX5GT	1.30
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6BE6	0.80
6BG6G	1.60
6BJ6	1.30
6BQ7A	0.85
6BR7	4.80
6BW6	6.20
6BW7	0.90
6C4	0.50
6C6	0.55
6CH6	8.20
6CL6	1.70
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6D6	0.70
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LEDS

0.125"		0.2"	
TIL32	55p	TIL220 Red	15p
TIL209 Red	13p	TIL222 Gr	15p
TIL211 Gr	16p	TIL228 Yel	22p
TIL212 Ye	18p	Rectangular LEDs (R, G, Y)	30p
TIL216 Red	18p	NSB5881	670p
		TIL311	600p

DISPLAYS

3015F	200p	TIL312/3	110p
DL704	140p	TIL321/2	130p
DL707 Red	140p	TIL330	140p
FND357	120p	7750/60	200p

DRIVERS

FND500	90p	9368	250p
FND507	90p	9370	300p
MAN3640	175p	UDN6118	320p
MAN4640	200p	UDN6184	320p

VOLTAGE REGULATORS

FIXED PLASTIC

	+ve		-ve	
1A				
5V 1A	7805	50p	7905	55p
12V 1A	7812	50p	7912	55p
15V 1A	7815	55p	7915	60p
18V 1A	7818	55p	7918	60p
24V 1A	7824	55p	7924	60p
5V 100mA	78L05	30p	79L05	60p
12V 100mA	78L12	30p	79L12	60p
15V 100mA	78L15	30p	79L15	60p

OTHER REGULATORS

LM309K 1A 5V	135p	78HGKC	600p
LM317K	325p	78HOSKC	550p
LM317T 1A Adj	200p	78MGT2C	140p
LM337T	225p	78GUIC	200p
LM323K 3A 5V	500p	79GUIC	225p
LM723 150mA Adj	37p	79HGKC	700p
TL494	400p	TL497	300p
78S40	300p	LM305AH	250p

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HA1388	£2.70
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LC7130	£3.25
MB3712	£2.25
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TA7204	£1.95
TA7205	£0.90
TA7222	£1.60
TA7310	£1.60
TBA810	£1.00
TC9109	£10.00
2SC1306	£1.00
2SC1307	£1.50
2SC1957	£0.90
2SC1969	£1.50
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2SC2029	£2.50
2SC2078	£2.00
UPC575	£2.75
UPC1156H	£2.75

PCB MOUNTING RELAYS

6V DC coil SPDT 2A 24V DC	160p
12V DC Coil SPDT 2A 24V DC	160p
12V DC Coil DPDT 5A 24V DC/240V AC	200p

LOUD-SPEAKERS

Size		
2¼"	64R	80p
2¾"	8R	80p
2"	8R	90p
1½"	8R	100p

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