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Practical Wireless

THE RADIO MAGAZINE

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SP430	Matching Speaker	32.40	(1.50)
MB430	Mobile Mounting Bracket	12.50	(1.50)
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TS130S	8 Band 200W Pep Transceiver	598.00	(—)
SP120	Base Station External Speaker	29.27	(1.50)
AT130	100W Antenna Tuner	103.45	(1.50)
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MC35S	Fist Microphone 50K ohm IMP	16.20	(0.75)
LF30A	HF Low Pass Filter 1kW	23.49	(1.00)
TR7930	2M FM Mobile	338.03	(—)
TR9130	2M Multimode	479.62	(—)
TW4000A	2M/70cm mobile	510.97	(—)
TM201A	2M 25W mobile	295.19	(—)
TM401A	7cms FM 12W	324.45	(—)
TR2500	2M FM Synthesised Handheld	257.58	(—)
TR3500	70cm Handheld	277.96	(—)
TR2600	New 2M FM Synthesised Handheld	281.60	(—)
ST2	Base Stand	57.48	(1.50)
SC4	Soft Case	15.16	(0.50)
SMC25	Speaker Mike	17.77	(1.00)
PB25	Spare Battery Pack	27.70	(1.00)
MS1	Mobile Stand	35.52	(1.00)
R600	Gen. Cov. Receiver	285.26	(—)
R2000	Synthesiser 200KHz-30MHz Receiver	456.63	(—)
HC10	Digital Station World Time Clock	75.23	(1.50)
HS5	Deluxe Headphones	25.60	(1.00)
SP40	Mobile External Speaker	15.67	(1.00)

NEW MODELS

TH21E/41E	2M/70cm Mini-Handhelds	179.48/199.00
TM211E/411E	2M/70cm FM Mobiles	377.22/431.03
TS711E/811E	2M/70cm base stations	792.15/898.00
TR3600	70CM Handheld	298.89

Linear Amps

TONO (G series)

2M40G	2m, 1-3W in, 20-35W out, preamp	89.00	(2.00)
2M90G	2m, 10-15W in, 70-90W out, preamp	149.00	(2.00)
2M130G	2m, 10-15W in, 110-130W out, preamp		(2.50)
4M70G	70cms, 3-15W in, 40-60W out, preamp		(2.00)

MICROWAVE MODULES

MML144/30-LS	inc preamp (1/3 w i/p)	75.00	(2.00)
MML144/50-S	inc preamp, switchable	92.00	(2.00)
ML144/100-S	inc preamp (10w i/p)	149.95	(2.50)
MML144/100-HS	inc preamp (25w i/p)	149.95	(2.50)
MML144/100-LS	inc preamp (1/3w i/p)	169.95	(2.50)
MML432/30L	inc preamp (1/3w i/p)	139.95	(2.00)
MML432/50	inc preamp (10w i/p)	129.95	(2.00)
MML432/100	linear (10w i/p)	245.00	(2.50)

B.N.O.S.

LPM 144-1-100	2m, 1W in, 100W out, preamp	172.50	(2.50)
LPM 144 3-100	2m, 3W in, 100W out, preamp	172.50	(2.50)
LPM 144-10-100	2m, 10W in, 100W out, preamp	149.50	(2.50)
LPM 144-25-160	2m, 25W in, 160W out, preamp	207.00	(2.50)
LPM 144-3-180	2m, 3W in, 180W out, preamp	235.75	(2.50)
LPM 144-10-180	2m, 10W in, 180W out, preamp	235.75	(2.50)
LPM 432-1-50	70cm, 1W in, 50W out, preamp	184.00	(2.50)
LPM 432-3-50	70cm, 3W in, 50W out, preamp	184.00	(2.50)
LPM 432 10-50	70cm, 10W in, 50W out, preamp	155.25	(2.50)

SWR/PWR Meters

HANSEN

FS200	1.8-150MHz 20/200 Pep	57.95	(1.00)
FS210	1.8 150MHz 20/200 Auto SWR	65.50	(1.00)
FS5E	3.5-150MHz 20/200/1000W HF	42.75	(1.00)
FS500H	1.8 80MHz 20/200/2000W Pep	79.95	(1.00)
FS710H	1.8-60MHz 15/150/1500W Pep	102.95	(1.00)

WELZ

SP15	1.8-160MHz PWR/SWR	41.00	(1.00)
SP45	130-470MHz PWR/SWR	59.75	(1.00)
SP10X	1.8-150MHz PWR/SWR	28.75	(1.00)
SP200	1.8-160MHz PWR/SWR	82.00	(1.00)
SP250	1.8-60MHz PWR/SWR	57.75	(1.00)
SP300	1.8-500MHz PWR/SWR	115.00	(1.00)
SP350	1.8-500MHz PWR/SWR	69.95	(1.00)
SP400	130-500MHz PWR/SWR	82.00	(1.00)
SP600	1.8-500MHz PWR/SWR	106.00	(1.00)

TOYO

T430	144/432 120 W	44.65	(1.00)
T435	144/432 200 W	49.35	(1.00)

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Icom Products

IC751	HF Transceiver	1239.00	(—)
IC745	HF Transceiver	898.00	(—)
IC730	Mobile HF Transceiver	659.00	(—)
PS15	P.S. Unit	135.00	4.00)
PS30	Systems p.s.u. 25A	259.00	(—)
SM6	Base microphone for 751/745	36.50	1.00)
IC290D	2m 25w M/Mode	469.00	(—)
IC290E	Low Multi-Mode Mobile	399.00	(—)
IC271E	2m 25w M/Mode Base Stn.	699.00	(—)
IC271H	100W version of above	889.00	(—)
IC25H	2m 45w FM	359.00	( )
IC27E	25W FM mobile	359.00	(—)
IC45E	70c 10w FM	345.00	(—)
IC47E	25w 70cm FM mobile	449.00	(—)
ICBU1	B/U Supply for 25/45/290	24.50	(1.00)
ICR70	General Coverage Receiver	599.00	(—)
ICR71	General Coverage Receiver	699.00	(—)
IC02E	2m H/Held	259.00	(—)
IC2E	2m H/Held	199.00	(—)
ML1	2m 10w Linear	69.00	(2.00)
IC4E	70cm H/Held	259.00	(—)
IC04E	70cm handheld	269.00	(—)
BC30	Base Charger	56.35	(—)
HM9	Speaker mic	18.55	(0.75)
IC3	Carry Case	5.50	(0.75)
ICBP3	Std Battery Pack	27.50	(0.75)
BP5	High Power Battery Pack	52.80	(0.75)
CP1	Car Charging Lead	5.50	(0.75)
DC1	12v Adaptor	13.75	(0.75)

Mutek Products

SLNA 50	50MHz Switched preamp	44.90	(1.20)
SLNA 144s	144MHz Low noise switched preamp	39.90	(1.20)
SLNA 145sb	Preamp intended for 290	27.40	(1.20)
GLNA 432e	70cm Mast head preamp	149.90	(2.50)
RPCB 144ub	Front end FT221/225	74.90	(1.20)
RPCB 251ub	Front end IC251/211	79.90	(1.20)
BBA 500u	20-5000MHz Preamp	32.90	(1.20)
GFBA 144e	2m Mast head preamp	139.90	(2.50)
SBLA 144e	2m Mast head preamp	89.90	(2.50)
RPCB 271ub	Front end for IC271	89.90	(1.20)
TVHF 230c	2M-FM Transverter	334.90	(5.00)

Datong Products

PC1	Gen. Cov. Con.	137.40	(1.00)
VLF	Very low frequency conv.	29.90	(1.00)
FL2	Multi-mode audio filter	89.70	(1.00)
FL3	Audio filter for receivers	129.00	(1.00)
ASP/B	r.f. speech clipper for Trio	82.80	(1.00)
ASP/A	r.f. speech clipper for Yaesu	82.80	(1.00)
ASP	As above with 8 pin conn	89.70	(1.00)
D75	Manual RF speech clipper	56.35	(1.00)
D70	Morse Tutor	56.35	(1.00)
MK	Keyboard morse sender	137.40	(1.00)
RFA	RF switched pre-amp	33.90	(1.00)
AD270-MPU	Active dipole with mains p.s.u.	51.75	(2.00)
AD370 MPU	Active dipole with mains p.s.u.	69.00	(2.00)
MPU	Mains power unit	6.90	(1.00)
DC144/28	2m converter	39.67	(1.00)
PTS1	Tone squelch unit	46.00	(1.00)
ANF	Automatic notch filter	67.85	(1.00)
SRB2	Auto Woodpecker blanker	86.25	(1.00)

CW/RTTY Equipment

Tono 9000E	Reader/Sender	P.O.A.	(—)
Tono 550	Reader	299.00	(2.50)

MICROWAVE MODULES

MM2001	RTTY to TV converter	189.00	(1.25)
MM4001	RTTY terminal	269.00	(1.25)
MM4001KB	RTTY term with keyboard	299.00	(2.00)

HI-MOUND MORSE KEYS

HK702	Up down keyer marble base	30.95	(1.00)
HK703	Up down keyer	29.35	(1.00)
HK704	Up down keyer	19.25	(1.00)
HK705	Up down keyer	15.49	(1.00)
HK706	Up down keyer	16.25	(1.00)
HK708	Up down keyer	14.35	(1.00)
HK802	Up down solid brass	82.85	(1.00)
HK808	Up down keyer	39.95	(1.00)
MK704	Twin paddle keyer	13.50	(1.00)
MK705	Twin paddle keyer marble base	25.50	(1.00)

KENPRO

KP 100	Squeeze CMOS 230/13.8v	79.50	(2.50)
KP200	Memory 4096 Multi Channel	169.50	(2.50)

Yaesu

FT1	HF Transceiver	P.O.A.	( )
FT980	HF Transceiver	1475.00	(—)
SP980	Speaker	64.40	(2.00)
FT77	Mobile HF Transceiver	479.00	(—)
FP700	PSU	145.00	(5.00)
FC700	Tuner	105.00	(2.00)
FT77s	10w. version	449.00	(—)
FMU77	FM Board for FT77	28.35	(1.00)
FT757	HF Transceiver	759.00	(—)
FC757	Auto A.T.U.	245.00	(2.00)
FP757HD	Heavy Duty PSU	179.00	(2.00)
FP757GX	Switched Mode PSU	140.00	(2.00)
FL2050	Linear Amplifier	115.00	(2.00)
FT290	2m M/Mode Port/Transceiver	309.00	(—)
FT290	With Mutek front end fitted	339.00	(—)
FL2010	Linear Amplifier	69.00	(1.00)
FT790	70cm M/Mode Port/Transceiver	299.00	( )
MMB11	Mobile Bracket	28.75	(1.00)
NC11	Charger	10.75	(0.75)
CSC1	Carrying Case	4.60	(0.75)
YHA15	2m Helical	5.75	(0.75)
YHA44D	70cm ½wave	9.95	(0.75)
YM49	Speaker Mike	20.30	(1.00)
FT230	2m 25w FM	269.00	(—)
FT730	70cm 10w. FM	239.00	(—)
MMB15	Mobile Bracket	14.55	(1.00)
FT203R	NEW 2m H/Held/C/W FNB3	185.00	(—)
FT209R	NEW 2m H/Held/C/W FNB3	239.00	( )
FT208	2m H/Held	209.00	(—)
FT708	70cm H/Held	189.00	(—)
MMB10	Mobile Bracket	8.80	(0.75)
NC9C	Charger	9.60	(0.75)
NC8	Base/station Charger	56.75	(2.00)
PA3	Car Adaptor/Charger	16.85	(0.75)
FNB2	Spare Battery Pack	23.00	(0.75)
YM24A	Speaker Mike	23.75	(1.00)
FT726R	2m Base Station	839.00	(—)
430/726	70cm Module for above	770.00	(7.50)
FRG7700	HF Receiver 15-30MHz	385.00	(—)
FRG7700M	As above with memory	455.00	(—)
FRT7700	A.T.U. for above	43.00	(1.00)
MH1B8	Hand 600 8pin mic	16.85	(1.00)
MD1B8	Desk 600 8pin mic	64.40	(1.00)
MF1A3B	Boom mobile mic	19.95	(1.00)
YH77	Lightweight phones	14.95	(0.75)
YH55	Padded phones	14.95	(0.75)
YH1	L/weight Mobile H/set Boom mic	14.95	(0.75)
SB1	PTT Switch Box 208/708	17.25	(0.75)
SB2	PTT Switch Box 290/790	14.55	(0.75)
QTR24D	World Time Clock	34.50	(0.75)
FF501DX	Low Pass Filter	29.90	(0.75)
YP150	Wattmeter/Dummy Load 150w	97.75	(1.00)

NEW MODELS

FRG8800	HF Receiver	525.00	( )
FRV8800	Convertor 118 175 for above	95.00	(—)
FT703	70cm H/Held	P.O.A.	(—)
FT709	70cm H/Held	P.O.A.	(—)
FT270R	2m 25W F.M.	325.00	(—)
FT270RH	2m 45W F.M.	380.00	(—)
FT2700R	2m/70cm/25W/25W	520.00	(—)

Power Supplies

DRAE			BNOS		
4 amp	34.00	(2.00)	6 amp	52.90	(2.50)
6 amp	53.50	(2.50)	12 amp	95.45	(3.00)
12 amp	79.50	(3.00)	25 amp	138.00	(4.00)
24 amp	110.00	(4.00)	40 amp	276.00	(4.00)

Aerial Rotators

9502B	3 core Lighter Duty	69.50	(2.00)
AR40	5 core Medium Duty	115.00	(2.00)
KR400	Med/H Duty	109.95	(2.50)
KR500	6 core Elevation	125.50	(2.50)
KR400RC	6 core Medium Duty	132.50	(2.50)
CD45	8 core Heavy Duty	189.95	(2.50)
KR600RC	8 core Heavy Duty	189.50	(3.00)
HAM1V	8 core Heavier Duty	299.00	(4.00)
T2X	8 core Very Heavy Duty	365.00	(4.00)

Switches

Sigma	2 way SO239	13.00	(0.75)
Sigma	2 way 'n' Skts	16.65	(0.75)
Welz	2 way SO239	20.75	(0.75)
Welz	2 way 'n' Skts	37.00	(0.75)
Drae	3 way SO239	15.40	(0.75)

Miscellaneous

DRAE	Wavemeter	27.50	(1.00)
T30	30W Dummy load	8.05	(0.50)
T100	100W Dummy load	30.48	(1.00)
T200	200W Dummy load	42.55	(1.50)
CT300	300W Dummy load	58.00	(2.00)
DRAE	2m Pre-set A.T.U.	11.80	(1.50)
	Altai Dip Meter	49.00	(1.00)

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FOR THE Radio ENTHUSIAST . . .

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Staff

EDITORIAL OFFICES
Practical Wireless
Westover House
West Quay Road
Poole, Dorset BH15 1JG
✆ Poole 671191

Geoff Arnold T.Eng FSERT, G3GSR
Editor

Dick Ganderton C.Eng., MIERE, G8VFH
Assistant Editor

Steve Hunt
Art Editor

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Technical Editor

Alan Martin G8ZPW
News & Production Editor

Elaine Howard G4LFM
Technical Sub-Editor

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ADVERTISEMENT OFFICES
Practical Wireless
King's Reach Tower
Stamford Street
London SE1 9LS
Telex: 915748 MAGDIV-G

Dennis Brough
Advertisement Manager
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✆ 01-261 6807

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Secretary
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LOWE SHOPS

Whenever you enter a LOWE ELECTRONICS' shop, be it Glasgow, Darlington, Cambridge, Cardiff, London or here at Matlock, then you can be certain that, along with a courteous welcome, you will receive straightforward advice. Advice given, not with the intention of "making" a sale, but the sort which is given freely by one radio amateur to another. Of course, if you decide to purchase then you have the knowledge that LOWE ELECTRONICS are the company that see the standard for amateur radio after-sales service. The shops are open Tuesday to Saturday and close for lunch 12.30 till 1.30pm.

In Glasgow the LOWE ELECTRONICS' shop (telephone 041-945 2626) is managed by Sim GM3SAN. Its address is 4/5 Queen Margaret's Road, off Queen Margaret's Drive. That's the right turn off Great Western Road at the Botanical Gardens' traffic lights. Street parking is available outside the shop and afterwards the Botanical gardens are well worth a visit . . .

In the North East the LOWE ELECTRONICS' shop is found in the delightful market town of Darlington (telephone 0325 486121) and is managed by Don G3GEA. The shop's address is 56 North Road, Darlington. That is on the A167 Durham road out of town. A huge free car park across the road, a large supermarket and bistro restaurant combine to make a visit to Darlington a pleasure for the whole family.

Cambridge, not only a University town but the location of a LOWE ELECTRONICS' shop managed by Tony G4NBS. The address is 162 High Street, Chesterton, Cambridge (telephone 0223 311230). From the A45 just to the north of Cambridge turn off into the town on the A1039, past the science park and turn left at the first roundabout. After passing a children's playground on your left turn left again into High Street. Easy and free street parking is available outside the shop.

Cardiff now has its own LOWE ELECTRONICS' shop. Managed by Richard GW4NAD, who hails from Penarth, the shop (our telephone number is 0222 464154) is located within the premises (on the first floor) of South Wales Carpets, Clifton Street, Cardiff. Clifton Street is easily found, being a left turn off Newport Road just before the infirmary. Once in Clifton Street, South Wales Carpets is the modern brick building at the end of the street on the right hand side. Enter the shop, follow the arrows past the carpets, up the stairs and the "Emporium" awaits you. Free street parking is available outside the shop.

MOVING . . . MOVING . . . MOVING . . From the 13th September 1984 the LOWE ELECTRONICS' London shop will be located at 223/225 Field End Road, Eastcote, Middlesex (the new telephone number is 01-429 3256). The new shop, managed by Andy G4DHQ is easily found, being part of Eastcote tube station buildings. Immediately behind the shop is a large car park where you can currently park for the day for 20p. There is also free street parking outside the shop.

Finally, here in Matlock, David G4KFN is in charge. Located in an area of scenic beauty a visit to the shop can combine amateur radio with an outing for the whole family. May I suggest a meal in one of the town's inexpensive restaurants or a picnic on the hill tops followed by a spell of portable operation.

the handheld TH21E,

In trying to describe the new 2 metre FM transceiver from **TRIO,** I am faced with a major difficulty. The **TH21E** is small, 2.24 inches wide, 4.72 inches high and only 1.1 inches deep but size alone is not the rig's fascination. Only by holding the transceiver can one begin to appreciate the attention that has been placed on its ergonomics. The way in which the **TRIO TH21E,** once picked up, seems impossible to put down. Its ability to slip into the inside pocket and for you to forget you have it. So far no one who has seen a **TH21E** has been able to resist picking it up, it's as simple as that. There is also a 70 centimetre version of the **TH21E** available, the **TH41E.** I am pleased that I can claim one of the rigs to use at home prior to writing the advertising and let the rest of the company fall out about who is having the other one. Never before can I remember two handhelds that have had such fascination.

Repeater shift, tone burst and reverse repeater on the **TH21E,** repeater shifts (both 1.6 and 7.6 MHz) and tone burst on the **TH41E.**

SPECIFICATION

General

Frequency range	TH21E 144 to 146 MHz. TH41E 430 to 440 MHz.
Mode	F3 (F3E).
Power requirement	7.2 volts DC. 5.8 to 10V DC operating range.
Current drain	less than 25mA (TH21E) 30mA (TH41E) in receive mode with no input signal. Less than 580mA (TH21E) 600mA (TH41E) in High power transmit mode (8.4V DC). Less than 250mA (TH21E) 300mA (TH41E) in low power transmit mode (8.4V DC).
Dimensions	57 (2.24) × 120 (4 72) × 28 (1.1) mm (inches).
Weight	260 grams (0.57 lbs).

Transmitter

RF power output	1 watt high, 150 milliwatts low.
Modulation	reactance modulation.
Frequency deviation	+/− 5kHz maximum.
Spurious radiation	less than −60dB.

Receiver

Circuit	double conversion superheterodyne.
Sensitivity	12dB SINAD less than 0.5 uV.
Squelch sensitivity	less than 0.5 uV.
Audio output	more than 300mW (8 ohms at 10% distortion).

TH21E	2 metre transceiver	**£179.48 inc VAT,** carr £7.00
TH41E	70 centimetre version	**£199.00 inc VAT,** carr £7.00
SMC30	speaker/microphone	**£22.47 inc VAT,** carr £1.00
HMC1	headset with VOX	**£26.14 inc VAT,** carr £1.00
DC21	DC power supply .	**£19.85 inc VAT,** carr £1.00
PB21	Nicad battery pack	**£19.34 inc VAT,** carr £1.00
BT2	Dry battery case	**£9.41 inc VAT,** carr £0.75
SC8	Soft case	**£9.41 inc VAT,** carr £0.75
EB2	External battery case.....	**£15.16 inc VAT,** carr £1.00

LOWE ELECTRONICS

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Telephone 0629 2817, 2430, 4057, 4995. Telex 377482.
(Delivery of stock items normally by return of post)

the base station for 2 metres, the TS711E.

Ever since the demise of the **TRIO 700** series of equipment, we, here at **LOWE ELECTRONICS** have been campaigning for the introduction of a new "true base station" transceiver. Those who have used a **TRIO TS700S** or **G** will know what I mean. There is that certain feel which a base station transceiver has which the mobile or portable rig, when taken out of the car or used in the shack, definitely has not. I am pleased to say that **TRIO** have introduced a new 2 metre base station, it is called the **TS711E**. I have been fortunate enough to have used the transceiver over the past couple of weeks and again I am lost for words. Certainly there will be a **TRIO TS711E** in my shack, I have even prepared a space for it!

Having used the rig let me explain some of its features. In size, weight and appearance the **TS711E** is similar to the **TS430S** HF transceiver but unlike the **TS430S** it has its own internal power supply. It also has an inbuilt speech processor and IF shift, both ideal features for today's active 2 metre band. Power output is 25 watts but the rig I have been using produces 32. Typical **TRIO!** The **TS711E** has two VFO's and, wait for it, forty memory channels. Yes, I too wondered how one could use so many memories.

Initially I started to use the rig as I had my dual band **TRIO TS780.** One VFO left on 144.300 and the other on 145.500. Since the rig remembers both frequency and mode there was no problem operating SSB on one VFO and with the electronic click step engaged, FM on the other. Electronic click step? . . . the **TS711E** has been designed so that as a multi-mode rig you can have a free running VFO on SSB and CW and when operating FM, a VFO with 5 or 12.5 kHz click steps. I refer to the click step as electronic because a touch switch instantly changes the VFO function. Of course, I need not tell you that the memories remember which VFO operation has been selected or for that matter whether repeater shift was required. On SSB and CW the **TS711E's** synthesized VFO tunes in 10 Hz steps

After using the rig for some time without the 40 memories I concluded that since it was possible to move a frequency from memory to VFO it would make sense to program the memories logically and then use them as a basis for operating. Result, the rig is a dream to use. With the **TS711E's** memory carrying a sequence of calling channels, beacon, simplex and repeater frequencies a swift rotation of the VFO (which also serves to change memory channels) and the entire band can be looked at in seconds. To check on OSCAR 10, dial up the correct memory holding say the satellite beacon frequency, if that's audible then move the beacon frequency to the VFO by pushing the appropriate switch and there you are, tuning the correct part of the band, in the right mode and with the VFO running free. The same can be applied to the CW end of the band and with the VFO set to click stop, FM channels also.

There are facilities to put both VFO's on the same frequency, to operate split using one VFO for receive and the other for transmit. A priority call channel is available as is the ability to go back to a predetermined frequency. The **TS711E** will scan the band or the memories holding for a brief period on an occupied frequency. It will also scan the memories looking at only those frequencies entered in a particular mode.

Programmable scan is also included, memory channels 39 and 40 setting the limits. The now standard full repeater facilities are included.

For the blind operator the **TS711E** is a dream come true. Full voice announcement of frequency and whether the rig is set to repeater shift comes by fitting the optional VS1 board. A push button, conveniently located on the bottom corner of the front panel, activates the voice. The careful location of this control shows **TRIO's** attention to detail. How difficult would the switch have been to find for the blind operator had it been located in the middle of the panel. Mode of operation is indicated by switches which when pushed instead of a general beeping, send the morse code letter F for FM, U for USB, C for CW, L for LSB and A for auto. Auto, what's auto? . . . With auto switched on, as you tune across the band the **TS711E** selects the correct mode for the appropriate frequency. You can over-ride this function and as I have said elsewhere, **you too can transmit FM on the SSB part of the band.**

Enough I hear you say. Sorry, one more feature. DIGITAL CODE SQUELCH! The transceiver has as standard an inbuilt selective tone call system incorporating a call alarm. So if you are not in the shack then you will know you have been called. The transceiver will also send up to 6 letters or numbers as part of the selective call. I am sure it will not be long before **TRIO** introduce a **TS711E** accessory (I am told it is called the CD-10 call sign display) which will decode the information. Then will you not only know that you have been called but who has called you, the 6 letters or digits making up the callsign.

What more can I say, what a rig! For the operator who wants the finest two metre base station transceiver **TRIO** have produced the **TS711E.** For the UHF operator there is the **TRIO TS811E,** the 70 centimetre version. Both ideal ways of getting on to the VHF/UHF bands.

TS711E	2 metre base station transceiver with DCS	**£792.15 inc VAT,** carr £7.00
TS811E	70 centimetre base station transceiver with DCS	**£898.00 inc VAT,** carr £7.00
CD10	Callsign display unit	**£110.25 inc VAT,** carr £7.00
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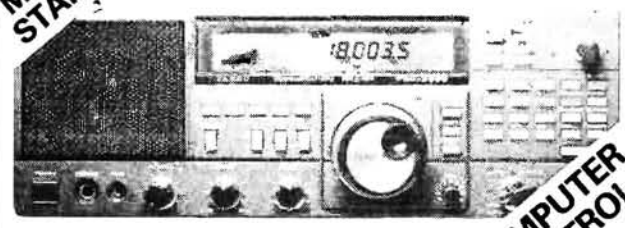

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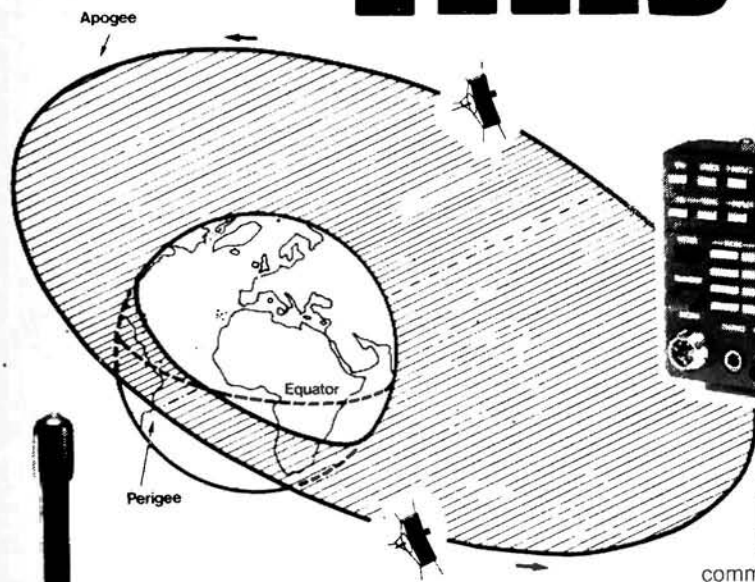


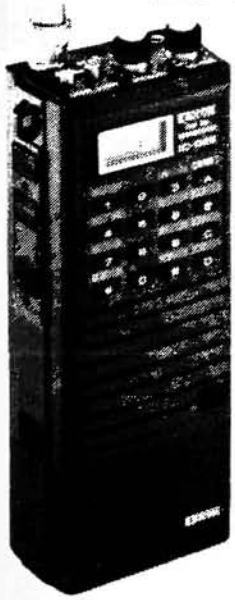
IC-271 & 471

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

By making simple modifications, you can track the VFO's of the Rx and Tx either normally or reverse. This is unique to these ICOM rigs and therefore very useful for OSCAR 10 communications. Digital A.F.C. can also be provided for UOSAT etc. This will give automatic tracking of the receiver with digital readout of the doppler shift.

The easy modifications needed to give you this unique communications opportunity are published in the December '84 issue of OSCAR NEWS. Back issues of OSCAR NEWS can be obtained from AMSAT (UK), LONDON, E12 5EQ.

BUT, ON THE OTHER HAND...



IC-02E
IC-04E, (70cm).

The new direct entry microprocessor controlled IC-02E is a 2 meter handheld jam packed with excellent features.

Some of these features include: scanning, 10 memories, duplex offset storage in memory and odd offsets also stored in memory. Internal Lithium battery backup and repeater tone are of course included. Keyboard entry is made through the 16 button pad allowing easy access to frequencies, duplex, memories, memory scan and priority

The IC-02E has an LCD readout indicating frequency, memory channel, signal strength, transmitter output and scanning functions. New HS-10 Headset, with earphone and boom microphone, which operates with either of the following:- HS 10-SB Switch box with pre-amplifier giving biased toggle on, off and continuous transmit. HS 10-SA Voice operated switch box, with pre-amplifier, mic gain, vox gain and delay. The IC-2E and 4E continue to be available.

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IC-751

The IC-751 could be called the flagship of the ICOM range as it features 32 memory channels, full HF receive capability, digital speech synthesizer, computer control and power-supply options The 751 is fully compatible with ICOM auto units such as the AT-500 and IC-2KL The IC-751 now has a remote push-button frequency selector pad

Standard features include: a speech processor, switchable choice of J-FET pre-amp or 20dB pin diode attenuator and two VFO's, marker, 4 variable tuning rates, pass band tuning, notch variable noise blanker, monitor switch direct feed mixer in the front end full break-in on CW and AMTOR compatibility

The first IF is 70.045 MHz. Any XIT and RIT adjustment is shown on the display. The transmitter features high reliability 2SC2904 transistors in a low IMD (-32dB@ 100W) full 100% duty cycle. For more detailed information on this excellent set please get in touch with us

IC-290D

290D is the state of the art 2 meter mobile, it has 5 memories and VFO's to store your favourite repeaters and a priority channel to check your most important frequency automatically Programmable offsets are included for odd repeater splits, tuning is 5KHz or 1KHz.

The squelch on SSB silently scans for signals, while 2 VFO's with equalising capability mark your signal frequency with the touch of a button. Other features include: RIT, 1KHz or 100Hz tuning/CW sidetone, AGC slow or fast in SSB and CW,Noise blanker to suppress pulse type noises on SSB/CW.

You can scan the whole band between VFO's/scan memories and VFO's. Adjustable scan rate 144 to 146 MHz, remote tuning with optional IC-HM1 microphone. Digital frequency display, Hi/Low power switch. Optional Nicad battery system allows retention of memory.

Special Offer as from 15th January '84 IC-290D reduced to £469 and the IC-290E to £399. Also 70cm version IC-490E, £529. Take advantage of this money saving offer.

Agent Gordon G3LEQ, or telephone Knutsford (0565) 4040. Please telephone first, anytime between 0900 – 2200 hrs.

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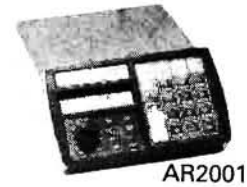

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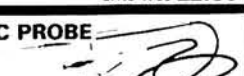

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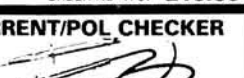

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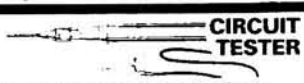

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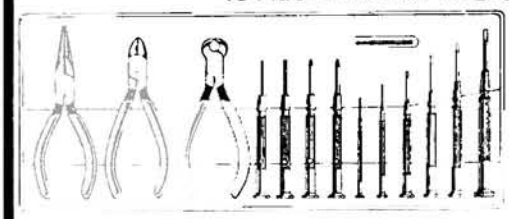

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O/No. 1971 **£5.60**

Ideal outdoor motorist, boat, caravan owner. SK1 SOLDERING KIT for miniature work. Kit consists of 1–15w iron (C240) 3 bits 3.32", 5/32", 3/16", Solder & heat shunt + Booklet "How to Solder
O/No. 1938 **£8.00**

THE THIRD AND FOURTH HAND

you always need but have never got until now This helpful unit with rod mounted horizontally on heavy base crocodile clips attached to rob ends. Six ball & socket joints give infinite variations and positions through 360 also available attached to rod, 1 2½" dia. magnifier giving 2.5× magnification. Helping hand unit available with magnifier as illustrated.

ORDER NO. T402 **£5.50**
Without magnifier ORDER NO T400 **£4.75**

UNIVERSAL STAND

A combined Third & Fourth Hand with magnifier and Soldering Iron Stand all in one unit. *A must for all who solder and need hands free!* O/No 403 **£5.50**

BI-PAK SOLDER–DESOLDER KIT

Kit comprises O/No VP80
1 High Quality 25 Watt General Purpose Lightweight Soldering Iron 240v mains incl 3/16" (4·7mm) bit. 1 Quality Desoldering Pump High Suction with automatic ejection Knurled anti-corrosive casing and Teflon nozzle. 1.5 metres of De Soldering braid on plastic dispenser 2 yds (1.83mm) Resin Cored Solder on Card. 1 Heat Shunt too tweezer Type.
Total Retail Value over £12·00.
OUR SPECIAL KIT PRICE £9.95

AUTOMATIC WIRE STRIPPER

Will clamp 5 different sizes of wire, strip and remove the insulation in one single operation. Accepts wires of dia., 1mm, 1·6mm, 2mm 2.6mm and 3.2mm Has hardened steel cutting surfaces, spring loaded insulated handles
O/No. 1997 **£5.45**

BA BOX SPANNER SET

Contains one of each size: 0BA, 2BA, 4BA, 6BA, 8BA. Fixed Chrome Vanadium 3mm Shaft in Plastic Handle. O/No. 2057 **£4.00**

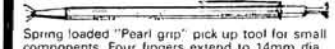
DESOLDERING PUMP

High suction pump with anti-corrosive casing & Teflon nozzle
O/No. 1936 **£4.50**
Spare nozzle O/No 1937 **50p**

CRIMPING SET

A crimping tool set consisting of a crimping tool suitable for insulated terminals Supplied with 34 assorted terminals in a plastic tray with hinged, transparent lid.
O/No. 1966 **£3.75**

PICK-UP TOOL



Spring loaded "Pearl grip" pick up tool for small components Four fingers extend to 14mm dia when plunger is pressed and close up when retracted Chrome metal. Pocket clip.
O/No VP139 **£1.75**

IC EXTRACTION TOOL

IC Extraction is made relatively easy with this tool The IC is held by specially designed teeth
O/No. 2015 **50p**

MAINS NEON TESTER/DRIVER

Has strong transparent handle with insulated screwdriver blade & pen type pocket clip – rated at 500v max Length 140mm (5½")
O/No 2016 **55p**

SUB-BOX

A neat swivelling disc provides close tolerance substitution resistors of 36 preferred values from 5 ohms to 1Kohm Simply fix clips into circuit and swivel until optimum result is achieved
O/No VP112 **£4.75**

BATTERY TESTER

Tests all types of battery including standard, NICAD Alkaline, etc. Takes all standard sizes including 6V lantern batteries and watch/hearing aid cells. Also tests fuses and lamps by means of internal 9V (PP3) battery Can also be used to recharge NICAD batteries by means of external 3·12V d c power supply (not included). Dims: 185 × 103 × 30mm (approx.)

Full instructions provided
O/No. VP101 **£7.00**

POWER SUPPLY

Power supply fits directly into 13 amp socket Fused for safety. Polarity reversing socket. Voltage switch Lead with multi plug input – 240V AC 50Hz, Output – 3, 4, 5, 6, 7·5, 9 & 12V DC Rating – 300ma MW88 O/No. 137 **ONLY £3·75**

BRAND NEW LCD DISPLAY MULTITESTER

RE 188m
LCD 10 MEGOHM INPUT IMPEDANCE
* 3½ digit * 16 ranges plus hFE test facility for PNP and NPN transistors * Auto zero auto polarity * Single-handed push-button operation * Over range indication * 12·5mm (½-inch) large LCD readout * Diode check * Fast circuit protection * Test leads battery and instructions included

Max. indication	1999 or 1999
Polarity indication	Negative only Positive readings appear without sign
Input impedance	10 Megohms
Zero adjust	Automatic
Sampling time	250 milliseconds
Temperature range	5 C to 50 C
Power Supply	1 × PP3 or equivalent 9V battery
Consumption	20mW
Size	155 88 31mm

RANGES
DC Voltage 0-200mV
0-2-20-200-1000V Acc 0·8%
AC Voltage 0 200-1000V
Acc. 1·2% DC Current 0 200uA
0-2-20 200mA 0·10A, Acc 1·2%
Resistance 0-2-20-200k ohms
0-2 Megohms Acc 1%
BI-PAK VERY LOWEST PRICE

£45.00 each

Leather case for 188m **£2.50** EACH

MULTITESTER

1,000 opv including test leads & Battery

AC volts – 0-15-150-500-1,000
DC volts 0·15-150-500-1,000
DC currents – 0·1ma-150ma
Resistance 0·25 K ohms 100 K ohms
Dims – 90 × 61 30mm

O/No. 1322 OUR PRICE **£6.80** ONLY

HT320 MULTITESTER

Facilities for testing transistors.
Mirror Scale leads and batts

SPEC	
DC Volts	20,000 O P V
AC Volt	8,000 O.P V
DC Volt	0-0·1 0·5 2·5 10-50-250 1000v
AC Volt	0-10 50-250 1000v
DC Current	0 50uA-2.5mA 25mA-0·25A
Resistance	2K 20K 2M 20M Ohms
AF Output (dB)	10dB to + 22dB for 10v AC
	As a Trans Tester tests Leakage, Current (Iceo), DC Current Amplification Factor (Hfe)
Dims:	146 × 95 × 55mm

Order No 1323 **£15.40**

BI-PAK PCB ETCHANT AND DRILL KIT

Complete PCB Kit comprises
1 Expo Mini Drill 10 000RPM 12V d.c. incl. 3 collets & 3 × Twist Bits
1 Sheet PCB Transfers 210mm × 150mm
1 Etch Resist Pen
1 ½lb pack FERRIC CHLORIDE crystals
3 sheets copped clad board
2 sheets Fibreglass copper clad board
Full instructions for making your own PCB boards

Retail Value over **£15.00**
ORDER NO VP81
OUR BI-PAK SPECIAL KIT PRICE

£9.95

RATCHET SCREWDRIVER KIT

Comprises 2 standard screwdriver blades 5 & 7mm size 2 cross point size 4 & 6 1 Ratchet handle 5-in 1 Kit. O/No. 329B **£1.45 each.**

BI-PAK

Send your orders to Dept PW2 BI-PAK PO BOX 6 WARE, HERTS
SHOP AT 3 BALDOCK ST. WARE, HERTS
TERMS CASH WITH ORDER. SAME DAY DESPATCH. ACCESS. BARCLAYCARD ALSO ACCEPTED. TEL (0920) 3182. GIRO 388 7006
ADD 15% VAT AND 75p PER ORDER POSTAGE AND PACKING

Use your credit card. Ring us on Ware 3182 NOW and get your order even faster. Goods normally sent 2nd Class Mail.
Remember you must add VAT at 15% to your Total order.
Postage add 75p per Total order.

Got Any Sky-hooks?

RECENT HAPPENINGS in the area of planning applications and appeals about amateur radio masts in the UK are covered in our *News* pages this month. Such problems for radio enthusiasts in the pursuit of their hobby are not confined to the UK. An article in the October 1984 issue of the US magazine *Worldradio* tells in graphic detail the experiences of Dick Knadle K2RIW, well-known for his many contributions to amateur radio communications at u.h.f.

Dick moved to a new property in Huntington, NY, way back in 1969. At about that time, a regulation was passed by the town of Huntington aimed at controlling antenna towers in commercial broadcasting. Since radio amateurs are specifically prohibited by international regulations from "broadcasting", there seemed to be no problem for Dick, and he duly erected his "antenna farm" consisting of 304 elements on 430MHz, atop a 33 metre tower. The whole system was more or less obscured by adjacent oak trees and offended no-one, either from the visual or TVI standpoints.

All went well until 1982, when a commercial radio relay firm applied for planning permission to erect a 79 metre-tall antenna tower with the associated equipment building to house up to 40 transmitters in the immediate neighbourhood of K2RIW. Public opinion was very much against the development and Dick's help was enlisted by his neighbours in their fight to get it stopped. Public opinion triumphed, and the commercial tower application was denied, but on that very day the Huntington Building and Zoning Board acted on a photograph of Dick's tower, which it had received from the commercial tower applicant. At the end of over two years of fruitless discussions about the tower, Dick was called upon to put his case to the Board at an appeal hearing. Expert witnesses spoke of his pioneering work, and the structural strength of the tower, etc., etc. A 114-signature petition from Dick's neighbours said that they wanted the tower to remain. Even the original commercial tower applicant wrote stating that they now had no objection to Dick's tower. At the end of the meeting, it seemed that the case was won, but when the decision was announced, the town took the position "My mind's made up, don't confuse me with the facts". APPLICATION DENIED!

Now a volunteer group of radio amateurs has been set up under the title of DART (Defend Amateur Radio Towers), to help K2RIW in his fight to prevent commercial tower regulations being used against radio amateurs. We will keep you informed on future progress.

Geoff Arnold

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.

INSURANCE

Turn to the "News" pages for details of the PW Radio Users Insurance Scheme, exclusive to our readers.

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 at £13 per annum to UK addresses and £14 overseas, from **"Practical Wireless" Subscription Department, Room 2816, 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 £1 each, including post and packing to addresses at home and overseas.

Binders are available (Price £5.50 to UK addresses, £5.75 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.

Planning Matters

The 12 October edition of *Planning* magazine contained an intriguing planning appeal snippet under the heading "Mast stays up". From the brief details provided it would appear that planning permission for a "radio ham's" three-section 9m telescopic mast had been refused and when taken to appeal the DOE inspector had granted permission subject to a condition requiring retraction from 7am to 6.30pm, Mondays to Saturdays. The inspector considered this condition to be enforceable. If you face similar problems a transcript of the appeal hearing can be obtained from the DOE, Common Services, Tollgate House, Houlton Street, Bristol BS2 9DJ. The reference is T/APP/5193/C/83/3152/P6.

A second planning appeal transcript arrived at the *PW* offices recently concerning the case of Colin Hyatt, G6HTN, who lives near Fareham in Hampshire—our Technical Editor attended this appeal which lasted for some 6½ hours! A very potted history of events reveals that Fareham Borough Council favour the use of a 12 month limited grant of planning permission for **all** amateur masts. After this time a further application (including £49 fees) is required. In this case the property was originally Council owned requiring their Housing Committee approval. This was granted providing the mast was placed at a distance from the rear of the house such that any collapse would not affect the property. The Planning Department subsequently saw fit to increase this distance to 22m (the mast is a 12m, two-section Strumech) before allowing 12 months permission, with a condition requiring subsequent removal of the mast. The reason quoted by the Council for the limited permission was "to have an opportunity of exercising control over any subsequent use of the site. To enable the local planning authority to review the position in the light of circumstances prevailing at that time".

Before expiration of the limited permission an application for full permission was made, bringing to light complaints of alleged interference to neighbouring TV. The Radio Interference Service were involved in two cases—both proved **not** to be caused by G6HTN and in fact the RIS also checked the station (at the voluntary request of G6HTN) finding no discernable problems. In spite of assurances from the RIS and a meeting involving John Nelson G4FRX, of the RSGB, Fred Robins G3GVM (who is the engineering liaison manager for the UK's leading TV manufacturer), the Council decided to circulate 43 neighbours requesting details of any TVI. This evoked 14 replies (including one **positive** report from G6HTN!) of which 13 claimed interference. RIS were again involved and again declared the station clean. A further application resulted with the Council then circulating a second questionnaire to **198** households!—only four cases of interference were reported. This second application was subsequently refused on the grounds of **visual** intrusion—if at first we refuse . . ?

In the final event the appeal inspector for the DOE, Mr M. S. Hancock allowed the appeal and granted full planning permission, providing the mast was relocated 2m from the rear of the house (closer to the shack) and that such antennas thereon should not drastically increase in size, without prior consultation with the Council. In his judgement the inspector recognised that radio amateurs were experimenters and that the mere presence of a radio mast was not sufficient evidence of likely TVI (See "Comment—Making Plans", *PW* December 1984). The case for the appellant was exceedingly well presented by John L. McFall, G4HFX, who is a corresponding member of the RSGB Planning Panel.

Once again a transcript of this appeal is available from DOE. Quote reference T/APP/AA20/C/84/1224/P6 and T/APP/AA20/A/84/15333/P6.

New Catalogue

South West Aerials, the Parkstone, Dorset based antenna specialists, announce the availability of their latest catalogue.

The catalogue contains details of antennas and accessories, from respected manufacturers, for all amateur radio applications, including satellites,

TVDXing, masthead and distribution amplifiers, filters and combiners, coaxial switches, cables and antenna hardware etc.

In addition to the products they stock, South West Aerials also provide a customer consultancy service to solve reception difficulties and problems.

The 22-page, 1985 catalogue includes a separate price list and costs 60p, from: *South West Aerials, 11 Kent Road, Parkstone, Poole, Dorset BH12 2EH. Tel: (0202) 738232.*

Intro. to Amateur Radio

A one-day non-technical course, providing basic information to help a newcomer decide whether amateur radio has anything to offer him or her, is to be held at Theobalds Park College on Tuesday, 5 February, 1985.

The course will explain who radio amateurs are, what they do, and how to join them.

Currently licensed amateurs, with friends or relatives who have expressed an interest in the hobby, may like to draw their attention to this course.

The course Tutor is Tony Smith G4FAI, and the course fee will be £6.00, which will include lunch and beverages through the day. Enquiries/bookings should be addressed to: *The Principal, Theobalds Park College, Bulls Cross Ride, Waltham Cross, Herts. EN7 5HH. Tel: (0992) 37255.*

RAE in Gwent

Readers living in the Abergavenny area of Gwent, who are thinking of sitting the March or May 1985 Radio Amateurs Examination, will be interested to learn that a venue to take the examination has been organised in Abergavenny.

Students should register for the March date by 15 January, and for the May examination by 15 February. Late entries can only be accepted for the May examination, and the very last date is 10 March.

All applications should be made to: *The Examination Secretary, Mr D. F. Jones GW3SSY, 80 Croesonen Parc, Abergavenny, Gwent NP7 6PE. Tel: (0873) 38674.*

Insurance

Readers who are interested in applying to the *PW Radio Users Insurance Scheme* are advised to use the coupon published on page 18 of a previous issue.

Handsized Portable

The Trio TH-21E, 144MHz band f.m. transceiver, recently introduced by Lowe Electronics is one of those pieces of equipment that makes you pause and reflect on the developments required to produce the proverbial quart in a pint pot—just to mix non-preferred volumetric measurements! Without recourse to the use of fiendishly pointed oriental finger operation Trio have come up with a *true* hand portable 'no nonsense" rig, ideal for those times when you need to leap out of the shack/mobile in a hurry.

Coverage of 144–146MHz is provided; synthesiser setting-up via thumbwheel switches and +5Hz push button. A rear slide switch provides simplex, normal and reverse repeater operation, with switchable autotoneburst and power outputs of 150mW or 1W. The receiver features a double conversion superhet arrangement with the first i.f. at 16·3MHz Sensitivity from the bi-polar front end/f.e.t. mixer combination is quoted at 0·25µV for 12dB SINAD and attendant selectivity −6dB at 12kHz, −40dB at less than 28kHz.

For the record the TH-21E, which costs around £175.00, measures 57 × 120 × 28mm and weighs in at a *massive* 280g, **including** the flexible helical antenna and AAA battery pack! Also included in the price is a mains powered NiCad battery charger.

Further details from: *Lowe Electronics, Chesterfield Road, Matlock, Derbyshire, DE4 5LE. Tel: (0629) 2817, 2430, 4057, 4995.*

Packet Radio Controller

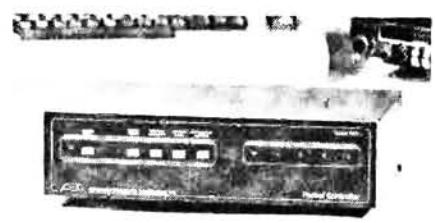
With the first packet radio contacts being confirmed in the UK, licenced amateurs interested in this high technology mode of communication would no doubt like to know that ICS Electronics Ltd. can supply, probably the first commercially available in the UK, packet radio Terminal Node Controllers (TNCs).

First, the PKT-1 from Advanced Electronic Applications Inc. is a fully assembled, tested and cased unit that costs around £500.

Second, is the respected Tucson Packet Radio Groups' terminal unit, in kit form, for approximately £300. Prices for these equipments will fluctuate with the international exchange rate and should be verified with ICS.

Both units, which interface directly to a transceiver, implement TAPR AX.25 and VADCG protocols, include a MODEM, and are designed to be driven by a dumb terminal unit or a personal computer, equipped with terminal emulation.

Typically, the units are suitable for high speed terrestrial or satellite, error correcting, data communication, with the added facility of multiple QSOs using only one frequency.



Each TNC can act as a digital repeater with the ability to "digipeat" via up to eight other PKT-1 intermediate stations, with the result that error-free and probably extended range communications, even under flat band conditions, may take place. Range advantages would be particular at v.h.f. and above where it would be possible to exceed the normal line-of-sight, single hop restriction inherent at these frequencies.

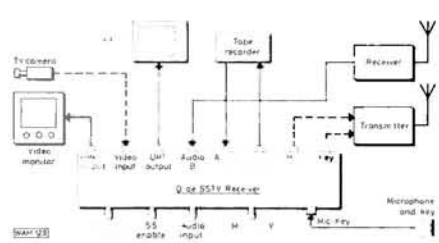
In time, through suitably equipped and attended stations, regular and reliable contacts throughout the length and breadth of the UK would be possible.

For further information, contact: *ICS Electronics Ltd., PO Box 2, Arundel, West Sussex, BN18 0NX. Tel: (024 365) 590.*

Slow Scan TV Receiver

Recently introduced by Davtrend Ltd. is the Drae SSTV receiver, a unit designed to decode and store slow scan TV pictures received by amateur band equipment.

Basically, the unit interfaces between a receiver (or transceiver) and a standard u.h.f. television, and picks up the transmission via the audio output of the receiver. Additionally, provision is made for recording of pictures onto a standard cassette recorder and also for



upgrading to full transmit/receive capability.

Operation of the unit is quite simple, assuming connections are as in the diagram, switch on the radio receiver and set the front panel switches as follows; Memory Input to Audio; SS Enable to On; Audio Input to B and select Microphone position. Tune the radio to a slow scan transmission by using the allocated channels as a guide and listening for the "chat" between pictures to identify the slow scan initially. The distinctive slow scan audio will quickly become a familiar sound—a sample cassette tape is supplied so that the user can become familiar with the operation of the receiver and the characteristic sound of an SSTV signal. Then carefully tune the radio receiver, watching the TV until a stable scan is achieved, with s.s.b. equipment tune for best stability by "tuning down" the audio tone. Some adjustment of receiver level and the potentiometer adjacent to the Audio B input may be required, but should be unnecessary.

The Drae Slow Scan Receiver costs £189, which includes VAT and carriage, and is available from: *Davtrend Ltd., Sanderson Centre, Lees Lane, Gosport, Hants. PO12 3UL. Tel: (0705) 520141.*

The Polarphaser

Our Technical Editor was fortunate enough to be invited to a trial demonstration recently of a brand new antenna polarisation control device, about to be introduced by South Midlands Communications.

The Polarphaser has been developed by Bill Sykes, G2HCG, who is well known for his antenna design work, whilst at the helm of Jaybeam of Northampton.

A discrete polarisation selection system designed by G2HCG is featured in the current RSGB *VHF Manual* and dates back nearly 20 years. However, this and similar designs have all used complex switching arrangements requiring the accurate cutting of λ/4 phasing lines, to achieve the phase shift effects. With the Polarphaser, **continuous** 360° adjustment (during transmit, up to the UK legal limit, or on receive) of polarisation is available, simply by the turn of a single control knob. When used in conjunction with an XY crossed Yagi, configured in the X mode, a pair of coaxial feeders (which do not need to be accurately matched) connect to the rear mounted SO239 sockets and the transceiver to the combined output socket.

During the test demonstration, conducted over a 30km semi-obstructed path, to a station similarly equipped, the effects of polarisation adjustment were vividly apparent. An S9 + 10dB indicated signal could be cross-polarised to the point where it was *just* discernable above the noise (lab tests indicate a very close approach to the theoretical 30dB point) whilst using either vertical, horizontal, R.H. circular

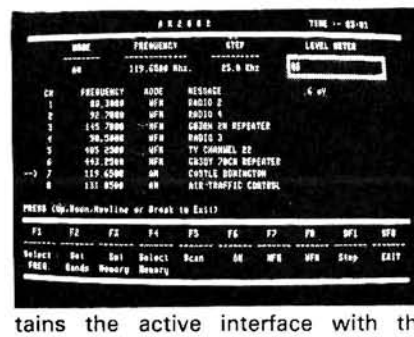
or L.H. circular. Similar results were obtained over direct "line of sight" paths.

For OSCAR satellite users the benefits to be obtained from *instantaneous* shack control over polarisation will be obvious and result in far more effective utilisation of available power resources/receive capabilities. For terrestrial purposes the ability to readily change to separate polarisations will often enable severe co-channel interference, for instance from a vertically polarised mobile, to be substantially reduced or even eliminated. From a pure reception point of view the effects of polarisation adjustment to signals arriving over obstructed paths, with attendant polarisation shifts, can be equally dramatic!

The Polarphaser (which is subject to a pending design patent) is available from SMC or their agents at £49.00 inc VAT. Further information from: *South Midlands Communications, S. M. House, Rumbridge Street, Totton, Southampton SO4 4DP or Tel: (0703) 867333.*

AR2001-Comp. Scan

During 1985 Lowe Electronics will be introducing an interface board and supporting software to allow the AR2001 scanning receiver to be fully controlled by a microcomputer. Our photo shows an evaluation unit, built in conjunction with AOR, and from the screen picture it can be appreciated that the flexibility of frequency monitoring/scanning is considerable. The IF232C board con-

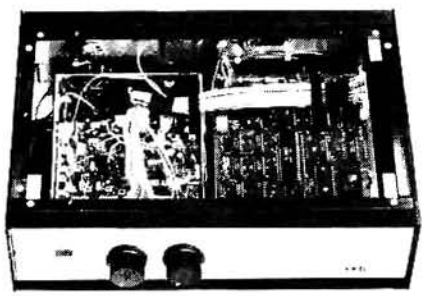


tains the active interface with the AR2001 and an RS232 link facility, only requiring a ribbon cable to the micro and a simple regulated d.c. p.s.u.

With the software loaded the host computer provides access to all functions of the AR2001 and can be programmed to scan/monitor any frequency within the 25–550MHz range of the receiver with any permutation of mode/hold time etc. An additional very interesting facility is the on-screen analogue level meter which in conjunction with the displayed signal strength figure, is derived from the receivers a.g.c. line, allowing instant comparisons to be made or a print-out log to be updated.

Whilst this interface has been primarily designed for government monitoring agencies all enquiries will be welcomed.

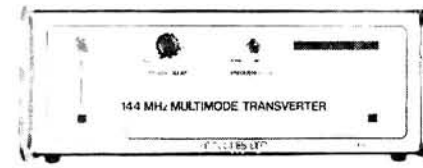
Look out for a further announcement!



New from MM

Several new amateur band products have recently been introduced by Microwave Modules, representing further inroads into current technology.

For those looking for a high performance 144MHz band system the MMT 144/28-R multimode transverter, when used in conjunction with a 28MHz (10m) transceiver provides a very potent combination. Between 250–300mW of 28MHz r.f. feeding an r.f. vox and an a.l.c./manual input level control, result in 25W of 144MHz r.f. The transverter is a linear device with an inbuilt l.e.d. bargraph display indicating relative output. The a.l.c. circuit has a 20dB dynamic range and is incorporated to ensure that a totally clean signal (spurious −65dB or better) is produced, virtually eliminating compressed signals with their resultant i.m.d. effects to "local" stations.



The local oscillator section contains two separate low-noise crystal oscillators running at 116·00 and 115·40MHz. Front panel selection is provided allowing simplex, normal and reverse repeater operation. After buffering and filtering the resulting high level injection at the mixer stage is extremely pure and free from harmonics.

On the receive section the "front end" features an NEC GaAs-f.e.t. in a noise-matched configuration feeding the high level double balanced mixer via bandpass filtering. Gain at i.f. is provided by a j.f.e.t. stage with the overall combination providing good signal to noise ratio, excellent immunity to overload/cross-modulation and a quoted third order output intercept point occurring at +19dBm.

Further details of the MMT 144/28-R which is available at £215 inc. VAT from: *Microwave Modules, Brookfield Drive, Aintree, Liverpool L9 7AN or Tel: 051-523 4011.*

PHOTO ACOUSTICS LTD. Tel: 0908 610625

58 HIGH STREET, NEWPORT PAGNELL, BUCKS, MK16 8AQ

TRIO TS 711E

TS 711E – The TS 711E is a dedicated 2m multi-mode base station that has its own built-in power supply, speech processor and IF shift. Power output is at least 25 watts, often more. There are also two VFOs and forty memory channels. The VFOs have been designed specifically for use in a multi-mode rig On SSB and CW you can have a free running VFO but the touch of a switch converts it to 5 or 12.5 kHz click steps. The memories will remember which VFO operation has been selected and whether repeater shift has been selected, or even if it is required.

Various scan options are available. The TS 711E will scan the band or the memories, holding for a few moments on occupied frequencies. It can also scan the memories looking at only those frequencies entered in a particular mode. There is also a programmable scan with memory channels 39 and 40 setting the upper and lower limits.

The optional VS1 board provides a voice synthesizer that gives full voice announcement of frequency and whether the rig is set to repeater shift. The mode of operation is indicated by the Morse code for the letters (F for FM, U for USB etc) being generated whenever the appropriate button is pushed.

Another major feature is the DIGITAL CODE SQUELCH. This is a built-in selective tone call system. An alarm is incorporated to let you know if you were called while out of the shack. Six letters or numbers can be sent as part of the selective call. This can be used to activate the optional call sign display and log that will keep a record of everyone who called you with DCS. This is probably the finest 2m base station available **£792:15**

TS811E 70cms version. Has all of the facilities of the 711E, including DCS **£898:00**

TH 21E

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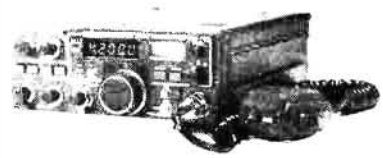

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TRIAMBIC KEYER

by Mike Rhodes G4FMS

Morse code isn't everyone's forte and I often wonder whether the majority of those who have come to find it an intriguing method of communication would have done so had it not been for compulsory learning at some stage. The Radio Amateur, who requires a knowledge of the code before being permitted to operate on the h.f. bands is a case in point. I also wonder how much this enforcement influences the operator in his choice of a code generating device. Use of the basic "up and down" key is another requirement and although there's something to be said for such a primitive device and it does have an enthusiastic following, many amateurs look for something easier to use after passing the test.

Thinking a little further along these lines, one might ask the same sort of questions about the various styles of keying paddles that are currently in use. These have evolved over the years but without the co existence of what we might call "compact" electronics. The full-blown keyboard is another device which has more recently appeared on the Morse scene. This may have plenty of associated electronics but the original idea came from the mechanical typewriter. Why not start from the present time and reconsider the problem? Using currently available components, what sort of device might the Radio Amateur find best suited to his needs?

This is no mean question and despite a strong lobby from the "left foot operators" association, in the end I had to narrow the field and conclude that the use of the left hand is probably the most convenient arrangement leaving the right hand free for operating the rig and pencil. (Left-handed scribes vice-versa). This immediately dismisses the keyboard as a medium, since it requires two hands and, incidentally, some typing ability.

A New Approach

So here we are back to one-handed operation—nothing new in that! But perhaps it's possible somehow to improve ease and efficiency.

Observation of the technique for operating a standard (telegraph) key convinced me that most of the skill developed is used firstly to eliminate contact bounce and secondly to time key depressions accurately. How much better it would be if, in the first place, we chose a switch specifically designed to reduce contact bounce to a minimum. The keyboard switch is such a device—light in action, good for a few million operations and, moreover, cheap. It's also quite fast in operation—just listen to your typist at her word-processor.

So, having found a suitable switch, the next problem is timing. There are many circuits around for twin paddle keyers where one paddle operates the dash and the other the dot. These produce self-completing dashes and dots of precise duration and may even include circuitry for defining the minimum gap between characters. Also, to reduce the number of paddle movements, the "Iambic" mode has been developed so that alternate dashes and dots are produced when both paddles are "squeezed" at the same time. This sort of circuit could be used with two keyboard switches and indeed this was an arrangement I used for a considerable time.

The Double Dot

However, it soon became apparent that because the "dot" and its following interval take only half the time duration of the "dash" and its following interval, then the time available for pressing and releasing the dot key is only half that for the dash key, so that more speed and skill is required by the "dot" operating finger. This lead to the idea of splitting the "dot" function between two keys, making three keys altogether, and so equalising the skill level required for the operation of each key.

The "dot" action is split between the two keys by making the first generate a self-terminating single dot with no repeat available and the second generate a self-terminating sequence of two dots (letter I) but in this case the action can be repeated by holding the key into the next "double dot" time period in a similar way to the dash repeat action. The double dot operating finger now has the same timing requirements as the dash operating finger and the single dot can be operated at the same sort of speed since it is only going to produce one dot even if held for twice the duration. To ensure that correct spacing is maintained between the elements of a character, each key must be electrically buffered so that regardless of the speed at which different keys are pressed, as long as they are pressed fast enough, the Morse output will be perfectly timed. An experimental circuit was devised to produce the required action and it also included an iambic mode facility to reduce the number of key movements as mentioned earlier[1].

Operation

The use of three keys will of course require a short learning period in order to memorise the required key combinations. If we label the three keys "E", "I" and "T" after their respective functions, a rudimentary fingering table can be constructed, see Table 1.

It will soon be found that some of the combinations can be keyed very rapidly indeed. Consider for example the let-

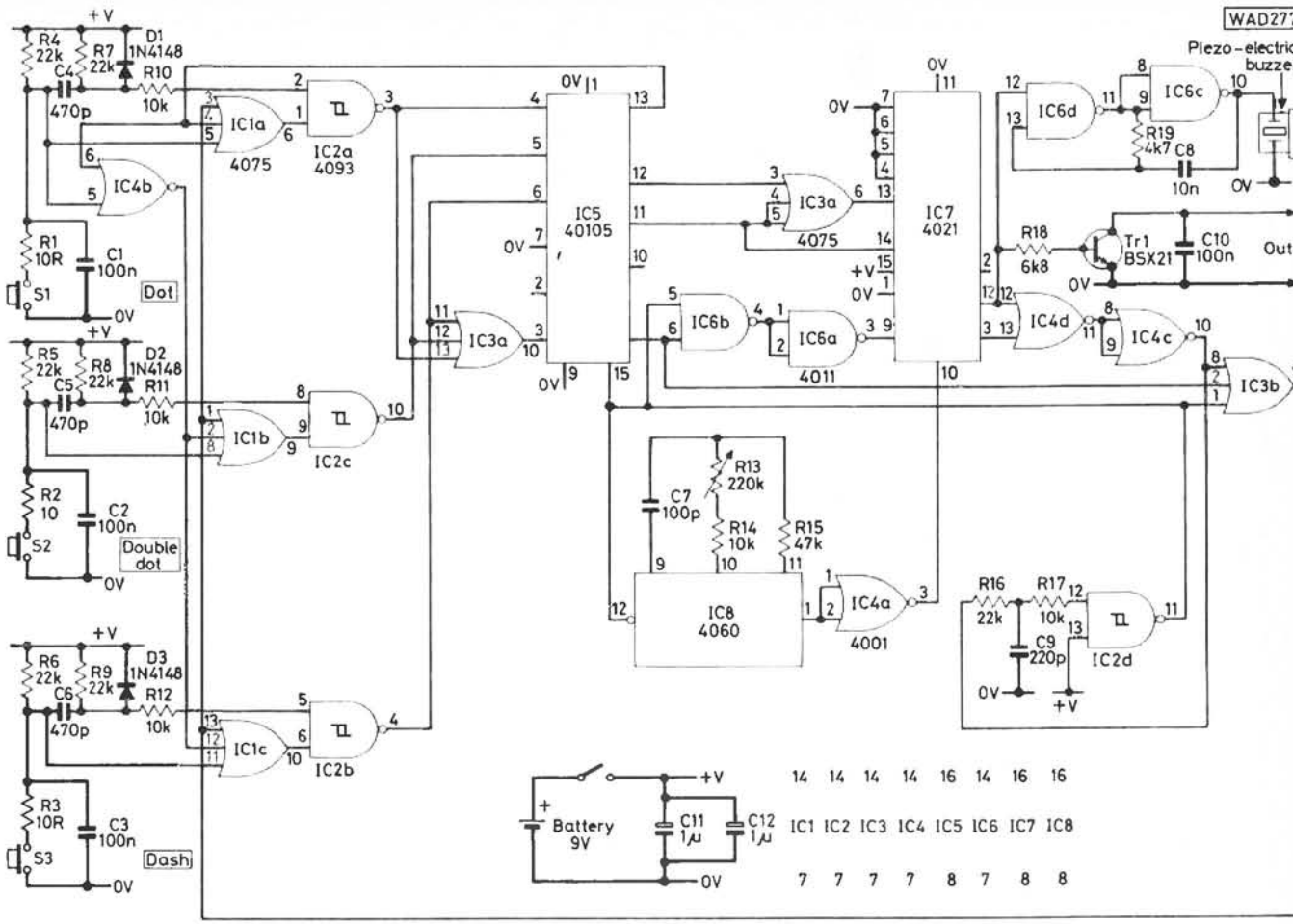


Fig. 1: Circuit diagram of the Triambic Keyer

ter F (di-di dah dit) which can be broken down as I-T-E. With the buffer provided, which gives a sort of type-ahead facility, the three keys can be struck in rapid succession, after which the operator can just wait for the keyer to complete its output before starting the next character. Again the letter S is particularly easy since the two keys I and E can be struck simultaneously and the three dots will appear at the output in due course.

At this stage I should issue a serious warning: **This keyer may become addictive.** The real advantage of the mechanism is probably not too obvious until you've tried it! It appears to have a much more rhythmic action in use than a standard paddle but the operation is by no means de-skilled. The selection of finger sequences soon becomes automatic and extra practice just makes excellent Morse perfect!

The FIFO Way

The only real problem with the prototype keyer was the size and complexity of the circuit which at the time of construction was considered of secondary importance to proving the principle. A cheap, compact and easily built unit was required to enable operators to test ideas for themselves. This has lead to the development of the f.i.f.o. Morse sender.

The f.i.f.o. itself (first in first out) which comes in the usual insignificant looking 16-pin d.i.l. package has integrated much of the original circuitry. It is, in effect, just a queueing buffer which takes inputs in turn—in this case from the keyboard switches—and permits them to appear at the output in the same order but at a different rate—here determined by the setting of the desired output Morse code speed.

Using the f.i.f.o. has enabled the number of integrated circuits to be reduced to eight, which brings the size and cost into comparability with other c.m.o.s. keyers.

BUYING GUIDE

Components for this project should be readily available. The 40105 f.i.f.o. device is available from Maplin, order code QW63T. The key switches and tops are available from Cirkit.

Approximate Cost £16

Construction Rating INTERMEDIATE

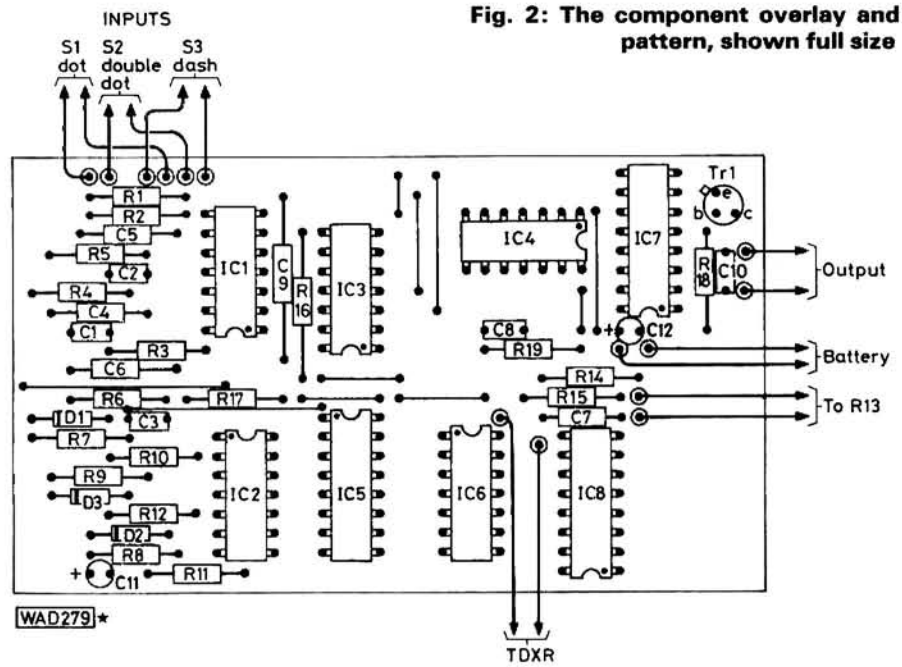
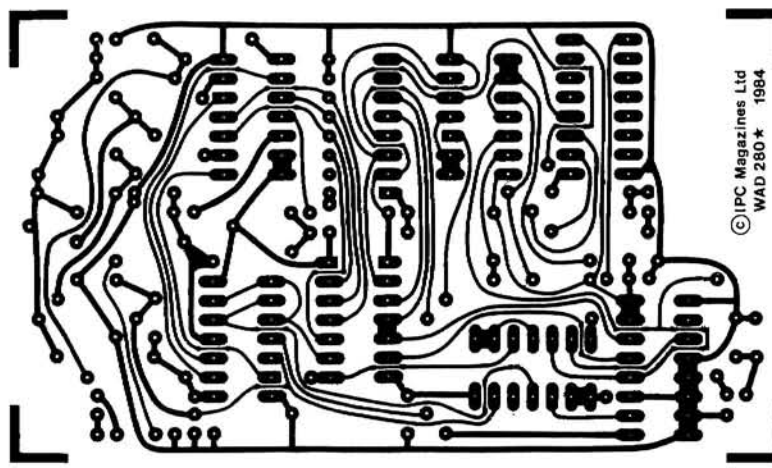


Fig. 2: The component overlay and p.c.b. track pattern, shown full size



Construction

To enable easy construction it was decided to design a single sided p.c.b. making things simple for home production or cheaper if you wish to buy out. The board was designed to fit a standard Bimbox size 113 × 63 × 31mm, although, of course, any suitable enclosure may be used.

Once the components have been collected together, assembly is very straight forward and it shouldn't take longer than the odd rainy weekend to complete. Observation of the usual c.m.o.s. handling instructions and the use of a pencil point soldering iron are strongly recommended.

The only really tedious bit of work seems to be cutting three square holes in the plastics box for the keyboard switches. These can be cut either along one edge of the box or in the bottom, forming the "portable" or "desk" model respectively. The former option fits more easily into the pocket and is convenient for portable or hand-held operation; the latter may be preferable if the keyer is to be located on a horizontal surface in front of the rig or on the chair arm. Three more holes—one for the speed control/on-off switch, one for the output jack socket and a small one for the piezo-electric transducer complete the drilling and hacking. A thin metal strip was bent up to form a clip for the battery and was securely attached to the bottom of the box with double sided sticky tape. This tape proved very powerful and was also used to attach the transducer; it would also be good enough to locate the battery itself if you didn't wish to bother with making the clip.

All the switches etc. are fitted into the box first and then connected by flying leads to the assembled printed circuit board which after removing the two corners indicated lies neatly (components downwards) just underneath the lid of the box. There's enough room for a small side-tone switch etc. if you want the optional extras.

Points to notice when assembling the components on the p.c.b. are that capacitors C4, C5 and C6 should be inserted last so that they have room to spread over the top of adjacent components since their width may be a little large. The output speed potentiometer is wired so that clockwise rotation reduces the speed to present a more uniformly graduated scale.

Logic Flow Description

A key depression causes a change from high to low level at the input pulse generator. A simple *CR* circuit differentiates the level change to produce a pulse fed to the

f.i.f.o. data input via an OR gate. All data input pulses are ORed to make the f.i.f.o. input load pulse (f.i.f.o. loaded with low to high going edge). Up to 16 sequential entries can be loaded into the f.i.f.o.

The loaded pulses pass through the f.i.f.o. to the appropriate data output pins and produce a high level on Data Output Ready. This output is taken to the asynchronous parallel load of the Output Shift Register (o.s.r.) where an encoded version (Morse) of the f.i.f.o. outputs is loaded.

Loading the o.s.r. causes the o.s.r. Empty signals to go low. A delayed version of this signal is used to remove the o.s.r. parallel load, remove the data from the f.i.f.o. and start the output clock.

Morse code is shifted serially from the o.s.r. at a rate determined by the setting of the clock speed (R13). The serial output is fed to an output stage and also to a side tone generator.

When the o.s.r. again becomes empty, the delayed empty signal is removed from the o.s.r. force parallel inputs load to enable transfer of the next data from the f.i.f.o.

If the f.i.f.o. itself has become empty after the last o.s.r. load, the f.i.f.o. reload pulse will be enabled and if keys still remain pressed a f.i.f.o. reload for the appropriate key will take place. This action will follow through to the o.s.r. as before after a negligible delay. If both single dot and dash keys remain depressed, the Iambic feedback will cause alternate dots and dashes to be reloaded.

Key to Schematic Diagram

Key Input Circuits: This serves two functions a) to produce a pulse for entry to the f.i.f.o., b) to produce a level to gate the f.i.f.o. reload pulse.

Reload Input Gates: Gates the f.i.f.o. reload pulse with the key input level qualified by "Iambic mode feedback" level.

FIFO Input OR: Passes the key input or the output from the reload gates to the f.i.f.o. data inputs and to the f.i.f.o. input load.

Table 1

A	di–dah	E–T
B	dah–di–di–dit	T–I–E
C	dah–di–dah–dit	T–E–T–E
D	dah–di–dit	T–I
E	dit	E
F	di–di–dah–dit	I–T–E
G	dah–dah dit	T–T–E
H	di–di–di–dit	I–I
I	di-dit	I
J	di–dah–dah–dah	E–T–T–T
K	dah–di–dah	T–E–T
L	di–dah–di–dit	E–T–I
M	dah–dah	T–T
N	dah–dit	T–E
O	dah–dah–dah	T–T–T
P	di–dah–dah–dit	E–T–T–E
Q	dah–dah–di–dah	T–T–E–T
R	di–dah–dit	E–T–E
S	di–di–dit	I–E
T	dah	T
U	di-di-dah	I–T
V	di–di–di–dah	I–E–T
W	di–dah–dah	E–T–T
X	dah–di–di–dah	T–I–T
Y	dah–di–dah–dah	T–E–T–T
Z	dah–dah–di–dit	T–T–I

★ components

Resistors

¼W 5% carbon film

10Ω	3	R1–3
6·8kΩ	1	R18
10kΩ	5	R10–12, 14, 17
22kΩ	7	R4–9, 16
47kΩ	2	R15, 17

Potentiometer, with switch

220kΩ (log)	1	R13

Capacitors

Monolithic ceramic

10nF	1	C8
0·1µF	4	C1–3, 10

Polystyrene

100pF	1	C7
220pF	1	C9
470pF	3	C4–6

Tantalum bead 16V

1µF	2	C11, 12

Semiconductors

Diodes

1N4148	3	D1–3

Transistors

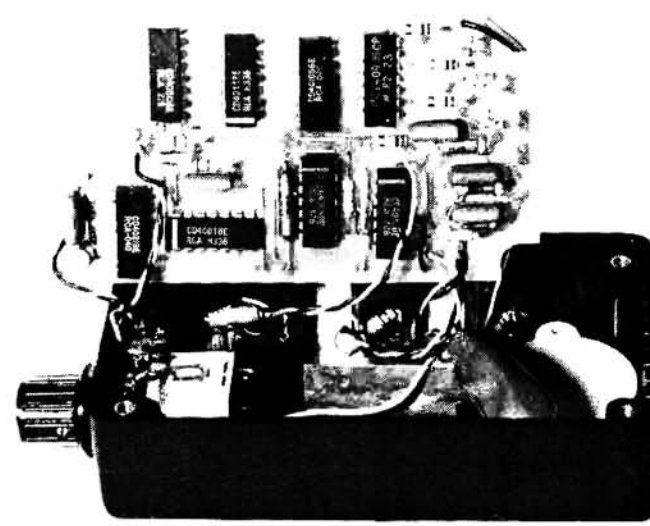
Tr1	1	BC108

Integrated circuits

4001	1	IC4
4011	1	IC6
4021	1	IC7
4060	1	IC8
4075	2	IC1, 3
4093	1	IC2
40105	1	IC5

Miscellaneous

Toko PB2720 piezo-electric transducer; 3·5mm jack socket; key switches (3) Alps KCC10002; tops (3) KT2-1; Bimbox 2003 (113 × 63 × 31mm); 6-F22 (PP3) 9V battery; p.c.b.



The authors prototype Triambic Keyer

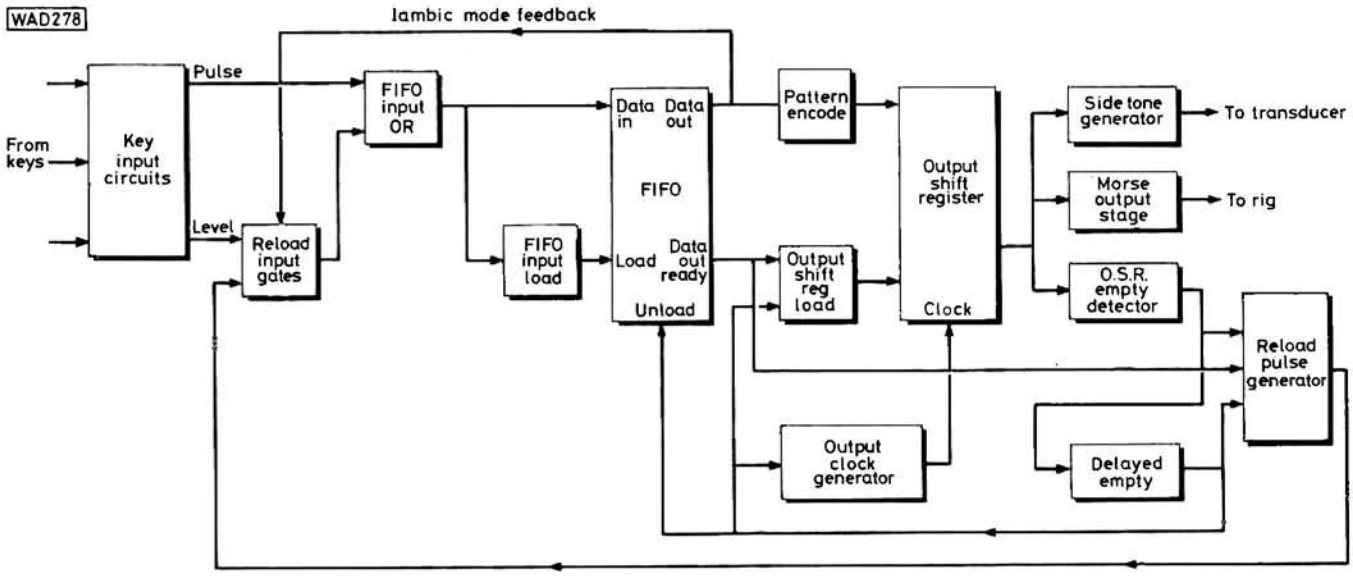


Fig. 3: Block schematic diagram of the Triambic Keyer

FIFO Input Load: Takes any f.i.f.o. data input pulse and generates a common f.i.f.o. loading pulse. The f.i.f.o. is loaded on the low to high going edge of this pulse.

FIFO: The action of the f.i.f.o. is to store the data inputs in the order received and present them to the data outputs in the same order, together with a "Data Output Ready" signal.

Sequential data outputs are "removed" by presenting a falling edge to the "Shift Out" pin of the f.i.f.o. This permits the next lot of data to appear at the outputs together with its "Data Output Ready" (if more data was available in its store).

When the f.i.f.o. becomes empty, the last data remains at the data outputs although of course the "Data Output Ready" signal still goes low to indicate that the data had been used.

Pattern Encode: The data stored in the f.i.f.o. shows which key has been pressed or is to be repeated. This is changed to a pattern corresponding to the Morse code for that key for presentation to the Output Shift Register.

Output Clock Generator: This circuit consists of an oscillator whose frequency is controlled by the variable resistor followed by a 14-stage binary counter/divider. The output—taken from the twelfth stage for convenience—makes shift pulses for the Output Shift Register at the "element" frequency of the Morse code to be produced. One element = 1 dot or 1/3 dash etc. The oscillator is enabled as long as the Output Shift Register is "not empty".

Output Shift Register Load: This logic controls the serial/asynchronous parallel pin of the Output Shift Register. When the f.i.f.o. Data Output Ready goes high, the encoded pattern is forced into the register. When this action is complete, a feedback from the "not empty" signal allows the Output Shift Register to revert to synchronous shift mode.

Output Shift Register: This is an 8-bit serial shift/asynchronous parallel load register. The register is parallel loaded asynchronously from the f.i.f.o. with a pattern corresponding to morse code i.e. with a high level for each output clock element (see Output Clock Generator) and a low level for each space element. Thus, the dash is loaded as high, high, high, followed by lows, and double dot as high, low, high, followed by lows. After being loaded, the register is switched into shift mode and the loaded pattern is shifted serially to the output. When all highs and one following low have been shifted out, the register will be reloaded from the f.i.f.o. if more data is available.

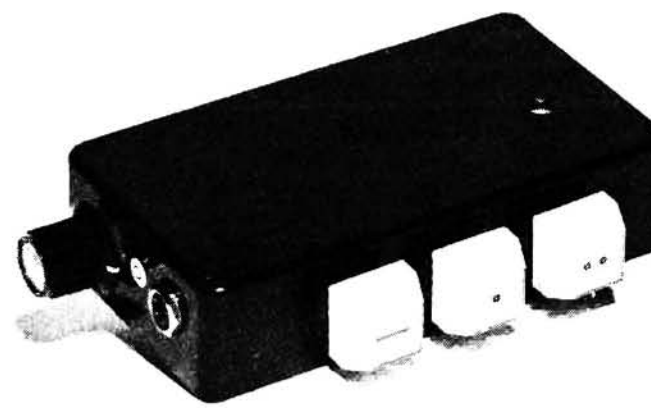
Output Shift Register Empty Detector: This circuit looks at two bits from the Output Shift Register to determine whether a pattern is currently loaded. The pattern always includes a single element space at the end so the detector indicates empty after that space has been shifted.

Delayed Empty: The Output Shift Register Empty signal is delayed by 2 to 3 microseconds to allow sufficient time for parallel loading the Output Shift Register and also for making the f.i.f.o. reload pulse.

Reload Pulse Generator: This pulse which feeds back to the f.i.f.o. Reload Input Gates is generated from the Empty and Delayed Empty signals and occurs at the point when the Output Shift Register becomes empty but only if the f.i.f.o. itself is also empty.

Iambic Mode Feedback: The f.i.f.o. output data indicating "single dot key" as the last output before going empty is used to inhibit the dot key reload pulse and enable the dash (and double dot) key reload pulse when both single dot and dash keys are held at the same time. This causes alternate dashes and dots to be reloaded.

continued on page 33▶▶▶



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Access

SPORADIC-E ON 144MHz 17 JUNE 1984

by Neill Taylor G4HLX

Amongst the interesting modes of propagation sometimes available to the v.h.f. operator is that known as "sporadic-E", abbreviated as E_s. Its characteristics will be well-known to the regular 144MHz amateur interested in DX:

- It enables communication at 144MHz over very long paths, typically 2000km.
- Signals propagated by E_s tend to be very strong, i.e. there is little attenuation on the path.
- A sporadic-E "opening" starts suddenly, provides steady signals for a period, which may be only minutes long, and then abruptly ends.
- Its effect seems to be very localised: you might hear stations 20km away working the dx, but can't hear the DX yourself.
- It occurs chiefly during the summer months of June to August, but is otherwise unpredictable.

Sporadic-E also affects signals at lower frequencies, generally more often and for longer periods, but the results are less spectacular in comparison with regular F-layer propagation on the h.f. bands. Exceptions to this, perhaps, are on 28MHz (10m) during sunspot minimum years, when E_s can provide useful paths within Europe in the summer months. On 70MHz the band is sometimes rendered virtually un-useable in the UK due to very strong East European broadcast signals, propagated by E_s.

It is, however, on 144MHz that E_s really creates a stir, due to the exceptional distances covered, the high signal strengths encountered and the rather mysterious manner in which these rare dx stations suddenly appear on the band and then rapidly vanish after a short time.

It is not only the amateur who finds E_s something of a mystery. Those whose job it is to study radio propagation have been interested in sporadic-E for a long time, and still have some important questions un-answered. The phenomenon is known to be due to a small but dense region of highly ionized gases in the ionospheric E-layer. This constitutes the sporadic-E "cloud", which is formed typically at a height of 100km and which efficiently reflects radio waves under certain conditions. What is not clearly understood, however, is the mechanism by which an E_s cloud is formed. If this were known, we might be able to predict its occurrence.

Observations of sporadic-E events by amateurs can provide a useful contribution to knowledge of the phenomenon. The IARU co-ordinate the gathering of information on the subject, supplied by national amateur radio societies—in the UK by the Propagation Studies Committee of the RSGB. The strength of contributions by amateurs in observations of E_s lies in the large number of stations and their widespread distribution.

If you wanted to study the effect of short E_s events on propagation at v.h.f., you might, for example, imagine an experiment in which hundreds of stations, equipped for 144MHz, were distributed around the UK and operated for an eight-hour period during which the sporadic-E occurs.

Just this situation was provided by the *Practical Wireless* 144MHz QRP contest on 17 June 1984. The sporadic-E openings on that day were by no means major events, but sufficient for a pattern to emerge, as we shall see. Were it not for the contest activity, in fact, the openings may well have been gone entirely un-noticed. The contest was entered by 234 stations spread around the British Isles (see the map accompanying the contest results in *PW* November 1984, for the distribution of stations by locator square), and 10 of these either had contacts via sporadic-E or have reported the reception of DX signals in this way.

The map, Fig. 1, shows the locations (small circles) of the UK stations involved, and where contacts had taken place or positive reception reports are provided; the lines indicate the paths to the distant station in each case. It should be noted that these have been drawn simply as straight lines on a Mercator projection and do not, therefore, show the precise great circle path. It must also be remembered that the sporadic-E cloud providing the reflection need not have occurred directly on the great circle path between the two stations.

There appear to have been three distinct periods of sporadic-E opening. The first was enjoyed by one station alone at 0825 GMT, but since this was before the start of the contest, it may have passed un-noticed elsewhere. The other two periods were 1205–1215 GMT, when all reported contacts were with Maltese stations in the JM75 locator square, and 1405–1420 GMT, with paths into Italy and Yugoslavia.

The most striking feature of the map is the distribution of the UK stations who experienced the openings. With two exceptions they lie on an almost straight line from IO84 to JO01 squares, a north-west to south-east line which is also close to the line of the propagation path. This sort of distribution is a departure from the conventional view of these openings affecting only stations in one small locality.

To learn anything about sporadic-E propagation from this event we need to ask the question—what caused it? One theory of the formation of E_s clouds suggests that it may result from wind shear, i.e. air masses moving at high speeds against each other, at high altitudes, giving rise to the required ionisation. This wind shear may, in turn, be brought about by severe thunderstorms.

Many operators in the *PW* QRP contest will recall that there were indeed severe thunderstorms in the UK on that day. These were mainly over south-east England. However, it is unlikely that these storms could account for the contacts with Malta as they occur so near to one end

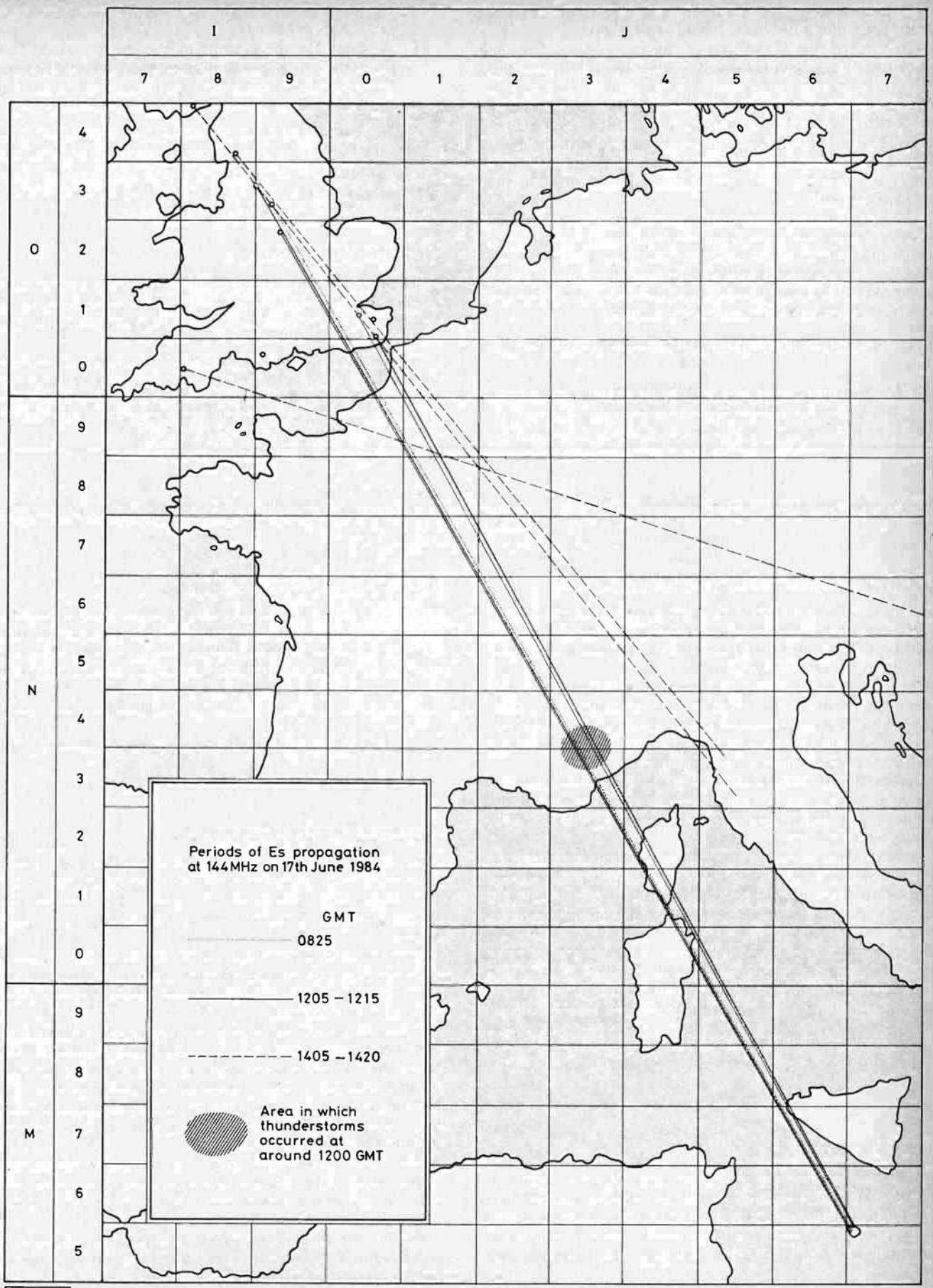


Fig. 1: Sporadic-E paths worked before and during the 1984 *PW* QRP Contest. The European map grid is based on the recently adopted Maidenhead Universal System

of the path and we presumably expect the E_s cloud to be somewhere mid-way between the two stations.

Most of the rest of the part of Europe we are interested in seem to have had a fairly fine day on 17th June, but with one important exception. Thunderstorms occurred at around 1200 GMT in the Alps, on the French-Italian border north of Nice, as shown by the shaded area on the map. This is at just the right time, and in just the right place, to be the location of the sporadic-E cloud reflecting signals between the UK and Malta, and lies close to the centre of the path.

The later contacts with Italy and Yugoslavia, which, by the way, seem to have been characterized by stronger signals than in the earlier opening, are more difficult to explain, but it is conceivable that the thunderstorms in the south-east of England could have played a part in the contacts from IO84 to JN45 and JN53 squares.

To summarize the important features revealed by this study:

- Of the many stations active on 144MHz on 17 June 1984, the few who experienced sporadic-E propagation were widely spread over the UK, but most lay on an almost straight line in the direction of the propagation path.
- At least for the second of the three periods of E_s propagation, a plausible cause of the formation of the sporadic-E cloud has been identified, in the form of thunderstorms at the central point of the path.

Perhaps we shall have to view thunderstorms in a new light if they prove, as this suggests, to be the cause of such an exciting mode of enhanced VHF propagation, rather than the bringers of static QRN and destroyers of antennas as they are commonly regarded. ●

Acknowledgments

The author is very grateful to the Director-General, Meteorological Office, Bracknell, for assistance in the provision of information regarding the weather on 17 June 1984.

The stations who "un-wittingly" provided the data for this study, in the form of their contest logs or comments submitted with them, were: G3YMD/P, G4RNL/P, G4OKY/P, G4VFG/P, G6EKR/P, G6PHF/P, G6PUS/P, G8RZO, and GM6WIX/P.

Packet Radio—A First in the UK?

Sir: What is thought to be the first Packet Radio QSO using AX25 protocols, between two licensed UK amateurs, took place on the evening of 10 June 1984, and on the morning of 11 June, on 145·300MHz f.m.

The two stations concerned were G3VPF of Chickerell, near Weymouth and G4VBY of Broadmayne, near Dorchester, Dorset. Several frames of information were exchanged using AX25 protocols, with both stations receiving good copy once the link was established.

Both stations used a Terminal Node Controller which is produced in kit form by the Tucson Amateur Packet Radio Group in the USA. Both kits were assembled and commissioned by G3VPF.

Perhaps anyone who is interested in setting up a Packet terminal (or has already set up a terminal) would like to contact G4VBY (tel: 0305 853408) with a view to a bulk purchase of parts thus reducing the initial cash outlay and/or an exchange of ideas.

It is known that other groups are already formed, so it would be of benefit to all if the amount of interest in this fascinating mode of communication could be estimated.

A. W. Dickson-Smith G4VBY.
7 Spring Gardens,
Broadmayne, Dorchester,
Dorset DT2 8PP.

Back Numbers

Sir: I recently came across some rather ancient copies of *PW*, and wondered whether any of your readers would be interested in purchasing them. The issues are as follows: Nov 1946; Jan, May–June, July, Oct and Nov 1947; Apr, May, June, July and Aug 1950; May and Sept 1951; Jan and July 1953.

R. K. Simmons, 29 Red Lion Lane,
Shooters Hill, Woolwich, London SE18 4LD.
Tel: 01-856 1240.

SS–105S User Group

Sir: I am the proud owner of a Shimizu Denshi SS–105S h.f. transceiver, and I wonder as there must be many hundreds of these rigs currently in use, whether any other owners might be interested in forming an SS–105S User Group, to exchange ideas and mods etc.

To get things rolling, interested parties are invited to write to me.

Tim Wills G8PZD, 66 Kipling Road, Cheltenham, Glos.

Sauce for the Goose

Sir: I read with great amusement Janet Dugmore's article about the long-suffering wives of radio amateurs. Well, in this house the boot is on the other foot. I'm the radio amateur and my OM Ken and son have no interest whatsoever.

Our wedding anniversary came along in March and the OM casually said that as he hadn't bought anything for me and if there was any radio equipment I would like, go ahead! Well fancy saying that.

I was kind and didn t go mad, I suggested that as I had a 144MHz band beam still in its box could I buy a 430MHz beam and kill two birds with one stone. So far so good, ok was the reply, now the sting! A couple of days later, I informed Ken that I had nothing to plug this new 430MHz beam into. Again ok was the reply, and I didn't waste any time and made the purchase.

Poor Ken, and I mean that in sympathetic and financial terms, must have thought about it because about a week later, he asked me how much it had cost him. The air was blue!

So the end result is two things, I've got a nice 430MHz rig and I've got a very attentive and alert husband, who reckons I'm the biggest con artist in the world of radio!

I also go past the Bank Manager in disguise.

Sue Frost G4GWY
Herne Hill

Radio Wave

Part 2 by F. C. Judd G2BCX

The methods used by Professor E. V. Appleton and others to measure the heights of the E and F layers were dealt with in Part 1 and we finally came to the use of a specially designed and completely integrated piece of equipment known as an "Ionosonde". This is an automatic ionospheric layer height recorder that operates over a portion of the radio spectrum ranging from about 1 to 25MHz. Ionosondes were put into regular use in various parts of the world, some before 1950, and notably by the Rutherford Appleton Laboratory at Slough, Berks; in this country, at South Uist in the Hebrides and at Port Stanley in the Falkland Islands. These are still in operation.

Recording the Height of Layers

The photographic recordings shown in Fig. 2.1 and produced by Ionosonde equipment are fairly typical and known as "ionograms".

(a) A winter day ionogram of normal E layer echoes from 1·6 to 2·8MHz. The F layer appears from 2·8 to 12·5MHz with magneto ionic splitting near the critical frequency. 12·5MHz is the highest frequency reflected at vertical incidence.

(b) A quiet summer day ionogram showing the normal E and sporadic-E up to 4·8MHz. Echoes from the F region appear from 3·7 to 7·6MHz. Beyond 5MHz magneto-ionic splitting is apparent and the critical frequencies of the F1 and F2 layers are clearly shown.

(c) A good example of sporadic-E return from 1·3 to about 9MHz, the actual Es cloud height being 100km. Also to be seen are three multiples of the primary echo, each spaced 100km apart.

The Ionosonde at Slough, Berks, has recently been replaced by digital equipment and is remotely controlled by land lines from the Rutherford Appleton Laboratory at Chilton, Oxfordshire. Signals from the Ionosonde are conveyed by land line to Chilton and converted directly to digital print-out as in the example shown in Fig. 2.2. The annotations explain the kind of information obtained and which is similar to that shown in the earlier photographic type of recordings as in Fig. 2.1.

Ionospheric Layer Characteristics

D region: The ionised layers, sometimes called regions, are known by letters the lowest being the "D" region which is between 60 and 90km above the surface of the earth. Since the atmosphere itself is relatively dense in this region the amount of ionisation that occurs depends directly on the amount of sunlight. Ionisation of the D region becomes a maximum at midday but disappears round about sunset. When a radio wave passes through the D region, electrons are set in motion and collisions with particles are frequent enough to cause a large proportion of the wave energy to be dissipated as heat. The distance a wave can travel through this region does however depend on its frequency e.g., if the frequency is low enough, collisions between particles may be sufficiently numerous to cause practically all the wave energy to be absorbed. This occurs quite often in the frequency band 3 to 4MHz, particularly with waves that enter the region at low angles and therefore have to travel a greater distance through it. During periods of maximum sunspot activity, waves entering the region at very high angles (at or near vertical incidence) can also be absorbed, particularly around midday, resulting for example in a seemingly dead 3·5MHz (80m) band at least as far as inter-G contacts are concerned.

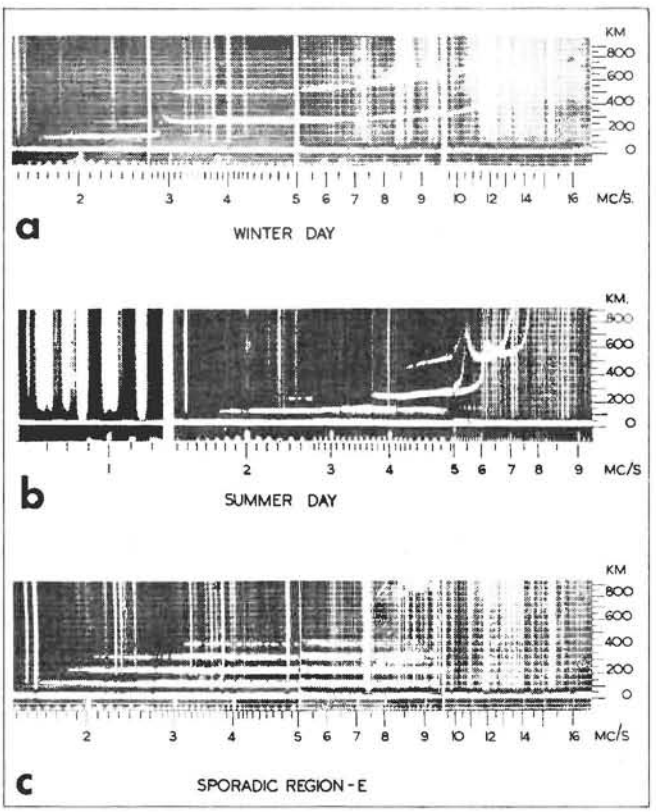


Fig. 2.1: Three typical ionograms—the interpretation of which will be found in the text

Absorption is much less at 7MHz and less still at 14MHz (and higher) and although the D region plays no part in DX on these bands, wave absorption even at 7MHz can often produce the "dead band" effect; but this is not the only reason as will be seen later.

E region: The E layer is the lowest capable of providing long distance radio contacts and its height above earth is between 100 and 125km. The atmosphere in this region is still fairly dense and again ionisation varies according to the height of the sun above the horizon. Whilst ultra-violet radiation has some effect on ionisation, other forms of radiation from the sun such as solar photons and X-rays are known to contribute. Ionisation of the E layer in-

Propagation

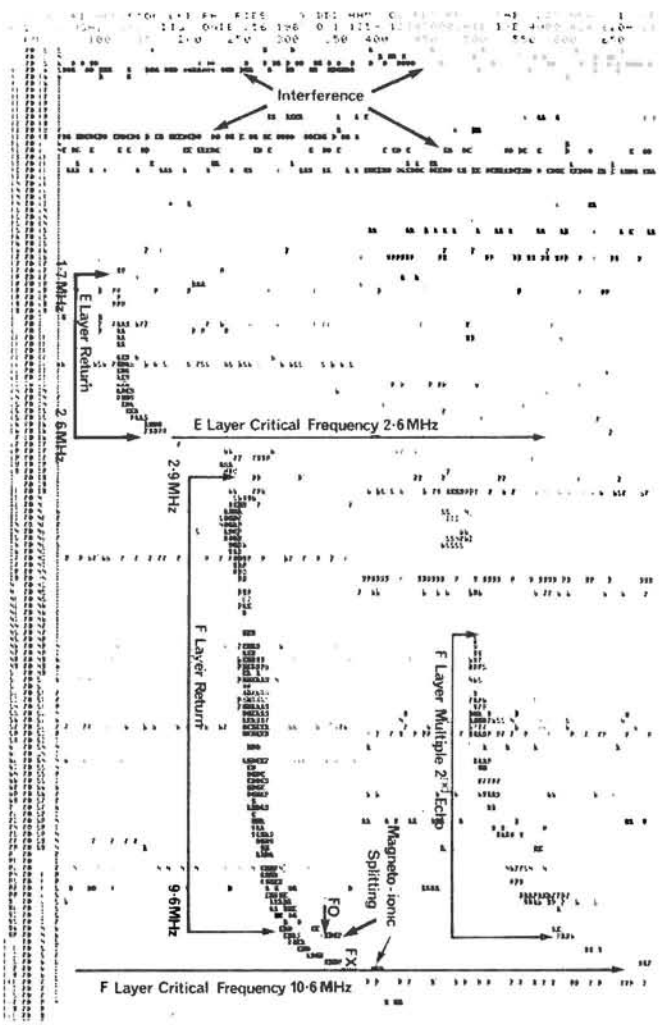


Fig. 2.2: Digital printout from the updated Ionosonde at Slough, Berks; and which is controlled from the Rutherford Appleton Laboratory at Chilton, Oxon

creases rapidly from sunrise and reaches maximum at around midday. The energy from low frequency waves can also be absorbed by the E layer during a period of maximum ionisation.

Sporadic-E: At approximately the same height as the E layer itself, "clouds" of ionised particles are formed at random in the Northern hemisphere, particularly during the months of June, July and August. They are generally small in total area and because the clouds are moving they appear to be effective sometimes only for a few minutes, or at most for an hour or so. Because of their transient nature and the altitude, propagation via these clouds is usually referred to as "sporadic-E", generally designated Es. The

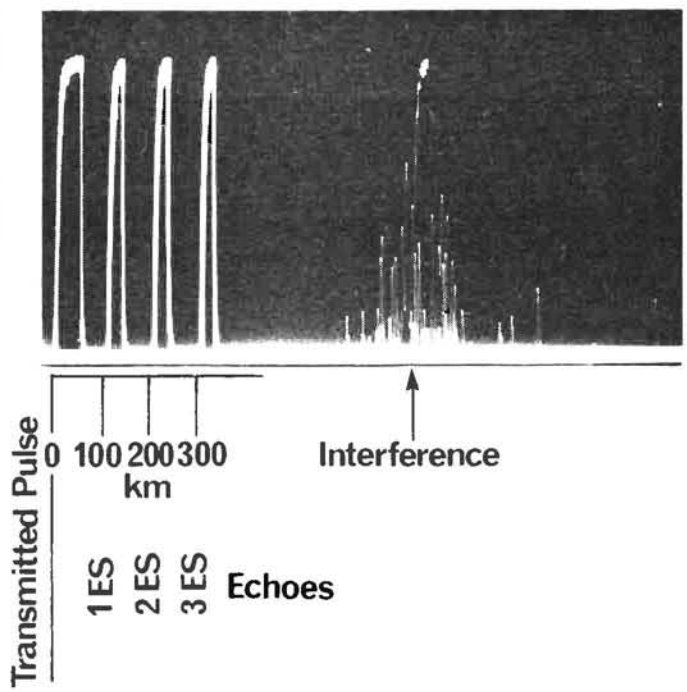


Fig. 2.3: An "A trace" display showing sporadic E echoes. The annotations explain height etc. Further details in the text

ionisation density of Es clouds varies but they also move through the atmosphere horizontally and at relatively high speed. The formation of Es clouds is thought to be due to the shearing action of winds in the upper atmosphere.

When the ionisation is intense, multiple echoes from Es clouds are quite common when ionospheric sounding is carried out as illustrated in the ionogram Fig. 2.1c. This is shown in another way in Fig. 2.3 by the photograph taken from an "A" trace c.r.t. display which shows multiple or repeat echoes marked as 2Es and 3Es equally spaced at 100km intervals from the primary echo 1Es which gives the real height of the sporadic-E cloud as 100km above the earth. This sounding was made at a frequency of 7MHz during the month of July 1983.

Sporadic-E clouds with sufficient density of ionisation can also reflect signals in the 28 to 30MHz amateur band, often resulting in contacts over several hundred kilometres as experimenters with low power f.m. on 29MHz have discovered. On occasions sporadic E clouds will also reflect v.h.f. transmissions resulting in contacts at distances of around 3000km providing that radiation from the antenna is at a reasonably low angle to ground.

On the other hand, tests carried out on the 7MHz band during periods of strong local sporadic-E have revealed enormous increases in signals, with "meter-on-the-stop" reports ranging from less than 30km to over 300km. This is largely due to the fact that wave absorption by E clouds

is much less and that the majority of antennas used for amateur radio on 7MHz have maximum radiation at a high vertical angle from ground thus invoking near vertical incidence reflection not only from sporadic-E clouds but from the F layer as well.

F layer (F1 and F2): Most amateur radio DX working stems from reflection of signals from the F region, the principal layer being F2 in which both ionisation and height vary to a considerable extent. Height may fluctuate between about 210 and 400km above earth but this depends on the season i.e., winter or summer, as well as the latitude, time of day and sunspot activity prevailing at the time. The atmosphere itself is very thin at these heights so ions and electrons are slow to recombine. The build-up of ionisation is therefore not so responsive to the height of the sun above the horizon although maximum ionisation is usually reached soon after midday. Then follows a gradual reduction although a nominal level is still maintained during the night hours. Ionisation begins to increase again shortly after sunrise.

During the summer the F region splits into two layers, the lower being called F1 and occurring at a height of about 200km, but because it has a lower density of ionisation plays little part in effecting long distance communication. During the hours of darkness it disappears altogether. **Note:** that when the F region becomes split the upper portion of the layer is called F2.

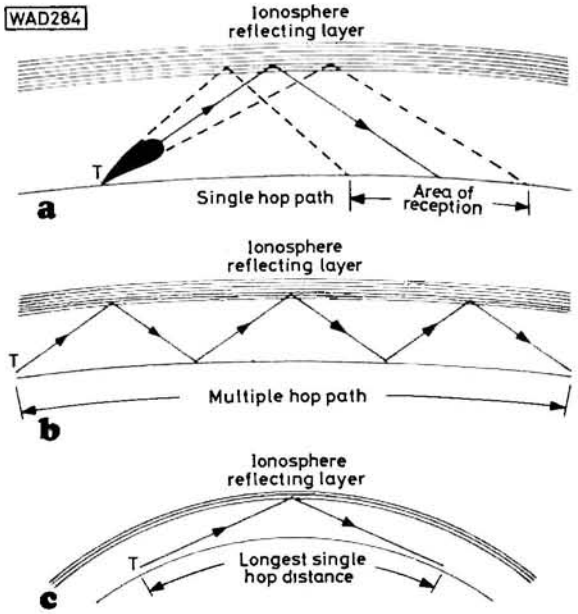


Fig. 2.4: Modes of reflection of radio waves from ionospheric layers

Ionospheric Propagation

Radio waves propagated along the earth's surface (ground wave propagation) suffer considerable attenuation at frequencies from 3MHz upwards and the higher the frequency the greater becomes the attenuation. This mode of propagation will be dealt with in detail later. Much more use is therefore made of ionospheric propagation over the h.f. part of the radio spectrum from 3 to 30MHz. When waves in this frequency region are directed at an angle toward an ionospheric layer (E or F) they can be reflected back to earth. A single reflection resulting in a "single hop" path taken by a wave arriving at an oblique angle is

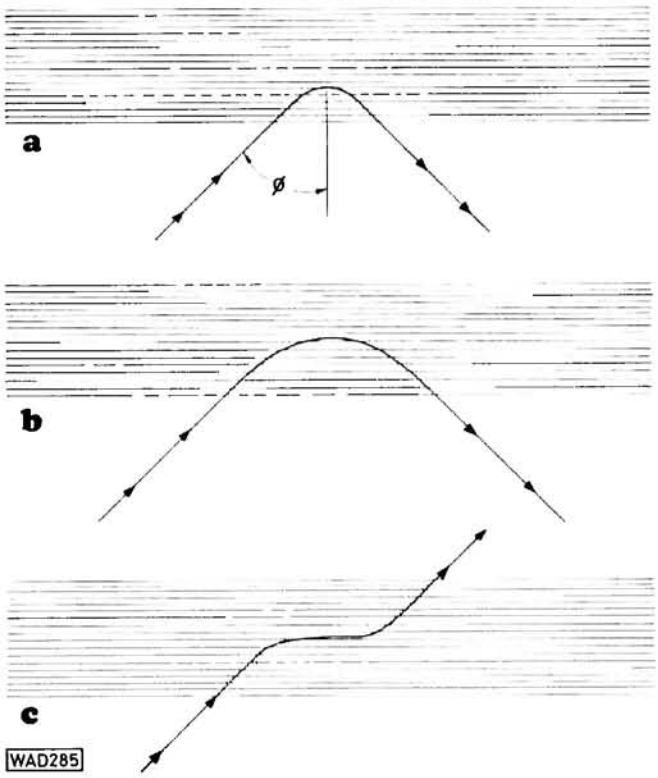


Fig. 2.5: Reflection path through an ionospheric layer of a wave at (a) lower than maximum frequency, (b) maximum frequency, (c) below maximum frequency when the wave passes through into outer space

illustrated in Fig. 2.4a. The upward going wave spreads by virtue of the beamwidth of the antenna and continues to do so on its path through the layer. Since reflection of the wave from the layer is at an angle equal to the angle of arrival, the wave front will continue to spread until it reaches the earth so covering a finite area at a distance much greater than could be achieved with ground wave propagation. However, since more than one reflection between an ionospheric layer and earth is possible, a wave can be returned to the layer again by reflection from earth a number of times resulting in what is termed a "multi-hop path" as in Fig. 2.4b.

The angle at which a wave enters an ionospheric layer largely determines the distance covered by a single hop i.e., the lower the angle of the radiated wave with respect to earth the greater will be the distance at which the wave reaches earth again. A wave leaving the surface of the earth tangentially as in Fig. 2.4c will normally make the longest possible distance single-hop. It should be noted however, that propagation over long distances becomes more complex that the simple explanation above would imply, partly because ionospheric conditions will differ at each point of reflection. However, observations have revealed that reliable multi-hop propagation can be maintained over distances of several thousands of kilometres.

Ionospheric Reflection

The refractive index of an ionised layer is less than unity and decreases as the electron density increases; an incident wave entering the layer will be bent over until it is moving horizontally. As the refraction process continues the bending is increased until the wave leaves the layer at an angle to that at which it arrived. The continuous refraction

is really equivalent to reflection from a virtual reflecting boundary within the layer, hence the term "reflection" rather than refraction is used, so we speak of "reflection from a layer". However, as the frequency of a wave is increased it will penetrate further into the layer before being turned onto an earthward bound path. With continued increase in frequency the bending becomes less and the wave will tend to travel much further horizontally where the ionisation density is maximum before further bending allows it to make an exit from the layer. If the frequency is increased still further the wave will be only partially bent whilst in the region of maximum ionisation and will then travel on into outer space.

The foregoing is illustrated in Fig. 2.5 in which the paths of three waves of different frequency are shown with (a) being below the maximum frequency that can be reflected, (b) being equal to it and (c) being above it. The frequency of waves reflected to earth and those that pass through the layer are closely related to the degree of ionisation and it is from this that the terms "maximum useable frequency" (m.u.f.) and "critical frequency" are derived and which will be dealt with next month.

Acknowledgement

The author is indebted to Mr. G. W. Gardiner and Mr. R. W. Smith, Higher Scientific Officers of the World Data Centre for Solar-Terrestrial Physics at the Rutherford Appleton Laboratory, Chilton, Oxfordshire for providing historical information concerned with the discovery of the ionosphere as in Part 1, the ionograms illustrated in this article, data concerned with ionospheric radio wave propagation and for checking both Part 1 and Part 2 of this series.

Triambic Keyer

◀◀◀*continued from page 24*

Side Tone Generator: The output from the Output Shift Register enables an oscillator using two NAND gates for driving the side tone transducer.

Morse Output Stage: A single *npn* transistor (grounded emitter with open-collector output) is used to amplify the signal from the Output Shift Register to drive the keyer input of the rig. Since the battery is a floating power supply, rigs requiring positive or negative inputs can be driven directly but voltage and current specifications should be checked before connection.

Conclusion

The f.i.f.o. Morse sender is a keying device specifically designed to increase the pleasure of sending good c.w. In addition, it is rugged, self-contained, portable and inexpensive. Give it the "drop test" on field day or just relax in your favourite armchair and enjoy that c.w. QSO as never before. ●

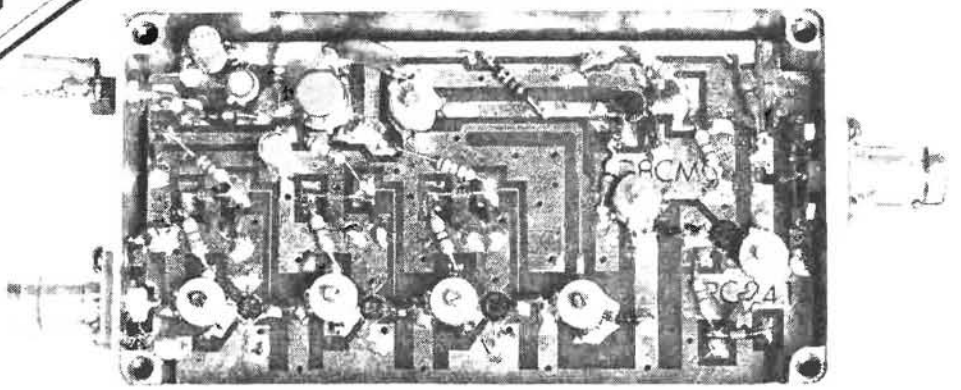
1) *The Triambic Keyer* by M. B. Rhodes G4FMS. *Radio Communication* November 1982.

Useful Reading

SGS Databook COS/MOS B-Series Devices, 2nd Edition. March 1981.

The Key to Morse by A. Smith G4FAI. *Practical Wireless* October 1981.

PW REVIEW



SOLENT SCIENTIFIC 1·3GHz ATV Converter

Interest in ATV on the 430MHz band has mushroomed in the UK over the last two years, due to several factors including the ready availability of commercial equipment and the excellent efforts of BATC. Such is the activity level that at times several different amateur TV transmissions can occur simultaneously, leading to interesting if not chaotic results. Meanwhile at three times the frequency, or thereabouts, *quietly* exists some 32MHz of spectrum devoted almost exclusively to ATV—enough bandwidth to simultaneously accommodate, without mutual interference, the equivalent of *four* full colour transmissions.

As with most amateur activities initial experiments often start with the acquisition of receiving equipment and to this end Allan Latham G8CMQ, recently introduced the Solent Scientific 1·3GHz ATV Converter which is available ready built and aligned or as a comprehensive kit of parts.

Naturally enough the higher in frequency we go, so the constructional techniques and design concept must follow—for acceptable performance, compromises that could be tolerated at u.h.f. can become insurmountable obstacles for all but those fortunate enough to have access to a spectrum analyser. However, having tried it, if you possess reasonable constructional capability it is entirely possible to assemble and align the kit version of this particular converter without *any* exotic test instrumentation.

Examination of the four page constructional notes supplied will reveal a circuit diagram of the converter which indicates the line-up. Microwave signal input is applied to a Zener stabilised bipolar r.f. transistor amplifier stage (2SC3358) which in conjunction with stripline tuned circuit elements results in a noise figure of under 2dB. A further two individually Zener stabilised r.f. stages follow before the signal is applied to an HP2835 diode mixer. The local oscillator is of free running design using stripline inductors and can be readily adjusted to produce a u.h.f. i.f. output within channel groups 21–41 or 48–68. A final i.f. amplifier stage ensures plentiful drive level for even the deafest of domestic TV receivers.

The complete down-converter is assembled onto a high quality double-sided glassfibre p.c.b. which incorporates plated-through connections to the ground plane, thus removing another potential pitfall to the first time constructor of microwave circuitry. From the accompanying photograph it will be clear that all components are surface mounted onto or, in the case of the semiconductors, into the stripline/track side of the board—a detailed component overlay drawing indicates the *exact* location of all components.

Construction time for the p.c.b. amounted to some 3½ hours, which allowed for a detailed check of the components against the parts list. The board can then be aligned as it stands or mounted within a 114 x 64 x 30mm diecast aluminium box (RS509–939), cut-outs being provided to engage the corner pillars of this enclosure. Input and output connections should be of good quality and 50Ω BNC or N type sockets are recommended. A 1000pF feed-through capacitor to supply regulated 12Vd.c. completes the assembly.

Test and alignment is quite straightforward, initially consisting of usual checks for d.c. faults (heavy current, smoke etc.) and the presence of 9·5–10·5Vd.c. at the emitter of the main on-board regulator. Instructions

Full alignment of the 1·3GHz ATV converter can be accomplished without specialist equipment; however, the micro TV transmitter, shown here almost full-size, provides an excellent signal source and the basis for a full transceive system

are given to establish the mid-channel of your selected u.h.f. i.f. range (usually determined by selecting the non-used group in your area). The TV set is then tuned to the l.o. frequency and adjustment made to the converter to provide a noise free blank screen. If correctly set tuning the TV across its range will verify correct l.o. frequency and the absence of spurious responses.

Following this procedure the TV is tuned to the i.f. channel group and on-board trimmer capacitors pre-set to specified mesh. A 1·3GHz antenna is now connected to the converter input and an off air signal is the next requirement.

If the activity is somewhat sparse in your area Solent Scientific can supply a micro TV transmitter which is ready built and aligned, only requiring 12Vd.c. and a source of standard video to provide you with a nice stable 10mW, 1285MHz f.m. (adjustable) ATV signal. With this QRP test device the converter can be easily peaked for optimum performance and is more than capable of providing colour pictures over an unobstructed range of several hundreds of metres, using simple mo opole antennas. You will be surprised how well a 58mm length of 16s.w.g. wire (approximately λ/4 at 1·3GHz) works!

This then completes the kit con struction and provides a very respectable receiver for 1 3GHz ATV, capable of full coverage of the allocated segments of the band, including repeater outputs. Obviously results will be influenced by other elements within the system and a good antenna (JVL Quad loop Yagi, a parabolic dish or similar) are essential for long haul reception under "normal" conditions Possibilities and results during "lift" conditions, which occur frequently, may well surprise you. A mast-head GaAsf.e.t. pre-amplifier, with attendant low noise figure, will reduce the need for high specification coaxial cable and at the same time elevate the system performance to a very high level.

Using the self-assembled converter kit, P3 f.m. monochrome signals have been received during "flat" conditions over the semi-obstructed path between Wimborne and Southampton—a distance of some 50km. The transmitting station was running approximately 2W peak sync to a single 20-element quad loop Yagi; a box of four similar antennas were used at the receiving end (including 3dB of cable loss—probably at both ends and don't forget this was slope detection!)

The 1·3GHz ATV converter (kit version £35.95; assembled and aligned board £49.95; ready built micro TV transmitter £30 95) can be highly recommended for those brave souls wishing to actually engage in the cause of amateur experimentation on 1·3GHz. Thanks for the review sample ATV devices go to **Solent Scientific, 75 Chalk Hill, Southampton (Tel: 0703 464675),** from whom all items, plus a state of the art u.h.f. f.m. receive converter and many other interesting r.f. devices are available ex-stock.

John M. Fell

Have Multi 700X, 25 watt transceiver, 144MHz band f.m., 144/28 transverter still under guarantee, 10XY Yagi plus AR40 rotator and cables. Would exchange for FT-480R or IC-290E 144MHz band multimode. Terry G4OXD. Tel: 0462 35248 after 6pm. Prefer buyer inspects and collects (Hitchin). *W617*

Have Lynx 48K micro plus six tapes, books, hints and tips. Would exchange for good general coverage communications receiver, cash adjustment if necessary for right RX. Pete, 23 Rosslyn Park Road, Peverell, Plymouth. Tel: 0752 670352. *W619*

Have 6 string "Spanish" guitar in carrying case, 6 spare strings and two tutors. Would exchange for Trio TS-700 VOX unit, Sinclair ZX81 48K. Rick Keens G8NDN, QTHR. Tel: 0679 64142 (New Romney). *W621*

Have Wagner home base f.m. CB, which is very simple and can be converted to 28MHz amateur band. Also have two up-converters for slow scan and fast scan TV. Would exchange for 48K Spectrum. Clive. Tel: 021-770 6966 (Birmingham). *W651*

Have two Russian mains/battery radios, 8-bands, one works on f.m. only. Would exchange both for any three ZX81 original commercial programs (no copies). Waghorne, 19 Castle Street, Upnor, Rochester, Kent ME2 4XR. *W659*

Have KW204 TX and manual in good condition. Would exchange for RA17 receiver (straight swap) or KW2000B TX/RX (with cash adjustment). Stan Saines G3RNB. Tel: 027874 370 (Holford). *W663*

Have Laney K50B guitar amplifier, immaculate condition, hardly used. Also have Philips 26in b/w television in excellent condition. Would exchange for Spectrum computer or w.h.y. Dave, Flat 5 The Chase, Gt Baddow, Chelmsford, Essex. Tel: 0245 75139. *W664*

Have FDK T1200 f.m. hand-held 143–149MHz, 1 and 4 watts, 10 memories, complete with NiCads, charger and case. Would exchange for 144MHz band mobile, cash adjustment if necessary. Tel: 0279 26647 (Harlow). *W668*

Have 48K Oric computer with games and cassette machine. Would exchange for v.h.f. scanning receiver or short wave receiver. Dave Howard, 2 Walton Crescent, Boythorpe, Chesterfield, Derbyshire. *W641*

Have Advance TC4A counter/timer up to 1MHz, Telequipment D43 double beam 15MHz scope, Grundig G4 single beam 4MHz 'scope, a.c bridge type BH/1001 also 215 electronic magazines. Would exchange for solid state double beam 'scope. Alan. Tel: 01-568 5458 (Hounslow). *W646*

Have dual CS505 turntable, Trio KA50 stereo amplifier 45 watts per channel, Acoustic Research AR28s 100 watt speakers plus QED 79 cable and stands. All nine months old. Would exchange for FRG 7700 or similar. George GI1JXE. Tel: Katesbridge 235 (N. Ireland). *W681*

Exciter lamp required Mazda type G/22, centre contact, vertical filament, 4V 6A, for a BTH portable projector. Would exchange for any valve or valves. P. G. Robins, 290 Priory Road, St. Denys, Southampton SO2 1LS. *W694*

Have Chinon CE-45 s.l.r. camera with winder and lenses, plus Realistic DX400 receiver. Would exchange for FRG-7700. Tel: 0443 755876 (Mid Glam.) *W696*

Have genuine Delta Sports Ski boat and trailer, requires inboard engine and underwater gear. Ideal d.i.y. winter project. Would exchange for FRG-7. Can be seen at Crown Farm Cottage, A52, Croft, Skegness, Lincs PE24 4AP. *W697*

Have Sprite 400 3·1m 3/4 berth touring caravan fitted with 'fridge, heater, gas and electric lights. Accessories include full awning, toilet tent, Porta-Potti, gas bottles and water containers. Would exchange for h.f. transceiver Trio or Yaesu. Rick Keens G8NDN. Tel: 0679 641412 (New Romney). *Y726*

Have Trio TS130V h.f. transceiver, fitted s.s.b. narrow filter, WARC bands fitted from 3·5MHz to 28MHz. Would exchange for Yaesu FT225RD or Icom IC-251E with cash adjustment. In mint condition. Graeme. Tel: Orpington 29230 (evenings). *W727*

Introducing Short-wave Listening

Part 1 by Charles Molloy

Why listen to broadcasting on the short waves? Isn't there enough to satisfy us all on the long, medium and v.h.f. bands? BBC Radios 1 to 4 each has its own following while that relative newcomer, local radio, is expanding. Short wave broadcasting is aimed at a worldwide audience. A single programme has to reflect the ideas and way of life of the country of origin so the casual listener must inevitably broaden his horizon. The variety of the programming will ensure that.

Many countries provide a service for expatriots, travellers and citizens living abroad. Where the language is English we can eavesdrop on another way of life. Canada has a feature on weeknights which carries *The World at Six,* a popular item at home. The United States provides a 24 hour service for military personnel stationed abroad. It relays features, mainly sport, from domestic networks at home. One can listen to the BBC World Service which is in English and has a worldwide audience.

Short Wave Bands

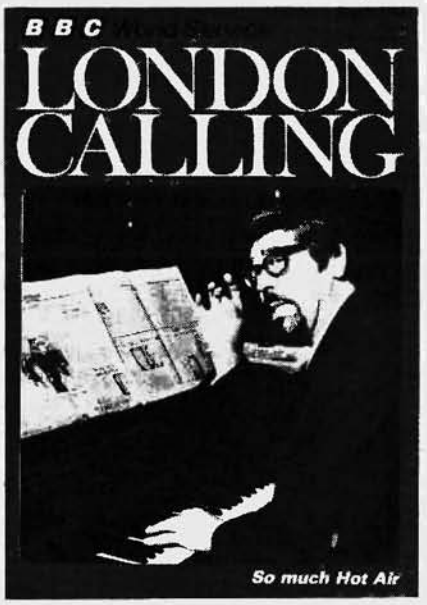
A region of rarefied gas in the earth's outer atmosphere called the ionosphere, controls short wave reception. Signals from the transmitter are bounced off the ionosphere to travel great distances with little loss in strength. The ionosphere is created by the sun so how well it reflects radio waves depends on the time of day, season of the year and the frequency (wavelength).

In order to cope with this ever changing scene, broadcasting takes place in bands scattered over the spectrum between 6MHz and 26MHz. The spaces between these bands are used by shipping, aircraft and other commercial users so we have to locate the broadcasting segments before we start listening. They are clearly marked on the scale of most receivers, usually by a broad line. Some receivers expand each band so that it has a separate scale to itself and this type of set is better for programme listening. The most modern and expensive sets have a pocket calculator type display from which the frequency can be read direct.

Broadcasts are often sent out simultaneously on two or more bands leaving the listener to select the one that comes in best at his location. A set with digital readout and memories is well suited to selecting the best channel. You just press the appropriate button.

Finding the Stations

How do we find broadcasts on the short waves? The easiest way is to tune across one of the bands, stopping when something interesting turns up. Information on times, frequencies and programmes are contained in station schedules available free of charge. Broadcasters like to hear from their audience, so it is usual at the end of a programme to hear an address to write to for the schedule and to comment on what has been heard and to ask questions, if you wish. Some stations have a mailbag feature so that listeners' letters can be acknowledged over the air, while others will attempt to answer queries by short features on particular topics.



London Calling is the monthly programme magazine of the BBC World Service

Publications

There are a few specialist publications that cover short wave broadcasting. *The International Listening Guide, English Edition,* comes out four times a year during March, May, September and November. These dates correspond to the seasonal changes in the ionosphere when many stations make changes to their schedule. The *ILG* gives an hour by hour summary of broadcasts in English quoting frequencies in use and giving an indication of the type of programme. It has a frequency list covering some 3000 stations, an *At A Glance* section which lists broadcasts in country order, a *World News and Commentaries* section. Further information about the English Edition of the *ILG,* whose annual subscription at the time of writing is £4, can be had by sending an International Reply Coupon, obtainable from main post offices, to the DX Listeners Service, c/o Bernd Friedewald, Merianstr 2, D-3588 Homberg, West Germany.

More comprehensive, and expensive, is the *World Radio and TV Handbook (WRTH),* which comes out annually at the beginning of the year. It has a section for each broadcasting country in the world. Station addresses, details of interval signals, frequencies used, times of broadcasts, maps, frequency lists, background in-

Programme schedules and information of use to the short wave listener can be obtained from various leaflets and publications available from the broadcast stations. The covers reproduced here are only a very small portion of the many available world-wide

formation, most suitable bands for the coming year, world time charts, articles of interest to the listener, are all in the *WRTH*. The country of origin is Denmark but it can be ordered through bookshops in the UK. At the time of writing it costs about £11. There is also the *WRTH Newsletter* which comes out three times a year as an updater.

A useful 24 page booklet issued free of charge by Radio Netherlands lists sources of information about short wave listening under the headings Listening Guides, Periodicals, Books and Pamphlets, Tape Recordings, Technical Books. Write to Media Network, English Section, Radio Netherlands, PO Box 222, 1200 Hilversum, Holland and ask for the *Booklist*.

BBC World Service

The BBC is a major international broadcaster whose *World Service* is on the air 24 hours a day. It was originally intended, as the Overseas Service for UK citizens living abroad. I first started listening to the *WS* while abroad and have continued since returning home. The *WS* now has a worldwide audience that runs into millions. It is on the air continuously on 5·975MHz in the 6MHz (49m) band, but can also be found on 647kHz medium wave during the evening and on other short wave frequencies.

Details of programmes and frequencies are in the various editions of the *World Service Quarterly Guide* and in the monthly programme magazine *London Calling*. Write to the BBC External Service, Bush House, PO Box 76, Strand, London WC2B 4PH. The BBC Bookshop at Bush House is worth a visit where copies of *London Calling*, pamphlets of interest to the s.w.l. and books such as the *WRTH* are available.

Broadcasts from Abroad

Countries broadcasting regularly in English which can be picked up easily in the UK are Australia, USA (Voice of America), Canada, Finland, Sweden, Holland, Switzerland, Israel, Turkey, Portugal, Spain, Belgium, India. Egypt, Kuwait, New Zealand, West Germany, Austria, Japan, Greece, Korea, Italy, Brazil. Eastern Europe broadcasts, usually well laced with political propaganda, are Radio Moscow, Prague, Sofia, Berlin International, Bucaresti, Tirana, plus Radio Beijing in China. In a category of their own are Radio Vatican, the gospel HCJB the Voice of the Andes and several others.

Foreign Language Studies

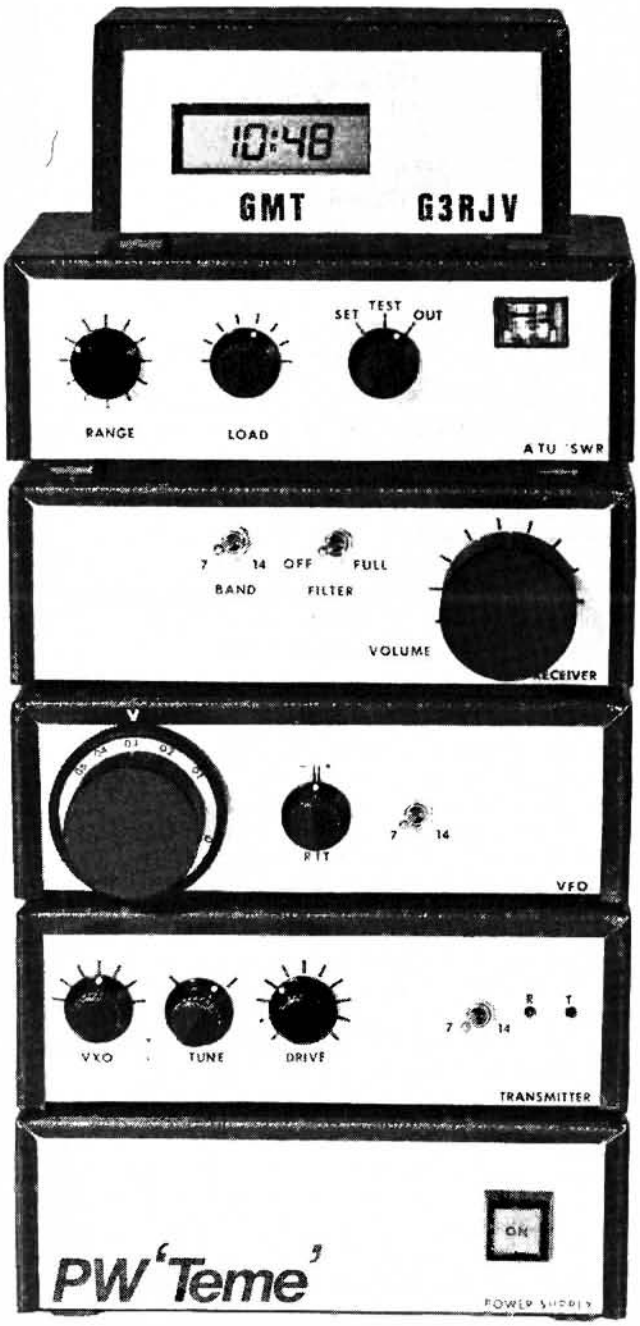
Anyone studying a foreign language should try the short waves. Native speakers of nearly every language under the sun, as diverse as Cree Indian and Maori, are to be heard. These broadcasts could be coming from anywhere but there are services from many lands intended for their nationals abroad. Details of these can usually be heard from the appropriate embassy in London.

A few countries give language lessons over the air. The BBC's *English by Radio* is well known and could be of interest to intending visitors or to immigrants. Details of some of these broadcasts are listed in the *WRTH* and not all are of major languages. Currently the programme *Starting Finnish* is broadcast weekly from Helsinki.

It is handy to be able to identify a foreign language when tuning round the bands and the unique *Foreign Language Recognition Tape* will help you do this. Some 50 languages are covered, presented in related groups. Examples of each language together with key words likely to be heard over the air, are given. Send a self addressed stamped envelope, or IRC if abroad, for details to the EDXC, PO Box 4, St Ives, Huntingdon, Cambs PE17 4FE, England.

PW 'TEME' Modular QRP Transceiver

Part 4 by
Rev. George
Dobbs G3RJV



It is standard practice in amateur radio equipment these days to have an r.f. input and output impedance of 50 ohms and the *PW* "Teme" project follows this convention. This is ideal when matching nominal 50 ohm antennas such as dipoles, beams and commercial verticals, but many amateurs use wire antennas which they tune for use on more than one band. This means they require an a.t.u. (antenna tuning unit) to enable the transceiver to "see" 50 ohms. In my view all antennas need an a.t.u. because they are rarely sufficiently broadly tuned to ensure an adequate match across a whole amateur band. Also the a.t.u. aids harmonic suppression and provides a degree of input tuning on receive. This module provides for an a.t.u. and a simple standing wave ratio (s.w.r.) bridge to match the *PW* "Teme" modules to most antennas. For those who do not require the a.t.u. in the line, a switch is provided to allow the s.w.r. bridge to operate alone between the transceiver and the antenna.

The Circuits

Many are the words but few are the ideas, written about antenna tuning in the amateur radio literature. An a.t.u. is really a device to deceive the transmitter output, by means of combinations of inductance and capacitance, into accepting antennas of various impedance as being 50 ohms terminated. The circuits are legion but they are usually just versions of "L", "T" or Pi (π) networks or tuned impedance transformers. For general work on more than one band, using "bits of wire" I still favour the first a.t.u. circuit I used 25 years ago: the simple "L" match. It can match a large range of impedances and is very much at home with end-fed lengths of wire tuned against ground or a quarter-wave counterpoise wire.

The "L" match is shown to the right-hand side of Fig. 4.1. The coil, 4L1, is in series with the signal path from transceiver to antenna and the variable capacitor, 4C1, is in parallel with the output to the antenna. Coil 4L1 is tapped giving a choice of inductance values and the tappings are chosen with a 12-way, single-pole, wafer switch, 4S3. Should the constructor be lucky enough to have a roller-coaster coil, one of those splendid continuously-variable inductances of yesteryear, that would be so much better than a switched coil in 4L1. It would not fit into the standard size cases being used in this project but it would ensure a mighty good a.t.u. In this module the a.t.u. section can be switched in or out of the line using a two-pole changeover switch, 4S2. "L" Match a.t.u. circuits are often made to suit a wide range of antenna impedances and the whole h.f. spectrum. In this case, where only the 7 and

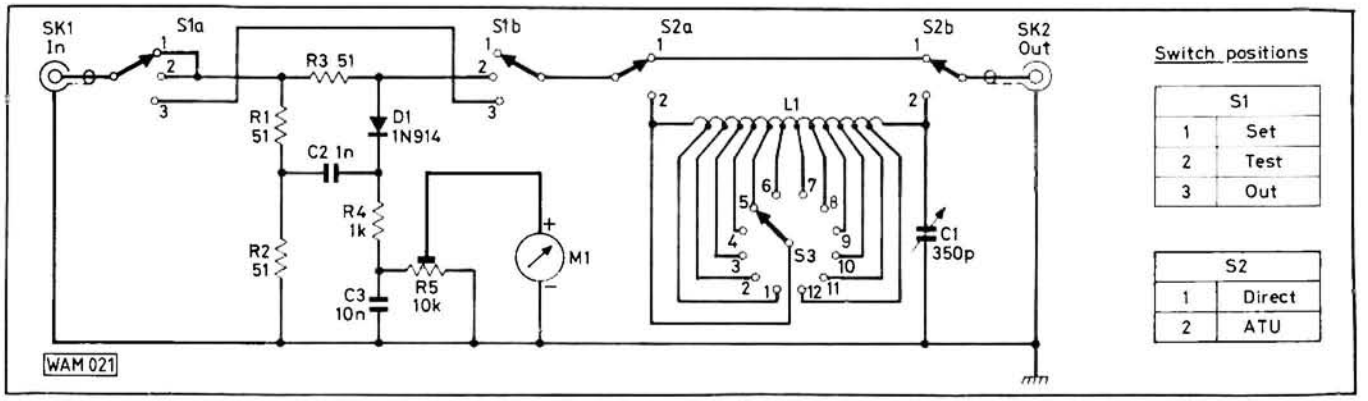


Fig. 4.1: Circuit diagram of Module 4, the Antenna Tuning Unit/SWR Bridge

14MHz bands are being used, with most reasonable wire antennas not much inductance will be required, so very few of the switch positions will ever be used.

The standing wave ratio bridge circuit is to the left of 4S2 in Fig. 4.1. I have chosen a resistive bridge as with the *PW* "Severn" (August 1983) to ensure that the transmitter final stage has a reasonable load across its output even during the worst mismatches in the tuning up process. The power amplifier stage in the transmitter of the *PW* "Teme" project is fairly sturdy but many a constructor has suffered from necrophilic transistor p.a. stages. The circuit is just another version of our friend Mr. Wheatstone's Bridge beloved of physics masters in school. Resistors 4R1 and 4R2 form two arms of the bridge, with 4R3 and the antenna load as the other arms. When the bridge is balanced at 50 ohms, an r.f. null will occur between the junction of 4R1/4R2 and the junction of 4R3 and the load. This is rectified by 4D1 into a d.c. voltage (or, rather, a lack of it when the null occurs!) and measured by the meter, 4M1. A variable resistor, 4R5, allows a range of cheap ex-tape recorder meters to be used in the circuit by acting as a meter sensitivity control. One of the disadvantages of this type of bridge is that it must be switched out of the r.f. line once the measurements have been made. This is done with 4S1, a four-pole, three-way, wafer switch. In switch position 1 the r.f. output goes across 4R1 and 4R2, without the antenna in the circuit, to enable the meter to be set to read full scale by using 4R5. Position 2 is the actual operating position for the bridge and in this position the a.t.u. may be adjusted to give a low or null reading on the meter. When this has been attained, positon 3 on the switch cuts out the bridge and gives a direct line between the transmitter output and the a.t.u.

Construction

The s.w.r. bridge and a.t.u. are built into the Minffordd Engineering type J6 Instrument Case. The a.t.u. section is direct wired between 4S3, 4L1 and 4C1. Coil 4L1 is wound onto a 25mm (1in) outside-diameter former. This can be any low-loss insulation material. A piece of plastics piping or a pill phial would be ideal. The prototype used a Perspex tube which was a 10p coin chute from a scrap fruit machine but more homely tubes may be used and even the diameter is only nominal. The coil is wound with 22 s.w.g. enamelled wire. It has 24 turns with a tapping at every two turns. Wind on the wire tightly and, after each two turns, pull out the wire at right angles to the former, make a small loop (about 6mm) and twist the wire round to form a termination point. It is helpful to stagger these tapping points by slightly offsetting them in twos or threes,

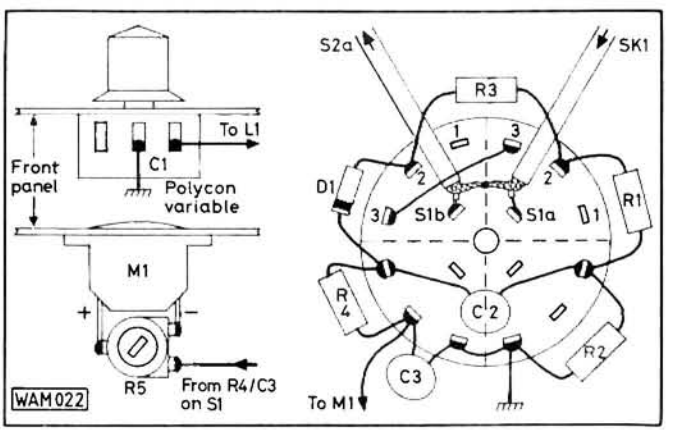
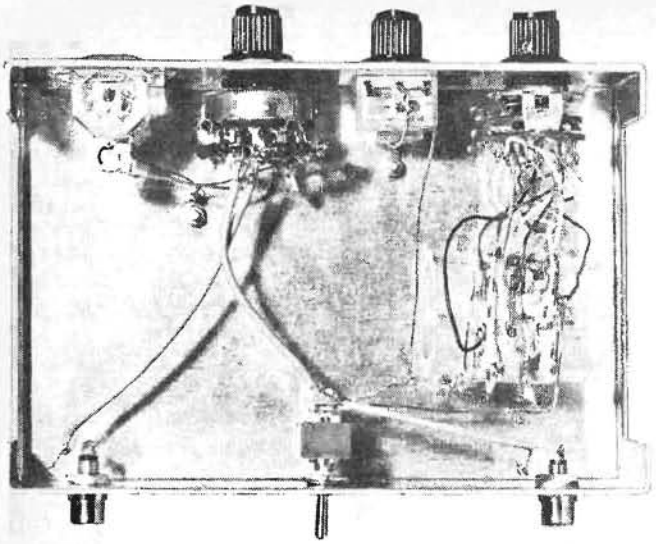


Fig. 4.2: Wiring details of Module 4

because if arranged in a straight line the job of soldering the switching wires to them becomes very fiddly. The coil is mounted above the base of the case on standoffs. These should be the correct size to space the coil equally from the top and bottom of the case.

The variable capacitor, 4C1, can be almost any capacitor of suitable physical size with a maximum capacitance in the 200 to 500pF range. The prototype used a Polycon capacitor of the type commonly used as the tuning control in cheap Far Eastern a.m. transistor radios. The transmitter output is such that this type of capacitor will serve quite well in the a.t.u. circuit. This capacitor could be gleaned from a scrap transistor radio but look for a capacitor which has a control shaft long enough to take a tuning knob. If a suitably sized air-spaced capacitor can be found, so much the better. Only one section of the Polycon capacitor is used (there are usually two ganged sections) and it is wired as shown in Fig. 4.2. The termination tags of these capacitors vary from type to type and the constructor may have to inspect the component to choose one section of the capacitor. One tag will be connected to ground via the control shaft. Check which tag is connected to control shaft with an ohmmeter so as not to connect it to 4L1 by mistake and so short out 4C1 to ground.

The s.w.r. bridge is mainly wired around the function switch, 4S1 as shown in Fig. 4.2. The wafer switch may be clearly marked in sections or the constructor may have to identify the various contact tags with an ohmmeter. The main components are mounted onto the back of 4S1 with screened leads taking the signal to and from the switch. The spare sections of the switch are used to provide



Top and rear-panel views of Module 4, the ATU/SWR Bridge

★ components

MODULE 4
ATU/SWR BRIDGE

Resistors

½W 5% carbon film

51Ω	3	R1–3
1kΩ	1	R4

Sub-min. horizontal pre-set

10kΩ	1	R5

Capacitors

Ceramic

1nF	1	C2
10nF	1	C3

Variable, Polycon

350pF	1	C1

Switches

S1	4-p, 3-w wafer
S2	d.p.c.o. min. toggle
S3	1-p, 12-w wafer

Inductors

L1 24 turns 22 s.w.g. tapped every 2 turns on a 25mm (1in) dia. former

Miscellaneous

Meter (see text); Phono sockets (2); Case, Minffordd J6; Feet, knobs (3), etc.

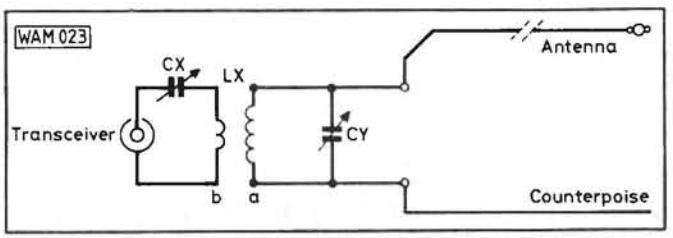
mounting points for the components not directly wired to switch contacts. The wiring for the meter and 4R5 is also shown in Fig. 4.2. The meter is an ex-tape recorder meter bought cheaply at an amateur radio rally. Any moving coil meter with a full scale deflection of 1mA or less is suitable. The meter in the prototype proved to have a full scale deflection of some 200μA but 4R5 will adjust the available meter to suit the bridge. The case layout is shown in the photographs.

Using the Module

The s.w.r./a.t.u. module requires no external power. It is simply inserted in the antenna line from the main transmit module. The transmitter output goes to the IN socket 4SK1 and the antenna is connected to the OUT socket 4SK2. If an end-fed piece of wire is being used as an antenna, tuned against an earth point, the output socket could be replaced with two terminals for antenna and earth. The module allows for the a.t.u. to be switched out using 4S2 and although the *PW* "Teme" will receive signals with the s.w.r. switch, 4S1, in position 2 or 3 (TEST and OUT), the transmitter should be used with the switch in the third position (OUT).

The setting-up procedure is very straightforward. With the antenna connected and the a.t.u. in the line, the transmitter is keyed with 4S1 in the SET position. This will show if an r.f. signal is being transmitted. In fact this position could be used to adjust the TUNE control in the transmit module for a peak in output. When using the s.w.r. bridge for the first time, 4R5 should be set to allow the meter to read full scale, with 4S1 on the SET position. Once this has been adjusted, that setting should suffice for all future use of the bridge with the transmitter. The switch in now placed in the TEST position. The aim is now to adjust the a.t.u. until the bridge detects a 50 ohm impedance on the antenna output. When this state is achieved, the meter will show a distinct null, indicating nothing, or next to nothing, on the scale. The actual null will be achieved by tuning 4C1 in conjunction with the correct setting of 4S3. Begin by trying to obtain a null with 4C1 and alter the position of 4S3 until a very low reading null point is found. The antenna should now be matched into the transmitter and the s.w.r. bridge can be removed by switching 4S1 to the OUT position. This type of s.w.r. bridge does not give any indication when the transmitter is keyed. Some operators like to see a dancing needle when they key the transmitter and such operators can find an alternative s.w.r. bridge circuit from the *PW* "Severn" in *Practical Wireless* August 1983, p. 65.

Alternative a.t.u. circuits could be used with the *PW* "Teme". One very suitable arrangement is to use the W3EDP Antenna on both bands. This is a simple antenna that will fit into many domestic situations, does not require an earth and gives a good account of itself with low power. It is shown in Fig. 4.4. The antenna does have a 26 metre



The W3EDP antenna and its associated a.t.u.

(85ft) top section but this can be bent around to fit available space. In faet, the antenna seems to work better with a few bends in it to break up the radiation pattern. The two capacitors can be made up from Polycon variables, as with the "L" match capacitor. One section is used for CY but both sections are parallel connected for CX. Again this arrangement was used, for only 7MHz, in the *PW* "Severn" transceiver. The a.t.u. is included again here because it works very well with many antennas which use open wire feeders. It could match up the *PW* "Teme" to a doublet or, as in my case, it tunes up a G5RV antenna with open feeders. Another possible a.t.u. circuit would be the "T" match circuit usually found in the *ARRL Handbook* as the "Transmatch".

Now that the a.t.u. and s.w.r. bridge are added the project is very nearly complete. All that remains is to add a suitable 12 volt stabilised power supply.

The Power Supply (Module 5)

The *PW* "Teme" transceiver requires a supply of 12 volts d.c. which should be stabilised and well smoothed. The power requirements of the project are such that a battery supply is quite viable. The prototype has been used with a "Dryfit" sealed lead-acid battery and with a bank of "Cyclon" cells. Either of these render the transceiver portable but for home applications obviously a mains-powered supply is more convenient. Most power supplies capable of giving 12 volts at around 1 amp would be suitable although some of the cheaper power supplies sold for the CB market might not be adequate. The transceiver uses a direct conversion receiver and such receivers are very prone to picking up mains hum from poorly smoothed supplies. This power supply is also built in a matching case which can stack with the other modules in the unit.

The Circuit

The circuit for the power supply (Module 5) is shown in Fig. 4.4. It contains no surprises, being the standard circuit associated with the three-pin integrated circuit stabiliser. The transformer is a toroidal type; the small physical size of this type of transformer being required to fit the whole supply into the standard J6 type case used throughout this project. The stabiliser i.c. requires some 18 volts to ensure the 12 volt output and the transformer chosen is, in fact, one with two 9 volt output windings which are wired in series to give the required voltage.

The a.c. voltage is rectified using a bridge rectifier capable of handling the voltage with a current rating at least twice the required 1 amp output. There is a whole range of such rectifiers made by various manufacturers. An experienced constructor could use four suitable diodes wired into a bridge circuit for full-wave rectification. The reservoir capacitor 5C1 is a 4700µF electrolytic capacitor rated at 50 volts. This is somewhat more than the theoretically required capacitance but allows for more effective elimination of mains hum. A 1kΩ, 1 watt resistor 5R1 provides a small constant load across the supply which aids stabilisation and also safely discharges 5C1 at switch-off.

Stabilisation is provided by the LM240K-12 integrated circuit, 5IC1. Again other suitable components could be used from the range of 12 volt, 1·5 amp regulator i.c.s. The input and output filter capacitors 5C2 and 5C3 are small tantalum bead types. and are necessary to prevent parasitic oscillation in 5IC1. A switch for the mains supply, a 1 amp fuse and a 12 volt POWER ON bulb complete the circuit. The prototype used a rather smart push-button, on-off mains switch with an integral indicator lamp and lens, but these are expensive. Any mains push or toggle switch with a separate indicator bulb would serve the purpose. The output is taken to a 5-pin DIN Socket, as shown in Fig. 4.4. This matches up with the control line cables used throughout the *PW* "Teme" project.

Construction

Once again, the power supply module uses the J6 Instrument Case sold by Minffordd Engineering. The layout for the case is shown in the photographs. The LM340K-12 is mounted onto a heatsink on the back of the case. The

★ components

MODULE 5
POWER SUPPLY

Resistors

1 watt 5%

1kΩ	1	R1

Capacitors

Electrolytic 50V

4700µF	1	C2

Tantalum Bead 35V

0·33µF	1	C2
1µF	1	C3

Miscellaneous

Transformer 240V primary, 15VA, 2 x 9V secondaries (ILP Type 02011); Bridge rectifier 50V 2A; Regulator LM340K-12; Fuse, 1A, with holder; Indicator Lamp, 12V 0·1A with holder; Switch s.p.s.t. 240V; Heatsink for TO3 package device (Maplin FL59P or similar); 5-pin DIN socket; Case, Minffordd J6; Mains flex and plug; Feet, etc.

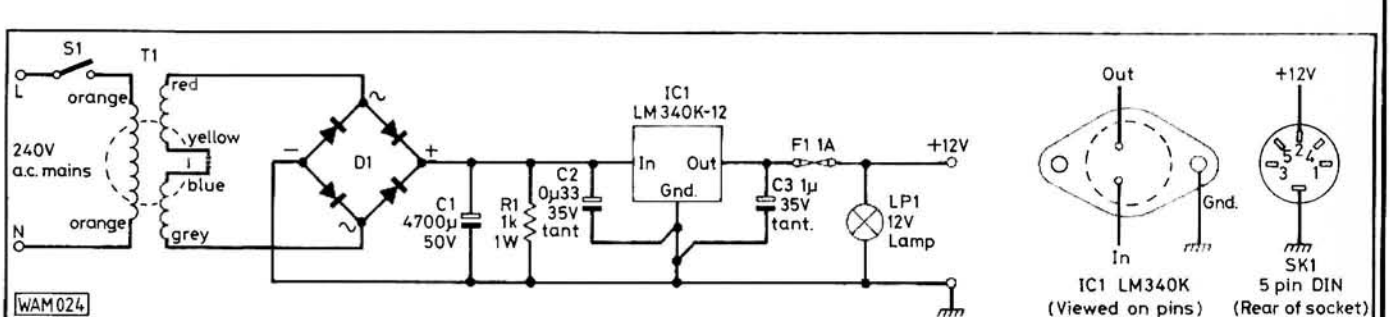
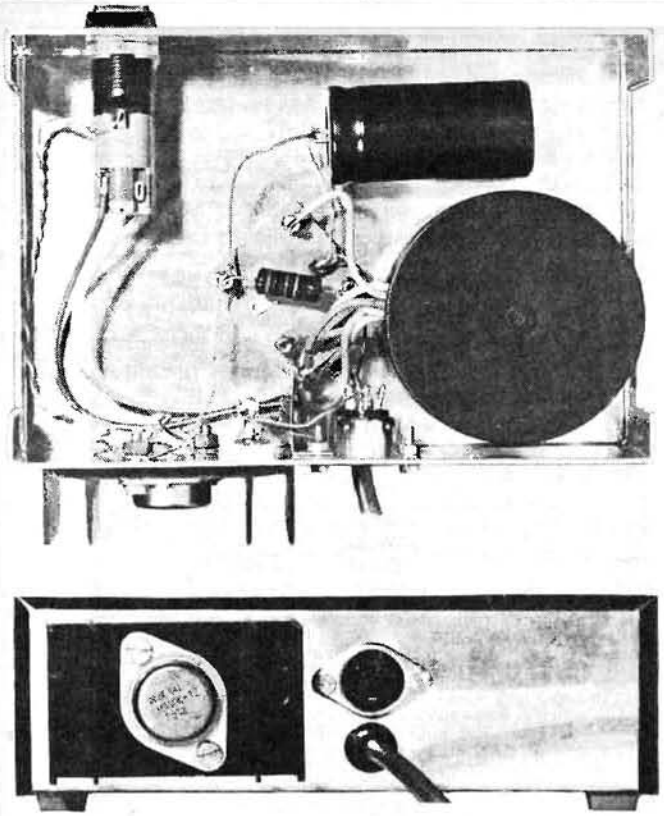


Fig. 4.4: Circuit diagram of Module 5, the mains-operated power supply



Top and rear-panel views of Module 5, the Power Supply

transformer has a single-hole fixing on the bottom panel and the various small components are directly wired around the fixed items in the case. The filter capacitors, 5C2 and 5C3 should be wired directly onto the pins of 5IC1, as close to the pins as possible and taken to the ground point on the i.c.

The prototype used a fuse inside the case but a panel-mounting fuse might be more convenient. No mains earthing was used on the prototype. Not good safety practice, but when a balanced antenna is being used, as in my case, I do not earth the case of the equipment. **THE RISK IS YOURS.**

Using the Supply

It is advisable to check the voltage of the supply before it is connected to the transceiver. A 5-pin DIN plug wired into the control voltage lines supplies the transceiver. So, "plumb it in" and use it.

The Clock

The photographs of the complete *PW* "Teme" system show a digital clock sitting atop the stack of modules. No detailed description of the clock will be given here, as it consists merely of a ready-built liquid crystal display (l.c.d.) module built into a matching case with two momentary-contact push-button switches (for setting the time) and a suitable battery. Modules providing similar facilities are available from suppliers such as Cirkit, or complete clocks at a very reasonable price are offered at car accessory shops.

Operating a QRP Transceiver

The completed *PW* "Teme" transceiver is a low-powered (QRP) station but is, in spite of the low power levels, capable of successful use on the 7 and 14MHz amateur bands. Remember that the power limitation means that the signal may be some 2 S-points down on a typical signal. As with all low-power operation, skill rather than brute force comes to the fore. Avoid calling "CQ" but instead look for stations making a CQ call and answer them. Another good technique is to "Tailend" an existing QSO. Sort out a required station making a contact, wait until the end of that QSO and quickly call in with a "two by two" (his callsign twice . . . DE . . . your callsign twice). Always remember to wait for that final "73" or "dit-dit" that many stations exchange at the end of a QSO.

Try to avoid letting the other station know too quickly that you are a QRP station. This can be worth 2 or 3 S-points in a report! A lot of useful advice on low-power operating can be found in the QRP section of the RSGB book *Amateur Radio Operating Manual*. Timidity is the enemy of the QRP operator; expect to gain QSOs and they often take place. It is often worth while calling "CQ QRP" on the International QRP Calling Frequencies of 7030kHz and 14 060kHz to enjoy the satisfaction of two-way QRP operating. Satisfaction is what operating a home-built QRP transceiver is all about. Contacts made on a transceiver built by the operator can exceed the satisfaction of those made on the most expensive of commercial stations. The respect that home-built equipment receives on the band can be quite surprising. Revel in the "FB SIGS FOR QRP" and "CONGRATS ON HOMEBREW STATION OM" and enjoy your home-built station. ●

Cases: The J6 Instrument Case is available from Minffordd Engineering, Sun Street, Ffestiniog, Gwynedd L141 4NE. (076676) 2572.

The remainder of the components are available from regular *PW* advertisers.

★ ATU/SWR Module £11
★ PSU Module £15

£ ★

INTERMEDIATE

G-QRP Club

If the idea of QRP operation appeals to you, and you'd like to pursue it further, why not join the G-QRP Club, a specialist group for users and builders of Low Power Equipment. Details from: Fred Garrett G4HOM, 47 Tilshead Close, Druids Heath, Birmingham B14 5LT.

First of all, a Very Happy and Prosperous New Year to you all, and I hope that the attendance at club meetings at this time of the year will not fall off too drastically as members drool over the black boxes and other presents heaped upon them by their friends and relatives, pushing the old gear aside in the haste of trying the new equipment on the air!

May I remind club secs and the like that I would appreciate a copy of club programmes for the coming months as this cuts out a lot of largely unnecessary correspondence between myself and club officals. If your committee hasn't yet produced such a programme it is high time that they did!

CLUB NEWS

Compiled by Eric Dowdeswell G4AR
Reports to Eric Dowdeswell,
57 The Kingsway, Ewell Village,
Epsom, Surrey KT17 1NA
PLEASE MARK "CLUB NEWS"

308 ARC Dave Davis G6YQD, 13 Maple Road, Surbiton, Surrey, for the time being, as the club is without a secretary. Every Tuesday at 8pm Coach House, St Mark's Church, Surbiton, Surrey. Closing date for the constructional competition is January 29.

Abergavenny & Nevill Hall ARC Dave Jones GW3SSY, 80 Croesonen Parc, A'gavenny, Gwent, is the sec and the club meets every Thursday at 7pm at the Pen-y-fal Hospital above the Male Ward 2, with code classes to kick off with. The club is an official RAE exam centre with January 15 the deadline for entries for the March 18 exam, and February 15 for the May 13 RAE. Late entries can only be accepted for the May exam the last date being March 10.

Acton, Brentford & Chiswick ARC G3IIU W. G. Dyer G3GEH, 188 Gunnersbury Avenue, Acton, London W3, the sec, says that important items will be discussed at the AGM to be held on Tuesday January 15 at the Chiswick Town Hall, High Road, Chiswick, London W4, at 7.30pm. Visitors and new members welcome.

East Antrim ARC GI4KK D. C. Simpson GI4PRH on Ballyclare 41655 is the sec. Second Tuesday at 8pm, the Fairview Primary School, Hillmount Avenue, Ballyclare, with a wide range of events already planned.

Aycliffe & Shildon ARC E. W. Bate on (0388) 774466 or (0325) 314638 is the sec, the club meeting at 8 on Tuesdays at the Sunnydale Leisure Centre, Middridge Lane, Shildon, Co Durham. January 8 is showing-off time for those Christmas presents, with a video evening on the 15th and a talk on antennas on the 22nd. The 29th is down for a discussion and quiz.

Basingstoke ARC G3TCR G8JYN E. C. Thompson G4SQZ, 21 Wigmore Road, Tadley, B'stoke, Hants. Second Tuesday at 7.30, the Swan Inn, Sherbourne St John, near B'stoke.

Bath & District ARC Colin Ashley G4UMN on Frome 63939. Meets alternate Wednesdays in the Englishcombe Inn, E'combe Lane, Bath, at 8pm, but contact the sec to find out which Weds this means. A winter schedule is in full swing.

Biggin Hill ARC G4RQT G6TBH Ian Mitchell G4NSD on (09598) 376. St Mark's Church Hall, Biggin Hill, Kent, third Tuesdays although the AGM is down for the fourth in January, the 22nd. Demos of RTTY and ATV are among events planned for '85.

Blackmore Vale ARS Bill Bailey G1GRG on (0963) 70969. Second Tuesdays in the old coach-house behind the Bell & Crown at Zeals, Somerset, for demos, lectures and the like and fourth Tuesdays for general chat and constructional projects. An RAE class is in full swing.

Braintree & District ARS G4JXG G6BRH Jeff Roberts G6OIX, daytime on (0376) 47525, evenings on 44857. Don't overlook new arrangements for first and third Wednesdays, 8pm, St Peter's Church Hall, St Peter's Close, B'tree. Own car park and talk-in on S15.

Bristol ARC T. E. A. Rowe G8NNU on Bristol 559398. Every Tuesday at YMCA, 6 Park Road, Kingswood, B'tol, with RAE and Morse code classes. January 8 is night-on the-air with the 15th devoted to 430MHz dish design and construction. The 22nd is Z80 machine code time for beginners.

North Bristol ARC G4GCT Ted Bidmead G4EUV, 4 Pine Grove, Northville, Bristol. Fridays at the SHE, 7 Braemar Crescent, Northville, Bristol, with the AGM on January 25.

South Bristol ARC G4WAW Len Baker G4RZY on (0272) 834282. Wednesdays, the Whitchurch Folk House, East Dundry Road, W'church, Bristol. January 9 is c.w. activity night with films and slide show on the 16th, while 70MHz is the subject for the 23rd ending with constructional workshop on the 30th. Note February 6 concerns cables and connectors.

Bury RS Brian Tyldsley G4TBT on Burnley 24254. Every Tuesday at 8pm, the Mosses Centre, Cecil Street, Bury, with principal meeting on second Tuesday the others being regarded as more informal.

South Cheshire ARS G6TWB Nick Gutten G6IGW on Crewe 60062. Centred on Crewe and Nantwich, the club meets on second and fourth Mondays at 8pm, the Victoria Club, Gatefield Street, Crewe, with very wide range of AR activities. Club net on Sundays at 8pm on S14.

Cheshunt & District ARC G4ECT G6CRC Roger Frisby G4OAA on Hoddesdon 464795. Wednesday evenings at 8 in the Church Room, Church Lane, Wormley, near Cheshunt, Herts. G4FAI speaks on the Morse telegraph on January 9 and on the 23rd G3GJW deals with the RSGB.

Chichester & District ARC C. Bryan G4EHG on Chichester 789587. First Tuesday and third Thursday at 7.30, the Fernleigh Centre, 40 North Street, Ch'chester, in the Green Room. Jan 1 is "Bring along a computer" evening, in the Long Room, with satellite communication systems by Graham Swann on the 17th.

North Cornwall RC John Heeson G4FHL on Camelford 770406. First Wednesday at the RAOB HQ, Fore Street, Camelford, at 7.30pm. Morse code classes by ex marine op G4WMJ.

Derwentside ARC (Consett) June Wallis G1AAJ, 10 Middlewood Road, Lanchester, Durham. New venue is the Consett Association Football Club, Belle Vue Park, Consett, on Mondays at 7pm. Old and new members welcome.

North Devon RC George Hughes G4CG, "Crinnis," Highwall, Barnstaple, North Devon. New venue and times, now first Wednesdays at 7.30, at Micro Chips, Castle Street, Barnstaple.

Doitwich ARC Gordon Taylor G4HFP, 6 Mariborough Drive, Stourport-on-Severn or S-on-S 3818. Second and fourth Mondays at the Scout HQ, Union Lane, D'wich, at 8pm. Micros and vintage radio among wide choice of AR interests.

Dunfermline RS GM3IDS R. Mackie on D'fermline 73640. New and permanent meeting spot is the Outh Wireless Station, Knockhill, by Dunfermline, with transport available from the town centre. It's every Tuesday evening at 7.30pm with a larger membership now being sought.

Dunstable Downs RC P. A. Morris G6EES on D'stable 607623. Friday evenings at 7.30, Chews House, High Street South, D'stable, Beds, with a junk sale on January 4 and AMTOR, RTTY and packet radio the subject for February 1. The club AGM is on February 15.

Ealing & District ARS G3UUP G8UUP Anton Berg G4SCR on 01-997 1416. Tuesday evenings at 7.30, Hanwell Community Centre, 71a Northcroft Road, London W13, with talk-in on S9 and 434·225MHz. Wide ranging interests from RTTY to micros. The club's AGM is on January 15.

Edgware & District RS G3ASR John Cobley G4RMD, Hatfield 64342, is sec of the club which meets second and fourth Thursdays at 8pm, 145 Orange Hill Road, Burnt Oak, Edgware, Middx. Slow code classes at the club and on the air from G3ASR. January 10 is AGM time but the 24th is informal.

Farnborough & District RS Peter Taylor G4MBZ on F'borough 837581 is the club's PRO. Second and fourth Wednesdays at the Railway Enthusiast's Club, Access Road, which is off Hawley Lane, F'borough, starting at 7.30pm, with a talk in on 144·775MHz f.m. On January 9 G3AQC will present his "Aerial Circus" with constructional contest winner G4JNT having the floor on the 23rd.

Flight Refuelling ARS G4RFR G6SFR Doug Wilkes G8ZLH, 63b Runnymede

Avenue, Bournemouth BH11 9SG on (0202) 570894. Club meets every Sunday at 7.30 pm at FR Sports and Social Club, Merley Park Road, Merley, Nr. Wimborne. January 13 has the new chairman G8MCP and new committee discussing ideas for the year.

Fylde ARS H. Fenton G8GG on Lytham St Annes 725717. Meets first and third Tuesdays, the first being a talk or similar, the second code classes and get-together, all at the Kite Club, Blackpool Airport at 7.45pm. Main feature for January is the AGM on the 15th. The RSGB video *Secret Listeners* will be shown on February 5.

Glenrothes ARC GM3ULG GM4GRC R. Lamont GM4LYQ, 132 Ballater Green, Glenrothes, Fife. Meetings every Wednesday and Sunday at 7.30 at Provosts Lands, Leslie. On Jan 20 it's tales of DXpeditions undertaken by club members, including GM3YOR's trip to VP2M-land. RAE and Morse code classes are conducted at the Balwearie High School, Kirkcaldy.

Greater Peterborough ARC G4EHW Frank Brisley G4NRJ of 27 Lady Lodge Drive, Orton Longueville, P'borough. The club's AGM will be held on January 24 at the Southfields Junior School, Stanground, P'borough, at 7.30pm. Normally, meetings on the fourth Thursday except during school holidays.

Grimsby ARS G3CNX G. J. Smith G4EBK, 6 Fenby Close, Great Grimsby, S. Humberside. "Every other Thursday" doesn't mean much I'm afraid, but first Mondays of the month is a special gathering for the computer boys and girls. All at the Cromwell Social Club, Cromwell Road, Grimsby.

Hambleton ARS Dr. A. Wilson G3MAE on Great Smeaton 530. "Fortnightly" also doesn't convey very much but I have interpolated it as January 7 and 21 in Room C11 of the Allertonshire School, Northallerton, N. Yorks. This new society will cover all aspects of amateur radio at its meetings.

Radio Society of Harrow G3EFX Alison Wilson G6NDJ on 01-868 2159 is the hon sec of this club which meets at the Harrow Arts Centre, High Road, Harrow Weald, Middx, at 8pm, every Friday evening at 8.15. The informal evenings include Morse code classes and on-the-air activity with the club station. A sale of used equipment takes place on Janauary 4. Talk-in is on RB14.

Hastings Electronics & RC Dave Shirley G4NVQ on Hastings 420608. Third Wednesdays at 7.45pm, West Hill Community Centre, Croft Road, Hastings with the club room at Ashdown Farm Community Centre, Downey Close, which is just off Harrow Lane, available at 8pm every Friday. The meeting on January 16 will have a demo on the Sony Compact Disc equipment.

Hilderstone RS Dr Ken Smith G3JIX, Staple Farmhouse, Staple, Canterbury, Kent. Fridays at 7.30pm, Hilderstone Adult Education Centre, St Peters, Broadstairs, Kent, with the emphasis on helping beginners and s.w.l.s. This new club also runs all the usual AR club features.

Inverness ARC GM4TPF GM1DZU David Jones GM4SXD on (08083) 240. Every Thursday evening at 7.30pm, Cameron Youth Club, Planefield Road, Inverness. Interests include a local RAYNET group.

Isle of Man RS GD4IOM Anthea Matthewman GD4GWQ on (0624) 22295. Meets Mondays at 8, the Keppel Hotel, Creg-ny-Baa, IOM. Contest operation is among the club's many interests.

West Kent ARS Brian Guinnessy G4MXL on (0892) 32877. Every Friday at 8, Adult Centre Annexe in Quarry Road, Tunbridge Wells, Kent. Club mag *QLF* has a very informative article on RTTY/AMTOR, plus info on local RAYNET group.

East Lancashire ARC Stuart Westall G6LXU on Accrington 393457. First and last Tuesdays of the month at the Conservative Club, Cliffe Street, Rishton, Lancs, with demo or lecture on the first and informal gathering on the last, all starting at 7.30pm.

Leighton Linslade RC G4LLR G6LRC Ian Jardine G1ACQ on (0525) 376741. In Room A64, the Vandyke Community College, Vandyke Road, Leighton Buzzard, starting at 7.30pm. First and third Mondays.

Leith Nautical College AR & Electronics Club GM4AXG Susan Beech GM4SGB, 24 Milton Road East, Edinburgh, which is the college's QTH. Constructional evening every Monday at 6pm in the electronics lab T2–4 with a wide range of testing equipment available to members.

Loughborough ARC G3RAL Jim Smith G4DZL, c/o Top Floor, Brush Sports & Social Club, 18 Fennel Street, L'borough, Leics, is the programme sec and the venue is the same. Every Tuesday at 7pm for the constructional group and every Friday at 8pm for the "organised" group, i.e. lectures, demos and the like. On January 25 G4RVW will talk on his QRP DXpedition to DL-land. Feburary 1 is down for an open forum.

South Manchester RC D. Holland G3WFT on 061-973 1837. Friday and Monday evenings at 8, the Sale Moore Community Centre, Norris Road, Sale, Cheshire. On January 4 G4AOK talks on 'scope design while on the 11th G6EAO deals with radio analysis (?), then on the 18th it's G3PFR on microwaves. At the end of the month, the 25th, RTTY is the subject of G4NTY and G4MYB. Note the club quiz on February 1.

Mansfield ARS Keith Lawson G4AAH, 233 Southwell Road West, Mansfield, Notts. First Friday and third Tuesday of the month at the Victoria Social Club, Prince's Street, Mansfield, Notts.

Medway AR & TS G5MW G8MWA Andy Wallis G4TQS on (0634) 363960. Meets at St Luke's Church Hall, King William Road, Gillingham, Kent. January events include G8VR on working meteor scatter on the 11th, and a video show on the 25th, which seems to make it every Friday. Note now the constructional contest scheduled for February 1.

Newark & District ARC Michael Gayler G4SDZ on (0636) 702076. First Thursday at the Palace Theatre, Appletongate, Newark, at 7.30, plus an informal meeting at a local pub around the middle of the month, to which YLs and XYLs are particularly invited. Club net every Monday at 8 on 144·525MHz.

ARC of Nottingham G3EKW G6CW G8IUT Jim Towle G4PJZ on N'ham 624764. Thursdays at 7.30, Sherwood Community Centre, Mansfield Road, N'ham, with a brains trust on January 10, G3OZ dealing with 'scopes on the 17th, and an activity on-the-air night on the 24th.

Oldham ARC Fiona Butterworth G4SPX on 061-652 8862. Monday meetings at 8.30pm at the Wheatsheaf Hotel, Derker Street, Oldham.

Oswestry & District ARC Brian Goldsmith GW6YIY on (0691) 831023. Meets first Tuesday of every month at 8pm, the Bell Hotel, opposite the Parish Church, Oswestry.

Port Talbot ARC GW3EOP Joe Griffiths GW4IGR on (0639) 720416. Every Thursday at 7.30pm, the British Steel Corp Sports and Social Club with a full winter programme promised.

RAIBC Frances Woolley G3LWY, 9 Rannoch Court, Adelaide Road, Surbiton, Surrey. The club now has its own call sign G1IBC for use on the many nets held by RAIBC members on v.h.f. during the week. The club derives quite a lot of income from the stalls it stages at the many rallies and shows during the year.

St Helens & District ARC Alan Riley G6MXT on 051-430 9227. Every Thursday evening at the Conservative Rooms, Boundary Road, St Helens, Merseyside, at 8pm, with code classes starting half an hour before that.

Southdown ARS G3WQK G1KAR T. Rawlance G4MVN, 18 Royal Sussex Crescent, Eastbourne. First Monday of the month at the Chaseley Home, Southcliff, Eastbourne, at 7.30pm. A south coast RTTY repeater project is on the cards.

Spen Valley RS G3SVC T. J. Clough G4PHR on Mirfield 499397. Thursdays at 8pm, the Old Bank WMC, Mirfield, with G4OTL speaking on Viewdata on Jan 10, and G8HUA discussing fast scan TV on the 24th.

Stowmarket & District ARS M. Goodrum G3ZQU on Stowmarket 676288. New venue is the Maltings Entertainment Complex opposite the railway station. First Mondays with a presidential lecture on January 7 and a junk sale on February 4.

Stratford-upon-Avon & District ARC David Boocock G8OVC on S-on-A 750584. Second and fourth Mondays of the month at the Control Tower, Bearley Radio Station, Bearley, near Stratford, at 7.30pm. "Oscilloscopes at work" is the subject for G3MXH on January 14 and a practical evening making p.c.b.s. on the 28th. For the diary there is a junk sale on February 11.

Sutton & Cheam RS Alan Keech G4BOX, 26 St Albans Road, Cheam, Surrey, with meetings on the third Friday at 7.30pm, the Downs Lawn Tennis Club, Holland Avenue, Cheam. Don't miss a chat on QRP operation from Chris Page G4BUE on January 18.

Swale ARC G4SRC Brian Hancock G4NPM on (0795) 873147. At the Ivy Leaf Club, Sittingbourne, Kent, on Mondays at 7.30pm.

Taunton & District ARC G3XZW L. S. J. Ford G4ZLF, 23 Laburnum Road, Wellington, Somerset. Fridays at 7.30pm in the basement of the County Hall, The Crescent, Taunton. New members and visitors most welcome.

Tiverton (SW) RC G4TSW G. Draper G4ZNV on (03634) 235. Every Monday at 7.30pm at the Queen's Head in Tiverton where antennas and a club station have been installed.

Thornton Cleveleys ARS Jack Duddington G4BFH on (0253) 853554. Every Monday at 7.45pm, 1st Norbreck Scout HQ, Carr Road, Bispham, Blackpool. First and third Mondays have guest speakers, second and fifth are advanced Morse classes by G3ZRZ, fourth Mondays are construction time and informal.

Todmorden & District ARS E. Tipping, 3 Cliffe Villas, Longfield Road, Todmorden,

Lancs, is social sec and says club meets on first Monday of the month at the Queen's Hotel, Todmorden, at 8pm, with a warm welcome for visitors.

Torbay ARS G3NJA G8NJA Tony Rider G6GLP, 3 Dawes Close, Orwell Cross, Newton Abbot. Sad news is that the club has had to vacate the premises where it has met for the last 27 years. So contact Tony for the latest news on a new place and details of club events.

South Tyneside ARS Tony Adamson on (0632) 567305. Newly-formed group meets every Monday at the Martec Club in the grounds of the South Tyneside College, enter via the Grove Road entrance. Plans under way for all the usual AR activities, including a club station.

Verulam ARC Hilary Claytonsmith G4JKS is on St Albans 59318. Meetings second and fourth Tuesdays at the RAFA HQ, New Kent Road, off Marlborough Road, St Albans, Herts, at 7.30pm. The subject for the gathering on January 22 is microwaves by G8MWR.

North Wakefield RC GB2NWR G4NOK G6WRS Steve Thompson G4RCH on (0532) 536633. Every Thursday at 8pm, the Carr Gate WMC. It's on-the-air night on January 10, with a visit to Pontefract for a junk sale on the 17th. Test equipment is the lecture subject for the 24th by G8UYZ.

West Bromwich Central RC John Bates G6ZLW on 021-553 0531. Change of venue for the club, now at the Hop & Barleycorn, Dartmouth Street, W. Bromwich, every Sunday evening at 8pm. RAE and Morse code classes are included in the facilities.

Wimbledon & District ARS George Cripps G3DWW on 01-540 2183. Second and last Fridays of the month at 8pm, the St John Ambulance HQ, 124 Kingston Road, Wimbledon, London SW19, with refreshments mid-evening. A video of the club's annual camp at Chessington will be shown on January 11, with general activity evening on the 25th including Morse code practice.

Wirral ARS G3NWR Cedric Cawthorne G4KPY on 051-625 7311. First and third Wednesdays at 7.45pm, the Parish Hall, Heswall, behind the church. Talk-in on 144·725MHz. Club net on this frequency at 7.30pm every night.

Wirral & District ARC G4MGR G8WDC Gerry Scott G8TRY on 051-630 1393. Second and fourth Wednesdays at the Irby Cricket Club, Irby, Wirral, with club net on S13.

Wolverhampton ARS Keith Jenkinson on (0902) 24870. Every Tuesday at 8pm, W'hampton Electricity Sports and Social Club, St Mark's Road, Chapel Ash, W'hampton, with a talk on home security on January 15, junk sale on the 22nd. On February 5, G4JCP delivers second part of his talk on data comms and packet radio. On Sunday January 20 there is 144MHz d.f. hunt starting at the children's paddling pool, Upper Green, Tettenhall, which is near W'hampton, starting time unknown.

Worcester & District ARC Derek Batchelor G4RBD on W'cester 641733 is the new secretary of this club which gathers for formal meetings on first Mondays at the Odd Fellows' Club in New Street, W'cester, and on third Mondays informally at the Old Pheasant in the same street, all at 8pm. Videos on an "Aerial Circus" and the JARL visit to China are featured on January 7.

Yeovil ARC G3CMH G8YEO Eric Godfrey G3GC on (0935) 75533. Thursdays at 7.30pm, the Recreation Centre, Chilton Grove, Yeovil, with G3MYM describing how to make an absorption wavemeter on January 10 and talking about the sunspot minimum, on the 17th.

Deadlines for copy for the next three months are as follows:

Cover Date	Deadline for copy	Covering events from early:
April 1985	January 15	March
May	February 15	April
June	March 15	May

Swap Spot

Have DXTV Antiference MH473 antenna for v.h.f. bands 1 x 3, v.g.c. Also 50m RG8U low loss cable with Realistic PRO47 scanner, 20 crystals amateur and maritime. Would exchange for scanner with air bands on it, 108–138MHz. Would prefer SX200N. John. Tel: 051-922 9632 anytime (Liverpool). *W698*

Have Cossor 480 radiogram and three receivers plus service data. All sets faulty—Philips 785A, Graetz Comedia, "4R" UKW Vollsuper Ferguson 325A. Would exchange for HMV 1120 receiver in perfect working order. Mattison, 177 Willow Lane, Lancaster LA1 5NB. *W699*

Have photographic colour printing analyser (valved) Lectra PTM-10. Would exchange for FRG-7700 or similar. Tel: Walsall 642509. *W701*

Have 12AVQ vertical trapped antenna. Would exchange for rotator, g.d.o. w.h.y. G3KEC. Tel: Looe 3651. *W703*

Have 90+ radio valves, many unused, 7 Dekatrons, various bulbs, switches, metal rectifiers, double rotating switch, valve holders, equipment fans, speakers etc. Would exchange for w.h.y. Please write first to to F. J. Hunt, 45 Ashmead Road, Maybush, Southampton SO1 6DJ. *W704*

Have sound cine camera and projector, audio dubbing facility, auto zoom, macro lens. Would exchange for any working 430MHz transceiver. G1JEO. Tel: 0942 712145 (Ashton in Makerfield). *W710*

Have Heathkit HW8 and astronomical refracting telescope, complete with spotting scope, field tripod, three eyepieces and Slo-mo dec axis. Would exchange for Sony ICF2001 or consider other solid state general coverage receiver. Kevin G4MDQ. Tel: 0709 877496 during working hours. *W718*

Have complete TV TX/RX with MTV 435 Pye camera, 21-element Tonna. Would exchange for h.f. linear, FC-102 a.t.u., FV-102DM v.f.o. Also have two colour monitor chassis. Would exchange for w.h.y. Dave. Tel: 0709 67471 (Rotherham). *W722*

Have electronic typewriter with matching plug-in 6K Memorymatic unit, M44. In v.g.c. with operating manuals. Would exchange for AR2001 plus discone antenna in mint condition. Cash adjustment and buyer collects. Tel: Hemel Hempstead 45649 after 6pm any day. *W724*

STOP PRESS!

It was announced on 7 December that UK Class B Licence-holders who wish to use Morse code in their radio contacts may do so for an experimental period of one year commencing 1 April 1985.

Any Class B licensees interested in participating in the experiment should apply to the RSGB requesting a letter of variation to their licence to permit them to transmit Morse code from their station address.

Write to the Secretary, RSGB, Alma House, Cranborne Road, Potters Bar, Herts EN6 3JW, enclosing two first-class stamps to cover costs and postage. There is no selection process, and all applicants will receive a letter of variation plus guidance leaflet.

It is hoped that the experiment will encourage Class B licensees to practise the sending and receiving of Morse in preparation for the amateur Morse test and help them to see its advantages as a mode of transmission.

Modifying The FRG-7

by Peter D. Rouse GU1DKD

Part 4

In this final part of the series on modifying the FRG-7 receiver we look at problems with b.f.o. drift and some of the points raised by readers.

BFO Drift

I mentioned in Part 1 of the series that one area of the receiver where performance was weak was the b.f.o. and its tendency to drift over fairly short periods of time. Sure enough it was the main point raised by those readers who wrote to me, in particular, Bob Marshall of Canterbury, Dr. Alan Bryce G4NCR and Bob Wilkinson G3VVT.

Everyone agreed that the close proximity (a mere 6mm) of the b.f.o. tuning coil to the heatsink of the audio amplifier i.c. was no doubt the main cause. Various suggestions were put forward but all involved fairly tricky modifications to the existing circuit. The philosophy of this series had been all modifications should be add-ons which could easily be removed and in fact by the time Part 1 was in print I was already working on a circuit that used ceramic resonators. I had chosen these in preference to quartz crystals which were expensive and bulky and not very easy to obtain.

Ceramic V Quartz

It has been known for years that oscillators could be made using standard ceramic filters as the resonating element and more recently manufacturers have been producing a range of ceramic devices intended specifically as inexpensive substitutes for quartz crystals. These ceramic resonators are not as accurately cut as good crystals and do not have the same temperature stability. Even so they are smaller than quartz equivalents at low frequencies and their stability is more than adequate for our purposes. Important as well from the point of view of this series, they cost pence and not pounds. Measurements made on the original b.f.o. showed that it was quite capable of drifting by as much as 200Hz over just 5 minutes whereas with the circuit presented here the drift is limited to less than 20Hz in the same period.

Although details are given only for u.s.b. and l.s.b. frequencies for the Toko MFL filter which has a centre frequency of 453·5kHz, it is possible to adapt the circuit for other i.f.s. A range of these devices is available from Cirkit and frequencies include 455, 460, 500, 560kHz and 1MHz.

Oscillator Design

Having decided on the method of curing the problem, the actual design proved a bit tricky. Several circuits for using ceramic resonators have been published and all involved using a standard Colpitts oscillator. When these circuits were tried they were rich in harmonics which appeared as very strong signals within the receiver's normal tuning range. Even including a 455kHz transformer for coupling had little effect as the circuits were radiating

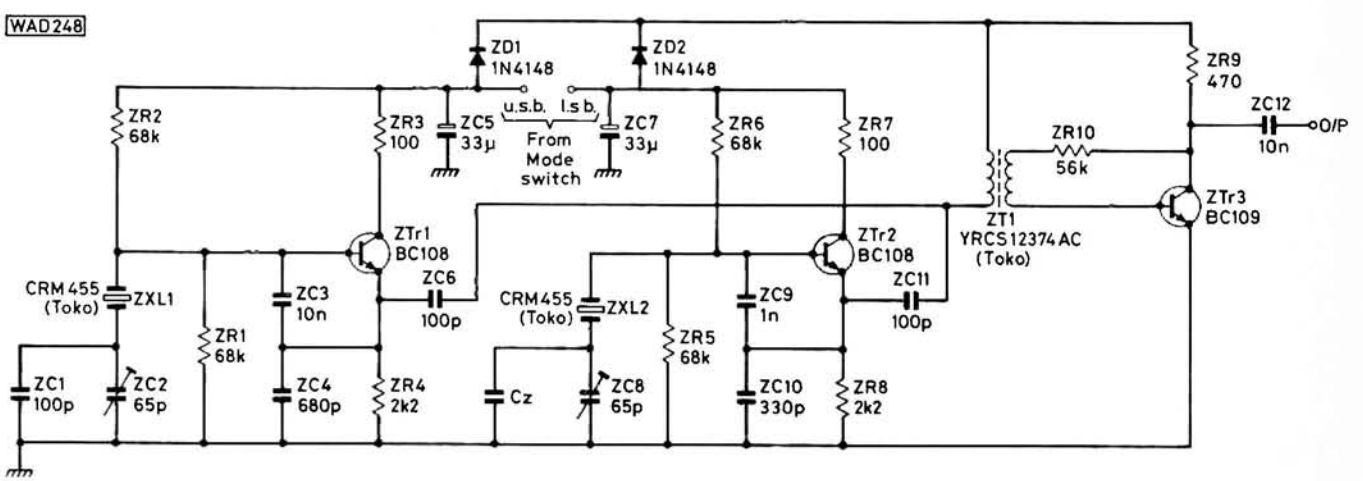


Fig. 4.1: Circuit diagram of the ceramic resonator b.f.o. for use with the Toko MFL 453·5kHz i.f. filter. See text for alternative centre frequencies

strong signals. Other oscillator arrangements were tried but all seemed to suffer from the same problem to one degree or another and so it was back to the Colpitts circuit. Some 455kHz transformers were tried as part of the oscillator circuit but the old problem of thermal drift appeared again particularly when the resonator was pulled off its natural frequency. The only solution was to include an unusually high value capacitor between the base and emitter of the transistor. Despite the relatively small difference in frequency of the two oscillators the values of these capacitors vary quite widely and are fairly critical as are the emitter/ground capacitors if symmetrical waveform and reliable starting are to be maintained.

The Working Circuit

The final circuit shows component values for frequencies of 452kHz (ZTr1) and 455kHz (ZTr2) and these are the b.f.o. frequencies required for the MFL filter. Notes are included at the end of this article for adapting the circuit for other frequencies. The two oscillators are switched into circuit by the FRG-7's MODE switch and diodes ZD1 and 2 ensure that whichever circuit is on, current is still supplied to the buffer amplifier, ZTr3.

I found harmonics only appeared at low level at two points on the kilohertz tuning dial and were not a nuisance.

Construction and Fitting

Construction is fairly straightforward and the only word of caution concerns the capacitors in the tuned circuits. These should be good quality devices otherwise expect degraded stability. Use of the printed circuit board is advised as materials such as strip board may cause problems because of capacitance between tracks and non-compatibility with the pin-out of the transformer. The p.c.b. also has the advantage of having mounting holes that match existing positions on the FRG-7's chassis.

Once construction is complete the fitting process is fairly easy although the MODE switch will have to be unmounted and pulled out of its hole. Refer to Fig. 4.3 and note the position of the wire that bridges two contacts on the back wafer of the switch and then goes to a pad on the IF/AF board where it feeds to R442. This connection is the power supply feed to the original b.f.o. and the bridge on the wafer switch must be cut and the wire unsoldered from the pad. A second wire is soldered onto the now disconnected switch contact and both the wires now carry the appropriate oscillator supply to the new b.f.o. board.

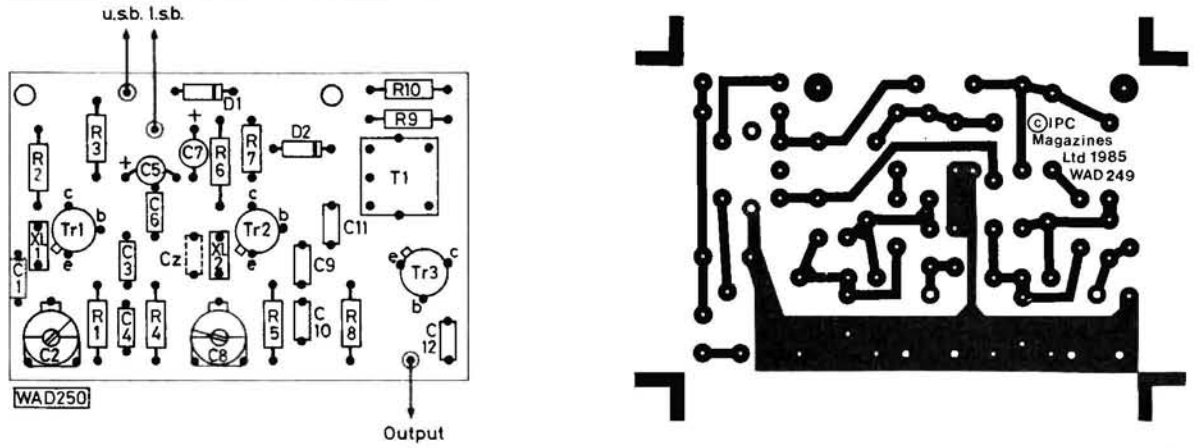


Fig. 4.2: Component placement and p.c.b. track pattern of the ceramic resonator b.f.o., shown full size. Capacitor C_z is not required when using the MFL 453·5kHz filter. Note the prefix letter Z has been omitted for clarity

The circuit based around ZTr1 is for the u.s.b. frequency, 452kHz and ZC1 provides the necessary high capacitance needed to pull the resonator, ZXL1, well off its natural frequency. The trimmer capacitor ZC2, is used to tune the circuit for the exact frequency and capacitor ZC6 couples the output to the transformer, ZT1. The oscillator based on ZTr2 is almost identical except for the values of ZC9 and ZC10 (as already explained). Capacitor C_z is not required when the circuit is used with the MFL filter but may be needed for other frequencies and so provision has been made for it on the p.c.b. layout.

The output from both oscillators goes to the coupling transformer ZT1 which was included to ensure that harmonics were not amplified to any appreciable degree. The transformer used was a second i.f. type salvaged from a portable radio but if a suitable component is not to hand a part number is included on Fig. 4.1.

Harmonics from this circuit are at roughly the same level as those from the set's existing b.f.o. and fitting the circuit board inside a screened case would obviously reduce them even further. Adding de-coupling capacitors back along the switched supply will also make a marginal difference. However, try the unit as it is as in my own case

It is important now that the coupling capacitor in the set's own b.f.o. is removed. It is clearly marked on the board as C439 and must be taken out of circuit otherwise the old b.f.o. will load the new circuit.

The output of the new b.f.o. is fed via a short wire link to the pillar of test point TP405 on the IF/AF board. The only other connection is chassis ground which can be taken to any convenient point.

Once these connections have been made, remove the two screws that hold the IF/AF board to the front right hand side of the chassis and replace them with screws from the underside of the chassis so that 25mm mounting pillars can be screwed onto them from the top. The p.c.b. is now mounted on these pillars and assuming there are no faults it only remains for the correct frequencies to be set up.

Alignment with Instruments

The use of a digital frequency meter and an oscilloscope will make alignment quick and easy but do not worry too much if you do not have access to such instruments. Absolute accuracy of frequency is not as important as

stability and that latter quality is virtually guaranteed by the ceramic resonators. Assuming the instruments are available, allow half an hour for the set to warm up, disconnect the antenna and find any tuning point where there is no signal of any kind. Switch to u.s.b. and monitor the circuit output. Tune ZC2 for 452kHz and adjust the core of the transformer for a good symmetrical waveform. Note that this adjustment may well affect the frequency of the oscillator slightly but don't worry about that at this stage. Now switch to l.s.b. and trim ZC8 for 455kHz. If the oscillator won't start, you will need to adjust the core of the transformer until it does. With the oscillators running at roughly the required frequencies it is now necessary to find a setting of the transformer's slug where the output level from each is roughly equal. Once this has been achieved, do not touch the transformer any further and now make final adjustments to obtain exact frequencies by using the trimming capacitors.

Trial and Error Alignment

If trial and error must be used then start by turning the core of ZT1 until it is fully out and set ZC8 for maximum capacitance. Connect an antenna to the set, switch in the WIDE filter and find a good strong a.m. broadcast transmission. Tune it as accurately as possible using the S-meter and then switch to l.s.b. Now trim ZC8 until you hear the b.f.o. zero beat with the transmission (if this does not happen try screwing in ZT1's slug until it does). Once you have the zero beat, screw in the transformer slug and at some point the oscillator should switch off (if it does not, just leave the slug set at the mid-way position). Bring the slug back by a slight turn, switch to a.m. and then back to l.s.b. and the oscillator should start again. Zero beat will probably have been lost but bring it back by slight adjustment of ZC8. That completes the alignment for l.s.b. and the transformer setting.

Now find an amateur s.s.b. station on any of the bands above 10MHz, switch in the NARROW filter, tune for maximum S-meter deflection and trim ZC2 until the signal is resolved. If needs be keep repeating this procedure with different stations until you are happy with the results.

Performance Tests

Performance can now be checked on the various bands and if a d.f.m. has been used the b.f.o. frequencies can be monitored for drift. On the two prototypes built the worst case variation was on the u.s.b. oscillator and this is no doubt due to the relatively high value of capacitor ZC1. If variations greater than 20Hz are encountered then it may be a good idea to change ZC1 for a better quality device. If ZT1 has been salvaged from the junk box it is a good idea to check that it is not coupling an excessive amount of signal to the buffer amplifier. This can be done by monitoring the set's a.g.c. voltage and ensuring that under no-signal conditions it does not alter when either b.f.o. signal is switched in.

Other Sets and IF Frequencies

There is no reason why this circuit should not be used with other sets, particularly those with standard 455kHz i.f. stages. The b.f.o. frequencies for 455kHz will be at 453·5kHz and 456·5kHz. For the lower frequency, the component values around ZTr1 should work although ZC1 may need to be reduced. For the higher frequency, it is advisable to use a 460kHz resonator and pull it down in frequency as pulling a 455kHz resonator up can lead to unreliable starting. Using the 460kHz version (CRM460) for ZXL2, C_z will need to be included (try about 100pF) and the values of ZC9/10 will need to be juggled although start by trying different values for ZC10 only.

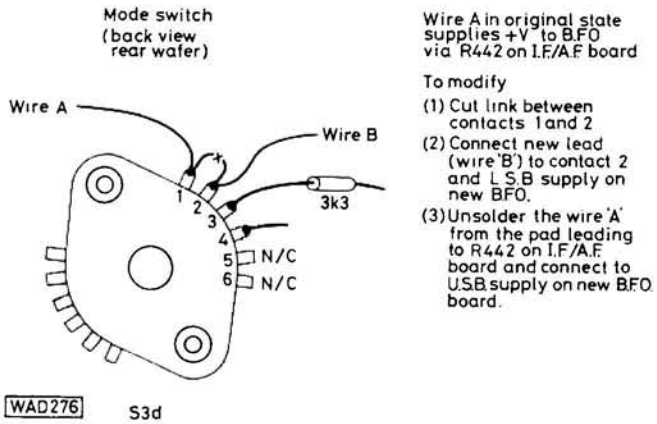


Fig. 4.3: Details of the modifications to the MODE switch wiring

Back to Battery Packs

Apart from b.f.o.s the other main query raised by readers concerned the battery pack. My brain was obviously not fully engaged when I suggested in the first article that NiCads could be used, U2 versions of these cells are rated at 1·2 volts and multiplied by 8 that comes to only 9·6 volts which is 0·4 volts less than the output of the set's regulator. Reader John Hunt picked me up on this point and offered a solution. John is currently working in Iran and has great difficulty in obtaining U2 dry cells and so has opted for NiCads. He suggests fitting an L-shaped bracket to the back of the battery pack and mounting a dual (side-by-side) U2 holder on it. This unit is then merely wired in series with the existing holder to give 12 volts from the 10 cells. I have not actually fitted this modification to my own set but have measured the available space and confirmed that John is quite right, the extra cells are positioned in the space above the audio amplifier i.c.

This modification is worth considering even for normal dry cell use because as reader Bob Marshall pointed out even 12 volts is going to leave the regulator struggling the moment the battery voltage starts to sag. Using ten cells will give 15 volts and the set will happily cope with this.

Bob Marshall came up with one final simple trick that improves the audio quality of the set. The FRG 7 and many sets like it suffer from poor loudspeaker performance particularly when receiving broadcast stations. Bob tried sealing up all the ventilation holes and slots and found there was a noticeable improvement. He pointed out that as the set only consumes around 15 watts of power these slots are really quite unnecessary and it is quite easy to carry out this modification using sticky tape.

Finally, thank you to everyone who wrote in with ideas and I am pleased to say that from the correspondence it is clear that this series has provided solutions to these shortcomings that could be tackled at reasonable cost. I hope owners who fit circuits get as much enjoyment from their "new" FRG-7 as I do from mine. ●

ON THE AIR

AMATEUR BANDS

by Eric Dowdeswell G4AR

Reports to: Eric Dowdeswell G4AR, 57 The Kingsway, Ewell Village, Epsom, Surrey KT17 1NA.
Logs by bands in alphabetical order.

With the great influx of licensed amateurs in recent years it is almost inevitable that there must be some who have served little or no time at all as "apprentices" in our great hobby, normally as a short wave listener, or s.w.l. It is a fact that some have not touched a receiver let alone a transmitter before being licensed. The result is that their method of communicating over the air can leave a lot to be desired. This is particularly noticeable on the v.h.f. bands, notably the 144MHz band.

Over the several decades that AR has existed a more or less standard operating procedure has been built up worldwide, understood even by amateurs with a limited knowledge of the English language. For example "W1QQQ this is G4AR" repeated as necessary and with phonetics if appropriate, meaning to all and sundry that G4AR is calling W1QQQ. The same applies to c.w. operation except that it is always "W1QQQ de G4AR" etc. But newcomers are reversing the order in some cases, so we get "G9BF to W1QQQ" and the s.w.l. or other operator may well believe that they are hearing W1QQQ especially if conditions are poor.

In other cases there is a QSO going on suddenly ending with "G9BF" and no reference to the other station's callsign. QSOs may start with the single callsign only, equally confusing. One would think that such ops would cotton on after a while and recognise the accepted standards but this does not always happen. In fact if two newcomers are working each other then they tend to copy each others faults, compounding the problem. These comments also apply in a way to operation on c.w. where the newcomer tends to spell out every word fully as he or she has been doing prior to taking the code test. In fact there is quite a long list of accepted abbreviations which should be used especially when working foreign stations, much more likely to be understood than if sent in plain language. It also saves time!

The indiscriminate use of phonetics is also rife. There have been several phonetic codes over the years but the current one should be used whenever possible, even though, in my humble opinion, it leaves a lot to be desired. In particular "Golf" for the letter "G" is about the worst that could be devised, not coming over at all well in difficult conditions. There should not be any forenames or place names in a good phonetic alphabet.

General

From **Steve Evans,** 181 Curborough Road, Lichfield, Staffs, comes a plea for a copy of the manual for the FR50B receiver, to buy or borrow, with all expenses reimbursed. He is using it with a 20m long antenna and hopes to start sending in reports very soon. Steve is also embarked on an RAE course at his local technical college and being an electrician it ought not to present too many problems.

I have had a couple of enquiries regarding the news item on page 19 of the July issue of *PW* concerning the Essex Federation of Radio Societies which only gave "G8YEZ QTHR" as the reference. For the newcomer I would mention that QTHR means that the full address (QTH) can be found in the **current** issue of the RSGB's UK Call Book.

QRP Corner

I have received from **Waldie Bartie** ZS2WM a specimen of the "Worked all Branches" QRP award available to QRP stations using not more than 5W input, c.w., s.s.b., f.m. or a.m. on any amateur band. Waldie belongs to the Algoa branch of the South African Radio league. ZS amateurs are being asked to include the name of their SARL branch on their QSLs. Enquiries or applications for this award should go to The Awards Manager, WAB, Algoa Branch, POB 10050, Linton Grange, Port Elizabeth 6015. The qualifying date for the award is 1 January 1984.

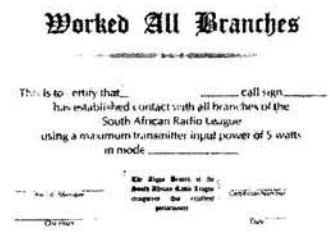
Waldie went on to say that there is a host of ZS stations using powers from 400mW to 5W. His own station is crystal controlled on 7030kHz, running 900mW from a 12V supply. He is in the process of getting a QRP rig working on the 21MHz band in order to work some DX. He hopes the new award will generate interest among UK amateurs in working ZS-land. As a footnote Waldie says that the 50MHz band is flourishing down there.

Thanks to the **Rev George Dobbs** G3RJV I have been placed on the mailing list for the G–QRP Club's journal *SPRAT,* and a jolly good read it is, too! Twelve technical articles on transceivers, antennas and circuit mods plus wide ranging info on awards, contests and member's news, and that's just the Autumn issue. The annual sub is only £3.50 and membership enquiries should be made to Fred Garrett G4HOM, 47 Tilshead Close, Druids Heath, Birmingham B14 5LT.

Among the articles in this issue of *SPRAT* is a modification for turning the *PW* "Dart" Top Band d.s.b. transmitter (*PW* November 1983) into a transceiver which should interest those readers who have built this project.

Phil Dykes G4XYX in Poole, Dorset, has now modified his Heathkit SB102 for QRP use by simply turning down the drive level to give him about 10W p.e.p. on s.s.b. and has worked EA8AMT and EA8AMX plus OZ1D which is not a bad start on 28MHz. Most of the African and S. American DX seemed to be working into W-land. The same rig on 7MHz s.s.b. worked into EI0WMD (special event station for World Maritime Day), GD4IOM/P and LA1EKO on a North Sea oil rig.

Although Phil passed the code test, obviously, he still feels a bit nervous on the air so has been practising hard. It happens to most newcomers OM and the only answer is to keep at it and not to be



Worked All Branches

This is to certify that _____ call sign _____
has established contact with all branches of the
South African Radio League
using a maximum transmitter input power of 5 watts
in mode _____

This certificate will be very difficult for UK amateurs to obtain, needing QSOs with each branch of the South African Radio League with input power of 5W max. Issued by the Algoa Branch of the SARL

ON THE AIR

afraid to ask the other chap to slow up a bit if necessary. It is generally accepted, anyway, that the other chap should come down to about your speed as a matter of courtesy.

M. Dunn BRS86500 is a newcomer to amateur radio and runs a Realistic DX160 receiver fed from a 40m-long antenna wire from his QTH in Grimsby, Sth Humberside

DX Bands

According to **Marcus Walden** up in Harrogate, N. Yorks, the openings on the h.f. bands are becoming scarcer by the day with 14MHz in particular closing down by around 1900Z. He is another reader who often feels that the 28MHz band is open but that the lack of activity there gives the impression that it is dead. He has logged mainly Euros on that band but also some DX beacons like ZS6PW, ZS1CTB, 9L1FTN, 5B4CY and 3B8MS, yet there have been no signs of stations from those parts of the world. This effect is all too common I'm afraid during the sunspot minimum phase of the solar cycle.

So on to Marcus's log for 3·5MHz and A71AD and VP2MW, to 7MHz for HZ1AB (QSL K8PYD) and ZL4IG. On 14MHz the best were KL7XD, VQ9YR, YB4FU, and a new prefix seemingly in V44KAM on St Kitts. Up to 21MHz and EL1AH of POB 2986 in Monrovia, FG7CM, FR0FLO, J28EB of POB 2417 Djibouti, J37AH (QSL W2GHK), KC7UU/5N6 (QSL K6EDV), S83H in the Transkei, 5Z4DE and 6W1NQ with cards to DL1HH. Marcus uses a Realistic DX302 and a 20m-long antenna in the attic.

Mr M. Dunn BRS86500 of Grimsby enters the fray for the first time being a recent convert to amateur radio. Welcome OM, I know you are going to enjoy yourself! He has a Realistic DX-160 receiver plus a 40m-long wire antenna on which he logged 9K2DZ, 3X-4DZ, AP2CR, and YV5APS on the 3·775–3·8MHz DX "window" of the 3·5MHz band. On 7MHz he caught C6ANU, CM2JG, V44KF (POB 173, Caicos Is) and XL1FG who turns out to be VO1FG. The 14MHz band produced HP9CSR/EA6, PS7AAH, VU2DZ and AP2MQ, plus maritime mobile LU1A-JH/MM.

From the October *RSGB Council Letter* it is learned that the research ship *RRS Discovery* has been given the special callsign GB4DIS/MM or /MA while working in the South Atlantic and Weddell Sea area between about 8 January and 12 April 1985 and will be run by licensed radio amateurs on board. GB4DIS will not, however, be able to take advantage of the greetings message facilities normally available to special event stations. A special QSL card will be issued for QSOs on 14 and 21MHz c.w. and s.s.b. Further information from Dr C. W. Fay, NERC Research Vessel Services, No. 1 Dock, Barry, South Glamorgan.

The lower frequency bands have been the target of attention of **Bob Parsley** in New Malden. Surrey, with his Heathkit SB101 and an end-fed wire antenna which is 40m long. He also uses a Trio 9R59D. On the 1·8MHz band he caught C31OF, EA8QL, EA9EU and 7X5AB, all s.s.b. Then on 3·5MHz he logged AP2ZR, A92EB, CT2CE, C31SD, HZ1AB, SU3KY (SU3 is a bit unusual), VK6HD, VP2VCW (QSL N6CW) 3V8WJ and 9K2DZ. So when the 14MHz band goes dead of an evening drop to around 3·5MHz and enjoy keeping up with the DX. I suspect the reason for Bob's excellent results on the lower bands is the 40m-long antenna. On the 21MHz band Bob logged only A22AA and A61AA as being of interest.

"Things really happened" says **Denis Norton** of London W6, referring to October 28 when he logged CP8HD, D68WB (QSL BP54O, Moroni, Grand Comore, Rep of Comoros, via France), H50A in Bangkok and cards to HS1BG, H5AK in Bophuthatswana, HZ1AB (QSL K8PYD), TG9VT (QSL W3HNK), TI1C, XN3BVD (QSL VE3BVD, XT2BR, YC0DPO, while on another couple of days he got 9J2JF and 9Y4AT, all on 21MHz. On 3·5MHz it was ZB2HM and 9H3JAM with solitary VQ9DG on Diego Garcia worthy of note on 14MHz. Denis's equipment is an FRDX500, a.t.u., 14AVQ antenna and 20m-long wire plus a Datong FL2 audio filter.

In Barnes, London SW13, **Roger Edwards** runs an FRG–7700 with a long wire antenna finding ZB2HM on 3·5MHz, then 9H1FN on 7MHz plus OD5CP. Up to 14MHz and Scout Jamboree station DX6BJP, 5Z4KSA, VP9CP, XN3XN and P29YT. Roger is G1IWZ and runs an Amtech 300 so must presume he worked all this stuff.

David Haigh in Halifax, W. Yorks, has now acquired an Eddystone EA12 set and has copied stuff from all over using a 10m-long wire antenna. He had a Vega 206 receiver before which was pretty "deaf" and he'd like to exchange it for an a.t.u. His QTH is 27 Dodge Holme Gardens, Mixenden, Halifax.

Melvin Dunn of Grimsby, again, has a Realistic DX160 and a 40m-long wire antenna on which he found DA2REF and ZF3IR/4X4 (QSL via WA4WTG) on 3·5MHz, then on 7MHz a whole string around 0200Z like YV5GFK, HI8MM, PY8RJB, 6Y5RP, HK5DZK (QSL POB 100, Medellin), YS1SA. On 14MHz Melvin logged VP2EC, VP9AD, FO8JV for a good catch, 5Z4JD and TG9VH.

A Yaesu receiver plus a 12AVQ antenna with an alternative 20m-long wire brought some nice DX to **David Price** in Wellington, Somerset, like ZL4AV around 0830Z as well as VK4KS on 7MHz, plus TK5EP on Corsica with cards to F6EYS. On 14MHz he found 6W1NQ, 8P6QT, K0GU/8R1, XT2BR and VP2MW. Up to 21MHz and YB0ZCE, VP9AD, TI1C, 4V2C on Haiti, K1KI/PJ4 (QSL K1AR), A61AA in Abu Dhabi QSL G3LQP. The few on 28MHz included 5T5RG, CE3BUC, and 3D6DX. David is busy at the Morse code and has software for his ZX81 computer enabling him to print out code on the v.d.u.

VHF Forum

The middle of October brought a tropospheric "lift" on the 144MHz band with many G stations working into the continent with contacts being made with DL East and West, OK, HB and, it is thought, EA. It all started as far as I was concerned late on October 13 when one or two high-powered stations with large antennas were working into East Germany. It was some five hours after before we, with more humble gear, could do likewise. Apart from some DLs I was able to work Y24BO/P in GM square. OK1KPU/P was heard weakly but not worked. I also heard G6UBE working an Austrian station.

On the 15th many French stations were madly working into GM and EI but the French stations were largely inaudible in southern England. Later I worked several GMs in YR and YP squares as well as two EIs in WO/WM, plus GJ1 and GI4 (XO). During this time several v.h.f. beacons could be heard including GB3CTC (Truro), GB3ANG (Angus), FX0THF near Paris and FX3THF in Britanny, while other stations reported hearing the Spanish beacon EA1VHF on the northern tip of Spain.

GM4NNC in Dumfries (YP) also commented on the "fantastic" strength of the mainly French stations and south coast stations. Trig runs an FT–201 driving a Europa transverter to 144MHz, plus a 5-element quad.

The newcomer to the 144MHz v.h.f. band will probably be confused by the plethora of antennas, receivers and transceivers, masthead amplifiers, pre amplifiers and rotators, to be seen in the various AR magazines. Getting down to basics, a simple vertical antenna, like the widely published Slim Jim, plus a receiver or transceiver will do to start with if operation on the f.m. segment of the band is intended where vertical polarisation is required. On the s.s.b. and c.w. segments horizontal polarisation is the order of the day so a simple three- or four-element Yagi beam antenna mounted at the top of a pole will do for starters. The antenna can be turned by hand initially but before long the need for a rotator will become apparent especially when the weather is bad! In some cases it may be possible to turn the antenna by hand from the shack window.

ON THE AIR

The cheaper rotators are capable of handling quite a large 144MHz beam, and are normally used for broadcast f.m. and TV antennas. If money is no object then get a heavy-duty rotator to take care of future larger antenna arrays. Height is the main criterion for an antenna, the higher the better for terrestrial contacts. Antennas intended for satellite operation can be at ground level if in the clear as they need to be elevated to as much as 50 degrees. If this facility is needed at the top of a mast then a separate rotator for elevation is required.

So we have our antenna and receiver. Very soon it will be noticed that other stations are working/hearing DX stations that you cannot hear and the best way of improving the situation is always to try a better antenna first before considering pre-amplifiers or masthead amplifiers. More elements at a greater height should be the object. This will increase signal strength without introducing more noise. In general 16 elements is about the maximum before the antenna becomes unduly long and an eyesore to the neighbours!

After that the best way to improve sensitivity is to stack two or more arrays one above the other or to use two or more spaced out in the horizontal plane. Vertical stacking is easier on the conventional mast but the spacing for, say, two 9 element arrays needs to be about 3m for optimum gain. More on pre amplifiers and masthead amplifiers next month.

A late note from **Roger Edwards** in Barnes, London SW13, G1IWZ, says he has worked F6CTT/P on the 430MHz band and three GWs. He is also interested in the 1·3GHz and 10GHz bands.

Licensed amateurs and s.w.l.s are invited to write in each month with details of what they have been hearing/working on the v.h.f. and u.h.f. bands. Don't forget the dateline is the 15th of the month.

MW BROADCAST BAND DX

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

by Charles Molloy G8BUS

Interference from other broadcasting stations, known as QRM, is, as regular readers will know, a major problem for the medium wave DXer. It should not come as a surprise since there are thousands of broadcasters right round the world, crammed into the 120 channels that lie between 531kHz and 1602kHz.

DXers are always on the lookout for ways to overcome the problem of co-channel interference. Good receiver selectivity does not help as we are dealing with stations transmitting on the same frequency. The DXer's medium wave loop, which is a directional, moveable antenna can, when connected to a suitable receiver (not a portable), produce quite dramatic results on occasion. Another method of overcoming QRM is to choose a time of day, or year, when QRM is minimal or even absent. We wait until 2300 for some Europeans to sign off for the night before DXing North America. If we listen just before sunrise in summer we won't hear any QRM from Eastern Europe as the path is in daylight. Local radio DXers know that sunrise and sunset at any time of year is favourable for medium range reception. There is another, less well-known dodge which is to exploit the different channel spacing in the Americas compared to the rest of the world.

9kHz or 10kHz

In Europe and in other parts of the world except ITU Region 2, the medium waves start at 531kHz. Add 9kHz and the next frequency is 540kHz, add another 9kHz to obtain 549kHz, then 558kHz and so on right up to 1602kHz. The spacing between each frequency (channel) is 9kHz and this is the separation between stations Less apparent, each frequency is a multiple of 9kHz. 531kHz is the 59th harmonic, 1602 the 178th. Arranging the band this way reduces the number of whistles and heterodynes.

Region 2, which is made up of North, Central and South America and the Caribbean, has 106 m.w. channels. The lowest is 540kHz, the highest 1600kHz. Channel spacing is 10kHz and each frequency is a multiple of 10kHz which means that the final digit is always a zero. Many receivers in the United States drop the final 0 and mark the scale with channels 54 to 160.

DX Slots

What has this to do with DXing? Well, if you study the two systems you'll find that there are only 13 frequencies on the medium waves that are used in both Region 2 and the rest of the world. These are 540kHz, 630kHz, 720kHz and so on in 90kHz steps up to 1530kHz. There are 24 frequencies in Region 2 that are 4kHz "away" from the nearest European channel, quite a windfall for the DXer! These frequencies occur in pairs, starting at 580kHz and 590kHz, then 670kHz/680kHz and so on at 90kHz intervals up to 1480/1490 and 1579/1580.

There are other places in the band where the separation between Region 2 and the nearest European is 3kHz. One such frequency is 930kHz whose European neighbours are 927khz and 936kHz. Our old friend CJYQ located at St John's in Newfoundland transmits on 930kHz. At my location (QTH) the Belgian station on 927 is too strong to suppress completely with a loop antenna but after it signs off for the night at approx 2230 the position changes in our favour. The remaining occupants of 927 are relatively weak and the nearest alternative channel 936, is 6kHz away. We can now listen on 930 even with a random wire antenna.

DX to be Found

What can we expect to hear in these holes in the European Band Plan? On channels with the maximum 4kHz separation from QRM listen for VOCM St John's on 590KHZ and CIYQ Grand Falls, both in Newfoundland, WABC in New York City on 770, WHDH in Boston on 850, CBM Montreal and Radio Jornal Brasil on 940, WBZ Boston on 1030, WNEW in NYC on 1130, WCAU Philadelphia and Radio Coro in Venezuela on 1210, Radio Globo Rio de Janeiro 1220, CKLM Montreal, which broadcasts in French on 1570. On channels reasonably clear of European QRM you may pick up CBNM in Bonavista, Newfoundland on 750kHz, Radio Mundial in Venezuela on 1020, WHN in NYC on 1050, CIGO in Port Hawkesbury on 1410 in Nova Scotia, WQXR in NYC on 1560kHz.

So the QRM problem when searching for DX from across the Atlantic is not as bad as might be thought. A way can be found round most problems which is part of the attraction of DXing. A final thought. How on earth would we work out all these channel spacings if we still used metres instead of kHz?

Sony ICF 7600D Receiver

"The reference to the ICF 7600D in the July issue prompts me to submit my own observation using this excellent little receiver" writes **Michael Rogers** of London. Our reader goes on to say that the m.w. and l.w. sensitivity is not as good as it might be since the internal ferrite rod antenna does not use a tuned winding. In order to improve sensitivity Michael uses a separate, external ferrite rod antenna with two windings that are tuned simultaneously by a twin-gang variable capacitor. No switching for medium to long waves is required. "The tuned ferrite

ON THE AIR

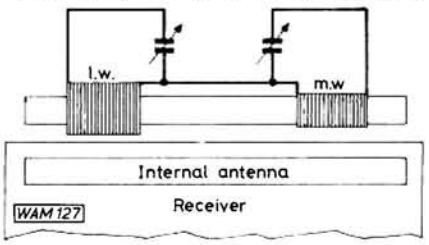


Fig. 1

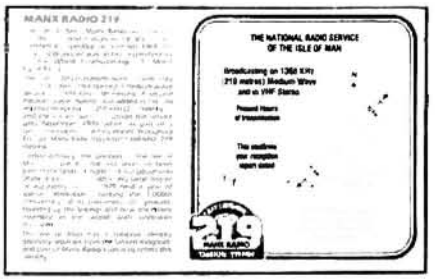
antenna can be moved relative to the internal one and peaked with the variable capacitor to provide sharp tuning and much improved sensitivity" concludes our reader.

The arrangement, which can be used with any receiver that has an internal antenna for use on the medium and long waves is shown in Fig. 1. No direct connection is made between the two antennas and no power supply is needed. You really do get something for nothing when you boost a signal this way. Michael used components from his junk box, so no values are quoted but a Maplin MW/LW Aerial Type LB12N used with their twin-gang 00 tuning capacitor (208/176) should be suitable.

Local Radio DXing

"I have a Bush 5 valve superhet made in 1954" reports **E. G. West** of Calne in Wiltshire, who goes on to describe his

Deutschlandfunk



Manx Radio

outdoor antenna. It is made from copper wire from an old transformer and is attached to a clothes pole 20 metres away from the house "Well above the clothes line I may hasten to add, the other end goes through the wooden frame of my up stairs bedroom window". With this set-up our reader pulled in Manx Radio in the Isle of Man on 1368kHz at 0700, BRMB Birmingham on 1152kHz at 1800, Radio Wyvern (160 watts) on 954 at 0834, Capital Radio in London on 1548 at 0816, Radio Leicester on 834 at 1011, Severn Sound (140 watts) on 774 at 1154, Radio Oxford 1485 at 1545.

Barrie A. Smith of Warley in West Midlands uses a Sharp 315E music centre. "Without any additional antenna other than the built-in one I can pick up Beacon Radio (90 watts) on 990kHz Signal Radio 1170, Viking Radio 1161. **Terry Greenhill** mentions CEEFAX page 195 and ORACLE page 590 which give up-to-date information on BBC and ILR stations respectively. These sources quote BBC Radio Sussex on 1359kHz and 102·7MHz, Radio Mercury (Reigate Crawley) on 1521kHz and 103MHz, Leicester Sound 1260kHz and 97·1MHz, Invicta Sound (Maidstone and Medway) on 1242kHz and 103·8MHz and East Kent on 602kHz and 96·3MHz, Radio Broadland (Great Yarmouth and Norwich) on 1152kHz and 96·7MHz, Hereward Radio (Northampton) on 1557kHz and 102·8MHz with separate programmes from Peterborough. Some new DX to listen for, depending on your location of course.

"Reading about medium wave DXing in *PW* the other day I decided to have a go myself. Using IBA's *Television and Radio 1984* I tuned quite easily to many local stations from around the country" says **Andrew Hill** who lives at Cheslyn Hay in Staffordshire. "Even using a Vega Selena I heard Capital Radio on 1548kHz and Country Sound on 1476kHz using a 20m random wire antenna. Although signals were quite weak they could easily be understood". Shows what can be done with simple equipment.

SW BROADCAST BANDS

Reports: as for Medium Wave DX, but please keep separate.

by Charles Molloy G8BUS

Although international broadcasting is confined officially to bands which are relatively small segments of the frequency spectrum, stations are to be found in the spaces in between. A few operate just beyond the band edges. Belgium for example on 5·895MHz. Others do not really belong to any band, the Voice of Lebanon on 6·550MHz lies half way between the 6MHz (49m) and 7MHz (41m) bands.

There are interesting broadcasts and DX to be heard out-of-band and there is the advantage of being able to listen relatively free from interference. The best place to start is at the band edges. The lower unofficial limit of the 6MHz band is 5·900MHz. Saudi Arabia transmits on 5·875MHz. At the other end of 6MHz listen for the Voice of Hope on 6·215 and the Voice of Peace on 6·240MHz.

Perhaps it is in the regions well away from bands that the most interesting catches will be made. The space between 4·000 and 4·750MHz, the limits of the 75m and 60m bands respectively, is the home of local broadcasting in China, Mongolia, Brazil, Vietnam, Ecuador, Peru, Bolivia, Bhutan, Indonesia, the USSR and Korea. There is also of course on 4·500MHz the well known Time and Frequency station VNG in Lyndhurst, Australia, which is a good guide to propagation on the tropical bands.

Search between 6MHz and 7MHz bands for Pyongyang on 6·340 and 6·540, for South Korea on 6·480, Beijing on 6·550/6·810/6·825. Similarly between the 7MHz and 9MHz and the 9MHz and 11MHz bands. Out-of band broadcasting does not extend much above 12MHz which seems to indicate that a lot of it is of a local nature.

Tropical Band DXing

"I have acquired a Racal RA17 Mk2, covering 0–30MHz in 30 bands—each 100kHz takes up 150mm with each kHz individually marked," reports **Richard N. Carrick** from Barrow-in-Furness. He is delighted with his new set, purchased at a radio rally for £150. I'll bet you had to have a helping hand to carry it away! Many would regard the RA17 as the ultimate in valved communication receivers and it is hard to think of a more suitable one for picking up DX on the tropical bands.

When used with a Datong AD270 active antenna this powerful receiver pulled in Monrovia in Liberia on 3·255MHz and Accra in Ghana on 3·366MHz both in the 90m band, All India Radio Delhi on 3·925 and Hubei in China on 3·940 both on 75m. Two interesting out-of-band catches were Fujian on 4·045 and Xinjiang on 4·220, both in China. The 5MHz band (60m) produced Bangui in the Central African Republic on 5·034 and Singapore on 5·010MHz. Times of reception were not mentioned but would probably be during the evening.

"Unfortunately I am not able to erect a long wire which would probably improve my DXing," concludes our reader. In-

ON THE AIR

deed it would. You really do need a good outdoor antenna to get the best out of a receiver like the RA17, or any other communications receiver. An outdoor TV antenna is often a reasonable substitute for a random wire. Plug it directly into the receiver if there is a coaxial socket. Get hold of a two-way TV antenna switch intended for switching the TV to either of two antennas. You can use it to switch the TV antenna to the TV set or to the radio as required, Fig. 1 shows how to do this.

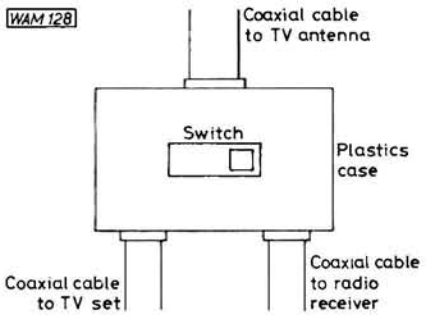


Fig. 1

DXing on 4MHz

The 4MHz, or 75m band as it is known by DXers, occupies the 100kHz from 3·9 to 4·0MHz. It is not a tropical band at all as it is not used for broadcasting in ITU Region 2—the Americas. Region 1, comprising Europe and Africa, only has the upper half of the band from 3·950 to 4·000MHz. This leaves 3·900 to 3·950 clear of local QRM for Asiatic DX, though there are some commercial users as the 4MHz band is a shared band.

"Recently I have noticed that Sao Vincente in the Cape Verde Islands comes in quite well during the late evening on 3·930MHz. Also I have heard relatively strong signals from India on 3·905MHz during the early evening—a sign that lower frequencies are improving," writes **Karl Lewis** of Pensilva in Cornwall. This DX was picked up using the Realistic DX160 communications receiver. At my QTH, using a BRT400 with 25m random wire and a.t.u., the BBC World Service has been heard at 1745 from the Singapore relay on 3·915MHz. During the day on the same channel there is a harmonic from a m.w. station on 1305kHz.

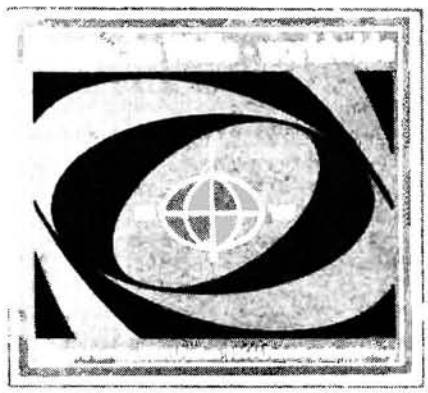
The 9MHz Band

Also known as 31 metres, this band provides medium range signals during the day and long distance reception after dark. Typical of daytime reception is Radio Sweden on 9·630MHz which puts in a really good signal at my QTH at 1100. Swiss Radio International can be heard in English on 9·535 at 1530, Bucharest on 9·690 at 1300, Beograd on 9·620 at 1530, Voice of Greece on 9·420 at 1540. DX to look for includes Bamako in Mali on 9·635, Sanaa in Yemen on 9·780, Addis Ababa in Ethiopia on 9·525.

During the evening listen for Israel on 9·425/9·920, Afghanistan on 9·663, Seoul in Korea on 9·870, Cairo on 9·475/9·675, KYOI Saipan in the Marianas on 9·670, Radio Japan on 9·615, Voice of Free China in Taipeh on 9·610/9·765, Radio RSA on 9·585, Radio Cairo in English 9·805 at 2115, Algiers on 9·510/9·685. Radio Nacional de Paraguay in South America is sometimes heard on 9·735 during the late evening while Radio Australia usually puts in a good signal on 9·580 around 0800.

On the Bands

Have you listened to India on the short waves? It comes in well in the UK during the evening. Try 11·620 at the low frequency end of the 11MHz (25m) band. Programming is in English throughout the evening until sign-off at 2230UTC and you can obtain a schedule, programme information and a QSL from All India Radio, External Services, PO Box 500, New Delhi, India.



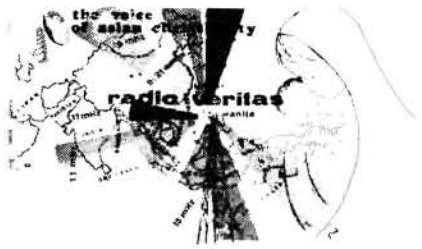
Deutsche Welle sticker

Broadcasts from both sides of the Gulf War, in English, are easily picked up in this country. Listen for Radio Bagdad on 7·120 and 9·610MHz at 2030 and for Teheran on 9·022MHz at 1930. Farther east is a more interesting broadcaster—Radio Korea. Located at Seoul in South Korea it can be heard on 15·575MHz (19m band) at 1800. The station address is Korean Broadcasting System, Overseas Service, Seoul, Republic of Korea. Radio Pyongyang in North Korea can usually be picked up on out-of-band 6·575. For a QSL write to Radio Pyongyang, Pyongyang, North Korea.

Readers' Letters

From Auckland in New Zealand comes an interesting letter from **Henry Falkner** (ZL1AN) who describes his efforts to improve reception with his Sony ICF 7600A portable. "It employs dual conversion with each of 7 s.w. bands employing its own 1st crystal oscillator. Dial accuracy 10kHz within calibrated dial but the BBC on 15·070 kept falling off the edge. Retuning definitely requires the use of the service manual—one slug for each of the seven centre frequencies, a slug and trimmer for correct spreading of bands. The centre-frequency slugs are used to match the r.f. circuit to the telescopic antenna, which is not as the service manual tells you, but improves sensitivity somewhat. To correct the dial readout you use the frequency coverage slug and trimmer." Not a task for the novice to undertake.

Karsten Petterson of Aarnes in Norway refers to reader N. Pound's problems with the Grundig Satellit 1400 (August issue). "I have a Satellit myself of the same type. I've solved the problem by using dipole antennas. I think the problem is more a matter of impedance (matching) between radio and antenna than overloading. The set has 6 antenna coils, one for each s.w. band and these are adjusted for 75Ω antenna input." Our reader has even constructed a dipole for the 5MHz band. "This antenna with a total length of 28·6m looks like two long wires and a garden is needed for this set-up."



Radio Veritas (front and back of QSL card)

"I tuned in to radio station KYOI between 1000 and 1110UTC on 11·900. Signal strength was very impressive and so was the music at times. KYOI is an all music station with announcements in Japanese and English. The address announced over the air is PO Box 1629, Canoga Park, California 91308, USA.", reports **Andrew Hill.** The transmitter is in the Marianna Islands near Japan. The last word is from **John Dennis Court** of Birmingham, "I am using a Realistic DX-100L which I bought for £5 on a radio phone-in." Quite a bargain John, hope you don't desert DXing for phone-ins!

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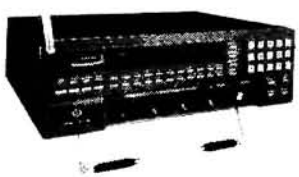

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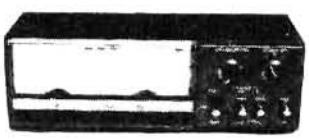

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VHF BANDS

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

by Ron Ham BRS15744

Aurora, sporadic-E, tropo and meteor "pings", we have it all under discussion this time, added to which, is news about a solar observer in South Africa, pleasing contest figures for two Sussex clubs and a bit of activity on the sun that set the magnetometers vibrating.

Solar

One of the many people interested in the sun's effect on radio communications is **Tony Voorvelt** ZS6CCD. He told me that apart from making radio observations of the sun, he also uses a v.l.f. (very low frequency) receiver, with a multi-turn frame antenna, to monitor the carrier of a distant station around 23kHz. He has noticed that when a solar flare manifests there is a sudden enhancement of v.l.f. signal. Tony uses a Microwave Modules converter into an FRG 7700 receiver for solar and satellite work between 136 and 138MHz and plans to listen out on 14·115MHz every evening from 1800 to 1900 with his FT-901 and multiband dipole, ready to work anyone who comes up. From his home in the Transvaal, Tony can hear the v.l.f. signal from Rugby at good strength and in reply to my question about special interests he said, "any band that is open". Readers wishing to make skeds or talk about solar observations can write to him at P.O. Box 943, Bedford View, Transvaal 2008, Republic of South Africa.

During the evenings of October 18 and 19 the magnetometers operated by **Ron Livesey,** Glasgow, Auroral co-ordinator of the British Astronomical Association and **Owen Pearson,** Edinburgh, gave warnings of a strong magnetic storm. Despite the bad weather, breaks in the cloud enabled **David Gavine,** Edinburgh, to identify an auroral homogeneous arc at about 10 degrees above the horizon around 1800. Later David observed a most brilliant and violent aurora between 1955 and 2005, which consisted of a bright arc, some 14 degrees above the horizon, topped with rays up to 70 degrees that were moving eastward and westward simultaneously. These were accompanied by a bright golden ball of light which appeared to dance back and forth above the arc and was as bright as the moon. What a wonderful sight David and your description will make many of us envious. "It was the most brilliant display that David has seen since the big events of the International Geophysical Year", said Ron, who added that their magnetometers were disturbed again at various levels on several occasions between the 19th and the 25th.

Dave Coggins, Knutsford, received auroral type television signals on 49·75MHz at 2040 on the 18th and I recorded a few small bursts of solar radio noise at 143MHz at midday on the 21st, 24th and 27th. It is most likely that the cause of all this activity was the small sunspot seen by **Ted Waring,** Bristol, on the 20th, and by Ron Livesey on the 21st, and drawn by **Patrick Moore,** Selsey, on the 17th, 20th and 21st, Fig. 1. Ted also observed 4 sunspots on November 10.

Roy Quantick G3UGL, Cranfield, is very interested in the sun's influence on the propagation of radio waves in the h.f. bands and has plans to use the smoothed sunspot number and the 10·7cm solar flux data to work out the m.u.f. between various points on the earth's surface.

The October issue of *Solar News,* the circular of the London Solar Committee, price 50p each or £2 per annum, contains articles about the position of the sun in the galaxy, meteor and solar activity and solar reports for July, August and September. One of the committee members, **Bill Wooller** G3GYZ, Hastings, is prepared to take solar reports over the air and sunspot drawings and enquiries regarding computer work should go to him at Stella Maris, Fairlight, Hastings, East Sussex TN35 4BG. Please remember to enclose an s.a.e.

"On October 25 the BBC World Service apologised to its listeners in North America because of poor reception due to a magnetic storm", writes **John Desmond,** Cork City. Thanks John, this is a useful source of information which other readers may like to consider.

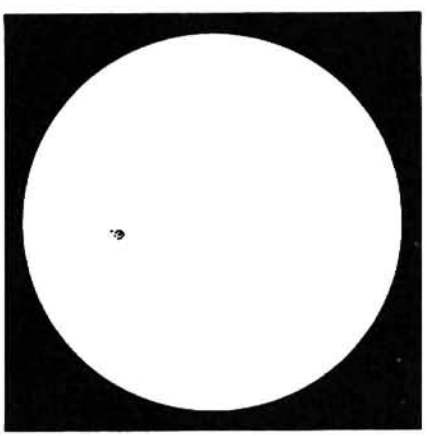


Fig. 1

28MHz Band

Two Newport readers, **Andrew Guy** and **Damien Read,** between them heard signals from Belgium, Holland, Germany, Italy and Scandinavia in the 28MHz band due to a short spell of sporadic-E during the morning of October 14. Andrew reported hearing Italian stations taking part in a contest on the 28MHz band.

"Some f.m. stations were ridiculously strong, some hitting the stop of my S meter, during the sporadic-E on October 14," writes Dave Coggins, having logged DF8CG, DL2GBT, HB0BJQ, HB9CXH and WB5NAR/M/DL, via this mode. Among the DX stations that Dave heard in October were CE0AA, CE6EZ, FR0FLO, J28EB, TL8CK, TR8IG, W4KVR, ZP5RG, ZS6BPL and 3D6DX.

A near neighbour of mine, **Fred Pallant** G3RNM, logged a good number of European stations on just a few days in October in addition to a PY2 at 1800 on the 18th. "High bands not very productive in October despite frequent excursions into 28/29MHz", writes **Bill Kelly,** Belfast, who adds an interesting point. "Many days the expected W. German beacon did not come through, strange as 27MHz was often very active with continental CB stations roaring in". While conditions are so poor on 28MHz, Fred is of the opinion that people should call on a seamingly dead band and see what happens. Several enthusiasts share your view Fred, after all it has been shown many times that a contest, because of the large number of operators, will find a band with often unexpected life. "There was quite a contrast in band conditions, some days it was completely dead and others it was full of stations", writes John Desmond who, on the good days logged signals from South Africa and South America and UA6 and UB5, for the first time in a long while, on November 1.

Propagation Beacons

Between October 1 and 18, **Roland Jeffery** G6DSA, Winsford, carefully monitored the signals from the 50MHz beacons GB3SIX on 50·020MHz and GB3NHQ 50·050MHz. Apart from days 3, 6, 12 and 13, he logged both signals daily at about strength 1, with a peak from GB3NHQ to 539 around 2130 on the 15th, which may have been due to the good tropo conditions at the time. During the high atmospheric pressure, see Fig. 2, at the end of October, Dave Coggins received signals from the RSGB beacons at Angus GB3ANG 144·975MHz and Wrotham GB3VHF 144·925MHz on the 29th, 30th and 31st and Cornwall GB3CTC 144·915MHz at 0800 on the 31st.

ON THE AIR

Unlike Dave, I can hear signals from the Wrotham beacon all the time, at about 539, with a vertical dipole feeding my receiver and when it increased to around 569 from the 26th to the 30th, I knew conditions on the 144MHz band had improved considerably. It is interesting to note that toward the end of an opening there is a real increase in signal strengths and at the same time on the 31st that Dave heard GB3CTC, a good distance from his QTH in Cheshire, GB3VHF was 599 with me.

Dave received strong signals from the German 28MHz band beacons DK0TEN and DL0IGI, via short-lived sporadic-E, daily from the 14th to 18th inclusive and again on the 22nd. On the 14th and 26th, Dave and Bill Kelly respectively reported hearing another German beacon sending, "EST DE DL0DTH QTH EJ14H PSE QSL". When between 0900 and 1000 on November 2, I heard the beacons from Cyprus and Norway come up from an otherwise dead 28MHz band, I realised something was on and tuned up to 49·75MHz and found pictures from the USSR. Then between 66 and 73MHz, I counted 31 very strong f.m. signals from eastern European broadcast stations and **Harold Bredribb,** St Leonards-on-Sea, counted 39 such stations at 1215 still loud and clear. Although short-lived, this was one of the most intense winter sporadic-E disturbances I have known and brought to my notice by a pair of 28MHz beacons whose signals at the time were out of character.

"Z21ANB is the Tom Short memorial beacon, P.O. Box 1372, Bulawayo, Zimbabwe, location 20° 7'S and 28° 38'E", writes **Ken Rawlings** Z2 288, from Majvingo. He tells me that the ZARS President's report in October points out that this beacon has had its problems for short periods and the antenna has been changed during the year to a vertical instead of a Yagi for better all round radiation. Thanks for the information Ken, we are always pleased to hear about such changes and details about individual beacons.

Bert Glass, Plymouth, received signals from the Gough Island beacon ZD9GI, at strength 7, on November 10 for the first time in months and Bert's log, along with those of **Chris van den Berg,** The Hague, Dave Coggins, **John Coulter,** Winchester, John Desmond, Bill Kelly, Ted Owen, Ted Waring and my own are combined to produce our monthly 28MHz beacon chart, Fig. 3.

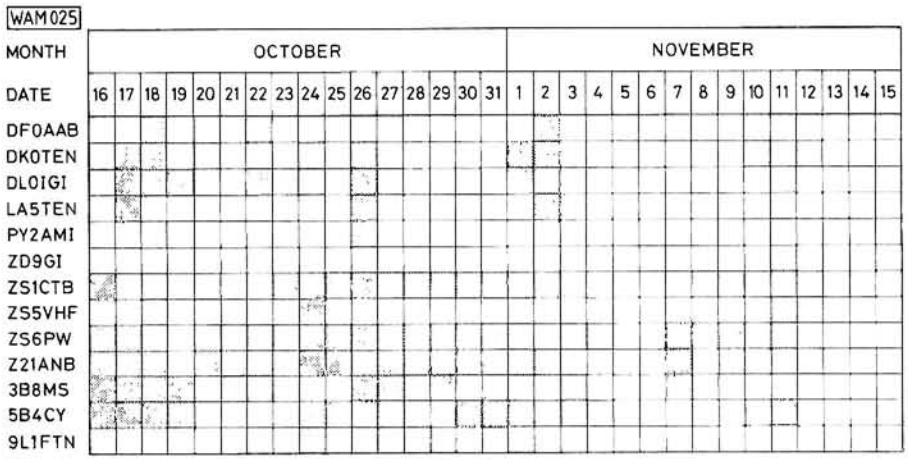


Fig. 2

Meteor Trail Reflection

When minute particles from our solar system collide with the earth's atmosphere, they burn up and leave, for a few seconds, a decaying trail of ionised gas which can scatter radio signals over a wide area. That is putting it as briefly as I can to explain why we hear "pings" of programme content from radio transmitters whose signals we cannot receive under normal circumstances.

Dave Coggins received signals via this mode from the 28MHz beacon in Sussex GB3SX on October 8 and from the German beacons DL0IGI and DK0TEN on the 12th and 17th respectively and Roland Jeffrey noted reflections from the 50MHz beacons GB3SIX on days 1, 2, 8 and 10 and GB3NHQ on days 5 and 14.

Between September 1971 and July 1975, I monitored the frequency, 70·31MHz, of a Polish broadcast station at Gdansk and with a home-brew electronic counter, coupled to my receiver, I recorded the number of times that the Gdansk signal was received at my QTH via the meteor scatter technique. The system worked for about 15 hours each day and after allowing for interference to the experiment by Aurora, sporadic-E and thunder static the results, over the 3 year period January 1972–December 1984, showed that a total of almost 4·5 million "pings" were recorded in just under 15 000 hours of observation. This gives an average of around 300 "pings" per hour and taking 1972 as an example, the lowest number I recorded in one day was 530 on January 18 and the highest was over 14 000 on August 12, at the peak of the Perseids meteor shower. During the past decade, many radio amateurs have made long distance QSOs on the 144MHz band at the specific times of the year when the earth passes through swarms or showers of these particles during its orbit around the sun.

Tropospheric

With a view to assisting newcomers to the world of v.h.f. and u.h.f. communications, I have reduced the atmospheric pressure readings on the chart of my barograph to those which it recorded each day at noon and midnight between October 16 and November 14, Fig. 2. The pressure at the beginning of this period was falling from a high and a tropospheric opening was on the wane and apart from the opening which coincided with the high pressure between October 26 and November 1, the v.h.f. band stayed typically quiet while the barometer was low. At Maldon in Essex, Ted Owen also records the daily pressure and his readings are similar to mine.

"Severe congestion on 144MHz with chaos resulting from repeater users activating more than one repeater", writes

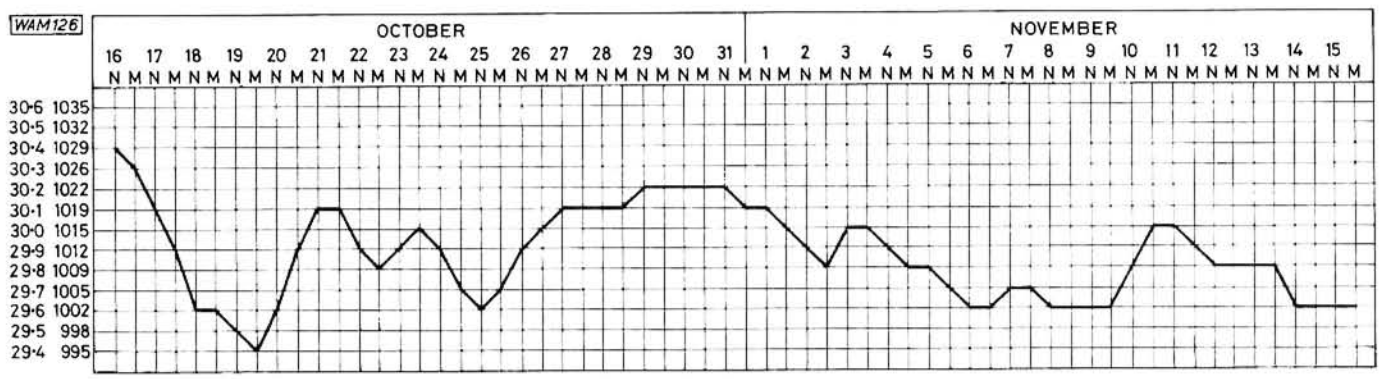


Fig. 3

On The Air

Paul Drinkwater on October 15. Around the same time Bill Kelly who has a poor location for v.h.f., received strong signals from the 144MHz band repeaters at Caernarfon GB3AR R4, Calbeck GB3AS R1, Limavady GB3LY R0 and heard an EI station work a GM through the Dundalk repeater EI7DAR on R3.

Band II

Right on the end of the deadline for our January issue a tropospheric opening was in progress and by the time I received your letters on the subject it was too late to use them, so that's where we start this time.

While enroute through Basingstoke on October 13, **Siomn Hamer** and **Bert Mills** GW3LJP, received Signal Radio from Stoke-on-Trent. When in Sussex on the 14th they found Band II full of French stations from Brest, Boulogne, Caen, Lille, Noirt, plus RTBF from Leglise. On their return home to New Radnor on the 15th and early on the 16th they logged similar French and Belgian stations in addition to BBC Radios Kent, Solent and Sussex and the IBA's, Invicta Sound, Radio Mercury and Southern Sound.

Paul Drinkwater, recently added a Vega Selena B212 multi band receiver to his station and says that it is "exceptionally sensitive" on Band II with its own sizeable telescopic antenna. Paul uses this set in conjunction with a less sensitive receiver with an outdoor half wave dipole. From his home in Sutton Coldfield, he heard BBC Radio Sussex and ILR Invicta Sound early on the 13th and during the morning of the 15th he logged 4 French stations between 99 and 104MHz, ILR Radio Mercury, Invicta Sound and Viking Radio and BBC Radios Northampton and Sussex. Paul made a phone call to an on-air competition on Invicta Sound and the DJ and programme producer were amazed to hear from him. At that distance, Paul, I am not surprised. On October 12, while on a visit to Damien Read's QTH, Andrew Guy, using his Sony ICF7600D receiver listened to programmes from France Frequence-Nord, Inter and Musique, BBC Radio London and ILR BRMB in Birmingham and 2CR Bournemouth. Back at his own QTH on the 13th, Andrew heard France Inter all evening and France-Cultur signing off with the French national anthem at 2300. Between then and midnight Andrew heard Frequence-Nord and Belgium's BRT, and early on the 14th he added BBC Radio Devon and ILR 2CR. At 1055 he caught an Italian station around 94·8MHz which faded quickly and was "flabergasted" at 1058 when he heard bells and found that this was Vatican Radio from which he listened to station IDs in English, Italian and Russian and the Pope's weekly angelus, live from St Peter's Square. "Amazing stuff, at 1113 I heard a strong pop station, non-stop pop music, presumably Italian", said Andrew after this short but interesting bout of sporadic-E. With all this excitement, Andrew did not forget the tropospheric lift that was still in progress and soon added BBC Radio 3 from the Channel Islands, ILRs Mercury and LBC and a couple more French stations to his log.

On the 15th he again received the BBC from the Channel Islands, plus BBC Radio Oxford and Bill Kelly heard Radio Cumbria and Cymru. Around 0930 on the 15th, **John Williams,** Charlton Kings, heard one of the French stations around 98MHz fighting for predominance and sometimes swamping an official station in this part of the spectrum and during the morning of the 16th, he gathered from the adverts that a strong station he was listening to around 102MHz was coming from the Corby, Daventry and Northampton area. During the 15th, John Coulter, reports strong signals from Chiltern Radio, Hereward Radio, Radio Mercury and Radio Sheffield. The next opening came at the end of the month when Bill Kelly received signals from BBC Radios Clyde and Merseyside, ILR Radio City and from Ireland Radio Telefis Eireann and Radios Dublin and Nova and Sunshine Radio. At 1730 on the 31st, I counted 8 French and 2 Dutch stations between 88 and 102MHz and a few French and Dutch again during the evening of November 11.

Contest News

The Chichester and District Amateur Radio Club, using an FT-221 transceiver, 150W linear and 2 × 16-element Tonna antennas, made 482 contacts in 72 QTH locator squares during the RSGB's 144MHz Trophy and IARU VHF and SWL contest which took place over the weekend of September 1 and 2. Their best DX was IW2CSM at 1014km. The Mid-Sussex Amateur Radio Club also used an FT-221, plus an Alinco 180W p.a. and a 16-element Parabeam in the same event and made about 650 QSOs and nearly 300 were with foreign stations. Their best DX was EA3AYN at 982km.

One of the Chichester club members, **Kevin Piper** G8TGM, took part in the 9H VHF/UHF/SHF Falcon contest and came 11th out of 31 entries. Our congratulations to all concerned, it is events and results like these that do great credit to the amateur radio movement around the world.

Television

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

by Ron Ham BRS15744

Obviously newcomers to TVDXing would be unwise to spend a lot of money on a television installation until they are sure that it holds sufficient interest for them. The periods of increased TVDX activity are limited to the times of the random atmospheric disturbances which manifest during a year. I was reminded of this by a letter from **Neil Purling,** Hull, a beginner with a Hitachi portable receiver, covering Bands I and III and u.h.f. and a combined Bands I and III antenna. He asks, which way should he point a fixed antenna so that he can see what DXTV is like before investing money in a rotator and a larger antenna system. If you do decide on a rotator Neil, it would be wise to add a wide-band u.h.f. array to the mast facing in the same direction as the v.h.f. antenna because, during a tropospheric opening there is a fair bit of DX to be seen between Chs. 21 and 69. Of course a rotatable antenna is best, especially for Bands III, IV and V where the direction is more critical than it is for Band I.

Although we talk in Channel numbers for television stations, try to ignore this and look at the dial on your set as though it were calibrated in megahertz and tune it in the same way as you would any other type of radio receiver. Reference to the *World Radio TV Handbook* will show that all TV transmitters, by international agreement, have a channel number and of course a fixed radio frequency. With this in mind, consider v.h.f. Band I, not as Chs. E2 to E4 as scribed on your dial, but as a tunable range of 48 to 68MHz and v.h.f. Band III not as Chs. E5 to E12 but as 175 to 230MHz. The same applies to the u.h.f. band, Chs. 21 to 69, which is divided into two sections, Band IV Chs. 21 to 38 (471 to 607MHz) and Band V Chs. 39 to 69 (615 to 855MHz). Because of the limited range of a television signal, most of the world's television networks are able to share these frequencies without interfering with each other, which is fine, until a natural disturbance occurs within the lower ionospheric or the tropospheric regions of the earth's complex atmosphere. The former, called sporadic-E, happens most frequently

ON THE AIR

between May and September and occasionally during the other months and the latter, known as a tropospheric opening or "lift" can occur at any time when the atmospheric pressure is high and the cold and clear or hot and dry weather is on the change. See the barograph chart in *VHF Bands*. Both of these natural phenomena can cause a TV signal to travel up to between 20 and 40 times its normal range and then, under these circumstances, we receive long-distance (DX) pictures for a few hours via sporadic-E, or sometimes for a few days if the cause is tropospheric.

During these events we can expect to see 625-line pictures from Austria on Chs. 2 and 4, Denmark, Finland and Iceland on Chs. 3 and 4, Portugal on Chas. 2 and 3 and from Germany, Norway, Spain, Switzerland and Sweden on Chs. 2, 3 and 4, 48·25, 55·25 and 62·25MHz respectively. Pictures from Ireland's Ch. B and Italy's Ch. A appear on 53·75MHz and Italy's Ch. B is on 62·25MHz while signals from Czechoslovakia, Hungary, Poland and the USSR can be found on Chs. R1 49·75MHz and R2 59·25MHz. Turning to Band III, transmissions from Belgium have been allocated Chs. 8, 10 and 11, Denmark Chs. 5, 6, 7, 8 and 10, Holland Chs. 5, 6 and 7, Ireland's Chs. D 175·25MHz, G 199·25MHz and H 207·25MHz and Germany, Norway and Switzerland have Chs. 5, 6, 7, 8, 9, 10 and 11 which represent 175·25, 182·25 189·25, 196·25, 203·25, 210·25 and 217·25MHz, repectively. These countries also have a number of channels for their use in Bands IV and V.

The number of stations which can be seen at any one time depends greatly on the extent and direction of the prevailing disturbance, conditions do ebb and flow throughout an event and signals often mix together, which makes it fun to sort them out and then write and tell me about it. My advice to all TVDXers is, tune the bands daily and be patient, you may have to wait days or even weeks between events, but when it comes it's well worth it. Getting back to the point of the fixed antenna, I would suggest facing it toward mid-Germany, what do you think readers?

Suitable sets and antennas for DXTV are not always available. However, I see by the new catalogue, price 60p, from South West Aerials, that they specialise in supplying the DXer and usually carry in stock such items as antennas, converters, connectors, distribution amplifiers, filters, mast and set-end amplifiers and rotators. David Martin, one of their directors, will give advice to enthusiasts on receipt of an s.a.e. I have often found that just browsing through an illustrated catalogue, like theirs, can solve existing problems or give ideas for a new installation. I see that SWA also supply the JVC CX610GB and Waltham 416 receivers, both suitable for DXing, as well as the books, *Long Distance Television* by Roger Bunney at £2.40 and *Guide to World Wide Television Test Cards* by Keith Hamer and Garry Smith, price £2.95. Like David, who you can write to at 11 Kent Rd, Parkstone, Poole, Dorset BH12 2EH, Roger, Keith and Garry are all TV enthusiasts so their writings and advice are helpful, because it is based on their own personal experiences.

As we look forward to the coming DX in 1985, it is worth, especially for our new readers, taking a look at some of the test cards received during previous events from Austria, Fig. 1, Germany, Figs. 2 and 3, Holland, Fig. 4, Norway, Fig. 5 and Yugoslavia, Fig. 6 by **Keith Hamer** and **Garry Smith, David Hackwell, Fraser Lees, Roger Wallis, Len Eastman** and **Dave Cawser** respectively.

Band I

Just to show that there is sporadic-E about during the late autumn months, I received colour bars on Ch. E2 and bursts of test card, scribed RS–KH, from Czechoslovakia on Ch. R1 at 1250 on October 17. Bursts of test cards from Czechoslovakia and Poland on Ch. R1 were seen at 0806 on the 20th, the Dutch caption Pauze and a clock showing 1125, with rapid QSB, on Ch. E4 was seen on the 23rd with continual fluttery syn-

Fig. 1

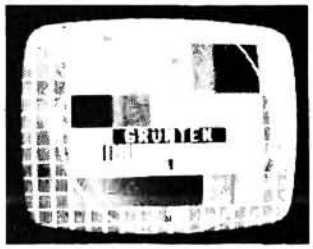


Fig. 2

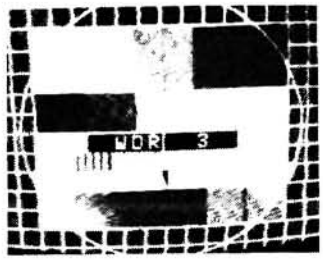


Fig. 3

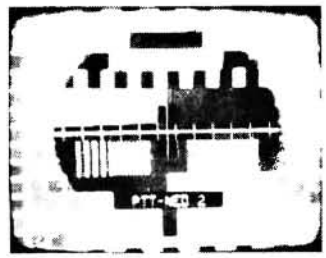


Fig. 4

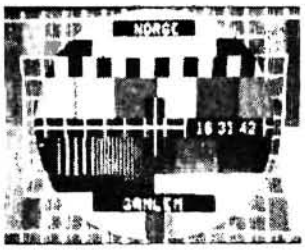


Fig. 5

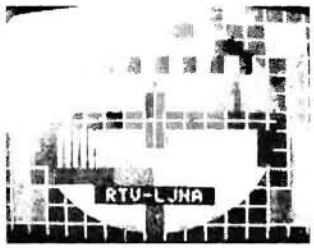


Fig. 6

Fig. 7

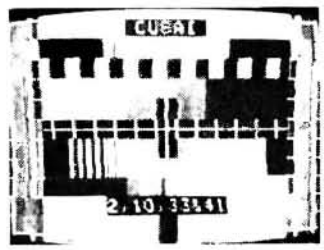


Fig. 8

Fig. 9

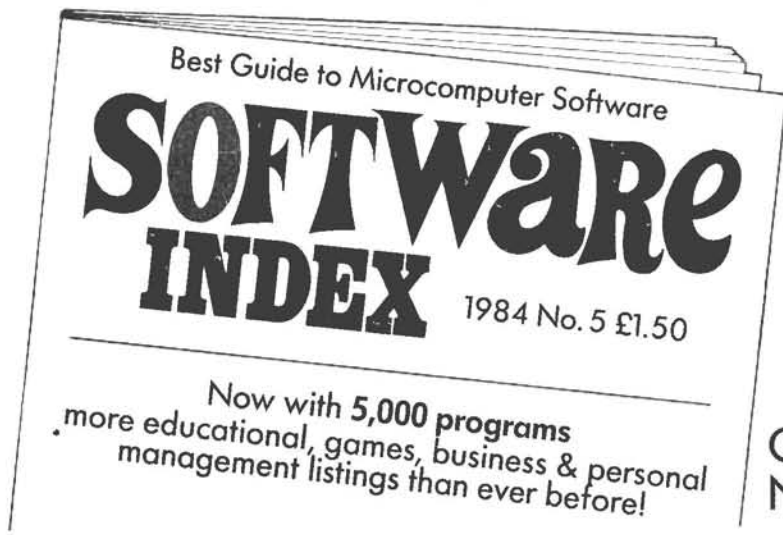
Fig. 10

Fig. 11

Fig. 12

Have you one of these?

Then you need one of these



ON SALE NOW!

ON THE AIR

chronising pulses and corresponding weak frame and line bars on Ch. R1 at 0850 on the 27th. On the 29th similar circumstances, plus a burst of test card from Poland at 0802. Between 0900 and 1030 on November 2 I logged a very strong electronic test card, sometimes in colour, from the USSR on Chs. R1 and R2 and the associated sound on 56·25 and 65·75MHz respectively. My attention was drawn to this event earlier when I copied reasonably strong signals from the 28MHz beacons in Cyprus 5B4CY and Norway LA5TEN which came up from a dead band and indicated that something was on. Readers may already be aware that the sound and pictures from overseas stations do not always come together, this depends on the type of set and the transmission, in my case I tune the Band I sound channels on an ex army R216, v.h.f. communications receiver or preset the sound frequencies on an SX200N scanner.

Tony Palfreyman, Stannington, received test cards from Norge Hemnes on Ch. E3 at 1530 on October 17 and Spain TVE1, E3 at 1235 on the 21st. In addition to the Russian stations he heard Harold Brodribb logged test cards from Czechoslovakia scribed RS–KH and BRATISLAVA.

Tropospheric

While using his receiver in its portable mode, in Basingstoke on October 13, **Simon Hamer** received pictures from TDF Canal Plus on Ch. 5. Then in Sussex on the 14th he logged TDF on the u.h.f. channels 22, 23, 25 and 28 and then, back home in New Radnor, on the 15th and 16th he counted French stations on 16 u.h.f. channels and saw the captions TDF, TF1 A2 and FR3. Simon also received u.h.f. pictures from Crystal Palace, Dover, Hannington, Midhurst, Oxford, Rowridge, Sandy Heath, Tacolneston and Waltham on the 15th.

For at least 8 hours on the 15th, **Mike Bennett,** Slough, received pictures in Band III from France. TDF TF1, and writes, "it began with a test card at 1003 and continued until 1800 when they shut down, there were adverts and short programmes and the strength was terrific, just like my local station with colour from start to finish".

During the afternoon of October 30, **Owen Jones,** Blurton, noticed a marked increase in strength of his BBC1 and IBA Channel 4 pictures along with wide black bands on the screen, which sounds to me like co channel interference due to the changing conditions. For the winter, Owen is playing safe and has lowered his DX antenna from 9m to 3m a.g.l.

News from Abroad

During the summer months of 1983, **Asim Aziz** and **Rehan Mullick,** Fig. 7 received a test card and programmes on Ch. 2 in Band I from Dubai, Figs. 8 and 9, and programmes and news with the HOBOCTN caption, from the USSR, Figs. 10 and 11, at their home in Lahore. It is not surprising that these two *PW* readers sent a report to Radio and Colour Television Dubai and on October 24 they heard the following, "Thank you for your letter and joint effort in producing a tape and some very interesting photographs of our Channel 2 TV", wrote Mrs Kay Fenner from the listeners section of Dubai's external services. She added, "This transmitter is 40kW vision and 4kW sound. Your reception results are outstanding for a 2000km path mostly over land". Mrs Fenner also told them that their letter was included in the 19th edition of their *Mailbag* programme which was broadcast on November 18, 19 and 20, 1983.

One of our readers in Qatar, **Eymard de Silva** reports an unusual TV broadcast, Fig. 12, which he tuned to in September at his home in Doha while using a Sharp PAL/SECAM receiver connected to an Akai VS–6 video recorder. "I first noticed this broadcast from *Cable News Network* on the 27th when it was on for 24 hours, appearing and disappearing and sometimes continuing with distorted pictures without sound", writes Eymard. He adds, "On many occasions the reception was very good, a fine well-defined picture in black and white and clear sound quality. The broadcast, intended for US personnel in the Arab Gulf region is sometimes entitled AFRTS and I shall be grateful if you could advise me from where this is relayed". The date and time is superimposed on the picture by the video recorder. Any ideas readers?

SSTV

"At last on October 15, while in 2 way 8 seconds black and white QSO with G3LUI and G8LWA on 144·495MHz, I learnt from G3LUI that he had seen a demonstration by G1AWK of SSTV using a BBC–2 computer and the G3LIV SSTV terminal unit and was impressed with the 'extremely good quality' of the pictures with 90 per cent detail and 'hard copy' through a printer", writes **Richard Thurlow** G3WW, March. "G3LUI is a home builder of SSTV equipment from the earliest days", said Richard, who also told me that just before their QSO G3LUI exchanged pictures with GU6EBI. During the tropo lift on the 15th, G4UDH, Stoke-on-Trent, received Richard's pictures on his home brew G3WCY SSTV converter and G3WW answered a computer-composed SSTV CQ from ON4ADI on 144·5MHz.

As from early November, the modifications to the SC–1s, belonging to G3WW, G4DYB and G4NJI, for 48 seconds single frame colour were completed, "beautiful" said Richard. **Maurice Webb** G1AMR, Prestcot. has to date swapped SSTV pictures with G1BIF, G3CCH, G3KLL, G6ICR, G6HDD, G6YBC and G8NSE and has sent pictures to 5 other, receive only stations. "Activity in the SSTV field is rising very fast around his QTH and neighbouring counties and many are using ZX Spectrum computers", comments Richard.

Between October 16 and November 15, **Peter Lincoln,** Aldershot, received SSTV pictures from France, Germany, Italy and Spain and finds that Sunday morning is a good time for this mode of communication.

SATELLITES

Reports to: Pat Gowen G3IOR, 17 Heath Crescent, Hellesdon, Norwich, Norfolk NR8 6XD.

by Pat Gowen G3IOR

The first phase of the amateur satellite programme began with the launch of OSCAR-1, a 4·5kg package containing a mercury primary cell powered 144·980MHz temperature indicating beacon, on 12 December 1961. It lasted just 22 days, followed by OSCAR-2, a similar device lasting only 18 days following launch on June 2 the following year. The 16kg OSCAR-3 followed on 9 March 1965 had only a 15 day lifetime, but carried the first solar cells and rechargeable batteries. OSCAR 4 was the first transponder from the 144MHz band to the 430MHz band, being put into a non-intentional highly elliptical orbit on 21 December 1965 with a two month lifetime before burn-up. Australis OSCAR-5 with its 28MHz and 144MHz band beacons, primary cell powered telemetry encoded beacons, command decoders, and with hysteresis spin dampening went up on 23 January 1970, under the auspices of AMSAT. All of these Phase I satellites gave valuable data and guidance in tracking, doppler techniques, thermal balance, and the basic technicalities of amateur satellite requirements.

ON THE AIR

Phase II commenced with the launch of the highly successful AMSAT-OSCAR-6 on 15 October 1972, an 18kg package containing solar-cell rechargeable NiCad batteries powering a long lived 144MHz to 28MHz band transponder a.g.c. controlled, with adequate telemetry, commandable programming, and a 896 bit codestore memory device. It was the first satellite permitting simple access to thousands of amateurs over the earth's surface in over one hundred different countries.

AMSAT-OSCAR-7 was launched into a similar orbit on 15 November 1974, the 29kg satellite carrying a highly effective 430MHz to 144MHz band transponder in addition to that equating OSCAR-6. It could produce either Morse code (c.w.) or RTTY telemetry from the beacons on 28MHz, 144MHz, 430MHz or 2·30GHz of all the varying parameters of power, voltage, temperature from many points of measurement.

AMSAT-OSCAR-8, the last of the Phase-II satellites, was also a 144 to 28MHz (Mode A) satellite, also carrying a Mode J (144 to 430MHz) transponder built by the Japanese JAMSAT group.

All of the previous satellites have long ceased to function, although OSCAR-7 was functioning long after the demise of its battery, due to a cell going open-circuit and permitting the systems to continue to function when the solar-cells were in sunlight, hence producing a positive power-budget.

The first of the AMSAT Phase III satellites, Phase IIIa, was intended for a highly elliptical orbit as was its successor, Phase IIIb, now OSCAR-10. As is well known, it finished as the world's first submarine satellite, deep in the sea off the coast of Devils Island, French Guiana, following a launch malfunction. The generosity of the world amateur-radio community, radio societies, and the IARU provided the means to re-build the satellite Phase IIIb, and this we now are successfully using as the current AMSAT-OSCAR-10. Even this launch had its problems, as despite a perfect launch and injection into orbit, the third stage of the Ariane launch vehicle, in jetting off its surplus oxygen, was propelled into the satellite that it had just released, damaging one of the three arm-end two-element beams, and tilting the spacecraft into an attitude where the cells of the solar-panels were not at 90 degrees to the sun, thus limiting the battery charge, this preventing the electric torquing magnets from being employed to re-orientate the new satellite to its correct attitude. As the sun-angle moved to the plane of the orbit, the situation resolved naturally, and manoeuvring, with eventual switching on of the on-board transponder was effected. Later problems were evidenced with the on-board computer control command, which dictated that the kick-motor, planned to be fired in two or more manoeuvres to first lift the low injection orbit perigee, and then to fire it into a high inclination above 60 degrees, gave a single total firing, lifting the perigee much higher than intended, with the inclination much lower than planned.

The general results of these problems give difficulties to both users and command stations alike, inasmuch as the bent end-of-arm antenna destroys the otherwise perfectly circular waveform of the downlink polarisation, producing a marked and regular variation of signal strength from the spinning satellite. The lower than planned elevation has produced a more serious problem, in that over the course of the year, the sun angle variations dictate that if the satellite was angled so that the end-of-arm antennas were earth-pointing, then the solar cells that produce the power to charge the batteries would not be facing the sun, hence giving an insufficiency of power to maintain the satellite systems. As continuous function of the computer system is essential for the housekeeping regime, this means that the angle of the spacecraft must be set for optimum sun-angle, and this dictates that at times of the orbit the antennas are NOT earth-pointing, thus giving frill side-lobes of the beam system, hence a marked signal strength variation called "spin-fading". The preferred polarisation may change from the normal right-hand-circular optimum to plane vertical, horizontal, and even left-hand circular to give best results. Twice annually the satellite falls into earth's shadow, and needs to have the transponder off for longer periods to maintain power. With a sufficiency of income and effort, the planned Phase IIIc satellite will be launched into the ideal orbit, and give superior results even to the current OSCAR-10 spacecraft.

IIIb, or not IIIb (that is the question!)

The long-term plans of AMSAT, called "Phase IV", is to provide a series of geo-synchronous satellites around earth, all operating in the wide-bandwidth microwave spectrum, each spacecraft with intercommunication to its adjacent, so that whole-world communication is possible at s.h.f. The problem is that few amateurs, even in the relatively affluent west have the combination of technology and capital to be able to afford the specialised equipment and antenna system necessary for the project. One way out of the problem is to have a neighbourhood satellite station, with the dish, equipment, tracking system all subscribed by the local group, and accessed by available shack apparatus, e.g. 430MHz f.m. in a similar way to existing repeaters. The satellite station would be equipped with a computer which would automatically track the satellite, select an unused suitable uplink frequency, adjust the power level of the uplink to that required, and put the downlink signal back on the "repeater" to the user from the corresponding satellite downlink frequency. Thus, all amateurs local to the satellite station would be able to manifest world-wide communication from their shacks, mobiles, or even hand-held f.m. transceivers on existing equipment, by pooling resources and know-how.

The foundations of this concept already exist, as in the USA a number of "gateway" stations are currently functional, successfully combining 144MHz band f.m. with a local satellite station on OSCAR-10, providing excellent communications around the earth to mobile and hand-portable stations in the Washington DC and other areas.

Thus, although we are officially still in the Phase III area, Phase IV has arrived, providing the long considered futuristic concept of working the world from a pocket transceiver! Perhaps the "Dan Dare" wrist-watch radio may not be so far away?

Topical News

The USSR "Radio" RS satellites are currently suffering from a month of eclipse but, with the exception of the now defunct RS-6, should be back with us on full operational schedule by the time that you read this.

OSCAR-10 continues to provide an ever-increasing menu of new and exotic DX callsigns, with A92P, CN8EO, K6LNP/DU2, SU3AM and 7P8CM to be added to last month's DX listing.

The UOSAT satellites, OSCAR-9 and OSCAR-11, continue to provide good service, with U–O-11 now engaged in parallel scientific tests on research projects. Efforts are proceeding to experiment with packet-radio tests, and soon to have the f.m. voice digitalker on, its vocabulary being sufficient to eventually deliver regularly updated news bulletins. The 435·025MHz beacon is equally as strong as its 145·825MHz associate.

Since the demise of USSR Radio RS 1 and RS-2 satellites, launched on 26 October 1978, a "mystery" satellite has been regularly sending "55" and "5015" and even "5555" on the RS 1 and 2 29·400MHz beacon frequency. Even a transponder, often without beacon identification has been heard in the common RS1/2 passband, giving rise to much speculation as to the possibility of a new satellite. Study by a number of enthusiasts, notably s.w.l.s **Harold Meerza** and **Birger Lindstrom** have shown that the signals were heard only when the satellite(s) were in full sunlight, indicating that either RS1 or its brother had an open battery cell, and were functioning directly from solar power. Some considerable confusion was introduced into the identification of which object, radar tracked by NASA, was RS-1, RS 2, the main COSMOS 1045 satellite, and the launch rocket upper stage, later corrected by **Greg Roberts**, ZS1BI at the Capetown Observatory. Most amateurs had literally lost track of the pair of satellites soon after they ceased function in 1979, so it was impossible to tell which of the two was functioning as what, as the telemetry was corrupted from the "RS" to "55". **Leo**

ON THE AIR

Labutin, UA3CR, founder of the USSR Satellite group called DOSAAF, thought that it was most likely that RS-2 was the re-activated spacecraft, as this member had much larger solar cells than RS-1, and could thus produce a sufficiency of power to energise the systems when out of sunlight if the battery were open circuited. Some smart detective work by the members of HAMSAT, the Dutch Satellite body, resulted in both visual sighting and some careful application of drag factors by **Nico**, PA0DLO, with a positive identification that it was the RS-1 Radio spacecraft that had received a further lease of life. It would appear that the occasional activated transponder, without accompanying telemetry beacon, might be RS-2 out of hibernation as well. For those anxious to follow up the mystery, the uplink to both is from 145·880 to 145·920MHz, with a non-inverting downlink between 29·360 and 29·400MHz.

Auroral Warning

The forewarning of an auroral event strikes dismay into the heart of many h.f. operators, and fills the space orientated v.h.f. amateurs with glee. The problem is that one is never that sure if and when the event is to occur, and it is within the first few minutes that the ultra-DX like UA3, OH, SM1 is most likely. Dellinger flares do not always later result in Aurorae, and can be completely missed, especially by the "B" licencees. Adding twenty-seven days to the last event to permit Solar rotation to the same coronal-hole area merely increases the statistical probability, as the holes may have sealed, and new ones may have appeared. More normally, by the time we find an Aurora is active, it is too late for the best.

John Branegan, GM4IHJ, has come up with a paper that gives a valuable guide to those keen to exploit the phenomena, in making use of the SABRE Radar, run from Wick by the University of Leicester. The Wick radar runs 45kW, on 153·213MHz, and can easily be heard on Amateur equipment sounding rather like ignition noise with timebase precision but, of course, only over a few kHz. It has a break in the pulse train every 20 seconds to permit identification.

John is correlating the RADAR with the appearance of the Arctic Ostersund 48MHz TV and with 144MHz band amateur Aurorae, and has evidenced that the radar normally appears as a strong signal some 15-20 minutes before the Arctic TV, and some 30 minutes prior to the arrival of strong amateur signals on 144MHz, thus giving ample time for getting the rig warmed up. Further, it appears at other times of anomalous v.h.f. propagation, such as Meteor Scatter, or Auroral Sporadic E. Copies of the original paper are available via G3IOR QTHR in return for a s.a.e. and £1.00 to cover postage and photocopying, for those needing the finer detail. Other radar stations exist at Uppsala, Sweden (thought to be on 142·583MHz), and at Tromso in Arctic Norway, frequency yet unknown.

RTTY

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

by Ron Ham BRS15744

"The committee of BARTG wish to thank *PW* readers for their past support of these annual events which are organised to promote interest in the RTTY mode as used by Radio Amateurs. They hope that the Group will continue to enjoy the participation of *PW* readers in any future RTTY contents that the group may organise," writes **Peter Adams** G6LZB, Contest Manager for the British Amateur Radio Teleprinter Group. "I look forward to receiving any of *PW* readers logs or comments in connection with our future RTTY contests," said Peter, when he told me about their Spring RTTY Contest which will take place on the 3·5, 7, 14, 21 and 28MHz bands between 0200GMT on March 23 and 0200GMT on the 25th. The event is open to multi and single operator transmitting stations and s.w.l.s and from the 48 hours of the contest period, only 30 hours of operation is permitted. Further details are available by sending an s.a.e. to Peter at 464 Whippendell Road, Watford, Herts WD1 7PT.

Mike Rowe G8JVE, President of the Chichester and District Amateur Radio Club took part in the BARTG Autumn RTTY Contest on the 144MHz band and made 50 contacts, with a best DX of 390km. There is nothing like a contest to wake activity, as I proved during the event on November 10 when I copied RTTY signals from 12 call areas, AE, C53, DL, ED, HG, LZ, OE, OK, UB, W5, 4Z4 and 9H1 around 21·090MHz, having only logged two, D4 and N2, despite checks on the band, on each of the 24 previous days when it appeared almost dead.

Roger Davis G3IUZ, Berkhamsted, became involved in RTTY in the early 1970s using a Teletype 15 page printer, a modified optical tape reader and a Creed tape punch. His terminal unit is an ST-5. Now Roger is in the process of updating his station and is currently installing a BBC computer for future activity.

I am looking forward to hearing from some of the many newcomers to RTTY, such as **Edgar Abraham** ZS6AFF who is intending to get started using a ZX Spectrum as part of his station.

Like myself, **Jack Wingrove**, Battersea, uses a Trio R2000 receiver followed by a Tono Theta 550 terminal unit and to date has logged many RTTY stations from Australia and the USA and is hoping to install a converter for AMTOR in the future.

Packet Radio

The Federal Communications Commission has granted a 180 day special temporary authority, effective 18 October 1984, to 21 amateur radio stations for teleport operation. Teleports in this case act as automatic relay stations between packet radio networks on the ground and amateur satellites. Station covered by the STA are WD4IWG, K1KSY, W3IWI, KD2S, N5AHD, W1HDX, KE6ZE, WA9FMQ, WB6YMH, WA6GXD, KA9Q, WA2LQQ, W1AW, KA6M, K0CY, NK6K, WD0ETZ, WB5YFU, N5BRG, N2EKH and N6IIU. These stations may use 144 to 146MHz and 435 to 438MHz to or from satellites and any amateur frequency at 50MHz or above where digital communication is permitted.

Month on Air

During the period October 16 to November 15, I copied RTTY signals from 7 international call areas, DF, F, G, GW, ON, SM and YZZ around 3·590MHz and 37, CT1, DF, D4, EA, EA8, EI, F, FG, HG, I, KA1, KA9, KL7, LA, LX, LZ, OE, OH, OK, OZ, PY, SP, SV, UA3, UB5, VE, VP9, WS2, 3, 4, 5, 6 and 8, YU, 4X6, 7X4 and, one of the strongest signals on the 14MHz band 9H1EL.

Among the interesting stations logged were KL7TC from Alaska received on October 29, D44BC Republic of Cape Verde October 31 and November 1 and 4, VP9BY Bermuda November 2, PY1WF Brazil on the 2nd and KA1IN Japan on the 4th.

"I found that 14MHz RTTY quite active with signals mainly from Europeans during the day and North Americans in the late afternoon," writes **Peter Lincoln**, Aldershot. He also copied OD5NG and the ZS6CC mailbox, during the month prior to November 15.

Finally the new address for John Beedie, the membership secretary of BARTG is Ffynnonlas, Salem, Llandeilo, Dyfed, Wales.

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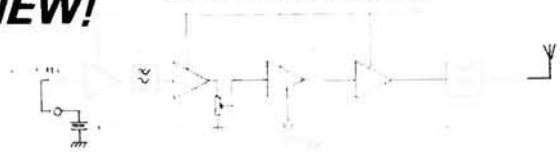

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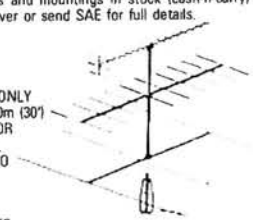

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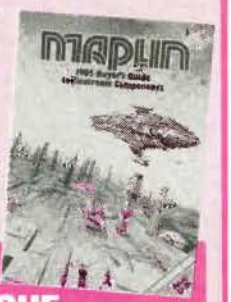

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