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Practical Wireless

THE RADIO MAGAZINE

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TM401A	7cms FM 12W	316.00	(—)
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PB25	Spare Battery Pack	29.10	(1.00)
MS1	Mobile Stand	37.31	(1.00)
R600	Gen. Cov. Receiver	299.52	(—)
R2000	Synthesiser 200KHz-30MHz Receiver	479.47	(—)
HC10	Digital Station World Time Clock	78.99	(1.50)
HS5	Deluxe Headphones	26.88	(1.00)
SP40	Mobile External Speaker	16.46	(1.00)
NEW MODELS			
TH21E/41E	2M/70cm Mini-Handhelds	170.00/199.00	
TM211E/411E	2M/70cm FM Mobiles	365.00/399.00	
TS711E/811E	2M/70cm base stations	768.00/895.00	
TR3600	70CM Handheld	292.00	
TS940S	9 Band TX General Cov RX	1695.00	

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TONO (G series)			
2M40G	2m, 1-3W in, 20-35W out, preamp	101.81	(2.00)
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2M130G	2m, 10-15W in, 110-130W out, preamp	159.00	(2.50)
4M70G	70cms, 10-15W in, 40 60W out, preamp	219.74	(2.00)
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MML144/30-LS	inc preamp (1/3 w i/p)	82.90	(2.00)
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B.N.O.S			
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LPM 144-3-180	2m, 3W in, 180W out preamp	247.00	(2.50)
LPM 144-10-180	2m 10W in, 180W out preamp	247.00	(2.50)
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LP 144 10-50	2M 10W in, preamp	108.00	(2.50)
LPM 432 1-50	70cm, 1W in 50W out preamp	197.00	(2.50)
LPM 432 3-50	70cm, 3W in, 50W out, preamp	197.00	(2.50)
LPM 432-10-50	70cm, 10W in, 50W out, preamp	167.00	(2.50)

SWR/PWR Meters

HANSEN			
FS50VP	50 150MHz 20/200 Interval PEP/SWR	106.70	(1.50)
FS300V	50-150MHz 20/200 PWR/SWR	53.50	(1.50)
FS300H	1.8 60MHz 20/200/10W	53.50	(1.50)
FS210	1.8-150MHz 20/200 Auto SWR	63.50	(1.50)
W720	140-430MHz 20/200W	41.50	(1.50)
WELZ			
SP15	1.8-160MHz PWR/SWR	49.00	(1.50)
SP45	130-470MHz PWR/SWR	69.00	(1.50)
SP10X	1.8-150MHz PWR/SWR	34.00	(1.50)
SP200	1.8-160MHz PWR/SWR	89.00	(1.50)
SP250	1.8 60MHz PWR/SWR	65.00	(1.50)
SP300	1.8-500MHz PWR/SWR	129.00	(1.50)
SP350	1.8-500MHz PWR/SWR	79.00	(1.50)
SP400	130-500MHz PWR/SWR	89.00	(1.50)
SP600	1.8-500MHz PWR/SWR	106.00	(1.50)
NEW RANGE OF WELZ METERS NOW AVAILABLE			
TOYO			
T430	144/432 120 W	44.65	(1.00)
T435	144/432 200 W	49.35	(1.50)

Scanning Receivers

SMC8400	VHF/UHF Scanner	249.00	(2.50)
SX200	VHF/UHF Scanner	299.00	(2.50)
SX400	VHF/UHF Continuous Coverage	598.00	(2.50)
AOR2001	VHF/UHF Continuous Coverage	378.01	(2.50)
FDK RX40	141.00-180.000 MHz	159.00	(2.00)

Icom Products

IC751	HF Transceiver	1299.00	(—)
IC745	HF Transceiver	899.00	(—)
IC735	New HF Transceiver	P.O.A.	(—)
PS15	P.S. Unit	145.00	(4.00)
PS30	Systems p.s.u. 25A	297.85	(—)
SM6	Base microphone for 751/745	40.25	(1.00)
IC290D	2m 25w M/Mode	479.00	(—)
IC290F	10w Multi Mode Mobile	449.00	(—)
IC271E	2m 25w M/Mode Base Stn.	729.00	(—)
IC271H	100W version of above	899.00	(—)
IC25H	2m 45w FM	359.00	(—)
IC27E	25W FM mobile	379.00	(—)
IC45E	70c 10w FM	345.00	(—)
IC47E	25w 70cm FM mobile	469.00	(—)
ICBU1	B/U Supply for 25/45/290	29.90	(1.00)
ICR70	General Coverage Receiver	629.00	(—)
ICR71	General Coverage Receiver	729.00	(—)
IC02E	2m H/Held	269.00	(—)
IC2E	2m H/Held	199.00	(—)
ML1	2m 10w Linear	79.35	(2.00)
IC4E	70cm H/Held	259.00	(—)
IC04E	70cm handheld	279.00	(—)
BC35	Base Charger	62.10	(1.00)
HM9	Speaker mic	18.56	(1.00)
IC3	Carry Case	5.50	(1.00)
ICBP3	Std Battery Pack	27.50	(1.00)
BP5	High Power Battery Pack	52.80	(1.00)
CP1	Car Charging Lead	5.50	(1.00)
DC1	12v Adaptor	13.75	(1.00)

Mutek Products

SLNA 50	50MHz Switched preamp	44.90	(1.50)
SLNA 144s	144MHz Low noise switched preamp	39.95	(1.50)
SLNA 145sb	Preamp intended for 290	29.90	(1.50)
GLNA 432e	70cm Mast head preamp	149.90	(2.50)
RPCB 144ub	Front end FT221/225	79.90	(1.50)
RPCB 251ub	Front end IC251/211	84.90	(1.50)
BBBA 500u	20-500MHz Preamp	34.90	(1.50)
GFBA 144e	2m Mast head preamp	149.90	(2.50)
SBLA 144e	2m Mast head preamp	89.90	(2.50)
RPCB 271ub	Front end for IC271	89.90	(1.50)
TVHF 230c	2M FM Transverter	334.90	(5.00)
LBPF 144v	Bandpass Filter	22.40	(1.50)
LBPF 432u	Bandpass Filter	22.40	(1.50)
TVVF 50c	6M Transverter	199.90	(2.50)
GLNA 433e	70cm Pre-amp	79.90	(2.50)
TVVF 144a	2M Transverter	239.90	(2.50)

Datong Products

PC1	Gen Cov Con	137.40	(1.50)
VLF	Very low frequency conv	29.90	(1.50)
FL2	Multi mode audio filter	89.70	(1.50)
FL3	Audio filter for receivers	129.00	(1.50)
ASP/B	r.f. speech clipper for Trio	82.80	(1.50)
ASP/A	r.f. speech clipper for Yaesu	82.80	(1.50)
ASP	As above with 8 pin conn	89.70	(1.50)
D75	Manual RF speech clipper	56.35	(1.50)
D70	Morse Tutor	56.35	(1.50)
MK	Keyboard morse sender	137.40	(1.50)
RFA	RF switched pre-amp	33.90	(1.50)
AD270-MPU	Active dipole with mains p.s.u	51.75	(1.50)
AD370-MPU	Active dipole with mains p.s.u	69.00	(1.50)
MPU	Mains power unit	6.90	(1.50)
DC144/28	2m converter	39.67	(1.50)
PTS1	Tone squelch unit	46.00	(1.50)
ANF	Automatic notch filter	67.85	(1.50)
SRB2	Auto Woodpecker blanker	86.25	(1.50)

CW/RTTY Equipment

Tono 9000E	Reader/Sender	P.O.A.	(—)
Tono 550	Reader	329.00	(2.50)
MICROWAVE MODULES			
MM2001	RTTY to TV converter	189.00	(2.00)
MM4001	RTTY terminal	269.00	(2.00)
MM4001KB	RTTY term with keyboard	299.00	(2.00)
BENCHER			
BY1	Squeeze Key, Black base	53.95	(1.50)
BY2	Squeeze Key, Chrome base	69.95	(1.50)
HI-MOUND MORSE KEYS			
HK702	Up down keyer marble base	30.95	(1.50)
HK703	Up down keyer	29.35	(1.50)
HK704	Up down keyer	19.95	(1.50)
HK705	Up down keyer	15.49	(1.50)
HK706	Up down keyer	16.96	(1.50)
HK708	Up down keyer	14.95	(1.50)
HK802	Up down solid brass	86.30	(2.00)
HK808	Up down keyer	39.95	(1.50)
MK704	Twin paddle keyer	13.50	(1.50)
MK705	Twin paddle keyer marble base	25.65	(1.50)
KENPRO			
KP100	Squeeze CMOS 230/13.8v	82.50	(2.50)
KP200	Memory 4096 Multi Channel	169.50	(2.50)

Yaesu

FT1	HF Transceiver	P.O.A.	(—)
FT980	HF Transceiver	1650.00	(—)
SP980	Speaker	79.95	(2.00)
FT77	Mobile HF Transceiver	479.00	(—)
FP700	PSU	170.00	(5.00)
FC700	Tuner	119.00	(2.00)
FT77s	10w. version	449.00	(—)
FMU77	FM Board for FT77	28.35	(1.00)
FT757	HF Transceiver	829.00	(—)
FC757	Auto A.T.U.	290.00	(2.00)
FP757HD	Heavy Duty PSU	200.00	(2.00)
FP757GX	Switched Mode PSU	180.00	(2.00)
FL2050	Linear Amplifier	115.00	(2.00)
FT290	2m M/Mode Port/Transceiver	349.00	(—)
FT290	With Mutek front end fitted	379.00	(—)
FL2010	Linear Amplifier	69.00	(1.00)
MMB11	Mobile Bracket	31.45	(1.00)
NC11	Charger	11.50	(1.00)
CSC1	Carrying Case	5.00	(1.00)
YHA15	2m Helical	7.65	(1.00)
YHA44D	70cm ½wave	10.19	(1.00)
YM49	Speaker Mike	20.30	(1.00)
FT230	2m 25w FM	269.00	(—)
MMB15	Mobile Bracket	14.55	(1.00)
FT203R	NEW 2m H/Held/C/W FNB3	225.00	(—)
FT209R	NEW 2m H/Held/C/W FNB3	269.00	(—)
MMB10	Mobile Bracket	8.80	(1.00)
NC9C	Charger	9.60	(1.00)
NC8	Base/station Charger	64.80	(2.00)
PA3	Car Adaptor/Charger	18.00	(1.00)
FNB2	Spare Battery Pack	24.90	(1.00)
YM24A	Speaker Mike	23.75	(1.00)
FT726R	2m Base Station	869.00	(—)
430/726	70cm Module for above	295.00	(2.50)
FRT7700RX	A.T.U.	49.85	(1.50)
MH1B8	Hand 600 8pin mic	17.65	(1.00)
MD1B8	Desk 600 8pin mic	74.75	(1.00)
MF1A3B	Boom mobile mic	19.95	(1.00)
YH77	Lightweight phones	15.70	(1.00)
YH55	Padded phones	16.10	(1.00)
YH1	L/weight Mobile H/set-Boom mic	15.70	(1.00)
SB1	PTT Switch Box 208/708	18.00	(1.00)
SB2	PTT Switch Box 290/790	17.25	(1.00)
SB10	PTT Switch Box 270/2700	17.25	(1.00)
QTR24D	World Time Clock	34.50	(1.00)
FF501DX	Low Pass Filter	31.45	(1.00)
NEW MODELS			
FRG8800	HF Receiver	559.00	(—)
FRV8800	Convertor 118-175 for above	90.00	(1.50)
FT703	70cm H/Held	P.O.A.	(—)
FT709	70cm H/Held	P.O.A.	(—)
FT270R	2m 25W F.M.	349.00	(—)
FT270RH	2m 45W F.M.	399.00	(—)
FT2700R	2m/70cm/25W/25W	559.00	(—)
FRG 9600	60-905MHz Scanning RX	475.00	(—)

Power Supplies

DRAE			BNOS		
4 amp	40.50	(2.00)	6 amp	58.00	(2.50)
6 amp	63.00	(2.50)	12 amp	99.00	(3.00)
12 amp	86.50	(3.00)	25 amp	148.00	(4.00)
24 amp	125.00	(4.00)	40 amp	296.00	(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	139.95	(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	(2.50)
HAM1V	8 core Heavier Duty	299.00	(4.00)
T2X	8 core Very Heavy Duty	365.00	(4.00)

Switches

Sigma	2 way SO239	14.49	(1.00)
Sigma	2 way 'n' Skts	19.95	(1.00)
Welz	2 way SO239	22.95	(1.00)
Welz	2 way 'n' Skts	41.90	(1.00)
Drae	3 way SO239	15.40	(1.00)
Drae	3 way n Skts	19.90	(1.00)

Miscellaneous

DRAE	Wavemeter	27.50	(1.00)
T30	30W Dummy load	8.05	(1.00)
T100	100W Dummy load	35.20	(1.00)
T200	200W Dummy load	42.55	(1.50)
CT300	300W Dummy load	69.00	(2.00)
DRAE	2m Pre-set A.T.U.	14.50	(1.50)
ALTAI	KDM6 Dip Meter	68.60	(1.50)

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NEXT MONTH

The new *PW* gives you even better value for money. For details see page 19

PW COMMENT

FOLLOWING ON the recent period of experimental use of the 50MHz (6m) band, it has now been announced that 50–50·5MHz will shortly be made generally available to UK radio amateurs. Bearing in mind that in Regions 2 and 3 (the Americas, southern Asia and Australasia), 50–54MHz is allocated to the Amateur Service, it is a great disappointment that we have such a narrow allocation, though it is pleasing that we are the first country in Region 1 to get a confirmed spot in this band.

Any special conditions of use, such as an e.r.p. restriction, are yet to be finalised, as is the starting date. Let us hope that responsible use of the new band will convince the DTI that there will not be wholesale interference to existing European TV services in Band I (far more likely to happen in the reverse direction), and that they can safely widen the allocation to at least the 2MHz-wide window given for the experiment. It's up to you! Real-location of the full 4MHz to amateurs in all of Region 1 at the next WARC would be even better news.

A run-down of the other main points of the Government announcement on the future of Bands I and III is given in our *News* pages.

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LOWE SHOPS

In Glasgow the LOWE ELECTRONICS' shop (the telephone number is 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 (the telephone number is 0325 486121) and is managed by Don G3SEV. 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 (the telephone number is 0223 [illegible]). From the A45 just to the north of Cambridge turn off into the town on the A1309, past the science park and turn left at the first roundabout, signposted Chesterton. After passing a children s playground on your left turn left again (between the shops) into Green End Road. Very quickly and without you noticing it, Green End Road becomes High Street. Easy and free street parking is available outside the shop.

For South Wales, the LOWE ELECTRONICS' shop is located in Cardiff. Managed by Richard GW4NAD who hails from Penarth, the shop (the telephone number is 0222 464154) is 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 red 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.

LOWE ELECTRONICS' London shop is located at 223/225 Field End Road, Eastcote, Middlesex (the telephone number is 01 429 3256). The shop, managed by Andy G4DHD is easily found, being part of Eastcote tube station building and as such being on the Metropolitan and Piccadilly lines (approximately 30 minutes from Baker Street main junction). For the motorist, we are only about 10 minutes' driving time from the M40, A40, North Circular Road (at Hanger Lane) and the new M25 junction at Denham. 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.

Although not a shop there is on the South Coast a source of good advice and equipment – John G3JYG. His address is 16 Harvard Road, Ringmer, Lewes, Sussex (telephone 0273 812071) An evening or weekend telephone call will put you in touch with John.

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.

DON'T FORGET OPEN DAY 17th AUGUST

The TS-530SP HF transceiver is designed in accordance with TRIO's latest, most advanced circuit technology, providing wide dynamic range, high sensitivity, very sharp selectivity.

FEATURES

● 160-10 Metre coverage, including three WARC bands ● Built-in digital display ● Narrow/wide filter combinations ● IF shift reduces QRM ● Tunable notch filter built-in ● Wide receiver dynamic range ● Built-in speech processor ● Two 6146B's in the final ● Advanced single-conversion PLL system ● Adjustable noise-blanker level ● RF attenuator for IMD rejection ● More flexibility with optional VFO's ● Expanded frequency coverage ● Built-in VOX semi-break-in ● Built-in 25 kHz marker ● RIT/XIT ● Attractive appearance with rugged construction ● Amplified type AGC circuit ● Amplified type ALC circuit ● Built-in AC power supply ● Final cooling fan ● Multifunction meter ● Built-in CW zero-beat function ● Carrier level control ● Microphone gain control ● Heater switch (for driver and final tube filaments) ● Built-in speaker.

SPECIFICATIONS

(GENERAL)

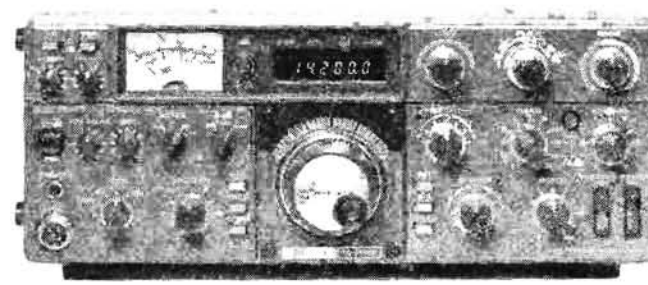
● Frequency range: 160, 80, 40, 30, 20, 17, 15, 12, 10 metre Amateur bands ● Mode SSB/CW ● RF output impedance: 50Ω-75Ω ● Power requirement: 220/240 V AC50/60 Hz ● Power consumption: TX=295 W, RX=27 W (with heater OFF) ● Dimensions: 333 (13.1)×133 (5.2)× 333 (13.1)mm (inch) ● Weight: 12.8 kg (28.2lbs).

(TRANSMITTER)

● Final power input: 220 W PEP for SSB operation, 180 W DC for CW operation ● Carrier suppression: better than 40 dB ● Unwanted sideband suppression: better than 50 dB ● Spurious radiation: better than −60 dB ● Harmonic radiation: better than −40 dB.

(RECEIVER)

● Sensitivity: 0.25 μV at 10 dB S+N/N ● Image ratio: better than 60 dB ● Receiver system: single superheterodyne ● IF rejection: better than 70 dB ● Selectivity: SSB/CW WIDE=2.4 kHz (−6 dB), 4.2 kHz (−60 dB), SSB NARROW=with YK-88SN (option filter) 1.8 kHz (−6 dB) 3.3 kHz (−60 dB), CW NARROW=with YK-88C (option filter) 500 Hz (−6 dB), 1.5 kHz (−60 dB), CW NARROW=with YK-88CN (option filter) 270 Hz (−6 dB), 1.1 kHz (−60 dB) ● Audio output power: 1.5W (8Ω).



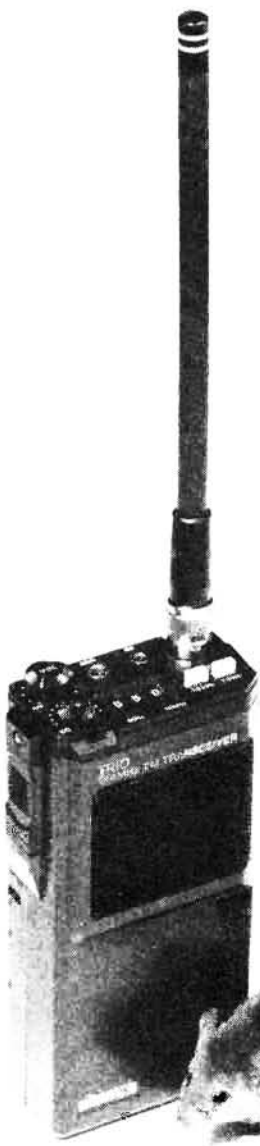
from **TRIO**, the TS530SP.....

£698.00 inc VAT Carriage £7.00

LOWE ELECTRONICS
Chesterfield Road, Matlock, Derbyshire. DE4 5LE.
Telephone 0629 2817, 2430, 4057, 4995. Telex 377482.

not even a mouse, could hide behind a TRIO TH21E.....

I am not for one moment suggesting that current hand-helds should be photographed with an elephant but I have heard many amateurs refer to their existing hand-helds as "bricks" That the TH21E could not be called. In fact I am tempted to say it is the rig that not even a mouse could hide behind. Over the past fourteen years I have watched amateur radio equipment develop from cumbersome to perfection. I remember John, G3PCY, showing me the first TR2400 and our mutual amazement at how TRIO could put so much radio in such a small package. Later developments produced the TR2500 and its 70 centimetre version, the TR3500 and left me in no doubt that TRIO would soon produce a compact inside pocket transceiver. At the same time it became apparent that a simpler rig with performance would have great appeal. That transceiver is the TH21E and being typically TRIO is right first time. Size is not the most important feature, it's just the way the transceiver feels when picked up, impossible to put down. I am not going to give its dimensions, I will just say that it is hand sized, the true inside pocket transceiver. As an owner and with the rig always on your person the hobby of amateur radio expands to an all day event. **Never miss a contact, never miss a friend.**



A similar transceiver is available for 70 centimetres, the TH41E. Having the same features including reverse repeater the TH41E is just the rig that newcomers to the hobby have been looking for. Around the country are many 70 centimetre repeaters and what has been needed for some time has been a low cost FM rig that everyone could afford. The TH41E from TRIO is that transceiver and many amateurs are discovering the 70 centimetre band with one.

First of all the Pocketfone, now the TH41E.

1 watt output in high power position, 150mW in low position.

Full coverage of the 2 metre amateur band from 144 to 146MHz. (TH41E covers from 430 to 440MHz.)

Frequency selection by simple thumbwheel switches.

Full repeater facilities including reverse repeater.

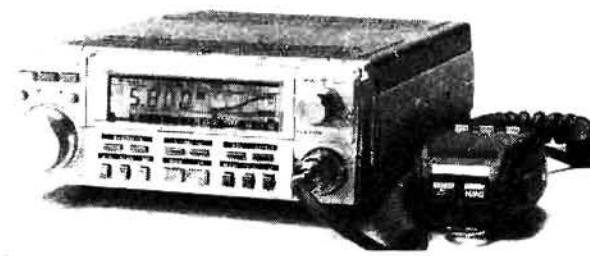
The rig comes complete with nicad pack and charger.

TH21E ..... £170.00 inc VAT
TH41E ..... £199.00 inc VAT

TS430S

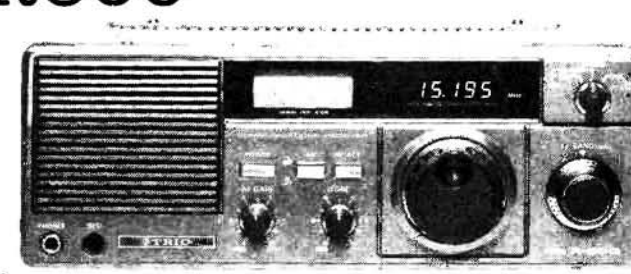
The TS430S combines the facilities of a solid state HF transceiver with those of a general coverage receiver. It's the ideal rig for the radio amateur who not only wants to communicate with his fellows but also enjoys listening to the world. As an amateur band transceiver the rig covers top band to ten metres, as a short wave receiver coverage is from 150KHz to 30MHz. Operating on AM, FM, USB, LSB and CW the TS430S is extremely compact and, as such, is the perfect transceiver for mobile, portable or base station operation.
TS430S HF transceiver with general coverage receiver . **£720.00 inc VAT**

TW4000A



Taking into account the amount of activity on the 2 metre FM channels it is not surprising that many people have turned their attention to the wide open spaces of 70 centimetres. With the TW4000A, TRIO have produced a dual band FM transceiver that gives its owner the best of both worlds. Facilities include 10 memories, two VFO's, priority channel, full repeater operation, band scan and memory scan. In memory scan mode the rig can be instructed to look for either 2 metre or 70 centimetre signals. The transceiver produces 25 watt RF output on both bands and comes complete with mobile mount and microphone. For greater safety whilst mobile the optional VS1 board will announce frequency, memory channel and whether or not the rig is set on repeater shift.
TW4000A dual band FM mobile ..... **£522.00 inc VAT**

R600



For those who are banned from the house and have to operate from the shed at the bottom of the garden, why not consider an R600 to monitor the bands from the comfort of the fireside. No wife would forbid such an attractive looking receiver in the lounge, after all it could also be used to listen to *Women's Hour*. The R600 is a basic receiver covering from 150KHz to 30MHz and having switched upper and lower sidebands, wide and narrow am and cw. It has a 20dB attenuator and a noise blanker fitted as standard. Operation is simple, select the mode of operation, turn the MHz dial to the correct band and, by using the VFO knob, tune to the desired frequency. The clear digital readout makes station selection simple. The TRIO R600, your passport to comfortable listening.
R600 general coverage receiver ..... **£299.52 inc VAT**

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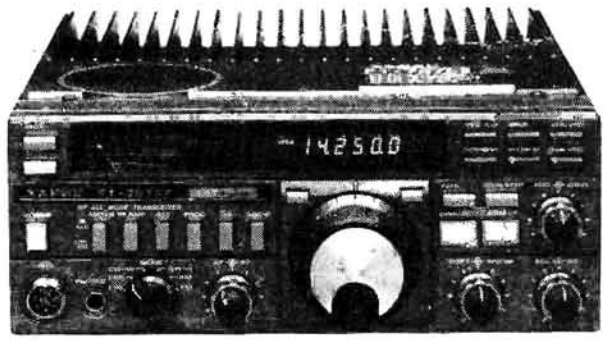
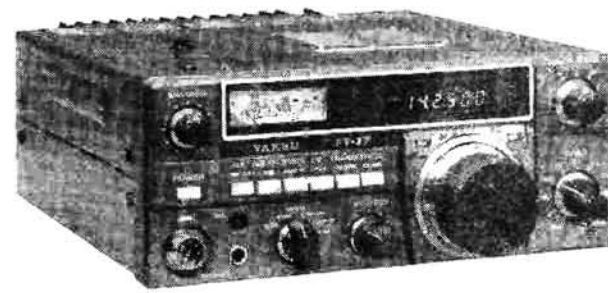


~~£829~~ **£739 inc. VAT**



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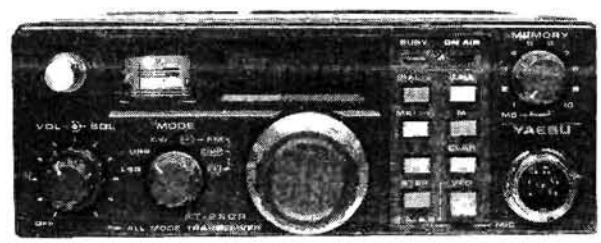

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FT703R

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FT709R

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FRG8800
~~£559~~ £475 inc VAT

FRV8800
~~£90~~ £80 inc VAT

Continuous coverage from 150KHz to 30MHz. Two speed spin tuned VFO plus keyboard plus computer interface control.

The FRG-8800 demodulates SSB (USB & LSB) CW, AM (Wide and Narrow) and FM narrow as standard. The FM narrow is useful for 10M, CB and for VHF with the optional convertor.

The FRG-8800 comes with twelve memories programmed and scanned at the touch of a single button. Any of the memory channels will accept a frequency within the whole range of the receiver including the VHF range (with the optional VHF unit). The mode is also stored in the memory eliminating the need for inconvenient manual mode change, when hopping from one memory to the next.

Four filters are fitted as standard (SSB/CW, AM, AM-NAR and FM-NAR) with bandwidths chosen for optimum performance, with switchable AGC and variable tone control for maximum enjoyment.

The back-lit green LCD display incorporates easy to read "any angle" 10mm digits.

A twelve function display indicates the transceiver's status at a glance. It includes memory channel number, mode, and frequency to a resolution of 100Hz. Also included is a two dimensional LCD, graphical SIMPO and 'S' meter. A 12 button keyboard allows quick accurate changes of frequency and band, (MHz and KHz programmed invidually). The keyboard also has nine control buttons to allow rapid changes from memory to VFO, memory to memory and VFO to memory. Memory channels can also be recalled at the turn of a knob, ideal for storing calling/working channels or broadcast reception.

The keyboard is complemented by a opto-coupled two speed, VFO drive fast for rapid tuning of a band or slow for accurately tuning in a signal. In addition a fine tune control compensates for drift in the received signal.

Dual accurate 12 hour clocks, with AM/PM indicators are ideal for log keeping (GMT/Local). The clock uses the main digital display and features full back-up facilities in the event of a mains failure.

The timer can activate the receiver or tape recorder via the relay contacts provided. A snooze facility allows up to 59 minutes of listening. The FRV-8800, extends coverage to include 118-174MHz all within the main frame, thereby allowing monitoring of, PMR, marine and air bands, as well as 2M.

The FRG-8800 is operated as before via the keyboard or VFO, and the memory still holds any frequency and mode. The *actual* VHF frequency is displayed on the main LCD to a resolution of 100Hz. At 6·1kg (excluding convertor) the FRG-8800 is ideal for taking on any trip. The power supply is easily adjustable from 240-220VAC to 110-120V, 50/60Hz mains and 12VDC operation is optional.

FRG9600
~~£475~~ £449 inc. VAT

The FRG-9600 is an all mode scanning receiver that provides features never offered before, covering 60 through 905 MHz continuously, with 100 keypad-programmable memory channels.

In addition to FM wide (for FM and TV broadcasts), FM narrow and AM wide and narrow, the FRG-9600 also provides SSB (single sideband) reception up to 460MHz, allowing monitoring of amateur CW, SSB and ACSB now used experimentally as the mode of the future for VHF. A front panel tuning knob is provided to simplify tuning of SSB and narrowband AM. Seven tuning/scanning rates between 100 Hz and 100 kHz assure fast and efficient scanning while still permitting easy tuning of narrowband signals.

The scanning system allows either full or limited (keypad programmed) band scanning as well as memory channel scanning, with auto-resume. In addition to carrier sensing scan stop, audio scan stop sensing is also selectable to avoid stopping on inactive "carrier-only" channels. Scanning steps are selectable, with the wide steps indicated on the front panel display. Signal strength is indicated by a two-colour graphic S-meter on the display. A 24-hour clock/timer is included, along with a recorder output, for automatic power on/off switching and recording. Additional jacks provide cpu band selection outputs, multiplexed (FM wide) output, AF and RF mute and other control signals for maximum expansion potential with future options or for those who wish to provide their own add-on hardware for special applications.

The Yaesu CAT System provides a direct control link to the cpu in the FRG-9600, allowing operators with personal computers to add virtually unlimited customized control functions in software; such as multiple, organized memory banks; automatic tuning; and customized scanning systems; using most any personal computer and a Yaesu FIF CAT Interface Unit.

The FRG-9600 requires 12 VDC, which may be provided using the optional PA-4B/C AC adapter from the AC line.

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ICOM ICOM

IC-735, The Complete HF Radio

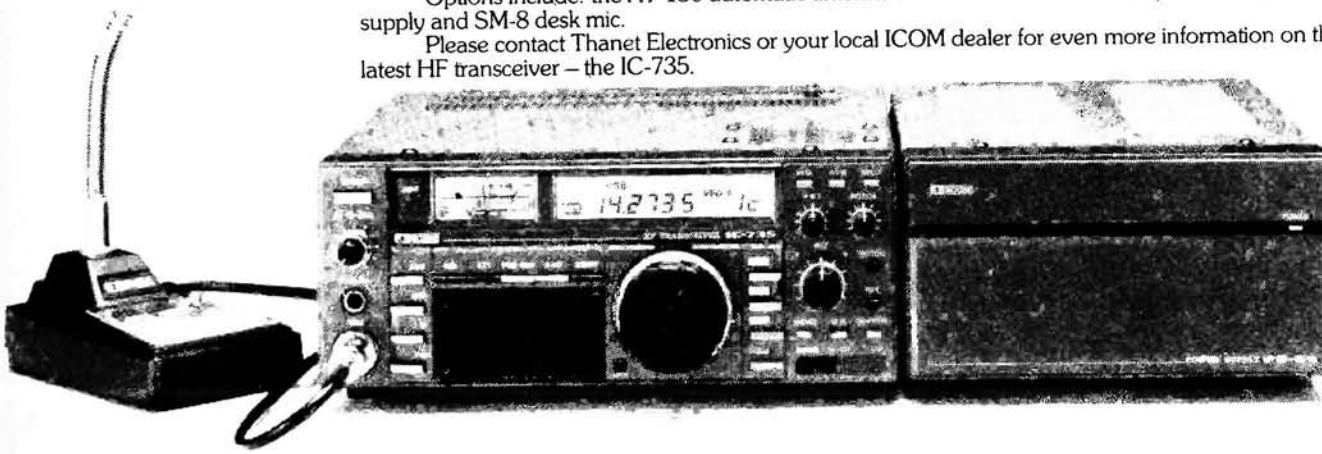
This new HF transceiver from ICOM is compact enough to make mobile or portable use a possibility. The IC 735 covers all Amateur frequencies from 1.8MHz to 30MHz including the three new bands 10, 18 and 24MHz. Modes include SSB, CW, AM and FM, all circuits are solid-state and output is approximately 100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

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

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

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

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



IC-290D/290E Mobile

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, 1 KHz 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 IC-HM10 and HM11 microphones. Digital frequency display, Hi/Low power switch. Optional Nicad battery system allows retention of memory.

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IC-02E, IC-04E Handheld

The direct entry microprocessor controlled IC-02E is a 2 meter handheld, 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 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.

HS-10 Headset also available, 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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Reg Ward & Co. Ltd S W England, 0297-34918
Waters & Stanton Electronics, Hockley Essex, 0702-206835.

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

IC-27E Mobile

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

This must be the smallest, 2M, FM mobile available today, measuring only 38mm H x 144mm W x 177mm D. It has all the features that you probably require included in this microprocessor controlled unit. In addition, if you feel lonely and can't find anybody on the band, just press "speech" and the optional built in speech synthesizer will tell you the frequency you are tuned to. This is a boon to the blind operator or to those that tuck their rigs out of sight

Brief features:- 25/1 Watt output, green LED readout, scanning (memories and programmable limit band scan), priority scan, programmable duplex splits, 25 and 5Khz tuning steps, 10 memory channels with lithium back up cell, normal and reverse repeater switch, dual VFO, internal speaker and optional speech synthesizer. Just ask for a leaflet and we'll be glad to send you one.

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FT-980

FRG-8800. All band all mode Gen coverage receiver. 150kHz to 30MHz. Large liquid crystal display. 100Hz frequency resolution. S/SINPO "bar graph" type indicator. 21 button keypad. 12 internal memories and multi function scanner. AM, SSB, CW and FM. Wide and narrow bandwidths. All mode data/freq can be stored in mem's. Selectable AGC rates. Two 24 hr clocks. 8-bit CPU. Three scan modes. Yaesu CAT system comparable with most personal computers. Programme scanning.

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FRV-8800 **£80.00**

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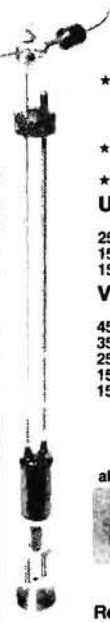

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15 FM/CW/SSB/AM	V15L	£49.50
15 FM/CW	V15F	£39.50

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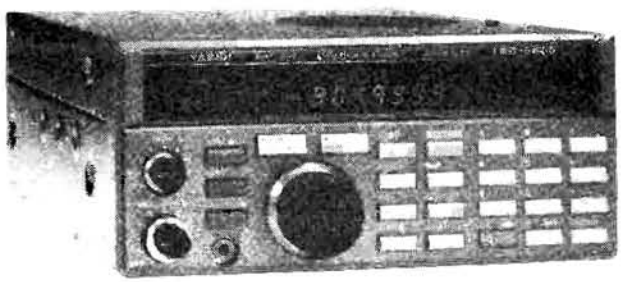

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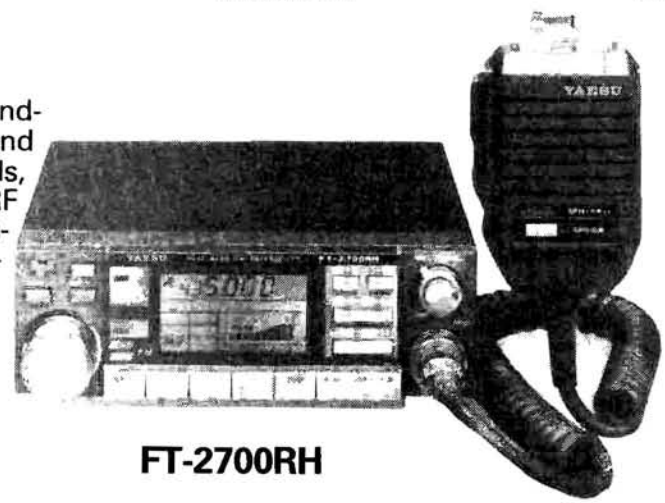

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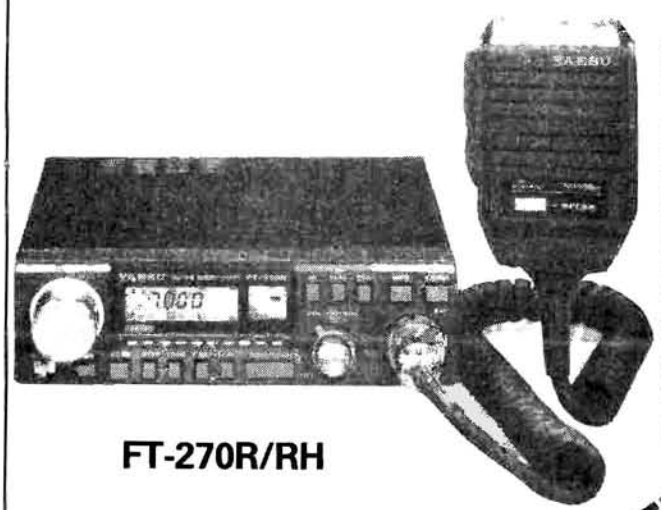

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AMATEUR RADIO EXCHANGE

Bands I and III—Future Use

The same Press Notice that brought the long awaited news about an amateur band at 50MHz also contained a considerable amount of information regarding future use of the now vacated TV bands I and III and plans for wide-area paging.

Band I (41–68MHz):

Only a limited number of frequencies will be assigned at this time which include 49·82–49·90MHz for low power devices such as toys and telemetry and a further 0·5MHz for on-site paging.

Band III (174–225MHz):

The development and introduction of single sideband techniques will be encouraged within Band III. Some displaced Band II (88–108MHz) services will be relocated at around 139 and 148MHz (fuel and power industries).

General

One or two nationwide area paging systems will be introduced at 153MHz with possibly two more at 454MHz. Five local networks to be introduced (each with 20 channels) in London with smaller networks in 10 areas of greatest demand outside London.

Five blocks each 1MHz wide, will be assigned at 900MHz for development of cordless telephones. The existing private mobile radio (p.m.r.) specification MPT1323 will be revised to form a communal European specification with the UK reference MPT1326. Proposals are sought for two-way mobile data systems at 454MHz.

New Electronics Shop

Readers, particularly those living in Farnborough and Blackwater Valley area, will be interested to learn of a new source of electronics components and associated products in Farnborough.

The company, Martelec Ltd., intend to cater for the electronics enthusiast and the considerable local electronics industry, via a broad range of components and tools. In addition, for those unusual items not available off-the-shelf, they can offer a 24-hour ordering service from any of their 80-odd suppliers.

The shop is open Monday to Saturday between 10.00am and 5.45pm, closing at 1.00pm on Wednesdays, and the company welcome mail order business. A free catalogue is available to readers who would care to telephone or send their name and address to: *Martelec Ltd., 43 Queen's Road, Farnborough, Hampshire GU14 6JP. Tel: (0252) 515666.*

Special Event Station

To celebrate the 500th anniversary of Henry Tudor's visit to Tamworth, prior to the Battle of Bosworth, the Tamworth Amateur Radio Club will be operating a special event station from Tamworth Castle, on 3·5MHz and 144MHz between 1000 and 2000GMT on 17 August and 1000 and 1700GMT on 18 August.

A special QSL card will be available for all contacts and for further details, apply to: *G4SRI. QTHR.*

Come and join us

Practical Wireless staff will be manning stands at the following rallies etc., where we look forward to meeting our readers.

Hamfest '85—Near Wimborne, Dorset on Sunday 11 August.

Lowe Open Day—Chesterfield Road, Matlock, Derbyshire, on Saturday 17 August.

Red Rose Rally—Haydock Park Racecourse, near Wigan, on Sunday 18 August.

Lincoln Hamfest—Lincolnshire Showground, near Lincoln, on Sunday 8 September.

Telford Radio Rally and Exhibition—Telford Town Shopping Centre, Shropshire, on Sunday 8 September.

Scottish Amateur Radio Convention—Dundee College of Education, Dundee, on Saturday 21 September.

Great Lumley ARES Rally—Community Centre, Great Lumley, near Chester-le-Street, County Durham, on Sunday 6 October.

Welsh Amateur Radio Convention—Oakdale Community College, Blackwood, Gwent, on Sunday 6 October.

BTI Morse Tests will be conducted at the Red Rose Rally, Telford Radio Rally and Exhibition and at the Welsh Amateur Radio Convention.

On the *PW* stand we will be selling recent issues of the magazine, the full range of *PW* publications, computer program tapes and *PW* parabolic dishes.

Can You Help?

A reader who owns an Acorn Electron 32K computer is experiencing difficulty obtaining an RTTY program.

If you are able to help, please contact (reverse telephone charges if you wish): *P. S. Garlick, 12 Bishopscourt Road. Sheffield, South Yorkshire S8 9HP. Tel: (0742) 588303.*

Easier Morse Tests?

Well, it's not going to be any easier to pass the actual exam but much better arrangements are now available for your choice of where to sit it, which must help.

Following the success of a pilot scheme run this year by Gavin Williams G3YCP of BT, amateur rally organisers and radio clubs can now arrange for on-site Morse tests. Providing a minimum of 10 candidates can be guaranteed, G3YCP will undertake to attend rallies and/or weekday evening club meetings to test would-be c.w. types—all at no additional cost. Being relieved of the often extensive travelling/weeks of waiting to attend a Head post office or radio station will be a great advantage—you can even book on the day if time and numbers permit. The even better news is that you get your results on the spot, together with the necessary pass slip and class A licence application form.

To find out more about the scheme contact Gavin Williams by writing to: *BT Radio Station, Worston Lane, Highbridge, Somerset.* The 1985 rally pass rate averages out at 70 percent—can we do better?

Special Event Station

Exmouth Amateur Radio Club will be operating a special event station from Hayes Barton, East Budleigh, Devon, using the callsign GB4HB during the 28 days from 5 September until 2 October on the h.f. bands, 144MHz, 430MHz and via OSCAR–10 and the RS satellites.

Hayes Barton is the birth place of Sir Walter Raleigh who was born in the house in 1554, he later went on to establish a colony in North Carolina in 1585 and it is hoped to contact the Raleigh Amateur Radio Society in the City of Raleigh, as part of their 400 year celebrations. It is also hoped to contact the Operation Raleigh ship *Sir Walter Raleigh*, callsign GB0SWR/MM on her round the world mission.

A special QSL card featuring the Elizabethan farmhouse will be issued to all contacts.

Further details from: *Michael Newport, 30 Maristow Avenue, Exmouth, Devon EX8 3JF. Tel: (0395) 274172.*

More on pages 18 & 24

News

RAE Courses

Courses to prepare students for the Radio Amateurs Examination (City and Guilds 765) will be available at the following locations:

Belfast—*College of Technology Belfast, Cameron Building, Millfield, Belfast. Tel: (0232) 227244 Ext. 297.* On Tuesday evenings, details from the Course Tutor J. E. Wilson.

Bradford—*Bradford & Ilkley Community College, School of Science and Technology, Dept. of Electrical & Electronic Engineering, Great Horton Road, Bradford, West Yorkshire BD7 1AY.* Three courses are available; 1—Preparation for the RAE, 2—Preparation for the Amateur Morse Test and 3—A project based course, covering Construction for the Radio Amateur. Enrolment commences on 10 September and the Course Tutor will be P. M. Nurse.

Brighton—*Brighton College of Technology, Pelham Street, Brighton BN1 4FA. Tel: (0273) 685971.* Enrolment is on 9 and 10 September, between 1600 and 2000hrs and further details are available from R. A. Bravery, Senior Lecturer, G3SKI, at the College. The Course Tutor will be P. D. Simmons G3XUS.

Derby—*Derby College of Further Education, Wilmorton, Derby DE2 8UG.* Two courses are available, Preparation for the RAE and an Advanced Radio Amateurs Course. Enrolment 9 and 10 September, and further details are available from the Course Tutor, F. Whitehead G4MLL, tel: (0332) 73012, Ext. 52.

Fleetwood, Lancs.—*The Nautical College, Broadwater, Fleetwood, Lancs FY7 8JZ. Tel: (03917) 79123.* In addition to the RAE Course, the College also offers a Morse class and courses on specialist areas of the hobby, such as, AMSAT, UoSAT, RTTY and similar subjects. The RAE course will be held on Thursdays between 1900 and 2100, commencing 26 September and enrolment is on 17 September between 1900 and 2100. Further details are available from the Course Tutor, N. Watson on Ext. 28 at the College.

Grantham, Lincs.—*Grantham College of Further Education, Stonebridge Road, Grantham NG31 9AP. Tel: (0476) 63141.* The course will be run on Wednesday and Thursday evenings between 1830 and 2100, dealing with part 1, Licensing Conditions and Theory and part 2, Operating Practices, Procedure and Theory. Further details from B. R. Phillips, Head of Department of Engineering and Technology, at the College.

Hemel Hempstead, Herts.—*Dacorum College, Marlowes, Hemel Hempstead. Herts. HP1 1HD. Tel: (0442) 63771, Ext. 56.* Enrolment on 9 September and the course commences on Wednesday 25 September between 1830 and 2100.

Ware, Herts.—*East Herts. College, Turnford. Tel: Hoddesdon (0992) 466451.* Full details of the course, which is likely to be on Monday evenings between 1900 and 2100, will be available during August, from Jim Sleight G3OJI, QTHR, tel: Ware (0920) 4316, or from the College asking for Mr. France or Mr. Norman. Also, subject to demand and final arrangements, a Morse for Beginners course will be available, further details from Jim Sleight.

London, North—*De Beauvoir Evening Institute, Tottenham Road, Dalston, London N1.* Enrolment at the Institute will be through the week starting 16 September, between 1900 and 2100, and the course will start on Wednesday 25 September, between 1930 and 2130. Latest results available, indicate a 100% pass rate in the last examination. Further details from the Course Tutor, T. C. Clark G4BZW, tel: 01-249 1843.

London, North West—*Hendon College of Further Education, The Burroughs, Hendon, London NW4 4DE. Tel: 01-202 3811, Ext. 224.* Enrolment 10 September between 0200 and 2000, commencing Tuesday 17 September between 1530 and 2130, and the Course Tutor will be Tony Essex. For details of this course and a Microelectronics class, contact, Chris Holford, Head of Technology, at the college.

Manchester, Stretford—*North Trafford College of Further Education, Talbot Road, Stretford, Manchester M32 0XH. Tel: 061-872 3731, Ext. 53.* RAE on Monday or Thursday evenings, or Wednesday afternoon, with a Morse class on Tuesday evening or Wednesday morning. Enrolment 9, 10 and 11 September. The Course Tutor will be J. T. Beaumont G3NGD, who can provide further details of all courses available at the college.

Manchester, Swinton—*Pendlebury High School, Cromwell Road, Swinton, Manchester.* RAE on Monday evenings at 1930, commencing end of September and the Course Tutor will be P. Whatmough G4HYE. A Morse class will be held on Tuesday evenings at 1930 and a Construction class on Thursdays, in both cases the instructor will be W. Stevenson G4KKI. Further details from G4HYE, tel: 061-794 3706, or from Swinton Adult Education Centre, tel: 061-794 5798.

Nottingham—*Arnold and Charlton College of Further Education, Digby Avenue, Mapperley, Nottingham NG3 6DR.* Full RAE course starts Wednesday 18 September between 1830 and 2100 with Course Tutors G4DVW and G4NZU. A short course, for the December examination, starts on Thursday 19 September between 1830 and 2100, Course Tutor G4DVW, a further short course for the May examination will start in February. In addition, a Beginners Morse Class and Beginners Construction Class, both starting in September will be available. Enrolment at the College, is on 9, 10 and 11 September between 0200 and 2000.

Princes Risborough, Bucks.—*Princes Risborough Adult Education Centre, Merton Road, Princes Risborough. Tel: (084 44) 4977.* An RAE and Morse Course is available, starting 26 September between 1930 and 2130. Course Tutors will be, RAE, Ron G3NCL and Morse, Stan G4MQC. Further details from either, the College or Ron Ray G3NCL, 21 Parish Piece, Holmer Green, Nr High Wycombe, Bucks.

Stoke-on-Trent—*Stoke-on-Trent Technical College, Moorland Road, Burslem, Stoke-on-Trent, Staffordshire ST6 1JJ. Tel: (0782) 85258/85599.* In addition to an RAE course, there will be an Advanced Radio Amateurs Course. The College is h.f./v.h.f./u.h.f. and microwave equipped, all of which is available to students. Further details from K. L. Jones G6ZBL, of the Electrical & Electronic Engineering Department.

Wigan—*Wigan College of Technology, Dept. of Engineering Technology, Parsons Walk, Wigan WN1 1RR. Tel: (0942) 494911.* Three courses will be available, covering the RAE, the Morse Code and Hobby Electronics. Starting in September, interested parties are invited to contact Roy Hesford G4UAE, Senior Lecturer at the college.

NEXT MONTH

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Practical Wireless

The Radio Magazine

The new *PW*—it's bigger, it's better, and it's the least expensive radio hobbyist magazine on the UK bookstalls! Our October issue is jam-packed with the sort of features that you've asked for.

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Full constructional details for a FET-DIP OSCILLATOR covering frequencies from 1·8 to 150MHz; a SIMPLE CAPACITANCE METER for values up to 1μF; and more besides.

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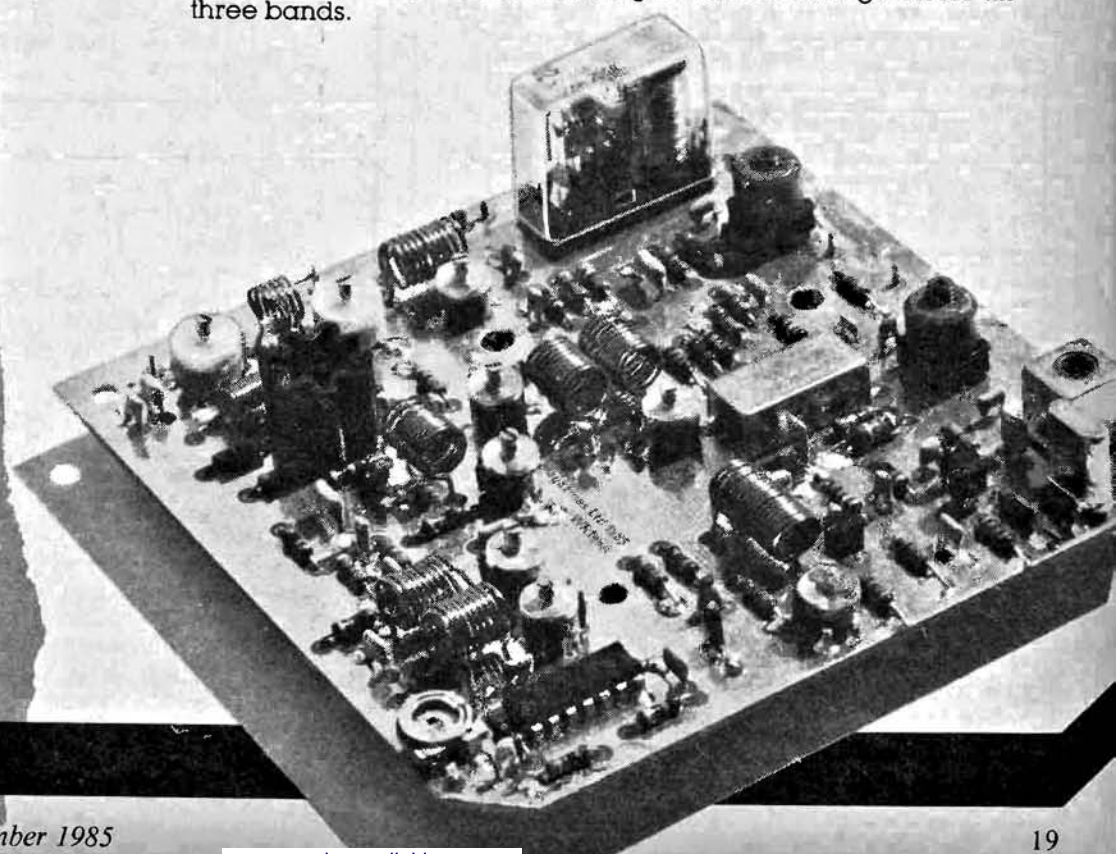


AMATEUR RADIO UNDER COMPUTER CONTROL

Part 2 by Ronald Alpiar

In the final part of this article Ronald Alpiar discusses the BASIC programming needed to control the receiver

Basic Communications Procedures

Simple BASIC procedures for sending instructions to the R70 appear in Figs. 2.1 and 2.2 with the following caveat: they are intended to illustrate the principles explained before, and are certainly **not** offered as examples of good programming practice. In particular they repeatedly commit the cardinal sin of resorting to the convenient indirection operator ("?") rather than the officially recommended OSBYTE calls. Even as examples of BASIC programming they are lamentably inefficient. BBC-B buffs are asked to exercise tolerance, bearing in mind that this article may be read by many radio hams, whose expertise in their own subject is as unquestionable as ours in our own.

Comments on the Instructions

10 Location &FE62 contains the USER PORT "direction register". A "1" on any bit of this register ensures that the corresponding bit of the USER PORT is an output: whilst a "0" indicates an input. In our case bits 0 and 2 (unused and $\overline{DV}$) are the only two inputs, the remaining bits being outputs. The bit pattern is thus (high order first) 11111010 which is &FA.
20 FOLD is the previously set frequency, used to check whether the new frequency FNEW is in a different band. This instruction provides its initial setting.
100 This procedure rests the R70's frequency to FNEW, in receiving mode M$: the latter string variable is allowed to take the values "U" "C" "A" "R" "L" for Upper Sideband, c.w., a.m., RTTY or Lower Sideband reception modes.
110 C% is a counter of passes of the transmission sequence.
120 Decode M$ with possible error exit
130 Ensure that FNEW is in allowed range, with error exit
140 PROCADDR sends the initial address (&E) to the R70
150 PROCDATA(D%) sends the data item D% to the R70: in this case the Mode instruction code
160 Send the VFO data to the R70: here we are addressing VFO A.
170 Split FNEW up into its 6 component digits, and send
230 them in turn to the R70
240 Test for crossing a frequency band boundary, and if
250 so repeat whole transmission sequence after a 1·5 second pause: otherwise reset FOLD and exit
300 This procedure sends the initial address to the R70
310 Set the upper 4 bits of the User Port to &E and set the DBC bit (02) ON. (DBC is in bit 1)
320 Pause for 50 milliseconds
330 Set the DBC line OFF
340 Pause for 10 milliseconds
350 Set the RT line ON (RT is in bit 3)
360 Wait until the R70 sets the $\overline{DV}$ line (bit 2) OFF
370 Set the RT line OFF
380 Wait until the R70 resets the $\overline{DV}$ line ON again
390 Exit.
400 This procedure sends the data item D% to the R70
410 Place D% in the upper 4 bits, and set the DBC line ON
420 Set the RT line ON
430 Wait until the R70 accepts data by setting the $\overline{DV}$ line OFF
440 Set the RT line OFF
450 Wait until the R70 resets the $\overline{DV}$ line ON again
460 Set the DBC line OFF
470 Exit.

```
  10 ?&FE62=&FA
  20 FOLD=0
  ...................
 100 DEF PROCFREQ(M$,FNEW)
 110 C%=0
 120 IF M$="U" M%=0  ELSE
     IF M$="C" M%=6  ELSE
     IF M$="A" M%=8  ELSE
     IF M$="R" M%=&C ELSE
     IF M$="L" M%=&B ELSE
     PRINT "Invalid Mode": ENDPROC
 130 IF FNEW<0 OR FNEW>30 PRINT"Invalid
frequency": ENDPROC
 140 PROCADDR
 150 PROCDATA(M%)
 160 PROCDATA(&A)
 170 F%=INT(FNEW) DIV10: PROCDATA(F%)
 180 F%=FNEW-10*F%: PROCDATA(F%)
 190 F%=10000*(FNEW-INT(FNEW))
 200 PROCDATA(F% DIV1000)
 210 F%=F% MOD1000:PROCDATA(F% DIV100)
 220 F%=F% MOD100 :PROCDATA(F% DIV10)
 230 PROCDATA(F% MOD10)
 240 IF C%=0 AND ABS(FNEW-FOLD)>1 GOTO
250 ELSE FOLD=FNEW: ENDPROC
 250 C%=1: A=TIME: REPEAT UNTIL TIME>A+
150: GOTO 140
```

Fig. 2.1

```
 300 DEF PROCADDR
 310 ?&FE60=&E2
 320 A=TIME: REPEAT UNTIL TIME>A+5
 330 ?&FE60=&E0
 340 A=TIME: REPEAT UNTIL TIME>A+1
 350 ?&FE60=&E8
 360 REPEAT UNTIL (?&FE60 AND 4)=0
 370 ?&FE60=&E0
 380 REPEAT UNTIL (?&FE60 AND 4)=4
 390 ENDPROC


 400 DEF PROCDATA(D%)
 410 ?&FE60=16*D%+2
 420 ?&FE60=?&FE60+8
 430 REPEAT UNTIL (?&FE60 AND 4)=0
 440 ?&FE60=?&FE60-8
 450 REPEAT UNTIL (?&FE60 AND 4)=4
 460 ?&FE60=?&FE60-2
 470 ENDPROC
```

Fig. 2.2

Applications

By now the reader may be wondering why such an elaborate programming sledgehammer has been devised to crack such a fragile nut: we appear to have laboriously accomplished what might have been achieved by a casual twist of the R70's tuning knob!

Of course, by the same token, your entire home computer might be regarded as an ill-conceived substitute for the abacus!

In both cases, the saving graces are automation and programmability. These open the door to unlimited scope for ingenuity and experiment in a very new application of home computer activity. The applications proposed in this article barely scratch the surface of this exciting new ground.

Memory Expansion

The R70 boasts of a desultory two (yes 2—not 2K) memories for frequency tuning: its updated version, the R71, augments this to a grand 32 memories. However, using the BBC-B micro as controller, we can access a virtually unlimited library of interesting frequencies. Each can be linked to tables of signal strength, transmission times, modulation mode, callsign, etc. In other words we can operate the receiver from a radio frequency ***database***, with all the flexibility that database operation offers.

The R70 as an HF Scanner

Some readers may be familiar with the v.h.f./u.h.f. scanners at present on the market. Now the principles which we have discussed can effectively turn the R70 into a super-scanner in the h.f. range. It can be instructed to search at intervals between any two frequencies, and to take any action (e.g. pause, commit to memory, ignore, etc) at each interval, according to the signal strength or squelch status there.

In this manner the receiver can be programmed to build up its own library of interesting signals, which can later be individually recalled and examined at leisure. It can be instructed to ignore frequencies known to carry noise or interference only: in particular any spurious signals generated by its proximity to your micro and v.d.u.!

Frequency Spectrum Analysis

The R70 can be programmed as a radio frequency spectrum analyser. That is it can build up a picture of the radio activity strength in any part of its 0–30MHz range. Utilising very powerful statistical techniques, we can detect and resolve signals which are far too faint for the human ear, and which could not normally be distinguished from the noise level. Clandestine or unauthorised signals can be discovered, logged and monitored. Using an on-line printer, graphs of the spectrum can be drawn.

It is important to take a large sample of readings at each frequency—a single reading is practically meaningless. The larger the sample, the better your chance of distinguishing genuine faint signals from noise. Calculating the standard deviation on each set of readings will provide a measure of its credibility. Advanced mathematical methods (e.g. convoluting the frequency spectrum with the R70's selectivity function) can be used to distinguish transmissions too close to be separated by conventional means.

Acknowledgement

The author would like to thank **Thanet Electronics Ltd.** for their kind permission to reproduce information relating to the R70, and for supplying me with a secondhand set and accessories. ●

Directory

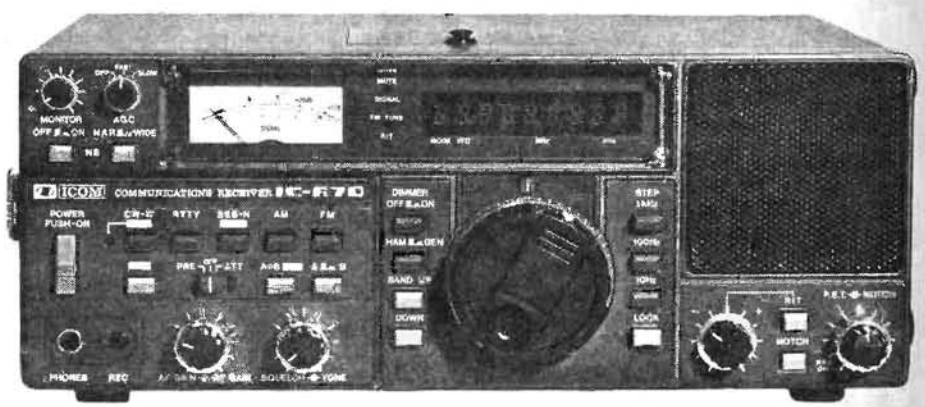
a. *Manufacturer*
Icom Incorporated
1-6-19, Kamikuratsukuri Hirano-Ku
Osaka, Japan.

b. *Principal UK Supplier of Receiver and Accessories*
Thanet Electronics Ltd
143 Reculver Road
Beltinge
Herne Bay, Kent CT6 6PD
(02273) 63859
(cost of R70 about £565: but it's well worth inquiring for secondhand sets, which can be excellent value when purchased from a reputable dealer. Due to the updated R71A a number of secondhand R70s are around)

c. *Miscellaneous Electronic Components*
Maplin Electronic Supplies
PO Box 3, Rayleigh, Essex, SS6 8LR
(0702) 552911

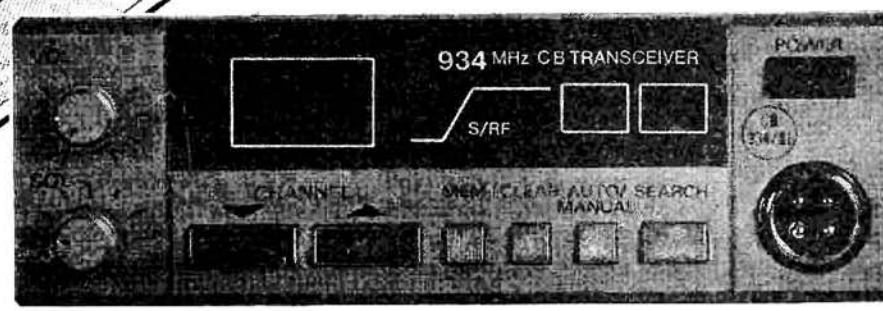
Pin	Function
1	+5V
2	CB1—Control line 1 of port B
3	+5V
4	CB2—Control line 2 of port B
5	0V
6	PB0—Data bit of port B
7	0V
8	PB1—Data bit 1
9	0V
10	PB2—Data bit 2
11	0V
12	PB3—Data bit 3
13	0V
14	PB4—Data bit 4
15	0V
16	PB5—Data bit 5
17	0V
18	PB6—Data bit 6
19	0V
20	PB7—Data bit 7

◀ Table 2·1 BBC-B micro USER PORT pin functions



The Icom R70 receiver

PW REVIEW



The Nevada 934MHz Range

The Citizens Band radio service arrived legally in the UK in the November of 1981 and had been preceded by many months of argument and debate. It is now a matter of historical record that an allocation at 27MHz was "forced" into existence—the close connection with the 11 year Sunspot maxima should not be overlooked. However, those with long memories may well recall the original "open channel" concept for a well-defined personal radio system operating at 900MHz. The year was 1980 and, being hailed as a world first, it was supposed to represent the state of the art in r.f. technology and the salvation of the UK's radio manufacturing industry. So what happened?

The intervening years have been littered with manufacturers' plans for 934MHz equipment, with just about all remaining at that tentative stage. *PW* reviewed Reftec's MTR 934–2 transceiver in March 1984—the only UK contender and now sadly defunct. Even then the equipment really remained in the "enthusiast" category and more akin to amateur radio for its pioneering spirit.

Today the parallel with amateur band equipment has become even more obvious and it has taken the Japanese Cybernet brandname to set the current standard in design and performance, introduced into the UK as the Nevada Delta One.

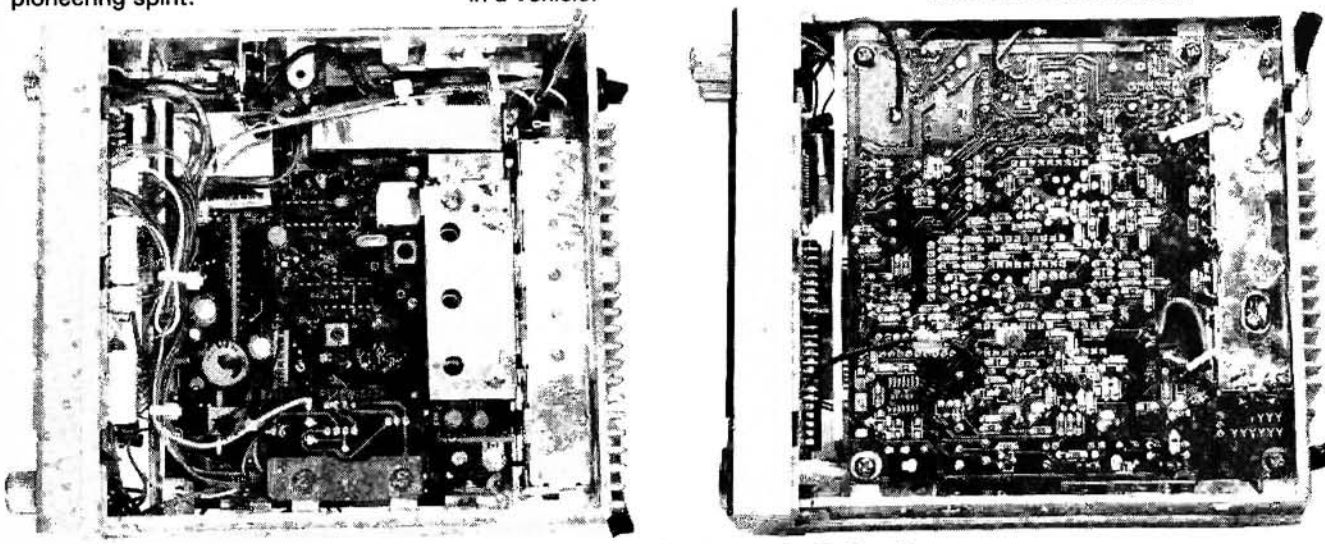
Externally the transceiver is well laid-out with all operating controls mounted on the front fascia in a simple uncluttered manner. Volume and squelch are provided as rotary controls with "chunky" pushbuttons for power, up/down channel indexing and memory programming/control actuation. Located above the pushbuttons is a composite display combining channel number, ramped signal strength/relative power output bargraph meter and function indicators, all incorporating high visibility l.e.d. elements.

Rear apron features include flying leads for d.c. power input and N-type line socket for antenna connection. Two 3·5mm jack sockets to the side of the substantial extruded aluminium heatsink fins allow connection of an external loudspeaker and optional external analogue power/S-meter. The internal loudspeaker is mounted on the underside of the transceiver to allow underslung dashboard mounting in a vehicle.

Internally the layout and engineering standard of the Delta One are, without doubt, exceedingly good—properly designed stripline techniques are used extensively with the majority of decoupling components based on low inductance, surface-mounting devices. All major components of the r.f. and control circuits are individually screened within their own metallic compartment.

The receiver section is based on a conventional dual-conversion superhet with i.f.s at 58·1125MHz and 455kHz. Incoming signals travel through low-pass filtering, a discrete *pin*-diode TX/RX switching network and bandpass filtering before encountering the first r.f. amplifier stage, which features a low-noise bi-polar device. Further bandpass filtering follows before the first mixer stage, again utilising a bi-polar device. Subsequent signal processing to audio follows the now familiar 455kHz i.c. f.m. demodulator and audio amplifier arrangement.

Naturally enough for a device operating at close to 1GHz and using p.l.l. frequency synthesis the reference oscillator stability is of paramount importance. The Delta One uses a 12·8MHz oven-mounted temperature-controlled master oscillator.



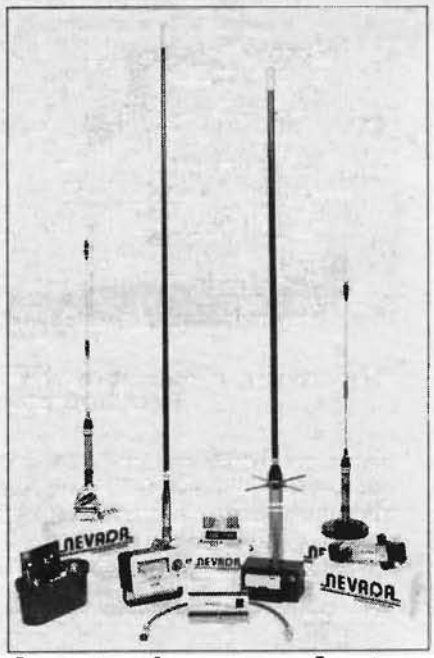
Internal views of the Nevada Delta One

Laboratory measurements confirmed that the final frequency stability and accuracy are of very high standard—bettering the performance normally found with equipment running at h.f./v.h.f. No problems of mechanical instability (direct f.m.) were in evidence either—an effect that is often encountered with similar arrangements and somewhat of a handicap in a mobile environment!

Once again the transmitter line-up is based on conventional techniques with the final stage based on a Mitsubishi thick film r.f. power module. This device which incorporates three active devices on the substrate is capable of withstanding supply voltages of up to 17V and according to the specification table should withstand a 20:1 v.s.w.r. condition when supplied at 15·2V and outputting 7W of r.f. The previously mentioned vertically finned external heatsink for this device, coupled with the typical r.f. output level of 5W, ensure that those prone to long "overs" will certainly warm up the device, but at no time exceed the +110°C quoted maximum temperature for this stage. This design parameter seems to be frequently exceeded, with expensive results, in lower frequency equipment.

Operating

I won't dwell too long on this category—suffice to say that the designers have not succumbed to the temptation to over exploit the capabilities of the c.p.u. This is not intended as a criticism, the Delta One is designed for the specific purpose of communication and this it does very well. Both transmitted and received audio was



An extensive range of antennas and accessories are available

found to be of good quality, the audio bandwidth being well defined. Squelch action was found to be positive, temperature stabilised and capable of being set to low threshold levels. Channel selection is accomplished by the use of the UP/DOWN pushbuttons indexing one channel at a time, or if held, continuously. With the current 20 channels available in the UK the memory facilities are of limited use but as the system is set for expansion to 40 channels (with reduction in channel spacing) its availability for the future is worthwhile. Scanning of all or programmed memory channels only is available; the scan stops when activity is detected and can be overridden by the CLEAR button. The Delta One can be readily modified for 40 channel use and its selectivity will easily cope with 25kHz spacing.

System Evaluation

The Nevada range is not confined to the Delta One and includes several mobile and base station vertical antennas, power meters and a masthead pre-amplifier. Operational tests were conducted from the *PW* offices in Poole, allowing signal penetration and potential range assessments to be made over built-up and semi-rural areas.

Two antennas were evaluated, the PA7-E, which is a 1·1m-long multiple stacked 5λ8 base station colinear, together with the 815mm long P7R-E mag mounted mobile antenna. Both types provide a gain of 7dBi over the range 934–935MHz and will handle up to 50W. On installation both were found to be well matched, with negligible reflected power indicated.

Antenna location at 934MHz is considerably more important than at lower frequencies and the old maxim of the higher the better prevails. Unfortunately this does dictate the use of a good low-loss coaxial feeder run—we used Andrew LDF-450 foam dielectric Heliax and for any cable run in excess of 6m the minimum specification of cable should be regarded as Pope H-100. The attenuation of UR67 types will severely limit both radiated power and incoming signal strength.

Having said all that the ranges obtained during tests were, in the main, above expectations. The correspondingly shorter wavelength allows enhanced signal penetration/reflection within built-up areas and is only completely blocked by large objects such as high ground. Trees and shrubbery exhibit various absorption levels, varying with the density and variety. With our base antenna at 12m a.g.l. reliable contacts across built-up areas occurred at up to 8km, extending to over 25km in semi-rural parts. Parking the mobile at 200m a.s.l. allowed fully

★ specifications

TRANSMITTER

Output power:	5W at 13·2V d.c. *(4·8W across bandwidth)*
Modulation:	F3E (f.m.)
Deviation:	5kHz maximum *(3·8kHz)*
Max. Frequency response:	3kHz

RECEIVER

Sensitivity:	Less than 0·5μV for 12dB SINAD *(0·54μV e.m.f.)*
Selectivity:	12kHz at –6dB, 30kHz at –70dB *(9kHz at –6dB)*
Spurious Response:	60dB
Audio output:	3W into 4Ω, internal speaker *(3W at 3·5% distortion)*

GENERAL

Channels:	20 (provision for expansion when legislation permits)
Channel spacing:	50kHz
Frequency range:	934·0125–934·9625MHz
Frequency control:	p.l.l. synthesiser
Frequency tolerance:	$\pm 5 \times 10^{-6}$ *(within 80Hz of nominal channel centre frequency)*
Power requirements:	13·2V d.c. (negative earth) at 2·6A *(2·1A transmit, 0·3A "squelched" receive)*
Accessories:	Mobile mounting bracket, supply lead with in-line fuse, 4-pin dynamic fist microphone
Dimensions:	150 × 182 × 50mm
Weight:	1·2kg
Antenna Connector:	50Ω N type on 150mm coaxial lead

***PW* test results are shown in italics.**

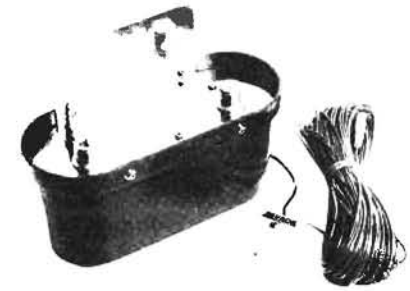
Test equipment used: 2017 and 2019 signal generators, TF2370/TK2373 spectrum analyser, 2435 frequency meter, TF2304 modulation meter. TF2337A distortion meter, TF893A power meter, all by Marconi Instruments; Bird model 43 power meter.

quietened reports to be exchanged with a base station some 45km away, who was reportedly running approximately 3W e.r.p. Yes people are using 934MHz CB!

To further improve reception performance of the base station you can employ the Nevada HRA-900 masthead mounting low-noise GaAsf.e.t. pre-amplifier. This device, which comes in its own waterproof plastics housing, effectively places the first stage of the receiver at the antenna, a technique widely adopted by radio amateurs at u.h.f. and above. A 2SK361 series device is used and was found to provide a gain of 19dB with a 3dB bandwidth of 26MHz. Coaxial r.f. bypass relays are used in this unit to ensure minimal insertion loss and 50W power handling. Supply requirements are 13·8V d.c. at 0·2A and if not required the unit can be remotely switched out of circuit—TX/RX switching is controlled by r.f. vox.

Thanks for the review items from the Nevada Communications range go to **Telecomms, 189 London Road, Portsmouth PO2 9AE. Telephone 0705 662145.**

John M. Fell



The twin movement HPS900 power/v.w.s.r. meter and HRA900 masthead pre-amplifier

News

144MHz Contest

Salisbury Radio and Electronics Society have organised a 144MHz (2m) contest on Sunday, 18 August, between 0900 and 1500GMT.

The contest will be for s.s.b. and c.w. modes only, with a maximum power limit of 250W e.r.p. (e.g., 25W to a 10dB gain antenna) and an upper frequency limit of 144·295MHz. To count, contest exchanges must consist of: callsign, report and serial No., and county.

Scoring will be on the basis of one point for each contact and ten points for each new county, for contacting G3FKF/P, and each new country (including the UK).

A specially endorsed Salisbury Award Certificate will be awarded to the top three contestants. All entries must be received by 18 September 1985, and should include station details, such as: rig, antenna, antenna a.s.l., county, and an sae for results.

Entries should be sent to: *Salisbury R & ES Contest, c/o M. E. Wright G4RLF, 27 Bulbridge Road, Wilton, Salisbury, Wilts. SP2 0LQ.*

SERT Symposium

The Society of Electronic & Radio Technicians has announced the programme for its residential "Home Entertainment Technology Symposium" to be held at the University of Sussex from 16 to 18 September 1985.

Five sessions are provided to cover the topics of Digital Television, Satellite Broadcasting, Economics of the Domestic Market, Component Developments and Product Developments.

Those who have previously attended SERT Symposiums, will attest to their importance to those involved in the subject field, and the high quality of the papers presented. Of equal importance to some are the question and answer periods programmed into the time-table.

Further information about the symposium and a registration form can be obtained by contacting: *Janet Firmin, Conference Organiser, SERT, 57–61 Newington Causeway, London SE1 6BL. Tel: 01-403 2351.*

Benny

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Our Earlestown shop is very well run by Peter G4KKN and now holds all our amateur radio equipment. We shall shortly be enlarging our showrooms there to two floors and personal callers will be able to try out all the equipment side by side. We sell all the main makes YAESU, ICOM, TRIO, KENWOOD etc. etc. so you can decide for yourself (with our advice if you want it) which rig is best for you.

Our servicing department at Earlestown has been extended and re-equipped with the latest test equipment and will be able to help you with any problems you may have.

If you can take a trip to Earlestown, which is just a couple of miles from Junction 22 or 23 on the M6 and close to the intersection of the M6 and M62, Peter will make you most welcome with a cup of coffee brewed to Brenda's own secret recipe! But if the shop is just too far away from you then please telephone 09252 29881 and Peter will be pleased to advise you on the phone and send anything you want by post or securicor.

Bernie & Brenda

FT270RH

"45W FM MOBILE"

Fully synthesised 2M FM Transceiver. 45W (RH), 25W (R) Power Output. Dual VFOs. Optional Voice Synthesiser. 1MHz/25kHz/12½kHz Steps. 10 Channel Memory. '+' '–' Repeater shifts with reverse facility. Memory Priority and Programmable Memory Scan. 17 Function Priority and Programmable Memory Scan. 17 Function LCD Display, LED 'S' Meter. One piece diecast alloy chassis. (Fan assisted cooling on 45W model). 140mm W × 40mm × 180mm D.

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Dual Band FM 2M and 70cms. Full Duplex Operation. Aesthetically pleasing LCD Display/'S' Meter. 25W power output both on VHF and UHF! Optional Voice Synthesiser. 1MHz/25kHz/12½kHz steps (12½ on UHF!) '+' '–' Repeater shifts with reverse facility. 10 Channel Memory. Priority Memory Scan/Programmable. Memory Scan. One piece diecast centre chassis. 50(H) × 150(W) × 168(D) mm.

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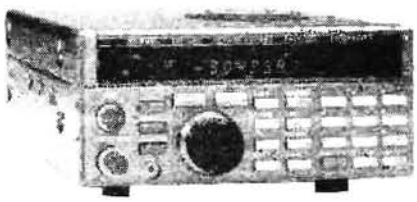

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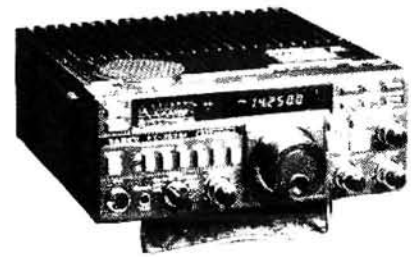

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FT209	Hand held 2m with NiCad	£239
FT290	All mode portable	£299
FRG8800	Gen. Cov. H.F. Receiver	£499
FRG8800	With VHF Module	£559
FT757GX	H.F. Gen. Cov. Transceiver	£779
FC757AT	Auto Tuner	£259
FP757HD	Power Supply	£269
FT726	With 2M Module	£799

ICOM

IC751	H.F. Transceiver	£1,229
IC745	H.F. Transceiver	£869
ICR70	Gen. Cov. Receiver	£589
ICR71	Gen. Cov. Receiver	£675
IC271	VHF Base Station	£689
IC471	UHF Base Station	£789

KENWOOD/TRIO

TS940	H.F. Transceiver	£1,595
TS430	H.F. Transceiver	£695
R2000	Gen. Cov. H.F. Receiver	£469
R600	Gen. Cov. H.F. Receiver	£275
TH21E	2m Hand Held	£179
TH41E	70cm Hand Held	£199

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BATC

by Colin Redwood G6MXL and Tony Marsden G6JAT

The 1985 BATC rally/show was again held at the Post House Hotel at Crick near Rugby, on Sunday May 5. Despite the rather showery weather, even more people attended than last year.

This year's show demonstrated the many differing facets of Amateur TV–cameras, monitors and other ancillary equipment were on display for narrow band, slow scan and fast scan modes, together with r.f. equipment for 430MHz and 1·3GHz, transmission and reception.

Many more companies were showing ATV equipment, our apologies to those that we missed. In one case the company had sold its entire stock and left before we had a chance to chat! Fortop Ltd. were showing a new ready-built and boxed, 18W output, 430MHz amplifier, designed for their 250mW transmitter kit, introduced last year. It looks as though these amplifiers are going to be a very popular way of generating some extra power from other QRP transmitters such as the popular BATC design which appeared in *CQ-TV 122* and in the *Amateur Television Handbook*. The same company also have a new ready-to-go transmitter which produces a similar output.

Television activities on 1·3GHz continue to gain interest, with two lectures being devoted to the band, repeater groups showing their activities, and several companies with equipment for sale. The Worthing Repeater Group were showing a very interesting video of their operations, as well as selling their 1·3GHz colinear antenna kits and their ATV computer program cassettes.

The fast scan outside broadcast contingent were present in even greater strength than previous years, with over a dozen professional and semi-professional cameras in action, linked to four separate control points. Brian Summers G8CQS and his team produced a very convincing demonstration of the technique of "chroma keying", which enabled the unsuspecting subject to suddenly appear to be on the other side of the car park!

There were several demonstrations of SSTV. Grant Dixon G8CGK had a printer coupled up to his gear, enabling many a proud parent to take home a slow-scan portrait of tomorrow's ATVer. Davtrend were showing their SSTV system in addition to their ever popular power supplies and accessories. G4ENA and others were demonstrating colour SSTV, which together with a very informative lecture, awakened many visitors to the possibilities of this mode of world-wide visual communication.

H.S. Publications were selling a number of very useful books, including the second edition of their *Guide to World-Wide Television Test Cards*. This book must be worth its weight in gold to the keen TV DXer. Also being demonstrated on the stand was the D-100 DX-TV converter, which tunes both v.h.f. and u.h.f. broadcast TV bands. This unit features wide and narrow bandwidth i.f. switching. Video recordings were shown of some of the very impressive results obtained using it.

As usual the BATC stand was busy all day, with new members joining and sales of p.c.b.s and other items to members. The latest BATC book *Micro and Television Projects*, by Trevor Brown, was particularly popular. The demand for back issues of CQ-TV magazine is getting so great, that the club is planning to produce a new book containing some of the most popular projects from past issues—this will be very welcome.

If you are interested in joining the BATC, please send a large (230 × 165mm) s.a.e. for full details to: The Membership Secretary, "Grenehurst", Pinewood Road, High Wycombe HP12 4DD. ●

In view of the weather, the outside broadcast demo was operating under cover!

ECONOMY UHF PRESCALER

This simple project by Basil Spencer G4YNM will uprate your h.f. digital frequency meter to around 600MHz

During construction of home-brew projects the author often borrows an h.f. digital frequency meter from a colleague. However, the meter only covers up to about 60MHz and so, after considering the cost of commercially available meters, it was decided to see if a prescaler could be used to extend the coverage up to at least v.h.f. and preferably u.h.f. for a reasonable cost.

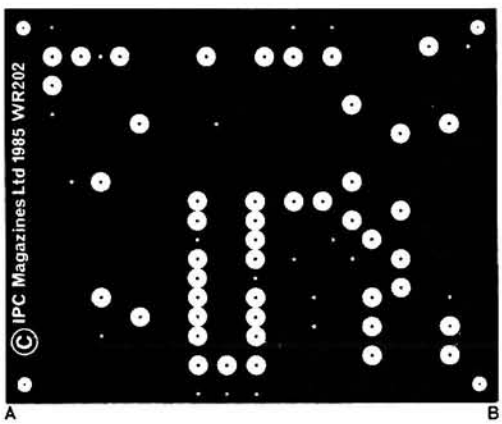
The first attempt used a cheap divide-by-100 chip that would toggle at about 220MHz and whilst this functioned well the accuracy was only 100kHz. The main instrument had five digits and a fixed decimal point, so that an input of 145·55MHz was read out as 1·455MHz. Consequently a more expensive divide-by-ten chip was purchased and tried. The SP8680B is a divide-by-ten or divide-by-eleven chip which is rated at a maximum frequency of 575MHz but which will go up to about 650MHz if it is bullied a little. It divides by ten when Pins 2 and 3 or both are taken to logic 1 and divides by eleven when both are taken to logic 0. With three separate outputs there are not many meters that will not be able to match. Pin 8 is the ECL output, Pin 9 is the $\overline{\text{ECL}}$ output. The one used in this design is Pin 11 which is the TTL output. The maximum input voltage is specified as 2·5V pk-pk and the minimum is 350mV pk-pk at 575MHz.

Circuit Description

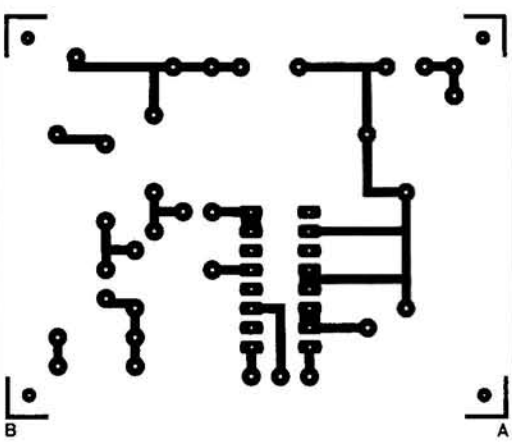
The supply line is regulated at 5V using IC1, this chip is by-passed for r.f. by C1 as otherwise it has a habit of oscillating, C2 just helps smooth it out a little. The input signal is amplified by a BFY90 transistor pre-amplifier in a common emitter configuration. The signal is then passed to the SP8680B via C5. The divided output is taken from Pin 11 (TTL output) and fed directly to the d.f.m. as though it were a normal input signal. Any reading appearing on the counter is simply multiplied by ten.

Construction

The prescaler is built onto a small double-sided p.c.b. using the upper side as a ground-plane. The prototype board measured 64 × 51mm but this is only because the size of the metal box to hand dictated that size. All the components are mounted on the ground-plane side. Fig. 1 shows the p.c.b. ground-plane side indicating where the leads pass through, and where they are soldered directly to ground. The p.c.b. is fitted into the die-cast box using 6BA screws and nuts.



WRM343



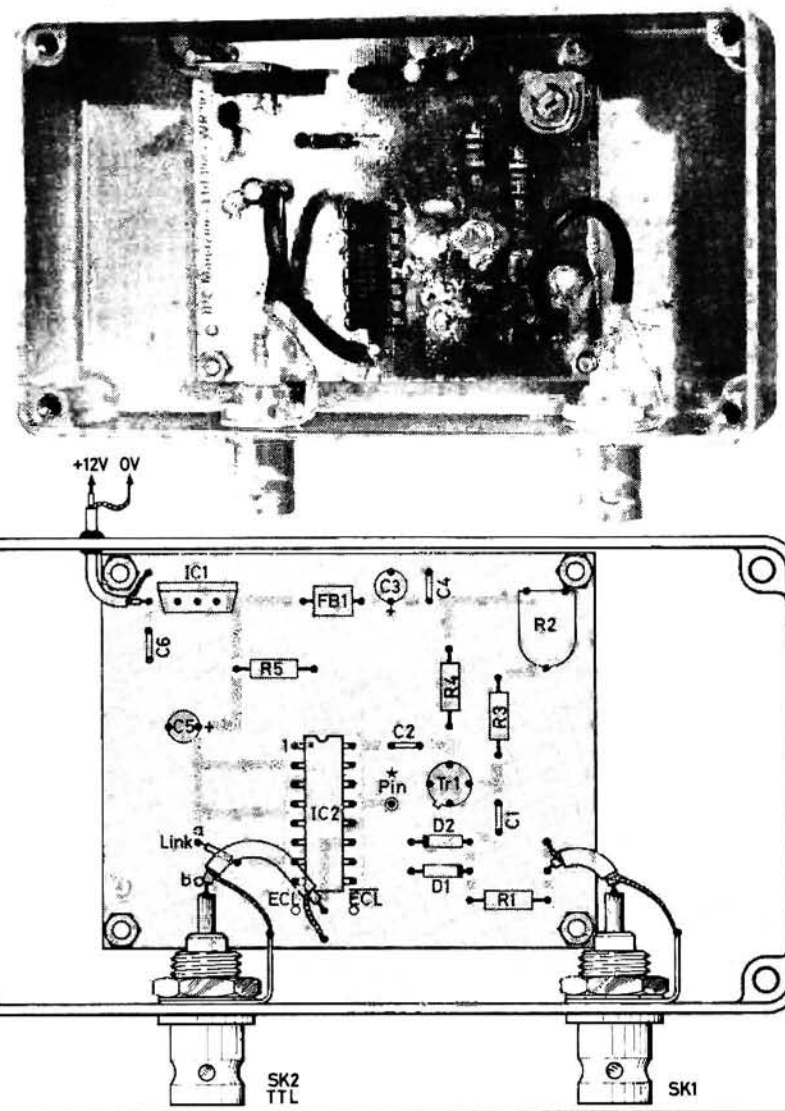


Fig. 1: Full size p.c.b. layout and constructional details

Setting Up and Using

To set up the unit connect to a 12V d.c. supply and check that the voltage output from IC1 is 5V, then adjust R2 until the voltage on the collector of Tr1 is 2·5V. Feed in a signal in the v.h.f. or u.h.f. range and check that the output on the frequency counter is correct. Bear in mind that the readout will be one tenth of the input and must be multiplied by ten. With a five-digit counter this gives accuracy to 10kHz, which is sufficient. A six-digit counter would improve this to 1kHz.

This project has proved to be a useful add-on unit. The prescaler reliably triggers from a "sniffer" wire placed near a coaxial line carrying only 100mW at v.h.f. and no problems have been experienced when using overtone oscillators within the original meter range. ●

BUYING GUIDE

Most of the components used in this project are readily available from our advertisers. The SP8680B prescaler chip is listed by Maplin Electronic Supplies Ltd. Marco Trading list the BFY90 transistor.
Using the layout shown our second prototype operated on signals up to 810MHz before suddenly stopping counting. This point can be determined quite simply as the counter display ceases to be steady and randomly changes.

Approximate Cost £20

Construction Rating INTERMEDIATE

★ components

Resistors

Carbon Film ¼W 5%		
50Ω	1	R1
330Ω	1	R4
4·7kΩ	2	R3,5

Potentiometers

Min. horizontal preset		
2·2kΩ	1	R2

Capacitors

Ceramic		
100pF	1	C6
10nF	3	C1,2,4
Min. electrolytic		
10µF 16V	2	C3,5

Semiconductors

Diodes		
1N914	2	D1,2
Transistors		
BFY90	1	Tr1
Integrated Circuits		
7805	1	IC1
SP8680B	1	IC2

Miscellaneous

Diecast box 114 × 64 × 30mm; Printed circuit board; 50Ω BNC sockets (2); Ferrite bead; 6BA nuts, washers and bolts.

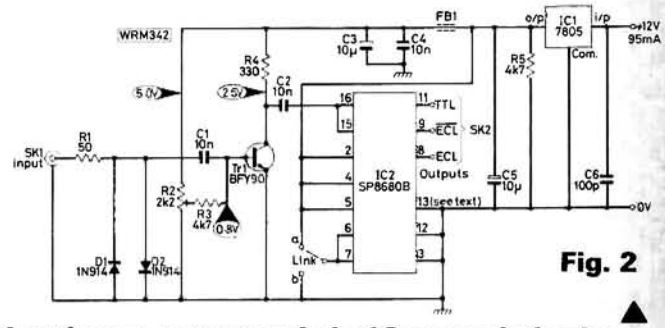
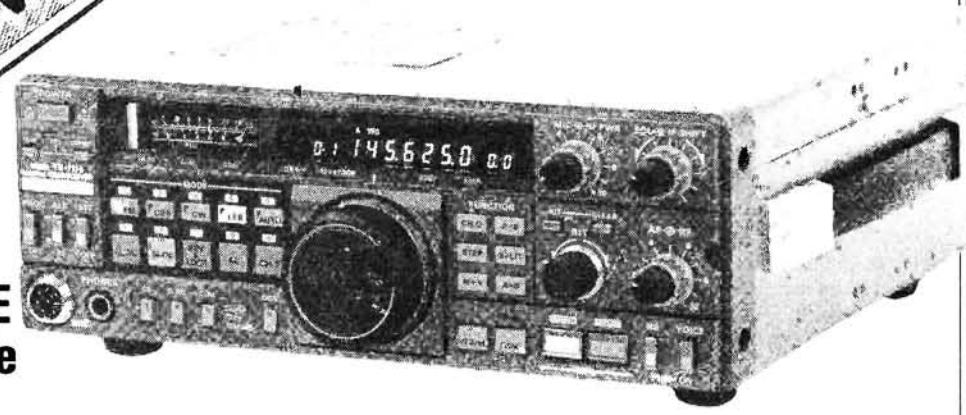


Fig. 2

Note: The link should be connected to "a" when using the TTL output and pin 13 grounded using a through-board pin indicated on the p.c.b. layout. For the ECL outputs the link should be connected to "b" and pin 13 left open circuit

PW REVIEW

TRIO TS-711E 144MHz All Mode Transceiver



Trio have been producing amateur band equipment for over a decade with many of their transceiver ranges gaining "standard" status. Amongst these the TS-700 series provided top flight, fully comprehensive multi-mode base station transceivers for the 144MHz band. The recent introduction of the TS-711E marks the continuation of this tradition and yields a potent combination of r.f. performance and operational ergonomics, together with a brand new subsystem—Digital Code Squelch.

An examination of the incorporated facilities will confirm from the outset that this transceiver has been designed to provide just about every function you could want within a compact 270 x 108 x 327mm transportable package.

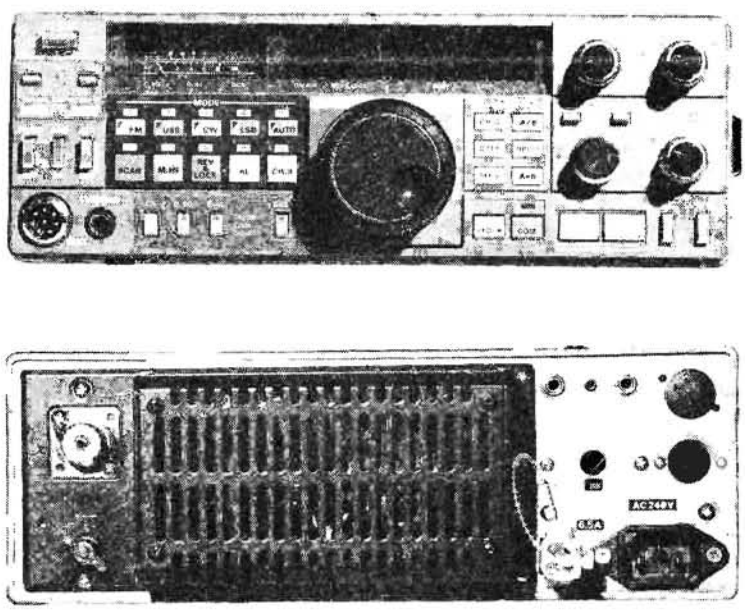
Control Facilities

Even though the front panel control deck leaves little unoccupied space, operating is exceedingly straightforward and in the main immediately self-evident from the well laid out and notated keys and controls.,

Each of the four principal modes (f.m./u.s.b./l.s.b./c.w.) are summoned by individual keys—selection being confirmed by an integral l.e.d. "flag" and audibly by c.w. ident, based on the first letter of the mode. An additional key found adjacent to the mode selectors marked AUTO, when deployed, automatically changes the operating mode when tuning through the band, either manually or under scanning control. The mode l.e.d. flag indicator confirms the action together with a single "beep" from the internal loudspeaker as the change is made.

Frequency selection is principally controlled by a centrally mounted 48mm diameter serrated rubber faced rotary dial knob, the action of which is nicely weighted. Twin synthesised v f.o.s are provided and allow 10Hz resolution, virtually indistinguishable from a true continuously variable control, with selectable 10 or 100kHz increments per revolution. When f.m. is selected it is also possible to tune in 5 and 12·5kHz steps. If the key marked CH Q is enabled a solenoid operated "click-stop" mechanism comes into play on the main dial knob, providing positive indexing capability throughout the channelised portions of the band. Rapid UP/DOWN MHz shifts are obtained from further keys on the front panel and the dynamic microphone head also allows frequency incrementing or, when held continuous manual scanning. A 15mm control knob to the right of the main dial controls the r.i.t., which provides receiver frequency offsets of up to ±9·9kHz in 10Hz increments.

Located above the frequency control is a multi-segment blue fluorescent display, providing frequency indication down to 10Hz, memory channel status and r.i.t. offset details. Above this section red mode and status indicators confirm the majority of key commands. To complement the frequency/status display an illuminated rectangular analogue meter provides the familiar multiple functions of S meter, a.l.c. indicator and/or relative power output level.

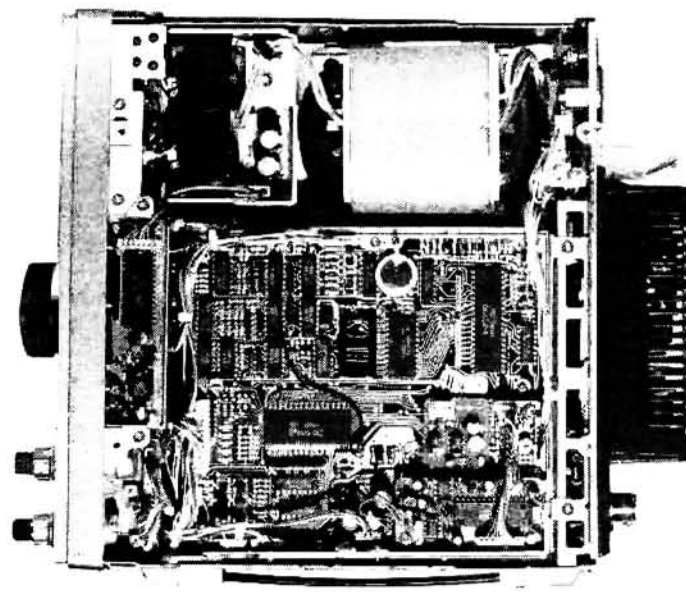


Front and rear features of the TS-711E. The control layout and identification is really excellent. Frequency readout can be backed-up by optional synthesised voice announcements

Three dual-concentric controls to the right of the display allow continuous variation of mic gain (s.s.b. only), r.f. output level (2W minimum up to rated maximum), receiver volume, r.f. gain, squelch and i.f. passband shift. This latter control provides a limited ± shift of the receiver's i.f. passband allowing the removal, or considerable attenuation, of adjacent frequency transmissions when operating in s.s.b. or c.w. For rapid reduction in receiver sensitivity a switched 20dB attenuator is also provided.

Repeater operation is accommodated by the inclusion of switchable auto toneburst, ± TX offset and reverse repeater key for input checking.

Further keys, grouped under the FUNCTION heading, allow the selection of v.f.o.s A or B, memory channel operation (40 channels, of which 36 can be mode and frequency programmed, three allow split frequency operation and locations 39 and 40 can be used to define the scanning range limits), split frequency (between the v.f.o. frequencies) and a facility to transfer selected memory channel details directly into v.f.o. Operating the A/B key sets both v.f.o.s to the same frequency and mode, whilst the COM key can be programmed to directly revert operation to a designated frequency and mode, i.e. S.20 f.m. or similar calling channel.



An internal view of the TS-711E which indicates the extent of the circuit integration employed in current transceivers

Memory programming is easily accomplished and requires the desired frequency to be first established via the v.f.o., the mode determined by the mode key together with key selection of main dial control status (click or continuously variable option) and, if required, the TX offset. With this data available the CHS key is used to enable the main dial control to select the desired memory channel. Pressing the M IN key produces a string of eight beeps from the speaker to confirm that the transceiver's c.p.u. is ready to accept the memory data. Whilst this beep sounds the M IN key is again pressed and acceptance of the data is confirmed by a single long tone.

★ specifications

TRANSMITTER

Frequency coverage:	144·0–146·0MHz
Types of emission:	c.w. (A1A), u.s.b./l.s.b. (J3E), f.m. (F2A, F3E)
Power output:	2–25W variable *(2·3–24·5W across bandwidth)*
Carrier suppression:	Better than –40dB
Unwanted sideband:	Better than –60dB
Frequency stability:	±300Hz 1–60 min. after power on, within 50Hz after 60 min.
Frequency Accuracy:	Within ±3p.p.m. (s.s.b./c.w.), ±5p.p.m. (f.m.)
Max. f.m. deviation:	±5kHz *(4·5kHz)*
Microphone impedance:	500–600Ω
Antenna impedance:	50Ω

RECEIVER

Intermediate frequencies:	1st i.f. 30·265MHz, 2nd i.f. 10·695MHz (s.s.b./c.w.), 455kHz (f.m.)
Sensitivity:	less than 0·2µV for 12dB SINAD (f.m.) *(0·28µV e.m.f.)* 0·13µV for 10dB (S + N)/N (s.s.b.) *(0·15µV e.m.f.)*
Selectivity:	12kHz –6dB 24kHz –60dB (f.m.); 2·2kHz –6dB, 4·8kHz –60dB (s.s.b./c.w.)
Squelch sensitivity:	less than 0·16µV, threshold *(f.m. 0·28µV e.m.f.)*
Audio output:	2W into 8Ω, 5% distortion *(2W at 2·3%, 2·5W at 5%)*
Audio output impedance:	8Ω

GENERAL

Power requirements:	120/240/220V, 50/60Hz a.c. mains or 13·8V d.c. (12–16V), negative ground 6·5A max. TX, 1·2A RX
Dimensions:	279 x 108 x 327mm (inc. projections)
Weight:	7·1kg

Test results are shown in italics

Test equipment used:
2017 and 2019 signal generators TF2370/TK2373 spectrum analyser, 2435 frequency meter, TF2304 modulation meter, TF2337A distortion meter, TF2005R two-tone generator, TF893A power meter, all by Marconi Instruments; Bird model 43 power meter; Tektronix 2215 oscilloscope.

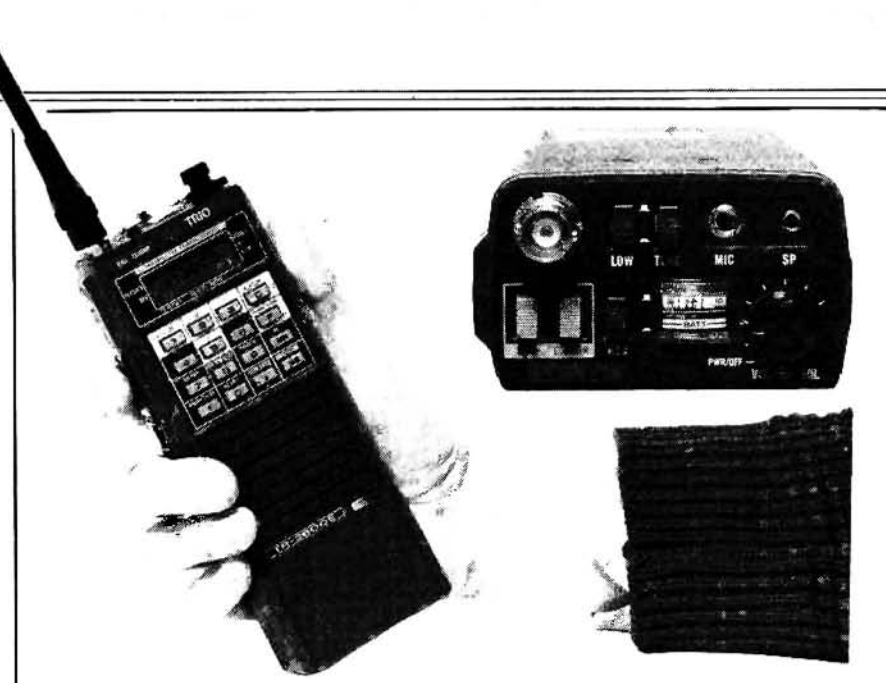
Digital Code Squelch (DCS)

The features noted so far in themselves represent a comprehensive array of operating facilities, most of which have been available in one form or other on previous transceivers —what most definitely has not is the f.m. Digital Code Squelch sub-system.

This uses a digital code recognition system based on a five digit ASCII group to either open the squelch and/or sound a beep string alarm. The TS-711E is also keypad programmed to automatically transmit your digitally encoded callsign at the beginning and end of DCS f.m. mode transmissions. At the point of reception, which requires a similar DCS installation, the digital code is read and if found to correspond to the pre-arranged code group (10 000 possible combinations) will open the squelch, allowing normal speech reception. Without this appropriate coded prefix the squelch (in DCS mode) will remain firmly shut. Two separate methods are used to alert you to the fact that you have been called (assuming you were out of earshot at the time). The first, which would normally be used for unmanned standby reception triggers a three beep alarm burst and turns off the DSQ indicator l.e.d. This action either summons you to the transceiver or will alert you, on your return, to the fact that you have been called. The alternative alarm causes the speaker to emit continuous groups of three beeps until disabled. Up to ten separate digital codes can be entered into the TS-711E memory and set to be active or ignored.

DCS can also be employed in scanning mode operation, pausing on occupied frequencies for approximately six seconds as it would during normal scan. However, the squelch will not open and scan will resume unless one of the "active" code groups is detected. In this case scan would be stopped on this frequency and DCS disarmed to await your further instructions.

In order to evaluate the effectiveness of DCS we arranged for the loan of Trio's new DCS handheld f.m. transceiver, the TR-2600E. As with the base station DCS operation first requires the input of your callsign, which can contain up to six elements. This is achieved by reference to the instruction manual which provides an ASCII look-up conversion table. Each letter and number of your Callsign has a corresponding two digit code (G=71, 4=52 etc), which is entered sequentially using the numeric keypad. The encoded callsign can be recalled for verification using the keypad on the TR-2600E, or the rotary control and CS key of the TS-711E.



Recently introduced the Trio-2600E f.m. handheld has DCS and full coverage of 144–146MHz

In operation DCS was found to be very effective and would reliably activate the partner station with very low signal levels, in fact to the point where it was getting difficult to copy the recovered speech.

A further optional system add-on is the CD-10 callsign display unit which can be directly interfaced to the TS-711E via its ACC-2 data communications jack socket. This device incorporates its own modem, c.p.u./memory and will decode and display the ASCII callsign data of the DCS data string. This covers the alphabet and numbers 0–9; the more adventurous could even use this facility for other purposes . . .

As its input signal is derived from the audio output line the CD-10 can also be used in conjunction with non-DCS receivers. The display uses a 6-digit, 5 x 7 dot matrix and up to 20 different callsigns can be held in its on-board memory. It is possible to recall the callsigns of stations activating the TS-711E, whilst you were absent. A computer interface port on the CD-10 outputs t.t.l. level serial data, suitable for driving your home micro and deriving a hard copy log. The audio output of non-DCS receivers is "looped through" the CD-10 to an external loudspeaker—high input impedance ensures negligible loading of the audio rail.

Obviously for a system of the DCS type to be fully effective will require the general adoption of this operational format. It remains to be seen whether or not other manufacturers will follow suit or create their own versions. Coded access "Selcal" type systems may not be universally appropriate within the amateur bands, but there are probably many areas of concentrated activity where such a system could well restore operating sanity.

Operating Impressions

As I have often said before, my idea of a well designed transceiver is one in which the fundamental controls are easily accessible and whose function is readily apparent. Many design teams seem to loose touch with the reality of amateur operating requirements, where contacts are at best marginal and can often be of very short duration. Having to wade through an operating manual to refresh yourself on odd operating quirks is definitely taboo for the DX orientated station. It is pleasing therefore to report that the TS-711E, whilst possessing the wealth of facilities previously noted, was immediately "up and running" when plumbed into the shack mains and antenna system. During an extended period of evaluation at the home QTH I formed a very favourable impression of the rig, whilst operating both s.s.b. and f.m. Semi break-in c.w. operation, also proved to be effective—the hang time is adjustable and side tone is provided via the loudspeaker.

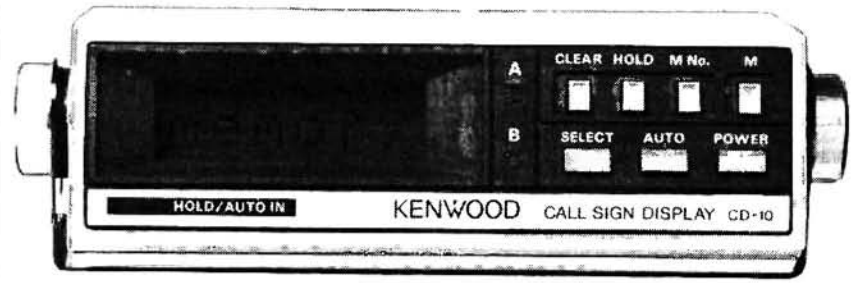
The receiver's selectivity proved in all modes to be well tailored and my only real criticism in this area concerns the non-availability of a dedicated c.w. filter to fully realise the potential of this mode. Sensitivity measurements are quoted in the specification table and

equate to the current state of commercial equipment from Japan. Whilst the front-end features a GaAsf.e.t. and m.o.s.f.e.t. mixer arrangement the sensitivity has been held within the bounds of practical use. The indiscriminate use in some receiver designs of high gain, low noise, GaAs-f.e.t. front-ends/mast head pre-amplifiers may yield results during periods blessed with non-local activity, but when your local QRO (or even next door QRP) merchant comes on the band the reduction in dynamic range performance becomes all too apparent. For all but the extremes of such activity or hill top (open) contest operation the TS-711E should hold its head well above water.

If, like me, you continuously assess the band capabilities by frequent monitoring of known signal sources, the easy to access and multimode memory programming will be a great asset, as is the all mode squelch. As with many transceivers the TS-711E uses an M57727 hybrid output stage p.a. module which according to the Mitsubishi catalogue has a linear power gain of 24dB and is capable of getting very hot! Many nominal 25W transceivers have suffered from heat exhaustion during extended high duty cycles—in this respect the TS-711E should set the example. Thermal sensing is provided to enable a low noise fan and hold the module temperature within safe limits. The same sensor technique is used to protect the mains transformer from excessive temperature rise and will disable transmission in such circumstances. Pre-set a.l.c. ensures that the p.a. is not overdriven and is automatically adjusted to take into account high load mismatch.

Finally both received and transmitted audio were found to be very good—a pre-set switchable speech processor provides a modest but worthwhile enhancement to s.s.b. transmissions. Thanks for the loan of the review equipment go to **Lowe Electronics, Chesterfield Road, Matlock, Derbyshire DE4 5LE or Tel: 0629 2817,** the current price of the TS-711E is £775. The TR-2600E £282 and the CD-10 callsign display £117.26. All prices include VAT and carriage.

John M. Fell



The CD-10 callsign display decodes and displays digital data input as audio. Up to 20 callsigns can be held in its memory or interfaced with your micro for log keeping

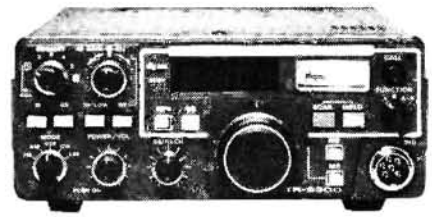
Products

50MHz Equipment Available

If you want to be ready on Day One of the new UK amateur 50MHz (6m) band you will probably be very interested in the two new items from the Trio range which have been recently introduced into the UK by Lowe Electronics. The TR-9300 is the 50MHz (6m) version of the popular TR-9130 144MHz (2m) transceiver. Providing coverage of 50–54MHz the TR-9300 will supply 10W of r.f. on f.m., u.s.b./l.s.b. and c.w. modes together with 3W of a.m. Basically designed for mobile installation the rig with its twin v.f.o.s., six memory channels and green l.e.d. frequency display will perform equally well as a base station.

The other device is the TS-670 quad-bander, which apart from its 50MHz band coverage, provides 7MHz (40m), 21MHz (15m) and 28MHz (10m) transceive facilities and an optional general coverage receiver covering 500kHz to 30MHz. Once again power output is 10W with all modes available, twin v.f.o.s and 80 memory channels, which can be programmed for mode, memory scan, etc. Whilst primarily intended for base stations use the TS-670 is compact enough for mobile installation.

For further details and price of either transceiver contact *Lowe Electronics Ltd, Chesterfield Road, Matlock, Derbyshire DE4 5LE. Tel: (0629) 2430.*



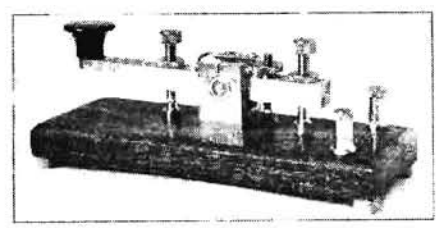
▲ **The TR-9300**

▼ **The TS-760**

Morse Key Kit

In these days of electronic, iambic or even triambic keyers, the old-fashioned up-and-down key still has many devotees. This kit from R. A. Kent Engineers lets you build your own solid brass key, all parts being fully machined and ready for assembly. Ball races are used for the arm pivots giving a very smooth action, and the contact points are solid silver, mounted on fine-pitch threaded screws for easy setting of the gap.

The kit is priced at £19.95 plus £2.00 post and packing. This does not include a base, but a fully dimensioned drilling drawing is provided for you to convert a suitable lump of slate, or other heavy material. If you are not up to such engineering feats, a polished wood base, weighted with steel sections, is available at £7.00 plus £1.00 post and packing. This is nicely finished, with a green baize bottom and non-slip plastics feet.



Further details can be yours by sending an s.a.e. to *R. A. Kent Engineers, 243 Carr Lane, Tarleton, Preston, Lancs PR4 6YB, telephone Hesketh Bank (077473) 4998.*

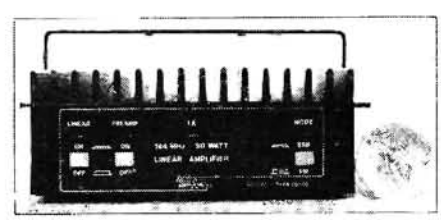
New 144MHz Linear Amplifiers

B.N.O.S. Electronics Ltd. announce the introduction of two new 144MHz amateur band linear amplifiers, both of which produce outputs of 50 watts r.m.s.

The two versions differ only in the r.f. power input maximums, Model LP144-3-50 up to 3W and Model LP144-10-50 up to 10W. Both incorporate the respected B.N.O.S. switchable low-noise receive preamplifier, and are switched by the usual p.t.t. line or by vox sensing.

In addition transmission mode switching for f.m. or s.s.b. is available, and input/output connections are terminated with BNC sockets. The standard mobile mount makes the unit suitable for either in-car or base station installation.

Both units measure 178 × 122 × 48mm overall, cost £108 each, which includes VAT (carriage is free) and is available direct, from: *B.N.O.S. Electronics Ltd., Bigods Hall, Great Dunmow, Essex CM6 3BE. Tel: (0371) 4677.*



RTTY Software

Owners of the Amstrad CPC 464 home computer may be interested in a 100% machine code program from PNP Communications, that will enable them to both receive and transmit RTTY information, when used in conjunction with a suitable terminal unit and, of course, a receiver or transceiver.

The specification of this versatile program includes the following;

1/Split screen operation. The top 14 lines by 72 characters are used to display the received text, the next four lines by 72 characters display the current state of the transmitted text and the bottom three lines by 72 characters display the last 288 characters of the 1024 character type-ahead buffer. The remaining screen area is used to display the current status of the program, ie Tx/Rx switching, baud rate, etc.

2/ User selectable baud rates of 45·45, 50, 60 and 75. All are selected from the keyboard and may be changed at any time the program is

running. No external UART or baud rate clock is required.
3/ Ten user-programmable memories are provided, each of 512 characters.
4/ CW ident. An a.f.s.k. Morse call-sign identification is included, to comply with the requirements of some licencing authorities.
5/ Automatic carriage return/line feed is provided.

VAT inclusive prices for the program are; cassette £12.36 and disc £17.55. These prices include p&p in the UK, however, for overseas orders add £1.00.

In return for an s.a.e., PNP Communications will happily deal with all enquiries and will also provide their full catalogue which lists suitable terminal units etc.

PNP Communications, 62 Lawes Avenue, Newhaven, East Sussex BN9 9SB. Tel: (0273) 514465.

Pre-amplifiers

A range of receive pre-amps, ready-built and tested or in kit form, that are designed for the 144, 70, 50 and 28MHz bands (2, 4, 6 and 10 metres) are available from Spectrum Communications, either with onboard relay switching for masthead or full transceive operation, or without switching for inclusion into an existing switched system or for receive only operation.

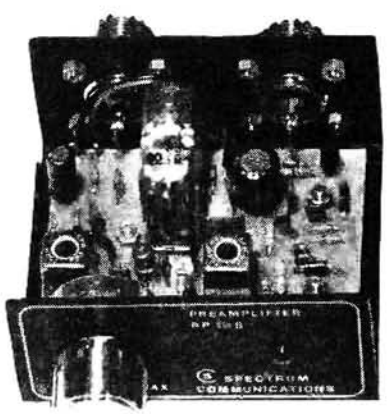
The unswitched versions, designated RP2, RP4, RP6 and RP10, provide a gain of greater than 14dB, ie, 5× amplification, which together with a noise figure of 2·5dB will significantly improve the receive performance of most rigs in use nowadays. The antenna input possesses diode protection against static and transients, plus the supply rail is protected against accidental polarity reversal. The units will operate satisfactorily from a supply of between 10 and 13V d.c., negative ground, with a current consumption of less than 10mA.

The switched versions (RP2S, RP4S and RP6S) utilise the 3SK88 m.o.s.f.e.t., which delivers more than 20dB gain, ie, 10× amplification, and have noise figures of 1dB for the RP2S and 1·5dB for the RP4S and RP6S versions. The RP10S employs the proven 40673 m.o.s.f.e.t. to give a 2·5dB noise figure, with a typical gain in excess of 30dB. Although these parameters far exceed the practical requirements for base station use they are ideally suited for masthead application. A front panel gain control gives a smooth variation of gain from 0 to 20+dB.

The 144MHz switched version (RP2S) also includes a d.c. sensing addition for specific use with FT-290 and FT-480 type rigs, which apply 12V through a 10kΩ resistor to the antenna socket, when on transmit. The pre-amp senses this and goes into transmit mode whilst the p.t.t. button is pressed regardless of the presence of speech.

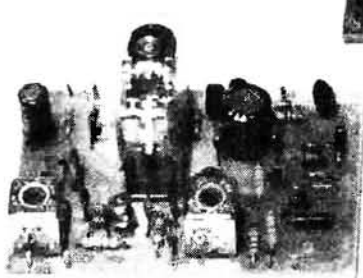
Overall measurements of the unswitched versions are 23 × 50 × 14mm (RP2 and RP4) and 25 × 60 × 14mm (RP6 and RP10). The switched version cases measure 79 × 74 × 39mm, have a transmit mode l.e.d. indicator on the front panel, are terminated via SO239 sockets, and the transmit power rating of the relay is 100W, suitable for most stations.

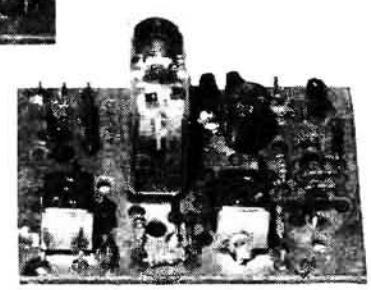
The unswitched receive pre-amps are available as a kit at £5.50, or ready-built and aligned for £7.00. The switched versions are available as a p.c.b. kit at £10.25, boxed kit at £18.75, or boxed, built and aligned for £24.75. Details from: *Spectrum Communications, Unit B6, Marabout Industrial Estate, Dorchester, Dorset. Tel: (0305) 62250.*



▲ **A switched unit, less its lid**

An unswitched unit ◀





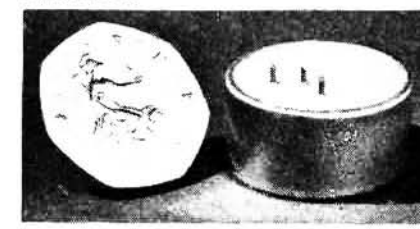
Two switched p.c.b.s

Versatile d.c.-d.c. converter

Readers who power equipment with batteries, such as, PP3, PP9 etc, will be very well aware of the cost of these products.

In an effort to counteract the price differential between single cells and batteries, J. Biles Engineering have recently introduced the Verkon V12, a high-efficiency d.c.-d.c. converter, which lifts the voltage from a single 1·5V alkaline cell to provide a nominal 12V d.c. output. The V12 may also be employed with a voltage regulator to produce a 9V supply.

The cost effectiveness of the system works like this; an alkaline PP3 battery has typically a 4·5 watt/hour capacity and costs about £1.79, where an alkaline "D" cell will have a typical 15 watt/hour capacity and cost around 89p. Therefore at 80% efficiency, the "D" cell/V12 combination will deliver 12V for 12Wh. If this voltage is stabilised at 9V, up to 25% of this capacity is lost, but will still provide 9Wh of capacity. It is not difficult to see how, over a short time, the cost of the V12 converter will be recouped and further supply costs minimised.



Nickel-Cadmium (NiCad) batteries also offer savings, however, there are several inherent snags in this system. Probably the most important of which is the fact that sealed sintered NiCad batteries discharge themselves on standing, typically losing up to 40% of charge in only 40 days. In contrast, an alkaline cell can be expected to lose only 15% in 2 years. Also, the NiCad equivalent types lack by four to five times the available electrical energy of their alkaline counterparts, plus they are expensive and the cost of recharging equipment must be considered. Finally, early failure of one cell will prematurely render the battery useless. However, it has occurred to frugal old ZPW that a combination of a "D" type NiCad, with a life of 600 full-charge/discharge cycles, and the Verkon V12, could introduce a whole new set of calculations!

The Verkon V12 d.c.-d.c. converter costs £5.25, inclusive of VAT, plus 45p p&p per unit and is available from: *J. Biles Engineering, 120 Castle Lane, Solihull, West Midlands B92 8RN. Tel: (05432) 22382.*

Weather Satellites

An enormous amount of weather data is available from space. In Part 1 of this series Terry Weatherley G3WDI looks at the developments.

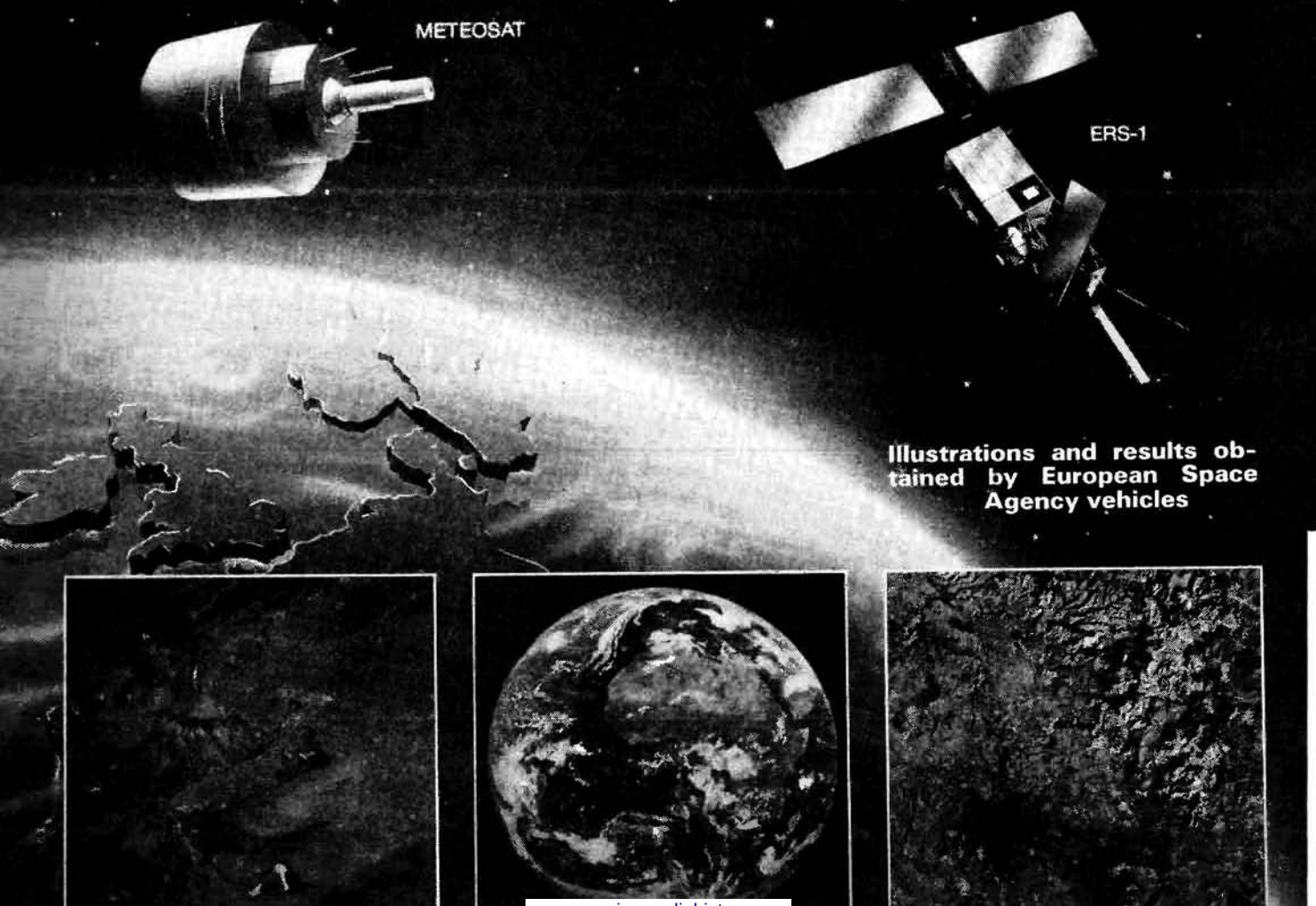
This year sees the twenty-fifth anniversary of the launch of automatic picture transmitting (APT) weather satellites. At a conference held in the United States to mark this anniversary, due acknowledgement was made to the work of the amateurs in a number of countries world-wide who have participated in the programme. One of the original intentions of the meteorological satellite programme was to encourage the setting up of low-cost receiving stations to receive the data in remote areas. It is in this area that the work of amateurs was particularly significant. An impressive display of homebuilt equipment and received pictures was mounted as an integral part of the twenty-fifth anniversary celebrations.

In this series I will discuss first the satellite systems, giving some of the history and present-day operating practice. This will be followed by a consideration of receiving systems including frame store and the use of home computers. The illustrations will show some of the range of pictures that can be obtained. These will show both weather systems and geographical features. They will, I hope, show that the weather satellite enthusiast has a unique window on the world. In the words of John Glenn from *Friendship Seven*, "The view is tremendous".

Prior to the satellite age, which began with the launch of Sputnik-1 on 4 October 1957, weather forecasting depended on a large number of observations being made in a large number of places by a large number of people. Data was returned from places as diverse as the centres of large urban areas, deserts and from the wild wastes of the oceans. These readings were sent to a central collecting point and interpreted. The movement of weather systems was charted and the progress of individual fronts monitored. All this, of course, took time to prepare. The forecaster did not have a clear picture of the systems as they are but as they were some time ago.

When these same scientists saw the first remarkable pictures from Tiros-1, launched twenty-five years ago in 1960, they saw at once that forecasting had entered a new era. For the first time forecasters were able to see the systems as they were now, in real time. The immense size of such systems became immediately apparent on a picture which covered from polar regions to the tropics. Forecasting had, in the memorable words of one forecaster, gone "from rags to riches overnight".

The satellite that sent these pictures to the receiving ground stations was Tiros-1 (Television and Infra-Red



Illustrations and results obtained by European Space Agency vehicles

~What's Up There?

The British Isles from NOAA–9, March 1985

Western Mediterranean from NOAA–7

UK on the edge of a MET–30 picture showing "bottle distortion"

Observation Satellite) launched on 1 April 1960. The satellite was a joint NASA/Defence Department project. It orbited the earth at some 700km and sent back over twenty-two thousand pictures during the seventy-eight days that its batteries lasted. The first eight Tiros satellites were all launched into similar orbits during the period up to 1964. Tiros-9 launched in January 1965 was the first attempt to place a satellite in polar orbit from Cape Kennedy. Unfortunately a second-stage failure caused the satellite to be placed in a highly elliptical orbit 700km × 2578km. What could have been a disaster turned out to be advantageous. The higher apogee provided excellent whole-earth cover and a photo-mosaic of the whole earth was built up from 450 excellent photos. By the time Tiros-10 was switched off in 1967 the Tiros series had returned over 500 000 pictures.

The Tiros satellites were 18-sided polygons 1·07m in diameter and 0·56m high with cameras mounted top and bottom. Tiros-1 weighed 119kg which rose to 138kg by Tiros-9. The TV cameras were able to take 16 pictures at 128-second intervals during one orbit. Two tape recorders were able to store up to 48 pictures when out of range of ground stations.

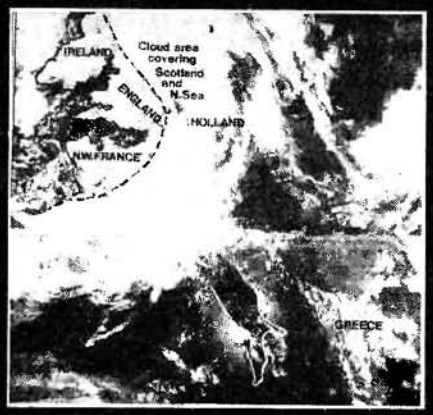
While the Tiros series progressed, a series of Nimbus satellites were built and launched from 1964 onwards. Nimbus-2, launched in 1966, had an expected life of 6 months but it in fact provided 33 months of operations. Receiving stations in 43 countries were able to receive the high resolution infra-red pictures. From the Nimbus series came the sophisticated earth resources satellites which have so revolutionised Earth Resources Studios.

A series of ESSA satellites, the most successful being ESSA-8, continued the meteorological series. The ESSA series were controlled by the Environmental Science Services Administration, the last ESSA satellite being launched in 1969. ESSA-8 proved to be an excellent satellite, it gave good service until 1975 when the performance of camera one fell below acceptable limits. Camera two was switched on to replace it. Unfortunately in late 1975 the camera shutter began to malfunction and ultimately failed. The role of ESSA was taken over by the National Oceanic and Atmospheric Administration (NOAA) and their first satellite was an improved Tiros satellite named NOAA-1. Successful as ESSA-8 was it only transmitted pictures on the daylight part of its path around the earth. When the satellite's camera was facing the earth a 600Hz tone was transmitted indicating that a picture was about to start. A shutter on the TV camera opened briefly and then closed. The earth image was stored in the camera tube. This picture was then slowly scanned at 4 lines a second for 200 seconds. The picture information was used to amplitude-modulate a 2·4kHz sub-carrier. The transmission to earth was by means of a 5 watt f.m. transmitter on a frequency in the 136–138MHz satellite band (137·620MHz).

The NOAA satellites used a different method of producing the picture information. They utilised not a TV camera but a mechanical scanning system. This system, known as the scanning radiometer (SR), is still used today. As the satellite moves in its orbit a rotating mirror scans the earth from the horizon to horizon at right angles to the satellite's path. Optics focus the light onto sensors. Each sensor is sensitive to a particular frequency in either the visible or infra-red part of the spectrum. As the mirror scans, the infra-red data is used to modulate the sub-carrier. During the mirror "flyback" the stored visible light information is transmitted. The end result is two pictures side by side, one in the visible spectrum and one in the infra-red. The satellite transmits continuously, the vertical "scanning" being provided by the forward motion of the satellite. The first NOAAs to use a scanning radiometer scanned at 48 lines per minute. This was changed in the late seventies to the present standard of 120 lines per minute. One big advantage of the SR satellites is the ability to transmit infra-red pictures taken at night.

Weather satellites are launched into near-circular, polar orbits which are sun-synchronous. A sun-synchronous orbit ensures that the satellite is "overhead" each day at the same local ("sun") time each day. The NOAA series satellites are overhead at 0930 and 1430GMT each day. The first NOAAs were at an altitude of 1400km, which gave an orbital period of 115 minutes. Late in 1978 this was changed with the launch of Tiros-N. This was placed into a lower orbit of 825km which gave an orbital period of 102 minutes. This meant that the area covered was less but the resolution much improved together with a much stronger signal received on the ground (3–6dB). Circuitry to remove "bottle distortion" (distortion at the edges of a scan produced by the

Summertime in the UK taken by a NOAA vehicle in 1976



Photographs received from ESSA–8 by the weather department of Anglia TV

curvature of the earth) was also incorporated into the system. The scanning speed was increased to 360r.p.m. This was then processed to produce the 120 line per minute format for the v.h.f. transmission.

The five sensors inside the spacecraft are sensitive to five distinct spectral ranges as follows:

Channel	Spectrum Range (μm)
1	0·55–0·90
2	0·725–1·0
3	3·55–3·93
4	10·5–11·5
5	11·5–12·5

Channels one and two are visible light sensors while three, four and five are in the infra-red. One of the visible light sensors can discriminate between fine cloud structures but does not respond well to land-sea boundaries. The second sensor performs less well on clouds but picks out land-sea boundaries and geographical features particularly well. The sensors can be switched under ground control and thus the picture detail can vary from day to day.

The Russian equivalent of the NOAA weather satellites are the Meteor series. Experimental weather satellites were launched as part of the Cosmos programme as early as 1964 with the launch of Cosmos-44 and Cosmos-45. Cosmos-45 is reported to have returned a film capsule from orbit. Others in the series were Cosmos-144, 156, 184, 206 and 226. The satellites were phased to provide almost continuous coverage of the earth's surface. Meteor-1 was launched in March 1969. Transmissions from the satellites usually take place only when the satellite is within range of ground stations in the USSR. Some of the satellites only switch on when there is a predetermined amount of daylight beneath the spacecraft.

Transmissions from the Meteors are similar in format to the American Polar orbiters with picture information being sent at 120 or 240 lines per minute. There are differences however, the 120-line transmissions are of visible light information only, much of the side of the picture is taken up with sync pulses and a grey scale. Differences in the number of "white bars" allow for easy identification of the particular Meteor. The most recently launched was *MET2-11*. The image shows 16 white bars and is transmitted at 120 lines per minute. The 240 line per minute Meteors are *MET-30* and *MET-31*. Here telemetry figures appear at the picture edge — at least they used to in the case of *MET-30* but recent pictures (not now received on a regular basis) do not show this telemetry. The spectral response of these satellites shows up land/sea boundaries and geographical features particularly well.

Two other Russian Satellites are worth mentioning here since although they are not "weather" satellites in the true sense they do transmit "pictures" in the recognised format on a "weather" satellite frequency. They are Cosmos-1500 and Cosmos-1602. In a recent edition of *Space* (4/85) [3] Greg Roberts wrote a detailed report from information obtained from *Aviation Week and Space Technology*. Both are Oceanographic Satellites carrying Sideways Looking Radar (SLR) which is used to detect ocean/sea surface disturbances, determine wind direction, provide detailed ice pack data, detect natural or man-made slicks on the sea surface, track fronts, observe currents and detect wind fields off coastlines.

Cosmos-1500 was launched in September 1983. Transmissions from the satellite have been heard on 137·4MHz. The format is 240 lines per minute and the picture resembles those of *MET-30/31*. Cosmos-1602 was launched in September 1984 and the picture format is similar. The edge-code telemetry gives Moscow time incremented each minute. It was this data which led Geoff Perry to report in a letter to *Oscar News* [4] a very interesting discovery about a picture sent to him received from Cosmos-1500 in Italy. The picture did not appear to show any recognisable land mass. When Geoff obtained the reception time he discovered that it was not consistent with the time shown in the edge-telemetry. At the time shown the satellite was over the Caribbean Area. On inverting the picture Geoff was able to identify the Yucatan Peninsula. This clearly indicated that Cosmos-1500 has a storage capacity. This discovery was prior to the IAF conference in Lausanne where the Russians presented papers giving details of the instrumentation and results obtained from the sideways looking radar on Cosmos-1500.

The satellites mentioned so far are all in low polar orbits, some being "sun-synchronous" and some not. They all transmit their data in APT format in the 136–138MHz satellite band. A receiving station will be able to receive six good passes each day. One to the east, one overhead and one to the west with the satellite travelling south to north and three approximately 12 hours later travelling from north to south.

In the next part I will look at Geostationary Weather Satellites and discuss the advantages they bring.

References

1: *The Observer's Book of Unmanned Spaceflight* by R. Turnhill.
2: *A Guide to Earth Satellites* by D. Fishlock
3: *Space 4/85*. ESRU
4: *Oscar News* Feb. 1985 published by AMSAT-UK.

WEATHER SATELLITES

We are able to supply the complete weather satellite reception package. Everything you need has been designed around the superb new ROM from Peter Clappison and Mathew Atkinson. We have commissioned Jaybeam to make a special aerial for us that doesn't need to be moved or turned when it is used with our pre-amp and receiver, it gives good predictable pictures. Our receiver will give 12dB SINAD with only 0.15µV which is considerably better than any of our competitors. The interface unit has several switchable op-amp filters giving enhanced pictures from weak signals and also allows low frequency FAX data to be demodulated. The BBC EPROM has been designed to be used with our interface and will also decode the HF and VLF data from our interface.

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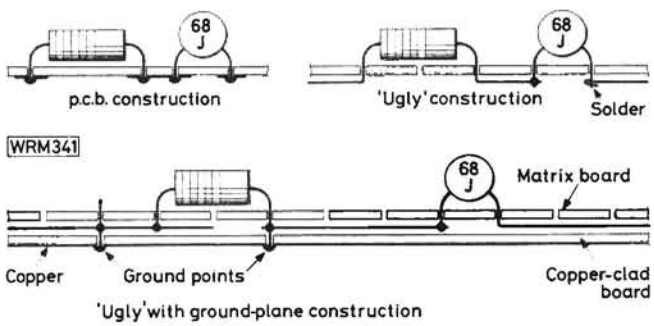
"UGLY" CONSTRUCTION

by Alex Comfort MB,DSc KA6UXR

When most amateur radio equipment was home-built, circuits were chassis-mounted and point-to-point wired, using tagboards, bus wire, and sleeving. One of the reasons for the decline in home building, I feel sure, is the obstacle offered to the beginner by printed-circuit techniques. The temptation is to copy the commercial article, crowd components into the least space—and miss the occasional track error or dry joint in the process. This applies even to the etching patterns printed in amateur journals. The beginner who has a schematic and tries to transfer it to an etched board has a design problem which may be beyond him.

The solution is "ugly" construction. This does not mean slovenly construction, but refers to a specific technique —one which R and D engineers use far more than they would admit. The aim is to transfer the schematic into hardware rapidly, inexpensively, and in a form which allows checking and modification, but gives a permanent result less unstable than a breadboard. With this in mind the components are used to support one another. Most of the wiring is done with component leads, and the circuit layout is designed, like the old valve circuits, around available tie-points.



Chassis

The ideal chassis for "ugly" layout, unless one needs a groundplane, is perforated or matrix board. The hole spacing will depend on the compactness of what you are building. For most projects, choose 5mm centres with the rows parallel to the sides of the board. This makes it easy to arrange component groups in a parallel manner, so that the upper surface of the board, which is usually the only visible part, is neat and tidy.

Start by bending all the resistor and capacitor leads close to the component but spaced so as to fit the holes. Roughly arrange the circuit in this way, leaving spaces for transistors, i.c.s, toroids and so on, and checking pinouts for the shortest access. In many circuits it is a good idea to run two stiff wires, or two of the epoxy-adhesive copper tapes now available, across the top and bottom edges of the board, one hole in from the edge, to serve as supply and ground busbars. Now start to wire up the circuit, using the component leads as much as possible, and keeping all junctions at right-angles. To marry two pigtail leads, cut one about 5mm over-length, bend a hook in the extreme tip with fine pliers, hook it to the other, pinch snug and solder carefully. Bring down coil and transformer leads through suitable holes and attach to the stiff-wire component leads, bending the tip of the stiff wire up through a hole to provide a tiepoint. For transistors, use push-in sockets similar to valve-bases, making the additional holes with a fine drill and attaching stiff (20 s.w.g.) bus wire to the pins with the socket in place. For i.c.s, use wire-wrap sockets. Drill the board for the leads, then bend the wire-wrap standards over and align them in the required directions (using care—they snap off easily). If component leads do not reach, hook the ends and marry the hook with another on the end of a piece of bus wire. Where circuits must cross, either take the wire to the upper board surface through one hole, then down again through the next-but-one, or use sleeving. Where components have to be mounted securely, transformers, for example, extra holes can be drilled for bolts.

Small components can be fixed to the board with a drop of cyanoacrylate glue. I attach four toothpaste-tube caps to the four corners of the board, solid ends down, to make standoffs. The solid ends can be drilled to take self-tapping screws when the unit has been tested and a metal case is in order. If a groundplane is needed, as in many oscillators and transmitters, which are temperamental without it, I turn up the grounding points *away* from the perforated board, take a single-sided copper-clad board of the same size, and drill it at each grounding-point, copper side down. The grounding wires are then threaded through the holes and soldered to the copper on the underside. For r.f. connections, copper desoldering braid is easier to solder with a small iron than thick copper wire, especially when it has to be attached to large metallic objects such as tuning capacitors.

Advantages

Apart from speed of construction, the leading advantages of the "ugly" approach are ease of checking, modifiability, and—if the idea proves a dud—the salvageability of nearly all the components. If your p.a. works but your oscillator is unstable, you can take out half the circuit and wire in a different oscillator, etc. "Ugly" construction gives some of the latitude one used to enjoy with valve circuits to modify, add stages, or even change valve types during testing. The under-board result, when one gets the hang of it, is aesthetically as pleasing as a printed circuit, and takes less than half the time to assemble.

To produce "ugly" construction which is not ugly, it is worth putting in a few minutes' practice, using matrix board and stiff wire only, to acquire the knack of angling the wires with pliers and forming the joints. Use fine-diameter solder as for printed circuit work, but a slightly bigger iron bit. For the characteristic right-angle joins which render the circuitry tidy, form the hook first and slide the lead to which it is to be attached into the preformed hook. Attempts to hook a wire round an existing lead usually pulls it out of straight. End-to-end joints are made hook to hook. Don't crowd the components, at least until you have mastered the tricks of this method. Though one can, after practice, assemble an entire amplifier on a seven-lug tagstrip. *Lay the whole circuit section out* before soldering anything.

Knitting

Even if you are a printed circuit expert and assemble your finished equipment in that form, it is worth acquiring skill at "knitting" prototypes for rapid testing. With practice, this is nearly as fast as breadboarding and has the advantage of permanence if it works well. Many designs which operate on breadboard somehow fall down in transfer to p.c.b. form through changes in circuit constants. "Ugly" construction is one workshop technique which engineers can share with raw beginners. ●

Radio Wave

Part 8 by F. C. Judd G2BCX

Apart from the more orthodox ionospheric and tropospheric modes of radio wave propagation there are others that sometimes provide an alternative although not completely reliable means of radio communication over relatively long distances. Such modes are known as "scatter propagation" and can occur in various ways.

Ionospheric Scatter

The E and F layers and the D region each contribute to ionospheric scatter. Above maximum usable frequency (m.u.f.) signals are not reflected back to earth in the normal manner and yet some are in fact returned by being scattered due to irregularities in the layers. These signals will sometimes continue forward or be returned to earth in random directions but like tropo-scattered signals, they are usually very weak. However, when scattering occurs from the higher layers of the ionosphere, the distance covered can be quite considerable, often as much as 2000km. Two-way communication by this mode requires the use of very high power and high-gain antennas. Although not suitable for regular amateur band operation scatter propagation does offer scope for experiment and investigation.

With normal F layer propagation as described in previous parts of this series of articles, it might be thought that within the "skip zones", i.e. the areas between the points where signals reflected from the ionosphere reach ground, no signals would be heard. In other words, the point of reception may not be far enough from the place of transmission for signals to reach it by sky-wave propagation and yet sufficiently distant to be out of ground-wave range, particularly when the frequency in use is in the h.f. region. Due to certain irregularities in the ionosphere, similar to that illustrated in Fig. 8.1, signals can often be heard by stations within a skip zone, not very strong as a rule and usually with a fluttery sound or rapid fading characteristics.

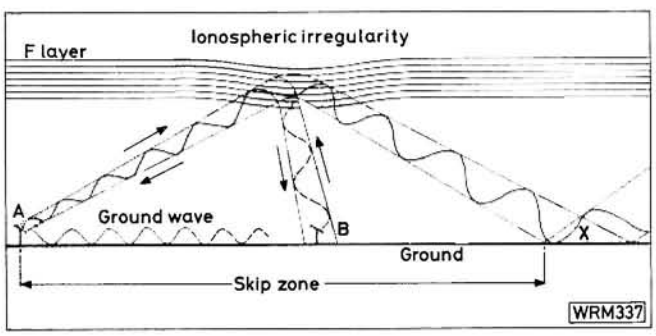


Fig. 8.1: Irregularities such as tilting in an ionospheric layer can cause scatter mode propagation so that signals from (A) arrive at some point (B) within a skip zone but which would otherwise only be heard at (X). Groundwave from (A) is too weak to reach point (B)

This is because the signals may arrive at the point of reception from different directions which, in turn, will cause them to be randomly phased.

There are also ionospheric modes of propagation by which radio communication is possible over fairly long distances that do not follow the great circle path in the normal way. For example, two stations, perhaps fairly close to each other but out of communication because of skip distance, could establish contact due to signals being scattered from some distant and more intensely ionised region. Each station would have to direct its antenna towards the region concerned as illustrated in Fig. 8.2, rather than towards each other. The signals may be weak but otherwise reasonably stable and with little fading. Signals may have a "hollow" sound which is caused by some of the transmission being delayed by following a different and longer path.

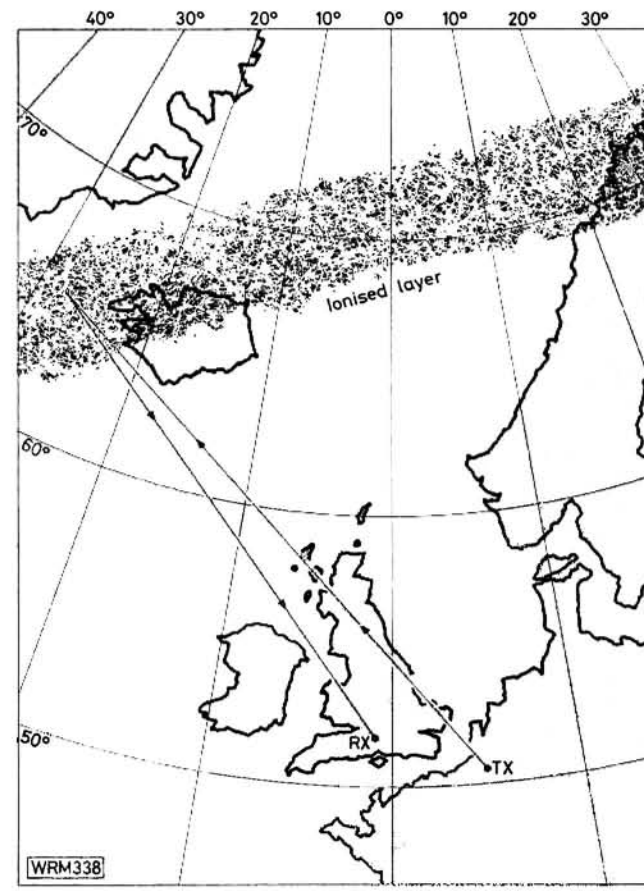


Fig. 8.2: A form of back-scatter allowing communication between two stations a relatively short distance apart but having no direct propagation path to each other. (TX) transmitter (RX) receiver

Propagation

Back-scatter propagation is said to occur when a signal is returned to the point of transmission, along the path originally taken, e.g. transmitting antenna to ionosphere, then to ground, then reflected in the reverse direction. This form of scattered propagation is employed for over-the-horizon radar such as the American CONUS-B system for which the transmitted power used is in the hundreds of megawatts region[1].

Side-scatter propagation is not unlike back-scatter except that signals are returned from an ionospheric layer and bounced sideways on reaching earth. Stations a few thousand kilometres apart might well establish good contact using a frequency above the prevailing m.u.f. along a great circle path and providing the same conditions exist in areas to the side of the path. In this case signals can be received from stations in directions well off the great circle path but again it is necessary to direct antennas towards the area from which scatter is taking place.

Tropospheric Scatter

Although similar in principle to normal tropospheric propagation, this form of scatter takes advantage of small variations in the atmosphere which cause partial reflection, or refraction, at isolated points along a transmission path. This mode does not lend itself to regular operation in the v.h.f. region because of the high level of attenuation that occurs and which would make it necessary to use very high power and antennas with high gain. On this basis however, the distance covered could be as much as 800km. Tropo-scatter signals decrease rapidly in strength as the distance from the transmitting source increases, but the rate of decrease becomes less as the frequency is increased.

Trans-equatorial Scatter (TE)

This region is mainly effective at the lower frequencies of the v.h.f. region. Over the equator the ionosphere is higher, its thickness is greater and it becomes more intensely ionised than in other parts of the world. This allows scatter propagation over distances of around 8000km. The m.u.f. for the TE mode is generally 1·5 times higher than that for any particular day and over the same path. Therefore, if the day time m.u.f. were as high as 35MHz, the TE mode m.u.f. would be in the region of 50MHz or higher. Propagation at 145MHz is not possible by this mode.

Scatter modes of propagation are not consistent and not particularly reliable when they do prevail but as with all modes of radio wave propagation are worthy of investigation.

Ground Wave Propagation

This series of articles would not be complete without some mention of ground-wave propagation although this mode is of little use for other than daytime operation on 1·8MHz. The term "ground wave" applies to waves that at least stay close to the surface of the earth and are not otherwise propagated by reflection, or refraction, from the ionospheric layers or by the special atmospheric conditions responsible for v.h.f., u.h.f. and s.h.f. propagation. Ground waves may travel very close to earth or even in actual contact with it. Sometimes known as "surface-wave" propagation, it is a mode that functions well at relatively low frequencies (medium and long wave broadcast bands), and even at 1·8MHz is capable of providing good signal strength over distances in the region of 160km during the daytime. Field strength *v* distance at 1·8MHz and based on the Sommerfeld equation is shown in Fig. 8.3 (daytime transmission). However, the attenuation of a wave travelling close to ground increases rapidly as the frequency of operation is increased and above about 3·5MHz ground-wave propagation is of little or no use for amateur radio communications. The graph in Fig. 8.4 shows typical ground wave propagation distance versus frequencies within the h.f. part of the radio spectrum 2 to 30MHz. Vertical antennas provide better daytime coverage on 1·8MHz because attenuation is greater with horizontal polarisation although the latter is far superior for night-time operation on either 1·8 or 3·5MHz. Ranges with 1·8MHz mobile operation often exceed those obtained with v.h.f. during the day. After dark quite long distances can be covered from

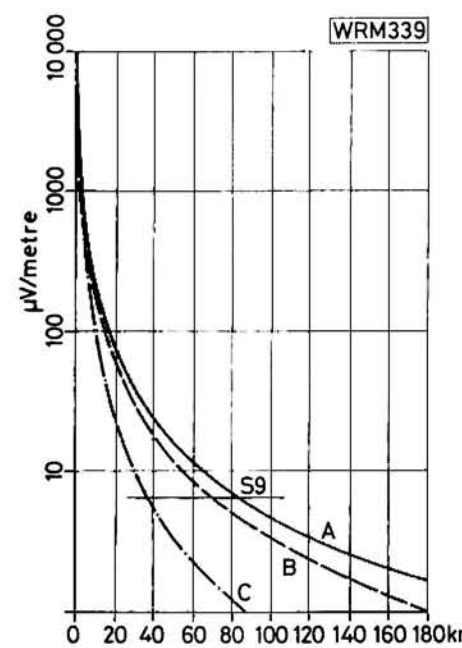


Fig. 8.3: Groundwave field strength at 1·8MHz based on the Sommerfield equation. (A) from a $\frac{3}{8}\lambda$ vertical antenna. (B) from a well elevated horizontal $\frac{1}{4}\lambda$ antenna. (C) from an "L" shaped antenna with most of the horizontal portion at low height. Note: These are for daytime conditions

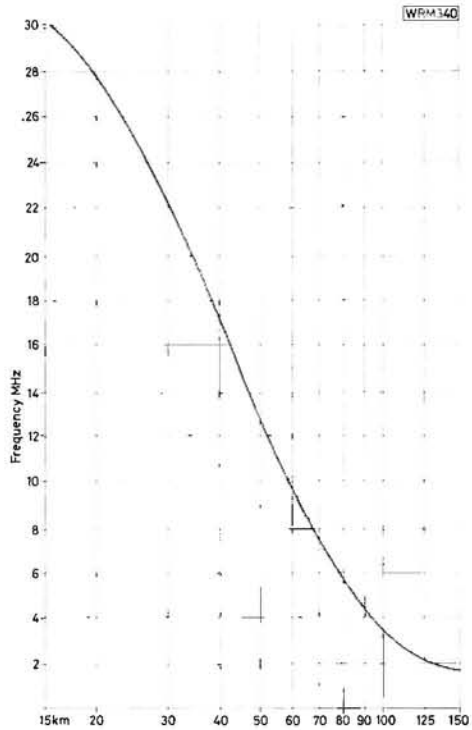


Fig. 8.4: Ground range versus frequency for groundwave propagation. (Daytime conditions 2 to 30MHz)

1·8MHz, especially if a half-wave horizontal antenna is used. In this case propagation is via the ionosphere. Successful amateur radio communication over long distances depends largely on using the most efficient antennas possible and having the most suitable propagation conditions at the right time. Propagation conditions vary from one frequency band to another and except for transmissions over very short distances, the conditions for reasonably good DX are also closely related to the time of day, the season of the year, prevailing weather and the all important sun spot activity. For the benefit of those new to both h.f. and v.h.f./u.h.f. amateur band operation, the following may be found useful as a general guide.

Band	Daytime	At Night
1·8–2MHz (160m)	Local contacts up to 80km or more depending on antenna. Mobile to fixed stations in the region of 50–65km. Ground wave propagation.	Up to 800km or more with horizontally polarised antennas. Summer static can be troublesome. Ionospheric propagation.
3·5–3·8MHz (80m)	Good contacts with British and continental stations. Ionospheric propagation.	Contacts are possible over thousands of kilometres during winter, e.g. VK, ZL, VE, W, etc. Ionospheric propagation.
7·0–7·1MHz (40m)	Good contacts inter-UK and with continent. Interference from commercial stations. Ionspheric propagation.	As for 3·5MHz band. Possible to work good DX if local interference is minimal. Ionospheric propagation.
14·00–14·35MHz (20m)	The most popular DX band but often very crowded when conditions are good. Ionospheric propagation.	Times of propagation for DX variable but worldwide coverage is possible.
Band	**Day or Night**	**Comments**
21·00–21·45MHz (15m)	Generally similar to the 14MHz band and good for worldwide DX if suitable ionospheric conditions prevail.	Conditions may vary seasonally. Sometimes daily.
28·00–29·7MHz (10m)	An excellent DX band but only when the right ionospheric conditions prevail. Daily openings on odd occasions. Best conditions prevail during 11-year periods of maximum sunspot activity.	Sometimes used for very short range ground-wave contacts. Ranges similar to those for CB radio.
70·025–70·5MHz (4m)	Similar to the 144MHz band but has possibilities for auroral and sporadic-E propagation, the latter during summer months. Normally tropospheric propagation.	A band not very much used but has interesting possibilities.
144–146MHz (2m)	Normally tropospheric propagation. Most popular v.h.f. band. Normal range of working depends a lot on antennas used. Long-distance working during tropo-lift conditions, e.g. region of 500–1000km with horizontal polarisation.	Used considerably for repeater and mobile operations at all times. Vertically polarised antennas. Good distances with s.s.b. and horizontal antennas.
430–440MHz (70cm)	Generally similar to the 144MHz band operation for normal short distance working. Tropo-lift conditions often very effective for DX with horizontal polarisation.	Also used for repeater and mobile operation at all times with vertically polarised antennas.

Reference

(1) *Over the Blue Horizon*, F. C. Judd. *Practical Wireless* issues August and September 1983.

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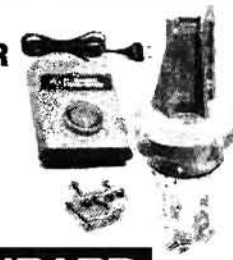

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Safeguarding the GLA1000 Linear Amplifier

by A. J. Nailer G4CFY and G. J. Morgan G3ROG

The Dentron GLA1000 linear amplifier was introduced in 1978 and has since become popular with h.f. operators on both sides of the Atlantic.

Measuring only 137 × 280 × 280mm this compact amplifier runs up to 1200W p.e.p. when driven by popular 100W s.s.b. transceivers. The amplifier uses four line output valves in parallel operated in the grounded grid configuration with 1200V on the anodes.

Although the valves are capable of supplying the rated output with ease, problems were frequently encountered in day-to-day use. The techniques used for solving the problems are applicable to all amplifiers with similar bias arrangements.

The Problems

The GLA1000 linear amplifier operated well for the first three months until operation was attempted on 21MHz into a 3:1 s.w.r. The mains fuse blew and examination revealed that all the valves were ruined. A replacement matched set of D50 valves was acquired from Dentron and fitted but suffered a similar fate when another accidental mismatch occurred.

In despair, Dentron was contacted for advice. They recommended updating the GLA1000 to the latest B specification using a tuned-circuit kit, new grid-bias Zener diode, and add-on resistors for the anode parasitic chokes.

The original amplifier section of the unit, shown in outline form in Fig. 1, clearly depicts the bias arrangement.

Tuned Input Kit

The modification kit replaces the fixed filter at the input with a p.c.b. carrying five pre-tuned *pi* circuits. These reduce the input s.w.r. and hence improve the power transfer from the transceiver whilst filtering unwanted harmonics.

The Zener diode in the modification kit is a 24V 1N3321 which replaces the original 9·1V 1N3308. This increases the negative grid-bias which reduces the no-signal anode current to 150mA and reduces both the overall dissipation and the peak currents under drive conditions.

The four 100Ω resistors added in parallel with the anode parasitic chokes are included to reduce their *Q* which may prevent possible v.h.f. instability.

A simplified diagram of the modified circuit is shown in Fig. 2.

After modification, the third set of p.a. valves lasted twelve months until an open circuit antenna feeder caused their demise together with the new Zener diode. The circuit arrangement is far too critical of any mismatch and instead of failing safe it always seems to destroy the costliest circuit components.

Analysis

Examination of the modified circuit reveals that the *pi* input circuit would not help power sharing between the valves but would make the input look close to 50Ω on all bands. Whilst this is obviously an advantage to owners of

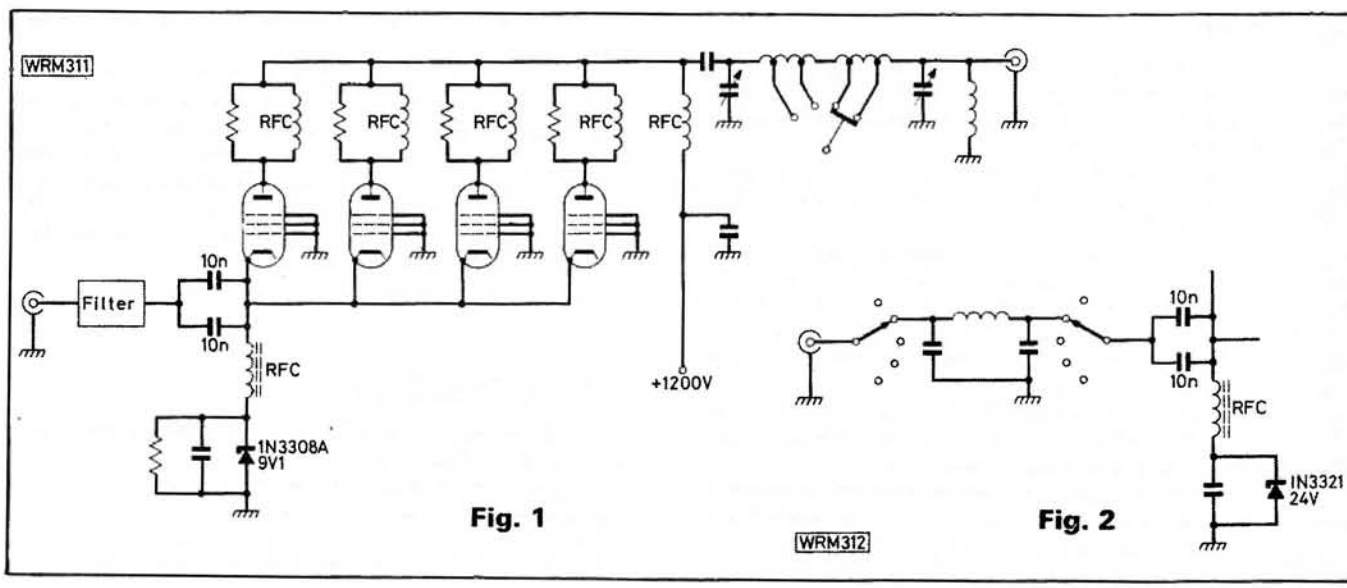


Fig. 3

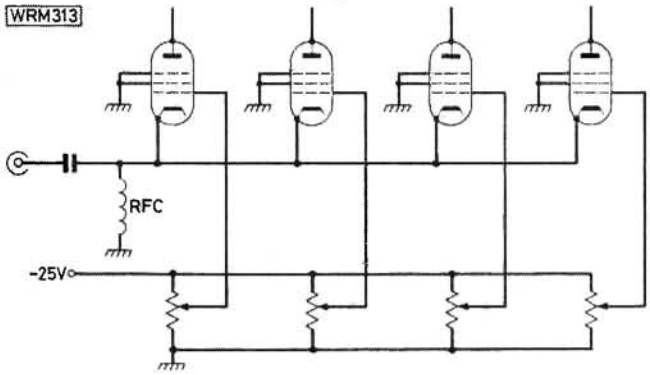
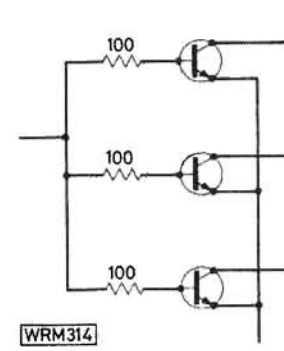


Fig. 4



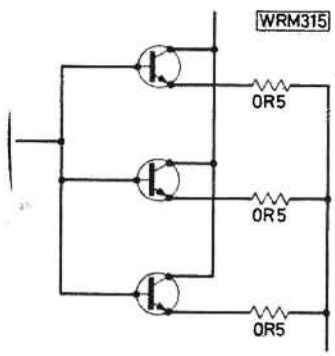


Fig. 5

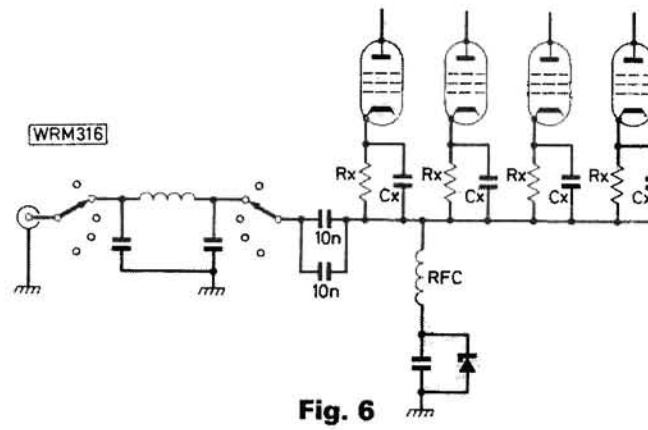


Fig. 6

all-solid-state transceivers it is of little help to operators of transceivers with valve p.a.s and their attendant *pi* output networks.

The change of Zener was obviously intended to keep the valves tame but will not cope with an unmatched set of valves or a condition where one valve is rogue. Under such circumstances the bad valve would shut-down by either going gassy or short-circuit. In the shut-down case the remaining valves would overdissipate and successively fail like dominoes falling down. This is what appears to have happened the first two times. The third catastrophe would indicate a short-circuit valve which blew the Zener and left the remaining valves with no negative grid-bias.

Solution

The bias is developed by drawing the cathode current of all four valves from the single power Zener diode. This puts the cathodes positive with respect to the earthed grids by the value of the Zener voltage.

With the replacement of the Motorola Zener diode likely to cost £18, drastic modifications to provide a separate bias supply were considered.

An article in *QST* February 1980 showed how separate bias could be applied to the grid of each valve and allow independent adjustment of cathode currents under static conditions. This modification was not undertaken as it would require extensive rework of the unit and would not clamp a valve if it went rogue.

The arrangement of bias presented in the *QST* article is shown in Fig. 3 and could be arranged to independently feed the cathodes from preset positive supplies.

To control both dynamic and quiescent valve conditions a measure of automatic bias would have to be introduced in each valve cathode. This together with the Zener bias would ensure equal power sharing. The idea was taken from the common practice used with parallel transistor stages where balancing resistors are used in the base or emitter circuit to overcome differences in base/emitter voltages and to ensure equal power sharing. Figs. 4 and 5 show typical transistor power sharing circuits.

Automatic bias is provided simply by adding a resistor in the cathode such that cathode current produces grid-bias. The value of resistor has to be chosen with care such that it does not drop too many volts on current peaks and cause flat topping. Nevertheless it has to be large enough to cause about 1V change of bias for a 50 per cent change of cathode current. With a combined current of 150mA, each valve should be taking 37·5mA, about right for most class AB1 valve p.a.s. A 50 per cent change would be 18·75mA, so for 1V the automatic bias resistor Rx would be given by Rx = 1V ÷ 18·75mA = 53·33Ω (56Ω was selected as the nearest preferred value).

The cathode is also the signal input of the valves in this configuration and the 56Ω resistors in series would cause appreciable loss of drive and also mismatch the newly installed *pi* input circuit. To overcome this each resistor could be by-passed to r.f. by a low reactance capacitor. A value was chosen by trying standard values in the formula $X_C = 1/2\pi fC$ giving the reactance of 10nF as 4·55Ω at 3·5MHz and 0·57Ω at 28MHz.

The new circuit configuration is shown in Fig. 6.

Implementation

The valve sockets in the GLA1000 are mounted on a p.c.b. which is shown in Fig. 7.

The four 10nF bypass capacitors Cx are fitted to the four resistors as shown and soldered across the four breaks made in the tracks connecting pins 3 of the valves.

A suitable alternative to the 1N3321 Zener is the BZY93

24 volt type available at low cost but which has a stud anode instead of cathode. It can be fitted in the hole used by the old diode, using an insulating kit and solder tag to pick up the positive stud and an earthing strap on its wire end.

Operating Experience

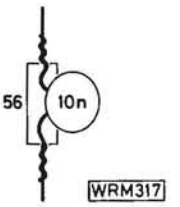
It is well over a year since the modification was done, including a six month period of intensive activity and repetitive abuse. The absence of TVI suggests that the modification has not degraded the signal purity in any way. The peak power output is easily achieved and appears stable under continued full power operation. Reports from a regular stateside contact suggests the amplifier is producing higher peak outputs than ever before.

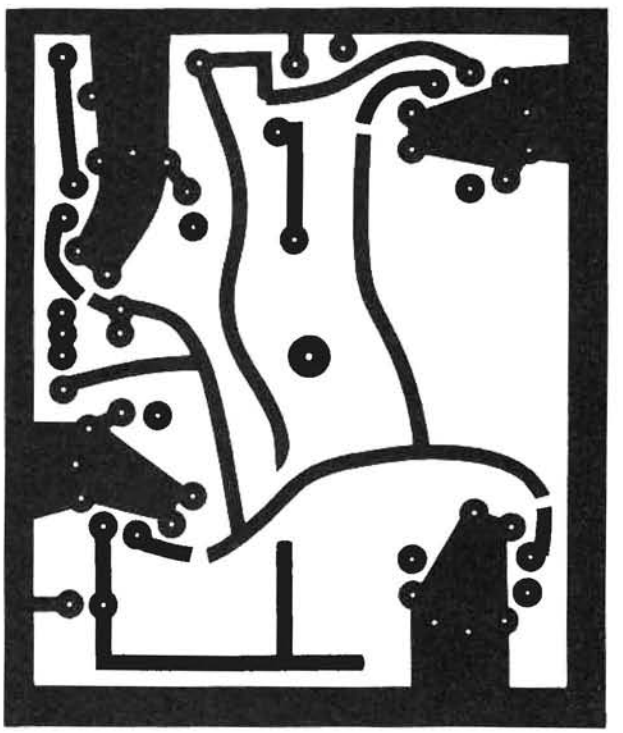
The current sharing technique prevents the "domino effect" breakdown under fault conditions. This was convincingly demonstrated when a severe mismatch caused the mains fuse to blow and nothing else!!

The amplifier was designed to use selected and matched valves, designated D50 by Dentron. Nevertheless the third and fourth sets were standard type 6LQ6 manufactured in the USA. Valve types 6LQ6, 6JE6 or 6MJ6 may be used although standing currents may differ sufficiently to require adjustment of the bias Zener voltage to give between 35 and 40mA quiescent current. The source of valves listed under components currently stocks the 6LQ6 type by several American manufacturers and the 6MJ6 type which is capable of higher power at lower frequencies but is unsuitable for 28MHz use. Valves of Japanese manufacture were unstable in this design both before and after modification but appear to give higher gain. The American types are the cheapest and have shown no signs of instability. Higher power types 6MJ6 have not been tried at any time.

This modification has been so successful that the owner has at present shelved his half-built homebrew 813 linear. Undoubtedly the principle can be extended to other linears of similar design and should result in greatly extended valve life. ●

Fig. 7: The track pattern of the p.c.b. in the Dentron GLA1000 linear amplifier. Note the four cuts to be made in the track connecting pin 3 of the four valves. The capacitor and resistor combination shown on the right bridges each cut





BUYING GUIDE

The tuned-input kit for the GLA1000 is available direct from Dentron Radio Co. Inc., 2100 Enterprise Parkway, Twinsburg, Ohio 44087, USA. Tel. 216 425 3173.

The p.a. valves mentioned in the text are available from Colin Wilson, G4AZM, Peel Cottage, Lees Road, Mossley, Tameside, Manchester. Tel. 045 75 6114.

The BZY93C24V 20W Zener diode and the 1W carbon film resistors are available from Marco Trading.

★ components

Resistors

1W carbon film 5%

56Ω	4	Rx

Capacitors

Ceramic Disc

10nF	4	Cx

Semiconductors

Diodes

BZY93C24V 1	(20W 24V Zener diode)

Miscellaneous

Tuned input kit for GLA1000 (Dentron Radio Co.); 6LQ6, 6JE6, 6MJ6 p.a. valves (Colin Wilson, G4AZM).

the things people say

G3 . . .—"What's your QTH old man?"
G4 . . .—"I'm in the car park of the huge supermarket on the west side of town, helping the XYL with the routine shopping chore."
G# . . .—"What's the correct suffix in that situation—stroke M or stroke P."
G4 . . .—"Don't know old man—I just sign 'Married time mobile'!"

. . . *heard on 21MHz s.s.b. by G3TZG*

CLUB NEWS

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

Club secretaries may like a recap of the way entries are made in this feature. First, a mention every month for which specific information is given of a meeting. "Drinks and a natter" do not come within this category! An entry is made every other month if only meeting place and times are given. Newly-formed clubs have an entry every month for six months and thereafter as above.

All this is designed to give the maximum amount of information in the limited space available. May I also remind club secretaries that their telephone number is appreciated, taking up less space than a full postal address and speeding up communication between secretaries and the potential new member or visitor.

Abergavenny & Nevill Hall ARC GW4GFL: J. B. Davies GW4XQH on (0873) 4655. GB2PYF will be active on Saturday August 3 at the Pen-y-Fal Hospital Fete on h.f. and v.h.f. bands. Otherwise at the P-y-F Hospital, above Male Ward 2 every Thursday at 7.30, with code classes to begin with.

Acton, Brentford & Chiswick ARC G3IIU: George Dyer G3GEH, 188 Gunnersbury Avenue, London W3. "Hints and Kinks" forms the subject of the meeting on Tuesday August 20 at 7.30pm, the Chiswick Town Hall, High Road, Chiswick, London W4.

Basingstoke ARC G3TCR G8JYN: Dave Burleigh G4WIZ on (07356) 5185. First Monday of the month at the Forest Rings CC, Sycamore Way, Winklebury, Basingstoke, at 7.30. Direction Finding by G6AGE will occupy members on September 2.

City of Bristol RSGB Group: Colin Hollister G4SQQ on (0272) 508451. Meets at the Queen's Building, University of Bristol, with next gathering on Monday August 19 when G4KUQ speaks on RTTY and AMTOR.

South Bristol ARC G4WAW: Len Baker G4RZY on (0272) 834282. The Mendip Repeater Group will deliver a lecture on August 7, with tests and measurement by G4SDR on the 14th. A lecture on satellites is down for the 21st. So, every Wednesday at the Whitchurch Folk House, East Dundry Road, Whitchurch, Bristol. The AGM is down for Sept 4.

Bromsgrove & District ARC G3VGG: Norman Westwood G4NYH on Bromsgrove 73847. Second Friday of August at the Avoncroft Art Centre it's a talk on a.t.u.s with the fourth Friday devoted to constructional matters.

Bury RS: B. Tyldsley G4TBT on Burnley 24254. Tuesday evenings at 8pm, Mosses CC, Cecil Street, Bury.

Cambridge & District ARC G2XV: Brian Davy G4TRO on (0223) 353664. Brian is the new secretary of the club which meets every Friday, at 8pm, in the Visual Aids Room, Coleridge Community College, Radegund Road, Cambridge.

Carlisle & District ARS: Tony Leach G4WOQ on Scotby 500. New sec to the club says it meets every Monday at the Scout Hut, rear of Trinity School, Carlisle, at 8pm, unless it's a Bank holiday when the venue is the Grosvenor Hotel.

Cheltenham ARA G5BK: Tim Kirby G4VXE on (0242) 36723. A visit to the Madley satellite communications station is planned for Wednesday August 21, with a limit of 20 members. Normally first and third Fridays at the Stanton Room, Charlton Kings Library, Cheltenham.

South Cheshire ARS: Nick Gutten G6IGW on Crewe 60062. It's the Victoria Club, Gatefield Street, Crewe, on Monday August 12 for a talk on 50MHz band matters by G6DSA.

Cheshunt & District ARC G4ECT G6CRC: Roger Frisby G4OAA on (0992) 464795. Every Wednesday at 8pm, Church Room, Church Lane, Wormley. Feature of August 21 is a 144MHz portable station operating from Bass Hill Common, Broxbourne. On September 4, G4ZCX will talk on the club's constructional project.

North Cornwall RC: John West G6ICW on Bude 4976. First Wednesday at 7.30, at the RAOB Club, Camelford, Cornwall with the AGM slated for August 7. On September 4 G4XAF is organising a trip to the Launceston telephone exchange.

Coulsdon ATS G4FUR: Alan Bartle on 01-684 0610. Second Monday and last Thursday at St Swithuns Church Hall, Grovelands Road, Purley, Surrey at 8pm. A general discussion on August 12 with special code classes for everyone on the 29th.

Coventry ARS: Robin Tew G4JDO on Coventry 73999. Every Friday at 8, the Baden Powell House, 121 St Nicholas Street, Radford, Coventry. This may be in time to mention the d.f. hunt on August 2 with a treasure hunt on the 9th, and a v.h.f. expedition down for the 17th.

Darford Heath DF Club: Peter Sharman G8DYF on Greenhithe 844467. Very frequent d.f. hunts both at home and away, the next being on Sundays August 4, 11, 18 and 25. Normally pre-hunt meetings on preceding Tuesday at 9pm, the Horse & Groom, Leyton Cross, near Dartford Heath.

Devizes & District ARC G4WIK: Peter Greed G3MQD, 18 Nursteed Park, Devizes, Wilts. Formal meetings first Friday at the Devizes Town FC premises at 8pm, other Fridays are more of a social occasion.

Droitwich ARC: Gordon Taylor G4HFP on (02993) 3818. Second and fourth Mondays at the Scout HQ, Union Lane, Droitwich at 8pm.

Dunstable Downs RC G4ARD G4DDC G8DDC: Philip Morris G6EES on Dunstable 607623. There's a talk on radio controlled models on August 2 and a Top Band and 2m d.f. hunt on the 16th. Location is Chews House, High Street South, Dunstable, Beds starting at 8pm.

Echelford ARS: Peter Coleson G4VAZ on Sunbury 83823. Second Monday and last Thursday of the month at The Hall, St Martins Court, Kingston Crescent, Ashford, Middx. Feature on August 12 is a talk on Packet Radio by G4NNS. Club nets on Sundays at 10am on 1·985MHz and Wednesdays at 8pm on 144·575MHz.

Eden Valley RS: Alison Telford G4XPO, Ivy House, Culgaith, Penrith, Cumbria. Third Thursdays of the month at 7.30, the Kings Arms, Temple Sowerby, which is on the A66 between Penrith and Appleby. Event for August 15 is a car treasure hunt.

Edgware & District RS G3ASR: John Cobley G4RMD on Hatfield 64342. Second and fourth Thursdays at 8pm, 145 Orange Hill Road, Burnt Oak, Edgware, Middx. An important briefing for SSB Field Day occupies August 22. Club net is on 1·875MHz at 10pm Mondays.

Exeter ARS: Roger Tipper G4KXR on (0392) 68065. There is a visit laid on to the control tower of Exeter Airport on Monday August 12 with a convoy of cars leaving the Community Centre, St Davids Hill at 7.30pm. Places are restricted so get in early.

Exmouth ARC G4HOB: Des Thompson, Four Winds, 131 St Johns Road, Exmouth, Devon. Meetings at the Scout Hut, Marpool Hill, Exmouth, at 7.30pm on August 14 and 28.

Fareham & District ARC G3VEF G8KGI: Brian Davey G4ITG on (0329) 234904. Meeting spot is the Porchester CC, Westlands Grove, Porchester in Room 12 at 7.30 although G3CCB runs a code class starting at 7pm. All Wednesdays in August will be summer portable operation in the field.

Farnborough & District RS: Peter Taylor G4MBZ on F'boro 837581. Second and fourth Wednesdays at the

Railway Enthusiasts Club, Access Road, off Hawley Lane, F'boro, Surrey.

Fylde ARS: H. Fenton G8GG on Lytham St Annes 725717. On August 6 a visit to the Lytham CAA radar station at 7pm and on the 20th a Top Band d.f. hunt assembling at the club at 7.45pm. Club meets at the Kite Club, Blackpool Airport first and third Tuesdays with talks and code classes respectively.

Glossop & District AR Group: Geoff Sims G4GNQ, 85 Surrey Street, Glossop. Make it 8pm, last Thursday in the month at the Nags Head Hotel, Charlestown Road, Glossop.

Grafton RS: John Kaine G4RPK, 74 Camden Mews, London NW1. Begins operations at 8pm in the clubroom behind the Five Bells, East End Road, East Finchley, London. DX operation is the subject for G4CSB on Friday August 9.

Radio Society of Harrow G3EFX: Dave Atkins G8XBZ on (0923) 779942. Gets together at the Harrow Arts Centre, High Road, Harrow Weald, Middx, at 8.15pm every Friday, with talk-in on RB14.

Havering & District ARC G4HRC G8HRC: Dudley St J. Gray G1HTQ on Hornchurch 41532. Wednesdays at 8pm, the Havering Arts Centre, Fairkytes, Billet Lane, Hornchurch, Essex. G8ZKZ speaks on directional couplers on August 14 and there will be a talk, subject unknown, on the 28th.

Hilderstone RS: Annette Penfold G0BEX on (0304) 812723. Friday evenings at 7.30, the Hilderstone Adult Education Centre, St Peters, Broadstairs, Kent. Visits to mobile and other rallies feature in the first summer of this club.

Inverness ARC GM1DZU GM4TPF: Brian Adam GM1GFX on (0463) 242463. Get along to the Cameron Youth Centre, Planefield Road, Inverness any Thursday at 7 30

Ipswich RC G4IRC: Jack Tootill G4IFF on 0473 44047. The club room of The Rose & Crown, 77 Norwich Road, Ipswich, with a note that the club room is detached from the public bars, second and last Wednesdays at 8pm. Highlight in August is the Ipswich Carnival in Christchurch Park on Saturday the 10th. There will be Morse tuition in the club on the 14th.

West Kent ARS: Nigel Peacock G4KIU on (0892) 33586. The club holds a d.f. hunt on August 9 with another on the 23rd with prizes for the winners All meetings at the Adult Education Centre Annex, Quarry Road, Tunbridge Wells starting at 8pm. The club will be holding an open evening on September 6, so take along your non-AR friends!

East Lancashire ARC G3NTJ G1ELC: Stuart Westall G6LXU on (0254) 887385. There is a visit to the British Nuclear Fuels establishment on August 6 and a junk sale on September 3. Otherwise first and last Tuesdays of the month at the Conservative Club, Cliffe Street, Rishton, at 7.30. Club net on other Tuesdays at 8pm on 145·4MHz.

Leighton Linslade RC G4LLR G6LRC: Ian Jardine G1ACQ on (0525) 376741. First and third Mondays the Vandyke CC, Vandyke Road, Leighton Buzzard, Beds, in Room A64 at 7.30pm.

Maidenhead & District ARC: R. A. Fowler G3IQF on Marlow 6421. The Red Cross Hall, The Crescent, Maidenhead, Berks, at 7.30pm, first Thursday and third Tuesdays of each month. A video show is planned for August 20

Maltby ARS: Ian Abel G3ZHI on (0709) 814911. Fridays at the School Buildings, Church Lane, Maltby. There will be a junk sale on August 9 and on the 16th G1CAQ will describe how to get on the 144MHz band on the cheap.

West Manchester RC G4MWC G6FSA: T. Chapman G6YIO c/o WMRC, Astley & Tyldesley Miners Welfare, Meanley Road, Gin Pit Village, Astley, Tyldesley, Manchester. Meets at the same place every Wednesday starting at 8pm. The club really takes place on Sunday August 18 at the Haydock Park Racecourse, 50p to get in and free parking.

Mansfield ARS: Angela Fisher G1DZH, 5 Maunleigh, Woodhall Park, Forest Town, Mansfield, Notts. Foregathers at the Victoria Social Club, Mansfield first Friday and third Tuesday of the month.

Merion ARS: Ken Judge GW4KEV, Tyddyn Mawr, Arthog, Gwynedd. A film or video show from the RSGB library will be given on September 5. The club meets first Thursday of the month at the Dolserau Hall Hotel, Dolgellau, at around 7.30pm

Greater Peterborough ARC G4EHW: Frank Brisley G4NRJ on (0733) 231848. Fourth Thursday at 7.30pm, the Southfields Junior School, Stanground, although there will be a social gathering at an outside venue on August 22

Poole ARS G4PRS: Philip Dykes G4XYX, 68 Egmont Road, Poole, Dorset. New sec Phil says the club meets on the last Wednesday of the month at Poole College.

Preston ARS: George Earnshaw G3ZXC on (0772) 718175. Sunday August 25 is Preston Rally time at the Lancaster University with details from G3DWQ on (0772) 53810. Otherwise meetings at the Lonsdale Club, Fulwood, at 7.45pm. On August 29 G3UEC will present an audio/visual evening.

Reading & District ARC: Chris Young G4CCC, 18 Wincroft Road, Caversham, Reading, Berks. On Tuesday August 13 a canal boat trip from the IDR bridge to the Cunning Man pub and return. On the 20th G4KWT will hold forth on RAYNET matters. September is ushered in with a talk and demonstration of packet radio by G6CCA on the 3rd. Meetings second and fourth Tuesdays at 8pm, the White Horse Emmer Green, Reading.

Rhyl & District ARC GW4ARC GW1ARC: Melfyn Allington GW1AKT on Nantglyn 469. An important night in the year with the AGM on September 2, or first and third Mondays at 7.30pm, the Mona Hotel, Market Street, Rhyl.

Rossendale Valley ARC: Lee Standley G1EIU on (0706) 214411. It's the Bishop Blaize Hotel on the A56 in Rawtenstall, Rossendale, Lancs, every Thursday evening at 8.

Salop ARS G3SRT: John Orrells G6DQY on (0939) 260668. The Olde Bucks Head, Frankwell every Thursday at 8pm. On August 29 G3UDA gives a talk entitled *What can the matter be?*

Southdown ARS G3WQK G1KAR: R. Wilson G1BAB on (0323) 890234. Meetings split between the Chaseley Home, Southcliff, E'bourne, first Monday of the month at 7 30pm, and the clubrooms, Wealden DC Offices, Vicarage Fields, Hailsham, on Tuesdays and Fridays. Courses are usually held on the Tuesday at 7.30 also. The club will be running a demo station at the Hellingly Summer Show on Sunday/Monday/Tuesday August 25-27. The talk at the club on August 5 will deal with the technology of d.f. hunts.

Stafford & District ARS: Tony Bairstow G4RSW on Stafford 46306. Venue is the Coach & Horses Motel, Weston, on the A51.

Stamford & District ARS: M. Rochester G6ZCY on (0572) 55334. It's the Anchor at Stamford second and fourth Wednesdays with a net at 9pm on other Wednesdays on S9 (145·225MHz).

Stanley ARC: Ron Piper G6XCO on (0207) 235930. Meets every Tuesday at the Kings Head Hotel, Stanley, at 7pm. Constructional classes and code tuition.

Stratford-upon-Avon & District ARC: David Boocock G8OVC S-upon-A 750584. Don't forget the new venue for the club from September 9, the Baptist Church, Payton Street, S-upon-A. On September 9 the talk will be on Technical Topics. So, second and fourth Mondays it is.

Street & District ARS G6XYI: Colin Webber G4SCD on (0458) 45145. Gathers at the Strode College on the first Tuesday of the month at 7pm. On September 3 the presentation will be the RSGB video *Amateur Radio-a New Frontier.*

Stroud ARS G4SRS: P. R. Giney G1DCT, Prencott, Harley Wood, Nailsworth, Stroud, Glos. The group meets at Nelson School, Stratford Lodge, Stroud. Contact the sec for more details.

Telford & District ARS G3ZME G6ZME: Tom Crosbie G6PZZ on Telford 597506. The Dawley Bank CC, Bank Road, Dawley, Telford, Shropshire, on Wednesday August 14 for an RTTY on the air meeting, with ATV the subject for the 21st. On the 28th a mini d.f. hunt with burgers and bangers at the end. Wives, friends and all welcome.

Thornton Cleveleys ARS: Elizabeth Milne G4WIC on (0253) 821827. On August 7 a visit to the Red Rose local radio station in Preston at 7.30pm, but no meeting on the 26th. Meeting spot is the 1st Norbreck Scout HQ, Carr Road, Bispham, Blackpool.

Three Counties ARC: K. D. Tupman G6WWE on (0730) 66489. There is a film night on August 7 and a talk by G3VXM on 144MHz DX on the 21st. Wednesday evenings at 8pm, the Railway Hotel, Liphook, Hants. Early September date is G6VMA on computer decoded Morse on the 4th.

Tiverton (SW) RC G4TSW: G.W. Draper G4ZNV on (03634) 235. Every Tuesday at 7.30pm, the Half Moon Inn, Fore Street, Tiverton, Devon.

Todmorden & District ARS: J. Gamble G6MDB on (070681) 2494. A talk

by a leading antenna manufacturer is on the schedule for August 19 at 8pm in the Queen Hotel, T'morden, where the club gathers on first and third Mondays.

Trafford ARC: Graham Oldfield G1IJK, 17 Chapel Grove, Urmston, Manchester. This is a newly-formed club looking for new members and for speakers. It meets every Thursday from 7.30pm at the 9th Urmston Scout Group HQ, Bradfield Road, Urmston. On August 8 it's quiz time and off to the Red Rose Rally at Haydock Park on the 18th. G3MTL describes DX at the sharp end on the 29th.

Trowbridge & District ARC: Gerry Callaghan G4SPE on (02214) 4532. Meetings now at 8pm, the Southwick Village Hall, near Trowbridge, Wilts on the fourth Tuesday of the month.

Vale of White Horse ARS G4VWH G6VWH: Ian White G3SEK on Abingdon 31559. First and third Tuesdays in the upstairs clubroom of the Waterwitch, Cockcroft Road, Didcot, from 7.30pm. A 144MHz d.f. hunt is scheduled for August 6 with a barbecue on Saturday August 17. Advance notice of Jim Bacon G3YLA speaking on weather and propagation on September 17.

Welwyn Hatfield ARC: Dave Fairbank G0AII on Welwyn Garden 26138. This new club is still looking for new members and meets on first and third Mondays at 8pm, with a club net on other Mondays, S15 (145·375MHz), at the same time. The usual venue is the Knightsfield Scout HQ in Welwyn Garden City.

West Bromwich Central RC G4WBC: John Bates G6ZLW on 021-553 0531. Must be the only club in this feature that meets on a Sunday evening, at 8pm, at the Hop & Barleycorn, Dartmouth Street, West Bromwich, W. Mids. RAE and code classes.

Westmoreland RS: Gordon Chapman G1IIE, 61 Rusland Park, Kendal, Cumbria. Make it the second Tuesday of the month at 8pm, the Strickland Arms, Sizergh, near Kendal.

Wigtownshire ARC GM4RIV: Gerry Maxwell GM4BAE on (0776) 2876. The Stranraer CC every Thursday evening at 7.30. RAE, code and operating tuition.

Willenhall & District ARS G4ETW: John Phillips G4UPF on (0902) 782076. New secretary and venue for this club which now meets at the Cross Keys, Prouds Lane, Willenhall, W. Mids, every Wednesday at 8.30pm, in the external amenities room.

Wimbledon & District ARS G3WIM: George Cripps G3DWW on 01-540 2180. The club's annual camp will be running at the Barwell Estate, Chessington, Surrey until August 4 and on the 26th special event station GB0WIM will be operational at the Merton Concours D'Elegance in Morden Park. Normal meeting spot is the St Johns Ambulance HQ, 124 Kingston Road, Wimbledon, London SW19 on second and last Friday of the month, at 8pm.

Wirral ARS G3NWR: Cedric Cawthorne G4KPY on 051-625 7311. The Parish Hall Heswall (behind the church) first and third Wednesdays at 7.45 with a talk-in on 144·725MHz. Subject for the September 4 meet is to be a club quiz.

Cover Date	Deadline	For events from early
November	August 15	October
December	September 15	November
January '86	October 15	December

Wolverhampton ARS: Keith Jenkinson BRS84269 on (0902) 24870. Special event station GB2WM went well with a visit from the mayor and an interview by the BBC. On August 6 it is a visit to the police motorway control centre and a talk on fire prevention by the West Midlands Fire service on the 20th, followed on the 27th by a night on the air. All at the Wolverhampton Electricity Sports and Social Club, St Marks Road, Chapel Ash, W'hampton, at 8pm.

Worcester & District ARC: Derek Batchelor G4RBD on Worcester 641733. On August 5 G4ERP will deliver an address on contest techniques. First and third Mondays at 8pm, the Odd Fellows Hall, New Street, Worcester.

Worksop ARS: Carole Gee G4ZUN on (0909) 486614. There's a d.f. hunt on August 6, junk sale on the 20th, special event station GB2BTF at the Bassetlaw Show Ground on 25/26th, plus an evening visit to the Scunthorpe Club on September 3. Otherwise it's at the new venue at 7.30pm, the Sub-Aqua Club, The Maltkins, Gateford Road, Worksop, Tuesday evenings.

Worthing & District ARC G3WOR G8GCP: Roy Jones G4SWH, P0B 599, Worthing. It's the Parish Hall, South Street, Lancing, W. Sussex, every Wednesday at 7.30pm. Items for August include a d.f. hunt on the 14th and G4AET on photography on the 21st.

Yeovil ARC G3CMH G8YEO: Eric Godfrey G3GC on (0935) 75533. Thursday evenings at 7.30, the Recreation Centre, Chilton Grove, Yeovil. G3MYM comes into his own in August with a talk on Inductance on the 8th, h.f. propagation at sunspot minimum on the 15th, cosmic radio noise on the 22nd and great circle propagation paths on September 5!

Swap Spot

Have excellent Hammarlund HQ100A general purpose receiver, 550kHz–30MHz, a.t u., b.f.o., bandspread, 24-hour clock, handbook, circuit, spare valves. Would exchange for a good small lathe. Tel: Bury St. Edmunds 830411. *A064*

Have Video Genie EG3003 computer and Metz 402 high power flashgun with NiCads and charger. Would exchange for QRP rig or similar. G1DGO 3 Limes Road, Folkestone (anytime). *A065*

Have Heathkit valve receiver mains transformer (new), Shure hand mic, high impedance. Would exchange both for 007 mic or low impedance desk mic. Tel: Birmingham 021-742 4033. *A066*

Have FT-290R with 20 watt amp and pre-amp, NiCads, charger and case. Would exchange for FT-480R. Peter. Tel: 0328 51781. *A068*

Have Honda CX500, 9000 miles, crash bars and panniers. Would exchange for working amateur radio equipment. Tel: 0224 643887. *A074*

Have s.w r. meter and various portable radio parts, etc. Would exchange for World Radio & TV Handbook (urgently required). D. Wright. 47 Wyvern, Woodside, Telford. *A089*

Have Trio TR2300 in v.g c., Microwave Modules MML 144/30LS as new, Welz AC38M and SP15M, 144MHz 9-element Tonna in v.g.c. and 144MHz 5/8 wave base antenna. Would exchange for FT-290R. Alex G6YYU. Tel: 0953 604626 (evenings) or 602742 (day). *A092*

Have Icom IC-240 144MHz f.m. transceiver. Would exchange for Commodore 64 computer with cash adjustment. Tel: Corby 69664. *A103*

Have Realistic DX100L receiver for general coverage, b.f.o. etc. Also have Ferrograph 20 + 20 watts stereo amplifier v.g.c. Would exchange for cassette radio with three short waves. Dennis Hawken, 11 Maplewood Flats, Macclesfield, Cheshire SK11 7RP. *A109*

Have Coastal Radio Corvette, marine h.f transceiver. Reception from 170kHz–4MHz, 6 crystal controlled TX channels and b.f.o between 1·6 and 4MHz, includes manual. Would exchange for v.h.f. or u.h f. equipment or good receiver. Tel: 051-630 5219. *A028*

Have Gamma Twin 144MHz base antenna and Dragon user magazines (Aug 83–Feb 85). Would exchange for crystals for SR9 receiver or w.h.y. Tel: 0942 724649. *A056*

Have Colour Genie 32K Would exchange for AMTOR software RX/TX. Also exchange radio programs such as RTTY RX/TX, Morse RX/TX, Universal locator, etc. R. Plug PE1ITD, Krabbescheer 25, 2954 AD, Alblasserdam, Netherlands. *A164*

Have such valves as 2 x UY85,1 x UF89, 3 x UCH81 and 2 x UABC80. Would exchange for services VI103 (MO X63) equivalents, VR101 (6R7), VR100 (KTW62) and VR99 (X66) Tel: 07373 50172, evenings *A168*

Have electronic items. Would exchange for a video headwheel with good heads for a Grundig SVR4004 video-recorder, Write to: 112 Marsden Hall Road (North), Nelson, Lancs. *A176*

ON THE AIR

AMATEUR BANDS

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

by Eric Dowdeswell G4AR

The Hilderstone RS is once again organising an RAE course at the Adult Education Centre, Hilderstone House, St Peter's, Broadstairs, Kent, starting Friday October 4 at 7.30pm, with G3JIX the tutor. Details from the Centre or Annette Penfold G0BEX, Staple Farmhouse, Staple, Canterbury, Kent.

If you need to contact the RAIBC remember that the stalwart past secretary Francis Woolley G3LWY has now handed over to Cathy Clark G1GQJ, of 9 Conigre, Chinnor, Oxon.

A reminder of Hamfest '85 at the Flight Refuelling Sports & Social Club, Merley, near Wimborne, Dorset, on Sunday August 11 at which the QRP fraternity will be running a display and the special event station GB4QRP. Help is still needed so contact Phil Dykes G4XYX, 68 Egmont Road, Poole, Dorset if you can assist.

A repeat of the info that the Basingstoke ARC will be running an RAE course starting in September aimed at taking students up to standard for the May 1986 exam, assuming no prior knowledge. There will be 28 two-hourly sessions, with full information from Dave Burleigh G4WIZ on 07356 5185.

DX Bands

Let's start with a visit down to Weymouth, Dorset, where new correspondent **Mike Willgoss G4XRR** sticks to the 28MHz band with his Yaesu FT-902DM transceiver running around 100W with the occasional use of the FL-2100 linear amplifier boosting his power to 400W, into a 2-element quad antenna. With a bit of patience the seemingly dead band produced QSOs with C53FE, 5B4LP, YV6BQN, SV1SL, 4X6KX, LU1NCO, SV0DH/5 on Rhodes, 6W1NQ, EA9IB, PY5IW, YB0BZZ and 3X0HAB in Conakry, Guinea.

Lots of static spoiled the 1·8 and 3·5MHz bands for **Dick Stanbridge** of Leiston, Suffolk, so on 7MHz c.w. he got 0A4JR, with 4P1XKR on s.s.b. Only one logged on 10MHz was VE6UX on s.s.b. It is worth noting that the USA can now use the 24MHz band. On 14MHz Dick caught VU2BK on c.w. plus KL7H/P on s.s.b. with KH6SB.

Brendan McCartney G4DYO editor of the *DX News Sheet* points out that the previously reported A92D should read A92DZ for whom G3VIE is QSL manager. He also mentions that KC4CT is not on Navassa Island but just another American prefix. KC4CT can be QSLed at 2135 W Colonial, Orlando, Florida.

Carl Ratcliffe BRS86081 of Leeds is also new to the column and uses a Trio 9R59D receiver fed with half-wave antennas on 14 and 21MHz plus a half-sized G5RV. Logged on 14MHz were J88AQ, A71BK, HK6BCZ, JY9RL, TA1E, ZP5JCY, J37AH, TA1A, KV4JC, 8P6AW, KB6SX, 7S5SSA (QSL SM5AQD), KC2TU/TF, 6Y5AK, ZD8TM and FK7LP plus some VK's and a ZL. Carl, by the way is only 16 years of age.

More QRP reports from **Phil Dykes G4XYX** of Poole, Dorset, with his modified CB rig giving 10W p.e.p. into a dipole. Stations worked included EA9RP, EI4EP, HB0/DA1WA, LX1DZ, LZ1KVV and YT3P which I suspect is another YU. ''Gotaways'' included EL2AK, OE3HGB/YK and 7X2CE.

Brian Fields G4XDJ (Billingham, Cleveland) also stays with QRP running the home-brew *PW* Severn with 1W of c.w. on 7MHz, plus a ''half-sized grounded delta'' antenna for which I have asked him to send details. The log shows Y21DC, UA1ADY, YU3ESJ, SM6LJU, GU4YBW, OZ5UR/OY in a pile-up, OH5DS, IP1VXA, HA9OE and SP5CJQ. I would mention that Brian has around 100m of radials buried in the ground which no doubt helps a lot.

In Grimsby **Melvyn Dunn BRS86500** has a new Yaesu FRG-7700 and 40m-long wire to produce ZS6DT and PY0FG on 3·5MHz s.s.b. Only one on 21MHz was HI8LAR (QSL POB404, Santo Domingo, Dominican Rep), while 14MHz came up with JH7LBE, YB6MF (QSL POB232, Medan, Sumatra), ZB2GQ, and on 21MHz PY2CIL, 5Z4MX and VPMKS.

Regular **Robert Parsey** of New Malden, Surrey, has the FRG-7700 also, with a.t.u. and 60m-long wire. Catches on 3·8MHz were OE3HGB/YK on the Golan Heights, TK5EP (QSL F6EYS), and 3D6AN (QSL WK4V). Up to 21MHz and C53EK (QSL POB2596 in Banjul), OD5AS (QSL I5WVI), S79CW, TL8CK (QSL F6EWM), TU2NA (QSL K2IBW), VQ9YR (QSL KA4SPA), 5H3BH (QSL SM0EAI, 5X5GK (QSL DJ5RT) and 5Z4DU (QSL to KE4DA or POB 21355, Nairobi. It is noteworthy that Robert hangs on to his DX in order to get the all-important QSL information.

Tom Blamey BRS87461 (Tonyrefail, Mid-Glam) has an Icom IC720A and Amtech a.t.u. fed from a 17m-long antenna to catch such as EL8M, LU7AHS, TI2CDS, PY3PE, ZP5CD, ZL6AEO(?), 5Z4DU, CP6HI, FG4CH in Guadeloupe, KP2AJ of the Virgin Isles, and TU2NA all on 21MHz. The 14MHz band came up with JY5CI, VP2MD, ZD9BV, 5H3HM, YI1BGD, VU200, ZS3IL and 8P6AW.

Logs are invited from both licensed amateurs and s.w.l.s of DX heard or worked, making sure they reach me DIRECT by the 15th of the month.

VHF Forum

At last the 144MHz (2m) band has come to life albeit briefly with an opening attributed to sporadic-E (Es) activity on June 5 when a number of SE European stations appeared. Most of them came up to very good strengths and faded out again very quickly. I managed to work YU1UN with 59 both ways plus a doubtful QSO with I0LBK due to the inevitable QRM and pile-up. Incidentally, the YU station was in JN93UV. Another nice one lost was SW2PK thought to be in Salonika, Greece, in KN10LO.

Other stations active were HB9DX, LZ1ZB, an IT1, and LZ1AWL and LX2OY both on c.w. Other reports suggest that some USSR stations were heard in the south. I find that one of best ways of forecasting the likelihood of 2m DX is the old and tried method of listening to the various beacon stations on the bottom end of the 28MHz band. Short skip into Europe produces many strong Euro stations due to Es but the effect doesn't always reach as far as 144MHz. On June 15 beacons LA5TEN, DL0IGI, DF0AAB and EA6AU were all coming in strongly at 0730Z but nothing materialised on 144.

When this was being penned there was news of a flight by the space shuttle Challenger around the middle of July with the chance of amateur band operation on both f.m. and SSTV, possibly on 145·550MHz. Nothing seems to have been done to alleviate the hopeless chaos that ensued the last time this was tried and it is difficult to think of a suitable solution. There is no doubt that some s.w.l. reports sent in on the last venture were based on QSO information which became available in the amateur radio magazines.

This is as good a place as any to air my views on the operating of the many special event stations on the air these days. Considerable efforts by club members and a great deal of time and organisation go into most of these operations only to be let down in many cases by inexperienced operators. Once on the air the operator is engulfed with calls and becomes quite confused, constantly repeating information on every contact, to the annoyance of the many waiting for a QSO. It can almost become a contest-like operation, demanding

the use of competent operators. Newly-licensed operators should get their experience from home or from a club station before they attempt a special event station.

Incorrect procedures lead to problems. Say I Call "GB8QQQ, this is G4AR", if I'm lucky he should come back with my report, his location, etc. Instead he simply says "G4AR from GB8QQQ" and leave it to me to start the QSO, wasting valuable time. It is letting down the club members who have worked so hard behind the scenes. Nuff sed!

Don't forget that news of v.h.f./u.h.f. activity from both licensed amateurs and s.w.l.s, together with good photographs of station set-ups, etc., are most welcome.

From recent contacts on 2m it appears that the Es opening on June 5 was even more extensive than it seemed at the time, with reports of HG, YO, 9H1 and 9A being heard/worked. According to the *RSGB VHF/UHF Newsletter 50* and 70MHz were also affected, as one would expect, with the 5B4CY beacon being heard on both bands.

MW BROADCAST BAND DX

Reports to: Brian Oddy G3FEX, Three Corners, Merryfield Way, Storrington, W. Sussex RH20 4NS

by Brian Oddy G3FEX

May I, first of all, take this opportunity of thanking everyone who has so kindly written to wish me well as your new "scribe" for the Broadcast Bands sections of *On The Air*. Your letters of support are much appreciated and together we can ensure the continued success of this popular series.

Note: Frequencies in kHz. Times UTC = GMT.

Transatlantic DX—USA and Canada

A very impressive log, by anyone's standard, has been sent along by **Dave Mayhew** of Yapton, Sussex. Using a Grundig Satellit 1400 receiver and the very neat home-made loop antenna with amplifier shown in the photo, Dave listened for "two weeks of long and weary nights" —as he puts it!

USA From New York, WNBC 660, WABC 770, WCBS 880, WINS 1010, WHN 1050, WQXR 1560; also, WHAS Kentucky 840, WBZ Boston 1030, WBAL Baltimore 1090, WWWE Cleveland 1100, WCAU Philadelphia 1210, WLAM Maine 1470, WTOP Washington 1500, WMRE Boston 1510, WEGP Presque Isle Maine 1390 WAKN on 1050 did not reveal its location.

Canada From Montreal, CBM 940, CKLM 1570; also, CJCH Halifax 920. CJYQ St. John's 930, CHER Sydney N.S. 950, CHUM Toronto 1050, CFAX Victoria 1070, CKCW New Brunswick 1220, CHOO Ajax Ontario 1390 and CBC 600.

Central and South America From Brazil, Radio Social 740, Radio Mundial 860, Nacional 980, Radio Tupi 1040, Radio Globo 1100, Continental 1120, Nacional 1130, Radio Cultural 1200, Radio Globo 1220, Radio Tupi 1280. From Uruguay, Oriental 770, Monte-Carlo 930 and from Argentina Belgrano 950. Dave says "I waited hours to identify XEBBC 1470 from Mexico." He also heard a Caribbean Beacon on 1610. Most reception was around 0230 but he also heard quite a few stations between 0400 and 0500!

Fig. 1: The photograph shows Dave Mayhew's shack, complete with the neat home-made loop antenna

Biggest Loop in the UK?

Not content with all this DX, Dave has erected a giant loop antenna outside which covers the whole of one side of his house! The loop measures about 7·6 by 5·5m and is tuned by a 1000pF variable capacitor. A pick up turn ends in about 20 turns on a 178mm ferrite rod, which is varied in position near the receiver to avoid overloading. Daytime results are Milan, AFN, Czechoslovakia, Bulgaria, Norway and many German stations! Has anyone else tried a giant loop?

News from "Down Under"

It s winter now in New Zealand and **Paul Rawdon** of Wellington has sent along an interesting log of European stations and other DX heard on his Trio 9R59DSM receiver and 0·9m medium-wave loop antenna. His list includes Vatican Radio 1611, Luxembourg 1440, Swiss SBC Sarnen 1566, TWR Monte Carlo 1467 and Russian Vinnitsa 1548, Leningrad 1431 and Mayac 1476/1377. He also hears stations in Japan and Korea. The Saudi-Arabian station on 1440 is heard almost daily. Most of Paul's reception takes place at 0700 NZST = 1900 UTC. Early evening reception during the March Equinox 1730–1810 NZST = 0530–0610 UTC resulted in Radio Portugal, Canidelo 1575 using 10kW, SER Network, Spain 1584/1602. By the way, Radio New Zealand is now operating on 1620 and 1624. Paul says there is much interference from TV sets in the evenings there—a real problem here, too, Paul.

With the kind of hours **Bill Kelly** of Belfast keeps for DX hunting on the medium-wave band, TV interference will be no problem! His log of transatlantic DX suggests 0230 to 0330 is now the time to listen.

From Newfoundland, Bill logged CJYQ St. John's 930, CBGY Bonavista 750 and, from the USA, WMRE Boston 1510, WTOP Washington 1500, WHN New York 1050, WCAU Philadelphia 1210. Bill also heard Radio Globo de Mondo in Brazil 1220, on his NRD515 receiver. I also noted Radio Monte Carlo 1470 in Bill's log — so for those of you needing their QSL, try 0345 if you can stay awake!

Using only the internal ferrite rod antenna in his Satellit 1400SL, **Graham Powell** of Pontypridd heard WMRE 1510 at 0353 and has a QSL to prove it! He also heard WHN 1050 at 0400 and WQXR 1560 at 0356.

Other DX

Graham Powell logged RT Algiers International 981 at 2007 and Radio Mediterranean 1557 at 2310.

At her listening post in Leeds, **Margaret Sadler** has been busy checking the medium wave band on her Satellit 1400SL receiver. She noticed Manx Radio 1368 first at 2145 but found the signal much better after 2300 and listened to the *Late Show* Radio Moscow was heard well on 1323 at 2232 with a *Focus on Asia* programme followed by News and also on 1494 from 2315 with News. A QSL card, plus letter and schedule, has been received from Radio Moscow. Margaret also listened to *Woman to Woman—Joyful Giving* from TWR Monte Carlo 1467 at 2245.

Local Radio DX

Graham Powell has heard BBC Radio Shropshire testing on 756, which may by now be operational. His log includes BBC's Radio Guernsey 1116, Radio Leicester 837, Radio Jersey 1026, Radio WM 1458 and Radio Merseyside 1485.

Radio Forth 1548 (ILR) has been heard by **Andrew Hill** of Cheslyn Hay, Staffs, around 2200. He sent a report to them and received a letter, stickers (see Fig. 2) and a Radio Forth badge. Their address is: Radio Forth, Forth House, Forth Street, Edinburgh EH1 3LF. The transmitter has an effective radiated power (e.r.p.) of 2kW. Andrew has also heard Radio Shropshire.

Using his Panasonic DR29 receiver with its telescopic whip antenna, **Paul Price** of Merthyr Tydfil has been hearing quite a number of local radio stations during the

Fig. 2: Radio Forth stickers sent in by Andrew Hill

Fig. 3: A Radio Trafford poster for an experimental "neighbourhood" radio scheme sent in by Richard Eames

daytime. These include Radio Wyvern on 1530 (Worcester) and 954 (Hereford), Swansea Sound 1170 and the BBC's Radio Bristol (Mangotsfield) 1548, Radio Jersey 1026, Radio Shropshire (Shrewsbury) 756, Radio WM (Langley Mill) 1458, Radio Oxford 1485, Radio Northampton 1107 and Radio Leicester (Freemen's Common) 837.

Considering that the e.r.p. of these stations is 1kW or less (see list in August issue of *PW*) and that daytime reception is by ground wave, you really have been doing well, Paul!

After dark, Paul has been hearing Manx Radio 1368 very clearly and also lists RTE1 567 and RTE2 612, Hereward Radio 1557 and Severn Sound 774, with some interference.

Simon Collings G4SGI, of Crowborough, Sussex, is carrying out an interesting check on daytime m.w. stations using his FRG-7/FRT-7700 a.t.u. combination and 23m-long antenna. His log from Crowborough shows 21 local radio stations heard from as far as 280km away. He is moving to Cheltenham and will check from there to compare results.

From his sheep farm in New Radnor, **Simon Hamer** has heard Radio Solway 585 and BBC's Radio Cornwall 630 from Redruth and Radio Norfolk 873—which has an e.r.p. of only 250 watts—from West Lynn.

Community Radio

A letter from **D. Davis** of Romford asks if any details are known about Community Radio in England in the future and what equipment would be needed? Well, **Richard Eames** of Altrincham, Cheshire, had first-hand experience helping, in an unpaid capacity, the BBC Experimental "Neighbourhood" Radio team at Trafford, last year. The BBC set up a 45 watt e.r.p. transmitter on 1296kHz in five suburbs, as various off-shoots of Radio Manchester. Each was given just a few weeks on the air to test out public reaction. A frequency of 103·7MHz in v.h.f. Band II was used from Wigan in addition to the medium waves and proved to give a better reception over a wider area. Audience research showed the whole scheme to be a great success with 17 per cent of the quarter-of-a-million people tuning in at Trafford alone after only five weeks. Richard says he had the time of his life! (Fig. 3 shows a "Radio Trafford" poster.)

It may be that MW DXers will, at some time in the future, be able to hunt for "Neighbourhood" radio stations running very low power, but I hope this service will be on v.h.f. if it comes about.

SW BROADCAST BANDS

Reports as for Medium Wave DX, but please keep separate

by Brian Oddy G3FEX

World-wide broadcasting has reached the point today where anyone with a simple transistor portable short-wave receiver can expect to hear programmes from countries all over the world. The broadcasters are all mature in their outlook and offer a wide variety of programmes from news and political affairs to cultural and discussion items: depending on the listener's point of view, some programmes may be considered to be propaganda.

Things have come a long way since the early days of short-wave radio in the 1920s, the first Empire broadcasts by the late Gerald Marcuse (2NM) and, later, the inauguration of the BBC Short-wave Service from Daventry in 1932. Today, the transmitters generate enormous power and are directed to "Target Areas", using the language of that area. Some listeners may have little idea of how the signals are reaching them, or how to get the best out of prevailing reception conditions. Even an elementary understanding of the subject could help them to obtain better reception.

A number of readers who are newcomers to short-wave listening have written to ask if a few paragraphs each month in this *PW* series could be directed particularly to them, so that they can obtain a better understanding of their fascinating new hobby. With this in mind, starting this month, a new heading appears.

For the Newcomer SWL

Some of you have, no doubt, been looking at the dial calibration of your receivers and wondering just how you can translate "metres" into "MHz"—and what that means anyway. You have probably already noticed that these crop up very frequently in the *On the Air* series in *PW*.

So, this month, let us just consider the medium by which radio communication is made possible, for this will solve the metres and MHz mystery.

When high-frequency oscillations are generated by a transmitter and applied to a radiator or antenna, **Electro-magnetic waves** are set up. These waves consist of **Electric (E)** and **Magnetic (H) forces,** which always travel at right-angles to one another, their magnitude and direction changing with each half-cycle of transmitted signal. The waves travel away from the antenna with a **Velocity (V)** of about 300 000 000 metres per second or 186 000 miles per second, in concentric spheres of E and H fields called **Wave Fronts**—see Fig. 1. It takes only about one-seventh of a second for the signal to travel around the world!

When these waves meet another antenna they induce a portion of the original energy into it, which can be detected by a receiver connected to that antenna.

The distance between points on the wave where the field intensity is similar in magnitude and sign (i.e. the distance travelled to complete one cycle) is called the **Wavelength (λ)** in metres. The rate at which the cycles occur is called the **Frequency (f)** and is measured in cycles per second (c/s) or **hertz (Hz).** Note: 1000 cycles per second = 1kc/s or **1kHz** and

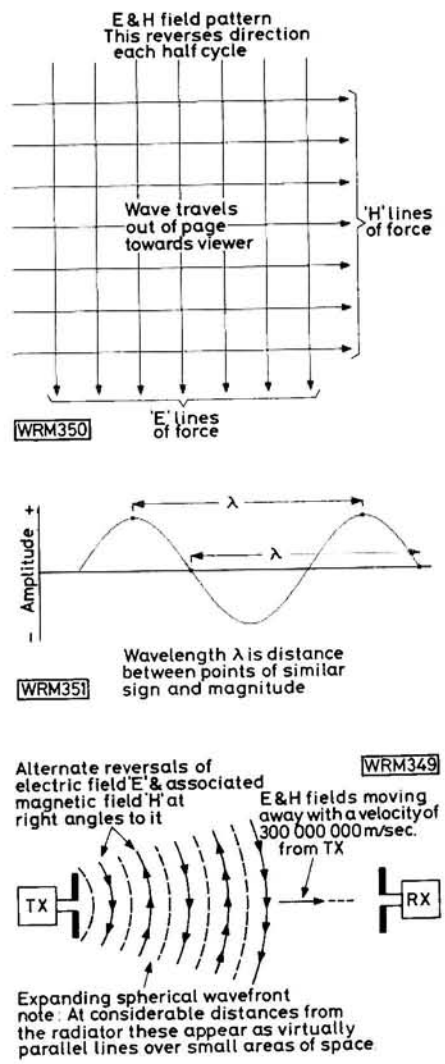


Fig. 1

1 000 000 cycles per second = 1Mc/s or **1MHz.** The prefix kilo (k) means 1000 or 10^3, and mega (M) means 1 000 000 or 10^6. The symbol λ is the Greek letter *lambda,* used in engineering to denote wavelength.

Velocity = frequency x wavelength

i.e. $V = f\lambda$, and, by transposing,

$$\lambda = \frac{V}{f} \text{ and } f = \frac{V}{\lambda}$$

Example 1: What wavelength corresponds to 10MHz?

$$\lambda = \frac{V}{f} = \frac{300\,000\,000}{10\,000\,000} = 30 \text{ metres}$$

Note: If the frequency is in MHz this can be simplified:

$$\lambda = \frac{300}{f} \quad \text{i.e. } \frac{300}{10} = 30 \text{ metres}$$

Example 2: What frequency corresponds to 30 metres?

$$f = \frac{V}{\lambda}$$

i.e. $\frac{300\,000\,000}{30} = 10\,000\,000 = 10\text{MHz}$

These days, it is usual to refer to a short-wave broadcast signal in terms of frequency in MHz, and to a band of frequencies by wavelength in metres (m).

Last month's Short-wave section of *On the Air* gave a list of s.w. broadcast bands and quoted the limits in frequency. These bands, then, are part of the electro-magnetic spectrum which extends from about 25 000 metres in wavelength through visible light to X-rays and beyond.

Conditions on the HF Bands

Note: Frequencies in MHz: Times UTC = GMT.

The 26MHz (11m) and 21MHz (13m) Bands

Conditions on 11m are very poor. Only the 25·650 BBC transmissions have been reported by *PW* readers.

At times during the day on 13m, however, several continents are audible until about 2000 in the UK.

A. H. C. Trickey of Bristol, using his Vega 206 receiver and whip antenna, has logged Radio Nederlands 21·485 from their Madagascar station at 0850, Radio Prague 21·705 at 0855, Radio Japan 21·610 at 1545, Radio Norway 21·690 at 1400 and, during the early evening, WYFR Oakland CA, USA 21·615 at 1945.

Margaret Sadler of Leeds and **Paul Price** of Merthyr Tydfil have both been listening to Radio RSA, South Africa 21·535 at 1300 and Paul has received an attractive QSL from there (Fig. 2). I have noticed that this signal is very poor at 1100 and much better by 1300. Paul has also received Vatican Radio on 21·485 at 1115, Radio Berlin International 21·540 at 1245 to SE Asia and BRT Belgium 21·810 at 1305.

Writing from Malaysia, **Peter Ng,** who has two receivers—a Sony ICF-7600D and a Panasonic RF-3100—hears the 0850 signals from the Madagascar Radio Nederland transmitter on 21·485 well. Radio Budapest 21·665 was another DX station for Peter at 1430.

Overseas listeners wishing to hear BBC programmes should try 21·470, 21·550, 21·660 and 21·710.

With some interesting programmes, HCJB Quito, Ecuador 21·4775 is usually a very good signal at 1900, but that frequency is very odd for a band with few occupants!

I regularly hear very strong signals from UAE Radio Dubai 21·605 from 1030 until 1900 and also on 21·695 during part of the day.

Fig. 2: QSL card from Radio RSA sent in by Paul Price

The 17MHz (16m) and 15MHz (19m) Bands–DX Hunting Ground?

These bands are the hub of DXing activities of many *PW* readers! Conditions on these bands have been good and much world-wide DX logged.

On 16m, **Graham Powell** of Pontypridd has been hearing Radio Australia 17·715 at 0857, All-India Radio 17·875 at 1030, FEBA Seychelles 17·875 at 1100 and Radio Damascus 17·840 at 1245. One that caught my eye was Radio Suriname International 17·755 which Graham says is via the Radio Bras 250kW TX in Brazil at 1808 (Wednesday and Friday). He has been looking at signals "out of band" as I mentioned in August *PW* and has been surprised at the number of stations present. His list includes Voice of Israel 17·630 at 1000, Radio Pakistan 17·660 at 1100, Radio Bangladesh 17·665 at 1237 and Radio Cairo 17·675 at 1215.

Margaret Sadler logged UAE Radio Dubai 17·775 at 1030 and news from HCJB, Quito, Ecuador, at 2140. Both Graham and Margaret use Grundig Satellit 1400 receivers.

Alan Williams of Helston, Cornwall, obtained a Radio Nederland QSL for their Bonaire, Netherlands Antilles, transmission on 17·605 at 1830.

A. Trickey heard Havana, Cuba 17·850 at 2025 and Paul Price logged Radio Berlin International 17·700 to Asia at 1245, while in Malaysia DX signals from Swiss Radio International 17·785 at 1330 and Radio Prague 17·705 with English at 1430 were received by Peter Ng.

News for the Caribbean area is transmitted by the United Nations NY 17·730 on Fridays at 2100. News from the USA is on Voice of America 17·785 or 17·790 from 1800 onwards. From Canada, too, RCI 17·820 has News at 2000.

The 19m band has been full of signals from all continents and Margaret Sadler logged KYOI Saipan, N. Mariana Islands 15·190 at 0730 and noted "this is a 'super-rock station'". Also, Radio Pakistan 15·595 with News at 1100, Radio Nacional Brazil 15·270 at 2145 and Radio Japan 15·235 at 0900 were received. Alan Williams heard Brazil and Japan too, and has received QSL cards from them and WINB Red Lion Penns. USA 15·185 at 2030.

Signals from the Voice of Greece came in well on 15·630 at my location at 0900 and 1500. A. Trickey also reports these signals at 1900: his log includes Radio Algiers 15·160 at 1505, Radio Afghanistan 15·255 at 0915 and Voice of Isreal 15·425 at 1005.

Paul Price has been busy with his Panasonic DR-29 receiver with whip antenna and reports Radio Australia 15·240 at 2330, AFRTS on 15·430 at 1215 and Vatican Radio 15·190 at 1200, to mention only a few stations.

Andrew Hill of Cheslyn Hay has a Vega receiver and a 23m-long antenna. He listens to Radio Australia's live sports programme on Saturdays 15·240 at 0200!

In the Far East, Peter Ng has been listening to ORF Vienna 15·185 at 1500, Radio Norway 15·300 at 1400 and FEBC Manila 15·315 at 0100.

Radio New Zealand International is still elusive and, to help readers, **Paul Rawdon** of Wellington NZ has sent along the latest schedule, effective May, 1985:

To Pacific 1845–2115 11·780, 15·150;
2345–0145 17·705;
0345–0730 15·150

To Australia and Papua New Guinea
2345–0145 15·150;
0345–0730 11·780;
1030–1215 9·600, 11·780.

Please send along any reception of these signals to me.

The 11MHz (25m), 9MHz (31m), 7MHz (41m) and 6MHz (49m) Bands

Conditions on these bands are good but they are overcrowded with high-power signals from all continents and considerable illegal jamming makes the situation much worse.

Some of the interesting stations heard by Margaret Sadler include All-India Radio 11·620 at 2120, KYOI Saipan 11·900 at 1408, SLBC Sri-Lanka 9·720 at 1445 and Radio Jamahiriyah, Tripoli 11·815 at 2230. On 6·576 Margaret logged Radio Pyongyang, Korea at 2000.

Bill Kelley of Belfast has been listening to the excellent signals from Radio Australia 6·035 between 1530 and 2000.

Alan Williams heard Voice of Free China 9·950 at 2130, Voice of Turkey 9·755 at 2000 and Radio Kuwait 11·675 at 1800. A QSL from this station, received by **Peter Vlietnek** of London, describes how their s.w. service—which started with a single half-kilowatt transmitter in 1951—now includes several 250kW ones with directional antennas! It is an interesting QSL and gives a lot of information. Peter received Radio Beijing 11·500 at 1900 and their QSL included their schedule, a pennant (Fig. 3), stickers and a guide to contemporary Chinese painting! (Fig. 4).

A. Trickey received, for the first time, Radio Bangladesh Dhaka 11·555 and 9·855 at 1815: also in his log was Radio Afghanistan 9·665 at 1910 and RCI Canada 9·555 at 1900.

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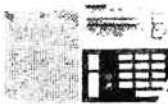

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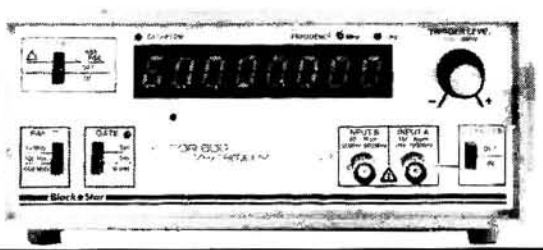

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Fig. 3: A guide to Chinese painting from Radio Beijing

The out-of-band signals log from Graham Powell includes Voice of Arab Lebanon 6·550 and 6·230 with English News at 1700, Radio Bangladesh 6·240, also with English News, at 1900, Radio Pyongyang Korea 6·576 and 7·550, Radio Beijing 6·933 with Spanish to Europe, Voice of Islamic Republic Iran 9·022 and Voice of Vietnam 10·040.

The 5MHz (60m), 3MHz (90m), 4MHz (75m) and 2MHz (120m) Bands

It gave great pleasure to Graham Powell to hear, for the first time, African drums from Malawi BC on 3·380 at 0324. Also logged were Radio Orion, S Africa 3·250, SWABC Namibia 3·270, SABC S. Africa 3·320.

Simon Hamer of New Radnor also heard these signals and his extensive log included TWR Swaziland 3·200, Zimbabwe 3·396, Capital Radio Transkei 3·930, All-India Radio 3·905, BBC Singapore 3·915, RRI Indonesia 4·719, La Voz de la Selva, Peru 4·825, Xinjiang, China 4·735, SABC (English) 4·835, Radio Capital Venezuela 4·850, La Cruz del Sur, Bolivia 4·875, SABC (Afrikaans) 4·880, Radio Brazil Central 4·985, Radio Barquisimeto, Venezuela 4·990 and Radio Nepal 5·005. **David Mayhew** of Yapton heard Nigeria on 4·770 at 2350.

It is not easy DXing on these bands but these reports are very impressive. Please keep your reports coming in for all bands, remembering to give frequencies in MHz and times in UTC (GMT).

Fig. 4: A pennant from Radio Beijing sent in by Peter Vlietnek

VHF BANDS

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

by Ron Ham BRS15744

The period May 15 to June 14, covered this time, contains reports of DX caused by meteor scatter, sporadic-E and tropospheric openings, in addition to information about solar observers in South Africa and the 28MHz beacon in Sierra Leone.

Solar

"Solar activity seems to have quietened down," writes **Ron Livesey**, Glasgow, on June 10. Ron, who observed two sunspots on the 10th, is the auroral co-ordinator of the British Astronomical Association. He says that the Boulder observatory reported a quiet to unsettled period for May 20 to 26, adding, "I have detected nothing particularly violent on my magnetometer recently, although it was slightly more active in the first few days of June." **Patrick Moore**, Selsey, found the sun's disc clear during his observations on May 26 and from the 28th through to June 3. However, he counted three sunspots spread across the disc, Fig. 3, on May 19, one seen through partial cloud on the 24th and two on June 4. In Sevenoaks, **Cmdr Henry Hatfield**, using his spectrohelioscope located one filament and one prominence at 1015 on June 1 and three spots, four filaments and a few plages around the spots, at 0955 on the 8th. Another regular observer, **Ted Waring**, Bristol, counted four sunspots on May 17, one on the 24th and eight on June 7. **Bob Anderson**, Johannesburg, an active member of the Astronomical Society of South Africa, is currently running a group of eight sunspot observers and plans to build a receiving station for the detection of solar flares and to study their effect on signals in the 28MHz band. Like our solar observers, **Davie Overbeer**, a council member of the ASSA reported considerable activity on the sun during the period April 21 to 24, which is not surprising when one studies the sunspot chart, Fig. 1, prepared by Bob's group for the month of April. They also send their information to the solar division of the American Association of Variable Star Observers and recently Bob was appointed by the ASSA to organise and lead an official solar section. **Tony Voorveld** ZS6CCD also keeps the group informed about radio communications and once again, we see the value of co-operation between enthusiasts with a common interest.

50MHz (6m) Band

Gordon Pheasant G4BPY, Walsall, worked Norwegian stations via meteor scatter in the early mornings, almost daily, from May 13 to June 3 taking an average of ten minutes to complete a QSO. During the period he exchanged reports with LA1K, LA6PV, LA6QBA and LA9DL, and among his crossband QSOs were PA0XMA on May 19, EA3AOW on the 25th, SM6PU on June 2, YO2IS on the 3rd and CT1WW on the 9th. At the time of writing Gordon had worked 54 of the UK 6m permit holders in G, GI, GW and GM. For 50MHz operation Gordon has a choice between an IC551 with a QQV06-40 linear in an outside shack, or an IC505 in his bedroom with remote control for his linear and home-brew 6-element beam, Fig. 5 which can be seen above his 28MHz antenna and below the airship, hi. Gordon also said that SM6PU reported hearing W3ZR on 50MHz, working in a contest, for about twenty minutes at 2100 on June 8 and that he and **Dave Newman G4GLT** heard the Canadian beacon VE3TEN that evening, but nothing else on either the 28 or 50MHz bands. **Norman Hyde G2AIH**, Epsom Downs, has a 2-element antenna for 50MHz and so far has logged 42 stations, many in the West Midlands. His best DX so far is GM3WOJ via m.s. on May 14.

28MHz (10m) Band

"I am sure that your readers observed the most unusual activity, May 24 to 26, teeming with stations both c.w. and s.s.b., after so long in the doldrums," writes **Bill Kelly**, Belfast. In about fifteen minutes from around 0850 on the 24th, with the aid of the Tono 550 communications terminal, I copied c.w. signals from stations in Austria, Bulgaria, France, Germany, Hungary, Italy, Switzerland and Yugoslavia and a bit earlier on the 25th, I logged Denmark, E. Germany, Italy, Rumania, USSR and Yugoslavia.

Among his comments for May 24, **Len Fennelow G40DH**, Wisbech, said, "Best session for months. Pandemonium reigned on CB all evening with several DX QSOs being attempted on nearly every channel, with varying degress of success." At 1349 on May 18, Len received strong but watery signals on 10m f.m. from EA2BGR while working a G and heard EA3ERD in QSO with a GW. Around 1700 on the 30th, he heard contacts on 29·600MHz between stations with the prefixes CT, DF, DL, EA, GI, I, IT9 and YU, plus others at good strength.

Between May 15 and June 11, **Dave Coggins**, Knutsford, received signals,

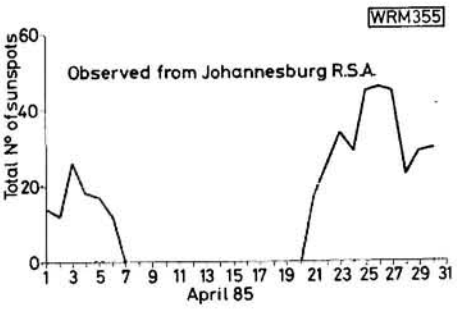
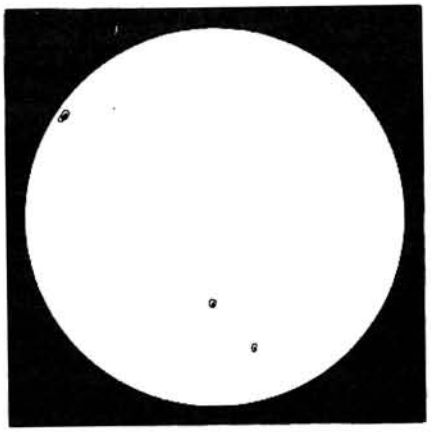


Fig. 1: Sunspot chart prepared by Davie Overbeer



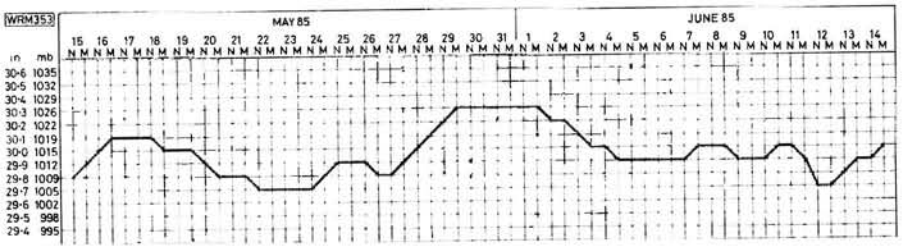


Fig. 2 ▲

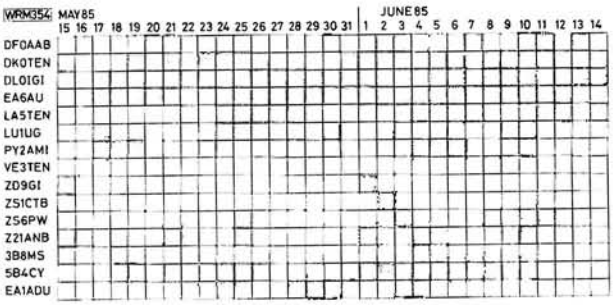


Fig. 3 ◀

Fig. 4 ▶

mainly via sporadic-E, from CT, DL, EA, F, G, HA, HB, I, OK, UP, YO and YU. On May 26, Dave heard the South American stations CX4HS, PY5EG and PY5NW, and at noon on June 3 he logged a very strong EI working his friend and neighbour Tony Usher G4HZW. At 1845 on June 1, I copied c.w. from three DLs. "28MHz open on June 6 to Bulgaria, France, Germany, Italy and Yugoslavia," writes **Chris van den Berg**, The Hague. "Interesting propagation on June 10, very short skip on 28MHz. PA0 QRP station calling at about 1710 and at 1845, I heard a couple of GM4s but did not manage to work them," writes Gordon Pheasant, who did get a QSO with UA9CRR in Asiatic Russia at 1932.

Propagation Beacons

"This is my best month's results this year," writes Len Fennelow, who, like other readers heard the beacon EA1ADU and said that it sends a c.w. ident, about the same speed as EA6AU, every 8 seconds. Another new beacon, heard by Dave Coggins and **Filip Rogister ON1BRL**, Overijse, is EA7AML on 28·197MHz sending "EA7AML EA7AML QRP BEACON BOX 17 POSDAS CORDOBA". **John Coulter**, Winchester, logged a Dutch beacon PA0ETE on May 25 and June 2, and **Bill Kelly** reports hearing "TEST DE DF0THD JN49HU PSE QSL" around 28·325MHz at 1115 on May 24, 0825 on the 25th and 0630 on the 31st. "There seems to have been a great awakening during May, mainly short skip to central Europe" and "Generally speaking the propagation was very good for the second half of May with lots of European beacons being heard and a decreasing number from Africa" remarked Billy Kelly and Filip Rogister respectively. Filip also logged our old friend the Gough Island beacon on May 15 and 31 and ZS1LA on the 15th.

It's good to have the 28MHz band active again and my thanks are due to Chris van den Berg, Dave Coggins, John Coulter, Len Fennelow, Henry Hatfield, Norman Hyde, Bill Kelly, **Ted Owen**, Maldon, Gordon Pheasant, Filip Rogister and Ted Waring for their reports which enabled me to prepare our monthly 28MHz beacon chart, Fig. 4. Thanks also to **Peter Davies G1KQA**, Enfield, a member of the Cheshunt and District Amateur Radio Club for the sample QSL card, Fig. 6, sent by the club in exchange for reception reports of signals from the Sierra Leone beacon 9L1FTN. This beacon, built by the Cheshunt Club and operated by the Sierre Leone ARS is part of the International Beacon Project and keys "de 9L1FTN", every twenty seconds on 28·272MHz. John Coulter also kept a watch on 14·100MHz and logged the beacons CT3B, OH2B, ZS6DN and 4U1UN daily from May 15 to June 13.

Between the logs of Norman Hyde and Gordon Pheasant, I see that the 50MHz beacons in Cyprus 5B4CY 50·498MHz and Gibraltar ZB2VHF 50·035MHz, were heard on May 23, 24, 25 and June 1, 2, 3, 5, 6 and 7 and May 25 to 29 and June 6 to 11 inclusive and respectively. From 1909 to 2045 on June 11, Gordon received signals peaking 429 from the 6m beacon FY7THF on 50·038MHz. I logged the RSGB Headquarters beacon GB3NHQ during the opensigns on June 2, 3, 4 and 13 and Norman received signals from GB3SIX 50·050MHz, via meteor scatter, up to mid-morning on most days. Apart from the few days of tropo lift during this period, I received signals, with a vertical dipole antenna, from the RSGB beacon at Wrotham GB3VHF 144·925MHz at a daily average of 539 and Chris van den Berg heard it on June 3 and 4.

Between **Harold Brodribb**, St Leonards on Sea and I, using ex-military RL85 and R216 v.h.f. communications receivers respectively and dipole antennas, we recorded the effect of sporadic-E signals between 50 and 100MHz during events lasting a few hours on May 15, 24, 25 and 29 and June 2, 3, 6, 9, 10, 11, 12 and 14. On each of these days, we received very strong signals from east European f.m. broadcast stations between 66 and 73MHz, their numbers varying with the intensity of each event, ranging from less than a dozen on some days to more than 60 on others. Typical peaks were on June 3, 6 and 11 when we counted 41, 56 and 64 such stations respectively. During the severe disturbance around 1700 on the 11th, I logged strong signals from seven stations, all with German voices, between 87 and 100MHz in Band II. **Andrew Guy**, Newport, identified broadcast signals in Band II from a variety of stations in Italy and Portugal, Radio Popular Huelva from Spain and Radio Skopje and Zagreb from Yugoslavia on some of the dates listed. Many of these were in good stereo and at times Andrew may have heard signals from Finland, Scandinavia and Switzerland, but when these bands are so full of stations a positive identification is difficult. **Fraser Lees**, Ringmer, reports that Band II was open to Italy and Yugoslavia around 1500 and June 2, when he identified a stereo transmission from a station in Naples.

"On June 7, my wife established contact with a Citizen Band station in Harwich as did an HGV driver about two miles away," writes **David Williams**, Motherwell, adding, "On the 8th, we were operating CB communications for a gala day and we heard a station in Canterbury contact one in Glasgow and another calling Jersey." David told me that between 0930 and 1130 on the 8th, CBers in central Scotland had good QSOs were stations in southern England. During one of these disturbances towards the end of May, Ian Davidson, Carmarthen, received CB stations from Lanark, Motherwell and Ireland.

Tropospheric

The atmospheric pressure measured at my QTH from May 15 to June 14, using a Short and Mason barograph, showed two periods when the indicator was above 30·0 in (1015mb), May 16 to 19 and May 28 to June 3. The former peaked at 30·2 on the 17th and the latter at 30·3 on June 1. As expected there were mild tropospheric openings affecting the v.h.f. and u.h.f. amateur and broadcast bands mainly following the peak of each event. The noon and midnight readings shown in our graph for the period, Fig. 2, were taken from the analogue chart on my barograph, and slightly rounded. My thanks to **Gordon Grigg G3PRX**, Rainham, for letting me hear a short tape recording which he made at 0607 on May 11, of LA6PV calling CQ on the 50MHz band. Although there was a lot of meteor scatter about at the time, the strength and clarity of the Norwegian signal left little doubt in my mind that it was received by the brief period of tropo.

On May 30, **Andy Stafford G4VPM**, Paignton, arriving home after listening to a good talk on v.h.f. DX, by G3PBV, at the Torbay Amateur Radio Society's meeting, switched on his 144MHz (2m) gear and heard PAs and a couple of DLs. He checked 430MHz (70cm) and worked three PAs adding two new QRA squares to his list. "I did not manage a DL for a new country on 430MHz but the PA I worked in DM square was only 2km from the German border." said Andy. During the evening of June 3, Andy heard a couple OZs on 144MHz, whilst on 430, OZ1HRA was about 56 but he could not get through the enormous pile-up to contact him.

On June 2, **Simon Hamer**, New Radnor, took his Daiwa Search-9 144MHz receiver and an HB9CV antenna to Penyfforest Hill and heard signals through the repeaters in Burnley GB3RF R7 and Dublin EI1DK R0 the stations from Lancashire and Norfolk on simplex. After adding the repeaters in Waterford EI2WRC R2 and Sligo EI7CS R4 to his list of regulars with his new Yaesu FRG-9600 receiver, Bill Kelly writes, "It's great, particularly on 2m, all very encouraging given my very poor location "

Band II

Harold Brodribb received signals from Egem, Belgium, on four channels between 90 and 101MHz on May 17, the French stations Culture, Frequence Nord and Musique on several channels on the 18th, and extra strong signals from the French transmitters at Abbeville, Boulogne, Caen, Lille and Rouen on the 31st. I logged French stations from the home QTH at 0830 on May 16, Dutch and many interstations warbles at 0850 on the 19th and more French while operating portable in Ashdown Forest, about 200m a.s.l., at 1700 on the 29th.

Fig. 5: The home-brew 6-element beam constructed by Gordon Pheasant

At 0100 on June 1, **George Garden**, staying at Laurencekirk and using a Russian Astrid receiver, heard IBA Radio Clyde from Black Hill. Then between 0810 and 0920 on the 2nd he received BBC Radios Cleveland and Newcastle and IBA Radios Forth and Tay. During the good conditions on the 1st, Simon Hamer heard programmes from the Netherlands transmitters at Goes, Roermond, Smilde and Wieringermeer between 87 and 88MHz, and from BBC Radio Sussex, IBA Invicta Sound, Radio Mercury and Southern Sound and Belgium, RTBF from Liege, above 100MHz.

Fig. 6: QSL card for reception of the Sierra Leone beacon

"Between November 1984 and January 1985, the New Zealand sporadic-E season, Australian f.m. broadcast stations were heard in Wellington," writes **Paul Rawdon**. He adds, "December 30 was the best day," when, during a three hour opening he logged the privately-owned stations 2DAY and 2MMM, public broadcast stations 2CBA, 2NUR and the ABC station 2JJJ, all in New South Wales some 1900km away. Paul uses a Pioneer SK51-F receiver with a 3-element Yagi antenna. "Broadcasting on f.m. in New Zealand is in its early stages with only 8 full-time and 3 part-time, university stations," said Paul, who can heard the two stations in Hamilton, 560km north of Wellington, fairly regularly. On one occasion, both were received in stereo.

TELEVISION

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

To quote a popular chant, "Here we go, here we go", etc., and here we sure do go again, it's the sporadic-E season and off to a good start, with a variety of captions, clocks, films, programmes and test cards.

Band I

Because of its topicality, I must give pride of place to the sporadic-E disturbances which manifested between May 15 and June 14 and, at times, totally disrupted the frequency range 40 to 68MHz, known as Broadcast Band I. "I bet everyone has been enjoying themselves in these conditions," writes **Simon Hamer**, New Radnor; "Many openings after a quiet time," said **Tony Palfreyman**, Sheffield, and "What a start to the season, much too much to go into any detail, so enclosed my log," remarked **Keith Chaplin**, Barrow-on-Soar. As this was the general trend of your letters, to save repetition I have selected interesting comments and items for your logs in order to get a cross sectional view of the events.

Having moved QTH, **Ian Davidson**, Carmarthen, installed his Bands I and III antennas in his loft and on May 17 he received a test card with digital clock from Spain TVE 1 on Chs. E2 48·25MHz and E3 55·25MHz. Among the regional stations seen, mainly by **Phil Hodgson**, Stamford and **Gordon Pheasant**, Walsall, were pictures from Norway, Bagn, Gulen, Greipstat. Hemnes, Kongsberg, Melhus and Steigen and from Spain, Barcelona, Gamoniteiro and Santiago, while **Mike Bennett**, Slough, logged Bayerischer Rundfunk from Germany. **Neil Purling**, Hull, saw the Russian captions CNOPT (sport), HOBOCTN (news) and TACC COObWAET (Tass report), Fig. 1 and like most of us, the Italian RAI 1 test card, Fig. 2 and caption, Fig. 3.

Fraser Lees, Ringmer, using his new antenna system, Fig. 4, watched military parades from Italy and Poland, programmes about cooking and children from Norway and Spain respectively. Like others he has identified clocks showing their local times from Hungary, Poland and the USSR. The less frequent signals like Denmark, Finland, Iceland and Rumania were reported by Keith Chaplin, myself, Simon Hamer and Gordon Pheasant respectively, and it is very possible that the Arabic caption seen by Simon on Ch. E3 on May 24 came from JTV Jordan. Both **Alan Taylor**, Coventry and Philip Hodgson saw a chequer-board test pattern from Italy while **Harold Brodribb**, St Leonards-on-Sea and **Dave Coggins**, Knutsford, between them saw cartoons, cycle racing, news and the Pope speaking at the times when the Italian signals were predominant.

Among your reports were the captions DR, Denmark; RS-KH and SR1 TV Bratislava, Czechoslovakia; PTT-SRG 1 and PTT SSR, Switzerland; TV1 Sverige, Sweden; RTP-1, Portugal; JRT BGRD and JRT ZAGREB, Yugoslavia; dt and TVP, Poland; MTV 1 Budapest, Hungary; TVR Bucuresti, Rumania; TV Reklam, Hungary; Televerket, Norway; YLE TV1, Finland; BPEMR, USSR and others like TV Dvenik, Videotext fur Alle, Achet het Niews, Betureklam and Telejurnal. Simon Hamer saw the Soviet Premier and Harold Brodribb an advert for Duracell batteries.

Tropospheric

"Two days after I erected my new antenna system, a ridge of high pressure was moving over Scandinavia," writes **Kenneth Begg**, Dundee, who received NRK, Norway briefly on Ch. E9 during the evening of May 21. Then, between 2100 and 2315, he saw a German war film with Danish sub-titles, followed by the late news, weather, next days programme schedule and the close down clock, from Denmark on Ch.E10. Ken is using a Triax MTH13 antenna for Band III and a Triax twin-grid for u.h.f. and has decided to add a JVC CX600 receiver to his station.

Fig. 1

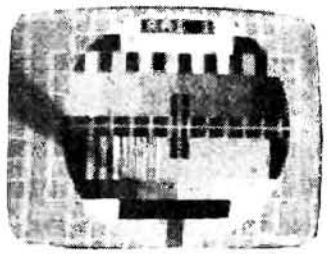


Fig. 2

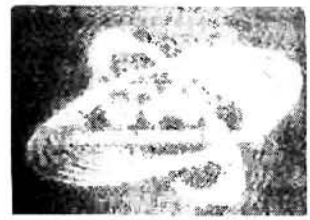


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Fig. 6

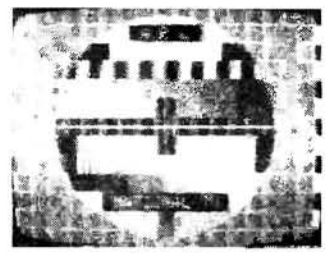

Fig. 7

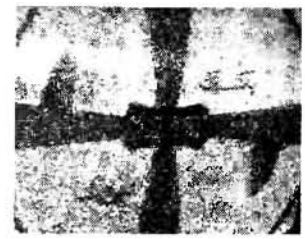

Fig. 8

Fig. 9

Fig. 10

◀ Fig. 11

Around 0700 on May 29, Phil Hodgson received from France a good, negative, picture from Canal Plus on Ch. F5 in Band III, TDF Antenne 2 on F21 and a positive picture from Nederlands-2 on Ch. E27 in Band IV. At 0700 on the 31st, he received pictures from Belgium, RTBF 1 on Ch. E8 and from Denmark on Ch. E7 and Holland on Ch. E27 during the evening of June 1. Fraser Lees logged signals from Holland at 0800 on the 30th and from Belgium, France and Holland an hour earlier on the 31st. On May 26, Simon Hamer watched a film on Radio Telefis Eireann RTE 1 on their Chs. F and H and a documentary on RTE 2 on their Ch. J in Band III He also received pictures from Belgium, France and Holland in Band III on May 31 and the RTE stations again on June 2

Around 0640 on May 29 and 30, Harold Brodribb watched pictures from France on Chs F5,7,9 and 10 and on about 7 spots in the u.h.f. band. Like other readers, both Harold and I logged the test card from RTBF 1 on Ch. E8 early on the 31st. Later I saw the caption PTT-NL-AVVC HVS on Chs. E4, 5 and 6, and at 0835 the Dutch signal on E4 was in strong colour and showing a weather report, followed by a test card, PTT NED-1 Co-channel interference was seen in the u.h.f. band during the evenings of May 31 and June 1, and at 1413 on the 3rd a Danish test card appeared on Ch. E7.

Tony Palfreyman, Sheffield, had a good haul on June 2 and 3 when he logged pictures in the u.h.f. band from Germany ARD, ZDF and NDR III and Holland, PTT NED 1 and 2.

During the weekend May 31/June 3, **George Garden**, while staying at Laurencekirk, used a Teleton receiver, a wideband amplifier and a four-stack bow-tie antenna in his upstairs bedroom. With the atmospheric pressure falling from a high of 30·7in. he received extremely strong colour pictures from the Scottish ITV transmitters at Black Hill on Ch. 43 and Craigkelly on Ch. 24 and a BBC1 signal on Ch. 33. While conditions were so good, George took his JVC CX610GB receiver to a high spot on Cairn O'Mounth, some 460m a.s.l., and his efforts were amply rewarded with pictures from the Tyne Tees transmitter at Bilsdale on Ch. 29. "As good as our local TV" said George, whose greatest surprise came when he tuned slowly around Ch. 60 and picked up part of the ITV *Survival* programe from the Granada Winter Hill transmitter on Ch. 59. All with the JVC's own telescopic rod antenna.

Amateur (fast scan) Television

While visiting a friend in Rhayader, Simon Hamer tuned his Hitachi receiver to the lower end of the u.h.f. band and received ATV pictures from Bert Mills GW3LJP, a local station, using a home-brew camera and showing hand-drawn cartoons of animals. Bert also has Microwave Modules and home-brew transmitting gear for ATV.

In Dorset **Mervyn Staton** G4BGT has just finished a Solent Scientific 1290MHz f.m. ATV transmitter which includes full inter-carrier sound. The 1W output fed to a single Tonna Yagi antenna produced P5 colour pictures at the QTH of **John Fell** G0API, some 3km away and a comment that this was the most hi-fi audio yet received in an amateur band!

SSTV

"The battle for a clear channel on the 20m SSTV calling frequency, 14·230MHz, continues daily. Call "CQ SSTV" on s s.b. followed by SSTV itself and listen, only to find someone calling "CQ SSB DX" on the channel. Granted 95 per cent will QSY when so asked, but they should not be there in the first place," writes one of our leaders in the art, **Richard Thurlow G3WW**, March. Interference is a problem Richard and, like others, I have often found reception difficult on 14·230MHz. However, between May 15 and June 14, I did copy signals from stations in France, Germany, Italy and Yugoslavia and read captions such as, "RSV 599", "WX SUNNY", "CQ SSTV DE DK4KE", "PSE K", "NOW QRT", "HOPE CUAGN", G3LTZ DE DK8SY", "NAME MANFRED", "QTH nr STUTTGART", "OKEY VIDEO 100%", "CQ CQ CQ DE GJ4YCR", a picture of Manfred (I think), Fig. 5 and a CQ from I1CEL, Fig. 6.

"At last I have managed to copy a G on the h.f. bands," writes **Peter Lincoln**, Aldershot, who continues, "It might not seem much, but after four years of receiving this mode it became a bigger ambition than some DX countries." Peter's "duck"

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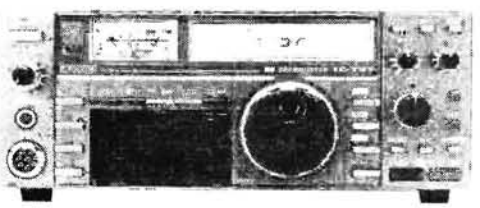
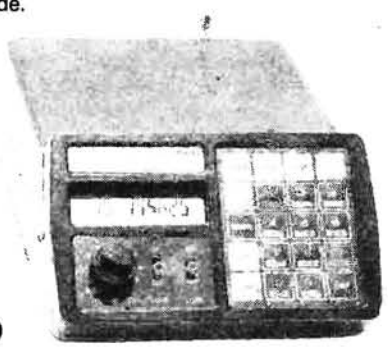
The IC-735 is a new HF transceiver from Icom that is small enough for mobile or even portable use. It covers all the Amateur bands from 1.8-30MHz, including 10, 18 & 24MHz. The solid state circuitry provides approximately 100w output and the modes include AM, FM, SSB & CW. RTTY operation is also possible.
The receiver tunes continuously from 100kHz to 30MHz and uses a high-side IF and a CPU control system. The direct feed mixer gives higher sensitivity, a wider dynamic range and rejects spurious response. Even during difficult conditions clear reception is possible by using the pass band tuning facility and sharp IF notch filter.
The easy to read LCD display shows a wealth of information, there are also 12 memories and various scanning functions, all of which help to make the IC-735 a very versatile and easy to operate radio.



The Icom IC-3200E is the smallest dual band (144 & 430/440MHz) FM transceiver available. The front panel has been simplified by the use of a function key for low priority operations. The easy to read LCD display shows: Frequency, VFO A/B, Memory channel, Duplex Mode and S/RF Meter information
The 10 memory channels not only store the operating frequency but also whether it is Simplex or Duplex and memories can be scanned or skipped by use of the lockout function. There is also a built-in duplexer that allows the use of just one antenna for both VHF and UHF.
Optional extras include:- HS-15 mobile mic, SM6 and SM8 desk mics, UT-23 speech synthesizer, SP-10 external speaker and PS45DC power supply.

The IC-751 is an amateur bands HF transceiver but with a general coverage receiver. Its features include: 32 memory channels, a digital speech synthesizer, a speech processor, two VFO's, a marker, the choice of a 20dB pin diode attentuator or a J-FET pre-amp (switchable), a pass band tuning, 4 variable tuning rates, a variable noise blanker, a monitor switch, a direct feed mixer in the front end, full break-in on CW, Amtor compatibility, computer control option and a remote push button frequency selector pad is available. Any XIT or RIT adjustment is shown on the display. The first IF is 70.045MHz and the transmitter features high reliability 2SC2904 transistors in a low IMD (−32dB @ 100w) full 100% duty cyde.



This wonderful new scanner from Regency has all the features of the well-known AOR 2001 (i.e. 25-550MHz coverage with no gaps, 20 memories, AM, FM-W, FM-N, lockout facility, search facility etc. etc.) PLUS EXTENDED COVERAGE. This model also covers 800MHz through to 1.3GHz without gaps! A truly superb scanner that opens up even more of the spectrum.

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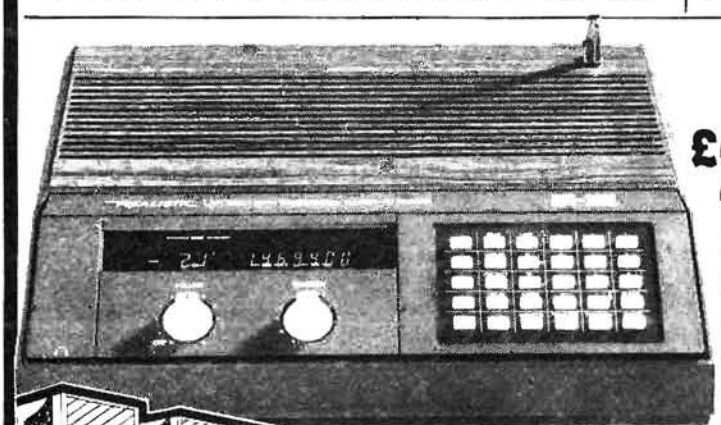

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was broken by G3LTZ at a range of 80km. Although the month prior to June 14 was quiet on SSTV for Peter, he did receive pictures from most European countries and OH2AQ/OHO from the Aaland Is.

During the same period, **Lester Curno**, Bude, using an h.f. pre-amplifier ahead of his FRG-7 and the Scarab/Spectrum combination for SSTV, received pictures from F3RT and like Alan Taylor G1MSA, Coventry, also using Scarab software, copied signals from France, Italy and Germany. While Lester added the USA to his list, Alan added Hungary and Yugoslavia, all on 14MHz. Lester copied signals from Luxembourg on 7MHz and a few Gs, including Richard G3WW on 3·5MHz. At 1849 on June 1, he received pictures from Spain, observe the caption, "GOOD AFTERNOON MY NAME IS NOCOLA," and, by June 14, Lester had 72 callsigns from 20 countries in his SSTV log. Richard tells me that G3LUI, G3NOX, G4VCN, G6ACL, G6OHM, G0BDD and G0BFL are active with SSTV on 144·5MHz f.m. and that OH5RM is back on 14MHz.

News from Overseas

"Our sporadic-E season commenced in mid-November 84 and finished rather suddenly in mid-January, although normally it extends into late February," writes **Paul Rawdon**, Wellington, New Zealand, adding, "Despite the shorter season, we did have some quality openings on the low TV channels, 50 to 70MHz." The first Australia-New Zealand opening took place on November 16 when Paul received signals from Sydney, followed by openings almost daily until the end of December. Paul, who uses a Thorn receiver in his car and a pair of "rabbits ears" for the antenna, edits the TV and f.m. columns in the NZ Radio DX League's magazine *DX Times*. He says that the Australian TV channels 3, 4 and 5 fall within their 88/108MHz f.m. band and their audio is frequently heard in Wellington. The choice of DX channels in Wellington is limited because their local station uses Ch. 1, but, "Despite this," said Paul, "ABN2, Sydney, Fig. 7, and ABT2 Hobart, Tasmania, are seen regularly in Wellington and at times these signals are almost at local strength." Paul remembers when the picture from Hobart was so strong in colour that it only went to monochrome when the signal faded. "Not bad for a pair of rabbits ears at over 1900km," quipped Paul. In Paraparaumu, 48km north of Wellington, pictures from Brisbane and Sydney can be seen during the DX season, despite the fact that they are only 1MHz higher than the NZ Ch. 1.

While looking for sporadic-E signals on May 9, I decided to look in Band III and was surprised to get a test card from Pakistan, Fig. 8, at 1700 on Ch. 10 via tropo," writes **Major Rana Roy**, India. On May 20, Rana received multiple signals on Ch. 2 and identified part of a feature film from the USSR. During the early evening of the 22nd, he logged two newscasters, Figs 9 and 10, and a caption, Fig. 11, on Ch. 2 via sporadic-E from the USSR. "We had heavy rain on May 10, which made the streets of Bikaner look like small rivers," said Rana, adding, "Besides this we have had sandstorms followed by light showers every week and with all this rain, Bikaner has become hot and humid, which is unlike the desert."

Mystery Picture

My thanks to **Ivo Swinnen**, Belgium, for the information that the picture Fig. 4 in my June *Television* column is from BRT news, with the map of Belgium in the upper left-hand corner and presenter Reddy de Mey.

SPACE & SATELLITES

Reports to: Pat Gowen G3IOR, 17 Heath Crescent, Hellesdon, Norwich, Norfolk NR6 6XD.

by Pat Gowen G3IOR

Current Satellite News

On Friday, June 7, only six days after entering eclipse, RS-8 switched itself off due to recognition of a low battery whilst under heavy use in shadow. Constant commands from RS3A eventually brought the satellite back to life after two days of re-charge, and all seems well again at the time of writing. However, this should be a cautionary warning to those who run excessive power to these sensitive transponders; in other words, use it gently, or lose it! If G3IOR can work VE5XU keying the mike button of a 1·5 watt hand-held, the 10kW e.r.p. run some users would appear somewhat unnecessary!

Bill Kelly has been listening at all hours to the "RS" series, and has logged lots of stations, with RS-7 and 8 usually in transponder mode. He has also been hearing the venerable RS-1 satellite sending out its corrupted telemetry, always starting and ending with a figure 5, e.g. 5295, 5855, 5755, 5975, 5785, and with its RS sent as 55, etc. Unfortunately, it is still quite random, and will not yet decode to anything meaningful.

Starting August 1, we have the new OSCAR-10 schedule, with the transponder off during the apogee eclipse time, with a charging up period either side. It will be on over perigee (see schedule last month) and observers will notice the change in maximum DX available. What will also be noticeable is the relatively rapid change of position of the spacecraft, and a change of beam direction will now be desirable every few minutes to maintain good tracking and optimum signal.

Graphic printouts of SV1KC's version of the GM4IHJ Spectrum program for OSCAR-10 are shown in Figs. 1-3. Fig. 1 shows the coverage of the satellite close to apogee on July 31, the last day of transponding at around apogee, when the footprint covers all of Europe and Africa, with most of Asia and lots of Australia. Fig. 2 shows the coverage soon after acquisition of signal on the first day of perigee transponder activation, whilst Fig. 3 shows the position only one hour later, just before the transponder is commanded off again.

Due to the rather unsocial hours of the availability of OSCAR-10 this past month, meaning an early rising or late bedtime, little new DX has been observed, but some good ones are coming. Look for activity from HC8, the Galapogos Islands between August 19 and 24.

JAS-1 More Time

Miki, JR1SWB reports from JAMSAT that it now appears that there will be a six month delay in the launch of their satellite. The problem is not in the satellite itself, as it has now undergone its electromechanical tests and potting of modules ready for thermal vacuum testing, with only some 15 per cent of the work-load outstanding. It was due for launch in February next year, due to the problems with BS-2A, the 12GHz Japanese Direct Broadcasting satellite. The BS-2B back-up that was due for launch this month will need a few modifications and will not meet this launch opportunity. It has now therefore been moved to

TABLE 1

	Typical Satellite Values in amateur bands								
Frequency in MHz	21 Day	21 Night	29 Day	29 Night	145	435	1269	2304	24 000
Maximum Doppler Shift of Each Link in kHz from Centre freq.	0·4	0·4	0·6	0·6	2·8	8·5	25	45	470
Path loss in dB including absorption	136	132	137	135	149	158	168	173	196
Required power from ground TX for −100dBm at Satellite (e.r.p. watts)	5	2	5	3	80	700	6kW	19kW	4MW
Ground Station Noise Temp. in kelvin	100k	100k	20k	20k	800	600	900	1k	6k
Signal: Noise in 3kHz b/w with 0·5 watts Satellite power (in dB)	2	4	11	13	12	5	−6	−12	−43

the next launch-window in February that would otherwise have been used for JAS-1. Japan only has two launch-windows each year, viz. February and August, so it would now appear that NASDA, the Japanese Launch Agency, will move the JAMSAT JAS-1 "FUJI" spacecraft to August next year.

AMSAT-1 Satellite

Piero, I5TDJ, and **Domenico, I8CVS** report on behalf of the Italian AMSAT group, who, after flying numerous highly successful high-altitude balloon-borne 432/145MHz transponders from Sicily to Spain, are now planning to use transponder space aboard the geosynchronous OLYMPUS satellite next year. OLYMPUS is a very large TV, military and radio communications satellite for Europe, and will be fully stabilised with a power supply available on-board, so few antenna pointing or power source problems arise. The AMSAT-I engineers have proved the split-passband a.l.c. channelling idea in practice, and will use this for a transponder that will handle c.w., s.s.b., and packet radio, with a possibility of a PACSAT system also.

UoSAT on UoSAT

Harold Meerza sends in a copy of his excellent reception of the UO-11 bulletin board, which is fulfilling its intention as an educational satellite by describing its functions. The "WOD" (Whole Orbit Data) ability is described adequately in Harold's direct-from-the-satellite print-out.

More on HF Satellites

Last month we dealt with some of the interesting propagational aspects of satellites using h.f., in preparation for the "RS" launch expected later this year. This month we can briefly cover the link path and other values that differ from the more normally used v.h.f. and u.h.f. up and downlinks by relating them for each amateur band.

In all the print-outs the sub-satellite point is shown as an arrow, pointing up if rising, down if going to perigee. The non-illuminated earth areas are shaded, footprint covered is unshaded. "PS" is phase, or mean anomaly, AZ and EL are beaming degrees, LO and LA is sub-satellite longitude and latitude. Note: The arrows have been broadened to make them clearer in reproduction

If we base our values on a satellite in a circular orbit of some 1780km, i.e. the expected two-hour orbit, we can make up Table 1.

Readers will note that the Doppler shift expected from an overhead orbit from acquisition to loss of signal will be (0·4 + 0·6) x 2kHz (2kHz altogether) for a 21 to 29MHz flown transponder. That is, the uplink Doppler added to the downlink Doppler for a non-inverting transponder, multiplied by two, for as the total Doppler shift is that shifted up from the centre (true frequency) plus that shifted down as the satellite leaves us, the total deviation is twice that of the single figure on our listing. If we look at a transponder such as the 432 to 145MHz Mode "B" on AMSAT OSCAR-7, then we would have a total shift of 22·6kHz were it not that this transponder had an inverted passband thus giving (8·5-2·8) x 2—just 11·4kHz. Note that when we get to 24GHz, the Doppler shift is enormous, and were it not for p.l.l. circuitry, virtually unmanagable.

Our path loss is very low at h.f., but due to ionisation of both the E and F layers of the ionosphere, is greater on the average day than at night, and is, of course, much greater in maximum sunspot years. It is this dispersing property that will give us the sub-horizon DX during times of good solar activity. The path loss increases with frequency, as shown in the second column.

From this we can calculate our third column showing the ground power required to give a reasonable constant detection level at the satellite's receiver, which goes from a mere 2 watts on 21MHz at night to a staggering 4 megawatts at 24GHz. This may sound an incredible level, but one has to remember that quite small dishes can give massive gains at s.h.f., thus meaning that the actual r.f. power input can still be only a few watts. If we take our satellite-to-ground path with the same values, it is quite feasible to have a small dish on the satellite (as with OSCAR-9) with a high gain, that could never be equalled by conventional beams at h.f.

In our fourth column we see the noise temperature, called the sky-noise, which, whilst quite low at 435MHz at a mere 600K (Kelvin), is a very high 100 000K at 21MHz and even this can be doubled at times. A sky noise of only 4·87dB at 435MHz is one of 25·48dB at 21MHz, needing a signal some one hundred times the power to give the same signal to noise ratio.

From all the above we can finally work out values for the last column, which gives the signal to noise ratio in a typical 3kHz receiver bandwidth, with 0·5 watts of radiated power from the satellite. You will clearly see why 145 and 29MHz were chosen for satellites, quite apart from the fact that these frequencies are readily available and easy to aspire to for most amateurs.

Even more amateurs have 21 and 29MHz capability than 145 and 435MHz, and we can expect a wide proliferation of callsigns to be heard on the coming new mode, with perhaps the only problem being terrestrial users of the uplink, even during a quiet sun year, who may be running powers that could severely block the transponder. The new "RS" satellite will enable amateurs to continue to use both the 21 and 29MHz bands for DX QSOs until we start to see the benefit of the new sunspot cycle that we enter next year, and will provide some interesting research into propagation as the m.u.f. escalates again.

Useful References

Many requests (mainly without stamped addressed envelopes from degree student readers doing projects) arrive in your author's mail requesting information on the means of tracking satellite orbits. Whilst appreciating that this is a complex issue of general interest, difficult for the newcomer, space (sic) is simply not available to cover this within our columns. To fulfill the need, here is a list of references provided by GM4IHJ and G3IOR.

1. *Satellite Experimenters Handbook* by Davidoff. Published by ARRL and available from RSGB Publications, Lambda House, Cranbourne Road, Potters Bar, Herts, EN6 3JW. A comprehensive treatise with an excellent all-round introduction, coupled with good explanations and maths.
2. *Satellite Tracking Software for Radio Amateurs* by Branegan. Published by AMSAT-UK and available from RSGB as above. A wide range of basic microcomputer programs suitable for the home computer for circular, elliptical and geostationary satellites.
3. *Astronomical Formulas for Calculators* by

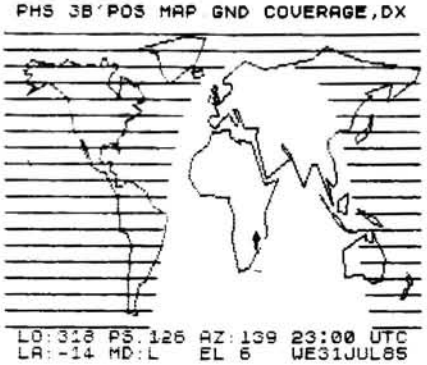


Fig. 1: OSCAR-10 close to apogee at 2300 on 31 July showing wide coverage (footprint) whilst transponder is on Mode "L"

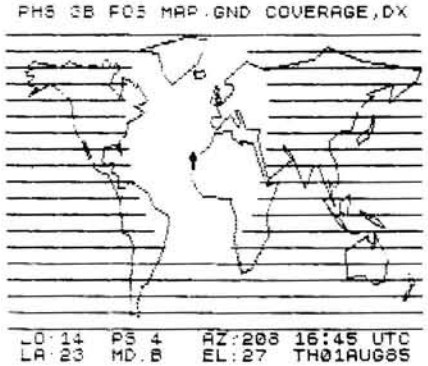


Fig. 2: OSCAR-10 soon after AOS at 1645 August 1 on Mode "B" with satellite just after Perigee, hence small footprint

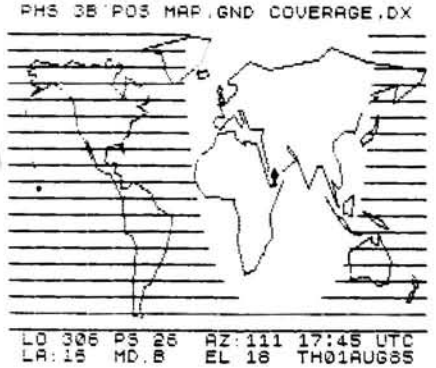


Fig. 3: OSCAR-10 at 1745 on August 1 just before we lose the transponder one hour after first hearing it

Meeus. Published by Willman-Bell, PO Box 3125, Richmond, Va. 23235, USA. A full review of mathematical formulas for solar astronomy and satellites.
4. *Orbits for Amateurs* by Tattersfield. Published by Stanley Thornes Ltd. Microcomputer programs for cometry and other solar system orbits.
5. *Halleys Comet* by Tattersfield. Published by Basil Blackwell. Microcomputer programs for tracking Halleys Comet.
6. *Spherical Astronomy* by Smart. Published by Cambridge University Press. Standard university student text book of orbital and other astronomical calculations.
7. *Orbital Motion* by Roy. Published by Adam Hilger. A very full mathematical study of orbits of all kinds.

RTTY

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

by Ron Ham BRS15744

Between June 1 and 9, **Norman Jennings,** Rye, logged RTTY signals from 31 countries on 14MHz ranging from the Americas through Africa, Europe and Scandinavia to New Zealand, and from the UK area he copied EI, G, GW and GU. "There seems to be much more on the bands over the past few weeks," writes Norman, whose log was beautifully prepared on his Sharp computer. "RTTY traffic has been fairly consistent, mainly on 14MHz and my most interesting catch was A4XRS, the HQ station of the Royal Omani Amateur Radio Society, at 1753 on May 29, when in QSO with several German stations," writes **Len Fennelow** G4ODH, Wisbech. In addition to his impressive computer-prepared RTTY log, which has been included with mine to compile our monthly signals-heard chart, Fig. 1, Len also copied AMTOR signals from stations in England, Scotland and Wales on 3·5MHz, Germany on 7MHz and England, Germany, Italy and Spain on 14MHz. **Peter Lincoln,** Aldershot, logged OE3HGB/YK, a new one for him, in the Golan Heights on 14MHz and he too found the bands active with RTTY between May 15 and June 14. During this period he copied signals from all continents on RTTY, including an interesting QSO between EA4SG and K8UNP who were both using ASCII at 110 baud. **Bert Mills GW3LJP,** Rhayader, demonstrated the reception of signals from Italy and South Africa, to Simon Hamer, with his home-brew RTTY gear. In Brighton, Gerry and Margaret Brownlow, G3WMU and G4LCU, are now active on RTTY using a G8JVE terminal unit, a Spectrum computer with Scarab software and their TS-130. They are pleased with the performance of the gear and said how easy it was to operate. Gerry also remarked about the large number of Italians using this mode.

Among the interesting stations that I copied were DI6HBI making his first RTTY QSO with an EA8 at 0820 on May 31, strong signals from a local QSO between VE1BRA and VE3NET at 0126 on May 29, KW1Y, Wake Island, working into Italy at 0049 on June 4, good signals from OH2AQ/OH0 on the Aaland Is at 0850 on May 26, OZ5DL/OY working a PA from the Faeroe Is at 1326 on June 8, an EA8 during the evening of May 25 saying, "CQ ENGLAND FOR STATIONS WORKING ASCII MODE" and at 1815 on June 12 UK3KPF told A4XRS, "UK3KPF IS BEING USED BY THE CLUB STATION OF THE KOMOSOMOLSKAYA PRAVDA NEWSPAPER STAFF . . ." but the signal faded before I could get the reason. It is good to see the table so full of stations, especially with some on 28MHz, mainly of course due to the large amount of sporadic-E. At midday on May 25, I copied GM4HBM telling a GU, "TNX FER NICE QSO ON TEN." It was good and typically sporadic-E with super strong signals at times.

RTTY Repeater

The South Coast RTTY Repeater Group, formed in mid-1984, hopes to get a 430MHz RTTY repeater working in Sussex. Although their current plan is for RTTY, the group wants to include ASCII and packet radio at a later date. At present the group is small and they need to expand in order to have the funds for such expenses as equipment, site rental, etc. Further details are available by sending an s.a.e. (A5 size) to P. Morgan G6VKM, PO Box 161, Portslade, Brighton BN4 1LW. We wish the group every success with this project.

Country	Prefix	Band (MHz) 3·5	7	14	21	28
Aaland Is	OH0			X		X
Argentina	LU				X	
Austria	OE			X		
Belgium	ON		X	X		
Balearic Is.	EA6			X	X	X
Canada	VE			X		
Canary Is.	EA8			X		
Ceuta & Melilla	EA9			X	X	
Columbia	HK5			X		
Czechoslovakia	OK			X	X	
Denmark	OZ		X	X		
England	G	X	X	X		
Faeroe Is.	OY			X		
Finland	OH			X		
France	F		X	X	X	
Germany	DF, DJ, DK, DL, DM	X	X	X	X	X
Gozo	9H4			X		
Greenland	OX			X		
Holland	PA	X		X		
Hungary	HA			X		
N. Ireland	GI			X		
Eire	EI			X	X	
Italy	I			X	X	X
Japan	JA, KA			X		
Luxembourg	LX			X		
Malta	9H				X	
Mexico	XE			X		
Norway	LA	X		X		
Oman	A4			X		
Poland	SP			X		
Portugal	CT1			X		
Rumania	YO			X		
Scotland	GM		X	X		X
Sicily	IT9				X	
Spain	EA			X	X	
Sweden	SM		X	X	X	X
Switzerland	HB9		X	X		
USA	K, N, W			X		
USSR	UA, UB, UZ			X		
Wake Is.	KW			X		
Wales	GW	X				
Yugoslavia	YU			X	X	

Fig. 1

Kindly Note

***PW* "Colne" April–July 1985**

A number of readers have pointed out the following errors and omissions in this popular series:

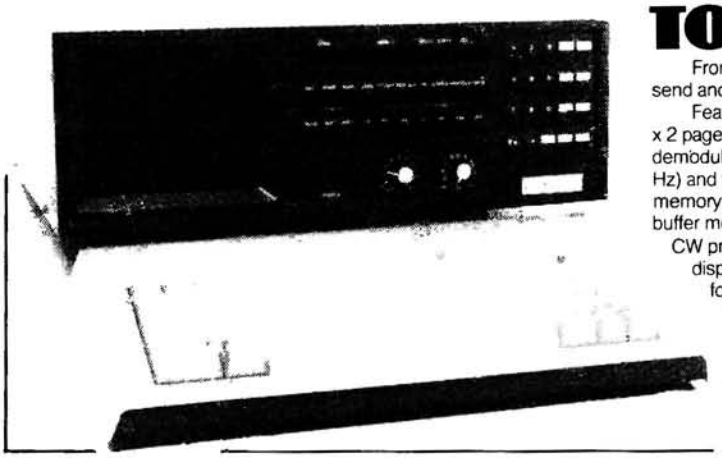
1. Add 2 off Inductors 1·5µH Toko 7BS to the Shopping List (April, page 26).
2. All the fixed inductors were omitted from the components lists for each board. They can be identified from the Shopping List given in Part 1.
3. Add C17 0·1µF Polyester to the Components List for Board 3 (May, page 22).
4. In Fig. 3.1 (June, page 40) C10 should be 15pF, and C14 should be 33pF.

Swap Spot

Have Trio TR2200GX f.m. TX/RX (R0, R8+S20–S23) with NiCads and charger, telescopic and rubber antennas, carrying case in excellent condition. Would exchange for FRG-7 RX or HW8 QRP c.w. TX/RX or similar. John Mullen. Tel: 0383 822206 (Dalgety Bay, Fife). *A194*

Have Ham-Master 4200 base station microphone with speech compression amplifier, as new, boxed, with specification sheet and wiring instructions. Would exchange for manual and circuit on Codar CR70A and preselector PR30RF. Paul (B.B.II) 75 Greystoke Avenue, Plymouth PL6 5UN. Tel: 0752 777579. *A200*

Have Swan 500, matching p.s.u./speaker, plus VFO420, valued at £200. Would exchange for Trio TS-120V or Yaesu FT-7. Can be seen West London or Somerset. Tel: Minehead 6283. *A201*



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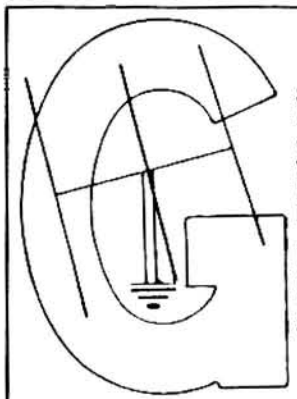

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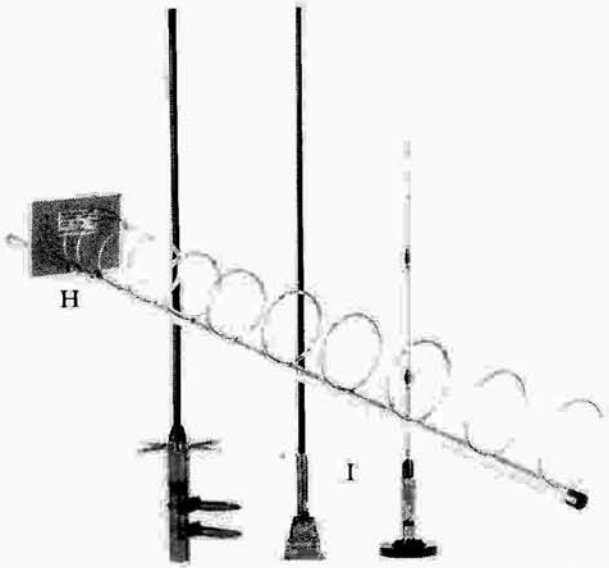

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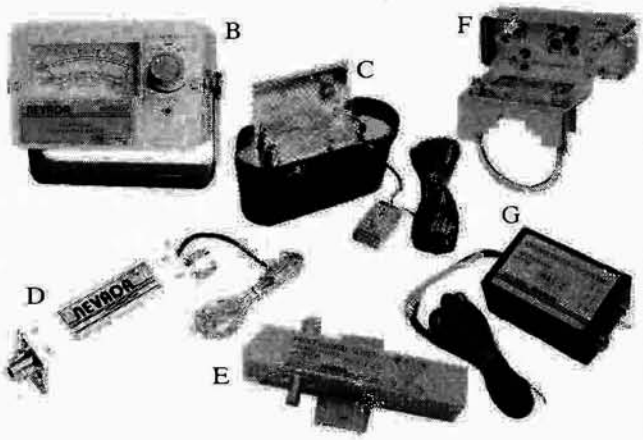

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Is it a turtle? Is it a robot? Is it a buggy? Yes! it's Zero 2.

- May be used by any computer with RS232 facility.
- Stepper Motor controlled.
- Half millimetre/half degree resolution.
- Uses ordinary felt-tip pens.
- Built-in 2-tone horn, line-follower. LED indicators.

The Zero 2 Robot is the first truly micro robotic system available and remarkably it costs less than £80. Complete kit (only mechanical construction required) £79.95 (LK66W).
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Top Ten Kits

THIS/LAST MONTH		DESCRIPTION	CODE	PRICE	BOOK
1.	(1)	Live-Wire Detector	LK63T	£2.95	14 XA14Q
2.	(2)	75W Mosfet Amp	LW51F	£15.95	Best E&MM
3.	(3)	Car Burglar Alarm	LW78K	£7.49	4 XA04E
4.	(4)	Partylite	LW93B	£10.95	Best E&MM
5.	(5)	U/sonic Intrudr Dtctr	LW83E	£10.95	4 XA04E
6.	(6)	8W Amplifier	LW36P	£4.95	Catalogue
7.	(10)	Logic Probe	LK13P	£10.95	8 XA08J
8.	(8)	Syntom Drum Synth.	LW86T	£12.95	Best E&MM
9.	(9)	Computadrum	LK52G	£9.95	12 XA12N
10.	(7)	Light Pen	LK51F	£10.95	12 XA12N

Over 100 other kits also available. All kits supplied with instructions. The descriptions above are necessarily short. Please ensure you know exactly what the kit is and what it comprises before ordering, by checking the appropriate Project Book mentioned in the list above.

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