

FOR THE RADIO ENTHUSIAST ...

Practical Wireless

APRIL 1983

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Bredhurst electronics

WELZ SP15M £32.00



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SP200	SWR-PWR Meter H.F./2M/70cm	61.95	(1.50)
SP300	SWR-PWR Meter H.F./2M/70cm	85.00	(1.50)
SP400	SWR-PWR Meter 2M/70cm 150W	61.95	(1.50)
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SP380	SWR-PWR Meter H.F./2M/70cm compact	49.00	(1.00)
AC38	A.T.U. 3.5 to 30 MHz 400W PEP	59.00	(1.00)
CT15A	15/50W Dummy Load (PL259)	6.95	(0.75)
CT15N	15/50W Dummy Load (N type plug)	11.95	(0.75)
CT300	300/1W Dummy Load 250MHz (SO239)	45.00	(2.00)

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Model 110	H.F./2M Calibrated Power Reading	11.50	(0.50)
YW-3	H.F./2M Twin Meter	11.50	(0.50)
UH74	2M/70	14.30	(0.50)
T435N	2M/70CM Twin Meter 120W	34.00	(0.75)
DAIWA CN620A	H.F./2M Cross Pointers	52.80	(—)
DAIWA CN630	2M/70 Cross Pointers	75.00	(—)

DUMMY LOADS

DL30	PL259 30W MAX	5.00	(0.50)
WELZ CT 15A	50W MAX PL259	6.95	(0.75)
WELZ CT 15N	50W MAX N type	11.95	(0.75)
T100	100W MAX 450MHz	22.95	(0.75)
T200	200W MAX 450MHz	34.00	(0.75)
DL600	600W MAX 350MHz	29.95	(1.50)
WELZ CT300	1000W MAX 250MHz	45.00	(2.00)

YAESU

FT1	Superb H.F. Transceiver	1349.00	(—)
FT980	H.F. Transceiver	1115.00	(—)
FT902DM	160-10m 9 Band Transceiver	885.00	(—)
FC902	All Band A.T.U.	135.00	(1.50)
SP901	External Speaker	31.00	(1.50)
FT102	160-10m 9 Band Transceiver	785.00	(—)
FT707	8 Band Transceiver 200W PEP	509.50	(—)
FT707	Matching Power Supply	112.50	(5.00)
FC707	Matching A.T.U./Power Meter	85.00	(1.00)
MMB2-	Mobile Mounting Bracket for FT707	16.10	(1.00)

FRG7	General Coverage Receiver	199.00	(—)
FRG7700	200KHz-30MHz Gen. Coverage Receiver	335.00	(—)
FRG7700M	As above but with Memories	399.00	(—)
FR7700	Antenna Tuning Unit	37.00	(1.00)
FRA7700	Active Antenna Unit	36.40	(1.00)

FT208R	2M FM Synthesised Handheld	199.00	(—)
FT708R	70cm FM Synthesised Handheld	229.00	(—)
NC7	Base Trickle Charger	26.80	(1.30)
NC8	Base Fast/Trickle Charger	44.10	(1.50)
NC9C	Compact Trickle Charger	8.00	(0.75)
FBA2	Battery Sleeve for use with NC7/8	3.05	(0.50)
FN82	Spare Battery Pack	17.25	(0.75)
PA3	12V DC Adaptor	13.40	(0.75)

FT480R	2M Synthesised Multimode	369.00	(—)
FT780R	70cm Synthesised Multimode (1.6MHz Shift)	409.00	(—)
FT290R	2M Portable Multimode	265.00	(—)
FT790R	70cm Portable Multimode	325.00	(—)

MMB11	Mobile Mounting Bracket	22.25	(1.00)
CSC1	Soft Carrying Case	3.45	(0.75)
NC11C	240V AC Trickle Charger	8.00	(0.75)
FL2010	Matching 10W Linear	59.00	(1.20)
Nicads	2.2 AMP HR Nicads	2.50	(—)
FF501DX	H.F. Low Pass Filter 1kW	23.00	(1.00)
FSP1	Mobile External Speaker 8 ohm 6V	9.95	(0.75)
YH55	Headphones 8 ohm	9.90	(0.75)
YH77	Lightweight Headphones 8 ohm	9.90	(0.75)
QTR24D	World Clock (Quartz)	28.00	(1.00)
YM24A	Speaker/Mic 207/208/708	16.85	(0.75)
YD148	Stand Microphone Dual IMP	21.10	(1.50)
YM38	4 Pin Plug	21.10	(1.50)
YM38	As 34 but up/down Scan Buttons	24.90	(1.50)

FDK VHF/UHF EQUIPMENT

Multi 750E	2M Multimode Mobile	259.00	(—)
Expander	70cm Transverter for M750E	199.00	(—)

DRAE

Power Supplies					
4 AMP	30.75	(1.50)	12 AMP	74.00	(2.00)
6 AMP	49.00	(2.00)	24 AMP	105.00	(3.00)
VHF Wavemeter 130-450MHz	27.50	(—)			

ICOM

		£	c&p
IC 740	H.F. 9 Band Transceiver	725.00	(—)
IC 720A	H.F. Tx + Gen. Cov. Rx	949.00	(—)
IC-PS20	P.S.U. for above with Speaker	139.00	(—)
IC-PS15	P.S.U.	119.00	(—)
IC 2KL	H.F. Linear 500 Watts O/P	915.00	(—)
IC 2KLP5	P.S.U. for above	234.00	(—)
IC AT500	1.8-30MHz Auto A.T.U.	339.00	(—)
IC AT100	3.5-30MHz Auto A.T.U.	249.00	(—)
IC 251E	2M Multimode Base Station	559.00	(—)
IC 290E	2M Multimode Mobile	379.00	(—)
IC 25E	2M FM Mobile 25W	269.00	(—)
IC 2E	2M Handheld	169.00	(—)
IC 4E	70cm Handheld	199.00	(—)
IC BC30	Base Charger	45.00	(1.50)
IC HM9	Speaker - Microphone	12.00	(1.00)
IC ML1	10 Watt 2M Booster IC2E	99.00	(1.00)
IC SW5	Desk Mic (8 pin for Icom only)	29.00	(1.00)
IC R70	General Cov. Receiver	469.00	(—)

TV INTERFERENCE AIDS

Ferrite Rings 1 1/2" dia. per pair	0.80	(0.20)
Toroid Filter TV Down Lead	2.50	(0.50)
Trio Low Pass Filter LF30A 1KW	20.00	(1.00)
Yaesu Low Pass Filter FF501DX 1KW	23.00	(1.00)
HP4A High Pass Filter TV Down Lead	5.95	(—)

ANTENNA BITS

H1-Q Balun 1:1 5kV pep (PL259 Fitting)	9.95	(0.75)
7-1MHz Traps Pair	7.95	(0.75)
Piece Polyprop Dipole Centre	1.20	(0.30)
Polyprop Strain Insulators	0.40	(0.10)
Small Egg Insulators	0.40	(0.10)
Large Egg Insulators	0.50	(0.10)
4mm Polyester Guy Rope (strength 400kg) per metre	0.18	(0.04)
75 ohm Twin Feeder - Light Duty-Per Metre	0.16	(0.04)
300 ohm Twin Feeder - Per Metre	0.14	(0.04)
URM67 Low Loss 50 ohm Coax-Per Metre	0.60	(0.20)
UR76 50 ohm Coax-Per Metre	0.25	(0.05)

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

TRIO TS 930S £1154

Amateur band transceiver/General coverage receiver

TRIO

TS930S	New Transceiver	1154.00	(—)
TS830S	160-10m Transceiver 9 Bands	678.00	(—)
VFO230	Digital V.F.O. with Memories	231.00	(2.00)
AT230	All Band ATU/Power Meter	129.00	(2.00)
SP230	External Speaker Unit	39.00	(1.50)
DFC230	Dig. Frequency Remote Controller	179.00	(1.50)
TS430S	160-10m Transceiver	TBA	(—)
TS130S	8 Band 200W PEP Transceiver	531.00	(—)
TS130V	8 Band 20W PEP Transceiver	433.00	(—)
VFO120	External V.F.O.	93.61	(1.50)
TL120	200W PEP Linear for TS120V	159.00	(1.50)
MB100	Mobile Mount for TS130/120	17.00	(1.50)
SP120	Base Station External Speaker	25.00	(1.50)
AT130	100W Antenna Tuner	88.50	(1.50)
PS20	AC Power Supply - TS130V	54.90	(2.50)
PS30	AC Power Supply - TS130S	96.00	(5.00)

MC50	Dual Impedance Desk Microphone	29.44	(1.50)
MC35E	Fist Microphone 50K ohm IMP	14.00	(0.75)
MC30S	Fist Microphone 500 ohm IMP	14.00	(0.75)
LF30A	HF Low Pass Filter 1KW	20.00	(1.00)
TR9130	2M Synthesised Multimode	411.00	(—)
B09A	Base Plinth for TR9130	37.25	(1.50)
TR7800	2M Synthesised FM Mobile 25W	257.00	(—)
TR7730	2M Synthesised FM Compact Mobile 25W	268.00	(—)
TR2300	2M Synthesised FM Portable	144.00	(—)
VB2300	10W Amplifier for TR2300	62.00	(1.50)
MB2	Mobile Mount for TR2300	20.00	(1.50)
TR9500	70cm Handheld	238.00	(—)
TR2500	2M FM Synthesised Handheld	220.00	(—)
ST2	Base Stand	49.45	(1.50)
SC4	Soft Case	13.00	(0.50)
MS1	Mobile Stand	30.20	(1.00)
SMC25	Speaker Mike	15.40	(1.00)
BP25	Spare Battery Pack	23.60	(1.00)
TR8400	70cm FM Synthesised Mobile Transceiver inc. PS10	299.00	(—)
PS10	Base Station Power Supply for 8400	64.00	(2.00)
TR9500	70cm Synthesised Multimode	428.00	(—)

R2000	200KHz-30MHz Receiver	391.00	(—)
R600	Gen. Cov. Receiver	244.00	(—)
SP100	External Speaker Unit	26.90	(1.50)
HC10	Digital Station World Time Clock	64.40	(1.50)
HS5	Deluxe Headphones	21.85	(1.00)
HS4	Economy Headphones	10.80	(1.00)
SP40	Mobile External Speaker	13.57	(1.00)

TELEREADERS (CW & RTTY)

TASCO CWR 610	189.00	(—)
TONO 500	299.00	(—)
TONO 9000	669.00	(—)

MORSE EQUIPMENT

MK704	Squeeze Paddle	11.95	(0.75)
HK708	Up/Down Key	10.50	(0.75)
	Practise Oscillator	8.75	(0.50)
EK121	Elbug	33.00	(0.75)
EKM12A	Matching Side Tone Monitor	10.95	(0.75)
EK150	Electronic Keyer	78.00	(—)

ROTATORS

Hirschman	RO250 VHF Rotor	39.95	(2.00)
9502B	Colorator (Med. VHF)	56.95	(2.00)
KR400RC	Kenpro - inc lower clamps	125.00	(2.50)
KR600RC	Kenpro - inc lower clamps	175.00	(3.00)

DESK MICROPHONES

SHURE 444D	Dual Impedance	39.00	(1.50)
SHURE 526T Mk II	Power Microphone	53.00	(1.50)
ADONIS AM 303	Preamp Mic. Wide Imp.	29.00	(—)
ADONIS AM503	Compression Mic 1	39.00	(—)
ADONIS AM 802	Compression Mic + Meter 3 O/P	59.00	(—)

MOBILE SAFETY MICROPHONES

ADONIS AM 202S	Clip-on	21.00	(—)
ADONIS AM 202H	Head Band - Up/Down Buttons	31.00	(—)
ADONIS AM 202F	Swan Neck - Up/Down Buttons	33.00	(—)

TEST EQUIPMENT

Drae VHF Wavemeter	130-450MHz	27.50	(—)
DM81	Trio Dip Meter	67.60	(0.75)
MM50/500	Dig. Frequency meter (500MHz)	75.00	(—)

Co-AXIAL SWITCH

2 Way Diecast (V.H.F.) SA450	10.00	(0.75)
2 Way Diecast with N sockets	12.95	(0.75)
2 Way Toggle (V.H.F.)	6.00	(0.50)
WESTERN 5V 1kW Switch	13.95	(1.00)

HELIAL ANTENNAS

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

MICROWAVE MODULES

MMT144/28	2M Transverter for HF Rig	109.95	(—)
MMT432/28S	70cm Transverter for HF Rig	159.95	(—)
MMT432/144R	70cm Transverter for 2M Rig	184.00	(—)
MMT70/28	4M Transverter for HF Rig	119.95	(—)
MMT70/144	4M Transverter for 2M Rig	119.95	(—)
MMT1296/144	23cm Transverter for 2M Rig	184.00	(—)

MML144/30	2M 30W Linear Amp	69.95	(—)
MML144/100S	2M 100W Linear Amp (10W I/P)	139.00	(—)
MML144/100LS	2M 100W Linear Amp (3W I/P)	159.00	(—)
MML432/30	70cm 30W Linear Amp (3W I/P)	99.00	(—)
MML432/50	70cm/50W Linear Amp	109.95	(—)
MML432/100	70cm/100W Linear Amp	228.64	(—)
MM2001	RTTY to TV Converter	189.00	(—)
MM4000	RTTY Transceiver	269.00	(—)
MMC50/28	6M Converter to HF Rig	29.90	(—)
MMC70/28	4M Converter to HF Rig	29.90	(—)
MMC144/28	2M Converter to HF Rig	29.90	(—)
MMC432/28S	70cm Converter to HF Rig	37.90	(—)
MMC432/144S	70cm Converter to 2M Rig	37.90	(—)
MMC435/600	70cm ATU Converter	27.90	(—)
MMK1296/144	23cm Converter to 2M Rig	69.95	(—)
MMD050/500	500MHz Dig. Frequency Meter	75.00	(—)
MMD600P	600MHz Prescaler	29.90	(—)
MMDP1	Frequency Counter Probe	14.90	(—)
MMA28	10M Preamp	16.95	(—)
MMA144V	2M RF Switched Preamp	34.90	(—)
MMF144	2M Band Pass Filter	11.90	(—)
MMF432	70cm Band Pass Filter	11.90	(—)
MMS1	The Morse Talker		

Practical Wireless

FOR THE **Radio** ENTHUSIAST ...

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four **new** models from Trio

for the HF man, the **TS 430S**

£698.00 inc vat carriage £5.00



A new HF transceiver, taking into account the outstanding performance of the previous Trio rigs you could be forgiven for thinking that it would be impossible for them to improve on existing models and specifications. Alternatively of course, you might be of the opinion that engineers with the talents as displayed by the designers of such rigs as the TS830S, TS130V and TR2500 etc. would have no trouble in pushing forward the frontiers of transceiver technology as we know it today.

The new HF transceiver from Trio is the TS430S. Those who have seen it and the fortunate ones who have used it on the air are all agreed that here we have a major advance for the enthusiastic operator on today's busy bands. Not only does the transceiver have full amateur band coverage from 160 to 10 metres (including the three new bands) but it also incorporates a general coverage receiver (150 kHz to 30 MHz). The new transceiver features are many; USB, LSB, CW, and AM with FM available (optional FM430 board), compact size 270mm wide/96mm high/275mm deep, continuous tuning over the entire frequency range, two separate VFO's and an up/down scan mode using the optional MC42S microphone. Eight memories, each of which can be used as a separate VFO are provided and frequency scan is programmable between the two frequencies held in memory channels six and seven. Not only does the memory remember frequency but also the mode of operation, thus short wave DX and Broadcast stations can be stored alongside a SSB net channel and complete sense made as the frequencies are scanned. The by now normal Trio features are all included, IF shift, notch filter, speech processor and narrow/wide filter selection on CW, SSB and AM modes.

The TS430S, Trio's rig for today's operator.

for the SWL who deserves the best, the **R 2000**

£391.20 inc vat carriage £5.00



Now from Trio, the R2000 general coverage receiver. By taking all the superb features of the R1000 and combining them with the latest in microprocessor control Trio have, in one step, completely revised the standard by which short wave receivers are judged. Among the many features provided for the discerning listener are programmable scan, memory scan, memory retention of the mode set for a particular frequency and last, but not least, Trio have included an FM mode - why FM after all this time and our repeated comment that for a shortwave broadcast receiver FM is not really necessary. Take a look at the rear panel of the R2000: a socket marked VHF converter. Wouldn't it be superb if Trio produced a VHF converter covering from 118 to 174 MHz - then you would require FM, you would also require AM. Study the features and I am sure you will agree the Trio R2000 is the receiver for you.

Continuous Coverage from 150 KHz to 30 MHz

Use of an innovative up conversion digitally controlled PLL circuit provides maximum ease of operation and superb receiver performance. Front panel up/down band switches allow easy selection within the full coverage of the receiver. The VFO is continually tunable throughout the full 150 KHz-30 MHz range.

Ten Memories Store Frequency, Band and Mode Data

Each of the ten memories can be tuned by the VFO, thus operating as ten built in digital VFO's. The original memory frequency can be recalled by simply pressing the appropriate memory channel key. All information on frequency, band, and mode is stored in the selected memory. The "auto M" switch allows two types of memory storage: when the "auto M" switch is off, data is memorized by pressing the "M in" switch; when the "auto M" switch is on the frequency being used at that time is automatically memorized.

Memory Scan

Scans all memory channels or may be user programmed to scan specific channels. Frequency, band and mode are automatically selected in accordance with the memory channel being scanned.

Programmable Band Scan

Scans automatically within the programmed bandwidth. Memory channels 9 and 0 establish the scan limit frequencies. The hold switch interrupts the scanning process. However, the frequency may be adjusted using the tuning knob whilst in the scan hold position.

Three Built In Filters with Narrow/Wide Selector

In the AM mode 6 KHz wide or 2.7 KHz narrow may be selected. In the SSB mode 2.7 KHz is automatically selected. In the CW mode 2.7 KHz is again chosen and if the optional YG455C filter is installed then 500 Hz in the narrow position. In the FM mode 15 KHz bandwidth is automatically selected. Other important features are: squelch on all modes, noise blanker, a large 4 inch front mounted speaker, tone control, RF attenuator, AGC switch, high and low impedance antenna terminals, optional 13.8V DC operation, record jack and, of course, provision for a VHF converter. All in all, a truly remarkable receiver.

and
later in the year for
the **R 2000** a
118 to 174 MHz internal
vhf converter.

LOWE IN LONDON, Open monday to saturday, six days a week
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for the VHF operator, the **TR 7930** mobile transceiver

£289.80 inc vat carr £5.00



Any amateur who has used or owns a Trio TR7800 has had the finest piece of 2 metre mobile technology at his fingertips. The TR7800 had simply everything that the keen mobile operator could ever want. Of course, there were a few points which customers said could be improved on and, I must admit, we, in the majority of cases, agreed. Trio, with the introduction of the new TR7930, have taken note of this feedback of information and the result, I am sure you will agree, is as close to perfection as you will find in a rig.

The improvements are, a green floodlit LCD readout which does not disappear in strong sunlight, additional memory channels, both timed and carrier scan hold on occupied channels, selectable memory channel for the priority frequency and automatically corrected mode selection (simplex or repeater) without having to instruct the rig. The most significant change is the liquid crystal frequency readout on a green illuminated background, but closely following this must be the ability to omit specific memory channels when scanning, and the programmable scan between user designated frequencies. This gives the rig the ability to scan simplex channels only, without holding on repeaters.

The Trio TR7930. The mobile 2 metre FM rig designed with ease of operation coupled to outstanding performance.

for the UHF enthusiast, a handheld transceiver, the **TR 3500**



Without a doubt one of life's great mysteries to me is why, when the two metre band is at times so busy, few people are to be found communicating on the wide open spaces of the seventy centimetre band.

I have come to the conclusion that misapprehensions exist about the band. The first being the lack of activity. From my first comments you will have gleaned the fact that seventy centimetres is not a busy band, however there are stations on, myself G8GIY, my colleagues David G4KFN and Roy G8ROR form the nucleus of a UHF group here in Matlock, there are many others like us up and down the country. Seventy centimetre repeaters abound and are a perfect means of communication, their somewhat shorter range serving well their immediate area and, please remember, in the words of that doyen of seventy centimetres Jack G5UM, "Activity breeds activity," simple but true. The second misapprehension is that the equipment is expensive. Not so, the Trio TR3500 costs only slightly more than its matching stable mate, the TR2500, and here again, with the same sensible approach which we have all come to expect from Trio, the accessories which you bought for your TR2500 are compatible with the new TR3500. The appearance, size and weight are similar to the TR2500, output power is 1.5 watts high and 300 milliwatts low, repeater shift is programmable, ten memory channels are provided and frequency scan between operator-defined limits is included. The conventional memory scan and reverse repeater facilities help to make operating a pleasure no matter how difficult the conditions. With the Trio TR3500 handheld as part of your station, you are equipped to expand your operating and begin communicating on the wide open spaces of the seventy centimetre band.

£238.50 inc vat carriage £5.00

and we now stock the superb **vibroplex** range of keys.

RING FOR DETAILS NO, THE VIBROPLEX IS NOT A MARITAL AID.

LOWE ELECTRONICS

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SHORT WAVE LISTENING BRINGS THE WORLD TO YOUR FINGERTIPS

WIDE COVERAGE ALL MODE MEMORY RECEIVER; FRG7700M £399 inc

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- ★ 30MHz down to 150kHz (and below).
- ★ 12 Channel memory with fine tune.
- ★ SSB (LSB/USB), CW, AM, FM.
- ★ 2.7kHz, 6kHz, 12kHz, 15kHz, @ - 6dB.
- ★ 3 Selectivities on AM, squelch on FM.
- ★ Up conversion, 48MHz first IF.
- ★ 1kHz digital, plus analogue, display.
- ★ Inbuilt quartz clock/timer.
- ★ No preselector, auto selected LPF's.
- ★ Advanced noise blanker fitted.
- ★ Antenna 500Ω to 1.5MHz, 50Ω to 30MHz.
- ★ 20dB pad plus continuous attenuator.
- ★ Switchable A.G.C. Variable tone.



'7700 THE ONE WITH FM!

Non memory version £335

- ★ 110 and 240V ac, 12Vdc option.
- ★ Signal meter calibrated in "S" and SIMPO.
- ★ Acc; Tuners, Converters, LPF, Memory.
- ★ FR7700; 150kHz-30MHz, Switch, etc.
- ★ FRV7700A; 118-130, 130-140, 140-150MHz.
- ★ FRV7700B; 118-130, 140-150, 50-59MHz.
- ★ FRV7700C; 140-150, 150-160, 160-170MHz.
- ★ FRV7700D; 118-130, 140-150, 70-80MHz.
- ★ FRV7700E; 118-130, 140-150, 150-160MHz.
- ★ FRV7700F; 118-130, 150-160, 170-180MHz.
- ★ FF5; 500kHz (for improved VLF reception).
- ★ MEMGR7700; 12 Channels (internal fitting).
- ★ FRA7700; Active Antenna.

COMMUNICATION RECEIVER; NRD 515 £985

Inc. VAT @ 15% + Securicor.

- ★ 30MHz to 100KHz or lower, 100Hz steps.
- ★ PLL digital VFO stability.
- ★ Backlash free, 10KHz rev, 500Hz analogue calib.
- ★ Fast tune up/down switch, dial lockout.
- ★ SSB (USB/LSB), CW, AM, RTTY.
- ★ 6 and 2.4 KHz, 600* and 300* Hz @ -6dB.
- ★ Passband tuning ±2KHz on SSB and CW.
- ★ Variable BFO on CW for preferred tone.
- ★ Modular plug in design with mother board.
- ★ High reliability - low power schottky & CMOS.
- ★ Designed for maximum ease of operation.
- ★ Noise blanker. 0-10-20dB attenuator.
- ★ Small (140 x 340 x 300mm) light 7½Kg, rugged.



PROFESSIONAL MONITOR

- ★ Up conversion, 70.455 MHz and 455 KHz.
- ★ No R.F. amplifier, balance U310 mixer.
- ★ Crystal filter before first IF amplifier.
- ★ Transceiver provisions; mute, trip etc.
- ★ Frequency data input/output port.
- ★ NHD518 96 (4 x 24) channel memory unit.
- ★ NCM515 Remote frequency keypad controller, LCD readout. Up/down step tuning, 4 channel memory.
- ★ NVA515 Junction unit (NCM515 to NHD518).
- ★ CFL260 600Hz mechanical filter.
- ★ CFL230 300Hz crystal filter.

TWO OR SEVENTY; FT230R, FT208R, FT708R, FT730, 2030, FT726 PLUS:-

- ★ Multimode USB, LSB, FM, CW.
- ★ 100Hz backlit LCD Frequency display.
- ★ 10 memory channels '5 year' backup.
- ★ Any TX/Rx split with dual VFOs.
- ★ Up/Down tuning from microphone.
- ★ AF output 1W @ 10% THD.
- ★ Bandwidth 2.4kHz and 14kHz @ - 6dB.
- ★ LED's; 'On Air', 'Busy', m/c meter; S, PO.
- ★ 58(H) x 150(W) x 195(D) (1.3kg).



6, 2 or 70!

SMC2.0C	NiCad 2.0A/hr "C"	2.35
SMC8C	Slow Charger (220mA)	8.80
MMB11	Mobile Mount	22.25
CSC1A	Soft carrying case	3.45
FL2010	Linear Amplifier 2m 10W	59.00
FL7010	Linear Amplifier 70cms	91.00

FT290R

£265
Inc. VAT @ 15%
+ Securicor.

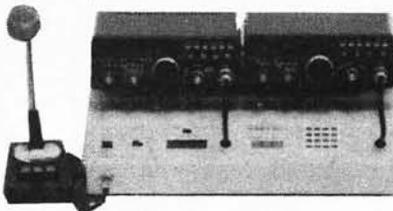
- ★ 144-146MHz (144-148) possible.
- ★ 2.5W PEP, 2.5W RMS/300mW out.
- ★ FM: 25kHz and 12.5kHz steps.
- ★ SSB: 1kHz and 100Hz steps.
- ★ ±600kHz repeater split 1750Hz burst.
- ★ Integral telescopic antenna.
- ★ Rx, 70mA, Tx; 800mA (FM maximum).

FT790R

£325
Inc. VAT @ 15%
+ Securicor.

- ★ 430-330MHz (440-450 alternative).
- ★ 1W PEP, 1W/250mW FM/CW out.
- ★ FM: 100kHz and 25kHz steps.
- ★ SSB: 1kHz and 100Hz steps.
- ★ 1.6MHz shift with input monitor, 1750Hz burst.
- ★ Rx; 100mA/200mA. Tx; 750mA max.
- ★ BNC Mounting ½ flexi antenna.

- ★ USB-LSB-CW-FM (A 3j, A1, F3).
- ★ 30W PIP A3j, 10/1W out A1 F3.
- ★ Any Tx Rx split with dual VFO's.
- ★ Four easy write-in memory channels.
- ★ Memory scanning with slot display.
- ★ Up/down tuning/scanning from mic.
- ★ Priority channel on any memory slot.
- ★ Digital RIT. Advanced noise blanker.
- ★ Satellite mode allows tuning on Tx.
- ★ Semi break in with side tone.
- ★ Very bright blue 100Hz digital display.
- ★ Display shows Tx & Rx freq (inc RIT).
- ★ String LED display for "S" and PO.
- ★ LED's; "On Air" Clar, Hi/Low, FM mod.
- ★ Size (Case): 8.3" D, 2.3" H, 6.9" W.



Ills. c/w SCL station consol and YD 148 mic.

FT480R £369 Inc. VAT @ 15% + Securicor.

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PRICES
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- ★ 144-146 MHz (143.5-148.5 possible).
- ★ ±600kHz standard repeater split.
- ★ Excellent dynamic range and sensitivity.
- ★ FM; 25, 12½, 1kHz steps.
- ★ SSB; 1,000, 100, 10Hz steps.

- ★ 430-434MHz (440-445 possible).
- ★ GaAs Fet RF for incredible sensitivity.
- ★ FM; 100kHz, 25kHz, 1kHz, steps.
- ★ SSB; 1,000, 100, 10Hz steps.
- ★ FT780R 1.6 fitted 1.6MHz Shift £459 inc.

FT780R £399 Inc. VAT @ 15% + Securicor.

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HF TRANSCEIVERS; FTONE, FT980, FT707, FT101Z, JST100 & FT102

- ★ 80-10 metres including WARC allocations
- ★ Multimode LSB-USB-CW (W)-CW (N) and FM
- ★ 100W PEP output. (10W "S" version)
- ★ No tune design — inbuilt SWR meter
- ★ Only 3 3/4" x 9 1/2" — Less than a foot deep!
- ★ Dual selectable pulse width noise blanker

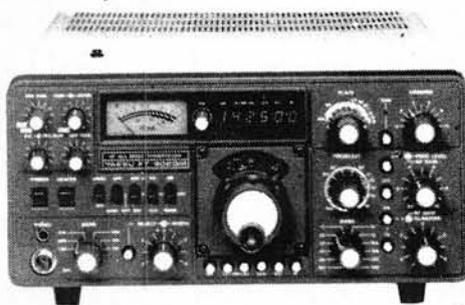


FT77	Transceiver 100W output	£475.00
FT77S	Transceiver 10W output	£399.00
MARK7	Crystal Marker board	£7.65
FMU77	FM Unit	£23.75
XF8.9HC (N)	600Hz or 300Hz (N)	£24.90
FV707DM	Digital Memory VFO	£203.15
FC707	Antenna Tuner	£85.10
FP707	Mains P.S.U.	£112.50
FTV707	Transvertor, frame only	£90.00
Modules	432 £185.00, 144 £100.00, 70 £80.00	

- ★ 160-10 metres including new allocations.
- ★ Variable IF bandwidth 2.4kHz down to 300Hz.
- ★ Audio Peak and independent notch controls.
- ★ AM, FSK, USB, LSB, CW, FM, (Tx and Rx).
- ★ Semi-break in, inbuilt Curtis IC Keyer.
- ★ Digital plus analogue frequency displays.
- ★ VOX built-in and adjustable.
- ★ Instant write in memory channel.
- ★ Tune up button (10 sec. of full power).
- ★ Switchable AGC and RF attenuator.
- ★ 350 or 600 Hz CW, 6kHz, AM filters.
- ★ Clarifier (RIT) switchable on Tx, Rx or both.
- ★ Plug in modular, computer style constructor.
- ★ Fully adjustable RF Speech processor.
- ★ Ergonomically designed with necessary LEDs.
- ★ Incredible range of matching accessories.
- ★ Universal power supply 110-234V AC and 12V DC.

FT902DM, £885 Inc. VAT @ 15% + Securicor.

NOW WITH CW FILTER,
AM FILTER, CURTIS
KEYER: INCLUDED



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HY GAIN				
12AVQ	Vertical 10-15-20M	14.0'H	£50.60	2.20
14AVQ/WB	Vertical 10-15-20-40M	18.0'H	£54.40	2.20
18AVQ/WB	Vertical 10-15-20-40-80M	25.0'H	£109.25	2.20
14RMC	Roof mount kit for above		£36.22	2.20
18V	Vertical 10-15-20-40-80M, tapped	19.0'H	£29.78	2.20
103BA	3 Ele Yagi 10 metres	17.0'LE	£67.85	2.20
105BA	5 Ele Yagi 10 metres	18.5'LE	£143.75	2.95
153BA	3 Ele Yagi 15 metres	23.0'LE	£90.85	2.90
155BA	5 Ele Yagi 15 metres	24.5'LE	£217.35	5.90
203BA	3 Ele Yagi 20 metres	35.0'LE	£166.75	4.90
204BA	4 Ele Yagi 20 metres	36.5'LE	£286.35	7.30
205BA	5 Ele Yagi 20 metres	36.5'LE	£362.25	9.40
402BA	2 Ele Yagi 40 metres	43.0'LE	£247.25	6.50
DB10/15A	3 Ele Yagi 10-15M	23.0'LE	£146.05	4.80
TH3JNR	3 Ele Yagi 10-15-20M	24.2'LE	£194.35	3.10
TH2MK3	2 Ele Yagi 10-15-20M	27.3'LE	£169.05	3.20
TH3MK3	3 Ele Yagi 10-15-20M	27.0'LE	£274.85	5.30
TH5DX	"Thunderbird" 5 Ele	31.0'LE	£378.35	6.70
TH6DX	"Thunderbird" 6 Ele	31.1'LE	£281.75	8.50
TH7DX	"Thunderbird" 7 Ele	31.0'LE	£458.85	8.75
18TD	Dipole Tape 10-80M	132"	£113.85	2.80

ANTENNA ROTATORS

KR500	Kenpro, elevation Meter calb ± 90°	£90.85	Free
KR400	Kenpro bell, box as KR500	£90.85	Free
RLD3	SMC, Bell Auto control	£38.53	Free
RK300	Channel Master, offset	£79.92	Free
9502B	Channel Master, offset	£56.92	Free
AR40	CDE Turn and Push	£79.35	Free
KR400RC	Kenpro Round meter 360°	£102.35	Free
Ham IV	CDE 8 x 4cm meter readout	£228.85	Free
KR2000RC	Kenpro Heavy Duty 360° meter	£270.25	Free
TXZ	CDE 8 x 4cm meter readout	£287.50	Free
H300	Hy Gain Digital readout	£451.95	Free

ROTOR ACCESSORIES

50425	Clamps/U Bolts ST CDE AR40 etc	£4.95	1.25
50463	Clamps/U Bolts HD CDE CD48 HAM4	£7.36	1.85
51472	Mast Mount Kit HD CDE HAM4 etc.	£12.08	2.10
51467	Mast Mount Kit HD CDE TXZ etc.	£24.15	2.10
9523	Support Bearing, Channel Master	£14.38	1.70
KS090	Rotary Bearing 1 1/4" Kenpro	£29.32	1.40
KS095	Rotary Bearing 1 1/2" Kenpro	£18.69	1.85
KCD38	Lower Mast Clamp KR400, KR600	£10.92	1.70
RG5W	5 Way AR30 AR40 KR400RC	p/m	£0.35
RG6W	6 Way KR250/400/500/600RC	p/m	£0.48
RC8W	8 Way CD45 Ham 4 TXZ KR2000RC	p/m	£0.52

CARRIAGE

Carriage charges (shown after the item price) are for the mainland only (excluding post) and the rates shown are for one off of the item. Where more than one article is ordered, total freight charge is likely to be much lower than the sum of the individual charges.

Cables, ropes and masting are normally despatched by Roadline. Carriage is £2.00 to 7Kg thereafter add an extra £0.15 per Kg. (Mainland.)

Where Securicor delivery on an item, or items is possible (i.e., less than 25kg/55lbs and 5'6" long) it is charged at £4.49 per lot.

If in doubt of carriage send a cheque crossed, "not more than £..."

ALL PRICES INCLUDE VAT @ 15%.

ANTENNAS VHF FIXED

JAYBEAM				
4Y/4M	Yagi 4 ele	7.5'B	7dBd	£29.90 2.20
PMH2/4M	Harness 2 way			£16.10 1.70
HO/2M	Halo head only	1' sq	dBdB	£5.98 0.70
HM/2M	Halo with 24" mast	1' sq	dBdB	£6.55 0.95
UGP/2M	Ground plane	1.7'	dBdB	£12.65 2.20
C5/2M	Colinear	13.1'	7.1dB	£54.62 2.20
5Y/2M	Yagi 5 ele	9.2'	7.8dBd	£12.08 2.20
8Y/2M	Yagi 8 ele	9.2'	9.5dBd	£15.53 2.20
10Y/2M	Long Yagi 10 ele	14.4'	11.4dBd	£33.35 2.20
14Y/2M	Long Yagi 14 ele	17.5'	12.8dBd	£36.23 2.20
05/2M	Yagi 5 over 5 slot	5.2'	10.6dBd	£21.85 2.20
08/2M	Yagi 8 over 8 slot	9.2'	12.3dBd	£29.33 2.20
PBM10/2M	10 ele parabeam	12.9'	11.7dBd	£44.85 2.20
PBM14/2M	14 ele parabeam	19.5'	13.7dBd	£55.77 2.20
Q4/2M	Quad 4 ele	4.9'	9.5dBd	£29.32 2.20
Q6/2M	Quad 6 ele	8.7'	12.6dBd	£39.10 2.20
Q8/2M	8 ele quad	11.6'	13.8dBd	£44.85 2.20
5XY/2M	Yagi 5 ele cross	5.5'	7.8dBd	£28.17 2.20
8XY/2M	Yagi 8 ele cross	9.2'	9.5dBd	£35.65 2.20
10XY/2M	Yagi 10 ele cross	11.8'	10.8dBd	£46.00 2.20
PMH2/C	Circular polarisation harness			£9.77 1.20
PMH2/2M	Harness 2 way			£12.65 1.20
PMH4/2M	Harness 4 way			£28.75 1.20
X6/X12	6 ele 2, 12 ele 70	7.2'	8.5/12	£25.25 2.20

SMC-HS

GDXA	Discone 100-440MHz			£34.90 2.20
SMCGDX1	Discone 80-480MHz 3dB	3.3'		£41.40 2.20
SMCGDX2	Discone 50-480MHz 3dB	6.2'		£47.95 2.20
SMCVHFL	Discone 65-520MHz, Rx only	5.0'		£16.85 2.20
SMC	Colinear 2M 2 x 1/2, 7.8dB	14.6'	T.B.A.	2.20
SMCGP144W	Colinear 2M 2 x 1/2, 6.5dB	10.2'		£24.90 2.20
SMCGP2M	1/2, 7M ground plane, 3.4dB	4.6'		£15.70 2.20
SMCSQ144	2M Swiss Quad, Vertical polarised			£52.90 2.20
SMCGP432X	Colinear 70cm, 3 x 1/2, 6.8dB	5.6'		£25.70 1.70
SMC70NZV	Vert. 2.8dB 2M, 5.7dB 70cm	3.6'		£25.70 2.20
SMCHS770	144/432MHz Diplexer 50w max.			£13.80 1.30
SMC2HB6	6M, 2ele, HB9CV Beam			£19.95 2.20

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THANET'S GUIDE

Just a few stars to choose from the fabulous galaxy of Amateur Radio Equipment available at Thanet Electronics.

IC-720A £949 inc.



The main problem that the amateur of today has to deal with is deciding just which rig out of the many excellent products available he is going to choose. Technology is advancing at such a rapid rate and getting so sophisticated that many cannot hope to keep up. Some go too far!

Perhaps one way of dealing with the problem is to look at just what each model offers in its basic form without having to lay out even more hard earned cash on "extras". The IC-720A scores very highly when looked at in this light. How many of its competitors have two VFOs as standard or a memory which can be recalled, even when on a different band to the one in use, and result in instant returning AND BANDCHANGING of the transceiver? How many include a really excellent general coverage receiver covering all the way from 100KHz to 30MHz (with provision to transmit there also if you have the correct licence)? How many need no tuning or loading whatsoever and take great care of your PA, should you have a rotten antenna, by cutting the power back to the safe level? How many have an automatic RIT which cancels itself when the main tuning dial is moved? How many will run full power out for long periods without getting hot enough to boil an egg? How many have band data output to automatically change bands on a solid state linear AND an automatic antenna tuner unit when you are able to add these to your station?

Well you will have to do quite a bit of hunting through the pages of this magazine to find anything to approach the IC-720A. It may be just a little more expensive than some of the others – but when you remember just how good it is, and of course the excellent reputation for keeping their secondhand value you will see why your choice will have to be an IC-720A!

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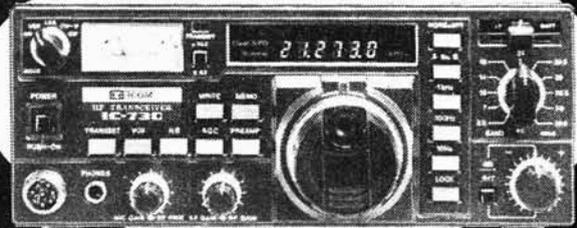
trap dipole £49.50 inc.

The MT-240X Multi-band trap dipole antenna (80m – 10m) is a superbly constructed antenna with its own Balun incorporated in the centre insulator with an SO239 connector. Separate elements



of multi-stranded heavy duty copper wire are used for 80-40-15 and 20-10 Metres. Really one up on its competitors

IC-730 £629 inc.



ICOM's answer to your HF mobile problems – the IC-730. This new 80m–10m, 8 band transceiver offers 100W output on SSB, AM and CW. Outstanding receiver performance is achieved by an up-conversion system using a high IF of 39MHz offering excellent image and IF interference rejection, high sensitivity and above all, wide dynamic range. Built in Pass Band Shift allows you to continuously adjust the centre frequency of the IF pass band virtually eliminating close channel interference. Dual VFO's with 10Hz, 100Hz and 1KHz steps allows effortless tuning and what's more a memory is provided for one channel per hand. Further convenience circuits are provided such as Noise Blanker, Vox, CW Monitor APC and SWR Detector to name a few. A built in Speech Processor boosts talk power on transmit and a switchable RF Pre-Amp is a boon on today's crowded bands. Full metering WWV reception and connections for transverter and linear control almost completes the IC-730's impressive facilities.

Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM

TO THE GALAXY

IC-AT500 £339 inc.



It was only when we started to use the new fully automatic antenna tuners from ICOM that we realised just how far ahead of their competitors they are! The very fast tune up time and simplicity of use make them a real worthwhile addition to any station even if the rest of your station isn't ICOM. If it is, then you have the added advantage of fully automatic band selection so that you can virtually hide it away in a cupboard if you want (though we think you will want to show it off).

Apart from its very rapid action and auto band selection facilities it will select the correct antenna for the band (up to four). The new bands are covered of course, but the AT100 does not cover topband, whereas the AT500 does.

Dual accessory sockets are supplied so that you can easily chain your IC-720A, (or IC-701 or IC-730) together with the IC-2KL and AT-500 to produce what must be one of the most advanced automatic stations available.

And remember we also sell **Yaesu, Jaybeam, Datong, Welz, G-Whip, Western, TAL, Bearcat, Versatower** and **R5GB** publications from our shop and showroom at the address below. Come in for a demonstration or just a chat, our qualified sales staff and technicians will be glad to assist you.

Listed below are other sets available from Thanet Electronics, a more detailed specification of these will appear in future advertisements, prices are inclusive of VAT, IC-730 £629, IC-740 £725, PSU for 740 £119, IC-SP3 £39, IC-410 £379, IC-PS15 £119, IC-ML1 £59, IC-451 £689, IC-4E £199, IC-505 £299, IC-251 £559, IC-290E £379, IC-290H £399, IC-25E £269, IC-2E £169, IC490 £429, IC-AT100 £249, IC-R70 £469, IC-45E £289, IC-551 £369, IC-PS20 £139.

TASCO CWR-670 £289, CWR-685E £789, CWR-610 £189, TONO MR250 £325, 9000E £669

Agents (phone first - all evenings and weekends only, except Scotland) **Scotland** - Jack GM8 GEC (031 665 2420) **Midlands** - Tony G8AVH (021 329-2305) **North West** - Gordon G3LEQ Knutsford (0565)4040 Ansafone available

To compliment the excellent IC-720A HF Transceiver, ICOM have produced the IC-2KL linear amplifier. It is of a similar size and matches the IC-720A perfectly. It produces 500W output on SSB, CW, AM and RTTY needing 80-100W of drive. As with the IC-720A it will operate from 1.6MHz to 30MHz continuously at full output power, but you still need an antenna that matches. It will follow the IC-720A automatically changing bands WITH NO TUNING - the operating is done from the prime-mover.

This automatic facility can be overridden for use on rigs other than the IC-720A, but can be added to the IC-701, IC-730, IC-740. The IC-2KL employs a heat pipe cooling system for the heatsink of the power transistors. This is a new technology used to transfer the heat, and has a high conductance, several hundred times that of copper, plus a very quick response.

The IC-2KL has a matching power supply the IC-2KLPS delivering 40vDC at 25A continuous for 10 minutes maximum.



IC-2KL + PSU £1149 inc.

CUE DEE antennas

The BEST in recent tests and really well made too. Send for a catalogue of these DX antennas. Here's part of the range:-

4el 2m yagi VHF	4144A	8 dBd	£24.93
10el 2m yagi VHF	10144	11.4 dBd	£45.16
15el 2m yagi VHF	15144	14 dBd	£63.00
17el 70cm yagi UHF	17432	14.5 dBd	£48.00
4/5el HF Beam	DUO 2	(14/21 MHz) 9/8 dBd	£356.71

All matching cables, clamps and booms available for stacking 10 and 15 element yagis.

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Now we are proud to announce our new Central Computer facility for instant matching of buyers and sellers of secondhand gear. No need to part-exchange it, or bring it to the shop, unless you're a coffee addict! Just phone us with the details, which we then

enter into our computer, at a normal charge of just £10 per item.

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So, if you have things you want to sell really fast, phone us now on our direct Central Computer line —

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AMT-1



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TS 130V	8-band 20W pep	445.00
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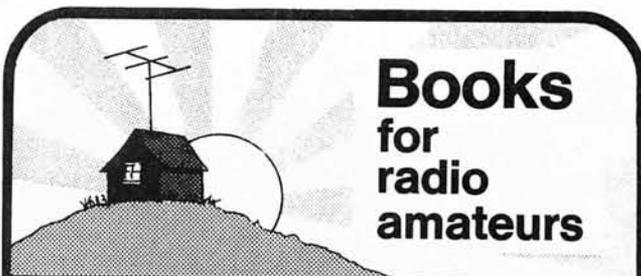
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FM Package 2 (Synthesised)	70PAC2	163.00	128.00
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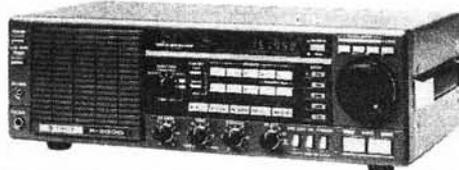
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If you're a beginner just starting out in radio you'll be delighted with the performance that the R600 offers you. Considering the electronics that are packed into this receiver, the price is remarkably low. A few years ago this performance would have cost you twice as much. Full digital readout and really simple tuning in of SSB signals makes this one of the few top receivers that the beginner should consider. With all the gloom and doom one hears about in the news these days, why not put a pair of headphones on your head, plug them into the R600 and whisk yourself away into the wonderful world of wireless. Signals from the Australian outback or the flying doctor, radio amateur expeditions on some remote Pacific island, signals from Russian amateurs or young American novices, the latest World news even before the BBC reports it, aircraft over the Atlantic, shipping distress frequencies; all this and much more is possible on this little receiver. So don't delay any further, send today for full details and introduce yourself to an exciting new hobby.

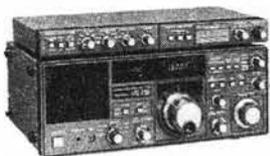
TRIO NEW R2000 £391

The R2000 is Trio's latest communications receiver covering the entire spectrum from 150kHz to 30MHz. It boasts a whole host of features that make it probably one of the best buys radio communications receivers currently available today. Its uncompromising design provides facilities for AM, SSB, CW and FM reception with 3 separate filters automatically switched in. The factory fitted memory module provides for 10 separate frequencies to be programmed in any mode and for automatic scanning of all channels. In addition, pre-programmed segments of the band may also be scanned making it one of the most versatile designs available. As an added feature an internal battery with an estimated life of 5 years retains the memory even when the power is disconnected. The rate of tuning is controlled electronically and has 3 speeds to suit all types of operation. Another novel feature is the squelch control that is effective on all modes for suppressing background noise when no signal is present. Other features include noise blanker, dual AGC, clear digital display down to the nearest 100Hz, dimmer switch, 24 hour quartz clock, front mounted speaker, tone control, RF step attenuator, dual impedance aerial terminals, 230v AC or optional 12v DC operation, built-in timer etc, etc.



YAESU FRG7700

£335



The FRG7700 is for the advanced listener or for the enthusiast who demands the best in short wave reception. The receiver covers the complete spectrum 200kHz to 30MHz with a highly accurate digital display. The receiver offers excellent sensitivity and selectivity and has separate detectors for AM, FM and SSB, plus switched bandwidth on AM. Other controls include automatic gain control, noise blanker, attenuator, squelch, rf gain control and clock with timer. There is also facilities for fitting an optional 12 channel memory unit. The receiver runs from 230v AC mains or 12v DC and there is an optional aerial tuner to go with it. And if you are interested in VHF, there is a complete range of specially designed converters to go with the receiver that covers the amateur, aircraft and marine bands, etc. Why not send today for our coloured brochure and get to know more about what the FRG7700 has to offer.

ICOM R70

£469



The R70 is possibly the ultimate in receivers designed for the amateur market. We've tested this thoroughly and are convinced that this receiver offers everything that the enthusiast could ever wish for. If anything can pull the signals in, this one will. Frequency coverage is 100kHz to 30MHz in 30 bands. A 3 stage rate of tuning enables easy tuning for all modes, AM, SSB, CW and FM (the latter requires the optional FM module). The dual VFO enables 2 separate frequencies to be used and the bright digital display gives precise frequency readout down to 100Hz with absolute stability. Great emphasis has been put on selectivity and in addition to independent filters for each mode, there is a separate selectivity control. This enables the bandwidth to be continuously varied down to 500Hz. Another control provides a variable notch filter to prevent heterodyne interference - now you can really dig deep for those elusive DX signals. Another nice feature on this receiver is its excellent sensitivity even on very modest aerials. This is obtained by the use of a well designed front end incorporating switched pre-amplifier and attenuator. Other features include dual-mode noise blanker, dual AGC action, transmitter monitor, dimmer switch, dial lock, RIT control, squelch control, tone control, FM tuning indicator, forward facing speaker, 230v AC power requirements, etc, etc.

NEW CD6000AR

MOBILE/BASE
AIRBAND MONITOR
110-140MHz
12v DC
DIGITAL READOUT



5kHz steps.
0.5µv for 20 dB.
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AIRBAND MONITORS

SPECIFICATION

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Channel Steps	:25kHz
Mode	:AM
Sensitivity	:0.5uv
Selectivity	:8kHz/6dB & 25kHz 60dB
Antenna	:50 ohms



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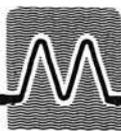
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- ★ AERIAL CHANGEOVER FOR RX CONVERTER
- ★ TWO CHANNEL USING PLUG IN CRYSTALS

This high performance ATV transmitter consists of a two channel exciter, video modulator and a two stage 20 watt linear amplifier. The unit will accept both colour and monochrome signals, and a sync-pulse clamp is incorporated to ensure maximum output. An internal pin diode aerial changeover switch allows connection of the aerial to a suitable receive converter when in the receive mode. (The MMC435/600 is ideal for this application, and has an output on channel 35 - £27.90 inc. VAT, p&p £1).

Full transmit/receive switching is included together with an internal wave form test generator. The unit is housed in a highly durable black diecast case and all circuitry is constructed on high quality glass-fibre printed circuit board. The two stage linear amplifier is housed in a separate internal compartment, thus ensuring excellent stability.

£149 inc VAT (p&p £2.50)

MM4001KB



RTTY TRANSCIVER

- ★ Complete Transceive Data Communication System using the Latest State of the Art Microprocessor
- ★ Wide Range of Popular RTTY & ASCII Speeds
- ★ 170, 425, 850 AND 1200 Hz Shifts Available on both RX and TX
- ★ Four Separate Message Stores
- ★ Compatible with a Standard Parallel ASCII Keyboard and Printer
- ★ Stored Test Functions
- ★ Auto CQ Call Facility
- ★ Automatic Carriage Return/Line Feed
- ★ Automatic Letter and Figure Shift
- ★ Upper & Lower Case Display for ASCII

Modes of operation:
: Murray Coded RTTY - 45.5, 50, 75, 100 baud.
Amateur Standard ASCII 110, 300, 600, 1200 baud.
In each of these modes the receive converter will accept FSK and AFSK signals.

This MM4001KB unit, when simply connected to any HF or VHF transceiver, a standard TV set, and the supplied keyboard, provides a complete data communication capability at a cost of less than half of any similar system. The MM4001 KB contains a terminal unit, a microprocessor controlled TV interface and the necessary transmit tone generators to enable transmission and reception of RTTY and ASCII, with the minimum of ancillary equipment.

£299 inc VAT (p&p £4.00)

MML144/50-S



144MHz 50 WATT LINEAR POWER AMPLIFIER

- A TRULY COST EFFECTIVE PRODUCT!
- REAL VALUE FOR MONEY!

This new product represents one of the best combinations of high power at a realistic cost, whilst still not requiring a huge power supply.

FEATURES:

- ★ 50 WATTS OUTPUT POWER FOR 10 WATTS IN
- ★ LINEAR ALL MODE OPERATION
- ★ STRAIGHT THROUGH MODE AT THE FLICK OF A SWITCH
- ★ ULTRA LOW NOISE RECEIVE PREAMP - 3SK88 - SWITCH SELECTABLE
- ★ RF VOX (WITH MANUAL OVERRIDE)
- ★ LED STATUS LIGHTS

£85 inc VAT (p&p £2.50)

MML432/30-L



432MHz 30 WATT LINEAR POWER AMPLIFIER

Following the success of the ever popular MML144/30-LS, comes a 70cm equivalent. Designed to complement the many 1 or 3 watt hand held transceivers, this new product will provide an output power of 30 watts. (An internal attenuator controlled by a front panel switch allows the input sensitivity to be selected between 1/3 watts.) An RF VOX circuit is provided to allow automatic changeover and switched delay times for SSB or FM can be selected on the front panel. A low noise receive preamp is included to provide an increased receiver sensitivity.

FEATURES:

- ★ 30 WATTS OUTPUT POWER
- ★ SUITABLE FOR 1 OR 3 WATT TRANSCEVERS
- ★ ULTRA LOW-NOISE RECEIVE PREAMPLIFIER
- ★ RF VOX (WITH MANUAL OVERRIDE)
- ★ LINEAR ALL MODE OPERATION
- ★ LED STATUS LIGHTS
- ★ SUPPLIED WITH ALL CONNECTORS

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KEEP AHEAD WITH THE FT-102!

Once again YAESU lead the field with the exciting FT-102 HF transceiver—no other manufacturer offers so many innovative features.

Better Dynamic Range

The extra high-level receiver front end uses 24 VDC for both RF amplifier and mixer circuits, allowing an extremely wide dynamic range for solid copy of the weak signals even in the weekend crowds. For ultra clear quality on strong signals or noisy bands the high voltage JFET RF amplifier can be simply bypassed via a front panel switch, boosting dynamic range beyond 100dB. A PLL system using six narrow band VCOs provides exceptionally clean local signals on all bands for both transmit and receive.

Total IF Flexibility

An extremely versatile IF Shift/Width system, using friction-linked concentric controls and a totally unique circuit design, gives the operator an infinite choice of bandwidths between 2.7kHz and 500Hz, which can then be tuned across the signal to the portion that provides the best copy sans QRM, even in a crowded band. A wide variety of crystal filters for fixed IF bandwidths are also available as options for both parallel and cascaded configurations. But that's not all; the 455kHz third IF also allows an extremely effective IF notch tunable across the selected passband to remove interfering carriers, while an independent audio peak filter can also be activated for single-signal CW reception.

New Noise Blanker

The new noise blanker design in the FT-102 enables front panel control of the blanking pulse width, substantially increasing the number of types of noise interference that can be blanked, and vastly improving the utility of the noise blanker for all types of operation.

Commercial Quality Transmitter

The FT-102 represents significant strides in the advancement of amateur transmitter signal quality, introducing to amateur radio design concepts that have previously been restricted to top-of-the-line commercial transmitters; far above and beyond government standards in both freedom from distortion and purity of emissions.

Transmitter Audio Tailoring

The microphone amplifier circuit incorporates a tunable audio network which can be adjusted by



In-line wattmeter with three ranges (20, 200 and 1200 watts full scale), and "peak hold" system.

the operator to tailor the transmitter response to his individual voice characteristics before the signal is applied to the superb internal RF speech processor.

IF Transmit Monitor

An extra product detector allows audio monitoring of the transmitter IF signal, which, along with the dual meters on the front panel, enables precise setting of the speech processor and transmit audio so that the operator knows exactly what signal is being put on the air in all modes. A new "peak hold" system is incorporated into the ALC metering circuit to further take the guesswork out of transmitter adjustment.

New Purity Standard

Three 6146B final tubes in a specifically configured circuit provide a freedom from IMD products and an overall purity of emission unattainable in two-tube and transistor designs, while a new DC fan motor gives whisper-quiet cooling as a standard feature. For the amateur who wants a truly professional quality signal, the answer is the Yaesu FT-102.

New VFO Design

Using a new IC module developed especially for Yaesu, the VFO in the FT-102 exhibits exceptional stability under all operating conditions.

A. SP-102 EXTERNAL SPEAKER/AUDIO FILTER

The SP-102 features a large high-fidelity speaker with selectable low- and high-cut audio filters allowing twelve possible response curves. Headphones may also be connected to the SP-102 to take advantage of the filtering feature, which allows audio tailoring for each bandwidth and mode of operation to obtain optimum readability under a variety of conditions.

B. FC-102 1.2 KW ANTENNA COUPLER

1.2KW band-switched L-C pi-network antenna coupler.

C. FV-102DM SYNTHESIZED, SCANNING EXTERNAL VFO



FT-101ZD Mk III

YAESU's FT-101ZD WITH FM. Undoubtedly the best selling HF transceiver ever — thanks to its superbly comprehensive specification and sensible prices. Incorporates notch filter, audio peak filter, variable IF bandwidth plus many other features.

FT-ONE SUPER HF TRANSCEIVER

The ultimate in HF transceivers - the superb FT-ONE provides continuous RX coverage of 150KHz-30MHz plus all nine amateur bands (160 thru 10m).

All-mode operation LSB, USB, CW, FSK, AM, *FM · 10 VFO system · FULL break-in on CW · audio peak filter · notch filter · variable bandwidth and IF shift · keyboard scanning and entry · RX dynamic range over 95dB! and NO band switch!!!

*OPTIONAL



A

B

C



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NEW! FT-980 ALL MODE HF CAT *



* Computer-Aided Transceiver

This incredible new transceiver incorporates the highest level of microprocessor control ever offered in an HF all solid-state radio. Including a general coverage (0.15-30MHz) receiver with its own, separate front end, this amateur transceiver offers a new dimension in frequency control; whereby frequencies can be entered by either front panel keypad or tuning dial, and then scanned in selectable steps either freely or between any two programmable limits. Twelve memories include four with special protection, and two large digital displays allow full flexibility and control for split

frequency operation while two meters allow full transmitter information.

Additional controls include IF Width and Shift on concentric controls, AMGC (Automatic Mic Gain Control) to set microphone input threshold, RF Speech Processor, ALC Meter Hold function, IF Notch and Audio Peak filters, Transmit Monitor, Noise Blanker and CW Full Break-in. Controls are also provided for FM Squelch and CW Keyer Speed when the optional FM and Keyer Units are installed.

The most important feature of the FT-980 is that

practically all of the above features can be controlled by the user's separate personal computer, when connected through an optional Interface, also available from Yaesu. Where up to now the few amateur transceivers that offered any kind of computer interfacing at all permitted only frequency control, the FT-980 permits almost total control of all functions from a separate micro-computer, including Mode; IF Width and Shift; Scanner Step, Speed and Limits; and switching of most other functions. (Microcomputers are not available from Yaesu.)



FT-77 Thrifty HF Transceiver

UTILIZING THE NEW CAD/CAM* MANUFACTURING TECHNIQUES, YAESU PRESENTS THE FT-77 AS A NEW MILESTONE IN RELIABILITY, SIMPLICITY AND ECONOMY IN HF COMMUNICATIONS.

Thrifty

Featuring efficient, all solid-state, no-tune circuitry, the FT-77 offers a nominal 100 watts of RF output on all amateur bands between 3.5 and 30 MHz, including the WARC bands. New CAD/CAM techniques plus the simple design of the FT-77 add up to one of the smallest, lightest HF transceivers ever; both in your hands, and on your wallet.

Simple

The front panel control layout and operation are actually simpler than some VHF FM transceivers, with only essential operating controls; while the simple circuit design leaves fewer parts that could cause problems. Nevertheless, all of the essential modern operating features for HF SSB and CW are included, along with extras such as dual selectable noise blanker pulse widths (designed to blank woodpecker or common impulse noise), full SWR metering, and capabilities for an optional internal fixed-frequency channel crystal, narrow CW filter and FM Unit.

Reliable

Computer-aided design of the circuit boards in the FT-77 ensures the most efficient component layout possible in the smallest space, while automatic parts insertion and soldering greatly diminish the chance for human error. Reliability and quality control are thus improved and simplified beyond the degree previously attainable in amateur equipment. This means longer equipment life with less chance of breakdown.

Expandable

The extremely compact size and simple control layout make the FT-77 ideal for mobile operation, or as the heart of a complete base station with the optional FP-700 AC Power Supply, FV-700DM Digital Scanning VFO and Memory System, FTV-700 V/UHF Transverter and the FC-700 Antenna Tuner. The competitive price of the FT-77, coupled with the expansion capabilities presented by these accessories, make this transceiver the perfect choice for those new to amateur HF communication, or as a practical second rig for old-timers.

*Computer Aided Design/Computer Aided Manufacture.

FT-726R VHF/UHF Multibander



Combining all of the best features from Yaesu HF and V/UHF transceivers, the FT-726R opens a new world of operating ease and flexibility for FM, SSB and CW on the 50*, 144 and 430/440 MHz amateur bands. The design of the FT-726R integrates the individual operating requirements of each of the three operating modes into one unit, and the user can then select which of the optional plug-in band modules he desires.

The VFO-A/B scheme has ten programmable memories, and can be tuned in 20Hz steps for CW and SSB operation, or in selectable steps for FM. FM tuning is accomplished by an indented tuning knob. IF Width and Shift controls are provided for CW and SSB operation, while both preset standard and user programmable repeater offsets can be selected for all modes. An optional Satellite Unit makes the FT-726R into a full duplex cross-band satellite transceiver.

*144 MHz Unit installed, other Units available as options according to local regulations.

AGENTS

North West - Thanet Electronics Ltd. Gordon, G3LEO, Knutsford (0565) 4040
Wales & West - Ross Clare. GW3NWS. Gwent (0633) 880 146
East Anglia - Amateur Electronics UK, East Anglia, Dr. T. Thirst (TIM) G4CTT
Norwich 0603 667189
North East - North East Amateur Radio, Darlington 0325 55969
Shropshire - Syd Poole G3IMP, Newport. Salop 0952 814275

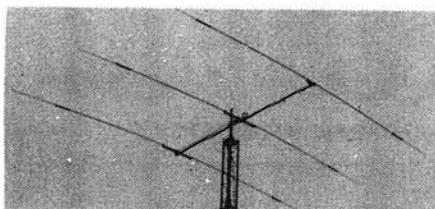
For full details of these new and exciting models, send today for our latest SHORT FORM CATALOGUE. All you need do to obtain the latest information about these exciting developments from the World's No.1 manufacturer of amateur radio equipment is to send 36p in stamps and as an added bonus you will get our credit voucher value £3.60 - a 10 to 1 winner!

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TET ANTENNA SYSTEMS



AX210N	10 ele. yagi for 2m crossed	74.95	(n/c)
HB10F2T	2 ele. 10m mono band beam	51.50	(n/c)
HB10F3T	3 ele. 10m mono band beam	74.95	(n/c)
HB15F2T	3 ele. 15m mono band beam	60.66	(n/c)
HB15F3T	3 ele. 15m mono band beam	93.46	(n/c)
HB15M2SP	VP mini size 15m 2 ele.	69.50	(n/c)
HB15M3SP	VP mini size 15m 3 ele.	102.30	(n/c)
HB34D	4 ele. tri band beam 10/15/20m	222.90	(n/c)
HB33SP	3 ele. tri band beam 10/15/20m	192.50	(n/c)
HB35C	Tri band array 10/15/20m	283.95	(n/c)
HB35T	3 ele. 10/15/20m	278.50	(n/c)
MV3BH	Vertical for 10/15/20m	37.99	(n/c)
MV4BH	Vertical for 10/15/20/40m	48.90	(n/c)
MV5BH	Vertical for 10/15/20/40/80m	63.95	(n/c)
MLA4	Loop antenna 10/15/40/80	105.60	(n/c)
SO22	Phased 2 ele. swiss quad 2m	58.95	(n/c)
SOY06	6 ele. quagi 2m	45.75	(n/c)
SOY08	8 ele. quagi 2m	52.75	(n/c)
HB210S	10 ele. dual driven yagi 2m	47.99	(n/c)
TE14	14 ele. long yagi 2m	74.40	(n/c)
SSL720	9 x 2 ele. (18) slot fed 70cm	77.20	(n/c)
HB23SP	2 ele. tri band beam 10/15/20m	135.60	(n/c)
SSL218	9 x 2 ele. (18) slot fed 2m	144.79	(n/c)
TPH2	Phasing harness 2m	17.25	(n/c)
QYU10	10 ele. quagi 70cm	67.90	(n/c)
SO007	70cm 2 ele. phased swiss quad	66.99	(n/c)
SO10	Swiss quad 10m	97.50	(n/c)
SO15	Swiss quad 15m	106.90	(n/c)

YAESU ANTENNAS

Base			
RSL145GP	1/2 wave base ant. 2m	21.20	(1.50)
RSL435GP	1/2 wave co-linear 70cm	31.60	(1.50)
HF Mobile			
RSL3.5	3.5MHz resonator & whip	12.21	(0.50)
RSL7.0	7.0MHz resonator & whip	11.80	(0.50)
RSL14.0	14.0MHz resonator & whip	11.45	(0.50)
RSL21.0	21.0MHz resonator & whip	11.20	(0.50)
RSL28.0	28.0MHz resonator & whip	11.00	(0.50)
RSL2A	Mast to suit above	5.00	(0.50)
RSM2	Gutter mount/Feeder/PL259 suit above	10.94	(0.75)
VHF Mobile			
RSL145	2m 1/2 wave fibreglass whip	12.10	(0.50)
RSL145S	2m 1/2 wave steel whip foldover	9.25	(0.50)
RSL150SS	2m 1/2 wave PL259 shock spring	3.90	(0.50)
RSM2	Gutter mount/Feeder/PL259 (RSL145)	10.94	(0.75)
RSM4M	Heavy duty mag/Feeder/PL259	13.25	(1.00)
ANTIFERRE ANTENNAS			
VHF Mobile			
TAP3009	1/2 wave 3db snap-in hinged whip	11.42	(3.00)
TAP3677	1/2 wave 3db snap-in shock coil	15.64	(3.00)
TAP3002	1/2 wave unity gain snap-in hinged whip	8.81	(3.00)
UHF Mobile			
TAP3482	1/2 over 1/2 wave 3db	9.89	(3.00)
TAP3697	1/2 over 1/2 wave 5db	18.40	(3.00)
K220	Mag mount/Feeder to suit above	10.73	(2.00)

Simply phone or write and leave the rest to us

Antennas Various/Accessories			
HQ1	Mini beam 10/15/20m 2 ele. 1kW	TBA	(4.00)
C4	Vertical 10/15/20m	48.50	(3.00)
G4MH	Mini beam 10/15/20	85.00	(4.00)
KTLM-4	Gutter mount/Cable assy. SO239	6.90	(0.50)

DATONG PRODUCTS			
PC1	50KHz to 30MHz receive converter	137.42	(0.50)
VLF	Very low freq. converter	29.90	(0.50)
FL1	Frequency agile audio filter	79.35	(0.50)
FL2	Multimode audio filter	87.70	(0.50)
ASP/A	Auto RF speech clipper (YAESU)	82.80	(0.50)
ASP/B	Auto RF speech clipper (TRIO)	89.70	(0.50)
D75	Manual RF speech clipper	56.35	(0.50)
RFC/M	RF speech clipper module	29.90	(0.50)
D70	Morse tutor	56.35	(0.50)
AD270	Active dipole RX ant. (indoor)	47.15	(0.50)
AD370	Active dipole RX ant. (outdoor)	64.40	(0.50)
MK	Morse keyboard	137.42	(0.50)
DC144/28	2m converter	39.67	(0.50)
RFA	Broadband preamplifier	33.92	(0.50)
MPU	Mains power unit	6.90	(0.50)

MICROWAVE MODULES			
Transverters			
MMT28/144	10m transverter	109.95	(2.50)
MMT70/144	4m transverter	119.95	(2.50)
MMT432/144R	70cm transverter	184.00	(2.50)
MMT1296/144	23cm transverter	184.00	(3.00)
MMT70/28	4m transverter	119.95	(2.50)
MMT144/28	2m transverter	109.95	(2.50)
MMT432/28S	70cm transverter	159.95	(2.50)

Linear Amplifiers			
MML28/100S	10m 100W linear amp.	129.95	(3.00)
MML70/50S	4m 50W linear amp.	85.00	(2.50)
MML70/100S	4m 100W linear amp.	139.95	(3.00)
MML144/30LS	2m 30W linear amp. 1-3W in.	69.95	(2.50)
MML144/50S	2m 50W linear amp.	85.00	(2.50)
MML144/100LS	2m 100W linear 1-3W in.	159.95	(3.00)
MML144/100S	2m 100W linear 10W in.	139.95	(3.00)
MML432/50	70cm 50W linear amp.	109.95	(3.00)
MML432/100	70cm 100W linear amp.	228.65	(4.00)
MML1296/10	23cm 10W linear amp.	199.00	(2.50)
MML432/30	70cm 30W linear amp. 1-3W in.	99.00	(3.00)

Converters			
MM1000KB	ASC11 morse converter with keyboard	99.95	(3.00)
MM4001	RTTY to TV converter	189.00	(2.50)
MM4001KB	RTTY transceiver	269.00	(2.50)
MM4000KB	RTTY transceiver with keyboard	299.00	(4.00)
MMC28/144	10m to 2m converter	29.90	(1.00)
MMC50/28	6m to 10m converter	29.90	(1.00)
MMC70/28	4m to 10m converter	29.90	(1.00)
MMC70/28LO	4m to 10m with LO	32.90	(1.00)
MMC432/28S	70cm to 10m converter	37.90	(1.00)
MMC432/144S	70cm to 2m converter	37.90	(1.00)
MMC435/600	UHF ATV converter	27.90	(1.00)
MMC1296/28	23cm to 10m converter	34.90	(1.00)
MMC1296/144	1296MHz low noise converter	69.95	(1.00)
MMK1691/137.5	1691MHz meteosat converter	129.95	(2.50)

Morse Talkers			
MMS1	Morse tutor 2-20WPM Side tone	115.00	(2.50)
MMS2	Morse tutor (advanced) 6-32WPM + speak back	169.00	(2.50)

Amateur TV			
MTV435	70cm 20W (PSP) transmitter	149.00	(2.50)
MMC435/600	Converter ATV UHF output	27.90	(1.00)
Preamplifiers			
MMA144V	2m preamp RF switched	34.90	(1.00)
MMA28	10m preamp	16.95	(1.00)
MMA1296	23cm preamp	34.90	(1.00)

Frequency Counters			
MMD650/500	500MHz digital meter	75.00	(1.00)
MMD600P	600MHz pre scaler	29.90	(1.00)
MMDP-1	Probe	14.90	(0.50)

Filters			
MMF144	2m band pass 40W max.	11.90	(1.00)
MMF452	70cm band pass 40W max.	11.90	(1.00)
Various			
MMS384	384MHz signal source	29.90	(1.00)
MMR15/10	15db 10W attenuator	11.90	(1.00)

HI-MOUNT MORSE KEYS			
HK702	Up down keyer marble base	24.50	(0.50)
HK704	Up down keyer	16.68	(0.50)
HK705	Up down keyer	12.50	(0.50)
HK706	Up down keyer	13.75	(0.50)
HK708	Up down keyer	11.96	(0.50)
HK808	Up down keyer marble base	39.57	(0.50)
MK704	Twin paddle keyer	10.95	(0.50)
MK705	Twin paddle keyer marble base	22.00	(0.50)
MOULDINGS			
IK	lambic keyer	19.95	(0.50)

TOKYO HY POWER			
HC150	HF ATU SWR/Power meter		
	200W PEP	62.50	(n/c)
HC2000	HF 2kW ATU SWR/Power meter		
	6 POS ant. switch. 6 to 1 vernier high Q coils 2kW peak 1kW continuous	276.55	(n/c)

Antenna Rotators & Accessories			
SU2000	Light duty rotator	34.95	(3.50)
9502	Channel master med duty up to 8 ele.	57.00	(3.50)
9523	Alignment bearing for 9502	14.38	(1.25)
KR400	Med/Heavy duty 180° meter (inc. lower casting)	90.85	(3.50)
KR400RC	Med/Heavy duty 360° meter Load 200Kg 1 1/2"-2" masts	102.35	(3.50)
CASTING	Lower casting set (400RC)	15.00	(1.25)
KR600RC	Heavy duty 360° meter Load 200Kg Rot600K/cm Brake 4000K/cm 1 1/2"-2" masts	136.85	(3.50)

Antenna Switches			
SA450	SO239 connectors 1 in 2 out	9.75	(0.50)
SA450N	"N" type connectors 1 in 2 out	12.75	(0.50)

Baluns			
BL50A	RAK 50 ohm ferrite BALUN 1:1 1.8-38MHz 1KW	12.88	(1.50)
W2AU	1:1 50 ohm 3-40MHz 1KW	14.99	(1.50)

Dummy Loads			
T30	30W DC 500MHz PL259	6.61	(0.50)
T100	100W DC 500MHz SO239	20.12	(1.00)
T200	200W DC 500MHz SO239	31.36	(1.50)
T210	Wide band 10W 1.2G-2.4G	24.50	(0.75)
AW05	Pocket RF wattmeter 5W up to 500MHz BNC	19.75	(1.00)

Filters			
AKD	Hi-pass blocks 0-200MHz RF interference to UHF above 400MHz	5.50	(0.50)

Linear Amplifiers			
YAESU			
FL110	HF 160/80/40/20/15/10m 100W (10W drive)	155.25	(n/c)
FL2100Z	HF WARC 1200W PEP. SSB 1kW CW, 400W AM/FM/FSK	449.00	(n/c)
FL2010	2m VHF 10W linear	54.00	(n/c)
FL2050	2m VHF 50W linear 10W drive	115.00	(n/c)
FL7010	70cm UHF 10W linear	91.00	(n/c)

TOKYO HY POWER			
HL32V	VHF 30W linear 1-5W drive HI-LOW output	53.50	(n/c)
HL82V	VHF linear preamp output meter 2-12W in 35-85+ out	144.50	(n/c)
HL160V	VHF linear preamp output meter 1-10W in 160W+ out	242.40	(n/c)
HL45U	UHF linear preamp 2-15W in 10-45W out	119.75	(n/c)

ADONIS MICROPHONES Mobile/Base			
MM202S	Mobile safety mic. (non scanning)	23.00	(1.00)
MM202HD	Mobile safety mic. (scanning)	30.00	(1.00)
AM502	Desk mic. (compressor selectable)	45.94	(1.00)

Miscellaneous			
SNL144S	2m preamp RF switched	33.90	(1.00)
RPCB	144UB FT221/225 front end board	64.50	(1.25)

Ni-cads			
AA	AA size Ni-cad	1.00	(0.20)
C	C size Ni-cad	2.40	(0.30)
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N404	"N" Socket to SO239	1.80	(0.25)

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S2	Headphones (cobalt magnets)	5.75	(0.50)
YAESU			
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CUE DEE

TONO

Specifications:

Antenna	4144A	10144A	15144A
No. Elements	4	10	15
Gain	8dBd	11.4dBd	14dBd
Front/Back	20dB	20dB	26dB
Front/Side	40dB	40dB	40dB
Boom Length	1.1m	4.5m	6.45m
Weight	1Kg	3Kg	5Kg
Boom		3 sections	4 sections

Independent Tests

Model	Boom	Gain	
	Length	Annaboda*)	Claimed
15144 (A)	3.1λ	13.0dBd	14.0dBd
C. C. Boomer	3.2λ	12.8dBd	16.2dBd
14 el Parab	2.9λ	12.7dBd	13.7dBd
Tonna	3.1λ	12.2dBd	15.7dBd

*) Gain over dipole under matched condition.

	Linears	
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MR-150W	140 Watt Linear For 2 Metres + switchable pre-amp.	169.00
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Opportunity

BY THE TIME this issue of *PW* appears on the bookstalls, the first of the additional March sittings of the UK Radio Amateur's Examination will be almost upon us.

Provisional figures for the December 1982 exam, just released as I write, show that 3855 candidates sat the first paper and 3929 sat the second. Overall, 68.2 per cent of candidates were successful.

Since the present multiple-choice format was introduced in May 1979 it has come in for a lot of criticism. Some people thought the exam had been made too easy by taking away the need to write essay-type, in-depth answers. Others thought it was too hard. The number of "questionable" questions included in the various papers since 1979 has not helped the exam's reputation, and you may recall that I've had a go at City and Guilds on that particular topic in past issues. There haven't been so many moans just lately, but whether that's because the papers have been getting better, or because people have given up complaining, I'm not too sure.

Like all City and Guilds examinations, the RAE comes up for a periodic review of the syllabus. There was a minor change in 1982, and the next review is now under way. Elsewhere in this issue (see page 30), we publish an invitation from the CGLI to any interested individuals or groups, to send in suggestions for alterations or amendments to the present syllabus. Now's your chance — let's have some really constructive comment.

The background of many aspiring amateurs now is quite unlike that of the average RAE candidate of a few years ago. The "short wave listener" route has been largely replaced by the "frustrated CBer" route (either legal or illegal), so that the student is building on different interests and experience. This means that, more than ever before, the real point is whether the RAE is asking the right questions. The sentence in the CGLI announcement: "The principal objective of the Examination is to ascertain the candidate's ability to operate an amateur station within the terms of the licence and not necessarily to test expertise in particular aspects of the Amateur Service" really says it all, to my mind. What the examination needs to discover is whether the candidate is safe to let loose on the amateur bands, using either home-built or bought equipment, without causing mayhem among other radio users, of whatever sort. The expertise comes later, with experience.

Should some basic level of practical operating ability have to be demonstrated by a candidate, as well as passing the multiple-choice papers? I can see considerable problems in such a scheme, not least in choosing and providing some standard form of equipment for the test, but they should not be impossible to overcome. No closing date for comment is quoted in the City and Guilds announcement, but don't leave it too long before setting pen to paper.

Geoff Arnold

QUERIES

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

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

PROJECT COST

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

INSURANCE

Turn to the following page for details of the PW Radio Users Insurance Scheme, exclusive to our readers.

CONSTRUCTION RATING

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

Beginner

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

Intermediate

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

Advanced

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

SUBSCRIPTIONS

Subscriptions are available to both home and overseas addresses at £13 per annum, from "**Practical Wireless" Subscription Department, Room 2816, King's Reach Tower, Stamford Street, London SE1 9LS**. Airmail rates for overseas subscriptions can be quoted on request.

BACK NUMBERS AND BINDERS

Limited stocks of some recent issues of *PW* are available at £1 each, including post and packing to addresses at home and overseas.

Binders are available (Price £5.00 to UK addresses, £5.25 overseas, including post and packing) each accommodating one volume of *PW*. Please state the year and volume number for which the binder is required.

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MODS

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

Roger Hall G8TNT (Sam)

No. 21

Mods for the FT-290R seem to be very popular and we have another set this month.

Semi-Reverse Repeater

I have received three mods for semi-reverse repeater (listen-on-input) operation. The first was supplied by Harry Leeming G3LLL, of Holdings Photo Audio Centre in Blackburn. He has said that although this mod has been approved by the importer, Amateur Electronics UK Ltd., anyone thinking of doing it should heed the warning at the top of this page about invalidating their guarantee. Harry has also asked me to point out that he will only do this

mod to rigs that he has supplied, so if you are unable to carry it out yourself, please do not send your rig to him.

This mod uses two diodes, any sort of small switching diode will do. After removing the top and bottom covers, locate the back of the MODE switch. Solder the anode of one of the diodes to the tag that has a green wire connected to it, this is the +600kHz wire. Use sleeving on the lead from the diode to prevent shorts. Solder the other end of this diode to the green/white wire that goes to Pin 1 of Plug A. You will need to scrape away some of the insulation on the wire to do this. Now turn the rig over and locate Plug B. Cut the green wire that is soldered to Pin 12. Wrap insulating tape around the end that is attached to the plug and solder the anode of the other diode to the end of the wire that leads to the MODE switch below. Solder the cathode of the diode to the black/white wire that is connected to Pin 11. Again you will need to scrape away some of the insulation. Make sure that the two joints that have been made by soldering to the green/white and black/white wires are well wrapped in insulating tape and then replace the covers. The +600kHz position on the MODE switch now switches the receiver -600kHz for listening on the input.

The second semi-reverse repeater mod was supplied by Amateur Electronics UK Ltd. First, remove the bottom cover and locate the black/white wire on SK1—it's the tenth one in from the left. Cut this wire at the socket and insulate the free end. Now find the green/white wire on SK2 and solder the anode of an 1S1555 or 1N914 diode to it. Connect the cathode of the diode to the red/white wire soldered to the p.c.b. adjacent to the microphone socket. Both diode leads should be insulated to prevent shorting. This mod is now complete and pressing the CALL BUTTON should allow listening on the repeater input whenever the MODE switch is in the + or - position.

A third variation of this mod which seems to have originally come from SMC has been sent in by Nick G8MCQ. He suggests adding a 10µF 16V capacitor, a 150kΩ resistor and a 1N4148 diode to Pin 2 of PO 3 as shown in Fig. 1. A lead should also be run from the end of Ca and Ra to Pin 11 on PO 4 on the Voltage Regulator Unit. D1 should then be removed from that unit and the track cut as shown. Now add two wires, one between R75 (220Ω) and the cut p.c.b. track near PO 4 and one from the junction of the red/white wire to Pin 1 of PO 2 via a new 5-6kΩ resistor and 1N4148 diode as shown. The CALL button should now activate the Listen Input facility and there should also be an automatic toneburst whenever the -600kHz shift is selected.

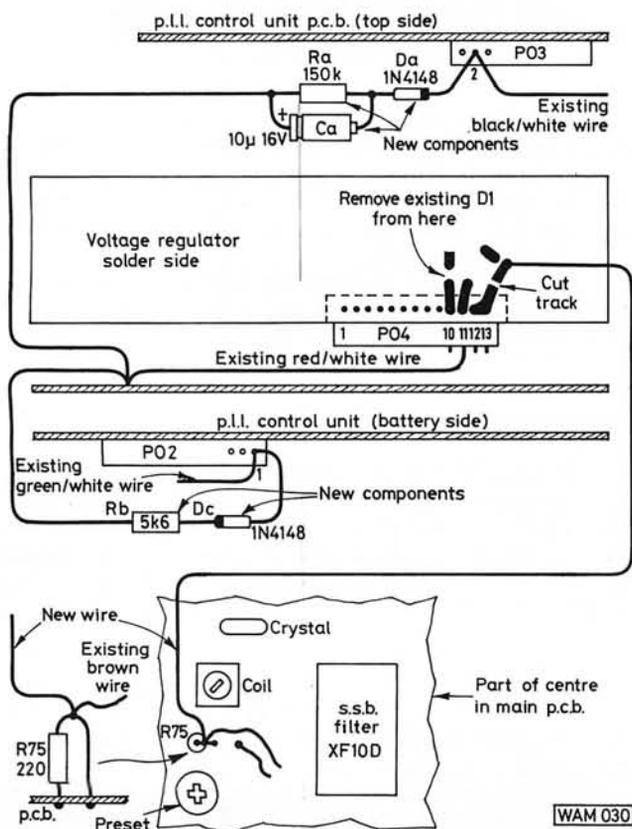


Fig. 1

PW

144MHz QRP CONTEST

Sunday 19 June 1983
1000-1800 GMT

This new v.h.f. contest, with its 3W p.e.p. power output limit, is open to all licensed radio amateurs in the UK. A simple contest exchange and straightforward scoring system will enable newcomers and experienced operators to enjoy the challenge of QRP on 144MHz. Full rules will be published in the May issue of *Practical Wireless*.

This is a simple a.t.u. based on the "transmatch" tuner originally developed by Lew McCoy WIICP about 20 years ago. This version can be used for low power transmitting, up to about 20 watts, on all authorised frequencies 1.8 to 30MHz, and for listening on the medium as well as all short wave bands.

Construction features a wood and hardboard case, use of a standard twin-gang receiving type capacitor instead of the split-stator capacitor usually specified, a simple all-band 4:1 ferrite balun, a dummy load to assist in tuning up QRP (low power) transmitters and an easily made tapped tuning coil. Three different types of antenna feed lines can be connected at the same time, selected for use from a switch on the front panel, and various options are possible to adapt the unit to the needs of the user.

A VERSATILE ATU

Tony Smith
G4FAI

What is an Antenna Tuner?

The first thing to remember is that an a.t.u. *does not usually tune an antenna*. It is merely a device which ensures that the antenna feeder does not present a mismatch to the equipment in use. Most transmitters today need to "see" a 50Ω load at their output and the function of the a.t.u. is to transform the impedance at the transmitter end of the feeder to meet the transmitter's needs whilst discriminating against the radiation of unwanted frequencies (harmonics) by the transmitter.

When used with a receiver an a.t.u. matches the impedance of the antenna circuit to the receiver input circuit ensuring maximum transfer of available signal. It also provides a high degree of selectivity which helps to reduce "image" interference from stations on other frequencies.

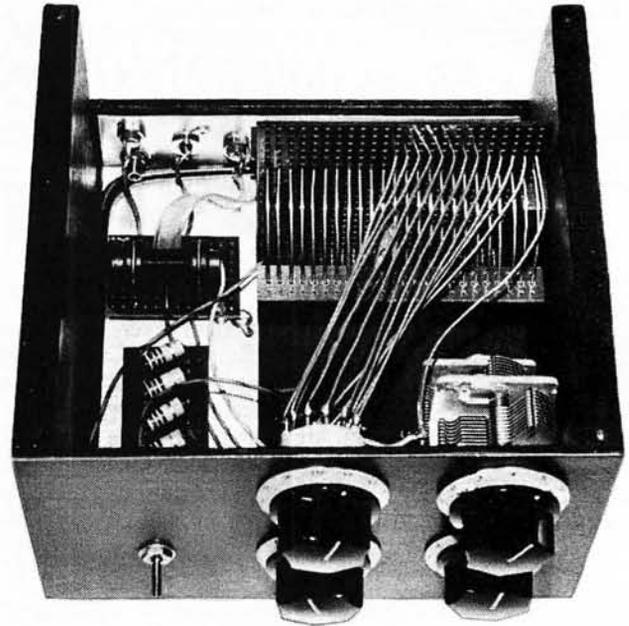
When used with random length end-fed wire antennas an a.t.u. will function as already described for both transmitting and receiving and will, in this case, also tune the antenna to resonate at the desired frequency.

Circuit Details

Switch S1a selects the dummy load in position 4 whilst switch S1b then isolates all antennas. The dummy load may be omitted if the tuner is to be used only for receiving. C1 tunes L1 and, whilst transmitting, provides good rejection of harmonics with TVI (television interference) protection when properly adjusted.

L1 is tapped at 12 positions by S2 to give full coverage from 3.5 to 30MHz whilst S3 extends the range to 1.8MHz (top band) and, if required, to the medium wave band.

The final match between input and output for both transmitting and receiving is achieved by adjustment of C1



and C2 in conjunction with each other. C1 in the prototype was of the type used in valve receivers, which can often be obtained cheaply as surplus components. Neither value is very critical. If bought new Jackson type OO twin-gang 365pF would be suitable for C1 and type O single-gang 365pF for C2.

S1b selects up to three different antenna feeders, i.e. single wire (end-fed), coaxial, and balanced, thus allowing a flexible and versatile antenna system to be tailored to the needs of the operator.

Construction

The base and ends of the case are made from 12.5mm wooden board with the front, rear, and top panels from hardboard, as shown in the photographs. If the constructor has limited workshop facilities it may well be possible to obtain the wood pre-cut to size from the local timber supplier when the making of the case will then become a simple assembly job.

Capacitors C1 and C2 are mounted on the front panel. Note that they are not earthed. The drilling of holes and the method of fixing will depend on the type of capacitor used. Switches S1, S2, and S3 are also mounted on the front panel.

The main coil, L1a and L1b combined, is threaded through a piece of Veroboard 95 x 95mm (0.15in matrix). The copper track is cut, and holes carefully drilled out, as shown in Fig. 2. A 4.5 metre length of 18 s.w.g.

WAD100*

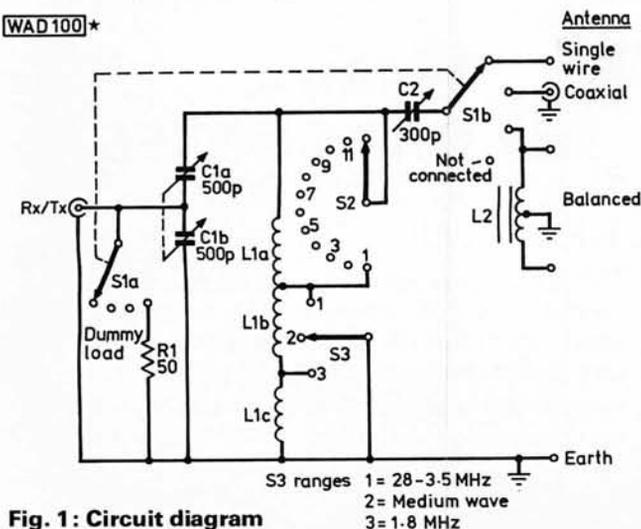


Fig. 1: Circuit diagram

★components

Resistors

Carbon

To suit dummy load (see text)

Capacitors

Air-spaced variable

500pF+500pF 1 C1 a,1b (see text)
300pF 1 C2 (see text)

Inductors

Main coil 1 24T 18 s.w.g. 47mm dia (see text)
Medium wave coil 1 140T 24 s.w.g. 9.5mm dia (see text)
Balun 1 10T + 10T 22 s.w.g. bifilar wound on ferrite rod 9.5mm dia x 40mm

Switches

Rotary

3p.4w. 1 S1
1p.12w. 1 S2

Min. toggle

s.p.d.t. 1 S3 (see text)
centre off

Miscellaneous

Chassis mounting phono sockets (2); Wander sockets, red (3), non-insulated (2); Knobs (4); Veroboard, 0.15 inch matrix (see text); Ferrite rod 40mm x 9.5mm dia; Wire, cable (see text); Wood, aluminium sheet etc. for case.

tinned copper wire is wound round a 47 mm diameter former. A sauce bottle found in the kitchen served this purpose for the author. When removed from the former the coil will spring out and be approximately the correct diameter to thread through the enlarged holes on the Veroboard. Before this is done two strips of plain Veroboard (24 x 3 holes) are required to act as spacers for the coil at right angles to the main board. These strips are cut from a larger board, using a sharp cutting/scoring tool, and the holes in the centre line are enlarged to 1.5mm.

CONSTRUCTION RATING

Intermediate

BUYING GUIDE

The majority of the components used for this project are easily obtained. The variable air-spaced capacitors are made by Jackson Brothers and should be obtainable from Bi-Pak, Electrovalue, Maplin Electronics and Watford Electronics.

APPROXIMATE COST

£15

The coil is threaded through the main board and the spacing strips in the direction indicated in the diagram. Some care is required towards the end of the operation to avoid distorting the windings with undue pressure but the enlarged holes allow the completion of the threading without too much difficulty. Individual turns should then be adjusted to ensure a uniform size winding and any surplus wire at the end removed. The spacing strips should be centred and secured with spots of glue at one or two points, and each winding then soldered to the main Veroboard.

The coil is mounted by wooden strips forming slots on the floor and side of the case. A piece of aluminium sheet is cut to shape and fitted to provide a back mounting and general earthing plate. Thin flexible aluminium, often obtainable in hardware/d.i.y. shops, is preferred as this is easily cut and bent to shape whilst the case can provide the necessary rigidity.

The medium wave coil L1c is made separately from the tapped coil. It is wound on a 60mm length of 9.5mm diameter wood dowelling. There are 140 turns of 24 s.w.g. enamelled copper wire in two layers of 70 turns each, so the two connecting wires are at the same end of the coil. Two rubber grommets having 9.5mm diameter holes are used to secure the windings. The coil is mounted on a piece of Veroboard by two pieces of 18 s.w.g. tinned copper wire, each 75mm long, bent round the grommets, inserted through the holes in the board and soldered underneath. The board is then secured to the side wall of the a.t.u. by small woodscrews using 6.3mm x No. 6 (4BA) spacers.

If the medium wave coil is not required S3 can be changed to single pole changeover as the centre-off facility will no longer be required.

The balun is wound on a piece of ordinary ferrite rod, as used for medium wave antennas, 9.5mm diameter x 40mm long. The rod can be cut to size by filing a groove all round and carefully tapping the rod to achieve a clean break at the desired point. Two lengths of 22 s.w.g. enamelled copper wire, each 420mm long, are wound

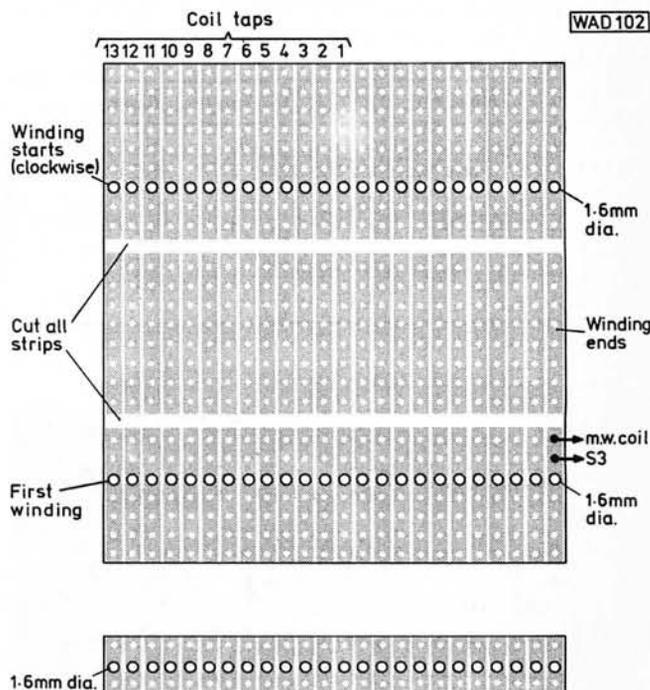


Fig. 2: Details of the 0.15in matrix Veroboard used to support the main coils

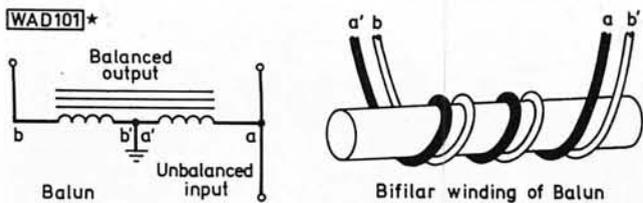


Fig. 3: Details of winding the balun

round the rod in bifilar fashion for ten turns. The windings are secured at each end by rubber grommets as for the medium wave coil, leaving approximately 40mm of wire protruding at each end. The balun is mounted on Veroboard and fixed to the earthing plate as shown in the photograph.

Dummy Load

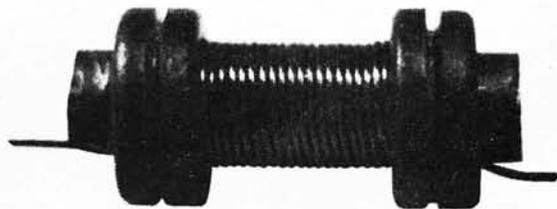
The optional dummy load consists of a number of carbon resistors mounted on Veroboard to provide the impedance and wattage required. In the prototype, for example, a two watt load was required, at approximately 50 ohms, and four resistors, each 220 ohms \times $\frac{1}{2}$ watt, were used. Five 270 Ω 1W resistors will give 54 Ω at 5W. If a dummy load is not required S1a can be dispensed with. In this case the number of positions on S1 can be reduced to three or a single pole-twelve way switch, with adjustable stop limit, could be substituted for selecting the outputs required.

The rear panel layout and general wiring details can be seen in the photographs. Before the components are finally mounted the case can be painted or covered with Contact or Fablon.

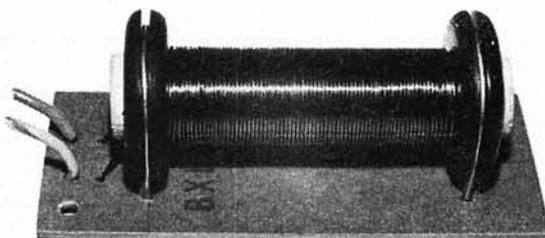
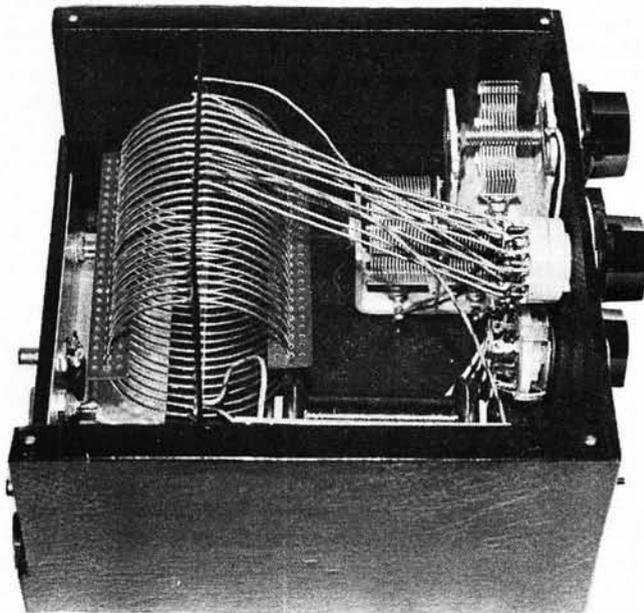
The various outputs are connected to S1 and a length of UR43 or similar 50 ohm coaxial cable wired from the input phono socket to C1. The tapings on the coil are wired as shown in Table 1. Note that position 1 of S2 effectively shorts out the coil windings when S3 is set for the 28-3.5MHz range. This is necessary to match some antennas when operating in the 28MHz band.

Table 1

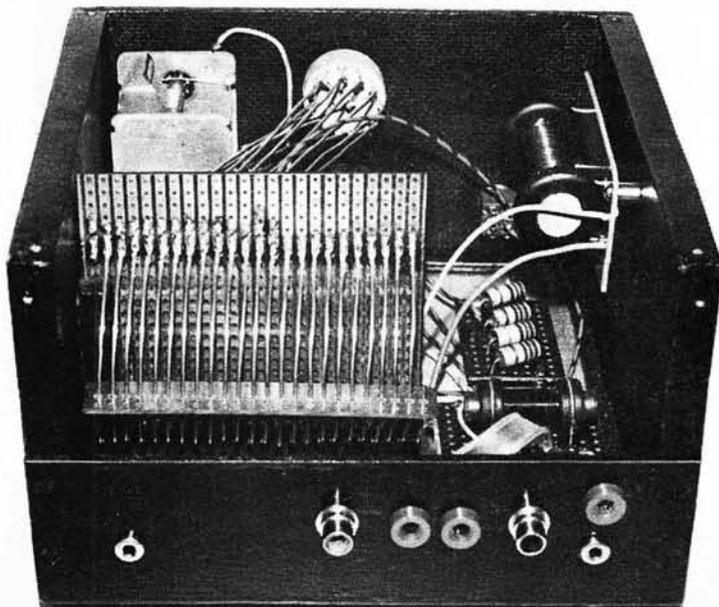
Tap	Connect to	Tap	Connect to
13	Rotor S2/Stator C2	6	S2 6
12	Not connected	5	S2 5
11	S2 11	4	S2 4
10	S2 10	3	S2 3
9	S2 9	2	S2 2
8	S2 8	1	S2 1
7	S2 7		



The completed balun



The medium wave coil



Cardboard discs are glued behind the knobs and marked by Letraset or similar system. The discs used were obtained from the local stationers in the form of "conference badges". The centres were removed by perforating them with the aid of a domestic sewing machine.

Operation

The input of the unit is connected to the transceiver or receiver. It is desirable to have an s.w.r. (standing wave ratio) bridge connected between the a.t.u. and the transmitter to assist tuning. The antennas to be used are connected to the appropriate output sockets and an earth connection is required if an end-fed antenna is to be used. When transmitting the dummy load can be used to establish the forward setting for the s.w.r. bridge before adjusting the a.t.u. Both capacitors should be fully open for this operation otherwise their capacitance affects the impedance of the dummy load.

The bands required are selected by S3 and the antenna to be used by S1. The correct setting for the tuner is found by adjusting the coil tapings (S2) in conjunction with the input and output capacitors. Starting with C1 and C2 at minimum capacitance C1 is adjusted for minimum s.w.r. and then C2 is similarly adjusted. This procedure may have to be repeated once or twice before the optimum setting is found.

This is not as difficult as it sounds and once the correct settings are identified they can be recorded on a reference chart (one for each antenna). On the 28-3.5MHz range the higher number tapings will be appropriate for 3.5MHz and the lower, probably Nos 1 and 2, for 28-21MHz. The aim should be to achieve maximum capacitance, i.e. vanes as fully meshed as possible, to obtain best power output. Where it is possible to tune a particular frequency to a 1:1 s.w.r. on more than one coil tapping the lowest number of tapings (i.e. minimum inductance) should be chosen and this will give maximum capacitance. On some bands it may be necessary to re-tune the unit at different frequencies across the band.

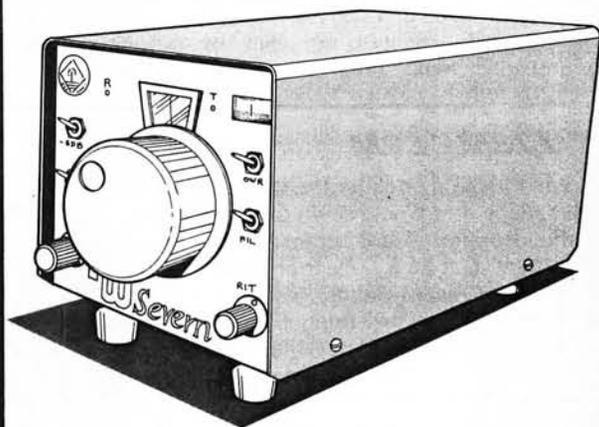
For listening the audible difference between peaks on different coil settings may not always be apparent. It is, however, still desirable to select maximum capacitance and minimum inductance, as with transmitting, in order to optimise performance.

The unit will effectively match random lengths of wire although the aim should always be to get as much wire up as possible in these circumstances. Matching will be simplified if lengths can be used which have a frequency relationship to the bands to be used. A good all-amateur band length is 40 metres, which is a half wave on the 3.5MHz band, but other lengths will often perform surprisingly well. Dipoles and beams cut to individual bands and fed by coaxial cable can be tuned across the band even if they are not accurately cut. Dipoles and loops cut to almost any length and fed with balanced feeder, including 300 ohm ribbon, can be matched to any frequency higher than that at which they naturally resonate.

This is a very versatile unit suitable for both the beginner and the more experienced operator interested in QRP working. Many antenna configurations of various dimensions can be tried and matched and satisfactory results obtained. It must be stressed however that as described the unit is suitable only for low power transmission. The switching arrangements may cause problems if higher power is used and this is not recommended. The basic circuit is quite suitable for higher power but a heavy duty switch would be required for selecting the coil tapings and the antenna switching arrangement as described would not be feasible. ●

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Morse Code Keyer/Trainer

I.C.S. Electronics Ltd announce the availability in the UK of a full function computerised Morse code keyer and trainer unit called the model KT-2, and manufactured by A.E.A. Inc. of Seattle, USA.

The KT-2 provides precisely calibrated code speed controls allowing the user to choose between the Fast (Farnsworth) mode or the Slow Code mode of intracharacter speeds and actual code speeds from 1 to 99 w.p.m. in 1 w.p.m. increments. For example, the user can program a character speed of say 12 w.p.m. within an overall code speed of 4 w.p.m.

An additional facility is the ability of the unit to increase automatically the

speed during practice sessions. The user may select a starting speed and a finishing speed, within a variable length of practice time (from 0.1 to 99.9 minutes). At the end of the practice time, the characters continue to be sent at the finishing speed until interrupted manually.

Two levels of code difficulty may be selected for practice: normal characters or all characters. The normal character mode sends all the alphabet, numerals and common punctuation. Also the user may select either five-letter code groups or random word length. Characters are perfectly timed but the ratios can be independently programmed (full weighting control).

A 24 000 character Answer Booklet is supplied to enable the student to check his progress. Ten known starting positions are available, that correspond to positions within the Answer Booklet. For normal practice there is also a random mode.

The unit provides an automatic Tune function which enables easy tuning of the transmitter, this function can be



overridden by simply touching any key pad or the paddle. Semi-automatic or "bug" key operation can be selected instead of the normal iambic operation. A sidetone can also be selected.

The KT-2 operates from any 12V ($\pm 3V$) d.c. source capable of delivering 200mA and costs £89.00 (inc. VAT) plus £2.50 p&p and insurance.

For further information contact: I.C.S. Electronics Ltd., P.O. Box 2, Arundel, West Sussex BN18 0NX. Tel: (024 365) 590.

QRV 28MHz FM

You can't judge a book by the cover is an old adage that would seem to apply to the Ranger 4800 transceiver, stocked by Dewsbury Electronics of Stourbridge, West Midlands.

The chassis for the Ranger 4800 was originally designed for the legal 27MHz f.m. CB service; however, in its imported form it has been re-engineered for amateur use on the f.m. section of the 28MHz (10m) band.

The rig employs Motorola devices and covers the frequency range 29.310 to 29.700MHz over 40 10kHz spaced channels selected by a rotary switch.

RF output power is 6W (1W low) and other front panel controls are Volume, Squelch and receiver sensitivity via a DX/LOC (local) toggle switch. Selected channel is displayed



on a digital readout and l.e.d.s indicate transmit and free channel, an S-meter is also provided.

The Ranger 4800 costs only £46.25 (inclusive of VAT) plus £2.00 for p&p, carries a six month warranty and is available from: Dewsbury Electronics, 176 Lower High Street, Stourbridge, West Midlands. Tel: (0384) 390063.

FT101 Modification Kit

Owners or prospective purchasers of Yaesu's FT101 Mk 1-E transceiver may be interested to learn of the availability of a modification kit that will enable the transceiver to operate on the 10, 18 and 24MHz bands.

Harry Leeming G3LLL, Technical Director of Holdings Photo Audio Centre, informs me that they now produce the simple modification kit which enables early FT101s to operate on the three new bands by adapting the CB and WWV switch options, together with an interlocked relay in the 15m position.

The kit is easy to install and is designed to produce full power; however, the manufacturers warn potential users that they should observe the power limitations of the particular band regulations. The manufacturers emphasise that the kit is specifically for the early series of FT101s, and that they have no intention of marketing a kit for other models.

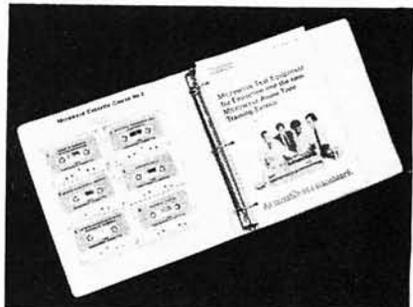
Priced at £15.75, which includes VAT and carriage, the kit is available from: Holdings Photo Audio Centre, Mincing Lane, Darwen Street, Blackburn BB2 2AF. Tel: (0254) 59595.

Microwave Learning Lab.

Schools, Colleges and perhaps even radio clubs and societies who wish to progress their knowledge of microwave technology and equipment may be interested in a tutorial package, called *Understanding Microwave Equipment*, prepared for the Microwave Products Division of Marconi Instruments Ltd.

The course, which comprises six lectures on 90-minute audio cassettes and an accompanying book of cross-referenced charts, diagrams and photographs, explains the basic concepts of microwave technology, principles of operation, performance and typical applications in simple terms without recourse to detailed mathematics.

Packaged in a sturdy ring binder that contains the six cassettes and associated lecture notes, the course (Part No. 2200284) costs £80.00 plus VAT and is available from: Marconi Instruments Ltd., Microwave Products Division, P.O. Box No. 10, Gunnels Wood Road, Stevenage, Herts. SG1 2AU.



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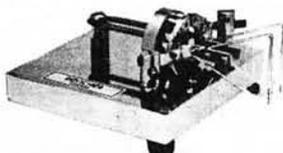
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are the voltages correct?

PART 11

ROGER LANCASTER

Solution to last month's problem: The circuit is reproduced here in Fig. 11.1.

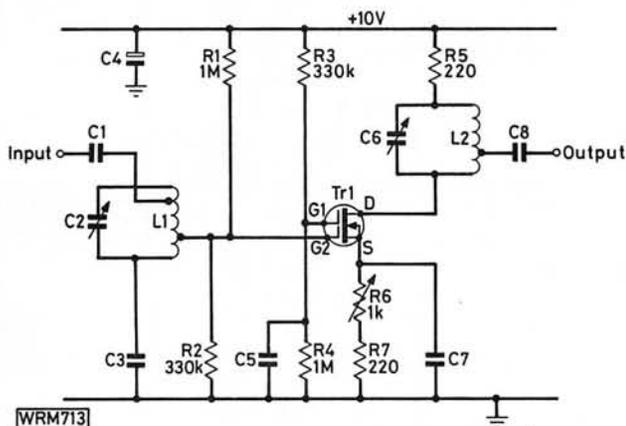


Fig. 11.1

You were asked to estimate the potentials at g1, g2 and d under no-signal conditions for the two extreme settings of R6, given that source potential was +3.1V (R6 at minimum resistance) and +4V (R6 at maximum resistance).

(a) When R6 = 0Ω:

$$I_s = \frac{V_s}{R_7} = \frac{3.1}{0.22} = 14.1 \text{ mA} = I_d$$

$$V_{R5} = 14.1 \times 0.22 = 3.1 \text{ V}$$

Therefore, potential at d = +10 - 3.1 = +6.9V

(b) When R6 = 1kΩ:

$$I_s = \frac{V_s}{(R_6 + R_7)} = \frac{4}{1.22} = 3.3 \text{ mA}$$

$$V_{R5} = 3.3 \times 0.22 = 0.7 \text{ V}$$

Therefore, potential at d = +10 - 0.7 = +9.3V

The setting of R6 does not affect either of the gate potentials with respect to earth, since gate currents are negligible, and so these gate potentials depend solely on the potential dividers.

So, potential at g1 =

$$\frac{R_4 \times 10}{(R_3 + R_4)} = \frac{1000}{1330} \times 10 = +7.5 \text{ V}$$

And, potential at g2 =

$$\frac{R_2 \times 10}{(R_1 + R_2)} = \frac{330}{1330} \times 10 = +2.5 \text{ V}$$

Integrated Circuits

There are such a wide variety of integrated circuits available that it is impossible to cover all types in this series. They vary in complexity from basic digital gates whose operation can be fully described by a simple truth table, through a vast selection of linear and specialised i.c.s which need several pages of description (as in *IC of the Month*) to microprocessor i.c.s which require a whole textbook to describe the operation of a single device.

One obvious voltage applicable to all types will be the power supply to each i.c. Ironically, it is all too easy to overlook this basic requirement, the reason being that the wiring of power supplies to i.c.s is often omitted from circuit diagrams in the interest of clarity. So don't forget that each i.c. will need its power supply even if no details of this are shown on the circuit diagram.

In this series, I shall only be able to look at certain general-purpose i.c.s and the d.c. voltages that apply to them. However, once you can understand the principles you should not have much difficulty in applying the same ideas to more specialised i.c.s in conjunction with data sheets.

On frequent occasions I shall be obliged to use words such as "normally", "usually", etc. This will contribute nothing to readers' confidence in dealing with i.c.s but it is unavoidable, unfortunately, because even among these basic general-purposes i.c.s there are variations available. The trouble is that, as soon as you attempt to generalise about the operation of any type of i.c., you will discover that some manufacturer has produced a version which operates in precisely the **opposite** way; and if not, some manufacturer will produce such a version next week! As an example, the usual master-slave JK bistable is clocked by a negative-going transient, but there are variations which are clocked by positive-going transients.

I shall therefore be describing voltage measurements applicable to the "most common" forms of these general-purpose i.c.s. Variations will be comparatively rare, but if you do take measurements around an i.c. which do not tally with the descriptions in this series, it is just possible that you may have one of the uncommon versions and you would have to refer to its data sheet.

Operational Amplifiers

The basic operational amplifier has many applications in scientific and experimental work as well as being a substitute for a multi-stage voltage amplifier. This is because it

is a **differential** amplifier (output being the amplified **difference** between two inputs) and also because its gain can easily be set to anything between unity and about 200 000 times. It has the further advantages of high input impedance (a megohm or so), low output impedance (about 150 ohms) and very good temperature stability. "Op. amps." form the basis of a multitude of more specialised i.c.s.

The circuit symbol for the basic op. amp. is shown in Fig. 11.2 (the voltages and the common line not being a part of the symbol).

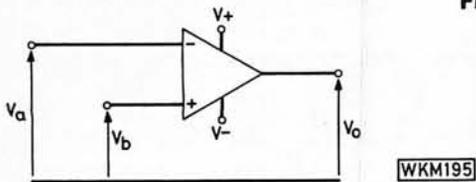


Fig. 11.2

Power supplies are "V+" and "V-", "V+" being positive with respect to "V-". The p.d. between these two will be quoted by the manufacturer and should not be exceeded, a typical figure being 30V. This is usually applied so that "V+" is positive with respect to the common line by half the total (e.g. +15V in the example quoted) and "V-" therefore negative with respect to the common line by the same amount (e.g. -15V). There are variations, but we will consider this symmetrical application of supply voltages to be the case for the time being. We will also consider the common line to be earthed (0V).

With no input voltages applied (i.e. $V_a = V_b = 0V$), the output voltage V_o should be halfway between the "V+" and "V-" supplies, i.e. at 0V. This results from the internal circuit configuration within the i.c.

When voltages are applied at the "+" and "-" inputs, the output is determined by the formula:

$$V_o = A_v (V_b - V_a)$$

where A_v is the differential voltage gain (or "open-loop" gain), a typical figure being 200 000 at low frequencies, although this falls as frequency increases. As we are only concerned with d.c. potentials in this series, A_v will be the full open-loop gain.

From the formula, V_o is therefore equal to A_v times the **difference** between the input voltages.

There are limits to V_o , however, imposed by "V+" and "V-". The positive limit of V_o is slightly less positive than "V+" (e.g. +14V) and the negative limit of V_o is slightly less negative than "V-" (e.g. -14V).

Using these typical figures, let us see what the input voltage **difference** will be to cause such a limiting of V_o . If the V_o positive limits to +14V, the formula will be:

$$14 = 200\,000 \times (V_b - V_a)$$

Therefore,

$$(V_b - V_a) = \frac{14}{200\,000} = 70\mu V$$

You are not likely to notice this very small difference in input potentials in your meter readings yet this is the **maximum** difference you are likely to get because the op. amp. will normally be operating well within its output voltage limits. So, for all practical purposes, the potentials measured at the "+" and "-" inputs will be **the same**, in this case virtually 0V.

There are two basic op. amp. circuits for conventional voltage amplification, the first of these being shown in Fig. 11.3. This is the **inverting** op. amp., where the input voltage is applied via R_1 to the inverting input ("−") and produces a **phase-inverted** output, V_o . The gain of the amplifier is determined solely by the ratio of the resistors. This gain, called the "closed-loop" gain, because negative

feedback is now being applied via R_2 , is given by R_2/R_1 . Notice that it is independent of A_v . Remember also that there is a phase reversal (change of polarity as far as d.c. is concerned).

In the example of Fig. 11.3, therefore, the gain is $100k\Omega/10k\Omega = 10$. So if $V_i = +1V$, then V_o is ten times this and with reversed polarity, i.e. **-10V**. If V_i is **-0.5V**, $V_o = +(10 \times 0.5) = +5V$. If $V_i = +3V$, however, V_o is **not** $-(10 \times 3) = -30V$, but will be **-14V**, the negative limit.

In all of the preceding examples, the potential measured at the "−" input will be **0V** because the "+" input is earthed and these two are virtually the same potential. In many cases there will be no d.c. component at the output, only undistorted sine waves (e.g. signals), in which case the measured d.c. potentials at V_i , "−", "+", and V_o would all be zero.

The other common amplifier arrangement is shown in Fig. 11.4. It is the **non-inverting** op. amp. circuit, so called because the output is **in phase** with the input. Voltage V_i is applied direct to the "+" input but the negative feedback is still to the "−" input via the potential divider R_2/R_1 .

Fig. 11.3

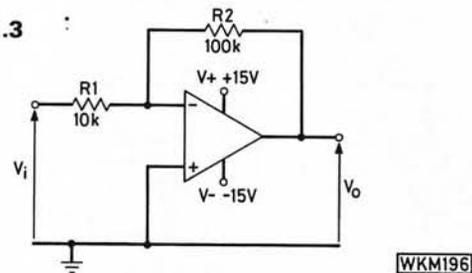
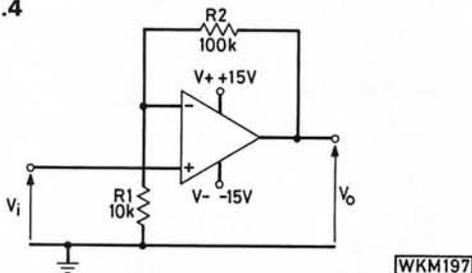


Fig. 11.4



Gain is given by:

$$1 + \frac{R_2}{R_1}$$

in this example gain is therefore $1 + (100/10) = 11$. So, if $V_i = +1V$, then $V_o = +11V$. If $V_i = -0.5V$ then $V_o = 11 \times (-0.5) = -5.5V$. If $V_i = +3V$, V_o is **not** +33V but is limited to **+14V**. The potential at the "−" input will be equal to V_i in all cases, since V_i is applied direct to the "+" input and we have already established that there is negligible difference between the potentials of the "+" and "−" inputs.

The circuits of Figs. 11.3 and 11.4 require two power supplies (the +15V and the -15V). Where a.c. only is to be amplified, as is the usual case in radio work, the circuits can be adapted to operate from a single supply of +30V, an example of an inverting op. amp. circuit of this type being shown in Fig. 11.5.

Now "V+" is at +30V and "V-" at 0V, the same potential **difference** existing between these as before. There is no d.c. input because of C_1 , so V_o will be at a d.c. potential halfway between "V+" and "V-" (due to the internal circuits of the chip), i.e. +15V. The "−" input will be at +15V also, via R_2 , through which no d.c. current flows. So the "+" input must be made to be +15V as well, otherwise the d.c. potential difference between the "+" and

“-” inputs would cause V_o to be other than +15V and would reach limit level if the “+” input was earthed to d.c. The “+” input level is therefore set by the potential divider R3/R4 until V_o is exactly +15V, the resistors being made variable pre-set to allow compensation for slight differences in their resistance values and to compensate for any asymmetry in the circuits of individual i.c.s. A slight difference of a few mV in p.d. between the “+” and “-” inputs usually has to be applied anyway in order to achieve the correct no-input value of V_o , this small p.d. being called the “input offset voltage”.

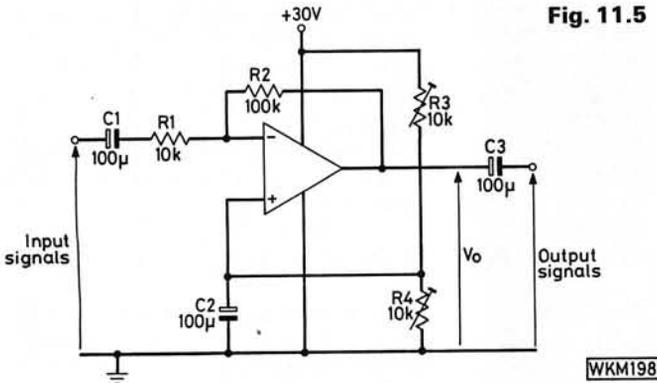


Fig. 11.5

Capacitors C1 and C3 are d.c. blocks which prevent the d.c. conditions of other stages from upsetting the critical d.c. conditions of the op. amp. circuit. As far as signals are concerned C2 earths the “+” input but allows the correct d.c. potential to exist there.

The single power supply version of the non-inverting op. amp. circuit is shown in Fig. 11.6. The d.c. conditions are as follows: “V+” = +30V and “V-” = 0V.

Therefore V_o is +15V. The “-” input is at +15V via R2, the “+” input is also at +15V via the potential divider R3/R4/R5 (there is no d.c. voltage dropped across R5 as no d.c. current flows through it).

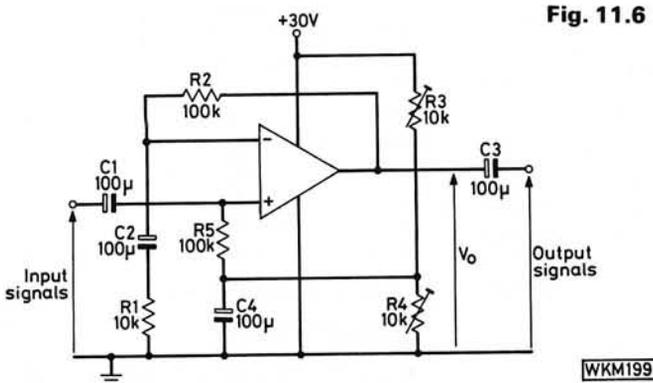


Fig. 11.6

As before C1 and C3 are d.c. blocks. Capacitor C2 allows the negative feedback to the “-” input to be due to signals only. The +15V bias is decoupled to the “+” input via C4, and R5 allows input signals to be developed across it, being connected between the “+” input and earth as far as signals are concerned.

External circuits are often connected to other pins of the i.c., for example to modify the op. amp.’s basic frequency response, but these will not normally affect the d.c. conditions of the points mentioned.

If the d.c. voltages are incorrect, the i.c. itself may be suspect. The easiest way to prove this is to substitute a new i.c., as most of them are relatively inexpensive. If this is not possible or convenient, the suspect i.c. could be removed and tested in a simple test rig similar to the circuit

of Fig. 11.3. Where the i.c. is plugged into a holder this makes substitution easy and also enables the d.c. potentials to be checked on the pins with the i.c. out of circuit. If the i.c. is soldered in, the voltage readings should be carefully analysed, if necessary taking into account meter resistance and referring to the appropriate data sheet, before undertaking the difficult task of unsoldering the i.c.

Often i.c. faults are intermittent and temperature sensitive. In these cases, a squirt of freezing fluid onto the i.c. can frequently bring a change in its operation, so directing suspicion to the i.c. rather than to the associated circuit. Freezing fluid should be obtainable from component retailers and is very handy when fault-finding on integrated circuits, whether of the op. amp. type or not.

Now to this month’s problems:

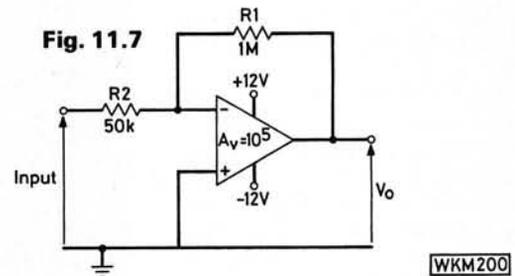


Fig. 11.7

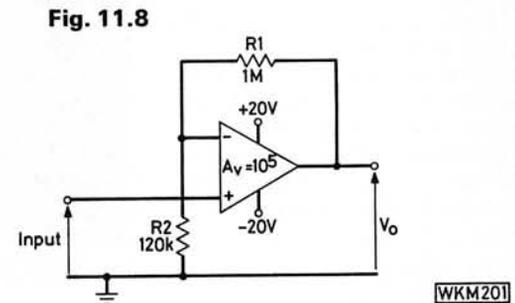


Fig. 11.8

No. 1: Calculate the d.c. potentials at the “+” and “-” inputs and the value of V_o if the following d.c. inputs are applied to the circuits of (a) Fig. 11.7 and (b) Fig. 11.8.

- (i) +100mV
- (ii) -500mV
- (iii) -2V

No. 2: Referring to Fig. 11.5, what d.c. potentials should exist on the following pins of the i.c. holder if the i.c. was removed?

- (i) “+” input
- (ii) “-” input
- (iii) “V+”
- (iv) “V-”
- (v) V_o

Next month we will take a look at some of the more common digital i.c.s as used in control and counting circuits.

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NEWS NEWS NEWS

Find That Project

The third edition of the *Electronic Projects Index* (EPI), compiled by M. L. Scaife G6RJU, Bibliographical Services Officer of North Tyneside Libraries and Art Department, is now available.

The index provides a complete list of projects published during 1979-80, in 16 named technical magazines, which includes *Practical Wireless*, *Practical Electronics*, *Everyday Electronics*, *Television*, *Wireless World* and *Practical Hi-Fi*.

Containing 118 A4 size pages, EPI No. 3 costs £2.50 (which includes p&p) and is available on a cash-with-order basis from: *EPI Sales, Central Library, Northumberland Square, North Shields, Tyne & Wear NE30 1QU*.

The next edition, EPI No. 4 covering 1981-82, is being compiled at this moment and should be published mid-1983.



New Amateur Radio Shop

A new shop, specialising in amateur radio equipment, has opened at Stourbridge in the West Midlands.

Called Dewsbury Electronics, the proprietor, Tony Dewsbury G4CLX, is the designer of the respected Morse sending "G4CLX Keyboard" and the firm, an approved Trio dealer, are also stockists of Daiwa, Wetzl, Davtrend, Tasco Telereaders, AEA Products, Microwave Modules, ICS Amtor and Drae equipment.

The address of the new shop is: 176 Lower High Street, Stourbridge, West Midlands. Tel: (0384) 390063.

News from AMSAT-UK

Phase IIIB: The latest launch date for this satellite, from French sources, is now 27 May, 1983.

Phase IIIC: The USAF has not taken up the launch option for this satellite. The cost is estimated at 1.8 million dollars and no part of the budget can be undertaken at this time. So, it looks like AMSAT will have to find another launch agency for Phase IIIC.

Components Fair

The Pontefract and District Amateur Radio Society will be holding a "Components Fair" at the Carleton Community Centre, Pontefract, on Sunday, 13 March, 1983.

The doors will open at 1100 and there will be talk-in on 144MHz (S22), bring-and-buy stall, licensed bar and refreshments plus RSGB publications, and the overall emphasis of the fair will be on home construction.

Further details from: G4AAQ, tel: (0977) 791071.

New Catalogue

Jaybeam's latest catalogue called *Amateur Radio Antennas* is now available. The catalogue contains technical details, including v.s.w.r. graphs of their entire range of amateur antennas, plus other associated products, such as rotators, masts, phasing harnesses, mounting brackets etc.

The catalogue is available from most Jaybeam stockists on receipt of a medium-sized s.a.e., or direct from: *Jaybeam Ltd. (Dept. AM/CAT), Kettering Road North, Northampton NN3 1EZ*.

Teleprinter Handbook

The 2nd edition of the *Teleprinter Handbook*, jointly edited by A. G. Hobbs G8GOJ, E. W. Yeomanson G3IIR and A. C. Gee G2UK, has recently been published.

The book, now revised and updated, is one of the most comprehensive guides to the theory and practice of amateur RTTY available, and is a must for anyone seriously interested in this mode.

The book gives system descriptions and servicing information for several popular European and American machines. Other essential RTTY equipment, including test gear, is described and designs for home construction are given where appropriate.

Chapter titles are: Basic telegraph transmission theory; Teleprinters; Other RTTY machines; Power supplies; Demodulators; Polarised relays; Keying methods; Filters; Test Equipment; A video display unit; The Hellschreiber system; Control systems; The RTTY station; Operating procedures; plus three appendices: Glossary of commercial equipment; Terminology; Data.

This hardbound book has 368 pages measuring 246 x 184mm and is fully illustrated with hundreds of line diagrams and photographs.

The UK cover price is £12.00 from booksellers, or £13.84 by post from: *RSGB, Alma House, Cranborne Road, Potters Bar, Hertfordshire EN6 3JW. Tel: (0707) 59015*.

Radio Amateur's Examination

The periodic review of the syllabus for the Radio Amateur's Examination is now due and the City and Guilds R.A.E. Committee has established a working party for this purpose.

The principal objective of the Examination is to ascertain the candidate's ability to operate an amateur station within the terms of the licence and not necessarily to test expertise in particular aspects of the Amateur Service. Suggestions for alterations or amendments to the existing syllabus would be welcome and should be sent to: *Mr. S. D. Allison, City and Guilds of London Institute, 46 Britannia Street, London WC1X 9RG*.

NEWS NEWS NEWS

GB3SF s.s.b. Repeater Experiment

We have recently received details of the proposals for the 144MHz pilot carrier s.s.b. repeater GB3SF submitted to the RSGB RWG by Dr. A. J. T. Whitaker G3RKL, of the University of Sheffield Department of Electronic & Electrical Engineering.

This unique experimental installation will be operational for a 12 month period, during which time investigations will be carried out into the feasibility of pilot carrier s.s.b. for mobile use. Comparisons will be made between f.m. and s.s.b. systems in respect of range, quality, ease of use and occupied bandwidth. The RWG have approved the proposals and have made it quite clear that this 12 month experiment is **not** being established to enhance or promote DX working — in fact the predicted range will be no greater (probably less) than a conventional f.m. repeater. Data obtained during the operational period will be fed back to the RWG and, if the system is found to be viable, will in the long term assist with amateur band planning.

Following the experimental period a full report will be submitted by G3RKL to the 1984 IARU Conference.

As this is an experimental project, involving a new technique, much of the equipment will also be experimental in nature. It will all be designed, constructed or modified at the University of Sheffield, some possibly by final year students in connection with their projects.

The pilot carrier system chosen for the repeater is thought to be the most appropriate for the amateur service and will allow adequate reception of the repeater without modification. A small modification will be required to the transmitting section of individual transceivers to provide a steady carrier at 16dB below peak output (14.5dB down on peak modulation). In practice this will be accomplished by leaking the correct amount of carrier around the balanced modulator/filter sections.

In order to provide acceptable voice quality in the presence of both frequency and doppler shift, the repeater

will extract the pilot from input signals, using a 200Hz wide filter, apply limiting and then be re-inserted as the b.f.o., resulting in "perfect" demodulation. This same system can be applied to individual receivers to derive the same "locked" benefits. To allow for drift in input signals the repeater receiver will have a capture range of $\pm 200\text{Hz}$ and a tracking range of approximately $\pm 500\text{Hz}$ with respect to the nominal input frequency.

Apart from status signals from the GB3US Mk II m.p.u. based control logic, to indicate H/L frequency and "overmodulation", the repeater will perform in the same way as existing f.m. devices. Output power will be 10W p.e.p. u.s.b. using a single vertical antenna (probably a $\frac{3}{8}\lambda$ ground-plane) and located at the top of the 36m University's metallurgy tower near to the city centre. In order to cause negligible interference to the existing repeater network the INPUT/OUTPUT frequencies requested are 145.185 and 145.785MHz respectively.

ZX81 QTH Locator Programs

With these two programs, written for the ZX81 + 16K, you can find your QTH Locator or, using QTH Locators, work out distance and bearings as well as contest scores. You will also be helping a good cause—the RAIBC (The Radio Amateur Invalid and Blind Club) as for each tape sold £1.00 will be donated to this worthy cause.

Program A uses latitude and longitude data and performs the complicated and tortuous calculations needed to work out the equivalent QTH Locator. This is displayed on the screen in a novel way showing the position within the final QTH Locator square as a black block and also showing the surrounding squares with their Locator designations.

The other program works out the distance, bearing and contest score from QTH Locators input into the ZX81 via the keyboard. The program also calculates your lat. and long. from your QTH Locator which it displays on the screen. As the contest progresses the computer keeps a tally of total points scored and the best DX so far together with the number of contacts. Of course

the program is useful even if you are not working a contest.

The two programs are available on a cassette from *G8CEZ, 35 Chichester Walk, Merley, Wimborne, Dorset*, price £3.50 inc. post and packing. Out of this £1.00 will be donated to RAIBC. RAIBC members can purchase the cassette for £2.50 but then no donation will be given to the club.

ATV Group

The Home Counties Amateur Television Group, which has been in existence for over a year, meets on the fourth Wednesday of every month at the Richings Park Sports and Social Club, Richings Park, near Iver, Bucks. A talk-in station is operated on 145.200MHz.

The group's committee is quite active in trying to attract newcomers to ATV and invite interested parties to attend their meetings.

At the moment, the group's main interest lies with fast-scan on 432MHz (70cm); however, they are trying to

generate more activity with fast-scan on 1.3GHz (24cm) and slow-scan on the h.f. bands and 144MHz (2m).

The group's next meeting, at Richings Park, is on Wednesday 23 March 1983, starting at 2000hrs.

Further information is available from: *Sec. HCATVG, P. Miller G4REE. Tel: Maidenhead (0628) 76020.*

Radio Rally

The White Rose Amateur Radio Society, based at Moortown R.U.F.C., Leeds, have organised their radio rally for Sunday 27 March 1983, starting at 1100 at The Refectory, University of Leeds, which is the same venue as last year.

In addition to all the usual attractions of a radio rally, ample car parking is available and the entrance fee is only 50p—free to senior citizens, XYs and harmonics.

For further details contact: *Rally Manager, Richard R. Hughes, 3 Primley Park Crescent, Leeds LS17 7HY.*

Continuing last month's theme of antennas for small gardens

HS-HF5 5-band Vertical Antenna

The HF5 operates as a quarter-wave vertical on the five pre-WARC h.f. amateur bands at 3.5, 7, 14, 21 and 28MHz, with a maximum power-handling capability of 200W p.e.p. on the two lower bands and 500W p.e.p. on the remainder.

Automatic band-switching is accomplished by the inclusion of one trap and one loading coil, with separate top-loading elements for 3.5 and 7MHz looking rather like the horns on a snail. The overall height of the antenna is 4.8 metres from the tips of these elements to the SO239 connector at the base.

The HF5 can be installed in three ways. 1: On a ground post, in which case the base of the antenna must be not more than 100mm from the surface of the ground. 2: As a ground-plane antenna using wire radials, at least one wire per band, sloping downwards at approximately 30° below the horizontal, and with lengths ranging from 2.7 to 21.5m ($\lambda/4$). 3: As a ground-plane antenna using the HF5R radial kit (maximum power 150W p.e.p.), which comprises a loading coil plus five adjustable rod elements slightly over 2 metres long, sloping downwards at 45°. Using either of the ground-plane systems, the antenna can be mounted above ground, on a mast or roof-top. The HF5 weighs 2.9kg and the HF5R 1.8kg.

Adjustment of the HF5 for minimum v.s.w.r. at the desired part of each band must be carried out at ground level, even if it is to be used ultimately with a ground-plane system on a mast, etc. The 28MHz band is pre-set (no adjustment), the 21 and 14MHz bands are set by telescoping the lower and upper sections respectively, and the 7 and 3.5MHz bands by trimming the loading elements to length.

Adjusting the ground-plane radials can be more difficult because of the problem of getting at them when the system is installed.

I first used the HF5 with an HF5R, all mounted on the gable-end of the roof, with the antenna above the ridge and the HF5R below. Because it was

very difficult to get at the system in that position due to a large beech hedge in my neighbour's garden, I set it up first using a temporary pole in my garden. This was fairly successful, though it was difficult to get the v.s.w.r. down to the specified maximum of 1.5:1, and bandwidth was very restricted on 3.5 and 7MHz. When mounted on the roof-end though, the radial element ends were obviously much too close to the brickwork, and the v.s.w.r. went way up and refused to come down again, no matter what adjustments were made. I used the antenna there for some months with an a.t.u. (but see comment later), though not with very great success.

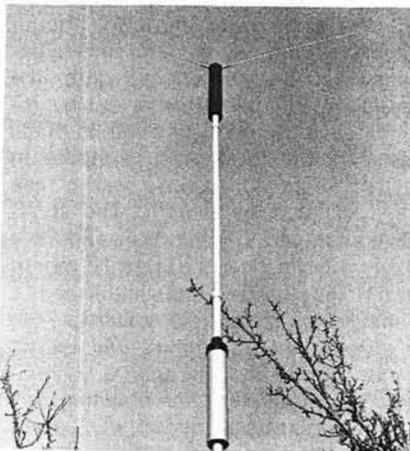
Other HF5 users have had better results with the system in the clear, on a mast-top or even on the corner of a house, so that the radials were farther from the wall, but neither of these solutions was really practical for me at the time. Eventually, against much advice, I drove an aluminium post into the ground at the bottom of the garden and bolted my HF5 to that, feeding it underground through about 15 metres of UR43 coaxial cable, protected by a length of garden hose-pipe. There are trees pretty well all round it, some of them twice as tall as the antenna, and all the pundits say it will give lousy results. But it works, giving good contacts even with a low-power transmitter (see *PW*, October 1982, page 54). After over two years' exposure, the only corrosion is rust on a couple of self-tapping screws.

The graphs show the v.s.w.r. measured on the three lower bands. You can, of course, set the minimum to whatever part of the band is your particular interest. In wet weather, the v.s.w.r. minimum moves down in frequency by about 10kHz on 3.5MHz and about 25kHz on 7MHz. On 21 and 28MHz the v.s.w.r. is between 1.2:1 and 1.4:1 right across the band. I would advise against trying to extend the operating bandwidth of the HF5 on the 3.5MHz band by using an a.t.u. to improve the match at the transmitter. I

tried this using a 100W transmitter but the high voltage generated in the 3.5/7MHz loading coil obviously caused a flashover. Result, one "dead" loading coil.

The HS-HF5 and HF5R are widely stocked by amateur radio retailers around the UK. Current prices are around £40.25 for the HF5 and £29.90 for the HF5R. Contact your local dealer or South Midlands Communications Ltd. for further details.

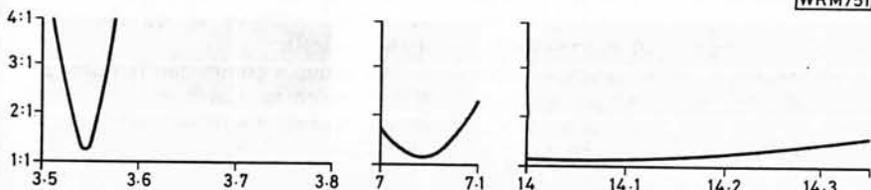
Geoff Arnold



The loading coil with its two "horns", and the trap



The HF5 base, with connections to five buried radials for improved soil conductivity



The v.s.w.r. obtained on the three lower bands with the HF5 on the ground post

YAESU FT-230R 144MHz FM Transceiver

Every month it seems that the Japanese electronics industry produces yet another 144MHz transceiver to make the radio amateur's choice even more difficult.

Yaesu's latest contender in the f.m. only mobile lists is the 25W FT-230R—a smart and compact piece of equipment which performs as well as it looks.

Simple to operate, an essential requisite for safe mobile operation, the FT-230R has 10 programmable memories selected by a rotary switch on the front panel. Programming the memories can be a little confusing at first but once the hang of selecting the DIAL mode to tune the rig has been mastered and the fact that the displayed frequency changes as the required memory is selected, the operation becomes simplicity itself. The memories can be scanned by turning the memory switch to MS and pushing the MR button. A slide switch on the rear panel selects BUSY/MAN/CLEAR modes for scanning.

Frequency is displayed on a liquid crystal display showing the last five digits of the operating frequency. The display also indicates memory opera-



tion, priority channel, scanning and priority checking and memory shift operation. A red l.e.d. indicates that the rig is in transmit mode while a matching green l.e.d. shows that the squelch is open. An analogue meter indicates signal strength on receive and r.f. output power during transmit. Manual tuning is carried out by rotating the large knob below the digital display panel.

Repeater operation is catered for by the provision of 600kHz shifts in both directions giving reverse repeater operation if desired. The audio tone-burst is selected by a push-button on the front panel just above the 7-pin mic socket. If required the tone-burst can be switched to auto by operating a slide switch on the rear panel. This is only recommended for accessing repeaters still requiring a tone-burst for re-access. Also on the rear panel is the antenna socket (SO239) and the 12V d.c. power socket which is also of the

screw-locking type—a good feature for a mobile rig as it makes life much safer.

Operating the rig was a pleasure and the reports received indicated that the output was clean and the audio very good. It must be pointed out though, that this was the fourth sample tried—the first three all suffered from such appalling audio quality on transmit that it was impossible for the other end of a QSO to even tell the sex of the operator! Obviously Yaesu have taken note of the complaints and it is understood that the necessary mods have been carried out to rectify the problem.

Receiver sensitivity was good and the squelch operated smoothly. The r.f. output measured 25W at 13.8V d.c. and on the low power setting was reduced to 2.5W. When pushing out full power the current consumption was 4.7A reducing to 1.8A on low power. On standby the current drawn was 200mA.

The handbook is good and clearly written and covers alignment and maintenance as well as operation and installation. A full circuit diagram and parts list is also included—useful when the rig is no longer a current model.

The FT-230R costs £235 inc. VAT from **South Midlands Communications Ltd., SM House, Rumbridge Street, Totton, Southampton SO4 4DP, Tel: 0703 867333**, to whom we extend our thanks for the loan of the review samples.

Dick Ganderton

Benny





M.J.AXSON B.A.G8WHG

The latest introduction to the amateur satellites currently in orbit is OSCAR 9, more commonly referred to in the UK by its pre-launch title of UOSAT.

After the successful launching of OSCAR 8 into a near-Earth circular orbit, the thoughts of AMSAT turned to more adventurous projects for dedicated radio amateurs to be known as the Phase 3 series satellites and which would be in elliptical orbit. However a number of people, principally in the UK, had the idea that an alternative route would be to introduce more of the non-technical population to the concept of satellite use and at the same time to provide facilities for scientific experimentation. Both projects were to be given the blessing of the appropriate authorities and to proceed in parallel.

UOSAT-OSCAR 9, which is the largest and most complex OSCAR spacecraft yet launched, was built by a team from the Department of Electronic Engineering at the University of Surrey, hence its name, who received support from AMSAT, the RSGB and various sections of industry. Unlike the other active satellites, UOSAT does not carry any transponders, since it is intended to be used for educational and scientific purposes rather than simply as a means of enhancing communication. To this end it carries a number of sophisticated experiments and has two on-board computers.

The experiments can be divided into two broad groups. Firstly, those on the scientific side. There is a series devoted to propagation experiments on various amateur bands. On the h.f. bands phase-related beacons, when activated, will be available on 7.050MHz, 14.002MHz, 21.002MHz and 29.510MHz, all at output powers of

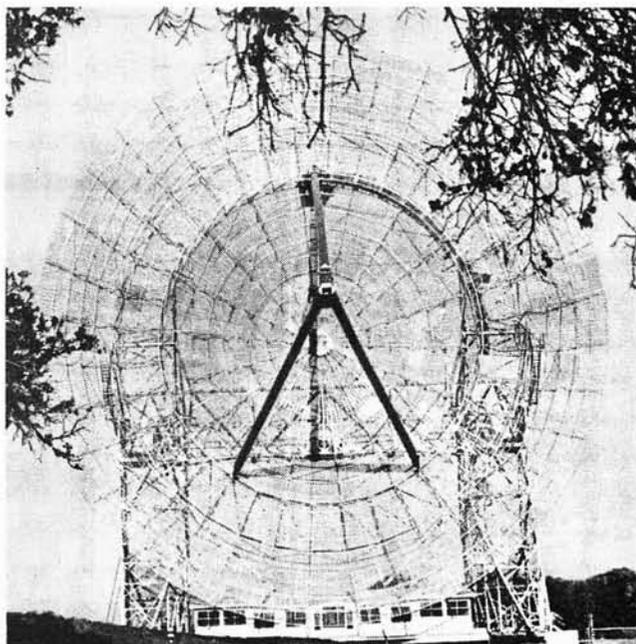
100mW. Two further beacons in the microwave regions will be on 2.401GHz and 10.470GHz with a power output of 125mW. There are two radiation detectors to provide information on solar activity and auroral effects, and a magnetometer experiment to study the earth's magnetic field. All of these will provide ample scope for the scientifically minded to carry out some meaningful research.

The second group, of the so-called educational experiments, are designed to be of more general interest, and are transmitted on the general data beacon at a frequency of 145.825MHz with a power output of 350mW. Much information is transmitted on the status of the spacecraft systems derived from sensors situated at vital points. These are available from time to time at various data rates and types of transmission, i.e.

1200, 600, 300 & 110 baud ASCII
45.5 baud RTTY
10 or 20 w.p.m. c.w.
and synthesised voice.

These varying formats allow for a considerable range of sophistication in the ground receiving equipment. The voice synthesiser has been switched on on a number of occasions, at first just going through its vocabulary, but more recently giving telemetry reports, and it can be clearly received at the author's home in Cheshire on an ordinary 144MHz band amateur transceiver (TR-9000) fed from a vertically polarised colinear antenna. The transmissions are n.b.f.m. and no pre-amplification is necessary. A friend who listened to the synthesised voice beacon did remark that it sounded rather like "an American Dalek with a cold", but that presumably originated with the programming of the synthesiser chip and not through any defect in the ground station!

Perhaps the most intriguing apparatus in this section is the camera. This is a solid-state charge-coupled-device (c.c.d.) and it will be pointed at the Earth to transmit SSTV pictures from orbit. The standard to be employed is rather higher than that usually used in amateur SSTV, being 256 lines \times 256 picture elements (pixels) and 16 possible grey levels, so good quality pictures should be obtained. Each frame will take approximately 3½ minutes to transmit and optimum resolution on the earth's surface is



The 46m antenna used to rescue OSCAR 9

photograph EIMAC VARIAN

expected to be 2km. Full details of a suitable decoder to display the pictures on a domestic TV set have been published by AMSAT-UK, and p.c.b.s should be made available when the system is proven.

Finally, the spacecraft carries an engineering beacon with a power output of 650mW on 435.025MHz which will transmit further telemetry.

UOSAT was successfully launched from Vandenberg Air Force Base in the USA on board a Delta launch vehicle which also carried an SME spacecraft into orbit, on 6 October 1981. Work then commenced on loading data into the on-board computers from the Surrey ground control station in preparation for attitude control manoeuvres required before initiating the major experiments—this was a slower process than had been anticipated. The orbital height of approximately 540km gives three useful orbits each day, with a further three at night, each averaging 10 minutes duration. The project manager, Dr. Martin Sweeting, graphically likened this aspect of the operation as attempting to de-bug a computer at the end of a noisy telephone line in your coffee breaks!"

However, all proceeded well until 4 April 1982, when through an unfortunate combination of circumstances, both the 145 and 435MHz beacons were switched on together without the usual computer control being in operation. This de-sensed both spacecraft receivers and prevented the reception of further command signals from the ground.

Eventually, on 20 September 1982, after a number of unsuccessful attempts by various parties throughout the world, a team of amateurs from Stamford University (USA) using very high power u.h.f. equipment were able to switch the 145MHz beacon off, so enabling Surrey to regain control of the spacecraft. The state of all systems appears to be good and work is continuing to achieve full operational status.

In addition to the information available from AMSAT-UK, the University of Surrey maintains a recorded information service on Guildford (0483) 61202, which is updated at frequent intervals and includes orbital predictions.

The Phase 3 Project

So far, the satellites discussed have been in relatively low, near-circular orbits. As was shown in Part 1 of this series, these have the disadvantages of short visibility times over fairly limited areas. High circular orbits would give a great improvement in coverage, but at a considerable cost in terms of power required from the launch vehicle. A compromise can be found by placing the spacecraft in an elliptical orbit and this is the plan adopted for the Phase 3 transponder project.

If an object in a circular orbit has its velocity increased, e.g. by firing a booster rocket, it will climb away from the earth. Unless the new velocity is greater than approximately 11 200m/s (the escape velocity from the earth's influence), gravity will slow it down until a point is reached where the velocity is too low to maintain a circular orbit at that distance and the object will return towards the earth. Gravity will now act to increase the velocity and the process will be repeated so sustaining an elliptical orbit (Fig. 3.1.). This is a very much simplified explanation but it may help in understanding the concept. The lowest point of the orbit is called the perigee and the highest, the apogee.

The Phase 3 project anticipates a perigee of 1500km and an apogee of 35 000km, with the apogee initially being over the northern hemisphere of the earth. In practice this means that the spacecraft will be visible for periods of ten hours at a time over the northern half of the earth, i.e. most of the land masses including Europe, Northern

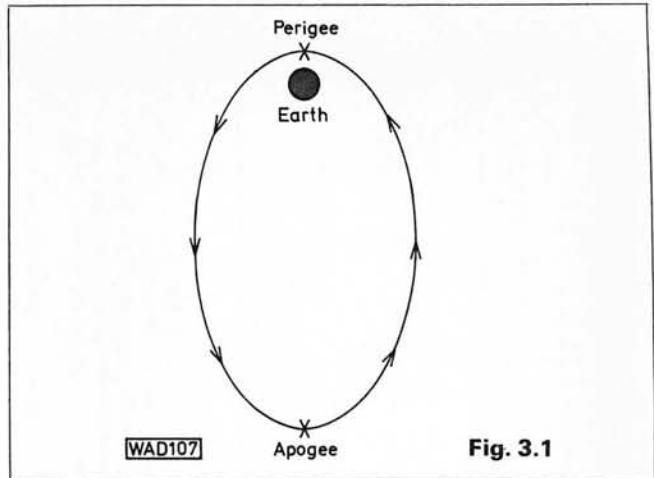


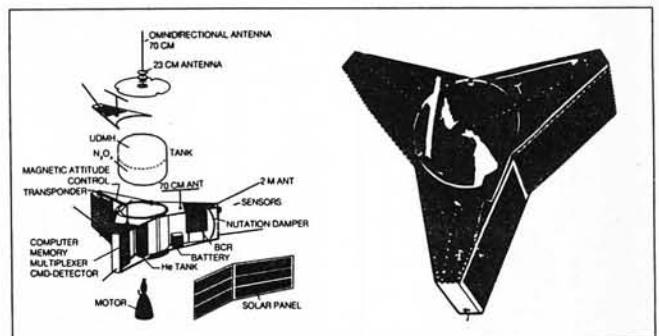
Fig. 3.1

Africa, Asia and North America. Further, due to the nature of an elliptical orbit it will appear to be almost stationary (i.e. in the same part of the sky) for about 3 hours either side of apogee, a total of 6 hours per orbit.

These facts lead to some interesting conclusions about the equipment and antennas required by a station wishing to operate through the satellite, particularly in view of the proposed uplink and downlink frequencies which are in the 1.3GHz and the 432MHz band respectively. Calculations suggest that antennas with a gain of 20dB would allow the use of a normal 432MHz amateur band transceiver. The output could be transverted to 1.3GHz so requiring a minimum of equipment.

A gain of 20dB for an antenna sounds formidable for those used to thinking in terms of h.f. and v.h.f. frequencies, but at u.h.f. the physical dimensions are so much smaller that it becomes a practical proposition. The RSGB *VHF/UHF Handbook* shows a design for a 32-element Yagi for 1.3GHz which has a gain of approx 19dB with an overall length of 2 metres. Two or more could be combined to give greater gain.

Don't think that the chimney would not stand up to the strain of such an array for there may be no need to put it up there. If the satellite is on a pass of say ± 30 degrees from overhead and the antenna has a 3dB beamwidth of 20 degrees it may simply be pointed in a roughly vertical direction, so that it could be fixed on a short post just



The Phase 3b satellite due to be launched in mid-1983

AMSAT-UK/ESA

above ground level. This would give the advantages of short feeder runs, no great wind loading and no planning approval required! Parabolic dish antennas would also be a practical proposition again situated at low level.

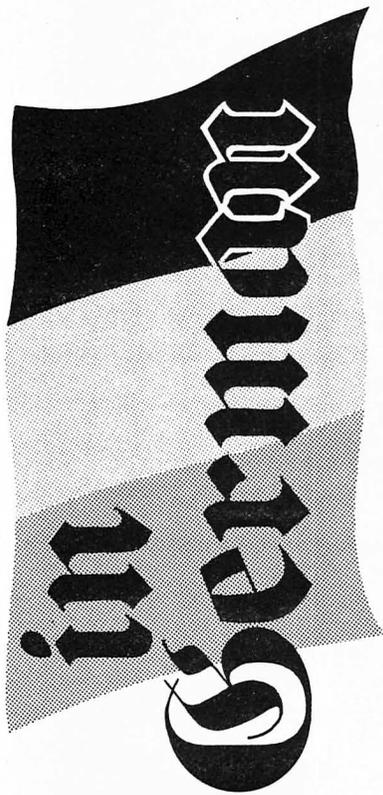
So when will it all happen? Sadly, it should already have done so, for the first Phase 3 satellite was on board the European Space Agency Ariane LO2 vehicle which was launched from the Guyana Space Centre on 23

continued on page 41▶▶▶

BASIC QSOs

PART 2

G.W.Roberts GW4JXN



Weather and Radio Conditions

The temperature is . . . degrees centigrade.
Today the weather is fine/sunny/(very) cold/hot/misty/windy.
It is raining. It is snowing. The snow is 300mm thick. The weather has been fine.

Today/yesterday/during the weekend it has been raining. It has been snowing.

Winter/spring/summer/autumn has come.

The wind has been strong. There has been thunder and lightning.

Working conditions are poor/bad/good/very good/excellent.

All the bands are open. The 10, 15, 20, 40, 80 metre band is closed/open to North/Central/South America, Eastern/Northern/Southern/Western Europe, Asia, Australasia, Africa, the Far East, Japan.

I have just heard a . . .

I can hear but cannot work a . . .

There is an opening on 2 metres, 70cm.

This lift is getting better/getting worse. Hope it lasts.

Nice to speak to you.

It is . . . o'clock approximately here local time/GMT.

What time is it in . . .

Die Temperatur ist . . . Grad Celsius.

Heute ist das Wetter schön/sonnig/(sehr) kalt/heiss/neblig/windig/bewölkt. Es regnet. Es schneit. Der Schnee ist dreissig Zentimeter tief. Das Wetter ist schön gewesen.

Heute/gestern/am Wochenende hat es geregnet. Es hat geschneit.

Der Winter/Frühling/Sommer/Herbst ist gekommen.

Der Wind ist stark gewesen. Es hat gedonnert und geblitzt.

Die Arbeitsbedingungen sind schlecht/gut/sehr gut/ausgezeichnet.

Alle Bänder stehen offen. Das zehn/fünftzehn/zwanzig/vierzig/achtzig Meterband ist geschlossen/offen in der Richtung Nord/Zentral/Südamerika. Ost/Nord/Süd/West Europa, Asien, Australien, Afrika, Fernostern, Japan.

Ich habe eben einen . . . gehört.

Ich höre aber ich bekomme keinen Kontakt . . .

Auf zwei Meter, siebzig Zentimeter ist es frei.

Diese Arbeitsbedingungen werden immer besser/schlimmer. Hoffentlich bleibt es so.

Prima so mit Ihnen zu sprechen.

Es ist hier ungefähr . . . Uhr Lokal/Grenwiczzeit.

Wie spät ist es in . . .

Dee temperatuur is . . . grad tselsiwiws.

Hooyte is das veter shoen/sonig/(zayr) kalt/haiss/neblig/windig/bevoelikt. Es raygniet. Es shnait. Der shnay is draisyg tseentimeter teef. Das veter is shoen geveesen.

Hooyte/gestern/am voochenende hat es geregniet. Es hat geshnait.

De winter/freeling/zomer/herbst is gekoomen.

Der vint is shtrark geveesen. Es hat gedonnert unt geblitzt.

Dee arbeidsbedingwvngen zind shlect/goot/zer goot/awsget-saichnet.

Ale bender shntayen ofen. Das tsen, finfisen, tswantsig, feartsig, achtsig meterbant is geshlossen/offen in der richtwng nord/tseentral/sidamerika. Ost/nord/sid/vest oyroopa, aziien, awstralien, africa, fernostern, Japan.

Ish habe eben ainen . . . gehoert.

Ish hoere aber ish bekoome kainen kontakt . . .

Awf tsvai meter/zeabtsig tseentimeter ist es frei.

Deeze arbeidsbedingwvngen verden imer beser/shliimer. Hoffentliich bliabt es zo.

Prima zo mit eenen tsw shprechen.

Es ist hear wngefayr . . . whr local/grenitshtsait.

Vee shpayt ist es in . . .

Arranging a Sked

May I speak to you again?

Are you free tomorrow/this time next week/at . . . hrs GMT?

How about this frequency or alternatively let's try the 10, 15, 20, 40, 80 metre band.

No I'm sorry, I am not free at that time.

I am usually on 20 metres at . . . GMT on (days of week) except . . .

I have to go to bed/to work now.

Darf ish zea noch mall roofen?

Zint sea morgen/tsw deezer tsait naychste voche wm . . . whr grenitshtsait frai.

Vee vayre es mit deezer freqvents oder verswuchen veer mal das tsayn, tswantsig, feartsig, achtsig meterband.

Nain es toot mir laid, ish bin tsw der tsait nicht frai.

Ish bin gevoenlich awf tswantsig metern um . . . whr grenitshtsait am montag (days of week) awsser.

Ish mws yetst ins bet/tswr arbeits gehen.

Technical

I have a new rig/linear/antenna which I am testing.
Is my modulation OK? Your modulation is good/bad.
What is my exact frequency?
I'm using a speech compressor.
Does this make any difference?
Thank you for the test.

Social

From the shack I can see mountains/sea/moors.
I have a friend/wife/children in the shack with me.
He is a visitor/a short wave listener.
She is a visitor.
He intends to sit his radio exam.
I am at home/at work/at a friend's house.
This is a demonstration/special station/club station.
I have visited your country.
I hope to visit your country.
We had a nice time.
Excuse my German.
I wish I could speak your language as well as you speak mine.
Can we continue in English?
May I say it in English?
May I explain it in English?

OSL

Could you please send me your QSL card?
I would be very pleased to get a QSL card from you.
I shall send you my QSL card via the bureau/direct.
My name is in the American/British callbook.
Is your name and address in the callbook?
Can you give me your address and telephone number over the air?
What is your postal code/telephone code?
This is my address and my telephone number.

Concluding Remarks

May I thank you once more for this call/contact and wish you a very good morning/afternoon/evening/good weekend.
Merry Christmas and a Happy New Year.
I send you my best regards.

Ich habe eine neue Anlage/eine neue Linear welche ich probiere/eine neue Antenne die ich probiere.
Ist meine Modulation in Ordnung? Ihre Modulation ist gut/schlecht.
Was ist meine genaue Frequenz?
Ich benutze einen Sprechcompressor.
Hören Sie einen Unterschied?
Danke für den Test.

Von dem Schack (der Funkbude) aus sehe ich das Gebirge/die See/die Heide.
Ich habe einen Freund/meine Frau/Kinder bei mir im Schack.
Er ist ein Besucher/ein Kurzwellenhörer.
Sie ist eine Besucherin.
Er will seine Amateurradioprüfung machen.
Ich bin zu Hause/am Arbeitsplatz/bei einem Freund.
Dies ist eine Vorführstation/Sonderstation/Klubstation.
Ich habe ihr Land besucht.
Ich hoffe ihr Land zu besuchen.
Wir haben viel Spass gehabt.
Entschuldigen Sie mein Deutsch!
Ich wollte ich könnte ihre Sprache so gut sprechen wie Sie meine.
Können wir englisch weitersprechen?
Darf ich es auf Englisch sagen?
Darf ich es auf Englisch erklären?

Könnten Sie mir bitte eine QSLkarte schicken?
Es würde mich freuen eine QSLkarte von Ihnen zu bekommen.
Ich werde meine QSLkarte über das Büro/direkt schicken.
Mein Name ist im Amerikanischen/Englischen Callbook (Rufzeichenliste).
Stehn Ihr Name und Ihre Anschrift in der Rufzeichenliste?
Könnten Sie mir Ihre Anschrift und Telefonnummer per Funk sagen?
Was ist Ihre Postleitzahl/Vorwahlnummer?
Heir sind meine Anschrift und meine Telefonnummer.

Noch einmal besten Dank für diesen Ruf(Kontakt)/dieses QSO und wünsche Ihnen einen guten Morgen/Tag/Abend/ein gutes Wochenende.
Fröhliche Weihnachten und glückliches neues Jahr.
Herzliche Grüsse.

Ish habe **aine noye anlage**/eine noye **linear velshe** ish probiere/**aine nocyte antene** dee ish probiere.
Ist maine modvlatsion in **ordn**wng. **Eere** modvlatsion ist goot/shlecht.
Was ist **maine genaue** freqvents?
Ish **benwrtse** **ainen** speechprocessor.
Hoeren zee **ainen wntersheet**?
Danke fir den test.

Fon dem shak (der **fwnkbwwde**) : **aws** sehe ish das gebirge/dee zee/dee **haide**.
Ish **habe** **ainen** froynt/**maine** fraw/kinder bai mir im shak.
Er ist ain **bezwcher**/ain **kwrtsvelenhoerer**.
Zee ist **aine** **bezwcht**.
Er vil **saine** amateurradioprfwng **machen**.
Ish bin tsw **haws**/am **arbeitsplats**/bai **ainem** froynt.
Deez ist **aine** **forfirstatsion**/**zonderstatsion**/**klwbstatsion**.
Ish **habe** ear lant **bezwcht**.
Ish **hoffe** ear lant tsw **bezwchen**.
Veer **haben** feel shpas **gehabt**.
Entshwldigen zee main doytsh.
Ish **voite** ish **koente** **eare** shprache zo gwt shprechen vee zee **maine**.
Koenen veer **english** **vaitershpprechen**?
Darf ish es awf **english** **zagen**?
Darf ish es awf **english** **erklayren**?

Koenten zee mir **bitter** **aine** **koesselkarte** shiken?
Es **virde** mish **froyen** **aine** **Koo** **ess** el karte fon **eenen** tsw **bekomen**.
Ish **verde** **maine** koo **ess** el karte **iber** das **biwro/deerekt** **shicen**.
Main **name** ist im **amerikanishen/englishen** callbook (**rooftsaichenliste**).
Shtayen eer name wnt **eare** **anshrift** in der **rooftsaichenliste**?
Koenten zee mir **eare** **anshrift** wnt **telephonnwmer** per **fwnk** **zagen**?
Was ist **eare** postlatstaal/**forvaalnwmer**?
Here zint **maine** **anshrift** und **maine** **telephonnwmer**.

Noch **ainmal** **besten** dank fir **deez**en roof (contact) **deezes** QSO unt **winshe** **eenen** **ainen** **gwten** **morgen/taag/abent** ain gwtes **vochenende**.
Froeliche **vainachten** wnt **glikliches** **noyes** jaar.
Hertsliche **grisse**.

All the best to you and yours.
I look forward to working you again.
May I wish you 73, 55, 88 and make this my final.
Back to . . . from . . . who is waiting for any concluding remarks from you.
So best wishes and good DX.
Goodbye until next time/until the pleasure of seeing you again.

Stating Future Intentions

This is . . . signing off and clear with . . . and I am now standing by for a call on this frequency.
. . . now monitoring this frequency and waiting for any call.
. . . now changing frequency to . . .
. . . now returning to the calling channel.
. . . now going QRT.

For those who have some knowledge of German there follows a list of the most common technical words and phrases. The pronunciation is not given.

absorption wavemeter — der Absorptionswellenmesser
ammeter — das Amperemeter
amplifier — Der Verstärker
amplitude modulation — Die Amplitudenmodulation
antenna — Die Antenne
antenna tuning unit — Der Antennen-Abstimmkreis
aurora — das Nordlicht
auroral — Nordlicht
auroral zone — Die Nordlichtzone
balun — das Symmetrierglied
beam — der Beam
calibrator — das Eichgerät
carrier — Der Träger
coaxial cable — Das Koaxialkabel
coil — die Spule
condenser — Der Kondensator
continuous wave — die ungedämpfte Welle (c.w.)
cross-modulation — Die Kreuzmodulation
deviation — Die Abweichung
dial — Die Skalenscheibe/Die Skala
directional antenna — Die Richtantenne
disturbance — Die Störung
dummy load — die künstliche Antenne
the earth — Die Erde
to earth — zu erden
earthed — zu Erde/geerdet
fading — das Fading/der Schwund
feeder — Die Verbindungsleitung/das Antennenkabel
final stage — Die Endstufe
fixed — fest

Alles Gute an Sie und Ihre Familie.
Ich hoffe Sie bald wiederzuhören.
Ich wünsche Ihnen dreiundsiebzig, fünfundfünfzig, achtundachtzig und mache jetzt mein Final.
Zurück an . . . von . . . der auf ein paar abschliessende Bemerkungen von Ihnen wartet.
Also alles Gute und gut DX.
Auf Wiederhören bis zum nächsten Mal/bis zu unserem nächsten Gespräch (Kontakt).

(Callsign) verabschiedet sich hiermit von . . . und geht jetzt auf allgemeinen Empfang. Ich bleibe auf dieser Frequenz.
. . . und warte auf einen Ruf auf dieser Frequenz.
Ich schalte jetzt um auf . . .
Ich gehe jetzt auf den Anrufkanal zurück.
Ich mache jetzt QRT.

frequency modulation — Die Frequenzmodulation
fuse — die Sicherung
groundwave — Die Bodenwelle
high-pass filter — das Hochpass-filter
indoor antenna — Die Zimmerantenne
insulator — Der Isolator
ionosphere — die Ionosphäre
jack — die Buchse
lightning protection — Der Blitzschutz
line of sight — auf Sichtweite
lower sideband — Das untere Seitenband
low-pass filter — das Tiefpass-filter
metal case — Das Metallgehäuse
a meter — Das Messgerät
modulated wave — die modulierte Welle
omnidirectional antenna — Die Rundstrahlantenne
operator — Der Funker
parasitic oscillations — parasitäre Schwingungen(f)
plug — Der Stecker
power supply — Das Netz/der Netzanschluss
preset — voreingestellt
preset potentiometer — der Trimmer
pulse modulation — die Impulsmodulation
radiate — strahlen/abstrahlen
the range — Die Reichweite
readability — die Lesbarkeit
receiver — der Empfänger
repeater — der Umsetzer/die Relaisstation
r.f. amplifier — Der h.f. Verstärker
rotating antenna — die drehbare Antenne

Ales gwte an zee wnt **eere fameelie**.
Ish hoffte zee balt **veedertswoeren**.
Ish **winshe eenen drauntzeebtsig, finfunftinftsig, achtwintachtisig**, wnt **mache** yets main **feenal**.
Tswrik an . . . fon . . . der awf ain paar **abshleesende** bemerkwngen fon **eenen vartet**.
Alzo ales **goote** wnt gwnt day ecs.
Awf **veederhoeren** bis tswm **nexten mal/bis** tsw unzerem **nexten geshprach** (contact).

(Callsign) ferabshaidet zich hecurmit fon . . . wnt gayt yets awf **algemeinern empfang**. Ish **blaiibe** awf **deezet** freqvents. . . wnt **vartit** awf **ainen roof** awf **deezet** freqvents. . . ish **shalte** yets **wm awf** . . .
. . . **ish gaye** yets awf den **anroofskanal** **tswrik**.
. . . **ish mache** yets coo er tay.

a rotator — der Rotor
satellite — der Satellit
selectivity — Die Trennschärfe
sensitivity — Die Empfindlichkeit
shielded braiding — die abgeschirmte Litze
short circuit — Der Kurzschluss
sideband — Das Seitenband
skip zone — Die Tote Zone
sky wave — Die Raumwelle
sound frequency — Die Tonfrequenz
splatter — der Splatter
standing wave — die stehende Welle
switch — der Schalter
to test — prüfen
transceiver — der Senderempfänger
transistor — der Transistor
transmitter — der Sender
troposphere — Die Troposphäre
tuned circuit — Der Schwingkreis
to tune up — abstimmen
upper sideband — Das obere Seitenband
valve — die Röhre
variable — veränderlich/variabel
vertical antenna — eine vertikale/senkrechte Antenne
voltmeter — das Voltmeter
wavelength — Die Wellenlänge
wavemeter — der Wellenmesser
Yagi — der Yagi

The German alphabet — this is used to give the Q code and also for call signs. The German names for the letters give an adequate representation of the pronunciation.

A	ah	N	enn
B	bay	O	oh
C	tsay	P	pay
D	day	Q	koo
E	ee	R	air
F	eff	S	ess
G	gay	T	tay
H	hah	U	ooh
I	ee	V	fow (as in fowl)
J	yot	W	vay
K	ka	X	icks
L	ell	Y	ipsilon
M	emm	Z	tset

Days of the week	Zontaag
Sunday	Sonntag
Monday	Montag
Tuesday	Deantaag
Wednesday	Mitwooch
Thursday	Donerstaag
Friday	Fraitag
Saturday	Samstag/Sonnabend
	Zamstaag/Zonabend

Numbers together with their pronunciation

1	eins	aims	18	achtzehn
2	zwei	tsvai	19	neunzehn
3	drei	dry	20	zwanzig
4	vier	fear	21	einundzwanzig
5	fünf	finf	22	zweiundzwanzig
6	sechs	sex	23	dreiundzwanzig
7	sieben	zeeben	30	dreissig
8	acht	acht	40	vierzig
9	neun	noyn	50	fünfzig
10	zehn	tsane	60	sechzig
11	elf	elf	70	siebzig
12	zwölf	tsvoelf	80	achtzig
13	dreizehn	draitsane	90	neunzig
14	vierzehn	feartsane	100	hundert
15	fünfzehn	finfsane	200	zweihundert
16	sechszehn	sextsane	500	fünfhundert
17	siebzehn	seebsane	1000	tausend
			2000	zwei tausend

Common German Christian names — it is easier to recognise them in the QRM if you have seen them before.

Alfred	Karl
Bernd	Klaus
Dieter	Kurt
Erich	Ludwig
Ernst	Norbert
Fritz	Otto
Georg	Paul
Gerhard	Peter
Günter	Philipp
Hans	Rainer
Heinz	Rudi
Helmut	Rudolf
Herbert	Thomas
Hermann	Tilman
Jürgen	Udo
Kai	Ulli

Time

It is 1 o'clock — es ist ein Uhr (es ist ain uhr)
 It is 2 o'clock — es ist zwei Uhr (es ist tsvai uhr)
 It is 2.30 — es ist halb drei (es ist halb dry)
 Note: The Germans look forward to the next hour at half past. quarter to/past — Viertel vor/nach (feiertel for/nach)

on Sunday Sonntag
 on Sundays Sonntags/
 jeden Sonntag Zontaag/
 am Sonntag Zontaags/
 am Zontaag Zontaags/
 jeden Sonntag Zontaag

**AUDIO FILTERS
 MODELS FL2, FL3, FL2/A**

Model FL3 represents the ultimate in audio filters for SSB and CW. Connected in series with the loudspeaker, it gives variable extra selectivity better than a whole bank of expensive crystal filters. In addition it contains an automatic notch filter which can remove a "tuner-upper" all by itself. Model FL2 is exactly the same but without the auto-notch. Any existing or new FL2 can be up-graded to an FL3 by adding Model FL2/A conversion kit, which is a stand-alone auto-notch unit. Datong filters frequently allow continued copy when otherwise a QSO would have to be abandoned.



Prices: FL2 £89.70, FL3 £129.37, FL2/A £39.67

ACTIVE RECEIVING ANTENNAS

Datong active antennas are ideal for modern broadband communications receivers — especially where space is limited.



- highly sensitive (comparable to full-size dipoles).
- Broadband coverage (below 200 kHz to over 30 MHz).
- needs no tuning, matching or other adjustments.
- two versions AD270 for indoor mounting or AD370 (illustrated) for outdoor use
- very compact, only 3 metres overall length. ● professional performance standards.

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- Generates a random stream of perfect Morse in five character groups.
- D70's unique "DELAY" control allows you to learn each character with its correct high speed sound. Start with a long delay between each character and as you improve reduce the delay. The speed within each character always remains as set on the independent "SPEED" control.
- Features: long life battery operation, compact size, built-in loudspeaker plus personal earpiece.

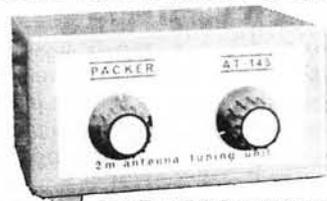
Price: £56.35

Our full catalogue plus further details of any product are available free on request. All prices include VAT and postage and packing. Goods normally despatched within 3 days subject to availability.



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 Tel (0532) 552461

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 HAMPTRON
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IMPROVE YOUR V S W R !

We are often asked, 'Why and ATU at VHF?', well for exactly the same reason that apply at HF.

- (1) Antennas are rarely 50Ω.
- (2) Their VSWR is never constant across the band from CW, through SSB & FM, to satellites.
- (3) Many modern rigs are VSWR protected. Even a slight increase in VSWR can cause dramatic loss in output.
- (4) Rotation of a beam can cause reflections from nearby objects.

Many customers are experimenting with long wires and with our AT-145Z (built-in balun) feeding rhombics, Vees and G5RVs.

USE FIXED OR MOBILE MATCHES 50-10/500Ω 500W

- AT-145 £24.45 SO-239 standard. N or BNC £23.75
 - AT-145Z £32.31 SO-239 plus terminals for built-in balun.
 - AT-145B £28.45 SO-239 plus 1m coax with car-radio plug.
 - AT-70 £26.33 Any connector to order, see you on 4m.
 - AT-432 £28.65 N standard, others to order, ideal for AT.
- YOU MUST HAVE A WAVEMETER! Over two thousand of our WM-2 two meter wavemeters are now in use.
 The cover 130-300 MHz, well past the second harmonic demanded by the Home Office, and are VERY sensitive. £22.95.
 WM-4 for 4m, similar to WM-2 and the same price.
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 2-XY POLARISATION SWITCH for XY antennas. Gives Vert, Horiz, righthand and lefthand polarisation. £34.45. With built-in antenna tuner £44.95.

All the products manufactured by Packer Communications of Coniston are now being produced by:

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Modern Receiver Front-End Design



part 1

G.W.GOODRICH

The keen radio amateur, short wave listener, or for that matter anybody else interested in communications receiver design, can hardly have failed to notice that some of the traditional design concepts of the superhet are slowly being superseded by modern, and to my mind at least simpler, techniques at the front-end of the system. However, I will qualify this statement by saying that actually generating the local oscillator frequency appears more complex in commercial equipment, due to the use of MPU driven digital frequency systems.

The use of higher, and yet higher, first i.f.s in the conversion process has meant that image responses can, with suitable pre-selection arrangements, be reduced to a minimum. This, along with the use of very efficient passive mixers and suitably narrow crystal filters for these high i.f.s, means that the home designer/constructor no longer needs to consider the double conversion technique in order to guarantee a reasonable performance in communication terms.

This article discusses, in simple terms, the implications of the modern single conversion approach, and how this may affect the potential designer/constructor.

The Traditional Superhet

The "traditional" double conversion superhet is a very complex beast indeed. I spent a lot of time in the early 70s looking at amateur designed receivers while researching data for my own project, and I have developed a great deal of respect for designers, such as G2DAF who produced a superb "advanced amateur receiver". Frankly, if I had been interested in designing my own equipment at this time, I would have given up long before drawing the block schematic!!

The problem for the designer of the traditional superhet front end, as shown in block schematic form in Fig. 1, was to provide enough selectivity to help alleviate cross-modulation and image responses. However, bearing this in mind, the designer also had to provide r.f. amplification to overcome noise generated in the mixer stages, and inherent noise in the rest of the receiver's circuitry.

In fact he had to work against himself, in that he was actually encouraging the very interference he was trying to filter to appear at the input to the first mixer. For this reason the local oscillator and the pre-selector (or r.f. tuning if you prefer) needed to be arranged in such a way that only the desired signal would find its way to the first mixer, whilst the local oscillator would provide the correct frequency to generate the desired i.f.

The usual method of achieving these goals was to track the r.f. pre-selection circuits with those of the local oscillator, the circuits' relationships to one another being designed such that the local oscillator ran higher, or lower, in frequency terms in order that a fixed i.f. would appear at the output of the mixer stage.

At a first glance it might appear to be quite easy to achieve such a condition. If the two circuits shared a common spindle to their respective variable capacitors, surely all the designer needed to do was to add a bit of inductance or capacitance to one circuit to create the ideal relationship? Inevitably it is not quite as simple as this. Why? Considering the equation used to derive the resonant frequency of a tuned circuit, it will be remembered that frequency is inversely proportional to the square of the product of two co-efficients, namely inductance and capacitance.

$$f_r = \frac{1}{2\pi\sqrt{LC}} \quad \text{so } f_r \propto \frac{1}{\sqrt{LC}}$$

The implications of this law are easier to understand by studying the graphs (Fig. 2). Fig. 2(a) shows the resonant frequency curves for two similar tuned circuits, except that the circuit giving curve T2 has a small amount of extra capacitance in parallel with the main tuning capacitor. If we look at the relationship between the two curves, we can see that the two circuits do not track one another constantly over the whole range. In fact there is only one point where the i.f. produced at the mixer was correct, and the error grows very quickly either side of this point. So by

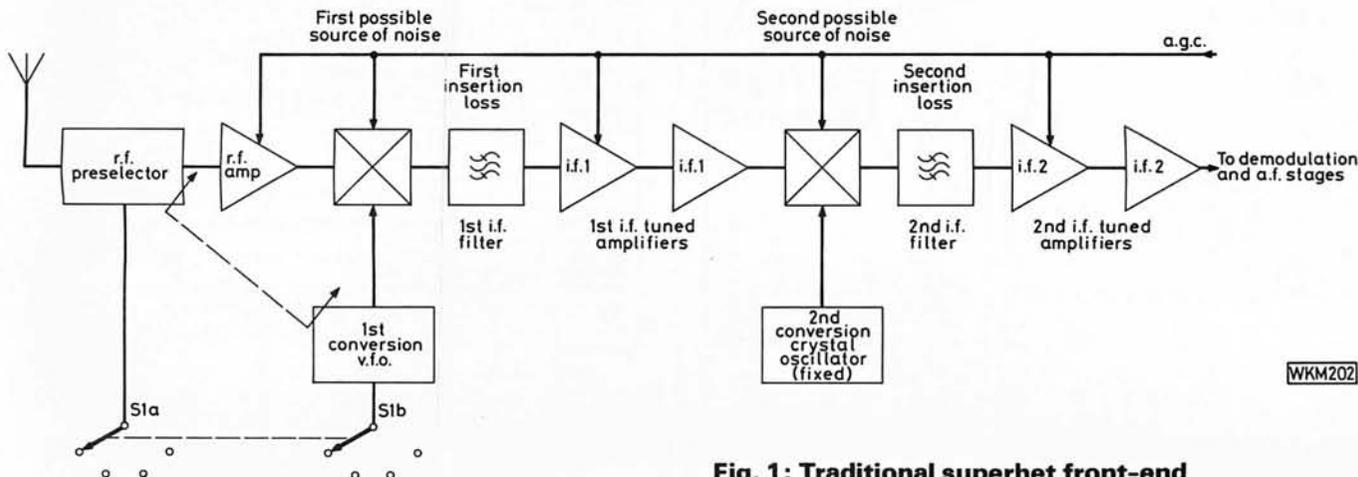


Fig. 1: Traditional superhet front-end

WKM202

Modern Receiver Front-End Design

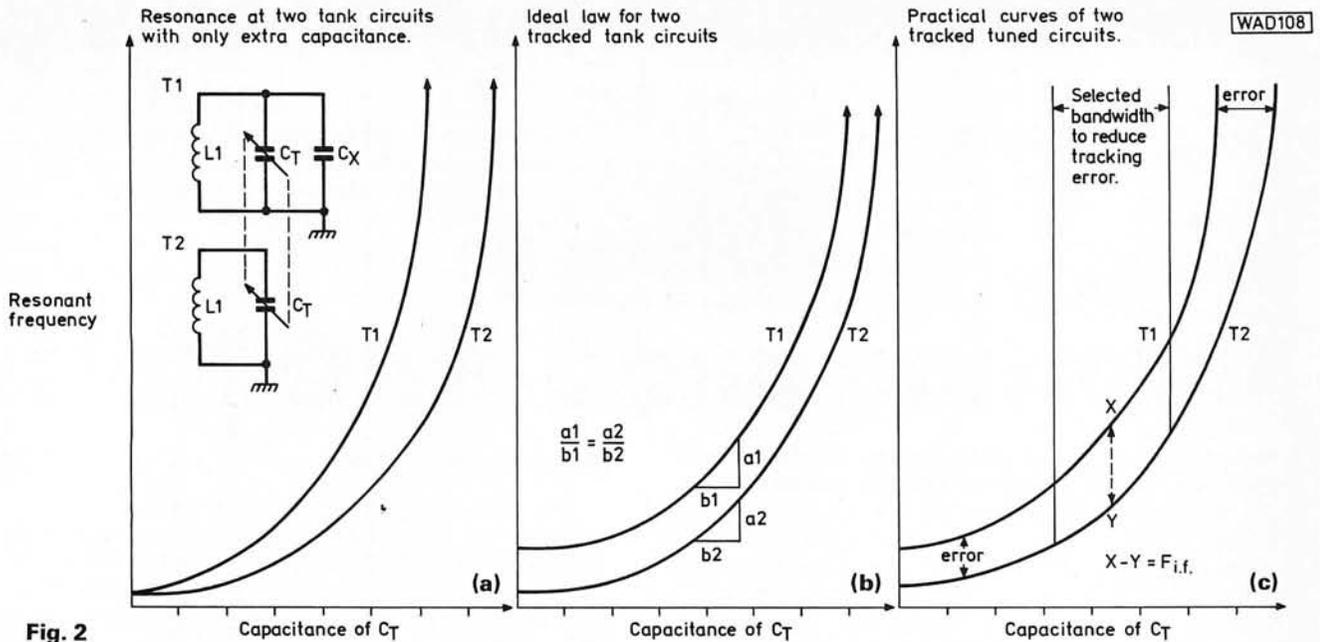


Fig. 2

simply adjusting one factor defining the resonant frequency of the circuit, we will certainly not get the ideal curves we require. The ideal curves are shown in Fig. 2(b). Notice how the curves for each idealised network have the same gradient, and that all along the graph the following relationship will apply.

$$F_{i.f.} = F_1 \pm F_2$$

This is impossible to achieve in practice, but a close approximation can be obtained by adjusting both the capacitance and the inductance of one of the circuits to obtain the graph shown in Fig. 2(c).

The capacitance and inductance are arranged so that the i.f. is correct at the centre of the band being tuned. Tracking errors then increase from the centre of the band toward the edges, and can therefore be reduced by keeping the band as narrow as possible.

Even when the designer went to the trouble of using a relatively high first i.f., he still needed to design the pre-selection and local oscillator circuits to track one another, because the filtering arrangement normally did not have a very high Q . Consequently the shape of the first i.f. response curve suffered, allowing any nasties appearing at the output of the mixer to bully their way onto the i.f. strip.

Having described the trouble the engineer has to go to get a decent signal into the first mixer, we will now look at the mixer itself.

The Mixer

The mixer was usually an active device, which found itself working in the non-linear portion of its characteristic curve. Any device operated in this way is liable to various forms of instability if it's not very carefully designed. Drive levels to the device will also be very different over the whole of the r.f. spectrum so some form of a.g.c. to this stage is very desirable; this needs to be done to prevent the circuit from becoming unstable should a very large signal appear at the input to the mixer. Thus the mixer needed as wide a dynamic range as possible in order that it could cope with the tiny signal of the DX, as well as "Bodkins wif-de-linear" five doors down the road, without causing cross-modulation in later gain stages.

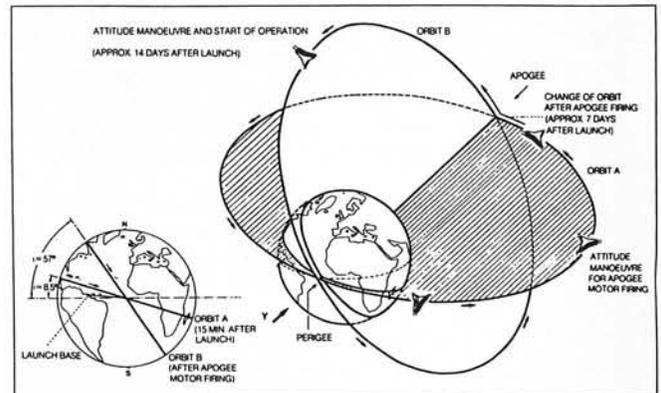
The need to provide the small tuning bands, to reduce tracking errors as previously described, coupled with the complexity of switching and aligning them, must have caused would-be constructors to give up. I am sure that I would have been numbered with them.

Part 2 will look at the modern approach to receiver design and how the latest technology has helped.

INTRODUCING OSCAR 3

▶▶▶ continued from page 35

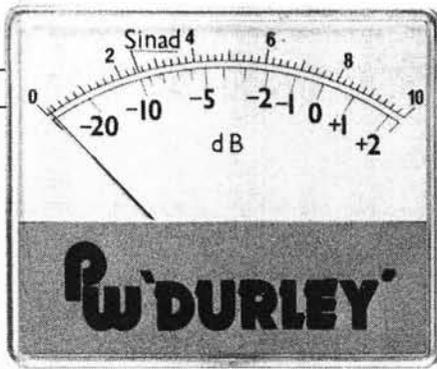
May 1980. Unfortunately, one of the first stage engines of LO2 failed and the vehicle and its payload ended up in the Indian Ocean instead of in earth orbit. AMSAT immediately authorised the completion of the back-up



Phase 3b launch/orbit details

AMSAT-UK/ESA

satellite 3b which is now awaiting launch on a later Ariane vehicle. It was initially hoped that this would take place in 1982, but further problems have taken place with the launch vehicle and it is now likely that it will be at least mid-1983 before another attempt to put the Phase 3 satellite in orbit will be made. However, it should be worth waiting for!



by E.A. RULE
Part 2

Distortion and SINAD Meter

Following the circuit considerations of Part 1 the second part of this article details the constructional phase of this versatile instrument.

Construction

Although full construction details are given, many readers will prefer to construct a chassis to match in with existing equipment. There is nothing against this, but great care should be taken to ensure that screening between the various sections and their general layout is carefully followed as shown. This aspect of construction is most important as we are dealing with circuits that have a high overall gain between input and output ($\times 10\,000$) and which are also of relatively high impedance. Particular attention should be given to the way switching has been carried out, **do not** be tempted to use less wafers to save on switching costs because stray capacitance coupling across switches can completely prevent satisfactory operation. (The author found out the hard way!)

Front Panel and Chassis

The rear layout of the front panel is shown in Fig. 2.1 and consists in fact of one sheet of aluminium folded into an "L" shape. No measurements are given for the indicating meter cut-out as this will depend on the type used, but it should be arranged so that its vertical centre line is on the same line as the voltmeter range switch. All other front panel measurements may be obtained from the two-thirds scale Fig. 2.1. The printed circuit mounting holes are best positioned by laying the finished boards in place and marking through their holes and then drilling the chassis to suit.

Details of the screens required are shown in Figs. 2.1, 2.2 and 2.3. The one mounted over the bridge section is best made from thin tinplate which is easy to form and can then be soldered into its final position with the help of solder tags fitted to switch S3 and the bridge potentiometers. Alternatively, brackets could be used and screwed to the front panel, but this would mean that the screws would be seen from the front. The other screen is made from aluminium and fixed in position by screws in the chassis.

The meter movement will also need screening while the unit is being tested without the main screens in place. This screen is formed by wrapping a thin tinplate strip around the meter and connecting to earth as shown in the main layout wiring diagram. It can then be left in position permanently. Calibration marks for the dB scale of the meter can be obtained from the prototype photograph used in the heading.

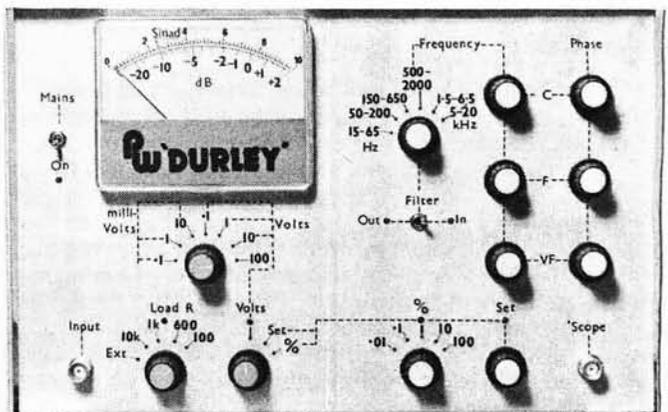
Case Construction

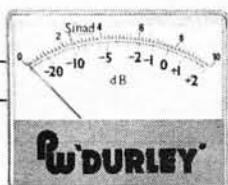
This is simply a wrap-around case made from one sheet of aluminium to form the top and sides to which is fitted another folded aluminium sheet to form a back. A commercial case of suitable size could be used for the PW Durley, with the overall size of the front panel/chassis modified to suit.

Control Assembly

If switch kits are used to make up the main switches these should be assembled first. They should be carefully checked to ensure that they are correctly assembled and that the end stops are in the correct positions. Check all wafers for position and don't forget the metal screen fitted between the wafers, this screen is very important. The FREQUENCY selector switch S3 has a dummy wafer fitted in its centre and this is used to anchor the common ends of capacitors etc. The required spacing of the various switches will be shown in Part 3, and is correct for the switch types specified. Other types of switch may need modified spacing. When mounting the finished switches onto the panel, make sure the wiper contacts are positioned as shown in the diagrams.

The various potentiometers, i.e.d.s and sockets can be assembled and when all controls have been fitted the two screens should be checked for size and fixing. These screens should then be removed while wiring is carried out. The meter should be fitted last, after any extra drilling or filing has taken place. Control spindles should of course be cut to the correct length to suit the knobs before fitting onto the panel.





★ components

Resistors

$\frac{1}{4}$ W 2% Carbon film

9.1 Ω	1	R37 (100 Ω and 10 Ω paralleled)
82 Ω	1	R36
91 Ω	1	R31 (100 Ω and 1k Ω paralleled)
820 Ω	2	R30, 35
8.2k Ω	2	R29, 34
82k Ω	2	R28, 33
820k Ω	2	R27, 32

$\frac{1}{4}$ W 5% Carbon film

100 Ω	2	R4, 19
150 Ω	3	R67, 68, 64
470 Ω	2	R24, 26
560 Ω	2	R65, 66
600 Ω	1	R3 (2 \times 1.2k Ω paralleled)
820 Ω	1	R72
1k Ω	9	R2, 9, 10, 18, 41, 49, 56, 61, 62
2.7k Ω	1	R70
5.6k Ω	4	R21, 51, 54, 58
10k Ω	4	R1, 38, 40, 47
15 Ω	1	R42
22k Ω	2	R13, 14
27k Ω	1	R43
47k Ω	1	R7
100k Ω	8	R39, 46, 48, 50, 53, 57, 60, 69
120k Ω	2	R16, 44
1M Ω	2	R17, 71

1W 5% Carbon film

2.7k Ω	4	R5, 23, 45, 63
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Miniature horizontal preset

10k Ω	3	R52, 55, 59
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Linear Carbon track potentiometer

2k Ω	1	R25
5k Ω	3	R8, 11, 22
100k Ω	2	R6, 20

Ganged linear potentiometer

100k Ω	1	R12/15
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Capacitors

Polyester

10nF	2	C6, 7
22nF	1	C17
32nF	2	C4, 5
68nF	1	C18
0.1 μ F	6	C2, 3, 22, 29, 41, 42
0.22 μ F	3	C1, 19, 21

Polystyrene

33pF	1	C26
220pF	1	C25
330pF	2	C12, 13
680pF	1	C14
1nF	6	C10, 11, 20, 35, 40, 49
2.2nF	1	C15
3.3nF	3	C8, 9, 28
4.7nF	2	C30, 31
6.8nF	1	C16

Electrolytic single-ended p.c.b. type

2.2 μ F (63V)	6	C32, 34, 38, 46, 47, 50
22 μ F (16V)	5	C27, 33, 36, 37, 39
22 μ F (50V)	2	C48, 51
470 μ F (63V)	3	C43, 44, 45

Air spaced trimmer

5 – 65p	1	C24
C23	1	see text
Cx	1	see text

Semiconductors

Integrated circuits

LF353	3	IC1, 2, 3
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Diodes

BZX61C18V	2	D11, 12
OA202	4	D13, 14, 15, 16
TIL209	7	D1, 2, 3, 4, 7, 9, 10
1N4148	3	D5, 6, 8

Switches

Midget wafer

1p 6w	1	S4
2p 6w	1	S1

Rotary switch assemblies

2p 7w	1	S5
4p 6w	1	S3
8p 3w	1	S2

Miniature toggle

d.p.s.t.	1	S7
d.p.d.t.	1	S6

Miscellaneous

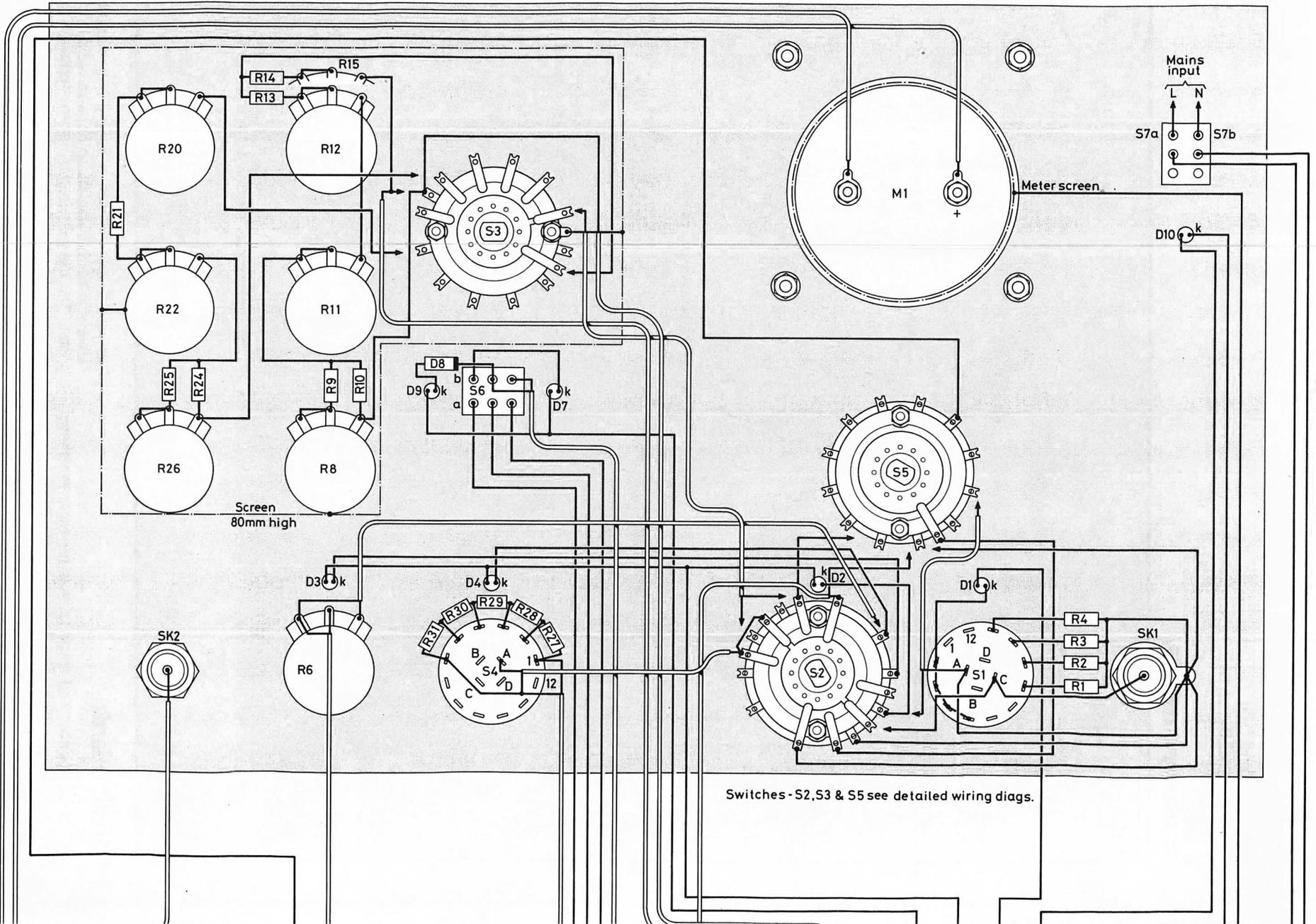
20–0–20V 6VA transformer; 1A bridge rectifier; 0–1mA f.s.d. meter RS 259–640 or equivalent; aluminium sheet; p.c.b.s; BNC sockets (2); knobs (12)

Circuit Boards

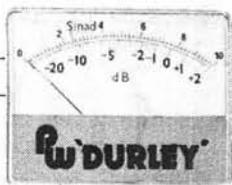
The component and track layouts for these are shown in Fig. 2.1, no problems should be encountered.

Start assembly with the smaller components and progress to the larger ones as assembly proceeds. Pay particular attention to the polarity of electrolytics and diodes

as with a split rail power supply the negative end is not always at earth potential, so be extra careful regarding this point. The use of Veropins for the terminations is recommended, although some constructors may prefer to solder the wires directly through the holes onto the copper track. The author prefers the use of pins as it makes it easier to remove the board for any reason at a later date.



Switches - S2, S3 & S5 see detailed wiring diags.



Once the components have been assembled into the board, the tinplate screen (Fig. 2.3) can be fitted over the input end of the main p.c.b. It is held in place by soldering to the earth pins, numbered 17, 18 and 19. A strip of Sello-tape is wrapped around part of its bottom edge to prevent possible shorts to the i.c. pins or components.

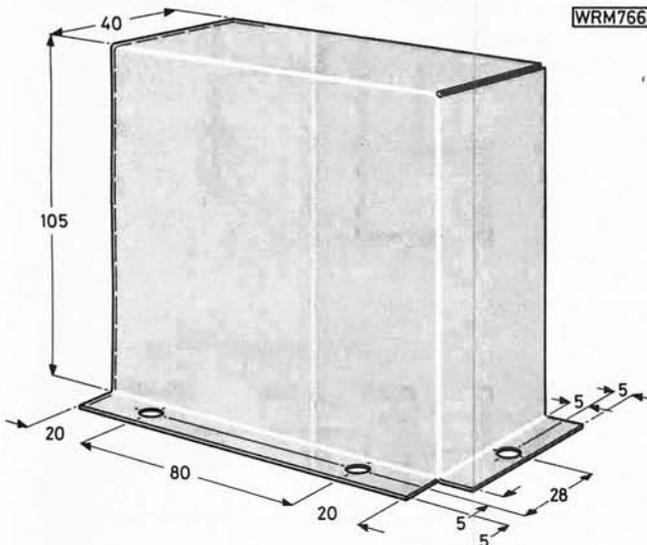
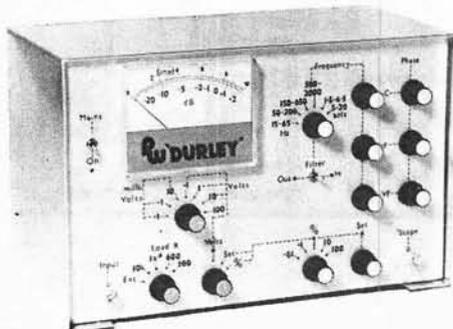


Fig. 2.2: Details of the 18 s.w.g. folded aluminium input section screen located over SK1, S1, 2 and 5

Final Wiring

As only low current is flowing, the wire gauge may be small and 7/0.2mm (0.22mm²) tinned copper wire with pvc insulation is suitable. A number of different colours will be found helpful in identifying the various circuits. The screened wire may be of the lapped braid type approximately 2mm diameter with a 7/0.1mm inner conductor.

The switches should have their components fitted before they are assembled onto the front panel and the layout and connections for these are shown in Figs. 3.1, 3.2 and 3.3 for the main switches. The layout for the other switches can be seen in the main wiring diagram, Fig. 2.1. **Warning:** When soldering components to the three main switches use only the minimum amount of heat and solder to ensure a good joint as the solder tends to flow along the switch contact into the centre and blocks the end. Once this has happened it is almost impossible to remove and the switch



is ruined. A pair of long-nosed pliers used as a heat shunt will be found helpful. This is something else the author found out the hard way, so be warned!

It should be noted that certain screened leads only earth by their braiding at one end. Others are earthed to certain earth points which may not be the nearest to where the inner connects. This is done deliberately so as to avoid earth loops which could prevent low signal measurements.

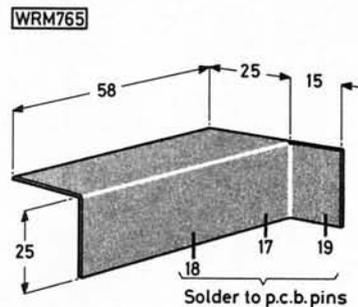


Fig. 2.3: The folded tinplate p.c.b. screen

Remember that properly constructed this instrument can measure signals as low as 20μV—this level of signal is often less than that arriving at the average radio antenna! Once wiring is complete it can be tidied up by the use of cable ties. The unit is now ready for testing.

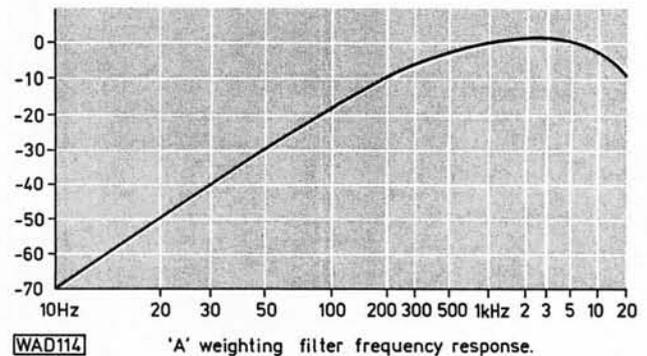


Fig. 2.4

Testing and Setting-up

The following minimum equipment is required to set up the *PW* SINAD/IHF meter. The inherent accuracy of the equipment used will determine the final accuracy of the meter and because of this should be of the highest standard possible.

1: An audio signal generator with either a calibrated output attenuator or a calibrated output meter. The generator should cover the frequency range of at least 15Hz to 100kHz and be level to ± 0.25 dB over this range, or better. The actual voltage output level should also be known to within 0.25dB or better.

Alternatively, a lower quality signal generator could be used with an accurate voltmeter and frequency counter to monitor its output.

2: An oscilloscope with a sensitivity of at least 1V/cm (most are much better than this).

3: A multi-range meter for checking voltages around the circuit.

Part 3 — Setting-up, uses and test procedures.



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RADIO COMMUNICATION & SUNSPOTS

by John Kennewell*

The radiations that we receive from our sun, catalogued by astronomers as a main sequence G2 type star, provide the right conditions for the existence of life on the earth. Its radiations also provide us with the ionosphere, a series of ionised layers from about 80 to 500km in altitude which allow us to communicate around the world on the h.f. (short wave) bands.

Solar Ionising Radiations

Both X-rays and hard ultraviolet (uv), with wavelengths from around 1000 to 1 Ångstrom (Å) (an Ångstrom is equal to one hundred millionth of a centimetre), are the main source of ionising radiation responsible for producing and maintaining the ionosphere.

The ionosphere consists of not one, but several different layers of ionisation, Fig. 1. The most important of these are the D, E and F layers, although by day the F layer splits in two: the F₁ and F₂ layers. The reason that different layers are formed is that the atmospheric composition changes with altitude and different wavelengths of uv or X-radiation interact with different molecules or atoms and thus a layered structure results. Ionisation occurs by the process of knocking one or more electrons off an atom or molecule in the atmosphere. The resulting free electrons form a conductive cloud which is able to reflect radio waves.

The larger the number of free electrons that exist in a particular layer, the higher the frequency that can be reflected by that layer. The maximum usable frequency (m.u.f.) for a radio circuit where the ground take-off angle is A (see Fig. 1) is given by the formula:

$$f_{m.u.f.} = \frac{9\sqrt{N_{max}}}{\sin A} \quad (\text{Equation 1})$$

where N_{max} is the maximum concentration of free electrons per cubic centimetre of the layer. The critical frequency for a layer is equal to the m.u.f. when the angle of incidence is 90 degrees. That is, when the transmission is directed vertically upwards. Although this situation is not particularly useful as far as communication is concerned, it does allow us to measure indirectly (via equation 1) the state of the various ionospheric layers.

The ionising radiations that produce the ionosphere arise in the upper atmosphere of the sun and increase with the number and extent of "active" regions on the sun.

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These regions are manifest in various spectral emissions from the solar chromosphere as light areas called **plage**, Fig. 2. One of these narrow bands of radiation is produced by hydrogen at a wavelength of 6563 Å and has a beautiful red colour which may be seen with the aid of an appropriate filter or a spectrohelioscope. The underlying agency responsible for the active region is a system of concentrated magnetic fields. Usually at some stage during the lifetime of these active regions a phenomenon occurs which is visible in white light and that is the development and growth of a sunspot group on the solar disc. Sunspots are relatively cool areas which appear dark on the otherwise brilliant surface, Fig. 3(a). When examined with greater magnification it can be seen that the larger spots have an internal structure. The central dark region called the **umbra** is surrounded by a somewhat lighter filamentary area called the **penumbra**, Fig. 3(b).

We have written evidence that man has been aware of sunspots for at least two millenia, but it has only been since the development of long range communication that they have had a vital significance for us. Because sunspot groups are associated with solar active regions, and because these are associated with solar and X-ray emissions, which in turn produce free electrons in the ionosphere, we might naturally assume that there is some correlation between the number of sunspots on the solar surface and the m.u.f. over a given communication path. This is indeed so, if we choose the right "index" to represent the sunspot population on the sun at any one time.

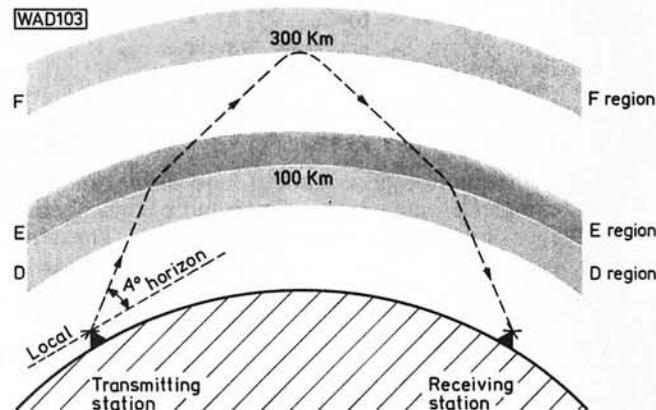


Fig. 1: Outline of the ionosphere. Region F, which reflects h.f. and is formed by uv radiation from 100 to 1000Å, contains the bulk of free ionisation. The E region reflects m.f. at night (when the D region does not absorb) and is produced by radiation from 10 to 100Å. Region D is an ill-defined layer which causes radio-wave absorption and is produced by uv wavelengths greater than 1000Å during quiet solar conditions or by 1 to 10Å X-rays from solar flares

The Sunspot Number

It is not sufficient simply to count the number of individual spots, because the surface area covered by each sunspot may vary enormously. It would, of course, be possible to measure the total area occupied by sunspots and it turns out that this method does in fact yield a good index of solar activity. However, the measurement of area requires accurate equipment, good drawing skill and a considerable amount of time — fortunately this is not necessary.

Around the middle of the last century Rudolph Wolf, the first director of the Zurich Federal Observatory,

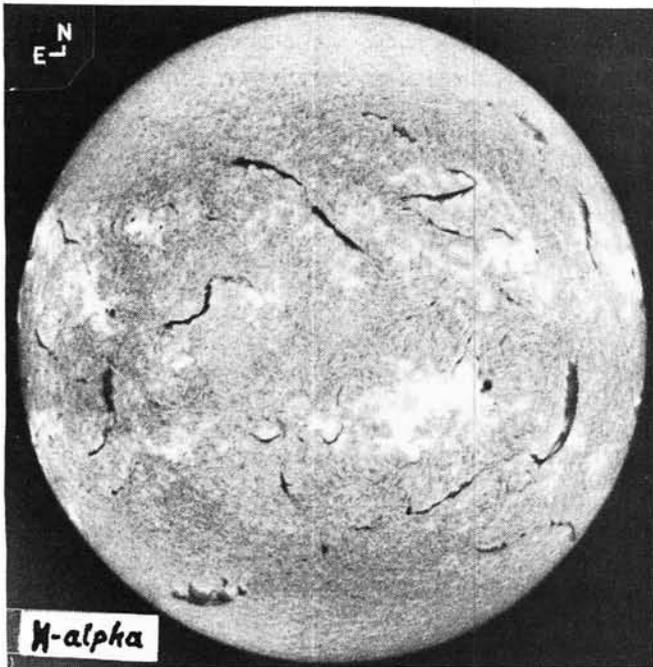


Fig. 2: Photograph of the sun as seen in the light of hydrogen at a wavelength of 6563Å. The light areas called plage indicate active regions on the sun. The dark ribbons are termed filaments and are huge clouds of gas suspended in the solar atmosphere by magnetic forces

Learmonth Solar Observatory Photograph

defined a relative sunspot number by the formula:

$$R = k(10g + s) \quad (\text{Equation 2})$$

where g is the number of sunspot groups visible, and s is the total number of individual spots, or more correctly the total number of umbra, comprising these groups. The term k is an observer correction factor, close to one which takes into account different observing equipment and observer efficiency or "overeagerness". An uncorrected relative sunspot number would use a value where $k = 1$. It can be seen that this formula gives more weight to the number of groups or in effect the number of active regions on the sun. Although the formula is really an arbitrary one, it is amazing how well this number, when averaged over a month, or a year, has stood the test of time in correlating with many varied geophysical events.

As discussed before, the m.u.f. for a particular circuit, at a given time of day, shows variation according to the value of the monthly mean sunspot number. The variation is not complete because of the influence of other factors, the largest being a superimposed annual cycle. This cycle is due in small part to the changing earth-sun distance throughout the year, but mostly due to the changing angle at which the sun's radiation is incident on the upper atmosphere — the same effect that gives us the seasons.

Even monthly mean values of the relative sunspot number can show large variations from month to month and so it is common to compute a smoothed sunspot number R_s for a particular month. This is produced by averaging together the monthly values from $5\frac{1}{2}$ months before to $5\frac{1}{2}$ months after the particular month in question. When this is done and the value is plotted over many years, the display shown in Fig. 4 is obtained. The well known solar cycle of approximately 11 years between successive peaks is clearly apparent. The value of R_s can drop to 10 at times of solar minimum and has risen to almost 200 during the peak of 1957-58. This was the highest value ever seen in

over 300 years of record keeping and corresponded with m.u.f.'s that exceeded 70MHz over some communication paths.

There is one other index of solar activity that should be mentioned and that is the value of solar radio noise at 3GHz or a wavelength of 10cm. This value follows the smoothed sunspot number quite closely (Fig. 5) and has the advantage of being totally objective, as compared with the subjective element that exists in sunspot counting. However, the relative sunspot number is likely to be with us for a long time to come, particularly in amateur circles, due in part to the comparative difficulty of constructing equipment to measure accurately radio signals on microwave frequencies.

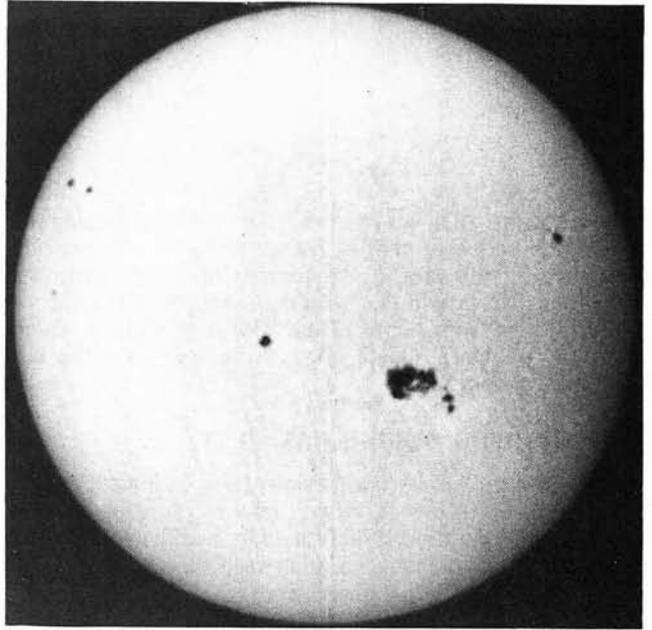
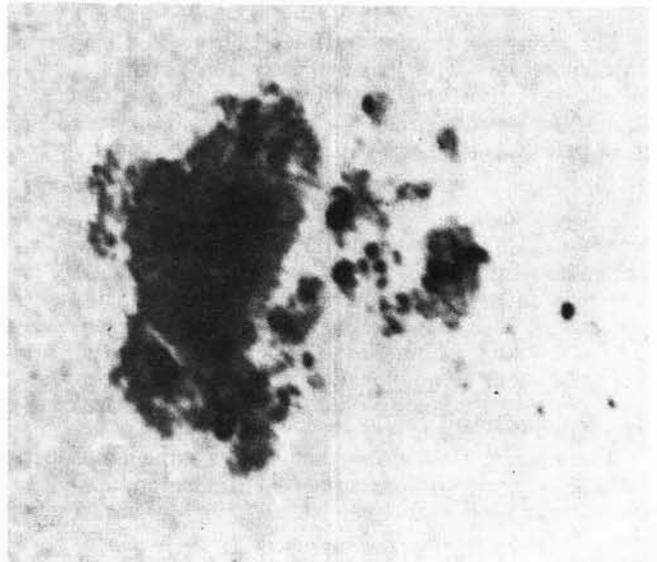


Fig. 3: Photographs of the sun taken in "white" light. (Above) Full disc shows a number of spots formed into groups dotted across the surface. (Below) An enlargement of a group shows that spots have an internal structure with dark central umbra surrounded by the lighter penumbra

Learmonth Solar Observatory Photographs



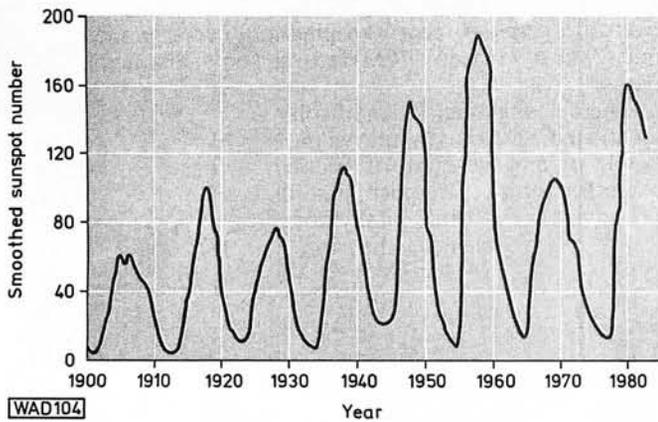


Fig. 4: A plot of the sunspot number over the years of significant long range radio communication clearly shows the approximately 11 year long solar cycle

Observation and Drawing

Counting sunspots is an activity that can be accomplished with reasonably modest equipment. **Never attempt to look at the sun directly, either through a telescope or with the naked eye.**

A small telescope or even a pair of binoculars can be used to project an image of the sun onto a clean white surface. It is usually necessary to shield this surface from direct sunlight and this is most easily achieved by placing a screening board at the objective lens or eyepiece of the telescope. A small hole of the appropriate size will let through the desired light, Fig. 6.

To trace the sunspots accurately it is almost essential to have some kind of motor driven tracking on an equatorial mount. However, accurate drawing is not really required for the calculation of sunspot number. Even so, it is still a good idea to attempt at least a rough tracing of the image; the reason for this will be seen later.

Whatever equipment is employed, a tracing sheet should be prepared beforehand. This should include a

circle of appropriate size and identification as to date and time drawn. Comments regarding equipment used, and viewing conditions are also helpful. Where possible, the viewed image should be at least 100mm in diameter, although this may be difficult to achieve with small binoculars. A compromise is also necessary here in relation to image size and image movement — the larger the image, the faster it will appear to move across your tracing sheet. It is thus necessary to develop a technique of rapid sketching combined with frequent movement of the sheet. Even when a motor driven telescope is used and the tracing sheet can be stuck to the projection board, a small white card should be oscillated across a particular region just before drawing, in order to help distinguish real features on the sun from spots present in the manufacture of the drawing paper.

Once the sunspots have been traced, or at least a careful inspection of the solar surface has been carried out, it is necessary to determine the number of spot groups present. This is usually the most difficult part of the whole procedure, and even the definition of a group does not help us much here. A sunspot group is defined as being all those spots belonging to the same magnetic system. This is sometimes the only way that two close groups can be told apart, but it is not at all helpful to the observer who has no access to a solar magnetograph (and this even includes many specifically solar oriented observatories). How then, can we determine the number of sunspot groups at any time?



Fig. 6: A simple makeshift set-up for viewing projected solar images employs a pair of binoculars (only one monocular used), a shielding board and an imaging board. This apparatus was actually used to view a solar eclipse in 1976 high on top of a mountain in SE Australia. The author's wife records temperature and light values in the background. Eclipses historically helped identify the agencies responsible for producing the ionosphere

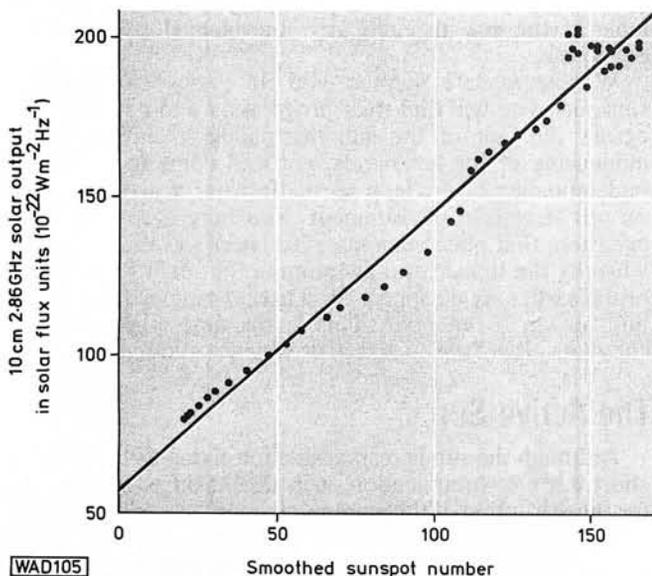


Fig. 5: This plot shows the degree of correlation between smoothed sunspot number and the radio output from the sun at 2.8GHz (for the current solar cycle)

Sometimes the sun is kind to us and all the groups are well separated from one another, Fig. 7(a), thus providing no difficulty in identification. In the case where there are many spots fairly closely bound, Fig. 7(b), there are two main characteristics that may help us to decide whether there is one or more than one group present.

The first fact to remember is that all groups start life as a single or small group of black dots called **pores**. These may initially be only 2000km across and are very difficult to see on a small scale projection. They then proceed through several stages of the evolutionary sequence depicted in Fig. 8. Not all groups go through all stages. Some

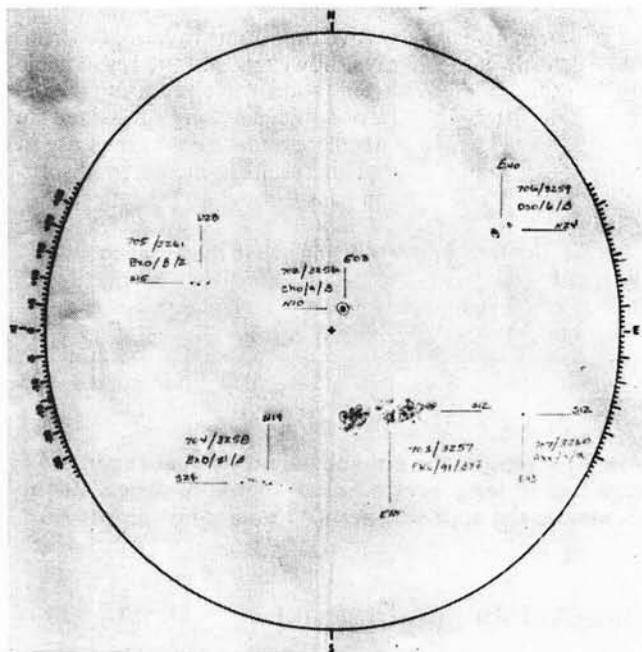
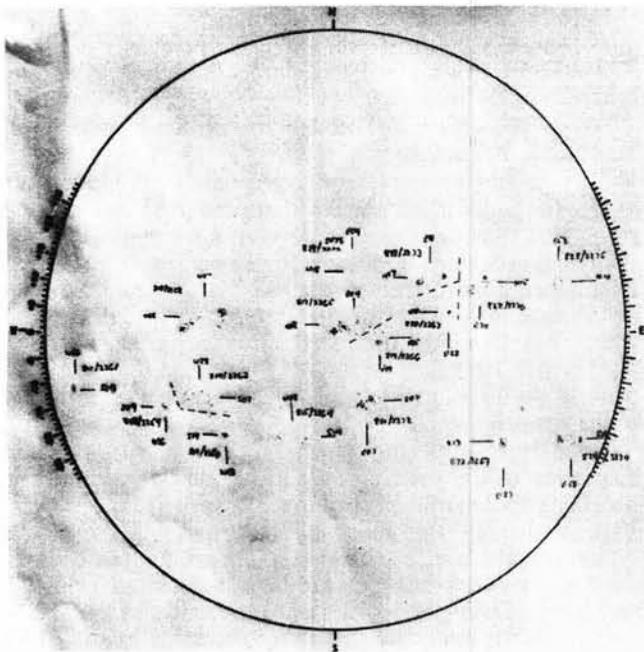


Fig. 7: Sunspot drawings illustrating cases where (left) six groups are clearly separated over the face of the sun and (right) a multiplicity of closely spaced groups makes identification very difficult

Drawings: Learmonth Solar Observatory

may start at A and develop right through to D and back again, while others may only go through the sequence A-B-A. When a large D group decays it may end life as an H-spot which slowly disappears. It is also possible for a group that has nearly decayed to reform again.

The second fact that may help us unravel the groups is the time factor. If two or more groups exist side by side, it is unlikely that they will be in the same stage of their life cycle. Observation of the sun over several days is likely to show the different groups developing at different times. Herein lies the importance of keeping your daily sketches. Comparison of records on a daily basis will resolve many group division problems. Of course, if two close groups suddenly rotate into view around the sun's east limb, it may be necessary to go back and correct your records of sunspot number after you have observed them decay at separate rates. Even with the foregoing knowledge, sorting out close groups can be a problem. The only consolation is to realise that even the professionals "get it wrong" on occasion.

After the groups have been sorted out, the total number of spots must be counted. This should be done a group at a time using the oscillating card technique mentioned before. When finished, your daily sunspot number can be calculated by substituting the appropriate values into equation 2. For the moment you should use a value for k of 1. When you have a whole month's data an average value for that month can be computed. Obviously there will be some missing observations due to clouds, etc. Remember when calculating the average, to divide only by the number of days that you could observe the sun and calculate R .

If you continue your observations over several months, it is possible to scale your observations so that they are in accord with the world accepted Zurich or International sunspot values (from January 1981 the Brussels observatory has taken over this function from Zurich). It is necessary to locate a source of these numbers for comparison with your own. Sunspot numbers are published regularly in the *Journal of Geophysical Research* and also in a number of amateur radio publications. Your observer correction factor k can then be found by dividing the

Zurich (International) number by your sunspot number for the same month. For accuracy, this should be done for several months and the values of k so obtained averaged. This average k value can then be used at any time in the future in equation 2. It is, of course, not necessary to go through the above procedure in order to examine trends in sunspot number: the uncorrected value is perfectly adequate.

Before leaving the subject of observation and drawing, it should be pointed out that sunspots can be counted from a photograph. A student in an astronomy class that the author recently conducted obtained good sunspot photos using a 35mm camera, a telescopic lens and lots of neutral density filters. A note of caution should be issued here. The sun emits sufficient radiation in the visible and infrared to be dangerous to the naked eye. When focused by an optical system it will quickly destroy any retina. **Never look at the sun through any unprotected telescope or equivalent.**

Whichever safe method you do choose to examine sunspots, you will find their progression and development across the face of the sun fascinating. Combined with monitoring of the h.f. bands, you will come to a greater understanding of the long term effect our nearest star has on our terrestrial environment. You may even notice on occasion, that phenomenon called short wave fade (s.w.f.) whereby the signal from a station in the sunlit hemisphere of the earth may disappear for a period ranging from a few minutes up to an hour. This is the time when the sun shows its other face — a face of violence and turmoil.

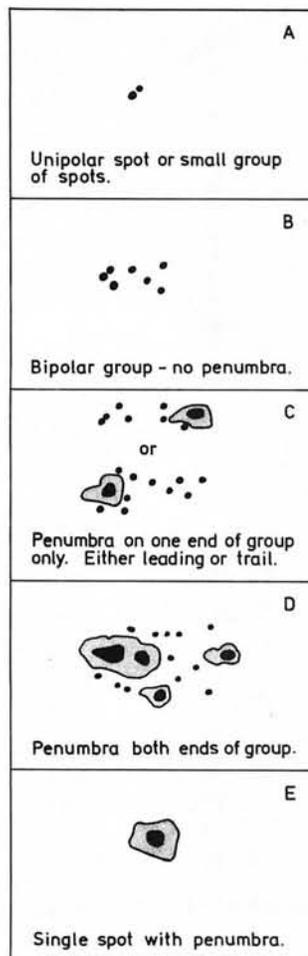
The Active Sun

Although the sun is responsible for giving us long-range short wave communication, it is also at times responsible for the disruption of this communication.

Occasionally the enormous energy stored in the solar magnetic field concentrations is released over a short time interval and large numbers of high energy, or hard, X-rays are produced. Simultaneous with this release it is usually possible to observe a sudden brightening, or flare at the red Hydrogen-alpha wavelength, and also an abrupt in-

crease in the solar microwave output at wavelengths from 3 to 10cm. It is the X-rays, however, that are responsible for the radio fades. With very short wavelengths, in the order of 1 to 10 Å, they have sufficient energy to penetrate to the bottom of the ionosphere and cause an increase in ionisation of the D layer. This results in increased absorption of radio waves as they pass through to the reflecting F layer.

It may at first appear strange that the F layer reflects radio signals whereas the D layer absorbs. This can be understood by examining the way in which a cloud of electrons interacts with r.f. Basically, when the high frequency



WAD106

Fig. 8: Diagram roughly illustrating the various evolutionary or developmental stages through which a sunspot group may pass. The words unipolar and bipolar refer to the magnetic fields present

signal encounters the electrons, it sets them into oscillation at the frequency of the r.f. signal. In the process, the electrons have extracted energy from the wave. These oscillating electrons then act as miniature individual transmitters and re-radiate the signal. The relative phase difference between the electrons is such that the signals tend to reinforce each other in the direction of mirror type reflection and cancel elsewhere.

This process can only occur efficiently if there are a negligible number of neutral atoms or molecules in the surrounding atmosphere, as is typical at F layer heights. At the height of the D layer, the atmosphere is sufficiently dense such that collisions occur between the oscillating

electrons and other molecules, before the electrons have a chance to radiate much energy. The net effect is an absorption of the exciting r.f. signal. The energy that is absorbed appears as heat energy (albeit small) at the height of absorption.

In very energetic solar flares, atomic particles, most importantly protons, are often released. These may reach earth in a matter of days or even hours, and cause further disruption to communications, especially at high latitudes around the polar regions.

Many questions have yet to be answered about processes occurring on the sun and about their effect on the earth. One field of particular interest to communicators is the ability to predict solar flares before they happen. Intensive research on this subject has so far provided no really satisfactory answers — only continued intensive observations, both on the earth and in space, can lead us toward more answers.

Additional Reading

For those who wish to pursue any aspect of this article more deeply the following texts are recommended.

Sun, Earth and Radio J A Ratcliffe, World University Library (1970)

The Face of the Sun H W Newton, Penguin (1958)

Skysighting — Photography for Amateur Astronomers R N Mayall and M W Mayall, Dover (1968)

Introduction to Solar-Terrestrial Phenomena and the SESC S J Mangis, NOAA TR ERL 315-SEL 32 (1975)

This last reference contains a wealth of information and may be purchased from: Superintendent of Documents, US Government Printing Office, Washington DC 20402 as stock number 1978-0-777-067/1249.



Have Pye Vanguard (f.m. modified) 144MHz transceiver complete with mic, control box, all leads (spare set for mobile use), crystallised S10, S14, S20, S21, S22 and R6, repeater tone burst fitted. Would exchange for a general coverage receiver. Tel: Manchester 061 766 5200. Q859

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Have Harvard 410T hand-held CB, 2.5W f.m., boxed, carrying case and strap also fly lead for external antenna. Would exchange for 144MHz scanner or receiver. S. Talbot, Menu, Town Lane, Chartham Hatch, Canterbury, Kent. Tel: Canterbury 738747. Q879

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ANTENNAS PART 3 F.C. JUDD G2BCX

In the last part of this article we dealt with the basic function of the helical antenna and its relatively wide bandwidth characteristic.

A helical antenna is, of course, circularly polarised and reception/transmission, to and from a linear antenna, either vertically or horizontally polarised, produces an inherent loss of effective transmitted power or effective received signal of 3dB. Circular polarisation has, however, at least one advantage and a useful one at that. Considerable fading over a distance of 50 or 60km can occur when the polarisation of the wave from a linear antenna, horizontal or vertical, becomes twisted. This effect is not unknown over even shorter distances and can frequently be permanent due to other local or environmental causes. The use of a circularly polarised antenna can obviate this effect to a very marked degree in that regardless of polarisation changes to the wave from a linear antenna, the signal received with a helical antenna will never be more than 3dB down.

Helical antennas are widely used for satellite operation because of the often constantly varying polarisation that can occur on signals transmitted from orbiting satellites. It

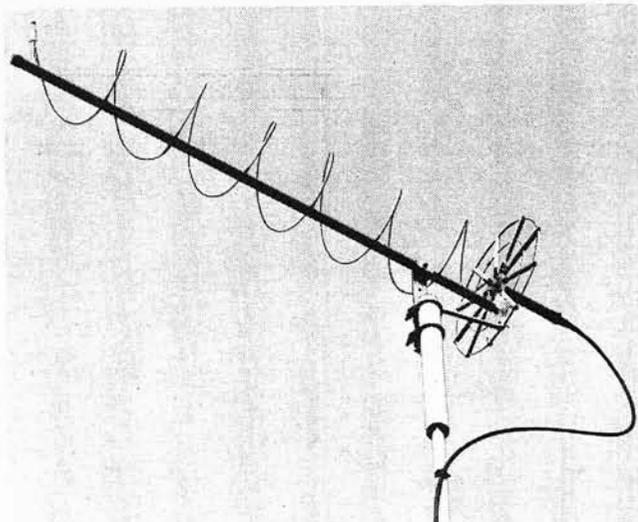


Fig. 3.1: The author's prototype six turn helical antenna

must be remembered, however, that circularly polarised waves revolve in the direction of the turns/pitch (or thread) of the antenna helix and that a right-hand orientated wave will be very poorly received by a helical antenna with a left-hand orientated helix. The loss due to circularly polarised waves orientated in opposite directions, i.e. one clockwise and one counter-clockwise, is in the region of 30dB. It can be said fairly simply that helical antennas can be "left or right-hand threaded".

Helical Antenna for 432MHz

A six or seven turn helical antenna with a circular plane reflector having a diameter of approximately $\lambda/3$ has an input impedance in the region of 140 ohms and therefore requires a matching transformer to provide a direct connection with a normal 50 ohm coaxial feed cable. This matching section can take the form of a $\lambda/4$ section (Ztr) of coaxial line with a self-impedance of approximately

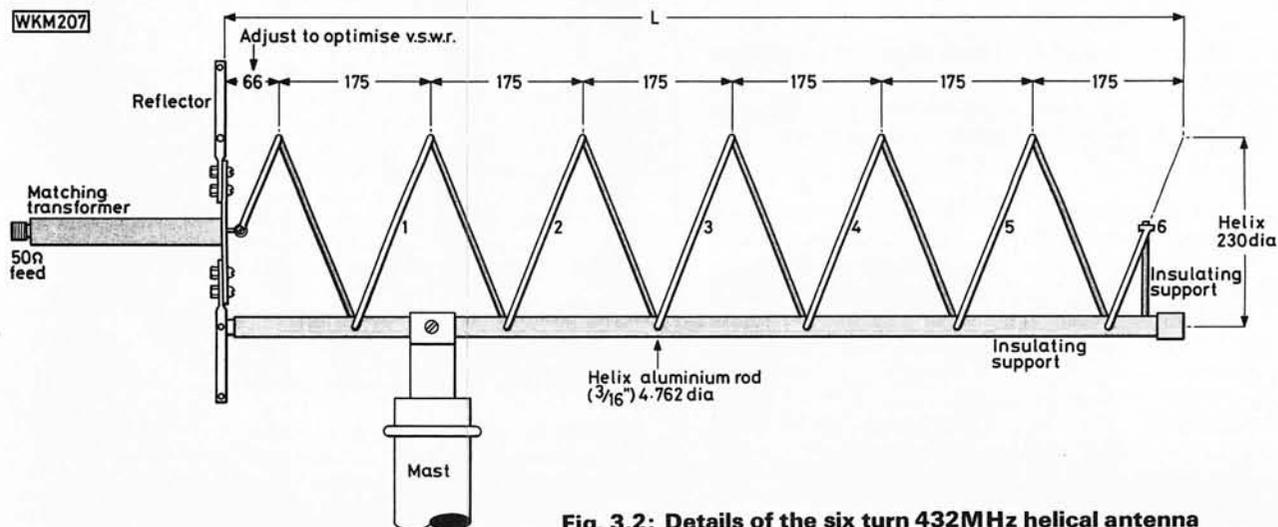


Fig. 3.2: Details of the six turn 432MHz helical antenna

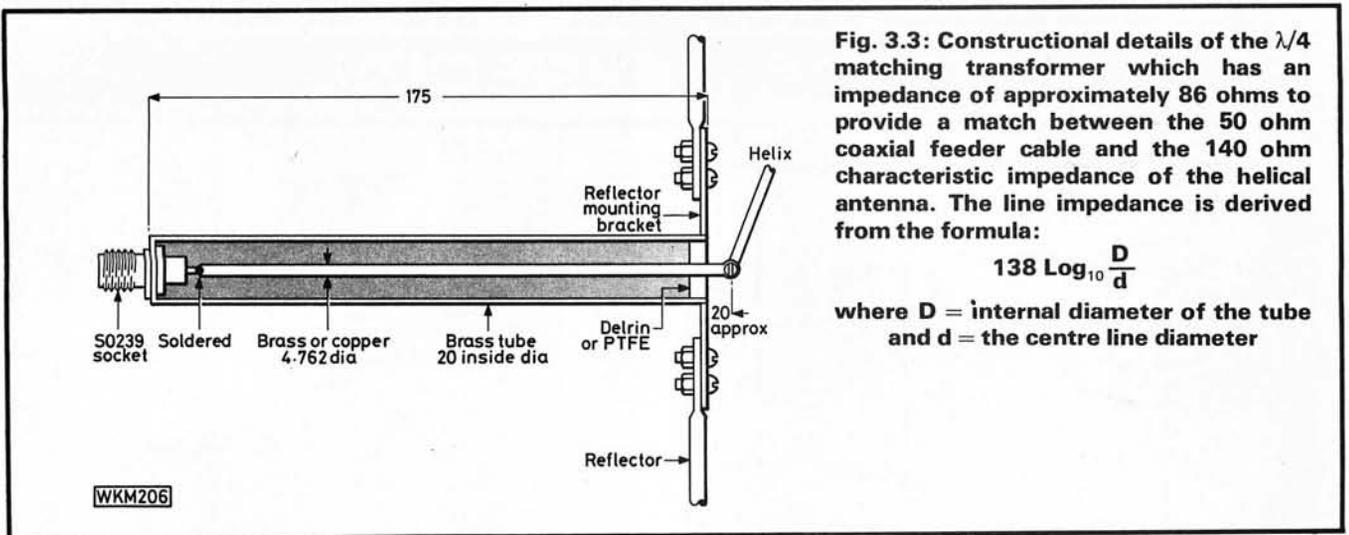


Fig. 3.3: Constructional details of the $\lambda/4$ matching transformer which has an impedance of approximately 86 ohms to provide a match between the 50 ohm coaxial feeder cable and the 140 ohm characteristic impedance of the helical antenna. The line impedance is derived from the formula:

$$138 \log_{10} \frac{D}{d}$$

where D = internal diameter of the tube and d = the centre line diameter

$\sqrt{Z_o \times Z_a}$, where $Z_o = 50$ ohms and Z_a is the drive impedance of approximately 140 ohms to the helix. This gives a value for Z_{tr} as $\sqrt{50 \times 140} = 83.6$ ohms. The nearest obtainable impedance to this value using standard dimensioned materials, is shown in Fig. 3.3 and using the formula $Z_{tr} = 138 \log_{10} D/d$, is 86 ohms. The small amount of mismatch is not critical and no problem was experienced in obtaining a v.s.w.r. of between 1.2 and 1.3:1 across the 432MHz band with the matching section shown in Fig. 3.3.

The Six Turn Helix

Axial mode helical antennas necessitate three major dimensions, of which none are that critical. These are the overall length (L), the diameter of the helix (D) and the pitch between turns (P). Length is more or less determined by (P) which is $\lambda/4$ and (D) which is constant at λ/π and gives each helix turn a circumference of λ at centre frequency. The physical dimensions for a six turn helical antenna for 432MHz are given in Fig. 3.2.

The insulating support for the helix turns used in the prototype was of pvc tube of approximately 20mm diameter secured at one end to the reflector. The helix was

threaded through holes along the pvc tube, spaced 175mm apart.

The completed antenna is shown in the photo, Fig. 3.1. The longest direct contact made during moderate lift conditions was about 210km with the antenna mounted only 4m above ground.

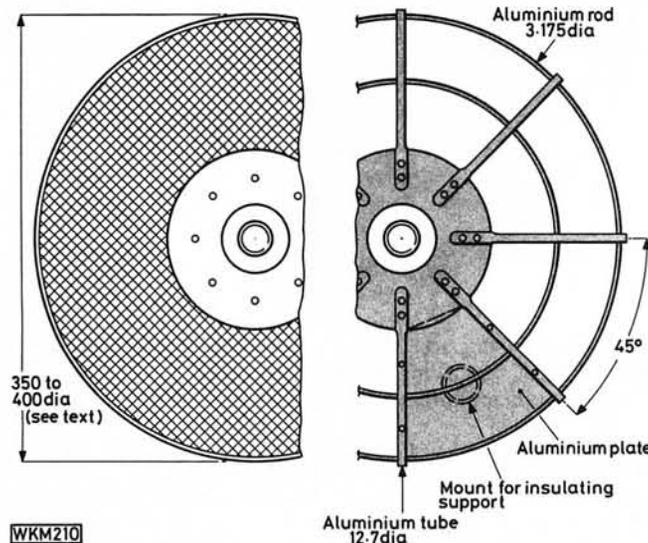


Fig. 3.4: Alternative reflector construction methods using either wire mesh or open spokes

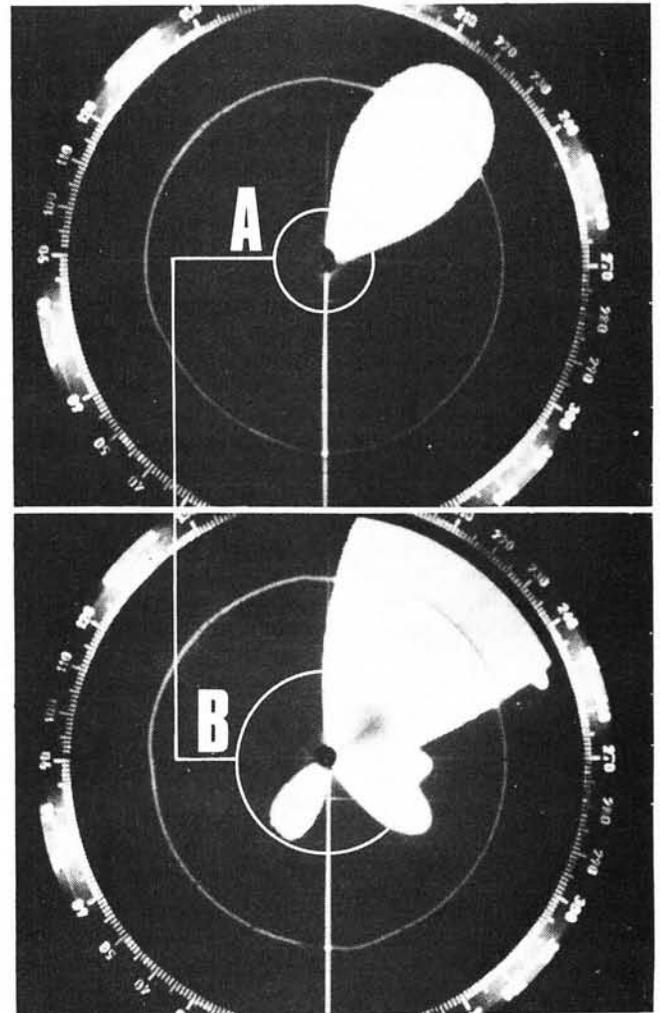


Fig. 3.5 (A): Prototype radiation pattern at mid-frequency (from horizontally polarised wave). Fig. 3.5 (B): Amplified rear section showing low level back lobes

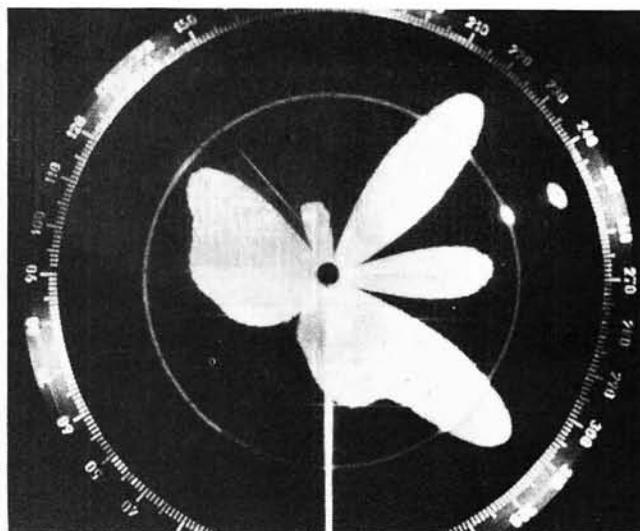
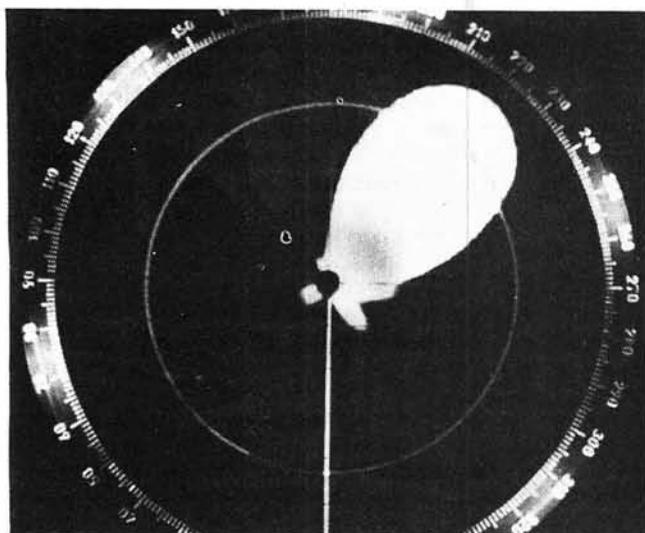


Fig. 3.6 (a): (left) Six turn helical antenna radiation pattern at mid-frequency from vertically polarised wave. Fig. 3.6 (b): (right) Break-up of uniform radiation pattern at extreme limit of frequency coverage

The circular plane reflector may have a diameter of between 0.5 and 0.8λ although the smaller is recommended to comply with the main band of operation, in this case 420 to 440MHz. There are various ways of making this but two suggested ideas are given in Fig. 3.4.

Radiation Patterns

At around the centre frequencies the forward radiation patterns remain fairly constant as shown in Fig. 3.5 and regardless of whether receiving from, or transmitting to, a linear antenna, either vertically or horizontally polarised. As a further check on this a half-scale model was made of the 432MHz design outlined in this article. Its centre frequency was therefore $435 \times 2 = 870\text{MHz}$, with end frequencies of 840 and 880MHz.

At centre frequency a clean and symmetrical lobe as in Fig. 3.5 (A) was obtained, with very little back radiation. Even with the main lobe greatly amplified, as in Fig. 3.5 (B), the minor rear and side lobes now visible are of little consequence. In this case the radiating antenna was a linear type and horizontally polarised; the helical antenna was operating in receive mode.

The next pattern, Fig. 3.6(a) was obtained with the radiating linear antenna in vertical mode. These patterns maintain reasonable uniformity and the gain of the model antenna over the frequency range 840 to 880MHz is the same as that for the full size 432MHz version. At the extreme ends of the test band the uniform pattern breaks up

as shown by Fig. 3.6(b), but these points are far beyond the normal working range. For a further study of these patterns the antenna bandwidth and v.s.w.r. etc. refer to Part 2 of this series.

To show just how accurate scale model antennas can be Fig. 3.7(a) shows a helical antenna modelled for a frequency of 3000MHz and Fig. 3.7(b) the radiation pattern obtained at centre frequency. Compare this with Fig. 3.6 of this article.

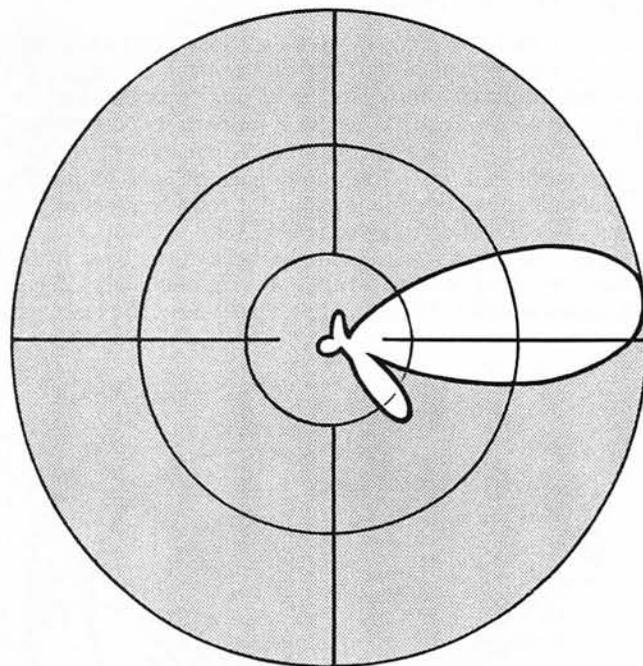
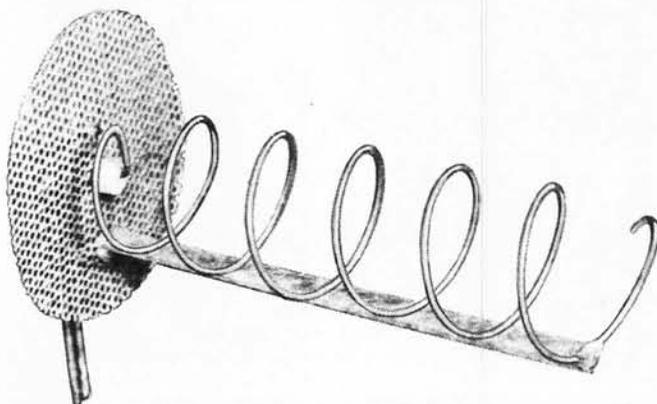


Fig. 3.7 (a): (above) 3000MHz model six turn helical antenna. Fig. 3.7 (b): (right) Model Radiation pattern

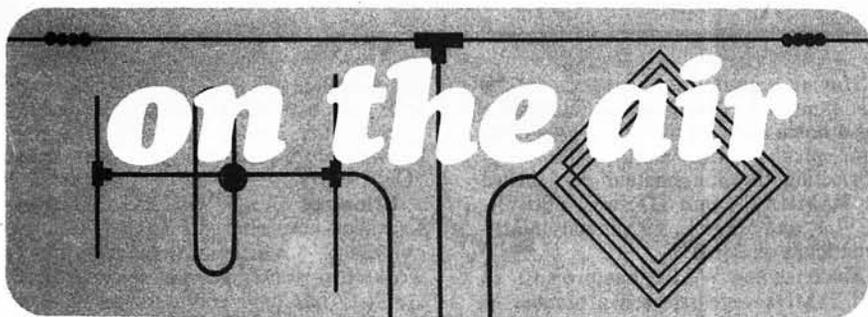
In the next part of this series we will be examining methods of specifying antenna gain and comparing these with various manufactured antenna specifications.

Information on Helical Antennas

ANTENNAS. J. D. Kraus. McGraw-Hill USA publication.

Amateur Radio Handbook. Third Edition, or later. Available from the RSGB.

ARRL Antenna Handbook. ARRL Staff. Available from the RSGB.



Amateur Bands

by Eric Dowdeswell G4AR

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

Some more discussion now on the a.t.u. described last month, as promised, with the six permutations of the coil and capacitor repeated here for convenience, Fig. 1. Whatever the arrangement tried the procedure is always to go from one end of the coil to the other, swinging the tuning capacitor from maximum to minimum at each switch position, finding the combination that peaks the signal strength and makes the length of antenna wire resonant at any given frequency.

If a low frequency is involved then start with all the coil in circuit and gradually decrease the number of turns in use. Conversely, at high frequencies start with a minimum of turns and increase until resonance is reached. Once the optimum positions have been found for a given band, **note the readings**, for future use, finally making up a table for all the bands.

Circuit (a) will prove best for antennas around 10 to 20m long. If not then try (b) by adding the tuning capacitor by means of the plugs. Position (c) will be found useful for loading wires on the lower frequency bands such as 3.5 and 1.8MHz or even 7MHz, depending upon the length of the wire. Note that in (d) the tuning capacitor is across the coil, making sure that point 3 is not still left earthed.

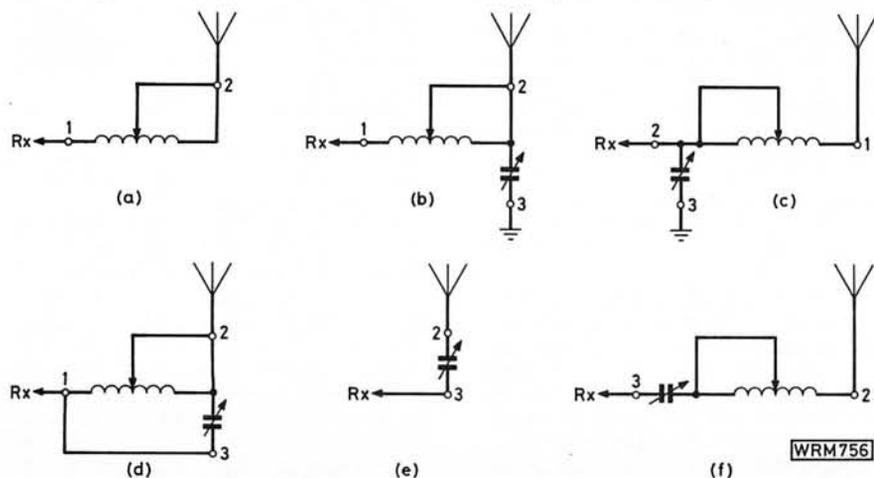


Fig. 1

Arrangement (e) is simply a method of electrically shortening a wire to obtain resonance using only the capacitor. A wire antenna some 50m long will prove an excellent antenna on Top Band (1.8MHz) when tuned with circuit (e). Finally circuit (f) will enable quite short wires to be used on the l.f. bands. Be assured that the improvement in signal strength that results when the a.t.u. is tuned properly is quite significant. False positions may be met where the peak is very shallow in which case continue to try other combinations.

The receiver's "S" meter may be used to tune the a.t.u. but if done by ear switch off the a.g.c. otherwise an increase in signal strength due to the a.t.u. will be counteracted by the action of the a.g.c. circuits unless the signal is of a very low level, insufficient to activate the a.g.c.

On a quite different tack now, most readers will be aware that we are now moving down the curve of sunspot activity known as the 11-year solar cycle although, at times, the sun seems not to have been told about it, judging by recent bursts of activity! Nevertheless it will decline with a noticeable effect on radio propagation, or "conditions" as we say. In general the low frequency bands 7, 3.5 and 1.8MHz will become more and more useful over longer and longer periods and amateurs will go along with this trend by moving down the bands, in terms of frequency. The recent addition of the 10, 18 and 24MHz bands now means that the steps down are not quite so drastic, as changing from, say, 14MHz to 7MHz has meant in the past.

Our two lowest bands, 3.5 and 1.8MHz, will become better and better

from the DX point of view and now that so many transceivers in use have Top Band included in their coverage so it will really begin to hum. Many countries have now obtained permission to use 1.8MHz to add to the number, making DXCC less of a remote dream. Top Band is dead except for UK or near European stations during daylight hours, coming to life at dusk and fading away at dawn or just after. A band well worth watching.

In General

David Ackrill BRS50878 in Birmingham hopes to get something better soon than his present HAC rig if the RAE results are satisfactory although it may mean a period as a G6 before the G4 comes along due to pressure of work at college. David is another who finds some of the DX nets rather confusing, often not knowing who is calling whom!

Good news from regular writer **Dave Warr** down in Weymouth, Dorset, who had to wait only a couple of weeks after applying for his licence. Proudly he is now G4RQI instead of G6HRV and started off with a borrowed FT-7 and a wire 10m long, with QSOs on c.w. and s.s.b. in the log. We wish you plenty of good DX OM.

Royston Price in Haverfordwest, Dyfed, has forsaken his GW8YJN for GW4PCX after a lot of glogging at code sessions. He also has an FT-7, plus a full-size G5RV and Z-match a.t.u. for starters, the FT-7 being the result of swapping some 144MHz (2m) gear. Already, he says, he is working the world on the 28, 21 and 14MHz bands. He gets a bit annoyed with the c.w. ops who don't have the courtesy to slow down a bit for him. Don't worry OM you'll soon be up to their speeds if you keep at it. As a PS Royston says his son Andrew is now awaiting the results of the last RAE! Now, don't squabble over that rig!

A brief repeat of the late late item which I hope will have appeared in the March issue. **Bob Salmon** G4LJX, professional skipper, has room in the crew for another op, sailing a 12m cutter from the British Virgin Islands to the UK, around five weeks in April/May, with plenty of amateur gear aboard. Muck in and share some of the expenses is the general theme. Interested? Contact Bob on Plymouth (0752) 862558 and we'll all be listening for that/MM!

Paul Morrison is aged 15 and lives in Morpeth, N'umberland and has caught the DX bug. "Having read thoroughly through your article on buying a s.w. receiver" he went and bought something from the local shop of a national network of electronics shops and promptly forgot all he'd read! I feel he may have been conned into something he didn't want and he could probably get his money back since it is not suitable for the purpose for which it was bought. So he can't copy s.s.b., which was the main idea. However, sticking to the job in hand he built an external b.f.o. and can now manage, after a style. All good experience!

Paul Martin lives at 18 Wilkinson Close, Temple Hill, Dartford, Kent, and

is new to the game. He has a Lafayette HA700 receiver and would dearly love to get hold of a circuit diagram or any other info on this receiver.

Round the Bands

Not a lot of reports this month, probably a spinoff from the Christmas and New Year lethargy as we are dealing with January. Let's start with **Dave Coggins** of Knutsford in Cheshire with his FRG-7700 plus 20m-long wire plus a.t.u. Best catch was undoubtedly HZ1AB on Top Band both on c.w. and s.s.b. at 2100GMT, frequencies of 1820 and 1833kHz respectively. Like I say, this band is worth watching and is very productive after dark. On 3.5MHz EP2TY, J3AH and 7X2HM turned up on s.s.b. while 7MHz revealed VK6AJW and ZL4BO on the short path around 1900GMT, with 6W8DY the only other DX mentioned. On 10, 18 and 24MHz little was heard from outside Europe. More reports on these bands would be appreciated. For 28MHz Dave reports CR9CT, JT1KAI, KB7IJ/KH2 on Guam, 5T5RR, 6T1YP the Omdurman Club and QSL to DF3NZ, 9N38 reported as a DXpedition to Nepal.

Gordon Carmichael in Lincoln has a Realistic DX302 and dipole on 21MHz to find C6AEY, J73CB who said QSLs to POB 389, Roseau, Dominica, VP5WJR, 6W8AAD and 6W8HL, ending with TU2IF. On to 14MHz where an inverted "V" and a.t.u. helped with CT3DH, HP1XXO, KH6WU, XT2A, 5B4ES and 5Z4WD. **Anne Edmondson** BRS47285 is all excited as she is after the call GM4SYL having received credits in both parts of the RAE which won't mean waiting very long by the look of it. On her Realistic DX200 and indoor wire in Edinburgh she stuck to 3.5MHz (80m) with A71AD, CP1PRS (POB 2349, La Paz), FY7AN, HH5CB, 4Z4AB, VE3LRU/6Y5 and a couple of PTs.

As he says, nothing too exciting this time from **Jon Kempster** in Berkhamsted, Herts with his FR400SDX plus half-size G5RV and about 40m of wire in the form of a loop and a.t.u. (I should hope so) to log YS9RVE, T12KD and ZS1CY on 28MHz. Then 9L1DR and SL1AH on 21 and sole 3A2EE on 3.5MHz.

Now that **Viv Doidge** down in Callington in Cornwall has got the DX bug he has started serious studies for the RAE but still spent some time copying the following on his FRG-7700 and matching a.t.u. with a wire 30m long. On 28 it was EL9A, HC1JQ, and J73DF, on to 21MHz and HH2JR, J6LJK, J73CB, VP2MF, V2AC and PY0KA on Trinidad Island. For 14MHz there was FB8ZQ, FR7VE, S83H, 4K1D, 6T1YP and 7P8CR. Goodies on 7MHz included YK1AH, 5N3EC, 5T5TO, 6W8DY, 8P6OR, CR9CT, DU7RLC, FM7WS, ZL4PO/C which is Chatham Island, and 9Y4RD/SU which looks like a UN outpost. Finally to 3.5MHz and HH2BM, HP3FL, J88AW and 6W8DY.

Having a go on the s.w. bands for the first time **S. J. Dunsmore** in Scunthorpe has a homemade set recently presented to him, plus a wire about 40m long. Neglecting the non-amateur calls heard on 3.5MHz the best DX was YB0WR, FC9UP and HP3FL, with mainly North Americans on 28MHz.

Since the new WARC bands on 10, 18 and 24MHz were released a number of readers have asked where they can obtain suitable traps for these bands so that they can make up trapped dipoles to suit. The only source that I know of is G2DYM Aerials, a *PW* advertiser (albeit, he is shown as G2Dym in the Feb index!) and, if you haven't got your copy to hand, it is 03986 215.

In Colchester, Essex, **Andrew Durrant** is determined not to miss the fun of constructing his own gear so is busy with a one-transistor set although he sports an AR88 the only items noted on that being F8HB/EA6 and F9UW/3A, both on 14MHz (20m) and both on holiday I'd suggest! From Grimsby **Jim Willett** reports returning to the fold after some 20 years starting with a DX100L which was swapped for an FRG-7700 and a.t.u. Logs are promised very soon. Apart from Euros the 3.5MHz band came up with JA's mainly.

Club Time!

A note or two to secs, chairmen, PROs and all those who kindly send in info for this feature. Please include club meeting place and time and day/s in each letter. This will save me a tremendous amount of time looking up past records. The sensible thing is to send in one list of events and details for the rest of the year! Some hope! But there are the odd clubs that do just that and it is much appreciated. While in the griping mood, please do write to me direct, details at top of feature every month, rather than to *PW* where they have plenty to do without having to redirect mail. Ta!

Abergavenny & Nevill Hall ARC GW4GFL Registered C & G examination centre, the club reminds potential candidates that it can accept late entries for the May exam up to March 10 entailing a late fee. Interested? Contact Hon Sec via Aircom, Brecon Road, A'gavenny. RAE courses run every Tuesday at 7.15 in the Seminar Room, Nevill Hall Hospital with club night on Thursdays at 7.30 in the Penyful Hospital (above male ward 2). Sec is Dave Jones GW3SSY, 2 Dalwyn Houses, Llanover Road, Blaenavon, Gwent, or (0495) 791617.

Acton, Brentford & Chiswick ARC On Tuesday March 15 a talk will deal with an introduction to c.w., at the usual spot, the Chiswick Town Hall, High Road, Chiswick, London W4 at 7.30. So says sec Bill Dyer G3GEH, 188 Gunnersbury Avenue, Acton, London W3.

Biggin Hill ARC Get together at the Biggin Hill Memorial Library at 8pm, not missing the junk sale on March 22. Ad-

vance notice of G8CQE talking about and demonstrating construction techniques for the amateur at home, date unknown. More from G4NSD who says "QTHR".

Braintree ARS G4JXG G6BRH Excellent newsletter *BARSCOM* comes out monthly which must mean a lot of work for some people. New editor G8UUO has only one message. "Can I have some copy?" the eternal cry of editors everywhere! New sec is Mike Jones G6DFZ 26 Anson Way, Braintree, Essex or B'tree 44168. So it is the first and third Mondays at the Braintree Community Centre, Victoria Street, B'tree at 7.45 with the club rigs activated, tea and coffee flowing and books and Morse practice tapes available on loan.

Bournemouth RS G2BRS First and third Fridays by the look of it from the club's newsletter, at the Kinson Community Centre but for more info you'll have to call Arthur Bagley G4EKE on Ferndown 877945.

Bristol ARC G3TAD New PRO is Mark Goodfellow G4KUQ, 99 Somerset Road, Knowle, Bristol (0272) 716093, who says club location at the YMCA, Park Road, Kingswood, Bristol gives good results on the v.h.f. and u.h.f. bands with the full range of equipment held by the club. There are regular courses, code sessions, constructional projects plus the usual talks and visits. Meetings every Tuesday at 7.30 with the fourth devoted to computers, particularly their applications to AR.

Bromsgrove & District ARC Second Friday at 8pm, the Avoncroft Arts Centre while QRP holds sway at the same place on the fourth Friday. More immediately, the AGM on March 11. Constructors to note that their efforts will be judged at the April meeting. Details of forthcoming club picnic and other events from A. Kelly G4LVK, 8 Green Slade Crescent, Marlbrook, Bromsgrove, B60 1DS, otherwise 021-445 2088.

Bury RS Mosses Community Centre, Cecil Street, Bury every Tuesday at 8 the principal gathering being on the second Tuesday, such as March 8 when Trevor Hopkins G8TYT's subject is 1296MHz (23cm) and repeaters. Newcomers very welcome of course, says sec Malcolm Pritchard G3VNQ, 56 Sheffield Lane, Norden, Rochdale, Lancs.

Carlisle & District ARS Mondays at 7.30, White Quay Inn, Durdar, Carlisle. Sec is Paul Boyd G8RJA, 13 Stackbraes Road, Longtown, Cumbria, and that's that! Short but succinct.

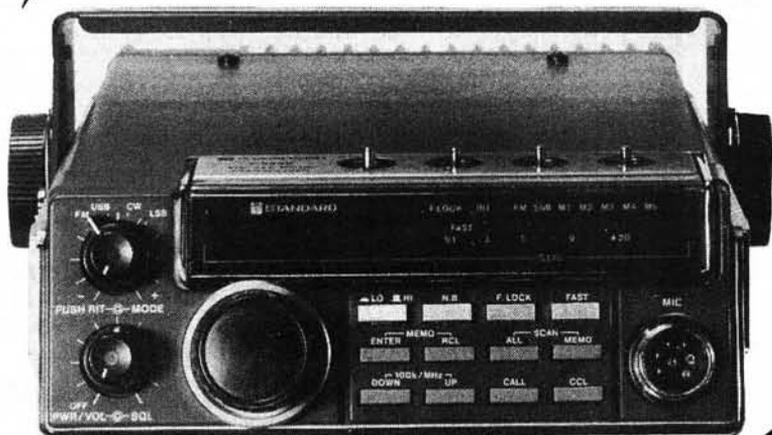
Chichester & District ARC First and third Thursdays, 7.30, in the Green Room, Fernleigh Centre, 40 North Street, Chichester with a club net on S11 Weds at 7pm. On March 17 it's G8HY telling all on wartime radar. Note the AGM is on April 21. All this info on the first page of the club's newsletter, where it should be. Hon sec is T. M. Allen G4ETU, 2 Hillside, West Stoke, Chichester, Sussex otherwise West Ashling 463.

Conwy Valley ARC The second Thursday at 7.45 at Green Lawns Hotel,

Lee Electronics Ltd



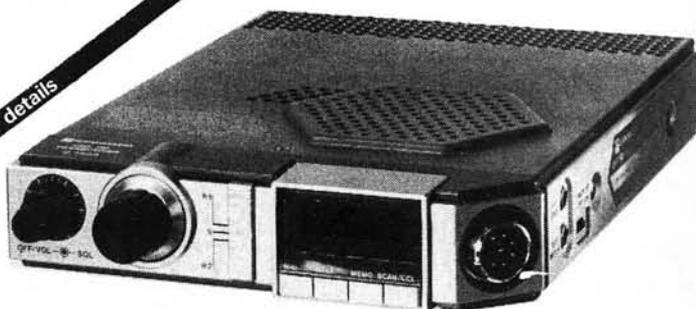
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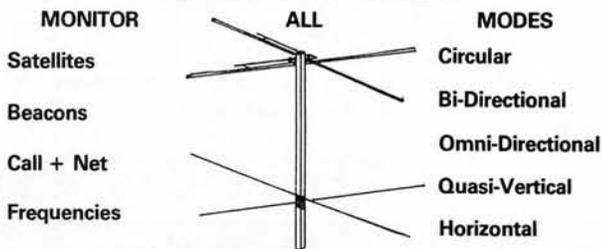
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Bay View Road, Colwyn Bay (sounds lovely!) with possibly top talk of the year on March 10 by Dr David Last of Bangor University, an eminent speaker but the subject remains a secret until the last moment. Sec is Norman Wright GW4KGI, 46 The Dale, Woodlands, Abergel. Also A'gele 823674.

Dartford Heath DF Club This specialist club meets at the Malt Shovel pub, Eynsford, Kent, on the Wednesday before a DF event to sort out the problems. That's their excuse, anyway! Like on March 2, which has probably gone, for the hunt on March 6 which probably hasn't. So had better give the dates for April which are the 6 and 10. Alan Birchmore G4BWV, 49 School Lane, Horton, Kirby, Dartford for more info.

Denby Dale & District ARS G4CDD G8KMK The club seems to be out and about on visits just as much as it spends on talks etc with coach trips to radio shows and other desirable places. However March 9 is devoted to OSCAR matters, all explained by G4JJ. Warning of the meeting on April 13 when Lowe Electronics have the floor, and of a visit by the RR. Could that be G4DAX again? Much further on but still worthy of note is the club rally on June 19, and G5RV on guess what on July 13. If there is any more you want to know then try Jack Clegg G3FQH, 8 Hillside, Leak Hall Lane, Denby Dale, Huddersfield.

Derby & District ARS Members gloating 'cos the RSGB "do" is at the NEC, literally just down the road! Wednesday meetings at 119 Green Lane, Derby starting at 7.30 with prospective members extremely welcome. Details from Jenny Shardlow G4EYM on Derby 556875 or drop a line to 19 Portreath Drive, Darley Abbey, Derby.

Echelford ARS Second Monday and last Thursday, 7.30, The Hall, St Martin's Court, Kingston Crescent, Ashford, Middx with club nets on 1930kHz Sundays at 10am and on 144.575MHz f.m. Weds at 8pm. Morse practice is handled by G3KKQ, G3MCK and G8ALB. Highlight of excellent Newsletter is Angela G4CKQ describing how to make scrumptious brandy truffles! Your contact is Anton Matthews G3VFB, 13a King Street, Twickenham, Middx also 01-892 2229.

Edgware & District RS G3ASR It's 145 Orange Hill Road, Burnt Oak, Edgware, Middx at 8pm on the second and fourth Thursdays, the main event in March being SKE, or straight key evening, with all the excitement on 3.5MHz (80m). If you have an SK I suppose you'd be welcome to call in. Club net on 1.875kHz Mondays at 10pm, plus slow Morse on 1.875 and 144.175 during the week from G3ASR. Secretary still is Howard Drury G4HMD, 11 Batchworth Lane, Northwood, Middx or N'wood 22776.

Farnborough & District RS March 9 is natter nite while on the 23rd G3OQB will handle satellite communications as a sub-

ject. Clear out the shack 'cos May 13 is bring-and-buy night. Place is the Railway Enthusiasts Club, Access Road, off Hawley Lane, Farnborough with PRO Chris French G8ZAJ, 26 Wood Street, Ash Vale, near Aldershot, Hants waiting to welcome new members and visitors, or buzz him first on Aldershot 29469.

Flight Refuelling ARS Sunday meetings see G4JET (I don't believe it!) describing power supplies on March 6 and 13, with an informal meeting with G8MCQ on the 20th. Visitor from the South Dorset RS G8EOJ discusses DF hunting on the 27th. So it's the Sports and Social Club, Merley, Wimborne, Dorset. The Society's sec is still Mike Owen G8VFX, "Hamden", 3 Canford View Drive, Canford Bottom, Wimborne, likewise (0202) 882271.

Fylde ARS Queens Hotel, Central Beach, Lytham, at 8, on second and fourth Tuesdays with G4AHZ describing aircraft instrumentation on March 8, an informal meeting on the 22nd, the usual pattern of the meetings. April 12 is worth noting when G3WGU deals with the logic and logistics of repeaters. Harold Fenton G8GG, 5 Cromer Road, St Annes, Lytham St Annes, as programme secretary can fill you in.

Hastings Electronics & RC G6HH All but third Wednesday of the month is micro night at the Ashdown Farm Community Centre. The third Wed is dedicated to the main meeting of the month at the West Hill Community Centre, that on March 16 being AGM time. On Tuesdays it's RAE course or code practice at the Farm at 7.30 and chat night there on Fridays. When does one get on the air?! More from George North G2LL, 7 Fontwell Avenue, Little Common, Bexhill-on-Sea where telephone Cooden 4645 is installed.

Inverness ARC Still wet behind the ears the club would love to welcome new members or visitors on Mondays and Thursdays at the Cameron Boys' Club, Planefield Road, Inverness, with an RAE course running on the Mondays with more practical work like club projects on the Thursdays, says club sec R. H. Brown GM8VIZ, The Flat, 21 High Street, Dingwall, Ross-shire, Scotland.

Ipswich RC First notice of the annual East Suffolk Wireless Revival taking place on Sunday May 29 at the Civil Service Sports Ground, The Hollies, Straight Road, Ipswich, running from 10am with new attractions the Fleamarket and a Car Boot Sale (anyone want to buy a car boot?). Other features not to be missed include a transceiver clinic and an antenna test range, plus all the trade stands and family attractions and displays. Much more info from Jack Tootill G4IFF, 76 Fircroft Road, Ipswich, Suffolk. Callsign for the special event will be GB4SWR if you can't get there but would like to call in.

Lincoln SWC G5FZ G6COL Pam Rose G8VRJ (Pinchbeck Farmhouse, Mill Lane, Sturton-by-Stow) wants me to tell you of the Hamfest '83 organised by

the club on Sunday May 8 from 1100 to 1730 at the Lincolnshire Fairground with trade stands, raffles, model aircraft display and bring and buy stalls. And you could win an FT290R if you've got the lucky programme number. Try Pam for the more mundane details of the regular club meetings at the City Engineers Club, Central Depot, Waterside South, Lincoln.

Midland Amateur RS Seems from club newsletter *Probe* that the club room is in use just about every night, but I know not where! But, in particular, March 15 is booked for G4KZH to talk on the new Midlands repeaters. Club net is on Thursdays from 8pm on 145.425MHz, while the club President monitors S17 from 10am to 10pm seemingly and he, surely, will have all the answers. Tom Brady G8GAZ, 57 Green Lane, Great Barr, Birmingham or try 021-357 1924.

Norfolk ARC G6NRC Meetings at 7.45 at the Crome Centre, Telegraph Lane East, Norwich on Wednesdays says Paul Gunther G8XBT who answers on N'wich 610247. VHF FD will be discussed on March 9, with a junk sale on the 23rd.

North Bristol ARC G4GCT Flourishing is hardly the word for this progressive club with 162 members on the books with some 50 per cent turning up at meetings. Sad note was the passing of Geoff Manning G2IK "father" of the club running the RAE classes and general training programme. It's every Friday, at 7pm, Self-Help Enterprise, 7 Braemar Crescent, Northville, Bristol. More from Ted Bidmead G4EUV, 4 Pine Grove, Northville, Bristol.

Northern Heights ARS G2SU Newsy newsletter *NHARS News* plus fixture card for the rest of the year shows that someone has been doing their homework up there! Meetings at 8pm at the Bradshaw Tavern, Bradshaw, Halifax, on Wednesdays. J. Fish G4MH (heard that somewhere) talks to the club on amateur radio on March 9 and there is a visit to the Bradford Police HQ on the 23rd while the AGM on April 6 should not be overlooked, with G4DAX of the RSGB reaching the club on April 20 in the course of his rounds. Chairman Geoff Milner G8NCK sent me all the info but I really think you should contact sec Brian Aspinall G6CJL, 11 Buck Street, Denholme, Bradford, also B'ford 834442 for more details.

North Wakefield RC Note that sec Steve Thompson, G6ELC last month, is now G4RCH, so congrats OM. He resides at 3 Harlington Court, Morley and will be pleased to see visitors and potential members at the Carr Gate Working Men's Club at around 7.45. He is also (0532) 536633. Make it Thursdays like March 10 when G8PUT talks on computers! Or the 17th when it's off to visit the BBC TV studios in Leeds. Note visit by G4DAX honourable RSGB RR on April 14, not to be missed when you can put all your grizzles and grumbles to him, poor chap.

Reading & District ARC "Alternate Tuesdays" but "RF hazards and the radio amateur" by G3SEK of the NRPB on March 15 is a good datum point. The Clubroom, The White Horse, Peppard Road, Emmer Green, Reading will be filled for a chat on the work of the RI department of BT by Don Franklin on March 29. Sec is Chris Young G4CCC, 18 Wincroft Road, Caversham, Reading.

Rhyl & District ARC Remember the new meeting place on the second and fourth Thursdays is the 1st Rhyl Scout HQ, Tynewydd Road, Rhyl, with rigs for all bands available for members on the first occasion plus constructional projects, while fourth Thurs are devoted to talks, film shows etc with March 24 being named RSGB film night. B. N. Jones GW8OYT lives at 6 Rhofa Maes Hir, Rhyl, Clwyd (this is worse than the Morse code!) or try (0745) 37284, and he'll bring you up to date.

Rossendale Valley ARC Still settling down in its new premises at 4 Bacup Road, Rawtenstall but not averse to getting a few more members. Celia Adams G6GZM, 373 Bury Road, Rawtenstall, Rossendale, Lancs (or Rossendale 220935) is your guide to the club's activities.

Southdown ARS Meets first Mondays, 7.30, at Chaseley Home for Disabled Ex-Servicemen, South Cliff, Eastbourne but you'll not miss the junk sale on March 7 I hope. Note that the April meeting is on April 11 due to intervention of the Bank Holiday. New sec is Tom Rawlance G4MVN, 18 Royal Sussex Crescent, Eastbourne.

South East Kent ARC G3YMD G8YMD An excellent press release tells all about the club and its activities and is ideal for the visitor or potential member. An idea that most other clubs could well emulate, helping to dispel the rather parochial attitude found in some clubs. Also known as the Dover Radio Club, meetings are held at the Dover YMCA, Leyburne Road, Dover every Wednesday at 7.45 with earlier arrivals getting their hands on the FT101ZD. As well as RAE courses by Pete G4EGQ also handles correspondence courses with the same object in mind. Right, March 9 with a talk on old Dover, then on the 16th a junk sale, construction contest on the 23rd, and G3LCK chats on the 30th, subject as yet unknown. Don't forget the AGM on April 6, and presentation of club awards. Club sec is Alan Moore G3VSU, 168 Lewisham Road, River, Dover or 'phone (03047) 2738 at home or (0304) 207670 at the salt mine.

Southgate ARC Second Thursdays at St Thomas' Church Hall, Prince George Avenue, Oakwood, London N14 with doors open at 7.40. March's event is a demo of amateur radio colour TV by G8FSL while the April date is the traditional junk sale. More from G8EWG, 16 Kent Drive, Cockfosters, Barnet, Herts.

Spalding & District ARS Second Friday at the Maples Room, White Hart Hotel, Market Place, Spalding, around

7.30 with a treat on March 11 when the Planning Officer of the South Holland District Council will deal with the planning aspects of antennas and masts. From the horse's mouth, as it were, and who better? April 8 has G3CCH telling all about slow scan TV. Ian Buffham G3TMA, 45 Grange Drive, Spalding, Lincs will fill in the details.

Stevenage & District ARS First and third Tuesdays at the TS Andromeda, Shephall View, Stevenage, Herts at 8 or 7.15 if you want to participate in the code classes. Note that the AGM is on March 15. Your contact is Les Mather G8OKI, 63 Woodhall Lane, Welwyn Garden City, Herts or try Terry Bailey G6CRF on Stevenage 62860.

Sutton Coldfield RS Second and fourth Mondays, 7.30, at the Central Library, SC. Nice list of events down to July but for the moment it's a natter nite on March 14 and Derby stalwart Fred Ward G2CVV telling how to set up an amateur radio station on March 28. Who better? For the diary, a Spring cleanout junk sale on April 25. PRO is Reg Smith G3XXJ, 29 Colestream Road, Warmley, or 021-351 2370.

Swansea ARS First and third Thursdays in Lecture Room "N" at the Applied Sciences Building, Swansea at 7.30 for code classes, otherwise make it 8pm. In the shack is a Trio TS530 put to good use after every meeting. Important note for April: On the Sunday April 10 an Amateur Radio Trade Rally in the Patti Pavilion hard by the St Helens County Cricket Ground with all the usual fun of the fair including RSGB bookstall, operational stations on h.f. and v.h.f., S22 talk-in from GB2SWR, and refreshments, all from 1030 to 5pm. Roger Williams GW4HSH is your man, at 114 West Cross Lane, Swansea, otherwise 404422.

Torbay ARS G3NJA G8NJA The club is mourning the loss of G3OTP, Fred Leeder, member for many years. Note now the AGM on April 30 but much earlier is the annual dinner on March 12. Club nights every Friday at Bath Lane (rear of 94 Belgrave Road) Torquay, says PRO Les Mays G2CWR, Atlantis, Clennon Avenue, Paignton.

Vale of White Horse ARS First Tuesdays, 7.40, The White Hart Inn, Harwell Village, with up-to-date info on club activities from the net on Thursdays at 7.30pm on 28.750MHz s.s.b. or at 8.15 on 145.2MHz f.m. Sec is Ian White G3SEK, 52 Abingdon Road, Drayton, Abingdon, Berks also (0235) 31559.

Wakefield & District RS "Alternate Tuesdays" makes it March 8 for a film show and an on-the-air cum natter nite on the 22nd. All at Holmfild House, Denby Dale Road, Wakefield at 8pm, says sec Dick Sterry G4BLT, 1 Wavell Garth, Sandal, W'field, W. Yorks.

West Kent ARS The Adult Education Centre in Monson Road, Tunbridge Wells, first and third Fridays with informal meetings on the intervening Tuesdays at the Drill Hall in Victoria Road. On March 18 Charlie Newton (could this be G2FKZ, I ask myself) deals with AR

research projects. Note the AGM on April 29. More from Brian Castle G4DYF, 6 Pinewood Avenue, Sevenoaks, Kent or (0732) 456708 with the office answering on 01-739 3464.

White Rose ARS G3XEP G8LVQ Rally '83 for the club is on March 27, a Sunday, at Leeds University with talk-in on 144MHz (2m) S22 and 432MHz (70cm) SU8 plus repeaters GB3NA (R3) and GB3WF (RB14), details from G4NDU or G4DZL, but where they hang out I haven't the faintest idea! Normally the club is open on Wednesday evenings at 8 at the Moortown RFC, off the Avenue it seems, where a well-equipped shack is enjoyed by members. Hon sec is Dave Coomber G8UYZ, 43 King Edward Avenue, Horsforth, Leeds, LS18 4BG.

Wimbledon & District RS 8pm, St John Ambulance HQ, 124 Kingston Road, Wimbledon, London SW19 second and last Fridays. On March 11 it's Morse practice and natter nite, but on the 25th G3EPU gives his views and advice on DF hunts. Your man in Wimbledon is Geoff Mellett G4MVS, 26 Paget Avenue, Sutton, Surrey, or try 01-644 8249.

Wirral ARS G3NWR Chatty newsletter *News & Views* reveals the club's main events way on until October but for the moment it's an inter-club QSO session on March 16, but don't miss the sale of surplus equipment on April 6. From which you may deduce that the club meets on the first and third Weds, at the Minto House School, Birkenhead Road, Hoylake, at 7.45. Newsletter editor Cedric Cawthorne G4KPY for the last five years is the new hon sec, at 40 Westbourne Road, West Kirby or 051-625 7311, so you can plague him now instead of G3UJX who becomes the editor.

Worthing & District ARC The Amenity Centre, Pond Lane, Worthing, W.Sx will find the club gathering around 8pm every Tuesday according to the comprehensive club newsletter from editor Stan Williams G3LQI. Let's see... page 15 for Diary Dates... March 8 when G4ILY will be expounding on slow scan TV matters, no doubt with a demo too, nosh time on the 15th when it is the annual dinner, at another place. Construction contest judging time on March 22 with the month's activities ending with G4EFO describing radio comms in the Fire Brigade. There is just not enough space to describe the multifarious activities of this club so get on to Joyce Lillywhite, 41 Brendon Road, Worthing for full information.

**PLEASE MENTION
PRACTICAL WIRELESS
WHEN REPLYING
TO ADVERTISERS**

Medium Wave Broadcast Band DX

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

Obtaining a QSL from a medium wave station requires a rather different approach to that used on the short waves. Some stations respond readily enough but it is worth remembering that they are doing you a favour as you are not one of their listeners. You are outside their target area and are eavesdropping into local broadcasting in another part of the world. Your report has to do two things: you have to convince the station that you really did hear it and you have to persuade it to reply.

Reception Reports

The report should start off by saying that you picked up their broadcast on . . . kHz, then you quote the time and date in operation at the station. For example, if you were listening to North America at 0200GMT on the 24th of the month, this corresponds to 2100EST on the 23rd in New York. Eastern Standard Time (EST) is five hours behind GMT (UTC) and of course the date can be one day earlier. If in doubt give the time in GMT as well, but you will be able in many cases to obtain the correct local time from station announcements.

It is very important to supply enough evidence to convince the station that you really did pick it up, this means listening, if you can, long enough to collect some programme details. The five minutes before the hour and again before the half hour is often productive as this is the period when programmes change and station identification is given. News bulletins usually start on the hour, followed by a weather report. Always give details of commercials. With small stations it could mean your letter being shown to the advertiser with the comment "we are even heard as far away as the UK!"

Give the exact time to the nearest half minute if possible of each programme detail you report e.g. 2155 commercial for . . . ; 2155½ "This is radio . . . in New York"; 2200 News read by . . . ; 2203 Weather "temperature 65 degrees"; and so on. The names of announcers, telephone numbers of commercials or even the station itself if you heard a phone-in, temperatures from weather reports, items of local news, these are the meat of the reception report as they are items that are easily checked.

The report now gives brief details of your receiver, antenna and signal strength. Reporting codes such as SINPO

or SIO are inappropriate and may not even be understood by small broadcasters. Say in words what their signal sounded like — weak, good, fading, interference from other stations etc. The station does not intend being heard in your area so your report would normally only be of interest.

The Personal Touch

The closing part of the report can be crucial, it may even determine whether you get a reply. Many DXers recommend that the report should take the form of a personal letter which gives details of the DXer, his equipment and his home town and the end of the report is the place for this information. Finally always enclose return postage. International Reply Coupons (IRCs) are useful but probably inconvenient for some stations to cash and some station personnel may not even know what they are. If you have made a really good catch then it is worth the effort to go to your local stamp shop for unused stamps of the country concerned. Say what you want them for and you may get advice on how many are required. Send off your reception report promptly by airmail. Surface mail can take weeks even to North America. Address the report to the Chief Engineer, followed by the name of the station e.g. Radio WINS, then the city, state and country and request a verification of reception.

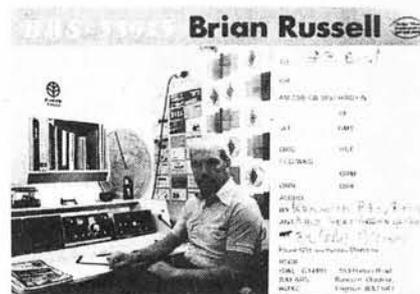
Reporting Cards

PW reader Brian Russell enclosed one of his reporting cards when writing to me recently. This card is designed for reporting to radio amateurs, the BRS number being issued by the RSGB to non-transmitting members. Such a card could not be used as a substitute for a full reception report when writing to a medium wave station but it does give the personal touch. Even the photograph alone, which is in colour, would be a very useful addition to any report. You could have a photo of yourself at the controls at the top of your stationery if you are prepared to find the outlay and this really would make an impact.

Mediterranean DX

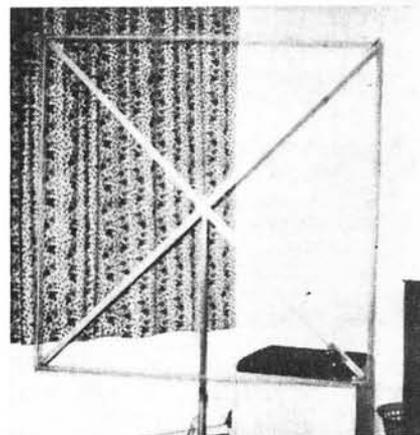
Radio Mediterranean, located in Malta, is now on 1557kHz for three hours every evening using the 600kW transmitter at Cyclops belonging to the Deutsche Welle relay station. Test transmissions were made in January and came in quite well at my QTH after 2300 when France-Culture was off the air. The schedule of R. Mediterranean is now 1800 to 1900 in English, 2130 to 2230 in Arabic, 2230 to 2330 in French. The address is Radio Mediterranean, PO Box 2, Valetta, Malta. In an interview on Radio Netherland's *Media Network*, the

manager said this schedule may be extended to include an English programme later in the evening.



Brian Russell's reporting card

From the same area listen for the Voice of Free Sahara on 927kHz. It is located in Beni Abbès in Algeria and can be heard regularly after 2300 when Brussels is off the air for the night. Programming, which is in Arabic, is intended for West Sahara, which was part of Spanish Sahara before Spain pulled out of the area. The easiest North African is Algiers on 891kHz which is often the dominant station on this channel in the evening and can easily be separated from any co-channel QRM by a loop or by rotating a portable receiver to make use of the directional properties of the internal antenna.



A photo of Brian Russell's loop antenna

According to a report from *Sweden Calling DXers* a station calling itself Radio Mediterranean International located in Morocco has been testing on 173kHz on the longwaves. At one time the Voice of America Tangiers used this frequency. I haven't heard the tests myself but the only other occupant of this channel is the USSR so it should not be too difficult to pick out Morocco when it is on the air. At the other end of the l.w. band listen to Tipaza in Algiers on 251kHz. It relays the international service and includes a daily programme in English at 2000. The address is RTV Algerienne, 21 Boulevard des Martyrs, Algiers, Algeria.

Origins of the Loop

My request for information about early loop antennas brought an interesting reply from **Douglas Byrne G3KPO** who is Hon. Curator of the National Wireless Museum. "I have been glancing through the Museum archives, for it is truly fascinating to find out how origins are quite often almost lost in the mists of antiquity" writes Douglas. He goes on to say that C.E. Prince converted the four open antennas of the Marconi Adcock system to a pair of closed loops in 1912. These loops would be used with a radiogoniometer so I suppose it would be a natural progression to move to a single rotatable loop when space was at a premium.

"The battle of Jutland was the first time that radio direction finding was used in warfare when British battleships fired over the horizon at the German fleet, guided by means of DF on their transmitters. Shades of Woodpecker!" concludes G3KPO. The National Wireless Museum which has the callsign GB3WM is located at Arreton Manor, Near Newport, Isle of Wight and Douglas can be contacted in advance by would-be visitors at Arlington House, 34 Pellhurst Road, Ryde, IOW, PO33 3BW. Tel: Ryde 62513.



G3KPO QSL card shows the site of Marconi's test near the Needles

A Problem with the DX160

A cry for help from down under comes from old-timer **Harry Capsey VK2OQ** who has acquired a secondhand DX160 receiver. This set works very well until the main tuning control is adjusted then the set starts to drift (wander in frequency) and it takes about 15 minutes to settle down again. Then it functions normally, even the bandspread can be used, but once the main tuning control is moved the drift starts again.

All the obvious checks have been made. Switch cleaner has been used, a check made for dry joints, the printed board examined with a magnifier, the

main tuning capacitor including the wipers examined and an outboard local oscillator tried. "Boy this is the best trap I have ever had in my 46 years in ham radio, even three 'experts' have given it up hi!" concludes Harry.



Harry Capsey's first station

On the face of it the fault is in, or around, the main tuning capacitor but this seems not to be the case. Percussion testing is a good way of stirring up an intermittent fault. Use a home made "hammer" consisting of a pencil and eraser and tap gently round the suspect area. Has anyone come across this fault on the DX-160? If so, please write to Harry at 58 Elliston St, Chester Hill 2162, NSW, Australia. Let us know what the trouble was Harry if you track it down.

Short Wave Broadcast Bands

by Charles Molloy GBBUS

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

"Can you recommend a good receiver? Which is the best buy?" Every month brings in letters from readers who, bewildered by the varied selection on offer, seek advice. Unfortunately, there isn't a simple answer since there is no standard, or best receiver. Not only do sets differ in appearance, they also offer different facilities to the user who will, or should, select the model most suitable to his needs. Not an easy task for the newcomer to the hobby, so perhaps it might be useful to have a look at the problem.

If you are interested in listening to short wave broadcasting then your receiver should be able to tune over the range 5.9MHz to 26.1MHz or the greater part of it. If you are a DXer you will want to try the Tropical Bands which lie in the range 2.2MHz to 5.1MHz. The amateur bands are found between 1.8MHz and 29.7MHz and to listen you will need a receiver capable of resolving single sideband (s.s.b.) and Morse (c.w.).

Medium wave DXers will want a receiver that does not have its own medium wave antenna so that it can be used with a m.w. loop.

If you want to put up an outdoor antenna, make sure your receiver can cope with it. Power supplies too are important. Dry batteries are expensive, so if you intend listening a lot at home then a receiver which operates from the mains is an obvious asset. It is an advantage, though, to have a set that operates on batteries as well as the mains. You may on occasion want to listen away from home, in a caravan or boat, and you can sometimes reduce electrical noise at home by operating on batteries.

Communications Receivers

This would be my personal choice. A communications receiver will cover the whole range from the l.f. end of the medium waves at 540kHz to the upper end of the short waves at 30MHz. It will resolve s.s.b. and Morse and sets currently on offer, such as the FRG7, FRG7700, SRX30D, DX302, R600, R1000 can be used with a m.w. loop. Most receivers in this category will have a noise limiter, r.f. gain control or attenuator, an "S" meter, provision for connecting a dipole antenna and on the more expensive models, digital readout which displays the frequency you are tuned to on a pocket calculator-type display.

There are two problems with this type of set. One is cost. You will have to spend

the best part of £300 for a new communications receiver. Not a great deal perhaps compared with the outlay required for other hobbies and pastimes. If you look after your set it will maintain its value and you will be able to trade it in, in part exchange for amateur gear if you move in that direction. If you decide later on that radio is not for you, then you can always realise on the set in the second-hand market or exchange it for something else (*Swap Spot*).

The second problem has to do with antennas. A communications receiver does not have an antenna of its own so you will have to provide one. A metre of wire hanging from the back will not do because the set would be operating on maximum gain on moderately strong signals and a poor signal-to-noise ratio would result. A short outdoor random wire, say 5 to 10 metres in length, is ideal for general short wave listening. So is a vertical antenna mounted on the chimney stack and a TV antenna is a good sub-

Thanks Shortwave Listener for the report
on a United Nations broadcast at 1930 GMT
on 9 December 1982 on 16782.5 kHz.
the details of which are correct.

RADIO AND VISUAL SERVICES DIVISION DEPARTMENT OF PUBLIC INFORMATION

Radio United Nations

ELECTROVALUE

- 24 HOUR NORMAL DESPATCH TIME
- ESTABLISHED 1965
- ALL GOODS GUARANTEED BRAND NEW AND TO SPECIFICATION
- APPOINTED SIEMENS DISTRIBUTORS

CAPACITORS

Polystyrene, Siemens

5% Tolerance 160V
5, 7, 10, 12, 15, 18, 22, 27, 33, 39pF 15p
47, 56, 68, 82, 100, 120, 150, 180, 220, 270, 330, 390, 470, 560, 680, 820pF, 1n, 1n2, 1n5, 1n8, 2n2, 2n7, 3n3, 3n9, 4n7, 10p, 5n6, 6n8, 8n2, 10n, 13p

Ceramic Very small 1.8, 2.2, 2.7 etc. up to 1n5 5p each, 1n5, 2n2, 3n3, 4n7, 6n8, 9p, 10n, 22n, 6p, 33n, 47, 7p, 100n, 8p

Polyester, Siemens Layer Type 7.5mm lead spacing 100V
1n, 1n5, 2n2, 3n3, 4n7, 6n8, 8n2, 10n, 12n, 15n, 18n, 22n, 33n, 47n, 7p, 56n, 68n, 7p, 82n, 100n, 9p, 120n, 150n, 15p, 180n, 220n, 12p, 270n, 330n, 330n, 390n, 470n, 15p, 560n, 680n, 24p, 10mm spacing 1uF 25p, 15mm spacing 2uF 35p, 22.5mm spacing 1uF 50p, 3.3uF 100V 68p, 1n depth stocks.

I.C.s - DIGITAL & ANALOGUE

DIGITAL		74LS161		7413		74157	
74LS161	36	7413	18	74157	30	4072	13
74LS163	36	7414	20	74190	45	4081	13
74LS164	30	7420	15	74191	45	4082	13
74LS165	50	7430	14	74192	45	4093	20
74LS166	60	7431	14	74193	45	4113	40
74LS167	11	74173	55	7442	32	74393	95
74LS168	12	74174	45	7443	60	4514	110
74LS169	12	74175	40	7444	36	4516	53
74LS170	12	74191	36	7447	36	4518	40
74LS171	12	74193	40	7448	40	4520	50
74LS174	25	74195	39	7450	14	4543	75
74LS175	12	74196	48	7451	14	4583	90
74LS176	12	74197	60	7453	14	4007	14
74LS177	12	74198	48	7454	14	4008	32
74LS178	14	74199	55	7460	14	4009	24
74LS179	14	74201	55	7470	24	4010	24
74LS180	28	74242	55	7472	24	4011	11
74LS181	28	74243	55	7473	26	4012	16
74LS182	28	74244	55	7474	30	4013	20
74LS183	16	74245	70	7475	25	4014	46
74LS184	16	74251	30	7476	25	4015	46
74LS185	18	74252	30	7480	35	4016	26
74LS186	15	74257	30	7482	65	4017	37
74LS187	40	74259	55	7485	65	4018	45
74LS188	20	74266	20	7483	38	4019	25
74LS189	20	74273	55	7485	60	4020	40
74LS190	20	74279	30	7486	18	4021	40
74LS191	22	74299	150	7489	159	4022	39
74LS192	20	74367	30	7490	20	4023	14
74LS193	20	74368	28	7491	35	4024	14
74LS194	20	74373	60	7492	25	4025	13
74LS195	24	74374	55	7493	25	4026	80
74LS196	25	74378	60	7494	35	4027	20
74LS197	23	74393	45	7495	35	4028	39
74LS198	90	7400	11	74104	45	4041	40
74LS199	27	7401	11	74107	20	4042	40
74LS200	70	7402	11	74121	24	4043	40
74LS201	75	7403	12	74123	34	4044	40
74LS202	40	7404	14	74125	34	4046	46
74LS203	40	7405	15	74126	33	4047	46
74LS204	40	7406	20	74141	51	4050	23
74LS205	30	7407	20	74151	40	4060	45
74LS206	30	7408	14	74154	60	4069	13
74LS207	27	7409	14	74155	39	4070	13
74LS208	27	7410	14	74156	40	4071	13

CMOS		74ALS161		74ALS163		74ALS164	
74ALS161	36	74ALS163	36	74ALS164	30	74ALS165	50
74ALS166	60	74ALS167	11	74ALS168	12	74ALS169	12
74ALS170	12	74ALS171	12	74ALS172	12	74ALS173	12
74ALS174	25	74ALS175	12	74ALS176	12	74ALS177	12
74ALS178	14	74ALS179	14	74ALS180	28	74ALS181	28
74ALS182	28	74ALS183	16	74ALS184	16	74ALS185	18
74ALS186	15	74ALS187	40	74ALS188	20	74ALS189	20
74ALS190	20	74ALS191	22	74ALS192	20	74ALS193	20
74ALS194	20	74ALS195	24	74ALS196	25	74ALS197	23
74ALS198	90	74ALS199	27	74ALS200	70	74ALS201	75
74ALS202	40	74ALS203	40	74ALS204	40	74ALS205	30
74ALS206	30	74ALS207	30	74ALS208	30	74ALS209	30
74ALS210	30	74ALS211	30	74ALS212	30	74ALS213	30
74ALS214	30	74ALS215	30	74ALS216	30	74ALS217	30
74ALS218	30	74ALS219	30	74ALS220	30	74ALS221	30
74ALS222	30	74ALS223	30	74ALS224	30	74ALS225	30
74ALS226	30	74ALS227	30	74ALS228	30	74ALS229	30
74ALS230	30	74ALS231	30	74ALS232	30	74ALS233	30
74ALS234	30	74ALS235	30	74ALS236	30	74ALS237	30
74ALS238	30	74ALS239	30	74ALS240	30	74ALS241	30
74ALS242	30	74ALS243	30	74ALS244	30	74ALS245	30
74ALS247	30	74ALS248	30	74ALS249	30	74ALS250	30
74ALS251	30	74ALS252	30	74ALS253	30	74ALS254	30
74ALS257	30	74ALS258	30	74ALS259	30	74ALS260	30
74ALS266	20	74ALS267	20	74ALS268	20	74ALS269	20
74ALS273	55	74ALS274	55	74ALS275	55	74ALS276	55
74ALS279	30	74ALS280	30	74ALS281	30	74ALS282	30
74ALS299	150	74ALS300	150	74ALS301	150	74ALS302	150
74ALS303	20	74ALS304	20	74ALS305	20	74ALS306	20
74ALS307	20	74ALS308	20	74ALS309	20	74ALS310	20
74ALS311	20	74ALS312	20	74ALS313	20	74ALS314	20
74ALS315	24	74ALS316	24	74ALS317	24	74ALS318	24
74ALS319	24	74ALS320	24	74ALS321	24	74ALS322	24
74ALS323	24	74ALS324	24	74ALS325	24	74ALS326	24
74ALS327	24	74ALS328	24	74ALS329	24	74ALS330	24
74ALS331	24	74ALS332	24	74ALS333	24	74ALS334	24
74ALS335	24	74ALS336	24	74ALS337	24	74ALS338	24
74ALS339	24	74ALS340	24	74ALS341	24	74ALS342	24
74ALS343	24	74ALS344	24	74ALS345	24	74ALS346	24
74ALS347	24	74ALS348	24	74ALS349	24	74ALS350	24
74ALS351	24	74ALS352	24	74ALS353	24	74ALS354	24
74ALS355	24	74ALS356	24	74ALS357	24	74ALS358	24
74ALS359	24	74ALS360	24	74ALS361	24	74ALS362	24
74ALS363	24	74ALS364	24	74ALS365	24	74ALS366	24
74ALS367	24	74ALS368	24	74ALS369	24	74ALS370	24
74ALS371	24	74ALS372	24	74ALS373	24	74ALS374	24
74ALS375	24	74ALS376	24	74ALS377	24	74ALS378	24
74ALS379	24	74ALS380	24	74ALS381	24	74ALS382	24
74ALS383	24	74ALS384	24	74ALS385	24	74ALS386	24
74ALS387	24	74ALS388	24	74ALS389	24	74ALS390	24
74ALS391	24	74ALS392	24	74ALS393	24	74ALS394	24
74ALS395	24	74ALS396	24	74ALS397	24	74ALS398	24
74ALS399	24	74ALS400	24	74ALS401	24	74ALS402	24
74ALS403	24	74ALS404	24	74ALS405	24	74ALS406	24
74ALS407	24	74ALS408	24	74ALS409	24	74ALS410	24
74ALS411	24	74ALS412	24	74ALS413	24	74ALS414	24
74ALS415	24	74ALS416	24	74ALS417	24	74ALS418	24
74ALS419	24	74ALS420	24	74ALS421	24	74ALS422	24
74ALS423	24	74ALS424	24	74ALS425	24	74ALS426	24
74ALS427	24	74ALS428	24	74ALS429	24	74ALS430	24
74ALS431	24	74ALS432	24	74ALS433	24	74ALS434	24
74ALS435	24	74ALS436	24	74ALS437	24	74ALS438	24
74ALS439	24	74ALS440	24	74ALS441	24	74ALS442	24
74ALS443	24	74ALS444	24	74ALS445	24	74ALS446	24
74ALS447	24	74ALS448	24	74ALS449	24	74ALS450	24
74ALS451	24	74ALS452	24	74ALS453	24	74ALS454	24
74ALS455	24	74ALS456	24	74ALS457	24	74ALS458	24
74ALS459	24	74ALS460	24	74ALS461	24	74ALS462	24
74ALS463	24	74ALS464	24	74ALS465	24	74ALS466	24
74ALS467	24	74ALS468	24	74ALS469	24	74ALS470	24
74ALS471	24	74ALS472	24	74ALS473	24	74ALS474	24
74ALS475	24	74ALS476	24	74ALS477	24	74ALS478	24
74ALS479	24	74ALS480	24	74ALS481	24	74ALS482	24
74ALS483	24	74ALS484	24	74ALS485	24	74ALS486	24
74ALS487	24	74ALS488	24	74ALS489	24	74ALS490	24
74ALS491	24	74ALS492	24	74ALS493	24	74ALS494	24
74ALS495	24	74ALS496	24	74ALS497	24	74ALS498	24
74ALS499	24	74ALS500	24	74ALS501	24	74ALS502	24

CRYSTALS

(in MHz)	4.433	128
0.032768	102	4.915
0.100000	453	5.000
1.000	453	5.026
1.8432	320	6.000
2.000	268	6.144
2.4576	268	6.536
3.2768	188	8.000
4.000	102	10.000
4.914	128	18.432

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1.3W/3.3-100V	11 15p
20W/7.5-75V	£1.98

CONNECTORS

DIN AUDIO	IOC Connectors
Pins plug	skt
2 8p	8p 14 way
3 14p	8p 16 way
4 17p	14p 24 way
5 1180 i 17p	11p 40 way
5 (240) i 20p	8p PARALLEL TYPE
6 18p	22/40 way
7 19p	22/60 way
8 19p	15 way plug
9 20p	15 way 1.25 1.30
10 20p	20 way 1.25 1.45
11 20p	26 way 1.50 1.70
12 20p	34 way 1.65 1.95
13 20p	40 way 1.85 2.10
14 20p	42p 1.85 2.10
15 20p	42p 1.85 2.10
16 20p	42p 1.85 2.10
17 20p	42p 1.85 2.10
18 20p	42p 1.85 2.10
19 20p	42p 1.85 2.10
20 20p	42p 1.85 2.10
21 20p	42p 1.85 2.10
22 20p	42p 1.85 2.10
23 20p	42p 1.85 2.10
24 20p	42p 1.85 2.10
25 20p	42p 1.85 2.10
26 20p	42p 1.85 2.10
27 20p	42p 1.85 2.10
28 20p	42p 1.85 2.10
29 20p	42p 1.85 2.10
30 20p	42p 1.85 2.10

ELECTROLYTICS

1/63	9	1000/10	19
2.2/25	13	1000/16	26



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FT 101ZDFM	£665	£325	£28.40
FT 101ZD	£635	£325	£25.90
FT 707	£509	£255	£21.25
FT 102	£725	£370	£29.59
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FRG 7700	£329	£170	£13.25
FT 480R	£379	£190	£15.90
FT 230R	£235	£126	£9.20
FT 290R	£249	£125	£10.40

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IC 720A	£883	£442	£36.76
IC 730	£586	£290	£24.67
IC 251	£499	£250	£20.76
IC 290E	£366	£180	£15.50
IC 2E	£159	£80	£6.59
IC 4E	£199	£100	£8.25
IC AT500	£299	£150	£12.42
IC AT100	£249	£125	£10.34

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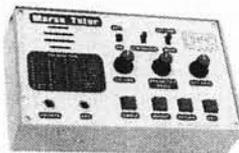
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70cm 3 Stage Colinear	Mobile £14.95 £1.50 p&p
10 Metre Fold Over Whip	Mobile £13.80 £1.50 p&p
15 Metre Fold Over Whip	Mobile £13.80 £1.50 p&p
20 Metre Fold Over Whip	Mobile £13.80 £1.50 p&p
Butter Mount with Keys	Mobile £3.45 -
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2m 6 element quad	£16.99 £3.20 p&p
2m 2 element Yagi HB9CV	£6.90 £1.80 p&p
2m 5 element Yagi	£14.99 £2.20 p&p
2m 6 element Yagi	£16.99 £2.50 p&p
2m 8 element Yagi	£24.60 £3.60 p&p
Porta Mast with Guyes 11'6" x 1"	£6.90 £1.80 p&p
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Porta Mast with Guyes 23'3" x 2"	£19.99 £3.60 p&p

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19.0mm	TUBE	12.7mm	£1.99	23p
25.4mm	TUBE	19.4mm	£3.16	26p
38.1mm	TUBE	33.1mm	£3.68	30p
9.5mm	SOLID ROD	97p		19p
10.0mm	SOLID ROD	£1.15		20p
16.2mm	SOLID ROD	£2.30		23p
4" pole spider up to 2" boom up to 1" spreader			£8.80	£2.20
8 pole boomless up to 1" spreader			£16.60	£3.20

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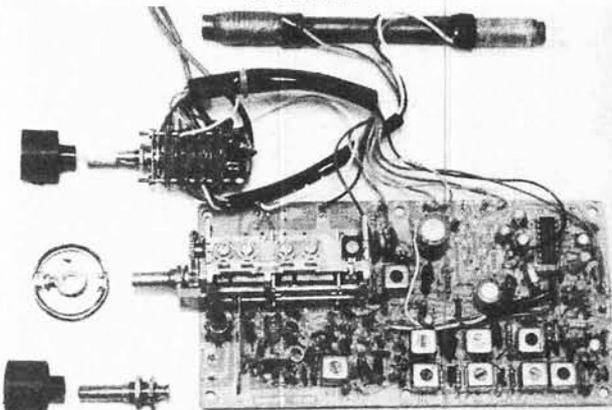
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stitute. Indoor antennas are to be avoided, for as well as picking up more signal they may also pick up more electrical noise. Many DXers have to use an indoor antenna but there can be problems with them.

Self-Contained Table Receivers

By self-contained I mean a set that uses a telescopic antenna for short wave reception and a ferrite rod antenna for the medium and long waves and perhaps for the tropical bands as well. You will pay nearly as much for a top priced receiver in this category as you would for a communications receiver, but you will be getting a really marvellous product of modern technology. This is the receiver for the short wave programme listener who can listen to the world. Multi-band receivers with digital readout and even keyboard frequency selection are available and is it not a luxury to know what you are listening to and to be able to go back to a station with certainty. Typical are the Sony ICF 2001, Panasonic RF2900 (DR29), Grundig Satellit at one end of the price range. The Grundig Ocean Boy is an example at under £50 of the other end.

This type of receiver is remarkably immune to the addition of accessories, as someone aptly put it. Even the ubiquitous antenna tuning unit (a.t.u.) has no place with a set that uses a telescopic antenna. Even if there is a socket for an additional antenna, it is likely to be coupled to the receiver in such a way that only a small fraction of the energy from the external antenna is used. If there isn't an antenna socket then clearly the maker does not

intend one to be used and you invite problems if you try to connect one by twisting the antenna lead round the whip or joining it to the end via a low value capacitor. A few of these sets will receive s.s.b. but it is not feasible to modify one that does not. Tropical band DXing is possible but you really need a good external antenna to DX on these bands. This type of set is rarely of much use to the medium wave enthusiast as a loop cannot null out a signal picked up by the receiver's own antenna.

Portables

There is no clear division between table models and portables as portability can mean all sorts of things. I am thinking of small battery operated sets that can be carried around. You can obtain good short wave reception from a portable but make sure that it covers all or most of the

	Thank you for your reception report of BPM. This is to verify the following reports:	
	Call	BPM Frequency 10MHz
	Location	109°31'E, 35°00'N
	Date	12/9/82 Time 20:29GMT
	Radiated Power	10 - 20 kW
	Antenna	omnidirectional
	Signature	杨怀旭
	Title	Chief, Section of Science and Technique
陕西天文台		

The Chinese Frequency and Time station BPM

short wave bands. These sets usually start at 6MHz and if you get one that goes up to 22MHz you will be doing well. More common is a top frequency of 18MHz which misses out 21MHz (13m) which is a good daytime band. A few sets will only tune as high as 12MHz and I have even seen one that only covers the 6MHz band (49m). These are to be avoided as you will miss 15MHz (19m) which is the main long distance band for daytime and evening reception. The Vega Spidola or Selena is a good example of a receiver at the bottom of the price range around £20, which covers the short waves adequately. I have a Vega 204 which performs very well and although this model is no longer available the Vega 308 is currently on offer in the small ads columns of *PW*.

Short Wave Broadcasting

During the evening you can hear broadcasts in English from all over the world. The peak listening time in Europe is around 2000 which is the hour for foreign broadcasters to beam-in their programmes. The peak listening time is not always the best time for reception on some paths so there is a tendency to use

relay stations to get round the problem. A relay station picks up and re-transmits a broadcast.

Holland is a major international broadcaster whose evening transmission to Europe is from 2030 to 2120UTC. The format is news, commentary, a feature programme. I try not to miss *Media Network* on a Thursday. The *Happy Station* programme, originated by Eddie Startz, has been on the air for many years.

Listen on 17.695MHz and 21.685MHz and prepare for a surprise. Although the programme is coming from Holland the transmitters are in Bonaire in the Caribbean as we are too close to Holland for night-time reception on the short waves. The signal goes from Holland to the Bonaire relay station by satellite link and is re-transmitted back to Europe. If you can listen during the day, try 5.995MHz or 6.045MHz at 0930 and 1330 for the same programme. This time you will be listening to Holland direct. The address of the station is Radio Netherlands, English Section, PO Box 222, 1200 JG Hilversum, Holland.

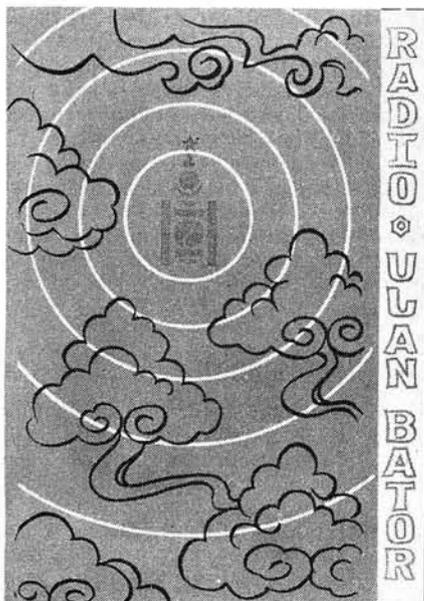
QSL Cards

The QSL cards this month are from the collections of **R. McDonald** (UN Radio and Ulan Bator) and **Philip Hodgson** (BPM and Radio Japan). The address of UN Radio is United Nations, New York, NY 10017, USA and the sta-



Radio Japan

tion transmits mainly from USA and the Philippines. Ulan Bator in Mongolia is on 12.07MHz in English at 1200, 1400 and 1445 daily except Sunday. Reports should go to PO Box 365, Ulan Bator, Mongolia. I picked up BPM on 10MHz at 1830 on July 30 last year and the entry in my log reads, "Clock pulses, BPM is Morse, YL in Chinese." The address is Shaanxi Astronomical Observatory, Chinese Academy of Sciences, PO Box 18, Lintong, Xian, China. Radio Japan comes in well in the morning on the h.f. bands. Listen on 21.61MHz and 17.785MHz and write to Radio Japan, Nippon Hoso Kyokai, Tokyo, Japan for a QSL.



Radio Ulan Bator

VHF Bands

by Ron Ham BRS15744

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

To all us radio enthusiasts those two important letters "DX" simply means rarity and/or long distance and to many of my readers, that's what their radio is all about. No matter what the band, amateur, broadcast or citizen's, or what mode, a.m., c.w., f.m., RTTY, satellite or s.s.b. is favoured, there is always that unexplainable thrill and sense of achievement, when that special bit of DX, previously thought impossible, is safely in the station log.

Solar

Although the sun was low in the sky, which may have affected sunspot visibility, **Ted Waring**, Bristol, counted 10 sunspots on December 22, 16 on the 28th and 24 on January 8 and observed active areas on the central meridian on December 28 and January 3 and 9. As far as radio observation on 136 and 143MHz was concerned, **Cmdr Henry Hatfield**, Sevenoaks, and I, recorded several individual bursts of noise on December 25, 29 and 31 and January 1, 5 and 18 and noise storms on December 26, 27, 28 and 30.

Readers often ask, "What does solar noise sound like?". Well, I can best describe an individual burst as a very definite rise in receiver background noise "whooOOoosh!", untunable and covering several megahertz and sometimes strong enough to blot out normal radio traffic on the band. An individual burst of solar radio noise may last several minutes, but when there is a noise storm in progress, this may continue for several days and the receiver noise is fluctuating all the time, in fact, it sounds like the waves breaking against the seashore.

WAD113	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
A92C																															
DF0AAB																															
DK0TE																															
DL01GI																															
HG2BHA																															
LA5TEN																															
PY2AMI																															
VK2WI																															
VK5WI																															
VP9BA																															
VS6TEN																															
YV5AYV																															
ZD9GI																															
ZS1CTB																															
ZS6PW																															
Z21ANB																															
5B4CY																															

Fig. 1: Distribution of beacon signals

These events are sometimes heard in the 28MHz (10m) band but the main area of activity is between 120 and 160MHz, depending on the intensity of the particular disturbance.

The 50MHz (6m) Band

"On December 18, the DL3ZM/YV5 beacon on 50.045MHz was heard at 1226 and **Trevor Brook** G3WBQ, Farley Green, Surrey, had a cross-band 50/28MHz QSO with PJ9EE at 1300 on c.w. and s.s.b.," writes **David Newman** G4GLT, Leicester. Around 1415 on the 19th, **John Wilson** G3UUT, Great Shelford, Cambridge, heard signals from the Colombian repeater on 50.075MHz, the 6Y5RC beacon on 50.025MHz and an H18 station. During this opening, SM6PU worked PJ9EE and **Gordon Pheasant** G4BPY, Walsall, worked TI2HL and TI2JIC, all cross-band and heard HK0BXX and numerous stateside stations on 50MHz. Between 1542 and 1554, David made c.w. cross-band contacts with K2OVS, WA1OUB, WB2RYY and W1RJA, all around 559 with some QSB.

Five members of the "6m GROUP" heard VE1YX on the 26th and between 1450 and 1515 on the 27th, David made brief c.w. cross-band QSOs with KIEM, K2MUB, WA1OUB, W1GCI, W1QXX, W1RJA and W3JO, with signals varying from 539 to 579 accompanied by some deep QSB. During the afternoon of the 28th, David was among the first stations to receive signals from the Anglesey 50MHz beacon GB3SIX 50.020MHz, when it began running continuously, beaming west and giving 20 watts to a 3-element Yagi, 15m a.g.l. at a QTH some 50m a.s.l. Prior to the 28th, this beacon was limited to operate between 0100 and 0830GMT and now, like the beacon keeper, **Alan Mills** GW3NMF, we are all delighted by this big step forward. Signals from the beacon FY7THF 50.038MHz were heard briefly in Leicester on the 30th and January 1 and David Newman tells me that three Californian 50MHz enthusiasts went on a DXpedition to the

Azores between January 3 and 9, using high power, a big beam and the callsign W6JKV/CT2 on 50.110MHz. At 1514 on the 8th, they had a DX QSO with K8MMM in Ohio, who uses a 20-element array, 4 x 5 element 6m Yagis, at 30m a.g.l.

The 28MHz (10m) Band

"Quite an interest in 28MHz f.m. is developing in Hampshire in particular and also in Surrey, with G3TUX, G4PSX, G4ARR and G4GGZ known to be active," writes **Norman Hyde** G2AIH, Epsom Downs, Surrey. He told me that on December 19, **Arthur Dorsett** G4PSX, worked JE6QJV in Tokio on 28MHz f.m. with a power of 4 watts and on January 6 Arthur worked LA0DT/MM, Bergen, via the US repeater in Boston on 29.620MHz. On the same theme, **John Coulter**, Winchester, writes, "f.m. boys are fairly active on 29.260, although there is deep and frequent fading—one eastern England ham was working southern England through a 9600km path via a Maryland repeater." That's amateur radio John and a credit to all concerned.

Harold Brodribb, St Leonards-on-Sea, Sussex, is a regular 28MHz buff and noted a variety of harmonics, between 28 and 35MHz, from lower frequency broadcast stations on December 19, 20, 21, 26, 28 and 31 and identified the Alma Ata I and II stations on several occasions. Harold also keeps an eye on the m.u.f. and between December 19 and January 5 he found the extremes were 37MHz at 1220 on the 28th and 46MHz at 1130 on the 30th. On most days during this reporting period there seemed to be plenty of signals from Canada, the USA and USSR on 28MHz, but the band went through a quiet patch between January 9 and 12. "Absolutely dead," said **Fred Pallant** G3RNM, Storrington, who was looking for some DX from his new QTH; "nothing heard at all," writes Henry Hatfield in his 28MHz beacon log for the 10th; "conditions poor around December 22 and 23 and band flat on January 10 and 11," comments Norman Hyde and when I checked the band at 0830 and 1500 on the 10th and 0920 and 1310 on the 11th, there was only local ignition interference above the receiver noise to prove my FR-101 was alive to the signals.

28MHz Beacons

Many of my readers who want to know about the prevailing condition of the 28MHz band make routine daily checks on the beacon frequencies which are mainly found between 28.2 and 28.3MHz. Most of these beacons, which usually transmit 24 hours per day, have been organised on an international basis by the RSGB and others by clubs and private individuals for the study of radio

wave propagation throughout the world. Among the regular beacon observers who have contributed this time to the list of beacons heard, Fig. 1, are **Susan Beech** RS50969, Dollar, Scotland, John Coulter, Henry Hatfield, Norman Hyde, Ted Waring and I, which all adds up to a reasonable report for scientific study in the years to come.

Congratulations to David Newman who heard his 45th and 46th 28MHz beacons early in January when he logged KA1YE/B at 1303 on the 6th and WB1GWS/B at 1419 on the 8th, on 28.284 and 28.280MHz respectively.

Tropospheric

Late on December 19, my barograph showed the atmospheric pressure well down at 29.2in (988mb) and still falling. At 0200 on the 21st a huge rise began from 29.1 (985) to 30.1 (1019) by 1000 on the 23rd, on up to 30.4 (1029) by noon on the 26th and peaking at 30.5 (1032) by midnight on the 29th, where it remained until 0200 on the 31st. At this point a gradual fall set in and the pressure hovered around 30.0 (1015) until 2200 on January 6 when it rose gradually to settle around 30.4 from 1800 on the 8th to midnight on the 11th, then falling slowly to 30.0 at 0600 on the 13th, when it began fluctuating between 29.9 (1012) and 30.1 until midday on the 16th where it settled at 30.3 (1026), only to commence falling again at 1400 on the 17th.

The barograph chart, Fig. 2, covering the period December 27 to January 2, shows a text book change in atmospheric pressure, which, coupled with associated tropospheric changes, gave us the lift at the end of 1982. I have placed an "X" on the chart to indicate the point in time where a v.h.f. disturbance is most likely to begin.

Susan Beech has been listening on the 144MHz (2m) band with an IC290E and during the mild lift over Christmas she heard signals through the 144MHz repeaters GB3AR, MP, RF, and WT and EI and GI signals through a repeater she could not identify on R3. The range of many 144MHz repeaters was extended by another mild tropo opening at the turn of the year and at 0848 on December 31. I heard PD0LUI have consecutive QSOs with G6DAY and G8YGK through the Belgian repeater ON0BT, situated in QRA square CK31b on R3.

With the barometric pressure over Southern Europe just beginning to descend from a record high of 1050mb it was not surprising that both 144MHz and 432MHz "opened-up" during January 21/22. Many UK stations contacted countries as far apart as EA and LA which was exceptionally widespread even for tropo.

Down in Dorset **Jim Marshall** G4MHF worked EA1KC in XD square at mid-day on the 21st, exchanging 5/5 reports. The Swiss beacon HB9HB on 144.865MHz in DH square peaked at 5/6 at this time, with the German beacon DLOPR on 144.910MHz in EO square also present. **John Fell** G8MCP reports working several PA, F, DL and long haul G stations during this lift. A personal first for John on January 22 was an exchange with OK1AIU/P (HK square) with several other Czechoslovakian stations heard but quickly disappearing in QSB. Jim G4MHF was also pleased with his recently re-engineered feeder system, which is now low-loss Helix and no doubt helped him to work OE, HB and Y22—this time on 432MHz.

No doubt your reports, which are still coming in, will provide further insight into the nature and extent of this first big 1983 season tropospheric opening.

Band II

Judging from reports and the number of French and Dutch broadcast stations I heard between 88 and 102MHz on December 31, the change of year opening also disturbed the normal paths of signals in Band II.

Between 2030 and 2045 on December 30, **Simon Hamer**, Presteigne, heard signals from Belgium BRT II, Egem, France TDF Culture from Abbeville, Caen, Lille, Perpignan, Reims and Vannes and Holland NOS-I from Goes, between 87 and 103MHz. Harold Brodribb counted 14 French stations in Band II at 0930 on December 30, 16 at 1130 on the 31st and again at 0930 on January 1. The situation changed on January 8 and 9 because although Harold's barometer was reading high, he only logged 8 French stations. This often happens Harold, especially when the opening is on specific rather than general paths. Simon noted that the lift on the 12th seemed confined to stations within

the UK, borne out by the fact that his DX during the event amounted to BBC Radios Cambridge and Solent and ILR Thames Valley. I think that **Michael Welch**, London, hit the nail on the head by saying, "Knowing the band in one's own area, one can tell when something appears that normally isn't there." Michael uses an Aiwa 9700 tuner and a 23-element antenna for his DXing and at present is not too pleased about the lack of response from some broadcast stations to whom he sent detailed reports. Last June and November he sent tape recordings to overseas broadcasters, heard around 96MHz via sporadic-E, but as yet there is no reply. I have experienced the same thing after sending photographs of television pictures to some overseas stations, so don't be too downhearted Michael, many of my readers, as well as myself, have received QSL cards, personal letters and programme schedules from station engineers and managers in answer to DX reception reports.

Following my report about Radio Boulogne Littoral on 103.7MHz, in our February issue, Michael tells me that he heard this station last October and again at 2300 on December 25 when they were transmitting pop music played by Jingle Joe and Carl. "I can get Boulogne on a Roberts 505 portable with its own rod antenna," writes Harold Brodribb; "it takes only a slight lift for me to be able to hear this station," says **Martin Messias** G4JCN, London, who uses a Rotel-925 tuner with an outdoor dipole antenna and heard a mixture of French and English programmes from RBL over the Christmas period.



Fig. 3: Horndean Award Certificate

RTTY

I see from the December 1982 issue of the BARTG newsletter that the Sunday news service on v.h.f. is transmitted under the call sign GB2ATG on 144.600MHz at 1130 for the Brighton area, 1200 Manchester, 1230 London 50 bauds, 1330 Northern Ireland, 1800 London 45.45 bauds, 1930 Wisbech and Glasgow and 2000 for the Blackpool area. Readers wishing to join the British Amateur Radio Teleprinter Group should write to Mrs T Crane, "Greta Woods", Bromley Road, Ardleigh, Colchester, Essex CO7 7SF.

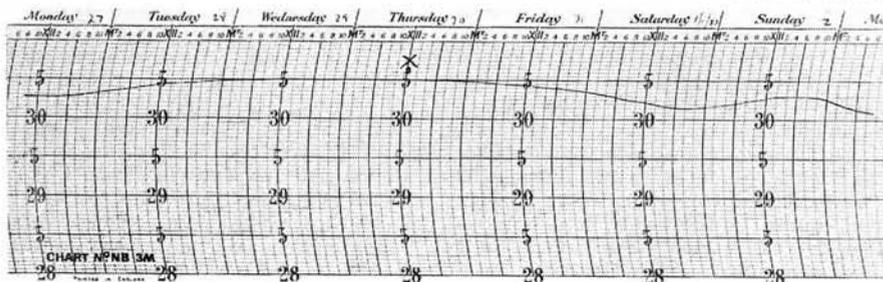


Fig. 2: Atmospheric pressure recorded by the author

Peter Lincoln BRS 42979, Aldershot, is now using an Icom IC-R70 receiver and a Datong FL2 filter for his RTTY reception and is very pleased with the performance of both units. During the month preceding January 6 he copied signals on 14MHz (20m) from most European countries and signals from Africa including 5N0HGB and 5N7HKB, Asia including OD5GN and 9K2KA, South America with CE3CBG and CE3FCF, and North America including AK2H and KX8E.

Although I did not get the usual listening time I would have liked during the period of this report, I did copy RTTY signals from 13 countries, EA, DK, F, HB9, I IT9, OE, OH, OK, OZ, SM, YU and YV on 14MHz and WB2JAB working into G at 1740 on January 16 on 28MHz.

Norman Jennings, Rye, did very well on December 10 when he copied RTTY stations in TU2, XT2, 8P6, 5B4 and plenty of VEs and Ws on 14MHz, JA1, VEs, YV1, PP5 and 9Y4 on 21MHz and CT2, ZS6 and a few Europeans on 28MHz. Between December 9 and January 10, Norman logged RTTY sta-

tions from 23 European countries including IT, LX and SV, which all goes to show there is a great deal to be had from RTTY.

Readers often ask where to find RTTY signals in the wavebands quoted. Well, most of the h.f. traffic is around 14.090MHz, 21.090MHz and 28.090MHz and do make sure that you only tune to one clear signal at a time, because if there is interference from another printer, c.w. or man-made sources on the wanted signal, then your equipment may only print garbage.

Station Information

For those readers interested in the weather, which plays a major role in v.h.f. DX, I have just finished building the Heathkit Digital Rain Gauge to replace my "manual" affair. The new instrument, with its automatic self emptying rain collecting unit, works very well and saves my XYL Joan a lot of work.

The Horndean and District Amateur Radio Club G4FBS, has introduced a

two class h.f./v.h.f. operating award open to both licensed amateurs and s.w.l.s. The certificate, Fig. 3, will be awarded for the required numbers of contacts, or in the case of s.w.l.s for call signs heard, with bona-fide members of the HDARC. Readers interested in more details should send an sae to Jonathan Kay G6DWT, 109 Drift Road, Clanfield, Portsmouth, Hants.

The input and output frequencies of the 1296MHz band (23cm) repeater GB3WX (RM9) are 1291.225 and 1297.225MHz respectively. In addition to the repeater facility, GB3WX transmits site weather telemetry, at present atmospheric pressure and local temperature, with more to come later, on RTTY 45.5 bauds, 170Hz shift, 1275-1445Hz tone using a.f.s.k. The carrier runs continuously with call signs and QTH identification, in c.w., every 3 minutes and telemetry every 30 minutes if the repeater is not in use.

GB3WX is located in ZK20j at the Sussex Repeater Group's site in Brighton and radiates 3W of r.f. from four horizontally polarised dipoles, with the main lobe westwards.

TV

by Ron Ham BRS15744

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

With the news that one of my readers was seen on Swedish television, pictures from Scandinavia and Spain via meteor pings, vintage literature found by DXers in Australia and Gloucestershire and a new antenna catalogue to review, is there any wonder why I look forward to your letters when I have items like this to consider for this column.

Tropospheric

George Garden, Bracknell, always keeps an eye on the prevailing weather and noted that he received the colour pictures from Central Television's u.h.f. transmitter, at Waltham, much stronger during the freezing fog and high humidity on December 13 and the hard frost and fog patches on the 22nd, than he normally does. Good observation George, I am sure other readers can add to this especially where u.h.f. DX is concerned. Knowing that readers are interested in TV captions which help to identify stations, George sent two of his DX pictures, Figs. 1 and 2, which he received from Germany on Ch. 21 during a tropospheric opening last September.

Between 2100 and midnight on December 30, **Tim Anderson**, Stroud, logged a weak picture from Radio Televis

Eireann, RTE 1, in Band III and some French sound on Ch. F5 around 175MHz. Conditions were up as the old year ended because at 1335 on the 30th I received a test card from Belgium, BRT TV1 and at 1945, I watched a film review programme, in colour, on Ch. E10. While the high atmospheric pressure continued falling on the 31st as shown in Fig. 2 in v.h.f. bands, the lift continued and around 0840 there were strong test cards from Holland PTT-NED 1, on Chs. E4 and 5 and at 1830 a clock appeared on Ch. E8 showing 1930. During the early evening I watched a bingo type programme, in colour and captioned "Lotto" on Chs. E7 and 10 most likely from Holland.

Band I

During the 1982 sporadic-E season, **Roger Wallis**, Solihull, received pictures from Austria ORF FS1, Fig. 3, on Ch. E2, Hungary Budapest, Fig. 4, on Ch. R1, Spain, Fig. 5, on Ch. E3 and at 1530 on May 3 he received a picture on Ch. R1, Fig. 6, that he could not identify, any ideas? Roger uses a 20 year old Ilford Sportsman camera with HP5 film, a shutter speed of 1/25 and a stop of f4 to take his TV pictures and judging by the results Roger, you seem to have the settings spot on.

Although well away from the sporadic-E season it is always worth running the rig periodically on Chs. E2 48.25MHz and R1 49.75MHz and by doing just this between December 19 and January 18, I easily identified many bursts of test card, especially in the mornings, from Austria,

Czechoslovakia, Hungary, Norway, Poland, Spain and the USSR and around 1900 on January 7 strong pictures appeared on Ch. R1 which looked like a comedian with an audience and then a male announcer. In mid-January, **Dave Cawser**, Burton-on-Trent, kept an eye on Band I and between 1300 and 1307 on the 11th he saw an advert for Ariel washing powder and YL news reader on Ch. E3, short bursts of test card from Portugal RTP 1, a cartoon film and a group of people in track suits doing keep fit exercises between 1743 and 1917 on the 12th and more pictures from Portugal at 1040 on the 14th.

Meteor Scatter

On January 2, **Brian Renforth**, Torquay, received many strong bursts of pictures and identified a YL singer and a male announcer, via meteor scatter on either Chs. E2 or R1 and because these channels are so close together in frequency one cannot be sure of the station unless a test card or caption is seen. During the peak of the Quadrantid meteor shower, which Tim Anderson found between 2300 on January 3 and 0200 on the 4th, many "pings" of signal were seen in Band I and as high as Ch. E10 in Band III. Among the signal pings that Tim identified, while using his Plustron TVR5D, were test cards from a Swedish station and Norway Gulen, on Ch. E2 and RTVE Spain on Chs. E2, 3 and 4. **Dave Cawser** also kept a meteor scatter watch and caught a glimpse of the TVE revolving caption at 2244 on the 3rd and the RTVE test card at 0943 on the 4th.

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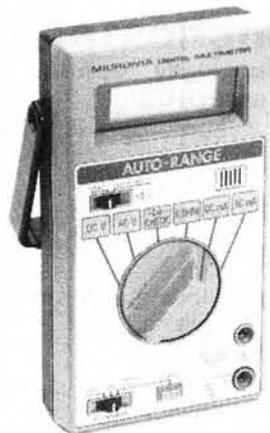
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	1x011	9-9	1.66	
	1x012	12-12	1.25	
	1x013	15-15	1.00	
	1x014	18-18	0.83	
	1x015	22-22	0.68	
	1x016	25-25	0.50	
50 VA 80 x 30mm 0.9 kg Regulation 13%	2x010	6-6	4.16	£5.70 +P £1.30 +VAT £1.05 TOTAL £8.05
	2x011	9-9	2.77	
	2x012	12-12	2.08	
	2x013	15-15	1.66	
	2x014	18-18	1.38	
	2x015	22-22	1.13	
	2x016	25-25	1.00	
80 VA 90 x 30mm 1 kg Regulation 12%	3x010	6-6	6.64	£6.08 +P £1.67 +VAT £1.16 TOTAL £8.91
	3x011	9-9	4.44	
	3x012	12-12	3.33	
	3x013	15-15	2.66	
	3x014	18-18	2.22	
	3x015	22-22	1.81	
	3x016	25-25	1.60	
120 VA 90 x 40mm 1.2 kg Regulation 11%	4x010	6-6	10.00	£6.90 +P £1.67 +VAT £1.26 TOTAL £9.96
	4x011	9-9	6.66	
	4x012	12-12	5.00	
	4x013	15-15	4.00	
	4x014	18-18	3.33	
	4x015	22-22	2.72	
	4x016	25-25	2.40	
160 VA 10 x 40mm 1.6 kg Regulation 8%	5x011	9-9	8.89	£7.91 +P £1.57 +VAT £1.44 TOTAL £11.02
	5x012	12-12	6.66	
	5x013	15-15	5.33	
	5x014	18-18	4.44	
	5x015	22-22	3.63	
	5x016	25-25	3.20	
	5x017	30-30	2.66	

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	6x013	15-15	7.50	
	6x014	18-18	6.25	
	6x015	22-22	5.11	
	6x016	25-25	4.50	
	6x017	30-30	3.75	
	6x018	35-35	3.21	
	6x019	40-40	2.81	
	6x020	45-45	2.50	
	6x021	50-50	2.25	
300 VA 110 x 50mm 2.5 kg Regulation 6%	7x013	15-15	10.00	£10.17 +P £2.00 +VAT £1.82 TOTAL £14.99
	7x014	18-18	8.33	
	7x015	22-22	6.82	
	7x016	25-25	6.00	
	7x017	30-30	5.00	
	7x018	35-35	4.28	
	7x019	40-40	3.75	
	7x020	45-45	3.33	
	7x021	50-50	3.00	
	7x022	110	2.72	
500 VA 140 x 60mm 4 kg Regulation 4%	8x016	25-25	10.00	£13.53 +P £2.20 +VAT £2.38 TOTAL £18.76
	8x017	30-30	8.33	
	8x018	35-35	7.14	
	8x019	40-40	6.25	
	8x020	45-45	5.55	
	8x021	50-50	5.00	
	8x022	55-55	4.54	
	8x023	110	4.54	
	8x024	220	2.27	
	8x025	240	2.08	
625 VA 140 x 75mm 5 kg Regulation 4%	9x017	30-30	10.41	£16.13 +P £2.50 +VAT £2.79 TOTAL £21.70
	9x018	35-35	8.92	
	9x019	40-40	7.81	
	9x020	45-45	6.94	
	9x021	50-50	6.25	
	9x022	55-55	5.68	
	9x023	110	5.68	
	9x024	220	2.84	
	9x025	240	2.60	

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Food For Thought

Throughout the 1982 sporadic-E season, Tim Anderson noted the best events in Band I often occurred on sunny days with high pressure systems and cloudy days rarely produced a major disturbance. Tim thought this was a coincidence until he found an old booklet, with a long title, *How to Receive Foreign TV Programmes on Your Set by Simple Modification*, in which, says Tim, "the author seems to imply that sporadic-E is best with fine weather and high pressure". I don't go along with this Tim, but you

have the best idea when you say "I shall certainly take more notice of weather conditions during the sporadic-E this summer". I will look forward to hearing about the results Tim because I feel that we still have a lot to learn about all modes of propagation.

On the subject of old journals, **Wenlock Burton**, Victoria, Australia, sent an article from the magazine *Radio, Television and Hobbies* (now *Electronics Australia*), dated March 1957 with a report about BBC television sound being received by an amateur in Sydney on 41.5MHz in October 1956 and some sync pulses on the vision channel of 45MHz.

SSTV

"There has not been too much DX that I could find on SSTV this month" writes **Peter Lincoln** from Aldershot, on January 6, who logged EA5AWK working an Italian station, Fig. 7, HB0AWK calling CQ, Fig. 8, along with signals from 4X4 and 5B4. During the previous month, Peter copied a CQ from what looks like DJ3OGF, Fig. 9 and on December 24, a picture of a building, Fig. 10, taken during a transmission by possibly a German station who stopped transmitting before Peter could get his callsign.

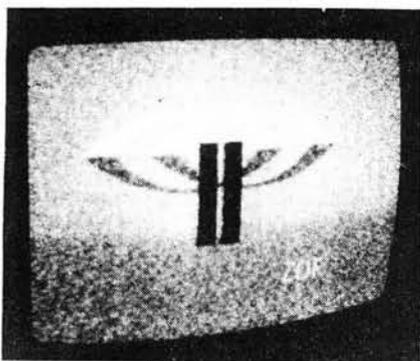


Fig. 1: German TV caption
(George Garden)

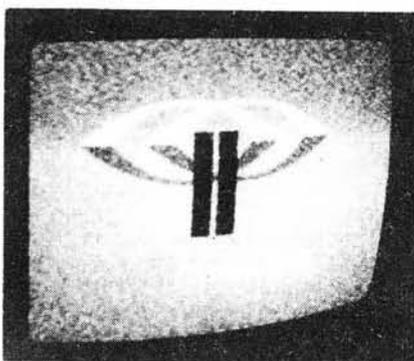


Fig. 2: German ZDF caption
(George Garden)



Fig. 3: Austrian test card (Roger Wallis)



Fig. 4: Hungarian test card
(Roger Wallis)

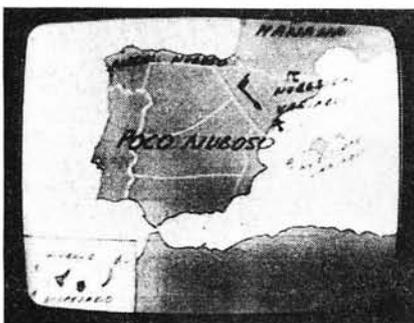


Fig. 5: Spanish weather (Roger Wallis)

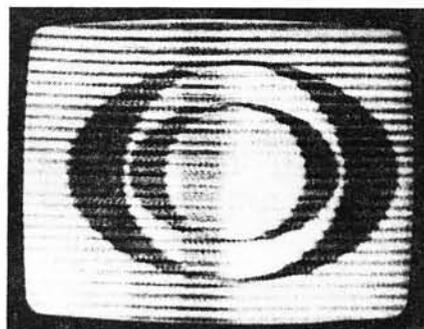


Fig. 6: Mystery picture (Roger Wallis)

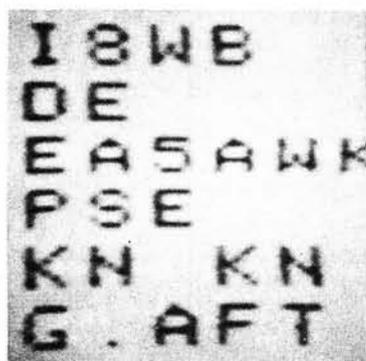


Fig. 7: Spanish SSTV picture
(Peter Lincoln)



Fig. 8: SSTV CQ (Peter Lincoln)

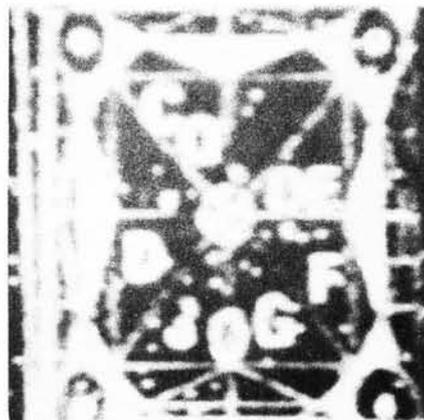


Fig. 9: SSTV CQ from a German station (Peter Lincoln)

"My SC422A SSTV converter is now fitted with Volker's 25 seconds single-frame colour board and I have exchanged excellent such colour pictures with I3XQW" writes **Richard Thurlow G3WW**, March, Cambridge. During 1982 Richard made first time two-way SSTV QSOs with 144 stations worldwide including 3 new countries, FM7CD, ZE1EK and 5B4CV, bringing his two-way SSTV score up to 112 countries worked. "The American 14MHz (20m),



Fig. 10: SSTV picture (Peter Lincoln)

Saturday 1800GMT SSTV net around 14.228 and 14.230MHz, is always worth viewing/listening in to/or working with, to learn the latest SSTV news, ac-

tivity, or just gossip", says Richard who in January 1983 added 2 DJs, 2 EAs and WB8UHZ to his new stations list. In our September 1982 issue, I reported one of Richard's many achievements during a QSO with a Swedish station, which resulted in the following letter from one of my readers in Sweden. "We all saw how Richard Thurlow transmitted a picture of a table laden with delicious food and how SM5EEP responded with a photograph of the Swedish royal couple and a small Swedish flag attached" writes **David Appleyard** from Uppsala, who during the evening of January 9 watched an hour long programme about amateur radio, on Swedish Television, which covered most aspects of the hobby including such items as moon-bounce and SSTV. Many thanks for the gen David, I know that Richard will be pleased to hear about it.

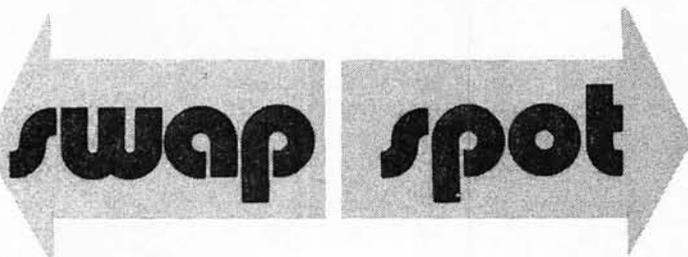
Other Stations

Brian Renforth has moved to Torquay and has been busy modifying and repairing valve type TV receivers to get his DXTV station back on the air. When complete his antenna installation will have a Plemi-Margon 103-element array for u.h.f. and a 3-element beam antenna for Band I, driven by a Stolle/Hischmann rotator and a 6-element Yagi in the loft for Band III.

Two well known TVDXers, Roger Bunney and David Martin, directors of South West Aerial Systems, sent me their firm's latest catalogue which, as well as many useful technical tips, contains a wide range of antennas, pre- and distribution amplifiers, filters, masts, rotators, up and down converters and a variety of accessories for the Band II and TVDXer. Readers interested should write to: SWAS at 10 Old Boundary Rd, Shaftesbury, Dorset, SP7 8ND.

In April 1981, Roger Wallis, purchased a Thorn 850 TV receiver, a Hugh Cocks up-converter and with a 3-element beam this set-up gave good results in Band I during the sporadic-E season. In May 1982, Roger purchased a working Bush TV183 and with the aid of some technical literature, made both sets switchable between v.h.f. and u.h.f., 405 and 625 lines and positive and negative video modulation. During the 1982 sporadic-E season, Roger's 10 year old son was the envy of his school friends, because he was able to see some of the World-Cup football matches that were not on British television.

I must once again warn readers not to attempt to modify old or new television receivers unless you know what you are doing, because of the high voltages and often live chassis employed and the great risk of electric shock.



Have heavy duty p.s.u. suitable for communications receiver, 300V h.t., 7V l.t. and dB meter in portable case. Would exchange for stereo tape deck. A. L. Holdsworth, 149 Blenheim Chase, Leigh-on-sea, Essex, SS9 3HJ. Tel: 76211. **Q653**

Have Raleigh Caprice ladies cycle 26in wheels, 3-speed and dynamo, as new, value £70. Would exchange for Trio-310 receiver or similar. Please collect and deliver. Walker, 35/37 Brighthouse and Denholme Road, Queensbury, Bradford, Yorkshire, BD13 1NA. **Q669**

Have Tandburg 15 reel tape recorder with group trainer facilities, Ferguson tape recorder, Avo valve voltmeter etc. Would exchange all or part for h.f. receiver or transmitter, non-working OK. Cain, 18 Oaky Balks, Alnwick, Northumberland. Tel: 602487. **Q670**

Have 240V-115V p.s.u. converter, high quality Aiwa AD 1800 stereo cassette deck top loader DIN 455500, cost £172. Realistic twin bass reflex speakers 70W each, 5 months old, cost £140. Would exchange for any amateur radio equipment. Northampton 0604 719233. **Q710**

Have Canon 814 super 8 cine camera. Would exchange for R216. Overall, 36 Eleanor Road, Waltham Cross, Herts, EN8 7DL. **Q739**

Have 140 amp welding kit complete with all leads, masks, brazing attachment, supply of welding rods. Would exchange for Sinclair ZX81 and 16K memory pack. 46b Musgrove Road, New Cross, London SE14. Tel: 01 639 3530. Anyone interested must collect. **Q579**

Have Pye Bantam and Pocket-phone, both in good and original condition (will crystal any reasonable channel of your choice). Would exchange for military radios or accessories, anything considered. G8MQT, 07073 27233 (Welwyn Garden City). **Q740**

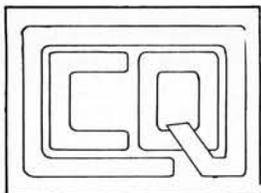
Have mint 144MHz handheld f.m. transceiver with band/memories scanning, l.c.d. readout, charger, Nicads etc., one or three watts output, one owner, model Azden PCS300. Would exchange for mint unmodified Trio R1000 RX with cash adjustment. Tel: 0373 64694 (Warminster area). **Q741**

Have Lafayette HA-600A solid state receiver 150kHz to 30MHz a.m./s.s.b./c.w. 220V/12V, operating manual. Would exchange for Sinclair ZX81 with 16K RAM or similar. 22 Murray Ave., Kilsyth, Glasgow. Tel: 0236 823424. **Q810**

Have Tektronix 543 oscilloscope with type B plug in unit. Would exchange for any 144MHz (2m) transceiver or w.h.y. Tony G6PDA. Tel: 0777 707698. **Q839**

Have h.f. mobile linear, 3-30MHz, switchable up to 200W p.e.p., still in box, with 13.8V 10A power supply. Also Amstrad CB900 f.m. CB and other items. Would exchange for 144MHz (2m) multimode in very good condition. Tel: Gravesend 59346. **Q857**

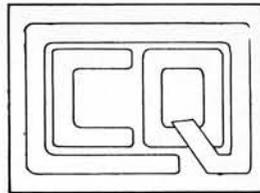
Have Grundig 1400 SL receiver one year old in mint condition. Would exchange for good f.m. scanner or Yaesu FRV7700D converter or w.h.y. M. Clapham, 99 Fairfax Avenue, Harrogate. Tel: 886627. **Q858**



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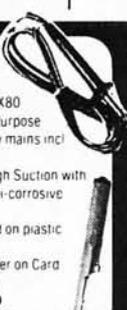
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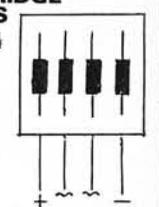
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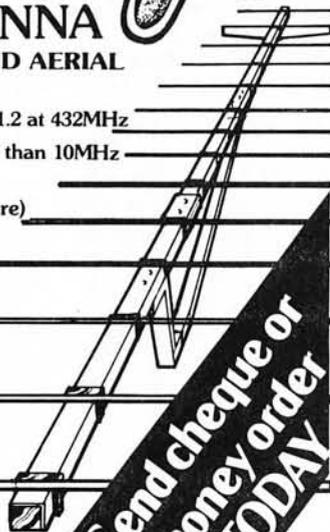
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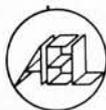
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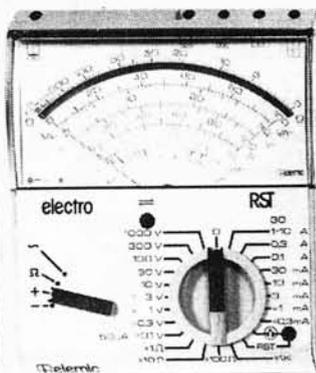
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22/16	6p	100/16	7p	470/16	11p	2200/16	20p

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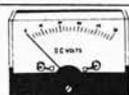


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DAF91 0.45	ECH3 2.50	EZ90 0.96	PL36 0.95	6AL5 0.52	12AX7WA 2.50	LC7120 3.50	AC187 0.25	BC184A 0.09	BF265 0.32	TIP42C 0.47
DAF96 0.65	ECH35 1.60	G1/371K 30.00	PL81A 0.72	6AM4 3.25		LC7131 5.50	AC187K 0.28	BC12 0.09	BF266 0.30	TIP295 0.80
DET22 28.00	ECH42 1.00		PL802 0.65	6AM5 6.00		LC7137 2.00	AC188 0.25	BC212 0.09	BF268 0.25	TIP3055 0.55
DET24 35.00	ECH81 0.58	G55/1K 9.00	PL500 0.95	6AN5 3.95		MCB3712 2.00	AD149 0.70	BC213 0.09	BF269 0.21	TIS91 0.20
DF91 0.70	ECH84 0.69	GS10C 12.00	PL504 4.85	6AQ5 1.20	12A77 1.95	MC1330P 0.76	AD161 0.39	BC213L 0.09	BFY51 0.21	2N3054 0.59
DF92 0.60	ECL80 0.60	GUX50 12.50	PL509 4.95	6AS5 1.50	12A7A 1.05	ML231B 1.75	AD162 0.39	BC238 0.05	BFY52 0.25	2N3055 0.52
DF96 0.85	ECL84 0.74	GY501 1.20	PL519 4.95	6AT6 0.75	12B7 1.50	SLB01B 6.65	AF124 0.34	BC307 0.09	BFY90 0.77	2N3072 0.12
DK91 0.90	ECL86 0.74	GZ30 1.00	PL802 4.50	6BA6 0.69	12B7A 2.75	SN76003N 1.95	AF126 0.35	BC327 0.10	BT108 1.22	2N3704 0.12
DK92 1.20	ECL88 0.74	GZ33 4.50	PV88 0.52	6BA7 4.50	12B7B 2.95	SN76013N 1.95	AF127 0.32	BC348 0.20	BT116 1.22	2N3705 0.12
DK96 2.50	ECL880	GZ33 4.50	PV800 0.69	6BA8A 3.50	12CN7 3.95	SN76023N 1.95	AF139 0.40	BC547 0.10	BU105 1.22	2N5284 0.42
DL92 0.60		GZ34 2.15	QV02-6 12.75	6BE6 0.72	30FL2 1.10	SN76033N 1.95	AF239 0.42	BC548 0.10	BU108 1.69	2N5296 0.48
DL96 2.50		GZ37 4.50	QV03-10 8.50	6BD6 1.00	31J56A 2.95	SN76131N 1.30	AU106 2.00	BC549A 0.08	BU124 1.00	2N5496 0.65
DLS10 8.00	EF37A 2.00	KT61 3.50	QV03-20A 18.50	6BE7 1.95	38HE7 4.90	SN76650N 0.80	AU107 1.75	BC557 0.08	BU126 1.60	2SA715 0.95
DLS16 10.00	EF39 1.00	KT66 USA 6.95	QV03-40A 18.00	6BN7 4.50	75C1 1.95	SN76666N 0.70	AU107 1.75	BC557 0.08	BU205 1.30	2SC495 0.80
DM160 2.75	EF45 2.25	KT77 9.50	QS150/45 7.00	6BN8 2.75	85A 6.50	TAA550 0.25	AU110 2.00	BC558 0.10	BU208 1.39	2SC496 0.80
DY86/87 0.55	EF80 0.55	KT88 USA 7.95	QS1200 3.95	6BR7 4.15	85A2 2.00	TAA661B 1.20	AU113 2.95	BC558 0.10	BU208A 1.52	2SC1096 0.80
DY802 0.60	EF85 0.55	KT88 UK 7.95	QS1209 2.00	6BR7 4.15	90CC 13.15	TA7081AP 3.95	BC108 0.10	BC103 0.40	BU326A 1.42	2SC1173 1.15
E80CC 7.00	EF86 0.95		QS1212 3.20	6BR8A 2.15	92AV 11.85	TA710 1.65	BC109B 0.12	BD135 0.30	BU526 1.90	2SC1306 1.00
E80CF 9.50	EF89 0.85		QS1213 3.20	6BS7 4.50	92AV 11.85	TA7130 2.15	BC141 0.31	BD136 0.30	BU526 1.90	2SC1307 1.50
E81CC 3.50	EF91 1.25		QS1214 3.20	6BV6 5.35	150C4 2.15	TA7205AP 1.50	BC141 0.25	BD137 0.32	BU526 1.90	2SC1449 0.80
E82CC 3.50	EF92 2.50		QS1215 3.20	6C4 2.00	807 1.50	TA7222 1.80	BC142 0.21	BD138 0.30	MRFA453 11.50	2SC1678 1.25
E83CC 3.50	EF94 0.55		QS1216 3.20	6C4 2.00	811A 12.95	TA7222 1.80	BC143 0.21	BD139 0.32	MRFA454 15.50	2SC1945 2.10
E83F 3.50	EF183 0.65		QS1217 3.20	6C6 10.35	813 18.50	TA7222 1.80	BC147 0.09	BD140 0.30	MRFA455 23.50	2SC1953 0.95
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E130L 14.50	EF806S 9.85		QS1221 3.20	6C6 10.35	813 18.50	TAA520Q 1.10	BC152 0.09	BF194 0.11	OC71 10.00	2SC2078 1.45
E180F 6.50	EF806S 9.85		QS1222 3.20	6C6 10.35	813 18.50	TAA520Q 1.10	BC152 0.09	BF196 0.11	R2008B 1.70	2SC2091 0.85
E182CC 9.00	EF806S 9.85		QS1223 3.20	6C6 10.35	813 18.50	TAA520Q 1.10	BC160 0.28	BF197 0.11	R2108 1.70	2SC2314 0.80
E810F 16.00	EF806S 9.85		QS1224 3.20	6C6 10.35	813 18.50	TAA520Q 1.10	BC170B 0.15	BF198 0.16	R2540 2.48	2SD234 0.50
E8BC80 0.65	EL34 (Mullard) 3.50		QS1225 3.20	6C6 10.35	813 18.50	TAA520Q 1.10				
EAF42 1.20	EL36 1.50		QS1226 3.20	6C6 10.35	813 18.50	TAA520Q 1.10				
EB91 0.52	EL38 6.00		QS1227 3.20	6C6 10.35	813 18.50	TAA520Q 1.10				
EB91 0.52	EL38 6.00		QS1228 3.20	6C6 10.35	813 18.50	TAA520Q 1.10				
EB91 0.52	EL38 6.00		QS1229 3.20	6C6 10.35	813 18.50	TAA520Q 1.10				
EB91 0.52	EL38 6.00		QS1230 3.20	6C6 10.35	813 18.50	TAA520Q 1.10				
EB91 0.52	EL38 6.00		QS1231 3.20	6C6 10.35	813 18.50	TAA520Q 1.10				
EB91 0.52	EL38 6.00		QS1232 3.20	6C6 10.35	813 18.50	TAA520Q 1.10				
EB91 0.52	EL38 6.00		QS1233 3.20	6C6 10.35	813 18.50	TAA520Q 1.10				
EB91 0.52	EL38 6.00		QS1234 3.20	6C6 10.35	813 18.50	TAA520Q 1.10				
EB91 0.52	EL38 6.00		QS1235 3.20	6C6 10.35	813 18.50	TAA520Q 1.10				
EB91 0.52	EL38 6.00		QS1236 3.20	6C6 10.35	813 18.50	TAA520Q 1.10				
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EB91 0.52	EL38 6.00		QS1265 3.20	6C6 10.35	813 18.50	TAA520Q 1.10				
EB91 0.52	EL38 6.00		QS1266 3.20	6C6 10.35	813 18.50	TAA520Q 1.10				
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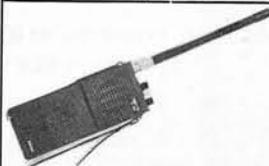
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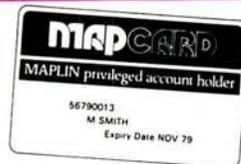
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