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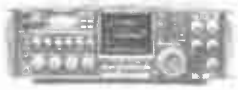

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YAESU

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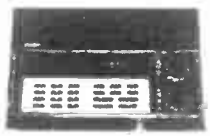

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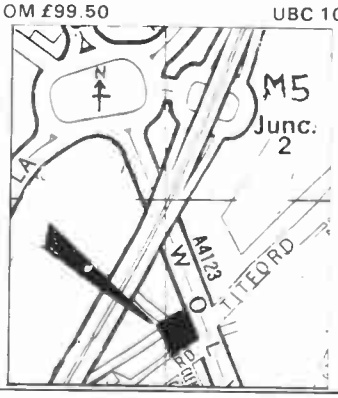

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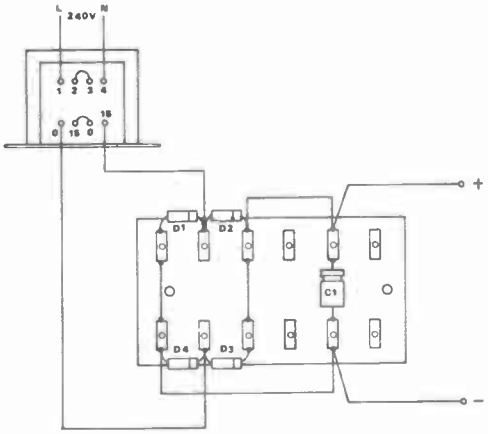
The Yaesu FT736R multiband multimode transceiver.
Photo by Dave Morgan



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BC108	0.10	BC547	0.10	BF158	0.22	BT100A/02		RCA16181	0.85	2SC789	0.55
BC108B	0.12	BC548	0.10	BF178	0.25		0.85	RCA16334	0.90	2SC931D	0.95
BC109	0.10	BC549A	0.10	BF179	0.34	BT106	1.49	RCA16335	0.85	2SC937	1.95
BC109B	0.12	BC550	0.14	BF180	0.29	BT116	1.20	RCA16572	0.85	2SC1034	4.50
BC109C	0.12	BC557	0.08	BF181	0.29	BT119	3.15	S2060D	0.95	2SC1096	0.80
BC114A	0.09	BC558	0.10	BF182	0.29	BT120	1.65	SKE5F	1.45	2SC1106	2.50
BC115	0.55	BC639/10	0.30	BF183	0.29	BU105	1.95	T602IV	0.45	2SC1124	0.95
BC116A	0.65	BCY33A	19.50	BF184	0.35	BU108	1.69	T6027V	0.45	2SC1162	0.95
BC116A	0.50	BD115	0.30	BF185	0.26	BU124	1.25	T6029V	0.45	2SC1172Y	2.20
BC117	0.19	BD124P	0.59	BF194	0.11	BU125	1.25	T6036V	0.55	2SC1173	1.15
BC119	0.24	BD131	0.42	BF195	0.11	BU126	1.50	T9002V	0.55	2SC1307	2.95
BC125	0.25	BD132	0.42	BF197	0.11	BU204	1.55	T9011V	0.75	2SC1364	0.50
BC139BC	0.20	BD133	0.40	BF198	0.16	BU205	1.30	T9015V	2.15	2SC1413A	2.50
BC140	0.31	BD135	0.30	BF199	0.14	BU208	1.39	T9034V	2.15	2SC1449	0.50
BC141	0.25	BD136	0.30	BF200	0.40	BU208A	1.52	T9038V	3.95	2SC1628	0.75
BC142	0.21	BD137	0.32	BC240	0.20	BU208D	1.85	THY15/80	2.25	2SC1678	1.50
BC143	0.24	BD138	0.30	BF241	0.15	BU326	1.20	THY15/85	2.25	2SC1945	3.75
BC147B	0.12	BD139	0.32	BF245	0.30	BU326S	1.50	TIP25	0.40	2SC1953	0.95
BC148A	0.09	BD140	0.30	BF256LC	0.35	BU407	1.24	TIP29C	0.42	2SC1957	0.80
BC148B	0.09	BD144	1.10	BF257	0.25	BU408	1.50	TIP30C	0.43	2SC1969	1.95
BC149	0.09	BD150C	0.29	BF259	0.28	BU500	2.25	TIP31C	0.55	2SC1985	1.50
BC153	0.30	BD159	0.65	BF271	0.28	BU508A	1.95	TIP32C	0.42	2SC2028	1.15
BC157	0.12	BD160	1.50	BF271	0.26	BU526	1.90	TIP33C	0.95	2SC2029	1.95
BC159	0.09	BD166	0.95	BF273	0.18	BU807	2.25	TIP34B	0.95	2SC2091	0.85
BC161	0.55	BD179	0.72	BF335	0.35	BUY20	2.15	TIP41A	0.45	2SC2098	2.95
BC170B	0.15	BD182	0.70	BF336	0.34	BUY69B	1.70	TIP41C	0.45	2SC2314	0.80
BC171	0.09	BD201	0.83	BF337	0.29	BUY71	2.50	TIP42C	0.47	2SC2371	0.36
BC171A	0.10	BD202	0.65	BF338	0.32	BUV41	2.50	TIP47	0.65	2SC931D	0.95
BC171B	0.10	BD203	0.78	BF355	0.37	MJ3000	1.98	TIP48	0.85	1SDS234	0.50
BC172	0.10	BD204	0.70	BF362	0.38	MJE340	0.40	TIP50	0.65	2SD325E	1.65
BC172B	0.10	BD222	0.46	BF363	0.65	MJE350	0.75	TIP120	0.50	2SK19	0.55
BC172C	0.10	BD223	0.59	BF371	0.26	MJE520	0.48	TIP125	0.65	2SK33	0.55
BC173B	0.10	BD225	0.48	BF394	0.19	MJE2955	0.95	TIP142	1.75	2SK105H	1.50
BC174A	0.09	BD232	0.35	BF422	0.32	MPSA13	0.29	TIP146	2.75	3SK88	0.95
BC177	0.15	BD233	0.35	BF423	0.26	MPSA92	0.30	TIP161	2.95		
BC178	0.15	BD236	0.49	BF457	0.32	MRF237	4.95	TIP2955	0.80		
BC182	0.10			BF458	0.38	MRF450A		TIP3055	0.55		
				BF467	0.65		13.95	TIS91	0.30		

DIODES

AA119	0.06	BYX36-150R	0.20
BA115	0.13	BYX38-600R	0.50
BA145	0.15	BYX55-600	0.30
BA148	0.17	BYX71-600	1.75
BA154	0.06	BZX71	0.15
BA156	0.15	BZX61	0.15
BA157	0.30	BZX88	0.10
BA244	0.75	BZY95C30	0.35
BA301	0.75	CS48	8.00
BA302	0.85	CS108B	16.50
BA313	0.75	MR510	0.65
BA318	2.95	MR512	0.65
BA328	2.95	OA47	0.15
BA521	1.75	OA90	0.10
BAV21	0.30	OA91	0.15
BAW62	0.19	OA95	0.10
BAX13	0.04	OA202	0.20
BAX16	0.12	1N21DR	5.00
BB1205B	0.30	1N23B	2.95
BT151	0.79	1N23C	2.95
BY126	0.10	1N23ER	4.95
BT127	0.11	1N23WE	4.95
BY133	0.15	1N4001	0.04
BY164	0.48	1N4003	0.04
BT176	1.20	1N4004	0.05
BY179	0.63	1N4007	0.06
BY182	0.55	1N4148	0.02
BY184	0.35	1N4448	0.10
BY187	0.45	1N5401	0.12
BY199	0.40	1N5402	0.14
BY206	0.14	1N5403	0.12
BY208-800	0.33	1N5406	0.13
BY210-800	0.33	1N5407	0.16
BY223	0.90	1N5408	0.16
BY298-400	0.22	1TT44	0.04
BY299-800	0.22	ITT923	0.15
BYX10	0.20	ITT2002	0.10
BYX25-600	1.25		

ZENER DIODES

BZX61 Series	0.15
BZY88 Series	0.20

EHT MULTIPLIERS

Universal Tripler	5.45
Decca 30	5.35
Decca 80	6.95
Decca 100	6.95
Decca 120	6.95
Decca 1730	6.35
GEC 2040	5.45
GEC 2110	6.95
ITT CVC1-9	6.35
ITT CVC20/25/30	6.35
ITT CVC45	6.95
Philips G8 (550)	6.95
Philips G9	6.00
Pye 697	6.50
Pye 713 4 lead	8.50
Pye 713 5 lead	8.50
Pye 731/25	8.50
Rank A774	6.35
Rank A823	6.95
Rank T20A	6.95
Siemens TVK76/1	6.95
Siemens Europa	7.50
Thorn 1500	5.45
Thorn 1600	5.45
Thorn 3500	7.95
Thorn 8000	6.95
Thorn 8500	7.15
Thorn 9000	8.50
Thorn 9600	8.50
TV11 Stick	0.90
TV13 Stick	1.25
TV18 Stick	1.10
TV20 Stick	1.40

VIDEO HEADS

NEW RANGE – LOWER PRICES

If in doubt please phone quoting your model number and we will confirm the head you require

3HSSV	For Ferguson/JVC	27.50
3HSSUIN	For National Panasonic/Philips	29.50
3HSS3N	For National Panasonic/NV777/330	39.50
3HSSN/4HSS	For National Panasonic	29.50
3HSSH	For Hitachi	35.00
3HSSU3N	For National Panasonic	35.00
3HSSP	For Sharp	35.00
3HSS6NA	For National Panasonic Industrial	75.00
3HSSU2N	For National Panasonic	39.50
3HSSSF	For Fisher/Fidelity	35.00
3HSSR	For Amstrad/Saisho/Triumph	35.00
PS38S	For Sony SLC5 6 7 etc	35.00
PS3BT	For Toshiba	39.50
PS482S	For Sony SLC20/30 etc	39.50
PS583S	For Sony SLC8/C9 etc	49.50
Philips	V2000	65.00

VIDEO BELT KITS

Akai VS93000/9500/9800	2.75	National Panasonic NV3000D	3.75
Amstrad 7000/Saisho Triumph 000000000 498Nf121.50		National Panasonic NV7000	2.75
Ferguson 3V16	2.75	National Panasonic NV8600/8610/8620	3.75
Ferguson 3V22/JVC HR3360/3660	2.95	Sanyo VTC5000	1.50
Ferguson 3V23/JVC HR7700	1.50	Sanyo VTC5300	1.75
Ferguson 3V29/JVC HR7200	2.75	Sanyo VTC5500	2.75
Ferguson 3V31/JVC HR7650	2.75	Sanyo VTC9300	3.75
JVC HR3330/3600	2.75	Sanyo VTC9300P	3.90
Hitachi VT11/33	2.75	Sharp 6300	3.50
Hitachi VT5000	2.95	Sharp 7300	3.50
Hitachi VT8000	1.25	Sharp 8300	3.50
National Panasonic NV300/333/340	2.95	Sharp 9300	3.50
National Panasonic NV2000B	3.75	Sony C6	2.75
National Panasonic NV777	2.75	Sony C7	3.50
		Sony T9	2.95
		Sony SL3000B	3.75
		Sony SL8000/8080	4.50
		Toshiba 7540	3.50
		Toshiba 9600	1.50

PUSH BUTTON UNITS

Decca/ITT	6 way	7.95	C8 (late)	6 way	14.50
Decca	4 way	7.95	ITT	7 way	10.50
Hitachi	4 way	11.95	Neons	7 way	12.50
Pye	6 way	10.35	Rank	4 way	10.50
GEC213	6 way	9.50	Rank	6 way	10.50
GEC2110	6 way	10.50	Luxor	6 way	11.00
GEC	6 way	10.50			

FUSES

2mm Q/B @ 0.06 each
100 MA, 200 MA, 250 MA, 500 MA, 1 AMP, 1.25 AMP, 1.5 AMP, 1.6 AMP, 2 AMP, 2.5 AMP, 3.15 AMP, 4 AMP

Special offer: 100 per type 4.50

20mm A/S @ 0.15 each
100 MA, 150 MA, 160 MA, 250 MA, 500 MA, 800 MA, 1.25 AMP, 1.6 AMP, 2 AMP, 3.15 AMP, 5 AMP.

Special offer: 100 per type 11.50

1.25 inch Q/B @ 0.06 each
250 MA, 500 MA, 750 MA, 1 AMP, 1.5 AMP, 2 AMP, 3 AMP, 7 AMP, 10 AMP

Special offer: 100 per type 4.00

1.25 inch A/S @ 0.15 each
50 MA, 60 MA, 100 MA, 150 MA, 250 MA, 500 MA, 750 MA, 1.5 AMP, 3 AMP, 4 AMP, 5 AMP

Special offer: 100 per type 10.00

SUNDRIES

Mono Tape Head	2.50
Auto Reverse Tape Head	3.95
Stereo Head	3.50
Pye IF Gain Module	5.99
4.433 MHZ Crystal (PAL)	0.45
5.5 MHZ Crystal (Sound)	0.45
Delay Line SL50/TAU82	1.15
Focus Control GEC210	1.50
Focus Control PYE731	1.50
Focus Stick	0.95
SAW Filter	0.10
Anode Cap 27KV	0.69
Solder Mop	0.64

LINE OUTPUT TRANSFORMERS

Decca 80	7.95
Decca 100	7.95
Decca 1700 Mono	9.95
Decca 1730	8.25
Decca 2230	8.25
GEC2040	7.50
GEC2110	14.50
Grundig 1500	15.45
Grundig 5010-6010	
222 5011-6011	13.45
ITT CVC20	8.20
ITT CVC25/30/32	8.20
Philips G8	8.50
Philips G9	8.95
Philips G11	13.95
Pye 691/697	11.50
Pye 713/715	11.50
Pye 725	10.95
Pye 731	9.95
RMB T20A	12.40
Rank Murphy T18A	10.00
Rank Murphy T20A	12.50
Rank Murphy A640	8.50
Rank Murphy A823	11.50
Tandberg 90	11.15
Telefunken 711A	11.15
Thorn 1500 (15KV)	15.45
Thorn 1590	9.50
Thorn 3500 (EHT)	9.50
Thorn 8000	23.50
Thorn 8500	17.50
Thorn 9000	19.50
Thorn 9800	22.40
Thorn Mains Transformer 3000/3500	9.70

TV MAIN SWITCHES

Mains Switch CVC5	1.00
Mains Switch Decca/GEC G8 Switch	1.00
G11 Switch	0.95
G11/12 with Remote	1.15
G11/12 with Remote and Mains off	1.50

VARICAP TUNERS

ELC1043/05 Mullard	8.65
ECL1043/06 Mullard	8.65
U321	8.25
U322	8.25
U324	11.00

THERMISTORS

VA1040	0.23
VA1056S	0.23
VA8650	0.45
VA1097	0.25

WIREWOUND RESISTORS

4 watt		2R-10K 0.20
7 watt	R47-22K	0.20
11 watt	1R-15K	0.25
17 watt	1R-15K	0.30

CATHODE RAY TUBES

A small selection from our stock of 10,000. Please add £3 additional carriage per tube

D10-210GH	45.00
D10-230GH	35.00
D13-610GH	59.00
D13-611GH	59.00
D13-630GH	59.00
D14-150GH	75.00
D14-173GM	53.00
D14-181GM	53.00
D14-200GM	75.00
D16-100GH/97	65.00
DG7 32	45.00
DH3-91	65.00
F16-101GM	75.00
F21-130GR	75.00
F31-12LD	75.00
M14-100GM	45.00
M17-151GVR	175.00
M23-112GV	55.00
M31-182GV	53.00
M31-184W	65.00
M31-190GR	65.00
M31-325GH	35.00
M36-141W	76.00
M40120W	59.00
SE5FP31	55.00
3BP1	16.00
3WP1	18.50
95447GM	75.00

A SELECTION FROM OUR STOCK OF BRANDED VALVES

A1714	24.50	C1134	32.00
A1834	7.50	C1149/1	195.00
A1998	11.50	C1150/1	135.00
A2087	11.50	C1534	32.00
A2134	14.95	CCA	3.50
A2293	6.50	CD24	6.50
A2426	39.50	CK1006	3.50
A2599	37.50	CK1007	3.50
A2792	27.50	CK5676	6.50
A2900	11.50	CK5678	7.50
A3042	24.00	CV Nos prices on request	
A3283	35.95	D3A	27.50
AC-P1	5.50	D41	4.50
ACSP3A	4.95	D63	1.20
AC/S2PEN	8.50	DA41	22.50
AC5 PEN	4.50	DA42	17.50
AC/VP1	4.50	DA90	4.50
AC/TH1	4.00	DA100	175.00
ACT22	59.75	DAF91	0.70
AH221	39.00	DAF96	0.65
AH238	39.00	DC70	1.75
AL60	8.00	DC90	3.50
AN1	14.00	DCX-4-5000	25.00
ARP12	2.50	DET16	28.50
ARP34	1.25	DET18	28.50
ARP35	2.00	DET20	2.50
AZ11	4.50	DET22	35.00
AZ31	2.50	DET23	35.00
B1153	225.00	DET24	39.00
BL63	2.00	DET25	22.00
BR191B	395.00	DET29	32.00
BS450	67.00	DF91	1.00
BS452	85.00	DF92	0.50
BS810	55.00	DF96	1.25
BS814	55.00	DF97	1.25
BS894	250.00	DG10A	8.50
BT17	25.00	DH63	1.50
BT5B	55.00	DH77	0.90
BT5B	55.00	DK91	1.20
C1K	27.50	DK92	1.50
C3E	22.00		
C3J	20.00		
C3M	17.95		

STRAIGHT & LEVEL

RAYCOM MOVE

Ray Withers Communications, the well-known dealers in amateur radio equipment, have made some changes to their outfit.

Firstly, as you will see from Ray's advert in our own unrivalled publication, the company name has been shortened to Raycom. Secondly, Raycom has moved to new and luxurious offices. Sited at International House, 963 Wolverhampton Road, Oldbury, West Midlands B69 4RJ, the company is now easily accessible and very central.

Raycom are official Sony dealers, also retailing Uniden, Yaesu and Icom goods (to name but a few). They also stock Butternut aerials, as reviewed by Angus McKenzie recently. Well worth a visit if you're in the West Midlands.

MONEY BACK

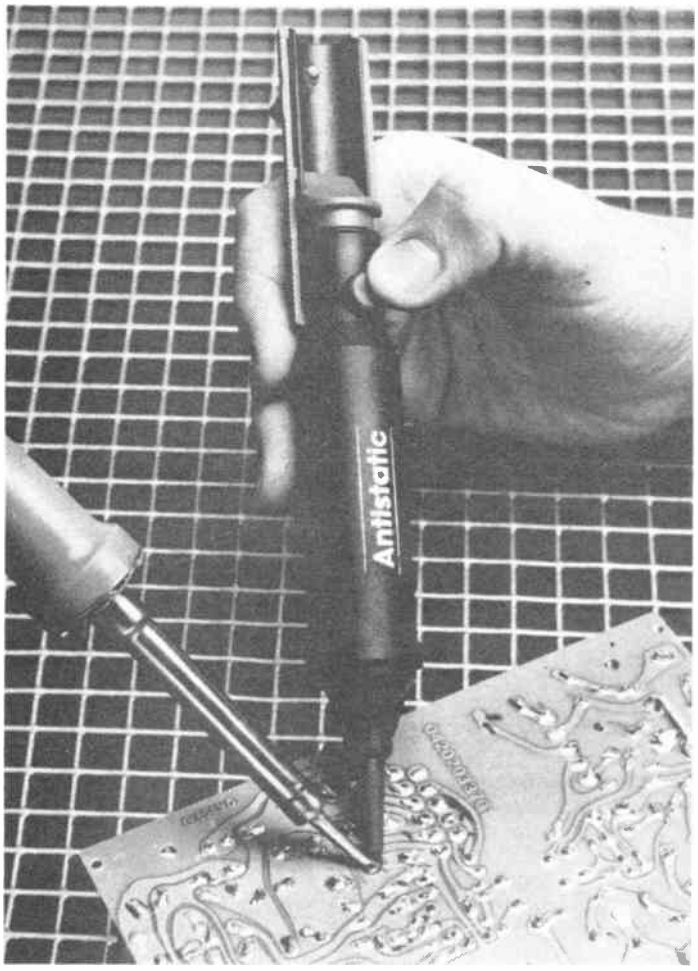
Owners of high quality, but now unused equipment that is gathering dust on storage shelves can realise valuable revenue by selling through Carston Electronics.

Carston has established a unique brokerage scheme that offers sellers a rapid means of 'liquidising' the large sums of money that can be tied up in redundant items such as instrumentation, test equipment, computer peripherals, etc.

In particular, the company is interested in hearing from owners of recent models from brand-name manufacturers. Many companies purchase specialist equipment to fulfil the needs of a project and, when this is completed, place the equipment in storage.

Carston has developed this capability in response to a growing requirement for companies to utilise their capital in the most efficient manner. The company also provides a proven source of fully calibrated and guaranteed equipment.

For further information, contact: *Carston Electronics Ltd, 2-6 Queens Road, Teddington, Middlesex TW11 0LR. Tel: 01-943 4477.*



SOLDER OFF

Ceka now offers a new antistatic desoldering pump with variable spring action suction.

The suction power is varied simply by unthreading the pump's nozzle and turning the spring to either the 'soft' or 'strong' suction position. The suction is strong, muffled and recoilless.

The desoldering pump, number 6103, is made from black antistatic nylon glass plastic. When it reloads, it clears solder through a heat-resistant non-stick carbon fibre tip. It is supplied in individual wallets, with full instructions for use and maintenance, and costs £11.00.

For further information contact: *Ceka Works Limited, Pwllheli, Gwynedd, North Wales LL53 5LH. Tel: (0758) 612254.*

PCB CONNECTORS

A new modular BLA/SLA connector system for printed circuit boards made its debut in the UK on the Klippon Stand at the All Electronics Show.

Designed for various process control systems, the range is available in a single row format from 2 to 24 poles and in a double row format with up to 48 poles. The modules can be built into blocks, can be easily terminated and are designed to be vibration proof.

The connectors are manufactured in PBTP, have an operational temperature range of 120 degrees centigrade and an 8A current rating.

For further details, contact: *Klippon Electricals, Power Station Road, Sheerness, Kent ME12 3AB. Tel: (0795) 580999.*

All the latest news, views, comment and developments on the amateur radio scene

ADAPTOR PLUG

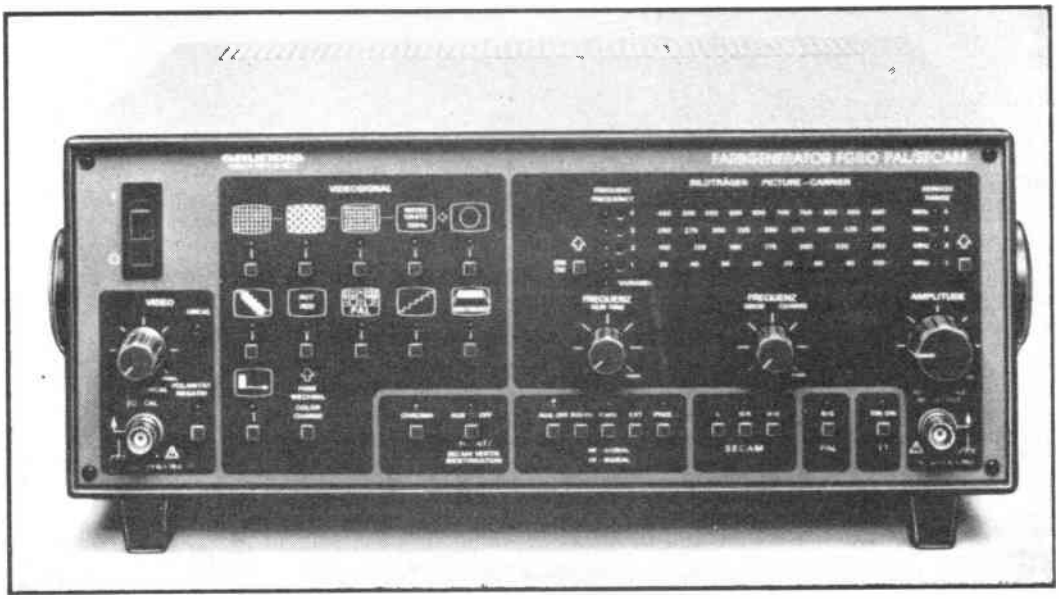
STC Electronic Services has introduced the new MK SafeGuard RCB adaptor plug to complement its MK Sentry-socket range.

Designed to provide immediate mobile earth fault protection by simple insertion into a standard 13A socket, the adaptor features sleeved pins, double pole isolation and a patented safety shutter on live and neutral.

As an added safety facility, the SafeGuard will trip off if it is removed from the socket or if the power supply is cut. More importantly, it will not automatically restore power to equipment (ie, dangerous tools) following an interruption until the reset button is manually operated.

The adaptor operates with a 30mA trip current, is fitted with a test button to ensure satisfactory function and features a mechanical indicator for maximum safety. If necessary, two units may be fitted into a twin 13A socket outlet.

For further information, contact: *The Tool Group, STC Electronic Services, Edinburgh Way, Harlow, Essex CM20 2DF. Tel: (0279) 626777.*



COLOUR PATTERN GENERATOR

Instrumex has now introduced the Grundig FG80 PAL/SECAM colour pattern generator for multi-standard testing in both eastern and western formats.

It can be used in broadcasting, where standard converters are increasingly important, or for video equipment production testing. A useful feature is its output to an external oscilloscope.

The comprehensive set of video test patterns includes a special moving test pattern to verify still frame, slow motion and time lapse operations when checking video recorders.

The FG80 can fully test stereo and dual tone functions, as well as the continental video program service (VPS) signal. Four station frequencies can be programmed into memory for rapid recall. The instrument has a logical, uncluttered front panel.

The FG80 operates over a full RF range of 30 to 870MHz. Its RF output is 40mV EMF (synchronised pulse) into 75Ω.

Further information can be obtained from: *Instrumex, Dorcan House, Meadfield Road, Langley, Berks SL3 8AL. Tel: (0753) 44878.*

SAFE DIMMER

The K613 is a fully-protected dimmer/controller kit which handles mains voltages of up to 5A. It is now available from ECW Sales.

The dimmer is a high-Q device that adjusts the power supplied to a load with minimum hysteresis. This makes it suitable for dimming lights, adjusting ac motor speed and the output of heating elements and many others.

The K613 assembles into a compact chassis unit that can be incorporated easily into an enclosure. It is fully suppressed and has a triac output, protected against inductive voltage loads.

For dedicated lighting control, ECW Sales can also supply dimmers that replace conventional wall switches with potentiometer or touch control.

The K613 is offered at a mail order price of £14.33, including VAT and posting/package.

For further information, please contact: *Electronic and Computer Workshop Ltd, Unit 1, Cromwell Centre, Stepfield, Witham, Essex CM8 3TH. Tel: (0376) 517413.*

ELECTRONIC LOADS

STC Instrument Services has introduced the Voltech EL100 and EL300 units, which offer a convenient and flexible means of loading dc power supplies and batteries.

These 3U-high modules provide a precise constant current load to the power source for the purpose of assessing the electrical performance of the source. Extremely versatile, the EL100 loads power sources up to 100W, 20A whilst the EL300 is rated at 300W, 60A. In addition, each unit has two current ranges enabling accurate setting of low current levels. Both units operate from below 3V to 110V dc – hence covering a very wide selection of applications.

Other features include an easy-to-read green LED display, push-button selectable operating modes with LED indication on the front panel, a current monitor output, which allows interfacing with an oscilloscope or external logger, and remote control facilities.

Totally self-contained, the units incorporate a variable speed dc fan which matches the cooling rate to the power demand – ensuring a long bearing life and high reliability as well as extremely quiet operation.

The units are very compact and are suitable for stand-alone bench use or for rack-mounting within Euroracks to form a flexible multi-load test station.

More details are available from: *STC Instrument Services, Dewar House, Central Road, Harlow, Essex CM20 2TA. Tel: (0279) 641641.*

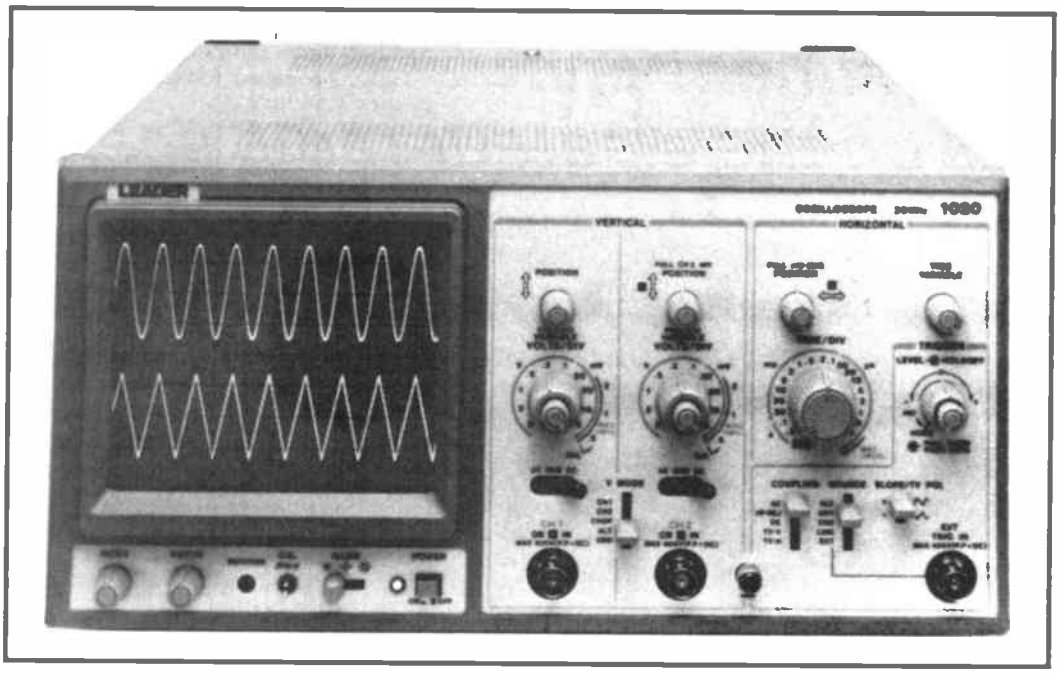
RIKADENKI FRANCHISE

Rikadenki Mitsui Electronics (UK) has franchised STC Instrument Services to carry the ROX Series of Y-T chart recorders. The agreement initially covers the 1, 2 and 3-pen ranges (types RO1, RO2 and RO3) plus the 4 and 6-pen ranges (R64 and R66).

The instruments have been developed from the highly successful R20 Series of Rikadenki flat-bed instruments.

Contact: *STC Instrument Services, Dewar House, Central Road, Harlow, Essex CM20 2TA. Tel: (0279) 641641.*

STRAIGHT & LEVEL



LOW COST 'SCOPE

A new 20MHz dual trace general purpose oscilloscope has been introduced by Thandar Electronics, designated the LBO-1020.

It is a 5mV/div, 20MHz (500μV/div, 4MHz) portable dual trace oscilloscope with a maximum sweep speed of 50ns/div (mag x 10) and 150mm CRT with internal graticule.

Alternate trigger mode allows the stable display of two asynchronous signals, plus display modes for CH-1, CH-2, CHOP, ALT, ADD and Polarity CH-2 INVERT.

The LBO-1020 is supplied complete with probes at a price of £315 + VAT.

More information is available from: *Thandar Electronics Ltd, London Road, St Ives, Huntingdon, Cambs PE17 4HJ. Tel: (0480) 64646.*

EGA TO WATCH

Panasonic has introduced a new 14in colour display monitor, available from Hero Electronics. The monitor is compatible with IBM PCs or IBM PC compatibles using enhanced graphics adaptors (EGAs).

The monitor has two modes. Mode 1 gives a horizontal sync frequency of 15.7kHz, a 16 colour display and a resolution of 640 × 200 dots. Mode 2 gives a horizontal frequency of 21.8kHz, 64 colours and a resolution of 640 × 350 dots.

The monitor is housed in an attractive case. A tilt and swivel stand is an optional extra.

For more information contact: *Hero Electronics Limited, Dunstable Street, Ampthill, Bedfordshire MK45 2JS. Tel: (0525) 405015.*

SWITCHING OPTIONS

Wavecom's latest SP7T-8 RF coaxial switch, available from Anglia Microwaves Ltd, is ideal for designing custom switch matrices in ATE and other microwave equipment. It can be used at frequencies of up to 18GHz and has internal 50 ohm terminations at all open positions.

Manufactured to MIL standards, the switch has a guaranteed lifetime of one million cycles per position, without intermittent contact and without insertion loss rising more than 0.1dB.

Options include TTL logic, BCD decoding, isolated indicator circuits and one of four standard actuation modes: latching, latching-reset, normally-open or normally-failsafe to position '1'.

Wavecom quotes a VSWR performance of 1-2.1 at 3GHz, and 1-5.1 at 18GHz with insertion losses of 0.2dB and 0.55dB respectively, while isolation figures are 80 and 60dB.

Further information from *Anglia Microwaves Ltd, Radford Business Centre, Radford Way, Billericay, Essex CM12 0BZ. Tel: (0277) 630000.*

GREENWELD CREDIT CARD

Greenweld is now offering an in-store credit card which enables customers to order goods by phone for dispatch the same day. The system offers a choice of an option account or a budget account.

Full details and an application form will be sent on request by contacting: *Greenweld, 443J Millbrook Road, Southampton SO1 0HX. Tel: (0703) 772501/783740.*

CRYSTALS, FILTERS AND OSCILLATORS

Cirkit Distribution has been appointed a UK distributor for Uniden Corporation of Japan, one of the few manufacturers in the world that grows its own crystals so that quality can be controlled right from the raw material stage.

Special frequencies and tolerances can be accommodated from 1.0MHz up to 130MHz in a variety of can sizes and mounting styles. Minimum order quantity is 1,000 per batch. Standard frequencies are held in stock.

Crystal filters are available in 2, 4, 6 and 8-pole configurations in a variety of centre frequencies and band widths.

For further information, contact: *Cirkit Distribution Ltd, Park Lane, Broxbourne, Hertfordshire EN10 7NQ. Tel: (0992) 444111.*

BAND THREE, TWO, ONE!

Band III radio was finally inaugurated on March 1st, in the exotic surroundings of the Roof Gardens in Kensington. Dedicated reporters from this magazine, manfully suffering the champagne and canapés, managed to ask a National Mobile Radio executive a few pertinent questions.

Band III, as you will know, is the frequency band around 200MHz vacated by television when it moved on to new allocations. Effectively, the band has now been divided into three – one for present use, one for future expansion and the last being reserved for new technology.

NMR Ltd have been awarded licences to operate 20 channels in the London region and 19 in both the Birmingham and Manchester regions. It is hoped to cover the country within 18 months, though 'the odd farmer in Auchtermuchty' will probably never be able to take part – you have been warned!

Three million pounds has been pumped into the development and the combined talents of National Radiofone, Storno, BT and Motorola have been utilised to bring the project to fruition.

Repeater systems are 'on the cards'. Calls will be free, with a standing charge of approximately £20 per mobile per month, and potential users can be 'up and running' within three days of asking for the system. Inter-region operating is possible. Both voice and data communications will be available and transmissions will be protected.

Only one shadow appears on this glittering scene – the threat that TV may ask the DTI to re-allocate these frequencies for its own use. Watch this space for future developments . . .

LINES AND TIGERS

Tiger Antenna Magazine, published quarterly by Ant Products, contains news and comment for radio amateurs, construction projects, pieces of theory and a regular computer program.

An annual subscription is £3.20, post paid.

For further information contact: *Tiger Antenna Magazine, Foundry Works, Old Great North Road, Ferrybridge, West Yorkshire WF11 8NN. Tel: (0977) 85274.*

STRAIGHT & LEVEL

Barry's birthday

Barry College of Further Education Radio Society is celebrating its 21st birthday and continues its commemorative series of demonstrations and lectures with a video presentation on May 19th, 'JARL DXpedition to China'.

The club meets on Thursday evenings from 7.30pm onwards at the college annexe along the Barry to Bonvilston Road (A4226), a few hundred yards from the site of Barry Zoo, now the Welsh Hawking Centre. Contact Dr Kevin Johnston GW4BCB, Barry College, Colcot Road, Barry, South Glamorgan CF6 8YJ.

Gordon's donation

Remember Roy (*Straight & Level*, March 1988)? He's the intrepid ex-Scout leader who was going to free-fall in tandem with one of his former Scouts.

At the time of writing, the event was set to take place on April 2nd or, if it was wet that day, April 9th.

What's more, Gordon Crowhurst, the well-known key maker, made and donated a special Morse key so that Roy could send a 21st birthday greeting to his former troop. Well done, Gordon. If you're making a record attempt, it's nice to know you can rely on the equipment.

Key technique

Ever fancied attending a master class, the sort where a virtuoso cajoles extra piquancy from a student's rendition? Perhaps not. If you turn up at Kevin Fox's, you'll at least be sure of the right key; then it's just a question of rhythm and tempo.

Class A licence holders will have a chance to improve their CW technique under the expert guidance of local, Sheffield HF operators. Class B holders need not be put off; they can practise identing by phone.

If you're interested, contact Kevin Fox G4MDQ, on air between 1730 and 1900, Monday to Friday.

Neater repeater

Reading and District ARC are holding two meetings, both in the 'White Horse' pub, Emmer Green, Reading.

On Tuesday, May 10th, David Bryant will speak on satellite reception and on Tuesday, May 24th, Gary Shipton G4CRJ will attempt to avoid hesitation, deviation and mostly, repetition, when he talks, for more than just a minute, all being well, on the 23cm TV repeater GB3HV. All are welcome, and further details are available from the club's honorary secretary, Mike Anthony G4THN, tel: Reading (0734) 774042.

Building in Stevenage

There's no stopping the construction projects that are taking place in Britain's new towns: Stevenage and District Amateur Radio Society are building a noise bridge on May 3rd, as well as an HF ATU.

If you're into the construction business, then the obvious place to meet is Sitec Ltd, Ridgemond Park, Telford Avenue, Stevenage. Will the spirit of the great bridge builder be on hand? Turn up at 8.00pm to find out. You can contact the club through G3SAD.

Edgware is it?

Lost in the bandscape or the landscape? Put your trust in a satellite; you can find out how on May 12th when P Machin will be giving a talk entitled 'Navigation by Satellite' at Edgware and District Radio Society, Watling Community Centre, 145 Orange Hill Road, Burnt Oak, Edgware.

You might like to retrace your steps on May 20th and 26th, when there will be a straight key evening and an NFD briefing/construction contest respectively. Contact Ian Cope G4IUZ, tel: Hatfield 65707.

Mystery lecture

The lure of the luminiferous ether could be the mysterious ways of waves and propagation delays. Mystery is usually a source of fascination, so there could be a large audience for G8VOI's lecture 'Mystery of Microwaves' on May 11th.

The title gives no clues as to whether the evening will leave unanswered questions to tantalise, or whether all will be revealed. Turn up at the Fareham and District ARC, Portchester Community Centre, Westlands Grove, Portchester, Hants, and you'll find out. Otherwise, you might glean a few more details from the secretary, G3CCB, tel: (0329) 288139.

MARS mart

Midland Amateur Radio Society has a rally at Drayton Manor on May 8th, followed by a junk sale and natter night. Surely there's no connection. For more details, phone (021) 357 1924.

Convenience listening

Now that packet soups have dissolved into the background, the latest stir is being created by packet radio. Find out about the UK network at the Verulam Amateur Radio Club on Tuesday, May 24th. Mr M Dennison G3XDV will be giving the talk at 8pm, but please turn up at 7.30pm at the RAF Association Headquarters, New Kent Road, off Marlborough Road, St Albans.

The club is also holding an activity evening on Tuesday, May 10th. Visitors are welcome at all meetings and further information is available from Hilary G4JKS, tel: St Albans 59318.

Waves and ovations

Dorking and District Radio Society could be divided into nodes and antinodes when Tony G4XYC poses the question, 'SWR, does it matter?' It takes place on Tuesday, May 10th at 8.00pm. Further details are available from G4XYC himself, who can also be contacted on Leatherhead 375976. Why not turn up and give him a standing ovation?

Soft soap

There are days when one wishes for instant mechanical know-how, and today's one of them. Wimbledon and District ARS are having a talk on May 13th, the subject being 'Allard Motor Cars'. Well, we knew they weren't all soft . . .

They are continuing an eventful month with a construction contest for the G3PGA Trophy. Hope no-one makes one of them 'ard motor cars!

All club meetings are held on the second and last Fridays of each month at 7.30pm in St Andrews Church Hall, Herbert Road, Wimbledon SW19. To find out more about the club, contact David Love G4RBQ on (07373) 51559.

Fings ain't wot they . . .

The good ol' days are the subject of the second May meeting of Stourbridge Amateur Radio Society. This is the club's formal meeting (white Tx and tails) on May 16th. Bill G3CAQ will be giving a talk and slides on early amateur radio, so be prepared for a bout of nostalgia.

The meeting on May 9th is informal – we expect that club members know what that involves! Nattering on the air, our sleuths believe after a thorough perusal of the club newsletter. You can't keep secrets from us!

Well, confidentially, you can, 'cos the club's forgotten to include its meeting place. You could try asking Derek G3ZOM, the Hon Secretary for 1987/88 (although, since new elections took place at the AGM in March, this may no longer be the case). Anyway, ring Kingswinford 288900 to find out more. Our sleuths are baffled.

Repeat performance

Our old friends the West Devon Repeater Group may well be out and about at the Princetown Rally, which is hosted by the Dartmoor Radio Club.

This rally takes place on Monday, May 2nd, from 10.30am till 5pm. The usual trade stalls will be in attendance, along with some Raynet display stands and a display held by the local repeater groups.

There will be a bring-and-buy stall and refreshments. Talk-in is on S22. Look out for the WDRG! Our thanks to Dave G1YPD who sent us this news item – hope you get better soon, Dave.

To find out more about the rally, phone Dave on (0572) 551955.

Back in time

The Binstead ARS on the Isle of Wight meet every Monday at 7.30pm. This month, on the first Monday, a talk will be given by Douglas G3KPO on vintage radio and TV. Another club looking at yesteryear!

The club meets at Dubbers Godshill, IOW, and to find out more about club events you should contact R Griffiths G0ISB.

Fast on the draw

Blackwood and District ARS is holding a construction competition, pardners, so strap those ol' solderin' irons in them thar holsters, and prepare for the shoot-out at the OK corral – sorry, Oakdale College, actually. Yee hah!

Those soldering irons will really be smouldering, as the entrants try to put together the Maplin Live Wire Detector Kit in the shortest possible time. Entrants are invited to bring friends for moral or vocal support – the more the merrier (and noisier).

Every entrant will get a copy of the construction details when his or her entry form is received, so hopefully they will all know what they're doing. Constructors can keep the finished product so that visitors can admire it. Oh well – you could always pretend that it was *meant* to be a scale model of Spaghetti Junction.

Prizes will be awarded for the fastest constructor overall, the fastest beginner and the fastest club constructors. Unfortunately, each entrant will receive a certificate stating their final position, but you can always Tipp-Ex out the 'Highly Unrecommended' and forge a 'First' . . .

To get into the competition send £4 to Terry John GW4XCU at 9 Yew Tree Grove, Woodfieldside, Blackwood, Gwent. Phone Terry on (0495) 222573 for details, and prepare for a showdown!

All the nice girls

Yo, ho, ho and an annual mobile rally at HMS Mercury, near Petersfield in Hampshire. We like the RNARS, they called us a 'fine magazine'. And they're a fine body of men – we'd send them a pin-up photo of the Ed, but we'd like to stay friends . . .

Anyway, back to the Mercury Rally, which will make an excellent family day out and will take place on June 12th. There will be trade stands and stalls.

The harmonics will be entertained with rides and amusements, exhibitions and demonstrations – there's even a touch of the Robin Hoods with an exhibition of DIY archery.

As if this wasn't enough, there will be vintage steam machines and fire engines, radio controlled model power boats, trains and racing cars. Refreshments will be available and talk-in will be on both 2 metres and 70cm. Too good to miss, this.

Viking trip

May 5th brings the North Wakefield Club out into the open, busy lot that they are. The club's first meeting is a talk by PC Workman. A cautionary tale, perhaps, with an arresting ending?

The club goes on the air on May 12th with G4NOK, and then on May 19th comes a real treat. The club is going by coach to the Jorvik Viking Centre in York. A good trip, by Odin, and for a paltry £5. Sounds worth horning in on.

The last meeting for the month is on May 26th and is the club's regular monthly meeting. The club meets every Thursday at 8pm in the White Horse Public House, Fall Lane, East Ardsley. To find out more about the club contact Steve G4RCH on Leeds 536633.

Highland fling

Aviemore, the jewel of the Cairngorms, is hosting a promotional day for Raynet in Scotland.

May 1st brings this series of talks from the Freedon Inn in the Aviemore Centre. Anyone who is interested can attend.

The theme is 'Emergency – Which Service' and the first talk will be by the Highland Region Emergency Planning Officer. After lunch there will be talks by members about fire and mountain rescue, then there will be an open forum on Raynet.

As this Sunday precedes a Bank Holiday, why not make a long weekend of it. There is plenty to keep the family amused – skating, pony trekking, go-karting, curling- . . . yes, our sleuths have checked the centre out and it's very nice, thank you.

For further details, contact Eric Garrington GM3RFA QTHR or on Fort William 3833.

WDRG

The West Devon Repeater Group has appointed a new secretary, Trevor G3ZYY. He tells us that the group is still alive and kicking, and that anyone wanting to join should contact him (QTHR).

Membership only costs £3 per year, for which you get an attractive membership certificate, fact sheet, newsletter and welcoming letter. Sounds too good to miss!

Electrifying!

The Bournemouth and District RAIBC Group will be operating their annual special event station from the Southern Electricity Museum, Bargates, Christchurch on May 14th/15th this year. Wonder if they'll talk about current affairs?

The museum, previously known as the Wedgewood Electrical Collection with the callsign GB2WEC, will now have the new call GB75SEM for this year's event. The station will be active on HF, VHF and UHF.

Visitors are welcome, and the museum will be open between 10am and 4pm. Talk-in will be available on VHF.

A special colour QSL card will be sent to all contacts via the RSGB Bureau or direct on receipt of an SAE to Bob G6DUN, 40 Fairmile Road, Christchurch, BH23 2LL.

Milligan, Gilligan

Over the sea, now, to Ireland, where the Mid-Ulster Radio Club is flourishing. Their annual Parkanaur radio rally will be held on Sunday, May 15th at the Silverwood Hotel, Lurgan, County Armagh. Being an easy-going crowd, the club's rally doesn't start till twelve noon, but it's bound to be a quality affair.

The entrance fee is £1 and there will be trade stands, a bring-and-buy stall, RSGB bookstall, QSL bureau and much more. Talk-in will be on S22 FM.

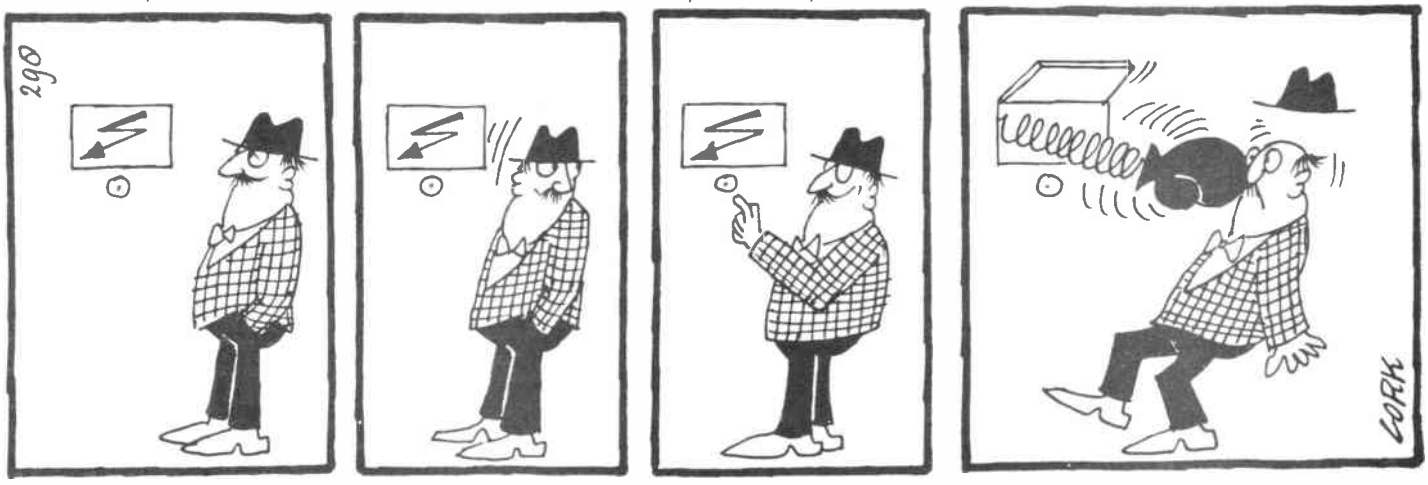
Not only this, but the proceeds will go to the Stanley Eakins Memorial Fund, so the club is hoping for a good turnout. Attend your rally – keep those Irish eyes smiling!

The Mid-Ulster ARC meets on the second Sunday of each month (except in July and August) at 3pm in the Guide Hall, Castle Hill, Gilford, County Down. There is usually a radio-related talk and everyone is welcome.

To find out more about the club contact Sam White GI1BIW on (07622) 22855.

Club secretaries please note:

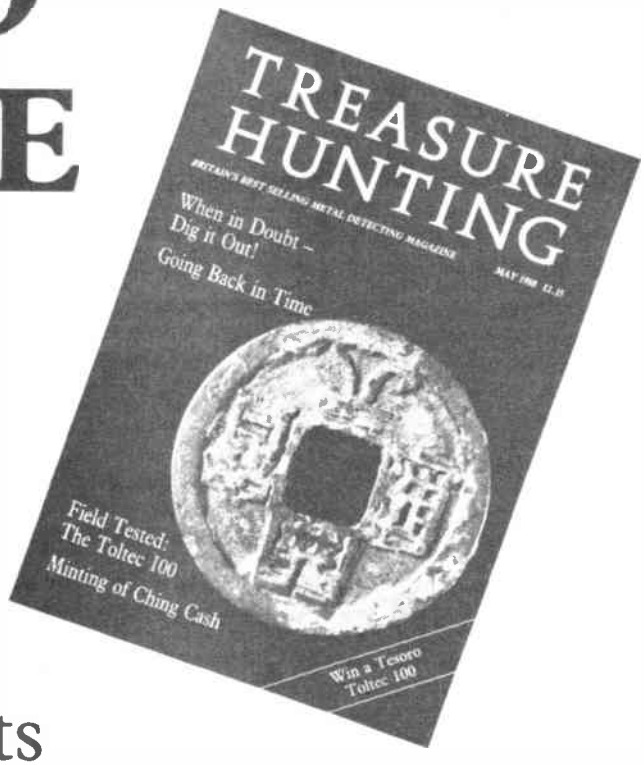
When you send details of events for inclusion in this section remember to state the venue, date and time. Also a contact address or phone number is useful Typewritten information is preferred



A FIND TO TREASURE

Britain's best selling magazine for the metal detecting enthusiast!

Don't miss the May issue at your newsagents



DX DIARY

News for HF operators compiled by Don Field G3XTT

There was some excellent propagation on the HF bands during March, even including some openings to the Pacific on 10 metres with strong signals from FO0AQ, KH2D, KG6DX and others. Unfortunately, these conditions didn't prevail during the WPX contest and a solar storm on the Saturday really put paid to any decent openings to the west on the higher bands, although stations from the Far East were absolutely pounding in on 20 metres.

Along with other members of the Chiltern DX Club, I was operating GB4CDX in the contest and we had quite a struggle, despite having an excellent antenna system including a 3-element 40-metre beam and a set of slopers for 80. However, there were many interesting prefixes for the *Amateur Radio* prefixes award. For example, we worked TX0A, FY91S, TW6A, FJ0A, TO7TSE, YM2KC, 9X1BE, etc.

During the BARTG Spring RTTY Contest, held over the previous weekend, I was able to make a brief appearance on RTTY. I was surprised at the level of activity, with some stations running serial numbers in excess of 400 by the end of the contest. I noted the following DX (not all worked by me, unfortunately!): 3C1MB, HD5G, ZC4JA, TG9VT, J39BS, HC8GR, AL7BB, 4U1UN and YS1TG.

Outside the contests, S0RASD continued to be very active, as were the various stations associated with the Canadian/Russian Trans-Polar Ski-Trek (particularly VO1SA/UA0, CI8C and CI8CW). Amir 4X6TT turned up as promised from various Pacific Islands. The KH1 DXpedition appeared just before the end of the month, with excellent signals on 20 metres and workable, although weaker, ones on 15 metres.

My apologies for giving some erroneous information concerning this DXpedition in the March issue. Previous operations from KH1 have been from Canton Island, but this time the operation was from the Baker and Howland Islands, which will count as a new one for the Islands on the Air Award.

Abu Ail

The A15 callsigns used by the recent German DXpedition to Abu Ail led to some raised eyebrows. However, *QRZ DX* has since shed some light on this by way of a letter from Dieter DK9KD.

Dieter's letter reads as follows: 'In the past, all kinds of calls were used. We tried to find a way to give this island a callsign like, for example, Spratly. After discussing the matter with DARC (the German national society) we came up with the as yet unissued called A1.

'We, the EUDXF, have been given the right by the owner of the island to issue a licence and, in future, we will supply a licence to everyone who likes it, even if he is not going to use it from the island. It will be valid for 5 years and will cost $50. The blocks A14, A15 and A16 will be used. The captain who is responsible for the island and the lighthouse agreed to this solution. The licence will be in such a form that it can be shown in any shack and we hope to use the money from the sale to further DXpeditions all over the world.'

Abu Ail, incidentally, is one of a group of rocks in the entrance to the Red Sea off Djibouti and isn't even shown in most atlases. Its significance is that a lighthouse sits on it and this is jointly administered by several nations with an interest in the area.

DX news

So let's move on to what is in store. Looking quite some way ahead, the 6-metre DX Society is mounting a DXpedition to Saba Island in the Caribbean from 7-14th July. The callsign will be PJ6M. Although they will be paying particular attention to exploring 6m multi-hop paths to the UK and Europe, they will also be active on the 80 to 10 metre HF bands. K2MUD will be handling the QSLs.

The following are a couple to look forward to from the Pacific. NZ1Q was due to be active as NZ1Q/KH7 until 3rd May, CW only, 26kHz from the bottom of the various bands. Although KH6JEB/KH7 has operated from Kure Island several times in recent years, this has been almost exclusively on SSB so NZ1Q is likely to find himself very popular. NY6M and KH2F will sign NY6M/AH0 from Saipan from 27-30th May, on 160-10.

DJ9GR is currently active as TU4GR and will be at the Ivory Coast until mid-August. He is mainly active on CW. QSLs will be dealt with on his return to Germany. Rudi was once of the last amateurs to operate from Yemen, signing 4W9GR in the mid-'70s.

Gerben PA0GAM, who has recently been very active from the Sudan, was due to visit several rare countries in Africa and Asia between 6th April and 6th June. These will include 9X, A5 and 9N. I can't imagine Gerben getting permission to operate from Bhutan, but he was hoping it would give him the opportunity to find out what the latest situation is regarding amateur radio in that remote kingdom.

Gerry 5X5GK is reported to have been forcibly expelled from Uganda, which is unfortunate both for him and for the amateur radio community. Gerry has been the only station regularly active from Uganda in recent years.

N5RM/PJ2 should be active from 24th-31st May, including during the CQ WPX CW contest when he will sign PJ0R. SX1RAAG will be active from Greece during the whole of May and June, operated by the Greek national radio club (the RAAG).

WAB enthusiasts should look out for G5LP and others who were due to activate the islands of Sark (30th April-4th May), Herm (5th May) and Alderney (6th May). The callsign was expected to be GU0ING and I would suggest checking the usual WAB frequencies (particularly 3760kHz).

DX News Sheet recently carried a reminder from G3AEZ that propagation forecasts are broadcast by Radio Australia on Mondays to Saturdays at 0425, 0827, 1627 and 2027. Reception in the UK is particularly good on 7205kHz from 1600 GMT. The morning transmissions are made on 9655, 15395 and 17715kHz.

Contests

The main contesting event of May is the CQ WPX CW contest on the last full weekend of the month (in other words 28/29th May this year). See the March *DX Diary* column for the rules, which are the same as for SSB.

The Russian CQ-M Contest is another interesting one to look out for this month. This is on 14/15th May, lasting for 24 hours starting at 2100 GMT on the Saturday. This is for both CW and SSB and is always an excellent opportunity to work rare Russian oblasts, as well as countries like JT (one year I worked three Mongolian stations on 20 metres within an hour of the contest starting).

Looking ahead, the All Asia Phone Contest takes place on 18/19th June. This is a full-blown 48-hour affair and the contest exchange is RS plus your age. YL operators are allowed to send OO! If propagation is favourable, this can be a very enjoyable and rewarding contest with lots of interesting Asian DX to be worked.

This month I have included

the UK results from the 1987 CQ WPX SSB Contest. The number of entries was disappointingly low compared with other European countries. I hope more UK stations decided to have a go this year. Congratulations are due especially to GW4BLE, whose 14MHz score was world 7th, and to G4VGO, who came world 4th on 1.8MHz operating as GB8DX. G4JVG also put in a very respectable all-band score of 1,130,220 points, operating as OH0/G4JVG from the Aland Islands.

Operating techniques

I have said quite a lot in the past about the best operating techniques for DX chasing. There is no doubt that the most successful DXers are those who spend much more time listening than transmitting and, if they hear a DX station, make a point of figuring out his operating technique before making their first call. It's probably fair to say that the majority of US and Japanese amateurs put these techniques into practice and operate in a well-disciplined way.

However, I continue to be appalled by the operating behaviour of most European DXers. Of course, we all get carried away in the excitement of a pile-up from time to time and occasionally make the mistake of selecting the wrong VFO when the DX station is operating split frequency. Nowadays, though, it seems to be common practice for most Europeans to call and call regardless of whether the DX station is already in QSO or is listening for a particular station or group of stations.

Then there are the 'policemen', who insist on being 'helpful' by sitting on the DX station's frequency in order to tell others to QSY off the channel. Often they make far more QRM than the stations they are trying to move. If all this were not enough, there are others who cause deliberate QRM out of sheer bloody-mindedness, sometimes playing music on the DX station's frequency or putting out a continuous carrier.

If you chase DX at all, I'm sure you could add several more examples of the way in which this aspect of the hobby seems to have deteriorated in recent years. I'm sure there has always been an element of this kind of behaviour, but perhaps matters have got worse due to the rapid increase in the number of DXers. I imagine much of the bad behaviour is due to sheer frustration at not being able to get through the pile-up. Even a major DXpedition, which might make 20,000 contacts or more, can't completely satisfy the demand, and the lone operator in a remote corner of Africa or wherever finds it even harder to please everybody.

The advent of new single band DXCC awards can only make matters worse. DXers will not be satisfied with 100 countries per band for their 5-band DXCC, but will want to press on and work every new one they can. What's more, they will also be wanting the QSL cards in order to send them off for the various awards.

I don't see any immediate respite from this kind of pressure. Perhaps things will improve when we get full access to the 18 and 24MHz bands but, if anything, it may be worse because DXers will now want to work a rare station on nine rather than six bands, making it even harder to satisfy everybody.

Pretty depressing? Well, maybe. On the other hand, many of us still find DXing the most rewarding aspect of amateur radio, gaining a real sense of achievement when something unusual finds its way into the log. Although the going can get rough at times it isn't always so, particularly for good listeners who latch on to the DX before anyone else realises it's around. If you listen on the HF bands on a weekday you might sometimes be forgiven for thinking that HF amateur radio is dead – the DX is booming in calling CQ and there is not a DXer to be heard.

No magic remedy, then. If the going gets too rough, call it a day and look around for someone else to call. There will always be another time. And in your own operating, try to set an example to others, even if it means taking a back seat occasionally. Do remember, as well, that life on CW is still generally much more civilised than on SSB and DX stations are beginning to realise that as well.

Books

If you want to read more about DX operating techniques, there are several books worth taking a look at. All are American, but available in the UK. One which has received good reviews recently, and which I am currently in the middle of reading, is *DX Power, Effective Techniques for Radio Amateurs* by Eugene Tilton K5RSG, published by TAB Books in conjunction with the ARRL.

TAB also publish *Secrets of Ham Radio DXing* by Dave Ingram K4TWJ.

Finally, *The Complete DXer* by W9KNI, published by Idiom Press, is also a good read. This one is principally aimed at CW DXing, but many of the techniques described are equally applicable to DXing on SSB.

Awards

This month I have concentrated on a series of Canadian awards issued by the Ontario DX Association.

The Canadian Provincial Capitals Certificate is an attractive award for which you need to work a station in each of the ten provincial capital cities of Canada: Edmonton (Alberta), Victoria (British Columbia), Fredericton (New Brunswick), St John's (Newfoundland), Halifax (Nova Scotia), Winnipeg (Manitoba), Toronto (Ontario), Quebec City (Quebec), Charlottetown (Prince Edward Island) and Regina (Saskatchewan).

Send certified log data (signed by one executive of your local radio club or two fellow amateurs) to Ron Nickle VE3SF, Awards Manager, 286 Burnett Avenue, Willowdale, Ontario, Canada M2N 1W1. There is a charge of $2 or 10 IRCs.

Another Canadian award to go for is the Trans-Canada Award. For this one work five stations in each of the 8 Canadian call areas for a total of 40 contacts, plus five stations in Newfoundland or Labrador (VO1 or VO2), plus one VE0 Maritime Mobile station. Of the VE8 contacts, at least one must be with the Yukon (VE8 or VY1) and one with an offshore island of the North-West Territories. The total number of contacts required is 46. The method of application and charge are exactly the same as for the capitals award described above.

Finally, the St Lawrence Seaway Award requires contacts with ten stations along the route of the St Lawrence, including at least one in each of the following areas: Thunder Bay, Greater Toronto, Greater Montreal and Greater Quebec City. The remaining six may be from any municipality located along the route. Again, charges and method of application are as for the previous two awards.

Incidentally, you may see in award details that applications require a GCR list. The term GCR gained acceptance as a standard for awards chasing due to the efforts of K6BX in the 1960s and '70s. GCR stands for General Certification Rule. When applying for an award the applicant is expected to provide a list of the contacts or QSLs required for the award. The GCR is a separate area on the application which contains a statement such as: 'The information and/or QSLs required for this award have been checked and are certified as being correct by the following amateurs'.

Almost all award sponsors require two (dated) signatures. Some require the signature of a club official. Others will specify an official of an IARU associated club or of the national society. The safest way when applying for awards for which QSL cards are required is to have the application certified by your national HF awards manager who, in the UK, is GW4BKG. That's the lot for this month. Happy DXing.

UK Scores in 1987 CQ WPX SSB Contest

All-band	GM4GPN	301,924 points
All-band	GM4WEN	177,000 points
21MHz	G3VOF	42,288 points
14MHz	GW4BLE	3,229,446 points
14MHz	GB6AR (op: G4XKR)	401,580 points
1.8MHz	GB8DX (op: G4VGO)	64,256 points
1.8MHz	G3XWZ	3,182 points
Multi-single	GB8AU	3,080,525 points
Multi-single	GB8PX	261,392 points
Multi-single	G4CVK	85,782 points

FOX-HUNTING

A light-hearted view of this most pleasant club pastime

BY KEVIN FOX

Funny how things change isn't it? I mean, when I was but a callow youth we always called it the 'coffee bar'. Nowadays, it's almost universally 'the caff'. Well, coffee bar was good enough in my day and it'll do today as well. At least I know what I mean, even if nobody else does. Ah! Those halcyon days of youth, sitting in the coffee bar drinking ice cold bottled Coke or espresso coffee (frothy coffee, we called it) and the Beatles belting out *Love Me Do* on the juke box. Happy days, indeed.

Anyway, me and Old Cyril were sitting in the coffee bar plotting. We'd completed all the events in the club's programme and had about three weeks to run before the start of the next one. 'Wot abaht a two metre ess ess bee contest?' said Old Cyril, looking at me hopefully. I swivelled my eyes from side to side in consternation, then snatched a quick glance behind me.

'Shush!' I urged him frantically, again sweeping the room with my eyes. I reminded him that we'd had so many two metre SSB contests recently that the club members had sworn to lynch the next person to suggest another.

'Junk sale?'

'Last month, Cyril.'

'Home-brew competition?'

'Remember the last one?' I asked him.

Old Cyril's eyes glazed over as he time-warped back three months to the club's last home-brew competition. We had acquired a new club member who was as keen as mustard, but unfortunately knew next to nothing about the bizarre world of amateur radio. He appeared faithfully, week after week, always dressed in the same clothes. Black three piece suit, white shirt and black tie.

He came up to me a few weeks before the home-brew competition and asked me what home-brew was all about. I explained to him that it referred to anything you made yourself.

On the night of the judging, among the various bits of electronic plumbing carefully displayed around the room was a long box-like shape covered with a white cloth and supported at each end by two chairs. The judges, including some very high up bod from the RSGB, were meandering around the room, picking up gadgets, passing a few comments then moving on to the next piece. Finally, they arrived at the shrouded box between the chairs. They stopped, wrinkled their brows then looked around the room for an explanation. Mr 'Black-suit', who'd been watching things closely, calmly walked over to his creation, took hold of a corner of the white cover and, with a nice theatrical gesture, swept it off to reveal . . . a beautifully polished and gleaming pine coffin, complete with sculptured brass handles.

I had forgotten to mention the word 'radio' when I explained what home-brew was all about. Still, he did win first prize; I think it was the brass handles which finally swung things his way.

'Natter nite?' suggested Old Cyril, returning to the present.

'Nope!' I vetoed.

'Fox-hunt. That's it! We 'aven't 'ad one o' them fer yonks.'

'Fox-hunt?' I queried, puzzled.

'Yeh. That's wot we'll do, we'll 'av a fox-hunt.' said Old Cyril, gleefully.

I'd never heard of a radio fox-hunt before. Visions of woofing dogs, scarlet coats and horses whizzed through my mind. I had remained curiously ignorant about amateur radio fox-hunting. I told Old Cyril that I had no idea about what happened on a fox-hunt, or how to organise one. Then I realised that I had made yet another blunder. Old Cyril grinned delightedly, leaned his elbows on the table, pushed his half full coffee mug away from him and began to light his evil smelling pipe. I recognised all the signs of an impending monologue and leaned back in my chair, resigned to an ear bashing.

As Old Cyril struggled with his pipe I cast a casual glance around the coffee bar. Seated at a table immediately to my right were four people, three men and a girl. They were students, judging by their avant garde dress and plethora of 'ban everything' patches. Their eyes roamed aimlessly around the room, one of the men was whistling tunelessly through his teeth. But it was very apparent that they were listening very carefully to everything we said.

'Yoo really don' know wot a fox-hunt is?' asked Old Cyril incredulously. Then, without waiting for me to answer, he launched into a description. 'Right! Well, first you choose a fox. That's somebody everybody else has to find. 'e takes orf to a secret location armed wiv a transmitter, then, every two or three minutes, he'll transmit on a certain frequency for a fixed time.'

Old Cyril whipped the pipe out of his mouth, narrowed his eyes and stared intently at me, checking that I was following his explanation. I nodded to reassure him and he re-inserted his pipe and continued.

'Everybody leaps into their cars and sets orf to find the fox by direction fixing on the fox's radio broadcasts. Yoo 'av to mek a speshul directionamal aerial so's yoo can null out unwanted signals, jus' leaving the one which points to the fox.'

Old Cyril had lost me by this time. I recapped on the highlights, then asked for more details. 'This, er, this directionamal – er, directional aerial baffles me, Cyril. What's it made of?'

Old Cyril smiled secretly at me, gave me a huge conspiratorial wink then tapped the side of his nose with the stem of his pipe.

'Ah! Now that's where success or failure lies,' he said, with a knowing smirk. 'There are stacks of different designs, most of them top secret.' He made a verbal detour to explain the principles of directional aerials, and gradually the fog began to clear away.

'So. You take three bearings on the fox from different locations, plot them on a map and the fox will be where the lines intersect!' I concluded, triumphantly.

'Yes, you've got it,' came the chorus from the students' table. I threw them my world famous withering look.

'Right then! We'll do it,' I stated, with authority.

Just as we got up to leave, one of the students stopped us cold with: 'You should be ashamed of yourselves, using high tech equipment to hunt down and slaughter an innocent animal. I've got some friends who know how to deal with people like you.'

Well! Old Cyril looked at me, and I at him. Our flabbers had never been so gasted. We synchronised Gallic shrugs, nodded our heads sadly and left the coffee bar. How I wish I had paid more attention to the long haired chappie; his pronouncement was to have dire consequences for all of us later on.

Having taken so long to find an amateur radio club, now that I belonged to one I was determined to enter fully into the spirit of things, and so I joined the club's committee. I put forward the suggestion for the fox-hunt at the very next meeting. To my surprise it was warmly received, so I didn't need the roller skates or the back door held open by Old Cyril after all. However, there was a proviso demanded by the club members: Old Cyril had to be the fox.

I was puzzled by this until a fellow committee member explained all to me

over a double brandy (my favourite drink, should we ever meet) at the committee meeting held to plan the fox-hunt. He related several apocryphal sounding tales of Old Cyril's DFing, finally ending with: 'And then there was the time he DFed the fox's position *before* the fox had even made his first transmission!'

'Aw, c'mon. You're winding me up,' I complained.

'Nope. S'true!'

'How?'

'Well, the crafty old bugger syphoned all the petrol out of the fox's car, then returned just the one gallon. Having noted the direction the fox set off in, Old Cyril carefully plotted the car's range on a map. Of course, it was quite a simple job to check all the likely areas. Old Cyril simply sat on the side of the road awaiting the arrival of the fox. He was just lighting his pipe as the fox rolled to a halt a few inches away from him.'

Well! I mean, how can you fail to be impressed by such animal cunning? We quickly concluded our committee meeting, supped up and left the pub.

Now, I can only concentrate on one thing at a time, but I concentrate and get involved one hundred per cent. Some people call it going over the top, or at least that's what the club members said as I drew up in my car on the evening of the fox-hunt.

I leaned against the bonnet of my car, flicking an imaginary speck of dust off my scarlet, tailed hunting coat, casually slapping my white blancoed jodhpurs with my riding crop and inspecting the shine on my knee length patent leather riding boots. 'Cor! Give us a toot on yer 'unting 'orn, John Peel,' said one of the older club members.

I nonchalantly lifted the heavy brass hunting horn to my lips and blew into it. A sound like an old cabbage being swallowed by a waste disposal unit pierced the peaceful calm and silence of the warm summer evening. The club members stared aghast as I donned my hard black riding hat. 'Well, it is supposed to be a fox-hunt,' I explained to all the mouths hanging open as I walked around my car.

We had arranged for all club members to travel in pairs. For some strange reason I couldn't get anybody to travel with me. I gave another hearty blast on the hunting horn. Two cows in an adjacent field came galloping over, eyes shining bright and huge smiles on their bovine faces. On reaching the fence, their heads flipped from side to side, looking for the bull.

Eventually, there were three luckless bodies left without transport. 'Never mind, chaps, you can come with me,' I beamed at them. Sobbing deeply, they got into the car and with me in the back, hanging out of the window and tooting merrily on the hunting horn, we set off in pursuit of the fox.

We drove up to a small hill and I leaped into action with the dipole and the AGC-less two metre receiver. I waved the dipole around, listened intently to the receiver, then waved the dipole some more. Of course, I was getting about two million nulls. Picking one at random (I wonder where Random is?), I plotted its bearing on the only map I had: a Mercator projection of the whole world! The track of the bearing dissected the North Pole, then dog-legged across Eastern Siberia.

On looking down the hill to try and align the new map hastily thrust into my hands by my assistants, I noticed quite a crowd had gathered. I never connected the press reports of a scarlet coated satanist waving deer's antlers above his head whilst performing black magic rites with my DFing antics!

Back to the car, and off for the second bearing. We travelled slowly down a country lane, with me hanging out of the car window, dipole in one hand, hunting horn in the other. I blew an occasional toot on the hunting horn, yelling 'Tally-ho!' for added authenticity. Pretty soon a dog appeared behind the car and began trotting after us. Then, from a hole in the hedgerow, another dog appeared. Then another – and another. By the time we had travelled two miles we had collected a pack of about forty dogs, all loping along behind the car.

I was enjoying myself enormously by this time. I tooted on the hunting horn and the dogs woofed in unison. Toot – woof. Toot – woof. It went on for miles. Again we pulled up at the side of the road for a second bearing on the fox. The dogs milled around the car as I busied myself with rig and aerial.

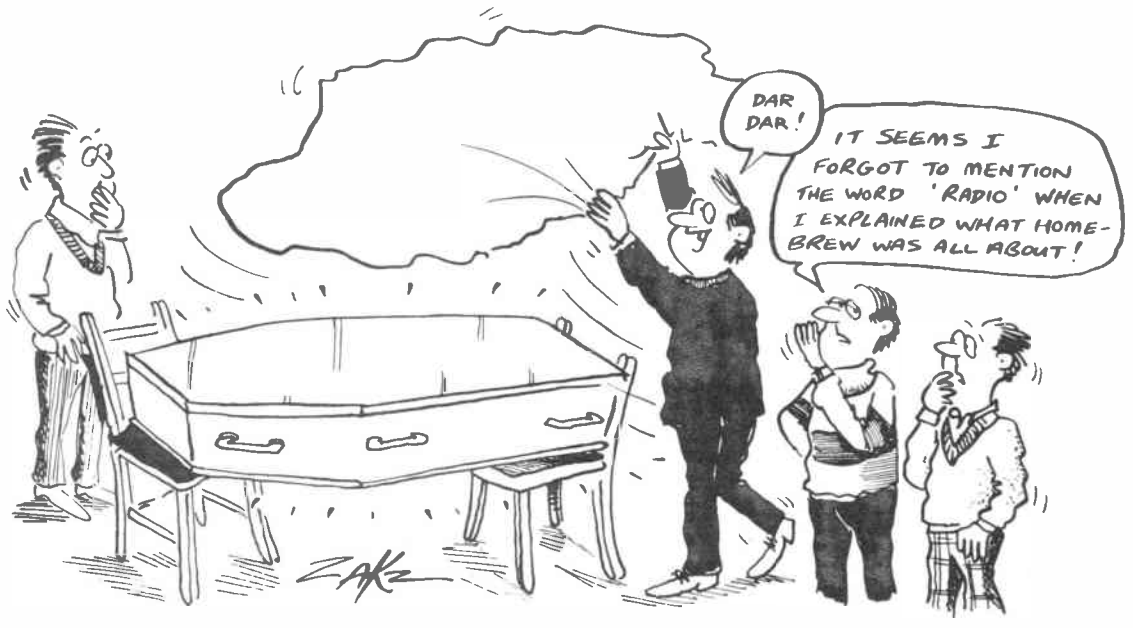
Presently, I heard a sound like distant thunder approaching. I ignored it for a while, but it grew louder and louder.

'Stop mucking about with those coconut shells,' I commanded my assistants. However, I suddenly saw a score of huge horses leaping over a hawthorn hedge, with scarlet coated portly gentlemen in the driving seats. Spotting the car and the dogs, the leading horseman hastily reined in his horse and cantered up to us.

'I say, old chap, which way to the fox?' enquired a bristling moustache seated on a giant bay horse.

I delicately moved out of range of his waistcoat buttons which appeared to be fighting a losing battle to contain his straining stomach. 'Don't know yet, old bean,' I replied. 'I've still got one more bearing to take before I pinpoint his position, then we'll have the blighter!'

'You mean you can pinpoint the fox by waving those two metal pipes around?'



FOX-HUNTING

said the moustache, enormously impressed.

'Is there any other way?' I riposted, nonchalantly.

All the scarlet coats, horses and dogs went into a huddle. I could overhear an excited buzz of conversation ripple around them. The horses seemed very impressed.

'OK. We have the blighter! Crossroads – Armageddon Road and Slaughter-house Lane,' I said, plotting the bearing on the map.

'But this is absolutely fantastic, old boy,' said the moustache.

'Hardly sporting though, Archibald, don't you know?' answered one of the moustache's lieutenants, looking at me down the length of his nose. I shrugged my shoulders. The moustache gave a long toot on his hunting horn, and I replied in kind, on mine.

'Tally-ho!' he said.

'Right on!' said I.

The horses, dogs, gentlemen and clouds of dust all disappeared up the road. We ambled back to the car, in no hurry now that we'd located the fox's position, but I kept the receiver on, to reassure us we were going in the right direction. Suddenly, the calm, slightly bored voice announcing a callsign and that he was the fox, turned into a panic induced shriek. Muffled bangs and crashes followed by muttered swearing filled the air waves. Then – silence.

Worried about the shouting and the sounds of a desperate struggle which had come over my receiver, I urged our driver to put his foot down and we melted the tarmac in our haste to get to the fox. I knew that we weren't too far away; before the fox's signal had vanished he had three oranges and two cherries on the bargraph LED display.

We arrived at the brow of a hill which overlooked the crossroads and coasted to a stop. I held the hunting horn three inches away from my lips, frozen into immobility. We each stared with horrified eyes at the debacle confronting us at the foot of the hill. A scene of pure lunacy was being enacted before our very eyes. Army surplussed combat jackets filled with student types were running around the scarlet coated gentlemen on the horses, screaming and shouting abuse at them. They were waving home-made banners, twisting football rattles and generally making as much noise as possible. The horses were bucking and kicking, whilst the portly gentlemen were swiping indiscriminately at each side of their horses with horse whips.

We drove up to the fringe of the mêlée. Getting out of the car, I heard four student types yelling, 'We've got it! We've got the fox!'

I saw them humping a large sack with something inside kicking and struggling furiously. To my horror, I recognised the four students holding the sack – they were the four people who had sat on my right in the coffee bar. On seeing me, they dropped the sack, which emitted a deep groan as it hit the ground and rolled over a few times. Another group of students rushed up to the sack and began spraying it with deodorants and various perfumes from an atomizer.

The four students who'd been carrying the sack marched up to me.

'That's 'im. He's the one that organised it all,' said one of the students. A deathly silence greeted this announcement. The students stopped abusing the horsemen and vice versa. They walked over to me and formed a circle around me. I hoisted my hands into the air, in the international signal of 'I surrender'.

'Look chaps, I'll give you a last chance to surrender,' I stuttered, nervously. The horsy types, intrigued, cantered over to join the circle.

'I told you you'd regret using high tech methods for fox-hunting,' said the leader of the hunt saboteurs, pointing her finger to a row of parked cars. I followed her pointing finger and saw six club members standing at the sides of their cars, holding various parts of their amateur radio equipment, staring disconsolately at smashed dials and hacked wires. My heart hit my boots.

I walked over to the still violently struggling sack, reached down and unfastened the string securing it. Out flopped a furious Old Cyril, which produced a gasp of amazement from the student types. I began an explanation of the terrible mistake they had made. Old Cyril, smelling like the perfumery department of Boots, added the odd four letter word at various stages.

'I say, old boy. Could do with a drinky-poohs, what?' said the bristling moustache. One of the students produced a six-pack of lager and passed one to the bristling moustache. The temperature lowered somewhat and the hunt saboteurs and horsemen both drifted off into small groups, discussing tactics and yarning about past hunts.

I was left with the six angry amateurs. One produced a shotgun from the boot of his car and, without a word, passed it to Old Cyril. Old Cyril walked over to me, his eyes glowing with satanic intention. He pushed his grinning face into mine. I took several steps backwards – the smell of the perfume was over-powering. Old Cyril pushed past me and walked up to my car. He then quite calmly, and grinning broadly, proceeded to blast the front nearside tyre of my car with the shotgun. This produced a loud cheer from the six rigless amateurs. Pumping the shotgun, Old Cyril methodically worked his way around my car, blasting the other tyres. Then, without a word to me, they returned to their cars and left.

I stood staring down at my mortally wounded car, a big lump in my throat. I put the hunting horn to my lips for a final toot. As the echoes of the hunting horn were slowly dissipating, a reddish brown shape with a long bushy tail crawled out from beneath my car, slunk over to the discarded sack and rolled itself around on top of it. With a backwards grin at me, the vixen loped off into the gathering darkness. I could have sworn I heard it chuckling in the distance.

ANGUS McKENZIE TESTS

YAESU FT736R

Multiband multimode transceiver

It makes a lot of sense for manufacturers to incorporate modular construction to allow one rig to cover up to four bands not covered by HF transceivers in general.

This brand new rig from Yaesu is normally supplied with 144 and 430MHz modules, each giving up to a nominal 25W output, but you can add 10W modules for 50 and 1296MHz bands, the latter being covered from 1240 up to 1300MHz. The FT736 provides LSB, USB, narrow or normal FM and CW, a 600Hz Rx filter being available as an optional extra. The rig also includes facilities for data input and output, as well as all the normal external computer control functions for use with packet, AMTOR and RTTY terminals.

The FT736 resembles both the earlier FT726, which it completely outclasses, and the FT767 HF transceiver, available with plug-in VHF and UHF modules. The FT767 gave a very unsatisfactory performance with the plug-in modules when I reviewed it a year ago, the main problem being the very high synthesizer noise. Let me assure readers straight away that Yaesu appear to have learned their lesson, for the synthesizer in the FT736 is the best Yaesu one yet, outclassing both HF and VHF Yaesu synthesizers so far encountered.

They have taken a long time to issue this rig, but it is quite clear that the delay has been well worthwhile. They have not only corrected many of the problems in the earlier rigs, but they have introduced some extremely useful and impressive ergonomic features. However, before launching into the rig's facilities and a description of its various functions, we had better have a look at the alternatives available. These need to be thought about in great depth before a rig such as this is contemplated.

All the eggs in one basket again

There are three completely different approaches that can be adopted when deciding what to purchase for multimode operation on two or more VHF/UHF bands. The first approach is to lay out a lot of money on the best and most suitable HF transceiver that you can possibly afford, adding transverters to it for each band.

SSB Products are increasing their range of transverters and very shortly they should be introducing their 28/430MHz model, which could run alongside the 28/144MHz one which I reviewed a year or so ago. They do not as yet make a 50MHz one, but RN Electronics should be producing a 28MHz IF version of their successful 144/50MHz one which I reviewed last Christmas. BNOS also promise to introduce some transverters soon.

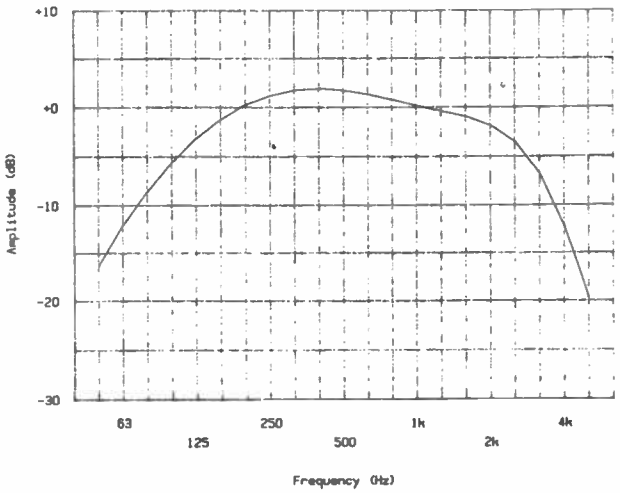
If you are fortunate enough to be able to find 50 or 144MHz muTek transverters in good condition second-hand, you will be very lucky indeed, for they offer a superb performance but are no longer made (see *Radcom*'s news pages, March 1988). Under the right circumstances, with careful attention to attenuator settings on the HF rig, the use of external transverters still offers the best possible overall performance, with superb system noise figures and RF input intercept points, so necessary for successful contest and DX operating.

The second alternative is to select the best multimode monoband rig for each band that is required. The new Icom 575, 275 and 475 models will, presumably, have a 1275 model added eventually for 23cm. The standard of performance of all these rigs is generally good (and somewhat better than the competition so far, other than dedicated transverters), but the cost of having two or more monoband rigs is becoming prohibitive compared with the significantly lower cost of a multiband rig. Incidentally, the Icom IC575 includes 28 as well as 50MHz, but you only get 10W PEP for your money!

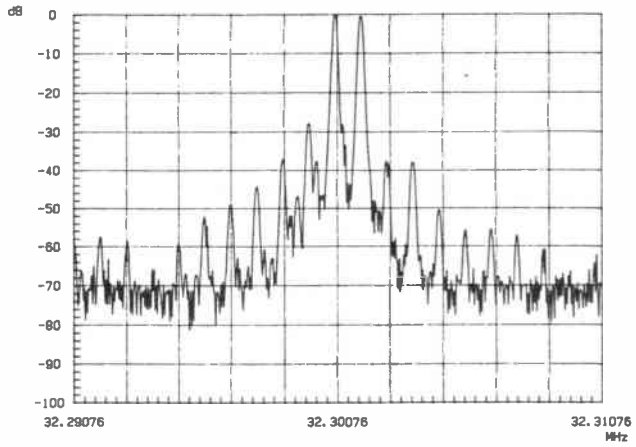
The third alternative is to purchase a rig such as the new FT736, the Trio TS780, a second-hand Yaesu FT726 or the Yaesu FT767 set-up, which I did not recommend. The FT736 under review is quite clearly the best multiband VHF/UHF rig available; its release will almost certainly result in second-hand prices of the older models beginning to fall. The biggest problem, though, is that you have all your eggs in one basket and, if you are as keen as I am and have the four band modules incorporated, you will be QRT on all bands if your rig has to go for a service. It is therefore even more important for you to investigate the efficiency of after sales service given by the dealer of your choice.

Tuning methods

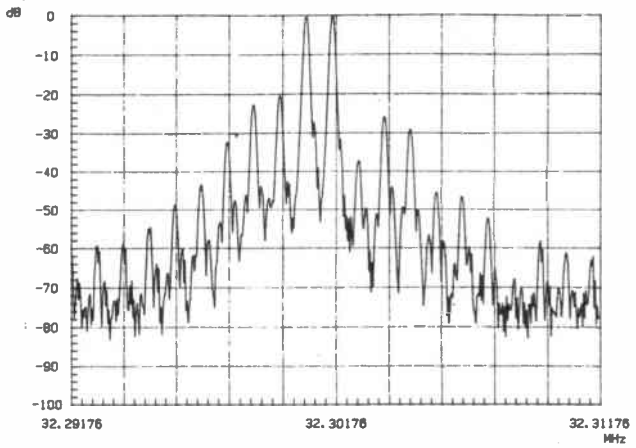
You can access a frequency on the FT736 in several different ways. You can select the required band first, then the mode and tune up and down the band either with the normal VFO tuning knob or in selectable steps. A separate click step rotary can be selected to tune up and down in channels. The main VFO rotates in 10Hz or 100Hz steps at approximately 10 or 100kHz per rev; the click step rotary can be selected to vary



Plot 1 *FM received audio response (750μs pre-emphasis)*



Plot 2 *144MHz module two-tone test, 700/1700Hz tones well into ALC. Resolution bandwidth: 100Hz. 2kHz per division*



Plot 3 *144MHz module two-tone test. 700/1700Hz approx 2W PEP output*

in 5, 10, 12.5, 15, 20, 25, 30 or 50kHz steps for FM and 2.5 or 5kHz steps on CW/SSB. Once the step size has been selected for a mode on one of the bands, a non-volatile memory retains the selection.

Note that you can select a different stepping rate for different bands; the rates for SSB/CW and FM can be set separately. Selector buttons choose either the main VFO or the click steps. Above the main VFO knob are two more buttons labelled 'up' and 'down'. You can use these for stepping, with the step rate appropriate to the chosen VFO or click step knob. As with the microphone's up and down buttons, you can also use the rig's up and down buttons for starting or stopping a scan.

You can enter a required frequency directly from the comprehensive keypad on the right-hand side of the front panel. There is provision for altering just one digit of a frequency with this keypad. The keypad is also used for accessing dozens of different functions, including memory selection, programmable search start and stop frequencies and various repeater and dual VFO functions.

Memory and repeater functions

There are 100 basic memories, which can retain frequency, mode and repeater information. In addition, there are separate memories for many different sets of duplex frequencies and specialised split VFO channels. Each band module retains its own information in conjunction with the main microprocessors in the rig, thus allowing different step and repeater shift data to be stored in non-volatile memories for each band.

The version sold in the UK is the 736R/C1. This also incorporates an automatic repeater shift on each band, which puts the shift in completely automatically when you are on a repeater frequency but takes it out again when you shift to a simplex one. Simplex or repeater shift can, of course, be overruled on a specific frequency.

There are two call buttons, which allow immediate access to a preselected call frequency. Whereas call 1 accesses just one stored frequency, known as a global call frequency, the call 2 button accesses a different call frequency on each band. You can select either of two VFOs known as A or B, but there is much more to it than this. Each of these VFOs has different stored frequencies and modes on each of the bands, so you could always use VFO A for SSB and B for FM, for example.

If you select 'satellite' operation, two more frequencies are stored as if there were two more VFOs, the receive and transmit frequencies being memorised independently. A series of satellite memories can also be accessed. You could choose to alter either receive or transmit duplex frequencies whilst transmitting, but there is a facility, which I believe is unique, for altering the two satellite frequencies at the same time, with one going upwards whilst the other is going down in frequency!

The FT736 can be programmed to go into the priority mode, which allows a required channel to be scanned very briefly whilst you are listening to another frequency.

VFO to memory and memory to VFO

A check button allows you to select any required memory and see what frequency is stored in it without affecting normal operation. In this way, you can set a memory up that you know you will want to use shortly or, alternatively, a channel that you will want to store something on. You can at any time store a VFO frequency or frequencies into a memory. The rig also allows you to switch a memorised frequency to the VFO for manipulation, whilst also storing the previous VFO frequency into the memory. This can turn out to be an excellent way to completely louse up a memorised frequency, so one does have to be rather careful!

For a short while I was baffled that there was no apparent direct memory to VFO facility; it only took a minute or two, however, to realise that there is a perfectly good memory to VFO function. One must simply press the VFO/memory switch over and, following this, immediately depress the VFO to memory button. This worked without any trouble, although I would have preferred a single button to do the job.

Once you have selected a memory, you

can select the next one with a frequency stored in it by using the click rotary or up and down buttons.

I found memory access very simple and band change ergonomics excellent.

Narrower FM channelling

An extremely important new feature should be very popular for use on busy bands. Among the mode buttons are two for selecting normal FM or FM narrow. The normal FM IF filter has around 12kHz bandwidth. This in itself gives quite good selectivity, better than all previous Yaesu rigs checked, but if you press FM narrow an 8kHz filter is switched in, giving superb FM selectivity for 12.5kHz channelling.

The buttons not only change the Rx filters, though, they also change the deviation limiting threshold on Tx between just under 5kHz and just over 2.5kHz. This is undoubtedly a step in the right direction, although the considerable amount of research work that I have carried out for the RSGB's VHF Committee has shown that, for amateur radio purposes, it is not really necessary to reduce deviation to less than around 3 to 3.5kHz peak in order to obtain reasonable adjacent channel clearance.

The FM filters are of good quality and have quite steep sides, so an average FM transmission peaking at 5kHz deviation will sound distorted on peaks in the narrow position. However, if the transmitting station turns the deviation down somewhat, there is very little loss in system performance with the FT736 switched to narrow. The improvement in selectivity is phenomenal, however, and a strong station operating 12.5kHz off channel should not cause annoying interference unless the station is over deviating. I hope that other manufacturers will follow Yaesu's example here.

Front panel controls

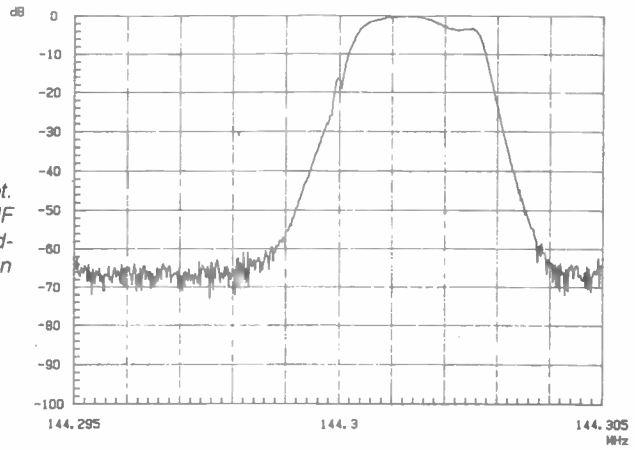
Split concentric rotaries are provided for carrier level/mic gain, audio tone control and squelch (all modes) and Rx audio and RF gains. The mic gain is operative on all modes, which I think is a very great advantage. The RF carrier level also operates on all modes and can be used to reduce the output power or PEP by up to 30dB. Thus, when set fully anti-clockwise, I was able to peak just 25mW quite predictably on SSB, for example. Although I like the idea of an audio tone control, I did note that there was not enough HF output when the control was fully clockwise and reproduction was far too woofy when it was anti-clockwise. I tend to prefer control with a centre indent, which cuts HF one way and LF the other way.

A switch selects three speeds of AGC. I found this a great advantage for SSB, where the medium speed was ideal when many stations were in a net with fairly short overs, but I liked going to slow AGC for longer overs. There was no way to turn AGC off, however, which is a pity.

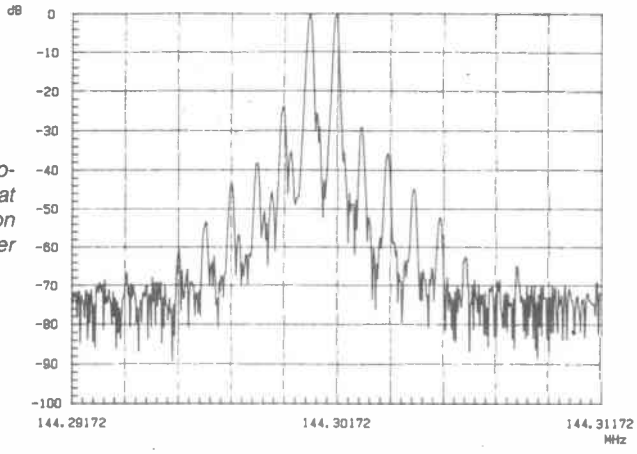
A five-position satellite switch has to be set to 'off' for normal use, with the remaining four positions being provided for satellite or other duplex operations.

The 'Rx' position enables the Rx frequency to be selected in the normal way, whilst the 'Tx' position allows one to vary the Tx frequency. In these two positions, the displayed frequency is the relevant one, actual duplex operation being possible once the PTT is pushed in. It is possible to alter just the Rx or Tx frequencies individually, but if you select the next position, 'normal', then both Rx and Tx frequencies can be varied in tandem.

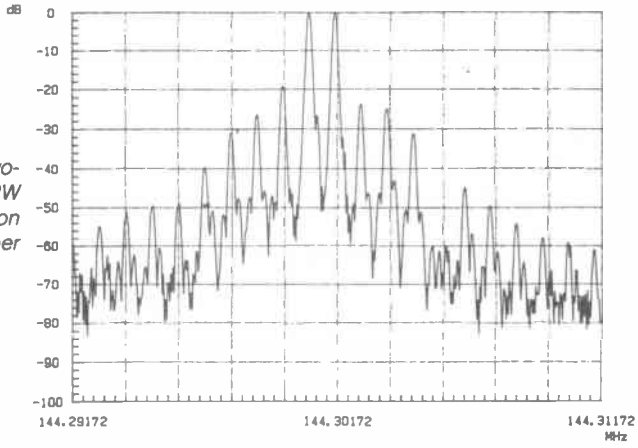
With the final position, 'reverse', the received frequency goes in the opposite direction to the transmitted one, which can really tie you in the most dreadful knots if you are not concentrating very hard!



Plot 4 *144MHz AF/RF Tx plot. USB −5 to +5kHz showing IF response. Resolution bandwidth: 100Hz. 1kHz per division*



Plot 5 *432MHz module two-tone test. 700/1700Hz tones at 20W PEP into ALC. Resolution bandwidth: 100Hz. 2kHz per division*



Plot 6 *432MHz module two-tone test. 700/1700Hz tones 2W PEP low level test. Resolution bandwidth 100Hz. 2kHz per division*

In the satellite mode, FM can be used as well as CW or SSB and separate modes can be chosen for Rx and Tx. There seemed to be almost no desensing at all when I used this facility for FM for 2m/70cm duplex, even when the transmitting and receiving aerials were fairly close to each other.

Mini rotaries are provided to adjust vox gain, anti-vox, vox delay and CW keying speed (optional board available to work with an external paddle). A rotary switches the meter to read Rx FM centre zero or S-meter, Tx power output or ALC. In duplex operation, the meter can be switched to read the received signal, if required, by selecting special switched positions.

A large push-button provides 13.8V dc on the centre of the co-ax socket of the

Yaesu FT736 Laboratory Measurements

Receiver Measurements

SSB 12dB sinad sensitivity		
144MHz	−125.5dBm (0.12μV)	
432MHz	−127dBm (0.1μV)	
FM normal 12dB sinad		
144MHz	−123.5dBm (0.15μV)	
432MHz	−124.5dBm (0.13μV)	
FM normal 12dB sinad, offset 1.5kHz tuning for best		
144MHz	−124.5dBm (0.13μV)	
432MHz	−125.5dBm (0.12μV)	
RF input intercept point, 100kHz spacing		
144MHz	−8dBm	
432MHz	−12.5dBm	
Reciprocal mixing performance, offset carrier level/SSB noise floor 144MHz		
5kHz	81dB ratio	
10kHz	90	
20kHz	97	
50kHz	109	
100kHz	116	
S-meter	SSB	FM
S1	−113dBm	−116dBm
S3	−110	−109
S5	−107	−106
S7	−101	−104
S9	−93	−102
S9 + 20	−74	−96
S9 + 40	−54	−91
S9 + 60	−35	−86
SSB selectivity bandwidth:		
3dB	1.9kHz	
6dB	2.4	
40dB	3.2	
60dB	4.2	
70dB	4.2	
80dB	4.2	
FM selectivity normal filter ±12.5kHz	+11/+16.5dB	
normal filter ±25kHz	+75.5/+76.5dB	
narrow filter ±12.5kHz	+24.5/+26dB	
narrow filter ±25kHz	+77/+77dB	
FM capture ratio normal filter	4.1dB	
narrow filter	4.3dB	
SSB product detector distortion (static test)	1% THD	
FM distortion higher deviations between 3 and 5kHz	2.5 to 3%, lower deviations 1 to 1.5%	
Maximum audio output for 10% THD		
8 ohms	2.1W	
4 ohms	3.5W	
Received frequency accuracy after warm up (SSB)		
144MHz	average 20Hz	
432MHz	average 70Hz	
Typical drift over 1 hour from switch on	around 50Hz	

Transmitter Measurements

Power output FM 144MHz	26 to 25W across band
430 to 439MHz	23 to 20W
Typical SSB two-tone PEP 144MHz	24W max
432MHz	20W typically
Variable power range ref full power	0 to −30dB (typically 25W to 25W)
SSB carrier rejection	−51dB
Alternate SSB rejection 1kHz audio	typically 60dB
FM max deviation normal filter 1kHz audio	4.7kHz
normal filter 600Hz audio	5kHz
narrow filter 1kHz audio	2.7kHz
Transmitted frequency accuracy after warm up	
144MHz	10Hz (high)
435MHz	20Hz (low)
Tx response FM ref 1kHz	
100Hz	−16dB
350Hz	−3dB
2.6kHz	−3dB
3.2kHz	−10dB
4kHz	−15dB (all ref 750μs de-emphasis)
Size (W×H×D with projections)	368 × 129 × 286
Weight	9kg

selected module for masthead pre-amp operation. On Tx, the voltage is instantly withdrawn to disable the masthead pre-amp.

There is one serious snag, however. Judging by the review sample, this entire facility can only be activated if a special jumper plug supplied is pushed home inside the appropriate module. However, getting at the module to do this is a lengthy and very tiresome job and, since we had very little time to carry out this review, we could not check the operation. I am most surprised that the factory did not despatch the equipment with the jumper plugs in position for each of the modules. If there is any chance that you will require the masthead facility, you should insist on the dealer doing the job for you.

It would have been so much better if, as in an alternative rig reviewed recently, the masthead drive facility was on a back panel switch.

Incidentally, from my personal experience, I can strongly recommend SSB Products' mastheads for use with this rig, as they have a very fine performance. Take care not to put 13V onto a co-ax lead directly connected to a dummy load or to an antenna system which puts a dc short circuit across the line.

In addition to mains on/off and Tx/Rx buttons, there are also switches for Tx processor on/off; noise blanker on/off; dial lock; notch filter enable; VFO A or B; split VFO for Rx and Tx in either direction; VFO dial or rotary click steps separate for SSB/CW and FM; CW keyer on/off; 1750Hz auto toneburst on/off; scanner pause on/off and light dim.

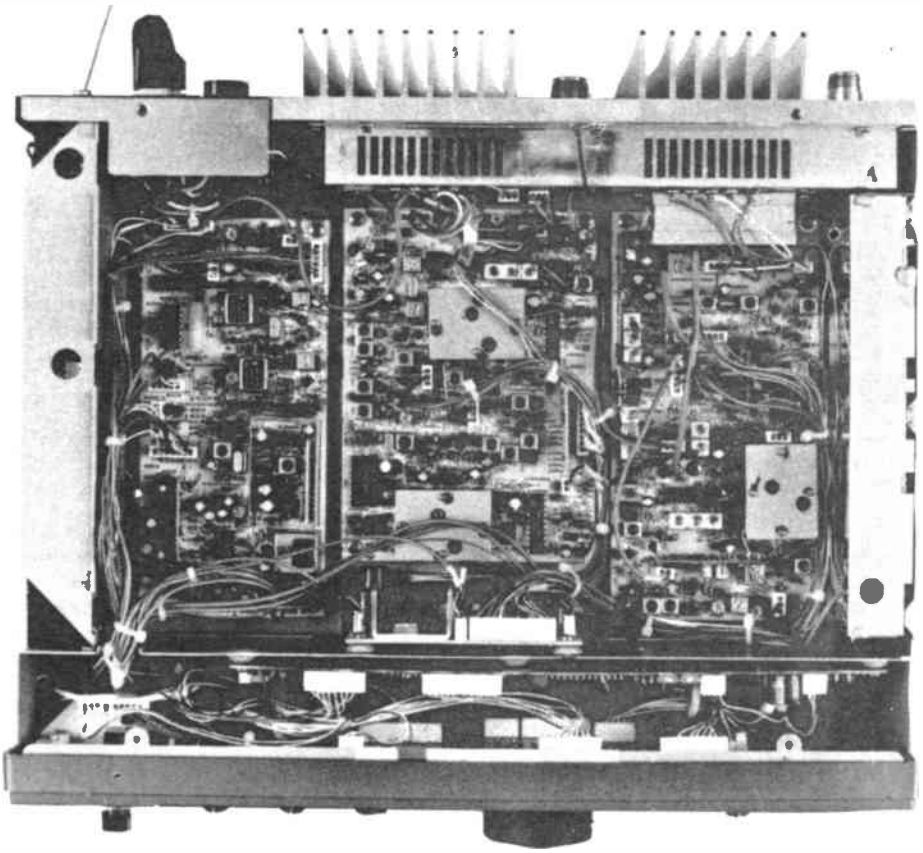
Microprocessor operation

To the right of the VFO are all the buttons used to interface with the microprocessors in the rig. Many of the buttons have second functions. The mode buttons (LSB, USB, FM narrow, FM normal, CW narrow and CW normal) have second functions, giving plus or minus repeater shifts or simplex, plus various enabling functions for tone squelch and Yaesu's AQS system, etc.

Two buttons are provided for QSYing up and down in 1MHz jumps and a split concentric rotary provides notch filter tuning and IF shift, the latter having a centre indent. A rotary is provided for adjustment of CW sidetone level. Three large buttons are used for switching to Tx with continuous toneburst, for selecting the second function of various buttons and for commencing an 'enter' process, eg, a required VFO frequency.

Matrix pad functions include VFO select, memory recall, step rate, memory check, T set, VFO and memory switch round, memory write from VFO, programmed search, clarifier on/off, speech enable (speech frequency readout board type FVS-1 is an optional extra), call 1 and call 2, frequency band, reverse repeater and priority channel. Second functions include numbers 1 to 9 and 0, ★, 'hash', code and offset. Additional buttons control various AQS functions.

The front panel display gives frequency with 100Hz resolution, selected memory channel in reserve and all the normal status indications. The S-meter is by the side of the frequency display. The front panel microphone socket has eight pins wired to the normal Yaesu configuration, which is different to Icom and Kenwood. There is also a quarter-inch headphone jack by its side. The rig has a carrying handle on the right cheek and is fitted with four feet underneath, extender feet being provided if you want to use them to raise the front. The loudspeaker is mounted on the top of the cabinet.



Shoot the reviewer!

This rig has the fascinating facility of automatically selecting repeater shift just between 145.6 and 145.8MHz. My wife, Fiona, and I spent a good hour trying to get this function to work, but it would only go into repeater shift under manual control. I telephoned the official Yaesu importers and applied many checks to the rig whilst on the phone to them. They went away and tried their own showroom model and eventually phoned me back to suggest that the set, which had been loaned to me by a very kind and helpful reader, was actually a faulty one. It was suggested that perhaps Yaesu had introduced some strange modifications.

We looked all the way through the manual to no avail. It was when we were writing this review and had reached the part about the top panel loudspeaker that I asked Fiona what on earth the two tiny rubber bungs were near the front. She didn't think there was anything down there but, on closer examination with a torch, there was a suspicion of two tiny microswitches a good half-inch down.

Closer perusal of the handbook found section 2.2 'top panel switches'. The first one was boring, its job being to reset the microprocessor, but the second switch produced considerable hilarity, for it was provided to switch off the automatic repeater shift function. Fiona eventually found a tiny screwdriver and, after much fiddling, managed to slide the switch over, whereupon the auto repeater function worked perfectly and all was forgiven. I don't feel too much of an idiot, though, and I await SMC's reaction when they too discover this secret switch!

The rear panel

The rig can be used either on 240V ac mains (as normally connected, but other mains voltages are available) or 13.8V dc. The ac socket is a standard IEC mains type. The output of the mains PSU feeds out of the rig and back in again to the dc socket, a separate dc power lead being an optional extra. The wiring of the IEC socket is perhaps a little bit 'open to the wind' internally, so do be careful if you have the lid off and are poking around with the mains connected.

Somewhat surprisingly, each module only has the antenna socket connection for the outside world, N type sockets being fitted to the UHF and microwave modules whilst S0239s are provided for the 6m and 2m ones. A five pin 'standby' socket provides solid-state switching pins for separate connection to external linears. It is most unfortunate that these pins were not independent short on Tx open or Rx relay connections, so interfacing will be very awkward for most makes of linear. Another multipin socket is provided as a CAT interface, with serial in and out, squelch on/off and 13.8V being available.

A separate data three contact micro jack is used for computer controlling. A 3.5mm jack socket is fitted for connection to an external speaker and a three-pole quarter inch jack is for a straight or paddle key connection. External PTT can be connected to a phono-type socket. Two large heatsinks occupy most of the space on the back panel.

I have to make the comment that I am very disappointed that no further interfacing is provided, so there is no input for external ALC, no convenient recorder feeds and none of the switching facilities that are fitted to models like the FT767.

Ergonomics

Although this rig has a great complexity of buttons, they are very sensibly laid out and easy to use. It should not take you too long to get the rig working in most of its modes, but some of the more specialised ones do require you to tuck your head into the instruction book for a while!

I very much liked the operational convenience of having the separate VFO knob and rotary click step control. The VFO runs very smoothly and is heavily knurled, a large finger hole also being fitted with a bearing which allows you to turn the VFO with your finger very rapidly. It is an excellent idea to have switches to select VFO or click steps for each step and the choice of steps is excellent. The up and down buttons above the VFO seem a little superfluous, however, unless you want to commence scanning; most users would probably use the up/down keys on the mic anyway.

I must praise the automatic repeater shift facility very highly. This operates on the 144MHz band only; it would have been very convenient if it could have been user programmable onto the 432MHz band as well, but perhaps this is too much to ask!

Memories were very easy to access and I soon got used to pressing two buttons to gain the memory to VFO function. The latter I feel is a must for any rig of this type these days.

I did not try the AQS system controls but I cannot help but feel that very few people are likely to be interested in using them because of the ludicrous lack of standardisation between all the manufacturers. It seems very childish for the Japanese manufacturers to each go their own way on this. They have done the same for years over the microphone socket pin connections, a constant irritation both to the trade and to amateurs who like fiddling around with mics.

I very much appreciated the facility for decreasing transmitted power by up to 30dB and the carrier level control had quite a smooth action on this. I also liked being able to alter the mic gain for FM as well as SSB. I do not understand why this gain is fixed for FM on so many other rigs, as some users almost eat a microphone

whilst others get well back and need much more mic gain.

I think that it is right to put the VOX controls on the front panel for a similar reason, although I do not like VOX on FM. Having three speeds of AGC is a great advantage and accessing the duplex mode with a rotary switch is commendable. I do prefer rotary switches to cyclic button pushing; perhaps Yaesu are now getting more consumer reaction against cyclic operating buttons. Manufacturers will only learn what people like and dislike if users let them know directly. I find that, in practice, it is no good letting shops know, as they often cannot be bothered to pass on the comments, especially if they are very busy at the time.

The notch filter was very poor indeed, the notch depth being less than 10dB, but I hope this was due to maladjustment rather than a design fault. The noise blanker seemed to be satisfactory.

I was very surprised that various interfacing possibilities were omitted on the actual modules themselves, for this was the obvious place to put external linear control, ALC input (completely omitted on the 736) and a switch to enable a masthead pre-amp on Rx. It would also be handy to have an easily available counter-sunk preset on the module's rear panel to set the maximum output power at a lower level than the factory set one. This would stop fiddlers at portable sites from whipping up the drive to a linear which may only require 10W PEP, for example.

Subjective trials

I was impressed by the rig's sensitivity on 70cm SSB and FM but the performance on 2m was not quite so good, although better than some of the competition. The selectivity was outstandingly good on all modes and I did not experience any RF input intermodulation problems until I put the masthead pre-amp on 2m by external control. Transmitted and receive quality were both reasonably good, but some amateurs may find the microphone somewhat coloured in the mid frequency region. FM reception was excellent and the tonal quality good, but I felt that SSB sounded a little muffled, although the actual bandwidth was ideal as far as the IF filter is concerned.

It seemed that there was too much audio cut at HF. There did not seem to be quite enough audio power available on the internal speaker and, in making a careful comparison of transient distortion on the 736 against my Kenwood TS940S/muTek on SSB, there seemed to be a slight roughness on peaks on the Yaesu which was not noticeable on the Kenwood. This would not be of concern to many, but was noticed by several friends of mine in my shack during the tests.

The rig worked well on CW, although the optional narrow CW filter was not supplied on this sample as the friend who loaned it to me is not particularly interested in that mode. Unfortunately, it was not fitted with speech frequency readout, so I could not try this either, and, whilst he was interested in the 6m and 23cm modules, they had not yet arrived at the retailers.

Brief circuit description

The main rig has intermediate frequencies of 13.69MHz and 455kHz. Each module contains its own mixer, fed with the output from its own synthesizer and, whereas the two VHF modules both mix down directly to 13.69MHz, the 70cm UHF module has an extra IF of 47.43MHz. The 23cm module also has an extra intermediate frequency, at 133.91MHz. GaAs-FET front ends are provided for the UHF and microwave units, whereas the VHF ones use conventional devices.

The synthesizer on each module takes its frequency standard from the temperature compensated crystal oscillator in the main rig, this being a very stable one. The RF circuits and PA blocks are all separate for each module. Digital information is provided from the rig's main microprocessor to processors within each module to give the required information for appropriate frequency synthesis.

Much of the internal construction is in the form of vertically mounted printed circuit boards, many of the interconnections being on plugs and sockets. There is quite a lot of room around for experts to put in their favourite modifications, but I would not advise anyone to fiddle about inside unless they really do know what they are doing! Although the instruction book is reasonably clear, far better than the majority of Kenwood ones, for example, I still feel that amateurs are not given enough information about the circuitry and I am sure that many users of equipment do like to read for themselves all about the principles of circuit design, etc. I remember that most rig manuals of 20 years ago were very much better than they are today.

Laboratory tests

Complete receiver with 144MHz module

The front end sensitivity on 144MHz measured well, although not quite as well as that of a first class transverter. The front end intercept point, although measuring quite satisfactorily, was actually about 10dB inferior to the performance of muTek front ends; I remain baffled as to why Japanese designers don't seem to be able to get their front ends right.

To put it into perspective, though, the FT736 intermodulation performance is much better than many older rigs and you are not likely to have any intermodulation problems unless you are using a masthead preamplifier and have some very strong competition around.

I have to admit to being very surprised to find that Yaesu's synthesizer design is better than they have achieved before – measurements produced some excellent figures for a VHF rig. You can often tell by just listening to a carrier that synthesizer noise is good. Harmonic distortion and noise actually measured at very low levels. Reciprocal mixing performance is important on 144MHz, and it was in this area that I criticised the FT767 144MHz module so strongly.

The FM sensitivity did not quite come up to expectation, despite being checked several times on different frequencies, but I noted that it was actually around 1dB better if I retuned the oscillator to 1.5kHz off channel. Since the synthesizers were obviously very accurate and SSB frequency accuracy was superb, I have to assume that the discriminator was very slightly out of adjustment.

The selectivity on SSB was outstandingly good and, in order to get sensible and accurate measurements, I had to use the low noise muTek oscillator. Since the rig only gave frequency to 100Hz resolution, what more can I say other than that the filter is virtually a brick wall at around 4.2kHz bandwidth. The −60, −70 and −80dB bandwidths all measured between 4.2 and 4.3kHz.

When I tuned across GB3VHF (I receive it at about 30dB above the level required for S9), the signal suddenly vanished outside the passband. Clean but strong signals seemed to knife out when I tuned away from them and the measurements confirm the excellent subjective impressions. FM narrow and wide filters were both superb, with about the best compromise that I have yet noted on an NBFM rig.

We noted a 20dB difference between S1 and S9, the S1 indication being at approximately 24dB above the receiver noise floor. The plus 20, 40 and 60dB points were all remarkably accurate to within a dB or two. On FM, the S-meter had only 14dB range between S1 and 9 and, whilst this is not the worst on FM, it is not particularly good, readings above S9 being ridiculous.

Although the harmonic distortion, including noise, on SSB was only 1%, two-tone intermodulation well within the filter passband was fairly poor. Third order products at around 3.2% were noted on static tones, considerably higher distortion being seen on medium AGC. This was more apparent on fast than on slow AGC, perhaps showing up the reason for transient distortion heard in the subjective tests. However, the distortion was considered a lot better than on the earlier FT726, and Icom rigs do not seem to measure any better anyway, although Kenwood ones do.

FM distortion with the wide filter was a little high at between 2.5 and 3% at higher deviations. Lower ones were very much cleaner, however, again pointing perhaps to incorrect discriminator adjustment. The maximum audio power output was slightly limited into both 8 and 4 ohms and I would have liked a lot more in a mains rig.

After we had measured the FM received response, we understood the reason for a slight plumminess audible on most FM stations; the LF response

was extended flat to well below 200Hz and even 100Hz was only just over 5dB down. If you contrast this with 3kHz at nearly 7dB down, the roll-off continuing very steeply above this, you will see that the response is not ideal, the plot being taken with the treble control flat out *(Plot 1)*. The ideal response should be flat from around 350Hz to 3kHz with 12 or even 18dB per octave cut outside these limits.

FM capture ratio measured well and quieting was also excellent, especially with the narrow FM filter which, incidentally, gave a marginally better sinad sensitivity than the wider filter did.

Finally, I must commend the incredibly accurate main crystal reference frequency, as the SSB received frequency error was a mere 20Hz after a few minutes warm up, the rig maintaining this minute error for well over an hour without noticeable drift. I would consider an HF rig to be good with this accuracy, but for a VHF one it is incredible.

432MHz module front end

The 432MHz sensitivity was some 1.5dB better than that of the 144MHz module, first class in fact, just 0.1μV emf/2 being required for 12dB sinad. FM was also very good, but again not quite as good as should have been obtained because the same discriminator problem arose.

The RF intermodulation distortion performance again measured quite well, and there is not normally the problem on 432MHz that there is on 144MHz. Reciprocal mixing seemed satisfactory, but no actual measurements were taken because of insufficient time.

The frequency accuracy was superb, an error of just under 70Hz being noted after warm up, this remaining stable for a long time. The front end gain was very similar to that of the 144MHz module and the S9 reading was within 1dB.

Tx tests

The complete transmitter section including the 144MHz module

On the 144MHz band the FM and CW output powers were around 25W output, with just a very slight rise noted at the very bottom end of the band. On SSB, we could not get more than 24W PEP on two tones if they were of equal level. When the carrier control was set to minimum the power was reduced to only 25mW, a very useful facility.

RF harmonics were at very low levels. The second harmonic, for example, was at −67dB! Although we tried long and hard to find spurii or transmitted images, none were noted on the spectrum analyser, the noise floor being typically at −80dB. I think this is quite remarkable.

The SSB carrier balance had been quite well set, the carrier being typically at a level of −51dB ref full output. The alternate sideband breakthrough at 1kHz was at −60dB, which is very good indeed.

Coming to the two-tone tests of the PA block, I have to express once again my dissatisfaction with modern PA block design. Third order products at −20dB are just not good enough (see *Plot 2*), nor is the fact that the high order products do not drop below −60dB until they go a long way out. Although results are cleaner at lower output levels *(Plot 3)*, they do not drop rapidly enough. Contrast all these results with the SSB Products transverter, which I reviewed so favourably last year.

It is not just Yaesu who are fitting PAs that are not really good enough, for I seem to be criticising almost all Japanese PAs these days. It is high time Japanese manufacturers did something about it. Perhaps it is the lack of use of discrete component circuitry which is the problem. Whatever, I do feel it should be given top priority, especially as a rig which is so good in almost every other way is highly likely to be used with good valve linears for contest operation.

The AF/RF transmitted response plot *(Plot 4)*, taken from mic input at low level to carrier output at a maximum of 2W carrier, is thus well below any ALC action. You can see how very steep the filter skirts are, although the top of the passband has a strange step in it which causes the top octave of speech frequencies within the passband to be transmitted at around half the power given to the lower register below 1kHz. I do not know the reason for this, but it will not help DX readability.

The peak FM deviation on the normal filter was very accurately set for 25kHz channelling. The maximum possible deviation also fell very rapidly at the HF end to prevent excessive transmitted bandwidth. At 3kHz the maximum possible deviation was just at 2.5kHz, 6dB down on the maximum at lower frequencies. With the narrow filter selected, the maximum possible deviation was reduced to only 2.7kHz at 1kHz audio frequency. I consider that this deviation is too low for an amateur radio service, although about right for a commercial one.

The actual limiting came in at just above 2.3kHz, incidentally, again on the low side. Reverting to the wider deviation performance, the signal-to-noise ratio was typically around 40dB, this being mainly background hiss. Distortion was below 1.7% for deviations below 3kHz, but above this distortion rose to around 6%. The transmitted response at lower levels was almost ideal, virtually what I recommend for Rx, in actual fact! The response was very well attenuated outside the range 300Hz to 3kHz. The toneburst frequency was accurate and its deviation just about right.

We noted the transmitted frequency error to be only 60Hz high immediately after switch on and, after some minutes, the error was only 10Hz – quite astonishing accuracy.

The 432MHz module

FM power tests on this module showed that the output was varying between 23W at the bottom end of the band up to just 20W at 439MHz on FM. As with 144MHz, we could not get quite as much power out with two-tones on SSB, a maximum of around 20W PEP being available. What was very odd in the two-tone plots was that the LSB and USB products were grossly dissimilar. Note in particular the third order of −20dB and −38dB on the 20W PEP plot. There was clearly some cancellation going on, but there is also a pointer to bad circuit layout, possibly even within the PA block itself, which might be outside Yaesu's direct control.

Note, again, that the high order products do not drop as they should do *(Plot 5)*, although the performance is better at lower levels *(Plot 6)*.

Deviations on FM and SSB performance were noted to be virtually identical on 432MHz, so full tests were not repeated. However, we checked for frequency accuracy and 435MHz FM was only 20Hz low, an SSB carrier being just 70Hz low. The two measurements were taken at around an hour apart, showing how little drift there was.

Conclusions

There is much that is impressive about this new rig and it deserves to be a better seller still than its predecessor, the FT726. I must particularly praise the receiver section, which is among the finest VHF/UHF designs to have come out of Japan. The transmitter section was also satisfactory, apart from the SSB intermodulation performance which I feel is not good enough for contest working if the rig is to be used with a big linear. Perhaps I am being too niggly here, for I have no doubt that its 13.8V dc facility will encourage its use by many portable contest stations who will find the CW narrow filter, IF passband tuning and its many other facilities suitable for contest working.

Although I am told the rig is officially priced at £1,450 including VAT, telephone enquiries showed that it can be bought for at least £100 less if you shop around. Sometimes this may be in the form of an inflated trade-in price on an old rig, whilst at other times, if you have enough cheek and very crisp notes in your hand, you might get it from your friendly local retailer. However, don't try too hard for discount if you want absolutely tip-top after sales service.

In conclusion, I recommend this rig highly. I think it is very good value for money, considering its facilities and the available options. The speech option will be a boon for blind amateurs. I would particularly like to thank most warmly my friend for so very kindly loaning me this rig immediately after purchasing it and, of course, Fiona, for helping with all the measurements and the word processing.

G3OSS TESTS

HOKUSHIN HS727VME AND HSWX1

Dual-band antennas

It is only in recent years that dual-band antennas have been made available to the amateur on the 144 and 432MHz bands, with the exception of a few discones and log aperiodic types. The earliest dual-band mobile antenna that I know of is the Trio-Kenwood MA4000. When I tested this it performed excellently until I absent-mindedly put 100W into it; the feed coil in the base promptly blew up. I learned my lesson and I was very careful with the second sample loaned to me.

I reviewed this antenna in comparison with two other dual-band mobile antennas in the July '87 issue of *Amateur Radio*.

Hokushin, distributed by Lowe Electronics, have now introduced two new higher gain models: a mobile, type HS727VME, and the HSWX1, which is referred to in the instructions somewhat amusingly as a 'grand plane' version. The latter is intended for roof mounting and is supplied with various types of bracket for ease of installation.

The Hokushin HS727VME

This mobile dual-bander is supplied with a PL259 plug recessed into the base which screws directly into an SO239 type mag mount or gutter mount socket. It seems that the thread is of the more unusual Japanese metric type rather than the ubiquitous, and older, European type thread, although it did screw onto a normal gutter mount quite adequately.

The antenna is marginally over 1.5m long from the base to the tip. It includes a matching network in the base and two large two-turn coils approximately one third and two thirds of the way up the antenna, a short joining section being provided in the centre.

The antenna is effectively a matched ¾ wave on 144MHz and three ⅝ waves in series on 432MHz, giving considerable gain over a normal ¼ wave vertical on both bands. As I do not have an antenna measurement range, I can only quote the subjective difference in practice between this antenna and my own MA4000, which I have used for some years.

Tests conducted outside my front door were misleading, as differences were varying from none at all up to a whole S point. These were all influenced by the angle of radiation, reflections from local buildings and even my own antenna masts, so it is better to give the subjective impression of a difference of nearly an S point in general use on the open road.

Ken G3MSW uses a very similar antenna to the one under review and regularly drives from Essex right across to the M25, near the A1, and agrees that an improvement of nearly an S point over the more usual dual collinear is a fair estimate. 70cm repeaters that are very marginal over the simpler antenna are fairly weak, but quite usable with the triple ⅝ on 433MHz FM.

I used the antenna on a long journey from North London to Ipswich and there was definitely an extension of my range on both bands. Furthermore, I was able to hold a QSO with a fixed station for much longer than I would have normally expected. In the past few years I have frequently travelled to the Braintree area, so I do know the terrain fairly well.

Both Ken and I were a little concerned about the greater than average length of this antenna. When screwed into an elderly gutter mount, in good condition, on the left side of the car, the tip of the antenna brushed several trees. This was less of a problem when used with a mag mount in the centre of the roof.

A strange problem

When Fiona and I first measured the SWR of the antenna mounted in this way, we obtained figures that were unexpectedly poor on the 432MHz band, although the 144MHz figures were good. I was very surprised at this and wondered if some moisture had got into the lead. So, all of the tests were repeated with a brand new spare lead which we happened to have. Readings were almost identical, so at this point I screwed on a very high quality Bird 50 ohm dummy load to the gutter mount socket end. I was astonished to see a 1.4:1 SWR on the old lead and just over 1.3:1 on the brand new one. Initially, I did not know what to do but, after a hunt, I found a superb quality 934MHz mag mount complete with an SO239 socket.

I can remember remarking at the time of the original review of the 934MHz equipment that the mag mount socket was not really appropriate for such a high frequency.

Upon closer examination, however, I found the construction of the socket of a very high standard and, when the mag mount and lead was tested in the same way, with the dummy load screwed onto it, I was delighted to find virtually no reflected power at all. The SWR tests were then repeated with this mag mount.

This introduces a subject which is very important: SO239 socket quality with respect to use at UHF. I cannot understand how any professional engineer could ever call the PL259/SO239 pair a 'UHF plug and socket' for, believe it or not, that is the alternative designation for them.

I have never had any problems with an N socket, but time after time PL259s on 145MHz (let alone 432MHz) have caused me difficulties. It took years of grumbling by various equipment reviewers, including myself, to wean the Japanese off SO239 sockets on 432MHz mobile gear. However much I enquired, I could not find one single make of mag mount with an N type socket on it, nor could I find any dual-band antenna available as an option with an N plug on its base, so there is still a long way to go!

In the meantime, if you are considering a gutter mount, make absolutely sure that the lead supplied with it, including the SO239 socket, is rated for proper use on UHF.

A superb SWR

On the 144MHz band the SWR measured 1.1:1 below 1.5MHz, rising to a mere 1.2:1 at 145.8MHz. This is an excellent performance which should not stress any rig or linear. On the 432MHz band there was almost no reverse power noted in the bottom part of the band; even at 434MHz it was no worse than 1.1:1. SWR gradually increased to a maximum of just 1.4:1 at the 440MHz band edge. This is a commendable performance once again.

The antenna is rated as taking the full output of a linear up to 125W, which is ideal.

The Hokushin HSWX1

The specification of the base station version is very similar to that of the mobile one previously described, apart from the power rating which is increased to 200W FM.

The antenna is a vertical white stick, again just over 1.5m in length, but this time with three horizontal radials protruding from the base.

An SO239 socket is built into the base, around which is a cylindrical metallic shroud, several centimetres long, which acts as a weather-proofing and mounting section. Various clamps and brackets are supplied for use with this section. A coaxial cable and plug feeds through this cylinder and is screwed into the base of the antenna.

Alan Goddard G3NQR installed the antenna at around 10m above ground level, well clear of any metallic obstacles on the roof, using Pope H100 cable through to the shack. Despite the fact that the SWR was, frankly, rather poor on the 432MHz band (averaging around 1.6:1), results were excellent in practice and SWR was quite good on 144MHz.

Alan has had an assortment of vertically polarised antennas on the roof over the years, but was totally convinced that the Hokushin white stick (my name for it, as I am a blind operator!) was far better than any previous antenna that he had used on 432MHz for FM.

We were both surprised that he could access as many repeaters as I could on the band, some of them at considerable

distances, as his QTH is not particularly good geographically. He certainly sounded much stronger to me than before on both 2m and 70cm FM.

I well remember the first time we tried the antenna out. We were working duplex on 2m/70cm. Fiona arrived in the shack with a cup of coffee for me, our bearded collie, Ceilidh, in tow. At the same time, Alan's XYL, Lucy, arrived in his shack with Sam, his West Highland White puppy. Ceilidh began to bark and Sam replied, whilst Alan and I sat back and listened to this remarkable canine exchange which they kept up for some minutes.

Incidentally, both dogs do have licences – but these are somewhat less expensive than amateur ones! The extremely strong signals between us over a 16km path were clearly responsible for the superb duplex system quality, which the dogs obviously appreciated.

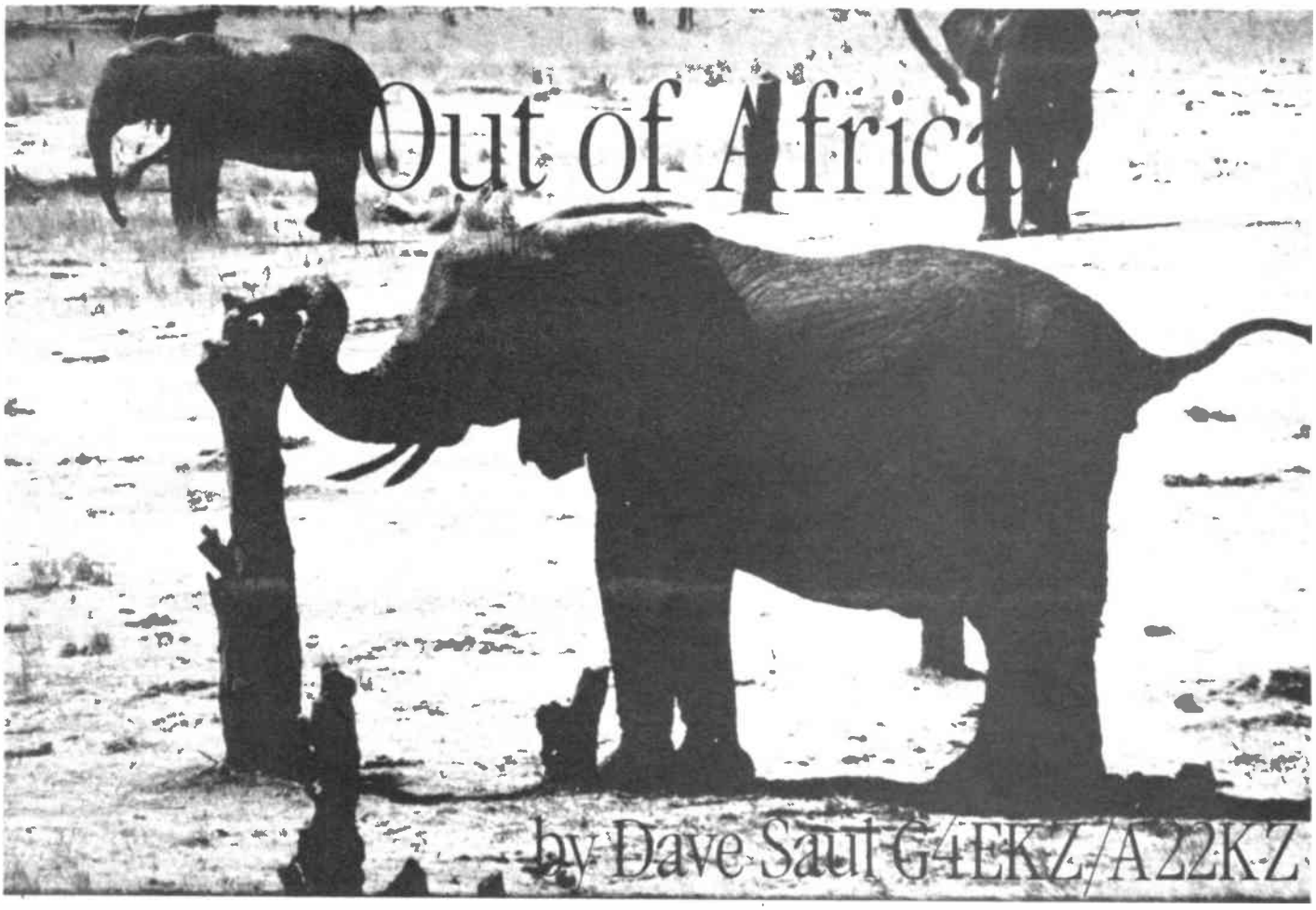
Conclusions

I recommend the mobile Hokushin very highly. It seems that the base station antenna is also an excellent performer, although you may have an SWR problem on 432MHz.

It is quite plausible that the review sample might have been a poor one for SWR, so I would be interested to hear readers' experiences if they purchase it. The mobile type, HS727VME, costs £37.42 including VAT, whilst the base station version, HSWX1, costs £59.62.

Many thanks to Lowe Electronics for the loan of the review samples, and to Alan and Fiona for helping with the review.

The Hokushin HS-VK5 vertical 5 band HF antenna was reviewed in the March issue.



In December, I returned to the UK after two years of teaching and amateur radio activity in Maun, Botswana. On picking up a copy of *Amateur Radio* I was surprised to see just how much interest there had been in my 50MHz activity from Botswana. So I would like to add my own account of amateur radio in A2-land.

The country

Botswana is a large country, its area almost three times greater than that of Britain. The population, however, is little more than one million, and most people live in the eastern part of the country. The capital, Gaborone, has a rapidly expanding population and is located in the south-eastern corner of the country, close to the border with South Africa. Much of Botswana is covered by the Kalahari Desert, a vast area of dry savannah which is still largely untouched by man.

The northern areas of the country contain some of the greatest concentrations of elephants and other game remaining in Africa. In the north-west is the Okovango Delta – a unique aquatic wilderness, which has recently been the subject of a BBC TV series. Close to the Okovango is the village of Maun, the administrative centre of this particular region of Botswana. I was posted here in September 1985 to teach science at Maun secondary school.

There are very few radio amateurs in Botswana. Most, like myself, are expatriates on short term contracts, and at any time there may only be about a dozen A2 calls active. I had applied for a reciprocal licence before leaving Britain, and was issued with the callsign A22KZ on arrival in Botswana.

I was very fortunate initially, as I was able to buy an FT101ZD from A22AA, who was about to leave the country. I also obtained a 14AVQ ground plane for 40/20/15/10 metres and needed only to find a suitable mast on which to perch it. The answer was growing on the opposite bank of the Thamalakane river, about a mile downstream from the school. My long suffering house-mate helped fell a choice bamboo which, after trimming, was still nearly 15 metres long.

A malevolent hippo?

Getting it back to the QTH was tricky; a malevolent hippo dissuaded us from simply floating it across the river and carrying it, so it was loaded precariously on the back of our pick-up and taken the long way back. A bamboo that long bends a lot but, with a system of pulleys and a group of school students, we were able to get it vertical again with the 14AVQ on top. With 8 radials, 12 guys and an 80m dipole to boot, it stayed up – much to our amazement, until the eve of my departure.

With this HF set-up, powered by the village 240 volt mains, I was able to maintain reliable twice weekly skeds with G3TKN in Portsmouth for two years. We generally used 15m and occasionally had to QSY to 20m, but we found that at 1600Z we could almost guarantee good communications between Portsmouth and Maun.

My nearest amateur neighbour was Charlie A22CL (VE6ASL). He lives in Etsha, a small and remote village some 200km to the north-west of Maun. Charlie ran his station from 12V batteries, trickle charged by a solar panel. We kept nightly skeds on 80m and often he would have urgent messages regarding the non-arrival of supply trucks, which frequently broke down on the sandy road between Maun and Etsha. Every two weeks or so, Charlie would make the journey into Maun and we would have an eyeball QSO over a Lion (Lion lager, that is).

50MHz operation

The 50MHz story dates back to March 1987. On Sunday mornings I would generally listen to the 'Amateur Radio Mirror' bulletin, broadcast by the Johannesburg branch of the South African Radio League. Excellently presented, it is transmitted simultaneously on 80, 40, 20 and 2 metres. Sometimes I would call in on 40m with a reception report and on one such occasion was heard by Hal Lund ZS6WB, in Pretoria. Hal is a very keen VHFer and is responsible for stirring up much of the VHF interest in South Africa. The October 50MHz transequatorial propagation (TEP) tests were on the horizon; Hal suggested that I was ideally situated to take part and offered to send me the necessary equipment.

The first 50MHz operation from A2 took place in July 1987, when ZS6BCR and ZS4TX paid a flying visit to Maun one weekend. With ZS6BCR at the controls, they flew from Pretoria with a plane full of 6m, 2m and HF equipment. We managed to unload the aircraft without customs noticing and minutes later, back at the school, ZS6BCR made the first 2m EME contact from A2, with W5UN. The remainder of their visit was devoted to 6m meteor scatter contacts to ZS.

In September I set up my 50MHz station, with 80 watts from an IC551D and a 4-element yagi on a 9m baby bamboo, rotated manually. Directed south, I was able to copy meteor bursts from the Pretoria beacons and make a few MS contacts with South Africa. But beaming north I heard nothing – until October 2nd.

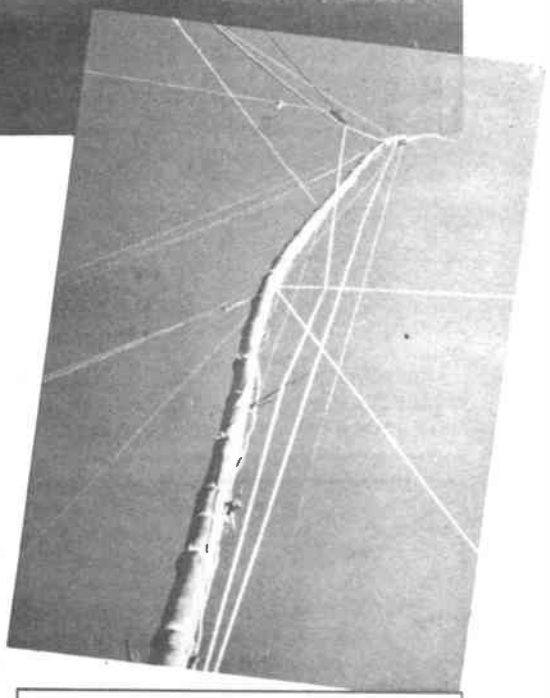
At 1527Z on October 2nd, 1987, the silence was broken by the Malta beacon, 9H1SIX, on 50.085MHz. I started calling on 50.110, both CW and SSB, and also on 28.885 SSB. At 1545Z, Costas SV1DH (SZ2DH) in Athens returned my call on 10m. We immediately QSYed to 6m and had a fine sideband QSO, conditions being better there than on 10m. I gave him 5 and 5; he returned 5 and 3. We signed off, but the Malta beacon remained audible until 1900Z. Throughout this period I had been in contact on 80m with ZS6WB and others who, some 700km further south, had not heard anything on 6m.

On October 5th the Cyprus beacon, 5B4CY, became audible and SZ2DH and I exchanged 5 and 7 each way. Three days later, on October 8th, the band again opened and I had an SSB contact with 9H1BT. On this occasion my signals were heard by G3JVL, but unfortunately the band closed quickly and I was unaware at the time of this brief opening to the UK.

For the next four weeks, trans-equatorial propagation on 50MHz occurred daily, almost without exception. I had numerous contacts with SZ2DH, and with 9H1BT, 9H1FL and 9H1CG on Malta, with signal reports as high as 5 and 9 + 30dB. We observed on some occasions loss of propagation, followed by its reappearance an hour later with severe distortion, characteristic of evening TEP.

Geographically, however, the effects of TEP are limited. Maun is located in latitude 20°S, and other stations in the same latitude were having similar experiences.

To the west, ZS3E in Outjo had many QSOs into Europe and, to the east, Z21FT in Bulawayo was receiving signals but unfortunately was unable to transmit on 50MHz from Zimbabwe. Further south in South Africa, however, openings to Europe were very brief when they did occur and many stations were frustrated at being unable to join in the fun. Similarly, in the northern hemisphere, propagation was limited to areas in the Mediterranean latitudes.



Above: *A22KZ/P (6m) Gumare.*
Left: *A22KZ, complete with bamboo!*

A2 – G on 50MHz

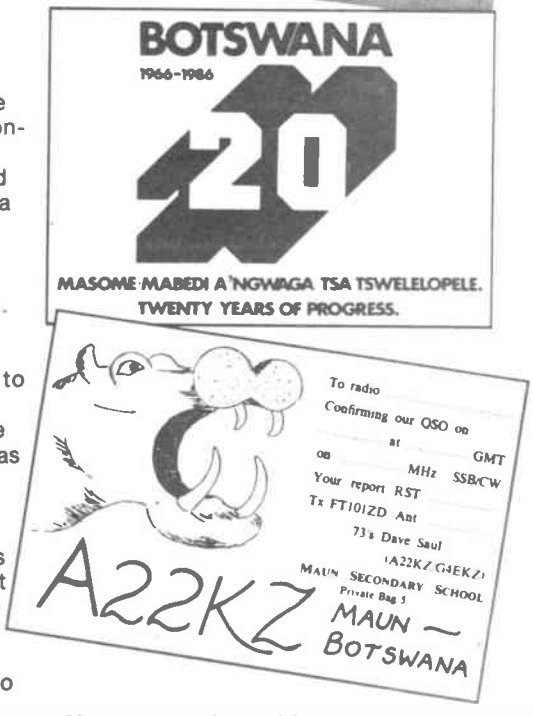
The highlight of the TEP season occurred on October 22nd when TEP, combined with sporadic-E over Europe, presented a path from Botswana to the UK.

I first heard Eric G2ADR at 1545Z, returning my CQ on CW. Describing the event afterwards in a letter, Eric said that the excitement was almost too much for his ancient heart. It was certainly too much for the fuse in my power line, which inexplicably went high resistance at the critical moment. That fault took several precious minutes to track down, and bemused visitors in the shack at the time didn't quite understand the cause of my panic!

Eventually, with the rig now in pieces on the bench, I was able to complete QSOs with G4HBA, G2ADR, GM4DGT, G1AWP, G4GAI and G3CCH. Signal strengths were no more than S2 and the band was quite noisy with QRM from non-amateur stations. An attempt to work GM4DGT on SSB at 1715 narrowly failed because he was suddenly swamped by a strong FM signal.

The path to the UK closed down soon after 1715Z, at which time I was able to compare notes with SZ2DH and 9H1CG. Propagation to Europe finally ceased altogether at 1825Z.

After this date, TEP openings started to be less frequent and were shorter in duration. On November 10th I heard the CT0WW beacon for the first time, but was unable to complete a crossband QSO with EA4CGN. During the third week of November the 9H1SIX and 5B4CY beacons were audible for short periods on most evenings. On November 20th at 1925Z I heard 9H1SIX for the last time, appearing briefly out of the noise and uttering its final dots and dashes. That was the end of TEP in Botswana, and two weeks later I was to dismantle the station.



Above: *David Saul's QSL cards*

Out of Africa

Above: *A22CL.* ***Left:*** *A22KZ*

QRT

Pulling the plugs for the last time and dropping the antennas down is a sad occasion. I have since spoken to other amateurs who have had similar experiences after operating abroad.

I knew that when the bamboo mast crashed to the ground, A22KZ would have gone irrevocably QRT. The event obviously deserved a bit of ceremony. A violent thunderstorm late at night is not the best time to handle masts and aerials, but after a few beers I and a couple of colleagues decided otherwise. Groping around in the wet and dark, I cut all the guys and then set about sawing through the base of the bamboo. Then, while I played the Last Post on the mouth organ, the remainder of the crew tried to push the mast over. A solitary guyline up there in the darkness, or perhaps Divine intervention, we shall never know; but the mast refused to fall. Maybe A22KZ was destined to remain on the air? Eventually, however, with more manpower brought to bear, 14AVQ and all came down out of the night sky – and I was going home.

Tony Smith G4FAI takes his bimonthly look at the world of dots and dashes

Dr Gary Bold ZL1AN and Barry Kirkwood ZL1BN alternate in writing a monthly column, *The Morseman*, in *Break-In*, the journal of NZARTS. In the September 1987 issue Gary discusses some interesting aspects of learning Morse by computer. He refers to an innovative computerised teaching system described by WA9VRU in *QST*, May 1977, which combines two 'beautiful, simple and obvious ideas'. One was the introduction of characters in postponed discrimination order; the other was that the computer should adapt to the human.

Postponed discrimination order means the longest characters are introduced first, as opposed to the more usual start with E, I, T, etc. The idea is to reinforce the need to listen to the whole character before deciding what it is. Plain text gives the learner little chance to practise the more uncommon letters. With postponed discrimination, by the time E is reached the Qs, Zs, Xs, etc, will have been heard so often that they will not cause the usual confusion.

Gary says that WA9VRU's is the only adaptive code teaching system he has seen and he would like to know of others, if they exist. 'Adaptive' here means adjusting the teaching to match the learning ability of the student. Gary's version, much worked over, is a program called 'Teach' which sends an audible character at about 12wpm and waits for a response. If you know what it is, you press the appropriate key on the keyboard. If you don't know, and do nothing, the program waits a reasonable time, prints the letter on the screen and sends it again.

Average response

If the wrong key is pressed, the character is sent again without comment. The program starts with Qs and goes on to Ys, introducing more as the learner begins to recognise the characters correctly. It continuously averages past response times and waits for a response for *twice* as long as this average.

It keeps track of the student's error rate on each character and the average error over all characters in use. All these error rates have to be acceptably low before a new character is introduced. Characters are sent with a non-uniform random probability, so that characters which a student finds difficult (determined from the student's response rate) are sent with a higher probability than those recognised more easily. At the end of a session the program provides information on how the student is progressing.

Barry Kirkwood is a psychologist who is setting up a psychology project for third-year students at Auckland University. They will scientifically investigate the effectiveness of adaptive Morse code teaching software. This is thought to be the first such investigation, but if readers know of any others, please tell me and I will pass the information on.

Now you have passed the test

'The passing of the CW test equips one with but a simple survival kit – just enough to survive a simple CW contact . . . I firmly believe that this hard-won skill should be developed and extended to whatever limits the individual wishes to set', says Ron Wilson G4NZU in his booklet *The Test and After*. This booklet takes over where many of the 'teach yourself Morse' books finish.

He offers guidance on preparing for and taking the test, then goes on to discuss in some detail what happens when you finally get on the air. It is useful for anyone nervous about using CW for the first time as it contains some good advice; for example, it explains how it is better to forget about speed and to concentrate on developing exactness of rhythm, the hallmark of good CW.

Ron says that abbreviations can be learnt as easily as anything else – but you have to remember to use them. Originally written for members of his Morse class, the booklet costs £1.50 post paid, available from Ron Wilson, Greythorn Drive, West Bridgford, Nottingham NG2 7GG.

QRP convention

The fourth Yeovil QRP Convention will be held on Sunday, May 8th. This is always a good Morse day for dedicated QRPers or for those who want to find out more about low power operating. Both 1930s style and modern QRP rigs will be demonstrated with the call GB2LOW. There will be component stands, a home-brew equipment display, nice refreshments and a natter area.

Rob Micklewright G3MYM, always worth listening to, will be talking about 80 metre propagation and I am going to be guest speaker, talking about my favourite subject, the origins of Morse. Further information from Dave Bailey G1MNM, 46 Goldcroft, Yeovil BA21 4DH. Tel: Yeovil 79804.

Straight key evening

Edgware and District Radio Society's annual straight key evening will be held on Friday May 20th, around 3.550MHz. This event is becoming increasingly popular, with participation spreading across the UK and into Europe.

It is a pleasant evening on the hand key, working at your own pace in a friendly atmosphere. Call CQ SKE and look out for GB2SKE, the Edgware Society's own special event station. Afterwards, write to John Bluff G3SJE, 52 Winchester Road, Kenton HA3 9PE, with your views, comments, and nominations for the best 'fist' heard.

Gloomy outlook?

Everything seems fine just now, but I still feel that within ten years there will be considerable concern about the future of amateur Morse. I hope I am wrong. I have previously mentioned in this column (*Amateur Radio*, May 1987) the proposed official abolition of Morse from the maritime bands in the 1990s. This could lead to the eventual abolition of the amateur Morse test.

There is not enough space in this column to go into what happened when the Morse test was abolished in Spain a few years ago, but the spring 1987 issue of *Morsum Magnificat* has the original articles which prompted my concern. The annual subscription for *MM* (4 issues) is £6, but if you just want the spring issue you can get it from me, QTHR, for £1.50.

UTC	Main frequency	Reserve frequency (if QRM is bad)
0700-0800	3.508	3.515
0800-0900	14.080	14.094
0900-1000	3.508	3.514
1000-1100	14.080	14.094
1100-1200	3.508	3.514
1200-1300	14.080	14.094

ICOM

IC-4GE 70cm FM Handportable

The IC-4GE is the first in a line of new handportables to be announced from ICOM. The small compact style provides easy operating and rugged durability. Other models for 2mtrs and 23cm will be released later this year.

A full 6 watts of RF power is available when using the IC-4GE with the option IC-BP7 nicad pack. The IC-4GE is equipped with a total of 20 memory channels. Each memory can independently memorise frequency, offset direction and frequency.

All circuits are designed using low power dissipation techniques to create a special power save circuit in the transceiver. The power saver circuit functions if no signal is received or no switch operation is performed for more than 30 seconds. In addition, the power saver circuit can be turned off for packet communications.

Two different scans, programmed scan and memory scan are provided and in addition memory skip channels can be programmed to skip selected memory channels during memory scanning operating. The squelch monitor function allows you to monitor weak signals without having to adjust the squelch control. The high impact case is splash resistant by the inclusion of rubber gaskets. The IC-4GE is supplied with a IC-BP3 nicad battery pack, flexible antenna, AC wall charger, belt clip and wrist strap. It is compatible with many of the existing accessories for ICOM's IC-2/4 and IC-02/04 series of handportables.

Also available for the IC-4GE is a large range of optional accessories including a variety of rechargeable nicad power packs, dry cell battery pack, desk charger, headset and boom mics and new slimline speaker mics. For more information on the IC-4GE or any other ICOM handportable contact your local ICOM dealer or ICOM (UK) LTD.

◀ Actual Size ▶

Icom (UK) Ltd.
Dept AR , Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour.

Count on us!

IC-575, 28/50MHz Dual band multimode.

The ICOM IC-575 base station has been developed to meet the demand for advanced communications for the recently acquired 6m band. Similar in appearance to the IC-275/475 2m and 70cm base stations, the beauty of this new transceiver from ICOM is that it gives you the best of both worlds, 6 & 10m in one compact unit. The IC-575 covers 28-30Mhz and 50-54Mhz.

Operating modes are SSB, CW, AM & FM. Power output is 10 watts (AM 4 watts) with a front panel control to reduce output for QRP operations. A pass band tuning circuit narrows the I.F. passband width, eliminating signal in the passband. A built-in notch filter eliminates beat signals with sharp attenuation characteristics.

Some PLL systems have difficulty meeting the lockup time demands placed on them by new data communications. This is why ICOM developed the DDS (Direct Digital Synthesizer) method. With a lockup time of just 5msec the DDS method allows the IC-575 to handle data communications such as packet or AMTOR. 99 programmable memories can store frequency, mode, offset frequency and direction. A total of four scanning functions for easy access to a wide range of frequencies, memory scan, programmed scan, selected mode memory scan and lock out scan. The IC-575 has an internal A.C. power supply, but can also be used on 13.8v DC for mobile or portable operation.

Optional accessories available are the UT36 voice synthesizer, the IC-FL83 CW narrow filter, SM7 external loudspeaker, HP2 communication headphones and SM8/SM10 desk microphones. Other transceivers available in this range are: IC-275E 2m multimode 25w, IC-275H 2m multimode 100w, IC-475E 70cm multimode 25w, IC-475H 70cm multimode 75w.

IC-505, 50Mhz Transceiver

The IC-505 is a 6mtr BAND SSB, CW, FM (Optional) transceiver. It can be used as a portable or like other transceivers of this type as a base station unit. When used with an external 13.8v power supply the 505 gives 10 watts RF output, 3 watts or 0.5 watts on low power is available when using internal batteries. Other features include 5 memories with memory scan, program band scan, dual VFO's with split operation.

The easy-to-read LCD readout includes frequency, memory scan and call modes. Full metering of battery condition signal strength and power output is provided. When fitted with the optional EX248 FM unit the IC-505 offers 50MHz operation at an affordable price.

Helpline: Telephone us free-of-charge on 0800 521145, Mon-Fri 09.00-13.00 and 14.00-17.30. This service is strictly for obtaining information about or ordering Icom equipment. We regret this cannot be used by dealers or for repair enquiries and parts orders, thank you.
Datapost: Despatch on same day whenever possible.
Access & Barclaycard: Telephone orders taken by our mail order dept, instant credit & interest-free H.P.

SHORT WAVE LISTENER

TREVOR MORGAN GW4OXB

As I mentioned in last month's column, an AM transmission consists of a carrier wave and two sidebands which are produced by the modulation of the carrier wave. The total bandwidth used by an AM signal is unacceptable when you consider the total coverage of the frequencies allocated to amateurs. It would take very few AM signals to completely swamp, say, 40m, so the accepted form of transmission on the amateur bands is single sideband. This uses less bandwidth and results in more power being available from the transmitter.

Although the usual receiver is inadequate for resolving such transmissions, there *is* a way to hear sideband signals using a second receiver. The technique is called zero beating.

Taking your main receiver, you tune it to an amateur signal which sounds distorted. Then you tune the other receiver to around 450kHz lower. With the volume of the second receiver backed off, you should be able to hear the whistle produced by the second receiver as you tune it through the signal of the main one. A little adjustment of the distance between the receivers and you can resolve the sideband signal. It's a bit hit and miss, but it does work.

The real answer, of course, is to get a receiver with a built-in oscillator that does this automatically – a beat frequency oscillator. There are many receivers on the market that have this facility. They start at under £100 new; less if you buy second-hand.

It has become standard practice for all transmissions below 10MHz to be on the lower sideband and transmissions above 10MHz to be on the upper sideband. This rule is not mandatory so you can still hear stations working the wrong end. AM transmissions can still be heard on 160m.

The areas of coverage of the amateur bands are controlled by international agreement, although individual countries have ultimate control over what can or cannot be used by their amateurs, so there are a few differences in the band coverage. However, there are few differences in band usage and, for the most part, all countries have similar rules which have to be observed.

On the other hand, the band areas where different modes can be used are not strictly controlled and many would like this to be resolved. It is easy to see why.

Slow-scan

Let us take SSTV, for instance, which is becoming very popular since the advent of the home computer. The generally accepted area on 20m is around 14230 and SSTV exponents usually stick to this. However, some operators still transmit SSB or even CW on the frequency, quite within their rights, but hardly in the spirit of amateur radio. The same applies to the QRP frequencies which are often overloaded with stations operating high power.

The 'old hairy' *(old hairy what? – Ed)* about contests being held in selected bands has also never been resolved. Maybe it is time the powers that be took a long look at this side of regulation. Of course, in an ideal world, all operators would stick to the rules, even if they were not mandatory, and there would be less hassle all round.

OK, so having got your sidebands sorted out, and being ready to log all those wonderful exotic stations, where do you look for them?

160 metres (or Top Band) can provide some good long-distance listening via multiple skip. The signals are bounced back to earth off the atmospheric E–layer, then bounced back again and so on. Unfortunately, this substantially attenuates the signal and is usually only possible during the hours of darkness. The best times to listen are late at night and early morning, when stations are on opposite sides of the darkness belt.

A very useful aid to determining when it's best to listen for DX is the DX Edge, a device which calculates the best areas to listen for at a given time.

The problem with Top Band is that it is shared with maritime and other 'official' stations which can be very powerful, making it difficult to copy weak amateur stations.

80 metres is generally regarded as the chat band. There are literally hundreds of regular local nets operating virtually all day, every day. Most special event stations spend at least part of their operating time on 80.

Although 80m has many of the same problems as Top Band, greater distances are possible, even during daylight hours. There are also commercial and official stations using this band and it is not unusual to be listening to a perfectly clear QSO one minute, only to have it obliterated by a heavy RTTY signal the next.

One of the variants of band allocations is worth noting in that American stations can use the area from 3.8 to 4.0MHz, so it is worth listening around there late in the evening.

40 metres can be a DXer's delight. Only 100kHz wide, it nevertheless attracts many DX operators and, despite being crowded for most of the time, can produce some worthwhile loggings. Although some countries allow amateurs to use up to 7.3MHz, this puts them right in amongst the 'heavy mob' of the broadcasting fraternity transmitting from Europe, so it is hard to hear the much weaker hams.

30 metres is another band that has to be shared with commercials and others. Like 40, it is a very small allocation, from 10.1 to 10.15MHz. Only Morse and RTTY are officially allowed on this band in the UK, but occasional sideband signals are heard. The area around 10.103 to 10.110 can be very fruitful.

20 metres is the 'bread and butter' band. Stations from all over the world can be worked here most of the day. Essentially a daytime band, the darkness line can almost be drawn, logging the stations as the conditions rise and fall. Australian and Asian traffic comes in during the early morning, followed by the Middle East and Africa until lunchtime when the Americans start to appear.

Although the band does drop significantly during the winter months, daylight still give some excellent listening and, once summer comes, the band can be alive almost 24 hours a day.

18 metres is a new band which is capable of excellent long-distance communications. However, amateurs are slow in taking this band seriously and it is not as well used as it could be. It is worth a listen, as some good DX can be heard.

15 metres is another excellent DX band during the day. At periods of low sunspot activity (more about this later), it can go almost completely dead; however, things are currently on the upward trend and stations are beginning to use the band again.

12 metres is also new. It could produce the goods when conditions are right. Sunspot levels make a big impact at these frequencies and it remains to be seen whether the band will be used as successfully as the other HF bands.

10 metres is the oddball of the HF bands. It is badly affected by sunspot levels, becoming virtually unusable for any distance during the low period, but it is perfectly usable (though not often) for short distance contacts. It is essentially a daytime DX band capable of excellent results during sunspot highs. Even low power communication can take place over dramatic distances.

It is affected by many of the propagation effects that trou-

ble VHF and a high on 2m can also mean similar conditions on 10m. A two or even three-element beam is perfectly feasible for this band, and converted 27MHz equipment has made this the 'poor man's DX band'.

So, what about those sunspots? One solar phenomenon is the appearance of the so-called sunspots at the sun's surface. These are dark areas which last anything from a few days to a few weeks. Sunspots occur at intervals of anything from eight to fifteen years, but we usually refer to it as an eleven-year cycle.

During periods of high sunspot activity, propagation of radio signals is enhanced by their effects on the ionised layers above the earth. The low end of cycle 21 was reached in 1987 and we are presently experiencing a gradual rise in conditions which should reach a peak around 1995. Radio wise, there's a lot of DXing ahead!

The wanderer

The usual thing for new listeners is to wander around a particular band, listening to anything that comes up. The novelty soon wears off and it all gets very boring.

If you are lucky enough to watch a seasoned DXer or award hunter, you soon pick up tips on how it's done. Most of these experienced chaps have prepared themselves before the current session and have details of any proposed expeditions to areas not regularly heard, any special event stations likely to be on the air and notes about interesting stations other listeners have heard recently.

Tuning a band is done slowly and deliberately. Be ready for any slight sound – it might be a new station for the log. Experienced listeners often use many aids, such as filters, but the most important is a good pair of headphones. They don't have to be expensive; just comfortable.

Before you rush out to find some, let's have a look at the entries submitted by some of our regular contributors. This month has been the busiest ever for the award hunters among our readers, with the regulars being hassled by some newcomers whom we welcome.

With the upper frequencies now showing signs of life, it is no surprise to see some single band claims coming in. The latest continental awards have created a lot of interest among new listeners, just as intended.

Heading this month's list is Trevor Newstead ILA 098, of Morecambe, who claims a bronze certificate for 15m only. He lists AA4, AB5, A22, CE3, HP1, HZ1, PP7, TK5, VP2, VP8, VX3, YC9, ZY5, 5B4, 8P9, 9Y4 and a Chilean special, 3G87PAX. Trevor also gained second place in the G-SSB section of the 1987 RSGB SWL contest, during which many of his loggings were made. Congratulations!

Peter Barnes ILA 341 of Blackpool claimed bronze and silver certificates and included 4S7, 5H3, AJ9, KP4, KT5, TI2, VS6, YB7 and ZY4 in his super lists.

Ernie Beckett ILA 261 used his new HF125 and end-fed antenna to get into the act with a claim for the bronze award, listing AB2, HH7, T77, VK6, VX3, 6W7, 8P9 and J28.

David Davidson ILA 320 of Ayrshire claimed his silver award and mentioned AA4, A71, DU7, FY7, HC8, HH2, HK1, J88, VQ9, XQ5, 4S7, 5W3, 8P9 and 9U5 amongst some of the less usual ones. David used the FRG7 and a G5RV.

David Tanswell G6LAU likes doing things a bit differently and still manages to get more prefixes on RTTY than many get on sideband! This time the claim was for 20m only, making it the *first* 20m all RTTY bronze award. Well done David. Prefixes like 4N7, 5H3, BV0, D44, HI8, KL7, P43, S79 and ZP5 are good catches at any time, but on RTTY they've got to be that little bit special.

Darrell Jacobs, now back in the UK, has only a temporary 10ft wire rigged up in his bedroom. However, he has still been pulling them in and offered 5L2, TU2, 5Z4, Z21, TZ0, 7P8, 9J2, KH0, NP4, 9Y4, V34, HC8 and ZD8 towards his bronze for 15m only. A special delight was to log PS7KZ on 21.228 flying at 29,000 feet over Brazil. He was calling and working US stations when Darrell logged him.

As I stated earlier, the new continental awards got a few newcomers off the ground. Rosemary Whyte ILA 301 took over the station from husband Martyn to get in her first claims for North and South America. This upset Martyn so much, he got his own back by logging furiously until he was able to claim his gold prefix award. Not to be outdone, Rosemary countered with claims for the bronze and silver. Martyn, now feeling decidedly miffed, got in again with a couple more continentals. Rosemary led with another continental, then a right cross . . . no, hang on a minute! Anyway, things are hotting up in Edinburgh and I'm watching for smoke from that direction.

Meanwhile, down in the quiet valley near Pontypridd, Susan Powell ILA 321 has been keeping the broadcast bands under observation. She has now claimed her broadcast award with some very nice loggings including R Discovery (Dominica), KTWR (Guam), SLBC (Sri Lanka), R Atlantica (Peru), HHRI (Honduras), R Mundial (Venezuela), FEBA (Seychelles), SWABC (Namibia) and RRI (Jakarta).

Hedley Falkinder ILA 150 of Malton has claimed the first of his continentals with help from Soviet amateurs. Hedley is still using the Racal RA17A to good effect!

Brian Pearson ILA 180 also got into the Russians for his claim and managed to dig out 48 oblasts into the bargain (these are the equivalent of our districts and there are over 200).

Ian Baxter ILA 322 of Blackburn used his FRG7700 to log more than the 100 stations necessary for his European continental. While mentioning this, contrary to the original rules, claims will be accepted from your own continent but must not include your own country.

David Glover ILA 339 (G1VJP) claimed the Broadcast Monitor Award and also had one for his loggings of jamboree stations from the 1987 JOTA. David uses one of the Matsui receivers and says it's excellent value (even more so, now that it's been reduced to £99.99). David is a member of many of the broadcast station monitor clubs and currently spends most of his time with them.

While looking for a bit of missing information, I discovered that from January 1st to March 4th I received and replied to 215 letters, not including the award claims, so if you have to wait a day or so for a reply, you know why.

Nice to hear from Mike Ribton of Gillingham again. HI Mike! A good piece of information for users of the Matsui 4099 (also known as the Sangean 803, TMR 7062 etc) might help to improve reception. Connect a length of wire to the earth side of a mini jack plug and insert it into the external aerial socket. This acts as a counterpoise for the whip. Just to prove it works, Mike put in a claim for the bronze prefix award including AA5, AL7, CM7, KP4, KZ8, XI2 and YC8.

Stan Porter, out there in Malawi (7Q 001/ILA 062), has now settled nicely into his new QTH and has used his recently acquired certificates to decorate the new shack. Pity he's got to buy real wallpaper for the rest of the house! He's been listening in to the RNARS net on 15m with WA1HMW as net controller. He says they just can't win down there with crops failing, first from drought and then from floods. Even his 4x4 vehicle can't get about! He's hoping to make it to the UK again this year so we may get to have that chat soon. Meanwhile, he's plodding away at the premier prefix award with over 1700 in the log so far!

One final point: it's just come to my notice that I, and many others, have been led astray for a long time. The problem lies in the coded greetings used on CW, in particular, the code 55. Now, I have always been led to believe this meant 'best of luck' (in the callbook as 'best success'). Well, apparently, during the 1930s, youngsters who were members of the Hitler Youth movement used to sign off HH, meaning 'Heil Hitler'. Realising they were giving the game away, they changed to 55. Apparently, some German stations still regard 55 as an insult! So, if you want to keep on the good side of German contacts, don't sign 55!

Well, that's about it for this month. Next time round, we'll be going further into the realms of amateur band listening and also taking a look at the broadcast side of the hobby. Meanwhile, have a good month and, remember, there's plenty out there to hear, it's just a matter of a little patience and some spare time at the right moment. Good listening!

POWER SUPPLIES FOR BEGINNERS Part 1

By Steven and John Goodier, G4KUB and G4KUC

If you are the type that likes to experiment with radio and electronics, then sooner or later you will need a power supply. I don't mean one that's big enough to start a car, but a simple low-current regulated supply suitable for powering the average VHF/UHF converter or even a low-power transmitter. The design and construction of power supplies has changed tremendously over the years and, as far as most amateurs are concerned (unless you are a constructor of large linear amplifiers), the days of high-voltage, high-current designs have gone. With the introduction of semiconductors, power supplies started to get smaller and smaller as the supply voltage needed for such circuits became less and less.

We have now reached the stage where there is a fully protected PSU on a single integrated circuit. The design of such power supplies is reasonably simple and there are many standard circuits to go by. They have a low component count and excellent performance. If you are a keen constructor, you probably know all about voltage regulators, such as the 7805, 7812 and the LM317, but if you are relatively new to radio and electronics, they might be a bit of a mystery.

The idea of these articles is to introduce the beginner to the most common types of regulator and to show how simple and easy it is to build a fully working, high-performance power supply unit. Various modifications to the standard circuits will be shown and help will be given on how to wire transformers and choose components. A little bit of power supply theory is also dealth with.

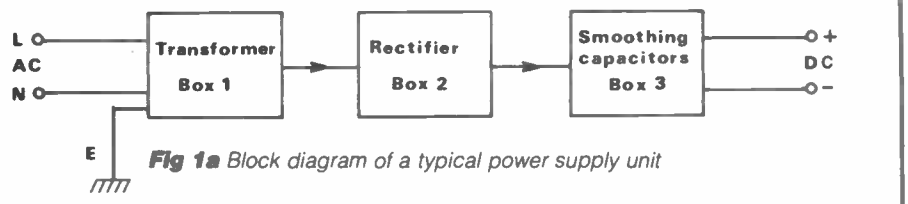
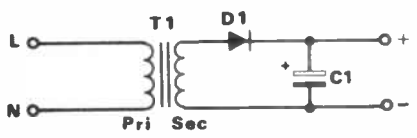
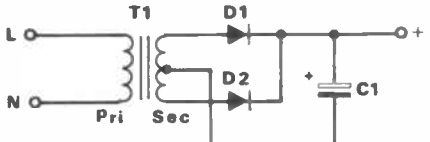


Fig 1a *Block diagram of a typical power supply unit*



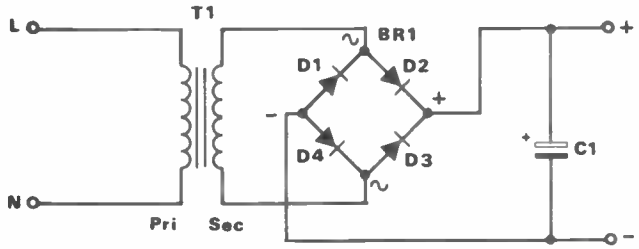
$V_{DC} = 1{\cdot}41 \times V_{AC}$

Fig 1b *Half-wave rectification. This circuit needs considerable smoothing*



$V_{DC} = 0{\cdot}71 \times V_{AC}$

Fig 1c *Full-wave rectification. This produces less ripple than half-wave*



$V_{DC} = 1{\cdot}41 \times V_{AC}$

Fig 1d *The most common type of rectifier circuit. Full-wave rectification has the advantage that the transformer does not need a centre tap and ripple is low*

Right from the start

Power supply circuits are designed to convert the standard line voltage (usually 240V ac in the UK) down to an isolated dc supply suitable for connecting to a piece of equipment. A basic power supply circuit consists of little more than a transformer, rectifier and smoothing capacitor. *Figure 1a* shows a block diagram of a typical supply unit. If we take one component at a time, it will give us a chance to discover its job and how it fits into the supply unit.

Box 1 is the transformer and, as its name suggests, its job is to transform the mains voltage down to a usable level. A transformer has two separate halves, one called the primary and the other called the secondary. The mains voltage is applied to the primary side of the transformer and the voltage for the power supply is then taken off the secondary. The value of the secondary voltage depends on the ratio of the number of turns on the secondary side of the transformer and the number of turns on the primary side of the transformer.

In most cases, the secondary voltage will be much less than the primary voltage – for example, 240V ac on the primary side and only 15V ac on the secondary side, though this need not always happen. A transformer can be made to work in the opposite way; for example, high-power linear amplifiers often use supply lines of many thousands of volts, provided by a transformer which has stepped up the mains supply to about 500 or 800V. This voltage is subsequently rectified, then doubled up by a special circuit.

The secondary voltage of the transformer is still ac, so the next job is to convert this into a dc form. This is done by using a rectifier, the second box in *Figure 1a*. Alternating current has two halves, one is positive and the other is negative. In the case of the British mains, the alternating current moves through this 'positive/negative' cycle fifty times a second. The rectifier does something very simple: it 'chops' half of the ac voltage away, thus leaving either a positive or negative supply. The rectifier circuit can be made from one, two or four diodes, or a special element called a bridge rectifier; more about these later.

Box 3 is the final section of our simple power supply. Its job is to smooth the output from the rectifiers. It uses an electrolytic capacitor. Raw dc voltage, supplied from the rectifiers, charges the capacitor. The capacitor then acts like a reservoir; in fact, it is sometimes known as the reservoir capacitor.

When a piece of equipment is connected to the supply, voltage constantly drains from the smoothing capacitor. Therefore, between pulses of voltage from the rectifier, the voltage across the capacitor slowly falls. This fall in voltage leaves a small ripple on the dc voltage level. Ripple will affect any equipment connected to the power supply. To reduce the amount of ripple, we make the value of the smoothing capacitor as large as possible. In power supply units designed to provide 20 or 30A, the value of the smoothing capacitors can be as large as 100,000μF (0.1F). In our low-current designs, the value of the smoothing capacitors will be about 1000 to 4000μF.

We can now move on and look at some practical circuits. *Figures 1b to 1d* show three simple supply circuits. As can be seen, each consists of a transformer, rectifier and smoothing capacitor.

Transformers

Let's start with the transformer. As we have already said, the job of the transformer is to drop mains voltage down to a suitable level, but there are a number of important points to consider when choosing the correct transformer.

The first thing to decide is the secondary voltage. This will depend very much on the expected final output of the supply. Transformers can be supplied with a number of secondary voltages, starting as low as 3V and going right up to many hundreds. It stands to reason that there is no point in choosing a transformer with a secondary voltage of 40V for a power supply that is only going to supply 12V. If you choose a secondary voltage of between 3 and 6V above the expected output, then all should be well.

Another important point is the transformer's regulation factor and its current rating. The secondary voltage of a transformer is usually quoted at full load. When the load is removed, the secondary voltage will rise by an amount dependent upon the regulation factor. A typical value is 10%, so a 15V secondary would increase by 1.5V when off load.

It is also important to make sure that your transformer can safely supply the maximum amount of current you expect to draw from your supply. There is no point in choosing a 200mA transformer when you expect the PSU to supply 1A or more. If you start to ask your transformer to supply more current than it was designed for, then there will be a considerable voltage drop across the secondary and the transformer will overheat.

As will be seen later, most transformers have two secondary coils which can be wired in a number of different ways to provide different currents and voltages.

Rectifiers

Figure 1b illustrates *half-wave rectification*, perhaps the least common type of rectification. Nevertheless, it does have the advantage of using only one rectifier diode and it needs no centre tap on the transformer. The main disadvantage is that it produces a lot of ripple so the output needs considerable smoothing.

Figure 1c uses a type of rectification known as *full-wave rectification*. The transformer has a centre tap which makes up the negative side of the supply and two diodes supply the raw dc voltage to the smoothing capacitor. This type of supply requires less smoothing, but it does need a transformer with a centre tap.

Figure 1d shows the most common of all rectifier circuits; it uses a type of rectifier known as a *bridge rectifier*. As can be seen, the diodes are arranged in a bridge configuration with the ac from the transformer entering at one side and raw dc leaving at the other. Again, it uses full-wave rectification and the transformer

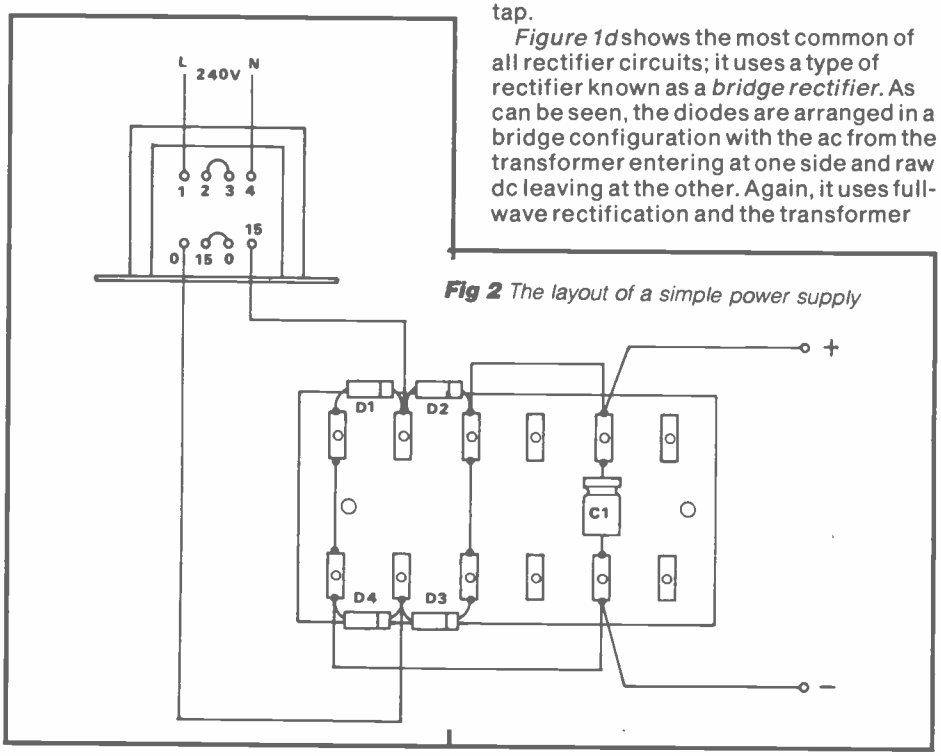


Fig 2 *The layout of a simple power supply*

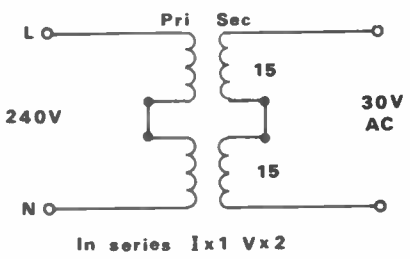
Table 1

78xx Specifications

Type	Output Voltage	Output Current	Input Voltage	Ripple Rejection
78L05	+5V	100mA	7 – 30V	62dB
78L12	+12V	100mA	14.5 – 35V	54dB
78L15	+15V	100mA	17.5 – 35V	51dB
78M05	+5V	500mA	7 – 25V	80dB
78M12	+12V	500mA	14.5 – 30V	80dB
78M15	+15V	500mA	17.5 – 30V	70dB
7805	+5V	1A	7 – 25V	78dB
7812	+12V	1A	14.5 – 30V	71dB
7815	+15V	1A	14.5 – 30V	70dB
78S05	+5V	2A	8 – 35V	54dB
78S09	+9V	2A	12 – 35V	47dB
78S12	+12V	2A	15 – 35V	47dB
78S15	+15V	2A	18 – 35V	46dB

Output voltages are ±4%

Fig 3a *The wiring of the secondary side of a mains transformer*



(a)

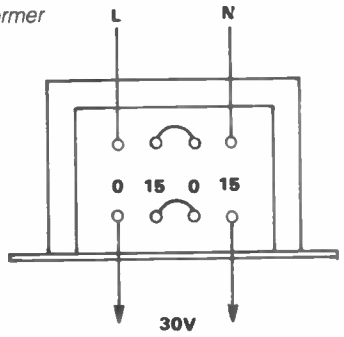
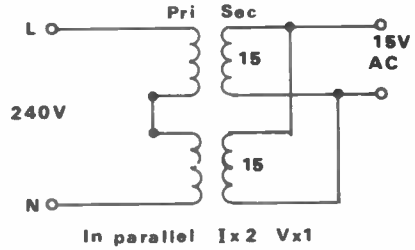
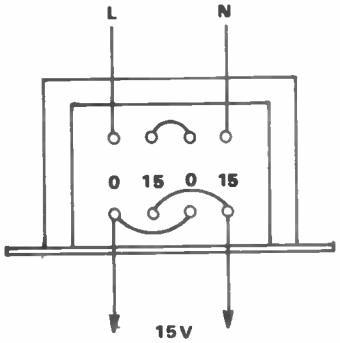


Fig 3b *The secondaries of the mains transformer wired in parallel. Here, the output is doubled*



(b)



needs no centre tap.

The examples given in *Figures 1b to 1d* are for positive output lines only. If you were to reverse the diodes, then the output would be negative.

Smoothing capacitors

The two most important facts to know about smoothing capacitors are their working voltage and value. The working voltage must be greater than the off load output voltage of the power supply. The value of the capacitor should be about 1500 to 2000μF per amp, so for a small 1A power supply, a value of about 2000μF should be fine.

Winding experiment

If you have suitable components and a tagboard, then perhaps you would like to have a go at building the circuit shown in *Figure 1d*. This would be a good chance to prove to yourself how easy it is to build a very simple power supply. It would also give you a chance to experiment with the different windings found on some transformers.

Figure 2 shows the layout of our simple power supply. For this circuit, none of the components are critical. Start by soldering into place the components onto the tagboard. The bridge rectifier is made up of four 1N4001 diodes, but almost any rectifier diodes will do. The value of C1 can be anything from about 220 to 2200μF, but take note to be careful about the working voltage mentioned earlier.

Next, wire the transformer. Almost any mains transformer will do, but have a look at any writing on the secondary side to get some idea of the output voltage. If you are using the type of transformer shown in *Figure 2*, then wire as shown.

A word of warning here. *Never forget that the mains supply voltage can kill.* After I have wired up the primary side of the transformer I always cover the terminals with insulating tape to stop any chance of an electric shock.

If you take a look at *Figure 3a* and *Figure 3b*, you will see that it is possible to wire up some transformers to provide double the output voltage or double the output current. *Figure 3a* shows the secondary windings wired in series. In this configuration, the output voltage is doubled but the current rating of the transformer stays the same.

Figure 3b shows the secondary windings wired in parallel. Here, the output voltage remains the same but the transformer now provides double the current.

It is important to note that on some transformers the primary side is made up of two 120V windings. These *must* be connected together for safe 240V operation.

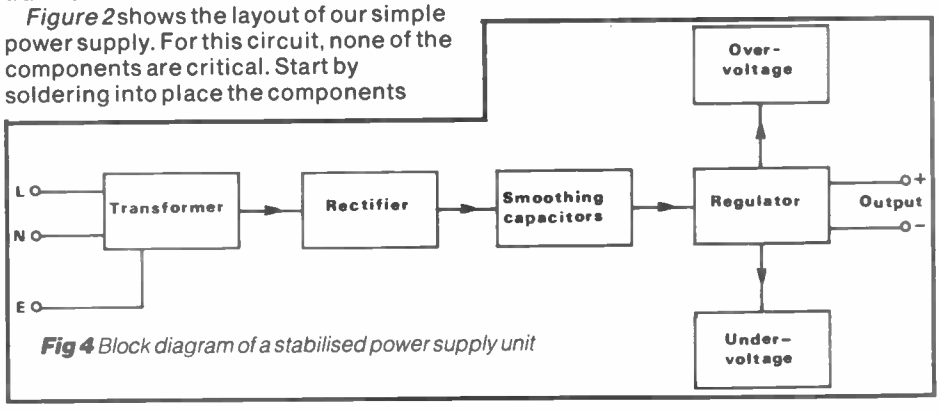


Fig 4 *Block diagram of a stabilised power supply unit*

Calculating the output

If you take a look back at *Figure 1d*, you will see that it is possible to calculate the output voltage across C1. For example, if the transformer secondary is 30V, the expected output across the smoothing capacitor is 30V $\times$ 1.41 = 42.3V. Remember, this voltage is the full load voltage, so that when the load is removed, the output voltage will rise by a small amount, dependent on the regulation factor of the transformer.

The combination of transformer, rectifier and capacitor is the basis of most types of power supply. The transformer could be rated at 16.5V, 40A. The bridge would then be rated at about 35A and the smoothing capacitors would have a value of about 60,000μF. Add the extra electronics to get a very nice 13.8V, 30A power supply unit. The extra components are the ones that do all the work in a power supply. In most cases they are responsible for voltage regulation, overvoltage and undervoltage protection and short circuit protection. All we have looked at so far is the conversion part of a PSU. What we need to do now is to take the smoothed dc voltage and turn it into a safe and useful output, suitable for powering all types of equipment.

Voltage regulators

Many circuits require an almost constant output voltage, irrespective of the amount of current being taken from the supply. This job is done by a voltage regulator and, over the years, a number of useful components have appeared on the market, making this job very simple indeed.

Take, for example, a transmitter and receiver with a common oscillator and an unregulated power supply. The receiver current consumption is fairly low, so the oscillator and received frequency are relatively stable. As soon as the transmitter is keyed, the current consumption will increase considerably and, because the power supply is not stabilised, the output voltage will drop. This drop in output voltage will cause the oscillator to shift its frequency, making the transmitted signal very unstable. If the transmitter is being used on CW, as the transmitter is keyed on and off an effect known as 'chirp' will result. The solution to this problem is very simple – use a stabilised power supply.

Figure 4 shows a block diagram of a complete stabilised power supply. As you can see, three extra boxes have been added to our original design. The

regulator is the component which controls the output voltage and in most cases this will have a fixed value, eg, 5V, 12V, etc. Overvoltage and undervoltage detectors are usually optional and will be looked at in more detail later. The most common series of voltage regulators you are likely to come across is the 78xx series (xx stands for two other digits which equal the output voltage, eg, the 7805 outputs 5V). The regulators in this series are positive regulators. Negative regulators belong to the 79xx series.

Both 78 and 79 series regulators (dropping the xx) have three legs: input, output and common. They incorporate features such as current limiting and thermal protection and they are also protected against short circuits. They are fixed voltage regulators, usually having 5, 12 or 15V as their output voltage. Output currents are commonly 100mA, 500mA, 1A, 2A and 5A. *Table 1* shows a list of useful specifications for the 78xx series; a much more detailed list can be found on page 401 of the current Maplin Electronics catalogue.

These regulators also provide considerable ripple rejection; in most cases this can be as much as 70dB or better. This means that a ripple of 1V on the input can be reduced right the way down to 1mV or below.

A complete PSU

Figure 5 shows a complete 12V 1A PSU. Notice how few components it contains. The voltage regulator used is a type 7812, but the following circuits are valid for all the other voltage ratings in the 78 series. When using this type of regulator, we must make sure that the unregulated supply on the input of the IC is at least 3V greater than the desired output.

The circuit in *Figure 5* uses a transformer that has two secondary windings of 15V wired in parallel (look back at *Figure 3b* and you will see that this doubles up the current but keeps the output voltage of the transformer the same); if each winding is rated at 600mA, the total current rating will be 1200mA or 1.2A. It is now possible to work out a value for the unregulated supply. We are using a bridge rectifier to turn the ac into dc and looking back at *Figure 1d* shows that

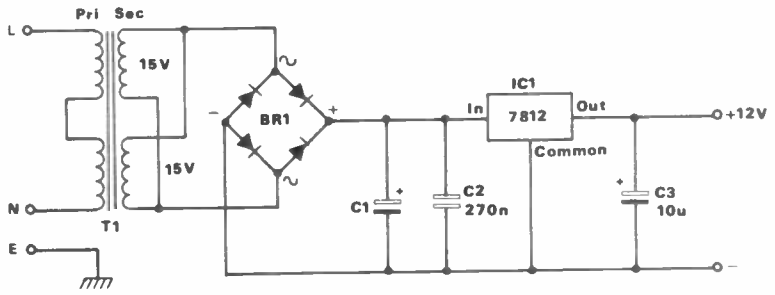


Fig 5 *Complete circuit diagram of a 12V stabilised power supply*

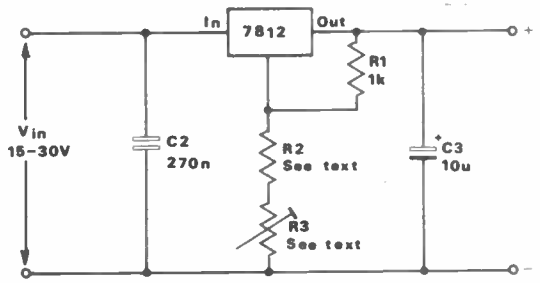


Fig 6a *One method of increasing the output voltage of a regulator*

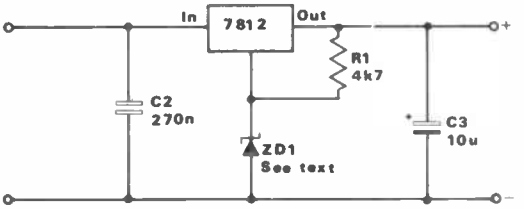


Fig 6b *A method of increasing the output voltage of a 7812 using a zener diode*

V dc = 1.41 × V ac. The secondary of the transformer is rated at 15V, so V dc = 1.41 × 15V = 21.15V approx. If you look down *Table 1*, you will see that the input range of a 7812 is between 14.5 and 30V, so an unregulated supply of 21V will be safe to connect to its input.

To stop them from breaking into oscillation, all 78 series voltage regulators need a capacitor between input and zero volts and a capacitor between output and zero volts. In *Figure 5* these capacitors are C2 and C3. The value of both capacitors varies from circuit to circuit and there seem to be no rules for choosing them. I must admit that, in the past, I have put in whichever capacitors have been available and have never had any problems. If you keep the value of C2 between 270nF and about 1μF, and the value of C3 between 1μF and 100μF, then all should work well.

More voltage

All 78 series regulators have a terminal called common, usually connected to zero volts (*Figure 5*). If a low-value resistor is connected between common and zero volts then the output voltage of the regulator will increase. This is a very useful feature and it means that a fixed-voltage device can be modified to

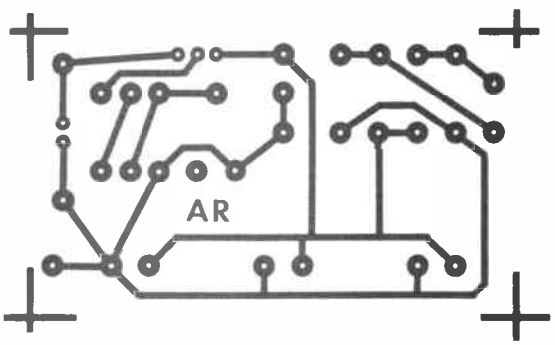


Fig 7a *The PCB foil pattern*

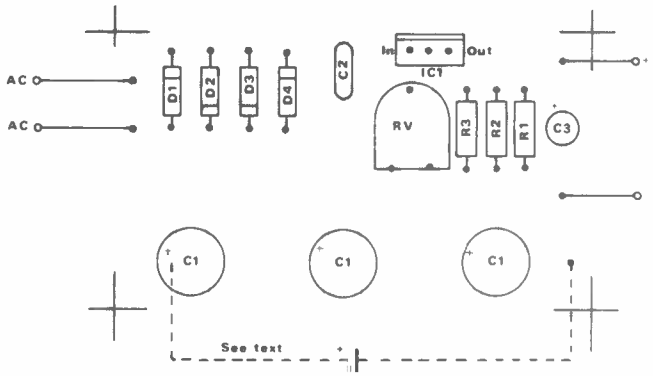


Fig 7b *PCB with component overlay*

provide a number of different output voltages. All you have to remember is to keep the unregulated supply at least 3V above the wanted output.

Figures 6a and *6b* show two methods of increasing the output voltage of a 7812. This configuration holds true for all the positive regulators in the 78 range. If you look at *Figure 6a*, you will see that a number of resistors have been added to the circuit. R1 provides a small bias current which will help to prevent any voltage drop when drawing higher currents. R2 and R3 vary the quiescent current in the common terminal of the regulator. This in turn will increase the output voltage. As an example, if we replace R2 with a wire link and make R3 a 470R variable resistor then the output voltage of a 7812 will be completely variable from 12 to about 20V.

A different method of increasing the output voltage is shown in *Figure 6b*. In this circuit, R1 still remains but it now has a value of 4k7. The two other resistors have now been replaced with a zener diode. The output voltage is now equal to the zener voltage plus the regulator voltage. If the zener voltage is 4.3V and the voltage regulator is a 7805 then the output voltage would be about 9.3V – similar to the standard PP3 battery. All this holds true for voltage regulators in the 78 range, but you must keep an eye on the unregulated supply voltage as well as the rectifier and transformer current ratings.

Layout

So far we have had a look at a number of different circuits and modifications which enable us to get a variety of output voltages from standard designs. We will now move on and describe the construction of a very versatile low-current power supply board which you could include in many of your projects. To make the board as complete as possible, we included the rectifier and smoothing capacitors on the main PCB. We also made the board versatile enough to include all the modifications to the standard circuits.

The layout of the board is shown in *Figure 7b*. We opted to use four individual diodes, not a bridge rectifier block, to make up the rectifier. The reason for this is that when you start to get up to currents of about 3A, the standard bridge rectifier starts to increase in size, making it difficult to design a suitable PCB layout to fit all types. The spacing for the diodes on the board is quite wide so you should find that a number of different types, ranging from 1A up to about 5A, should fit.

There is enough room for three smoothing capacitors. Looking through the various component catalogues, I was surprised to find that the largest single-ended electrolytic capacitor sold by Maplin Electronics was only 1000μF at 35V working voltage. STC Electronic Services sell 2200μF rated at 40V and 1000μF rated at both 50 and 63V. There is enough room on the board for three of these, making a total value of about 6600μF depending on the type used. Alternatively, you can replace the single-ended type with one axial electrolytic; values in this range go right up to 4700μF, at 50V. The only problem with this type of capacitor is the size. A 4700μF, 50V electrolytic has a length of about 50mm and a diameter of 25mm. If you plan to use this type then it would be a good idea to increase the length of the PCB to accommodate it.

The rest of the layout is pretty straightforward. C2 can either be a polyester or metallised polyester film capacitor but, to be honest, any type within the range of 270nF to 1μF will do. C3 can either be a tantalum bead or sub-miniature electrolytic capacitor and, again, the value of this can be between 1μF and 100μF. In the next article we will describe the construction of the board, before discussing R1, R2, R3 and VR1.

Don't miss the second part of this article in the June issue!

DATA SHEET

by Ian Poole G3YWX

Speech processing is an integral part of radio communication today. Even though many people do not like the degradation in speech quality brought about by some processors, its value in terms of utilisation of power and signal gain have been proved time and again. In fact, it is possible under some circumstances to achieve gains of up to 8dB by simply using a good RF speech processor.

AF or RF

Speech processors can come in many forms and they can use different methods to process the speech. Some use AF clipping, where the audio is clipped at audio frequencies. Others use RF clipping, where a single sideband signal is clipped. This has the advantage that the distortion products caused by the clipping stage fall outside the passband of the signal and the resultant audio is much cleaner. In addition to clipping, most processors will use some form of frequency tailoring. This all adds to the 'punch' of the signal.

Useful facility

Another facility which can be used in processors is audio gain control. Sometimes they are referred to as compressors and sometimes they are referred to by the name VOGAD, which stands for Voice Operated Gain Adjusting Device. This can be used on its own to maintain the level of modulation and take out variations in the levels of speech. Alternatively, it can be used with a clipper to maintain the level of clipping. This is very useful as it enables a known level of clipping to be used regardless of any variations in the speaker's voice level.

Although audio gain controls can be made up fairly easily using discrete components, there are a few integrated circuits on the market which can be used. One such device is the SL6270, one of the Plessey range of communications integrated circuits. It superseded the SL622, which was used very successfully in many transmitters including the G3ZVC transceiver design.

Basic data

The SL6270 comes in both TO8 can and 8-pin dual in-line packages, although the DIL package appears to be more common. It operates from a supply voltage which can lie between 4.5 and 10 volts. This is very convenient when building it into a system, as it is quite possible that a supply of this order will already exist. Finally, it has an overall gain which is typically around 52dB.

Internal structure

The internal structure of the device is given in *Figure 2*. From this it can be seen that it has two inputs. This is because they are intended for differential use, ie, the microphone leads are connected to the two inputs and not to one input and ground. Fortunately, it is possible to use it in a single ended mode because this is often more convenient. This is done by connecting the microphone to one input and then connecting the other input to ground via a capacitor. The disadvantage of this is that the differential input impedance of around 300 ohms falls to about 180 ohms.

A basic circuit using the device is shown in *Figure 3*. Here R_1 and C_1 set the AGC characteristic. The attack time is controlled by the value of C_1 whilst both components affect the decay rate. Then, C_2 provides the coupling between the two amplifier stages in the device. The value of the capacitor and an internal 680 ohm resistor govern the low frequency response. However, the tolerance on the internal resistor is quite large and this should be taken into account when making any calculations. The overall gain of the chip is defined by an internal 10k resistor. By placing a capacitor across this, ie, between pins 7 and 8, the high frequency response can be limited – but, again, beware of the large tolerances spread on the value of the resistor.

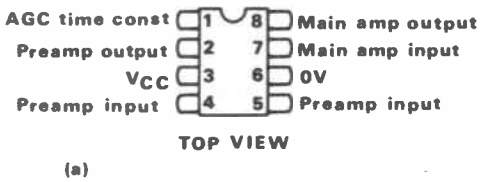


Fig 1a *DIL package pin connections*

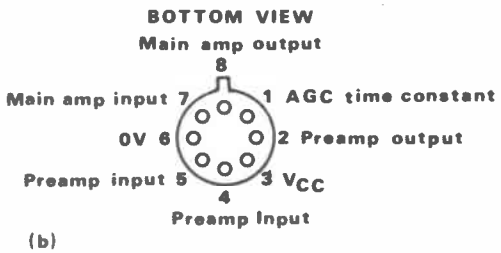


Fig 1b *TO8 can package pin connections*

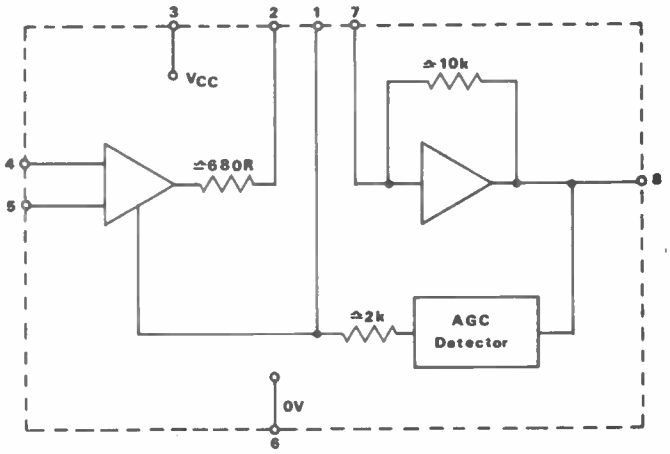


Fig 2 *Internal block diagram of SL6270*

Typical output

The output from the device is typically 90mV rms, although this can vary from 55mV up to 140mV. Even so, it is not really enough to drive a pair of back to back diodes into limiting. It is far better to add a further amplifier stage, possibly using a 741. If this is done, it can also be used to limit the frequency response. This is better than using the SL6270, because the components around the 741 will be more clearly defined and so the frequency

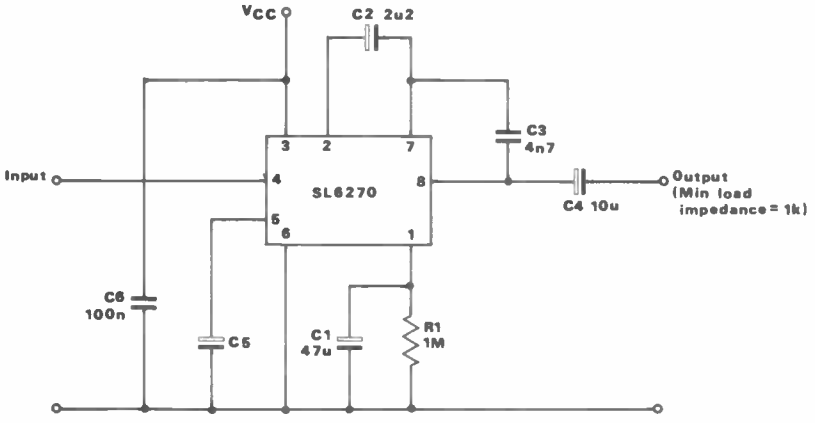


Fig 3 Typical SL627D circuit

response will be more predictable.

In use

The IC performs very well, and it is a very useful device. However, there are a few points which may enable any would-be experimenters to get the best out of it.

The first is associated with the low input impedance, particularly when it is used in its single ended mode. This is far too low for the majority of microphones in amateur use and, therefore, some form of impedance transformation is required. This is probably best done by using a simple buffer amplifier such as an emitter or source follower. One circuit which has been used quite successfully is shown in *Figure 4*. It consists of a simple FET source follower.

Match the input

In this circuit, the input impedance is governed by the bias resistor, R_2, and the value of this can be chosen to match the required input impedance. It is also possible to include an RF filter at this stage. This prevents any RF which is picked up on the microphone lead from entering the circuit and causing distortion or even oscillation. The component values have been chosen to operate with impedances between about 100k and 600 ohms.

If problems are encountered even with the filter included, it is possible to add a further stage of filtering. However, it is also worth checking that RF is not getting in by any other means. Further precautions should include placing the filter as close to the input connector as possible, ensuring the case is RF tight, placing filters in supply leads and so forth.

Problems

Another point worth considering is the gain of the IC. This can become a problem if a high output microphone is used. During speech pauses the gain can rise to an extent where the background noise rises to an unacceptable level. If this happens, the gain of the IC can be reduced by simply placing a resistor across pins 7 and 8.

Normally, the gain is controlled by the two internal resistors and is equal to 10k/680 ohms, so by reducing the value of the 10k resistor it can be seen by what proportion the gain can be reduced.

Final comments

As the SL6270 is very versatile and easy to use, it has found its way into many speech processor and transmitter designs. At around £3 each, one of these devices may not be as cheap as something like a 741 but it still offers excellent value. In fact, it would probably still work out much cheaper to use a '6270 than build an equivalent circuit from discrete components. On top of this, there is also the enormous amount of time saved in constructing and debugging the circuit, because only a few extra components are used and fewer mistakes are likely to be made.

Better processors

Essentially, these ICs enable much better speech processors to be made with only a few extra components and at a little extra cost. Because of this, they are worth considering if any speech processor designs are being contemplated.

Fig 4 Block diagram of a typical speech clipper using a Plessey SL627D

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FIGURE IT OUT!

by Tony Smith G4FAI

Mathematics are not to everyone's taste, although every radio amateur has to dip into them to some extent simply to pass the RAE. There are some whiz-kids who do everything by maths, and some who write magazine articles which lose most of their readers the moment they reach a formula which appears to be written in Greek, followed by columns of calculations.

There is no doubt that for those with an aptitude for the subject everything becomes that much easier and, for anyone taking up radio or electronics professionally a good knowledge of mathematics is a necessity.

Many radio amateurs today, however, are involved in the pursuit of a practical hobby, and have no great wish to become involved in too much juggling with figures. Nevertheless, even when working on a practical basis, simple calculations can help save hours of experimentation. They need not be too complicated, and a few are discussed here to illustrate the point. A simple approach has been adopted, and all calculations can be made with a pocket calculator. Mathematicians reaching this point are invited to turn the page and proceed to the next article!

Dipole antenna lengths

The formula to calculate the length of a half-wave wire dipole for HF is usually given as

$$L = \frac{468}{f}$$

where L = length of antenna in feet, and
f = frequency required in MHz.

Without knowing the precise location of the antenna, its height, the presence of nearby objects, trees, buildings etc, it is impossible to provide an accurate formula, and the factor of 468 can only be an approximation. Consequently, the newly erected antenna may well not be resonant at the desired frequency, and subsequent adjustments usually consist of arbitrary alterations until the correct length is found.

A simple reversal of the original formula saves all this. First, the (unwanted) resonant frequency of the antenna is identified by noting the receiver frequency when the lowest SWR is obtained during transmission.

Assume that an 80 metre dipole is required to resonate at 3.650MHz. The usual formula

$$L = \frac{468}{3.650}$$

gives a length of 128.22 feet, but when erected the antenna is found to resonate at 3.564MHz.

If the length is equal to the factor divided by the frequency, then the factor is equal to the length multiplied by the frequency. It has been established that the antenna has a frequency of 3.564MHz, and with this information a new factor can be calculated:

Factor = length × frequency
= 128.22 × 3.564
= 457

The new factor is tailor-made for the particular location, and can now be used to calculate the correct length for the frequency required:

$$L = \frac{457}{3.650} = 125.2 \text{ feet}$$

Coaxial wavelengths

A half-wavelength, or multiple thereof, is a useful length for coaxial feeders. For any given frequency, the impedance at one end is repeated at the other end. At VHF particularly, the length of feeder between a transmitter and an SWR bridge should be such as to ensure that the bridge indicates the condition at the transmitter output terminal. At all frequencies, it is helpful to have a feeder in multiples of a half-wavelength when experimenting with single band antennas, to ensure that the feeder itself does not act as a transformer and give misleading results to antenna adjustments.

All measurements of feeder lines refer to the electrical length of the line, taking into account the velocity factor of the cable used, as follows:

$$L = \frac{492V}{f}$$

where L = length of cable in feet
V = velocity factor of the cable, and
F = frequency in MHz

Example: A half-wavelength of coaxial cable with a velocity factor of 0.66, at 144.5MHz

$$= \frac{492 \times 0.66}{144.5} = 2.25 \text{ feet}$$

The formula for a full wavelength uses a factor of 984, and for a quarter wavelength, often used as an impedance transformer, 246.

Fig 1 *Basic voltage divider, see text*

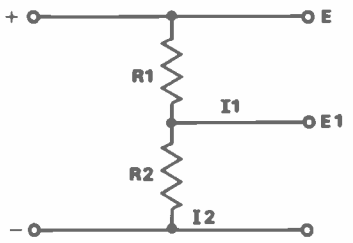
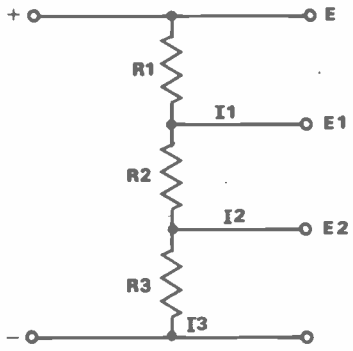


Fig 2 *Multi-voltage divider*



$$R1 = \frac{E - E1}{I1 + I2 + I3}$$

$$R2 = \frac{E1 - E2}{I2 + I3}$$

$$R3 = \frac{E2}{I3}$$

I3 = 10% (approx) of total load current, I1 × I3

SWR calibration

An SWR meter can be calibrated using the formula:

$$\frac{F+R}{F-R}$$

where F = full-scale deflection of the meter,
and R = meter deflection to the point to be calibrated.

This enables existing meter scale markings to be modified and used quite easily. If, for example, a scale is marked in tenths of FSD, each point represents 10 and FSD is 100, thus for a mid-scale reading:

$$\frac{100+50}{100-50} = \text{an SWR of 3:1}$$

and calculations can be made for other SWR calibrations in like manner.

Voltage dividers

Experimenters often find a need to apply one or more voltages to different parts of a circuit. A common way to do this is with a voltage divider: a simple resistor network from the positive to negative line of a power supply. This provides various voltages at the junction(s) of the resistors, as illustrated.

The formula to obtain the values of the resistors is based on Ohm's law, ie:

$$R1 = \frac{E - E1}{I1 + I2} \text{ and } R2 = \frac{E1}{I2}$$

where E = the voltage supply applied to the circuit
E1 = the load voltage required from the divider
I1 = the load current required in amps
I2 = 10% (approx) of the load current

Example: A circuit is supplied with 12

volts. A section of the circuit requires a supply of 6 volts at 10mA.

$$R1 = \frac{12-6}{.01+.001} = 545 \text{ ohms}$$

$$R2 = \frac{6}{.001} = 6000 \text{ ohms}$$

Finally, the wattage (W) of the resistors is determined by W = EI:

R1 = 6×.011 = .066W
R2 = 6×.001 = .006W

In this instance, ¼W or smaller resistors will suffice in both cases.

Dummy loads

A non-inductive (ie, not wire-wound) resistor provides a good substitute for an antenna for testing a transmitter without radiating a signal. It must, however,

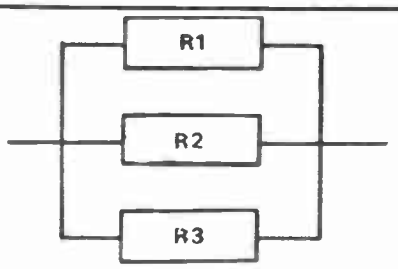


***Fig 3** QRP dummy load using carbon resistors in parallel*

present a resistance value matching the output impedance of the transmitter, and be capable of dissipating the full output power.

With low power (QRP), this presents little problem. A 1 watt transmitter is easily served by a 47 or 56 ohm, 1 watt, carbon resistor.

An application of a formula learned for the RAE:

$$R = \frac{1}{\frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3}} \text{ etc}$$

shows that several resistors connected in parallel will provide a dummy load capable of carrying more power, for example:

3 ×150 ohm, 1W resistors =

$$\frac{1}{\frac{1}{150} + \frac{1}{150} + \frac{1}{150}}$$

$$= 1 \times \frac{150}{3} = 50 \text{ ohms}$$

As the power route is now divided three ways, and as each resistor can carry 1W, the total dissipation will be 3W.

Various permutations are possible using 1 or 2W resistors, eg 11 × 560 ohm, 2W resistors would provide 51 ohms at 22W. The ratings of the resistors are for continuous dissipation. Keyed or speech transmissions are not radiating with a continuous duty cycle however, and the rating of a dummy load calculated as shown can probably be doubled, subject to an occasional check that it does not become too hot to touch when in use.

With powers above QRP level, dummy loads need to be carefully constructed and cased. Details are outside the scope of the present article, but examples can be found in many amateur radio reference books etc.

Many more

There are many more examples, gradually becoming more complicated, but there is no need to think that because maths *can* be difficult, that it is *always* difficult – this is not so. The simple calculations illustrated here show that maths can, and should, be used to assist the practical constructor to whatever extent he, or she, is capable of using it.

Velocity factor of coaxial cables:

This depends on the insulating material used for the cable. Popular types with solid polythene dielectric, such as UR43, 57, 67, 76 etc, have a velocity factor of 0.66

Those with a helical membrane, foam, or PTFE dielectric have factors ranging from 0.70 to 0.96 and should be checked against data tables found in various handbooks or other works of reference

NAME, RANK OR SERIAL NUMBER?

by John Feeley G4MRB

It was Kevin Fox G4MDQ who pointed it out to me.

'Isn't it strange,' he said, 'how few rigs have names?' He went on to say how those that do seem to be Western rather than Japanese – the KW Atlanta, the TenTec Argosy, the Micron and large numbers of QRP rigs, for example.

It struck me how strange this was, when you consider that cars from that part of the world are marketed in the West using names – many of which seem odd to us. The *Sunny* and the *Cherry* are not the usual macho names associated with cars in our culture. *Range Rover* or *Spitfire* sound better to the British ear. Japanese cars still sell well, though, so why are rigs not saddled with names as well? Why are we not boasting about our new Yaesu *Peach* or Trio *Moonshine*?

Having some contacts in Japan, I set out to ask this question. In the search, I stumbled across the answer to one of the great mysteries of amateur radio. Why is it that some rigs are better performers than others of the same model?

The significance given to numbers in the Orient is greater than in the West. The patterns in which they lie are important and are seen as holding the fortune or luck of the things to which they are attached. Sadly, the success of a rig will sometimes force a number onto the Japanese staff which, although logical from the Western point of view, is laden with ill-luck in their eyes.

As an example of this, let us consider the triumph of the FT101 and the failure of its two successors the FT One and the FT102. In the West the number one has a special meaning: first and best. In the Orient, one is a number that gains its strength from its place in the pattern of numbers. Thus 101 can be written in the form $1 \times 0 \times 1$.

This pattern accords with the static Yin line in the classic form of oriental fortune telling. A Yin line often has desirable connotations, since words meaning accord, gracefulness and the like are derived from it. This pattern of numbers holds great fortune, and the rig itself is a great success. What then of the FT One? The pattern here is another classic in the fortune telling system: $0 \times 1 \times 0$.

This is the static Yang line, and means the exact opposite of the Yin line. Thus, when casting the luck of the One, the engineers would have been aware that the fortune of the rig was exactly the opposite of the 101!

This is a hard idea for Westerners to grasp, so let me put it another way. If you

consider a one to represent a pillar or support, it is easy to understand that a bridge supported at both ends:

1 1

is stronger than a bridge with a single support in the centre:

1

Having had this unfortunate number forced onto them by Western sales staff, is it any wonder that the development staff could not find it in their hearts to spend a great deal of time on the One?

The FT102 also logically follows in the Western number system from the 101, but again the number signifies ill luck. Two in the oriental system is the number of the bird meaning 'Luck which flies away'. So the bridge starts strong:

1 2

but rapidly becomes weak as the luck flies away:

1

The experimental three valve final was dumped onto this number to get it out of the laboratory and into a field trial. Since the patient was going to die anyway, it wouldn't hurt to try a new treatment!

The numbers of value in the oriental system are 8, 3 and 9. The number of luck or good fortune is 8, while in common with Western mystics 3 and 9 (3 times 3) are numbers of worth and strength. One, as I have explained, is an important number which takes its meaning from its combination with other numbers.

Place is an important aspect of the fortune telling system, the order of luck favouring the centre, then the number to the left of centre and then the right. Thus luck favours number combinations such as 830, 930, 2300 (the 00 counts as 0), and of course 290.

Perhaps, then, we should not wonder that the runaway success of the FT290, and its fellow 690 and 490 rigs, was due to the development team being free to pick a number with good luck attached and to build a rig to match the success the number would bring. The new version of the FT290 still retains this magic number, being the Mark II, and not changing to the less lucky FT291!

Even in the best of rigs, one can find 'Friday afternoon' examples which perform in a disappointing manner.

Many years ago, when Douglas made Vespa motorscooters in this country, they boasted that any bike with a zero at the end of its serial number was subject to extra checks. A single zero warranted a special visual inspection, a double zero a full mechanical inspection, three zeros a complete performance test and 4 zeros, it was claimed, were destruction tested!

This number magic can apply to rigs as well. Remembering the numbers of strength (3, 8, 9), and the combination 1 – any number – 1, we must look at the serial number in the oriental manner from right to left. The number fifth from the left holds the fate of the sequence and the second number from the left gives it a value, ie much luck (or ill-luck) or little.

The numbers at the extreme left and right, it is said, hold the past and future luck of the equipment. Thus, a sequence 390083 with the 9 in fifth place supported by the 8 in second place should bode well and, as the history numbers at each end are both 3, they should indicate a trouble-free life for the equipment.

An example from life concerns one of my rigs with the number 311023. This has never misbehaved (as indicated by the history numbers) but has never been able to pick out the DX, perhaps due to the poor luck of the numbers in fifth and second places!

This system only applies, of course, to hand-built rigs, where the human factor can unconsciously affect the fortune as it is built. Computer-built rigs are more robust in this area, and it is then the luck of the robot which must be considered. This is often shown on the inspection slips enclosed with the rig as initials (the human inspector) and a number indicating the robot line. Divination can then proceed as above.

Times and dates too, carry importance. Certain number sequences are of great cultural significance. With this in mind, I have been careful that this piece is written at one of these meaningful points in the year:

John Feeley, 11.55GMT 1.4.88.

50MHz

by Ken Ellis G5KW

The period under review has not produced any spectacular results; nevertheless conditions have been interesting and the upward trend has continued with some interesting crossband QSOs taking place with DX stations. I am starting the column with some of the DXpeditions planned for the summer season this year.

I am indebted to Harry Schools KA3B for permission to reprint the following information from issue number 7 of his *International 6 Metre Digest*, March 1988.

DXpedition to St Pierre (FP)

'I had reported in the February issue of the digest that I had been making tentative plans to operate from the islands of St Pierre and Miquelon during the June VHF contest. So far, things are looking good. My vacation schedule has been approved by my immediate superior at work. The dates I have requested are June 7th to June 14th, which coincide with the VHF contest on 11th/12th.

'The location from which I am planning to operate, the Hotel Robert, is available on these dates. Readers who are familiar with the hotel will know that it has been host to many DXpeditions in the past, especially on the HF bands. The hotel's manager has been enthusiastic about amateur operations and has allowed a New England ham, Ralph Hirsch K1RH, to establish a permanent station on the top floor of the hotel.

'The station consists of a minibeam for 6, 10, 15 and 20 metres, a Butternut vertical for 40, 80 and 160 metres and a 5RV for utility work. Also in place is a MFJ 1500 watt tuner with SWR and power meters, an antenna switch and rotator plus 115/230V ac and 12V dc at 35 amps. All you need to do is bring your rig and you can be on the air within 10 minutes of arrival (anyone interested?). I spoke with Ralph on the telephone and enquired about whether there was room on the roof for additional antennas. He tells me that there is ample space for mounting a 5-element 6-metre beam. I shall therefore bring one along, plus rotator, and leave it there for future expeditions.

'I have applied for a special callsign, FP0SIX, although I am sure I shall be required to sign as FP/KA3B. My operation will concentrate on 6 metres, although I will probably operate on HF as well. The 6 metre operation will run about 100 watts. QSL/SAE's please!'

I have written to Harry about crossband working using 28.885 and his answer will be printed next month in this column.

DX briefs from KA3B

Phillip Delcroux TR8DX is reported as operational on 6 metres with 40 watts output and a 4-element beam. He is active in the evenings and at weekends. Others interested in operating on the band are TR8CA and TR8JLD.

Falkland Islands (VP8): Bob VP8BKK will shortly be operating on 6 with a Swan 250.

Nicaragua (YN): YN3CC is now operational on 6 with a Yaesu FT620B and a 5-element yagi, which were donated by the Six Metre International Radio Club (SMIRK).

Zambia: Bill 9J2WS will be active on 6 from Zambia until the end of 1989, before returning home to Sierra Leone as 9LIWS.

El Salvador (YS): In addition to YS1ECB, Marco Diaz YS10D is reported to be active on 6. His address is Box 464, San Salvador, El Salvador.

Martinique (FM): Three operators are reported as active on 6 from this small island in the Caribbean (Grid FK94). They are FM3AG, FM3BY and FM3CS. Note that the French Guiana beacon FY7THF on 50.038, which is received in the UK when conditions are favourable, is a good pointer for this area.

Peru (OA): From Ray Clark comes word that OA8ABT is active on 6 with 50 watts output. He is using stacked, 5-element yagis.

Ceuta and Mella (EA): From this area comes word that EA9ID9 will be starting out on 6 soon.

Other DX news

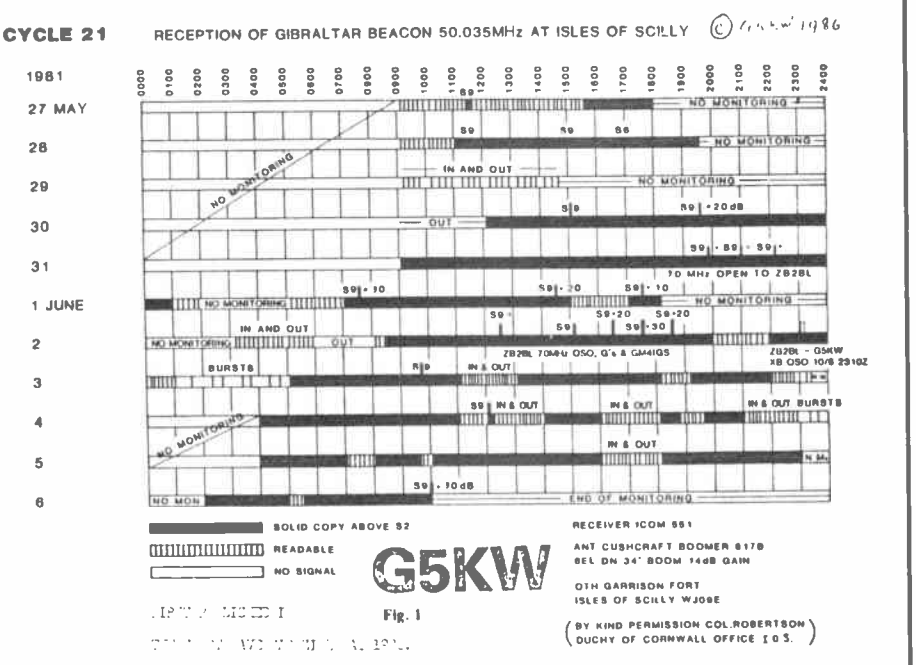
A Gibraltarian DXpedition is planned to take place between May 31st and June 14th. A letter from G4VXE gave details of the forthcoming 6 metre DXpedition. Tim says that callsigns have not yet been finalised, but will probably be ZB2/G4VXE, etc, rather than full ZB2 callsigns. Operation will begin on May 31st and end on June 14th. The period was chosen for best sporadic-E propagation to the UK.

Operating frequencies will be 50.165 and 50.200, with monitoring on 28.885. See *Figure 1* for details of reception of the Gibraltar Beacon in the Scilly Isles by G5KW during May and June 1981. As will be seen from the graph, the band was open for 70MHz operation on May 31st and June 1st. This was when many of us made QSOs on 4 metres. The propagation mode has not been established but we believe it to be enhanced sporadic-E.

John G3UUT writes to say that he has received a letter from Jimmy Bruzon ZB2BL. Jimmy is the keeper of the beacon ZB2VHF which, as reported earlier, was damaged by rats. He says that he is hoping to get the beacon Poperational again soon, as he has ordered the spares necessary to mend it. This is good news, as the beacon was a valuable guide for the conditions to the south of us.

I had a telephone call last week from Jimmy in California, saying that his plans for his annual DXpedition this year are not confirmed yet. He believes that he may go to Belize; I hope to give more

Fig 1 *Details of reception of the Gibraltar beacon*



information on this next month. Jimmy is probably the world's greatest operator of 6 metre DXpeditions and produces a very fine souvenir QSL card, giving full details of equipment and local colour.

Ascension Island beacons

In a news handout from the UK 6 Metre Group, we read that Mike Barry ZD8MB/G4MAB obtained licences for two beacons in the autumn of 1987: ZD8 HF on 2829kHz, with 50 watts output power, and ZD8 VHF on 50032.5kHz, having 50W output power. The necessary permits were issued by the Governor of Ascension Island. The antennas will be a 5-element yagi and a vertical, both available for 6 metre operation; for 10 metres a vertical will be used.

The same keyer is used for both transmitters, but the appropriate callsign for each beacon is sent, followed by the Ascension Island call, locator II22TB. The keying is synchronous throughout except for the callsign differences, permitting arrival timing comparisons.

Several organisations have provided hardware. Yaesu donated the components, South Midland Communications gave random antenna electronics and the keyer PCB is from G4FRE. The beacon was designed, built and tested by G3JVL; funding is by donations from interested members of the UK 6 Metre Group. The 10 metre beacon has been funded by ZD8MB, G4JCC, G3SED and G3JVL.

UK 6 Metre Group AGM

This will be held at the RSGB VHF Convention at Sandown Park on May 2nd. The convention opens at 11.30am and non members are cordially invited to attend but may not vote.

Aurora during March

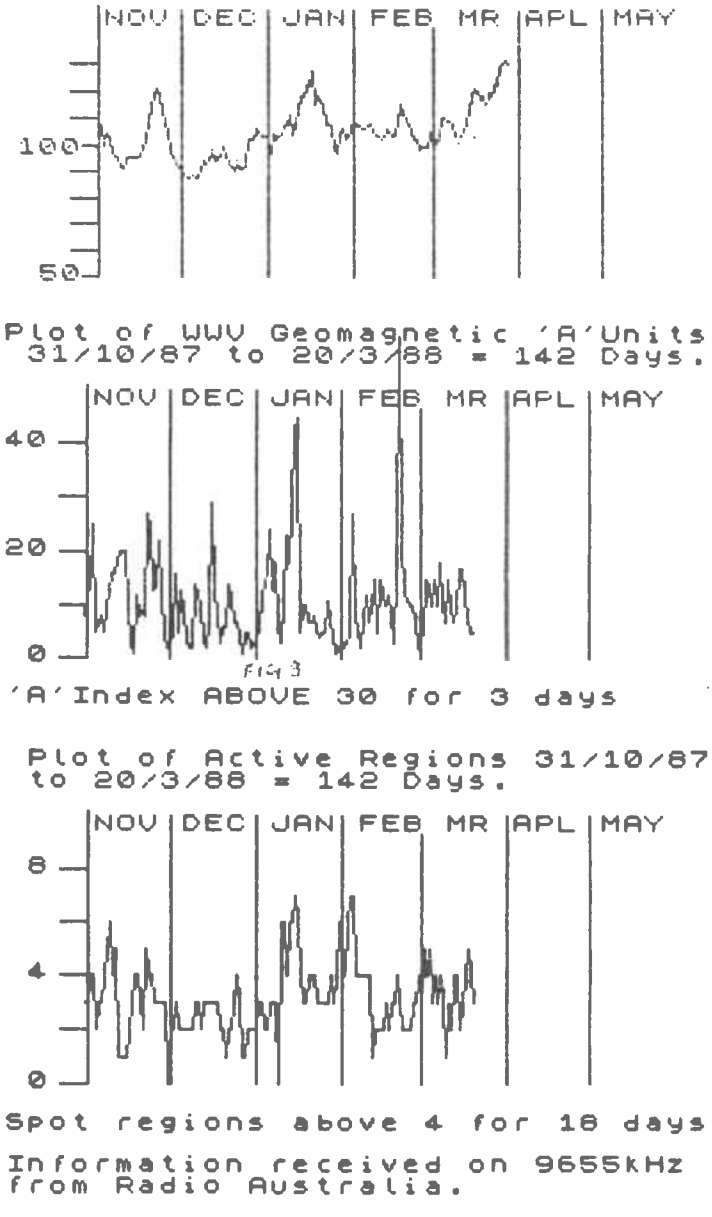
The magnetic storm on February 21st, which was followed by an intensive aurora on February 21st and 22nd suggested that similar conditions would probably return 27 days later. We were not disappointed! During the first two weeks of March there were several auroral openings, but these were not much in evidence from my QTH in the south-east. Stations further north and in Scotland, however, had some major openings – particularly towards the end of the month. With the solar flux at 132, an A index of 22 on March 29th and stormy geomagnetic conditions forecast as this column is being typed, no doubt more auroral contacts will have taken place by the time this is published.

Mike Barry ZD8MB has already been having some good crossband and direct 6 metre QSOs – although, isolated as he is, all QSOs can be considered DX! He is regularly in QSO with Costas SZ2DH and the 9H1 gang, and in crossband contact with OZ2BQ/EA7, EA4CGN, TR8DX and CT1WW. The highlight of the season so far was a crossband QSO on March 25th between EA4CGN on 10 metres and LU7DX on 50.105MHz just before the aurora started up in the UK. Enhanced conditions have been encountered in the past before an aurora.

In the March issue the captions were omitted from the graphs of the solar flux and sunspot data supplied by Geoffrey Roberts. An updated version has therefore been included this month. As mentioned earlier, the upward trend continues.

As we move through the summer sporadic-E season to the autumn F2 DX season, next month I shall be including a reprint of the propagation study I made, in the Scilly Isles, of the North Atlantic path with times and details of contacts made. Until next month, 73 and good DX on 6. Ken Ellis G5KW, 18 Joyes Road, Folkestone, Kent CT18 6NX. Tel: (0303) 53267.

Fig 2 *Graphs of solar flux and sunspot data*



News and comment from Glen Ross G8MWR

It has been some time since we had a serious look at what is happening on the higher microwave bands. Perhaps the most interesting occurrence is that a number of people are now running private beacon systems on the bands from 10GHz upwards. There are several reasons why beacon facilities are useful. The obvious one is to find out what conditions are over a particular path, a service provided by the official beacon network.

A secondary function is providing a tune-up facility for tweaking up newly-built equipment. Here, the official network is not very helpful if you are located some distance away. The problem is that the gear could be off frequency and as deaf as a post, so you would need to get close to the beacon site to make a start on the lining up job. Because the official beacons are few and far between, this could involve a lot of travelling.

A good idea

The private beacon network which is springing up around the country helps to cut down on your travelling by putting signals into areas which are not well served by the official network. So, how do they operate?

As you know, an RSGB type beacon has to go through a thorough DTI examination before being granted a licence. This is largely because the unit is going to be installed on a remote site and will be left to run unattended.

There is, however, nothing to stop anyone transmitting a constant carrier with tone or other modulation from home, provided that the callsigns are transmitted at the stated intervals. This is, after all, exactly the way you run a normal QSO.

Objections

Some people have said that efforts should be concentrated on providing more official beacons. The reason given is that because the private ones are not running continually and because the aerial may be pointing in different directions at various times, depending on the user's requirements, it is not possible to use them to keep a check on propagation. This argument misses the whole point of the private beacon system, which is to provide signals and help to get gear up and running when requested.

Advantages

In one sense, the private beacon has a great advantage over the official ones as the operator will be available to respond to your requests via a two metre talkback link. This effectively gives you a duplex QSO, with you on 10GHz and the beacon operator on 144MHz. Any adjustments you make can be immediately reported back to you, making the tweaking progress a lot easier. Many of the home beacons also have full 10GHz transceive operation available, so a final test can be made using full duplex telephone style contacts – the ultimate in luxury.

Get 'em up

As starters you could try the following to get a signal up on the band. In the Glasgow area, try Mark GM4ISM for 10GHz FM and possibly 24GHz FM. In Geordie land, try John G4NWU who can help with 10 and 24GHz FM. In the Midlands you can call me for a signal on 10 FM, 10 SSB or 24GHz FM. For the area south of Birmingham, contact Dave G0DJA who also has 10 and 24 FM available. In the Wolverhampton area the man to get is Glynn G8SWZ, who can also manage 10 and 24 FM.

Moving to the Bristol area, you could ask Roy G3FXL who can manage signals on most bands above 1.3GHz including 10GHz ATV. In the Swindon area you could contact Tim G3KEU for 10 FM, SSB and ATV. In the Sheffield area you could try Peter G3PHO.

If you live in the South Wales area then Doug GW3ATM, located near Chepstow, would be pleased to help on 10 FM. In the Hitchin area, Harold G3UYM is available for 10GHz FM and, in Reading, you could ask Ian G8KQW for 10GHz FM and SSB and also 24GHz WBFM. Most, but not all, of these operators have a mast-mounted system but they can all get a signal on the band for you with little trouble.

Contacting them

All of them are QTHR and phone numbers are available via directory enquiries. Please bear in mind that you cannot expect a signal at the drop of a hat. Contact the people concerned well in advance to arrange a suitable time to do your tests. All these people are very helpful and very experienced microwave operators – just the sort you need to hold your hand when you are getting started.

This is by no means a full listing and I would be very pleased to hear from anyone else who is prepared to put up signals.

Proper ones

Just to round off the information, the official beacons – working upwards in frequency – are, on 10.1GHz, GB3IOW on the Isle of Wight; on 10.12 GB3ALD on Alderney; on 10.368 we have GB3SCX at Bournemouth, GB3MHX at Ipswich, GB3CEM at Birmingham and GB3AZA at Scarborough. All the preceding beacons are high stability types for SSB use but can also be received as carriers on wide-band FM receivers. The FM beacons with nominal 300kHz deviation are all on 10.4GHz. These are GB3GBY at Grimsby, GB3MLE at Emley Moor, north of Sheffield, GB3XGH located at Chester and GB3LEX which is located between Leicester and Loughborough.

More units coming

There is also news of a new 10.4 FM unit to be installed at Blackhill near Glasgow (NGR reference NS 828 647) as soon as all the paperwork is approved. Further news of this one is obtainable from GM4ISM. It is hoped that GB3OHM will have made an appearance from the Birmingham area by the time you read this. Information on this one is from G6KOA. On 21.4GHz you will find GB3ALD and GB3IOW putting out signals.

These beacons are all fairly reliable, but they do have to be taken out of service for short periods for running repairs and so on. If you want to check the latest status try contacting the RSGB Databox on (0707) 52242 using normal Prestel 1200/75 baud rates. Lots more interesting information for the VHF man is also available from the same source.

Cumulative results

Last year's 10GHz cumulatives were well supported in spite of the terrible weather conditions. Any time you want rain, just take a dish aerial up onto a local hill – it rarely fails. The score is the best results from three of the available contest days and the winner was G4EFT with 2554 points from 38 contacts, with a best DX of 219km.

Second was G8KQW with 2522 points from 35 contacts, the best DX being 163km. The greatest number of contacts was 42, scored by G4EML. On SSB the winner was G8KQW with 1329 points from 16 contacts, the best DX being 153km. This is actually less than he achieved on

wideband FM but, of course, there are a lot less stations around on SSB even though the number is increasing rapidly.

Activity

As well as the cumulative contests on 10 and 24, there is now a well established idea of using the first Sunday in the month as an activity day. This has promoted a lot of interest and each month sees more people joining in. The Midlands, South Yorkshire and the Lancashire area are particularly busy.

There is now a well established South Wales microwave group doing a lot of operating from their site at Hay on Wye. In North Wales there have been reports of contacts into Eire and Scotland, where the Glasgow group are getting very well organised. There is also a very active group in the Hull area, although high spots are not easy to find around there.

Expeditions

News is coming in of a planned trip to GD-land by G8KQW, possibly in August. He will be taking 10 and 24GHz FM and also 200 milliwatts of 10GHz SSB with him. This may not sound much to a two metre operator, but bear in mind that the average 10 SSB system runs about a third of a milliwatt output and his system is really QRO.

Around the same time we can expect an expedition to the south-west corner of Scotland, possibly with both 10 and 24GHz being carried. Several operators are planning trips up Snowdon; in fact it is getting to the point where a rota system will have to be brought in for this site to stop local QRM from becoming a problem.

Summer holidays

July and August are possibilities for an expedition to the south-east of Scotland, from where long distance sea paths into the north of England and East Anglia are being attempted.

The Belfast Group will be out on most contest days looking for paths into Scotland and North Wales. A new interest in microwaves is appearing on Anglesey and the north-west coast of Wales, plus there is a very active Glasgow group, so the limited success of last year should improve.

Mobile

Mad though it may sound when you consider that microwaves are a line-of-sight game, a fair amount of work has gone into mobile operating. This is usually achieved using Alford slot aerials mounted on the roof of the car. This type of aerial is intended to give good all round coverage and does an excellent job.

However, when doing mobile tests rather than looking for random mobile contacts (*What, on 10GHz! – Ed*), both cars are following the same route and much better results can be obtained by using the extra gain of a small horn aerial. These are usually mounted inside the rear window of the leading car and inside the windscreen of the following one.

Using this layout G8OIT and I have managed contacts of up to three miles when, obviously, the cars are not in visual range. Even better results were obtained on the M62 where visual distances in some areas are greater. I have also done some tests on 24GHz FM mobile with G0EDT. So far, they have only provided contacts of less than a mile, although we are sure that this could be easily extended.

Using SSB mobile on 10GHz has provided some problems due to Doppler shift as the relative speed of the cars has changed. Using the throttle as an RIT control has to be experienced to be believed!

Close-down

Next month we move back to the lower end of the spectrum and perhaps also get an update on the awards that have been issued. If you want information on these, or just want to comment generally, then the QTH is 81 Ringwood Highway, Coventry; or you could use Prestel on 203616941. Good hunting.

SECOND-HAND

BY HUGH ALLISON G3XSE

The subject of mains hum is an old favourite from the postbag. It can be a real pain, though it can normally be separated out into three main sources. The easiest of the lot to deal with is heater cathode shorts in valve sets. Hum *all* the time has got to be limited to the audio stages (this is the most likely cause), the rectifier or the detector, assuming it's coming from the heaters. Heater cathode shorts down the RF/IF/mixer stages normally only show up when you tune in a strong signal.

In my experience the indirectly heated series heater valves, for example PL, U types etc, are the worst for this problem, though 6.3V 'E' series strung in series can play up. The way to check is to heat the valve up (ie put the correct volts up the heater pins) out of the set and AVO the resistance between cathode and heater. Although there should be no conduction, in an audio or rectifier valve you should disregard anything 10kohms or above. You will gather from this that I don't like using the valve tester. I get a belt off it every time I play with the damned thing!

The old trick of listening to your local oscillator (or, in more advanced receivers, conversion crystal oscillators, etc) is very worthwhile when you are only getting the hum when a signal is tuned in. Any trace of 50Hz and I'd be wopping in a new oscillator bottle. Another good trick, for 6.3 or 12 volt parallel connected heaters only, is to disconnect the heater transformer winding and run the heaters off an external dc supply. If the hum is gone, the heater circuit is your chief suspect.

A bodge way out of heater induced mains hum is the so-called 'hum-dinger' circuit. It is very, very important that you do not try this technique on series connected heaters; you must only do it with parallel connected ones, isolated from chassis heaters. *Figure 1* is self-explanatory.

The HT supplies

We are now talking either valve or solid-state equipment, with HT either meaning your hundreds of volts in the valve box or only the 12 volts or what-have-you in your semiconductor wonder-box. If you have a 'scope handy, it's well worth a nose round the 'main' rail, with the 'scope on ac coupling, to see if you have any 'modulation' on it, be it 50 or 100Hz, dependent upon half or full wave rectifying.

On a 12 volt(ish) system I begin to worry when confronted with more than roughly half a volt's worth of wiggle. Your 300 volt valve heap can probably take 5 to 10 volts of ripple. First move, if confronted with yards of the stuff, is to wop an electrolytic of roughly the same value and voltage as that already fitted straight across the rail. Remember to be careful and to discharge the substitute after use.

Induction hum

If you have been adding new mains transformers and the like, the radiated magnetic field round it can be upsetting other gubbins within the set. Try rotating it through 90° and see if the hum disappears. Another favourite complaint is the mounting screws of the mains transformer not making good contact to the chassis. Try loosening them off and re-tightening.

One final mains transformer related hum problem can be loose laminations. Not loose enough to physically rattle (this is annoying; cure it with liberal 'coatings' of high temperature lacquer), but loose enough to impair the efficiency of the transformer. Think about it – if the laminations are loose, the magnetic circuit is inefficient. Your 'lost' power, which goes as an increase in the external magnetic field (ie the inefficiency), can induce mains hum into other nearby inductors, principally audio-inter-stage transformers or the 'L' bit of audio filters. Try a clamp on the lams if you suspect this. A G clamp and some scrap wood can sometimes suffice.

Magnetic radiation from transformers can be the cause of 'judder' on the picture of a CRT screen, be it computer, TV, monitor, 'scope or whatever. I tend to extend the mains transformer leads (well insulated) so that I can run the set from it, but with the transformer physically located well away from the set. With monitors, as often as not, the whole thing runs on 12 volts or thereabouts so it can also be worthwhile running it up from an external supply. If the transformer is the problem, a mu-metal screen can sometimes effect a good cure.

Yaesu FT720

These FM machines come in three variants. The FT720RV is a 10 watt, two metre FM box, the FT720RU is 10 watts on seventy and the FT720RVH is 25 watts on two. The most unusual feature is that the transceiver can be split in half; the control gubbins separates away from the RF 'deck'. It is thus possible to mount the little control box under the smallest dash in a car and put the rest of the set in the boot or under the seat. Control cables come in two or four metre lengths.

There is also a special combiner box so that you can have one control unit and separate two and seventy RF decks. A point to watch with this family is their extreme sensitivity to VSWR. There is a built-in safety feature whereby any mismatch trips out the transmitter. This is really sensitive – in my view a bit over sensitive. Even a watt 'back' will trip out the ten watt version, so a well matched aerial is essential.

Performance-wise the quoted figures are 0.32μV for 20dB quieting on two and 0.5μV for the UHF variant. In practice, they all seem to be exactly this, which is reasonable considering the slightly dated design. The Tx side always gives a bit more than stated, typically 12 watts out for the 10 watters, 27 to 30 out of the 25 watter.

Price-wise, the two metre versions go for £125 for the low power one to about another twenty quid(ish) for the higher one. Last year I only saw two UHF ones sell, one at £135 and the other at £155, so I can offer no definitive price. They are not bad machines.

Repairing Spectrums

My comment in the second-hand computer special recently about dead Spectrums that will only produce multi-coloured flashing squares seems to have touched a very raw nerve indeed. Most of

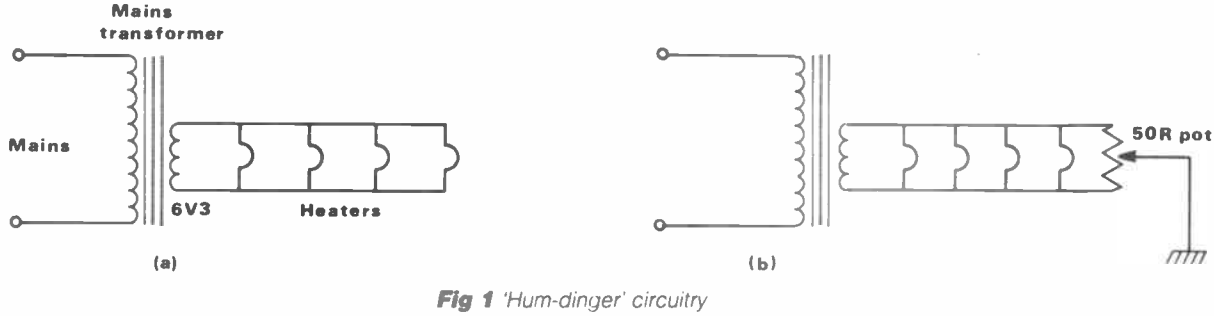


Fig 1 *'Hum-dinger' circuitry*

the correspondence about this ruefully agrees with my comment that you should never unplug or plug in any accessory to a running Spectrum; that's how those concerned blew theirs up.

For starters, I think it's only fair to point out that there are several firms about who will repair a dead Spectrum for a fixed price of £15 to £20. The repair isn't a lot of fun, but is relatively inexpensive so this might be worth considering. If all goes against you, you are in for about a tenner's worth of bits.

Assuming you are a sadist, though, open him up and look, with an AVO, at the block of eight memory chips in the bottom left-hand corner. These should have +12, −5 and +5 on them, on pins 8, 1 and 9 respectively. Bet they haven't. Now cut the supply rails to that area (ie cut the tracks) and see if the +12, −5 and +5 comes up. Bet it doesn't.

The inverter's a gonner. This features a ZTX650 transistor, an itsy bitsy thing that is a lion in sheep's clothing. This tiny, insignificant transistor has the ability to shake *two amps* or two and a half watts maximum dissipation.

It also has a gain of 100 min, 300 max, so don't wop in a BC108. The correct transistor is essential and they *are* cheap (5 for £1.50), so it's not worth playing games. Well, would I lie to you?

So now we have a running inverter. The real bad news is that the memory block has to come out, which is soldered in, plus it's double-sided, plated through-holes. Eight sixteen-pin ICs. Yuck. That's one hundred and twenty-eight goes with the solder sucker and solder wick. Super fun! Folklore has it that when a 4116 has not got its full complement of all rails across it, it will die – permanently. My experience of this is that it isn't true.

In a normal dead Spectrum, six out of the eight chips are normally OK. The problem is that you've got to get them all out to check them (rails run under the chips so you cannot keep cutting tracks). The easiest way is to cut all the legs off on the top of the board, then unsolder each leg one at a time until the area is clear. This obviously makes re-use of the memory chips a no-no. Still, 4116s are under a quid a go, so eight new ones aren't going to cost the earth. Incidentally, you weren't going to solder the new chips in, were you? For the extra eighty pence or so it will cost you for a set of IC sockets, I'd advise you to fit them.

I, however, am extremely tight when it comes to parting with money on electronics. I'd rather waste an hour carefully sucking out all the old memory chips so that they come out whole. It's then a case of plugging them one at a time into a socket fed with +5, −5, +12 on the appropriate pins whilst watching the current meters on the power supplies. Any dead 'uns obviously get binned; it's worth remembering that one of them *ought* to be a short, 'cos that's what took out the inverter.

Unfortunately, the above PSU tests will not find 'dynamically dead' ICs, ie ones that are taking the right sort of current but don't work. Nearly all Spectrums in my experience die with one IC going a dc short and another going dynamically. So in go the seven dc good ones, plus one new one. It might work. If not, replace each chip in turn with a known good one. Sure you could have seven dynamically dead ones, but I've never met this. A 4116 is a 16,384 bit random access read/write memory organised as 16,384 × 1 words. Since the Z80 is an eight-bit machine, it needs all eight bits to 'live'. As a rough guide, we are talking only μA on the −5V rail and 45mA on the +12.

A common misconception

Quite a common letter in the postbag is the one from the person who wishes to add a BFO (beat frequency oscillator) to a short wave radio to allow him/her to listen to SSB and CW. What makes me laugh, because I thought the same myself mega years ago, is that the correspondent goes on to say something like, 'The set covers 1.8 to 4.5MHz and I need a BFO to cover that'. Wrong. It needs to tune only across the IF of the set. That's normally 455kHz, maybe 465 or 475, but in your average grotty MW/LW/short wave domestic box it's around there. I'm being rude; your one isn't grotty, of course not.

If we are talking of only listening up to 10MHz or so, then all the transmissions you are going to bump into are likely to be lower sideband. Above 10MHz, most are upper. A lot of sets don't make 10MHz so you don't even have to tune the BFO. You can set it and forget it.

A BFO can be built for nothing out of an old transistor radio. All the bits are there, in the IF strip. *Figure 2* shows the nominal last IF of an average Japanese radio. Copy the circuit diagram of your set, then reconfigure it like the example in *Figure 3*. If it doesn't oscillate then reverse the collector and +ve connections to the coil.

455kHz IF coils are yellow, mixer to first IF, white is interstage IF and black (ie natural ferrite colour) is the last IF/detector. For this circuit you can use any of them. Should you require a tunable BFO then add a variable across the 'hidden' one in the IF coil, ie from the unused pin to earth. If you are really tight, the variable capacitor in the set could be used with, say, a 10pF in series, or a small variable could be used.

Should you find frequency drift a problem, normally noticeable with a circuit like this only when the battery is getting low, then a 5.6V zener (plus series limiting resistor, of course) should effect a cure.

You will note that there is no coupling into the set shown. With most transistor radios, merely having the BFO near it will give you enough injection. Should more be required, a couple of pF from the BFO collector to the set's detector should do the trick.

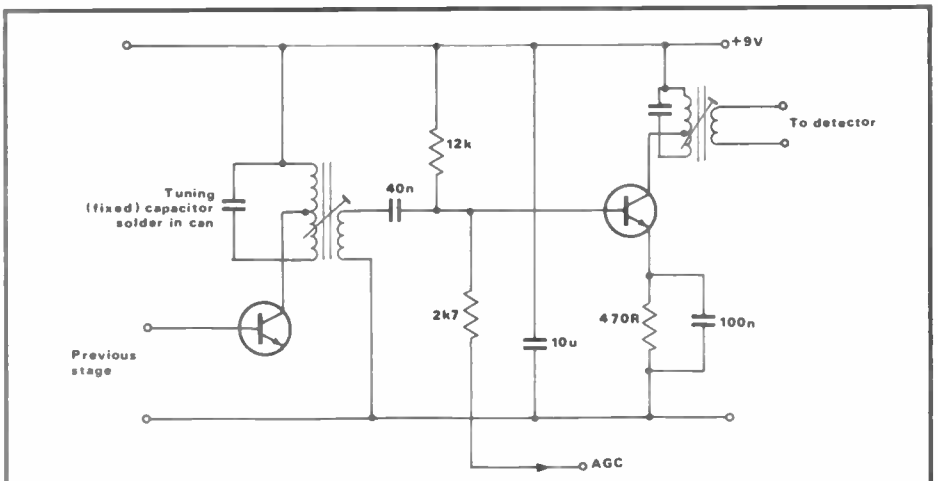


Fig 2 *Standard IF stage*

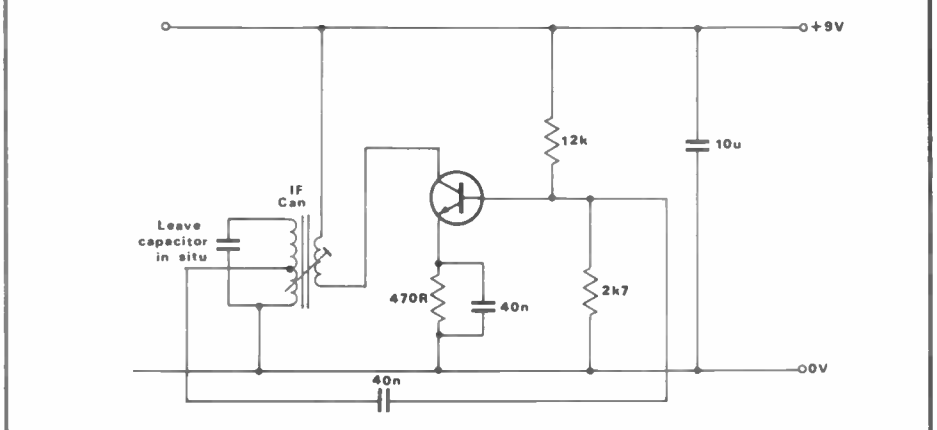


Fig 3 *Reconfigured as a BFO*

PROJECT BOOK

by Martyn Williams

This month we come to the last part of the series on various coding systems and we concentrate on valves. There are still far more of these in use than is perhaps realised, particularly amongst the growing band of old equipment restorers, so information on the coding systems used will be very helpful.

American codings

These are still readily available and, in fact, are probably the sort you will run into most frequently.

The point about this system of coding is that, although the code does not appear to be much help in determining what sort of valve you are looking at, you can glean a lot of useful information once you know what to look for. Let us take as an example type number 6V6GT – this is not an exotic callsign, as some may think.

Detective work

The first figure of this code tells us that this valve has a six volt heater. Other numbers you may come up against are 1 (.5), 25, 35, 50 and even as high as 117, all indicating heater volts. The next bit is the 'V' and this conveys no information at all.

The next figure can generally be taken to indicate how many of the base pins are connected and, allowing for the fact that the heater will have two connections, this indicates that there are actually five electrodes in the valve. A fair guess will come up with heater, cathode, grid, screen and anode and this is exactly what we have. The valve is, in fact, a power output tetrode.

Go faster?

So what about the GT bit – is there anything to be gleaned from this? Yes, there is. The 'G' tells us that the enclosing envelope is made of glass and the 'T' shows that it is of tubular construction rather than the more usual pear shape.

Instead of the 'G' you may find an 'M' marking; this indicates that the valve is in a metal container. Another marking you may find could be something like 6SK7, the 'S' indicating single-ended construction. The 6K7 is a small signal RF pentode with the control grid connected to a cap on the top of the valve. The 6SK7 is exactly the same valve type, but with the control grid connection brought out to one of the pins on the base.

JAN codes

Another American coding you may come across is 'JAN'. These codes were used by the armed forces and are, in effect, stock numbers from which no useful information can be obtained-unless, of course, you have a stock list.

One final point on the American coding system, the 12K7 is exactly the same as the 6K7 except for the heater volts; the same applies to all the other type numbers.

One oddball you may come up against is something that was used in car radios to reduce current drain on the battery. This is a rectifier with a filament rated at *zero* volts, thus having a 0 as its first code letter. Perhaps you might care to work out how you can get a heater to run on zero volts?

British types

In Britain all manufacturers used an in-house system of type numbers and most tell little or nothing about the valve you are looking at. In the early days, say pre-1939, valve numbering was very simple and a frequency changer with a four volt heater was simply marked FC4. A pentode with 'straight' transfer characteristics and a thirteen volt heater was marked SP13 and so on; all very straightforward.

Of the post-war types only those of Mullard manufacture (just about the largest maker, as it happens) actually have a useful coding. The most likely codes you will find are ones like EF39, EL34 and similar markings.

Making sense

The final 39, 34 or whatever is simply a series number and gives no information, but the letters between the two sets of figures indicate exactly what type of valve it is. *See Table 1.*

A	Diode
B	Diodes
C	Triode
F	Pentode
H	Heptode
L	Tetrode
M	Magic eye
Z	Rectifier

Table 1 *Valve types*

From this it can be deduced that an EBC33 would have a six volt heater and would contain two diodes and a triode in the same envelope. The magic eye may take some explaining. This was a valve with a fluorescent screen mounted at the top. The valve was fixed in the radio cabinet in such a way that you could see the screen, on which was displayed a dark shadow. The size of this shadow varied with the strength of the incoming signal, providing a signal strength indication which was used in much the same way as a modern S meter.

Next month, Martyn Williams starts a new Project Book series

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■ Yaesu FT2302 5 watt 2m mobile with Heatherlite safety mic, £145. muTek SLNA1445 2m pre-amp, £17. Icom ICO2E with speaker mic, DP4 case, CPI 12V car charger, super rod ⅝ telescopic antenna, £185. Fidelity 2000, converted by Spectrum for 10m FM, Zetagi BZ7 10m pre-amp, £50. Katsumi MK1024 electronic keyer with 1024 bit memory, £115. Tel: Pete (Epsom). 01-393 9115, evenings

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■ Yaesu FT290R 2m multimode transceiver with mic and manual, Yaesu FP700 power supply and loudspeaker, Microwave MML 144/30-LS linear amplifier, JD110 SWR and power meter and 'J' pole vertical antenna. A complete 2 metre station in first class condition for £375. Kelly, 11 Linden Crescent, Westwood, Bradford-on-Avon, Wiltshire. Tel: (02216) 2024

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■ Spectrum 128K complete with data recorder, interface and joystick. Includes RTTY, SSTV, CW programs plus other software, bargain at £95 ono. Tel: (0623) 552912

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■ Dressler active antenna, ARA30, 200kHz-40MHz, £99. Novex 12/500MG video monitor, amber, £75. Dactron PX402 PU, 13.8V 3 amp, 4A max, £15. All new condition. Tel: 01-556 2969

■ KW2000E PS, vgc, £220. Valves, £20. 6146B, £15. Shure low impedance mic, £15. KW traps, £12. Home-built Z-match switchable wide spaced caps, £35. Kenwood 530S trans/c, vgc, £525. MC50 mic, £25. Twin SWR bridged, £10 each. Colour Genie comp, RTTY, c/w split-screen tape recorder, B/W portable, £120. ZM home-built switchable, with SWR 200 watt output, £30. Buyer collects. Noel G3ZLN. Tel: Ipswich 49139

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■ Shure 201 mic, £18. Lowe FX1 frequency absorption meter, £28. KW traps and balun (1 to 1), £20. All items are new, carriage will be paid. Walter Beswick, Normanby, Sinnington, York YO6 6RH. Tel: Kirkbymoorside 31766

■ Realistic DX300 communications receiver, digital readout, 10kHz-30MHz. Still in box, never used, £135. Tel: Stourport (02993) 3815

■ FT250, FP250, mic, manual, mint, reliable, 80 to 10 metres. No gadgets HF rig by Sommerkamp. Bargain at £275 + carriage. Tel: (061) 7431570, any time

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■ Datong MK Morse keyboard, vgc, £55 ono, Trio MC50 desk mic, vgc, £25 ono, Howes 40m Tx and 40m VFO, both built, £9 and £7. Tel: (0305) 813202

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■ SSB (German) LSM24 24cm (1268-1270) oscillator/mixer unit for satellite (Oscar) band phase III etc. 2 metre IF, 500mW out, super condition, III etc. 2 metre IF 500mW out, super condition, £125. Trio 751E 2 metre multimode, as new, box, all accessories, £485. Commodore Amiga 500 computer, 1081 RGB monitor, modulator, software, £500. Still under guarantee. Paul G4XHF. Tel: (0293) 515201 (evenings preferred)

■ Adonis 503 processor desk mic, £15. Have various years of *RadCom* from 1979-1987, *Practical Wireless* from 1970-1988, offers, buyer collects. Wanted Trio-Kenwood AT230, MML 144-1005 linear, reasonable price paid. Terry G4OXD. Tel: (0462) 35248 (Hitchin) after 6pm

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■ FT101ZD MkIII, fan mic, manual, FM board with spare valves, Welz SP300 VSWR meter AVT18 (10-80m) antenna and parts for 1kW ATU. All in ex cond, £550. Prefer not to split. Contact Bill G0BIK QTHR. Tel: Felixstowe 282526

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■ FT208R and FT708R, 4 NiCads, NC1A charger, YM24 spkr/mic, W/shop manuals, £300. NEC 8201A portable computer, disc drive and technical manuals, £150. Sinclair QL 640K twin 5/x/in disc drives. Microvitec monitor, loads of software, £250. Simon Hopkins G8PXB. Tel: (0442) 42277 ext 2537

■ Tet antenna system, 6 element beam, £40, plus automatic antenna rotator, £30. Tel: 01-659 7083 after 6pm

■ FT1012 plus TS930S, mint, faulty but working, also Hygain five, double high to double low, will convert to 10 metres. All equipment mint condition, can be viewed. Will swap for 934MHz gear or other ham Tx or Rx or offers, please write, all letters replied no SAE needed, I will pay postage. Shaun Imms, 33A Woodland Road, Handsworth, Birmingham B21 0ES

■ RCA AR88D Rx good condition, spare valves, plus handbooks, £40 ono. Wanted PSU for BC221. Tel: Bristol (0272) 574893

■ Signal R532, airband only, very good base receiver in vgc. 100 memories in 10 banks of 10, scans 10 channels, A to J, PSU, box, instructions etc, £150. Tel: (061) 436 7224

■ FDK multi 750A 2m multimode, vgc, c/w mobile mount, box, instructions, £230 ono. Standard C432 6ch 70cm portable c/w base, master charger and acc's, £95 ono. MM freq counter, 50MHz, £35; MM 600MHz prescaler, £20; Avo 8 MkII, tatty, £8. Tim G8HEB. Tel: (021) 358 0524

■ Yaesu FT200 transceiver, spare valves, good working order. Ideal first HF rig or transverter use, £200. Also pair hand-held Tandy 40 channel CB rigs, 4W output, offers. G1VJL QTHR. Tel: Nailsworth (045383) 3554

WANTED

■ Icom SP3 external speaker. Icom PS30 power supply. Also Icom AH7000 discone and Diamond D130N discone. All must be in excellent condition. Tel: (0206) 394336 after 7pm (Essex)

■ Yaesu FT290R and 30W linear amplifier, must be in excellent condition; or Yaesu FT480R transceiver, must also be in excellent condition. Please write to Peter G7AYU, 5 Wouldham Terrace, Saxville Road, St Paul's Cray, Orpington, Kent BR5 3AT

■ Yaesu 7000, must be in mint cond and perfect working order. Good price paid. Tel: 01-28† 2493 any time

■ Yaesu FRG9600 Mk3 only, or Icom ICR7000. Tel: (0602) 277941

■ MkXV transmitter/receiver, Paraset transceiver, BP3, AP4 transceivers, MkII suitcase set, B2 suitcase set, MkIII suitcase set, 53 Mk1 receiver, 51/1 transmitter, accessories for 18 set. Tel: Tony (051) 931 1716

■ 50MHz module. Swap or £160. Used 736R + modules. Offer £965. Mike G1XGM, 51B Brownhall Road, Catford, London SE6 2HB. Tel: 01-461 4698

■ Microreader (Era or similar) state price and condition, or exchange 35mm Yashica Electro 35GT camera kit and other photo equipment. G A MacLauchlan, 16 Wellpark Terrace, Bonnybridge, FK4 1DE. Tel: (0324) 813349

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■ Ex-Service WW2 German equipment for museum purposes. Parts, literature, WHY. British T1190, WS11, WS1, WS65, WS66, AD67, S2 ERT, RG37, YQ. Cash or swap. Will collect. Rag Otterstad OZ8RO, 5 Vejdammen, DK-2840 Holte, Denmark. Tel: 010-452 801875

■ R109 Rx (pref unmodified), your price paid plus carriage. Tel: Peter (0642) 456327, 10am-4pm

■ Cobra 148GTL, in good condition. Tel: (0283) 221870

■ FT7 or similar 10W HF Tx/Rx. G5HD. Tel: (040) 928 342

■ Yaesu FT757, any condition, working or not. Also a Metron MA1000 HF mobile amp or similar QRO HF mobile linear, anything around 600 to 1kW PEP. WHY. Tel: Philip G4ZOW (0442) 68931

■ Outer case for WS62; outer case for WS19; chassis/carrier for spare valves inside R109. WS209 Mk1, R107, R208, R1155, T1154, WS19 etc and BC348, in fact anything WW2. Circuit for American RAXI series receiver – any information (covers 1.5MHz-9MHz in 4 bands). Roller coaster, with or without wire for WS62. Can collect up to 120 miles. Tel: Tony Howard (0908) 73114

■ Racal RA1770 Rx, prefer inspect and collect. Tel: (041) 649 2328

■ 2X4CX250B 70cm linear amp, ie K2RIW, without PSU or valves, or any other high power 70cm amp. 70cm module for FT726R. KS065 rotary bearing. 14-el parabeams or any other group of 2m high gain antennas, PMH 4/2m harness/power splitter. KR500, preferably 'B' model. Also LDF 250/450 and/or connectors. Any other VHF/UHF items of interest, ie valves/bases, triodes/tetrodes, espec-

FREE CLASSIFIED ADS

ially 3CX800 welcome. Calum GM0EWX QTHR.

■ SEM Tranzmatch, 80-10m. John G4UBB. Tel: 01-868 7684

■ MuTek, SLNA145 SB, pre-amp for FT290 Mk1. Fair price paid. Not working unit considered. Tel: (0277) 823146 evenings

■ Trio-Kenwood AT230, MML 144-100S linear, reasonable price paid. Terry G4OXD, Hitchin. Tel: (0462) 35248 after 6pm

■ Mel type L662 miniaturised comms Rx. J Ball, 17 Heathdene Rd, Wallington, Surrey SM6 0TD. Tel: 01-647 9502

■ Yaesu freq counter, YC601 to match 101E, must be in good working condx, for which I will pay fair price. Faulty one might be considered at a knock-down price. Please check the shack and help me out. Tel: (07622) 24855 anytime

■ Drake T-4XC and/or KW107 ATU. GM3BKC QTHR. Tel: Falkirk 23533

■ KW type 103, combined SWR/RF power meter or type 107 or similar. Must be pwo and sensible price. Bill G0DVW QTHR. Tel: Guildford (0483) 893411

■ Mains transformer for NEC CQ110E transceiver, or would buy non-worker for spares. A Swainsbury. Tel: 01-460 4134

■ Realistic Pro-30 hand-held scanner must be in good condition (or thereabouts). Money waiting. Tel: Rik, (061) 436 7224

■ I have a Yaesu FRG7 and need a manual, has anyody got one, I will pay the postage. I Thomas Street, North Ormsby, Middlesbrough, Cleveland TS3 6JE. Tel: (0642) 230911

■ R109 Rx, prefer unmodified your price plus carriage paid. Peter. Tel: (0642) 456327 10am-4pm, or (0287) 34397

■ Icom IC402 70cms SSB must be vgc. Cash waiting. Tel: (0926) 498388

■ Bird 43 thruline wattmeter inserts. Please ring giving power handling and freq available or similar compatible inserts. Mike Buckley, 12 Ranmore Ave, Croydon, Surrey CR0 5QA. Tel: 01-654 2582

■ Sommerkamp TS788 DX, FT707, FT101, with or without 11 metre conversion. Also general coverage receiver up to £175. I have unused, boxed, Pioneer 50 watt stereo (RPH 4120) valve, £150. Will exchange for any of above, cash adjustment either way or sell for best offer. Please write with details, guaranteed reply any location. Mr N Treece, 126 Bembridge Drive, Alvaston, Derby DE1 0UH

■ Trio TR7010 2m Rx/Tx up to £65 plus post, Icom IC24O FM 2m Rx/Tx up to £60, Trio TL120 linear amp, tel: Jim (0202) 518828

■ Old telephones, radio books, mags, *Radio Times*, RAF T1083 transmitter, R1082 Rx, details please. D Byrne G3KPO, 52 West Hill Road, Ryde, IOW PO33 1LN. Tel: Ryde 67665

■ HF transmitter or transceiver, FT7, 101, 200, FT77, anything considered up to £200 plus Realistic DX 302, 0 to 30MHz receiver. Also open to offers on receiver. Tel: (0332) 372696, ask for Ian

■ Complete HF station required. Must be general coverage on receive (no Yaesu equipment please) and all in A1 condition. Buyer will collect. Tel: (0533) 774506

■ WW2 German ex-service equipment, parts, literature, for museum purpose – any condition acceptable. Also wanted: WSII WS65, WS66, T-1190, AD67, 52ERT, 4Q, 5G, RG37, H2S modules, suitcase radio. Will collect, cash or swap. WHY? Rag Otterstad OZ8RO, Vejdammen 5, DK-284, Holte, Denmark. Tel: 010-452 801875

■ KW2000B Tx/Rx, must be in good condx, but no objection to repairs on electronics. Would p/e for unused Pye, SSB130, HF Tx/Rx. Cash adjust, also require Command Tx, Command PSU/mod, any items for this installation. Need T1154/R1155 plus cabling and other associated items, Jones type plugs, sockets. Anyone got a BC348 Rx Dynamotor? Good price given. Cain, 18 Oaky Balks, Alnwick, Northumberland NE66 2QE. Tel: (0665) 602487

■ I will swap a Delta 1 collinear p/pack for 934MHz hand-set, must be in good condition. Andreas Pratopapou, 190 Fresh Field, Brighton BN2 2YD. Tel: Brighton 688613

■ External VFO for FT102 with at least 2MHz drop. Urgent. Converter for Cobra 148 GTL DX for 45 metre band. State price. Please write or call. Dave Cummins, 23 Mahan Crescent, Blackrock, Co Cork, Eire. Tel: (021) 358396

■ Need substitute for 2N6258 used in dc/ac inverter. Any ideas welcome, costs gladly refunded. Max. Tel: (0303) 872048

■ Headphones for B40 Rx, same as used or issued if poss, or any ex-govt that would be suitable. Also PSU for HRO Rx. J Edwards, 15 Folly Row, Kington St Michael, Chippenham, Wilts SN14 6JD

■ Have *Admiralty Handbook of Wireless Telegraphy*, 1938, vols 1 and 2. *Measurements in Radio Engineering*, 1935. *Radio Engineering*, 1937. *Radio Engineers Handbook*, 1943, all by Terman. All books as new. Tektronix 465B instruction manual, new. Want Eddystone 750, also BC453, in good condition. W E Stedman, 133B Lynton Road, Bermondsey, London SE1 5QX

■ Buy or borrow mags relating to *AMRAD* 10GHz system (published 1986). Bubez, 4 Southway, Burgess Hill, West Sussex RH15 9ST. Tel: (04446) 2974

■ Pye Olympic FM radiotelephone, also manual and extender boards. PF70 pocket phone, code E1. Tel: 01-856 4123, evenings

■ Wanted, dead or alive Samurai S16 bits and pieces, part working, dead or condition unknown, all acceptable, anything whatsoever to do with the S16 machine. Ring now for an instant offer on your items. Serial keyboard for above, any serial keyboard will do, condition not important but must be in working order. 70cm Westminster, must be FM and working, will accept any condition of rig but must be complete if boot mount, would prefer dash mount, but not fussy, unit is for Packet only, so single channel unit OK, also any 70cm Tx/Rx considered. Xerox 820 computer or similar, any disc-based MS-DOS or CPM machine, condition not important, what have you? Wanted for Packet mailbox 1 level 3 node, Pye A200 E band amp, again condition not important but required in working condition – modified or unmodified. 2m FM Westminster, as above, anything considered, WHY? Would swap my TS700G, ST5MC or TNC220 for anything above. Ring and surprise me. Simon GM4PCM. Tel: (0505) 29363

FREE CLASSIFIED AD FORM

Send to: Amateur Radio Classified Ads · Sovereign House · Brentwood · Essex CM14 4SE

Classification: (tick appropriate box) If you want to insert ads under more than one classification use separate sheets for second and subsequent ads

For Sale ..... ☐ Wanted ..... ☐

USE BLOCK CAPITALS (One word per box)

To avoid mistakes please write clearly and punctuate your ad

Name/Address Postcode/Telephone							

USE SEPARATE SHEET FOR MORE WORDS

Ensure that you have included your name and address, and/or telephone number

CONDITIONS: Ads will be published in the first available issue on a first come first served basis. We reserve the right to edit or exclude any ad. Trade advertisements are not accepted

Amateur RADIO SMALL ADS

RF DEVICES AT ROCK BOTTOM PRICES!

Nobody beats us!

Over 30,000 RF devices at low prices

REPLACEMENT RF TRANSISTORS

MRF454 HF/SSB 80W	£24.50
MFR450 HF/SSB 50W	£11.60
MRF238 VHF/FM 25W	£12.80
MRF475 HF/SSB 20W	£3.25
2SC1969 HF/SSB 18W	£2.75
2SC2043/1307 HF 16W	£2.00
2SC1947 VHF 3.5W	£7.60
2SC1946A VHF 32W	£15.30
BLW 60R HF/VHF 50W (Special)	£7.50

REPLACEMENT RF POWER MODULES

M57704/SAU3 UHF 15W	£39.20
M57712/37 SAV7 VHF/FM 25W	£39.50
M57713/SAV8 VHF/SSB 15W	£39.00
M57716/SAU4 UHF/SSB 15W	£39.00
M57716/SAU4 UHF/SSB 15W	**£49.50**
M57719 VHF/PMR 15W	£31.20

JAYCEE ELECTRONICS LTD

JOHN GM30PW

20 Woodside Way, Glenrothes, Fife KY7 5DP

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Open: Tues-Sat 9-5

Quality secondhand equipment in stock. Full range of TRIO goodies. Jaybeam – Microwave Modules – LAR.

AGRIMOTORS

MERTON CB AND RADIO CENTRE
MERTON GARAGE AND POST OFFICE, MERTON.
Nr OAKHAMPTON, DEVON EX20 3DZ

OPEN 6 DAYS 9-6 LUNCH 1-2pm
EARLY CLOSING THURSDAY 1.00pm
(SUNDAYS BY APPOINTMENT)
SPECIALIST IN 934 MHz
SUPPLIERS OF ALL 27MHz AND 934 MHz EQUIPMENT
AMATEUR ACCESSORIES CATERED FOR
08053 200

24v ni-cad battery contains twenty XD type cells, used condition, some cells may be faulty **£12.00**
Spring tension gauges, set of 3. 0-4 ounce, 0-16 ounce, 0-6lb **£8.00**
Ex Vulcan bomber hitch and roll assembly, contains gears, shafts, bearings etc **£15.00**
Range and bearing marker unit, contains bevel gears, servos, shafts etc **£15.00**
Radar drive unit, contains 2 ex 24v motors, gears, components etc **£15.00**
Eddystone type 770R VHF receiver, 19-155 MHz **£120.00**
Type R210 receiver 2-15 MHz, complete with plug and headphones **£55.00**
ITT UHF TX-RX base station **£40.00**
ITT 149 MHz VHF transmitter **£40.00**
Collins R390A receiver, poor condition **£150.00** Ring for details
Readyphone 100 watt, LIN, amplifier, complete with ATU **£75.00**

Prices include postage and packing

A C ELECTRONIC SERVICE

17 APPLETON GROVE, LEEDS LS9 9EN
TELEPHONE: 0532 496048

ALAN HOOKER ELECTONICS

42 Nethernall Road
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Tel: 0302 25690

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Large stocks of electronic components

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Amateur RADIO

ADVERTISING RATES & INFORMATION

DISPLAY AD RATES

depth mm x width mm	ad space	1 issue	series rates for consecutive insertions: 3 issues	6 issues	12 issues
61 x 90	⅛ page	£66.00	£62.00	£59.00	£53.00
128 x 90 or 61 x 186	¼ page	£115.00	£110.00	£105.00	£92.00
128 x 186 or 263 x 90	½ page	£225.00	£210.00	£200.00	£180.00
263 x 186	1 page	£430.00	£405.00	£385.00	£345.00
263 x 394	double page	£830.00	£780.00	£740.00	£660.00

COLOUR AD RATES

colour rates exclude cost of separations

depth mm x width mm	ad space	1 issue	series rates for consecutive insertions: 3 issues	6 issues	12 issues
128 x 186 or 263 x 90	½ page	£305.00	£290.00	£275.00	£245.00
263 x 186	1 page	£590.00	£550.00	£530.00	£470.00
263 x 394	double page	£1,130.00	£1,070.00	£1,010.00	£900.00

SPECIAL POSITIONS

Covers: Outside back cover 20% extra, inside covers 10% extra
Bleed: 10% extra [Bleed area = 307 x 220]
Facing Matter: 15% extra

DEADLINES

*Dates affected by public holidays

issue	colour & mono proof ad	mono no proof & small ad	mono artwork	on sale thurs
May 88	31 Mar 88	6 Apr 88	8 Apr 88	28 Apr 88
Jun 88	28 Apr 88	4 May 88	6 May 88	26 May 88
July 88	2 Jun 88	8 Jun 88	10 Jun 88	30 Jun 88
Aug 88	30 Jun 88	6 Jul 88	8 Jul 88	28 Jul 88

CONDITIONS & INFORMATION

SERIES RATES
Series rates also apply when larger or additional space to that initially booked is taken.
An ad of at least the minimum space must appear in consecutive issues to qualify for series rates.
Previous copy will automatically be repeated if no further copy is received.
A 'hold ad' is acceptable for maintaining your series rate contract. This will automatically be inserted if no further copy is received.
Display Ad and Small Ad series rate contracts are not interchangeable.

If series rate contract is cancelled, the advertiser will be liable to pay the unearned series discount already taken.

COPY
Except for County Guides copy may be changed monthly.
No additional charges for typesetting or illustrations (except for colour separations).
For illustrations just send photograph or artwork.
Colour Ad rates do not include the cost of separations. Printed – web offset.

PAYMENT
Above rates exclude VAT.
All single insertion ads are accepted on a pre-payment basis only, unless an account is held.
Accounts will be opened for series rate advertisers subject to satisfactory credit references.
Accounts are strictly net and must be settled by the publication date.
Overseas payments by International Money Order or credit card.

FOR FURTHER INFORMATION CONTACT
Amateur Radio, Sovereign House, Brentwood, Essex CM14 4SE
(0277) 219876

Commission to approved advertising agencies is 10%.

CONDITIONS
10% discount if advertising in both Amateur Radio and Radio & Electronics World.
A voucher copy will be sent to Display and Colour advertisers only.
Ads accepted subject to our standard conditions available on request.

ADVERTISERS INDEX

POPULAR BAKERS DOZEN PACKS (still available)

All packs are £1 each, if you order 12 then you are entitled to another free. Please state which one you want. Note the figure on the extreme left of the pack ref number and the next figure is the quantity of items in the pack, finally a short description.

BD1 5 13A junction boxes for adding extra points to your ring main circuit.
BD2 5 13A spurs provide a fused outlet to a ring main where devices such as a clock must not be switched off.
BD7 4 In flex switches with neon on/off lights, saves leaving things switched on.
BD9 2 6V 1A mains transformers upright mounting with fixed clamps.
BD11 1 6½in speaker cabinet ideal for extensions, takes our speaker. Ref BD137.
BD13 12 30 watt reed switches, it's surprising what you can make with these – burglar alarms, secret switches, relay, etc., etc.
BD22 2 25 watt loudspeaker two unit crossovers.
BD29 1 B.D.A.C. stereo unit is wonderful value.
BD30 2 Nicad constant current chargers adapt to charge almost any nicad battery.
BD32 2 Humidity switches, as the air becomes damper the membrane stretches and operates a microswitch.
BD34 48 2 meter length of connecting wire all colour coded.
BD42 5 13A rocker switch three tags so on/off, or change over with centre off.
BD45 1 24hr time switch, ex-Electricity Board, automatically adjust for lengthening and shortening day. original cost £40 each.
BD49 10 Neon valves, with series resistor, these make good night lights.
BD56 1 Mini uniselector, one use is for an electric jigsaw puzzle, we give circuit diagram for this. One pulse into motor, moves switch through one pole.
BD59 2 Flat solenoids – you could make your multi-tester read AC amps with this.
BD67 1 Suck or blow operated pressure switch, or it can be operated by any low pressure variation such as water level in water tanks.
BD91 2 Mains operated motors with gearbox. Final speed 16 rpm, 2 watt rated.
BD103A 1 6V 750mA power supply, nicely cased with mains input and 6V output leads.
BD120 2 Stripper boards, each contains a 400V 2A bridge rectifier and 14 other diodes and rectifiers as well as dozens of condensers, etc.
BD122 10m Twin screened flex with white pvc cover.
BD128 10 Very fine drills for pcb boards etc. Normal cost about 80p each.
BD132 2 Plastic boxes approx 3in cube with square hole through top so ideal for interrupted beam switch.
BD134 10 Motors for model aeroplanes, spin to start so needs no switch.
BD139 6 Microphone inserts – magnetic 400 ohm also act as speakers.
BD148 4 Reed relay kits, you get 16 reed switches and 4 coil sets with notes on making c/o relays and other gadgets.
BD149 6 Safety cover for 13A sockets – prevent those inquisitive little fingers getting nasty shocks.
BD180 6 Neon indicators in panel mounting holders with lens.
BD193 6 5 amp 3 pin flush mounting sockets make a low cost disco panel.
BD196 1 in flex simmerstat – keeps your soldering iron etc. always at the ready.
BD199 1 Mains solenoid, very powerful, has 1in pull or could push if modified.
BD200 8 Keyboard switches – made for computers but have many other applications.
BD210 4 Transistors type 2N3055, probably the most useful power transistor.
BD211 1 Electric clock, mains operated, put this in a box and you need never be late.
BD221 5 12V alarms, make a noise about as loud as a car horn. Slightly soiled but OK.
BD242 2 6in x 4in speakers, 4 ohm made from Radiomobile so very good quality.
BD246 2 Tacho generators, generate one volt per 100 revs.
BD252 1 Panostat, controls output of boiling ring from simmer up boil.
BD259 50 Leads with push-on ¼in tags – a must for hook-ups – mains connections etc.
BD263 2 Oblong push switches for bell or chimes, these can mains up to 5 amps so could be foot switch if fitted into pattress.
BD268 1 Mini 1 watt amp for record player. Will also change speed of record player motor.
BD275 1 Guitar mic clip-on type suits most amps.
BD283 3 Mild steel boxes approx 3in x 3in x 1in deep – standard electrical.
BD293 50 Mixed silicon diodes.
BD296 3 Car plugs with lead, fit into lighter socket.
BD305 1 Tubular dynamic mic with optional table rest.

Most other packs still available and you can choose any as your free one.

5A BATTERY CHARGER KIT

All parts, including case, Only £5 plus £1 postage

OVER 400 GIFTS YOU CAN CHOOSE FROM

There is a total of over 400 packs in our Baker's Dozen range and you become entitled to a free gift with each dozen packs.
A classified list of these packs and our latest "News Letter" will be enclosed with your goods, and you will automatically receive our next news letter.

THIS MONTH'S SNIP

3½in Floppy Disc Drive, made by the Chinon Company of Japan. Beautifully made and probably the most compact device of its kind as it weighs only 600g and measures only 104mm wide, 162mm deep and has a height of only 32mm. Other features are high precision head positioning single push loading and eject direct drive brushless motor – Shugart compatible interface standard connections interchangeable with most other 3½ and 5¼ drives. Brand new with copy of maker's manual. Offered this month at £28.50 post and VAT included.

CASE – adaptable for 3" or 3½" FDD, has room for power supply components. Price only £4 includes circuit of PSU. Our Ref 4P8

POWER SUPPLY FOR FDD –5V and 12V voltage regulated outputs, complete kit of parts will fit into case 4P8 price £8 or with case £11.

MULLARD UNILEX AMPLIFIERS

We are probably the only firm in the country with these now in stock. Although only four watts per channel, these give superb reproduction. We now offer the 4 Mullard modules – i.e. Mains power unit (EP9002) Pre-amp module (EP9001) and two amplifier modules (EP9000) all for **£6.00** plus £2 postage. For prices of modules bought separately see TWO POUNDERS.

25A ELECTRICAL PROGRAMMER

Learn in your sleep. Have radio playing and kettle boiling as you wake – switch on lights to warn off intruders – have a warm house to come home to. You can do all these and more. By a famous maker with 25 amp on/off switch. A beautiful unit at **£2.50.**

MINI MONO AMP on p.c.b. size 4" x 2" (app.) Fitted volume control and a hole for a tone control should you require it. The amplifier has three transistors and we estimate the output to be 3W rms. More technical data will be included with the amp. Brand new, perfect condition, offered at the very low price of **£1.15 each, or £13 for 12**

LIGHT BOX

This when completed measures approximately 15" x 14". The light source is the Philips fluorescent 'W' tube. Above the light a sheet of fibreglass and through this should be sufficient light to enable you to follow the circuit on fibreglass PCBs. Price for the complete kit, that is the box, choke, starter, tube and switch, and fibreglass is £5 plus £2 post. Order ref. 5P69.

Ex-Electricity Board. **Guaranteed** 12 months

VENNER TIME SWITCH

Mains operated with 20 amp switch, one on and one off per 24 hrs, repeats daily automatically correcting for the lengthening or shortening day. An expensive time switch but you can have it for only **£2.95** without case, metal case – **£2.95,** adaptor kit to convert this into a normal 24hr time switch but with the added advantage of up to 12 on/offs per 24hrs. This makes an ideal controller for the immersion heater. Price of the adaptor kit is **£2.30.**

FANS & BLOWERS

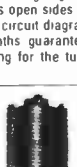
5"£5+£1.25 post. 6" £6+£1.50 post.
4" x 4" Muffin equipment cooling fan 115V **£2.00**
4" x 4" Muffin equipment cooling fan 230/240V **£5.00**
9" Extractor or blower 115V supplied with 230 to 115V adaptor **£9.50**+£2 post.
All above are ex-computers but guaranteed for 12 months.
10" x 3" Tangential blower. New. very quiet – supplied with 230 to 115V adaptor to use two in series to give long blow **£2.00**+£1.50 post or **£4.00**+£2.00 post for two.

9" MONITOR

Ideal to work with computer or video camera uses Philips black and white tube ref M24/306W. Which tube is implosion and X-ray radiation protected. VOU is brand new and has a time base and EHT circuitry. Requires only a 16V dc supply to set it going. It's made up in a lacquered metal framework but has open sides so should be cased. The VOU comes complete with circuit diagram and has been line tested and has our six months guarantee. Offered a a lot less tyhan some firms are asking for the tube alone, only £16 plus £5 post

12 volt MOTOR BY SMITHS

Made for use in cars, etc. these are very powerful and easily reversible. Size 3½" long by 3" dia. They have a good length of ¼" spindle – 1/10hp **£3.45**
1/8hp **£5.75.** 1/6hp **£7.50**



TELEPHONE LEAD

3 mtrs long terminating one end with new BT flat plug and the other end with 4 correctly colour coded wires to fit to phone or appliance Replaces the lead on old phone making it suitable for new BT socket. Price £1 refr BO552 or 3 for £2 ref2P164

COMPACT FLOPPY DISC DRIVE EME-101

The EME-101 drives a 3" disc of the new standard which despite its small size provides a capacity of 500k per disc, which is equivalent to the 3½" and 5¼" discs. We supply the Operators Manual and other information showing how to use this with popular computers BBC, Spectrum, Amstrad etc All at a special snip price of £27.50 including post and VAT Data available separately £2, refundable if you purchase the drive

POWERFUL IONISER

Generates approx. 10 times more IONS than the ETI and similar circuits. Will refresh your home, office, workroom etc Makes you feel better and work harder a complete mains operated kit, case included. £11.50+£3 P&P

J & N BULL ELECTRICAL

Dept AR, 250 PORTLAND ROAD, HOVE BRIGHTON, SUSSEX BN3 5QT

MAIL ORDER TERMS: Cash, PO or cheque with order Orders under £20 add £1 service charge. Monthly account orders accepted from schools and public companies Access and B/card orders accepted **Brighton (0273) 734648 or 203500**

NEW ITEMS

Some of the many items described in our current list which you will receive with your parcel

13A PLUGS Good British make complete with fuse, parcel of 5 for £2. Order ref. 2P185.

13A ADAPTERS Takes 2 13A plugs, good British make, packet of s for £2. Order ref. 2P187.

20V-0-20V Mains transformers 2½ amp (100 watt) loading, tapped pnmary 200-245 upright mountings £4. Order ref. 4P24.

BENCH ISOLATION TRANSFORMERS 250 watt 230V in and out with plenty of tappings to give exact volts. £5 plus £2 Order ref. 5P5.

POWERFUL 12V MOTOR – was intended for Sinclair car, rating approx ⅓hp. Price £15. Ref. 15P8.

BURGLAR ALARM BELL – 6" gong OK for outside use if protected from rain. Mains or 12V batteryn operated, state which required. Price £8. Ref. 8P2.

24 HOR TIME SWITCH – 16A changeover contacts, up to 6 on/offs per day. Nicely cased, intebnded for wall mounting. Price £8. Ref. 8P6.

CAPACITOR BARGAIN – axial ended, 4700μF at 25V. Jap made, normally 50p each, you get 4 for £1. Our ref. 613.

AGAIN AVAILABLE – 12" mini fluorescent tubes. Price £1 each. Ref. BO314

POWER PACK OR AMPLIFIER CASE – Size approx. 10" x 8¼" x 4¾" plated steel – with ample perforations for cooling. Front panel has on/off switch and EEC mains inlet plug with built-in RF filter – undoubtedly a very fine case which would cost at least £50 from regular sources. Our price is £5 each and £3 post. Ref. 5P111.

MINIATURE BCD THUMB WHEEL SWITCH – Matt black edge switch engraved white on black gold plated, make before break contacts. Size approx 25mm high, 8mm wide, 20mm deep, made by the famous Cherry Company and designed for easy stacking. Price £1 each. Ref. BO601

EDGE METER – Miniature, whole size approx 37mm x 13mm 100ua fsd, centre zero scaled 0 to – 10 and 0 to + 10. Price £1 each. Ref. BO602.

CLEANING FLUID Extra good quality – intended for video and tape heads. Regular price £1.50 per spray can. Our price 2 cans for £1. Ref. BO604.

PIEZO ELECTRIC FAN An unusual fan, more like the one used by Madame Butterfly than the conventional type, it does not rotate. The air movement is caused by two vibrating arms. It is American made, mains operated, very economical and causes no interference, so is ideal for computer and instrument cooling Price is only £1 each. Ref. BO605.

SPRING LOADED TEST PRODS Heavy duty, made by the famous Bulgin company very good quality. Price 4 for £1. Ref. BO599.

TELEPHONE BELLS These will work off our standard mains through a transformer, but to sound exactly like a telephone, they then must be fed with 25Hz 50V. So with these bells we give a circuit for a suitable power supply. Price 2 bells for £1. Ref. BO600

ULTRA SENSITIVE POCKET MULTIMETER – 4k ohms per volt – 11 ranges carry one of these and so be always ready to test ac/dc volts to 1000 OC milliamps and have an ohms range for circuit testing. Will earn its cost in no time. Price only £7. Ref. 7P2.

BLOW YOUR ROOF OFF! 40 watt speaker systems – new type you must not hide! They have golden cones and golden surrounds and look really "bootiful". 12" woofer, Midrange and tweeter and comes with a crossover at a special introductory price of £49 carriage paid. Two sets for £95 carriage paid. 140w Woofer only £35 carriage paid.

ASTEC P.S.U. – Switch mode type. Input set for +230V. Output 3.5 amps at +5V, 1.5 amps at +12V, and 3 amps at +5V. Should be OK for floppy disc drives. Regular price £30. Our price only £10. Ref. 10T34. Brand new and unused.

APPLIANCE THERMOSTATS – Spindle adjust type suitable for convector heaters or similar Price 2 for £1. Ref. BO582.

COMPOSITE VIDEO INPUT UNIT – For our 9" monitor with notes on suppression of fly back lines and improving "hold" makes our monitor ideal for use with any computer or camera. Kit contains p.c.b. and all components. Price £4. Ref. 4P23.

3-CORE FLEX BARGAIN No. 1 – Core size 5mm so ideal for long extension leads carrying up to 5 amps or short leads up to 10 amps. 15mm for £2. ref. 2P189

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