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Radio & Electronics

The communications and electronics magazine

World

**SATELLITE TV:
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DEATH OF UK DBS**

**DRAGON MORSE:
A RANDOM TUTOR
PROGRAM**

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Published by

Radio & Electronics World
Magazines
Sovereign House
Brentwood
Essex CM14 4SE
England
Tel: (0277) 219876

ISSN

0262-2572

Printed

In Great Britain

Newstrade sales

Seymour Press Ltd
334 Brixton Road
London SW9 7AG
Tel: 01-733 4444

Subscriptions

Tel: 01-760 0409

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Radio & Electronics World Magazines

Safety in the shack

Some of the constructional projects featured refer to additions or modifications to equipment; please note that such alterations may prevent the item from being used in its intended role, and also that its guarantee may be invalidated.

When building any constructional project, bear in mind that sometimes high voltages are involved. Avoid even the slightest risk - safety in the shack please, at all times.

Whilst every care is taken when accepting advertisements we cannot accept responsibility for unsatisfactory transactions. We will, however, thoroughly investigate any complaints.

The views expressed by contributors are not necessarily those of the publishers.

Every care is taken to ensure that the contents of this magazine are accurate, we assume no responsibility for any effect from errors or omissions.

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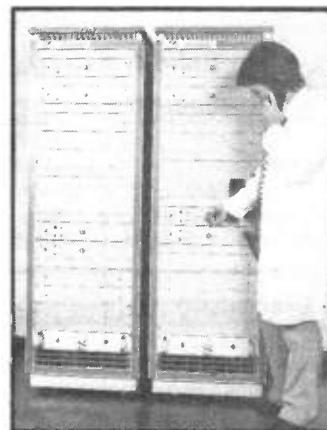
Cover date April 1986 on sale Thursday, 13 March

Publication Date

Second Thursday of the month preceding cover date



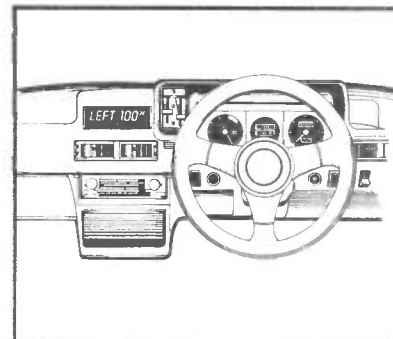
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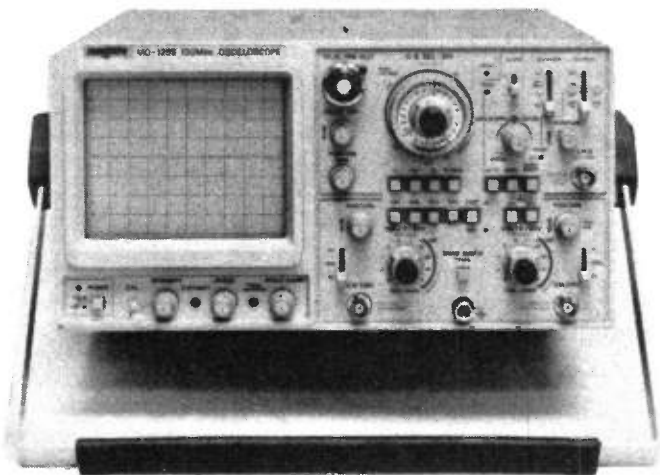


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PRODUCT NEWS

Featured on these pages are details of the latest products in communications, electronics and computers. Manufacturers, distributors and dealers are invited to supply information on new products for inclusion in Product News.

Readers, don't forget to mention **Radio & Electronics World** when making enquiries



BUDGET OSCILLOSCOPE

Fieldtech Heathrow has introduced the Meguro MO-1255 100MHz, 3 channel, 8 trace oscilloscope. With a bandwidth from dc to 100MHz,

maximum sweep rate of 2ms and maximum deflection factor of 1mV per division (20MHz), the MO-1255 achieves the performance and offers the functions of

more expensive scopes.

The control layout has been designed with ease of operation in mind. The vertical deflection mode and sweep mode switches are arranged together on the front panel and all controls are sized for optimum accessibility and convenience of use.

Providing a wide range of waveform observations of both digital and analogue signals, the Meguro MO-1255 is suitable for use in research and development applications, field analysis, production lines and general maintenance services.

*Fieldtech Heathrow Limited,
Huntavia House,
420 Bath Road, Longford,
Middlesex UB7 0LL.
Tel: (01) 897 6446.*

RENT-A-SCOPE

The Tektronix 2430 portable digital oscilloscope is now available for short or long term hire from Instrument Rentals; the first time this instrument has been available for hire in the UK.

The 2430 includes key features of the industry standard Tektronix 2400 in a digital 'scope. A 150MHz bandwidth instrument with 100Ms/sec sample rate, the 8-bit resolution 2430 features 5ns/div maximum sweep speed, and a simultaneous acquisition of two channels to analyse wide band signals.

Five standard acquisition modes are available. The unique envelope mode records and displays maximum and minimum waveform values as fast as 2ns over any sweep rate. Average mode enables continuous averaging for a user selectable number of acquisitions from 2 to 256.

Using Tektronix's patented 'Save on Delta' mode, incoming waveforms can be compared against a user definable reference waveform envelope, and saved for later display, analysis or comparison if it is outside reference limits. Normal mode is for repetitive and non-repetitive acquisition.

Extensive trigger capability includes delay by time, delay by events and combinational triggers. Two external trigger inputs provide flexibility for use in TTL, ECL and analogue circuit applications. Features also include low frequency reject: 0.5 div from 80kHz to 50MHz increasing to 1.0 div at 150MHz; and high frequency reject: 0.5 div from dc to 30kHz, with signals above 30kHz attenuated.

Up to six waveforms can be stored, and full on-screen readout and extensive cursor functions make operation and measurements easy.

*Instrument Rentals,
Dorcan House,
Meadfield Road,
Langley, Berks.
Tel: (01) 897 2434.*

ACCURATE TESTING

A new modulation meter from Radio Telephony Test Systems provides the test engineer with a useful combination of features, including fully automatic frequency operation and full remote IEEE bus control.

The unit, the first in a new range known as the 100 Series, combines high accuracy with a high dynamic range. Three filter bandwidths are available for selective analysis of demodulated signals, and a built-in loudspeaker is included as an aid for RF testing.

Analogue bar graph and digital displays, and software driven testing routines, ensure fast and accurate completion of calibration, commissioning and repair work.

The meter is housed in a rugged, lightweight, impact-

resistant case with a carrying handle and internal battery pack. In workshop applications, compact dimensions ensure minimal use of bench space.

*Radio Telephony Test
Systems Ltd,
Enterprise House,
Central way,
North Feltham Trading
Estate,
Feltham,
Middlesex TW14 0RX.
Tel: (01) 844 1811.*

HANDY-TIMER

The new Handy-Timer offered by Cobonic Ltd features count-down from a preset time duration (maximum 23hr, 59 min) to 0, followed by a one minute time limited acoustic alarm and a count-up which indicates the time lapse since the alarm started.



This count-up can be of considerable advantage. For example, if a chemical lab technician misses the count-down alarm, the Handy-Timer will tell him exactly to the second how much time has elapsed since the alarm started.

Repetitive identical timings do not need to be re-entered, as the preset value is reloaded from internal memory.

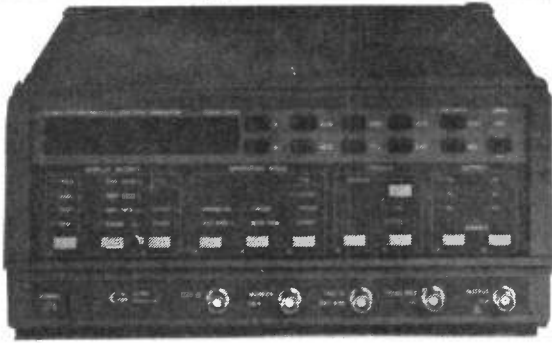
The Handy-Timer has a multi-purpose spring clip for attaching to the user's jacket, or it can stick to any steel surface by its magnetic pad, or simply stand upright on a desk.

The Handy-Timer costs £12.95 plus VAT.

*Cobonic Ltd,
32 Ludlow Road,
Guildford,
Surrey GU2 5NW.
Tel: (0483) 505260.*



FUNCTION GENERATOR



New from Global Specialties is the 8200 series of 20MHz fully-programmable function generators.

Suitable for use in electronic laboratories, design centres and automatic test systems, the 8200 series provides sine, triangle, square and pulses with variable amplitude, symmetry and offset over a 2mHz to 20MHz frequency range.

Fully programmable via the standard IEEE-488 interface bus, the 8200 series features a 6-digit, 7-segment LED display with automatic decimal point, exponent and polarity indication, and easy front panel set-up through a parameters entry keyboard. Parameters are easily modified by the vernier control, and fast and easy access is provided to all programmed parameters.

Output can be continuous, gated, or triggered by an external signal or by means of a front panel manual switch. Start phase of the output signal is continuously adjust-

able from -90° to $+90^\circ$.

When used as a bench unit, the 8200 series function generator uses an internal, battery-operated RAM to enable storage and recall of up to 10 front panel set-ups.

In the sweep generation mode, an internal ramp with variable duration provides a recurring logarithmic sweep over a 10-decade range. Sweep is automatic, up or down, depending on the start and stop frequency set-ups.

Output amplitude ranges from 3.2mV to 30V peak-to-peak into open circuit or 1.6mV to 15V peak-to-peak into 50 Ω , and dc offset is variable from $-15V$ to $+15V$ into open circuit or $-7.5V$ to $+7.5V$ into 50 Ω .

Three models are available in the series: the 8210, the 8230 and the 8232.

*Global Specialties Corporation,
Shire Hill Industrial Estate,
Saffron Walden,
Essex CB11 3AQ.
Tel: (0799) 21682.*

PRICE CUTS

Philips Test and Measurement is introducing a new, improved version of its popular PM3305 series of digital storage oscilloscopes, rationalising the number of models, and cutting prices.

Heading the range is the PM3305CD, which has new digital plotting facilities in conjunction with full IEEE bussability. With the 'scope operating in single-shot

mode, an auto plot facility allows the transient to be recorded automatically on an associated digital plotter. The instrument then resets itself for the next single-shot transient.

The plot software is compatible with the company's PM8154 low cost A4 digital plotter and with the newly-introduced PM8153 high speed, high accuracy A3 digital plotter. The software is designed for HP-GL command language, further extending the versatility of the unit.

Plot size can be either 8cm \times 10cm, giving four on an A4 sheet, or 16cm \times 20cm.

The new PM3305CD, which

CHECKMAN 11

The following features are included on a new low cost pen-type digital multimeter from Telonic Instruments: auto/manual ranging; a continuity 'bleep' tester; a large clear LCD display; data hold; over-voltage protection; and a carrying case.

The Telonic distributed Checkman 11 3 $\frac{1}{2}$ -digit multimeter is an inexpensive pocket-size instrument suited to the needs of field engineers. The Checkman 11 will measure dc or ac volts with 100 μ V resolution on its most sensitive range, ie 200mV fsd to 500 volts fsd. Resistance ranges are 200 ohms fsd with 0.1 ohm resolution to 20 megohms.

The continuity 'bleep' tester provides a simple method of cable tracing or short circuit detection. Operation is easy and a 'data hold' button is provided for locking the reading. The 8mm LCD display guarantees quality reading of measurements.

Another DMM from Telonic, the DM4351, has a 3 $\frac{1}{2}$ -digit maximum 1999 count; 12mm



LCD display; auto and manual ranging; a continuity 'bleep' tester; a 10 amp current range; and a carrying case.

Current ranges are 200mA fsd or 10 amps on a separate input. The continuity bleep, which can be used for cable tracing or short circuit detection, is fast-working, ie approximately 1ms. For diode testing, the DM4351 has an open circuit voltage of 1.5V in continuity mode and continues to read ohms. In resistance mode the open circuit voltage is 0.45 volts.

*Telonic Instruments Ltd,
Boyn Valley Road,
Maidenhead,
Berkshire SL6 4EG.
Tel: (0628) 73933.*

also incorporates analogue output facilities, is available at £3,095 (plus VAT) which represents a price cut of 12 per cent. The PM3305D, a model with analogue recorder output but no bussing facilities, costs £2,595, a 17 per cent drop, and the standard PM3305 has been reduced by 18 per cent to £2,350.

*Philips Test and Measurement Instruments,
Pye Unicam Ltd,
York St,
Cambridge CB1 2PX.
Tel: (0223) 358866.*

PORTABLE MULTIMETER

Now available from Electronic Brokers is the Thandar TM351 multimeter, which has a 3 $\frac{1}{2}$ -digit liquid-crystal display (LCD) with a 0.1%

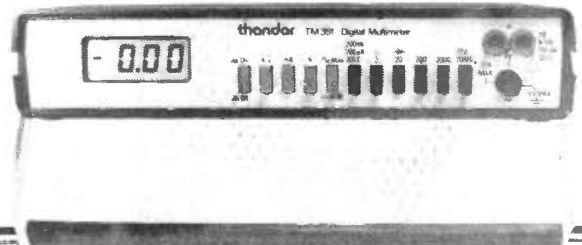
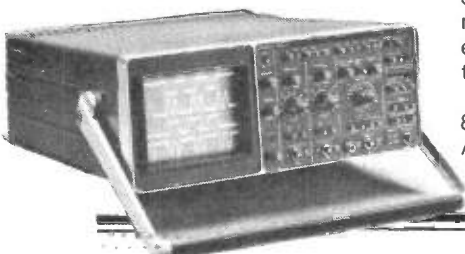
basic dc accuracy.

Features include a dc voltage range of 200mV to 1000V, an ac voltage range of 200mV to 750V, with a 100 μ V to 1V range of resolution, current to 10A, resistance to 20M Ω and diode check facility.

Offering 29 ranges, the TM351 has a maximum common mode voltage of 1000V dc or ac peak, a common mode rejection ratio (CMRR) of more than 100dB at dc 50/60Hz and a common mode noise rejection of more than 60dB at 50/60Hz.

The display has 0.5 inch digits and includes polarity, over-range, and a low battery indication.

*Electronic Brokers Limited,
140-146 Camden Street,
London NW1 9PB.
Tel: (01) 267 7070.*



ECONOMIC DEVICES, PO BOX 228, TELFORD TF2 8QP

16181	1.04	2SC1124	1.26	2SD348	16.13	AN5435	3.08	BC106	0.27	BD222	0.49	BF195	0.14	BSR59	1.29	BZK79 RANGE	0.10
16182	1.04	2SC1151A	4.72	2SD350	5.20	AN5610	7.43	BC187	0.28	BD225	0.49	BF196	0.17	BSS38	0.59	BZY88 RANGE	0.10
16334	0.51	2SC1152	4.68	2SD350A	2.29	AN5612	3.51	BC204	0.16	BD228	0.63	BF197	0.16	BSTBD140G	4.96	C1060	0.46
16335	0.80	2SC1162	1.05	2SD353	7.50	AN5613	3.41	BC207	0.11	BD229	1.05	BF198	0.17	BSTC0246	2.48	C1129	0.58
16446	0.98	2SC1172	2.22	2SD389	2.41	AN6320N	4.28	BC212	0.11	BD231	0.50	BF199	0.17	BSTC0246	6.99	CA1310E	2.70
16600	1.38	2SC1172Y	2.20	2SD401	3.55	AN6326	3.98	BC212B	0.26	BD232	0.50	BF200	0.37	BSTC0233	6.12	CA3044	3.50
16799	2.89	2SC1195	3.26	2SD561	2.42	AN6342	1.61	BC212L	0.10	BD234	0.42	BF216	0.36	BSTC1233	4.34	CA3046	2.06
16801	0.54	2SC1213	0.89	2SD588A	1.99	AN6344	5.87	BC212LB	0.26	BD237	0.47	BF218	0.36	BSTC3146	0.79	CA3060	1.65
16802	1.14	2SC1226	3.13	2SD600	3.25	AN6363	16.00	BC213	0.10	BD238	0.45	BF222	0.55	BSTC00143	3.07	CA3065	1.29
16803	5.30	2SC1306	1.98	2SD621	12.67	AN6551	1.35	BC213L	0.10	BD240	0.45	BF224	0.17	BSTC0643	3.07	CA3069	0.83
16905	0.86	2SC1307	1.98	2SD636	0.40	AN6552	0.68	BC213LB	0.15	BD242	0.37	BF227	0.65	BSV578	3.49	CA3089E	1.43
17074	9.30	2SC1316	4.10	2SD657	2.80	AN7115	2.52	BC214	0.10	BD241	0.59	BF230	0.17	BSW68	0.60	CA3090	1.38
17127	3.51	2SC1364	0.49	2SD679	3.35	AN7145	2.80	BC214L	0.14	BD242	0.50	BF241	0.17	BSX19	0.34	CA3094	2.20
1N4001	0.06	2SC1383	1.20	2SD731	2.11	AN7146	9.50	BC214LB	0.26	BD243	0.50	BF244	0.57	BSX20	0.34	CA3131EM	3.12
1N4002	0.06	2SC1398	0.84	2SD787E	0.62	AN7150	2.45	BC225	0.40	BD243A	0.37	BF245A	0.37	BSX21	0.87	CAH76023N	6.60
1N4003	0.06	2SC1410	3.29	2SD811	5.54	AN7151	2.26	BC237	0.10	BD244	0.51	BF255	0.20	BSY52	0.50	CBF16848N-07	1.56
1N4004	0.04	2SC1413	2.55	2SD823	1.98	AN7156	2.78	BC238	0.10	BD244A	0.85	BF256	0.28	BSY79	0.51	CD4001	0.38
1N4005	0.08	2SC1505	1.00	2SD856	6.61	AN7158	6.75	BC238A	0.13	BD245C	0.99	BF256LC	0.42	BT100A	1.61	CD4002	0.27
1N4006	0.08	2SC1578	8.74	2SD869	7.17	AN7218	1.64	BC239	0.12	BD246C	0.89	BF257	0.34	BT106	1.18	CD4008	1.06
1N4007	0.07	2SC1617	3.89	2SD898B	7.45	AP58076	4.68	BC239B	0.25	BD253	1.05	BF258	0.36	BT108	1.45	CD4011	0.29
1N4148	0.04	2SC1670	3.13	40498	0.50	AS560S	1.58	BC251A	0.12	BD278A	0.80	BF259	0.34	BT109	1.45	CD4012	0.24
1N4448	0.05	2SC1678	1.98	40594	1.53	AU1113	2.57	BC252	0.10	BD317	2.60	BF262	0.57	BT112	2.48	CD4013	0.47
1N5401	0.14	2SC1810	0.66	40595	1.43	AY105K	2.08	BC258	0.25	BD318	2.59	BF263	0.57	BT113	2.48	CD4016	0.45
1N5402	0.15	2SC1815	0.66	40636	1.43	AY106	1.09	BC261A	0.22	BD375	0.42	BF264	0.37	BT116	1.20	CD4017	0.82
1N5403	0.16	2SC1829	2.22	40671	1.53	BA130	0.14	BC262	0.22	BD377	0.26	BF271	0.34	BT119	1.76	CD4020	1.23
1N5404	0.15	2SC1855	1.88	40672	1.53	BA1310	1.98	BC287	0.50	BD379	0.76	BF273	0.20	BT120	2.17	CD4021	0.39
1N5406	0.35	2SC1875	4.77	60857	1.21	BA1320	1.38	BC294	0.50	BD380	0.76	BF274	0.20	BT121	2.48	CD4023	0.28
1N914	0.04	2SC1891	3.69	74LS30	0.32	BA1330	2.75	BC301	0.45	BD410	0.52	BF324	0.23	BT122	2.48	CD4025	0.64
1S44	0.09	2SC1893	3.62	7805 TD-20	0.63	BA145	0.19	BC302	0.53	BD411	6.27	BF336	0.33	BT123	1.98	CD4028	0.84
1S5012A	0.81	2SC1929	2.25	7805 TD-3	1.16	BA148 DIDD	0.33	BC303	1.04	BD418	0.87	BF337	0.36	BT125	2.48	CD4047	1.06
1S921	0.10	2SC1942	5.70	7806	0.73	BA154	0.40	BC307	0.18	BD433	0.41	BF338	0.40	BT126	2.48	CD4049	0.46
2N1302	0.27	2SC1945	4.53	7808	2.39	BA156	0.05	BC307A	0.14	BD434	0.49	BF355	0.49	BT128	2.48	CD4050	0.55
2N1303	0.38	2SC1953	1.53	7812 TD-3	2.85	BA157	0.22	BC308	0.18	BD435	0.49	BF362	0.66	BT128P	3.07	CD4052	0.75
2N2218	0.42	2SC1957	0.95	7812 TD-20	1.16	BA159	0.12	BC308A	0.11	BD436	0.67	BF363	0.60	TBA970	3.06	CD4053	0.80
2N2219A	0.40	2SC1959	0.31	7815	0.64	BA182	0.19	BC309	0.17	BD437	0.49	BF371	0.50	BT151-800R	1.15	CD4059	0.29
2N2222	0.30	2SC1962	1.93	7818	0.70	BA222	1.66	BC317A	0.13	BD438	0.40	BF391	0.25	BT151 500R	1.38	CD4081	0.35
2N2646	0.80	2SC1968	2.92	7824	0.64	BA284/2	0.17	BC327	0.15	BD441	1.42	BF393	1.59	BT16018	2.42	CD4093	0.72
2N2904	0.36	2SC1985	1.75	AC107	0.73	BA301	0.87	BC328	0.11	BD442	0.86	BF417	0.84	BT16218	2.51	CD4511	1.10
2N2905	0.43	2SC1983 TR	7.00	AC117	0.43	BA302	1.24	BC337	0.08	BD507	0.60	BF418	1.87	BT18024	4.43	CP5521	17.83
2N2906	0.38	2SC2009	0.34	AC123K	0.43	BA311	1.32	BC338	0.12	BD509	1.42	BF422	0.29	BT18124	4.89	CV22	3.07
2N3053	0.27	2SC2029	2.33	AC128	0.34	BA312	0.97	BC360	0.34	BD510	0.75	BF423	0.29	BT18214	5.99	CX034	11.83
2N3054	0.99	2SC2027	1.42	AC138	0.09	BA313	0.76	BC368	0.24	BD518	1.50	BF435	0.54	BT18224	2.97	CX095D	3.14
2N3055	0.61	2SC2028	2.11	AC141	0.29	BA317	0.04	BC440	1.09	BD519	1.50	BF450	0.35	BU105	1.50	CX104	9.64
2N3055H	0.85	2SC2057	1.18	AC142K	0.43	BA318	0.08	BC441	1.44	BD529	1.32	BF451	0.29	BU106	2.48	CX120	8.16
2N3442	1.16	2SC2073	1.54	AC151	0.28	BA328	4.77	BC454	0.36	BD530	1.10	BF457	0.41	BU108	1.50	CX109	7.86
2N3702	0.14	2SC2078	2.39	AC153	0.34	BA333	1.37	BC455	0.36	BD533	0.67	BF458	0.39	BU109	2.25	CX121	11.83
2N3703	0.14	2SC2091	1.30	AC176	0.30	BA401	0.64	BC460	0.42	BD534	0.53	BF459	0.52	BU110	5.69	CX130	4.35
2N3704	0.14	2SC2122A	5.12	AC179	0.28	BA511 (IC)	2.92	BC461	0.47	BD535	0.77	BF460	1.56	BU111Y	4.16	CX131	11.83
2N3705	0.14	2SC2141	1.86	AC183	0.72	BA521	2.02	BC462	0.30	BD536	0.67	BF469	0.31	BU124	1.38	CX134	11.04
2N3706	0.14	2SC2166	1.98	AC187	0.39	BA524	8.94	BC463	0.64	BD537	0.74	BF470	0.55	BU126	0.90	CX136	11.49
2N3707	0.11	2SC2216	0.69	AC187K	0.43	BA526	7.98	BC464	0.64	BD538	0.67	BF471	0.31	BU134S	4.57	CX137	11.83
2N3711	0.16	2SC2233	2.20	AC188	0.37	BA532	2.67	BC465	0.64	BD544B	0.83	BF472	0.33	BU204	1.58	CX139	11.83
2N3711	2.04	2SC2271	4.01	AC188-01	0.44	BA536	3.44	BC477	0.32	BD580	1.17	BF479	0.61	BU205	1.08	CX157	4.84
2N3772	1.01	2SC2278	1.14	AC188K	0.43	BA6304A	2.92	BC478	0.32	BD590	1.17	BF480	0.60	BU206	1.27	CX158	4.10
2N3773	2.29	2SC2314	0.87	AC193K	0.65	BA843	3.96	BC479	0.41	BD598	1.25	BF491	0.32	BU207	1.65	CX170	7.62
2N3819	0.41	2SC2335	10.41	AC194K	0.65	BAV18	0.21	BC532	0.28	BD677	0.53	BF495	0.64	BU208	1.12	CX177	6.75
2N3823	1.17	2SC2526	1.87	AD140	1.06	BAV19	0.11	BC546	0.17	BD679	0.57	BF506	0.43	BU208/02	1.97	CX506	9.33
2N3904	0.62	2SC2951	1.26	AD145	1.60	BAV20	0.11	BC547	0.10	BD680	0.76	BF509	0.41	BU208A	1.12	CX507	7.62
2N3908	0.62	2SC2970	2.39	AD149	0.90	BAV21	0.34	BC548	0.10	BD681	1.48	BF523	0.20	BU208D	1.95	CX755	12.95
2N4101	1.33	2SC2970A	1.05	AD161	0.56	BAX12	0.11	BC549	0.10	BD695	2.30	BF594	0.27	BU209	1.93	CX758	7.62
2N4240	3.30	2SC2578	6.75	AD162	0.45	BAX13	0.11	BC550	0.10	BD696	2.47	BF595	0.27	BU226	2.45	D1693	2.59
2N4444	0.90	2SC2644A	4.82	AD262	1.05	BAX16	0.11	BC556	0.16	BD697	3.60	BF596	0.18	BU312	2.38	DEC1	2.20
2N4914	0.72	2SC2671	1.99	AF114	2.47	BB119	0.17	BC557	0.10	BD698	1.85	BF597	0.27	BU326	2.00	DEC2	2.20
2N5064	0.71	2SC2728	0.95	AF115	1.24	BC107	0.13	BC558	0.10	BD699	3.49	BF617	1.05	BU326A	2.20	E1222	0.40
2N5293	0.50	2SC2785	0.75	AF117	0.50	BC107B	0.11	BC559	0.10	BD700	3.70	BF618	1.05	BU326S	2.20	E5024	0.28
2N5294	0.50	2SC372	1.40	AF118	1.20	BC108	0.15	BC560C	0.14	BD702	3.70	BF694	0.22	BU406	1.49	E5386	0.25
2N5296	0.49	2SC373	1.16	AF127	0.50	BC108B	0.15	BC635	0.36	BD707	1.06	BF757	0.59	BU407	0.82	E5529	0.25
2N5297	0.50	2SC383	1.33	AF139	0.53	BC109	0.12	BC636	0.20	BD709	1.12	BF758	0.65	BU407D	1.00	E8021	1.29
2N5298	0.61	2SC388	0.50	AF178	1.46	BC109B	0.15	BC637	0.24	BD710	0.80	BF759	0.47	BU412	5.29	E9003	0.46
2N5490	1.49	2SC394V	0.81	AF179	0.55	BC113	0.14	BC638	0.20	BD807	0.34	BF760	0.65	BU426	1.90	E9005	0.50
2N5496	0.59	2SC41	2.19	AF180	0.55	BC116A	0.25	BC639	0.20	BD809	0						

ECONOMIC DEVICES, PO BOX 228, TELFORD TF2 8QP

HA1338	7.50	M1130	5.35	NE645N	2.98	SAS560	1.85	SN76620	2.59	TA7109	3.71	TC4063BP	4.34	TD2611AQ	2.98	TIP30C	0.40
HA1339	2.33	M191	6.32	NE650N	4.34	SAS560S	1.65	SN76622	1.65	TA7120P	0.64	TC1A150	1.79	TD26120	4.68	TIP31A	0.34
HA1342	2.85	M183	18.55	NE654BN	4.18	SAS560T	5.32	SN76623	0.69	TA7122B/P	0.92	TC1A160B	1.79	TD2620	1.98	TIP31B	0.38
HA1350	3.67	M51102L	6.25	NP1106	5.61	SAS570	1.78	SN76630	2.55	TA7124P	2.34	TC2A270Q	1.71	TD2630	1.96	TIP31C	0.50
HA1355	4.02	M5115P	5.24	OA200	0.11	SAS570S	2.61	SN76640	4.24	TA7130P	1.27	TC2A270S	2.15	TD2631	2.73	TIP32B	0.69
HA1366WR	1.86	M51231P	3.04	OA202	0.11	SAS570T	5.42	SN76651	1.49	TA7136AP	1.27	TC2A270SQ	1.29	TD2640	2.59	TIP32C	0.40
HA1367	4.32	M5124P	4.82	OA47	0.14	SAS580	2.85	SN76650N	2.48	TA7137P	0.98	TC2A290A	1.65	TD2643	12.12	TIP33C	0.80
HA1368	1.90	M5134-3041	4.13	OA90	0.08	SAS5800	2.89	SN76655N	1.49	TA7141AP	3.87	TC2A290A	2.16	TD2651	2.95	TIP34	1.18
HA1368R	2.45	M51394P	11.97	OA91	0.09	SAS590	2.85	SN76665N	1.41	TA7146P	4.23	TC2A40A	1.93	TD2652	6.95	TIP41A	0.49
HA1370	3.71	M5142P	5.49	DA95	0.09	SAS5900	2.56	SN76705N	1.34	TA7148P	1.67	TC2A4500A	2.15	TD2653	5.65	TIP41B	0.31
HA1374	8.80	M5143P	7.33	OC28	2.52	SAS660	1.97	SN76707N	4.39	TA7149P	3.26	TC2A50	3.26	TD2654	4.73	TIP41C	0.45
HA1374A	8.80	M5144P	3.77	OC29	2.15	SAS6600	2.33	SN76709	5.12	TA7161P	5.45	TC2A640	10.16	TD2655B	5.44	TIP42A	0.49
HA1377	3.96	M51513L	2.55	OC35	1.06	SAS660S	1.33	SN76709N	5.45	TA7162P	2.59	TC2A650	2.04	TD2660	2.47	TIP42B	0.79
HA1389	2.39	M51515BL	3.23	OC36	1.28	SAS6610	1.33	SN76730	5.36	TA7169	9.54	TC2A660B	3.00	TD2661	2.47	TIP42C	0.53
HA1389R	2.05	M51516L	3.95	OC44	0.35	SAS670	3.96	SN76810N	0.60	TA7171P	2.79	TC2A730	3.81	TD2670	2.48	TIP47	0.65
HA1392	3.90	M51521L	3.71	OC45*	0.18	SAS6700	1.33	SN76920N	2.80	TA7172P	1.41	TC2A740	2.48	TD2670A	1.94	TIP48	0.92
HA1394	3.95	M5152L	2.88	OC75	0.44	SAS670S	1.33	SN9401	5.54	TA7176P	2.48	TC2A750	2.25	TD2680	3.20	TIP49	3.61
HA1397	3.76	M51522	5.39	ON188	1.87	SAS6710	1.33	SN9402	4.35	TA7193P	6.67	TC2A800	5.95	TD2690A	2.65	TIP55A	3.65
HA1398	3.98	M5191P	4.94	ON236	1.06	SAS6800	2.53	SP8385	0.55	TA7193P	7.26	TC2A800Q	5.95	TD2690A	5.14	TIS43	1.34
HA1406	2.07	M5192	2.20	OT112	1.08	SAS6810	1.43	ST4441C	2.75	TA7201P	2.71	TC2A830S	2.98	TD2790Q	6.52	TIS90	0.28
HA1452	1.63	M5194AP	5.74	OT121	1.32	SBA550B	2.15	STK0029	5.54	TA7202P	2.47	TC2A900	2.04	TD2791	2.50	TIS91	0.29
HA17723	5.94	M53273P	1.02	PD144	2.24	SBA750	1.61	STK0039	5.35	TA7203P	2.18	TC2A910	1.65	TD2795	2.78	TMS1000NL	11.86
HBFA4030AF	2.48	M53274P	1.33	PT2014	3.04	SQ4888P	2.09	STK0050	7.67	TA7204P	2.16	TC2A940E	2.83	TD2800T	2.55	TMS3748HS	16.13
HD38750A53	8.71	MA06	1.07	PT5006	2.48	SC9503	1.85	STK0059	7.13	TA7205P	1.38	TC2C300	3.99	TD2830A	11.49	TMS4116	2.06
HD4480	17.16	MA8001	0.82	PT6042	1.79	SC9504P	1.95	STK0080	9.16	TA7206P	6.25	TC2E527	1.86	TD2830B	2.68	TV106	1.76
HD44801A05	17.49	MB3705	1.81	R1038	2.19	SC9511P	2.39	STK0111	3.96	TA7207P	3.34	TC2E82	1.08	TD2830B	6.47	TV6010B	2.97
HEF4001P	0.67	MB3712	1.85	R1039	2.19	SC9511P	1.33	STK0113	9.25	TA7208P	2.15	TC2E83	1.08	TD2830C	4.25	U05G	1.14
HEF4001BP	0.67	MB3713	1.69	R2008B	1.33	SG264A	5.26	STK0114	8.84	TA7210P	3.58	TC2E84	1.08	TD2830D	7.25	U143M	3.08
HEF4011	0.29	MB3730	3.25	R2009	1.98	SG608	5.26	STK0115	7.75	TA7214P	3.63	TC2E100Q	10.25	TD2830E	9.98	U37003	0.49
HEF4528	0.00	MC13002	6.22	R2001B	1.33	SG613	8.75	STK0116	6.91	TA7215P	2.58	TC2E100	9.61	TD2830F	6.55	UA723CA	5.53
HM6231	9.81	MC1303P	2.16	R2029	1.33	SG629	8.27	STK022	5.25	TA7217AP	1.37	TD190	0.95	TD2830G	9.71	UA758PC	5.29
HM6232	8.89	MC1307P	1.92	R2030	1.33	SG6533	10.31	STK025	12.50	TA7222	1.95	TD3F700H	0.60	TD2830H	13.39	UA783PC	3.38
HM9102	3.22	MC1310P	1.30	R2257	2.38	SI-1125HD	13.86	STK040	10.70	TA7227P	2.81	TD3F800H	4.86	TD2830I	2.98	UA1170	2.31
HM9104	3.24	MC1327P	1.33	R2265	1.49	SI1125H	7.50	STK043	10.48	TA7229P	4.45	TD3F800R	4.86	TD2830J	5.00	UA180	2.36
HM9105	3.24	MC1330P	1.69	R2305	1.18	SKE2F 1/04	1.39	STK054	7.13	TA7233P	3.67	TD3F900H	4.16	TD28361	6.50	ULN2165	1.49
HT4207	17.16	MC1349P	0.99	R2306	1.36	SKE2G 2/04	0.95	STK070	22.31	TA7240AP	7.83	TD4003A	1.79	TD28361A	7.50	ULN2204	7.70
ITT2003	0.22	MC1350P	1.21	R2322	0.59	SKE2G 3/04	0.99	STK077	7.67	TA7245P	7.50	TD41005A	2.22	TD28371A	6.24	ULN2166F	2.15
K1749P	3.46	MC1351P	1.33	R2323	0.76	SKE4F 1/02	1.32	STK078	8.52	TA7314	5.94	TD41006A	1.69	TD28371Q	2.83	ULN2209C	6.32
KA2101	2.92	MC1352P	1.12	R2348	2.01	SKE4F 1/06	0.73	STK082	11.86	TA7325P	1.15	TD41010	1.15	TD28376	7.09	UPC1001H	2.75
KC581C	6.32	MC1357P	2.15	R2354A	2.01	SKE4F 2/06	0.85	STK086	13.59	TA7609	3.17	TD41011	2.40	TD28380	6.79	UPC1026C	1.24
KC582C	3.97	MC1358P	1.30	R2354B	2.01	SKE4F 2/08	0.86	STK1201	6.32	TA7676P	2.81	TD41028	2.45	TD28390B	1.54	UPC1028H	2.00
KC583C	5.54	MC14001	2.40	R2441	0.49	SKE4F 2/10	1.24	STK1210	7.33	TA4300	2.97	TD41029	4.89	TD44050A	3.47	UPC1020H	2.77
L129V	0.25	MC14013	0.41	R2443	0.88	SKE4F 2/02	0.96	STK2230	7.70	TA4310A	1.16	TD41035T	2.52	TD44180P	1.92	UPC1025H	2.90
L200CV	1.69	MC14016CP	0.84	R2461	1.50	SKE5F 3/10	1.30	STK415	7.07	TA4320A	1.27	TD41034B	2.45	TD44260	1.54	UPC1025H	0.62
LA1111AP	0.88	MC14011	0.26	R2477	1.02	SL1310	3.14	STK433	4.95	TA4350A	0.80	TD41037	3.25	TD44280	7.20	UPC1030H	2.27
LA1201	1.02	MC14025	0.60	R2501	1.28	SL1327E	1.33	STK435	5.94	TA4435	1.82	TD41037D	2.95	TD44290	4.47	UPC1031H	4.50
LA1210	1.56	MC14049UBC	1.05	R2540	1.98	SL1430	1.39	STK436	7.21	TA4550	0.37	TD41041	2.16	TD4440	4.90	UPC1031H	6.00
LA1230	2.87	MC1438R	1.05	R2540X	3.30	SL1430T	2.31	STK437	7.80	TA4570	1.74	TD41044	2.62	TD44400	4.27	UPC1154H	1.93
LA1320	2.87	MC14493P	2.82	R2615	0.67	SL1432	2.25	STK439	8.28	TA6611B12	1.30	TD41047	4.20	TD44420	3.95	UPC1155H	2.96
LA1352	1.54	MC14556BCP	3.47	RCA195NB	2.16	SL1414	3.69	STK441	11.31	TA6621AX1	2.00	TD41054M	1.21	TD44422	8.32	UPC1186H	2.94
LA1357N	11.07	MC1712	3.88	RCA16083	5.30	SL432A	3.44	STK443	10.29	TA6640	4.24	TD41059B	0.80	TD44430	4.78	UPC1182H	1.82
LA1363	6.21	MC7724CP	3.49	RCA16029	2.01	SL437	7.43	STK459	9.40	TA6616B	1.00	TD41060	2.59	TD44431	2.27	UPC1186H	1.05
LA1364	3.02	MC7818C	2.18	RCA16334	1.02	SL439	2.48	STK460	10.75	TA6700	2.59	TD41082	3.06	TD44432	2.87	UPC1181H	1.25
LA1365J	3.44	MC7824CP	4.68	RCA16335	1.36	SL480	3.18	STK461	9.68	TA6740	2.50	TD41104	5.61	TD44440	2.27	UPC1213C	0.99
LA1378	6.52	MC78M12	0.83	RCA16600	1.38	SL490	2.37	STK463	11.53	TA6930	4.87	TD41151	1.17	TD44600	3.84	UPC1217C	2.47
LA1385	1.94	MC78M24	0.94	RCA16799	2.38	SL901B	8.32	STK465	10.31	TA6970	2.83	TD41170	2.37	TD44610	2.11	UPC1212C	1.72
LA1387	7.60	MCR100	0.38	RCA16801	0.95	SL917B	9.96	STK466	11.77	TA6100	2.52	TD41170S	3.25	TD44620	4.46	UPC1351C	7.85
LA3155	1.25	MCR101	0.67	RCA16802	1.08	SL918A	9.07	STR441	9.45	TAD332-600	0.73	TD41180	3.25	TD44630	2.73	UPC1353	1.81
LA3300	1.54	MCR106/5	1.57	RCA17028	2.48	SN16861N-07	2.72	STR453	8.16	TAG626-600	1.06	TD41190	2.11	TD44640	2.31	UPC1355C	1.07
LA3301	1.41	MCR220/7	2.28	RCA17074	6.60	SN16880N	3.63	STR6020	8.16	TA120	1.05	TD41190Z	2.48	TD44650	2.92	UPC1350C	2.13
LA3350	1.43	ME0402	0.17	RCA17376	1.58	SN16968N	8.95	T8007V	0.95	TBA120A	1.05	TD41200A	1.43	TD44660	5.15	UPC1362	7.75
LA4030P	4.20	ME0404	0.26	RCA608575	4.95	SN29715N	6.04	T8007	0.62	TBA120AS	1.24	TD41220	1.95	TD44670	2.92	UPC1365	7.10
LA4031P	3.20	ME0404/2	0.47	RGP10	0.50	SN29716N	3.96	T8016	0.60	TBA120S	1.05	TD41230	3.23	TD44680	5.44	UPC1366	7.14
LA4032P	2.35	ME0411	0.28	RT402	1.58	SN29717N	7.19	T8017	0.72	TBA120SB	1.05	TD41235	3.88	TE527	1.38	UPC1360C	4.51
LA4050P	1.57	ME0412	0.24	RT905A	2.38	SN29722	11.85	T8018V	0.72	TBA120T	0.95	TD41270	3.76	TE538	1.40	UPC1458	8.86
LA4051P	1.79	ME4102	0.50	SD280	2.14	SN29723AN	1.65	T8021	0.40	TBA120U	2.50	TD41327A	1.50	TE626	0.49	UPC2022	5.86
LA4100	1.25	ME545B	10.02	SO281	2.14	SN29744N	1.29	T8022V	3.92	TBA1440	2.03	TD413					

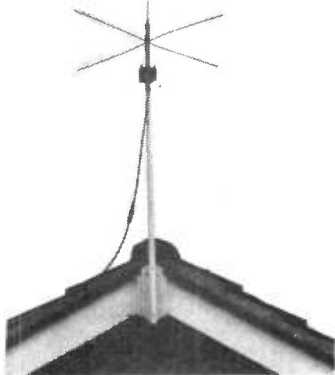
PRODUCT NEWS

2m COLLINEAR ANTENNA

Readers living in flat areas near the sea, where aerials suffer damage from wind and corrosion from the salty atmosphere, may be interested in a new 2m collinear antenna from Buckleys Ltd.

The Uvral X2 is constructed using aluminium and PVC, and the Marconi principle allows the phase change necessary to feed the top element (coil). The end result is a high gain omni-directional antenna (6dBd) which gives a good performance and is resistant to damage from the elements.

It is 3.14 metres long, weighs 1.2kg and wind load is 4.6kgf at 100mph. It comes with 0.5m of UR67 cable, fitted with an 'N' socket, and has an SWR of 145MHz. Maximum power handling is 100W, with a face mounting diameter of 25mm. It costs £28.37 plus £1.50 P&P.



Buckley (Uvral) Ltd,
Beta Works,
Range Road,
Hythe,
Kent CT21 6HG.
Tel: (0303) 60127/8.

CB POWER

CB radio enthusiasts can power their mobile radio units from the mains with a new high quality power supply kit from Electronic and Computer Workshop Ltd (ECW).

The kit, the K2556, is designed primarily for home-based applications, providing a regulated dc output, nominally 12 volts but adjustable from 11 to 13.5 volts dc. Maximum current rating is 3.5 amps.

All the necessary items are supplied with the kit, including a high quality PCB, all electronic and mechanical components, an attractive case with front panel termi-

nals, on/off switch and indicator LEDs. Full instructions are included to make assembly and testing very simple.

Full overload protection is included with an overload LED. Although designed for CB applications, the performance of the K2556 makes it suitable for a wide range of amateur radio and laboratory applications.

ECW can supply the kit at a price of £30.87 including post/packing and VAT.

Electronic & Computer
Workshop Ltd,
171 Broomfield Road,
Chelmsford,
Essex CM1 1RY.
Tel: (0245) 262149.

ON THE RAK

RAK Electronics now have a completely new range of audio amplifier, pre-amplifier, PSU and active crossover modules for the audio professional and enthusiast. The range includes a series of MOSFET power amplifiers featuring low distortion and high reliability, in powers ranging from 150W rms to 500W rms.

In addition, a range of low cost, high quality bi-polar modules is also offered, this time covering powers from

50-300W rms. Both the MOSFET and bi-polar ranges of modules can be bridged if required to generate even higher powers – in excess of 1.2kW continuous from two of the company's MF500s!

These modules are particularly well suited to applications such as PA, studio monitoring, and musical instrument amplification.

RAK Electronics,
Rosewood House, Bridge Rd,
Downham Market,
Norfolk PE38 0AE.

RX MOD

R Withers Communications Ltd have announced a modification for the Yaesu FRG9600 scanning receiver.

As many users will know, the standard frequency range is 60-905MHz. The company has now extended the range to cover up to 945MHz (940MHz guaranteed) with adequate sensitivity to cover the 934MHz range.

The modification also includes improved receiver sensitivity on earlier models, and S-meter recalibration for more realistic readings.

Customers who purchase the FRG9600 at RWC can have the option fitted at no cost. Owners of the FRG9600 can have the mod fitted by RWC

(and the improvements) for £25.00 inc VAT.

Further developments are in progress, with a low frequency option under development to enable operation below 60MHz. It may also be possible to include additional bands to be fitted in 20MHz increments.

Owners are warned, however, that the warranty will be affected on sets not supplied by RWC.

R Withers Communications
Ltd,
584 Hagley Road West,
Oldbury,
Quinton,
Birmingham B68 0BS.
Tel: (021) 421 8201.

20M TRANSVERTER

The CM Howes Communications HC220 enables a 2 metre SSB/CW or multi-mode transceiver to be used on the 20 metre band. It will produce a good 10W or RF output from mismatch proof transistors when operating from a 13.8V dc supply.

In addition to main station use, the HC220 makes HF mobile operating a practical possibility for anyone who can squeeze a 2m rig under the dashboard; the HC220 can

be mounted away out of sight.

The HC220 is available in kit form or as a ready-built and tested PCB module. Full, clear instructions, a parts list and a circuit diagram are included in the package. The kit price is £48.90 and the assembled PCB module costs £79.90 plus 80p P&P.

CM Howes Communications,
139 Highview,
Vigo, Meopham,
Kent DA13 0UT.
Tel: (0732) 823129.

INTELLIGENT DISPLAY

A new programmable 8-character display is now available from RR Electronics Ltd, the Siemens PD-2816, for use with 8-bit micros.

Each character is directly addressable and includes a highlight attribute control bit (blinking, non-blinking, underline) and a decimal point.

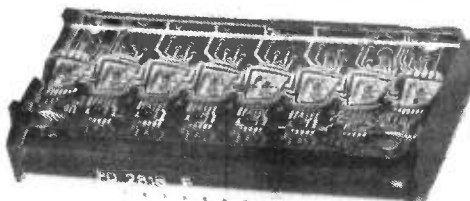
A built-in CMOS chip contains memory, ASCII ROM character generator, multiplexing circuitry, display drivers and bus control. Any number of PD2816s can be cascaded.

The display comprises eight 18-segment, 160mil-

high characters. All displays are intensity-coded for ease of matching in multiple-module designs.

RR Electronics, part of Electrocomponents Group plc, stocks a product range of over 22,000 different lines, all carefully selected 'state of the art' semiconductor, passive components, electro-mechanical products and cables and connectors from over 60 of the world's leading manufacturers.

RR Electronics Ltd,
St Martin's Way,
Cambridge Road,
Bedford MK42 0LF.
Tel: (0234) 47211.



ENGINEERING SOFTWARE

Seasim's growing range of professional engineering software, which includes Harcourt's range of Circuit Modellers and Tatum Lab's ECA 2, has just been expanded to include two new products: Microspice, an electronic circuit and component modelling package supplied on disk for the BBC computer; and Logic Simulation, a MS.DOS and PC.DOS package for nipping tricky problems in the bud.

Microspice is a comprehensive circuit simulator for the BBC computer, having many of the features of Spice (Simulation Program with Integrated Circuit Emphasis) developed at the University of California and used in integrated circuit design where computer simulation is often the only viable method of assessing circuit performance before manufacture.

Microspice handles operating points, small signal (linear) ac analyses, and noise (thermal shot and flicker contributions). These may be used in conjunction with a sweep facility which, at a spot frequency (or dc operating point), allows changes in response with component values to the investigated. Microspice will be valued in engineering

research, design and development, and should prove a very useful educational aid. Price, complete with a manual, is £99 plus VAT.

Tatum's logic simulation system (LSS) allows the behaviour of logic circuits to be checked and analysed. A built-in editor (or your word processor) allows you to build the circuit from a variety of components, including user-defined macros which may be nested indefinitely.

The command list is short and memorable and the simulation is fast, typically 5000 gate evaluations per second. Four logic states are supported - logic 1, logic 0, Hi-z and unknown - and a number of user-defined signal sources may be introduced. The output provides a timing diagram, loading report (fanout) and circuit listings.

Full disk save and load facilities are included. A complete manual is provided containing step-by-step tutorial instructions for first-time users. It costs £350 plus VAT.

*Seasim Engineering Software Ltd,
The Paddocks,
Frith Lane,
Mill Hill,
London NW7 1PS.
Tel: (01) 346 9271.*

PORTABLE PC

Rapid Terminals have received their initial stock of Hewlett-Packard's latest battery powered personal computer, the HP Portable Plus.

Physically similar to the popular HP110 portable, the Portable Plus (measuring 33 x 25 x 7.6cm and weighing 4kg) has a full size keyboard, large

LCD display and a built-in electronic disc. This provides 128KB of mass storage in RAM and can be expanded to 896KB. It has the advantage of being much faster than floppy disc drives.

The Portable Plus can be configured with up to 896KB RAM and 3MB ROM. The machine can be customised



EPROM ERASER



An EPROM eraser which is capable of erasing up to 14 EPROMs simultaneously by exposing them to short wave, ultra-violet radiation is now available from GP Industrial Electronics.

Called the Model 141 EPROM Eraser, the device incorporates an electronic timer adjustable from 5 to 50 minutes in discrete steps. This provides a very useful 'set and forget' facility, preventing accidental over-

posure which can shorten an EPROM life.

The 141 also features an easy-to-use slide in tray for the loading of EPROMs, and a panel indication to show when the device is in use. It is priced at £88.

*GP Industrial Electronics,
Unit E,
Huxley Close,
Newnham Industrial Estate,
Plymouth.
Tel: (0752) 332961.*

EUROBUS

Eurobus, an intelligent I/O channel, is the only bus system which supports the most popular 8-bit (internal 16/32-bit) microprocessors which are available in NMOS, high speed CMOS, or a mix of these technologies.

With 20 address lines and 8 data lines this bus supports all the important industry standard microprocessors, the ease of use and the low cost of interfacing to the bus providing a product suited to a diverse range of industries and applications.

The Eurobus standard, which has been refined over the past decade, is now supported by multiple vendors world-wide.

The Eurobus supports both asynchronous and synchronous access to memory due to the wide variety of processors supported. The asynchronous mode is applicable to the more pseudo 16/32-bit processors (ie 68008) whereas the synchronous mode allows ease of interfacing to earlier generations. For ease of compatibility I/O is always accomplished synchronously.

*PEP Modular Computers,
Am Klosterwald 4,
D - 8950 Kaufbeuren.*

with ROM-based programs to suit specific needs. In a typical configuration, six to eight frequently used programs can be accommodated (twelve 128KB ROMs per software drawer).

ROM software includes Lotus 1-2-3, Memo-Maker/Time Management, Microsoft Word (word processing) and PC2622 (terminal emulation - HP2622 or DEC VT102).

A variety of peripherals may be connected to the computer and two built-in I/O ports are provided - an RS232 and an HP interface loop (HPIL). Battery powered peripherals include the HP9114A 3.5 inch double-sided microfloppy disc drive with 710KB capacity, and the HP2225B ThinkJet personal printer.

Suitable graphics plotters are the 2-pen HP7470A or 6-pen HP7475A. An optional 300/1200bps modem is available.

The price of the Portable Plus with battery pack is £2,154.

*Rapid Terminals,
Rapid House,
Denmark Street,
High Wycombe,
Bucks HP11 2ER.
Tel: (0494) 450111.*

PRODUCT NEWS



FEED-THROUGH CAPACITORS

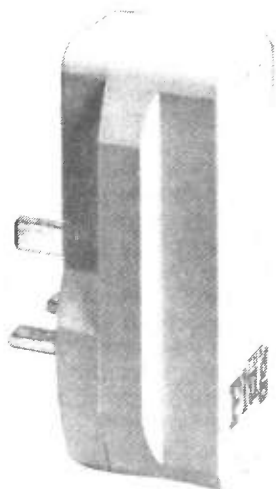
Specialist capacitor distributors Newsham Components Ltd have signed a deal to stock the range of high-current feed-through capacitors made by Belling Lee Intec Ltd, the RFI technology company in the Cambridge Electronic Industries Group.

These capacitors are believed to be the only ones still made in the UK with oil-impregnated paper and foil. This time-consuming manufacturing method produces capacitors of exceptional resilience and durability thanks to the self-healing

properties of the paper layer. They can be used on mains supply circuits as well as in equipment and in the arduous conditions of ship-borne and military applications.

The Intec range extends from 0.05 μ F to 8.0 μ F, with current capacities up to 200 amps. A data sheet is available on request.

*Newsham Components Ltd,
Holly Bank,
Newsham Hall Lane,
Woodplumpton,
Preston PR4 0AS.
Tel: (0794) 22743.*



THE PLUG

LCR Components, manufacturers of a broad range of capacitors and other electronic components, has produced a new plug-in mains filter. Designed to protect microcomputers and sensitive electronic equipment from mains-borne interference, the filter can remove both high energy transients and symmetrical and asymmetrical interference over a wide frequency range.

By simply connecting the filter to the equipment lead in a similar manner to a 13 amp plug, the resultant single plug

and socket connection to the mains supply reduces the risk of accidental disconnection.

The LCR mains filter consists of both a transient suppressor for removing mains-borne spikes and a filter to remove interference. The transient suppressor has an energy rating of 32J and a response time of less than 25ns for a peak current of 1200A.

The filter consists of a twin choke wound on a high permeability ring core coupled with an arrangement of two 2,500pF (Y) capacitors and a 0.1 μ F (X) capacitor. The Y capacitors are of a fail-safe design which prevents short circuits. This is important, since in other makes of filters employing inferior Y capacitors, ignition can result from a short-circuit. The filter gives both symmetric and asymmetric attenuation of mains-borne interference over the frequency range 0.1 to 30MHz.

LCR also offer low earth leakage current filters. This is particularly important for medical equipment etc.

*LCR Components
Woodfield works,
Tredegar,
Gwent NP2 4BH.*

NO ELECTRONIC AMNESIA

A new IC 'smart socket' for RAMs from MS Components eliminates loss of data due to power failure.

Two lithium batteries built into the socket provide dual redundancy back-up in case of power failure. A transparent and automatic switching circuitry senses the loss of power when it occurs and selects which of the two batteries has the highest potential to supply memory retention voltage. If both of the batteries fall below 2 volts, a battery status warning is initiated.

The smart socket accepts either 28-pin 8K \times 8 or 24-pin 2K \times 8 CMOS static RAM chips, and provides a 'write protect' signal at switchover to prevent garbled data. Memories used with the smart socket should have a standby current of less than 1 microamp. Typical types include the Toshiba TC5564PL and TC5517BPL.

*MS Components Limited,
Zephyr House,
Waring St.
West Norwood,
London SE27 9LH.
Tel: (01) 670 4466.*

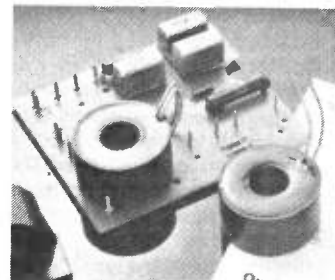
NEW FROM TOROID

Toroid Technology Ltd are manufacturing a new range of toroidal current transformers designed to be used as linear interface elements between electronic circuitry at low power, and high power primary circuits.

The range of transformers features total encapsulated units allowing simple installation direct to printed circuit boards or chassis, with the provision for the primary conductor to be horizontal or parallel to the mounting surface.

Mouldings are flame retardant ABS and casting resins meet UL94V0 standards. Input to output insulation is in excess of 4kV ac rms.

Twelve models are included in the range, each providing current ratings from 5A to 200A with a linear response extending into a 200% overload region for



pulsed and transient inputs. Applications for these products include: as motor controllers, ac, dc and 3 phase; as temperature controllers; power supplies and inverters; energy management control systems; and many uses in the electronic, electrical, engineering and manufacturing industries.

*Toroid Technology Ltd,
175a Brigstock Road,
Thornton Heath,
Surrey CR4 7JP.
Tel: (01) 689 8002.*

SMOOTHLINE

Conblock Electrical Ltd have introduced the new 'Smoothline' connector. It costs no more than a couple of computer games and allows the enthusiast to almost totally eliminate system problems caused by interference transmitted via the mains supply.

Program loading and running problems and other data corruption in computer systems can often be attributed to mains-borne interference. This interference is generated by a variety of electrical equipment and may be attributed in the home to any

appliance being switched on or off either manually or by means of a thermostat, for example, a fridge or central heating.

Voltage 'spikes' appearing on the mains supply can, if transmitted to a computer, appear on the supply line and cause data to be corrupted.

Home computer systems are likely to suffer from similar problems without the use of Smoothline.

*Conblock Electrical Limited,
Mochdre Industrial Estate,
Newtown,
Powys SY16 4LF.
Tel: (0686) 27100.*

SOLDERING ON

A new low-oxide solder cream is now offered by Indium Corporation of America. The second-generation spherical powder used in the new Indalloy solder creams offers less surface area than conventional non-spherical powders and suffers less oxidation, leading to reduced tendency for solder balling.

Indium employs a proprietary technique to produce a highly uniform spherical powder, available in three sizes: -100/+200 mesh, -200/+325 mesh, and -325 mesh.

*Dage (GB) Ltd,
Intersem Division,
Rabans Lane,
Aylesbury,
Bucks HP19 3RG.
Tel: (0296) 33200.*

The lamp has an acrylic lens with a magnification of $\times 2$, a safety cover, and is housed in a stylish white plastic shade. It comes complete with a 40 watt SES candle lamp.

Precise positioning is easy with a neat, chromed adjustment handle, and the lamp is supported by spring-balanced arms. An adjustable clamp is provided, and the 11mm diameter base pin will fit any of the standard Anglepoise bases or brackets.

The lamp, which retails at about £25, is model 87V in the Anglepoise range.

*Anglepoise Lighting Ltd,
Unit 51,
Enfield Industrial Estate,
Redditch B97 6DR.*

LIGHTWEIGHT IRON

The comprehensive Oryx soldering iron range has been extended by the introduction of the Oryx 15. This is a 15 watt, 240 volt lightweight iron. It is based on a successful unit

Oryx built for a national public service organisation.

Now in 'civvy' colours, with an orange handle and black bush, and presented in a point-of-sale transparent package, this unit will serve all aspects of the market, from the hobbyist through to industrial applications. The temperature is set at 350°C nominal from a wirewound element in a tubular ceramic insulator.

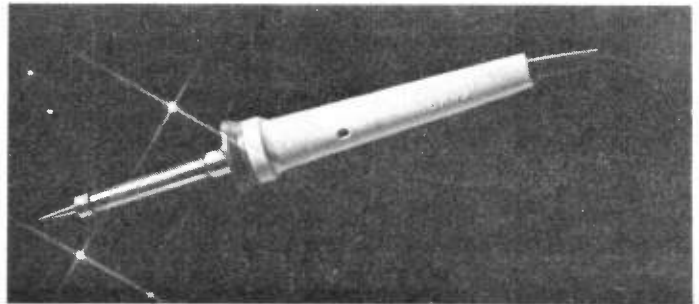
Also available from Oryx is an electronically controlled soldering iron, the Oryx Platinum 45, which is designed for use in the most demanding of

production environments.

The iron incorporates a unique thick film cermet element and an ultra stable platinum resistance temperature sensor, together with miniaturised electronic control circuitry.

The Platinum 45 is available in 24 volts, 45 watts. Its tip temperature is controllable to within $\pm 2^\circ\text{C}$ over the range 260°C to 420°C, and nominal temperature is easily adjustable by the user.

*Greenwood Electronics,
Portman Road,
Reading RG3 1NE.*



LIGHT UP

Anglepoise Lighting Ltd have increased their range of magnifying lamps with a new hobby magnifier.

A FULL HOUSE

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Pixmore Avenue,
Letchworth,
Herts SG6 1JJ

Phone:
0462 685648

NEWS DESK

ITT show off

At this year's Ideal Home Exhibition, ITT Consumer Products (UK) will equip the prestigious Potton show house throughout with working models from the electronics company's extensive range of televisions, videos and audio products.

On display outside the show house will be the most sophisticated colour television in ITT's Digivision range, the Multicontrol, which was unveiled earlier this year.

The Multicontrol has a revolutionary 'picture in picture' facility which adds a postcard-size 'window' to the top right-hand corner of the main screen. In addition to a freeze frame function, picture-in-picture also opens up other opportunities.

The one-sixteenth screen area 'window' of Multicontrol allows other parts of the house (eg, the front door or a child's bedroom) to be monitored via a video camera while a TV channel may be viewed simultaneously. Similarly, it allows the image in the inset picture to be interchanged with the image on the main screen. Thus a computer display can be seen on the main screen, while viewing a TV channel in the window. Alternatively, teletext can be shown on the main screen while monitoring a video or TV channel in the window.

Letter from America

Ever heard of Opelika? Well, nor had I until a press release landed on my desk from one H D Norman Junior, who aims to start a new short

wave radio station from this city in Alabama.

NDXE Global Radio is due to start broadcasting, apparently, on 4 July this year, using a 100kW transmitter and a 100 foot rotatable log periodic antenna. Programming will be based on a mass appeal format of live concerts, sporting events, worldwide phone-ins, news and weather, etc, with financing provided through paid advertising as well as through a 'massive' mail order business. Listeners will be able to write to or call the station to order goods 'from blue jeans to refrigerators'.

An interesting aspect of the new station is its QSL card, which incorporates a 3-D holographic image (much like the new cheque guarantee cards).

No details were given of the frequency to be used, but advertiser enquiries and listener suggestions regarding NDXE should be directed to: *NDXE Global Radio Headquarters, PO Box 569, Opelika, Alabama 36801, USA.*

Distribution contract

Marconi Instruments has appointed Electronic Brokers as an authorised distributor for the company's ranges of high performance RF and microwave test and measuring instruments, including signal sources, digital voltmeters, power and modulation meters, and spectrum analysers.

The appointment marks Marconi's first move into distribution of its top-of-the-range products as an extension of the company's own sales and marketing efforts,

and it also represents a big expansion in the distribution activities of Electronic Brokers.

BT hits high seas

Telex messages for shipping on the high seas can now be received and stored, and relayed later - all automatically - through a new computer-based system installed at British Telecom's Portishead long range radio station in Somerset.

Previously, storage and later transmission of telex messages was done manually by operators. Now, once a vessel is ready to receive the telex message, the new system will automatically transmit.

All ships need do is enter their own watchkeeping arrangements in advance to the Portishead computer's database for automatic transmission during pre-determined times. In this way telex messages can be received on board ship within minutes.

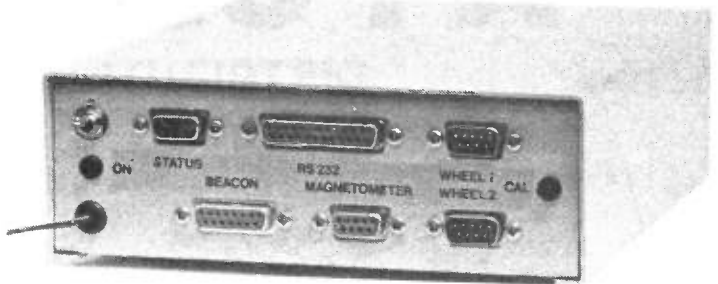
A land-based customer wanting to send a telex to a ship sends the message on a

telex machine in the normal way. The message is relayed to Portishead, where it is held in the radio station's computerised store, and forwarded to the ship. Ships not supplying watchkeeping instructions are called on a regular basis by Portishead until messages have been successfully delivered.

Users of the service can also now send multiple messages during a single call. This feature will benefit companies using modern telex terminals with memory and pre-recorded address list facilities.

One exclusive feature of BTI's radiotelex service is the Frequency Watch facility. This enables watchkeeping instructions to be sent automatically to Portishead. Up to ten instructions a day can be stored for a maximum of 21 days.

BTI's charge for its long range automatic radiotelex service is £1.60 a minute, excluding VAT. With the introduction of new facilities calls are now charged in steps of six seconds.



PACE from Plessey

In-car navigation

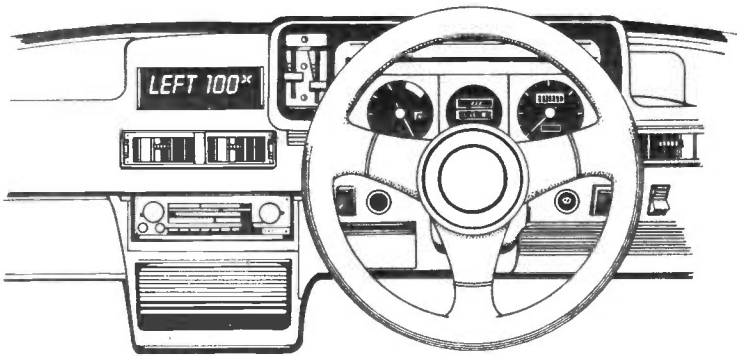
An electronic compass, capable of giving a motorist precise road-by-road directions to any address anywhere in the world while he is driving, has been developed by Plessey.

Motorists with cars equipped with the device will no longer have to consult road maps or stop in busy city streets to ask the way to an address.

They will be able to read the directions from a small display panel on the instrument facia.

All the driver will have to know is the grid reference of his starting point and destination. Once he has entered those into the miniature computer it will give him precise directions: 'Turn left at next junction'; 'Take the A33 at the next roundabout'; 'Road forks - bear right'.

The device, called PACE (Plessey Adaptive Compass Equipment), also has far-reaching security and military applications where there is a need for instantaneous identification of a vehicle or aircraft's precise position.



Channel change

The Department of Trade and Industry recently announced a change in the designated use of international maritime VHF radio Channel 70 (156.525MHz) which took effect on 1 January 1986.

Channel 70 was available for 'intership' communications but now it will be used exclusively for distress and safety purposes using digital selective calling. The DTI has instructed that all intership use of that frequency must cease.

The change is necessitated by Resolution 317 of the International Radio Regulations. It follows a decision made at the 1983 World Administrative Radio Conference (WARC) for mobile services and the clearing of that channel will enable testing to get under way of the future global maritime distress and safety system.

Satellites in education

The UK Co-ordinating Committee on Satellites in Education has published a strategy paper, *Satellites in Education*, which outlines the possible uses in schools and colleges of the data received from radio amateur satellites, University of Surrey satellites and weather satellites.

It will provide the opportunity for technological projects such as constructing detecting apparatus and creating computer models; allow experimentation which reflects many aspects of large-scale research, that is, collecting, processing and interpreting considerable amounts of live data; promote cross-curricular activities linking mathematics, science and technology with the humanities, particularly geography.

Other educational applications currently under way include the use of direct broadcasting satellites as an aid in modern language teaching.

A large number of interested organisations have joined forces to form The UK Co-ordinating Committee for Satellites in Education. The group will assist and liaise with teachers who wish to become involved in using satellite data in education,

individuals or institutions who wish to conduct research on the educational uses of satellites, and agencies that may fund projects.

An immediate task that the group will tackle is the identification of the roles of satellites and satellite data in education.

As part of the initiative a 40-page booklet, *Satellites in Education - a guide for teachers*, is now available. The booklet is distributed by AMSAT (UK), 94 Herongate Road, Wanstead Park, London E12 5EQ. The price is £3.50 (inc p&p) and cheques should be payable to SEUK.

The strategy paper is available free of charge from Dr John Gilbert, Dept of Educational Studies (AA), University of Surrey, Guildford GU2 5XH. Other enquiries regarding the activities of the committee should be directed to the UoSAT project, tel: (0483) 509143.

Education offer

Atari Corporation (UK) Limited has introduced a special educational offer for its top selling 16-bit personal computer, the 520ST.

This will enable educational establishments to purchase the 520ST, with 500K disc drive, 12 inch high resolution monochrome monitor and mouse, for £499 excluding VAT - a saving of over £150 against normal retail. The same system with 14 inch colour monitor is available for £699 excluding VAT - a saving of over £130 against retail.

A software pack including '1st Word', a window based word processor, DB Master One, a data base, ST Basic and Logo programming languages will also be included with both packages.

Full details are available from all Atari authorised dealers or direct from the Atari Education Desk on (0753) 33344.

Electronic messages

Contracts worth about £5 million are to be placed by British Telecom for a public message handling service which will help to make electronic transfer of messages as commonplace as the post.



Shipmate

In order to meet CCIR and IMO recommendations regarding the new international weather and warning service for all types of vessels at sea, Shipmate launched its new generation Navtex receivers at the London Boat Show '86.

Available now is the RS6101 Basic Navtex, where area selection is carried out manu-

ally. To follow shortly will be the RS6100 Automatic Navtex, where area selection will be automatic when connected to Shipmate's navigation receivers. A spin-off from Navtex production will be the RS6150 printer which can be connected to navigation receivers, computers and other equipment requiring a hard copy record of data displays.

This new managed-network service will be started by British Telecom's National Networks Division later this year. It will offer a 'conversion' facility, enabling users to exchange messages electronically between dissimilar equipment such as office workstations, personal computers, word processors, teletex and telex terminals or facsimile. It will also be capable of interconnecting different electronic mail systems.

The message handling service (MHS) will adopt the principles of Open Systems Interconnection (OSI). In general, OSI enables users to mix equipment from different suppliers.

In particular, British Telecom's service will comply with international and European standards for public message handling services, such as the X400 recommendations of the CCITT - the International Consultative Committee on Telephones and Telegraphs.

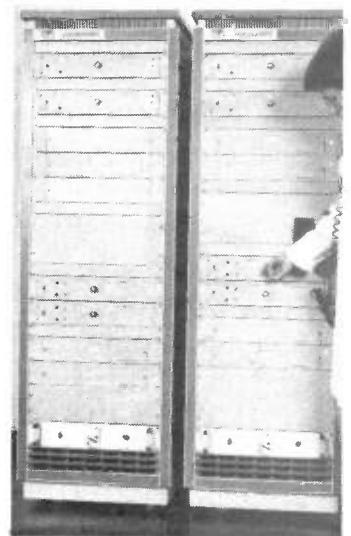
African connection

Final testing has just been completed in the Incomtel workshops on three new studio transmitter links which the company have designed

to win a major North African contract.

This line-of-sight FM radio relay communications system will provide a high quality broadcast audio channel, with sub-channels, and the 10 watt output transmitters will operate in the 800/960MHz band.

Ease of use and minimal maintenance are seen as of prime importance to the customer, and Incomtel have built the whole system into custom designed racks equipped with ac distribution



Incomtel's transmitter terminal

and protection. Four silent vibrationless extractor fans will ensure ventilation in a hot humid environment.

The system provides a one-way broadcast link between the studio and transmitter, and duplicate two-way links connect into the local telephone network and, if necessary, telemetry by means of subcarriers. Telephone interfaces have been designed specially for the unit.

All transmitters and receivers have been duplicated and a facility for automatic changeover incorporated in case of failure. Sophisticated metering will facilitate trouble-shooting. Complete antenna systems were also provided.

Hunt for the sun

Growing interest in alternative energy sources has resulted in a great deal of research into ways of improving the efficiency of known technologies.

The solar cell has a lot of promising applications. Unfortunately, not only is the available sunlight subject to the amount of cloud cover and seasonal variations but also to the angle of the sun at any given hour. Significant improvements, often as much as 100%, can be made by mounting the cell array on a rotating mount that tracks the sun. Some of the systems currently available are fairly costly but a much simpler drive should soon become available.

Mr Alan Freeman has recently patented a sun-seeking cell array. This senses the angle of the sun by means of a pair of solar cells mounted on the array. An opaque screen, between the cells, casts a shadow on one or other of the cells if the array is not pointing directly at the sun.

As the sun passes across the sky, the shadow causes the output of one cell to fall. The cells are connected in inverse parallel so that the

outputs cancel out when both are equally illuminated.

As one output falls, it produces a differential voltage according to the polarity of the higher output. This voltage is passed to a Portescap miniature dc motor/gearbox combination which turns the array towards the sun until both cells are equally illuminated once again. After sunset, the array remains in position until the dawn rays cause it to realign itself on the sun.

Despite the simplicity of the design, the array does not hunt for the sun if a cloud passes overhead, since both sensing cells remain equally illuminated.

Japanese award

On 20 December 1985 Philips, together with Sony, received the Japanese Mainichi Technology Award for the development and commercialisation of the compact disc system. It is the first time that a non-Japanese company has received this award.

It is the eighth international award that Philips have received for the development of the compact disc system.

The Chinese way

Analogic Corporation has announced the signing of an exclusive long-term agreement with Kejian Corporation of the People's Republic of China.

The agreement calls for the establishment of a corporation in China to be known as Analogic Scientific Inc, which will be equally owned by Analogic and Kejian. Under the terms of the agreement, Kejian will work exclusively with Analogic in various areas of technology, including precision data acquisition, signal processing and high-speed computational electronic instruments.

Analogic will manufacture sub-assemblies in the United States and supply these to the joint venture to be combined with assemblies manufactured in China.

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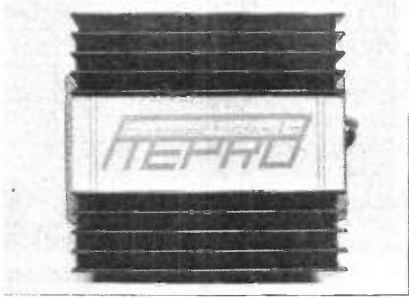
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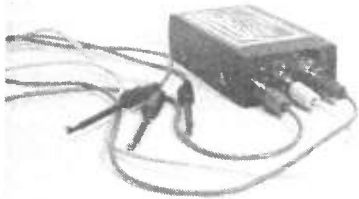
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TV sets of the future will be wider than the present generation (photo IBA)

The IBA has launched a campaign to win acceptance of its Enhanced C-MAC (or E-MAC) TV transmission system. E-MAC enters the arena at a time of intense international battling over the next generation of TV standards.

The E-MAC transmission system is designed to get the most out of the already defined C-MAC satellite transmission format. Europe's first two DBS birds (France's TDF-1 and Germany's TV-SAT) are due to be launched later this year. C-MAC is one of a family of MAC standards that are being adopted by EBU members for transmission through DBS satellites.

E-MAC as a theory was first announced by the IBA in 1982, but it was not until late 1984 that a prototype was engineered. E-MAC was demonstrated alongside the rival Japanese NHK 1125 line 60Hz system at the International Television Symposium in Montreux last summer.

Evolutionary development

E-MAC is an evolutionary development towards HDTV from the C-MAC/packet system, which allows extra 'sides' to be added to a normal 4:3 aspect (width-to-height) ratio TV picture to produce a wider picture. Wide screen TVs of the future will have an aspect ratio of around 5:3. The optimum aspect ratio for future TV systems is one of the several technical parameters at the centre of the current international debate on TV standards.

The IBA achieve this extra picture width by putting additional picture information in part of the line blanking interval that is otherwise used for sound/data signals in the standard

C-MAC format. E-MAC can carry two high-quality sound channels (instead of the eight with C-MAC).

The IBA believe that an evolutionary development towards a future HDTV system is preferable to a revolutionary leap with its consequential forced obsolescence of equipment.

Tom Robson, IBA director of engineering, told the managing directors of the ITV companies and government officials who had been invited to view the system that E-MAC was evolutionary and compatible with existing receivers and studio equipment. This is in sharp contrast to the Japanese MUSE system for the transmission of HDTV, which Robson described as revolutionary and non-compatible. The IBA feel strongly that the NHK 1125 line 60Hz HDTV with its MUSE transmission system is not the solution for 50Hz countries.

The theme of 'evolution or revolution' in the development of higher definition TV systems was also taken up by Philips Electronics' new boss, Mr C J van der Klugt, speaking recently at the Royal Television Society. Philips, said van der Klugt, preferred the evolutionary approach of the MAC system which is 'able to transmit both the TV programming of today as well as that of tomorrow and the day after'.

Referring to the global 'field frequency' conflict, van der Klugt reminded his RTS audience that the world falls into two categories, 50Hz and 60Hz, 'but that the crucial fact is that 75% of the world falls into the 50Hz group'.

Both the IBA as broadcasters and Philips as manufacturers have come out with clear statements in favour of an

evolutionary rather than revolutionary approach to HDTV. Evolution, unlike revolution, they argue, would make possible an orderly transition from today's TV standards to those of tomorrow.

Cellular dumping

The number of cellular radio subscribers in the US has now passed 200,000 (in the UK it was around 40,000 at the turn of the year). A large number of cellular carphones in the United States come from Japan. Some \$150m worth of cellular sets were imported into America last year.

US cellular phone manufacturers, and in particular Motorola, have been accusing the Japanese of dumping. Now it appears that Motorola have won their case against the Japanese importers who have been selling their product at unrealistically low prices.

Anti-dumping duties imposed on Japanese carphone imports to the US range from 3% to 107%. Following the imposition of such swingeing anti-dumping duties in the US, Japanese manufacturers may now be redoubling their efforts elsewhere.

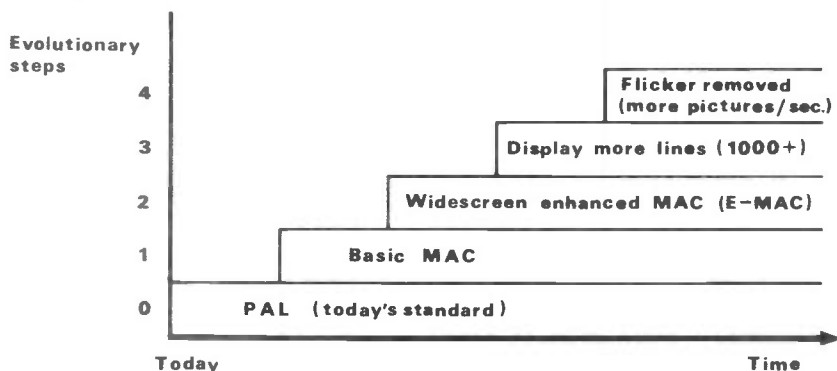
Japan is reported to have opted for the TACS system for their next generation domestic cellular carphone network. This may be good news for the egos of the designers of the UK's TACS system (which was derived from the US AMPS cellular system), but is also likely to signal an even stronger Japanese presence in the UK cellular carphone market.

In amateur radio there is an ominous parallel. The vast home market generated by Japan's own amateur radio population and the Japanese domination of the European amateur transceiver market are not unrelated phenomena! Cellular radio carphones in the UK may be going the same way.

Mobile radio in Germany

Germany's first ever mobile radio conference and exhibition, 'Funk '85', took place in Dusseldorf in mid-November. The clash of dates of the two-day German event with a similar event in the UK (Comex '85) no doubt reflects, in its own small way, the general lack of effective co-ordination that exists in

The IBA's proposed evolutionary route towards the higher definition TV standards of the future (courtesy of the IBA)



mobile radio throughout Europe!

The 500 delegates attending Funk '85 heard eight well documented papers on the current situation and future developments in mobile radio in Germany.

A general overview paper by the DBP (German Post Office) explained that there are some 1.5 million mobile radio installations in service in Germany today, and that they were all confined to a spectral bandwidth (below 1GHz) totalling no more than 80MHz (mobile radio in Germany, unlike in the UK, has not had the 'windfall' allocation of Band III).

About 600,000 of the German mobiles are PMR in one form or another. Public services such as police and ambulances account for 300,000 units. Paging systems where each unit is counted separately represent another 300,000 units. Germany's saturated Netz-B2 carphone network (which was originally installed in 1972) has 26,000 subscriber units. The European paging network accounts for another 100,000 units.

Germany's new Netz-C 450MHz cellular network came on stream on a test basis in September and will be opened to the public on 1 May 1986. In September Netz-C area coverage was 70%, and this will be increased to 100% (including West Berlin) before the public opening.

The German C-450 cellular system is not compatible with any of the first generation cellular systems being used by its neighbours (Benelux: NMT 450, France: Radiocom 2000, Switzerland: NMT 900, Austria: NMT 450), but it has been exported to South Africa.

Radiopaging in the UK

With more than a quarter million pagers already in service on British Telecom's radiopaging network and an annual growth rate in excess of 25%, radiopaging in the UK has come a long way since the days of the first experimental networks in 1973.

National coverage has always been a primary objective of BT's planning engineers. The UK is divided into 40 radiopaging zones, which cover in excess of 95% of the population. Radiopager users can select geographic zones according to the coverage they require.

The backbone of BT's national pager network is the network of 360 transmitters sited all around the UK operating on a pair of radio channels at 153MHz.

By the use of 30-second and 60-second time-slot sequences within a two minute calling cycle, as well as judicious planning of the zones, it has been possible to combine good service coverage with an efficient use of radio spectrum.

BT claim that no more than two minutes ever elapses between the request for paging and the transmission of the radiopaging call in all the required zones. Five interconnected, high-capac-

ity terminals are used to manage the routing of paging calls. The present network can accommodate up to one million tone-alert pagers. BT claims to have the largest national radiopaging system in the world.

As part of an expansion programme, BT are now adding a third calling frequency. The new 'message display' pagers take up more air time than tone-only pagers and put a heavy demand on the network. Initially the new third frequency will be used in the busiest areas only. Rediffusion Radio Systems are currently supplying BT with a hundred PT2100 paging transmitters for the new third paging channel. The second channel of these new dual-channel transmitters can eventually be used for a fourth channel at 153MHz.

Cordless QRM!

There is, it seems, ever increasing interference to users of the amateur HF bands from both near and far. Computer hash, over-the-horizon radar, the DIY

brigade with their electric drills and TV timebases have now been joined by another spectral pollutant: the cordless telephone.

The majority of cordless phones in use are the 1.7MHz/49MHz type. There is a full-duplex link between the fixed and the portable unit, and the base unit transmits into an inefficient antenna on frequencies none too far from Top Band. Even though cordless telephone antenna efficiencies at 1.7MHz and power are both low, a casual spin around the dial between the top end of medium wave and the low end of Top Band in any built-up area reveals numerous 'ringing-tones' and a clutter of cordless telephone conversations.

The unsuppressed first harmonic of some local cordless phones can land right in the middle of the CW portion of 80 metres! There's nothing worse than trying to winkle out some juicy DX station on 80 metres CW only to have it blotted out by a neighbour's cordless telephone ringing all across the band!

REW

BT's national radio paging network on 153MHz is divided into 40 zones and covers 95% of the population



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5. CW operation is available.
6. Free CW/RTTY applications software.
7. The board may be used to send and receive ASCII.
8. Write your own routines using the interface board.

The good news is that this board is still available at the old price of £37.50 (inc VAT) + P&P @ 75p which makes it even better value than before. Existing users need not feel left out, your old interface board can be upgraded – please write or ring for details.

PLEASE NOTE. The SS99H requires an external 5V logic compatible terminal unit, such as the MPTU-1 (See previous adverts).

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We are pleased to also announce the introduction of a new electronic log book. This program will allow you to enter details of up to 232 contacts including name, callsign, date, time, RST. Routines available include the ability to search, printout, save, load and amend files. The program is written in machine code for compact fast operation and is MICRODRIVE compatible. The software also features an automatic cassette to MICRODRIVE transfer routine. Order code – SS03C. Price £5.95 (inc VAT) + 25p P&P.

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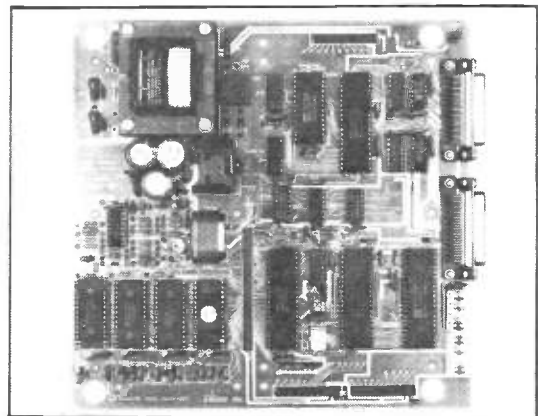
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AMATEUR RADIO WORLD

Compiled by Arthur C Gee G2UK

One of our daily papers recently ran the headline: 'Radio Hams Run Higher Risk of Killer Disease!' In so doing they resurrected the old question of high frequencies being dangerous to health. Their heading related to two short papers which appeared in *The Lancet*, a much respected medical journal, concerning the death statistics from leukaemia – a malignant disease of the blood system.

During the last war constant rumours circulated that those operating the new-fangled system known as 'radar' were being subjected to influences which would hasten their death from that much dreaded disease, cancer. As far as the writer knows, no concrete evidence was ever produced which supported these rumours. They were in the same category as those which asserted that the depressant drug 'bromide' was put into army tea 'to keep the boys off the girls', or that vitamin A was given to night-fighter pilots in the form of carrots to enable them to see better in the dark! However, it started the popular belief that radiation of the type associated with 'radio waves' was dangerous.

With the greater concern about atomic radiation coming along with the arrival of the 'nuclear age', the possible dangers of radio waves fell into disregard. But from time to time the argument reappears, as the daily paper heading above indicates.

The matter has been further brought to public attention by a report from Poland that military personnel who have been exposed to microwave radiation are statistically more likely to suffer from cancers than those not so exposed. And again, the media recently came out with the suggestion that microwave cookers might be a possible source of dangerous radiation, resulting in skin cancers and cataract.

Thermal danger

Undoubtedly constant exposure to high levels of microwave radiation could cause harm, if only due to the heating effects they can produce in human tissue. Similarly, damage to the eyes could be caused by the heat generated if the tissues of the eye were exposed to it for any considerable time. One can safely say, however, that with the amount of radiation which may be absorbed from such equipment as amateur radio trans-

mitters, domestic microwave cookers, TV and computer type cathode ray tubes etc, the chances of being exposed to sufficient radiation to damage one's health is small indeed.

Further reassurance is contained in a reply the RSGB received from the National Radiological Protection Board to an enquiry they made relating to the matter. From a note in *Radio Communications* for August last we reproduce their observations: 'NRPB scientists keep all the harmful effects of non-ionizing radiation under continual review, and it is still our opinion that electromagnetic fields are not carcinogenic. However, we would repeat our previous warnings against excessive exposures to the thermal effects of electromagnetic fields: in amateur radio, such exposures can always be avoided.'

Licensing information

The Radio Regulatory Division of the DTI has recently issued a useful and interesting information sheet outlining the radio amateur licensing work carried out by the department. It begins by saying that the job of looking after the interests of radio amateurs has high priority. This entails issuing amateur licences, interpreting licence conditions, taking responsibility for the Radio Amateur Examination and the Morse test, enforcing the Wireless Telegraphy Acts and deciding on changes to the licence where they appear necessary.

The RRD advises the government on amateur radio policy and takes part in international discussions about such matters as reciprocal licensing, etc.

The leaflet explains in detail a number of these topics. The Post Office, for instance, through its Radio Amateur Licensing Unit, issues licences by computer on behalf of the department. Full definitions of the A and B licences are given as well as the procedure for issuing repeater and beacon licences. There is an interesting paragraph on Morse code and the desirability of keeping it in the amateur licence for the foreseeable future.

The leaflet can be obtained from the DTI Radio Regulatory Division, Waterloo Bridge House, Waterloo Road, London SE1 8UA. It is issued free of charge and should be read by those persistent complainers who continue to gripe at the

licensing procedure for radio amateurs in this country.

Band planning

The newcomer to amateur radio transmitting may find it difficult to know just where in the various bands he should be for transmissions in, say, CW or SSB: this is not always obvious. Tuning over the 80 metre band recently the writer came across a newcomer innocently calling CQ on CW right on top of a very well-established and much respected SSB net! His efforts rapidly got him a request – very nicely given I must add – to please QSY as a phone net was on that frequency, and anyway convention indicated that CW should be at the other end of the band. True enough – quite apart from the fact that he would not have found anyone else around that frequency to have a CW QSO with!

So, if this catches the eye of any raw beginner just starting off 'on the air', make sure you are in the right part of the band for what you are attempting to do. Band planning is not determined by any 'radio regulations'. It has 'grown up over the years', more or less by gentlemen's agreement, weighted by the accord of the IARU at conferences.

Very roughly, the lower frequency ends of the bands are reserved for CW operators and the rest is taken up by SSB operators who use more space and make up the majority of users. Between the two is a small band of frequencies occupied by those using 'specialist' types of communication, such as RTTY, etc. This is more or less the pattern, so make sure you don't get into the wrong patch!

AMSAT-UK

Towards the end of last year, AMSAT-UK circulated a questionnaire among its members to ascertain their views on the possibility of AMSAT-UK 'co-ordinating a building project to make a satellite – or part of a satellite – and if so, what sort of a satellite should it be?'

This was sparked off by a feeling, expressed more and more frequently recently, that the builders of satellites due for launch in the near future are putting their energies into 'high tech' projects which, whilst very praiseworthy in stimulating technical advances, are not providing the majority of amateur radio satellite users with the facilities

they really want. There is a bit of a rift developing between the majority of users of amateur radio satellites and those who design and build them.

The questionnaire was put together and subsequently analysed by AMSAT-UK committee member Richard Limebear G3RWL. A comprehensive report on the survey results is given in *Oscar News* No 56, December 1985, p10.

Of 2,000 questionnaires sent out, 301 were returned; a response level of about 15%, which is said to be about typical. The preferred transponder mode was Mode B, ie, 70cm up, 2 metres down. There was good support for types of communication techniques requiring the use of computers; on the other hand many were opposed to what they regarded as unnecessarily complex systems.

There seemed to be enough opposition to this trend to warrant planners considering carefully that, whilst there is obviously a need for high-tech development, the needs of the less experienced must not be forgotten. It is the newcomers and less experienced who will keep the organisation going and it is just as important to keep them interested and coming into the fold as it is to provide something challenging for the

experienced 'high-tech' enthusiasts.

Oscar 10 memory fault

One often wonders, with all the satellites up in space these days, and what must be masses of bits and pieces of rockets, old satellites, etc floating around, whether any damage gets caused to the former by the latter! Even the professionals are getting concerned by what they call 'space debris', judging from a recent article in the *ESA Bulletin* entitled *Space Debris - a Hazard for the Space Station?*

It seems that a memory unit on Oscar 10 has been damaged, not by a bit of spacecraft debris, but possibly by an 'energetic' cosmic particle. A fault in the Integrated Housekeeping Unit (IHU) memory unit has occurred. The IHU memory was designed to correct what are called 'soft errors', the kind which occur randomly and are one-shot events, and so-called 'hard errors', ie ones which represent a physical change in the hardware and are permanent. The IHU software can not only detect errors when they occur but can automatically correct them so as to avoid any serious consequences. The satellite is completely under computer control and any uncorrected software error could be devastating.

The system is designed to count the number of times the error-correcting feature has functioned. This count indicates the number of errors incurred. Some time ago it was noticed that the number of errors had increased. After some diagnostic software was applied to the satellite it became apparent that the errors were hardware based (the memory chips involved, 16K NMOS devices, had been modified by AMSAT to reduce radiation hazards. The modification included a tantalum metal strip on the chip and a brass enclosure).

Fortunately the memory is concerned with data collection and not with functional aspects of the satellite so no degradation of performance is likely.

Amsat Arsene

The French amateur radio satellite Arsene is progressing satisfactorily and a launch for it is being sought on a future Ariane launch. The mechanical structure is complete and spin balance and vibration tests have taken place. The prototype spacecraft electronics are performing satisfactorily and work is progressing on the aerials and the solar array panel deployment mechanisms, a new kick motor and the command and telemetry systems. REW

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- 2 - mains operated relays 3 x 8 amp changeover, (s.h.)
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- 61 - ferrite slab aerials with 1.6 & 1.4 wave coils
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- 10 - assorted knobs 1/4 spindles
- 5 - different thermostats, mainly bi-metal type
- 1 - magnetic brake - stops rotation instantly
- 1 - low pressure 3 level switch can be mouth operated
- 2 - 25 watt pots 8 ohm
- 20 - 25 watt pots 1000 ohm
- 71 - 4 - wire wound pots - 18, 33, 50 and 100 ohm your choice
- 1 - 1250 watt dimmer Ultra ref SE20
- 77 - time reminder adjustable 1-60 mins clockwork
- 80 - 2 - 10A bridge rectifiers 30V
- 81 - 2 - 30A panel mounting stylok fuses
- 85 - 1 - mains shaded pole motor 3/4" stack - 1/4 shaft
- 88 - 1 - mains motor with gear box 1 rev per 24 hours
- 91 - 2 - mains motors with gear box 16 rpm
- 96 - 1 - thermostat for fridge
- 97 - 1 - infra red fire element 1000 watts
- 98 - 1 - motorised stud switch (s.h.)
- 101 - 1 - 2 1/2 hours delay switch
- 102 - 1 - mains power supply unit - 9V DC
- 103 - 1 - mains power supply unit - 6V DC
- 104 - 1 - mains power supply unit - 4.12V DC
- 105 - 1 - 5 pin flex plug and panel socket
- 107 - 1 - 5" speaker size radio cabinet with handle
- 110 - 1 - slider type volume controls
- 111 - 2 - musical boxes (less keys)
- 112 - 1 - heating pad 200 watts mains
- 113 - 1 - FM front end with tuning condenser and data
- 114 - 1 - 1W amplifier Mullard 1172
- 115 - 1 - wall mounting thermostat 24V
- 118 - 1 - teack effect extension 5" speaker cabinet
- 120 - 2 - p.c. boards with 2 amp full wave and 17 other reeds
- 121 - 4 - push push switches for lamps etc
- 122 - 10 - mtrs twin screened flex white p.v.c. outer
- 124 - 25 - clear plastic lenses 1 3/4 diameter
- 123 - 100 - staples for thin flex
- 125 - 4 - items - rev per hour mains motor, counter, coin switch and srbp panel
- 127 - 4 - pilot bulb lamp metal clip on type
- 128 - 10 - very fine drills for pcbs etc
- 129 - 4 - extra thin screw drivers for instruments
- 130 - 2 - centre zero panel meters 100-0-100 UA
- 131 - 1 - 100 UA edge wise balance meter
- 132 - 2 - plastic boxes with windows, ideal for interrupted beam switch etc.
- 134 - 10 - model aircraft motor - requires no on/off switch, just spin to start
- 136 - 2 - car radio speakers 5" round 4 ohm made for Radiomobile
- 137 - 1 - 6 1/2" 4 ohm 10 watt speaker and 3" tweeter
- 142 - 10 - 4 BA spanners 1 end open, other end closed
- 145 - 2 - 4 reed relay kits 3V coil can be normally open or clo if magnets added
- 146 - 20 - pilot bulbs 6.5V 3A Philips
- 147 - 1 - secret switch kit with data
- 148 - 1 - printed circuit kit with 100 circuits
- 149 - 4 - socket covers (protect inquisitive little fingers) for twin 13A
- 152 - 1 - air or gas shut off valve - clockwork operated
- 153 - 1 - air or gas shut off valve - thermostat operated
- 154 - 1 - 12V drip proof relay - ideal for car jobs
- 155 - 3 - varicap push button tuners with knobs
- 158 - 5 - 12 way connector blocks 2A 250V
- 159 - 3 - 12 way connector blocks 2.5A 250V
- 162 - 1 - 13A fused and switched spur for surface mounting or can be removed from box for flush mounting
- 163 - 3 - 13A sockets good British make but brown
- 165 - 4 - short wave air spaced trimmers 2.30F
- 171 - 1 - shocking coi kit with data - have fun with this
- 172 - 10 - 12V 6W bulbs Philips m.s.
- 176 - 4 - heavy duty push switches - ideal for foot operation 3A 250V
- 175 - 5 - lilliput bulbs 12V
- 178 - 3 - oblong amber indicators with lilliputs 12V
- 180 - 6 - round amber indicators with neons 240V
- 181 - 100 - p.v.c. grommets 3/8 hole size
- 182 - 1 - short wave tuning condenser 50 pf with 1/4" spindle
- 183 - 1 - two gang 50 pf short wave tuning condenser with 1/4" spindle
- 184 - 1 - three gang tuning condenser each section 500 pf with trimmers and good length 1/4" spindle
- 188 - 1 - plastic box sloping metal front, size 16 x 95mm average depth 45mm
- 191 - 6 - B.C. lamp holder adaptors white
- 193 - 6 - 5 amp 3 pin flush sockets brown
- 195 - 5 - B.C. lampholders brown bakelite threaded entry
- 196 - 1 - in flex simmerstat for electric blanket soldering iron etc.
- 197 - 2 - thermostats, spiffle setting - adjustable range for ovens etc.
- 198 - 1 - rod thermostat for water heater etc. 11" rod
- 199 - 1 - mains operated solenoid with plunger 1" travel
- 200 - 1 - 10 digit switch pad for telephones etc.
- 202 - 8 - computer keyboard switches with knobs, pcb or vero mounting
- 206 - 20 - mtrs 80 ohm, standard type cox off white
- 211 - 1 - electric clock mains driven, always right time - not cased
- 216 - 1 - stereo pre amp Mullard EP9001
- 2 - stereo headphone leads, curly and terminating with stereo jack plugs
- 231 - 2 - TV aerial outlet sockets, brown but easily painted to match skirting
- 232 - 2 - 12V solenoids, small with plunger
- 233 - 1 - mains transformer 9V 1 amp secondary C core construction
- 238 - 3 - boxes with hinged lids size 2 1/4" x 1 1/4" x 7/8 made from clear plastic
- 241 - 1 - car door speaker (very flat) 6 1/2" 15 ohm made for Radiomobile
- 241 - 2 - speakers 6" x 4" 4 ohm 5 watt made for Radiomobile
- 243 - 2 - speakers 6" x 4" 16 ohm 5 watt made for Radiomobile
- 244 - 1 - mains motor with gear-box very small, toothed output gives 1 rpm
- 245 - 4 - standard size pots, 1/2 meg with dip switch
- 1 - 13A switched socket on double plate with fused spur for water heater
- 266 - 2 - mains transformers 9V 1/2A secondary split primary so ok also for 115V
- 267 - 1 - mains transformers 15V 1A secondary p.c.b. mounting

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 (EP9001) 100 amp module (EP9001) and two amplifier modules (EP9000) all for £8.50 plus £2 postage. For prices of modules bought separately see TWO POUNDERS.

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Flat Battery! Don't worry you will start your car in a few minutes with this unit - 280 watt transformer 20 amp rectifiers, case and all parts with data £18.50 or without case £16.00 post paid.

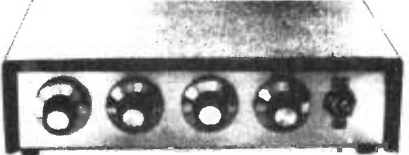


Ex-Electricity Board. Guaranteed 12 months.

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/off's per 24hrs. This makes an ideal controller for the immersion heater. Price of adaptor kit is £2.30.

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Complete kit of parts for a three channel sound to light unit, controlling over 2000 watts of lighting. Use this at home if you wish but it is plenty rugged enough for disco work. The unit is housed in an attractive two tone metal case and has controls for each channel, and a master on/off. The audio input and output are by 1/4" sockets and three panel mounting fuse holders provide thyristor protection. A four pin plug and socket facilitate ease of connecting lamps. Special price is £74.95 in kit form.

TANGENTIAL BLOW HEATER

By British Solartron, as used in best blow heaters. 3Kw £6.95 complete with 'cold' half and 'full' heat switch, safety cut out and connection diagram.

Please add post £1.50 for 1 or 3 for £20 post paid 2.5 Kw Kit Still available: £4.95 + £1.50 post or have 3 for £16 post paid.

FROZEN PIPES

Can be avoided by winding our heating cable around them - 15 mtrs connected to mains costs only about 10p per week for run. Hundreds of other uses as it is waterproof and very flexible. Resistance 60 ohms/metre. Price 28p/metre or 15m for £3.95.

CORDLESS TELEPHONES

"IT'S FOR YOU-OU" even if you are in the bath, its an infinite extension any room and even in the garden. No need for approval or come and try one here. BT approved £120 not yet approved £59. Both have 10 memory. SOCKETS PLUGS ETC for BT phones Master socket (has surge arrester - ringing condenser etc) and takes B.T. plug £2.95 Extension socket £2.95 Dual adaptors (2 from one socket) £3.95 Cord terminating with B.T. plug 3 metres £2.95 Kit for converting old entry terminal box to new B.T. master socket, complete with 4 core cable, cable clips and 2 BT extension sockets £11.50

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Learn in your sleep. Have radio playing and kettle boiling as you wake - switch on lights to ward 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. Independent 60 minute memory jogger. A beautiful unit at £2.50

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Following the popularity of our BAKERS DOZEN £1 PARCELS, we are now introducing some BAKERS DOZEN £2 PARCELS. We feel that you will agree that most are exceptional bargains but you can still get a bit extra, as with the £1 parcel, if you buy 12 you get another free!

- 2P1 - 24 hour time switch with 2 on/off's, an ideal heating pad
- 2P2 - Wall mounting thermostat, high precision with mercury switch and thermometer
- 2P3 - Variable and reversible 8-12v psu for model control
- 2P4 - 24 volt psu with separate channels for stereo made for Mullard UNILEX Amplifiers.
- 2P6 - 100 watt mains to 110 volts auto-transformer with voltage tapping
- 2P7 - Mini key, 16 button membrane keyboard, list price over £12, as used on PRESTEL
- 2P8 - Mains motor with gear box and variable speed selector. Series wound so suitable for further speed control
- 2P9 - On and off switch. Boxed, glass fronted and with knobs. Controls up to 18 amps. Ideal to program electric heaters
- 2P10 - 12 volt 8 amp mains transformer - low volt winding on separate bobbin and easy to remove to convert to lower voltages for higher currents
- 2P11 - 8 amp module Mullard Unilex EP9000 (note stereo pre-amp module Unilex 9001 is SD216)
- 2P12 - Disk or Tape precision motor - has balanced rotor and is reversible 230v mains operated 1500 rpm
- 2P13 - Sun Lamp switch stays on for 1/2 hr or 1 hr depending on setting of grub screw
- 2P14 - 20 Amp Stop meter, with thrown arm piercing squawk
- 2P18 - Interrupted Beam kit for burglar alarms, counters, etc
- 2P17 - 1 rev per minute mains driven motor with gear box, ideal to operate mirror ball
- 2P18 - Liquid/gas shut off valve mains solenoid operated
- 2P19 - Discio switch-motor drives 8 or more 10 amp change over miniature switches supplied ready for mains operation ah
- 2P20 - 20 metres extension lead, 2 core - ideal most Black and Decker garden tools etc
- 2P21 - 10 watt amplifier, Mullard module reference 1173
- 2P22 - Motor driven switch 20 secs on or off after push
- 2P23 - Clockwork operated 12 hour switch 15A 250V with clutch
- 2P24 - Counter resettable mains operated 3 digit
- 2P27 - Goodman's Speaker 8 inch round 8ohm 12 watt
- 2P28 - Drill Pump - always useful couples to any make portable drill
- 2P29 - 24 position Xalkey switch contacts rated 5A - 1/4 spindle
- 2P30 - 15 metres 8 way telephone or interconnecting wire
- 2P31 - 4 metres 8 way interconnecting wire easy to strip
- 2P32 - Hot Wire amp meter - 4/2 round surface mounting - old but working and definitely a bit of history
- 2P34 - Solenoid Air Valve mains operated
- 2P35 - Battery charger kit comprising mains transformer, full wave rectifier and meter, suitable for charging 6v or 12v
- 2P36 - 20 Amp meter, with shunt unused but ex-equipment
- 2P37 - 0-100 micro amp meter, 2" square flush mounting good make
- 2P38 - 200 R.P.M. Geared Mains Motor 1" stack quite powerful, definitely large enough to drive a rotating arm or a tumbler for polishing stones etc.
- 2P41 - Liquid crystal display, 8 digit 13mm black on silver.
- 2P42 - Tubular timer, 50 watts per ft. unused but slightly storage soiled, made by G.E.C. Perfect order (must be collected by appointment as 12ft long).
- 2P43 - Small type blower or extractor fan, motor inset so very compact, 230V.
- 2P44 - Inverter to operate 21" 13 watt fluorescent tube off 12 volts.
- 2P46 - Our famous drill control kit complete and with prepared case.
- 2P47 - Joy switch kit complete as previously sold.
- 2P48 - Telephone ringing unit reduces mains to 50 volts and changes frequency from 50 Hz to 25 Hz to give right ringing tone.
- 2P49 - Fire Alarm break glass switch in heavy cast case.
- 2P51 - Stereo Headphone amplifier, with pre-amp and normal controls.
- 2P54 - 2 1/2kw. blow heater section of coal or oil effect fire, this is a sheet metal assembly which holds the elements, the motor with fan, and the lamp holders and bits which give the flickering flame effect. Please collect or add £3 to cover packing and postage.
- 2P55 - Mains motor, extra powerful has 1 1/2" stack and good length of spindle both ends.

IONISER KIT

Refresh your home, office, shop, work room, etc. with a negative ION generator. Makes you feel better and work harder - a complete mains operated kit, case included. £11.95 plus £2.00 post.

£5 POUNDERS

Most items listed under this heading have been discounted by at least 30% previously they were bargains so now they must be super buys, but you can still have a free one order any twelve and you can pick another free. All items new unless otherwise stated.

- 12 volt submersible pump complete with a tap which when brought over the basin switches on the pump and when pushed back switches off, an ideal caravan unit.
- Sound to light kit complete in case suitable for up to 750 watts.
- Silent sentinel ultra sonic transmitter and receive kit, complete.
- Dial indicator, measures accurately down to 0.1mm, "John Bull" or equally first class make, a must for toolmaker or lathe worker.
- 250 watt isolating transformer to make your service bench safe, has voltage add, taps, also as it has a 115V tapping it can be used to safely operate American or other 115V equipment which is often only insulated to 115V. Please add £3 postage if you can't collect as this is a heavy item.
- 12V alarm bell with heavy 6" gong, suitable for outside if protected from direct rainfall. Ex GPO but in perfect order and guaranteed.
- Tape punch and matching tape reader, not new but believed in perfect working order if not so we would repair or replace within 12 months. Please add £2.50 postage.
- Sensitive voltmeter relay, this consists of a 4 1/2" ama moving coil meter with electronics (we will supply cct. dig.) were made for the GPO at a cost we understand of over £120 each, they are new and still in maker's boxes.
- Box of 25 fluorescent tubes 40 watt daylight or warm white ideal window pelmet, signs, show cases etc. Please collect or add £2 postage.
- Box of 25 18" fluorescent tubes assorted colours, please collect or add £2 postage.
- 24 x 8 ft 85-120 watt warm white tubes. Ideal plant growing, potatoe chitting etc - collect or send open cheque to cover carriage.
- Equipment cooling fan - mini snail type mains operated by quiet running shaded pole motor.
- Ping pong ball blower - or for any job that requires a powerful stream of air - ex computer, but perfect order collect or add £21 post.
- Uniselector 360 degrees rotation, 5 poles, 50 ways, standard 50V coil.
- Washing machine water pump, main motor driven so suitable for many applications.
- Control panel case, conventional design with hinged front and finished metallic silver, easily arranged as lockable size approx. 15" x 10" x 5 1/2", wall mounting.
- Two kits: matchbox size surveillance transmitter and 2 FM receiver.

VARIABLE AC POWER SUPPLY

by Dr M A Kiam-Laine

Most electrotechnicians have encountered variable mains auto-transformers (commonly known as variacs) in laboratories and colleges, but it seems that the use and virtues of such devices are hardly appreciated by radio amateurs in general.

Admittedly they are expensive; a new 8 amp unit costs nearly £90, and this fact alone deters most domestic buyers, but second-hand units (usually very robust and as good as new) are not so difficult to find. The Service Trading Co, for example, were advertising some at Chiswick some time ago for £40, and if you are lucky you may see them for around £10 at bring-and-buy stands. So, assuming you can get hold of one, it just remains to convince you of its merits, which should leave you wondering how you ever managed to live without one before.

Genuine experimenters and persons of the type quite happy to rewind normal mains transformers to get the secondaries they want are the people who will benefit most by having an adjustable ac

bench supply with automatic earth-failure cut-out and current metering. We will also discuss the topic of mains 'isolation', which is familiar to television repair technicians on account of the bad habit many manufacturers have of not fitting input transformers and so causing one side of the mains to be wired direct to the chassis. This is becoming a problem to radio amateurs as they increasingly use TV monitors for computer-controlled RTTY and data transmissions.

Great need

If you are like me, with about 30 healthy-looking but unmarked transformers stacked in various cupboards and other equally interesting pieces of equipment bought for next to nothing simply because they were of foreign origin and needed 110V ac supply, then a variac becomes really useful.

The great problem with switching any ac motors or primary windings of uncertain type straight onto 240V ac is

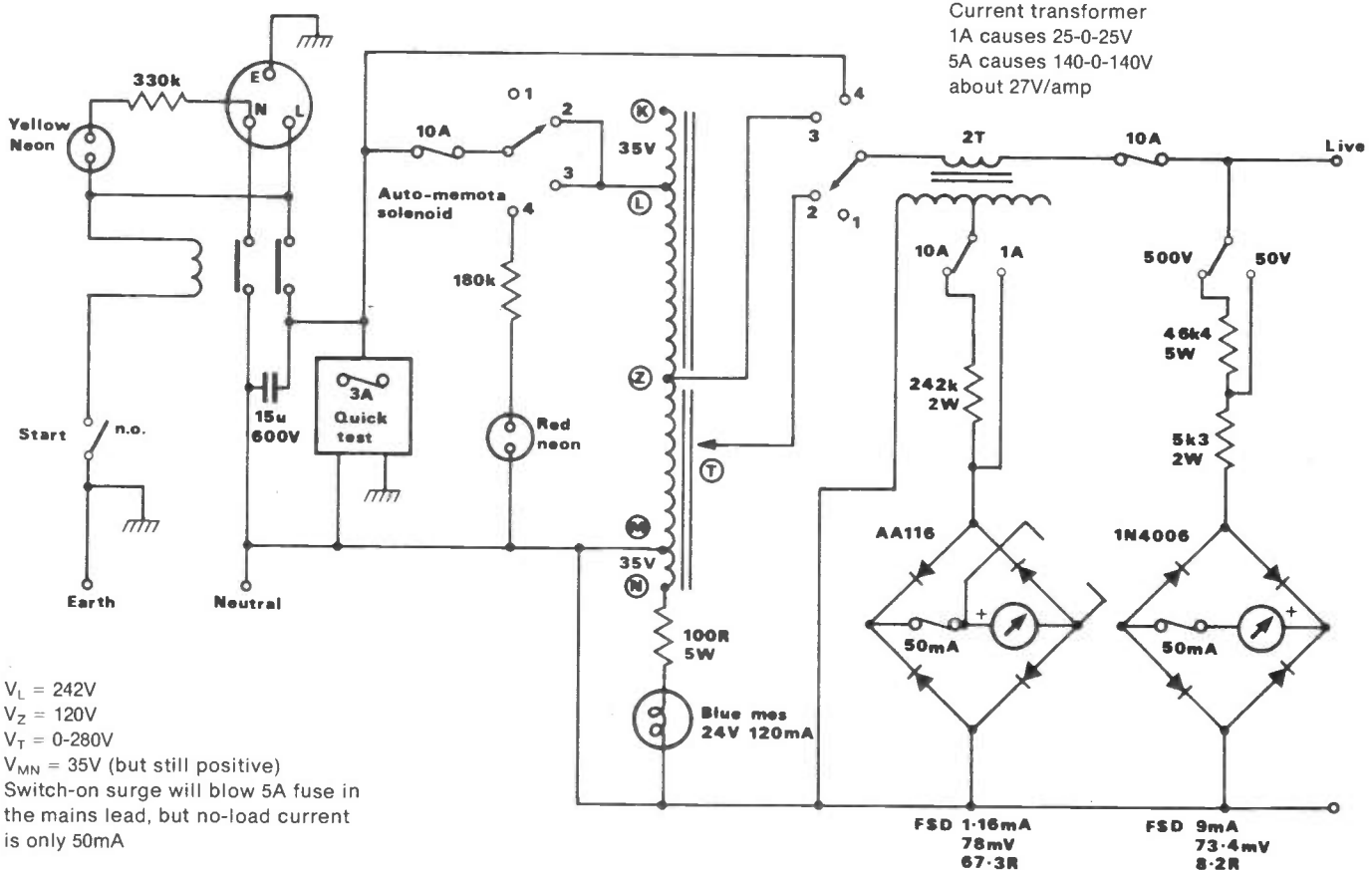
simply that of restricting the ac current consumption to within the limit you reason it might take. If you guess incorrectly (see later) as to which is the primary winding on a transformer, then applying 240V could draw 20 amps and blow the fuse, or even worse burn out the winding itself. A variac allows you to gradually turn up the voltage and watch how the current is increasing.

First, then, we will present the circuit diagram of the equipment to be described, and later talk about the uses to which it can be put.

Referring to the circuit diagram and starting at the top left with the 240V mains input socket, we see that the amber neon is directly across the input to indicate 'stand-by' when the equipment is connected.

The 'Auto-Memota' is a solenoid contactor switch manufactured by Mem Ltd and available from local electrical installation shops. On pressing the spring-return 'push to start' switch, the solenoid will only hold down the contac-

Variac power supply circuit diagram



tor if the supply earth exists, and will immediately release (thus disconnecting the equipment) if the earth route becomes disrupted. The Auto-Memota operates with quite a loud clunk and proceeds to hum and buzz with authority.

The 15 μ F capacitor is for power factor correction in view of the inductive loads which the unit may supply, but it's not likely to be essential unless you plan to leave anything running for days at a time. It must, however, be rated at 600V ac if you do fit one.

'Quick test'

The 'quick test' spring terminal block is one of those (similar to 'Safebloc' and 'Keynector') which allows any apparatus without plugs to be quickly tested by snapping the bare wire ends under the levers and shutting the lid to apply 240V.

The 10 amp (or 13 amp) fuse is necessary since the variac itself is highly inductive, and the switch-on surge will blow a 5 amp fuse even though the no-load steady current is only 50mA ac.

The four position selector switch (get one off an old electric cooker) gives (1) off, (2) variable output, (3) fixed 120V ac, and (4) fixed 240V ac via the current transformer and metering. The red neon emphasises that the live terminal is live (even though the voltmeter should also be reading 240V when position 4 is selected). The blue light is of the 24V MES type since neons in blue are so dull, and it shows that the variac itself is operating in either mode 2 or 3.

The variac used here had terminals labelled K, L, Z, M, N, T, where Z is the centre tap and L and M are each 35V away from the end terminals. T is the actual carbon slider which you can rotate around the winding causing the output voltage to vary from zero to 275 volts. Other makes of variac may be labelled differently but usually follow this design; there's not much scope for them to be different.

Negligible

The current transformer is so named due to it only having 2 or 3 turns of copper bar on its primary but hundreds of fine wire turns on the secondary, with the result that voltage on the primary is negligible and does not subtract from the 'live' line output voltage. However, the current through the primary does cause a fairly high (about 27V/amp on this one) voltage on the secondary which can be rectified and used as an indication of the current flowing in the primary.

This device has an unpleasant non-linear characteristic, which means that a moving coil dc meter can only be arranged to be exact at (say) the middle of its scale but may be severely in error at the far right. However, it's better than nothing, and since you're most likely to never be using more than 5 amps it's advisable to calibrate (using an AVO 8)

for 5 amps at centre scale.

The spring-loaded switch allows a $\times 10$ expansion for the more normal transformer primary currents, which will be less than 1 amp.

Another approach would be to mark the scale on the meter with actual operational values of current, then take it out and repaint it. I didn't do so on this variac, but have often changed scales on meters with good results. You can buy typists' 'Tipp-Ex' correction fluid and 'Letraset' black rub-on lettering and make quite a nice job of custom scales.

The voltmeter similarly has a $\times 10$ expansion switch and of course the actual metering devices can depend on what you have available.

In retrospect I may try replacing the current transformer with a low value heavy duty resistor. 0.1 ohms would only drop 1 volt at 10 amps and the scale would be linear provided the resistor doesn't heat up and change its value (as noted once in a dc supply). Actually the wiring you use between terminal T and live may be resistive enough to develop a few millivolts at 10 amps and so drive a meter direct without adding a resistor.

You will find in practice on transformer

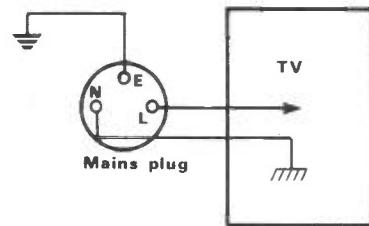
cores of less than 1kW that you will not be concerned with decimal places of accuracy, nor with linearity on current readings. The primary concerns are (1) whether the current is less than 1 amp, or (2) whether it rapidly increases, indicating saturation of the core, as you slowly turn up the voltage.

Alternatives

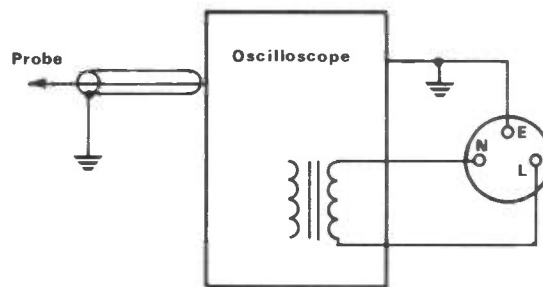
Alternatively, of course, if you can buy one of the older types of moving iron ac meters for 10 amps, its scale will already be marked non-linearly and can directly replace the current transformer etc.

The control dial on a variac is usually marked 0-275V on one side and 0-100% on the other, giving you a choice. I prefer the 0-100% and rely on an accurately calibrated voltmeter on the output.

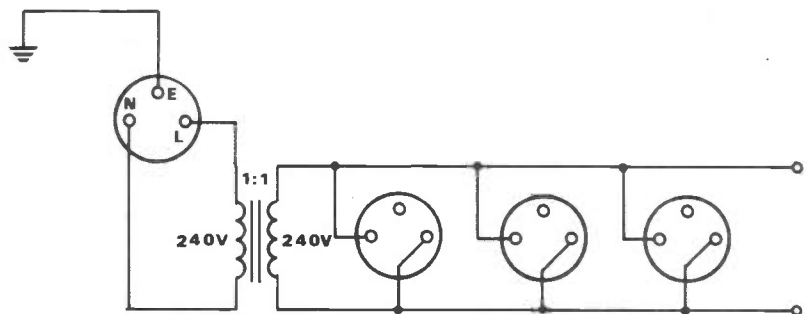
In the photograph showing the internal layout there is a large transformer on the left which is not actually wired in yet. It delivers a ferocious 2700 volts. I don't yet know what use it may have but since the variac case had plenty of space inside it this transformer was fixed there ready for future design. Thus the apparatus can be considered a comprehensive ac bench supply.



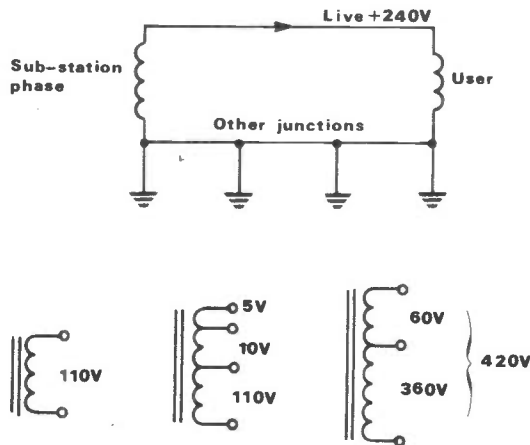
Showing a cheap TV with only 2 wire mains leads



Showing oscilloscope chassis and probe screen bonded to mains earth



Showing 3 pin sockets with earth not wired in because of the transformer



Showing the three sections of core transformers

Television technicians in particular may wonder why this design does not include a one-to-one 'isolation' transformer to 'protect' them as they connect their oscilloscope earth clip onto what can often be a live TV chassis. Well, if you've got such a transformer then certainly include it in the final circuit, but it should be clearly understood that an 'isolated' 240V supply can still kill you just as efficiently as direct mains, and this fact is often understated in books on TV servicing.

Real 'protection' occurs more in your thinking processes prior to making connections to anything, and personally I prefer to check each and every TV to make sure that the mains plug is *not* wired so as to bring the chassis live. Thus the false sense of security induced by having isolation transformers is avoided. Sockets should also be fused at about 3 amps maximum for each television.

The principle of mains isolation is best shown by the diagrams. Cheap TVs do not have input transformers and have

only 2-wire mains leads. If the wires are reversed through carelessness, the TV would still work but the chassis would be at +250V potential. The oscilloscope chassis and probe screen are both bonded to mains earth. Thus if you hastily clip your scope onto a TV chassis you could be connecting mains earth directly to mains live, with a flash and a bang if you're lucky, or a bad shock if your left hand is holding the TV chassis while the right holds the oscilloscope earth clip.

One-to-one

To reduce this danger, most TV servicing company benches supply the mains through a one-to-one ratio transformer. The sockets have 3 pins but earth is not wired to them, and because of the transformer *either* side of the socket can be earthed by an oscilloscope probe clip without shorting the pin shown as L in the diagram.

However, I repeat that it is a much better habit to first check the wiring of the TV plug and chassis, and if it has been

wired incorrectly you will then have also improved its safety for whoever next services it. People who *do* have isolated mains benches are the ones who get careless when working elsewhere on a bench that is not isolated.

Earthing systems

A few paragraphs should be added about earthing systems likely to be encountered around England. According to the IEE regulations on domestic and industrial wiring of public mains supplies (pages 107-110) there are several variations on exactly how and where the earth line is connected. These are known as 'TN-S', 'TN-C', 'TN-C-S', 'IT' and 'TT' and may come as a surprise if you thought all earthing was nationally the same (TN-C = terra neutral combined).

As far as users need be concerned, the main message of these variations is that there is plenty of cable and junctions between your socket and the local substation transformer, and consequently plenty of opportunity for earth connections to become faulty; or perhaps your building was never wired properly in the first place. Are you *sure* that *your* earth actually provides a return route for large currents?

It's no good testing with a neon, since one of these will light without any definite copper route to earth at all, and the well-known 'push to test' earth circuit breakers are legally optional and rarely fitted in domestic houses, so you probably haven't got one.

In short then, merely because your socket has got an earth pin this does not mean it's got a functional or reliable earth.

The use of the Auto-Memota in this variac design will save any worries as it automatically drops out in the event of an earth failure, and you can't switch it on at all if the earth doesn't exist to start with.

Incidentally, if anyone cares to write in and explain, I've never yet heard any convincing reason why this country needs 3-wire supplies at all. What's wrong with 2 and a law to say that the return neutral must be earthed at the user's end and at all other junctions en route? This would seem to simplify the system, and America runs on 2-wire distribution, doesn't it?

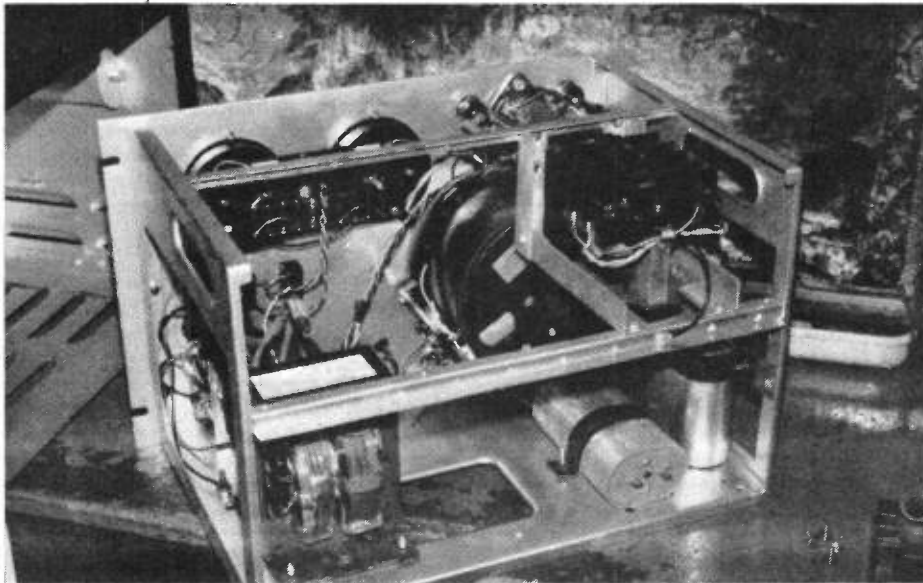
This completes the description of the apparatus' design, and now we can consider its uses.

Transformer testing

With regard to the testing of transformers, some readers might be keen to enquire why they should not use an ohmmeter to sort out the various windings, and not bother with variacs?

Well, of course you should do that, drawing a diagram at the same time, and on most small and medium sized (less than 300 watt) cores you can deduce reliably what the connections are.

Inside the completed unit



However, with larger cores the primary windings can be of such low resistance (less than an ohm) that normal ohmmeter readings become untrustworthy. Not only may the basic accuracy of the meter itself be inadequate to discriminate, but your test leads, their sockets, and solder blobs on winding terminations cause resistances similar to the winding itself.

So in short you can't easily be sure which are primary and which are secondary windings. It is quite ridiculous that transformers costing £20-£100 to produce are commonly not fitted with good quality tags and engraved with their voltages, but such is the tendency of manufacturers nowadays anxious to save £2 with these bad habits.

Older transformers of higher quality by companies such as Gardner and Partridge always used to have good termination panels, but even then the tags might annoyingly be numbered instead of marked with voltages.

Further confusion

A further confusion with large core transformers is that the primaries may be in three sections: (a) 110V, (b) 110V + 10V + 5V, (c) 360V + 60V, to allow connection to different types of supply.

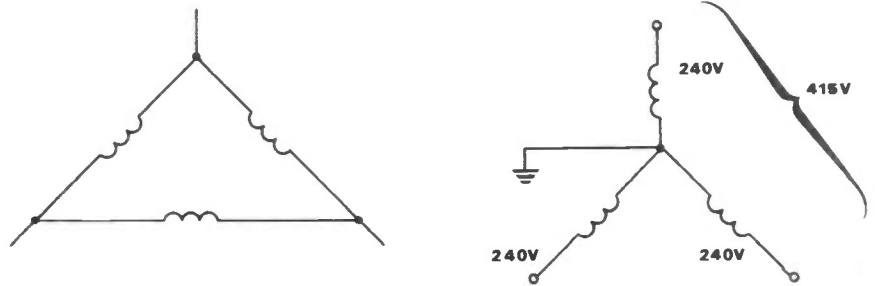
Obviously the 110V would suit American users, and the first two windings in series (make sure they are magnetically in series as well) would suit English users. The third winding is for industrial 3-phase supplies from which 415V (=240√3) is obtainable between lines in England (or 360V in France).

Thus the simple idea of a transformer having only two wires in and two wires out has to be expanded to maybe 10 wires in and another 10 out with multiple secondaries, and you are faced with a full hour's work sorting them all out.

Note that 'magnetically in series' means that any two windings put electrically in series must also cause an increase (not decrease) of a secondary voltage being monitored. This indicates that the 'finish' of one winding is correctly feeding the 'start' of the next.

Furthermore, these heavy duty types of primary can also be used as secondaries. If in the above example you had a 240V ac supply then the 360+60V winding could be used as an output of probably at least 5 amps ac. Try to physically see the thickness of copper wire on the windings as a gauge of what current you think it can take by comparison with known windings such as the ubiquitous 18swg used on little 12V 5A units. To make sure that the copper wire you can see (if at all) is the actual winding you've got an ohmmeter connected to, use a pin in the test lead clip and stick it through the enamel to make contact with the copper.

Actually these types of multi-choice primaries can be very convenient. If the secondary happened to be, say, 50 amps at 15V and you really wanted a couple



Delta generation and star distribution

more volts to allow for regulation circuits, it would not be easy to dismantle a thoroughly dipped core and bend extra turns of $\frac{3}{8} \times \frac{1}{16}$ copper bar onto the secondary, but according to the fundamental relation

$$\frac{V_1}{V_2} = \frac{N_1}{N_2}$$

we see that

$$V_2 = \frac{V_1 N_2}{N_1}$$

So to increase V_2 without changing V_1 (volts) or N_2 (turns) we need to apply the available supply to *less* turns (N_1), and if the primaries were as shown above then wiring one of the 110V windings in series with the 60V section of the 'phase' winding would give you about 18 or 20V.

A pedantic designer would object to this and say that the core might saturate or too much primary current be drawn, but unless you are loading the transformer to its full limit this is unlikely. As long as the off load primary current is less than $\frac{1}{2}$ an amp and on load current is less than 3 amps you're probably safe. Another gauge for amateurs is to put your hand on the laminations after 10 minutes of running. If it's too hot to touch then it's overloaded; if it's just 'hot' then it's probably OK.

A further technique to remember is that of applying a few volts ac (about 5V) to one of the thick wire secondaries (rather than to a primary) and then checking around with a voltmeter to note

what the other windings are producing. This 'reverse' testing is useful to make it clear which taps on a very low resistance primary are the 10V tail sections and which is the main 220V section.

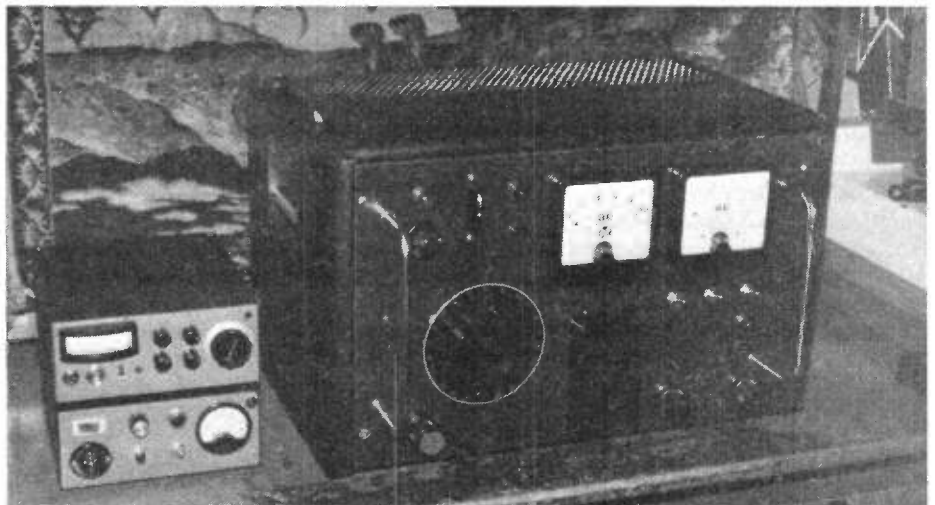
In summary of testing transformers, then, we can say that a variac with an ammeter allows you much more safety and relaxation, as you choose the most likely primary and gradually turn up the applied voltage. If the current stays well below one amp you've probably found the right winding.

Actually, most primaries off load only draw 100 or 200mA after the initial switch-on surge. Stop at about 30V and check around the other windings with a voltmeter to get an idea of what they will produce by the time you've applied the full 240V. Be especially careful for any unexpected high voltage windings which may be giving several hundred volts already.

Continue turning up the variac, and if the consumption is still looking good stop at 100V exactly, then go round *all* the windings and measure their outputs exactly. 100 is a convenient number for using in subsequent ratio calculations when finally deciding what the original design intentions for the transformer were.

In general, a variac can be used in a similar 'gradually increase the volts and watch the current' way on any unmarked ac device: motors, fans etc. So don't delay, build one today!

REW



50MHz, A New Dimension for the U.K.

IC-505. 50MHz transceiver



The IC-505 is a 50MHz band SSB, CW, FM (optional) transceiver, and has already gained an excellent reputation worldwide. The dual VFO system has been developed using advanced computer and PLL technology. The IC-505 features 6 channel memories and can be used independent of emission modes, memory scan, program scan which searches only specified frequency band. LCD ensures clear visibility even in sunlight. The R.F. amplifier, a dual gate MOSFET features high gain and low noise characteristics. The IC-505 accepts a standard dry cell pack, rechargeable nicad battery pack (BP10) or 13.8v external power supply, 3 watts R.F. output, 0.5 watts low power, 10 watts at 13.8v. Accessory circuits include split frequency operation, noise blanker, squelch and CW break-in. Options include:- EX248 FM unit, PS45 AC Power Supply and LC10 Carrying Case. All these features make the IC-505 a great transceiver for operation on the 50MHz band.

IC-551. 50MHz Base station

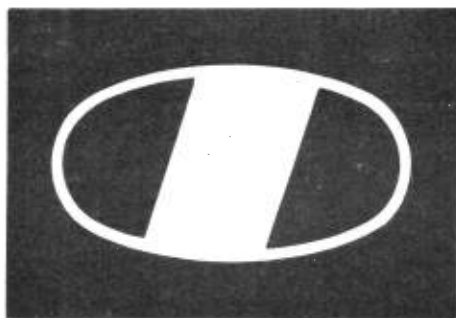


This base station has all mode capability, SSB, CW, AM and FM (when optional FM is installed). It covers 50-54MHz with 80 watts variable R.F. output power (40 watts A.M.), Dual VFO's for split frequency operation. 3 memory channels and memory scan, program scan with adjustable scanning speed and auto stop when a signal is received. A powerful audio output, 2 watts at 8ohms for easy listening even in noisy surroundings.

Other features include a noise blanker, AGC fast or slow RIT, VOX passband tuning and speech processor. Options include:- PS15 20 amp external power supply, IC-EX106 FM unit and IC-HP1 headphones.

These two transceivers allow you to explore this fascinating part of the spectrum. UK stations have worked in VE, VO, W1,2,3,4 and 8. The UK beacon GB3NHQ has been received as far west as Washington State. Please contact Thanet Electronics Limited or your local ICOM dealer for more information on these 6m transceivers.





IC-751 The ICOM Flagship



SM-10 Desk-top Mic

The IC-751 is the Flagship of the ICOM range, it is a competition grade ham transceiver with a 100KHz - 30MHz continuous tuning, general coverage receiver and a full featured all mode solid state transmitter that covers all the WARC bands. Utilising an ICOM developed J-Fet DBM, the IC-751 has a 105dB dynamic range and a switchable choice of pre-amp 0-20dB attenuator. The transmitter features a high reliability 2SC2904 transmitters in a low IMD (-32dB @ 100W) full 100% duty cycle. Other features include 32 tunable memories, mode selective scan, frequency scan and memory scan, full break in on CW and Amptor compatibility, Pass band tuning, notch filter, variable noise blanker, Dual VFO's for DX or 10m repeater operation. The IC-751 is fully compatible with ICOM auto units such as the AT500 and IC-2KL. Options include internal or external power supplies, frequency controller, Speech synthesizer, various optional filters and SM6 or SM10 Desk Microphone.

The **SM10** desk top microphone consist of an electret condenser microphone element with a compressor amplifier, plus tunable equalizer for maximum control of the audio characteristics of your transmitted signal. The SM10 is highly sensitive and produces clean crisp audio.

IC735 compact HF Transceiver



As predicted the ICOM IC-735 has rapidly gained the reputation it deserves. When compared with similar 'top names' transceivers the IC-735 towers above them (despite its smaller size). The IC-735 has a larger number of programmable channels, but notably most important is the superb sensitivity in all modes SSB, CW, AM and FM. This superior sensitivity is due to the excellent front end performance. All amateur frequencies from 1.8MHz to 30MHz are available including the three new bands 10, 18 and 24MHz. RF output is approximately 100 Watts. Tuning ranges from 100KHz to 30MHz, made continuous by using a high-side IF and a CPU control system. RTTY operation is also possible.

Dynamic range is 105dB with a 70.451MHz first IF circuit. Pass-band tuning and a sharp IF notch filter provide clear reception even under duress. Preamp is 10dB and attenuator 20dB. Computer remote control is possible via the RS-232C jack. Options include: the AT-150 automatic antenna tuner, the PS55 AC power supply and the SM-6, SM-8 and SM10 desk mics. Why not find out more about the IC-735 by ringing us or your local ICOM dealer.



Thanet Electronics
Sea Street, Herne Bay, Kent CT16 8LD
Tel: (0227) 363859
Dept. RW


```

1060 PRINT"E";A$="L3G":RETURN
1070 PRINT"F";A$="L3GP3L3GP3L1GP3L3G":RETURN
1080 PRINT"G";A$="L1GP3L1GP3L3G":RETURN
1090 PRINT"H";A$="L3GP3L3GP3L3GP3L3G":RETURN
1100 PRINT"I";A$="L3GP3L3G":RETURN
1110 PRINT"J";A$="L3GP3L1GP3L1GP3L1G":RETURN
1120 PRINT"K";A$="L1GP3L3GP3L1G":RETURN
1130 PRINT"L";A$="L3GP3L1GP3L3GP3L3G":RETURN
1140 PRINT"M";A$="L1GP3L1G":RETURN
1150 PRINT"N";A$="L1GP3L3G":RETURN
1160 PRINT"O";A$="L1GP3L1GP3L1G":RETURN
1170 PRINT"P";A$="L3GP3L1GP3L1GP3L3G":RETURN
1180 PRINT"Q";A$="L1GP3L1GP3L3GP3L1G":RETURN
1190 PRINT"R";A$="L3GP3L1GP3L3G":RETURN
1200 PRINT"S";A$="L3GP3L3GP3L3G":RETURN
1210 PRINT"T";A$="L1G":RETURN
1220 PRINT"U";A$="L3GP3L3GP3L1G":RETURN
1230 PRINT"V";A$="L3GP3L3GP3L3GP3L1G":RETURN
1240 PRINT"W";A$="L3GP3L1GP3L1G":RETURN
1250 PRINT"X";A$="L1GP3L3GP3L3GP3L1G":RETURN
1260 PRINT"Y";A$="L1GP3L3GP3L1GP3L1G":RETURN
1270 PRINT"Z";A$="L1GP3L1GP3L3GP3L3G":RETURN
1280 PRINT"0";A$="L1GP3L1GP3L1GP3L1GP3L1G":RETURN
1290 PRINT"1";A$="L3GP3L1GP3L1GP3L1GP3L1G":RETURN
1300 PRINT"2";A$="L3GP3L3GP3L1GP3L1GP3L1G":RETURN
1310 PRINT"3";A$="L3GP3L3GP3L3GP3L1GP3L1G":RETURN
1320 PRINT"4";A$="L3GP3L3CP3L3GP3L3GP3L1G":RETURN
1330 PRINT"5";A$="L3GP3H3CP3L3GP3L3GP3L3G":RETURN
1340 PRINT"6";A$="L1GP3L3GP3L3GP3L3GP3L3G":RETURN
1350 PRINT"7";A$="L1GP3L1GP3L3GP3L3GP3L3G":RETURN
1360 PRINT"8";A$="L1GP3L1GP3L1GP3L3GP3L3G":RETURN
1370 PRINT"9";A$="L1GP3L1GP3L1GP3L1GP3L3G":RETURN
1380 PRINT".";A$="L3GP3L1GP3L3GP3L1GP3L3GP3L1G":RETURN
1390 PRINT",";A$="L1GP3L1GP3L3GP3L3GP3L1GP3L1G":RETURN
1400 PRINT"?";A$="L3GP3L3GP3L1GP3L1GP3L3GP3L3G":RETURN
1410 PRINT"/";A$="L1GP3L3GP3L3GP3L1GP3L3G":RETURN
1420 PRINT"=";A$="L1GP3L3GP3L3GP3L3GP3L1G":RETURN
1430 PRINT"@";A$="L3GP3L3GP3L3GP3L3GP3L3GP3L3G":RETURN
1440 PRINT":";A$="L3GP3L1GP3L3GP3L1GP3L3G":RETURN
1450 'LIBRARY ENDS
1460 LETLR=1:GOTO1500
1470 LETNR=1:GOTO1500
1480 LETPR=1:GOTO1500
1490 LETLR=1:LETNR=1:LETPR=1:GOTO1500
1500 PRINT@289,"WORDS PER MINUTE?"
1510 PRINT@321,"(4,6,8,10,12,14,16)"
1520 PRINT@353,"ENTER NO. & PRESS RETURN";INPUTSP
1530 IFSP<4 OR SP>16 THEN SP=12
1540 PRINT@417,"1 SECOND DELAY Y/N?":DL$=INKEY$:IFDL$="" THEN1540
1550 IFDL$="N" THEN1580ELSE1560
1560 IFDL$="Y" THEN1570ELSE1540
1570 TD=1:GOTO1590
1580 TD=0
1590 PRINT@449,"SCREEN OFF Y/N?":SC$=INKEY$:IFSC$="" THEN1590
1600 IFSC$="Y" THEN1620
1610 SC=65496:GOTO250
1620 SC=65497:GOTO250
1630 CLS:PRINT@34,"THE KEYBOARD WILL REPEAT IN":PRINT@66,"MORSE ANY CHARACTER PR
ESSED"
1640 PRINT@130,"PRESS '@' FOR ERROR CODE":PRINT@162,"PRESS ':' FOR END TX CODE"
1650 PRINT@258,"PRESS '$' TO STOP AND CHANGE":PRINT@290,"PRESS '£' TO END"
1660 PRINT@322,"(DONT FORGET THE SHIFT KEY)"
1670 PRINT@386,"ENTER SPEED (4,6,8,10,12,14,):PRINT@418,"16)":INPUT " AND PRES
S RETURN";KS
1680 IFKS<4 OR KS>16 THEN KS=12
1690 CLS:PRINT@481,"$=STOP @=ERROR :=END-TX £=END"
1700 KX=KS
1710 PRINT@232,"CHARACTER = ";
1720 K$=INKEY$:IFK$="" THEN1720
1730 IFK$="A" THENGOSUB1020
1740 IFK$="B" THENGOSUB1030
1750 IFK$="C" THENGOSUB1040
1760 IFK$="D" THENGOSUB1050
1770 IFK$="E" THENGOSUB1060
1780 IFK$="F" THENGOSUB1070
1790 IFK$="G" THENGOSUB1080
1800 IFK$="H" THENGOSUB1090
1810 IFK$="I" THENGOSUB1100
1820 IFK$="J" THENGOSUB1110
1830 IFK$="K" THENGOSUB1120
1840 IFK$="L" THENGOSUB1130
1850 IFK$="M" THENGOSUB1140
1860 IFK$="N" THENGOSUB1150
1870 IFK$="O" THENGOSUB1160
1880 IFK$="P" THENGOSUB1170
1890 IFK$="Q" THENGOSUB1180
1900 IFK$="R" THENGOSUB1190
1910 IFK$="S" THENGOSUB1200
1920 IFK$="T" THENGOSUB1210
1930 IFK$="U" THENGOSUB1220
1940 IFK$="V" THENGOSUB1230
1950 IFK$="W" THENGOSUB1240
1960 IFK$="X" THENGOSUB1250
1970 IFK$="Y" THENGOSUB1260
1980 IFK$="Z" THENGOSUB1270
1990 IFK$="0" THENGOSUB1280
2000 IFK$="1" THENGOSUB1290
2010 IFK$="2" THENGOSUB1300
2020 IFK$="3" THENGOSUB1310
2030 IFK$="4" THENGOSUB1320
2040 IFK$="5" THENGOSUB1330
2050 IFK$="6" THENGOSUB1340
2060 IFK$="7" THENGOSUB1350
2070 IFK$="8" THENGOSUB1360
2080 IFK$="9" THENGOSUB1370
2090 IFK$="." THENGOSUB1380
2100 IFK$="," THENGOSUB1390
2110 IFK$="?" THENGOSUB1400
2120 IFK$="=" THENGOSUB1420
2130 IFK$="/" THENGOSUB1410
2140 IFK$="@" THENGOSUB1430
2150 IFK$=":" THENGOSUB1440
2160 IFK$="£" THEN2300
2170 FORM=1TO5
2180 IFKX=4THENPLAY"T7"+A$
2190 IFKX=6THENPLAY"T12"+A$
2200 IFKX=8THENPLAY"T15"+A$
2210 IFKX=10THENPLAY"T19"+A$
2220 IFKX=12THENPLAY"T24"+A$
2230 IFKX=14THENPLAY"T29"+A$
2240 IFKX=16THENPLAY"T34"+A$
2250 FORTX=1TO8000/KX:NEXTTX
2260 KB$=INKEY$:IFKB$="" THENGOTO1700
2270 IFKB$="$" THENM=0
2280 NEXTM
2290 GOTO1700
2300 CLS:PRINT@481,"'R'=RE-CYCLE 'M'=MENU 'E'=END
2310 T$=INKEY$:IF T$="" THENGOTO2310
2320 IFT$="R" THEN1630
2330 IFT$="M" THEN90
2340 IFT$="E" THEN2350
2350 END

```

situated in lines 2180-2240. The value of T should correspond roughly to twice the wpm figure required.

A shorter version

You may well find that you can live without the 'LEARN' section, in which case a shorter program can be used. Delete lines 90-160 and 1630-2340. **REW**



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SATELLITE TV

The Editor investigates the development of TV reception via satellite and concludes that, despite some setbacks, the future looks bright

The subject of TV reception from satellites has attracted a lot of interest lately, not least because of the money being invested by companies large and small in the production of equipment suitable for the consumer market. This level of interest has remained high in spite of the major setback suffered by DBS (direct broadcast by satellite) in the UK last year.

After the failure of Britain's original DBS proposals, due largely to some quite ridiculous meddling by the Government, the IBA called for further ideas on the subject during the autumn. As a result of this, they are now considering a dozen or so representations regarding a future DBS service, although it looks as though it could be some time before this service gets off the ground (pardon the pun!).

All this is in sharp contrast to what is going on in the neighbouring European countries, with France and Germany both due to launch DBS satellites, TDF-1 and TVSAT respectively, later this year (as detailed in *Spectrum Watch*).

Another significant development last year was the relaxation of the rules regarding the reception of those TV signals already being broadcast via

certain satellites. These signals were originally intended to reach ordinary domestic users only through cable TV network operators, but it is now permissible for anyone to receive such broadcasts if they obtain the necessary licence from the DTI (fee £10).

The combination of DBS being no more than a distant possibility and the legalisation of public reception of existing services has created a market for domestic equipment which a number of companies are now seeking to exploit.

The satellites

Two satellites are of interest with respect to TV transmissions, namely ECS1 and Intelsat V. Both are general telecommunications satellites and accordingly use much lower power transponders than satellites intended specifically for TV broadcasts, such as DBS (which will use around 200W per channel compared with typically 20W for telecommunication use).

The European Communications Satellite (ECS) 1 is operated by Eutelsat, an organisation formed in 1977 by more than a dozen European countries, and is in geostationary orbit at 13°E. Intelsat,



Tratek block downconverter

which was originally an organisation of 11 countries but has, since its birth in 1964, grown to include 100, runs Intelsat V, which is at 27.5°W.

The orbits of these satellites are such that their period of rotation about the Earth's centre of mass is 24hrs, and since they orbit in the equatorial plane they appear stationary above a single point on the globe. Their height (35,800km) makes them, in effect, extremely high transmitting antennas with none of the problems of shadowing or multipath effects which cause picture degradation encountered with lower terrestrial transmitters.

However, because of the frequency used, 11/12GHz, there is the possibility of signal attenuation due to heavy rainfall, but this is a minor problem. In addition to this, there is the drawback that only those sites with line of sight access to the satellites (ie, no buildings in the way) will be able to receive them.

Reception equipment

Numerous companies are now offering suitable equipment for the 10.95-11.20GHz and 11.45-11.70GHz signals involved. Reception is via a dish of 1.8m diameter made of aluminium or glass-fibre coated with aluminium. This reflects signals to a low noise downconverter/amplifier, usually known as an LNC (low noise converter) or LNB (low noise block converter).

This employs GaAsFETs (get everywhere, don't they?) to achieve an acceptable noise figure (typically 2.5dB) and produces an IF of 700-1750MHz which is fed to a set-top tuner (or, indeed, a tuner within the set with Salora or Luxor). The tuner produces an output suitable for the TV, and has a facility for tuning different audio subcarriers (different channels which are not all using the same subcarrier).

The downconverter, small though it is, forms a considerable proportion of the cost of a system, and a price tag of £500 for this unit alone would be typical. Furthermore, since the satellite signals may be either vertically or horizontally polarised, depending on the channel, you will need two of them to receive all the channels available. These can both be mounted on one dish, although the NEC NESAT system is unique in allowing them to be end-stackable (casting a smaller 'shadow' on the dish).



NEC manufactures and installs almost 50% of the world's total satellite communications systems

There have been rumours that Greenwich Satellite, who are the sole UK importers of NESAT equipment (with a growing network of dealers – applications welcome!), might have a facility to allow one converter to receive signals of either polarity. This will be through a rotating system in the unit, in much the same way that a rotating mount can be used to move the dish between satellites in different directions.

Why bother?

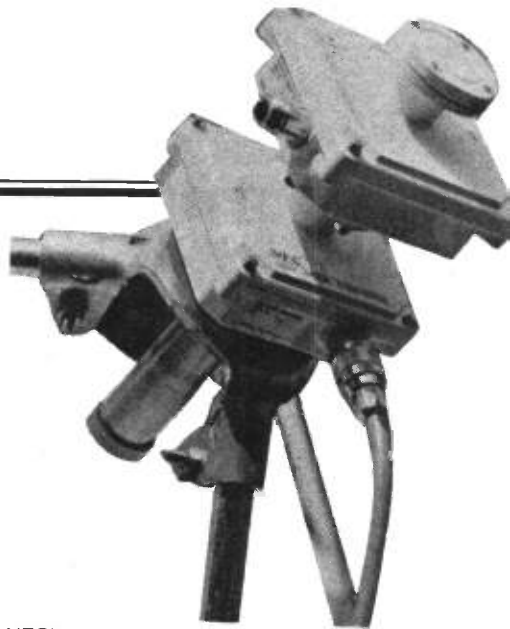
Programmes available include news, films, pop music, and general entertainment in French, German, Italian etc, as well as in English.

Only one of these programmes, Sky Channel, is scrambled at present, which means that a wealth of material can be received without making the payments

who simply cannot receive them due to their geographic location. Reception in cities can be tricky because of large buildings getting in the way, and for these areas satellite master systems (SMATV) might be the answer.

An SMATV system uses a 2.5/3.5m dish to feed a mini cable network to, say, a block of flats or an hotel. This larger dish gives an increase in gain over smaller ones of 3 or 4dB, which is necessary to counteract the loss inherent in the greater signal processing for such a network.

Satellite TV generally seems to have a brighter future than cable TV in the UK. Cable has suffered from serious lack of revenue, with companies pulling out, a revision of the franchise arrangements, and in some cases a change of plan to use overground, low-tech coaxial cables

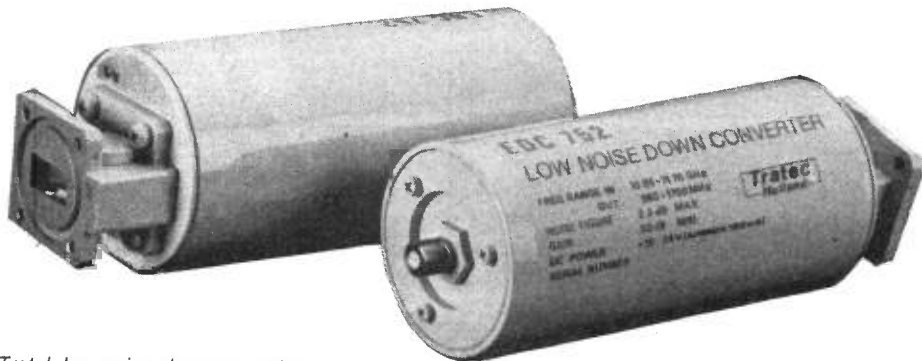


NEC's stack-mounted LNCs enable dual polarisation reception

UK. The publisher Robert Maxwell has booked a channel on the French DBS satellite TDF1, due to be launched later this year. This English-language channel should be receivable in much of the UK.

So if you've got between £1,000 and £1,600 to spare, why not buy yourself a satellite receiving system? Be sure to get it mounted properly; many firms installing dishes fail to appreciate the tremendous force even a moderately high wind can exert on such a shape. If the price sounds a little steep, bear in mind that many people are quite happy to pay £1,000+ for a video camera/recorder (I'm not one of them, not on my pay!).

Depending on how the market develops, it is quite possible that prices will fall as sales rise, so it might be worth while waiting. It all depends on how much of a TV addict you are! **REW**



Tratek low noise downconverters

demand by the programme providers. Until all transmissions are scrambled, these providers will have to rely on honest customers paying up, and it is worth bearing in mind that without sufficient revenue they will withdraw and take their programmes with them!

The future

Judging by the interest shown already, there should be a sizeable market for equipment to receive these transmissions. There are many people, however,

rather than underground high-tech optical fibre.

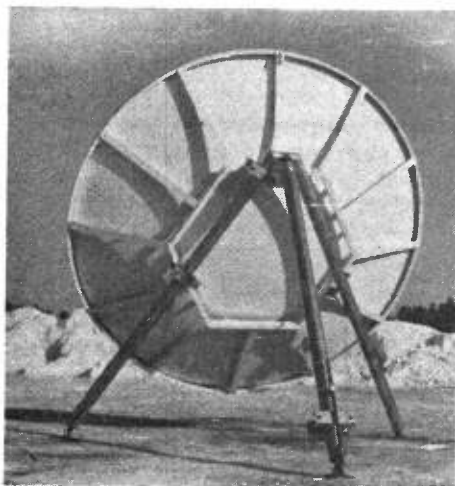
The reasons for such market resistance seem, in retrospect, fairly clear. Unlike say, the USA, where cable TV is much more successful, there are no great expanses in the UK which would be inadequately covered by more conventional broadcast services. It is also generally acknowledged that British TV programmes are better than those in other countries, which in countries like America must surely account for the enthusiasm which greeted cable TV when it was first introduced.

There is, of course, always the question of whether people actually want more TV. Although there are no conclusive results to work with, it is clear that those who do form a financially viable market even now, mainly because cable laying does not involve huge outlay by the companies concerned.

The satellite TV coming via telecommunications satellites is receiving a response which will provide an indication of the level of interest in such schemes to DBS organisers, and will also raise the level of awareness of the general public about the subject.

Competition?

Before long it won't be just ECS1 and Intelsat V that provide satellite TV in the



A Salora dish antenna

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Connexions Satellite Systems Ltd,
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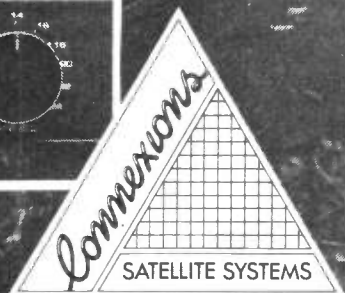
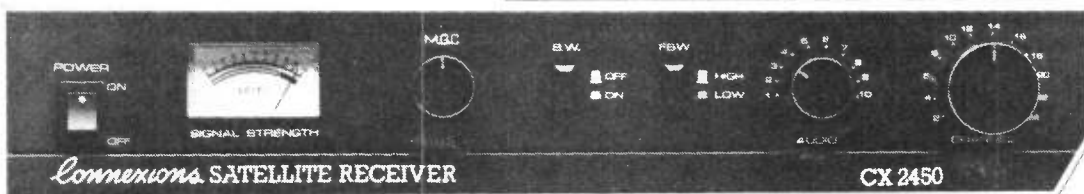
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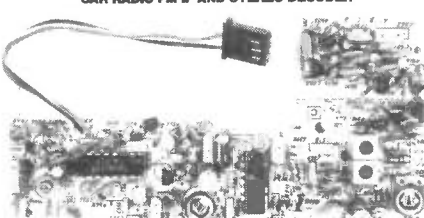
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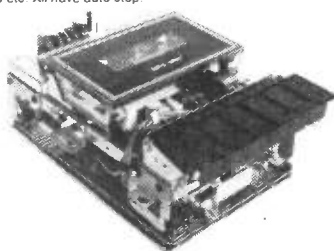
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DATA FILE . . .

Ray Marston looks at bipolar transistor principles and applications

The bipolar transistor is probably the most important element used in modern electronics, and forms the basis of many linear and digital integrated circuits. In its discrete form the bipolar transistor can function as either a digital switch or as a linear amplifier, and is available in many low, medium and high power forms.

In the present edition of *Data File* we look at the basic characteristics of the discrete bipolar transistor, and present a round-up of basic application configurations. In later editions of 'The File' we will take a detailed look at a variety of practical linear and digital application circuits.

Bipolar basics

A bipolar transistor is a 3-terminal (base, emitter, and collector) current amplifying device, in which a small input current can be used to control the magnitude of a much larger output current. The term 'bipolar' indicates that the device is made from semiconductor materials in which conduction relies on both positive and negative (majority and minority) charge carriers.

A practical transistor is, in essence, made from a 3-layer sandwich of n-type and p-type semiconductor materials, with the base terminal connected to the central layer, and the collector and emitter terminals connected to the outer layers. Thus the device may use an n-p-n construction sandwich, as shown in *Figure 1a*, in which event the device is known as an npn transistor and uses the standard symbol shown in *Figure 1b*. Alternatively it may use a p-n-p structure, as shown in *Figure 2a*, and the device is known as a pnp transistor with the standard symbol shown in *Figure 2b*.

In practice, npn and pnp transistors must each be used with a power supply of the appropriate polarity, as shown in *Figure 3*. An npn device must be used with a supply that makes the collector positive to the emitter; in this case the 'output' or main-terminal signal current flows from collector to emitter, and has its amplitude controlled by an input current that flows from the base to the emitter via an external current-limiting resistor (R_b) and a positive bias voltage. A pnp transistor must be used with a negative supply; the main-terminal current flows from emitter to collector, and is controlled by an emitter-to-base input current that flows to a negative bias voltage.

Wide variety

A wide variety of bipolar transistor types are readily available. *Figure 4* lists the basic characteristics of two typical general purpose low power transistors, these being the 2N3904 npn-type and the 2N3906 pnp-type, which are each housed in a TO-92 plastic case.

Looking at *Figure 4*, V_{CEO} (max) is the

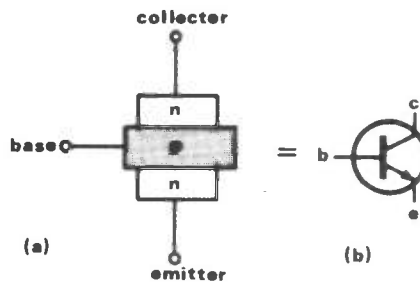


Fig 1 Basic construction (a) and symbol (b) of npn transistor

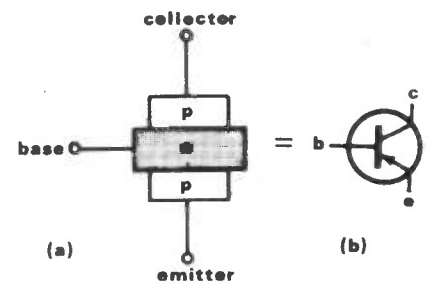


Fig 2 Basic construction (a) and symbol (b) of pnp transistor

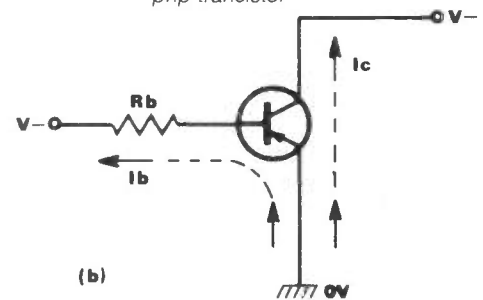
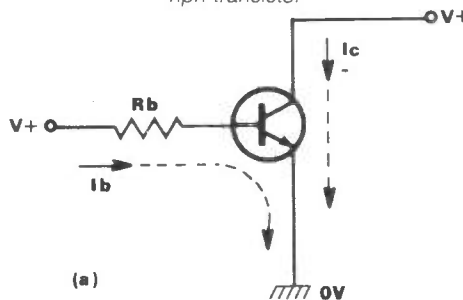


Fig 3 Polarity connections to (a) npn and (b) pnp transistors

Parameter	2N3904	2N3906
Transistor type	npn	pnp
I_C (max)	200mA	200mA
V_{CEO} (max)	40V	-40V
V_{CBO} (max)	60V	-40V
P_T (max)	310mW	310mW
h_{fe} (= ac beta)	100-300	100-300
f_T (typ)	300MHz	250MHz
(= gain/bandwidth product)		

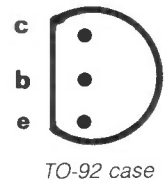


Fig 4 Outline of the 2N3904 and 2N3906 low power transistors

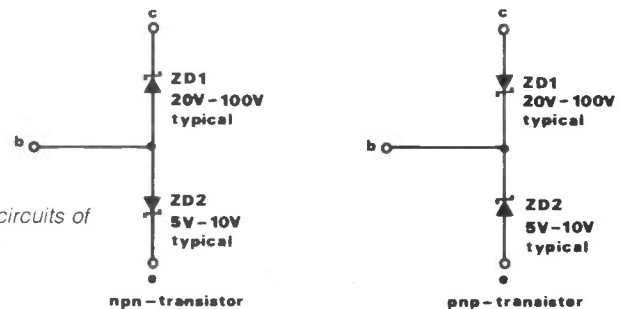


Fig 5 Static equivalent circuits of npn and pnp transistors

maximum voltage that may be applied between the collector and emitter when the base is open-circuit, and V_{CBO} (max) is the maximum voltage that may be applied between collector and base when the emitter is open-circuit. I_C (max) is the maximum mean current that can be allowed to flow through the collector terminal of the device, and P_T (max) is the maximum mean power that the device can dissipate, without the use of an external heatsink, at normal room temperature.

One of the most important parameters

of a transistor is its forward current transfer ratio, or h_{fe} , and this can be simply described as the current gain or output/input current ratio of the device (typically 100 to 300 in the devices shown).

The f_T figure indicates the available gain/bandwidth product frequency of the device, ie if the transistor is used in a voltage-feedback circuit configuration that provides a voltage gain of $\times 100$ the bandwidth will be 100th of the f_T figure, but if the voltage gain is reduced to $\times 10$ the bandwidth will increase to $f_T/10$, etc.

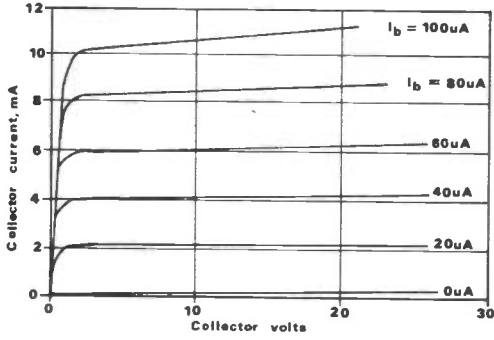


Fig 6 Typical transfer characteristics of low power npn transistor with h_{fe} value of 100 nominal

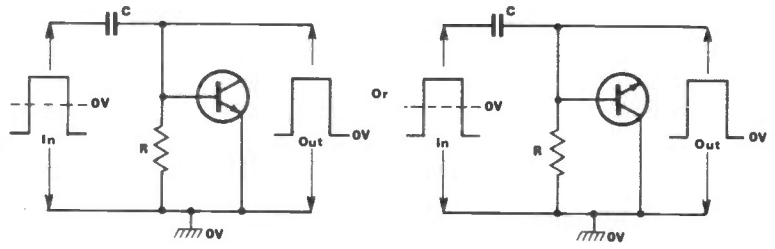


Fig 7 Clamping diode circuit, using npn transistor as diode

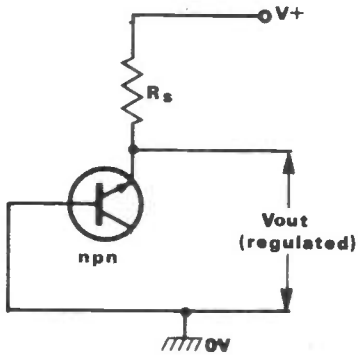


Fig 8 A transistor used as a Zener diode

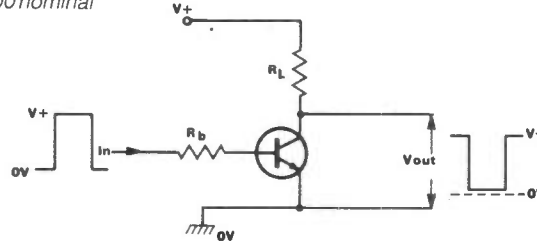


Fig 9 Transistor switch or digital inverter

Transistor characteristics

To get the maximum value from a transistor, the user should have a basic understanding of both the static and the dynamic characteristics of the device. By 'static' characteristics we mean the way the device appears between individual terminals, under dc conditions, or when looked at with an analogue ohmmeter.

Figure 5 shows the static equivalent circuits of npn and pnp transistors. As can be seen, each device is equal to a pair of reverse-connected Zener diodes wired in series between the collector and emitter terminals of the transistor, with the base terminal wired to the 'common' point of the two Zeners.

The Figure 5 equivalent circuit can in fact be inferred from the basic construction of the transistor shown in Figures 1 and 2: a diode is inevitably formed at each n-p or p-n semiconductor junction of the device, and when this diode is sufficiently reverse biased it inevitably reaches an avalanche or 'Zener' point; thus a Zener diode is formed at each n-p or p-n junction of the device. In most practical low power transistors the base-to-emitter junction has a typical Zener value in the range 5 to 10 volts, while the base-to-collector junction has a typical Zener value in the range 20 to 100 volts.

Forward biased

Thus, if the base-to-emitter junction of the device is forward biased it exhibits the characteristics of an ordinary diode, and if reverse biased it exhibits the characteristics of a Zener diode. If the transistor is a silicon type, the forward-biased junction will pass virtually zero current until the bias voltage rises to roughly 600mV, but beyond this value the current will increase rapidly; when forward biased by a fixed current, the

forward voltage of the junction has a temperature coefficient of about $-2\text{mV}/^\circ\text{C}$.

When the transistor is used with the emitter open-circuit, the base-to-collector junction exhibits similar characteristics to those just described, except for a greater Zener value. If the transistor is used with its base open-circuit, the collector-to-emitter path acts like a Zener diode wired in series with an ordinary diode.

The basic dynamic characteristics of the transistor can readily be understood with the aid of the graph of Figure 6, which shows the typical forward transconductance characteristics of a low power npn silicon transistor with a nominal h_{fe} value of about 100.

Note the following points: when the base current (I_b) is zero, the transistor passes only a very small collector 'leakage' current; when the collector voltage is greater than a few hundred millivolts, the collector current value is almost directly proportional to the base current value, and is little influenced by the actual collector voltage value. Thus the device can be used as a constant-current generator by feeding a fixed bias current into the base, or it can be used as an excellent linear amplifier by superimposing the input signal on a nominal input bias current (we'll show how later).

Practical applications

The transistor can be used in a vast range of useful applications, and in a broad range of different basic circuit configurations. The following is a brief summary of the most important of these basic configurations (we will take more detailed looks at most of these designs in future editions of *Data File*). Unless otherwise mentioned, all the specific circuits shown are based on npn transistor types, but can be used with pnp transistors by simply changing circuit polarities etc.

Diodes and switches

It has already been mentioned that the base-emitter and base-collector junctions of a silicon transistor each take the form of a Zener diode. In practice, either of these junctions can readily be used as either a fast-acting diode or rectifier, or

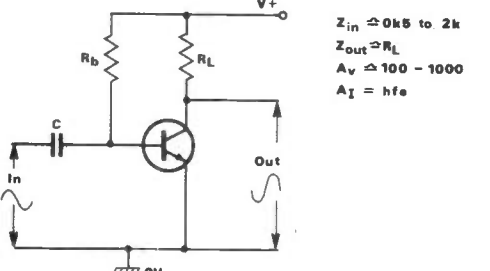


Fig 10 Common-emitter linear amplifier

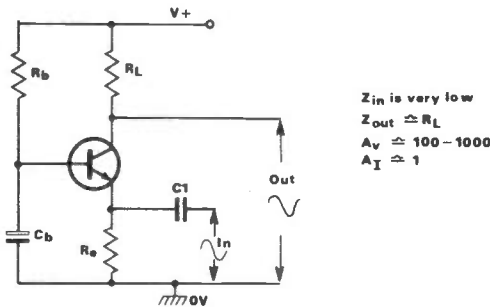


Fig 11 Common-base linear amplifier

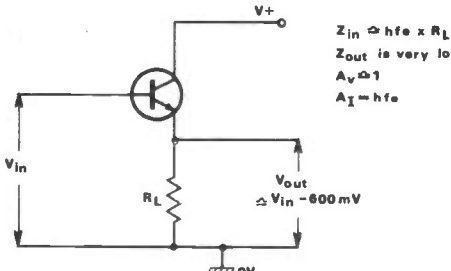


Fig 12 dc common-collector linear amplifier

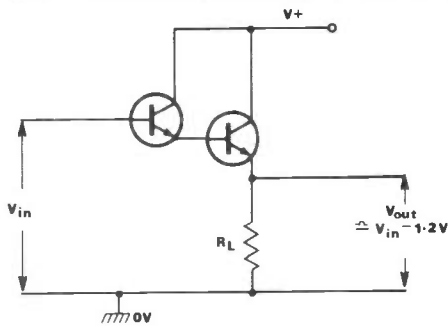


Fig 13 'Darlington' dc emitter follower as a Zener diode, depending on the polarity in which it is used.

Figure 7 shows the two alternative ways of using an npn transistor as a diode - in this particular case in a 'clamping' circuit which converts an ac-coupled rectangular input waveform, which swings equally above and below the zero-volts point, into an output signal of similar form and amplitude which swings between zero and a positive voltage value only, ie which 'clamps' the output signal to the zero-volts reference point. In practice, it is best to use the base-collector diode in this type of application, as it has the greater Zener voltage value.

Figure 8 shows how an npn transistor can be used as a Zener diode in a circuit that converts an unregulated supply voltage into a fixed-value regulated output voltage with a typical value in the range 5 to 10 volts, depending on the individual transistor. Only the base-emitter junction is suitable for use in this application.

Figure 9 shows how a transistor can be used as a simple electronic switch or digital inverter. Here the base is driven (via R_b) by a 'digital' input voltage that is at either zero volts or at a significant positive value, and load R_L (either a simple resistor or a useful load such as a lamp or relay coil etc) is connected between the collector and the positive supply rail.

When the input voltage is zero the transistor 'switch' is cut off, so zero current flows through the load and the full supply voltage is available between the collector and emitter terminals. When the input voltage is high the transistor 'switch' is driven fully on, so maximal current flows in the load and near-zero volts (usually a few hundred mV) is developed between the collector and emitter terminals. The output voltage signal is thus an 'inverted' form of the input signal.

Linear amplifiers

A transistor can be used as a linear current or voltage amplifier by simply feeding a suitable bias current into its base and then applying the input signal between an appropriate pair of terminals. In practice a transistor can be used in any one of three possible basic

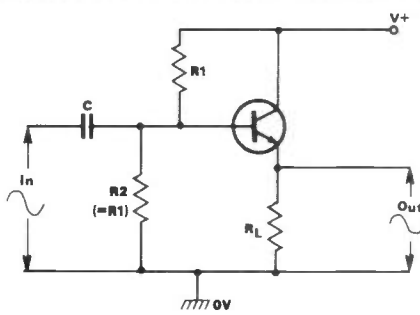


Fig 14 ac common-collector amplifier operating modes, each of which provides a unique set of characteristics. These three modes are known as 'common-emitter' (Figure 10), 'common-base' (Figure 11), and 'common-collector' (Figure 12).

Common-emitter

In the common-emitter circuit of Figure 10, load resistor R_L is wired between the collector and the positive supply line and a bias current is fed into the base via R_b , the R_b value being chosen so that the collector takes up a quiescent value of roughly half-supply voltage (to provide maximal undistorted output signal swings). The input signal is applied between base and emitter via C_1 , and the output signal (which is phase-inverted relative to the input) is taken

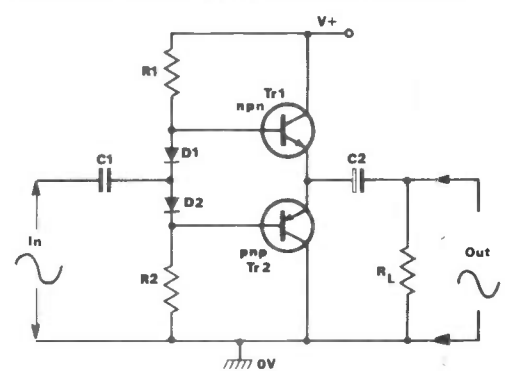


Fig 15 Complementary or 'bilateral' ac emitter follower circuit

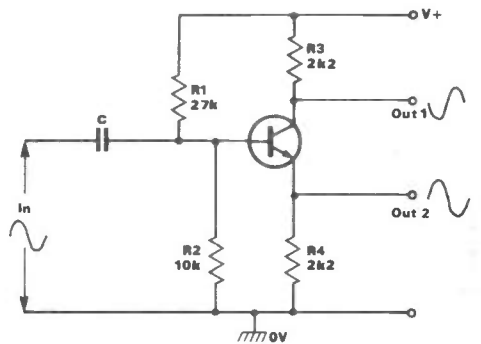


Fig 16 Phase splitter

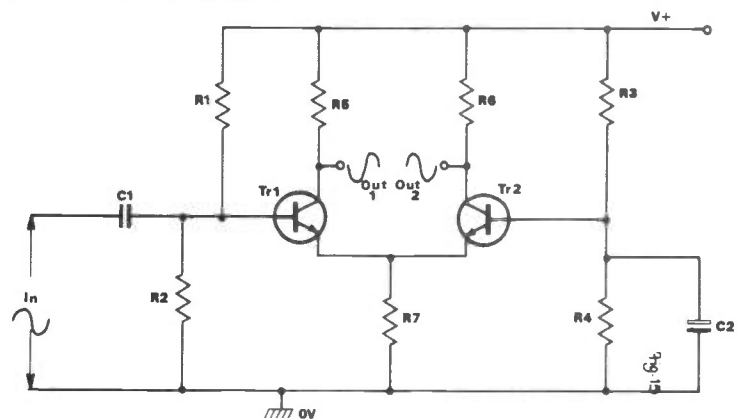


Fig 17 Long-tailed pair phase splitter

between the collector and emitter. This circuit gives a medium-value input impedance and a fairly high overall voltage gain.

In the common-base circuit of Figure 11, the base is biased via R_b and ac-decoupled (or ac-grounded) via C_b . The input signal is effectively applied between the emitter and base via C_1 , and the amplified but non-inverted output signal is effectively taken from between the collector and base. Note that this circuit features good voltage gain, but near-unity current gain and a very low input impedance.

In the common-collector circuit of Figure 12, the collector is wired directly to the positive supply rail and is thus

effectively at 'ground' impedance level. The input signal is applied directly between base and ground ('collector'), and the non-inverted output signal is taken from between emitter and ground ('collector'). Note that this circuit gives near-unity overall voltage gain, and that the output voltage is roughly 600mV less than the input voltage: this circuit is consequently often known as a 'dc voltage (or emitter) follower'.

A major feature of the voltage follower circuit of Figure 12 is that it provides a very high input impedance, this being equal to the product of the R_L and h_{ie} values. If an ultra-high input impedance is required, it can be obtained by replacing the single transistor of Figure

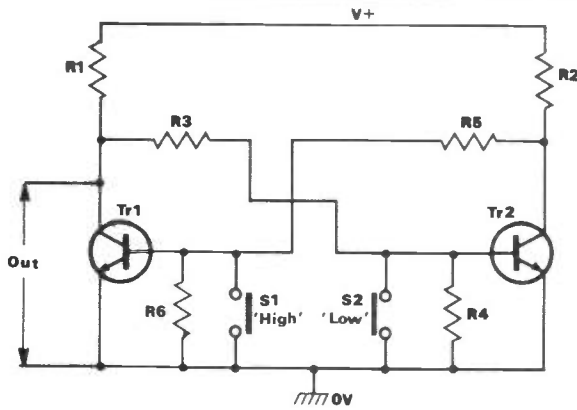


Fig 18 Manually-triggered bistable multivibrator

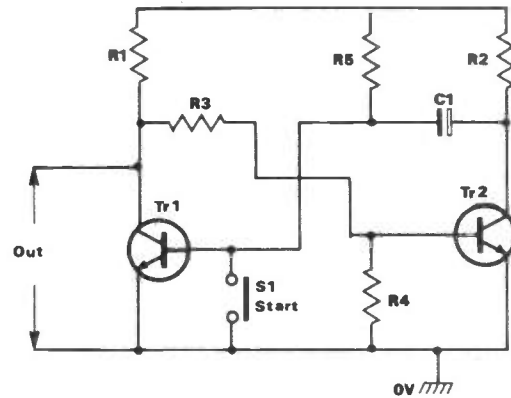


Fig 19 Manually-triggered monostable multivibrator

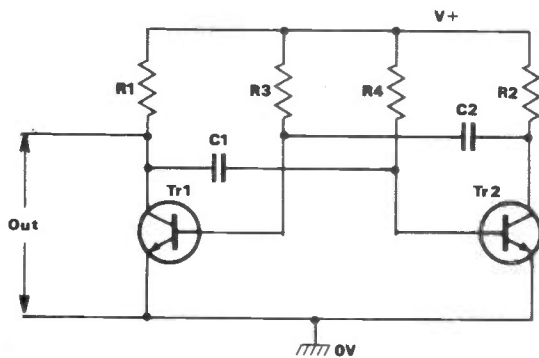


Fig 20 Astable multivibrator or free-running square-wave generator

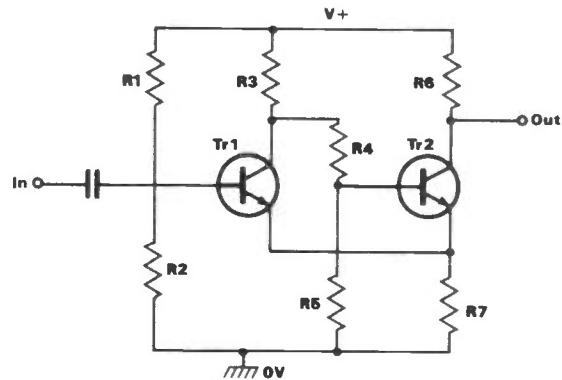


Fig 21 Schmitt trigger or sine-to-square waveform converter

12 with a pair of transistors connected in the 'Darlington' or 'Super-Alpha' mode, as shown in *Figure 13*. Here the emitter current of the input transistor feeds directly into the base of the output transistor, and the pair act like a single transistor with an overall h_{fe} value equal to the product of the two individual h_{fe} values, ie if each transistor has an h_{fe} value of 100, the pair act like a single transistor with an h_{fe} of 10,000.

The *Figure 12* voltage follower circuit can be modified for ac use by simply biasing the transistor base at half-supply volts and feeding the input signal to the base. *Figure 14* shows the connections.

Unilateral output

Note that the emitter follower circuits of *Figures 12 to 14* can 'source' or feed fairly high currents into an external load via the emitter of the transistor, but that the circuits cannot 'sink' or absorb high currents that are fed to the emitter from an external voltage source, since the emitter becomes reverse biased under this condition. These circuits thus have only a 'unilateral' output capability.

In many practical applications (particularly in audio amplifier output stages), a 'bilateral' output characteristic (in which the amplifier has equal 'sink' and 'source' output capabilities) is essential. This can be obtained by using the 'complementary' emitter follower circuit of *Figure 15*, in which the series-

connected npn-pnp pair of transistors are biased to give a modest quiescent current via the R1-D1-D2-R2 network. In use, Tr1 can provide large 'source' currents, and Tr2 can absorb large 'sink' currents.

Phase splitters

Transistor linear amplifier circuits can be made to act as active filters or as oscillators etc, by connecting suitable feedback networks between their inputs and outputs. Another useful linear amplifier application is that of a phase splitter, which provides a pair of anti-phase output signals from a single input signal. *Figures 16 and 17* show alternative circuits of this type.

In the *Figure 16* circuit, the transistor is wired as a common-emitter amplifier with virtually 100% negative feedback applied via emitter resistor R4, which has the same value as collector resistor R3. A unity-gain inverted output signal is thus available at output 1, and a unity-gain non-inverted signal appears at output 2.

The *Figure 17* phase splitter circuit is known as a long-tailed pair, since the two transistors share a common emitter-feedback resistor (R7). The basic circuit action is such that a rising signal on Tr1 base causes the R7 voltage to rise and thus reduce the Tr2 bias voltage, and vice versa, thus causing anti-phase signals to be generated at the collectors of the two transistors.

Multivibrators

To complete this edition of *Data File*, *Figures 18 to 21* show how transistors can be used to make the four basic types of multivibrator.

The *Figure 18* circuit is that of a simple manually-triggered cross-coupled bistable multivibrator, in which the base bias of each transistor is derived from the collector of the other so that one transistor automatically turns off when the other turns on and vice versa. Thus the output can be driven low by briefly turning Tr2 off via S2; the circuit automatically locks into this state until Tr1 is turned off via S1, at which point the output locks into the high state, and so on.

Figure 19 shows a monostable multivibrator or one-shot pulse generator circuit. The output is normally low, but switches high for a preset period (determined by C1-R5) if Tr1 is briefly turned off via S1.

Figure 20 shows the circuit of an astable multivibrator or free-running squarewave generator. The on and off periods of the squarewave are determined by C1-R4 and C2-R3.

Finally, *Figure 21* shows the circuit of a Schmitt trigger or sine-to-square waveform converter. The circuit action is such that Tr2 switches abruptly from the on state to the off state, or vice versa, as Tr1 base goes above or below pre-determined 'trigger' voltage levels. REW

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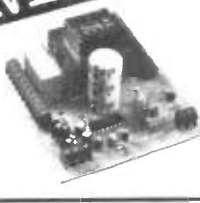
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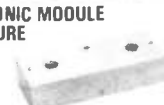


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Assembled PCB Module: £19.90

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CTX40 or CTX80 Kit: £12.95

Assembled PCB Module: £18.95

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PART II

This month we look at the software involved in the project

(8) Test program.

The test program consists of a main menu and a number of small subroutines (most written in machine code) called from the main menu. This was arranged to allow the program and the hardware to be developed and tested piece by piece, and should allow the constructor to understand (and modify if desired) each element of the program.

Alignment aids have been included in the program to allow the filters and the baud rate to be set up without the need

for specialised equipment (only a multi-meter is required).

The program

To conserve memory, REMs have been kept to an absolute minimum. However, a brief description of the program is given below.

The F(3) array sets the test tone frequencies.

The poke in line 30 sets the caps shift.

The receive routine (lines 150 to 190) is extremely simple, since all the hard work

is done by the machine code routine located at 31153 decimal.

The transmit routine provides the option of transmitting one of five 255 byte memories, a continuous stream of RYs, or up to 255 characters entered from the keyboard. Before sending a memory, the routine at lines 410-460 calculates its position in memory and its length, and stores this for the program's use in locations 31309, 31310 and 31311. The OUT statements in lines 260 and 225 turn the PTT bistable off and on respectively

Basic program listing

```
10 DIM F(3)
20 PAPER 7:INK 0:BORDER 7
30 POKE 23658,8
40 REM
50 LET F(1)=27.4:LET F(2)=29.6:LET F(3)=32.4
60 CLS
70 PRINT AT 3,12;"MENU":AT 5,8;"RECEIVE....{1}":AT 6,8;"TRANSMIT
...{2}":AT 7,8;"SET MEMORIES {3}":AT 8,8;"SET UP/TEST.{4}":
AT 9,8;"END.....{5}"
80 PRINT AT 11,8;"WHICH?":PAUSE 0:LET I=CODE(INKEYS)
90 IF I=49 THEN GOSUB 150
100 IF I=50 THEN GOSUB 200
110 IF I=51 THEN GOSUB 550
120 IF I=52 THEN GOSUB 800
130 IF I=53 THEN GOTO 1010
140 GOTO 60
150 REM RX
160 CLS
170 PRINT AT 0,0
180 RANDOMIZE USR 31153
190 RETURN
200 REM TX
210 CLS:PRINT AT 3,8;"TRANSMIT:-"
220 PRINT AT 5,8;"MEMORY 1.(1)":AT 6,8;"MEMORY 2.(2)":AT 7,8;
"MEMORY 3.(3)":AT 8,8;"MEMORY 4.(4)":AT 9,8;"MEMORY 5.(5)":
;AT 10,8;"RY's.....{6}":AT 11,8;"KEYBOARD.(7)":AT 12,8;
"MAIN MENU (8)"
225 OUT 95,1
230 PRINT AT 15,8;"WHICH?"
240 PAUSE 0:LET I=CODE(INKEYS)-48
250 IF I<1 OR I>8 THEN GOTO 210
260 IF I=8 THEN OUT 95,0:RETURN
270 CLS
280 IF I<6 THEN GOSUB 410:RANDOMIZE USR 30966:GOTO 200
290 IF I=6 THEN RANDOMIZE USR 31053
300 LET C=0
310 CLS:PRINT "ENTER TEXT '# TO STOP:-"
320 PAUSE 0:LET I=CODE INKEYS
330 BEEP .04,35
335 IF I=35 THEN GOTO 390
340 PRINT CHR$(I);
350 POKE 30576+C,I
370 LET C=C+1:IF C=255 THEN GOTO 390
380 GOTO 320
390 POKE 31310,112:POKE 31311,119:POKE 31309,C
400 RANDOMIZE USR 30966:GOTO 200
410 LET ADD=31319+256*(I-1)
420 LET LSB=INT(ADD/256):LET MSB=ADD-256*MSB
430 POKE 31310,LSB:POKE 31311,MSB
440 LET L=PEEK(31313+I)
450 POKE 31309,L
460 RETURN
550 REM SET MEMORIES
560 CLS:PRINT"WHICH MEMORY {1-5}?"
570 PRINT:PRINT"ENTER FOR MENU"
580 PAUSE 0:LET I=CODE(INKEYS)-48:IF I=35 THEN RETURN
590 IF I<1 OR I>5 THEN GOTO 550
600 CLS:PRINT "PRESENT CONTENTS OF MEMORY ";I;:"-
610 PRINT
620 FOR C=1 TO PEEK(31313+I):PRINT CHR$(PEEK(31318+C+256*(I-1)))
;NEXT C
630 PRINT:PRINT "ALTER {Y/N}?"
640 PAUSE 0:LET IS=INKEYS
650 IF IS<>"Y" THEN GOTO 560
660 PRINT:PRINT "ENTER NEW MESSAGE:- { } ENDS"
670 LET C=0
680 PAUSE 0:LET IS=INKEYS
686 BEEP .04,35
690 IF CODE IS=35 THEN GOTO 770
700 IF C>240 THEN BEEP .2,10
710 IF C=255 THEN GOTO 770
720 IF CODE IS=9 THEN GOTO 750
730 POKE 31319+C+256*(I-1),CODE IS
740 PRINT IS;
750 LET C=C+1
760 GOTO 680
770 POKE 31313+I,C
791 RETURN
800 REM SET UP/TEST
810 CLS:PRINT AT 3,12;"TESTS:-":AT 5,8;"1275Hz TONE..{1}":AT
6,8;"1445Hz TONE..{2}":AT 7,8;"1700Hz TONE..{3}":AT 8,8;
;"BAUD TEST...{4}":AT 9,8;"MAIN MENU...{5}":AT 11,8;
"WHICH?"
820 PAUSE 0:LET I=CODE(INKEYS)-48
830 IF I<1 OR I>5 THEN GOTO 810
840 IF I=5 THEN RETURN
850 IF I=4 THEN GOTO 870
860 BEEP 10,F(I):GOTO 800
870 CLS:PRINT AT 3,8;"BAUD RATE "
880 POKE 23560,0
890 LET A=USR 31109
900 LET A=INT(A*0.97656+.5)/10
910 PRINT AT 3,18;A;" "
920 IF PEEK 23560=13 THEN GOTO 800
930 GOTO 890
1010 SAVE "RTTY" LINE 1050
1020 SAVE "rtty" CODE 30966,1635
1040 STOP
1050 CLEAR 30000
1060 LOAD "rtty" CODE 30966
1070 GOTO 10
```


when transmitting.

The routine from 550-790 allows the contents of the memories to be changed if required. The new message may be stored by ending the program (option 5 on main menu), whereupon the user will be asked to start the recorder then press a key. The saving routine 1010-1040 saves the BASIC program first, followed by the bytes which include the memories, eliminating the need to find the start of the memory code block on the tape - just rewind to the beginning and start recording.

Lines 1050-1070 load the bytes on initial start-up after reserving sufficient space. If the program is re-run without reloading, then these lines are not executed.

Machine code subroutines

(1) Transmit memory or string input.

There are two entry requirements to this routine, both of which are performed by the BASIC program. Firstly the start address of the memory block to send must be stored in locations 31310 and 31311, and secondly the length of the block (255 characters max) should be stored in address 31309. The routine takes one character at a time from the required memory, and searches through the table of characters for a match. The least significant 5 bits of the address of the matching character is the ASCII code for that character.

The program then checks if the UART is ready to send. If so the character is printed on the screen and then sent (a figure shift or letter shift precedes the character if required).

If a return character is found, or if the 'enter' key is pressed, the program returns to BASIC. If the transmission of a string is chosen, the typed-in text is loaded starting from address 30576, and the transmit routine then treats this entry as if it was a memory.

(2) Transmit RYs.

This routine alternately sends the 5-bit ASCII code for letters R and Y after first checking if the UART is ready to send. The keyboard is checked at regular intervals for the 'enter' key.

(3) Baud rate check.

This routine uses bit 5 of the frame counter bytes of the Spectrum as an accurate 640 millisecond gating signal. During this time period, the number of cycles of the baud clock generator are counted in the DE register pair. On completion of the time period, this count is returned to the BASIC program (in the BC register pair) and the baud rate calculated.

(4) Receive RTTY.

This routine uses the 5-bit parallel ASCII code from the UART's receive register as an offset pointer in the table of characters used for transmitting to find the required character to print. Bit 0 of the status register is the 'data received' bit of the UART, and is

Letter shift	Fig shift	Code	
		(BIN)	(HEX)
A	-	00011	03
B	?	11001	19
C	:	01110	0E
D	*N/A	01001	09
E	3	00001	01
F	%	01101	0D
G	@	11010	1A
H	£	10100	14
I	8	00110	06
J	*N/A	01011	0B
K	(01111	0F
L)	10010	12
M	.	11100	1C
N	,	01100	0C
O	9	11000	18
P	0	10110	16
Q	1	10111	17
R	4	01010	0A
S	'	00101	05
T	5	10000	10
U	7	00111	07
V	=	11110	1E
W	2	10011	13
X	/	11101	1D
Y	6	10101	15
Z	+	10001	11
SPACE	SPACE	00100	04
CARRIAGE RETURN		01000	08
LINE FEED		00010	02
LETTER SHIFT		11111	1F
FIGURE SHIFT		11011	1B

* These characters are not used by the current program. Their table entries are set to 04HEX (space character) but may be changed as required. Any other characters not used are given a table entry of 0, which when printed gives a question mark.

** Carriage return and line feed characters both give the same response, ie move to beginning of next line.

List of 5-bit ASCII codes

(1) Transmit memory or string input

```

2A 4E 7A      LD HL,(7A4E)  start add of memory
3A 4D 7A      LD A,(7A4D)  memory length
A7           AND A      is length=0
C8          RET Z
5F          LD E,A
16 FF       LD D,FF
AF          XOR A      clear A
32 08 5C    LD(5C08),A  clear keyboard
3A 08 5C    LD A,(5C08)  check keyboard for
FE 0D      CP OD      'enter' key
C8          RET Z
7E          LD A,(HL)  get character from mem
E5         PUSH HL  save position in mem
21 00 7A    LD HL,7A00  start add of char table
01 40 00    LD BC,40  length of char table
ED B1      CPIR      search table for match
20 20      JR NZ,NDMAT
D5         PUSH DE
E5         PUSH HL
D7         RST 10  print routine
E1         POP HL
D1         POP DE
2B         DEC HL
7D         LD A,L
E6 20      AND 20
BA         CP D
28 0E      JR Z,XXX
57         LD D,A
FE 00      CP 00  is it a letter?
20 04      JR NZ,YYY
3E 1F      LD A,1F  letter shift code
18 02      JR,XXX
3E 1B      LD A,1B  figure shift code
YYY:      CD 3B 79  CALL SEND
7D         LD A,L
CD 3B 79  CALL SEND
E1         POP HL
1D         DEC E
C8          RET Z  was that the last char-
23         INC HL  in mem?
18 CA      JR,AGAIN  next char
SEND:     P5         PUSH AF
STAT:     DB 3F      IN A,(3F)
CB 4F      BIT 1,A  ready to send?
28 FA      JR Z,STAT
F1         POP AF
D3 3F      OUT (3F),A
C9         RET

```

(2) Transmit RYs

	21 08 5C	LD HL,5C08	keyboard buffer
	AF	XOR A	
	77	LD (HL),A	clear keyboard
TSTAT1:	DB 3F	IN A,(3F)	
	CB 4F	BIT 1,A	ready to send ?
	20 07	JR NZ,READY1	
	7E	LD A,(HL)	if not check for
	FE 0D	CP 0D	an 'enter' key
	28 22	JR Z,EXIT	
	18 F3	JR TSTAT1	re-check status
READY1:	3E 0A	LD A,0A	ASCII 'R'
	D3 3F	OUT (3F),A	send character
TSTAT2:	DB 3F	IN A,(3F)	ready to send
	CB 4F	BIT 1,A	again ?
	20 07	JR NZ,READY2	
	7E	LD A,(HL)	check keyboard
	FE 0D	CP 0D	as before
	28 0D	JR Z,EXIT	
	18 F3	JR TSTAT2	
	3E 15	LD A,15	ASCII 'Y'
	D3 3F	OUT (3F),A	
	7E	LD A,(HL)	
	FE 0D	CP 0D	
EXIT:	20 D1	JR NZ,TSTAT1	
	C9	RET	back to BASIC

(3) Baud rate check

	21 78 5C	LD HL,5C78	frame count add
	11 00 00	LD DE,0000	zero the count
WAIT1:	CB 6E	BIT 5,(HL)	wait for gate
	28 FC	JR Z,WAIT1	to go high
WAIT2:	CB 6E	BIT 5,(HL)	and then low-
	20 FC	JR NZ,WAIT2	
WAIT3:	DB 5F	IN A,(5F)	look at input
	CB 6E	BIT 5,(HL)	is gating time
	20 11	JR NZ,EXIT	up yet ?
	CB 47	BIT 0,A	wait for input
	28 F6	JR Z,WAIT3	to go high
	13	INC DE	
WAIT4:	DB 5F	IN A,(5F)	
	CB 6E	BIT 5,(HL)	is gating time
	20 06	JR NZ,EXIT	up yet ?
	CB 47	BIT 0,A	wait for input
	20 F6	JR NZ,WAIT4	to go low
	18 E9	JR WAIT3	
	42	LD B,D	put count into
	4B	LD C,E	BC registers
	C9	RET	back to BASIC

(4) Receive RTTY

CC:	21 00 7A	LD HL,7A00	table base address
	AF	XOR A	clear A reg
	32 08 5C	LD (5C08),A	clear keyboard
EE:	3A 08 5C	LD A,(5C08)	
	FE 0D	CP 0D	is 'enter' pressed
	C8	RET Z	back to basic
AA:	FE 37	CP 0B	is '7' pressed ?
	20 04	JR NZ,BB	
FF:	2E 20	LD L,20	if so do fig shift
	18 EE	JR CC	
BB:	FE 36	CP 0A	is '6' pressed ?
	20 04	JR NZ,DD	
GG:	2E 00	LD L,00	if so do let shift
	18 E6	JR CC	
DD:	DB 3F	IN A,(3F)	read status reg
	CB 47	BIT 0,A	char received ?
	28 E2	JR Z,EE	
	DB 1F	IN A,(1F)	read character
	D3 1F	OUT (1F),A	clear DR bit
	FE 1B	CP 1B	is it a fig shift
	28 E0	JR Z,FF	
	FE 1F	CP 1F	is it a let shift
	28 E4	JR Z,GG	
	B5	OR L	add let/fig offset
	6F	LD L,A	as required....
	7E	LD A,(HL)	and find character
	C5	PUSH BC	save registers
	E5	PUSH HL	because print
	D5	PUSH DE	routine corrupts
	D7	RST 10	print routine
	D1	POP DE	restore all
	E1	POP HL	registers
	C1	POP BC	
	7D	LD A,L	save current shift
	E6 20	AND 20	state back into
	6F	LD L,A	L register
	3E FF	LD A,FF	stop that damn
	32 8C 5C	LD (5C8C),A	'scroll?' message
	18 BD	JR EE	ready for next
			character

monitored to tell the program that a character has been successfully received.

To enable the UART to accept another character the 'data received' bit is cleared by outputting an arbitrary number to address 31 (1F HEX). Characters which the Spectrum does not recognise are replaced with question marks, although this action may be changed by modifying table entries.

The current shift state is held in L register, and can be modified in two ways: firstly from the keyboard (key '7' will change to figure shift, key '6' to letter shift), and secondly on receipt of the appropriate code from the receiver. The print routine used is resident in the Spectrum ROM.

Entering the program

The machine code should be entered first, by running the simple loader program shown. The BASIC is then entered, overwriting the loader. Note: *do not* use 'NEW' or switch off the supply to clear out the loader, otherwise the machine code will be lost!!

It is advisable to save the BASIC and the code before attempting to run the program, since even a small error could corrupt the whole program. Save the program in the following way:

```
SAVE "RTTY" LINE 1050
SAVE "rtty" CODE 30966, 1635
```

Remember that an improved version of the program is available from the author!!

Construction

The unit may be built on standard 0.1 stripboard provided that the usual layout and building techniques are employed. The prototype was constructed on a board of size 9x4 inches. All ICs should be mounted in holders, and normal CMOS handling precautions should be observed.

To reduce radiated interference, the terminal should be housed in a metal case and a multicore screened cable used to connect the terminal to the computer. Fourteen cores are required, and should be kept as short as possible.

The terminal is connected to the Spectrum using a double-sided edge connector with a pitch of 0.1 inch. A locating peg is required in position 5 to prevent misalignment of the connector.

As with all peripherals, the interface should be connected to the computer *before* switching on the supply - damage to the computer may result if this is not done. When the power is applied, the Sinclair Research message should appear as usual. If not, switch off and check connections, paying particular attention to address and data lines.

When all appears to be well the program should be loaded in the usual

Memory layout	Address	
	HEX	DEC
MEM 5 (255 bytes)	7F56	(32598)
	7E57	(32343)
MEM 4 (255 bytes)	7E56	(32342)
	7D57	(32087)
MEM 3 (255 bytes)	7D56	(32086)
	7C57	(31831)
MEM 2 (255 bytes)	7C56	(31830)
	7B57	(31575)
MEM 1 (255 bytes)	7B56	(31574)
	7A57	(31319)
MEM 5 LENGTH	7A56	(31318)
MEM 4 LENGTH	7A55	(31317)
MEM 3 LENGTH	7A54	(31316)
MEM 2 LENGTH	7A53	(31315)
MEM 1 LENGTH	7A52	(31314)
ADD OF CURRENT MEM (msb)	7A4F	(31311)
ADD OF CURRENT MEM (lsb)	7A4E	(31310)
LENGTH OF CURRENT MEM	7A4D	(31309)
FIG/CHAR TABLE	7A3F	(31295)
LETTER TABLE	7A1F	(31263)
	7A00	(31232)
RECEIVE PROG	79FC	(31228)
	79B1	(31153)
BAUD RATE CHECK	79AF	(31151)
	7985	(31109)
TRANSMIT RYs	7983	(31107)
	794D	(31053)
TRANSMIT MEM/STRING	794B	(31051)
	78F6	(30966)

way (using LOAD " "), whereupon the operator is greeted with the main menu. Note that the program is loaded in two parts - so don't stop the tape until you see the menu.

Alignment will only be required initially when the unit has been constructed or when components have been changed, and should be carried out in the following order:

(1) Select 'set-up/test' on main menu, then 'baud check' on set-up menu; the current receive/transmit baud rate is then displayed. With SW1 in the '45.5 baud' position, RV1 on the serial/parallel board should be adjusted until a reading of 45.5 is obtained. This should be repeated with SW1 in the '50 baud' position, adjusting RV2 for a reading of 50.0. To stop the baud check routine, press the 'enter' key.

(2) Connect the input lead of the terminal into the 'ear' socket of the Spectrum and select 'set-up/test' on main menu. Monitor the dc voltage on test point 1, select the '1445Hz tone' option and adjust RV3 for a maximum positive reading (about 3 volts). Note that the test tone lasts only 10 seconds; if a longer time is needed, the tone should be re-selected.

(3) Repeat (2) above for 1700Hz tone after changing the position of SW2,

Table

```

00 45 0D 41 20 53 49 55
0D 44 52 4A 4E 46 43 4B
54 5A 4C 57 48 59 50 51
4F 42 47 00 4D 58 56 00
00 33 0D 2D 20 27 38 37
0D 20 34 20 2C 25 3A 28
35 2B 29 32 60 36 30 31
39 3F 40 00 2E 2F 3D 00
                    
```

Print side Components side

Loader program

```

10 FOR A = 30966 TO 31295
20 READ D
30 POKE A,D
40 NEXT A
50 DATA 42,78,122,58,77,122,167,200,95,22,255,175,50,8,92,58,8,
92,254,13,200,126,229,33,0,122,1,64,0,237,177,32,32,213
60 DATA 229,215,225,209,43,125,230,32,186,40,14,87,254,0,32,4,
62,31,24,2,62,27,205,59,121,125,205,59,121,225,29,200
70 DATA 35,24,202,245,0,0,0,219,63,203,79,40,250,0,0,0,
241,211,63,201,0,0,0,33,8,92,175,119,0,0,219,63,
80 DATA 203,79,32,7,126,254,13,40,34,24,243,62,10,0,0,211,
63,0,0,219,63,203,79,32,7,126,254,13,40,13,24,243
90 DATA 62,21,0,0,211,63,126,254,13,32,209,201,0,0,0,0,33,
120,92,17,0,0,203,110,40,252,203,110,32,252,219,95,203
100 DATA 110,32,17,203,71,40,246,19,219,95,203,110,32,6,203,71,
32,246,24,233,66,75,201,0,0,0,33,0,122,175,50,8,92,58,8
110 DATA 92,254,13,200,254,55,32,4,46,32,24,238,254,54,32,4,46,
0,24,230,0,0,219,63,203,71,40,226,0,0,219,31,0
120 DATA 0,211,31,254,27,40,224,254,31,40,228,181,111,126,197,
229,213,215,209,225,193,125,230,32,111,62,255,50,140
130 DATA 92,24,189,0,0,0,69,13,65,32,83,73,85,13,68,82,74,78,
70,67,75,84,90,76,87,72,89,80,81,79,66,71,0,77,88,86,40
140 DATA 0,51,13,45,32,39,56,55,13,32,52,32,44,37,58,40,53,43,41,
50,96,54,48,49,57,63,64,0,46,47,61,0
                    
```

adjusting RV4 for a maximum positive reading on test point 1.

(4) Repeat (2) above for 1275Hz tone, adjusting RV5 for a maximum negative reading on test point 1 (about -3 volts).

(5) Connect link 1, and with SW2 in the 1445Hz position, adjust RV7 for a maximum positive reading on test point 1.

(6) Repeat (5) with SW2 in the 1700Hz position, adjusting RV6 for a maximum positive reading.

(7) Make link 2 and adjust RV8 for a maximum negative voltage on test point 1.

(8) Remove links 1 and 2; calibration is now complete.

Using the program

Operation of the program should be self-explanatory, since it is completely menu driven. It is best to firstly set up the five 255 byte memories as required, then end the program (option 5 on main menu). The program will then prompt the operator to start the recorder in order to save the memories, rewind the tape to

the beginning, then press record. The saving operation is in two parts, so look out for the second prompt. Once the memories have been saved, the program may then be re-started.

Whenever the program is ended in the above way it will be assumed that the memories require saving. If this is not so, simply press any key without starting the recorder.

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RODIME 10MB ST506 Winchester NEW £299.00
BASF 6172 23Mb Winchester, as seen £199.00
 Carriage on other drives £10.00.
 Unless stated all drives are refurbished with 90 day guarantee. Many other drives and spares in stock - call sales office for details.

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TRANSDATA 307A Acoustic coupler 300 baud full duplex, **£49.00**
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Ex BRITISH TELECOM full spec, CCITT, ruggedised, bargain offers. Sold TESTED with data. Will work on any MICRO or system with RS232 interface.
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DATL 2412 Made by SE labs for BT this two part unit is for synchronous data links at 1200 or 2400 baud using 2780/3780 protocol etc. Many features include 2 or 4 wire working, self test, auto answer etc.
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A MASSIVE purchase of these attractive stand alone terminal units enables a SUPER BARGAIN offer. Made by the US GENERAL ELECTRIC CORPORATION the GE MODEL 30 features a standard QWERTY 80 key electronic keyboard coupled to a quality built matrix printer with variable 3" to 9.5" forms tractor. The printer is capable of continuous duty printing, with up to 120 characters per line. Standard RS232 interface accepts ASCII data at 110, 150 or 300 baud. Ideal for Terminals, Data loggers, local label printing, or just as a printer! Sold TESTED with data ONLY £95.00. Also available with TWIN MAGTAPE CASSETTE unit for data capture, data preparation etc £150.00 Carriage £10.00.

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GOULD OF443 enclosed, compact switch mode supply with DC regulated outputs of +5v @ 5.5a, +12v @ 0.5a, -12v @ 0.1a and -23v @ 0.02a. Dim 18 x 11 x 6 cm. 110 or 240v input. BRAND NEW only **£14.95**
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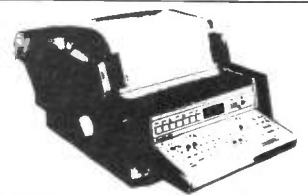
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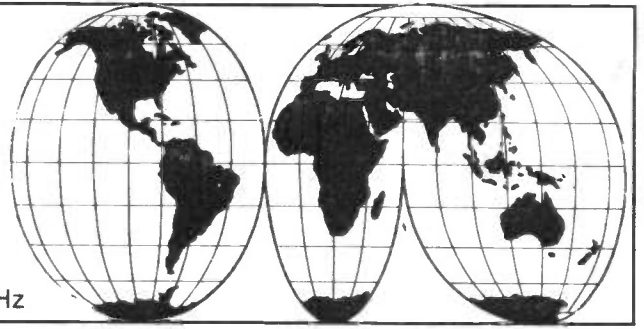
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Signature

SHORT WAVE NEWS FOR DX LISTENERS

By Frank A Baldwin

All times in GMT, **bold** figures indicate the frequency in kHz



In the last two instalments of this series, attention was drawn to some of the stations currently operating from Asia on the 60 metre band, India, Pakistan and Sri Lanka being the countries under discussion.

In this issue, a review of some of the transmitters located in other Asian areas is presented for the interest of Tropical Band DXers.

Bangladesh

Radio Bangladesh, Dhaka operates a 100W transmitter radiating Home Service programmes in Bengali from 0030 to 0130, from 0300 to 0505, from 1230 to 1500 and from 1700 to 1715, at least according to one published schedule, the frequency also being stated as **4880** (ex-**4890** and **4879**). Just recently the writer logged it on a measured **4893.5** at 1557 and a few days later on **4894.1** at 1558, putting a good signal into the UK on both occasions.

No doubt the channel will have changed by the time these words appear in print. A search around the frequencies mentioned at the times specified may bring results.

Mongolia

There are several Mongolian stations listed on the 60 metre band. Some of them are considered by the DX world to be probably inactive; they will not therefore be mentioned here.

Only rarely do the two Mongolian stations dealt with here appear in DXer publication reports – at least those available to the writer. However, for a wide coverage of Asian transmissions and in order to make the information available to readers, the following are listed.

Ulgii, Bayan-Ulgii Province radiates Home Service programmes, mostly in Mongolian from 2200 to 1600 which includes relays of the Moscow Foreign Service in Mongolian from 0600 to 0630,

from 0930 to 1000 and from 1200 to 1245.

On Tuesday and Friday there are programmes in Russian from 1130 to 1200, in Chinese from 0830 to 0900 and in Kazakh from 1330 to 1500. The frequency is **4750** and the power is 12kW.

Choibalsan, Eastern Mongolia is occasionally heard on or around **4995**, the frequency varying on occasions from **4994** to **4996**. At 12kW it features Home Service 1 programmes in conformity with the above schedule, except for the Kazakh programme which is omitted.

Nepal

Radio Nepal can often be heard on **5005** at which frequency its 100kW transmitter operates the Channel 2 Commercial Service from 0020 to 0520, from 0620 to 1020 and from 1150 to 1720. An external service in English is radiated from 1050 to 1150, identifying as Radio Nepal. The identification in Nepali is Yo Radio Nepal Ho.

On occasion, it is possible to note Radio Nepal gaining in signal strength from a mere whisper to an almost stentorian bellow as time progresses from initial tune-in until final sign-off.

Vietnam

Than Hoa operates on **4886**. The schedule, in Vietnamese and/or local vernaculars, is from 2330 to 2400 and from 1030 to 1100. The power is unknown and the frequency is subject to some variation. It is reported to operate irregularly and the chance of logging this station here in the UK or Western Europe is remote indeed.

Hanoi broadcasts programmes in the Home Service on **4770** from 2145 to 0200 (Sunday until 0400). The time-slot matches in well with Radio Pyongyang on the same channel, this North Korean radiating the Foreign Service in Korean from 1000 to 1025, 1200

to 1225 and from 1400 to 1425 at 120kW. The power of Hanoi is unknown to the writer at this point.

In the next issue, some of

the Far Eastern stations operating between **4000** to **4460** will be brought to the attention of interested readers.

AROUND THE DIAL

In this section areas of the world and countries logged within them are listed in alphabetical order, and the frequencies numerically. Align the receiver dial at some of the latter, coinciding with the times quoted, when you may hear the wanted signals.

AFRICA

Ascension Island

BBC Atlantic Relay on **17885** at 1514, OM with announcements and programme preview in an English World Service transmission for East Africa, scheduled from 1400 to 1600.

Botswana

Gaborone on **3356** at 1845, YL with a pop song then OM with some announcements in English, including a promo, two chimes then OM in SeTswana.

Radio Botswana, Sebele (transmitter site) is on the air from 0400 to 0630 (Tuesday to Thursday inclusive until 0530, and during school terms also Monday to Friday inclusive) and from 1400 to 2100. There is an English newscast at 0510 Monday to Friday, at 0600 (BBC relay), at 1610 and at 1910. The power is 50kW.

Mali

Bamako on a measured **4783.4** at 2252, OM with announcements in French followed by OM with a folk song in a vernacular complete with a backing of local-style music.

This 18kW transmitter is on the air from 0600 (on Sunday this is from 0700) to 0800 and from 1800 to 2400.

Swaziland

TWR (Trans-World Radio) Manzini on **9550** at 1926, OM

with the station identification in English, musical chimes interval signal repeated several times, YL with station identification in both English and French at the commencement of the French transmission to Zaire.

CENTRAL AMERICA

Antigua

BBC Relay on **9510** at 0450, OM with a financial review of the UK market in an English programme for Australasia and the Pacific Islands, timed from 0430 to 0915.

Netherlands Antilles

Bonaire on **9715** at 0624, YL with the station identification at termination of an English transmission for North and Central America, scheduled from 0530 to 0625.

NORTH AMERICA

Canada

Montreal on **15325** at 1940, OMs and a YL with the English programme for Western Europe timed from 1900 to 2000.

USA

WYFR (Family Radio) Okeechobee, Florida on **9510** at 1944, YL with the station identification and announcements including address for listeners' letters as 94621 Oakland, California, USA, then OM with the song 'Amazing Grace'. The schedule is from 1900 to 2000.

SOUTH AMERICA

Brazil

Radio Relogio, Rio de Janeiro on **4905** at 0312, OM with a talk in Portuguese, and a time signal (3 pips) superimposed every minute. At 5kW, Radio Relogio is scheduled from 0730 through to 0330.

SHORT WAVE NEWS

Colombia

Radio Sutatenza, Bogota on **5095** at 2224, OM and YL with a discussion in Spanish about the earthquakes. Radio Sutatenza works around the clock with a power of 50kW.

Peru

Radio Atlantida, Iquitos on **4790** at 0443, OM with a folk song in Spanish complete with guitar backing. The schedule is from 0900 (Sunday from 1130) to around 0500 (Sunday until 0400) with a power of 5kW. The frequency can vary slightly on occasions.

Radio Eco, Iquitos on **5010** at 0440, OM with a sports commentary in Spanish mixed with some interference from the co-channel Radio Garoua in Cameroon. Radio Eco is scheduled from 0900 through to 0300 but, as will be noted, the closing time can vary when radiating programmes of national or local interest. The power is 1kW.

Venezuela

Radio Bolivar, formerly Radio Mundial, **4770** at 0134, OM with records of local pops and announcements in Spanish. This one is on the air from 0900 to 0400 at 1kW.

ASIA

Bangladesh

Dhaka on **17670** at 0720, OM with a song in Bengali. According to the latest information to hand, the Bengali programme – assuming that this is what I heard – is listed from 0830 to 1000.

China

Voice of the Strait, Fuzhou on **2430** at 1458, YL with announcements in Chinese (Amoy), YL with some songs then Chinese orchestral music.

This 10kW transmitter radiates programmes in Chinese and Amoy to Taiwan and other offshore islands from 1345 to 1755. Amoy is used from 1400 to 1415, from 1445 to 1500, from 1600 to 1615 and from 1645 to 1700.

Zhejiang PBS on **2475** at 2213, OM with a talk in Chinese during a Home Service 1 programme. The schedule is from 2100 to 0530 and from 0850 to 1505 with a power of 10/50kW. English language

lessons are featured from 2140 to 2210 and from 1330 to 1400.

Voice of the Strait, Fuzhou on **2490** at 2218, OM with a talk in Chinese, OM with a song then some local-style orchestral music. At 10kW this one is on the air from 1205 through to 2355.

Voice of the Strait, Fuzhou has also been logged on **2600** at 1506 and on **2810** at 1509.

India

Gauhati on **3235** at 1515, OM and YL with a talk in a vernacular in the East Regional Service scheduled on this channel from 1230 to 1740 with a power of 10kW.

Kurseong on **3355** at 1518, OM with a talk in a vernacular, also in the East Regional Service. Kurseong radiates from 1130 to 1740 with a power of 10kW.

Delhi on **9550** at 2125, YL with a talk about an Indian religious festival in an English presentation to Australia and New Zealand, timed from 2045 to 2230.

SOUTH-EAST ASIA

Indonesia

RRI Medan on a measured **4764.2** at 1558, OM with some announcements in Indonesian then YL with a talk. This 50kW Sumatra transmitter is on the air from 2230 to 0300 (Sunday from 2300 to 0800), from 0500 to 0800 and from 0900 to 1700.

RRI Yogyakarta on a measured **5046.8** at 1545, OM announcer then OM and YL with a duet in Indonesian. This one is on the air around the clock with a power of 20kW.

NEAR AND MIDDLE EAST

Iraq

Baghdad on **9610** at 0440, YL and OM with songs in Arabic, also logged in parallel on **9635**, schedule unknown.

Oman

Muscat on **9735** at 0617, YLs with songs in Arabic, local-style music, OM with announcements, schedule 0400 to 1400.

Cyprus

BBC Relay on **9580** at 0600, time-check then OM with the station identification (BBC London) followed by a news-

cast of world events in the English World Service programme which is directed to the USSR and Northern Europe, scheduled from 0500 to 0630.

Saudi Arabia

Riyadh on **9870** at 1950, OM and YLs with songs in a relay of the Arabic Home Service, scheduled from 1700 to 2130 on this channel.

Syria

Damascus on **9565** at 2012, OM and YL with news of the Arab world in an English transmission to Europe, schedule 2000 to 2100.

Turkey

Ankara on **9560** at 0412, OM with local news, YL with the station identification, all in the English programme for North America, Australia and New Zealand, scheduled from 0400 to 0500.

United Arab Emirates

Abu Dhabi on **9610** at 1952, OM and YLs with songs in Arabic during an External Service presentation to Africa, timed from 1800 to 2000.

PACIFIC

Australia

Melbourne on **7205** at 1548, OM with announcements, YL with a programme preview in an English transmission to Asia, scheduled from 1530 to 1730.

Guam

KTWR Agana on **9820** at 0927 with interval signal of chimes then OM with announcements, station identification and programme in Russian timed from 0930 to 1000.

NOW HEAR THESE

Radio Bangladesh on a measured **4893.5** at 1557, OM with a talk in Bengali, some instrumental music, pips time-check at 1600, YL with the station identification.

Radio Neuva America, La Paz, Bolivia on a measured **4796.8** at 0038, YL with pop songs, OM with announcements in Spanish and mentions of La Paz. The power is 1kW and the schedule is from 1000 to 1430 and from 2200 to 0400 (Sunday from 1030 to a closing time of around 2300).

Ulan Bator, Mongolia on **4080** at 2214, YL with a talk in Mongolian then some stringed instrumental music in a Home Service 1 transmission, scheduled from 2200 to 1600.

The schedule includes the Moscow Foreign Service in Mongolian and some Russian and Chinese transmissions. The power is 50kW.

Radio Tropical, Tarapoto, Peru on **4935** at 0324, OM with a talk in Spanish until full identification at 0328. At 1kW, Radio Tropical is on the air from 0900 to 0300, both times being variable. It has been reported signing off as late as 0400.

NOW LOG THESE

Radio Voz de Sao Vicente, Cape Verde on a measured **3929.8** at 2031, OM with a pop song then OM with announcements in Portuguese.

This 10kW transmitter is scheduled on the air from 1800 to 2400. The frequency can vary up to **3931** on occasions.

Rangoon, Burma on **4725** at 1425, YL with a song, YL with announcements and a talk in Burmese until 1439 then some music in typical local style. Signal lost under interference at 1443.

The power is 50kW and this one signs off at 1445 (Saturday and Sunday at 1545) in October, January and February, at 1545 (Saturday and Sunday at 1445) in November, December and March.

PBC Karachi, Pakistan on **4815** at 1802, a programme of local-style music in the Regional Service, scheduled on this frequency from 0230 to 0600 and from 1200 to 1900 with a power of 10kW.

CPBS Beijing, China on **4770** at 1934, YL with a talk in Chinese. This was a transmission in the Taiwan Service 1 which is on this channel from 1515 to 2300. CPBS Beijing has a power of approximately 50kW.

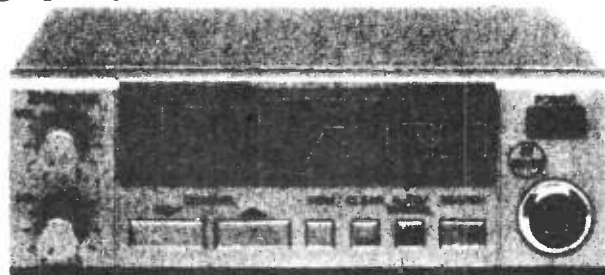
Radio Beijing, China on **4960** at 1442, YL with announcements in Japanese then some Chinese orchestral music. This was a programme in the Foreign Service in Japanese which is on this channel from 2130 to 2200 and from 0930 to 1530. The power is 50/120kW. REW

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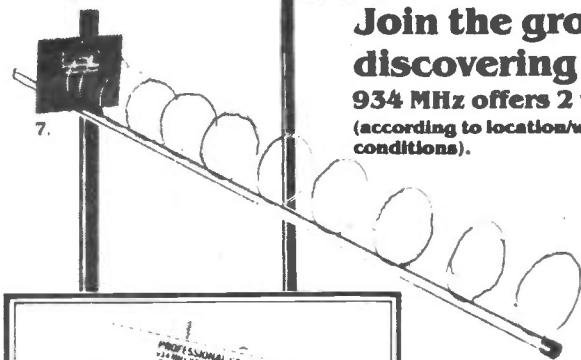
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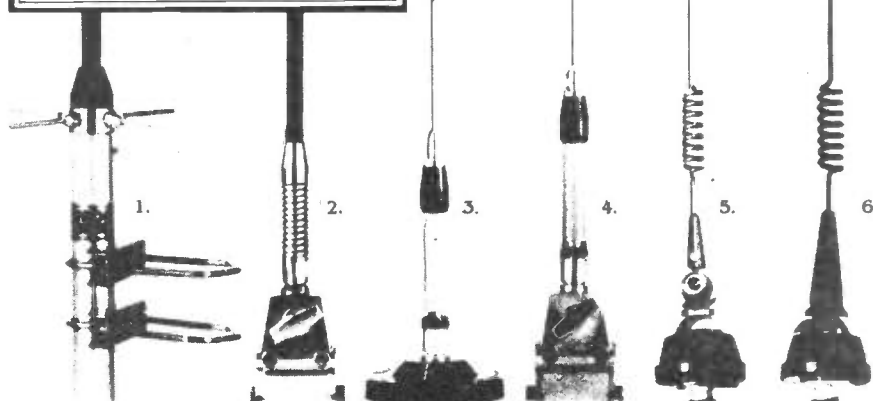
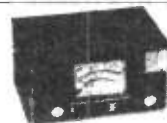
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Following a month of hectic activity, DX-TV reception returned to a more leisurely pace during November. On the whole it was a fairly typical winter month for DX-TV reception, with many days being somewhat inactive.

Sporadic-E reception was recorded on at least three days in various parts of the UK. November 2nd and 3rd were particularly interesting, with sustained signals from most points of the compass. Tropospheric DX failed to produce anything of significance. Reception came from the Low Countries and was present between the 13th and 18th. It was mainly Band III frequencies which were affected.

Meteor shower activity resulted in DX-TV reception from time to time during the month. The 17th was perhaps the best day with early morning 'pings' being noted on the lower Band I channels.

DX-TV log for November

Despite the fairly quiet conditions, Bob Brooks of South Wirral has managed to produce an interesting log. The details are as follows:

1/11/85: Austria (ORF) on channel E2a showing the Philips PM5544 test pattern with 'ORF FS1' identification; Sweden (SR1) E2 with 'TV1 SVERIGE' PM5534 and clock insert.

2/11/85: Italy (RAI) on channel IA showing a film at 0915 via SpE reception. Cycling was noted on this channel from RAI at 1302. An unidentified film, *Our Gang*, was present on channel E3 at 1045 – no clues as to its origin could be gleaned; Spain (TVE) on channel E3 with a lottery at 1325.

3/11/85: Unidentified station transmitting *Madame Butterfly*, an opera, on channel E3. This was at 1030 via SpE propagation; Sweden (SR1) E2 on test pattern with digital clock at 1045 (the clock was showing 1145); Norway (NRK) E2 radiating the PM5534 test card incorporating the transmitter identification 'Steigen'; Czechoslovakia (CST) R1 with 'PRAHA' studio identification logo at 1203.

4/11/85: Czechoslovakia (CST) R1 using the EZO electronic test pattern bearing the letters 'RS-KH'. A cartoon appeared on the same channel at 0825 possibly of Hungarian origin; Sweden (SR1) E2 was noted at 0853 with the station opening clock identified by the letters UR.

5/11/85: Sweden (SR1) E2 with the UR station opening clock caption.

8/11/85: Sweden (SR1) E2 showing the PM5534 test pattern at 1000.

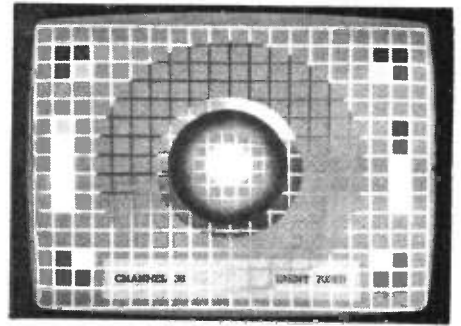
11/11/85: Russia (TSS) on channel R1 radiating the colour electronic test pattern 0167 type; Czechoslovakia (CST) R1 with the 'RS-KH' EZO test card at 0845; Switzerland E2 with the '+PTT SRG1' FuBK electronic test pattern from the Bantiger transmitter at 1020.

12/11/85: Sweden (SR1) E2 showing the 'TV1 SVERIGE' PM5534 test card at 1050.

15/11/85: Quite a productive day with Hungary (MTV1) R1 on clock caption at 0750 followed by programmes via SpE through until 0925; Austria (ORF) E2a transmitting the monochrome

DX-TV RECEPTION REPORTS

Compiled by Keith Hamer and Garry Smith



Telefunken TO5 test card at 1450; an unidentified clock was noted on E2 at 1452 but the signal faded before any identification captions appeared.

16/11/85: A film was noted on channel E2 at 0900 – no clues as to its origin could be gained.

20/11/85: Another unidentified film on channel E2, this time at 1050.

21/11/85: Poland (TVP) R1 radiating the dark background PM5544 without identification; West Germany E2 (Bayerischer Rundfunk) showing the FuBK test card with 'GRUNTEN' identification.

22/11/85: Czechoslovakia (CST) R1 radiating the EZO test card with RS-KH insert.

23/11/85: Unidentified clock caption on channel E2 noted at 1000.

Reception reports

Tony Privett of Basingstoke has been busy with both broadcast and ATV DX during the month. The 2nd was extremely active with signals from Italy (RAI) on channels IA and IB. Russia on R1 with programmes and Spain on all Band I 'E' channels. Italy was again seen on the 4th at 2129GMT via sporadic-E (SpE). On the 8th and 14th, tropospheric DX occurred and several Belgian and Dutch transmissions were present.

Tony is looking for another DX receiver, ideally a 9-inch colour portable with French system L facilities as well as the usual sound switching for European and British standards. He's also on the look-out for new aerials. His present array system would appear to be a little top-heavy, as he's commented that 'everything has a nice 10-degree declination and list to port!' Tony reckons the bending was due to the length of his MH308 Bands I/III array and he's seriously contemplating changing over to separate Band I and III aerials. We feel this should be all right provided it is positioned on the stub mast close to the rotator and that the whole structure is suitably guyed.

William Maries of Studley in Warwickshire has sent a letter of apology regarding his depressed DX-TV log for November! Don't worry – we know the feeling. Fortunately it wasn't all gloom for William. The 3rd brought a display of Scandinavian signals in Band I on channels E2, E3 and E4. Between 1100 and 1215GMT he logged NRK (Norway) on test with the PM5534 with the

transmitter identifications 'NORGE MELHUS' and 'NORGE GULEN'. Bagn and Gamlem were seen on E3 while on E4 the test card displayed 'NORGE KONGSBERG'. During the same period, programmes from Sweden were noted occasionally as co-channel signals.

Illegal telephones

Sporadic-E was present in Scotland on the 2nd. Iain Menzies of Aberdeen saw Russian programmes on channel R1 at 0800. During the afternoon he noted Spain on E2 and Italy on IA. There was also a fair amount of meteor shower activity. Iain uses a scanner to alert him of any early morning DX. On the 24th he awoke to find East Germany on E4, Poland on R2 and Norway on E2. The scanner is occasionally turned off during the night because some illegal cordless telephones (thought to be in use at the local fish market) on 49.75MHz often shatter his dreams in the early hours!

Canal Plus (France) was logged in Band I by John Bray of St Neots on the 17th. The signal appeared slightly HF of channel E2. The strange thing is, the frequency of 49.25MHz is supposed to be the sound frequency of channel L2. Note that in Band III the sound channel is 6.5MHz higher than the vision carrier but in Band I it is 6.5MHz below.

An improvement in tropospheric conditions from the 13th allowed John to view RTL from Luxembourg on E7, WDR (West Germany) from Langenberg on E9, Belgium on E8 from the Wavre transmitter and NOS-1 (Netherlands) on E4 (Lopik) and E7 (Markelo).

Bob Brooks has questioned a mystery noted during mid-October on channel E2. At 0817 on the 15th, a test card was resolved via an SpE opening. It consisted of a centre circle which enclosed a word resembling 'Greece' in the Cyrillic alphabet. The pattern had four corner circles making it look very much like one of the early monoscopic types. Earlier there was a report of a news programme on E2 carrying the logo 'YENED'. This used to be transmitted by the Greek Armed Forces TV service. However, this network was disbanded some time ago. One likely explanation is that another country, such as West Germany, was broadcasting a 'Guest-worker' programme aimed at Greeks working there. If anyone has further ideas, please write to Bob via ourselves.

Kevin Jackson (Leeds) reports a poor month for DX-TV reception. He's obviously flogged his equipment to death during the October tropics! Italy (RAI) was seen on programmes at 1606 on the 2nd via SpE while on the 3rd an opening produced Russian signals on channel R1. The Swedish 'TV1 SVERIGE' PM5534 test card was also noted during the morning, on E2.

The highlight of the month for Kevin took place during the evening on November 18th between 2123 and 2205GMT. He was tuning through the FM radio band when he noticed an Italian-language station at 95.60MHz. The signal appeared to be propagated via tropics. To rule out sporadic-E he checked for transmissions in Band I on channel 1A and on the 27MHz CB. There was absolutely nothing. Working on the assumption that it was indeed via enhanced tropospheric conditions, he searched through Band III expecting to see Swiss signals. Again nothing was resolved. After some head-scratching Kevin decided that the signal must have been the Italian-language FM network in Switzerland. He consulted various books only to discover that nothing was listed on this frequency. A glance through the Italian listings revealed a 24kW outlet at Torino radiating RAI-2 FM.

So, then, why no sign of TV signals? Well, TV from Torino is radiated on channel IC (82.25MHz vision) and Kevin doesn't have any means of covering this

frequency. This was a very odd logging indeed! Although the trailing edge of a high pressure system was sitting over Europe from Switzerland towards Iceland Kevin wasn't really expecting a great deal.

Alarming DX

Dave Lauder of Barnet (Hertfordshire) has devised a DX alarm system which detects the 15.625kHz sync pulses of a received signal. The circuit is extremely sensitive and will detect transmissions which are not normally viewable on the screen. His circuit was published in issue 20 of the DX magazine *TeleRadio News*. This publication is available via subscription (£6 for six bi-monthly issues or £1.50 per single copy) from: *HS Publications, 17 Collingham Gardens, Derby DE3 4FS*.

Dave is situated in a valley, so DX reception is usually poor. However, he's moving to High Barnet shortly. His new location will be 400 feet above sea level and there will be nothing in the way to the south-east between him and Europe.

AFTV Iraklion

Bakos Gabor of Hungary has sent information confirming that the American Forces TV service in Iraklion (Crete) is still operational. The station has been received in the UK on several occasions, mainly during the mid-seventies, although we have not received reports about the service since then.

In June 1974 the network was received

in Derby using the RETMA monoscopic test card. Enthusiasts in the south of England also noted the station on programmes. Perhaps this service is unique, since it is the only one in the European area (and one of the very few around the world) which uses channel A2 (55.25MHz vision, the same as E3). The transmission system is 525 lines/60Hz, so reception from AFTV would necessitate adjustment of the frame timebase lock and picture height controls to secure a true picture.

The transmitter has an output of 100W and NTSC colour is used. Broadcasts normally begin at around 0700GMT on Saturdays and Sundays. On weekdays the station opens up at 1100GMT. They don't have programme announcers. Photographs of flowers are sometimes shown instead.

Italian TV in Kuwait mystery

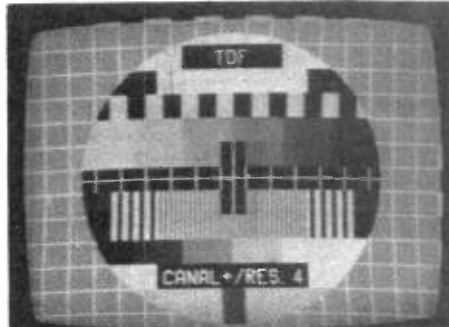
We recently received a very interesting telephone call from a DXer in Kuwait. Jamil Charawi of Safat reported that he could receive transmissions from an AFRTS satellite intended for US Forces personnel stationed in Italy. The station logo is 'SEB TV' (Southern European Broadcast) although an AFRTS (American Forces Radio & Television Service) identification caption is also radiated.

Mystery surrounds these transmissions because Jamil can receive them on his standard UHF receiver in Kuwait. He

PHOTO FILE ● PHOTO FILE ● PHOTO FILE ● PHOTO FILE ● PHOTO



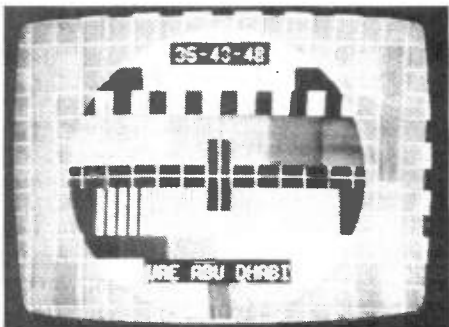
Identification caption used by WDR in West Germany



PM5544 test card from the French 'Canal Plus' service



A modified PM5534 pattern radiated in Saudi Arabia



Test card transmitted by Abu Dhabi with channel details at the top



Programme caption used in East Germany for educational broadcasts



News summary from NOS in the Netherlands (Middle East photos - Fred Pilkington)

DX-TV RECEPTION REPORTS

telephoned the AFRTS headquarters in America and they were fairly forthcoming with information until he happened to mention that he was speaking from Kuwait. The phone line suddenly went dead and all further attempts to find out exactly what 'SEB TV' is have failed.

Jamil has sent a video tape of his reception and we hope to feature photographs in the near future. If any of our readers can shed light on Jamil's strange reception of Italian TV, please write in and we'll pass on the details.

Service information

Sweden: The SR/SVT-1 transmitter on channel E2 at Hörby closed down on January 1st. This is yet another Band I transmitter which will be missing from DX-TV enthusiasts' logs!

West Germany: There are three regional variations to the normal programme radiated by Norddeutscher Rundfunk (NDR-1). The regions are Hamburg, Schleswig-Holstein and Niedersachsen. Details of the regional broadcasts are as follows:

Hamburg radiates a programme called 'Hamburger Journal' from its outlet on channel E9.

'Schleswig-Holstein Magazin' is transmitted from the following outlets: E4

Flensburg; E5 Kiel; E7 Lübeck; E10 (V) Heide; E28 Neumünster; E41 Sylt; E46 Lauenburg; E50 Bungsberg; E53 Mölln.

The region of Niedersachsen radiates a programme called 'Hallo Niedersachsen' from the following transmitters: E7 (V) Viselhövede; E8 Hannover, E10 Harz-West; E41 Lingen; E43 Dannenberg; E47 Stadthagen; E50 Osnabrück; E51 Cuxhaven; E53 Aurich; E55 Steinkimmen; E56 Hamburg.

The regional programmes are aired between 1920 and 1950 local time, Monday-Friday. At all other times each NDR region transmits the same programme.

Regional test cards are also transmitted as follows:

Hamburg: FuBK with circle and 'NDR 1 HAMBURG' identification;
Schleswig-Holstein: FuBK without circle and 'NDR KIEL' identification;
Niedersachsen: FuBK with circle and 'NDR 1 HANNOVER' identification.

The regional test card from Hamburg with the identification 'LF-HH' (Landesfunkhaus Hamburg) and the NDR test card showing 'LFHS-NDS' (Landesfunkhaus Niedersachsen) are no longer radiated. The other idents, however, are still used, namely 'NDR 1 SH', 'NDR 1 HH', 'NDR 1 WN' and 'NDR 1 ON'. 'SH' =

Schleswig-Holstein, 'HH' = Hamburg, 'WN' = West Niedersachsen and 'ON' = Ost (East) Niedersachsen.

There are also five regional programmes from WDR-3 originating from five different studios ('Landesstudio') as follows:

Bielefeld via: E46 Bielefeld; E48 Eggegebirge; E57 Minden.
Dortmund via: E40 Hochsauerland; E53 Dortmund; E60 Lüdenscheid.
Münster via: E45 Münster.
Köln (Cologne) via: E49 Bonn; E50 Monschau; E55 Düsseldorf; E58 Aachen.
Düsseldorf via: E39 Düsseldorf (new!); E42 Wuppertal; E48 Wesel.

The regional programmes are broadcast Monday-Friday between 1945 and 2000 local time, during the news bulletin 'Aktuelle Stunde'. The new transmitter at Düsseldorf on channel E39 has an ERP of 100kW. During commissioning tests a special identification was used on channels E39, E42 and E48, namely 'DSSD KANAL 39'.

The channel E5 outlet at Bonn, which carries programmes from WDR-1, will remain in service until December 31st 1986.

This month's service information was kindly supplied by Gösta van der Linden (Rotterdam, Netherlands). REW

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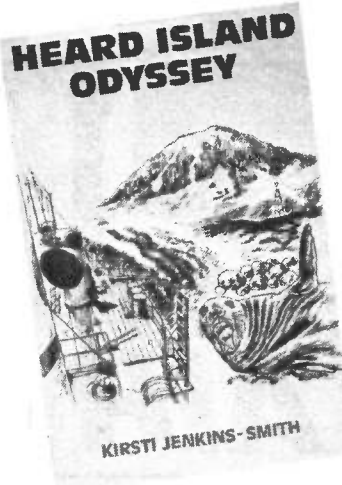
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HEARD ISLAND ODYSSEY

Kirsti Jenkins-Smith
This paperback tells the complete story of the perilous journey to this uninhabited and remote island isolated by stormy seas in the Antarctic (see the articles in the August and September editions of *Radio and Electronics World*, written by this author's husband, Jim Smith).

Cirkit

Cirkit has introduced many new products in their 144-page spring catalogue, which will shortly be obtainable from leading bookstalls or by post from the company's Broxbourne headquarters at the cover price of £1.15.

Featuring components, equipment and information for the home constructor, the new issue features for the first time a special section with pin-outs of linear ICs plus an enlarged section on computer communication peripherals for the Amstrad, including modems, text dump, RS232 interface, parallel/centronics interface and ROM card. Among the new construction kits featured are low power HF amplifiers and HF pre-amps plus a windscreen wiper delay mechanism for motor cars.

The catalogue also includes an expanded range of PCB drafting materials.

Originators and co-sponsors of the Young Electronic Designer Awards Scheme for full-time students in the United Kingdom, Cirkit has set up a special educational desk with its own telephone number, (0992) 445736, to service the individual requirements of schools, colleges, polytechnics and universities. By contacting Cirkit, science and technology

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In 1983 the multi-interest private expedition set off for the island in a 36 year old whale-chaser, *Cheyne II*. But as the ship travelled south through the 'roaring forties', the expeditioners and crew on board learnt that there was more than rough seas to worry about. The *Cheyne II* herself presented numerous problems.

After considerable delays, the expedition finally reached Heard Island where the members lived ashore for 11 days in primitive conditions, pursuing their various aims.

At the end of their stay, they re-embarked, only to find that it was the voyage home which would really test their mettle.

HIDI-Y' Enterprises, PO Box 90, Norfolk Island, Australia 2899. ISBN 0-9589185-0-3

departments can receive a complimentary copy of the catalogue and regular updates about all the latest introductions and special offers from the company.

*Cirkit Distribution,
Park Lane,
Broxbourne,
Herts EN10 7NQ.
Tel: (0992) 444111.*

Marconi

Available from Marconi Electronic Devices' Microwave Division is a new 22-page technical catalogue (M38) of surface acoustic wave devices. Information is given on SAW oscillators, filters and dispersive delay lines.

Marconi's broad capability is shown in the range of filters in the catalogue: from the DA9201 ST cut quartz wide-band bandpass filter, at a centre frequency of 200MHz, to the DA9210 lithium niobate filter at 120MHz.

Of note in the oscillator section are the DA9822F and DA9825F low cost tunable oscillators at 504MHz and 420MHz respectively, and the 500MHz resonator based oscillator, DA5908C, which is optimised for single sideband noise.

Highlighted in the catalogue are dispersive SAW

delay lines for pulse compression radar, compressive receivers and ECM applications. Due to the nature of these devices, no standard specifications are given, but Marconi offers a complete design service against customer requirements.

*Marconi Electronic Devices,
Doddington Road,
Lincoln LN6 3LF.
Tel: (0522) 688121.*

Siemens

Siemens Components' most recent catalogue features the usual comprehensive information about its components group as well as many useful and interesting articles for the home electronics constructor.

The catalogue is available from bookstores and newsagents but can also be obtained from the company by subscription.

*Siemens Ltd,
Siemens House,
Windmill Road,
Sunbury-on-Thames,
Middlesex TW16 7HS.
Tel: (09327) 85691.*

Dage

Dage has released a catalogue of Positronic D-sub-miniature connectors, made in the United States and Switzerland.

This catalogue describes thirteen families of products, giving full specification data in each case. The data includes the component materials and finishes, mechanical features, electrical specifications, sizes and contact layouts. There are simply explained formatted guidelines for ordering the precise specification of the connectors required.

There is a section of the catalogue devoted to accessories such as hoods, quick release devices, mounts, etc for use with the connectors.

Two useful cross-reference tables are provided. One lists the equivalent part numbers of competitors' products. The other lists the official United States military designations against Positronic part numbers which are qualified under Military Specification

MIL-C-24308 and MIL-C-39020.

*Dage (GB) Ltd,
Eurosem Division,
Rabans Lane,
Aylesbury,
Bucks HP19 3RG.
Tel: (0296) 33200.*

Tandy

Tandy, the world's largest electronics retailer and one of the UK's leading suppliers of consumer electronics, toys and business products, has sent us its 1986 catalogue.

The new range includes the company's own-branded quality LCD pocket televisions, personal and portable stereos, British Telecom approved telephones for home and office, video recorders and business computers.

Tandy offers full guarantees on all products and has 215 UK stores. The company has over 135 dealers and owns 50% of the AT Computer-World business computer chain, which is a joint venture with ACT.

*Tandy Corporation
(Branch UK),
Tameway Tower,
Bridge Street,
Walsall,
West Midlands WS1 1LA.
Tel: (0922) 648181.*

Matra-Harris

A 450-page digital products data book just published by Matra-Harris is available free from RR Electronics of Bedford.

The book features their range of CMOS and HMOS RAMs, microprocessors, microcontrollers and peripherals together with a dual port RAM controller and circuits for telecommunications and video storage displays.

Data sheets are included for all products and include functional diagrams, pin-outs, electrical characteristics and where necessary commercial, industrial and marketing specifications.

*RR Electronics Ltd,
St Martins Way,
Cambridge Road,
Bedford MK42 0LF.
Tel: (0234) 47211.*

Many thanks to all those who sent letters for this edition's activity round-up; I must say I could have done with some more, though. Amazing that so few operators noticed the openings during October, for instance!

Seventy centimetres

Anyway, one of those who exploited the lifts was Peter G8KZG, residing in Wargrave. On October 16th both he and Mike G8LES received pictures from Bob G1DPM in Paignton. Bob was running about 20W and Peter was able to give him P1. Mike did better, being closer and higher and with a better pre-amp. Peter says that excluding F1EDM this is the longest 70cm path for him.

Later the same evening G1IRF in Dawlish was sending to G8LES and seen at 'KZG's. Peter hazards a guess that this is the first time 'KZG, 'DPM or 'IRF have been mentioned in this column, which just shows there are some others active!

Bad blood in the air?

There were very few letters, but I have had passed to me some contest logs from the 1985 international event. These reveal no little dissatisfaction plus some interesting tips, such as this one from G8MNY: "Again the 0.5MHz narrow-band TV receiver worked well. This meant that running 250W peak sync on Tx we could see many stations with only 20W at the same grade 1."

John continues: "Some stations' technique leaves a lot to be desired, such as calling almost continuously on 144.750, leaving no gap after another station had just called. Also long colour shack shots not only during the early hours, and stations transmitting while the QSO partner was unready or unable to receive. With fifty or more stations on at the same time, some slicker operation might push up the G entry in the international ratings."

G4TGM of the G4WRA contest group also had some complaints to make about operating standards, so it appears there was bad feeling in more areas than one. It seems a shame, really, as we ATVers only have a few contests annually. Perhaps the 'ignorant' operators will get better with experience ... Of course it is easy to let excitement take over, but this should be avoided if it leads to bad feeling. Thank goodness this is only a hobby!

New station: G0BII is now active at Cassington, near Oxford. Welcome to 70cm!

Megastars on 24

Another welcome, or welcome back on the air, goes to media megastar of BATC promo tapes, Eric GW8LJJ. Married life has 'taken its toll' on his ATV activities but he is making a come-back on 24cm. This he hopes will compensate for the total lack of TV activity in his neck of the woods, once a real hot spot.

It's a new regime now – no more constructing until 3 in the morning – but Eric plans to build a portable/mobile outfit as well as the fixed station at his new Barry QTH. The video effects and

ATV



ON THE AIR

Andy Emmerson G8PTH puts you in the picture

production side are due to be modernised, too, probably with the aid of a BBC micro. Let's hope this sparks off more activity in south Wales ...

Another media star (did you see him in *New Scientist*?) and keen 24cm operator is Garry G4CRJ in High Wycombe. He now runs a Solent transmitter (1.5W) into a loop yagi. For receive there is an MGF1402 pre-amp and G8LES converter. A recent operating highlight was a 2-way duplex hook-up with G8LES (Four Marks): Garry transmitted on 70cm and received on 24.

The transmitted pictures were genlocked to the incoming signals and mixed with them for retransmission. This was over a lengthy path and under flat conditions – just shows what you can do when both ends are mountain tops!

A week later an interesting chain of six stations was tried out. Starting on 70cm with G3MCS (Farnham) to G8LES, then on 23 to G4CRJ, out on 23 again to G6HVQ (West Molesey), onward on 70cm to G8MNY (Croydon) who recorded it on tape then played it back to the others on 70cm. Apparently it worked well, and John 'MNY employed the useful dodge of a camera pointing at a monitor to reduce or integrate the noise on the video playback.

Garry tells me things are starting to move on the Home Counties repeater project. So far no interfering signals have been noted on the proposed input and output frequencies, and simplex activity has been stepped up on the 'output' in order to establish "squatters' rights".

The air traffic control centre at West Drayton has also been alerted to this source of signals. Occupancy of the 23cm band increases, though, with a new radar source with a low repetition rate springing up south of Heathrow. This may be the new Pease Pottage machine.

The repeater group has also been experimenting with aerials. The Alford slot has been a bit of a disappointment and they may instead use numbers of quad loops. This is the twin-square 'figure of eight' design from the *UHF Compendium*, which has surprising gain for its simplicity.

Clever tricks on the south coast

News from the deep south comes now from Robin G8XEU, who is treasurer of the Worthing and District Repeater Group.

The repeater is located at G6MPE in Brighton for the moment, and stations working through it include G6MPE and G4LXC (Brighton), G4HSY (Shoreham), G8XRJ and G8VEH (Lancing), G8DHE, G8XEU and G4WTV (Worthing), G8KOE (East Preston), G1NBX, G3UEQ and G6CSX (Chichester), G1DSO (Havant) and "would you believe, all are members!" G6XGH is also a member but cannot get in from home, though he did when on the Isle of Wight. Guest user is F1EDM, of course.

They have almost completed a second back-up repeater, as access to the new site will be less easy than currently. This will simplify repairs, "not that we expect any failures, but this lot just love tinkering around with new ideas." As proof of this, the repeater can now relay both 5.5 and 6.0MHz sound and several users can transmit both standards; useful for transmitting computer data on one channel while continuing a conversation uninterrupted on the other. This is also useful for any foreign contacts.

Video AGC has now been fitted to the repeater and a dynamic range of 23dB can now be handled. This means that between 0.2 and 4.0 volts can be detected and cleaned up. The practical utility of this is that many computers do not put out 1.0V video and users would need to adjust deviation if they intended to switch between camera and computer. Now they can let the 'box' worry about that. It is not recommended that deviation is set watching the repeater output, though.

Another novelty is G8DHE's band scanner design, which can be used with a Wood & Douglas or other tuner. Scanning info comes up on the receiver screen showing the state of the 24cm band and a tuning indicator in great clarity. It proved of great value in the recent contest and it is hoped to have constructional details in *CQ-TV* soon (join the BATC to get this!).

October opening

Back on the band, the evening of October 13th proved memorable for several folk. F1EDM was active and was heard (but not seen, perhaps because of ducting) at my QTH in Northampton. I gather he may have worked G6EHJ in Tamworth, though.

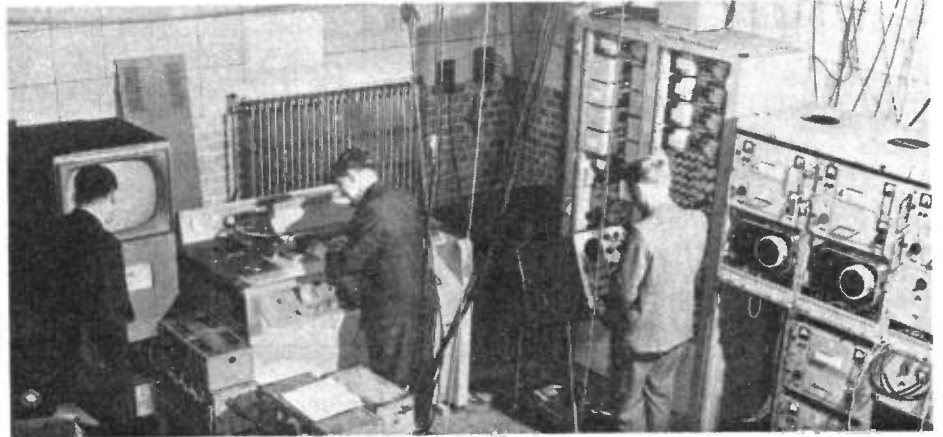
People who gave me useful two-way contacts were Richard G8BWC, 10km NNW of Nottingham, and Allan G8CMQ down in Solent country. Richard was providing 15W from a 2C39 on 1250MHz and we both noticed deep fading on this path. Allan chose 1285MHz and sent 4W, which seemed to reach here much better. He even recorded my signals and sent them back for checking!

Others in the party that evening included G3DFL, G3YQC and G4EUF, and all found this a welcome opportunity to work a bit of DX for a change. Conditions faded out just after midnight.

Activity on the Isle of Thanet continues: a new 24cm 'catch' was F1ESA received by Roy G6OKB on September 29th. F1ESA is at Seclin, south-west of Lille - not a bad haul.

Slow-scan and sign-off

All the running this time comes from G3WW, who has been licensed for over 47 years now - not bad going, Richard! On



This is not GW8LJJ's shack but it used to be not dissimilar. It shows an early Ampex video recorder at the BBC research establishment (courtesy 3M)

November 3rd DL1KAD/A gave Richard his 2100th new station on SSTV - others worked that day were HB0AWQ, DL9DAC, G1OZH, HA5XY, SP9KJM, EA9NN and G3KDD. On the 9th, Robot 12 and 36 second colour pix were exchanged with W1JKF and K4KG, the latter reporting 90 per cent reception on an opening band; later 100 per cent colour pix were received by G3WW.

Richard is currently hoping to move home somewhere southwards to be closer to his family, but this does not

mean he is giving up the hobby. The aerial system has been simplified but activity continues! G3WW has updated his Robot 450C to 1200C but still finds the SC-2K very good. G4NJI is now the agent for Volker Wraase in the UK.

That's it for this time. As I said, I could do with a few more letters for the next round-up, so don't keep all the news to yourselves. Drop me a line care of Sovereign House or run up your phone bill and leave a message on the answering machine (0604) 844130. **REW**

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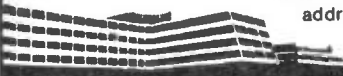
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Welcome to the March issue of *R&EW*. This month I'll be looking at a subject that affects not just the MW-DXer but just about every radio listener; that unwelcome occupant of the radio spectrum, interference. In fact it is usually the level of interference rather than any other factor that limits the reception of weak and distant stations on the MW band.

Interference is usually taken to mean any unwanted signal (or noise) that, by adding to the desired signal, degrades reception of the wanted information. It is generally the case that the interference most often encountered on MW is man-made, and whereas there is very little one can do about naturally occurring interference, it is possible, theoretically at least, to eliminate man-made sources.

The first step in suppressing interference is in fact recognising it and identifying its origin. Having identified a source of interference it is an unfortunate fact of life that it may prove impossible to do anything about it. The following are the most common forms of man-made interference to affect MW reception.

Co-channel interference

Since the MW band is operated in a channelised manner, and because there is only 1080kHz of available MW spectrum, there are inevitably several stations transmitting simultaneously on each channel.

Normally the powers and locations of stations allocated to a particular frequency are chosen to ensure that a low level of co-channel interference occurs within the target area of each transmitter. However, listeners outside the target area will experience this form of interference, which generally gets worse at night as interfering signals propagate further via the 'sky wave'. In fact it is the acceptable limit of co-channel interference (also known as the protection ratio) that defines the target area boundary for a particular transmitter.

Modulation splash

Modulation splash, or adjacent channel interference, can be recognised as unintelligible modulation or programmes heard mixed with the desired programme, with the interfering signal originating from a station transmitting on a channel adjacent to that of the desired station. Given that stations are adhering to the 9kHz MW band channel separation, there are two main causes of modulation splash.

Firstly, splash can be the result of a station not limiting the bandwidth of its transmitted audio which results in components of the transmitted sidebands interfering with signals on adjacent channels. This form of splash can also result from a poorly maintained or over-modulated transmitter.

Secondly, a form of adjacent channel interference can be generated within a receiver with insufficient front end selectivity when receiving very strong signals. To test whether adjacent chan-

MEDIUM WAVE

DXING

by Steve Whitt



nel interference is in fact receiver generated, an aerial attenuator should be used to reduce the strength of the incoming signal; if the relative degree of interference reduces a receiver effect should be suspected, but if no change is observed then it is likely that the interference is actually being transmitted.

Heterodyne interference

A heterodyne is an audible beat note or whistle that is generated in a receiver when two signals on slightly different frequencies are received simultaneously. In a perfect world, where all MW stations operated exactly on their allocated channels, heterodyne interference would not be a problem.

An example of heterodyne interference can be heard by tuning to 1404kHz, when a 2kHz whistle will be heard as a result of the off-channel Libyan transmission on 1402kHz.

Electrical interference

This title covers a multitude of interference sources which will tend to affect listeners living in built-up areas, particularly near industrial zones. Man-made electrical interference comes in all shapes and sizes but can be classified as intermittent or long-term.

It can be difficult to track down intermittent sources of interference, but fortunately their nuisance value is not long-lasting. Common examples are engine interference from the poorly suppressed spark plugs of passing cars, and arcing of electrical contacts in thermostats and switches. If the source is identified it is not too difficult to suppress this sort of interference.

The longer-lasting variety is commonly due to harmonic radiation from television timebases. This is audible (only if a nearby TV is operating) as a rough buzzing located at intervals of 15.625kHz across the MW band. Unfortunately this form of interference often restricts any serious DXing to outside TV hours.

Generally, as more and more electrical equipment enters the home and office the greater the level of interference and the less chance there is of suppressing it. Among the more recent sources of (very potent) interference are VDUs,

computers, electronic telephones and office exchanges. Regrettably there is usually little DXers can do to cure this affliction unless they own the offending piece of equipment.

Jamming

This is a deliberate attempt to interfere with reception and is usually a transmission of man-made noise intended to blanket another programme to make it unintelligible. The amount of jamming present tends to reflect the degree of political unrest in the world, and at present there is relatively little to bother the MW listener. One very prominent and well established jammer can be heard during the evening on 720MHz, designed to prevent reception of R Free Europe.

Even if one lived in a world without any man-made interference, one would still notice a whole range of noises that limit reception of very weak signals. Of these the least significant (for the MW listener) are the thermal noise and other electrical noise components actually generated within the receiver. This is because the level of other naturally occurring noise sources picked up by the receiver's aerial is many times greater.

Common examples of these types of interference are atmospheric static, which manifests itself as a continuous crackling noise, and lightning discharges, which are heard as loud crashing noises. The distinguishing feature of these signals is their broadband nature; the noise will be heard at all frequencies in the MW band at roughly the same intensity.

DX file

After some excellent DX in October and November MW-DX conditions appear to have deteriorated somewhat. This seems to be a regular feature of the winter DX season and has come to be known as the mid-winter anomaly. However, if conditions follow pattern, better DX should be heard as we approach February and March.

Some of the more unusual stations recently heard in the UK include Jamaica Broadcasting (750kHz), Radiodiffusion Tchadienne (840kHz), CBS Luchiang Taiwan (600kHz), BSKSA Saudi Arabia (1512kHz) and R Gronlands (570kHz) **[REW]**

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On these pages we present details of interesting contacts from clubs and individuals. We would be happy to receive any similar items from readers

Components fair

The Pontefract and District Amateur Radio Society is having a components fair on Sunday 16 March from 11am to 4.30pm at the Carleton Community Centre, Pontefract (between Darrington and Pontefract town).

The event is based on the Mobile Radio Rally but the difference is that it is aimed at the home constructor and the DIY enthusiast.

Traders are invited to sell only components, surplus equipment, instruments and antennas. New black box type equipment is not allowed.

There will be talk-in on S22, a licensed bar, a bookstall and a QRP club stall.

For further information about this and the society's other activities contact: *C Mills G0AAO, 27 Pendennis Avenue, South Elmsall, Nr Pontefract. Tel: (0977) 43101.*

Publicity please!

The UoSAT Spacecraft Control Centre of the University of Surrey receives many letters asking for details, descriptions and results of experiments carried out on UO-9 and 11. While they do their best at UoS to write articles and papers for publication, they believe that there must be many experimenters around the world carrying out interesting activities which could be published and shared with other enthusiasts.

So please take some time this year to write up your activities (articles from the simplest station to the most complex can be equally interesting) and send them to G3YJO at UoS (and to your national society and radio magazines). Suitable articles/papers/descriptions will be included in the UoSAT Oscar-9 Bulletins and also forwarded (if desired) to AMSAT-UK for possible

inclusion in *Oscar News*.

A further point raised by the UoSAT team was that there still seems to be a widespread lack of confidence in the programme's relevance to amateur radio - mainly due to a lack of published information, particularly results. Do, therefore, devote a little time to making your national society, other radio magazines, and AMSAT groups aware of what is going on with UoSAT - the chances of success in raising support for further UoSAT spacecraft depend on this publicity.

Bath-time

The Bath and District Amateur Radio Club meets on alternate Wednesdays at 7.45pm in the Englishcombe Inn, Englishcombe Lane, Bath.

Club night generally includes talks and demonstrations, as well as 'On The Air Nights' using the club callsign, G4TMH. In March, club nights will be on the 5th, when there will be a talk on the use of computers in amateur radio, and the 19th, when there will be a natter night.

All facets of amateur radio are catered for and newcomers will be given a warm welcome.

For further information contact H Welchman G6E1Y on (0225) 318128 (home) or (0225) 28010 (business), or L Lear G3FIH on (0225) 837539.

75th anniversary award

As part of their 75th anniversary celebrations, the Derby and District Amateur Radio Society, incorporating Derby Wireless Club which was founded in 1911, are issuing a special commemorative certificate.

The certificate, issued in conjunction with the Derby City Council, is for contacts with the special event station

GB3ERD during the anniversary year 1986. The station is operational each month. The first occasion was on 8 January from the Council House in Derby.

To obtain the award, stations in the UK are required to contact GB3ERD and four other Derby stations. Amateurs outside the UK have to work GB3ERD and two other stations in Derby.

All contacts must be made during 1986 and claims, with a copy of log details, should be certified by two other amateurs and sent with a 9 inch by 6 inch SAE plus 75p (UK) or 5 IRCs (outside UK) to: *G4HDP, 97 Woodlands Road, Allestree, Derby DE3 2HH.*

Special QSL cards are to be issued for contacts with GB3ERD and claims should be sent to G4HDP.

Dubus subscriptions

Readers with an interest in UHF projects will doubtless be aware of the magazine *Dubus*. It is published in Germany four times a year and distributed in the UK by Kenneth J Hatton.

Dubus is a non-profit making publication, with no advertising or support from commercial enterprises.

Subscriptions for 1986 are currently being collected,

The Russians are coming!

In an article entitled *Conspiracies thrive on seventy-five* in the December 1985 issue of *Media Monitor*, a monthly bulletin for SWLs and DXers, the following report was made:

'Right-wing American hams are using amateur radio to swap horror stories about alleged threats to the American way of life.

'The Soviet Union, 'world government', liberal US politicians and sexual permissiveness are all targets on the Liberty Net, monitored in London on Sundays at around 03.45-4.30UTC.

'The participants meet on 3950kHz (75 metres) in LSB. Prominent among them is K12J/Maritime Mobile.'

K12J's operator has apparently said of the Russians: 'All the people in our government that are talking to these monsters, these jail-

and cost £7.50 from: *Mr K J Hatton, 'Thornycroft House', Shield Hill, Haltwhistle, Northumberland NE49 9NW.*

Sexist comer

We recently heard some most intriguing news from the QTI Talking Newspaper Association for radio amateurs. Apparently, the organisation has a new employee, Shirley Evans, described as: '18, blond with blue eyes' and the QTI-TNA 'fully expects amateurs to beat a path to its door' in future.

We are sure that Shirley Evans has many talents other than her ability to be decorative and are curious as to what the association is suggesting. Anyway, good luck in your new job, Shirley, and we hope that the QTI-TNA's press release doesn't bring you too much unwanted attention!

The QTI-TNA can be contacted at: *2 Cartmel Walk, North Anston, Sheffield S31 7TU. Tel: (0909) 566301.*

GB3KB apologies

We would like to apologise to the Kent Border Repeater Group (GB3KB) for some erroneous information published in *QSO* in the January 1985 issue.

In an article entitled *Biggin*

ers, these Gulag operators, are in my opinion party to the crime. Shame on them; shame on them indeed...soon we will all be behind the same Gulag when they've colonised the entire planet.'

Many readers may disapprove of the hobby being used as a political mouth-piece, although, according to *Media Monitor*, Liberty Net is not the only political forum conducted by radio amateurs. The World Peace Net meets on Saturdays at 23.55UTC on 14250kHz, '...for the exchange of ideas and information connected with the peace movements in different countries'.

Media Monitor makes interesting reading. The subscription rates for the UK are £30 for 52 issues or £15 for 26 issues. Contact Roger Tidy at: *11 St Philip House, Lloyd Baker Street, London WC1X 9BA. Tel: 01-833 0978.*

Hill repeater we referred to the GB3KB repeater as a project of the Biggin Hill ARS, when in fact it is under the control of the Kent Border Group.

It is correct that the group are currently negotiating about the possible use of a site in Farnborough, Kent, but it is apparently too early to say whether the repeater will be installed there.

Up to date information can be obtained from the Honorary Secretary G4NSY QTHR, and not, as previously stated, from Robert Senft G0AMP.

Radial

The Radio Amateur Invalid and Blind Club has sent us its newsletter, *Radial*, which is full of useful and interesting information.

One item mentions that the manual for the Icom 751 HF all band transceiver has now been transcribed into Braille by the Leeds Braille Group and is obtainable, free of charge, from Custom Liason, 338-346 Goswell Road, London EC1V 7JE, or by telephoning the night-line service on (01)278 9615.

Also the recent publication *How to Improve Television and Radio Reception*, produced by the Radio Investigation Service of the Department of Trade and Industry, will be recorded on one C90 cassette if the cassette is sent to The Express Reading Service, 79 High Street, Tarporley, Cheshire.

If you are interested in joining the RAIBC or would like to find out more about them, write to: 9 Conigre, Chinnor, Oxon OX9 4JY.

Grovel, grovel . . .

Can any of you charitable TV-DXers help a newcomer to the hobby? Mr G Godfrey would like to share some of your valuable experience and is also looking for suitable equipment, so if you can help write to him at: 558 Fulbridge Road, Werrington, Peterborough PE4 6SB.

Weather or not

The City of Bristol RSGB Group is having a visit from the Bristol Weather Centre staff on 24 March.

The group meets at the Small Lecture Theatre, Uni-

versity of Bristol, University Walk, Clifton, Bristol at 7.30pm and meetings are usually held on the last Monday of the month.

For further information contact: Colin Hollister G4SQQ, 34 Battersby Way, Henbury, Bristol BS10 7SU. Tel: (0272) 508451.

Green flash

The Irish Radio Transmitters Society has sent us its newsletter which features, among other things, a very useful article about lightning and its effects on antenna sites.

The society is crying out for articles for the newsletter (who isn't?), so if you've got a few spare minutes, why not knock out a piece on your own special interest?

If you live on the Emerald Isle and are interested in finding out more about the society, write to them at PO Box 462, Dublin 9.

More from MARS

Happily settling into new premises at Broad Street, Birmingham, the Midland Amateur Radio Society has managed to achieve its objective of having something happening every night of the week.

On Monday nights there is an RAE class in preparation for the May exam. On the third Tuesday of each month there is usually a lecture. Morse classes by Ian G4TKM are on Wednesdays, and Thursday is now 'Night on the Air.' A recent innovation is a club 'Activity Night' on Fridays, when members can use the premises for any radio amateur activity.

If you want to know more contact: Stewart G8ODT, 138 Hillside Road, Great Barr, Birmingham.

G-QRP Club

The diary for the G-QRP Club in 1986 reminds us that the ARRL International DX SSB and DX CW contests are being held on 15/16 February and 1/2 March respectively.

The club's journal, *Sprat*, is choc-full of interesting and practical items including an ingenious design for a 'fag box transmitter' by Chris Page G4BUE.

Further details can be

obtained from: Rev George Dobbs G3RJV, St Aidan's Vicarage, 498 Manchester Road, Rochdale, Lancs OL11 3HE. Tel: (0706) 31812.

FET fetish

On 21 February the South Manchester Radio Club will host a lecture called 'Introduction to FETs' by Chris Ward G4HON.

The club meets at 8.00pm every Friday at the Salemoor Community Centre, Norris Road, Sale, and there is an informal meeting on most Monday nights in the shack.

For more details contact: J R Higson G4NTY, 24 St Mary's Road, Walkden, Manchester M28 5RF.

Venue change

The Biggin Hill Amateur Radio Club wishes to remind its members that from Tuesday 18 February the new meeting place will be the Downe Village Hall (next to the George & Dragon pub), 24 High Street, Downe, Kent.

Meetings will start at 7.30pm and finish at 10.00pm to enable younger members to attend and to allow the dipsomaniacs of the club to have a noggin before closing time in the George, next door!

For more details about the club's activities contact: Robert Senft G0AMP, Mill Hay, Standard Road, Downe, Kent BR6 7HL. Tel: (0689) 57848.

Movin' on

The Southgate Amateur Radio Club's meetings will now be held at the Holy Trinity Church Hall, Green Lanes,

Winchmore Hill, London N21.

On 13 February, Harry G4CCM will give a talk on VSWR meters and this and all other meetings will start at 8.00pm, with doors opening at 7.30pm.

For further details please contact: R F Snary G4OBE, 12 Borden Avenue, Enfield, Middlesex EN1 2BZ. Tel: (01)360 6555.

Edgware net

The Edgware & District Radio Society meets on the second and fourth Thursdays of each month at 8.00pm at the Watling Community Centre, 145 Orange Hill Road, Burnt Oak, Edgware.

The society has a net on 1.875MHz at 22.00hrs (clock) and transmits slow Morse on 1.875 and 144.175MHz from 20.30 to 22.00 at 4 - 14 words per minute on Mondays, and from 19.30 to 21.00hrs on the first and third Thursdays of each month at 8 - 16 words per minute.

For further information contact: John Cobley G4RMD, 4 Briars Close, Hatfield, Herts. Tel: Hatfield 64342.

Brighton and District

The Brighton and District Amateur Radio Society meets on the first and third Wednesdays of each month at 8.00pm in the Seven Furlong Bar of the Brighton Race Course.

Each Monday there is a Morse class and details of this can be obtained from G4HLH or G3YY, both QTHR.

For more information contact Peter Turner G4ILL on Brighton 607737.

AN APOLOGY

It appears we've been rather naughty boys and girls. In January's *Medium Wave DXing* we reproduced a drawing of a 40 inch box loop for MW which was, unbeknown to us, copyright of IPC Magazines. It originally appeared in the article *Out of Thin Air* by the late lamented Charles Molloy, in *Practical Wireless* during 1981.

We would like to offer IPC our wholehearted apologies for this unforgivable piece of poaching. Although inadvertant it was still inexcusable, and Yours Truly has quite rightly had his wrist slapped. Sorry. Won't happen again. DAL.

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■ Yaesu FRG-7700 HF communications Rx, 0-30MHz. Used only a few hours, mint condition, boxed with manuals, £280 ono. Tel: (0274) 594880 (Bradford, W Yorks).

■ Ultra Cub 2 metre handy-talkie. Five channel rugged rig, 1/2W RF to BNC socket. Metal cased type 4B7 PH2T. Xtalled on R7, S20, S22, S23. Complete info and ccts, free 12V Nicads, only £35. Phone Steve G8KDL, Ipswich (0473) 54405 evenings.

■ 10m SSB 28.275-28.740, 12 watts, Realistic 40ch \pm 4kHz vgc, £50. WPO Morse memory, unwanted gift, 120sec, brand new, £45. Heathkit Rx HR10B, 3.5-30MHz vgc, £50 ono. MBM 48/70cm ant, £15. H/man rotator with 25ft lead, £25. P Darcy, 254 James Greenway, Lichfield, Staffs WS13 7JZ.

■ Bird Thruline element, 70cms 50W, £25. Advance industrial power supply, 10A cont. metered and fused, 13.8V adjustable, £30. 12 core screened cable, 80ft, £5. 24cms valve PA, CQ-TV design, brass cavity, includes 2C39A, unused, silver plated anode and fingers, needs PSU. Offers? Tony G4NGU. Tel: King's Lynn 760667.

■ Trio TS520S with VFO 520 and Z match in very good condition, £350. Marconi Commander 400 watt marine Tx with handbook and QV08/100 valves, £200. Buyer collects. G I Sydenham, 41 Alexandra Road, Beccles, Suffolk NR34 9UD. Tel: (0502) 715419.

■ Commodore Vic20 computer with C2N cassette recorder, Kempston Competition Pro Joystick, 50 games program book, manual. All boxed in good condition, £65 ono. Also Aquarius computer with Mini Expander 2 joysticks and 2 games (Tron and Snafu). Boxed in excellent condition, offers around £40. Mr Witham, 4 King George Road, Colchester, Essex CO2 7PE.

■ Model 8 AVOMeter. Very good condition, recently recalibrated, £85. Tel: (0942) 31155.

■ Oscilloscope: Crotech 3337 30MHz dual trace triggered model, current list price over £450. Only two years old, virtually unused. Telephone Tucker on Chesterfield (0246) 882113.

■ Yaesu FRG-7700 HF comms Rx, mint condition, boxed, manual, hardly used. 0-30MHz, USB, LSB, AM (3), FM, good bargain at £260 ono. Edwards. Tel: Bradford (0274) 594880.

■ Sony ICF-7600D PLL synthesised receiver with long wire aerial, mains supply and headphones, £99. Tel: Brighton (0273) 37459 after 6pm.

■ Yaesu FT290 multimode 2m, £200. Prism VTX 500 modem for ZX Spectrum, £40. RTTY unit, complete, connects via transceiver and Spectrum computer, £90. 2m mobile antenna, £15. 2m home base antenna, £20. PRO47 scanner, complete, 70cm crystals, £45. Tel: Harpenden 64349 after 7pm.

■ Metal detector, C-scope K5000, VLF, TR, ground exclude, discriminator. New, only used once. Cost new as kit, £120. Now made up in perfect working order complete with manual, half price bargain, £60. Tel: Whitstable 264983 afternoon or evening.

■ Icom IC271E 25W 2m base multimode, fitted muTek front end, £525. Brother M-1009 Centronic parallel dot-matrix printer, true descenders. Nearly brand new, £130. Tripler i/face: link Commodore computer to Centronic printer, no software required, £30. Terry Bruce G6IAT QTHr. Tel: Luton (0582) 23750.

■ Trio 2300 2m trcvr and 10W linear. Synthesised

80ch, super for portable/mobile/base, complete with 1/4-wave telescopic, and 'rubber' flexi aerials, Nicads, charger, case, all leads, manuals. Boxed, mint condition, £150.00 complete or consider p/x for HF transceiver. Wanted: HF ATU, 100W + power handling, and DFM up to 30MHz +. Please contact Roy G0BZT on Sedgley (West Midlands) (09073) 78792.

■ Large amount of tested ex-equip parts: semi-conductors, resistors, caps, motors, aerials, varicaps, trans, valves, VO640, VO620, VO310, 6BH6, etc. Complete Pye sets F27, Reporter, Westminster/Cambridge, Vanguard, Bantams. RTC mod-meter freq counter, test osc, sig gen. All at ridiculous prices. Alan Page, Homeleigh House, East Taphouse, Liskeard, Cornwall DL14 4NQ. Tel: (0579) 20187 for details.

■ 400W HF ATU, 1.8 to 30MHz with two roller coasters etc and RF ammeter, £60. Carriage £8.00 extra. muTek TVV50a 10m to 6m transverter, high performance, new and unused, £200 ono. Unwanted Xmas present. John Moxham G8KBQ, 22 Whiting Road, Glastonbury, Somerset BA6 8HP. Tel: (0458) 34105.

■ R2000 gen cov Rx, all mode, one year old, £350. Used with HQ1 triband minibeam 10m, 15m, 20m, other frequencies, with ATU. HQ1, £80. £420 both. Tel: Ely (0353) 61323 anytime.

■ Shack clear out by order of XYL. Lots of transformers, meters etc, SAE list. Army C42 Tx/Rx, covers 6m, offers or swap for 2m mobile. Public address system, CTH amplifier, 100W 12V, 6 horn speakers, mic, stands etc, offers or swap for radio/video gear WHY. Marconi V322 studio camera c/w manual, cables etc, £40. Wanted: Circuit diagram info for R210 Rx Army. Ray Hill G6TSL, 7 Willowbrook, Greytree, Ross on Wye, Hereford HR9 9JS.

■ Trio TS530SP HF transceiver, as new, boxed, £565. Triband HF Gem quad, £100; buyer dismantles. FT902 speaker, £15. FP707 12 volt power supply, as new, £90. FT707 linear relay, £15. National (USA) NC81X hamband receiver, 10 tubes, 1938, £60. Early French superhet, C1928; four early Marconi portables 1927-1932; Ekco mains TRF C1930; Pye portable, 1929; Corsor Melody Maker, 1929; McMichael 135 superhet; Philips Monoknob table and console; many other early radios. Jim Taylor, 5 Luther Road, Winton, Bournemouth. Tel: (0202) 510400.

■ 23cm gear, new and unused, no time for use as XYL ill. Fortop TVR1300 Rx, £95. Fortop TVD100 demodulator, £15. Two CR23 J/B antennas, £20ea. Two AR100250kg rotators, £20ea. Two oscilloscope transformers, £5ea. All prices collect, carr extra. Burton G2JR, 149 Longfellow Road, Coventry. Tel: (0203) 455021.

■ Have AR40 rotor, 2 metre beam, also 15m UR67 cable, HF5 vertical and Trio grid dip meter. Would swap for BBC hardware, modem, DFS, disc drive, printer etc or general coverage receiver WHY?. John. Tel: (0606) 550258 after 6pm.

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■ Samantha Fox! Now that I have your attention, I am clearing out electronic components. All are new and unused. For full details contact: D Martin, 6 Downland Garden, Epsom, Surrey.

■ FT101ZD with 250Hz CW filter, £390. FRG-7

receiver with commercial FM board fitted, £120. Trio TR2400 2m hand-held with ST1 base stand, speaker mic, leather case, £145. WPO Comms Universal Morse Memory, £40. 4m AM dash Westminster, £30. 70cms Westminster, £55. Dragon 32 computer with books, tapes and G4BMK RTTY cartridge, £60. Three-band trapped HF vertical, £40. Buyer to inspect and collect. George G14SJK QTHr. Tel: (0762) 334648.

■ Wood & Douglas 70cm Tx/Rx 600mW output on RB6, £45. G8RHU QTHr. Tel: (0273) 516801.

■ Marconi bridge TF868/1, £75. Nicolet range translation unit, £25. Oscilloscope thermal recorder, £45. Modems, Racal 5500/96, £45. Tektronix oscilloscope, dual beam 25MHz Type 551, £110. 30MHz with delay sweep Type 555, £185. CT436 oscilloscope, needs attention, £25 ono. Solartron 'scope, CD1740 with CX1741 and CX1744 plug-ins, spares or repair, £65 ovo. Tektronix manuals, plug-ins, trolleys and spares. Tel: (01) 868 4221.

■ HF Rx, Edystone 830/9 300kHz-30MHz, AM, SSB, CW, very good condition, working. May be able to deliver, £175 ono. Will exchange WHY. Tel: Leeds 677101.

■ Wireless World FM tuner and hi-fi preamplifier, both working. Black and white television camera, should work. Wireless World magazines 1968-1982. Offers. Mr D Corder, Low Weasdale, Newbiggin-on-Lune, Kirkby Stephen, Cumbria CA17 4LY. Tel: (05873) 246 after 6pm.

■ Signal R532 digital airband scanner, £140. Swinburne DR600 airband monitor, £140. Samatron U-verter - converts 118-136MHz to 225-400MHz, £40. Altai AR200XL rotator + controller, £25. Tel: (051) 426 3375 (after 5.00pm).

■ Frequency counter: Black Star Meteor 1000, 1GHz, brand new with leads, PSU and manual. Unwanted gift, £175 ono or WHY. John G1LUG. Tel: Coventry 450476.

■ 20MHz dual trace scope, HP, vgc, £70 ono. Aircraft band converter 118/24, £20 ono. Cassette head de-magnetizer, £5. Buyer collects. Tel: (031) 229 7012 office hours, ask for Tommy.

■ Yaesu FTV-901R 2m transverter with manual, in good condition, also Yaesu FT-901DM VFO with manual, good condition, £150 each ono or both for £275 ono. Tel: (01) 471 0669 after 5pm, ask for Danny.

■ DX302 general coverage receiver, 0-30MHz, digital display, AM, SSB, CW modes, mains/battery operation, telescopic aerial, handbook, boxed in excellent condition. Cost £290 new, will accept £135 ono or exchange for Spectrum Plus computer. Howard, 9 St Catherines Road, Pound Hill, Crawley, West Sussex RH10 3TA. Tel: (0293) 884327.

■ Transistor curve tracer, Telequipment model CT71. Measures and displays dynamic characteristics of transistors, FETs and diodes. In first class condition and complete with full operating instructions and maintenance and calibration details. Full details and specifications will be sent on receipt of an SAE. Price, £300. Tel: Milton Keynes 662791.

■ Trio 9130, as new, 3 months old under guarantee (recently passed Morse, going to HF), £420. Tel: Nailsea 851608.

■ Clearing out: Model 40 AVO; Pye power/SWR meter; CB SWR meter; Shibaden video camera with electronic viewfinder; zoom lens; Phillips stereo speakers; Goodmans heavy duty 20 watt speaker; BSR 3 speed autochanger with diamond stylus; GEC wire recorder, last used in WWII but still working; Agavox dictaphones; QQV03-20A valves; Pye Vanguard and Bantam manuals. Also many other bits for Pye Cambridge and Westminster. Offers invited. Walker, 23 Forest Hill, Yeovil. Tel: (0935) 25225.

■ Maplin Matinee organ, £250 or exchange WHY? Mr J Tyler/Tel: Worcester 429413.

WANTED

- Heathkit airband receiver, faulty one considered. Also seek set Radioshack books understanding dc and ac circuits; data and circuit Hitachi 5446-P766 tuner display module plus LC7257 chip data. Jones, 14 Algreave Road, Chedale Heath, Stockport, Cheshire SK30NH. Tel: (061) 428 9539 after 6pm please.
- TV DXers, newcomer to hobby seeks advice and equipment. Please write to Mr G Godfrey, 558 Fulbridge Rd, Werrington, Peterborough PE4 6SB.
- A young man wants to be trained and work for any electronics company or small electronic home constructor. I want to know about making and repairing electronics: PAs, alarms, video, audio etc. I want to have my own company in future. I shall be glad to hear from any firm, company or home constructor. Please write to Anthony Oboh, 31 Farnborough Way, North Peckham Est, London SE15 6HQ.
- HF ATU, 100W + power handling, and DFM up to 30MHz +. Please phone Roy G0BZT on Sedgley (09073) 78792.
- Wanted urgently, 807 valve bases + Woden type UM3 modulation transformer, will pay cash, Alan Page, Homeleigh House, East Taphouse, Liskeard, Cornwall PL14 4NQ. Tel: (0579) 20187.
- Ex-army receivers, R107, R109, W538, R209, W519, command receivers, BC453, BC454, BC946, R28, Aircraft receiver R1155, also other ex-forces receivers and transmitters working or suitable for spares. Tel: (091) 4103706.
- WW2 British airborne radio collection still requires R1116, R1082, H2S, R3136, DF loop type 1, 3 or 4. Also need bits and pieces for these and other airborne set-ups WHY? Available for other museums: Loran APN-4 and Gibson Girl BC778. Mr C Baker, 71 Sunnyhill Ave, Littleover, Derby DE37JR. Tel: (0332) 769404.
- Q multiplier unit for Heathkit RA1 receiver, also SSB unit for Murphy B40d receiver. Can collect

- London or Oxford area. Eason, Lynwood, Holton, Oxon OX91PU. Tel: (08677) 2300.
- SX200 scanner or similar, must be cheap. Tel: (0762) 42870 (Craigavon, N. Ireland) after 6pm.
- Marconi 1017 receiver, Heathkit RA-1 receiver, Codar AT5 transmitter. Please write to Richard Marris, 35 Kingswood House, Farnham Road, Slough, Berks SL2 1DA.
- Pye pocket phone PE2UB, must be working with mike. Also CB rig, any condition, prefer 27MHz multi-mode, must be cheap: very limited budget due to unemployment. Steve Kelly, 137 Brookhurst Ave, Bromborough, Merseyside L63 0LE. Tel: (051) 334 4301.
- Totsuko TR-2100M 2 metre SSB rig. State condition of equipment and price, letters only please. Mr Iain J Menzies, 105 Craighton Road, Aberdeen, Scotland AB17TY.
- Sony ICF2001 scanning Rx. Tel: (0903) 776570 (West Sussex).
- Samantha Fox! Now that I have your attention, please can anyone with TV knowledge correspond. I need to get two TVs working again so I can sell them to buy some radio gear. In one I need to locate the video amp; I can't work out what components make up the video amp and get colour going. I would be extremely grateful for your help and will pay all postage. I also want CB radio gear - nothing too large or small, but for this please send SAE. I am also trying to get a TV Tank Battle game, a dedicated chip type similar to the Stunt Cycle type game. It was a project in some electronic magazine in '79 or early '80. Must be working or main chip must be OK. Please write and enclose stamp for reply. D Martin, 6 Downland Garden, Epsom, Surrey KT185SJ.
- Add-on Teletext decoder with remote control for use with a colour TV set. Unit must be in excellent working order. Tel: Walsall (0922) 27011.
- Details of any mods for the receiver section of the Redifon A43R Mark 2 UHF radio set. Also copy

- of circuit and data to photocopy. Also handset and rod antenna for same. A Blair, 55 Burnopfield Road, Rowlands Gill, Tyne and Wear NE39 1QQ.
- Marconi TM9954 log amp, AR88 Rx cabinet, AR88 S meter, Marconi TF2172 amp, Marconi TE137 2 piece trimming tool for CR100/B28 receiver. Tel: Winchester (0962) 56064.
- Cheap scanner or 2m Rx for a new SWL. Also has anyone got any unmodified Pye Motofones. Spares also needed for Motofones: crystals, spare boards etc. Contact Ian or Simon on Lincoln (0522) 46145.
- Any info, operating instructions, circuits etc on the following: ex-govt test set TD279, Weston oscillator model E692, Roberts valve and circuit analyser. All expense gladly met. D J Tabor, Woodside Cottage, Wheelers Lane, Smallfield, Horley, Surrey RH6 9PT. Tel: (034284) 3144.
- Pensioner needs Arac 102 receiver, as cheap as possible please. Walter Gates, 16 Highmill Drive, Scarborough, North Yorkshire YO12 6RN. Tel: (0723) 365093.
- Revcone discone antennas, multi-channel 70cm rig, eg PF2UB or PF70 or WHY. Short wave comms Rx, eg Eddystone EC10 MkII or similar, about £50. G8RHU QThr. Tel: (0273) 516801.
- Manual for Hewlett Packard 185B oscilloscope 1963 to buy or copy. Tel: (09276) 5562.
- R107 ex-army Rx, complete and in original condition. Details to Tony Howard, 55 Harpur Centre, Bedford MK40 1TH. Tel: (0234) 68559.
- Codar AT5 transmitters in working, dying, or dead condition. Also circuit, handbook or any info on Heathkit Model FM-4U and SD-1 tuner. Also handbook for Heathkit RG-1 Rx. Please write to Marris, 35 Kingswood House, Farnham Road, Slough, Berks SL2 1DA.
- Yaesu HF transceiver FT77, good working order. Also power pack, HF horizontal aerial, multi-band, reasonable price. William McCann, 1 Ross Rd, Belfast, Northern Ireland. Tel: Belfast 242663.

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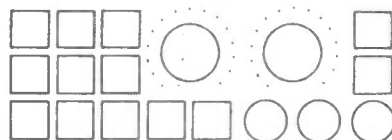
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<p>SERIES RATES Series rates also apply when larger or additional space to that initially booked is taken. An ad of at least the minimum space must appear in consecutive issues to qualify for series rates. Previous copy will automatically be repeated 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.</p>	<p>If series rate contract is cancelled the advertiser will be liable to pay the unearned series discount already taken.</p> <p>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.</p>	<p>Printed — web-offset</p> <p>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 publication date.</p> <p>FOR FURTHER INFORMATION CONTACT Radio & Electronics World, Sovereign House, Brentwood, Essex CM14 4SE. (0277) 219876</p>	<p>Overseas payments by International Money Order. Commission to approved advertising agencies is 10%.</p> <p>CONDITIONS 10% discount if advertising in both Radio & Electronics World and Amateur Radio. A voucher copy will be sent to Display and Colour advertisers only. Ads accepted subject to our standard conditions, available on request. CM14 4SE</p>

EAST CORNWALL COMPONENTS

NEW 1986 Catalogue is now available — range of components greatly increased — over 136 pages fully illustrated. Price £1.00 per copy (free upon request with orders over £15.00). Includes 50p Credit Note, Special Offer Sheets, Order Form and Pre-Paid Envelope. Order your copy now — will be despatched within 7 days.

<p>PLUGS & SOCKETS</p> <p>Metal Co-ax Plug 0.18 Plastic Co-ax Plug 0.14 Metal Line Socket 0.32 Single Junction Socket 0.80 Plastic Phone 0.20 F/M Plugs 0.20 PL259 Plugs 0.38 Reducer 0.15</p> <p>FUSEHOLDERS</p> <p>20mm Panel Mounting 0.28 20mm Chassis Mounting 0.06 1/4" Panel Mounting 0.35 1/4" Chassis Mounting 0.12 Carline 1/4" Holder 0.10</p> <p>TELEPHONE SPECIAL</p> <p>BT App Telephone Plug + 3m Lead 1.25 BT App Master Socket Inc. Wiring Instrns 2.85 BT App Secondary Socket 1.95 4way plug 5.50/10/25.50 BT 4-Core Cable per metre 1.15 100 metres 12.00 Cable clips for above 100/75p</p> <p>RESISTORS — CARBON FILM 5%</p> <p>1/4W 1R0 to 10M (E12 Range) 2p each, 15p/10, 75p/100 1/2W 1R0 to 10M (E24 Range) 2p each, 15p/10, 75p/100 1W 1R0 to 10M (E12 Range) 7p each, 40p/10, 3.50/100 2W 1R0 to 10M (E6 Range) 8p each, 60p/10, 5.00/100</p> <p>RESISTOR KITS — each value individually packed</p> <p>1/4W pack 10 each value E12 — 10R — 1M 610 pieces 5.75 1/4W pack 5 each value E12 — 10R — 1M 305 pieces 3.35 1/2W pack 10 each value E12 — 2R2 — 2M2 750 pieces 7.95 1/2W pack 5 each value E12 — 2R2 — 2M2 365 pieces 4.75 1W pack 5 each value E12 — 10R — 10M 365 pieces 15.00 2W pack 5 each value E12 — 10R — 10M 365 pieces 18.50</p> <p>RESISTORS — WIREWOUND Generally 5%</p> <p>25W 0.47R — 470R 15p each 140/10 4W 1R0 to 10K 1R0 to 680R 14p each 1K — 3K3 15p each 4K7 — 6K8 18p each 10K 19p each 7W 1R0 to 22K, 1R0 to 5K6 22p each 6K8 — 12K 15p each 15K — 22K 17p each 11W 1R0 to 22K, 1R0 — 4K7 18p each 6K8 — 10K 19p each 15K — 22K 22p each 17W 1R0 to 22K, 1R0 — 10K 24p each 15K — 22K 25p each</p> <p>TRANSISTORS DIODES</p> <p>Support pillars for 4W/7W/11W/17W/25W 0.47R — 470R 1.45 each 12.50/10 50W 0.47R — 470R 1.85 each 13.00/10</p>	<p>UNIGAD</p> <p>Universal Ni-Cad charger, charges PP3, AA, C, D Price £5.10</p> <p>RECHARGEABLE BATTERIES</p> <p>AA (HP7) 0.95 ea 10/0.85 ea. C (HP11) 2.14 ea 10/0.98 ea. D (HP2) 2.30 ea 10/2.10 ea. PP3 3.75 ea 10/3.65 ea.</p> <p>ZENER DIODES</p> <p>400mW Plastic 3V-30V 8p each 10/70p 1/1.3W Plastic 4.7V-120V 12p each 10/2.10 1.5W Plastic 11V-75V 1.25 each 10/11.50 2.5W Plastic 75V-75V 0.75 each 10/7.00 1.5W Plastic 12V-30V 85p each 10/8.00 20W Metal 1.5W-66V 1.32 each 10/11.60 *Only Available while Stocks Last *Zener Diode Pack-400mW-5 each-value=11 values-individually packed & marked 52 Zener Diodes 3.50 per pack</p>	<p>SPECIAL OFFER — MARCH ONLY</p> <p>1/4 Watt Resistor Kit — 10 Each Value — 10R to 1M Each value individually packed and marked — TOTAL 710 Resistors Price £4.75 Available with all orders of £10.00 + over</p> <p>Terminal Blocks</p> <p>2 amp 12 way 0.20 5 amp 12 way 0.24 15 amp 12 way 0.42 32 amp 12 way 0.88</p> <p>FUSEHOLDERS</p> <p>20mm Panel Mounting 0.30 20mm Chassis Mounting 0.12 Carline 1/4" holder 0.10</p> <p>SOCKETS</p> <p>8 pin 0.80 14 pin 0.10 16 pin 0.11 18 pin 0.14 22 pin 0.21 28 pin 0.22 40 pin 0.28</p> <p>CAPACITORS</p> <p>Mixed Dielectric 01mf 1000V 0.30 022mf 1000V 0.20 01mf 1000V 0.48 47mf 1000V 0.75</p> <p>CERAMIC CAPACITOR PACK</p> <p>50V, Ceramic Capacitors — 5 each value 25 values — each value individually marked and packed — 125 total, £3.50 per pack.</p> <p>D.C. MOTORS (Min)</p> <p>35/086 6-12 volts 25mmx38mm 75p each 10/£6.00 35/552 9 volts 35mmx42mm 85p each 10/£7.00 35/129 6-12 volts — m/bracket 25mmx38mm 80p each 10/£6.50 35/016 6-12 volts — m/bracket 38mmx42mm 82p each 10/£6.70 SPDC 12 volt Fujiya + Speed Control Board 32mmx38mm £2.80 each £10/£22.00</p> <p>All prices are subject to change without notice</p> <p>Soldering Section</p> <p>XS25W Iron Kit/complete with stand & plug attached 10.00 CS 18W iron 5.90 1K-2M2 Single gang tin 38 10/3.50 5K-2M2 Single gang DP switch 10/9.50 5K-2M2 Double gang log & lin 1.25 10/10.50</p> <p>POTENTIOMETERS</p> <p>Carbon Track, Rotary 0.25W Log & 1 in values All Vain Spindle, 20ml body dia Shaft 2' long 4K7-2M2 Single gang log 40 10/3.80 1K-2M2 Single gang tin 38 10/3.50 5K-2M2 Single gang DP switch 10/9.50 5K-2M2 Double gang log & lin 1.25 10/10.50</p> <p>CHART RECORDER SPECIAL</p> <p>Brand new 3 channel pen recorders complete with charts. Full spec upon request once only price £40 + £10 p&p + VAT</p>	<p>VALVES</p> <p>A231 4.50 A241 1.98 DAF96 1.00 DM71 2.95 DY86/87 .66 CY802 .95 EY4015 2.85 EY4030 .98 EB91 1.30 ECC81 1.00 ECC82 .90 ECC84 .80 ECC85 .85 ECC86 2.80 ECC88 1.25 ECC198 .85 EFC80 1.20 EFC86 1.40 EHC35 3.75 EHC42 1.20 ECL80 .75 ECL86 1.75 ECL90 .60 EFA6 1.80 EF91 2.00 EF184 1.00 EL34 3.25 EL84 1.00 EL94 .85 EL99 7.85 EL99 7.95 EM84 1.75 EY86/87 .85 EY500A 2.50 EZ200 1.40 EY501 1.40 KT66(GEC) 18.00 KT88(GEC) 19.00 PCC189 .85 PCF80 .95 PCF84 1.75 PCF87 .50 PCF800 1.20 PCF805 2.05 PCL82 1.00 PCL84 1.00 PCL86 .90 PCL805 1.05 PD500 2.90 PFL200 1.85 PL95 1.75 PL94 1.40 PL508 2.70 PL519 5.15 PL802 5.50 PY81/800 1.00 PY500A 2.20</p> <p>INTEGRATED CIRCUITS</p> <p>741 .35 747 .07 AN214Q 3.80 AN240P 3.42 BT16218 1.98 CA301AT 2.88 LM324N 0.95 CA810CM 1.20 CA3020 2.10 CA3065 1.60 CA3080E 0.68 CA3130E 0.90 CA3140 0.45 HA1366W 1.59 LA4422 3.20 LC7131 4.90 LC7137 5.40 LM324N 1.15 LM3808N-P 1.80 LM3808N-14P 1.80 LM1011N 3.20 LM1458N 0.98 LM3900N 0.85 MS1513L 2.20 W51915L 3.18 MC1307P 1.99 MC1327P 1.50 MC1330P 1.60 ML23213 2.10 ML233713 2.90 NE555 0.25 SAA1025 4.00 SA5550 2.50 SAS570 1.85 SN7533N 2.85 SN76131N 1.99 SN76226DN 1.70 SN76227N 1.10 SN76680N 0.75 SN76690N 1.50 STK101 6.20 TA7146P 4.60 TA7203P 2.78 TA7204A 1.50 TA7205AP 1.30 TA7222A 2.32 TA555 0.50 TAA611A12 3.50 TAAD100 2.90 TDA120A 0.80 AS/S/SB/T/U 0.90 SA/SO/UO 1.30 TBA520 1.80 TBA530 1.20 TBA540 1.64 TDA560 1.50 TDA800 0.80 TBA810S 1.20 TBA950/2A 3.05 CA2705A 4.02 TDA1003A 5.50 TDA1006A 2.45 TDA1035S 2.20 TDA1170S 1.99 TDA1352A 1.80 TDA2002 1.80 TDA2002 1.80 TDA2020 1.90 TDA2140 2.90 TDA2160 2.50 TDA2522 2.75 TDA2530 2.20 TDA2543 2.50 TDA2581 4.60 UPC57512 1.45 UPC741 0.95 UPC1156P 2.75 UPC1180 1.80 UPC1218H 1.80 UPC1370C2 2.50 UPC2002H 2.75 UPC2002U 2.75</p>	<p>TOOLS</p> <p>Complete range of Economy and Professional quality hand tools CROS 0.19 4002 0.24 4001 0.24 4002 0.24 4006 0.68 4007 0.24 4008 0.59 4009 0.44 4010 0.39 4011 0.23 4012 0.24 4013 0.35 4014 0.58 4015 0.58 4016 0.38 4017 0.54 4018 0.59 4019 0.59 4020 0.70 4021 0.55 4022 0.68 4023 0.30 4024 0.49 4025 0.24 4026 0.70 4027 0.44 4028 0.44 4029 0.73 4030 0.33 4031 1.28 4032 0.73 4033 1.40 4034 1.40 4035 0.68 4036 2.48 4037 0.73 4038 2.50 4039 0.70 4040 1.48 4041 0.48 4042 0.42 4043 0.58 4044 0.74 4045 0.33 4046 0.58 4047 0.74 4048 0.58 4049 0.68 4050 0.68 4051 0.68 4052 0.58 4053 0.58 4054 0.68 4055 0.24 4056 0.24 4057 0.24 4058 0.24 4059 0.24 4060 0.24 4061 0.24 4062 0.24 4063 0.24 4064 0.24 4065 0.24 4066 0.24 4067 0.24 4068 0.24 4069 0.24 4070 0.24 4071 0.24 4072 0.24 4073 0.24 4074 0.24 4075 0.24 4076 0.68 4077 0.24 4078 0.24 4079 0.24 4080 0.24 4081 0.24 4082 0.24 4083 0.58 4084 0.58 4085 0.58 4086 0.58 4087 0.58 4088 0.58 4089 0.58 4090 0.58 4091 0.58 4092 0.58 4093 0.58 4094 0.58 4095 0.58 4096 0.58 4097 0.58 4098 0.58 4099 0.58 4100 0.58</p>	<p>CHART RECORDER SPECIAL</p> <p>Brand new 3 channel pen recorders complete with charts. Full spec upon request once only price £40 + £10 p&p + VAT</p> <p>74LS00 0.24 74LS01 0.24 74LS02 0.24 74LS03 0.24 74LS04 0.24 74LS05 0.24 74LS06 0.24 74LS07 0.24 74LS08 0.24 74LS09 0.24 74LS10 0.24 74LS11 0.24 74LS12 0.24 74LS13 0.24 74LS14 0.48 74LS15 0.48 74LS16 0.38 74LS17 0.24 74LS18 0.24 74LS19 0.24 74LS20 0.24 74LS21 0.24 74LS22 0.24 74LS23 0.24 74LS24 0.28 74LS25 0.24 74LS26 0.24 74LS27 0.24 74LS28 0.24 74LS29 0.24 74LS30 0.24 74LS32 0.24 74LS33 0.24 74LS34 0.24 74LS35 0.24 74LS38 0.24 74LS40 0.24 74LS42 0.50 74LS44 0.24 74LS47 0.79 74LS48 0.24 74LS49 0.24 74LS55 0.24 74LS73 0.30 74LS74 0.33 74LS75 0.44 74LS76 0.38 74LS78 0.38 74LS83 0.68 74LS85 0.82 74LS86 0.35 74LS90 0.48 74LS91 0.48 74LS92 0.54 74LS93 0.54 74LS94 0.60 74LS96 1.20 74LS107 1.40 74LS109 0.90 74LS112 0.44 74LS113 0.40 74LS114 0.39 74LS122 0.68 74LS123 1.00 74LS124 0.52 74LS125 0.52 74LS126 0.52 74LS132 0.60 74LS135 0.24 74LS138 0.68 74LS139 0.98 74LS145 0.53 74LS147 1.64 74LS148 1.28 74LS150 0.70 74LS153 0.45 74LS154 0.58 74LS157 0.48 74LS160 0.62 74LS161 0.69 74LS162 0.70 74LS163 0.68 74LS164 0.74 74LS165 1.10 74LS166 1.50 74LS168 1.48 74LS170 1.40 74LS173 0.98 74LS174 0.75 74LS175 0.70 74LS176 0.70 74LS190 0.82 74LS192 0.98 74LS193 0.98 74LS194 0.75 74LS195 0.74 74LS196 0.84 74LS197 0.98 74LS221 0.85 74LS240 0.80 74LS241 0.80 74LS242 0.94 74LS243 0.84 74LS244 0.80 74LS245 1.00 74LS246 0.80 74LS251 0.75 74LS257 0.73 74LS258 0.75 74LS259 1.20 74LS266 0.55 74LS273 1.20 74LS279 0.70 74LS283 0.60 74LS285 0.50 74LS366 0.50 74LS367 0.50 74LS376 0.50 74LS378 1.00 74LS379 1.00 74LS384 1.00 74LS387 1.25 74LS398 0.95 74LS399 0.80</p>
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EAST CORNWALL COMPONENTS
DEPT REW, 119 HIGH STREET
WEM
SHREWSBURY SY4 5TT TEL: 0939 32689
Telex: 35565



ORDERING: All components are brand new and to full specification. Please add 65p postage/packing (unless otherwise specified) to all orders and then add 15% VAT to the total. Minimum order £5. Either send cheque/cash/postal order or send/telephone your Access or Visa number. Official orders from schools, universities, colleges etc most welcome.
(Do not forget to send for our 1986 catalogue — only £1.00 per copy — details at top of advertisement.)
RETAIL 1000 sq ft shop, open Mon-Fri 9.00-5.00, Sat 9-12.00.

Table listing various electronic components such as resistors (R275-TIP41c), capacitors, diodes, and integrated circuits with their prices.

Table listing integrated circuits including operational amplifiers (OP07), comparators (CMC1), and logic devices (74138, 74149).

Table listing various passive components like resistors (25C458, 25C515) and capacitors (25C141, 25C173).

PHILIP

- Philips stereo headphones
- Philips solder irons, 25w mains
- 2x Hi-Fi Philips car tune up tweeter EN8320
- ITT CVC45 8 way resistor unit
- for v/cap
- 4700x10v x10
- 68x16v x10
- 150/16v x10
- 47x10v x10
- 220/25v x10
- 1/250v x10
- G8Speaker
- 6x48F
- TA2581
- TA2580
- TA2593
- TA2580
- TA2600
- TA2611A
- TA2611AQ
- TA2653
- TA2A200
- TA2640
- TA2690
- TA2593
- TA2A390
- TA2A360
- TA3571Q
- TA2A940
- TA2A351AQ
- UPC1365
- SN74LS125AN
- SN74LS248
- SIL4516
- SN16961NG
- SN16962AN
- SN16964AN
- SN29764AN
- UA721
- UA7300
- MJE3055
- MJE2801
- MJE2955
- MJE1605

VM6501

- MULLARD TELETEX DECODER
- With interface panel and data command panel
- New £8 Post £2
- 12 Volt Aerial Changer over Relays 144 Mc/s
- 45 watts

VM6501

- Indicator Tube
- ITT 58705
- 8 Seg Display FND50
- Mullard 12.5V/170 Mc/s 45 watts
- BLW60C
- Mullard Broadband R.F. power modules
- UHF BG22E
- PT4236C, PT8706C
- ITT Micro Phone M5
- with switch
- Sub-mm Relay
- low voltage 50P
- Mains relay coil 230V 30P
- Philips PP3 batteries
- 10 for £3
- 12v battery holders A.A.
- 50P
- TA12V 2 pin battery lead 30P

Various Tools and Accessories

- Philips microphone SBC 466
- Philips The Credit Card calculators, solar powered
- Philips dual power calculator SBC 1533
- Hills MR TRRS HT520 £15.90, HT420
- Microphone Philips stereo SBC 469
- VM6103 Mullard Teletex Decoder
- T/V V/Aerial 3000
- L.C.D. clock display with alarm
- =4 D/P push mains switch
- Mains lead & two pin socket for radio cassette
- T/V top aerial
- Radio Telescope Aerial
- Philips Neon Lamps for TV sets
- GP412
- GP412/11
- GP406

Transistors

- A1222
- A1223
- AC106
- AC121
- AC124
- AC128
- AC137
- AC151
- AC131
- AC138
- AC152
- AC153K
- AC142K
- AC169
- AC176
- AC176K
- AC178K
- AC179
- AC186
- AC187K
- AC188
- AC188K
- AC188K
- AC188K
- AD143
- AD148
- AD161/162
- AF139
- AF181
- AF239
- AF367
- AL102
- BC161
- BD507
- BD509
- BD510
- BD519
- BD534
- BD535
- BD544D
- BD562
- BD610
- BD616
- BD646
- BD676
- BD681
- BD807
- BD826
- BD948
- BDX75
- TCA270Q
- TC4640
- TCA680
- TCA270SQ
- TCA740
- TCA800
- TCA830
- TCE100
- TCE120CQ
- TDA440Q
- TDA1003A
- TDA1010
- TDA1060A
- TDA1072
- TDA1151
- TDA1170
- TDA1190
- TDA1200
- TDA1327A
- TDA1365
- TDA1412
- TDA2003
- TDA2004
- TDA2010
- TDA2140
- TDA2030
- TDA2525
- TDA2532
- TDA2540
- TDA2541
- TDA2571AQ
- TDA2575A

Sendz Components

63 Bishopsteignton, Shoeburyness, Essex SS3 8AF

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SENDZ COMPONENTS

63 Bishopsteignton, Shoeburyness, Essex SS3 8AF

Various Tools and Accessories

- Philips microphone SBC 466
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- GP412
- GP412/11
- GP406

Transistors

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- AC169
- AC176
- AC176K
- AC178K
- AC179
- AC186
- AC187K
- AC188
- AC188K
- AC188K
- AD143
- AD148
- AD161/162
- AF139
- AF181
- AF239
- AF367
- AL102
- BC161
- BD507
- BD509
- BD510
- BD519
- BD534
- BD535
- BD544D
- BD562
- BD610
- BD616
- BD646
- BD676
- BD681
- BD807
- BD826
- BD948
- BDX75
- TCA270Q
- TC4640
- TCA680
- TCA270SQ
- TCA740
- TCA800
- TCA830
- TCE100
- TCE120CQ
- TDA440Q
- TDA1003A
- TDA1010
- TDA1060A
- TDA1072
- TDA1151
- TDA1170
- TDA1190
- TDA1200
- TDA1327A
- TDA1365
- TDA1412
- TDA2003
- TDA2004
- TDA2010
- TDA2140
- TDA2030
- TDA2525
- TDA2532
- TDA2540
- TDA2541
- TDA2571AQ
- TDA2575A

Mixed Packs

- TO66, 12 Power Trans RCA 16182 NPN
- Replacement for BD124 and Mounting
- 50 Mixed AC series Transistor
- 15cm metal mount rocket switch 250V/10A
- 25 Panel Mount Bulbs & Neons
- 10A
- Mixed ribbon cables
- 25 LEB red/yellow/green
- 20/C Holders
- 20 Large LED Red
- 20 Small LED Red
- 100x20 Turn 100K Pots
- 100 Transistor
- 20 Convergence Pots
- 100 Sticks
- 10 Thermistors
- 20 Slider Pots
- 30 Presets
- 40 glass reed switch
- 10 Press to make switch
- 40 Pots
- 10 Gun Switches
- 5 Tube Bases
- 1,000 Diodes, Condensers, Resistors
- on Bandolier
- Lucky Dip 600 gram
- Jungle Bag 5g
- 20 Knobs
- 40 Pots, 1/4" + 6mm spindles for audio/TV
- 20mm Fuse Holders
- Chassis Mount
- IN4001/6/100 mixed
- EHT Diodes, small
- 20 Mixed Switches
- ITT M5
- Microphone - ITT - Rank
- 400V/4A Triac

Diodes

- BY127
- BY133
- BY134
- BY164
- BY176
- BY179
- BY184
- BY187
- BY190
- BY196
- BY198
- BY204/4
- BY206
- BY208/800
- BY210/400
- BY210/800
- BY223
- BY224/600 4.8A/600v bridge
- BY226
- BY227
- BY228
- BY229/400
- BY237
- BY254
- BY255
- BY298
- BY299
- BY406
- BY527
- BY407a
- G11 470M/250V SP

Min 12 volt relays

- R1038
- R1039
- R2093
- R2093
- R2010b
- R2029
- R2210
- R2257
- R2285
- R2305
- R2306
- R2322/2323
- R2323
- R2396
- R2461
- R2030
- R2443=BD124
- R2737
- R2738=TIP41

Diodes

- BY127
- BY133
- BY134
- BY164
- BY176
- BY179
- BY184
- BY187
- BY190
- BY196
- BY198
- BY204/4
- BY206
- BY208/800
- BY210/400
- BY210/800
- BY223
- BY224/600 4.8A/600v bridge
- BY226
- BY227
- BY228
- BY229/400
- BY237
- BY254
- BY255
- BY298
- BY299
- BY406
- BY527
- BY407a
- G11 470M/250V SP