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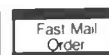
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Safety in the shack

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.

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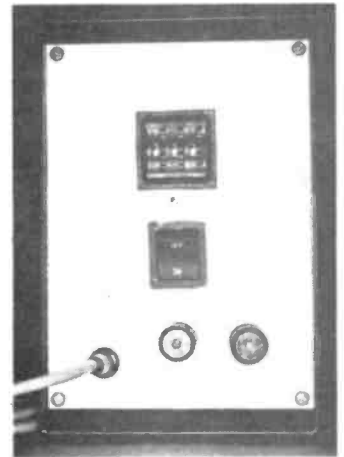
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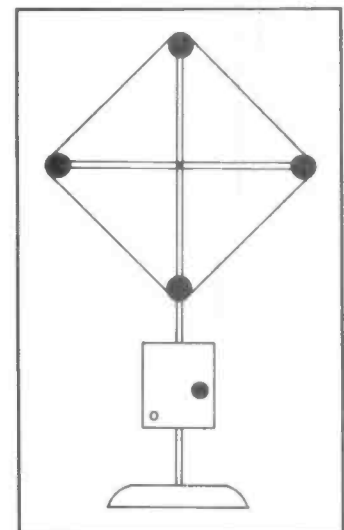
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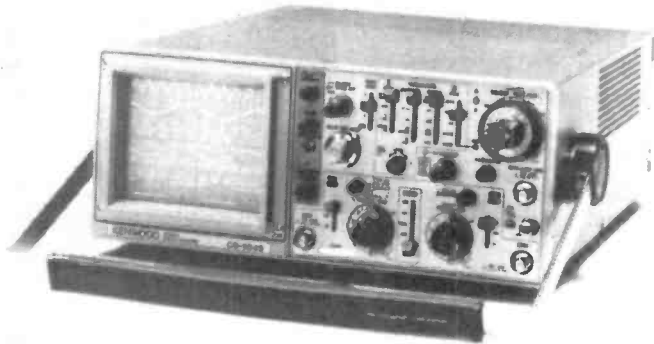
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PRODUCT NEWS

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

40MHz OSCILLOSCOPE



The new Trio-Kenwood CS-1045, available ex-stock from Thurlby Electronics, is a low-cost 40MHz oscilloscope of unusually high specification.

The CS-1045 has the range of facilities normally associated with more expensive wideband oscilloscopes. These include dual timebases with calibrated delay time multiplier, and a choice of immediate or triggered B sweep following the A sweep delay. An alternate-sweep capability enables simul-

taneous display of the expanded and unexpanded sections of a waveform.

The oscilloscope has three input channels, with individual position controls, giving it a six-trace capability in the alternate sweep mode. The maximum input sensitivity is 1mV per division and the maximum sweep rate is 10 nanoseconds (ns) per division. Trigger facilities include dc and HF reject modes, single shot and an active sync separator for TV-

and video frame and line synchronisation. The A timebase can be frame synchronised while the B timebase is line synchronised, allowing easy selection of individual lines. A variable sweep hold-off provides for stable triggering on complex waveforms.

The instrument has a 6in rectangular CRT with a 12kV post-deflection acceleration voltage which gives a sharp trace with the brightness reserve needed to view highly-expanded waveform sections.

The CS-1045 is easily portable, measuring only 12.5 x 5.2 x 14.9in (319 x 123 x 380mm) and weighing just 9.2kg. It is supplied complete with two wideband switchable sensitivity probes. It is priced at £695 + VAT.

A 60MHz version is also available.

*Thurlby Electronics Ltd,
New Road, St Ives,
Huntingdon,
Cambs PE17 4BG.
Tel: (0480) 63570.*

90% and 100% scale markings are provided to simplify pulse measurements.

Other features include a dc offset function which enables high accuracy, vertically expanded measurements of any desired portion of a waveform; an alternate magnification facility whereby simultaneous observation of the x10 magnified waveform and the original waveform is possible; and stable triggering on both channels, even if the signal frequencies of CH1 and CH2 differ.

The V425 also has a guaranteed $\pm 35\%$ accuracy for voltage and time over the 10 $^{\circ}$ -35 $^{\circ}$ C operating temperature range and a vertical sensitivity of 1mV/div, thereby enabling accurate measurement of the low level signals often encountered in microcomputer test and measurement applications.

Other features include eight divisions of dynamic range; a dedicated TV sync separation circuit which speeds up measurements of video signals; a built-in signal delay line, enabling measurement of the leading edge of fast rise-time signals; and an X-Y mode which enables accurate phase-difference measurements.

The Hitachi V425 measures just 310 x 130 x 370cm and weighs only 7kg.

*Thurlby Electronics Ltd,
New Road,
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Cambs PE17 4BG.
Tel: (0480) 63570.*

SIGNAL MULTIPLEXER

Available from Thurlby Electronics is the OM358 signal multiplexer which converts any conventional oscilloscope into a eight-channel oscilloscope.

The OM358 accepts up to eight signals with a bandwidth content from dc up to 35MHz, and multiplexes them together so that they may be displayed using just one channel of an oscilloscope. The ability to observe a large number of waveforms simultaneously can be an important aid in analysing complex equipment. Typical application areas include micro-processor based products, data transmission systems, phase locked loop products and analogue to digital converters.

Each channel of the OM358 has an input impedance of 1M Ω /20pF and accepts input signals up to $\pm 6V$ (12V peak-to-peak). This can be

extended to $\pm 60V$ using a standard x10 oscilloscope probe. A switched attenuator provides three different sensitivity levels and has a calibration accuracy of $\pm 3\%$. The multiplexing rate is continuously variable over a wide range.

All inputs and outputs are via standard BNC sockets. The multiplexer is connected to the CH1 input and to the external trigger input of the oscilloscope. An eight-way switch enables any of the input channels to be used as the trigger source. A four position mode switch is provided which gives a choice of display between all eight channels, channels one to four, channels five to eight, or any single channel.

The OM358 is equally suited to the display of analogue or digital signals. It is compact and lightweight, measuring only 230 x 230 x 90mm (9 x 9 x 3 $\frac{1}{2}$ in) and weighing 1.3kg.

*Thurlby Electronics Ltd,
New Road,
St Ives,
Huntingdon,
Cambs PE17 4BG.
Tel: (0480) 63570.*

LOW-COST SCOPE

Currently available from Thurlby Electronics is the Hitachi V425, a 40MHz, two-channel oscilloscope.

A major feature of this instrument is its digital CRT readout of voltage/time differences whereby the user simply adjusts the cursor to obtain a direct digital readout of the voltage difference and time difference between two points on the display. The panel setting display function provides a digital CRT display of the CH1 sensitivity and the sweep time, thus preventing errors.

The V425 has an 8 x 10cm high resolution display with an internal graticule. 0%, 10%

QUALITY DMM

The M3560 digital multimeter from Electronic & Computer Workshop Ltd offers a wide range of measurement ranges including voltage, current, impedance, continuity, transistor hFe, frequency and capacitance.

Competitively priced, it is meant for use in all types of electronic and electrical testing. Its front panel has a single 30-position range-

selector switch and it features full protection for all ranges, together with auto-zero and surge protection from 1.5 to 3kV.

The measurement ranges include voltage up to 750V ac, 1000V dc, dc/ac up to 20A, resistance from 200 ohms to 20Mohms, LED/audible continuity testing, transistor hFE, capacitance from 2000pF to 20µF and frequencies up to 200kHz.

The 3½-digit '1999' LCD has a range of annunciators including a low-battery indication and shows the units selected.

The operating temperature range is from 0 to +40°C and the M3650 measures 90 x 176 x 36mm.

Electronic & Computer Workshop Ltd,
Unit 1,
Cromwell Centre,
Stepfield,
Witham,
Essex CM8 3TH.
Tel: (0376) 517413.

MODAL ANALYSER

Solartron's new 1202 structural analyser offers facilities for 4-channel modal analysis in a single package.

The 1202 is suited to problem-solving applications in the field, but is also versatile enough for the laboratory. Solartron has solved the compatibility problems associated with combined systems using spectrum analysers and computers. In the 1202, software and hardware are matched for optimised system performance, yielding a system with low cost capability.

Results are presented on a fast graphic display featuring hidden line animation of mode shapes, strain contour maps, cross sectioning and flexible stack plots. Many features which are usually available only as accessories are standard in the 1202, for example forced response simulation and structural modification software. It is straightforward to operate,



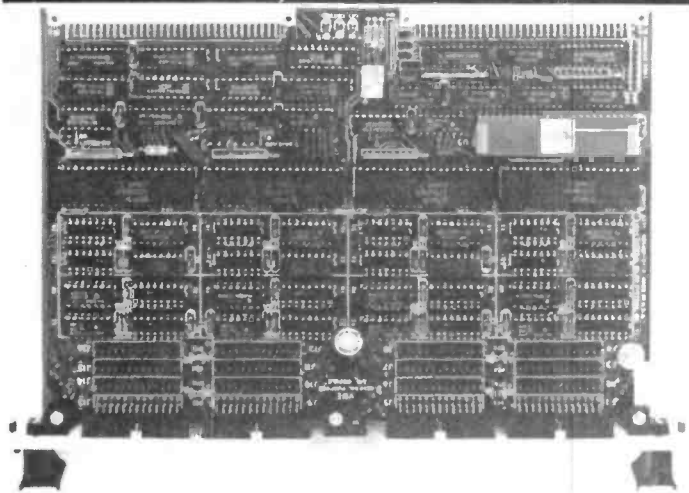
with self-explanatory menus and soft keys. All operations can be programmed for repeat testing, and considerable built-in memory is provided.

IEEE-488 and RS232 interfaces and signal generator are standard. The 1202 can be expanded to provide up to 36 channels for fast, accurate results in large-scale tests using stepped sine analysis.

Generator capability includes burst, periodic or pseudo-random noise, sine wave at arbitrary frequency, and user-definable waveform.

Solartron Instruments,
Victoria Road,
Farnborough,
Hants
GU14 7PW.
Tel: (0252) 544433.

I/O MODULE



118An I/O module for VME-bus users offering both serial and parallel I/O is now available from UECs (Universal Engineering and Computing Systems Ltd).

The GMS VO1 has 24 parallel I/O lines offering a Centronics-compatible printer port plus 12 additional bi-directional buffered I/O lines (or second printer port). Eight serial channels are provided. In addition to this I/O the module features a fully programmable 24-bit timer/counter with interrupt capability. A

control latch enables interrupt on any level from 1 to 7, with masking and disable functions.

The module gives VME users a building block for configuring multi-user I/O. Terminal, modem and printer ports can be configured allowing systems or communications control. All serial I/O is via one-to-one ribbon cable. All parallel I/O is accommodated through the P2 connector.

Serial channels are operable on RS232 or RS422 stan-

dards. Up to 18 programmable baud rates are available from 50 to 38.4kbps. The GMS VO1 also features one user-definable baud rate.

Universal Engineering and Computing Systems Ltd,
5/11 Tower Street,
Newtown,
Birmingham B19 3UY.
Tel: (021) 359 1749.

FORTH COMPUTER

The TDS9090 is a powerful control computer based on the high level language, Forth. Although small, it has features which make it easy to use in instrumentation applications. For example, it interfaces with an alphanumeric liquid crystal display and has a built-in keyboard encoder. The software support included helps in writing programs for operator input and output. Its low power CMOS and surface-mount construction allow the TDS9090 into applications where some control cards cannot be used.

The computer uses the Hitachi 63A03Y micro-processor. It has a 16Kbyte Forth and full symbolic

assembler. Programs can be written in high level language mixed with assembler for time-critical parts. There is 30K of RAM and 16K for the user's program. There are 35 parallel input-outputs and two serial ports. An on-card 256 byte EEPROM is for storage of system parameters which have to be kept while the unit is not working. Additional features include the watchdog timer, time-of-day clock, multitasking and its single power supply drawing only 3mA in a low power operational mode.

The TDS9090 is just 100 x 72mm in size. In one version it has a DIN connector so this is a shortened Eurocard. The other has pin headers and you connect to it by ribbon cable.

Any serial terminal can be used as the development interface to the TDS9090 but an IBM-PC compatible is best. BBC computers are also supported. The development card costs £194.95 and support software is £90.

Triangle Digital Services Ltd,
100a Wood Street,
Walthamstow,
London E17 3HX.
Tel: 01-520 0442.



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Table listing various semiconductor components such as AAY12, AC126, AC127, etc., with their respective prices.

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Table listing various diodes such as BYX36-150R, BYX36-600R, BYX55-600, etc., with their respective prices.

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Table listing various zener diodes such as BZX61 Series, BZY88 Series, etc., with their respective prices.

EHT MULTIPLIERS

Table listing various EHT multipliers such as Universal Tripler, Decca 30, Decca 80, etc., with their respective prices.

VIDEO HEADS

Table listing various video heads such as 3HSSV, 3HSSUJN, 3HSSUN, etc., with their respective prices.

PUSH BUTTON UNITS

Table listing various push button units such as Decca/ITT, Decca, Hitachi, etc., with their respective prices.

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Table listing various fuses such as 2mm Q/B @ 0.05 each, 100 MA, 200 MA, etc., with their respective prices.

TV MAIN SWITCHES

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Table listing various wirewound resistors such as 4 watt, 7 watt, 11 watt, 17 watt, etc., with their respective prices.

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Table listing various video belt kits such as Aki-VS93000/9500/9800, National Panasonic NV3000D, etc., with their respective prices.



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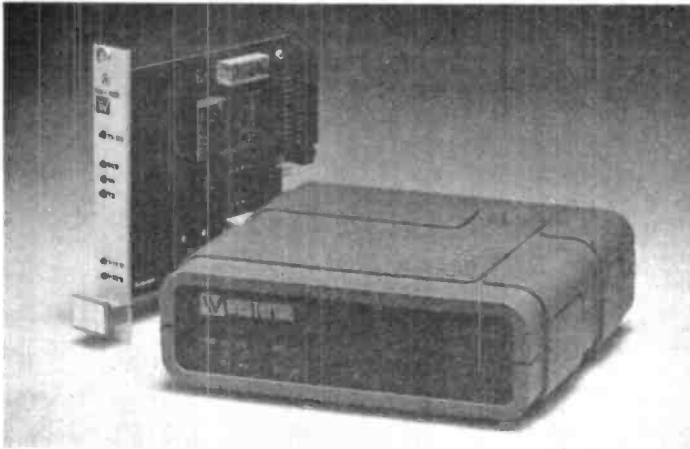
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EROC 19.80	EF86 Mullard 4.50	KT66 GEC 17.50	PC97 1.10	PCF87 0.88	XG1-2500 1.50	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5759 2.95
EROC 12.50	EF89 1.50	KT66 Sp 50.00	PC97 1.10	PCF82 0.80	XG5-500 22.50	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5760 2.95
EROC 18.80	EF91 1.95	KT66 Sp 50.00	PC97 1.10	PCF86 1.20	X109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5761 2.95
EROC 29.90	EF92 2.15	KT66 Sp 50.00	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5762 2.95
EROC 12.50	EF93 0.95	KT67 9.00	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5763 2.95
EROC 12.50	EF94 4.80	KT77 Gold ion 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5764 2.95
EROC 12.50	EF95 1.95	KT77 Gold ion 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5765 2.95
EROC 12.50	EF96 0.95	KT81 7.00	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5766 2.95
EROC 12.50	EF97 0.95	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5767 2.95
EROC 12.50	EF98 0.95	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5768 2.95
EROC 12.50	EF99 0.95	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5769 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5770 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5771 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5772 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5773 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5774 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5775 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5776 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5777 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5778 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5779 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5780 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5781 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5782 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5783 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5784 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5785 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5786 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5787 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5788 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5789 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5790 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5791 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5792 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5793 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5794 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5795 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5796 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5797 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5798 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5799 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5800 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5801 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5802 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5803 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5804 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5805 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5806 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5807 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5808 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80	35T23GT 3.50	5809 2.95
EROC 12.50	EF184 0.85	KT88 USA 10.95	PC97 1.10	PCF87 0.88	S109/K 10.00	4CX250B 49.00	6DQ6 2.80	7ZL 4.80</		

PRODUCT NEWS



LIGHTNING PROTECTION

The Swedish company Westermo Teleindustri has launched a lightning-protected modem for asynchronous communication over short distances, up to 18 kilometres.

The modem, called MA-12, is designed for transmission speeds of up to 38,400 bits/sec, full duplex.

Both the modem and the equipment connected to it

are protected against lightning and other forms of electrical interference by built-in transient protection. In addition, the line and terminal sides are electrically isolated, to provide even more interference protection.

The modem can be connected to all equipment which uses the RS232C and V24/V28 specifications. It can also be used to communicate

with Westermo's earlier asynchronous modem.

Two or four-wire connection can be used. Transmission is not code-dependent, so that the modem can handle all protocols, codes, bit formats and parity requirements.

The standard MA-12 is mounted in a plastic box, but can be supplied as a plug-in card for rack mounting or as a wall-mounted unit.

The modem is one of a new series of units called Access, which according to the manufacturer have high reliability and long life expectancy. Specially manufactured hybrid circuits are said to ensure a dependable modem with very few fault nodes.

A special tri-state technique is used to give error-free transmission. This technique additionally allows status signals to be transmitted.

*Westermo Teleindustri AB,
Jan-Erik Lundström,
S-640 40 Stora Sundby,
Sweden.*

Tel: +46-16 612 00.

written on the device can be easily modified using simple TTL levels and a single 5 volt power supply.

Writing to the KM2865A is very easy. The internally self-timed write cycle latches both address and data to provide a free system bus during the 10ms (max) write period.

The device features two end of write detection schemes to provide maximum design flexibility while enhancing the system performance. DATA Polling is a software detection scheme to detect the early completion of a write cycle without using any additional hardware.

Other features include a fast access time of 200ns and a low power requirement of 120mA active (max), 50mA standby (max).

The KM2865A is housed in a 28-pin DIP which conforms to the JEDEC byte-wide memory pin-out specification.

Life expectancy of the device is 10,000 write cycles/byte.

*Rapid Silicon,
Rapid House,
Denmark Street,
High Wycombe,
Bucks HP11 2ER.
Tel: (0494) 26271.*

DIGITAL PLOTTER

New from Advance Bryans Instruments is the Colour writer 6400 series of digital plotters.

The 6400 digital plotter has a large 240K buffer memory which permits transfer of complex plots at high speed, thereby releasing the host computer and operator to continue other tasks. The plotter accepts the HPGL standard graphics language.

The 6400 series has a maximum writing speed of 40cm/s and a pen-up speed of 55cm/s

to ensure fast generation of accurate plots. To optimise for different writing media, the speed is programmable in steps of 0.4cm/s.

The 6400 accepts a wide variety of plotting media including coated or bonded papers, or transparencies.

The 6400 series allows unattended automatic plotting of up to 105 consecutive graphs; and a digitising sight capability enables the Colourwriter to digitise and feed back to a computer coordinates from maps, diagrams and

other plots for storage or precise positioning and replotting of stored shapes.

Built-in intelligence is provided, including over 65 commands, which include bar and pie charts, fills, three character sets and seven line types. The plotter is software compatible with a wide variety of programs.

A standard RS232 or IEEE-488 interface is included.

*Advance Bryans
Instruments Ltd,
14/16 Wates Way,
Mitcham,
Surrey CR4 4HR.
Tel: 01-640 5624/640 3490.*

NEW EEPROM

Rapid Silicon have introduced a high performance 65,536-bit electrically erasable and programmable read only memory from Samsung.

Known as the KM2865A, this device is organised as 8,192 words by 8 bits, and is fabricated with the well defined floating gate NMOS technology using Fowler-Nordheim tunnelling for erasing and programming. Its circuit design is such that data

MINIATURE PRINTER

Crotech's MP-280-40 is a ruggedly-designed miniature printer module which is capable of printing 40 highly legible characters per line on 69mm wide plain-paper rolls.

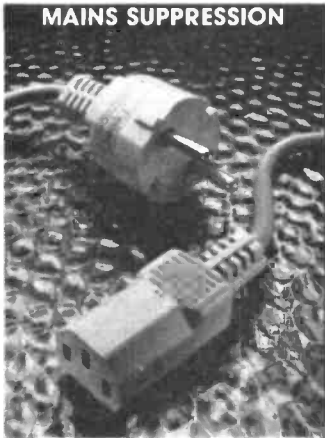
It is ideal for use in instruments and equipment where space is an important consideration. The dot matrix is 5 x 7 and provides a graphic point density of 240 per line. Print speed is 4 dot lines per second and the power supply requirement is +5V dc. The average motor current is 0.2A, while peak needle current is approximately 2.5A. The small dimensions of the printer (103.6 x 15.4 x 45.5mm) allow it to be incorporated into compact and portable packages.

RRP for the MP-280-40 is £48.94 excluding VAT.

*Crotech Instruments Ltd,
2 Stephenson Road,
St Ives, Huntingdon,
Cambridgeshire PE17 4WJ.
Tel: (0480) 301818.*



MAINS SUPPRESSION



Rendar have introduced an efficient low-cost method of blocking mains-borne interference.

The Combicord is a mains cable cordset which uses the cable itself as a capacitance, together with the coils and capacitors built into the plug and receptacle. Excellent suppression characteristics result. The Combicord retains its filtering efficiency even at very high frequencies. There is virtually no interference on the appliance side.

Filters are not always built into basic equipment. Retrofitting can be an expensive nuisance and is frequently not carried out. Susceptible equipment can be suppressed by utilising the Combicord.

*Rendar Ltd,
Durban Road,
South Bersted,
Bognor Regis,
West Sussex PO22 9RL.
Tel: (0243) 825811.*

UNINTERRUPTABLE MODULE

New from Coutant is an uninterruptable power supply module for the ML range of switched mode power supplies that provides an automatic changeover to battery power should the mains 'sag' or break altogether.

Called the MLU250, the unit connects to the ML via a pair of wires and to a NiCad or lead acid battery. Power hold up time depends on the capacity of the battery employed and can be in excess of twenty minutes – more than enough to shut the powered equipment down in an orderly fashion should the mains fail. When the mains is present the

battery is charged, the charging current being dependent on the state of the battery.

There are four models in the MLU range, covering all combinations of either 24 or 48V input and capability with either a NiCad or a lead acid battery.

*Coutant Electronics Ltd,
Kingsley Avenue,
Ilfracombe,
Devon EX34 8ES.
Tel: (0271) 63781.*

TCO FUSES

A new range of miniature thermal cut-off (TCO) devices from Steatite is designed to provide fast, accurate protection against thermal overloads in electronic equipment.

Small enough to be incorporated into motor windings, solenoids and heat-sinks, the TCOs are rated for operation at 125 or 250 volts for the protection of mains-operated equipment. Axial and radial-leaded as well as plug-in types are available to suit different application requirements.

Elcut TCOs cover rupturing temperatures from 76°C to 187°C.

*Steatite Group,
2 The Square,
Broad Street,
Birmingham B15 1AP.
Tel: (021) 643 6888.*

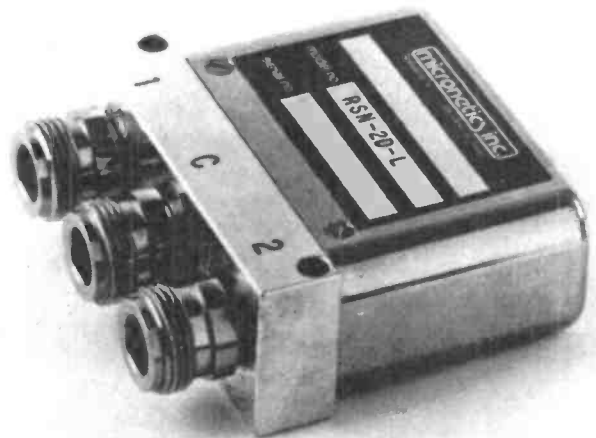
QUAD OP-AMP

National Semiconductor Corporation has announced the arrival of a quad operational amplifier which achieves a low 140dB dynamic range with less than 0.0015% distortion. This feature gives the LM837 the high performance required by the latest generation of compact disc players and digital audio systems. In addition, the LM837 requires less board space than low-noise duals, which increases reliability.

The LM837 has the ability to drive 600 ohm loads, a high slew rate exceeding 8V/μs, and a wide power bandwidth of 140kHz.

The LM837 quad op-amp contains a new type of output stage that drives a 600 ohm

CO-AX SWITCHES



Micronetics have a new range of co-ax switches covering the frequency band dc to 18GHz in single pole change-over and transfer configurations.

Both dc and ac operation is available, as well as latching and fail-safe options. Connector interfaces available are N, SMA, TNC, together with PCB mounting models or microstrip and strip line.

Waveguide models are also

available from the Micronetic range, covering the most popular waveguide designated bands. Modular drive heads provide the option for manual or motor operation.

*Tony Chapman
Electronics Ltd,
Electron House,
Hemnal Street,
Epping,
Essex CM16 4LS.
Tel: (0378) 78231.*

load, and so is well suited for amplification and signal-conditioning circuits.

The LM837 is also well suited for active filter designs, since it has a low-input noise voltage of 0.5μV and low THD of 0.0015%, and contains four very low noise amplifiers on a single chip.

The LM837 also has a pin-out compatible to other standard quad op-amps, and so can be used to upgrade existing systems with little or no design changes.

*National Semiconductor,
Industriestrasse 10,
D-8080 Fürstfeldbruck,
West Germany.*

CONNECTORS

Bulgin's BS4491/IEC 320 ultra-sonically welded, non-rewirable connectors have gained BSI approval, as well as VDE and UL recognition.

The appliance connectors can be supplied as components in their own right or as cord sets with BS1363A, CEE7, American and many other types of mains plugs to meet

customer requirements.

The BSI Kitemark has been awarded to both cold conditions (P887 and P887SE) 6 amp and hot conditions (P897 and P897SE) 10 amp connectors, whilst VDE and UL recognition has been granted for the 6 amp versions and SEMKO for (P887) 6 amp.

*AF Bulgin and Co PLC,
Bypass Road,
Barking,
Essex IG11 0AZ.
Tel: 01-594 5588.*



PRODUCT NEWS



POWERMAG

New from Advance Power Supplies is the recently expanded range of Powermag A1500 series PSU.

The Powermag range is now available with 2V, 300A; 5V, 300A; 12V, 125A; 24V, 65A; 48V, 35A; and 60V, 25A outputs. The ranged units deliver up to

SMARTPAK

Communication Development Specialists Limited have introduced what they claim is a new concept in communication power supplies.

The design of the power supply was inspired by the fact that standard power supplies used in communication environments have several drawbacks. The main problem is that the power supply must be capable of supplying full load without any ripple or degradation of supply voltage. This full load condition may only occur 5-10% of the power supply duty cycle time, with the remaining load only 20% of the full load condition.

This means that most power supplies are manufactured to supply a continuous output at full load condition and operate at 20% of their capacity for 90% of their duty cycle, and are bulky and unnecessarily expensive. Power supplies designed for intermittent full load condition can generate unwanted heat and sometimes fail under extreme conditions if their specification is not strictly adhered to.

Regular non-specialised power supplies are designed as stand-alone units and are

often unattractive, and problems may arise when attempting to mount or connect fixed equipment to their enclosures. Also, many power supplies are entirely reliant on the availability of a continuous mains supply.

The Smartpak communication power supply is an attractive unit, with adhesive front panel and indicator filter for OEM applications. A quickly detachable equipment tray has adequate clearance for bolting guest equipment bracketry.

The power supply internals consist of a 6AH gas recombination (totally sealed) lead acid battery, to provide up to 20A of 13.8V dc (or more if required). A battery condition circuit and a dual rate charger ensure the battery is working to full capacity.

The advantage of this combination is that should the mains fail the power supply battery will maintain power to the extent of its capacity.

Smartpak will operate on 120 or 240V ac mains, and can be supplied with 6, 12 and 18AH standby capacity.

*CDS Ltd,
PO Box 83, Basingstoke,
Hampshire RG25 2PX.*

1680W dc output (model dependent), when powered from either a nominal 220V ac or 110V ac input.

Features of the range include dual input (user-selectable input voltage ranges of 88-132V ac and 176-264V ac); input frequency of 47-63Hz; soft switching and magnetic amplifier technology, ensuring high reliability, full filtering to VDE 0871, Curve A and creepage and clearance distances to VDE 0806 and IEC 435.

The Powermag range has an efficiency of better than 70% and a temperature coefficient of 0.015%/°C. Both parallel and series operation are enabled.

The series has an operating temperature range of 0°C to +70°C.

*Advance Power Supplies,
Raynham Road,
Bishop's Stortford,
Herts CM23 5PF.
Tel: (0279) 55155.*

their range of high-resolution 13in colour monitors.

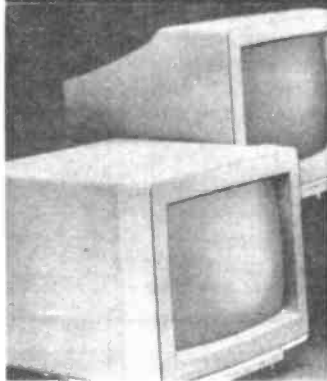
The cases are manufactured from laminate or sheet metal and a special ultra-thin high permeability foil which has excellent electro-magnetic shielding characteristics.

Tests have shown that the new case attenuates both static and dynamic electro-magnetic fields by more than 60dB.

At the same time as reducing the effect of electro-magnetic interference on the monitor, the new case has an equal effect on the electro-magnetic fields generated by the monitor. Not only does this make the monitor more secure, it being more difficult to 'eavesdrop' on the displayed data using radio receiving equipment, it also makes the monitor a good choice in those applications where the generation of radio interference has to be kept to a minimum.

*Electrohome Electronics,
7 Civic Way,
Ellesmere Port,
South Wirral,
Cheshire L65 0AX.
Tel: (051) 356 1365.*

ANTI-MAGNETIC CASES



When a monitor is used in areas of high magnetic interference it is likely that the quality of the display will become distorted, or even totally unreadable.

Sources of such magnetic interference are common in factories, near underground railways and in any other area where heavy motors or switching gear are employed. It is also possible for electro-magnetic cross talk to occur between two monitors that are mounted side by side or one on top of the other.

To solve the problem, the Canadian company Electrohome have introduced a screening case which is available as an optional extra for

INTRUDER ALARM

The increasing incidence of burglary and other crimes involving the illegal entry of property has caused many householders to try to improve the security of their homes.

The fitting of good quality window and door locks is important, but in many cases the determined criminal can still force an entry. A cost-effective way to deter them is to fit an intruder alarm. Infrared alarm systems are simple to set up and install, with a good sensitivity to movement within the protected area.

Electronic and Computer Workshop (ECW) can now supply an infra-red security system which consists of transmitter and receiver modules used in conjunction with a central alarm station. The transmitter/receiver units are sited at strategic points in the rooms to be protected and the infra-red light forms invisible beams that can be used to detect the presence of intruders. If the beams are broken, a

signal is sent to the central unit which can be programmed to sound an alarm.

The transmitter can be sited up to five metres from its receiver unit, and both run from low voltages supplied by the central station. Their small size means that they can be unobtrusively placed at almost any location.

The central alarm station can run with up to three transmitter/receiver pairs and offers a range of alarm alternatives, set by the user. Normally operating from mains power, the central station has an automatic battery back-up function that protects the system in the event of a power failure.

ECW offers the K2549 transmitter unit at a mail order price of £19.61, the K2550 receiver at £23.09 and the central alarm station at £26.98. Prices are for easy-build kit versions and include post/packing and VAT. Ready-built versions are available at a small extra cost.

*Electronics and Computer Workshop Ltd,
Unit 1, Cromwell Centre,
Stepfield,
Witham,
Essex CM8 3TH.
Tel: (0376) 517413.*

PORTASOL TIPS

A range of replacement tips, with diameters of 1.0, 2.4, 3.2 and 4.8mm, is available from Freetrade (TEP) Ltd for the Portasol portable gas powered soldering iron.

The tips are easily fitted and include the patented catalytic converter that generates heat right at the tip for maximum efficiency. Powered by gas cigarette lighter fuel, the Portasol has a variable temperature range of up to 400°C – equivalent to an electric iron's output power from 10 to 60W. One filling of gas gives up to 60 minutes of continuous operation.

No larger than a felt-tip pen, Portasol can be carried in a top pocket and has a clip-on cover with a built-in igniter. The powerful gas-operated heater gives a stable output that is superior to battery-operated portable types. This frees the user from having to work near a mains power

CORDLESS SOLDERING

The Oryx Iso-Tip range of rechargeable battery-powered soldering irons is now available from Greenwood Electronics. Performance is said to match that of a 50W iron with a tip temperature of over 370°C. One charge is sufficient for at least 100 soldered joints.

Each tool comprises an iron and a base stand/charger unit. Typical zero to full charge time is between three and four hours but a battery which is only partially discharged will return to full capacity in under two hours. An iron can be left on charge indefinitely without risk of over-charging.

A version which can be charged from a 12V car battery (via the vehicle's cigar lighter) is also available. Tips can be quickly changed without tools.

A PC drill attachment is also available which fits in place of the tip and can be used for cleaning excess solder from the PCB holder or as a small, low power, general purpose miniature drill.

*Greenwood Electronics,
Portman Road,
Reading RG3 1NE.
Tel: (0734) 595843.*

point or bother with extension cables.

*Freetrade (TEP) Ltd,
Moor Lane,
Witton,
Birmingham B6 7HH.
Tel: (021) 356 2582.*

MULTIPURPOSE TIMER



Cobonic Limited has announced a battery-operated electronic timer,



incorporating a true stopwatch, a countdown/alarm/count-up timer, and a clock.

The timer has a memory and does not need to be keyed in again for repetitive identical timer settings. The multipurpose clip can be used to attach the timer by magnetic force to metallic surfaces or by a spring-loaded clip to a writing pad. Alternatively, it can be stood on a desk. The timer sells for £17.50 but during the company's introductory sale, they are offering it at a 20% discount, at £14.00.

If a cheque or postal order is sent in advance to Cobonic they will pay the carriage.

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

BONDING TOOLS

The Gaiser Tool Company's range of semiconductor wire bonding tools is now available in the UK from Dage Intersem.

For thermosonic and thermocompression bonding, Gaiser introduced the ceramic capillary to the industry and now offers sapphire and ruby-tipped ceramic capillaries. These give a long tool life, with reduced friction on the bonding wire to eliminate looping and breaking problems. Gaiser wedge bonding tools are designed to ensure bond integrity whatever the materials and techniques used. The range includes high-strength tungsten carbide wedges for minimum wear, and special alloys for reliable room temperature bonding of gold wires.

The tools are suitable for use with both thermosonic and thermocompression bonding machines, from simple manually operated to high-speed pattern-recognising automatic types. Die collets and vacuum pick-up tools are also available.

*Dage (GB) Ltd,
Rabans Lane, Aylesbury,
Bucks HP19 3RG.
Tel: (0296) 393200.*

NEWS DESK

Goonhilly celebrates

Twenty-five years ago world-wide communications entered a new era. Telstar, the world's first commercial communications satellite, was launched on July 10th, 1962, and the first live television signals via satellite were received by British Telecom's Goonhilly earth station in the early hours of the following morning.

Today, British Telecom International (BTI) handles more than three million minutes of telephone calls, television pictures, data, facsimile and telex every day through Goonhilly and its other intercontinental links.

World-wide satellite communications began with that first live television transmission from America, and, on the evening of July 11th, the first live television transmission from Goonhilly to the USA. Two days later the world's first telephone call by satellite was made, from London to New York.

Tests during the Telstar trials showed that satellite transmission had a commercial future in world telecommunications, heralding the introduction of services which are now taken for granted. Six days after Telstar was launched, Goonhilly transmitted the first colour television pictures via satellite, long before colour television was commonplace in the United Kingdom or the United States.

The first antenna, used in the Telstar transmissions, and still operational, was unique. British-designed, it was a 'dish' antenna, compared to the French and American 'horn' antennas. But the unique dish design was to prove superior for satellite communications and is now used generally by nearly 700 satellite stations in more than 150 countries.

Goonhilly visitors' centre is open to the public from 10am to 6pm, every day of the week between Easter and the end of September.

A day to remember

Twenty-five enthusiastic young electronic designers, ranging from 12 to 21 in age and representing sixteen different educational institu-

tions in virtually all parts of Great Britain, took part in the finals of the 1987 Young Electronic Designer Awards contest at the Institution of Civil Engineers, Great George Street, London SW1.

Projects were designed to satisfy key requirements in everyday life and were judged on their commercial viability as well as presentation, technical competence and originality. They were created in response to the YEDA Scheme's challenge for young people to apply electronics know-how in the development of world beating products, which are so important to the future prosperity of British industry.

Each of the overall winners in the three age groups was awarded a trophy, individually sculptured in solid bronze and engraved with silver by Sir David Hughes Bt, which represents a three dimensional YEDA seedling. Designed to symbolize youth and technical creativity, the trophy can be retained as a permanent memento of the occasion.

Winner in the Senior category was Douglas Mackay, aged 21, of Robert Gordon's Institute, Aberdeen, for his

Mobile data

Sweden, Norway and Finland agreed recently to go ahead with a common system for mobile data comms.

The system, called Mobitex, has been in operation in Sweden since October 1986, and is the first public radio telecommunication network for text, voice and data.

Finland has definitely decided to introduce the Mobitex concept, and Norway plans to follow suit. Denmark is not committed, but is undertaking a quick market research exercise to determine the concept's potential.

Following the acceptance of the mobile telephone as an everyday business tool, the demand for mobile data telecommunications has increased. In addition, text and data transfer provides more efficient use of the available frequencies than speech.

The Scandinavian mobile data market is still in its

robotic functional arm.

First in the Intermediate category were Paul Dagley-Morris, 16, and Roger Lucas, 15, of Cheltenham College, for their animal stress meter.

In the Junior category Neil Motson, 14, and Jonathan Cragg, 14, of Wilford Meadows School, Nottingham, came first with their digital tyre pressure gauge.

Wilford Meadows School also won the Texas Instruments Business-Pro computer for the project adjudged to have the most commercial potential.

Come out to play

The tenth Personal Computer World Show this year hopes to illustrate a thriving games and leisure industry, complete with the top 20 names in entertainment software and a new generation of more sophisticated video games. Stand space in Olym-

pia's National Hall is sold out and visitors can expect an action-packed exhibition, with the chance to try for themselves the latest games from all over the world.

Last year, 66,030 visitors clicked through the turnstiles at Olympia, creating record-breaking attendance figures on all five days of the show. An even bigger turnout is expected at this year's exhibition, which runs from Wednesday 23rd to Sunday 27th September. The first two days are for business and trade visitors only, but the public are admitted from Friday 25th onwards.

Regular faces amongst the exhibitors include Activision, launching the Bangkok Nights successor to The Last Ninja, Amstrad, Ocean Software, Prism Leisure Corporation, US Gold, Acorn Computers, Mastertronic, Electric Dreams, Elite Systems and

infancy. Forecasts indicate that there will be 40,000 mobile data terminals in the region by 1990, increasing to 160,000 by 1995. It will take

energetic marketing of both the service and the terminals and application systems to achieve this rate of expansion.



Mirrorsoft. Atari is planning to repeat its successful village style stand, and this year's show sees a number of major new exhibitors, many from abroad.

The Personal Computer World Show is sponsored by *Personal Computer World* magazine and organised by Montbuild Ltd. Opening times are 10.00 until 19.00 hours every day except Sunday 27th September, when the exhibition will close at 17.00. Tickets are available through Keith Prowse ticket agencies (tel: 01-741 9999), or at the door, priced at £3 for the public, with discounts on groups of 10 or more.

CB licence evasion

A concerted campaign to combat Citizens' Band (CB) licence evasion is to be carried out in London over the next few weeks by the Department of Trade and Industry's Radio Investigation Service (RIS).

The campaign is part of a continuing effort by the DTI to

ensure that CB users are licensed. As well as countering licence evasion, the RIS will also be checking on the use of illegal equipment. Linear amplifiers (known as 'burners'), AM and single sideband equipment, as well as certain types of aerials, are all outlawed under CB regulations.

A CB licence currently costs £10 and can be bought from post offices. The maximum penalty for unlicensed use is a fine of up to £2,000 and/or up to three months imprisonment. The courts can also order forfeiture of equipment.

The brain drain

For some years there has been an increasing concern that among factors adversely affecting science, technology and engineering in the UK is a growing loss of talent abroad – the so-called 'brain drain'. In order to secure a sounder basis of data on this subject, the Science and Engineering Policy Studies Unit of the

Royal Society and the Fellowship of Engineering has undertaken a study of the inward and outward flows of scientists and engineers to and from the UK. The scope of the study was limited to those working in Biochemistry, Chemistry, Earth Sciences, Electronic Engineering and Physics, who left or came to the UK between 1975 and 1985.

A report describes the results of that study. It is based largely on a questionnaire survey of university departments, research groups and industrial, governmental and research council establishments.

The numerical scale of migrants identified here would not generally be considered large in comparison with the overall size of the groups that migrants left or joined. But the significance of migration, inward or outward, lies not only in counting heads but also in the intellectual capacity of the migrants, their experience and the period of

time they spend in any one institute or country. The majority of those leaving the UK did so for long-term posts abroad; most foreign scientists and engineers coming to Britain from overseas came for relatively short periods.

Thus, although almost as many 'experienced' scientists and engineers entered the UK as left, the data provides no grounds for complacency. It was found that, over the ten year period of the study, many recent PhDs left the UK without having taken up employment in this country. A greater proportion of these young people emigrate permanently than was the case 25 years ago. This illustrates that an increasing proportion of our most talented scientists have been among those who have left the UK.

Home taping royalty

It was announced in June that a home taping royalty of 10% will be added to the price of blank audio tapes, as part of a new copyright law. The proceeds of the royalty will be distributed to the performers, composers and producers of sound recordings. The new legislation will be introduced during the 1987-88 session of Parliament.

Commenting on the move, Ian Thomas, the Director General of the International Federation of Phonogram and Videogram Producers (IFPI) said: 'As the international organisation of the recording industry, IFPI welcomes the British Government's firm commitment to copyright reform and in particular its proposal to deal with the home taping problem. Although a royalty does not represent a totally satisfactory solution to the problem of private copying, such a move will bring the United Kingdom into line with the majority of its European Economic Community partners. Three member states (France, Germany, Portugal) already have such a royalty, while bills have been introduced in the Parliaments of Spain, Belgium and Italy, and the Dutch Government has announced its intention to provide a private copying royalty.'

Radiopaging by satellite

Trials of British Telecom's world-first satellite radiopaging service are to start at the end of the year.

It will enable drivers of long-distance lorries to be contacted immediately by their companies while they are on the road – particularly those of road haulage firms operating on routes across

Europe, the Middle East and Africa.

The service will provide another international extension to the existing radiopaging service operated in the United Kingdom by British Telecom Mobile Communications (BTMC).

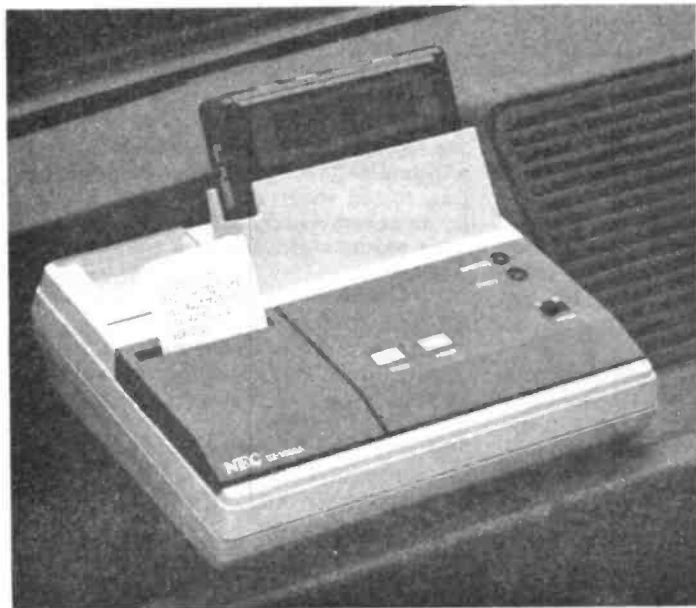
Earlier this year BTMC announced that it would provide a transatlantic paging

service through a joint operation with Metrocast, a US-based paging company. The Metrocast service is due to be launched this autumn. It uses a frequency-agile pager and does not depend on satellite transmission.

Customers taking part in the trials will make their satellite paging calls in exactly the same way as an inland paging call. Messages will be routed via BTI's satellite earth station at Goonhilly Downs, Cornwall, to an INMARSAT satellite. The signal the satellite sends back to earth will be received by a small 'patch' antenna mounted flush with the roof of the lorry cab. A Message Master pager in the cab will display the message and a printer will provide a copy.

The receiving equipment forms the most compact mobile receive-only satellite earth terminal yet designed, while it requires no more power from the vehicle's battery than a 6W side-light bulb.

Prospective customers can obtain more information by calling 01-388 4222 and asking for satellite radiopaging sales.



AMATEUR RADIO WORLD

Compiled by Arthur C Gee G2UK

At long last, the much heralded Russian amateur radio satellites have been launched. Because of a lack of prior information from the Russian authorities, the launch, which took place on 23rd June from Plesetsk, came as something of a surprise, and the lack of tracking information and orbital predictions led to much confusion which is taking some time to clarify. Matters were not helped by the complexity of the satellite – or satellites – launched. The launch of further Russian amateur radio satellites in the RS series had been 'confidently' predicted by some amateur radio commentators for the past two years or so, and their predictions helped to confuse the issue still further.

A TASS statement received in this country on 25th June by the space authority, Geoff Perry, and immediately published in a newsheet from the Kettering Group, said that an 'artificial Earth Satellite Cosmos 1861 had been launched. It was intended for operation as part of the space navigation system established to determine the location of ships of the marine and fishing fleets of the Soviet Union in any point of the world's oceans. The Sputnik was put into an orbit with the following parameters: the initial period of revolution – 105 minutes; the maximum distance from the surface of the Earth – 1014km; the minimum – 995km; the inclination of the orbit – 83 degrees.

The Sputnik Cosmos 1861 also carries equipment designed by wireless enthusiasts of the Voluntary Society for assisting Army, Air Force and Navy, to ensure amateur radio communications and carry out experiments in scientific and education purposes. The systems aboard the Sputnik are functioning normally.'

This would suggest that the amateur radio equipment was part of the Cosmos 1861 spacecraft and not two separate satellites launched along with Cosmos 1861, as was stated in some quarters.

Monitoring the frequencies expected to be used revealed that the navigational signals were on 150.00MHz and that the amateur radio signals were on a number of frequencies around 29.350–29.450MHz and used the callsigns RS10 and RS11. Besides the beacon CW telemetry, quite a number of other signals were identified, suggesting data, RTTY, etc modes

of transmission. It was thought that these might be due to cross-modulation of the navigational transmission with the radio amateur ones. If this is so and is incurable, this might mean a permanent shut down of the amateur radio transmitters.

The complexity of the new satellite 'package' is illustrated by the quite extraordinary number of modes of operation of the amateur radio side of the set-up. There are transponders working with an uplink in the 15 metre band and a downlink in the 10 metre band, there is another with a 2 metre uplink and a downlink in the 10 metre band and there is also one with a 15 metre uplink and a 2 metre downlink, plus various combinations of these. There are also robot transponders.

So far most of these modes have been identified by amateurs, and QSOs have been had through some of them. At the time of writing, the telemetry has not been deciphered completely and there does not appear to be any indication from the beacons about which channel the satellite is working on or is going to work on in the immediate future. No doubt in time all will be revealed, but until it is, confusion reigns!

Youth award

When John Butcher, the Industry Under-Secretary in the previous Government, opened the RSGB National Convention earlier this year, besides hinting at the increase in facilities being contemplated for the 50 and 70MHz bands, he said that to mark the 75th anniversary celebrations of the RSGB next year, the DTI is to award a prize for Youth Achievement in Amateur Radio. He said this idea had been enthusiastically welcomed by the RSGB, who will make it a joint DTI/RSGB venture. This, he hoped, would focus a lot of young people's attention on the hobby of amateur radio.

With their subscription reminders, the RSGB is enclosing a smart brochure drawing members' notice to the advantages to be gained from RSGB membership: a good idea to remind members of what they get for their money, as well as encouraging non-members of the merits of joining the society.

During the past six years, membership has nearly doubled, from 19,000 in 1977 to

34,000 today. As the brochure points out, this is very comforting and flattering – everyone likes to think of their special interest as going from strength to strength rather than declining.

Apart from this, there are other important considerations. The larger the number of members, the greater the service that can be provided and the lower the cost. A further, very important consideration is that amateur radio is essentially international in nature. A strong national society is essential if it is to continue to play a leading role among the 117 other national societies which go to make up the International Amateur Radio Union. Without a concerted effort on the international scale there would be great difficulty in maintaining, let alone extending, that most valuable, and essential, requisite of our hobby – our amateur radio bands.

Operation Raleigh

We have mentioned the activities of Operation Raleigh several times in this column and the amateur radio operations from the flagship, SES Sir Walter Raleigh.

The Sir Walter Raleigh has had to return home prematurely, the main reason being one of cost. The day to day running costs of a 2,000 ton ship absorb a great deal of cash, which the Operation Raleigh organisers consider could be better spent on other projects.

The amateur radio station on board the ship, GB0SWR, participated in some interesting VHF experiments during her return journey. Running 100 watts on 144.175MHz into a 4 element quad antenna at 15 metres above sea level, it was found that contacts with the UK could be achieved with relative ease and good signal strengths over a distance of 1000km.

50 and 70MHz

Apparently, the release of the 50 and 70MHz bands to Class B licensees seems to have been one of the most popular of the recent achievements of the RSGB. The response to this success by letter and telephone leaves no doubt about the appreciation of the membership. Getting these facilities was no easy task and was the result of a lot of very hard work by the society.

Having secured these facilities, every

responsible user of these frequencies is very anxious that the selfishness of a few might put these privileges in jeopardy. 50MHz is still allocated to the broadcasting service in numerous countries within range of the UK. If interference to these broadcast services occurs from amateur radio activity, the use of the band will be immediately withdrawn.

The power limits at 50MHz are 14dBW carrier and 20dBW ERP. How do you calculate these? The problem seems to be bothering more than a few users of these bands. If you are one of them, consult the *News Bulletin* feature in the issue of *Radio Communication* for July 1987, page 502. Here you will find the topic very well covered indeed. We need say no more. If you are in doubt, this is essential reading for you.

Computer software

One of the snags about computers is that each variety seems to specialise in one particular type of activity, or, more often perhaps, ignores one particular interest.

The Sinclair computers are very well supplied with a lot of good software for amateur radio activities - particularly with regard to satellite interests. The most popular computers nowadays seem

to be those in the Amstrad series, but they do not accept Sinclair software nor do they seem to be producing technical software of an amateur radio interest.

There is, however, an organisation known as the Sinclair Amateur Radio User's Group - SARUG for short. They have recently added the Amstrad CPC to their interest. They were formed in 1981 to provide amateur/SWL users of Sinclair computers with a way of sharing knowledge concerning the wide range of activities opened up by cheap home computers. They became the main source of supply for a wide range of public-domain software for amateur radio users and they claim that they have helped to influence the commercial availability of both software and hardware by bringing members' needs to the attention of those working on radio-computing projects.

This has included RTTY, weather fax, satellite telemetry, etc. The group has a 5-times yearly newsletter of 16 pages. The newsletter is circulated to other interested groups in several countries and is read in over thirty countries. The 'software service' makes certain programs available on tape free to members. SARUG is the sole source for GM4IHJ satellite and propagation software for

the Spectrum micro. The membership fee is £5.00. Readers with Amstrad computers should contact this group not only to see what software they can supply, but also to register their interest in technical software for the Amstrad. Write to Paul Newman G4INP, 3 Redhouse Lane, Leiston, Suffolk IP16 4JZ.

Free from the DTI

The following are available free of charge from the DTI. They are all very well worth getting, particularly the Annual Report for 1986. They can be obtained by phoning the 24 hour answering machine on 01-275 3072 or by writing to The Librarian, Communication Branch, DTI Room 605, Waterloo Bridge House, Waterloo Bridge, London SW1.

You may ask for any or all of the following, post free: *The Annual Report of the DTI Radio Frequency Service*; *Radio Amateur Information Sheets 1 to 5*; *Frequency Allocation Wall Chart*.

The number of current amateur radio licences in the UK at the end of April last was as follows: Class A - 30,242; Class B - 27,166, making a total of 57,408. This is an increase of 2.4% over the last 12 months. The number of prosecutions for offences under the Wireless Telegraphy Act for the first quarter of 1987 was 111. [REW]

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Basically designed for measuring between two parallel objects up to 20ft. (5M with Optional Parabolic Reflector). Applications: Room dimensioning, Car reversing, Surveying, Robotics, Intrusion, height gauge, and lots more. OUTPUT: Four digit BCD (Multiplexed), interfaces indirectly to a four-digit LCD display board (optional). Kit comprising PCB, Components, Transducer, Slide switch, Push switch, Thermistor, PP3 Battery connector, KIT PRICE 22.95 BUILT AND TESTED 25.95 Optional Extras LCD Display board comprising: 4-digit Liquid crystal display with drivers and on-board DF oscillator. 13.95 KIT PRICE 17.95 4K7GM472W 1.95 Ultrasonic parabolic reflector. distances up to 55ft have been achieved. 2.95 RS232C - Parallel Centronics Converter Ideally suited for computers that cannot support Parallel Printers. Kit comprising: PCB, Components, 36 way Centronics IDC plug & patch lead. 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<p>* TRANSFORMER RM CORES RM/RM7/RM10 respectively</p> <p>RM CORES LA4146 0.82 LA4246 0.96 FX3436 0.66</p> <p>RM CLIPS DT2498 0.07 DT2487 0.07 DT2506 0.09</p> <p>RM BOBBINS ADJUSTERS DT2517 0.52 DT2466 0.46 DT2535 0.84</p>	<p>LEDs 4.0mm DIA RED TLR113A 0.10 GRN TLG113A 0.13 YEL TLY113A 0.17 ORG TLO113A 0.21</p> <p>LEDs 3.1mm DIA RED TLR123 0.08 GRN TLY123A 0.11 YEL TLY123 0.13 ORG TLO123 0.17</p>	<p>LED DISPLAYS 0.30in CA TLR332 0.89 AN TLR333 0.89</p> <p>0.43in CA TLR342 0.89 AN TLR343 0.89</p> <p>0.53in CA TLR358 0.89 AN TLR359 0.89</p>	<p>D TYPE CONNECTORS SOLDER BUCKET 9 Way Slt 0.43 9 Way Plg 0.38 9 Way Shell 0.98 15 Way Slt 0.60 15 Way Plg 0.53 15 Way Shell 1.07 25 Way Slt 0.60 25 Way Plg 0.53 25 Way Shell 1.16</p>	<p>PLEASE ADD £1.00 P&P + 18% VAT. Data sheets zero rated. Data sheets 50p each, free on request with component. Stock items normally by return of post. Please ask us to quote for items not listed. Part numbers are exact or near equivalents. Prices correct at time of going to press. * Coil winding facility available. * Available until stocks are exhausted. ** EPROM programming available 0.01p per 8 bit-byte min chg £5.00. £2.50 for duplications. * CATALOGUE NOW AVAILABLE SEND S.A.E *</p>			

2 NEW MOBILE MASTERPIECES

IC-900 Super Multiband FM System.

This new addition to ICOM's Ham radio equipment is a multiband FM transceiver system that allows the mobile operator to customize a communications system for his favourite bands. Up to 5 optional band-units can be installed with the IC-900 for instant access to a wide range of frequencies from the 28MHz HF band to the 1240MHz UHF band. Only a small remote controller is necessary for control of all these bands. A flexible optical fibre is used between the Remote Controller and the Interface Unit. The IC-900 has independent, full duplex capability on all bands, providing simultaneous receive and transmit operation.

The function display on the Remote Controller shows two separate operating frequencies simultaneously. The IC-900 system transceiver is equipped with 10 fully programmable memory channels in each Band Unit. The system can therefore store up to 50 different memory channels.

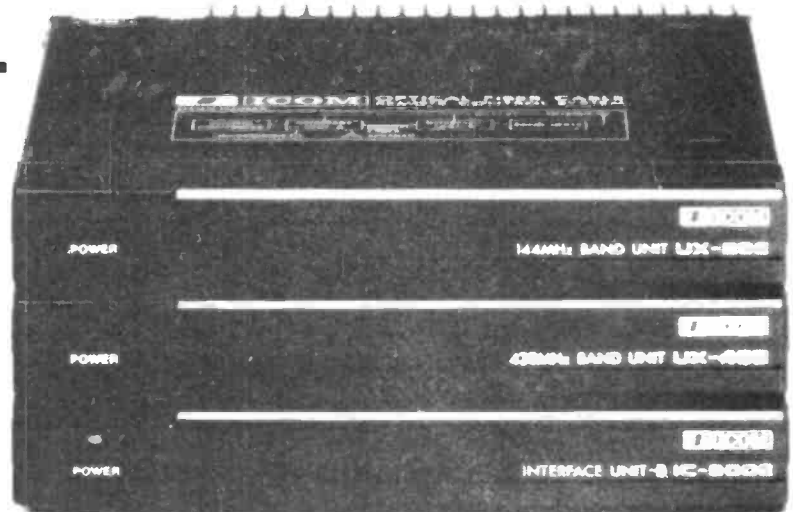
This revolutionary new concept in Multiband operation is available from your ICOM dealer. Also feel free to contact ICOM (UK) LTD for assistance or information. The IC-900 Multi-band system consists of a Remote Controller, Interface Unit A, Interface Unit B and a series of specially designed Band Units.

UX19	28—30MHz	10 watts
*UX59	50—54MHz	10 watts
*(No mobile operation allowed in UK)		
UX29	144—146MHz	25 watts
UX29H	144—146MHz	45 watts
UX49	430—440MHz	25 watts
UX129	1240-1300MHz	10 watts



IC-1200, 23cms FM Mobile.

To complete the range of VHF/UHF FM Mobiles this new model is now available for the 23cm Ham band, it is based on similar features to the already existing IC-28E 2m and IC-48E 70 cms mobile units. This Mini-mobile transceiver will fit easily anywhere in your vehicle or shack. Power output is 10 watts or 1 watt low. The IC-1200 is so new we do not even have a picture of it, however, the large front panel LCD readout is designed for wide angle viewing and front panel controls are straightforward to make mobile operation safe and easy. The IC-1200 is a superb example of ICOM's dedication to exploring new communication equipment.

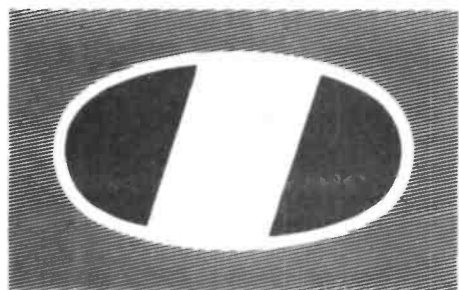


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ICOM

Communications

VHF/UHF FM Handportables

If you want a handheld with exceptional features quality built to last and a wide variety of interchangeable accessories, take a look at the ICOM range of FM transceivers. All ICOM handportables come with a nicad battery pack, AC wall charger, flexible antenna and wrist strap.

Micro 2E/4E

These new micro-sized 2 metre and 70 centimetre handportables give the performance and reliability you've come to expect from ICOM.

Measuring only 148 x 50 x 30 the Micro fits in your pocket as easily as a cassette tape. The Micro 2E/4E features an up/down tuning system for quick frequency adjustments, 10 programmable memories, a top panel LCD readout, up to 2.5 watts of output (optional).

IC-2E 2 metre Thumbwheel Handportable

This popular handheld from ICOM is still available. For those amateurs who require a straightforward and effective FM transceiver the IC-2E takes some beating. Frequency selection is by means of thumbwheel switches (with 5Khz up switch) simplex or duplex facility. Power output is 1.5 watts or low 150 milliwatts (2.5 watts possible with BP5A battery pack).

IC-02E/04E 2 metre and 70cm Keypad Handportable

These direct entry CPU controlled handhelds utilise a 16 button keypad allowing easy access to frequencies, memories and scan functions. Ten memories store frequency and offset, these handhelds have an LCD readout and power output is 2.5 watts or low 0.5 watt. 5 watts is possible with the IC-BP7 battery pack or external 13.8v DC.

IC-12E 23cm Handportable

Similar in design and style to the 02E/04E this 1296Mhz handheld utilises ICOM's experience in GHz technology, gained by the excellent IC-1271E base station. Power output is 1 watt from the standard BP3 nicad pack, external 13.8v DC powering is available to the top panel jack. With the growing number of repeaters on 23cm, the IC-12E makes it an ideal band for rag chew contacts.

ALSO AVAILABLE FOR ICOM HANDPORTABLES ARE A LARGE RANGE OF OPTIONAL EXTRAS INCLUDING A VARIETY OF RECHARGEABLE NICAD POWER PACKS, DRY CELL BATTERY PACKS, DESK CHARGERS, HEADSET AND BOOM MIC, LEATHERETTE CASES AND MOBILE MOUNTING BRACKETS.

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ATV ON THE AIR

Andy Emmerson G8PTH puts you in the picture

EARWIG as you'll remember, is the European Amateur Television Working Group, founded a little more than a year ago. The second international meeting was held at Crick in May, coinciding with the BATC's annual convention there. Delegates came from Switzerland, Italy, France, Germany, Holland, Belgium and Britain, while only our Austrian colleague was unable to attend.

One of the decisions taken at the meeting was to invite other European countries with ATV activity to join the working group and consolidate our efforts, with the hope of becoming truly representative of all European television amateurs. Letters accordingly went off in the direction of Sweden, Norway and Spain (we don't know of ATV operation in other countries), and so far Helmer SM6CCD has replied from Sweden. He says that, as far as he is aware, there are some 10 to 12 ATVers in Sweden and thus they do not have an ATV manager. He will, however, act as contact and feels that international cooperation is very important for all ATV-interested amateurs in the future.

Repeater news

Readers may be interested in another list of ATV repeaters to add to that which I recently published for Europe (right). This time they're for Down Under, just the thing for the next big lift! A similar list for North America would be useful; can anyone supply this?

There are now more than 50 ATV repeaters in Europe, of which some 12 are in the UK. An interesting develop-

ATV repeaters in New Zealand					
Area	Callsign	Input - MHz		Output - MHz	
		Vision	Sound	Vision	Sound
Gisborne Kaiti Hill	-	1251.25	1256.75	443.25	448.75
Belmont	-	443.25	448.75	614.25	619.75

ATV repeaters in Australia					
Area	Callsign	Input - MHz		Output - MHz	
		Vision	Sound	Vision	Sound
Canberra	VK1RTV	426.25	431.75	579.25	584.75
Wagga	VK2RTW	444.25	449.75	579.25	584.75
Bendigo	VK3RMZ	426.25	431.75	579.25	584.75
Melbourne	VK3RTV	444.25	449.75	579.25	584.75
Townsville	VK4RAT	444.25	449.75	579.25	584.75
Brisbane	VK4RTV	426.25	431.75	579.25	584.75
Central North	VK5RCN	426.25	431.75	444.25	449.75
Central North	VK5RCN	579.25	584.75	444.25	449.75
Adelaide	VK5RTV	426.25	431.75	579.25	584.75
Adelaide	VK5RTV	444.25	449.75	579.25	584.75
Perth	VK6ROD	426.25	431.75	579.25	584.75
Perth	VK6RUF	426.25	431.75	579.25	584.75
Devonport	VK7RAE	444.25	449.75	579.25	584.75
North West	VK7RTV	444.25	449.75	426.25	431.75

ment is the planned 10GHz 'gateway' for GB3TV (Dunstable Downs). To be situated in the Milton Keynes area, the idea is that this should act as a remote base to feed signals into and out of the repeater. Much of Milton Keynes is shielded from the repeater site, but a well-located station can of course access the repea-

ter. If poorly situated stations could 'see' this remote base station with 10GHz, they could then use it to get into the repeater proper. It's a novel concept and I shall keep you informed of progress.

The BATC has been liaising with the RSGB's microwave committee on TV working frequencies for 10GHz and has also agreed a 13cm bandplan. The Worthing video repeater group is proposing a 2.3GHz repeater co-sited with their 23cm machine at Brighton (GB3VR). The Bristol repeater, GB3ZZ, is now fully operational, as is GB3TV's new high-power output stage. No applications have been made yet for the proposed repeaters at Emley Moor (Yorkshire) or Nottingham.

News from Rugby

GB3RT, the Rugby TV repeater, goes from strength to strength and is hoped to be fully licensed by the time you read this (fingers crossed!). The transmitter has been fully air-tested (approximately 210 hours to date) and all necessary adjustments have been carried out. The output power is set at 10 watts, resulting in an ERP of 25 watts. This is the maximum currently allowed by the DTI for video repeaters - we wait to see if Cambridge gets the kilowatt ERP it requested!

The receiver is running continuously and the sound ident generator,

European ATV Working Group members at the Crick Convention



incorporating a Morse code EPROM kindly programmed by Geoff Mather of the Worthing group, has also been air-tested.

The repeater continues to operate in attended relay station mode, with regular QSOs and good picture reports. Most of these tests are carried out on Fridays and Mondays, according to the commitments of Mike G6IQM, on whose premises the repeater resides. Full specification CCIR pre-emphasis and de-emphasis are now incorporated, and to obtain the best results users should ensure that their transmitters and

receivers are similarly equipped.

The repeater's licence application has passed the Radio Investigation Service and site clearance stages, and is now with the frequency planning committee. The box has been funded by the bring-and-buy sale held at May's BATC convention, and also by the following kind donations: Bob G6GSG, main power supply; Barry G6IKQ, erection of repeater aerials; Worthing and District Video Repeater Group, two Alford Slot aerials; David G1GPE, glass fibre stub mast; and Mike G8DLX, interdigital bandpass filter and brand new Microwave Modules

receive preamplifier.

Sign-off

Don't forget this Autumn's contests! Saturday 12th and Sunday 13th September see the international ATV contest. This is for fast-scan TV on all bands, lasting from 1900 to 1300 local time. The Autumn Vision contest is held on Sunday 25th October on all bands, all scan speeds from 0001 to 2359. Finally, an SSTV-only event on Sunday 29th November, from 0001 to 2359 local time. See you next month, when I hope to include *your* contribution!

PREW

This month we attempt the hazardous feat of looking into the future. Luckily there are some firm steers, so not much guesswork is involved!

PRS, SSR and PARS

Remember PRS, the personal radio system? It was (and is) a cross between Citizens' Band and cellular radio, providing private communication between two radio users. You could call it an automatic selcall (selective calling) system. As it doesn't use an exchange you can only link up with people within normal radio range, but conversations cost nothing once you have the equipment – and a licence!

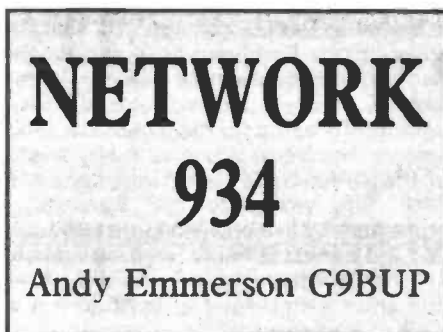
PRS is big in Japan and is also in operation on the 933 and 934MHz bands in Switzerland, where it appeals to business and private users alike. It is due to come into operation in Holland as well later this year.

The concept also has some appeal to the British authorities, who promptly renamed it SRR, short range radio. Since then, there has been pressure from industry to design a higher specification system which would use the same technology as the next generation of digital cellular car phones and offer extra facilities.

This has been given the title PARS, private advanced radio system, and there is now some momentum to develop this commercially for sale throughout Europe. It was recently announced that eleven European electronics firms, including British Telecom, Plessey, GEC, Philips and Racal, have formed a joint venture to develop PARS. We'll have to see if this takes off, and also whether it will be as affordable as the current generation of 934MHz sets. The chances are that it will...

DTI speaks out

Some useful information was contained in a recent talk given to the annual general meeting of the 934MHz Club UK by Mr Robert Pringle of the Department of Trade and Industry's Radio Communication Division. You can read the full text of his speech in the latest edition of the club's magazine (you are a



member, aren't you?), but here are some of the high spots:

'Around the middle of last year my section within the division began to revise the entire licensing process of CB – the actual document itself and the regulations and restrictions. This was prompted by our decision to launch a European 27MHz system, which will be available from 1st September this year, and the need to amend legislation to allow this to happen. We also needed to look at 934 since the two are licensed under the same document.

'We were pleased to talk to representatives of major national user groups for both frequencies. Members of the committee of the 934MHz Club UK actually took a leading role in putting forward suggestions for the development of the licence, pointing out rules which were considered unnecessary and helping us to consider areas that, perhaps, we had not considered before.

'We had a big meeting towards the end of last year which the club, together with other groups, attended. We put forward our proposals for the development of the licence and received back a reaction from the groups, and I am pleased to say that we were able to take on board most of the things that were put to us.

Fewer restrictions

'The most important result of the review is that we are going to lift restrictions on antenna use for 934MHz. We are going to allow, in future, 12 element antennas of any configuration, providing each element does not exceed 17cm. You may use 12 element beams,

collinears or slots – whatever you want – providing it is within the 12 element limit.

'We were considering controls on preamplifiers and, at 27MHz, we had to respond to interference problems by prohibiting them. However, it is widely recognised that they are used at 934MHz. The 934MHz Club UK pointed out the extensive use of them and assured us that they have had no problems. I am pleased to tell you that you may continue to use your preamplifiers.

'We also looked at the attenuation ruling contained in the present CB licence, which requires attenuation to the signal by 10dB if the antenna is more than 10 metres above ground level. This rule, it was felt, was unfair to operators, particularly at 934MHz, who are in localised hollows and who may be able to erect masts with the appropriate local authority permission.

'We undertook an extensive amount of monitoring and field tests, and experienced no interference problems in the field. I am pleased to tell you that the attenuation ruling will disappear on September 1st.

Licence revision

'We are also conscious that, as people get more involved with their hobby, they tend to buy more equipment. At the moment we charge you more if you use more than three sets. As I have already told you a moment ago, we are introducing an additional service – the European 27MHz system – and this means that people are going to have more and more equipment.

'We felt it was, perhaps, an unfair restriction to license on the basis of the number of sets. I am pleased to be able to tell you that, as from 1st September you will be able to use any number of CB sets under the cover of a single licence. Other changes we have in mind will limit the current hire clause, which is perceived as being a loophole. It has certainly been mentioned to us by user groups as being unfair, so we are going to restrict licences to cover individual persons or anyone under their supervision. This is in line with other government policy such as your driving licence,

NETWORK 934

for example. All changes will, I point out, come into effect on 1st September 1987.

More to pay?

'One question I will not be able to answer concerns the licence fee. The licence fee has stuck at £10 since November 1981. I do not need to tell you that inflation would suggest that the fee should now be at least up to £14. I think I would be misleading you if I said we were not considering adjusting the fee. Since all these other changes are happening on 1st September it would seem to be a good date for an adjustment, but I am pleased to assure you that we do not intend to adjust the fee to a vast level.

Or lose 934?

'One question that always crops up when people telephone or write to me about the 934MHz radio frequency: "Are we going to lose our service? We have heard that the DTI is going to shut down 934." You can take it from me today that we are not going to shut down 934; its future is assured for the foreseeable future.

'The Government will be reviewing all CB allocations in 1990 and this is part of a rolling programme. For example, at the moment the defence spectrum is being reviewed. The CB review is obviously on a smaller scale but whatever the outcome, whatever the recommendations made by the minister, he has committed the Government to allowing a good life for users' sets, and we are taking this to mean that the specification will still be available up to at least the mid 1990s. So please do not worry about buying new equipment, thinking that it will become out of date.

Looking further afield

'Another area that raises queries is the scene in Europe at 900MHz. A lot of you will know that there is a Japanese system called 'Personal Radio Service' that operates at 903-905MHz in Japan. This is often seen as being a second or third

generation CB system. European administrations, the UK amongst them, have been looking to introduce such a system in the 933-934MHz bracket, and, indeed, it has been agreed in Europe to leave this particular slot in the spectrum for CB and personal type radio systems. The good news is that if we were to introduce such a system it would, in effect, be giving you more of the spectrum to use and the two systems could live quite happily side by side.

'The not quite so good news is that the UK will not be introducing the system for at least three years. This is to allow the development of competing technology which is a British-inspired move towards a digital system. I can tell you that, in advance of a European-wide agreement on the introduction of one or other system, some administrations have unilaterally opted for the Japanese-style system. The Swiss you are already aware of, the Netherlands plan to introduce one later this year and the Spanish, I understand, have one available although I do not think it is being used very much.

'The European front is an important one and I am pleased to say that it is a case of Europe catching up with the UK. We knew that 900MHz was perfectly practicable for mobile radio and for hobby communications back in 1980/81 and you, the users, have recognised that it is technically difficult to get going. However, once established it can produce a very high quality service.

Friendliest service

'Finally I would like to relate a few of my hopes for the future. One is that the 934MHz band gets much more popular. We have a quorum of a few thousand licensed users, who operate to a high standard. They enjoy, I think, one of the friendliest services on radio, certainly compared to other CB and, I would say, licensed amateur services as well. The relaxed, informal but well-ordered atmosphere is, I think, a treat to listen to. I hope that this develops and

continues as the band expands.

'I hope also to see more commercial use of 934. A lot of you will say "What's he talking about? We don't want business coming onto the band and taking us over." Well, I do see there is a very real need for a simple, local system for very small businesses. I am thinking of, perhaps, a small shop with a single delivery van. The 934MHz band is a good slot for those people to use, and it is a good way of defending the band and ensuring its survival into the long-term future. The Government is very keen to promote business use and business has first call on the spectrum - even above the Ministry of Defence. We have seen the defence spectrum review and ministers are pressing for the spectrum to be taken away from the military and allocated to private users. If the 934 CB band is also used by small businesses, that is a big bonus for it and will help to defend it in the long-term.

'My other hopes are that the 27MHz service takes on board some of the operating practice of the 934MHz system, and I also hope that the European 27MHz system is the prelude for European systems elsewhere.'

That's it - I hope you feel reassured. I certainly find this very encouraging and agree with nearly all these thoughts. By the way, if you have any further information on the Dutch or Spanish services please let me know. We can then share the knowledge. REW

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R05 (50 mill-ohm) 1% 3W 4 for £1	
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620R 910R 1K0 1K2 1K5 1K8 2K7 3K3 3K9 4K7 8K2 10K 15K 16K 20K	
W23 or Sim 9W	6 of one value £1
R22 R47 1R0 1R1 3R0 15R 56R 62R 68R 120R 180R 220R 300R 390R 680R 1K0 1K5 5K1 10K	
W24 or Sim 12W	4 of one value £1
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2µ2 160v rad 22mm	100/£10
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A LABORATORY POWER SUPPLY

by DAVID SILVESTER

If batteries are not to form the main method of providing power to small transistor projects, the constructor will need to build a variable voltage power supply unit to replace them; the cost of electrical power from batteries is some 2,000 times the cost of mains power.

A quick evaluation of the requirement reveals that the supply should have the following characteristics: mains derived power; output voltages of 3, 6, 9V, etc to cover the battery voltages normally used; current capability in excess of 1A as a nicad replacement.

It is possible to build a PSU to fit this specification using a single CA3140 op-amp and one unregulated input voltage, but the author did not like the resulting method of setting the output voltage using a potentiometer even if a 10 turn pot could be used to improve accuracy.

It was decided to use digitally selected output voltages using a group of three BCD encoded thumbwheel switches. These switches are used to represent the output voltage in tens, units and tenths of a volt. The tens switch is limited to a maximum setting of 3 and a minimum of zero, the values 4 to 9 being made non-selectable by stops on the tens switch. Thus, the output voltage can range from 0.1 to 39.9V in steps of 0.1V.

The problem is that to be able to do this the op-amps need to have a separate $\pm 15V$ supply from the unregulated main supply at 55V, but as this is at very low currents a small secondary transformer and a simple fixed power unit is built on the main PSU to supply the necessary voltages.

The design of the power supply unit derives from the circuit in *Figure 1. A*

reference voltage is provided by a separate circuit into the non-inverting input to the op-amp IC1, and a portion of the output voltage selected by the potential divider R2 and R3 is placed on the inverting input of the IC. Provided that the IC does not load the potential divider due to its input current, then if say R3 is 10Kohms and R2 is 90Kohms the output voltage will be 10 times the reference. The resistor R1 is used for the current limit circuitry, but this is not shown in this diagram. Now, if the reference comes from a potentiometer with one side grounded, the output can range from zero to theoretically 10 times the maximum reference voltage. However, the op-amp itself limits the available outputs that can be obtained.

How it works

If we look briefly at the op-amp inputs and outputs, only expensive and difficult to obtain types can operate with supply voltages in excess of 36V, and of the common types the bipolar output stage limits the maximum finished power supply output voltage to a guaranteed value of 31V. Consequently, in *Figure 1* the maximum output voltage from the PSU will be 29.8V. In this diagram the transistor Tr1 will have a voltage drop of 0.65V and R1, which is the current detect resistor for the current limit circuit, will also show a maximum voltage of 0.65V at the point of operation. As for the minimum output voltage available, only the CA3140 will operate correctly with its inputs both close to the low input voltage rail, but the circuit is still unable to give us the full range of zero to 40V required.

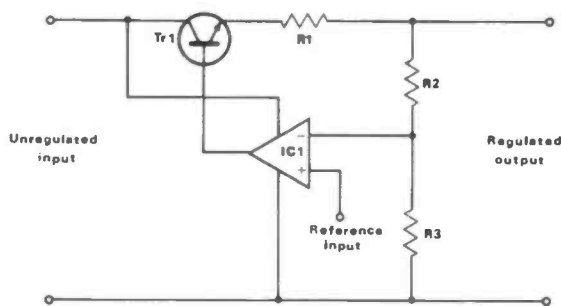


Fig 1 Basic supply

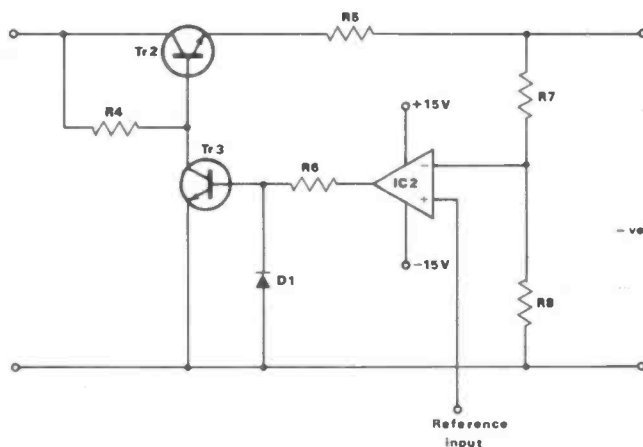


Fig 2 Supply for increased output voltages

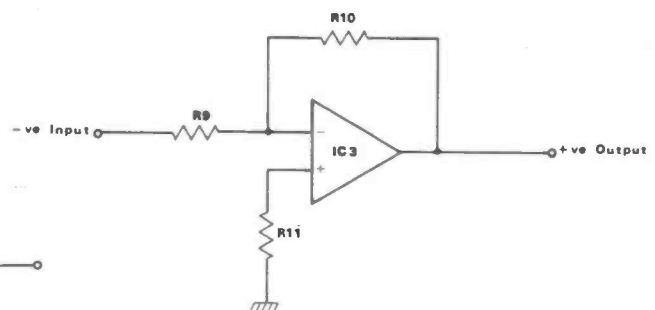


Fig 3 Basic reference generator

Figure 2 cures all problems caused by the op-amp limits. In this circuit, the separate supplies for the op-amp IC2 allow the reference voltage to vary from zero to between 12 and 14V, depending on the IC type, before the IC causes any problems. Negative reference voltages are obviously not acceptable, as the main output cannot go below zero. With R7 and R8 fulfilling the same function as R2 and R3 in Figure 1, the output could vary up to 120V, if the transistors can cope with these voltages.

Theoretically, this can be extended so that if we used 500V breakdown transistors and altered the feedback ratio by increasing the value of R7, increasing the unregulated input voltage to 480V, then we could make a 475V output PSU. The transistors used in this project all have breakdown voltages of 80V or more, so outputs up to 75V are possible if the main unregulated voltage is increased. However, the power dissipation of the pass transistor will be exceeded if the output current exceeds about 1A.

In Figure 2, transistor Tr2 is turned on by the action of R4, whilst Tr3 under the control of IC2 attempts to turn Tr2 off. Due to the inverting action of Tr3, the reference signal goes into the inverting input of the IC and the portion of the output voltage goes into the non-inverting input. D1 is included to provide protection for Tr3 in cases where the output of the IC goes negative. It is possible for the voltage into this transistor to be -15V when the op-amp demands a quick turn on of the output current due to transients and, as no transistor is able to stand a reversed base-emitter voltage above 5V, D1 limits this reverse voltage to 0.65V. It is frequently necessary to add a capacitor between the inverting input and the output of the IC to suppress the high frequency loop of IC2, Tr3, Tr2 and the resistors, this being a simple method of adding extra frequency compensation to that which is internal to the IC.

Up to this point we have ignored the reference voltage, but this is derived from the simple inverting amplifier stage shown in Figure 3. In this amplifier configuration the operational amplifier tries to maintain the voltage at its inverting input at ground potential, known as the virtual earth point. If a negative potential is applied to the end of R9 then a current will flow through R9 and, since the op-amp input cannot supply current, the op-amp output will rise to a positive voltage sufficient to drive the same current through R10 and retain its input voltage at virtually zero.

R11 is a compensation resistor to overcome the temperature effects of input bias current and should be of a value similar to the parallel resistance of R9 and R10. By keeping a fixed voltage at the end of R9, but allowing the value of R9 to be altered - in our case by switching a parallel bank of resistors controlled by the BCD thumbwheel switch - and provided that the correct values of

parallel resistor are chosen, the output voltage of the IC in Figure 3 can be varied in 0.01V steps up to 3.99V. This is, in fact, a simple digital to analogue converter.

Having broken the circuit into its constituent parts, it is now easy to examine the full circuit shown in Figures 4, 5 and 6. T1, Br1 and C1 provide the main +55V used by the control circuit, whilst T2, Br2, C2, C3 and the three-terminal regulators IC3 and IC4 give the + and -15V supplies to the op-amps IC1 and IC2. The capacitors C4 and C5 help to increase the stability of the output of the regulators and also assist with noise reduction. The voltage for the input to the DAC comes from the 7905 IC5, but due to the manufacturing limits on this device the output voltage may vary between 4.8 and 5.2 volts. I will give advice on how to cope with this tolerance problem later.

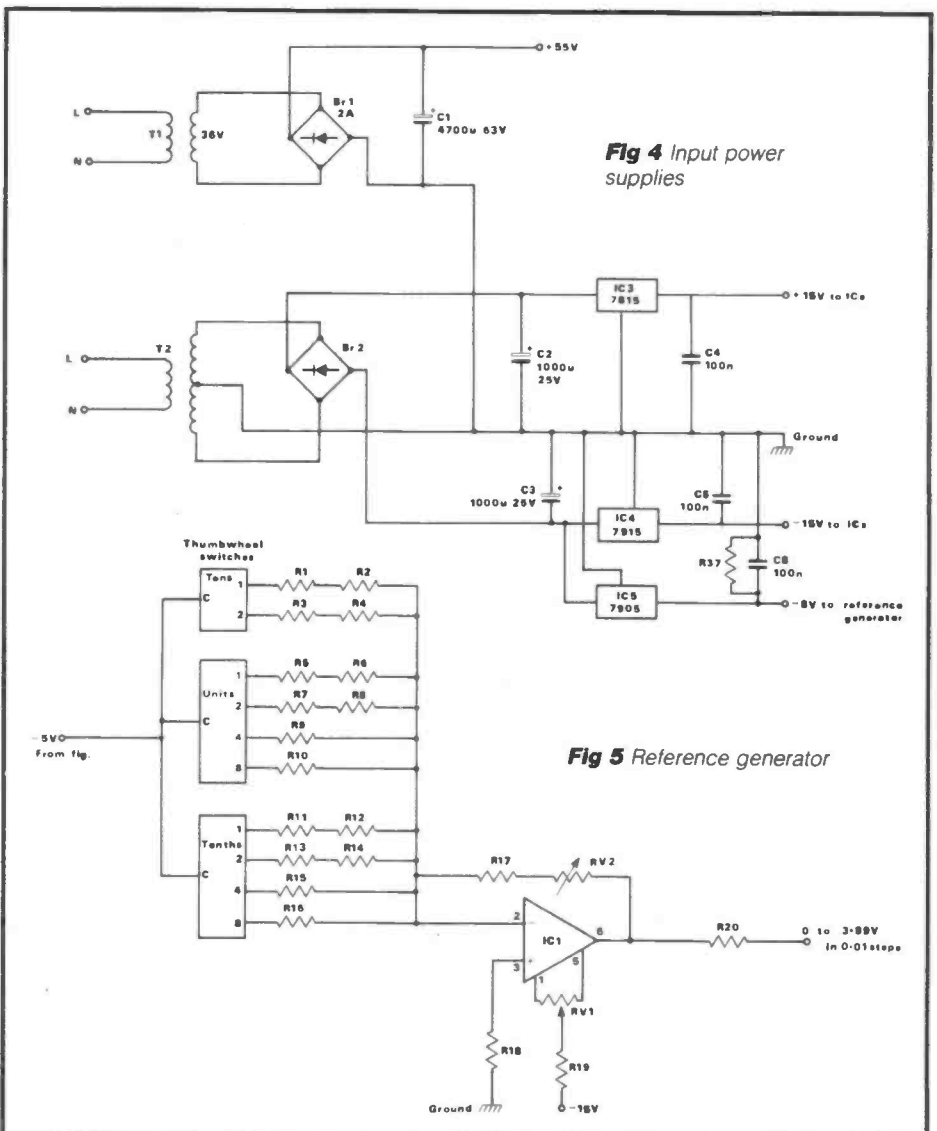
C6 provides noise reduction for this supply. The tolerance on the + and -15V supplies in no way affects the operation of IC1 and IC2. An interesting problem is that the three terminal regulator, IC5, does not like to work into an open circuit

represented by the thumbwheel switches being set to zero or into a digital voltmeter with a typical input impedance of 10Mohms, and to give a stable output voltage a current leak resistor, R37, has to be included.

The reference generator

The similarity between Figure 5, the reference generator, and Figure 3 can be seen with the nominal input of -5V. R1, R2, R3 and R4 in the prototype were 0.1% tolerance resistors, as errors in these resistors have the greatest effect on the output of the DAC. Although single resistors of the correct values (800 ohms for R1 + R2) are available to special order, it was easier to use standard values and have two resistors in series. The parts list gives the supplier of the 0.1% resistors. 1% devices may be used but with a corresponding error in the output from the DAC.

A similar problem exists with the values of R5, R6, R7, R8, R11, R12, R13 and R14 and, although the Author was able to obtain suitable single resistors for this article, it was felt better to select more



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common resistor values. As the 7905's output can be between 4.8 and 5.2V, Vr2 needs to be included in the circuit to cope with this variation.

Let us look at the way that the values for the resistors in the DAC are calculated. The easy way is to work backwards from a nominated resistor value for one of the thumbwheel lines. It was assumed that the 8 line had a 1K0 resistor equivalent to R9 in Figure 3, and that the 7905 output voltage was accurately 5.0V. With the values selected and the information that the op-amp will try to hold the inverting input at ground potential, a current of 5mA flows away from the op-amp input and the op-amp must supply this current from its output pin via R10 of Figure 3. But we also know that with the thumbwheel set on 8 representing an 8V output, the DAC must give a 0.8V output due to the ten times gain of the next stage. Thus, the value of R10 can be calculated as we have the voltage 0.8V and the current 5mA, and

this gives a value of 160 ohms.

To allow for the tolerance of the -5V regulator, the same calculations can be carried out for the highest and lowest values for the -5V supply; in practical terms the values become a resistor of 150 ohms and a 20 ohm pot. The rest of the values for the DAC resistor bank can be calculated very easily, as the values will be in the inverse ratio to the switch settings. Vr1 and R13 provide a zeroing for the output, with no resistor selected by the thumbwheel switches. By the use of Vr1 and Vr2, the output from the DAC can be set to give outputs from 0 to 3.99V.

The main regulator

As in Figure 2, the main circuit of Figure 6, showing the main regulator, consists of an op-amp controlling a transistor Tr3, with the feedback coming from the combined resistors of R21, R22, R23 and Vr3. The 56pF capacitor, C7, provides a high frequency short around the feedback network, speeding up the

high frequency response of this part of the circuit.

In the prototype, the feedback system has been made variable so that an accurate setting of a divide by ten can be obtained. In practice, this setting can be ignored, provided that 1% or better tolerance resistors can be used for the feedback loop as the variability in Vr2 and consequently small offsets of the 0 to 3.99V output of IC1 can be used to correct for any error in the feedback to IC2.

In the fixed resistor case, the values of R21, R22 and Vr3 become fixed 1K resistors of the values 6K8, 1K2 and 1K0 ohms respectively. Once again, Vr4 and R36 provide zeroing of the output of IC2 when its reference input is at zero. As in Figure 2, D1 protects Tr3 from negative input voltages, with R35 as a current limit for the diode. C9 is an additional frequency compensation capacitor needed to overcome the larger loops' (IC2, Tr1, Tr2, Tr3) high frequency response, as at some voltages there may be a tendency to go into high frequency oscillation. C10 and R33 provide a switch-on soft start signal in that whilst C8 is charging, Tr3 will be partially turned on, limiting the output voltage.

The pass transistor (Tr2 of Figure 2) becomes a Darlington transistor of Tr1 and Tr2 in Figure 6. R32 is again the turn on resistor and the resistors R30 and R31 act to give stability to the Darlington, just as the inbuilt resistors of a single package Darlington transistor would do. A current limit selection switch, S1, has been used to enable the choice of 15, 150 or 1500mA current limit settings; the lower the resistance selected the higher the limit current. This is a three-position switch, ie, two-way plus centre off, being the lowest cost alternative for this item considering the fact that the switch will carry the full output of 1.5A. It will be noted that neither of the output lines has been connected to the mains earth so that the unit can be used with outer items of equipment that may already have earth connections.

The output error sensing of the supply (Figure 6, right-hand side) can be seen to be separate from the two output rails. In all supplies it is advisable to arrange that

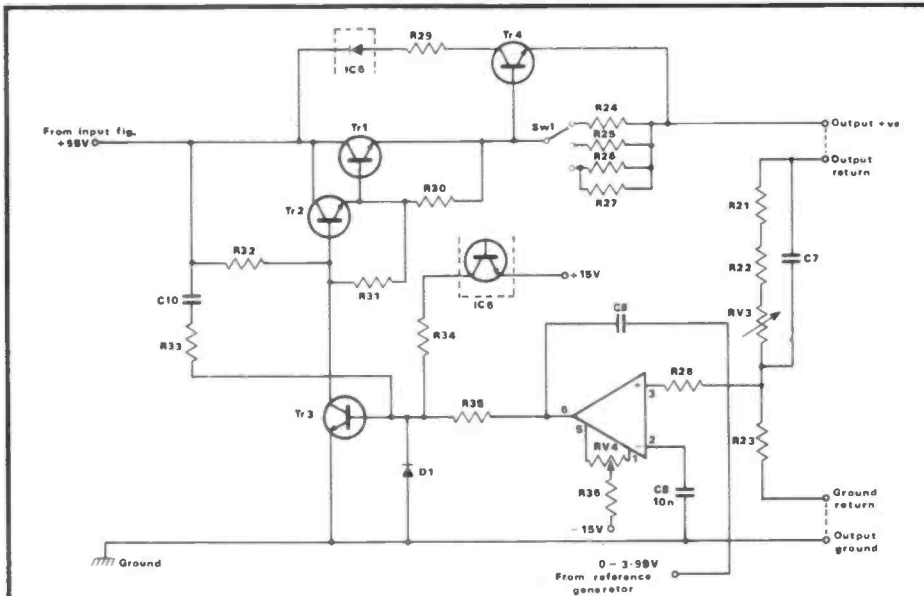


Fig 6 Control unit

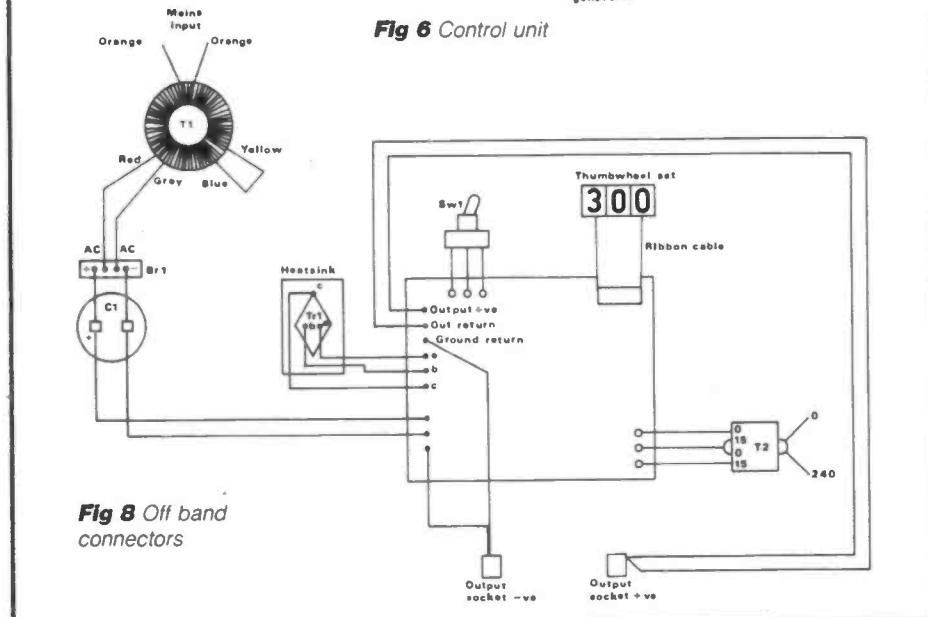


Fig 8 Off band connectors

Table 1

Pin	Connection
1	1 of tens thumbwheel
2	2 of tens thumbwheel
3	C of tens thumbwheel, the -5V supply
4	no connection, remove wire
5	no connection, remove wire
6	1 of units thumbwheel
7	2 of units thumbwheel
8	4 of units thumbwheel
9	8 of units thumbwheel
10	C of units thumbwheel, the -5V supply
11	no connection, remove wire
12	1 of tenths thumbwheel
13	2 of tenths thumbwheel
14	4 of tenths thumbwheel
15	8 of tenths thumbwheel
16	C of tenths thumbwheel, the -5V supply

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the point at which the output error is sensed is as close to the item being supplied as possible. In the case of this project, the actual output socket was chosen as the sensing point, although some constructors may choose to fit separate sense and supply sockets. In this case, extreme care must be taken in ensuring that when in use the sense connection is always made, and it may be advisable to add two 50 ohm resistors between both source and sense lines as a safety precaution. The resistive value of the normal connecting wires will swamp the effect of these 50 ohm resistors.

The only extra item is the current limit system, using the resistors R24 to R27, transistor Tr4, opto-coupler IC6 and the opto-diode current limit resistor R29. The switch S1 selects a value of resistor in the current sensing circuit so that at the current limit set the transistor Tr4 is turned on. The current that flows through Tr4 illuminates the diode in the opto-coupler and turns on the opto-transistor connected between the controlling transistor Tr3 and the +15V supply. When Tr3 turns fully on, the collector voltage will be reduced to about 0.2V, which is insufficient to turn on the output Darlington transistor, and the output voltage will fall to zero independent of the signal from the control op-amp, IC2.

Although it was originally intended to use CA3140 op-amps, the selection of a system with a separate power supply for the ICs means that any FET input op-amp could be used, but modifications to the zeroing circuits may need to be made since many other op-amps may not accept the 4K7 ohm resistor in addition to the 10kohm pot. Theoretically, the good old 741C could also be used for both op-amps, but in practice the higher input bias current for this and other bipolar input devices means that errors

in the output due to this input current would occur.

Construction

Figure 7 shows the layout of the components on the main PSU, whilst Figure 8 shows the connections off the board. The only components not on the PCB are the two transformers, the main reservoir capacitor C1, the main bridge Br1, the thumbwheel switch and the pass transistor Tr1 which is mounted on a 1.1°C/W heatsink. The thumbwheel switch is connected to the board through a ribbon cable and an IDC 16-way plug and socket.

Initially, solder into the PCB the two 8-pin DIL IC sockets and the IDC socket. The IDC socket has a notch cut into one

face and this should be orientated towards the resistor bank. Failure to do this will mean that the connections in the ribbon cable will not be valid, Table 1. The opto-coupler has only 6 pins and in the prototype another 8-pin DIL socket was used, but with pins 1 and 8 removed before soldering the socket to the board.

Before proceeding any further it is essential that the constructor check that each connection on the IDC socket is separate from its neighbour. With only 0.1 inch between the pins and with tracks passing between the gaps it is very easy to form a solder bridge that will give the most peculiar effects with the DAC. The Author, so far, has yet to solder an IDC socket down without forming at least 1 bridge, but luckily the bridges are easy to

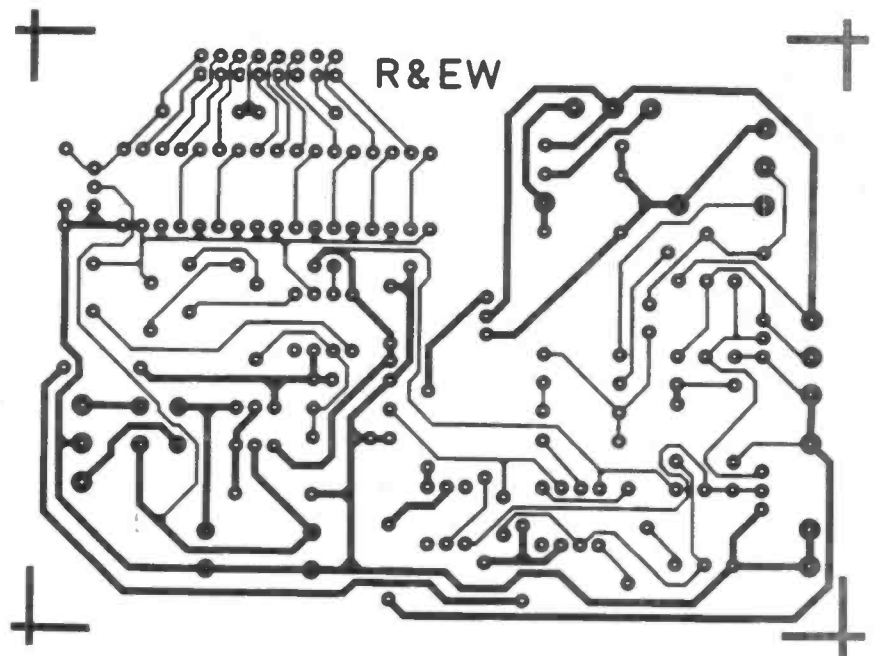
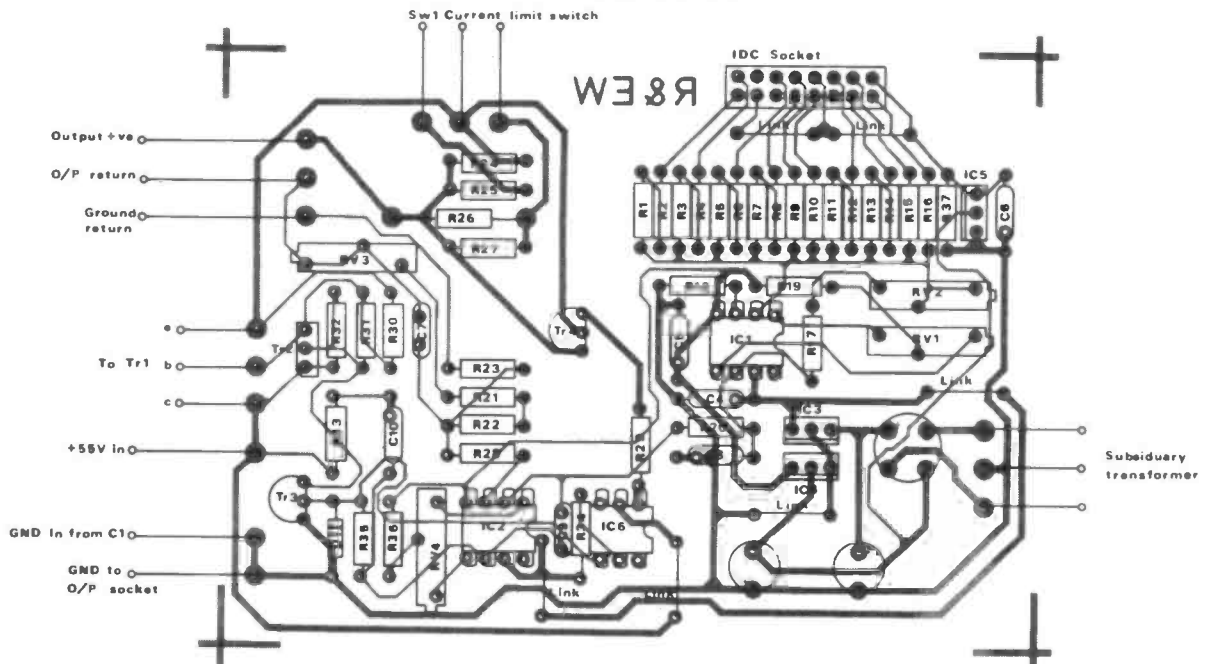


Fig 7 Component overlay



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remove using a small modelling knife.

Incidentally, a very small soldering iron is needed – anything with a tip diameter over 1mm is asking for trouble. The Author suggests an iron with a 0.4mm tip to make the connections easier. A fine solder is also needed and 22 gauge seems suitable. *Table 1* gives the cable numbering for the ribbon cable. The IDC plug can only fit one way round in the socket and the ribbon cable is pressed home into the back of the plug with the red polarity lead on the left-hand side, ie closest to R1.

Check carefully to see if the IDC plug is supplied with an extra supporting clip, as the ribbon cable will be bent back on

itself with the extra support and may end up coming out over the PCB rather than away from the board. The rough end of the cable can be cut back level with the edge of the plug using the modelling knife. Using *Table 1*, the wires can be soldered to the three thumbwheel switches and the setting for the maximum and minimum positions for the tens unit can be set by the insertion of stops in the small holes on the side marked E and J.

The rest of the components can be fitted to the PCB using *Figure 7* as the guide. There are no special problems in soldering any of these components as there is plenty of space around all the

terminals. Layout of the supply in the case is again up to the constructor, remembering that the case must be sufficiently large to allow the heatsink to be mounted with its fins in a vertical direction. There are a number of wire links on the board, and these simply save the expense of a double-sided PCB. The tolerances of the 0.1% resistors can be affected permanently by overheating during soldering, and so a heat shunt may be advisable just as in soldering semiconductors.

The main reservoir capacitor with its mounting bracket can be screwed to the case at a later stage and the main bridge Br1 is soldered to the capacitor using its wires to hold it in place. Two wires to take the 55V to the PCB should also be added. The power transformer has two windings with 18V ac outputs and the blue and yellow wires are joined to form a single winding of 36V ac. The remaining transformer output wires (the red and grey) are soldered to the ac input to Br1. The heatsink with Tr1 attached, when in the vertical position, ensures the full heat dissipation capability of the heatsink of 1.1°C/W. With this heatsink power rating, the power supply is capable of withstanding the full current limit of 1.5A on a continuous basis, although the sink will become very hot, reaching about 100°C. If the constructor will accept a reduced continuous current from the supply and a reduced time for the 1.5A current limit, then the heatsink may be made smaller, which will ease the problem of positioning it on the case.

The problem is that if an overload such as a short circuit current limit of 1.5A occurs and is allowed to continue, then the heatsink will be unable to dissipate the continuous power of 75 watts (actually 55V by 1.5A) without allowing the pass transistor junction temperature to exceed its maximum of 200°C and the pass transistor will fail. The PSU will be OK until this junction temperature is reached, and the thermal mass of the sink will keep the transistor in a safe condition for a short time. However, if the constructor chooses the smaller heatsink option then he/she can use an overtemperature cut-out (RS part no 331-528) on the heatsink to cut off the supply when the heatsink temperature reaches 90°C.

Setting up and testing

Before describing the set-up procedure it is possibly a good idea to look at the errors that occur due to the tolerances in modern multimeters. If we ignore the effect that an analogue meter's current drain can have on a circuit, then in addition each of the ranges has a tolerance, indicating the maximum error between the true and indicated readings. For an analogue meter this may amount to 5%, whilst for low cost digital meters 0.5 to 1% is more common. The problem is that in setting up the power supply unit we must

Parts List

Resistors (all 0.25 watt tolerance 1% unless stated)

Available from Verospeed, Stansted Wood, Eastleigh, Hants SO5 4ZY

R1	680R 0.1%
R2	120R 0.1%
R3	220R 0.1%
R4	180R 0.1%
R5	6K8
R6	1K2
R7, 8, 9, 35	2K0
R10, 23, 29, 37	1K0
R11	68K
R12, 32	12K
R13, 14, 15	20K
R16, 20, 28, 34	10K
R17, 18	150R
R19, 36	4K7
R21	470R
R22	8K2
R24	43R
R25	4R7
R26	R47 3 watt 5%
R27	6R8
R30	75R
R31	2K7
R33	220K
Vr1, 4	10K 20 turn pot
Vr2	20R 20 turn pot
Vr3	500R 20 turn pot

Capacitors

C1	4700µF 63V electrolytic radial
C2, 3	470µF 63V electrolytic radial
C4, 5, 6, 10	0.1µF ceramic
C7	56pF ceramic
C8	0.01µF ceramic
C9	470pF ceramic

Semiconductors

IC1, 2	CA3140E
IC3	7815 regulator, 78L15 may also be used
IC4	7915 regulator, 79L15 may also be used
IC5	7805 regulator, 78L05 may also be used
Tr1	2N3055
Tr2	MPSU06
Tr3, 4	MPSA06
Br1	Any 200V 2A bridge rectifier, such as BR82D
Br2	W004 200V 1A bridge rectifier
D1	1N4148 or similar diode

Miscellaneous

Heatsink – Redpoint 6W-1
 IDC socket and plug, 16-way
 30cm of 16-way ribbon cable – may have to be made from 20-way ribbon
 3 thumbwheel switches, BCD encoded, end cheeks and stop set (Maplin)
 Transformer 0-15 + 0-15V, 3W each winding
 Transformer 0-18 + 0-18V 80W torroid (Maplin YK17T)
 Case to constructor's requirements, noting heatsink positioning
 Miniature single pole centre off switch

remember these errors exist between the ranges.

Having built the unit, ensure before initial switch on that the two ICs and the opto-coupler are removed from their sockets. Find one of the ground rails (the centre tap of the transformer T2 is the most suitable) for the negative terminal of the DVM for the voltage tests. The author used a low cost 0.7% tolerance digital voltmeter for his tests as, like most constructors, he cannot condone the expenditure of over £200 on a DVM with a maximum 0.1% tolerance.

The problem is that when switching between ranges with the same input voltage the reading may alter by more than the factor of 10 expected. The author's meter shows that if the output of the DAC is made 1.00V on the 2 volt range of the DVM, then on the 20 volt range the reading is 1.01V - your own DVM may behave differently. This apparent error is inside the guaranteed accuracy of the meter, being less than twice the quoted error of 0.7%.

Check that the voltage across C1 is about 55V; in fact, anywhere below 80V the breakdown voltage of the transistors will be safe for the supply. Also ensure that the voltage across C2 and C3 is about 27V, remembering that, with

respect to ground, the voltage across C3 will be negative. Next check the voltages at the outputs of the three terminal regulators. The + and -15V are on pins 4 and 7 of the two IC sockets and the -5V is on the link wires across the space between the resistor bank R1 to R16 and the IDC socket. The 15V supply voltages should be between 14.4 and 15.6 volts if the regulators are in spec, and the -5V should be between 4.8 and 5.2V. If all is satisfactory at this stage, insert IC1 only and if not connected plug in the IDC connector along with the thumbwheel switches.

The testing of the digital to analogue converter consists of setting the zero Vr1 and scale Vr2 potentiometers. The op-amp end of R31 is a convenient connecting point for this test. Firstly, set the thumbwheel switches to zero and turn Vr1 until the output of IC1 becomes zero with the DVM set on its most sensitive range normally 200mV full scale. Set the thumbwheel switches to 100 and the DVM to the 2V range. The thumbwheel setting of 100 represents a 10.0V final output, but this gives 1.00V at the output of the DAC. If 1.00V is not obtained then vary Vr2 until the meter shows the required value.

The full DAC can now be tested as the

reading on the thumbwheel switches will be reflected in the readout on the DVM, but don't forget the tolerance problem at voltages above 2V DAC output when the DVM range will need to be changed. Any problems that occur at this stage are most likely to be caused by solder bridges in the IDC socket and can be isolated by looking at the -5V supplied to the end of the resistor bank, R1 to R10. This test will give an idea of the errors in the output that are likely to occur due to the tolerance of the resistors in the DAC.

When the DAC is working correctly, turn off the mains input and allow the voltages on the capacitors to fall to zero or the ICs may be damaged on plugging into the sockets. Insert the remaining ICs and switch on again, then set the thumbwheel switches to 002. As the supply cannot work to zero with any degree of adjustment left, the value 002 gives some play in the system. With the DVM probes across the output, the voltage measured should be 0.2V and if not then Vr4 can be adjusted to give this value. Now switch the thumbwheels to 100 and set the output to 10.0V using Vr3 (Vr2 if Vr3 has been replaced by the fixed resistor). The only test left is to try the main output at other thumbwheel settings to verify that all is correct. REW

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LIGHTHOUSES OF THE AIR

In describing the airways system in my article on air traffic control and communications, which appeared in the July issue, I mentioned that the route of an airway is delineated by VHF omni-range/distance measuring equipment (VOR/DME) and/or non-directional beacons (NDB).

The latter is by far the oldest and simplest aid in use today, for although it has serious operational disadvantages in crowded airspace, its simplicity, low cost and ease of maintenance have ensured continuing use, whilst in many less developed countries it is the only aid available.

The equipment is a simple transmitter operating on the 250-450kHz waveband. The carrier is modulated by a continuous tone, which is interrupted from time to time to key the beacon callsign in international Morse code.

The NDB is used in conjunction with the aircraft automatic direction finding equipment, sometimes called the radio compass. To home onto the NDB, the aircrew simply steer the aircraft so that the beacon is ahead and in due course the facility will be overflown.

Unfortunately, however, when crosswinds are present, the aircraft will be deflected from its track to the leeward and, although it will still eventually overfly the beacon, its track whilst using the aid will be anything but a straight line. This is of little consequence in regions of low traffic density, but in crowded skies, such as over Western Europe, the deviation from the desired track could cause a traffic conflict or worse. However, for short range use, such as an airport identification beacon,

Aviation Electronics Part Two

NDBs are still very useful and economical.

The waveband in which NDBs operate is extremely crowded, and often geographically separated beacons share the same frequency. It is therefore essential that the minimum power necessary is used and that this level is carefully maintained at all times.

Within the United Kingdom the signal strength of each NDB is checked daily by the Civil Aviation Authority from their measuring station near Rugby, and any deviation from the specified level is quickly followed by a request for corrective action. Such is the congestion on the beacon band that airports wishing to extend their facilities have been known to wait years for an NDB frequency to become available.

The third major problem with NDB is that as it operates on the LF band it suffers heavily from static interference. This is even more evident in tropical regions, where I have heard experienced pilots say that in these areas the radio compass needle invariably points at the nearest electrical storm! To overcome this difficulty to some degree, beacons in tropical countries frequently run high power, 1kW being common, compared with 10-200 watts being more usual in temperate climates.

To overcome these problems, the VHF omni-range beacon (VOR) was developed. In this, the course informa-

tion is provided by the beacon, so that regardless of wind speed and direction the approach path will always be a straight line. Furthermore, by using VHF, static problems are eliminated and the inherently short range of VHF transmissions ensures that frequency sharing problems are minimised.

VOR operation

VOR operates in the 112.0-117.9MHz waveband with an output power of 200 watts using horizontal polarisation. The transmitter radiates three, sometimes four modulations, two of which provide navigational guidance, the third identifies the beacon in international Morse code and a fourth is sometimes provided to give operational information regarding the airport with which the beacon is associated.

The navigational information comprises two 30Hz modulations whose phase difference corresponds to the magnetic bearing of the receiver from the VOR beacon. Obviously these modulations (or phases as they are called) cannot be directly impinged on one another, for they would then be indistinguishable. Other methods are necessary and that chosen is for one to be a direct 30Hz amplitude modulation of the carrier (variable phase), whilst the

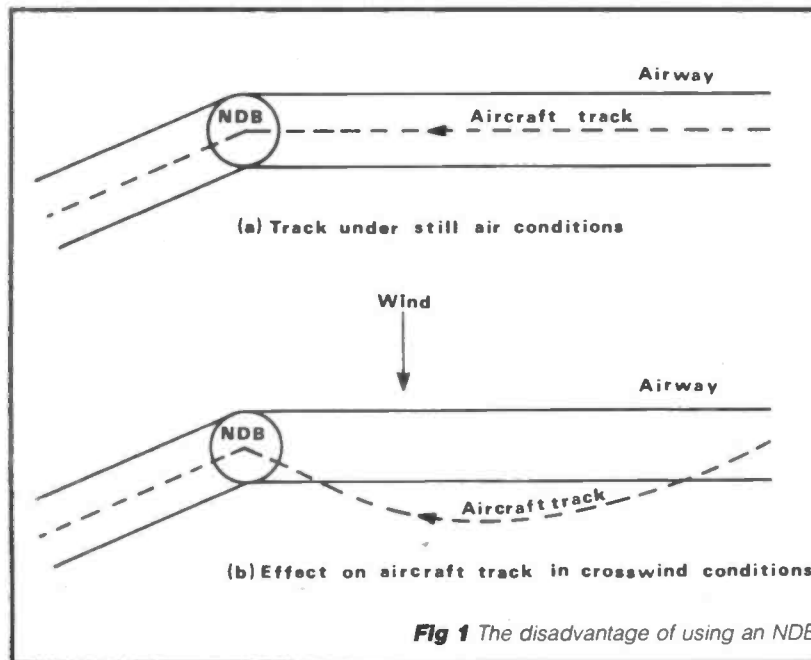
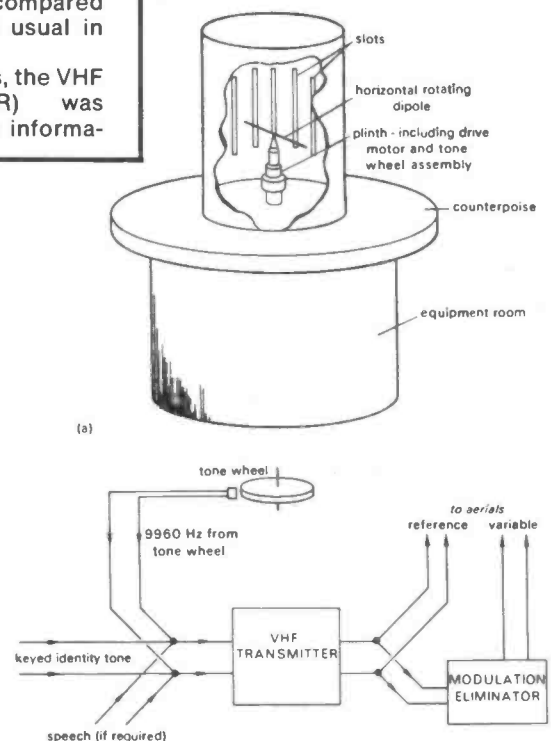


Fig 2 Conventional VOR. (a) Building layout; (b) Schematic



BY BRIAN KENDAL G3GDU

second is a 30Hz frequency modulation on a 9960Hz amplitude modulated sub-carrier. The total modulation depth contributed by the two phase modulations amounts to less than 100%, thus leaving adequate modulation depth available for identification signals, etc.

There are two means of generating this modulation pattern. These are known as the Conventional (CVOR) and Doppler (DVOR) systems. Each has advantages, the former being cheaper and more convenient to install whilst the latter is more accurate and is less susceptible to siting difficulties.

CVOR

Although the most modern equipment uses all-electronic methods of generating the aerial radiation pattern, to describe this would take far more space than is available in this article. I will therefore describe one of the earlier systems which, nevertheless, still remains in service in many countries of the world.

The heart of almost every radio navigational system is the aerial system and in the case of CVOR the horizontal polar diagram radiated is a limaçon, a somewhat heart-shaped pattern which, if rotated, causes the signal strength at a remote receiver to vary sinusoidally at a frequency equal to the rate of aerial rotation.

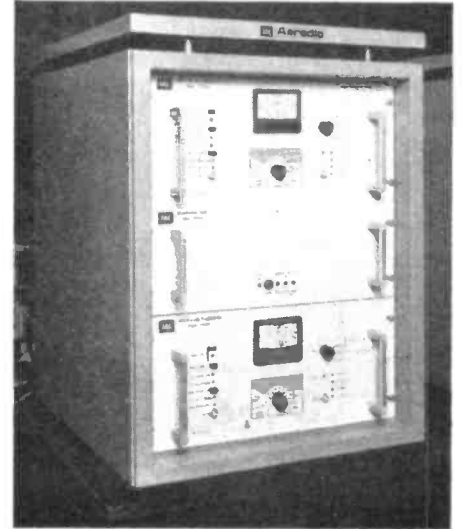
This pattern is achieved by radiating an unmodulated signal from a horizontal dipole which is fitted to a shaft and rotated at 1,800 rpm (ie, 30Hz). In space this combines with the omnidirectional

radiation of the reference phase signal to produce the required rotating limaçon radiation pattern.

The reference phase modulation must be locked to the variable, and this is achieved by fitting a metal tone wheel to the shaft supporting the variable phase aerial. The tone wheel has 332 teeth around its periphery. Mounted closely to these teeth is an electromagnetic pick-up which will give an electrical output each time a tooth passes by its head. If the wheel is rotated at 1,800 rpm, the output will be 9960Hz, ie, the reference sub-carrier frequency. The teeth, however, are arranged in a somewhat staggered manner and the irregularity imparts a cyclic variation of between 9480Hz and 10440Hz on the output frequency, this being dependent on the instantaneous position of the toothed wheel.

The output from the pick-up is then coupled to the input of the amplitude modulation circuits and the RF from the transmitter is radiated omnidirectionally.

A simple variation from this technique is that the metal tone wheel is replaced by a transparent disc on which bands are printed to correspond with the metal teeth they replace. The 9960Hz signal is then picked off with an optical pick-up



This IAL equipment is typical of the modern generation of fully solid-state, non-directional beacon transmitters. The output power is up to 100 watts, which is continually monitored with changeover to standby equipment automatically initialised should the output power vary from the preset level (photo: IAL)

before being fed to the modulator.

To ensure that the correct RF phase relationship between reference and variable phase signals is maintained, the

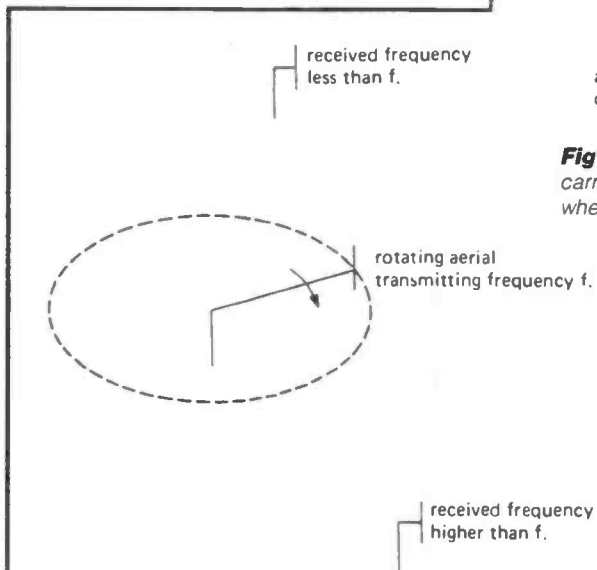


Fig 3 Effect of rotating the transmitting aerial in a circle. Frequency f will only be received at either receiving site when the transmitting aerial is either at point of nearest approach to, or farthest from, the receiving site

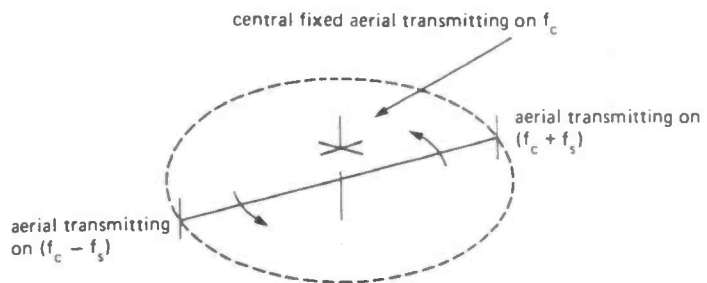


Fig 4 Principle of double sideband Doppler VOR. The central aerial radiates the carrier frequency, f_c , one of the rotating aeri­als radiates $f_c + f_s$ and the other $f_c - f_s$, where f_s is the frequency of the sub-carrier

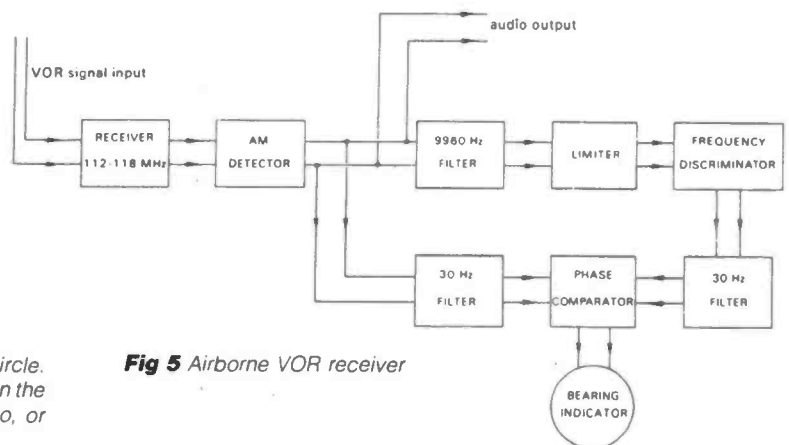


Fig 5 Airborne VOR receiver

LIGHTHOUSES OF THE AIR

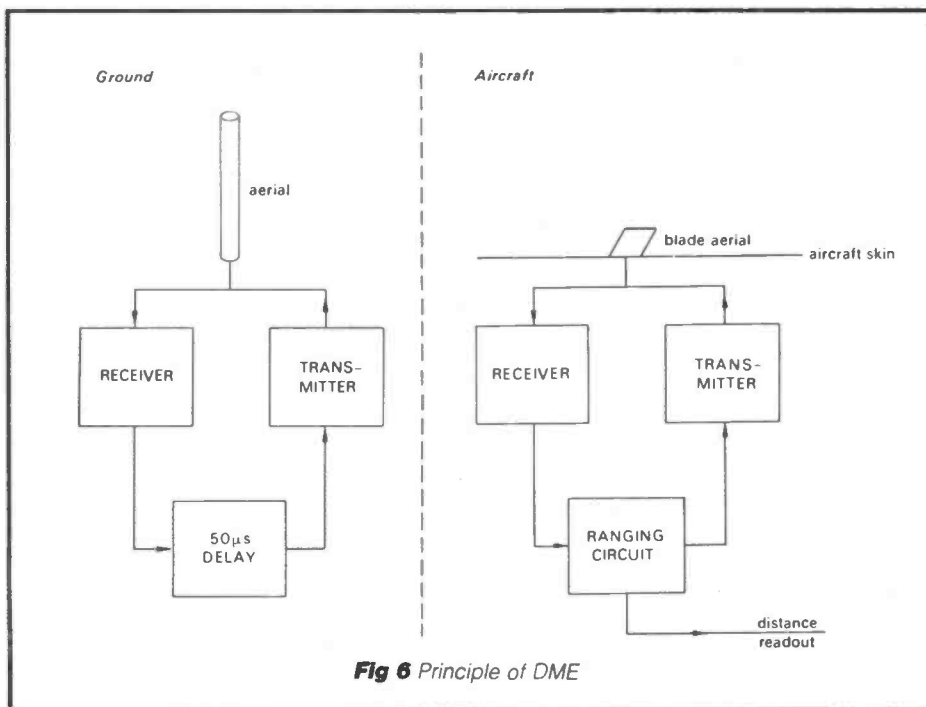


Fig 6 Principle of DME

unmodulated variable phase is derived from the reference phase signal by feeding a proportion of the transmitter output through a limiting stage (often a Class 'C' amplifier) to strip the modulation before feeding to the rotating dipole.

Allowance is also made in the modulator design to receive a keyed audio tone (for identification) or speech, which may typically take the form of air traffic control information such as aerodrome unserviceabilities, altimeter pressure settings, etc.

DVOR

Although the radiation pattern of a Doppler VOR is identical to that of Conventional VOR the means of

generating it are quite different.

In the DVOR, the well-known Doppler principle, in which the frequency of an approaching source of radiation is increased and, conversely, that of a receding source is decreased, is used to generate the frequency modulation of the reference phase signal. The variable phase signal is radiated from a central, omnidirectional aerial as carrier, amplitude modulated at 30Hz.

To understand the generation of reference phase frequency modulation, first consider the effect of fitting an aerial to one end of a horizontal shaft which is pivoted at the other. If the shaft is rotated rapidly around the pivot and then to a receiver located at a distant point, as the aerial approaches, the

frequency will increase, and as it recedes it will decrease. Due to the circular motion of the aerial, the received frequency variation will be sinusoidal with the deviation being proportioned to the diameter of the circle being described by the aerial.

It can be proved mathematically that if the length of the shaft is 22ft, and the rotational speed is 1,000 rpm, then the frequency variation due to the Doppler effect will be $\pm 480\text{Hz}$, ie that specified for VOR.

If, therefore, the rotating aerial is energised from a transmitter whose frequency is 9960Hz displaced from that radiating the 'variable phase' signal, then a standard VOR radiation pattern will be produced.

Obviously, rotating a 22ft arm at 30 revolutions per second is mechanically impracticable. However, the same effect may be achieved electronically by installing a ring of aeriels of the appropriate diameter and switching the signal from one aerial to the next by means of solid-state switching circuits.

However, as the reference and variable phase signals have effectively exchanged places - ie instead of the reference phase being fixed and the variable phase rotating, the variable phase now is fixed and the reference phase is rotating - in order to maintain the correct relationships the rotation of the reference phase pattern must be in the opposite direction to that used in CVOR.

The similarity to CVOR may be improved by adding a second transmission displaced 9960Hz on the opposite side of the variable phase signal and feeding this to the diametrically opposite aerial of the array.

The airborne receiver

The airborne receiver consists of a standard multichannel equipment in which the signal is split three ways after signal detection.

The first is connected to the aircraft intercommunications system to enable the aircrew to identify the facility being received and the second and third are filtered to separate the variable and reference phase signals. The latter is then applied to a discriminator to recover the 30Hz modulation.

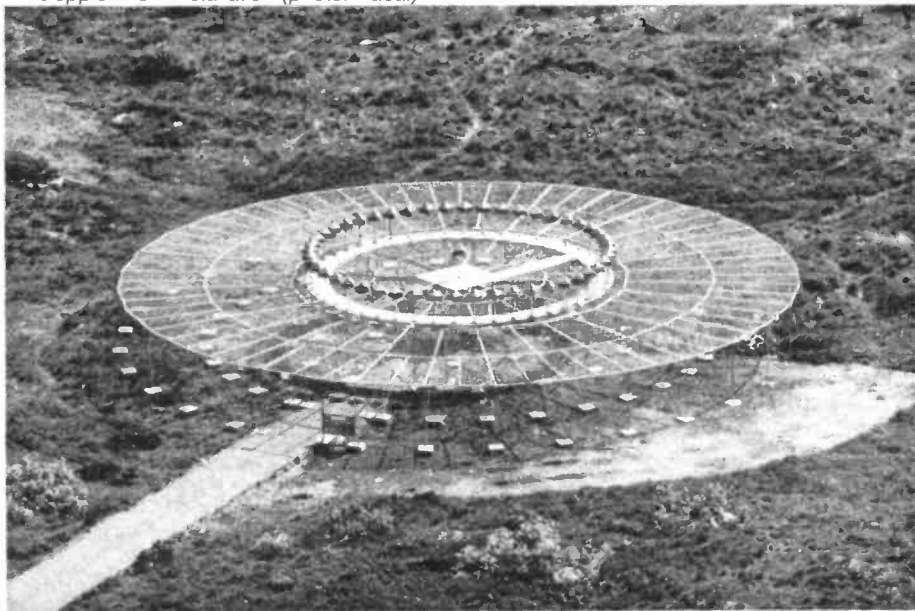
The phase difference of the two 30Hz modulations is measured, the result being applied to either the flight director or an electro-mechanical indicator, as appropriate.

Distance measuring equipment

Although the navigational information radiated by a VOR beacon enables the pilot to determine his bearing from that facility with a high degree of accuracy, he is still ignorant of his actual position for he does not know his distance from the beacon. This information is provided by distance measuring equipment.

DME operates between 960 and

A Doppler VOR installation (photo: Racal)



1215MHz, with the aircraft interrogating the ground beacon on one of the 126 channels between 1025 and 1150MHz and the beacon replying 63MHz either above or below that of interrogation. When working in conjunction with VOR, by international agreement, the frequencies are paired in a predetermined manner. Likewise, DME may be paired with instrumental landing systems to give distance-to-run on the final approach path.

The principle of DME is that the aircraft interrogates the beacon by radiating a pair of pulses, each 3.5 microseconds wide, spaced by either 12 or 36 microseconds at a repetition rate of about 150Hz. On receiving a valid interrogation, the transponder delays by 50 microseconds and then replies with a pulse-pair spaced 12 or 30 microseconds. The airborne equipment receives this reply, measuring the elapsed time between the initiation of interrogation and receipt of reply, deducts 50 microseconds and displays the remainder as a distance presentation in nautical miles.

With such a relatively simple system it would appear that two main problems would arise if more than one aircraft was interrogating the beacon at the same time:

1. How does the aircraft identify its own reply?
2. What happens when too many aircraft interrogate the beacon?

The first of these is achieved in a quite simple manner, for the interrogator circuitry is arranged to make the pulse repetition frequency somewhat unstable and the receiving equipment is designed so that it will only respond to replies with exactly the transmitted PRF.

The second problem is tackled in two ways. The beacon is only capable of transmitting 3,000 pulse-pairs per second. If the interrogations do not reach this figure, random pairs are radiated to maintain a constant duty-cycle for the transmitter.

The initial aircraft interrogation is at about 150 pulse-pairs per minute (known as search mode). However, once communication is established, the airborne equipment automatically reduces the interrogation rate to about 25 pulse-pairs per second (tracking mode), thus enabling more aircraft access to the beacon.

Should the number of interrogations of the beacon approach 3,000 pulse-pairs per minute, then the sensitivity of the beacon receiver will be automatically reduced, thus removing service from the most distant aircraft. An extreme case of this would occur if the beacon were to fail for a brief period whilst being interrogated by 100 aircraft.

Under such circumstances all the aircraft would revert to search mode and on restoration to service the beacon would be faced with 15,000 pulse-pair interrogations per second.

The beacon receiver gain would then automatically reduce until only 3,000

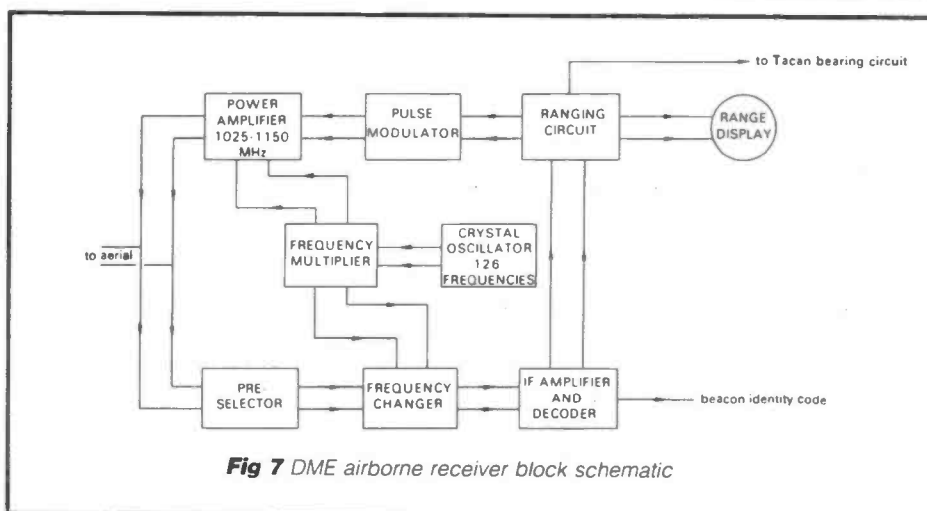


Fig 7 DME airborne receiver block schematic

interrogations were being received, ie, the nearest 20 aircraft. As each of these aircraft regained communication with the beacon and reverted to track mode, so the number of interrogations would reduce, thus allowing the beacon receiver to increase in sensitivity and accept more distant aircraft. Gradually, after a few minutes, all aircraft would have reverted to track mode and the total would be less than 3,000 interrogations per second.

An interesting alternative to DME is a system which was developed in Australia from wartime Rebecca/Eureka beacons and operates on approximately 200MHz. This, however, has only ever been used in Australia and the South Pacific area and is now coming to the end of its operational life.

The combined VOR/DME system provides a course accuracy in the order of two degrees and a range accuracy of 0.1 mile up to 200 miles range.

First Airbus B4 for Korean Airlines

Over the thirty-odd years during which VOR/DME has been the standard aeronautical short range radio aid throughout the world, it has proved to be accurate, reliable and popular with the aircrew which it serves.

As such there are, at present, no plans for its replacement in the foreseeable future.

When in the fullness of time replacement eventually becomes necessary, it is possible that this will be by a space-based system such as a development of Navstar which will be described in an article later in this series.

In my next article I shall be dealing with the approach and landing systems: instrument landing systems (ILS) and microwave landing systems (MLS), which allow suitably equipped aircraft to make a safe landing in visibility conditions in which most of us would think twice before venturing forth on a pedal cycle.

REW



Ray Marston presents a final selection of LM10 application circuits

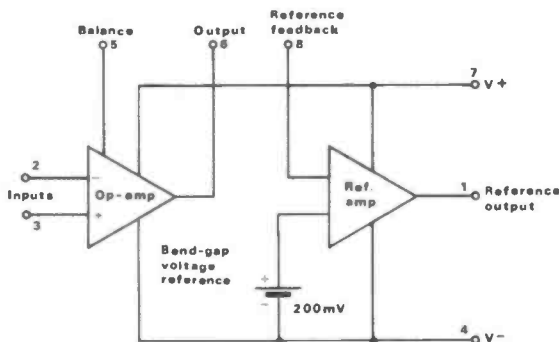


Fig 1 Functional diagram of the LM10

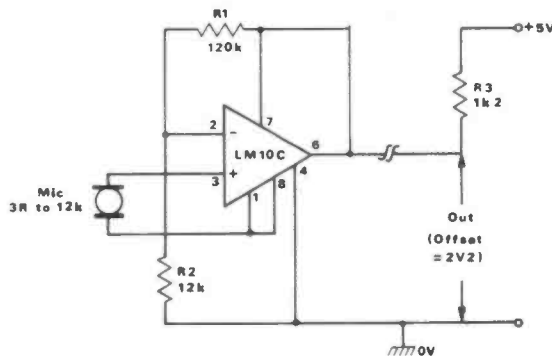


Fig 2 Remote 20dB voltage amplifier for use with inductive or magnetic input device

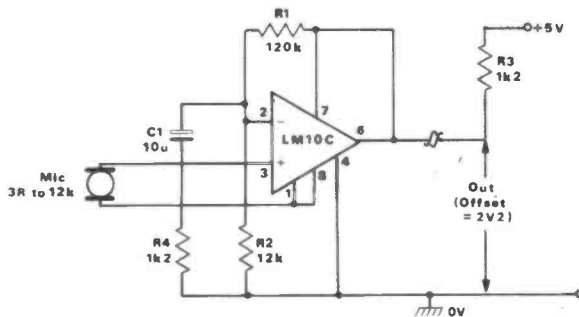


Fig 3 Remote 40dB voltage amplifier for use with inductive or magnetic input device

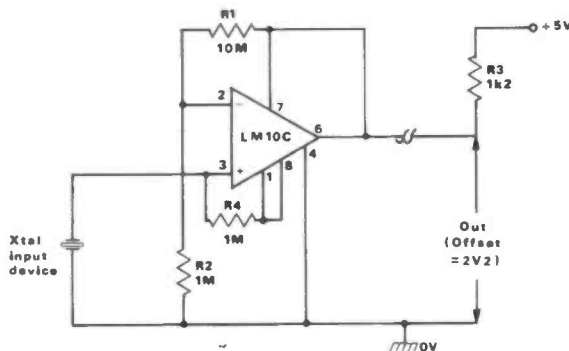


Fig 4 Remote 20dB voltage amplifier for use with a high impedance (crystal) input device

In the last three editions of *Data File* we have looked at the basic details and practical applications of the LM10, a unique bipolar linear IC that is produced by the National Semiconductor Corporation. It houses a high performance op-amp plus a precision 200mV band-gap voltage reference and a 2-input buffer amplifier in a single 8-pin TO5 package. To help refresh the reader's memory, *Figure 1* shows the functional diagram and pin notations of the LM10.

In this month's edition of 'The File', we conclude the LM10 applications theme by looking at a variety of practical remote amplifier, 2-wire transmitter and moving coil meter amplifier circuits.

Remote amplifier circuit

One of the most interesting aspects of the LM10 is its suitability for use as a shunt-connected, 2-wire, remote amplifier unit. The op-amp section of the IC has an output current drive capacity that is a couple of orders of magnitude greater than the device's quiescent current value, and this factor, combined with the op-amp's 96dB supply-voltage rejection figure and a wide operating voltage range, enables the op-amp to be used as a linear amplifier even when its output terminal is shorted directly to one of the device's supply terminals. In this case the supply leads can be used to carry both supply and output signal currents. *Figures 2 to 4* show some practical examples of circuits of this type.

In the *Figure 2 to 4* circuits the pin 6 output and pin 7 supply terminals are shorted together, enabling supply and signal currents to flow along the same wire via R3. Thus, the circuit to the left of R3 can be regarded as a signal amplifying 'transmitter' that is connected to the R3 'receiver' via only two wires (or via a single wire if a common earth return is used). This 2 wire type of circuit thus offers a very simple and inexpensive way of remote monitoring a microphone or vibration sensor, etc.

Note in the above circuits that pins 1 and 8 are shorted together so that a 200mV reference voltage is developed on pin 1, and this voltage is thence applied to the pin 3 non-inverting input terminal of the IC.

Each circuit is given a dc voltage gain of $\times 11$ via the R1 and R2 values and thus generates a quiescent output voltage of 2.2 volts, but this voltage can be modulated by the op-amp's output signal voltages.

The *Figure 2 and 3* circuits are suitable for use with low to medium impedance input transducers such as moving coil or magnetic microphones, etc, and the *Figure 4* circuit is suitable for use with high impedance devices such as crystal or ceramic microphones, etc. The *Figure 2 and 4* designs each give an ac signal

voltage gain of about 20dB, and the *Figure 3* design gives a gain of 40dB.

Figure 5 shows a simple circuit modification that enables the basic design to be used with any resistive transducers wired into the Rx position. Here, the op-amp signal gain is set at $\times 7.6$ via R1 and R2, but the pin 3 input voltage is variable from 200mV upwards via Rx, thus giving the output voltages shown in the diagram.

Fault Indicators

The shunt-connected 2 wire amplifier technique can easily be modified to form the basis of a variety of 2 level 'fault' indicator transmitters with either resistor, LED or transistor outputs at their 'receiver' ends, as shown in *Figures 6 to 9*.

In each of these circuits the LM10 is wired as a precision voltage comparator with a fixed reference voltage applied to one input terminal and a variable input applied to the other, with its output grounded via R3 and its supply current passing through R4. The basic circuit action is such that when the op-amp output (pin 6) is low (giving zero drive into R3), only 200mV is lost across R4, but when the output is high (giving a high drive current into R3), about 3.5 volts are lost though R4.

In practice, the circuit output can either be taken directly from the pin 7 supply terminal of the IC, or via an LED or a transistor that is wired across R4, as shown dotted in the diagram. In the former case, the LED ON current is determined by the R3 value; in the latter the final output can be taken from across Tr1 collector load resistor R5 and switches between an OFF value of zero volts and an ON value of 4.8 volts.

In each of the *Figure 6 to 9* circuits pins 1 and 8 are shorted together to generate a 200mV reference voltage that is applied to one of the input pins of the op-amp. In *Figure 6* an external test voltage is fed to the pin 3 non-inverting input terminal of the op-amp via potential divider R1-R2, and the circuit action is such that pin 7 output switches low (to 1.5 volts) when the pin 3 voltage exceeds 200mV; this

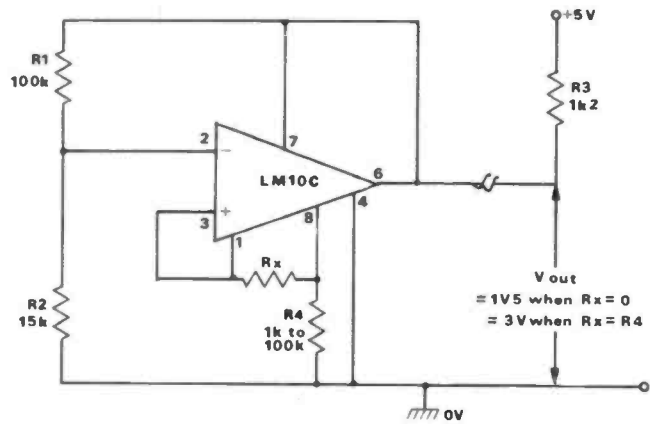


Fig 5 A 2-wire transmitter for use with a variable resistance sensor

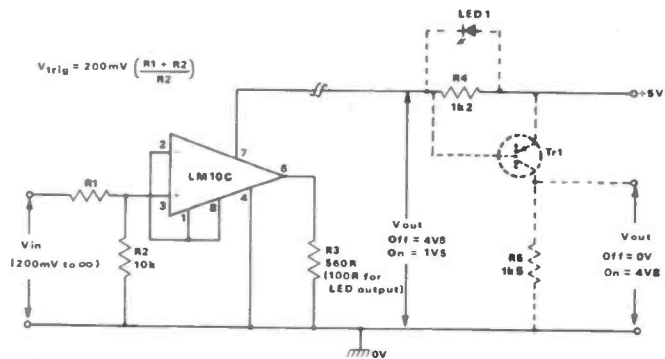


Fig 6 2-wire precision over-voltage transmitter with resistor, LED or transistor output

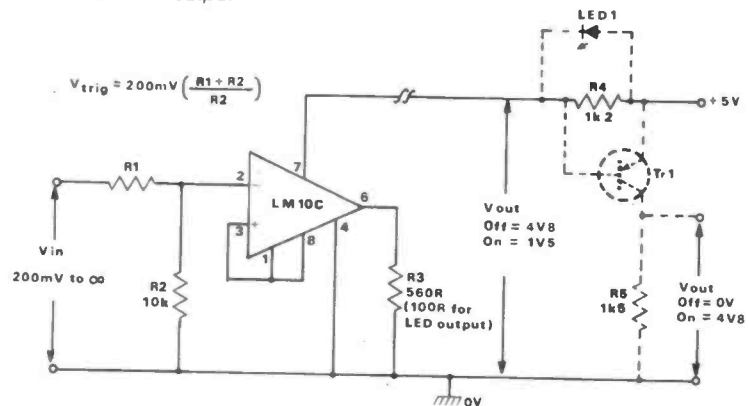


Fig 7 2-wire precision under-voltage transmitter with resistor, LED or transistor output

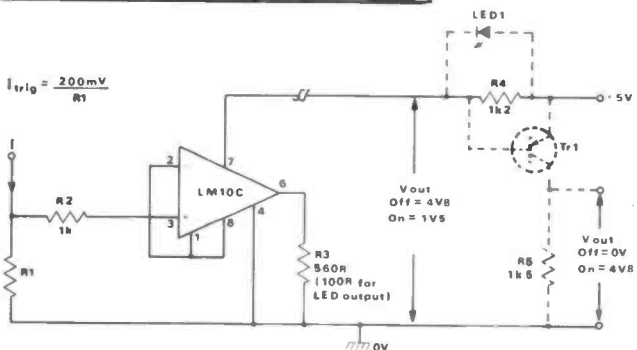


Fig 8 2-wire precision over-current transmitter with resistor, LED or transistor output

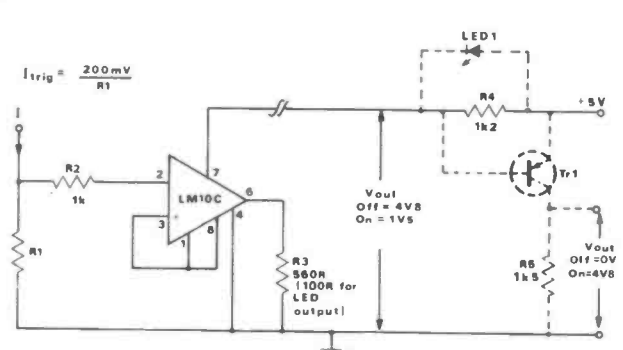


Fig 9 2-wire precision under-current transmitter with resistor, LED or transistor output

DATA FILE

circuit thus acts as an over-voltage detector. The *Figure 7* circuit gives the reverse of this action, with its pin 7 output going low when the pin 3 input voltage falls below 200mV, and thus acts as an under-voltage detector.

The *Figure 8* circuit is similar to that of *Figure 6* except that the pin 3 input voltage is taken from across R1 and is directly proportional to the R1 input Pcurrent; this circuit thus acts as an over-current detector. The *Figure 9* circuit is similar, but has its input terminals reversed and thus acts as an under-current detector.

Finally, *Figure 10* shows how this type of circuit can be modified to act as a light or temperature sensitive detector by using a cadmium-sulphide photocell or a negative temperature coefficient thermistor in the R1 position. In this case R1-RV1-R2 and R3 are wired in the form of a Wheatstone bridge that has its outputs fed to the pin 2 and pin 3 inputs of the op-amp, and the bridge is powered from a 400mV supply that is set up via R4 and R5.

In *Figure 10*, the LDR or thermistor should have a resistance in the range 500 ohms to 9K Ω at the desired trigger level. If the LDR or thermistor is wired in the position shown in the diagram, the circuit will act as either a 'dark' or 'under-temperature' detector, its output switching on when either the light level or the temperature falls below a value preset via RV1. Alternatively, the circuit can be made to act as either a 'light' or 'over-temperature' detector (in which the output switches on when the light or temperature level rises above a preset value) by simply transposing the positions of R1 and RV1.

Fault alarms

The *Figure 6* to *10* fault-detecting circuits give a simple ON or OFF form of output and can thus fairly be described as simple 'fault indicator' circuits. By contrast, *Figures 11* to *14* show a selection of fault detectors that give either a flashing LED or a 400Hz audible

monotone alarm signal output and can thus be fairly described as 'fault alarm' circuits. These alarms are, in fact, very similar to the four gated fault indicator circuits described in *Figures 12* to *15* of last month's edition of *Data File*, except that they are connected in the 2 wire 'shunt' mode and can thus give remote indication of the fault condition.

In each of the *Figure 11* to *14* circuits the op-amp section of the LM10 is wired as an astable multivibrator or square

wave generator that is gated (via D1) via the output of the internal reference amplifier, which is wired as a voltage comparator with one input taken from the 200mV band-gap reference and the other taken from an external source via pin 8. The *Figure 11* and *12* circuits are wired as under-voltage and over-voltage alarms respectively, and *Figures 13* and *14* are wired as under-current and over-current alarms respectively.

Note in the *Figure 11* to *14* circuits that

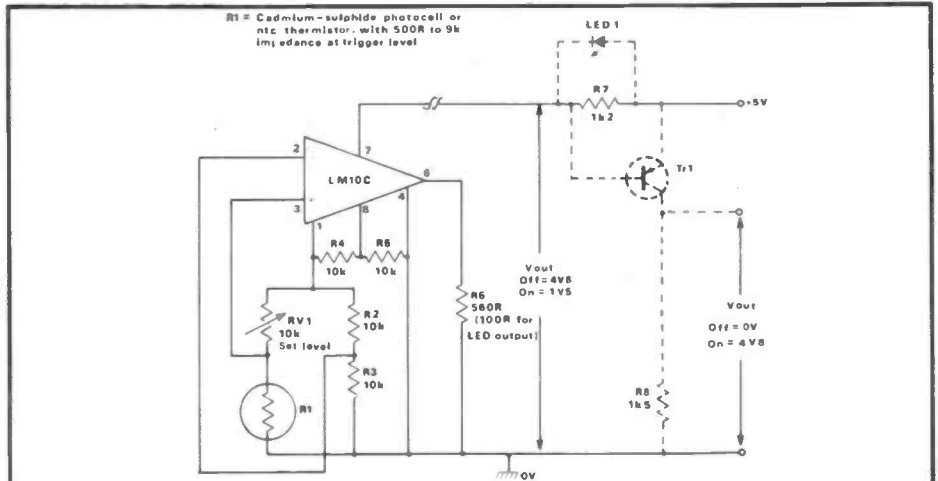


Fig 10 2-wire precision 'dark' or 'under-temperature' transmitter with resistor, LED or transistor output

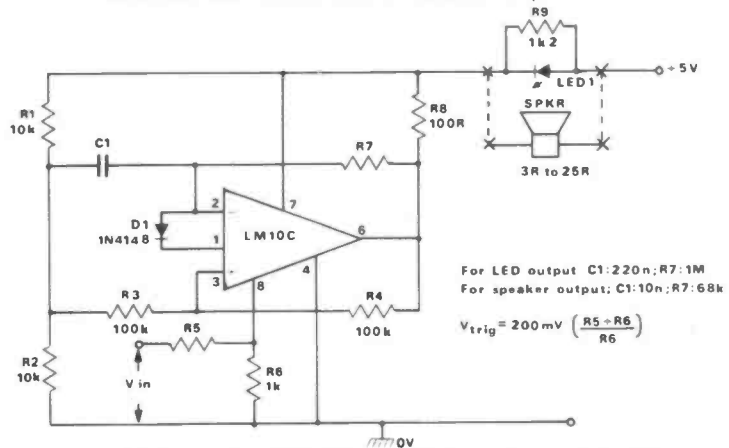


Fig 11 2-wire precision under-voltage transmitter with flashing LED or monotone audio (400Hz) output

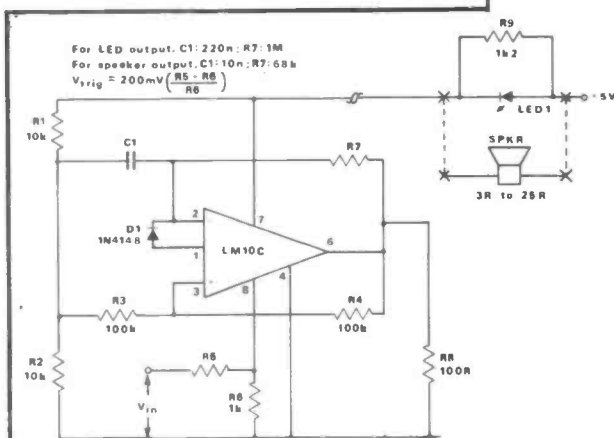


Fig 12 2-wire precision over-voltage transmitter with flashing LED or monotone audio (400Hz) output

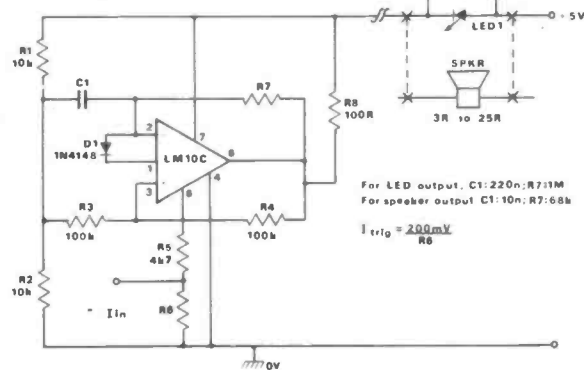


Fig 13 2-wire precision under-current transmitter with flashing LED or monotone audio (400Hz) output

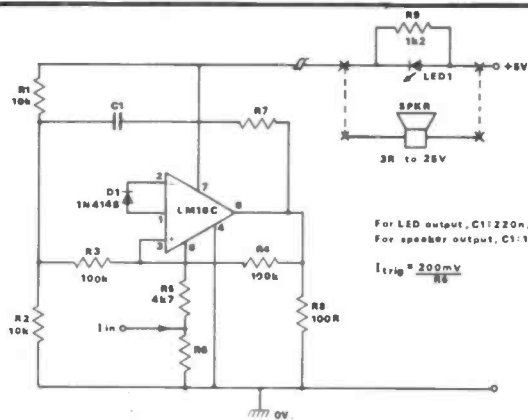


Fig 14 2-wire precision over-current transmitter with flashing LED or monotone audio (400Hz) output

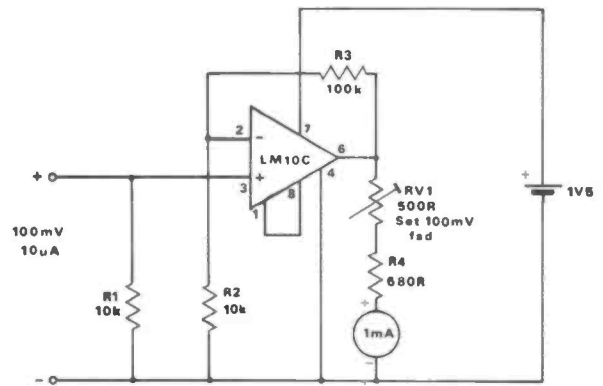


Fig 15 Simple meter amplifier giving a sensitivity of 100K/volt to a 1mA fsd meter

the astable timing is controlled by the C1 and R7 values. If a circuit is to be used to give a flashing LED output, these components should be given values of 220n and 1MΩ respectively, to give a flash rate of 100 flashes per minute. If a circuit is to be used to give a 400Hz audible alarm tone output, the components should be given values of 10n and 68K respectively.

Meter amplifier circuits

To conclude this look at applications of the LM10, Figures 15 to 18 show a variety of ways of using the device as a very low voltage amplifier that can be used to greatly increase the effective sensitivity of a normal moving coil meter or multimeter.

In the Figure 15 circuit the op-amp is used as a simple non-inverting amplifier and increases the effective sensitivity of a 1mA meter by a factor of about 100, to 10µA fsd. Note that this circuit has no 'set null' facility, and can give no indication of reverse-connected signals. The modified circuit of Figure 16 does not suffer from this defect.

The Figure 16 circuit uses a 100µA meter and increases its effective sensitivity by a factor of 100 to 1µA fsd. Note in this case that the 200mV reference voltage of pin 1 is used to create a 'common' input and output signal line that is 200mV above the 'zero volts' value, thus enabling the op-amp output to swing between +1.3 volts and -0.2 volts, therefore enabling the meter to indicate both forward and reverse voltage values. RV1 provides the circuit with a 'null' facility, enabling the output to be set to give a meter reading of zero with zero input signal applied.

Finally, to complete this LM10 mini-series, Figures 17 and 18 show how the basic Figure 16 circuit can be adapted for use as a 4-range dc millivoltmeter and a 4-range dc microammeter respectively. Note that each of these op-amp driven meter amplifier circuits is powered from a single 1½ volt battery supply!

REW

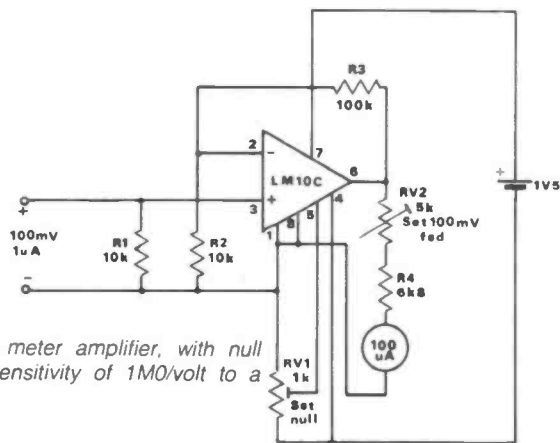


Fig 16 Precision meter amplifier, with null facility, giving a sensitivity of 1MΩ/volt to a 100µA meter

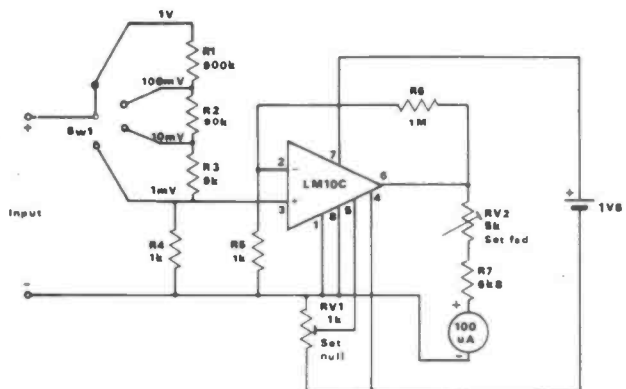


Fig 17 A 4-range dc millivoltmeter, with a sensitivity of 1MΩ/volt

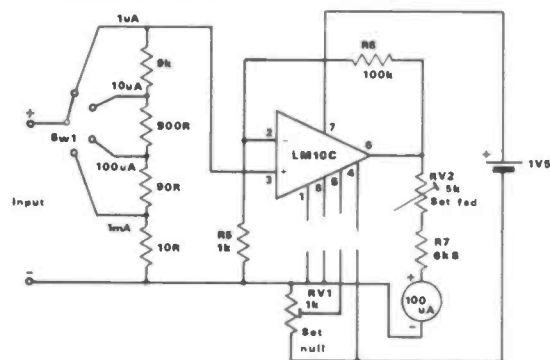


Fig 18 A 4-range dc microammeter, with a full scale sensitivity of 10mV

SOLDERING: Art or Science?

Some tips on a subject of relevance
to all home constructors

by P J Cooper G3CXI

We all speak glibly of soldering a connection, but do we know what is involved in making a sound joint?

Due to the prohibitive costs of amateur equipment, home construction is becoming increasingly popular, and this in my opinion is a good thing; in building something yourself you get a better idea of how and why it works – but back to the soldered joint.

In the initial stages, thought must be given to the compatibility of the base metals to be soldered.

Soldering can be affected by storage times, and it is a good idea to check the solderability before assembling. Some components may be tarnished and require tinning before assembly. Most small components will have a protective flux in the wire ends. But don't take chances; in most cases a wipe with the snipe-nose pliers will suffice. Remember that many dry joints start life because of this problem.

Fluxes and fluxing

Flux is used primarily to prevent oxidation of the metallic interfaces of the joint and should have these characteristics:

- 1) It should be a liquid cover over the material and exclude air from the joint.
- 2) It should continue to do this right up to soldering temperatures.
- 3) It should dissolve any oxides on the metal surface or on the solder and carry these unwanted materials away.
- 4) It should be displaced from the metal by the liquid solder.

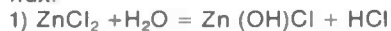
A mineral oil or jelly would satisfy the first two requirements, but not the second two. With regard to number 3, metal oxides dissolve in molten alkalis at high temperatures inconvenient to soft solders, but they also dissolve in acids at temperatures below the melting point of solders. Soldering fluxes are therefore acids or substances that yield acids when heated.

Hydrochloric acid in water is a good flux for soldering zinc. Lactic acid, phosphoric acid and oleic acids are used commercially for soldering fluxes. Resin yields an acid (abeitic) when heated to soldering temperatures.

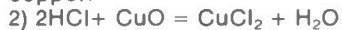
The halide group of fluxes – fluorine, bromine, iodine and chlorine – which form hydro-acids to become fluorides,

bromides, etc are very strong and quick acting, but they absorb water readily and then rapidly start corrosion, especially near the actual joint where sputtering of the flux has taken place. For this reason, exercise extreme care when using these fluxes. They are banned for use on electronic equipment but are still available, so take care.

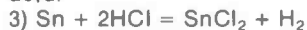
Let us look at what happens chemically when a copper clad board is soldered using a tin-lead solder and zinc-chloride flux.



The acid attacks the oxide on the copper.

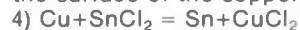


The copper chloride dissolves as soon as it forms in the zinc chloride solution, the bulk of which is still unchanged. At the same time, tin in the solder is dissolved by some of the hydrochloric acid.



The tin chloride also becomes dis-

solved in the zinc chloride solution. The clear copper surface underlying the zinc chloride flux now reacts with the tin chloride forming copper chloride and liberating metallic tin which deposits on the surface of the copper.

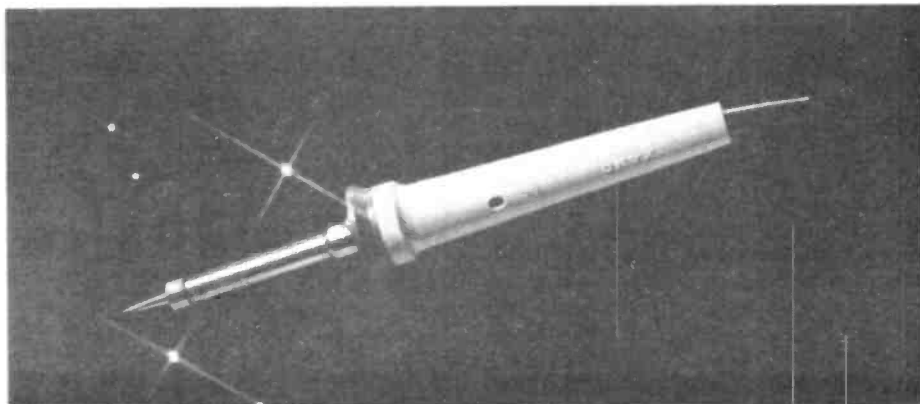


The deposited layer of tin now displaces the zinc chloride from the surface of the copper up to the edge of the molten solder. In the molten solder there is tin which instantly merges with the deposit of tin, and the edge of the molten solder therefore advances rapidly over the surface, pushing the flux ahead of it.

Although the zinc chloride content may be quite low, a strong possibility of corrosion exists and so another activator must be used instead of this for the sake of future circuit safety.

Activated flux use in electronics

Resin, rosin, or colophony, call it what you will, is the gum exuded from the pine tree. It reacts mildly at temperatures,



Examples of soldering irons currently on the market

yielding abeitic acid, and this is what we normally use for electronic circuits.

By itself it may not be strong enough for some stubborn oxides, so an additive is used. This is usually one of the amines group of hydrachlorides: hydrazine, aniline hydrachloride and glutamic acid hydrachloride (GAH). The latter is normally used and is limited to 0.7% of the volume. Any higher activation could give rise to corrosion again. There is no such thing as non-corrosive flux – whatever the adverts say.

Making the joint

Making the joint requires a little intelligent thought – in other words, use an iron that is adequate for the job. Most hobbyists will have various sizes of iron, to cater for large or small work surfaces. Generally, you must choose an iron and bit size best for the job in hand.

The temperature of the iron must remain reasonably hot in contact with the mass to be soldered. Apply the solder not to the iron, but to the joint. When the joint temperature is high enough the solder will flow round the joint to the iron and both iron and solder can then be removed together. Never, ever apply solder to the iron and then the loaded iron to the joint, because that wisp of

smoke you will see is all your flux burning away, never seeing the joint it is intended to work on. That is the way dry joints lie.

Cooling the joint

Cooling the joint is simply a matter of removing the iron. Do not blow on the joint or subject it to any forced cooling. The joint cools from the liquid state through the plastic state to the solid state in a fairly short time. The critical period is between 183°C and 140°C, and it is within this temperature range that things can go wrong if the joint is disturbed.

Cleaning the assembly

After your soldering work is finished it is time for inspection. If you have done a good job much cleaning will not be necessary, but if it needs it then don't use a flux solvent; this will only brush flux residue all over the assembly with possible faults due to tracking later. Use a stiff brush and that should be adequate.

Storage of part built assemblies

If you do not complete your assembly in one go, lightly solder the connections you have made – otherwise the interfaces will oxidise and you have the


makings of a first-class dry joint later.

When choosing which solder to use on your work you may not have a lot of choice. Try running the solder wire through your finger and thumb, then have a look at it. Is it lumpy? If so it is poor quality material. The flux is put into the wire solder in the correct volume per unit measure. If it appears lumpy then there are voids in the flux distribution throughout the solder, and this will create sputter.

Another cause of sputter is an iron that is too hot. 370°C is the ideal for normal operations. This allows the mass to be brought quickly to soldering temperature (183°C) and allowance for the cooling of the iron by the mass to be soldered.

Conclusion

This short article has only scratched the surface of soldering methods and the associated problems.

The soldered joint is probably one of the major means of connection in the electronics world, but is usually dismissed as merely a means of joining A to B. A physicist once remarked to me that if there was a better way of connecting two objects together in an electrical circuit, no one had told him about it. 

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The MFJ-1274 TNC 2 Packet Radio

There is good news indeed for those of you who have become interested in Packet Radio. Because of a growing movement towards it, prices have fallen to such an extent that, whereas one once had to budget for £600 plus as the cost of a top of the line unit or slightly less for one in kit form which had to be imported from the USA, it is now possible to buy a ready built packet radio transceiver for significantly less than one would pay for a typical 2 metre FM mobile transceiver. The MFJ-1274 is such a unit and, interestingly, was made in Hong Kong. It is available in this country from Amdat.

The MFJ-1274 is a TAPR (Tucson Amateur Packet Radio) TNC 2 clone, and all the circuitry is contained on one PCB. Twenty-four integrated circuits are used in the unit, four of which operate the tuning bar. The bar consists of 20 red LEDs placed vertically and I found it a great help when attempting to tune in a signal on the HF bands. The tuning unit can be purchased separately from Amdat and is suitable for connection to any TNC 2 clone.

The MFJ-1274 is quite a small piece of equipment, measuring only 192mm (7.5 inches) wide by 39mm (1.5 inches) high by 242mm (8.5 inches) deep. There is a 2mm overhang all round the front panel which reduces the actual measurements of the case by 4mm in respect of width and height. The case is made of aluminium, the body being painted matt black and the front panel matt silver, a pleasing combination.

The front panel carries five LED indicators: DCD (data carrier detect), PTT (transmit line state), STA (unacknowledged packets), CON (connect status) and PWR, the rear panel having all the necessary sockets and switches for the operation of the unit. The micro-processor is a CMOS Z80 running at 2.5MHz, and all the serial in/out data is handled by a Z80 S10.

An additional facility in the MFJ-1274 was the ability to accept input/output

TTL voltages from computers such as the Commodore 64 and the VIC-20. The MFJ-1274 will, in fact, operate from any computer having an RS-232 port. The power required is 12 volts dc at 400/500mA.

As with other packet radio transceivers, there is a fair amount of setting up to do before any actual operation can take place. The interconnecting leads have to be made up between the BBC computer which I was using and the MFJ-1274, but since 'xon/xoff' handshaking is used only three wires are required, transmit data, receive data and signal ground. The transmit tones and the PTT line are taken directly to the rig.

I was using two rigs, one for HF and the other for 2 metres, but found no means of connecting both rigs at the same time. This proved to be most inconvenient and, since the connections for the rig used for 2 metres and the main HF rig were different, I had to make up a small adaptor lead, one end being female and the other end male.

The software used for this review was an EPROM supplied by Amdat which was inserted in a vacant socket in the Beeb. I typed '*TNC' to call up the program, and the display was in the form of a split screen similar to a number of other displays used for RTTY and AMTOR. The program used the function keys of the BBC to activate different commands, and there were 25 alternatives which could be brought into action via the function key, some in conjunction with the shift key or control key.

Before any information could be shown on the screen, the baud rates had to be set via an eight-way DIL switch on the rear panel. This controlled both the computer and the radio in/out rates. The first five switches from the left applied to the computer side and the remaining three to the radio. The baud rates for the computer in/out were 300, 1200, 2400, 4800 and 9600 and the rates for the radio side were 300, 1200 and 9600. The 9600 baud

rate was not usable with the internal modem but was included for use with an external high performance modem.

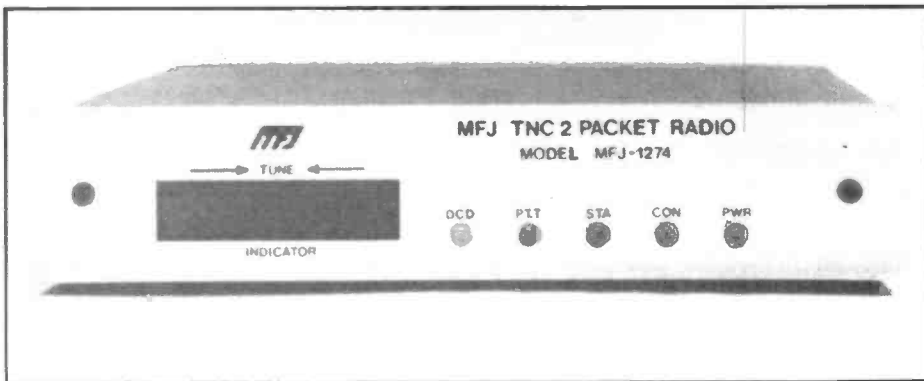
Personally, I found this operation very fiddly. It had to be done using a small screwdriver, and movement of the switches themselves was very stiff. Admittedly, the baud rate for the computer only had to be set once (in my case, for the Beeb, it was 1200 bauds), but the setting of the different baud rates for VHF and HF working I considered to be very awkward. When changing from VHF to HF one had to remember to press a switch to change the tones and bandwidth and also to move the audio input/output lead from one rig to the other. In my view, an altogether inconvenient operation.

Once everything was set up and switched on the sign-on message appeared. A lithium back-up battery was incorporated in the circuitry; this has a life of about five years and will retain all the personalised details entered into the RAM. The first thing I did was insert my callsign and the date/time.

There are more than 80 user configurable parameters and a number of immediate commands available, but in the main the default values are acceptable. Any different values would have to be set by the operator. Options are provided in the commands for monitoring other traffic on the frequency, which proved very interesting, but for the initial start of a contact it was only necessary to type CONNECT (or 'C') G3XYZ RETURN and the unit promptly went into the transmit mode and sent the packet. It would attempt to make a connection by sending the packet the default number of times (default for RETRY was 10), and then if no connection resulted the message '*** DISCONNECTED Retry Count Exceeded' would appear.

At the second attempt contact was made with GB3UP, the mailbox at the University of Surrey. This time the contact was satisfactorily completed, although the amount of activity on 144.650MHz in the London area was phenomenal, resulting in extra attempts between GB3UP and my QTH.

The unit also was able to 'digipeat', a facility which I was not able to take advantage of because my QTH is not in a very good position for VHF. Two types of connection are available. The first, and the one I used to contact GB3UP, is known as the 'CONVERSE' mode, and is rather like RTTY, where, hopefully, one can have a real-time QSO. I must admit that here in London it was very frustrating to try and do that because of the high occupancy of the frequency. Doubtless,



by Ken Michaelson G3RDG

elsewhere in the country it wouldn't be so difficult.

The other mode is called 'transparent' and is just that. It transmits all characters without modification, but can only have one connection at a time and would be used for the transmission of files, etc. The CONVERSE mode can support up to 10 different connections at the same time, with all incoming packets displayed showing the sender. There is also a 'BEACON' command, which sends out a pre-prepared message at given intervals. In my opinion, the use of beacons here in London is not a good thing; as an example of usage, I printed out a connection to GB3HQ (RSGB Headquarters station), which took place at 0325 UTC (!), which shows that even at that time of day packet is being used.

The HF operation was not so easily achieved. As I mentioned above, it was necessary to unplug the lead, connect it to the other rig and manipulate the switches before any operation could take place. However, this was done and


on a frequency of approximately 14.101MHz (this being one of the agreed frequencies for packet radio) I had several good QSOs, also gaining access to two mailboxes, LA3T-1 in Tromsø and EA4PE in Madrid.

The tuning bar came into its own during HF operation; without it, tuning in a transmission would have been difficult. One moved the transceiver tuning control until the illumination was centralised with the two end LEDs more brightly lit. Curiously enough, the TNC-220, which I built from a kit and reviewed for another magazine, had two radio ports, so connections to the two rigs could be installed permanently, the change from one to the other being carried out by commands to the unit. This was much superior.

It is unfortunate that the front panel has been cut out with some form of guillotine, thus giving it a sharp edge all the way round. I feel that it would not have been too much of an effort to smooth the edges down. However, this is

a minor point. The MFJ-1274 performed perfectly during the period of the review, and a bouquet must be given to the author(s) of the *Owner's Manual*, which contained 157 pages of information, a 17-page index in alphabetical order and 4 pages of circuitry. The cost of the MFJ-1274 ready built and cased, complete with an ac adaptor giving the required current at 12 volts dc, is £189.00. At that price, you can't go wrong. The Amrac EPROM containing the driver program is available at £11.50 extra.

For more instruction and information on the subject of Packet Radio, I would refer you to the *ARRL Handbook 1986*, sections 19/23 to 19/47, and also to an article written by Margaret Morrison KV7D and Ben Morrison KV7B. This article, entitled *Amateur Packet Radio*, was published by *Ham Radio Today* in July and August 1983.

Thanks are due to Martin Stubbs of Amdat, Crofters, Stoke Road, Bristol BS12 6HQ (tel: (0272) 699352/559398) for the loan of the unit for the review. 

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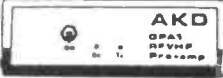


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What is Image Processing ?

Dr C J D Catto explains how new developments in this field could soon bring it within the reach of home enthusiasts

Electronic image processing is not a totally new science, but advances in semiconductor technology over the past few years have brought it within the reach of many more users; not just scientists working for well-funded research establishments, but also educationalists and quite soon even home-based enthusiasts.

Manipulation of true grey-scale images (as opposed to graphics) requires a huge amount of RAM and processing power. The key development that has brought down the size and cost of electronic image processing equipment is the steady improvement in semiconductor memory, averaging a doubling in density each year over the past decade.

History

Whereas in 1970 it would have been necessary to go through time-consuming optical and photographic processes if anything more advanced than rudimentary video processing was required, the ensuing years saw the gradual entry of digital techniques, as well as the introduction of analogue-to-digital and digital-to-analogue converters. This permitted the construction of 'solid-state' TV standards converters (eg to 'translate' NTSC to PAL), but in those days such equipment filled many racks and was within the budget of the national broadcast authorities only. They were followed by what we would understand as the original 'studio effects' machines, again somewhat bulky and not too versatile.

It was the arrival of the relatively compact Quantel machine that eventually achieved the breakthrough, mak-

ing this TV production technology available, and perhaps essential, to all TV studios. In the not too distant future, even domestic TV sets will include some basic image processing hardware such as picture memory, as part of the proposed high definition TV system for example.

Research

There are, of course, many applications of image processing outside the TV field. In scientific research, the user of an optical or electron microscope can benefit from a system that will improve contrast, reduce noise, sharpen edges, or even just act as a rapid-access archive. For routine image analysis, eg the counting of particles on a microscope slide or the measurement of grain boundaries in a specimen of steel, dedicated machines (such as the Cambridge Instruments' Quantimet) have been in production for more than a decade, but in many ways the more interesting field of true processing (as opposed to analysis) has opened up in only the last few years.

We now stand at the threshold of a new and potentially huge industry. For example, since the launch of the French 'SPOT' satellite, an enormous amount of high resolution remote sensing data is commercially available at a relatively low cost; a company prospecting for minerals in Africa, say, is wise to commission a study employing such data before embarking on an expedition to drill holes in the ground.

Equipment

The heart of an image processing and display system is the framestore, which

can be a basic video memory board with limited processing, such as the SPC512 card made for use with EPIC software by Synoptics of Cambridge. Such cards plug into the expansion slots of an IBM PC or clone, and need little more than the addition of a TV monitor for image display before quite interesting principles can be studied and experimented with.

More powerful systems employ separate framestore and processor boards, joined by high speed data buses, but for flexibility and ease of program control they generally require a link to a computer with keyboard and VDU. The 'host' may be as simple as a PC or as serious as a VAX, but the real-time content of the image processing must necessarily be handled by the 'guest' boards. Current generations of digital computers are adequate for graphics, but rapid manipulation of proper images needs dedicated IP hardware.

Video data

Clearly the video path through the IP boards is a vital consideration when designing a system whose object is to improve picture quality; in contrast with simple computer graphics circuitry, picture information of at least 8 bits brightness resolution must be handled. In a typical system, a TV video signal is converted to digital form by a 'flash' A/D converter, at a sampling rate of 15MHz.

Once in digital form, the data is stored in RAM and is available for digital processing, under hard-wired control, or increasingly by digital hardware which is under software control. The data is generally passed back to RAM. It can be transferred to hard disc for long term

storage. In cases where the image processing algorithm is beyond the capability of the on-board hardware, the picture data may be sent to the 'host' via an interface or bus. The nature of this interface obviously has considerable influence on the speed available, quite apart from the limitations of the 'host' itself.

Picture output

Assuming the data is back in the video RAM, in order to display it on a CRT or projection TV screen a high speed DAC is required, and the sync signals may be added or sent out on a separate cable. One 'wrinkle' that is now often employed is the colour look-up table (CLUT); this can be loaded under software control so as to assign colour values to the grey-scale signal, giving a 'pseudo-colour' result. Since the human eye is quite sensitive to colour variations, this method allows the perceivable contrast range of the video signal to be expanded considerably, at moderate extra cost. In fact, reasonably high quality colour TV monitors capable of linear display (such as the Philips CM8533) are no longer expensive.

Software development

Software for image processing has been developed in centres of learning such as Cambridge over a couple of decades, but it is the advent of lower-cost computers such as the IBM PC and similar machines that has widened the range of users and potential converts.

What used to be a subject accessible to only the most prestigious research departments is now open to anyone who can afford a personal computer, software, framestore card and TV monitor.

Processes

Some of the key mathematical processes in this subject will be mentioned below. The basic arithmetic operations such as extracting sub-regions from an image, shrinking or expanding them and so on do not require much in the way of processing, but rotation by an arbitrary angle clearly needs more complex operations. Work on the grey-level content of an image covers many topics, for example extraction of contrast statistics, creation of brightness contour maps, overlaying of text and graphics and non-linear or pseudo-colour conversion to enhance the contrast range of an image.

Example

For comparison of images, simple subtraction routines can be used, but they do depend on the original images being well aligned. This can nowadays be overcome by more advanced software, which can form the 'rubber sheet' corrections. As for statistics, an example

of histogram generation is shown in *Figure 1*, where a silicon chip is being examined in a scanning electron microscope.

Filters and transforms

Rather more interesting operations provide spatial filtering, for instance to smooth or to sharpen an image. An important point here is that digital image processing is able to provide true two-dimensional filtering, whereas a conventional analogue filter operating on, say, a TV signal can offer processing in the line-scan direction only.

Beyond the basic filtering and convolution operations, there are more abstruse transforms such as Fourier, Walsh or Hilbert. These 'classical' methods may be familiar to those who have studied signal processing for radio and communications. The advantage of using these transforms is that by converting an image from the spatial to the frequency domain, a mask or filter specially tailored to the task in hand may be employed, before the data is transformed back to an image for display; much superior results can be achieved this way.

Needless to say, such operations require a great deal of computation, and in order to speed up the 'number crunching' it is useful to have an extra couple of megabytes of RAM (semiconductor disc). Where speed is vital, a dedicated array-processor is a practicable proposition, now that the requisite 'hefty' chips are available.

Removing noise

For images obtained in electron microscopy or in astronomy, where one is dealing with low contrast data or signals buried in a background of noise, it is useful to have a means of averaging out the noise and enhancing the desired picture elements. This is traditionally done by taking some kind of long time exposure, either by averaging a sequence of stored images, or by continuous (recursive) filtering. Beyond this, it is often desirable to calculate diffraction patterns, for example to make a comparison with those calculated from

'theoretical' molecular structures.

Correlation

Another useful tool in the armoury of the image processor is the ability to calculate correlation functions. For a regular array of atoms on a grainy background, for example, an auto-correlation exercise will emphasise the atomic array at the expense of the random background. On the other hand, for comparison or alignment of two images, a cross-correlation would be used. The principle here is that the computed result shows peaks for those regions that are well matched. It is also possible to obtain correction signals from this process, for rotational as well as lateral alignment purposes.

Future developments

If current trends in semiconductor science continue, more powerful processor chips and higher density RAMs will come onto the market, and this will encourage designers to pack more IP capability onto their circuit boards; surface-mount technology is already making an impact here. As a result, the user will be able to carry out more complex processes, or alternatively to achieve the basic results more quickly, and to do more work in real time.

This last point is quite important, since IP will not make much impact on production-line and other industrial inspection applications unless results are obtainable rapidly, eg fast enough to reject faulty items on a conveyor belt. Equally, we can expect to see more intelligent office equipment, eg with the ability to handle true images as well as text and graphics. This will improve 'desk-top' publishing, as well as permitting better communications. With the parallel improvement in the telephone network, a video telephone with reasonably rapid response is not far away.

Conclusion

Just as the microcomputer opened up an enormous new field of activity in business, science and hobbies, the image processor will offer a similar boost to new applications in these fields. **REW**

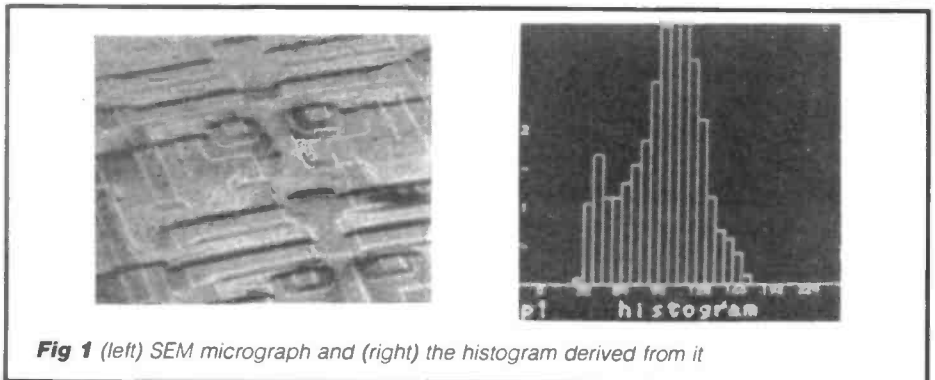


Fig 1 (left) SEM micrograph and (right) the histogram derived from it

DUO-BAND LOOP ANTENNA

Have a crack at this simple, low cost design

By Richard Marris G2BZQ

The loop receiving antenna which I shall describe here was designed for use indoors next to a communications receiver. It is simple, low cost and, above all, it works. It can be put together by the most inexperienced hobbyist, as long as he or she can do a bit of woodwork and wield a soldering iron. It will also be very useful to many experienced SWLs and Txers!

It was initially required for the 160 metre amateur band, although the prototype covered from 1.3MHz to 4MHz. In other words, with an amateur band Rx it

can be used for 160 and 80 metres, or with a general coverage Rx it can be used from the HF end of the medium wave band right up to 4MHz (75 metres).

The intention was to provide a compact indoor antenna which would reduce QRM and QRN plus all the general electrical interference generated by house wiring, domestic appliances, etc.

The physical dimensions of the loop are not necessarily the best, but were the most convenient for me at the time of construction.

Construction is dealt with in some detail with the inexperienced in mind. No doubt, however, the old hand will adapt (or mutilate!) the design to suit his own needs - that's what it's all about!

Description

The overall height of the loop is approximately 36 inches, with 24 inches maximum width. The winding circumference is 68 inches.

The final construction is shown in

Figure 1a, and the very simple conventional circuit in Figure 1b.

The loop consists of four turns of wire resonated to frequency by a 500pF variable capacitor. A one turn coupling coil is used for connection via a coaxial feedline to the antenna input of the Rx. Originally it was intended to fit a slow motion drive to the resonating capacitor, but initial tests indicated that this is not really necessary.

Construction

There are two basic units: the frame unit with windings (Figure 2) and the base unit (Figure 4). For the frame unit, cut out two pieces of 5/8 inch dia wooden dowel to lengths of 24 inches and 35 inches. These should be dove-tailed, as shown in Figure 2. At the centre 'X' a pilot hole should be drilled using a fine drill, and then a larger drill should be put through to accommodate the fixing nut and bolt. If you go straight at it with the larger drill, then you will probably split

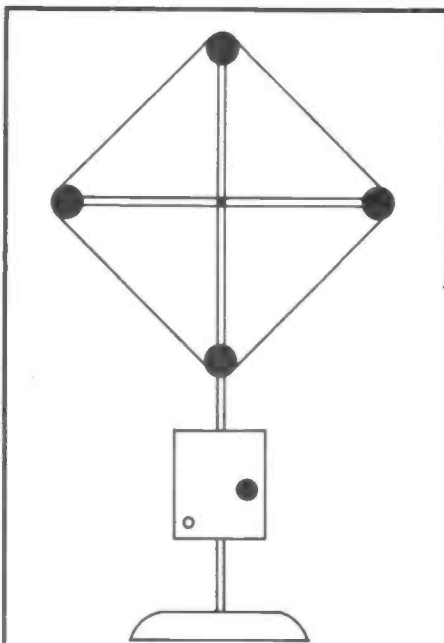


Fig 1a The duo-band loop antenna

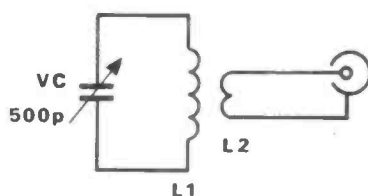


Fig 1b Circuit diagram

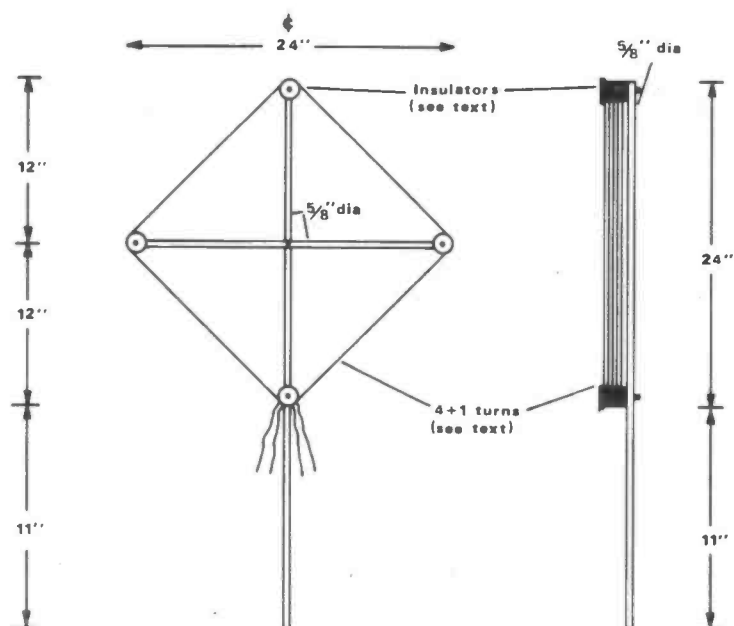


Fig 2 Frame unit with windings

the dowel. A spot of glue should be applied to the mating surfaces and washers put under the screw head and nut. The nut should be tightened until the washers just start to 'bite' into the dowel.

A number of ideas were tried for the corner insulators. Finally, at the local DIY shop four 1 3/8 inch diameter rubber doorstops were purchased at 16p each. They are 1 inch long with a centre hole. This diameter ensures that the winding is well away from the insulator fixing screws.

A ridge appears around the end of the insulator blocks, which conveniently stops the wire coming off the end during winding. The use of rubber ensures that the wire turns do not slip out of place if wound tightly.

The corner insulating blocks should be attached as shown in Figures 2 and 3. Once again, don't forget a fine pilot hole before drilling the bolt hole. A washer should be placed under the nut, and the nut tightened until the surface of the rubber block makes a slight indentation in the dowel.

For the windings, multistrand 7/0.2 PVC covered flex was used, with an o/d of 1.20mm. Firstly, wind on a single turn (L2) in the middle of the insulator blocks and secure it with tape at the bottom, leaving ends of at least 7 inches which can be trimmed back later.

L1 consists of 4 turns of wire, and two turns should be wound, evenly spaced, either side of L2 (see Figure 3) and the ends secured. This can best be done by pre-drilling the bottom insulator, with a 2mm drill, at the start and end of the winding. Leave at least 6 inch wire ends for trimming back later.

The turns should be 'dressed' to give even spacing - approximately 1/8 inch between turns. This can be seen in Figure 3.

For the base unit (see Figure 4) the

following items are required:

- 500pF variable capacitor and knob.
- Coaxial socket to suit individual taste.
- Piece of fibre glass or paxolin circuit board, 5 1/4 inches x 4 1/2 inches (not copper clad).
- Piece of wood, 9 inches x 1/2 inch x 3/4 inch.
- Wooden base 1 inch thick and 7 inches minimum diameter (could be 7 inches x 7 inches square).
- Metal bracket (size not critical - must be robust).
- Nuts, bolts, washers and wood screws as required.
- Two terry clips.

Firstly, as shown in Figure 4, drill a hole in the exact centre of the base, and countersink to take the head of a suitable wood screw. Secure the base to the piece of 9 inch x 1/2 inch x 3/4 inch wood using a suitable wood screw and a spot of glue.

Fit a convenient size metal bracket, as shown. Next drill the piece of circuit board to take the coaxial socket and variable capacitor, as shown in Figure 4.

The position of each hole is not critical as long as the variable capacitor does not foul the 1/2 inch x 3/4 inch piece of wood.

Using two small roundhead wood screws, secure the piece of circuit board to the 1/2 inch x 3/4 inch vertical member, as shown. Assemble the coaxial socket, variable capacitor and knob. Secure the two terry clips to the vertical member, as shown, and then clip the frame unit into them, thus securing the two units together as shown in Figure 1a.

All that remains is to trim back and solder the ends of L1 to the variable capacitor and the ends of L2 to the coaxial socket.

Operation

After it has been connected to the Rx with a short length of coaxial cable, the loop antenna is ready to test. If a signal

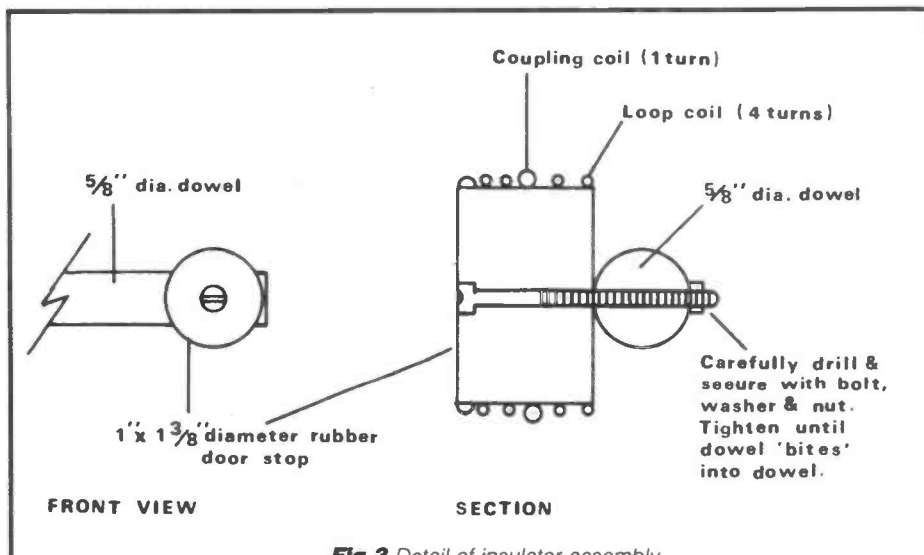


Fig 3 Detail of insulator assembly

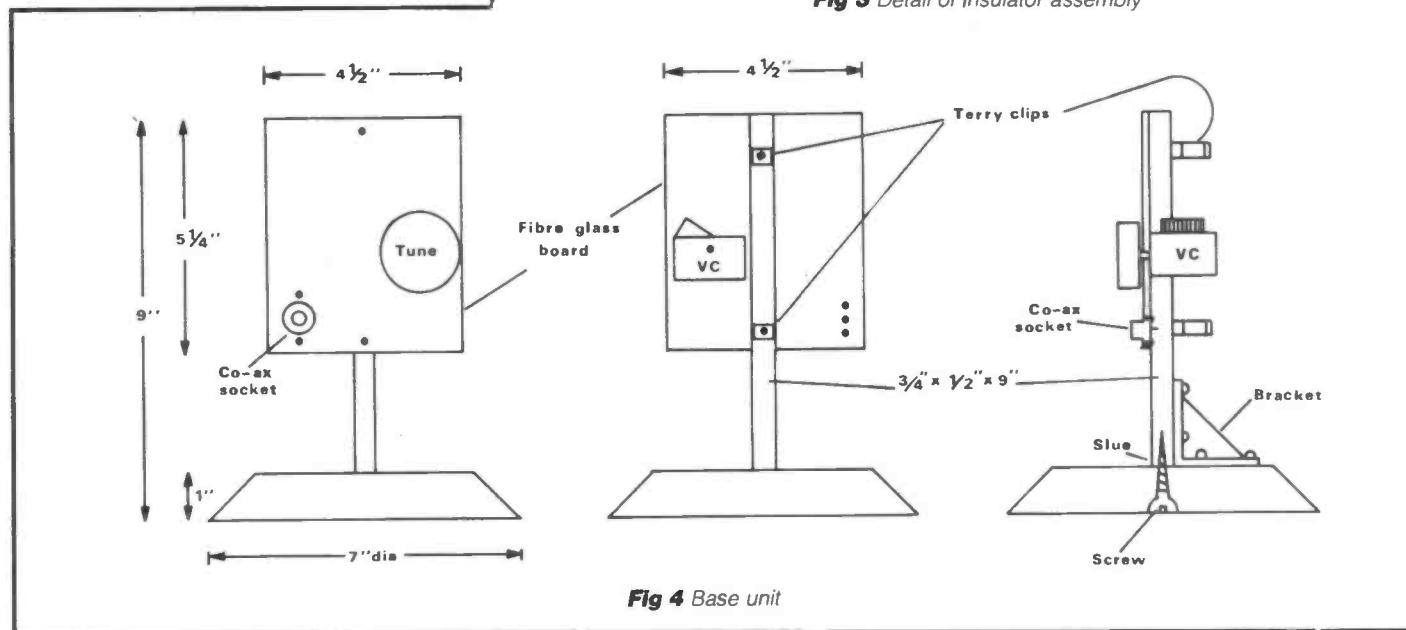


Fig 4 Base unit

DUO-BAND LOOP ANTENNA

generating source is not available, then it is suggested that the testing should be done in the evening, when there should be plenty of signals available.

Tune the Rx to approximately 3.5MHz onto a strong signal, and peak the loop VC for maximum signals. Repeat at approximately 4MHz, and also at around mid-band. Repeat the operation at 1.8MHz and 2MHz. If a general coverage Rx is being used then check at frequent spots between 1.3MHz and 4MHz.

Next, tune to a medium strength signal in the 3.5MHz band, peak loop VC and rotate the loop for maximum signal. Then

turn the loop slowly through 90 degrees and the signal should be eliminated or greatly reduced. See *Figure 5* for the loop polar diagram directivity pattern. Repeat the operation in the 1.8MHz band.

Minor adjustments to the frequency coverage of the loop can be effected by widening or reducing the spacing between the wire turns. It is also most important to ensure that the leads from L1 to the VC are as short as possible.

It will be found that the nulling of the loop is very effective. Interference comes from other stations (QRM), and it will be found that in most cases this can

be eliminated, or greatly reduced, except where two interfering stations are on exactly the same or reciprocal bearing.

In the domestic area much electrical interference is radiated from wiring and domestic appliances (and the TV!), and it will be found that a judicious use of the loop rotation will greatly reduce or eliminate this in most cases. Static from electrical storms (not overhead) is often directional, and again it will be found that the loop is most effective in reducing the racket. It must also be remembered that the loop is a very convenient compact receiving antenna for the lower HF bands.

Using a receiver with good RF amplification, it will be found that the loop can be plugged straight into the antenna socket. If the receiver has mediocre or poor RF amplification, then it is advisable to use a preamplifier between loop and Rx. Wideband RF amplifiers can be purchased commercially or made up from various published designs and kits.

This loop has been used over a period of some months alongside the Rx, mostly on 160 metres, and has produced good DX results.

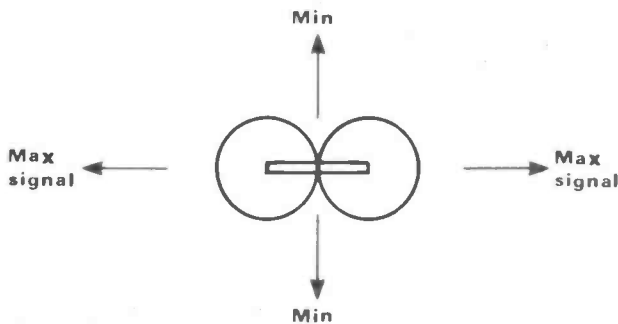
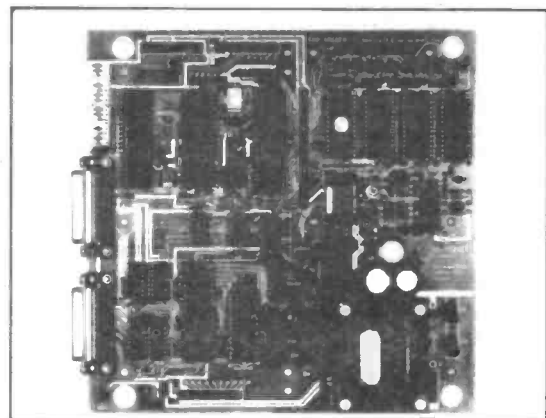


Fig 5 Polar diagram

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The SDS ARCHER – The Z80 based single board computer chosen by professionals and OEM users.

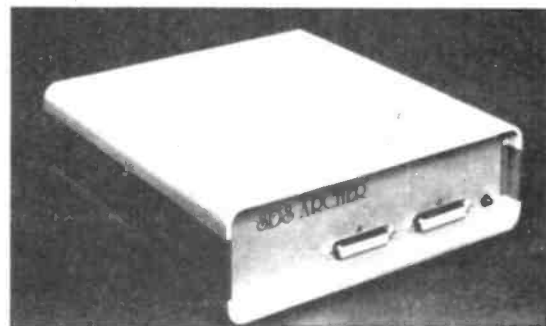
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Over the last few months I have been focusing my attention mainly on MW-DXing techniques and equipment that would allow more stations to be heard. It's about time now to take a more detailed look at what sort of stations the MW-DXer is likely to hear. The MW band is often overlooked by the SW listener, who views it merely as a source of local entertainment and information, but it is just this accessibility that can attract the new or casual listener into the world of DXing. Indeed, it is true that many a radio listener has found the MW band a fresh challenge, away from the mega-watt short wave propaganda stations and their associated jammers.

Stations galore

The MW band, covering those frequencies between 525kHz and 1605kHz, is used around the world by broadcasters in virtually every country. There are literally thousands of stations on the air at any one time operating on just 120 channels available in the MW band. Faced with this daunting situation, one might well give up any chance of hearing really distant stations, but as we shall see it is not all that difficult to pick out the interesting from the mundane.

For the UK based listener tuning around the MW band for the first time, the impression will be of a band dominated by local stations during the day and European stations at night. However, with a little care you'll soon pick out non-European languages emanating from stations in North Africa and the Middle East which will be audible most nights. Some of these stations will be up to 4000km away, but it should be remembered that the most audible stations will be using powers of 1000kW or more.


Across the water

If it is so easy to hear the Middle East, why is North America, at roughly the same distance, such a tough nut to crack? In contrast to the megawatts radiating from the Mid-East, stations on the other side of the Atlantic are restricted to maximum powers of 50kW. Whilst there are a few exceptions to this rule (located in Central and South America), the majority of stations are truly local operations using powers very much less than the upper limit. Even for the experienced DXer, the Atlantic Ocean can form a formidable barrier, yet for most UK based DXers the first taste of really long distances will be a station in the Americas.

It is often the case that many sleepless nights and much perseverance are needed to hear your first transatlantic station. However, having jumped this hurdle, you'll wonder why it was impossible to hear these stations before! Now, to give you a fighting chance, here are a few tips and suggestions.

The majority of transatlantic stations operate on frequencies that are multiples of 10kHz, whereas the Europeans are spaced by 9kHz. This means that there are certain 'window' frequencies

MEDIUM WAVE DXING



by Steve Whitt

where there is 4 or 5kHz separation between stations on the two continents. Some of the best window channels to DX on are 580, 590, 670, 680, 770, 850, 940, 950, 1130, 1210, 1220 and 1570kHz. There are, in fact, a total of 24 such frequencies, but on some, DX opportunities are limited by the low power used by the target DX stations.

Don't forget that you are likely to hear a range of languages; obviously English is the principle language of N America and much of the Caribbean, but you'll find some French stations in Canada and a few stations in the USA operating in Spanish (even Hebrew and Polish are used by some stations). From Latin America, Spanish is the dominant language, but look out for Portuguese from Brazil, Dutch from Surinam and some English from Guyana. In addition to looking at the window channels for transatlantic DX, there are a number of other stations that are almost regular visitors to these shores. Try looking after midnight for:

CJYQ in St Johns, Newfoundland on 930kHz playing pop music and using the 'Q Radio' slogan.

WINS in New York on 1010kHz with continuous news (a bit like LBC in London).

WFAN in New York on 1050kHz with continuous sports and talk programmes (this station used to be the country music station, WHN).

For Latin America try for R Globo in Rio de Janeiro on 1220kHz with a mix of phone-ins, sports, news and music, all in Portuguese of course. As a final tip in this section, you could try for the Caribbean by looking at the out-of-band frequency of 1610kHz, where you should find the English religious programmes of the Caribbean Beacon located on the island of Anguilla.

Finally, do not be too disappointed if at first you do not hear any transatlantic signals, since reception is very dependent on good propagation conditions. Some days absolutely nothing can be heard, whilst on others reception is so good that stations like CJYQ are audible on just a simple portable transistor radio!

Whilst many DXers enthusiastically

chase rare transatlantic DX, they often overlook the DX in their own backyard. Although many local radio stations can be very difficult or even impossible to hear, they are often regarded as not being real DX on account of their close proximity. However, they can present quite a challenge to the listener and certainly make a good target for both the seasoned DXer as well as the newcomer to the band. Under this heading I'd include all of the UK and Eire, where there are around 200 local stations on air, as well as much of Western Europe which includes another thousand or so stations under this umbrella.

To hear rare local stations the DXer need not rely on special ionospheric propagation conditions so much as skilled timing. It is sometimes only possible to hear a rare local station when a stronger co-channel station has closed down (either for the night or perhaps for monthly transmitter maintenance). In other cases it may only be possible to uniquely identify a station when it opts out from its usual network programming to carry local material. In addition, it often pays to tune the band when special events are happening (such as public holidays, government elections, etc) since stations will often extend or modify their usual broadcasting schedule, thus possibly allowing reception of a rare signal.

Although I have made the distinction between local radio and transatlantic reception, it should be remembered that, unlike the short waves, the MW band is primarily a local broadcasting medium no matter where in the world the signal comes from. Nevertheless, radio signals do not respect geographic boundaries and MW reception has been reported over distances as great as 20,000km. From the UK, however, some of the furthest DX ever reported has been from Chile and the Philippines, both about 12,000km distant (only Australia and New Zealand are further).

Info file

This month the spotlight falls on two very useful and highly recommended station listings. Firstly, there is the AM

MEDIUM WAVE DXING

Radio Log published by the National Radio Club (the premier MW-DX club in the States). The log is a comprehensive, 200-page, loose leaf, A4 size book listing every N American station in two lists (frequency order and callsign alphabetical order). Information includes powers, operating status, networks, formats, addresses and verification signers (where known). Although I've spotted a few errors in my copy, this still remains the most up-to-date info source available, because regular updates are published. The current issue is the 8th edition, which retails in the States for \$12.95. DXers outside North America should write to the National Radio Club Publications Centre, PO Box 164, Mannsville, NY 13661, USA for an exact price (probably around \$16).

Secondly, we come to the *Brazilian SW, MW and FM List* (8th edition) by Antonio Ribeiro da Motta, which is a 44-page, A5 format booklet of interest to both MW and Tropical Bands enthusiasts. It only lists stations in frequency order, but includes info on callsign, power, hours of operation and partial address (town and postcode). It even has an English introduction. To order, send 8 IRCs direct to Antonio at Caixa Postal 949, 12201 São José dos Campos - SP, Brasil.

Clandestine DX

It seems to be a fact of life that wherever there is war, strife or oppression radio becomes a powerful weapon used by all factions in the struggle, since it provides such a universal voice. Indeed, in almost every coup d'état the first targets are the broadcasting stations.


Radio Liberacion, the new Contra station beamed to Nicaragua, officially began broadcasts on 15th January this year, using 50,000W of power on 1520kHz. With such a power it's not surprising that I managed to hear this station back in March whilst on a DXpedition to Anglesey (it is regularly heard as far away as Ecuador and Mexico), but it is quite clear that such a station is not operating from a remote shed in the Nicaraguan jungle. In fact, spokesmen for the United Nicaraguan Opposition (UNO) have openly talked about the purpose of the station and the nature of its programmes, but they have not revealed the transmitter location - best guesses seem to indicate a location in Honduras, despite on-air claims that the station is in northern Nicaragua.

Radio Liberacion operates entirely in Spanish from 6pm to 6am local time (0000-1200UTC) using the slogan, 'The

Voice of Those Who Have No Voice'. Look also for an ID as 'Escuchas Radio Liberacion, Voz de la Unidad Nicaraguense en la frecuencia 1520kHz sur la onda larga'. Good luck with this one but, as with most clandestine stations, don't hold your breath waiting for a QSL card.

Odds and ends

Sometimes whilst I am researching material for this column I come across little snippets of unusual news. One such item concerns station WRHC, located in sunny Coral Gables in Southern Florida. This station has recently received permission to move frequency and in doing so to relocate its transmitter site. Unfortunately, a small piece of radio history will be lost forever when this happens since WRHC has its 10,000W transmitter site located offshore. It is actually the only multi-tower transmitter site to be built entirely at sea installed solely on piers and pilings. In fact, the station engineers can actually fish out of the windows and some have installed lobster pots in the pilings down below!

Well I'm afraid that's it for yet another month and until we meet again I'll look forward to your tips, queries or other correspondence - as usual c/o the *Radio & Electronics World* offices. 

NEXT ISSUE

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SPECTRUM WATCH

by John Andrews

In the December 1986 issue of the IEE Proceedings on Communications, *Radar and Signal Processing*, an article by J I Glaser on 'Fifty Years of Bistatic and Multistatic Radar' presented some interesting information on the Russian 'Woodpecker', which so often makes its presence heard on the amateur bands. Barry WA4VZQ posted some excerpts on an American bulletin board and you might like to share some of these insights, since many people are a little in the dark on this subject.

'A system recently developed in the United States which employs bistatic (two-site) operation is the AN/FPS-118 over the horizon backscatter (OTH-B) radar.

This will be used to provide long-range early warning against bomber aircraft and cruise missiles approaching the continental United States. This OTH-B, which operates in the 5 - 28MHz wave band, uses an FM/CW waveform rather than pulses to eliminate high peak-power components and to minimise radio frequency interference.

'The Soviet Union has a similar OTH-B radar, although information about this is sketchy. The initial evidence of Soviet OTH-B capability came to light in mid-1976. The first of these units, nicknamed the 'Kiev Buzzsaw' or 'Ivan the Terrible', was a 2 megawatt transmitter near Kiev, augmented by a smaller receiving installation near the Black Sea town of Nikolayev. From these initial efforts, the Soviets have expanded their system into a fully functional high-frequency early warning radar.

'Most of the information concerning the Russian 'Woodpecker', as it is now known because of its characteristic sound, has come from the efforts of amateur radio operators throughout the world. There are currently three OTH-B systems in operation in the Soviet Union.

'The current Soviet OTH-B systems have increased power and operate in the 20 - 50MHz range. Their capabilities are 1000 - 4000km, with longer ranges possible through multihop transmission'.

As WA4VZO says, 'Just think what I could do on 20 metres during the next DX contest with their multimewatt transmitter. I might even be heard over the W6s!'.

Pirates

Writing in *Broadcast*, Nick Higham notes that despite the 209 raids carried out last year on 70 land-based pirate broadcasters, there is still a healthy alternative radio scene in Britain. TX,

one of the newer publications covering this field, claims that London boasts a total of 43 regular unlicensed broadcasters and the rest of the country a further 30-plus. That last figure is probably underestimated.

In recent years, the DTI's Radio Investigation Service has become increasingly sophisticated, yet the most persistent offenders seem to be completely undeterred. The north London Greek Radio station has lost more than 100 transmitters confiscated during RIS raids, yet their enthusiasm remains unabated.

It is probably political rather than commercial motivation that keeps it going, an argument supported by the fact that more than half of London's pirates are 'ethnic', mainly 'black music' stations. Given the current state of resources in government departments the pirate radio phenomenon looks likely to continue.

High technology

British Aerospace's military aircraft division is reported to be enjoying early success in its flight tests of a joint tactical information distribution system (JTIDS) on an air defence Tornado FMK3. JTIDS is a British-American project, with equipment manufactured by Singer Kearfott and Rockwell Collins in the USA and by GEC Avionics in the UK. The system offers high capacity, secure, jam-resistant digital communication for air, ground and maritime operations.

JTIDS operates just below the amateur 23cm band and uses time division multiple access techniques to provide each user with controlled and simultaneous access to a constantly updated databank.

During the initial flight tests, successful secure voice, text and fixed format communications were established between the Tornado and a terminal on the ground.

Plessey has also enjoyed success with a contract to give the Australian army the most advanced battlefield communications network in the world. Known as Project Raven, the system employs frequency-hopping techniques and operates on both HF and VHF bands. It incorporates substantial electronic countermeasure capabilities and a novel field repair facility.

A mobile workshop with sophisticated electronics and computerised test and repair equipment is an integral part of the system and can be deployed in forward area to reduce time lost due to faulty or damaged radios.

Instant auroras

For many years the more adventurous among the amateur fraternity have exploited auroras for making contacts beyond their normal range, but now researchers in America are trying to exploit and enhance the Northern Lights for carrying operational traffic.

Professor Alfred Wong of the University of California in Los Angeles is hoping to create a 'pie in the sky' or circular charge in the ionosphere, which could be used as a cheap alternative to communications satellites for reflecting radio waves.

The aurora borealis, seen as curtains of beautiful colours shimmering in the Arctic skies, is hundreds of kilometres wide and its glowing apparition is caused by electrons raining along the lines of the Earth's magnetic field, which concentrate near the poles.

Unfortunately it is not very stable or permanent, but Professor Wong is aiming to change this.

During the past six years and at a cost of some \$4 million, he has built a 1.2 megawatt radio station in Alaska. By directing a small amount of RF energy into the ionosphere he can measure reflections and reconstruct a kind of hologram of the shape and intensity of the aurora. After this, 1.2MW of power



The picture shows a cellular radio antenna undergoing vibration testing at Marconi Communications Systems Ltd in Chelmsford

SPECTRUM WATCH

can be directed upwards to create a 'pie' of oscillating electrified air about one kilometre by 30km, which will reflect radio waves. Careful testing finds the correct resonant frequency to permit signals to bounce off the pie.

Professor Wong also hopes to seed larger fluctuations in the 40,000 megawatts of energy estimated to be locked in an aurora by mixing two radio frequencies and broadcasting a third, low frequency around the world. This low frequency cannot support fast data rates but such signals could penetrate 30 feet into the sea and would be suitable for sending coded messages to submarines, for instance.

Getting there

British Rail, which for some years has had a nationwide trunk-dialling internal telephone system, is close to completing its National Radio Plan which will give a direct-dialling radiophone capability covering 98 per cent of the rail network.

The new National Radio Network is trunked, unlike the older 105/138MHz system, and operates in Band III, close to 200MHz. It offers users the valuable

facility of intercommunication between mobiles and with the fixed network, and is remarkably economical in channel usage.

By using modern trunking techniques, mobile sets automatically select a free channel from those available. Careful planning and frequency allocation have given national coverage with just twenty-four channels, and the system is designed to use the same channel for call set-up throughout all of the twenty-five radio areas. Digital signalling is employed for dialling and selective calling of mobiles, while air time is saved by allowing the user to key the wanted number before pressing the transmit button.

The new system now covers about 60 per cent of the country, while the older mid-band system covers the rest for the present but is due to be replaced by 1995. Sets are also to be installed in train drivers' cabs, starting on Inter-City trains on the London-Liverpool and Manchester routes.

They will be extended to cover all Inter-City, freight and major provincial routes by 1988. All equipment is being supplied by Storno, who are the main contractors, and by Philips (Pye). Watch this space for new developments.

QRO at VHF

High-power klystrons made by Philips in Eindhoven are powering 'Tristan', the world's largest particle accelerator, housed at the research facilities of KEK, the Japanese Laboratory for High Energy Physics. According to Philips, the twin 508MHz klystrons - models YK1302 (800kW) and YK1303 (1000kW) - are the first to use vapour cooling at high power levels. In all, the Philips klystrons will generate 9.2 megawatts of power for the KEK. They might go quite well on 70cm, too!

REW

John Andrews presents this lively and informative news column every other month. Don't miss the October issue!

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Latest Literature

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This guide has been designed to be of use to the electronics designer, engineer or hobbyist.

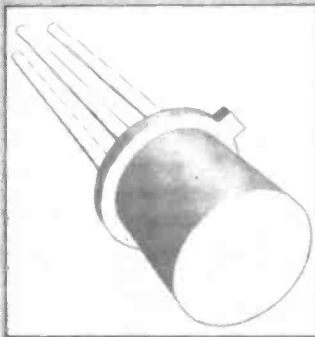
Prepared with the aid of a powerful computer system, the specifications of many thousands of electronic devices have been selected and indexed in tabular form.

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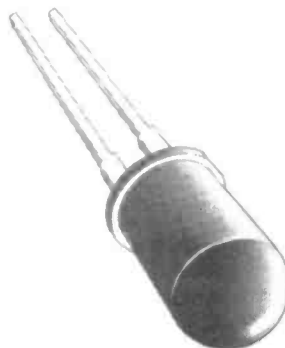
Simple Applications of the Amstrad CPCs for Writers

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Modern Opto Device Projects

R. A. PENFOLD



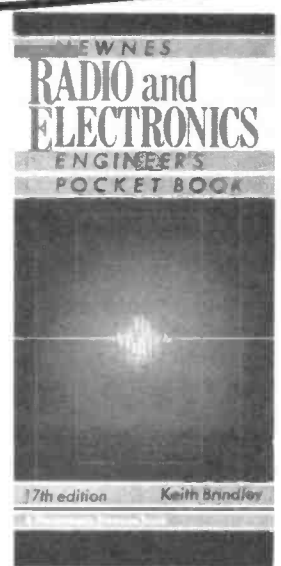
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In this book the ubiquitous Mr Penfold presents a number of practical designs which utilise modern opto-electric devices, including fibre optics, ultra bright LEDs and passive IR detectors.

Although some of the designs are suitable for beginners, most are aimed at the hobbyist with some experience of electronics construction.

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RADIO AND ELECTRONICS ENGINEER'S POCKET BOOK

by Keith Brindley

The 17th edition of this useful book has been considerably updated in terms of the broadcasting information included and new developments in the radio and electronics field.

The service engineer, designer and hobbyist will all find the data contained in this book invaluable and logically presented. At £6.95, it can be highly recommended.

Heinemann Newnes, £6.95. ISBN 0-434-90179-2

CATALOGUE CORNER

Cirkit

Cirkit's summer catalogue presents many new lines, especially in test equipment, with the introduction of a new frequency counter, bench and hand-held digital multimeters, lab PSUs and a useful hand-held inductance, capacitance and resistance meter.

The kits and module section also includes new designs, a low noise 23cm receiver and a 2 to 80 metre transverter to enable class A licensees to operate on 80m using a 2 metre multimode rig. There is also an updated design of the popular FDO kit with improved DIP and an extended LF range.

Cirkit are also running a competition in this issue of

the catalogue, and there are six multimeters to be won. It is priced at £1.20.

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

ECW

An informative and easy-to-understand book, describing in detail how to get the best from an oscilloscope, is now available from Electronic and Computer Workshop Ltd.

Written specifically for use with the cost-effective Crotech range of instruments, the book nevertheless provides a generalised introduction to

the internal workings and operation of an oscilloscope, describing the function of its controls, aimed at those with a basic knowledge of electronics.

The intricacies of X-Y use are covered, such as phase and frequency measurement, and the abilities of Crotech's built-in component tester are described, along with typical displays of 'good' and 'bad' semiconductors.

Entitled *How To Get The Best From Your Scope*, the book is a valuable source document and is available by mail order from Electronic and Computer Workshop at £3.50 including post/packing.

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

Latest Literature

Oryx

Greenwood Electronics' new Oryx catalogue pictorially demonstrates the company's extensive range of equipment.

Products illustrated include a wide range of soldering equipment and aids to PCB construction.

*Greenwood Electronics,
Portman Road,
Reading,
Berkshire RG3 1NE.
Tel: (0734) 595843.*

Solartron

Recently issued by Solartron Instruments is a 160-page hardback catalogue detailing the full range of test and measurement instrumentation available from this division of Schlumberger.

Details of many products are given, covering applications from precision dc voltage measurement to state-of-the-art optical fibre

instrumentation.

Products are divided into three broad areas according to shared measurement technology, and each section is prefaced by a discussion of the technology, its history and up-to-the-minute development.

This comprehensive, two-colour production is a valuable source of information to anyone purchasing or specifying test equipment, and is available free.

*Solartron Instruments,
Victoria Road,
Farnborough,
Hants GU14 7PW.
Tel: (0252) 544433.*

Bulgin

Just published, the new Bulgin catalogue offers a guide to the company's range of electrical and electromechanical components.

The new 272-page

illustrated publication incorporates the necessary technical data in easy reference format.

*AF Bulgin and Company PLC,
Bypass Road, Barking,
Essex IG11 0AZ.*

Walmore

The 1987 catalogue from Weinschel, now available from Walmore, provides in its 256 pages detailed specifications for the extensive range of fixed, variable and switchable attenuators and other coaxial components made by Weinschel. Among the many new components featured in the 1987 catalogue is the Model 150 compact binary step attenuator. This high reliability attenuator provides up to 75dB of loss in steps of 5dB for frequencies up to 18GHz. It has been designed for equipment manufacturers to build into microwave instrumentation.

Other new products featured include precision coaxial panel adaptors for use to 26.5GHz, a coaxial short circuit and a dc block, each with Type N connectors and for use to 18GHz.

*Walmore Electronics Ltd,
Laser House,
132/140 Goswell Road,
London EC1V 7LE.*

Diamond H Controls

Diamond H Controls has published a two-page, full colour leaflet on the company's embossing capabilities for membrane switch panels.

The leaflet explains both passive and tactile embossing and also gives details of the company's range of standard dies. Diagrams and photographs are also included.

*Diamond H Controls Ltd,
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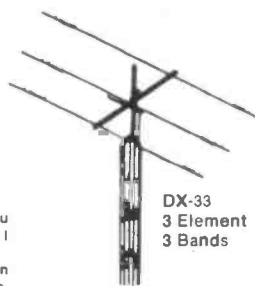
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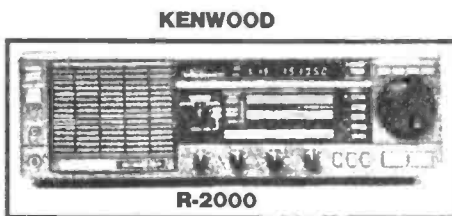
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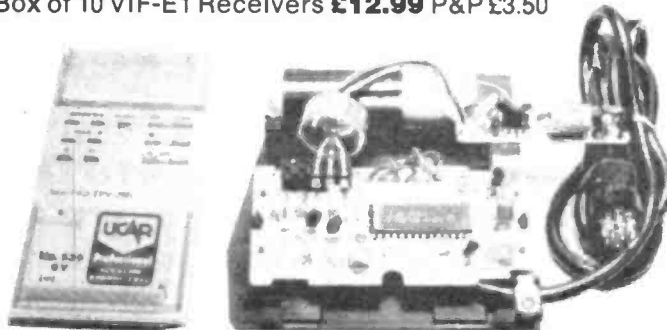
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FREE / Your monitor from its computer!! For only £29.95 it becomes a **SUPERB HIGH QUALITY - COLOUR - TV SET**

The fabulous TELEBOX an INVALUABLE MUST for the owner of any video monitor with a composite input, colour or monochrome. Made by a major UK Co. as a TOP QUALITY, stand alone UHF tuner and costing OVER £75 to manufacture. This opportunity to use your monitor a DUAL FUNCTION must not be missed!! The TELEBOX consists of a compact, stylish two tone charcoal moulded case, containing ALL electronics tuner, power supply etc to simply plug in and convert your previously dedicated computer monitor into a HIGH QUALITY COLOUR TV SET, giving a real benefit to ALL the family! Don't worry if your monitor doesn't have sound - THE TELEBOX even has an integral 4 watt audio amplifier for driving an external speaker, PLUS an auxiliary output for superb quality television sound via your headphones or HI FI system etc. Other features include: Compact dimensions of only 15.75" w x 7.5" d x 3.5" h, latest technology, BRITISH manufacture, fully tuneable 7 channel push button tuner, AUTO AGC circuit, SAW filter, LED status indicator, fully isolated 240v AC power supply for total safety. Mains ON-OFF switch etc. Many other uses.

LIMITED QUANTITY - DON'T MISS THIS OFFER!! ONLY £29.95 OR £24.95 if purchased with ANY of our video monitors. Supplied BRAND NEW with full instructions and 2 YEAR warranty. Post and packing £3.50 *When used with colour crt

COLOUR & MONOCHROME MONITOR SPECIALS

'SYSTEM ALPHA' 14" COLOUR MULTI INPUT MONITOR
Made by the famous REDIFFUSION Co. for their own professional computer system this monitor has all the features to suit your immediate and future requirements. Two video inputs, RGB and PAL Composite Video, allow direct connection to BBC/IBM and most other makes of micro computers or VCR's, including our very own TELEBOX. An internal speaker and audio amp may be connected to computer or VCR for superior sound quality. Many other features: PIL tube. Matching BBC case colour. Major controls on front panel. Separate Contrast and Brightness - even in RGB mode. Separate Colour and audio controls for Composite Video Input. BNC plug for composite input. 15 way 'D' plug for RGB input, modular construction etc.

This Must Be ONE OF THE YEAR'S BEST BUYS. PC USER Supplied BRAND NEW and BOXED, complete with DATA and 90 day guarantee. ONLY £149.00 as above OR IBM PC Version £165.00 15 Day 'D' skt £1.00. BNC skt 75p BBC Interface cable £5.50

DECCA 80 16" COLOUR monitor. RGB input.
Little or hardly used manufacturer's surplus enables us to offer this special converted DECCA RGB Colour Video TV Monitor at a super low price of only £99.00, a price for a colour monitor as yet unheard of!! Our own interface, safety modification and special 16" high definition PIL tube coupled with the DECCA 80 series TV chassis give a column deflection and quality found only on monitors costing 3 TIMES OUR PRICE. The quality for the price has to be seen to be believed!! Supplied complete and ready to plug direct to a BBC MICRO computer or any other system with a TTL RGB output. Other features are: internal speaker, modular construction, auto degaussing circuit, attractive TEAK CASE, compact dimensions only 52cm W x 34 H x 24 D, 90 day guarantee. Although used, units are supplied in EXCELLENT condition. ONLY £99.00 + Carriage.

DECCA 80, 16" COLOUR monitor. Composite video input. Same as above model but fitted with Composite Video input and audio amp for COMPUTER, VCR or AUDIO VISUAL use. ONLY £99.00 + Carr.

REDIFFUSION MARK 3, 20" COLOUR monitor. Fitted with standard 75 ohm composite video input and sound amp. This large screen colour display is ideal for SCHOOLS, SHOPS, DISCOS, CLUBS and other AUDIO VISUAL applications. Supplied in AS NEW or little used condition ONLY £145.00 + Carr.

BUDGET RANGE EX EQUIPMENT MONOCHROME video monitors.
All units are fully cased and set for 240v standard working with composite video inputs. Units are pre tested and set up for up to 80 column use. Even when MINOR screen burns exist - normal data displays are unaffected 30 day guarantee.

12" KGM 320-1 B/W bandwidth Input, will display up to 132 x 25 lines. £32.95
12" GREEN SCREEN version of KGM 320-1. Only £39.95
9" KGM 324 GREEN SCREEN fully cased very compact unit. Only £49.00
Carriage and insurance on all monitors £10.00

DC POWER SUPPLY SPECIALS

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. BRAND NEW only £19.95
GOULD G6-40A, 5v 40 amp switch mode supply NEW £130.00
AC-DC Linear PSU for DISK drive and SYSTEM applications. Constructed on a rugged ALLOY chassis to continuously supply fully regulated DC outputs of +5v @ 3 amps, -5v @ 0.6 amps and +24v @ 1.5 amps. Short circuit and overvoltage protected. 100 or 240v AC input. Dim 28 x 12.5 x 7 cm NEW £49.94
Carriage on all PSUs £3.00

KEYBOARDS

Manufacturer's BRAND NEW surplus DEC LA34 Un-coded keyboard with 67 quality gold plated switches on X-Y matrix - ideal micro conversions etc £24.95
AMKEY MPNK-114 Superb word processor chassis keyboard on single PCB with 116 keys. Many features such as On board Micro, Single 5v rail, full ASCII coded character set with 31 function keys, numeric keypad, cursor pad and 9600 baud SERIAL TTL ASCII OUTPUT!! Less than half price
Only £69.00 with data. Carriage on Keyboards £3.50



Double sided 40/80 track disk drives (1Mb per drive). PSU, 4K of memory mapped screen RAM, disk controller, RS232, CENTRONICS and system expansion ports, and if that's not enough a ready to plug into STANDARD 8" DRIVE port for up to FOUR 8" disk drives, either in double density or IBM format. The ultra slim 92 key, detachable keyboard features 32 user definable keys, numeric keypad and text editing keys, even its own integral microprocessor which allows the main Z80 to devote ALL its time to USER programs, eliminating "lost character" problems found on other machines. The attractive, detachable 12" monitor combines a green, anti-glare etched screen, with full swivel and tilt movement for maximum user comfort. Supplied BRAND NEW with CPM 2.2, user manuals and full 90 day guarantee. Full data sheet and info on request.

PC2000 System with CPM Etc. COST OVER £1400

NOW only £399

DON'T MISS THE CPM Deal OF THE CENTURY

The FABULOUS CPM TATUNG PC2000 Professional Business System

A cancelled export order and months of negotiation enables us to offer this professional PC, CPM system, recently on sale at OVER £1400, at a SCOOPE price just over the cost of the two internal disk drives!! Or less than the price of a dumb terminal!!

Not a toy, the BIG BROTHER of the EINSTEIN computer, the DUAL PROCESSOR PC2000 comprises a modern stylish three piece system with ALL the necessities for the SMALL BUSINESS, INDUSTRIAL, EDUCATIONAL or HOBBYIST USER. Used with the THOUSANDS of proven, tested and available CPM software packages such as WORDSTAR, FAST, DBASE2 etc. the PC2000 specification, at our prices, CANNOT BE BEATEN!!

The central processor plinth contains the 64K, Z80A processor, DUAL TEAC 55F 5 1/4" TELEPHONE (tone dial) with 5 CRT monitor and integral modem etc. for direct connection to PRESTEL, VIEWDATA etc. Designed to sell to the EXECUTIVE at over £600!! Our price BRAND NEW AND BOXED at only £99.00

PC2000 Business System with CPM and 'Ready to Run' FAST Sales and Purchase ledger, supports up to 9000 Accounts, VAT etc. COST OVER £1700

NOW only £499
Carriage & Insurance £12.00

PC2000 Wordprocessor System with CPM and TEAC TP25 daisywheel printer

NOW only £799

MODEMS

Join the communications revolution with our super range of DATA MODEMS, prices and specifications to suit all applications and budgets. BRAND NEW State of the art products.

DACOM DSL2123 Multistandard 300-300, 1200-75 Auto answer etc. £268.00
DACOM DSL2123AQ Auto dial, smart modem with multi standard AUTO SPEED detect, and data buffer with flow control etc. £395.00
DACOM DSL2123GT The CREAM of the intelligent modems, auto dial, auto call index, buffer etc etc. £498.00
Steebeck SB1212 V22 1200 baud FULL DUPLEX, sync or async, optional auto dial. £465.00
TRANSDATA 307A Acoustic coupler 300 baud full duplex, originate only, RS232C interface. £389.00

Ex BRITISH TELECOM full spec, CCITT, ruggedised, bargain offers. SOLD TESTED with data. Will work on any MICRO or system with RS232C interface.
MODEM 13A 300 baud unit, only 2" high fits under phone. CALL mode only. £45.00
MODEM 20-1, 75-1200 baud. Compact unit for use as subscriber end to PRESTEL, TELECOM GOLD, MICRONET etc. £39.95 + pp £6.50
MODEM 20-2 1200-75 baud. Same as 20-1 but for computer end. £65.00 + pp £6.50
DATEL 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. COST OVER £800. Our price ONLY £199 + pp £80.00
DATEL 4800, RACAL MPS4900 baud modem, EX BT good working order. ONLY £295.00 + pp £80.00

SPECIAL OFFER
MODEM TG2393, Ex BT, up to 1200 baud full duplex 4 wire or half duplex over 2 wire line. ONLY £85.00 PER PAIR + pp £10.00

For more information contact our Sales Office.

MATRIX PRINTERS

SPECIAL BULK PURCHASE of these compact, high speed matrix printers. Built in Japan for the Hazeltine Corporation this unit features quality construction giving 100cps bidirectional, full pin addressable graphics, 6 type fonts, up to 9.5 single sheet or tractor paper handling, RS232C and CENTRONICS parallel interface. Many other features. BRAND NEW and BOXED. COST £420. Our price ONLY £199.00

RECHARGEABLE BATTERIES

Dry Fit MAINTENANCE FREE by Sonnenschein & Yuasa.
A300 07191315 12v 3Ah NEW £13.95
A300 07191312 6v 3Ah NEW £9.95
A300 07191202 6-0-6v 1.8Ah TESTED Ex Equip £5.99

VDU TERMINALS

Standard VDU data entry terminals at give away prices!!

QUME QVT108. Current product, state of the art terminal with detachable keyboard, 12" Green screen, 2 page RAM, TVI 925, Hazeltine, ADMSA emulations, software setup, 25 x 80, Clock, Swivel and tilt base, Printer port, Function keys etc. BRAND NEW and BOXED AT ALMOST HALF PRICE ONLY £425.00
AJ510 - EX RENTAL, Z80 controlled, 15" green screen 24 x 80 display, graphics, cursor addressing, printer port etc. Very good condition TESTED complete with manual only £225.00
ADDS 520 - Dumb terminal, used, 12" b/w screen RS232C interface and printer port. TESTED. ONLY £125.00. Carriage on terminals £10.00
100's of other terminals in stock, CALL for more details

SURPLUS SPECIALS ON PRESTEL - VIEWDATA - TELEX

PLESSEY VUTEL, ultra compact unit, slightly larger than a telephone features A STANDARD DTMF TELEPHONE (tone dial) with 5 CRT monitor and integral modem etc. for direct connection to PRESTEL, VIEWDATA etc. Designed to sell to the EXECUTIVE at over £600!! Our price BRAND NEW AND BOXED at only £99.00

DECCAFAX VP1 complete Professional PRESTEL system in slimline desk top unit containing Modem, Numeric keypad, CPU, PSU etc. Connects direct to standard RGB colour monitor. Many other features include: Printer output, Full keyboard input, Cassette port etc. BRAND NEW with DATA A FRACTION OF COST only £55.00

ALPHATEL. Very compact unit with integral FULL ALPHA NUMERIC keyboard. Just add a domestic TV receiver and you have a superb PRESTEL system and via PRESTEL the cheapest TELEX service to be found!! Many features: CENTRONICS Printer output, Memory dialling etc. Supplied complete with data and DIY mod for RGB or Composite video outputs AS NEW only £125.00
Post and packing on all PRESTEL units £8.50

EX-STOCK INTEGRATED CIRCUITS

4164 200 ns D RAMS 9 for £11 4116 ns 1.50 2112 £10.00 2114 £2.50 2102 £2.00 6116 £2.50 EPROMS 2716 £4.50 2732 £3.00 2764 £4.95 27128 £5.50 6800 £2.50 6821 £1 68A09 £8 68B09 £10 80B5A £5.50 80B8 £15 80B8 £8 NEC765 £8 WD2793 £8 D8202A £22 8251 £7 8748 £15 Z80A DART £6.50 Z80A CPU £2.00. Thousands of IC's EX STOCK send SAE for list.

DISK DRIVES

Japanese 5 1/4" half height, 80 track double sided disk drives by TEAC, CANON, TOSHIBA etc. Sold as NEW with 90 day guarantee ONLY £85.00
TEC FB-503 Double sided HH 40 TRK NEW £75.00
SUGART S4400 SS FH 35 TRK £55.00
SIEMENS FDD100 SS FH 40 TRK £65.00
Carriage on 5 1/4" drives £5.50
Brand NEW metal 5 1/4" DISK CASES with internal PSU.
DSKC1 for 2 HH or 1 FH drive £29.95 + pp £4.00
DSKC 2 for 1 HH drive £22.95 + pp £3.50
DKSC 3 As DSK1 LESS PSU £12.95 + pp £2.50
DSKC 4 As DSK2 LESS PSU £10.95 + pp £2.00

8" IBM format TESTED EX EQUIPMENT.

SHUGART 800/801 SS £175.00 + pp £8.50
SHUGART 851 DS £250.00 + pp £8.50
TWIN SHUGART 851's 2 Mb total capacity in smart case, complete with PSU etc. £595.00
MITSUBISHI M2894-83 B DS1 Mb equiv to SHUGART S4850R. BRAND NEW at £275.00. + pp £8.50
DYSAN B Alignment disk £29.00 + pp £1.00
Various disk drive PSU's Ex Stock SEE PSU section.

HARD DISK DRIVES

DRE/DIABLO Series 30 2.5 Mb front load £525.00
Exchangeable version £295.00. ME3029 PSU £95.00
DIABLO 44/DRE4000A, B 5+5 Mb from £750.00
CDC HAWK 5+5 Mb £795.00. CDC 9782 80 Mb RMO3 £2500.00
ERTEC D3422 5+5 Mb £495.00
RODIME 5 1/4" Winchester ex-stock from £150 CALL Clearance items - Sold as seen - No guarantee.
ICL 2314 BRAND NEW 14" Mb Removable pack hard disk drive, cost over £2000 with data ONLY £99.00
BASF 6172 8" 23Mb Winchester £199.00

Unless stated all drives are refurbished with 90 day guarantee. Many other drives and spares in stock - call sales office for details.

All prices quoted are for U.K. Mainland, paid cash with order in Pounds Sterling PLUS VAT. Minimum order value £10.00. Minimum Credit Card order £10.00. Minimum BONA FIDE account orders from Government Depts., Schools, Universities and established companies £20.00. Where post and packing not indicated please Add £1.00 + VAT. Warehouse open Mon-Fri 9.30-5.30 Sat 10.30-5.30. We reserve the right to change prices and specifications without notice. Trade, Bulk and Export

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Telephone 01-679 4414 Telex 894502 Data 01-679 1888

ERS — PRINTERS — PRINTERS — PRINTERS

SUPER DEAL? NO - SUPER STEAL THE FABULOUS 25 CPS "TEC STARWRITER"

Made to the very highest spec the **TEC STARWRITER FP1 500-25** features a very heavy duty die cast chassis and **DIABLO** type print mechanism giving superb registration and print quality. Micro-processor electronics offer full **DIABLO/QUEM** command compatibility and full control via **CPM WORDSTAR ETC.** Many other features include bi-directional printing, switchable 10 or 12 pitch, full width 381mm paper handling with up to 163 characters per line, friction feed rollers for single sheet or continuous paper, internal buffer, standard RS232 serial interface with handshake. Supplied absolutely **BRAND NEW** with 90 day guarantee and **FREE** daisy wheel and dust cover. Order **NOW** or contact sales office for more information. Optional extras RS232 data cable £10.00. Tech manual £7.50. Tractor Feed £140.00. Spare daisy wheel £3.50. Carriage & Ins (UK Mainland) £10.00.



TELETYPE ASR33 DATA I/O TERMINALS

Industry standard, combined ASCII 110 baud printer, keyboard and 8 hole paper tape punch and reader. Standard RS232 serial interface. Ideal as cheap hard copy unit or tape prep. for CNC and NC machines. **TESTED** and in good condition. Only £235.00 floor stand £10.00. Carr & Ins. £15.00.

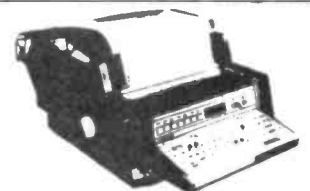
EX NEWS SERVICE PRINTERS

Compact ultra reliable quality built unit made by the **USA EXTEL Corporation**. Often seen in major Hotels printing up to the minute News and Financial information, the unit operates on 5 UNIT BAUDOT CODE from a Current loop, RS232 or TTL serial interface. May be connected to your micro as a low cost printer or via a simple interface and filter to any communications receiver to enable printing of worldwide **NEWS, TELEX** and RTTY services.

Supplied **TESTED** in second hand condition complete with DATA, 50 and 75 baud xtals and large paper roll.

TYPE AE11 50 Column **ONLY £49.95**
Spare paper roll for AE11 **£4.50**
TYPE AF11R 72 Col.
+ Ribbon **£65.00**
TYPE AH11R 80 Col.
ASCII/BAUDOT **£185.00**
Carriage and Insurance £7.50

GE TERMIPRINTER



A massive purchase of these desk top printer terminals enables us to offer you these quality 30 or 120 cps printers at a **SUPER LOW PRICE** against their original cost of over £1000. Unit comprises of full **QWERTY**, electronic keyboard and printer mech with print face similar to correspondence quality typewriter. Variable forms tractor unit enables full width - up to 13.5" 120 column paper, upper - lower case, standard RS232 serial interface, internal vertical and horizontal tab settings, standard ribbon, adjustable baud rates, quiet operation plus many other features. Supplied complete with manual. Guaranteed working **GE30 £130.00**, **GE1200 120 cps £175.00**. Untested **GE30 £65.00** Optional floor stand £12.50. Carr & Ins £10.00.

SEMICONDUCTOR 'GRAB BAGS'

Mixed Semis amazing value contents include transistors digital, linear, IC's, triacs, diodes, bridge recs, etc. etc. All devices guaranteed brand new full spec with manufacturer's markings, fully guaranteed.

50+ £2.95 100+ £5.15
TTL 74 Series. A gigantic purchase of an "across the board" range of 74 TTL series IC's enables us to offer 100+ mixed "mostly TTL" grab bags at a price which two or three chips in the bag would normally cost to buy. Fully guaranteed all IC's full spec. **100+ £6.90**, **200+ £12.30**, **300+ £19.50**

CENTRONICS 710 PRINTERS

Ex RENTAL Heavy duty full width carriage printer up to 132 columns on 17" fan fold sprocket fed paper, 60 cps print speed with standard RS232 or 20 mA loop interface. Supplied in **TESTED** used condition with data. **ONLY £85.00** carriage and insurance £10.00.

MAINS FILTERS

CURE those unnering hang ups and data glitches caused by mains interference with professional quality filters **DS5A** match-box size up to 1000 watt 240 V Load **ONLY £5.95**. L12127 compact completely cased unit with 3 pin fitted socket up to 750 watts **ONLY £9.99**.

EPROM COPIERS

The amazing **SOFTY 2** The "Complete Toolkit" for copying, writing, modifying and listing **EPROMS** of the 2516, 2716, 2532, 2732 range. Many other functions include integral keyboard, cassette interface, serial and parallel i/o UHF modulator ZIF socket etc. **ONLY £195.00 + pp £2.50**

"GANG OF EIGHT" intelligent Z80 controlled 8 gang programmer for ALL single 5v rail EPROMS up to 27128. Will copy 8 27128 in **ONLY 3 MINUTES**. Internal LCD display and checking routines for **IDIO PROOF** operation. **ONLY £395.00 + pp £3.00**

"GANG OF EIGHT PLUS" Same spec as above but with additional RS232 serial interface for down line loading data from computer etc. **ONLY £445.00 + pp £3.00**

Data sheets on request

SUMMER OFFER ONLY £399.99!!

DIY PRINTER MECH

Brand New surplus of this professional printer chassis gives an outstanding opportunity for the **Student, Hobbyist or Robotics constructor** to build a printer - plotter - digitiser etc. entirely to their own specification. The printer mechanism is supplied ready built, aligned and pre tested but **WITHOUT** electronics. Many features include all metal chassis, phosphor bronze bearings, 132 character optical shaft position encoder, **NINE** needle head, 2 x two phase 12V stepper motors for carriage and paper control, 9.5" Paper platen etc. etc. Even a manufacturer's print sample to show the unit's capabilities!! Overall dimensions 40 cm x 12 cm x 21 cm.

Sold **BRAND NEW** at a **FRACTION** of cost **ONLY £49.50 + pp £4.50**.

20,000 FEET OF ELECTRONIC AND COMPUTER GOODIES ENGLAND'S LARGEST SURPLUS STORE - SEEING IS BELIEVING!!

DEC CORNER

PDP 1140 System comprising of CPU, 124k memory & MMU 15 line RS232 interface.
RP02 40 MB hard disk drive
TU10 9 track 800 BPI Mag tape drive, dual track system. VT52 VDU, etc. etc. Tested and running **£3,750.00**
BA11-MB 3.5" Box, PSU, LTC **£395.00**
DH11-AD 16" x RS232 DMA interface **£1,900.00**
DLV11-J4 x EIA interface **£350.00**
DLV11-E Serial, Modem support **£190.00**
DUP11 Synch. Serial data i/o **£650.00**
DQ200 Dialog - multi RK controller **£495.00**
DZ11-B 8 line RS232 mux board **£650.00**
KDF11-B MB189 PDP 1123 PLUS **£1,100.00**
LA30 Printer and Keyboard **£80.00**
LA36 Decwriter EIA or 20 mA loop **£270.00**
MS11-JP Unibus 32kb Ram **£80.00**
MS11-LB Unibus 128kb Ram **£450.00**
MS11-LD Unibus 256kb Ram **£850.00**
PDP11/05 Cpu Ram, i/o etc **£450.00**
PDP11/40 Cpu, 124k MMU **£1,850.00**
RT11 ver 3B documentation kit **£70.00**
RK05-J 2.5 Mb disk drives **£650.00**
KL8 JA PDP 8 async i/o **£175.00**
M18E PDP 8 Bootstrap option **£75.00**
VT50 VDU and Keyboard - 20 mA **£175.00**
VT52 VDU and RS232 interface **£250.00**

Give your VT100 a Birthday!!
Brand New VT100 Keyboards
only **£85.00**

1000's of **EX STOCK** spares for DEC PDP8, PDP8A, PDP11 systems & peripherals. Call for details. All types of Computer equipment and spares wanted for **PROMPT CASH PAYMENT**.

MAG TAPE DRIVES

Many **EX STOCK** computer tape drives and spares by **PERTEC, CIPHER, WANGO, DIGIDATA, KENNEDY** etc. Special offer this month on DEI Cartridge tape drives **ONLY £450.00 each**.

CALL FOR DETAILS

COMPUTER/SYSTEM CABINET & PSU

All in one quality computer cabinet with integral switched mode PSU, mains filtering, and twin fan cooling. Originally made for the famous DEC PDP8 computer system costing thousands of pounds. Made to run 24 hours per day the psu is fully screened and will deliver a massive +5v DC at 17 amps, +15v DC at 1 amp and -15v DC at 5 amps. The complete unit is fully enclosed with removable top lid, filtering, trip switch, power and run leds mounted on all front panel, rear cable entries, etc. etc. Units are in good but used condition - supplied for 240v operation complete with full circuit and tech. man. Give your system that professional finish for only **£49.95 + carr. 19"** wide 16" deep 10.5" high. Useable area 16" w 10.5" h 11.5" d.

Also available less psu, with fans etc. Internal dim. 19" w, 16" d, 10.5" h. **£19.95. Carriage £8.75**

66% DISCOUNT ON ELECTRONIC COMPONENTS EQUIPMENT

Due to our massive bulk purchasing programme, which enables us to bring you the best possible bargains, we have thousands of IC's, Transistors, Relays, Caps, PCBs, Sub-assemblies, Switches etc. etc. surplus to OUR requirements. Because we don't have sufficient stocks of any one item to include in our ads we are packing all these items into the **BARGAIN OF A LIFETIME**. Thousands of components at giveaway prices. Guaranteed to be worth at least 3 times what you pay. Unbeatable value and perhaps one of the most consistently useful items you will every buy!! Sold by weight.

2.5kls **£5.25 + pp £1.25**
10kls **£11.25 + pp £2.25**

5 kls **£6.90 + £1.80**
20kls **£19.50 + pp £4.75**

1000's of other **EX STOCK** items including **POWER SUPPLIES, RACKS, RELAYS, TRANSFORMERS, TEST EQUIPMENT, CABLE, CONNECTORS, HARDWARE, MODEMS, TELEPHONES, VARIACS, VDU'S, PRINTERS, POWER SUPPLIES, OPTICS, KEYBOARDS** etc. etc. Give us a call for your spare part requirements. Stock changes almost daily.

Don't forget, **ALL TYPES** and **QUANTITIES** of electronic surplus purchased for **CASH**



DX-TV RECEPTION REPORTS

Compiled by Keith Hamer and Garry Smith

Despite a sluggish start to the month, sporadic-E DX-TV really got going during the second half of May. Some of the openings were prolonged, sometimes lasting from very early morning until after midnight.

The 24th and 25th were dominated by tropospheric activity, mainly from France and West Germany, although suspected ducting on the 24th permitted the reception of Switzerland at UHF.

DX-TV logs for May

This month we are featuring two reception logs from the Leeds area. The first covers up to, and including, May 19th and has been sent in by Mark Dent. The second log shows conditions noted by Kevin Jackson.

9/5/87: MTV (Hungary) on channels R1 and R2 with sample teletext pages at 0950; JRT (Yugoslavia) E4 (from the Zagreb studios) with programmes at 1011; TSS R1 prog at 1015; TVE-1 (Spain) on E2 with show-jumping at 1135; RAI (Italy) IA (2 transmitters) and IB on programmes at 1311; NOS-1 (Netherlands) E6 and E39; NOS-2 E45; NDR-1

(Norddeutscher Rundfunk – West Germany) E10; WDR-1 (Westdeutscher Rundfunk) E9; HR-1 (Hessischer Rundfunk) E7; DDR-1 (East Germany) E6.

17/5/87: TVE-1 E2, golf at 1505; unidentified channel R2 greyscale pattern at 1537; RAI with programmes on channels IA (from 3 transmitters) and IB.

18/5/87: TVE-1 E2, E3 and E4 with regional programmes at 1047; TSS R1 UEIT electronic test card with digital clock at 1056; RAI IA (3 transmitters) and IB with programmes at 1110; RTP (Portugal) E3 radiating the 'RTP-PORTO' FuBK test card at 1234; TVP R1 and R2 showing the PM5544 at 1245; DDR-1 E4 test pattern at 1245; TVE-2 on channel E2 with a bar pattern at 1418; RTP E2 'RTP LISB1' FuBK at 1634.

19/5/87: TSS R1 '0249' monochrome test card at 0945 from the Kuldiga transmitter; TSS R2 UEIT test card at 1000 from the Leningrad outlet; TSS R2 'EESTI TV TALLINN' PM5537 test pattern from the outlet at Tallin; TSS R2 UEIT test card with a white rectangle in the centre of the top identification line – suspect Vilnius transmitter; YLE (Finland) E4

'YLE TV1' FuBK at 1137; NRK E2 and E3 with the 'NORGE TELEVERKET' PM5534 at 1148; RUV (Iceland) on channel E4 radiating the 'RUV ISLAND' PM5544 at 1159; TVE-1 E4, 'TVE ANDALUCIA TELESUR' caption with digital clock at 1215; SVT (Sweden) E2 showing the 'TV1 SVERIGE' PM5534 test card at 1220; TVE-1 E2 programme at 1220; YLE E3 'YLE TV1' FuBK at 1227; SVT E4 PM5534 at 1300; TVE-2 E2 bar pattern at 1526; RTP E2 and E3 broadcasting the 'RTP-PORTO' FuBK at 1546.

20/5/87: TVP R1 and R2 PM5544 at 0645; TSS R1 'HOBOCTN' at 0652; TSS R2 UEIT with 'LRRTPC' identification at 0659; TSS R1 UEIT (Leningrad identification in Cyrillic) at 0728; TSS R1 '0249' monoscopic test card at 0739; NRK E3 'HEMNES' and 'KAUTOKEINO' PM5534 at 0915; NRK E2 'STEIGEN' PM5534 at 0915; TDF L3 prog at 0919; TSS R1 UEIT 'yrA' identification at 0924; unidentified R1 colour bars at 0946; NRK E4 'HADSEL' PM5534 at 0950; YLE E3 'YLE TV1' FuBK at 1006; RAI IA and IB progs at 1120; SVT E2 and E4 progs at 1810 – also E3 at closedown at 2104.

24/5/87: TDF tf1, L27 and L42; TDF

PHOTO FILE ● PHOTO FILE ● PHOTO



Fig 1 Armenian announcer received in Finland by Jukka Kotovirta



Fig 2 News programme from the Albanian TV service, RTS

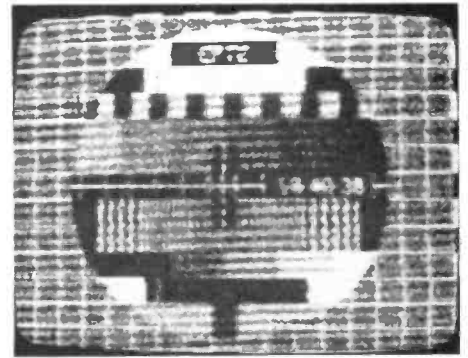


Fig 3 PM5534 from ETP-2 in Greece, received by Carmel Sommit in Malta



Fig 4 Arabic newsreader – note the characteristic headgear

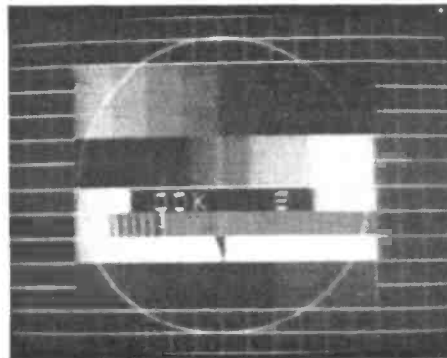


Fig 5 Czechoslovakian FuBK test card received in Malta via sporadic-E



Fig 6 An old clock caption from Denmark received some years ago by Simon Hamer

Antenne 2 on L21, L34 and L39; TDF FR-3, L24 and L45; TDF Canal Plus, L5; ZDF (West Germany), E33, E34, E35 and E37; NDR-1, E50 and E53; NDR-3, E40, E42, E43, E48, E56 and E60; RB (Radio Bremen, West Germany), E45; BRT-1 (Belgium, Flemish-language service), E10 and E43; BRT-2, E46; NOS-1, E6; E7, E29 and E39; NOS-2, E27 and E45; RTBF-1 (Belgium, French language) E8; DR (Denmark) E7; TSI-1 (Switzerland, Italian language network), E34 from the Sântis transmitter.

28/5/87: All-day opening from 0715, including JRT on channel E4 with the 'JRT ZGRB1' FuBK test card at 1102; JRT, E3 and E4 radiating the 'JRT BGRD' PM5544 at 1136; Band I was awash with signals at around 1608.

Our thanks to Mark and Kevin for supplying details about their impressive reception during May. Some loggings have been omitted due to space restrictions.

Reception round-up

Quite a few interesting sightings and observations occurred during May. The Russian test pattern, known simply as the 'Leningrad' type (or to use its technical abbreviation, the 'UEIT'), has been widely observed using various inscriptions, which in certain cases can help identify the originating transmitter. UEIT identifications noted at Derby on the 18th included 'Leningrad' (in its Cyrillic form), 'LRRTPC' (from the channel R2 Vilnius transmitter in Lithuania) and 'MTR'. Kevin Jackson managed to see the old Russian 0249 monochrome test card switch over to the UEIT which carried the name 'LATVIJAS TV' (Latvian TV) at the top. This occurred on channel R1 and it is thought to have originated from Kuldiga.

A new Yugoslavian transmitter appears to be using channel E4, radiating programmes from the Beograd studios. The PM5544 test pattern was seen by several enthusiasts during the morning of May 28th. The identification was 'JRT BGRD'. Normally this is seen only via Kapaonik on E3. Regular readers of this column may remember Kevin Jackson and Mark Dent of Leeds seeing this particular PM5544 on channel E4 towards the end of last year.

Another mystery is the appearance of the Spanish 'TVE-2' logo in animated form over channels E2, E3 and E4. At first it was thought to be a programme produced by TVE-2, but there have been repeated sightings. Can anyone help clear up this mystery?

Channel IA reception

Renewed interest has been centred on channel IA, which until the late seventies had been used exclusively by the Italian state-owned 'RAI-1' service. The introduction of private (at one stage pirate) television favoured channels in Band III and UHF, with only a handful of

private stations choosing Band I allocations. To the delight of the TV DXer, this situation seems to be changing, thanks to the congested higher frequencies.

Last year saw the introduction of 'Radio-Tele-Uno' on channel IA. Fortunately, most of the station's broadcasting time seemed devoted to radiating a colour test pattern and its very distinctive design made identification easy. Prior to Radio-Tele-Uno, the only other private station regularly seen was Nord Centre Television, a service in operation near Udine in Northern Italy. Towards the end of the last sporadic-E season, a small number of enthusiasts spotted another private station in existence on this channel. It was identified by the small on-screen identification letters 'TAI' which, thanks to our Italian correspondent David Bocca Corsico Piccolino, who lives virtually next door to it, was confirmed as being 'Telealtitalia' with an ERP of 200W.

Since then, a few more stations have come to light using this channel, such as Rete 4, Canale 5, Italia 1 and, a more recent discovery, TVA. At this stage, we don't know what this abbreviation means, and only at the end of the month was it actually occupying channel IA. Early sightings were on channel E3 with the logo 'TVA CANAL A'. This particular logo is also superimposed in the corner of the screen during programmes, so identifying it shouldn't pose a great problem. For newcomers to the hobby, we hasten to add that the on-screen identification isn't there for the benefit of the TV DX enthusiast. Its main purpose is to thwart attempts of programme piracy by other stations. Many of these stations remain on the air during the night to prevent other services starting up and occupying the channel. Fortunately, all of this is good news for the TV DXer living outside Italy, but not for those actually living there.

Arabic DX

There has been at least one definite sighting of an Arabic station so far this season. Kevin Jackson of Leeds saw it on channel E3 during an intense mid-morning opening on the 18th. Here at Derby, a suspected Arabic station came out of the noise on channel E2 on the 17th at 1050 BST. It consisted of a man talking, wearing Arab dress. The programme lasted for almost two minutes before disappearing into the noise. No other signals were present in Band I at the time.

Tunisian signals on channel E4 have been well received in the UK during intense openings from the south. Fortunately, reception has coincided with a test transmission towards late afternoon. The FuBK test pattern is used with the identification 'RTT' to the left of centre and its Arabic equivalent to the right. Transmissions are in SECAM colour and

originate from Ramada in the south of the country.

A reception report has arrived from a TV DXer living in Malta and his log indicates that an Egyptian transmitter is in operation on channel E3. Anyone involved with TV DXing during the seventies should remember the listing by the EBU of a 10kW channel E3 transmitter at Port Said. Later lists deleted this outlet and it was assumed to have been taken out of service, resulting in the discontinuation of Band I for TV transmissions. However, recent information shows two low power (900W) relays on channels E2 and E4 in operation at Dumyat for the Egyptian 2nd and 1st services respectively.

Reception reports

Trygve Thue, of Solheimsvik in Norway, witnessed a sporadic-E opening on the 19th with test cards and programmes from Central Europe and Russia. The latter country was present on channels R1 and R2 showing the UEIT colour test pattern, but at 1258 co-channel signals appeared which Trygve described as 'an unknown test card overshadowing TSS'.

A tropospheric lift on the 22nd brought in early morning broadcasts for Trygve from the Durris transmitter located in Scotland. Reasonably clear UHF channels are available for Norwegian DXers thanks to the absence of high power transmitters in Norway.

An excellent log arrived from Simon Hamer, of New Radnor in Powys, detailing some of the more unusual DX which was around during the month. The best day was the 28th when the sporadic-E MUF (maximum usable frequency) rose sufficiently for Band II TV reception to take place. The Italian RAI-1 outlet on channel IC (82.25MHz vision) was present, coinciding with similar signals on channels IA and IB.

However, the most significant event occurred when Russian reception materialised on channel R5 shortly before 1800 BST. The lower channels, R1, R2, R3 and R4, were carrying the same programme. The vision frequency of channel R5 at 93.25MHz is extremely difficult for most TV DXers to resolve owing to the high concentration of FM radio broadcasts occupying this part of the spectrum. Since Simon is situated in a valley he has the advantage of very few FM stations being present, which indeed helped on this occasion.

Another surprise occurred on channel IA, when a feature film was observed with the identification 'NCT' superimposed in small letters in the corner of the screen. The abbreviation stands for 'Nord Center Television' and, although it was a rarity last year, it is the longest established private Italian service in Band I to be regularly received in the UK. Other goodies included Rumania on channel R2 showing the news programme

DX-TV RECEPTION REPORTS

'Telejurnal' and Austria on test card from the low power Birkenfeld outlet on channel E3 on May 19th.

Bob Brooks of South Wirral has had an excellent month, with DX reception occurring most days. Like most of us, he also noted that the bulk of signals arrived during the second part of the month and by the 29th most countries had been logged. For Bob, the 29th was one of the better days with an all-day opening from most of Europe. At 1055 on E3 the usual Swiss FuBK with '+PTT SRG 1' identification was noted but with a difference. An additional feature was a moving line of text at the bottom of the pattern.

Tony Privett of Basingstoke was lucky enough to log two Arabic stations floating together on channel E4 at 1604 on the 23rd. These arrived from the south and one of these must be Tunisia. The origin of the second station is uncertain. Morocco does have an E4 outlet but its location is some 800 miles south-west of the Tunisian transmitter. Perhaps there is a more interesting explanation, such as the introduction of another E4 transmitter in North Africa. Tony queried the presence of a 'TVA' caption on channel E3 on the 19th and 23rd, which we now know happens to be one of the latest Italian private stations on Band I.

Carmel Sammut of Malta began TV DXing earlier this year, with many successes in Bands I and III. Unfortunately, problems exist on UHF due to congestion from Italian private stations operating in Sicily. Despite this, a few stations do succeed in penetrating the band and to date UHF reception from Greece and Tunisia has been possible. At Band III, Libya, Greece, Tunisia and Algeria are frequently available. On May 3rd, Band III reception consisted of Greece on E9, Algeria on E5 and E10, and Albania on R7. Egyptian signals were noted on channels E5, E7 and E8 during the early evening of the 23rd but perhaps of greater importance was the presence of the same programmes on channels E2 and E3.

Finally, on the 6th via sporadic-E, an unidentified African station was resolved between channels E3 and E4. This has been logged as channel R2 but there is no official information available to confirm its use in Africa. There is a transmission system K (in use by French Territories Overseas) which shares the same frequencies as those of system D in Band III. There are Band I allocations for this system and one of these channels, known as K3, does in fact lie between E3 and E4. However, none of the Band I

channels are known to be in use but an interesting entry was found in an early WRTHB, in which the Libreville transmitter in Gabon was listed as 'E3' and Port Gentil as E10. Both transmitters used system K. Could the prefix be wrong? This could explain Carmel's mystery reception.

During early June, the RAI-1 PM5544 was noted by a number of enthusiasts, with the 'RAI-ROMA' identification in the lower black rectangle.

Ray Davies, of Happisburgh in Norfolk, noted the Greek PM5534 test pattern on channel E3 and the Iranian FuBK test pattern on channel E2.

Andrew Webster of Billinge near Wigan saw the Syrian PM5534 test card on channel E4 on June 4th.

Service Information

Poland: Despite previous rumours, it would appear that TVP-2 will, in fact, continue to broadcast on VHF. Due to financial restrictions, only one new UHF station is taken into service each year. Many viewers would be deprived of the second network if VHF outlets were closed down.

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

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cmos 4001 - 20p, 4011 - 22p, 4017	40p
ALUMINIUM ELECTROLYTICS (Mfda/Volts)	
1/50, 2.2/50, 4.7/50, 10/25, 10/50	5p
22/16, 22/25, 22/50, 47/16, 47/25, 47/50	6p
100/16, 100/25 7p; 100/50 12p; 100/100	14p
220/16 8p; 220/25, 220/50 10p; 470/16, 470/25	11p
1000/25 25p; 1000/35, 2200/25 35p; 4700/25	70p
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2.2/35, 4.7/25, 4.7/35, 6.8/16 15p; 10/16, 22/6	20p
33/10, 47/6, 22/16 30p; 47/10 35p; 47/16 60p; 47/35.....	80p
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100/1A 1N4002 4p, 1000/1A 1N4007 7p, 60/1.5A S1M1 5p, 100/1A bridge.....	25p
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Return posting

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

Bristol rally

A busy month awaits the South Bristol Amateur Radio Club, who have been preparing for some time for the Bristol Radio Rally (special event call sign GB2BRR), to be held on September 6th.

The club also has a video evening planned for the 16th, followed by a computer activity evening on the 23rd and a lecture on the 30th. Plenty to keep the club members occupied here!

The club meets every Wednesday at the Whitchurch Folk House, East Dundry Road, Whitchurch, Bristol, Avon. For more information contact Len Baker G4RZY. Tel: Whitchurch 834282.

SMC open day

On August 30th, South Midlands Communications Ltd are holding another special open day, similar to last

year's, to celebrate the opening of their new premises - an event not to be missed, as it is not going to be held annually.

SMC are offering 10% off new equipment (except masts), cash only, and there will also be many ex-demo and second-hand bargains, as well as a car boot sale.

SMC are offering a free radio spec check, 1.8-430MHz, with prizes including an FT290R. In addition, there are many local attractions, so it sounds like an ideal family day out.

The venue is SM House, School Close, Chandlers Ford Industrial Estate, Eastleigh, Hampshire. Tel: (0703) 255111.

Space program

John Biro K1KSY is apparently the latest Digital Communications Experiment (DCE) station to interface



Roger Worth (right) of the Bristol FM TV Group gets turned on with the aid of Filton Parish Council

with the UoSAT OSCAR 11 DCE, according to *Amateur Satellite Report*, Amsat's newsletter.

John joins NK6K, N5BRG, WD0ETZ and WA9FMQ in the US, and VK5AGR among other DCE participants outside the UK. K1KSY's home packet BBS is K1UGM in Wakefield, Massachusetts.

K1KSY will be able to forward limited packet traffic to the authorised UK DCE stations and other DCE stations with which the US has third party agreements. You can monitor the DCE title frames

by observing the DCE data transfer in straight ASCII on UO-11.

Monitoring the DCE or other UO-11 data at 1200bps requires only a terminal and a surplus type 202 modem. UO-9 data can also be monitored with the same set-up.

TV repeater GB3ZZ

The Bristol FM TV repeater, GB3ZZ, was switched on at 8.30pm on June 2nd.

Filton Parish Council were very helpful in providing the site for the repeater for 'a peppercorn rent'. Without their help a small group such as the Bristol FM TV Group would have difficulty in maintaining a repeater.

The repeater is on RMT2, which has an input of 1249MHz and an output of 1318.5MHz. To date, coverage reports have been received from Bath, Portishead, Chepstow, Stroud and all over Bristol.

Construction contest

The Farnborough and District Radio Society is having a pre-AGM discussion on 9th September, while later in the month, on Wednesday 23rd, it is holding a construction contest. For further details contact the club secretary, Tim, on Camberley 29231. The club is pleased to announce the appointment of a new awards manager, Mr Ivor Ireland G4BJQ QTHR.

Club meetings are held at 7.30 for 8pm on Wednesdays at the Railway Enthusiasts' Club, Howley Lane, Farnborough.

Car boot sale

Each year the Dunstable Downs Radio Club organises and runs the National Amateur Radio Car Boot Sale, which has become a very popular rally. Although many traders are present, the event caters mainly for amateurs selling to amateurs.

There were over 250 stalls last year and more than 2,500 visitors created a great atmosphere, with people selling many items from new transceivers, computers and televisions to components, kits, aerials and, yes, some plain old 'junk'!

The club has managed to

provide a great day out for the whole family, as the event is held at one of this country's famous aircraft and motor museums, 'The Shuttleworth Collection', located at Old Warden Aerodrome, near Biggleswade, Bedfordshire. The museum has aeroplanes dating back to the pioneers of aviation, and many are still in regular flight today. Combined with a restaurant, souvenir shop, bar and children's playground, all set in the Bedfordshire countryside, this makes for an interesting and unique day out.

This year the rally will be held on Sunday 13th September. It is open from 10am till 5pm, and admission is 50p (parking free). Old Warden is about 2 miles west of Biggleswade and is well sign-posted from all major routes. Enquiries about the event and advance plot bookings can be made to Wendy on (0582) 451057, or Clive on 27907.

Bargain hunting at Dunstable Downs



Video on radio

Club secretaries should note that the Radio Communications Division of the DTI now has three videos available which can be borrowed free of charge - perfect for a club evening.

Subjects covered are the fixed links mobile service and the work carried out by the department.

To obtain the videos contact the DTI, Radio Communications Division, The Library Room, 605 Waterloo Bridge House, Waterloo Bridge Road, London. Tel: 01-275 3140 (24 hour answering machine).

Past and present

On Thursday 10th September, Ray Marden G3MWF will treat members of the Southgate Amateur Radio Club to a talk on the SARC's history.

This will take place at 7.45pm at the Holy Trinity Church Hall (Upper), Green Lanes, Winchmore Hill, London N21.

The club is also planning to operate special event station GB4EMC on 19th and 20th September at the Enfield Town Show at Enfield Town Park on HF and 2 metres.

For further details, contact Dave G4YLL on (0992) 30051.

More about Morse

The Coventry Amateur Radio Society starts its September programme with a 2 metre direction finding contest on the 4th.

For those who want to know more about Morse, special tuition and a night on the air are scheduled for the 11th and 25th.

On the 18th the club is running an evening of mini lectures, at their regular time of 8.00pm on Fridays, at Baden Powell House, 121 St Nicholas Street, Radford, Coventry.

For more details of club activities, contact Bill Hahn G3UOL, 91 The Chesils, Coventry CV5 9NA. Tel: (0203) 414684.

Exhibition weekend

The Sheffield Amateur Radio Club is holding an exhibition on Saturday 5th and Sunday 6th September, linked to the 'Sheffield Festival Spectacular'.

On the 21st the club hopes

to have a talk by Pete Sheppard G4EJP on Raynet, due to be held at 8.00pm in the Firth Park Stadium.

Details of both these events are available from Alan G8ZHG on (0742) 395287.

DX picnic

If you are in the Slough and Windsor area on 12th/13th September, the Burnham Beeches Radio Club is holding its autumn DX picnic. Bring good weather with you!

Club activities for the month include a Packet Radio demonstration on the 7th and a talk on slowscan TV on the 21st.

The BBRC meets at the Haymill Youth and Community Centre, Burnham Lane, Slough at 8.00pm on the first and third Mondays of each month.

For more information contact Eileen Chislett G6EIL on Maidenhead 25720.

RATS auction

If you want to combine bidding for bargains with a barbecue, the Rugby Amateur Transmitting Society is holding an amateur radio auction and barbecue on the 8th, admission only 20p.

The event will be held at the Cricket Pavilion, 'B' Building Entrance, BTI Radio Station, A5 Trunk Road, Hillmorton, Rugby, Warwickshire.

For further information, please contact Kevin Marriott G8TWH, 41 Foxon's Barn Road, Brownsover, Rugby, Warwickshire. Tel: (0788) 77986 (evenings only).

Hamfest

The Lincoln Short Wave Club would like a mention for their Hamfest, to be held at the Lincolnshire Showground on the 13th. A barbecue will be held on the 12th at the same venue, if the weather holds out.

Tom Arris G4OSB will present a lecture on 'QRP Communication' on the 23rd, and anyone wanting to know more about this or other activities, including a forthcoming photographic contest, should contact Pam Rose G4STO on Gainsborough 788356.

Natter night

The Bath and District ARC is holding a 'Club Natter

Night' on the 16th and a VHF night on the air on the 30th.

All meetings are at the Englishcombe Inn, Englishcombe Lane, Bath at 8.00pm. Club contact is H Welchman G6E1Y on Bath 28010 daytimes, Bath 318128 evenings.

How bazaar

The Wimbledon and District Amateur Radio Society is holding its annual bazaar on the 11th.

All meetings are on the second and last Fridays of

each month at 7.30pm in St Andrews Church Hall, Herbert Road, Wimbledon SW19.

Enquiries should go to George Cripps G3DWW on 01-540 2180.

BBC Orford

The Felixstowe and District Amateur Radio Society is staging a visit to the BBC Transmitting Station at Orford on the 21st.

The new venue for the society is the Scout Hut, Bath Road, Felixstowe. All lecture

RAE Courses

Croydon College, RAE on Mondays from 7.30 to 9.30pm, Morse on Thursdays from 7 to 9pm, starting September. For information, contact Tom G3EUU, QTHR.

Kidderminster College, Hoo Road, Worcestershire DY10 1LX, RAE from 23rd September, enrolment 7th, 8th, 9th September, 2pm-8pm, course fees £25 approx. Classes 7pm-9pm Wednesdays, plus a Morse class on Tuesdays depending on numbers. Further details from D Oakley G0DAA or Head of Department of Science and Technology on (0562) 820811.

Brunel Technical College, Ashley Down, Bristol BS7 9BU, RAE enrolment on 8th and 9th September. Mondays RAE Theory, Tuesdays Morse and Thursdays RAE practical. Tutor is Phil Brouder G3ZJH. Further details from the Department of Aerospace and Radiocommunications Engineering, on (0272) 41241, extension 2164.

Stevenage and District Amateur Radio Society (G3SAD), SITEC Ltd, Ridgmond Park, Telford Avenue, Stevenage, Herts, RAE classes from Tuesday 6th October, at 8pm. Further information from Peter Daly G0GTE. Tel: (0438) 724991 or Andy Adamson on Prestel MBX 219994795.

Reddish Vale Evening Centre, Reddish Vale Road, Stockport, Cheshire SK5 7HD, RAE classes from the beginning of the September term on Monday evenings from 7pm to 9pm, Morse on Thursday evenings 7pm to 9pm, both courses are a series of 25 sessions. Enrolment is on 14th, 15th and 17th September between 7pm and 9pm. For more information, phone Dave Wood, course tutor, on (0606) 41511 between 12.30 and 1.00pm.

Avondale Evening Centre, Heathbank Rd, Edgeley, Stockport, RAE enrolment for classes from 14th-17th September from 7.15-10.15pm. For further information, contact Mr G R Franklin (Principal) on (061) 477 2382, or Rik Whittaker G4WAU (course tutor) on (061) 427 4730. A Morse course is also planned for Mondays.

Clacton Adult Education Centre, Green Lodge, 180 Old Road, Clacton on Sea, Essex CO15 3AY, enquiries and enrolment from 7th September to 18th September. Class venue will be Colbaynes High School, Pathfield Rd, Clacton on Sea, Essex CO15 3AY. A 30-week RAE course will be held on Wednesdays from 7-9.15pm, commencing 23rd September, plus a 15-week Morse course on Tuesdays from 7-9pm, commencing 22nd September. For further information contact Green Lodge Adult Education Centre on (0255) 424151, or Mr J Harris G3LWM on (0255) 432621 (daytimes).

meetings take place at 8.00pm.

Further details from Paul Whiting G4YQC, (0473) 642595 (daytime).

Call the world

The summer issue of *Datacom*, BARTG's quarterly journal, gives details of a worldwide RTTY DX contest, its objective being for amateurs to contact others around the world in as many CQ zones as possible, using the digital modes.

This takes place over 48hrs from 0000 UTC on 26th September to 2400 UTC on 27th September, but no more than 30 hours of operation are allowed for single operator stations. Multiple-operator stations may operate the full 48 hours.

Contacts may be made using Baudot, AMTOR, (FEC/ARQ), ASCII and AX.25 (no digipeating QSOs).

Bands are 160, 80, 40, 20, 15 and 10 metres, only one contact per station allowed.

Standard CQ contest log and summary forms are to be used, samples from CQ. Please include an SAE or appropriate postage. Entries must be in by 1st December 1987 (postmark), although extensions will be considered on request. Logs should be mailed to CQ RTTY Contest, 76 N Broadway, Hicksville, NY 11801-USA.

Meter meet

The Bury Radio Society's meeting of the 8th will be on electricity metering and will be given by N Nurney of NORWEB.

Regular meetings are held on Tuesday evenings at 8.00pm in the Club Room at the Mosses Youth and Community Centre, Cecil Street, Bury.

Don't forget! We want to hear what your club or organisation is up to - write to the Editor.

Notes from the Past

To many amateurs it comes as a surprise when they discover that the new idea they have thought of, or a new application of an old one, has long since already been patented. Equally great is their surprise to find that such commonplace things as TV aerials, etc, cannot be marketed without infringing on patents covering certain aspects that are already held by someone else.

Radio and electronic patents nowadays are legion. Yet surprisingly enough we find that the first patent in the way of a 'wireless invention' was not granted until 1896. This was taken out by Guglielmo Marconi who was quicker than others in seeing the commercial possibilities of radio communications. The foundations of radio had long since been laid by the nineteenth century scientists. They had regarded their work as a contribution to scientific knowledge - but, as far as we can judge, they were blissfully unaware of the possibilities their discoveries opened up. Perhaps they did not even look upon their discoveries as having a practical value, let alone think of commercialising them.

MATMOS LTD,

1 Church Street, Cuckfield, West Sussex RH17 5JZ.
Tel: (0444) 414484/454377.

COMPUTER APPRECIATION,

111 Northgate, Canterbury, Kent CT1 1BH.
Tel: (0227) 470512. Tlx: 966134COMPAP G

DATA GENERAL ECLIPSE C840 SYSTEM comprising: ECLIPSE processor with 512kbytes MOS memory, 5 line terminal MUX type 005-6599, 2 x 50mbyte cartridge disc drives Model 6067-4, DATA PRODUCTS line printer, 8in floppy disc drive Model 6031-4 **£3800.00**

DATA GENERAL NOVA 1200 SYSTEM comprising: processor with 64kbytes core memory, magnetic tape drive Model 8021-2, 91track 800bpi, Phoenix 14in cartridge disc drive Model 6050, 5mbytes fixed + 5mbytes removable **£1250.00**

microNOVA SYSTEM comprising 3ft rack with: 8 slot backplane, box & PSU, 12mbyte 14in Winchester disc drive **£360.00**

AS ABOVE, but with addition of cartridge tape backup **£96.00**

microNOVA SYSTEM, all unused, comprising desktop mounted: Model E8711-N processor, Model E6267A dual half-height 5 1/4in floppy disc drives, Model E6271 5 1/4in Winchester disc drive, Model E8694-B2 power supply, Model 6261-2 monochrome monitor **£1290.00**

microNOVA Model MPT/100 SYSTEM with the following features: terminal sized desktop unit, m1802 processor with 64kbytes RAM, 2 x RS232 interfaces, connector for microNOVA 1/0 bus, dual D5DD 5 1/4in floppy disc drives, 83 key keyboard, green screen 12in monitor, 25 x 80 **£385.00**

DATA GENERAL MODEL 6220 8in Winchester drive, 6mbytes £380.00

DATA GENERAL Model 6041 DASHIER TP 1 printer, Serial interface 300/600B **£180.00**

DATA GENERAL Model 6052 DASHIER VDU TERMINAL, All Baud rates to 19200B **£190.00**

DATA GENERAL DASHIER 100 terminal £96.00

MONOCHROME MONITOR, With 12in green screen, composite video input, 20MHz bandwidth, all power supplies & attractive case. BRAND NEW **£49.50**

PLEBSY Model T24 V22/V22 bis MODEM, Compact, automatic modem featuring the latest technology & the highest possible data rate over the ordinary phone system. Offers both V22 & V22 bis compatibility, 1200/2400 Baud operation with auto bit rate recognition, operation on both ordinary phone (PSTN) & private circuit (PC), auto call and auto answer, duplex operation allowing simultaneous transmission & reception of data at 2400 Baud in both directions over a single phone line, compact size (9in x 9in x 2 1/2in), BT approved & suitable for new PRISETEL V22 bis service. Price includes software for use with public domain comms packages for IBM PC. BRAND NEW **£299.00**

VICTOR SpeedPac IBM PC ACCELERATOR, Half-wide 80286 accelerator card for IBM PC & compatibles. With 8kbyte cache memory & 7.2MHz 80286 processor. Offers AT/Peorant System 2 performance for a fraction of the cost. Runs up to 7.5 times faster. BRAND NEW **£199.00**

ITT SCRIBE III WORD PROCESSING SYSTEM, Professional system originally selling at around £5000 without printer. Now offered with software included & a variety of different options (including hard disc, comms, etc) available. This system is available from us ALL BRAND NEW at the cost of current budget systems, but with office-quality performance & features. With dual processor workstation (TI 9995 & Z80H), 12in green display with slow scrolling, 128kbytes RAM, dual 500kbyte SHUGART 5 1/4in floppy disc drives, & comprehensive software. **£290.00**

TOSHIBA Model T300 PC SYSTEM, 8088 (6MHz) based system with 192kb memory, 2 x half height D5DD floppy disc drives each of 655kb capacity (unformatted), high resolution green display 25 x 80 characters, RS232 & CENTRONICS parallel interfaces, MS-DOS Ver 2 & T-BASIC are included together with a diagnostic disc & manuals. We have low cost packages available now, including Word processing, Spreadsheet etc. BRAND NEW **£296.00**

AS ABOVE, but with single floppy disc drive **£249.00**

TOSHIBA Model T100 CP/M SYSTEM, With 64kb RAM, dual 500kb 5 1/4in floppy disc drives, serial & parallel interfaces. BRAND NEW **£149.00**

MATMOS TERMINAL, MATMOS PC with Ver 2 EPROM for terminal emulation. Probably the lowest cost terminal available anywhere. With set-up menu & with data rates up to 9600 Baud. Machine is easily modified for split Baud rate operation, 75/1200B, EPROM plugs into ROM socket accessible from exterior. Emulation is VT-52 compatible for cursor addressing; and for character attributes as far as the MATMOS PC allows. MICROSOFT BASIC is still available from the keyboard. (EPROM card on its own, £20.00. EPROM card with socket only for user's own EPROM, £8.00) BRAND NEW **£99.00**

NTACM Model 3058/8X 3in disc drives, With SHUGART compatible interface as for 5 1/4in drives. Unformatted, 125K (single density) or 250K (double density); 40 track; 100psi; soft sector; 3ms track to track time; standard 34 way edge connector, 12V & 5V powered (standard connector) with overall 3.7W typical power consumption. These drives have been tested by us on the BBC with DFS, on the AMSTRAD 612B and on the TATUNG EPROM, and are also known to be suitable for the AMSTRAD 664 & as a second drive for the AMSTRAD 464. Single sided, 250kb unformatted. BRAND NEW. Data cables are available from us for the AMSTRAD 612B & BBC at £7.50, and an installation pack including data & power cables with instructions is available for the TATUNG Einstein at £12.00 **£24.95**

KENTRON Model ADM 65H VDU, 24 x 80 Intelligent VDU with TELEVIDEO 920/925 emulation. Features include, non volatile set-up with status line, auxiliary port, all Baud rates 50-19200 Baud, cursor addressing, etc **£185.00**

DEC PDP 11/73 SYSTEM with DZV 11 asynchronous multiplexor, DLV 11 serial interface, BA11-66 9x 4 backplane, TANDON 8in floppy disc drive with DILOG Model RIVX-24 controller, 2 x AMPLEX PYXIS 27 5 1/4in Winchester disc drives with DILOG DR 614 controller, All contained in DEC cabinet with DEC power control, 512kb memory **£3960.00**

TOSHIBA HIGH RESOLUTION COLOUR MONITOR, RGB input, BRAND NEW **£100.00**

TOSHIBA LOW RESOLUTION COLOUR MONITOR, IBM compatible with RGB input. BRAND NEW **£96.00**

FUJITSU Model M2230AS 6 1/4in WINCHESTER disc drive, 6.66mbyte capacity unformatted, 16/32 sectors, 320 cylinders. With ST506 interface. BRAND NEW **£78.00**

DEC Model BA 11MF box, power supply & 8 slot backplane for Q-bus. BRAND NEW **£185.00**

ADAC Model 1822 128kbyte CMOS memory for Q-bus, With battery back-up **£179.00**

HATFIELD INSTRUMENTS Type 2105 50 ohm attenuator **£40.00**

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HEWLETT PACKARD Model 59307A dual VHF switch, DC to 500MHz 50 ohm switch for HP-IB **£185.00**

HEWLETT PACKARD Model 5045A digital IC tester with CONTRLE Model H310 automatic handler, With IEEE interface & print out of test results either pass/fail or full diagnostic including pin voltages at point of failure. With full complement of pin driver cards & complete with substantial library of mag card test programs for 74 series TTL & other ICs. CONTRLE handler allows fully automatic testing of ICs which are sorted into 2 bins. Price includes a second HPS045A (believed fully operational) for maintenance back-up **£1950.00**

TEKTRONIX Model 577 SEMICONDUCTOR CURVE TRACER, With 5 heads for various diodes & transistors. In excellent condition **£1750.00**

TIME ELECTRONICS Model 9610 programmable power supply **£160.00**

TIME ELECTRONICS Model 505 DC current source, 0.05%, With leather case **£55.00**

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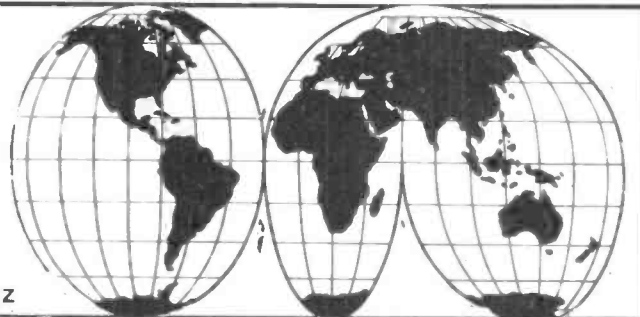
SPECTRA PHYSICS Model 170 HIGH OUTPUT ARGON ION LASER, 20 watt output laser (including approx 2W UV output) with tube newly refurbished **POA**

Please note:
* VAT & carriage must be added to all prices. Please enquire for details.
* All new equipment is guaranteed for 6 months.

SHORT WAVE NEWS FOR DX LISTENERS

By Frank A Baldwin

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



I last presented a review of some Bolivian transmitters, then operating on the low frequencies, some years ago. In this update, information both on the country and the current Bolivian short wave radio scene is presented for the interest of newcomers and those DXers whose aim is to log some of the stations in Bolivia.

The Republic of Bolivia in west South America is one of two inland countries on the continent, the other being Paraguay. The legal capital is Sucre, La Paz being the political and commercial centre.

The eastern part of Bolivia is tropical, the northern section being in rain forests drained by rivers of the Amazon basin. The southern part merges into the Chaco whilst the western part is Andean, one cordillera of which traces the border with Chile. The other cordillera runs north to south through the centre of the country. In the south-west there is a large salt plain and in the north-west is the great basin of Lake Titicaca.

On the high Altiplano (plateau) and contained in valleys are the main centres of urban development, industries and transportation.

Bolivia is fortunate to have some of the richest mines in the world, products of which include antimony, bismuth, copper, gold, lead, silver and wolframite. The important mining centres are Oruro and Potosi, the cities of Cochabamba and Tarija being agricultural and commercial centres.

Indian settlements were in evidence long before the country became part of the Inca empire, the Spanish conquistadores beginning their conquest in 1538. A large percentage of the population, some fifty per cent in fact, is of Indian stock, the remainder being of white and mixed descent.

The official language is

Spanish, the state religion being Roman Catholic, and the country is governed by a President and Congress. The Bolivian peso was devalued in January of this year, being replaced by the Boliviano, one million of the former equating to a single Boliviano.

DXing Bolivia

The reception of Bolivian transmissions is a far from easy matter. Reports of such transmissions tend to be sparsely scattered in the European and UK short wave listener press. The difficulties involved are mostly those associated with the low powers of many of the stations, who exist solely by catering for the inhabitants of the respective service areas. Moreover, as will be noted below, many Bolivian stations operate on out-of-band channels often subjected to commercial interference.

Both late night and early morning listening sessions are the order of the day when one is attempting to tune to Bolivian transmissions, this being impractical to many listeners, who are required to attend their respective places of work during weekdays. Weekends are therefore preferable when planning a late night or early morning session, the hope being that propagation conditions prove helpful in Latin American reception.

Start here

On **4421.6** Radio Reyes, Reyes, is scheduled from 2315 to 0335. Listed with a power of 0.4kW, it is thought to have recently installed a 1kW transmitter. It has reportedly been heard signing-off at 0240. This one has been logged several times recently by the writer.

I should mention here that only those scheduled time slots coinciding with a period during which reception would be possible for us here in the

UK are included in this update.

Radio Santa Rosa, Santa Ana, on **4440** programmes in Spanish from 2300 to 0230 with a power of 1kW, but is seldom heard outside the locality.

Radio Capitan Victor Ustari, Villa Tunari, identifying as La Voz de Tropic, on **4458.2** is on the air from 2100 to 0200 at 0.3kW.

In Santa Ana de Yacuma, Radio Movima is on the air from 2200 to 0300 at 1kW. It is reported from time to time by European DXers and has been entered into the log-book here several times of late. The frequency is **4471.9**.

Also in the town of Santa Ana de Yacuma is the transmitter of Radio Santa Ana which currently operates on **4648.5** with a power of 1kW. The current schedule is not known but it has been reported by DXers at 2330 and logged by the writer at 0121.

Guayamerin is the home of Radio Paititi, entertaining the local populace on **4682.2** from 2100 to 0300 at 5kW. This one has also been heard several times recently during good conditions for Bolivian reception here in the UK.

The frequency of **4710** is that of Radio La Voz de la Frontera in Puerto Suarez, operating in Spanish from 0900 through to 0330 at 0.5kW.

Radio Abaroa, Riberalta, is on **4712.4** from 1100 to 0400 with a power of 0.5kW, being logged here at 0158.

On **4712** are the signals from Radio Los Andes, Tarija, working to its stint from 1000 to 0400 (Sunday around-the-clock). Often heard in Europe, the power is 2kW.

Logged by the writer and other UK DXers on several occasions over the past few years have been transmissions emanating from Radio Nueva America located in La Paz. The power is 1kW and it is on the air from 2200 to 0400, the current frequency now being **4794.9**.

Radio Emisora Libertad,

Santa Fe, on **4810** is scheduled in Spanish from 1000 to 0300 at 1kW but alas co-channel occupants deny SWLs world-wide a logging.

Radio Grigota in Santa Cruz de la Sierra on **4829.6** transmits from 2200 to 0300 (Sunday from 1100 to 0100) with a power of 5kW.

La Paz and locality is served by Radio Fides on **4845** from 1000 to 0300 (Sunday from 1200 to 0315) with a power of 5kW.

Radio Paititi, Radio Fides and Radio Grigota, all at 5kW, do represent primary targets for newcomers to the Bolivian hunt.

The 1kW Radio El Condor in the town of Uyuni is scheduled from 1100 to 0210 on **4855**. It is rarely heard in our part of the globe.

Radio 16 de Marzo, Mina Bolivar, is now reportedly on **4864.3**, and reactivated, this represents a change of frequency from the former **3365** channel.

This update will be continued in the next issue.

ISWL '87

Readers interested in the short wave broadcast bands will be interested to know that the International Short Wave League 1987, which commenced operations on 1st January this year, currently offers to its membership twelve different DX award certificates, these being available post free to members and applicable to both amateur and broadcast interests.

Each month a broadcast band is specified as the Featured Band, this being surveyed by members. Subsequent reports to league headquarters are collated and published in the monthly journal, *Monitor*, providing an indication of current activity on the set band. Additionally, results obtained on other bands are featured.

Articles of broadcast interest to both international and tropical band listeners and

DXers are published, in addition to amateur band coverage.

Various free services exist for members, including IBIS (ISWL '87 Broadcast Bands Identifications Service), which provides station identifications to those seeking answers to their unidentified loggings.

Details may be obtained from ISWL HQ, 10 Clyde Crescent, Wharton, Winsford, Cheshire CW7 3LA. A sample copy of *Monitor* is available at 60p post paid.

AROUND THE DIAL

AFRICA

Botswana

Gaborone on **3356** at 1846, UK recorded pop songs and music, announcements in SeTswana. This 50kW transmitter is on the air in English and SeTswana from 0400 to 0700 and from 1500 to 2100.

Cameroon

Yaounde on **4850** at 2102, OM with an English newscast of local events. The schedule, in French and English, is from 0430 to 0700 and from 1630 to 0002. The power is 100kW.

Cape Verde

Radio Nacional de Cabo Verde on **3931** at 1957, folk songs in Portuguese together with local style music. The power is 10kW, the schedule being from 1900 to 0005 entirely in Portuguese.

Malawi

Blantyre on **3381** at 1845, OMs with a discussion in Chichewa. The schedule is from 0255 to 1105 (Sunday from 0325) and from 1300 to 2210. The power is 20kW.

Niger

Niamey on **3260** at 1947, YL with a song in French. Difficult to log owing to on-channel commercial interference, Niamey operates in 0530 to 0645 and from 1700 to 2201 (Sunday until 2301) entirely in French.

CENTRAL AMERICA

Costa Rica

Faro del Caribe (Light-house of the Caribbean), San Jose, on **5055.2** at 0425, OM with announcements, some songs in Spanish with music

typical of the locality. This 5kW transmitter operates from 1100 to 1800 and from 2300 to 0600 (Saturday and Sunday until 0612). There is an English programme timed from 0300 to 0400.

Dominican Republic

Radio Clarin, Santo Domingo on **11700** at 0120, OM with a CID (Cuba Independiente Y Democratica) identification, followed by a talk in Spanish about Cuban involvement in Angola.

SOUTH AMERICA

Brazil

Radio Sao Carlos on **2420** at 0153 on a good night for South American reception here in the UK, OM with promos complete with echo-effect then YL with a song in Portuguese. This 0.5kW transmitter is scheduled from 0800 to 0330.

Radio Difusora, Sena Madureira on **4117** at 0057, OM with announcements in Portuguese, YL with a ballad. The schedule is from 1000 to 0300 at 1kW.

Bolivia

Radio Padilla, Padilla on **3474.4** at 0005, announcements and folk songs in Spanish. At 0.5kW, R Padilla is on the air from 2200 to 0330 in Spanish.

Radio Abaroa, Riberalta on **4712.4** at 0158, OM with a ballad then YLs with a duet in Spanish. The schedule is from 1100 to 0400 with a power of 0.5kW.

Ecuador

Radio Nacional Espejo, Quito on **4679.9** at 0126, announcements followed by a talk in Spanish. RN Espejo operates from 1100 to 0500 at 5kW.

Peru

Radio Universo, San Ignacio on **6815.2** at 0202, YL with a ballad then OM with an announcement in Spanish. The schedule is from 2300 to 0300, the power unknown.

Venezuela

Radio Occidente, Tovar on **3225** at 0337, folk songs and music then an announcement in Spanish. At 1kW, R Occidente is on the air in Spanish from 0955 to 0400.

ASIA

India

AIR Delhi on **9910** at 2135, play theatre in an English presentation to Australasia timed from 2045 to 2230.

Jordan

Amman on **9560** at 1405, OM with a talk in English about the history of some African countries, station identification then the pop song 'Puppet on a String'. The English programme from Amman to the Western Middle East is from 1200 to 1600.

Pakistan

Karachi on **15605** at 1410, cricket commentary in the English Service directed to the Persian Gulf area and the Middle East from 1315 to 1545. Islamabad was in parallel on **11615** and **15190** at the time of reported reception.

Qatar

Doha on **11820** at 1843, local style music and OM with a song in the Arabic programme for Europe, timed from 1700 to 2120.

North Yemen

San'a on **9780** at 0337, OM with a harangue in Arabic during the Home Service transmission timed on this channel from 1000 to 2110.

SOUTH-EAST ASIA

North Korea

Pyongyang on **9960** at 2007, YL with a news bulletin during the English programme directed to the Middle East, scheduled from 2000 to 2050.

Vietnam

Hanoi on **15010** at 1900, National Anthem, YL with the station identification followed by the local news. This English transmission to Europe is scheduled daily from 1900 to 1930.

PACIFIC

Australia

Carnarvon on **9655** at 0850, OM with news of local sporting events in an English programme of the Pacific Islands Service timed from 0700 to 1030.

Shepparton on **11910** at 0600, OM with the station identification and a time check, followed by news of Pacific events and affairs.

This English programme is beamed to the South Pacific area from 0400 to 0630.

CLANDESTINE

Radio Iran on **7070** at 1827, the 'Internationale' then YL with the station identification and a talk in Farsi (Persian). This transmission is for Middle Eastern consumption, the frequency used resulting in difficult reception due to amateur band transmissions. This clandestine transmitter, formerly announcing as Free Voice of Iran, is located in Iraq. Radio Iran is organised by the National Resistance Movement of Iran and is pro-Bakhtiar, the ex-PM.

Radio Iran Toilers on **10870** at 1548, YL and OM alternate with items of, presumably, news in Farsi. Scheduled to the Middle East from 0230 to 0330 and from 1530 to 2100, this clandestine station broadcasts via Radio Afghanistan facilities and is pro-Iranian Tudeh (Communist) Party. It identifies as Radio-ye Zahmatkeshan-e Iran.

NOW HEAR THESE

Xinjiang PBS, Urumqi, China on **2560** at 2225, mandolin orchestral music with announcements in the higher programme scheduled from 2200 to 0130 with a power of 50kW.

Radio Orion, Johannesburg, S Africa, on **3955** at 1958, announcements in English then the song 'Oh Play to me Gypsy'. This Afrikaans/English programme is radiated from 1930 to 0300. The power is 100kW.

Radio Candip, Bunia, Zaire on **5066** at 1844, songs and local style music, OM with announcements in vernacular. The schedule is from 0330 to 0600 and from 1300 to 1915 in French and local vernaculars. The power is 10kW, the frequency is subject to commercial interference.

NOW LOG THESE

Radio Zaracay, Santo Domingo, Ecuador on **3395** at 0354, YL with a ballad in Spanish, OM with some announcements then sign-off without the Hymno Nacional at 0400. The power is 25kW and the schedule is from 1000 to 1400 and from 1900 to 0400 entirely in Spanish. NEW

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Advertisements will be inserted in the first available issue on a first come first served basis. We reserve the right to edit and exclude any ad. Trade advertisements are not accepted.

FOR SALE

■ AOR AR2002 scanner in mint condition, only 1 week old. Boxed with power supply, battery lead and telescopic whip aerial, £450. Extra coverage of 800-1300MHz not required, hence reason for sale. Also SSB adaptor for Grundig Satellit 2000/2100, £20. Telephone Brian on Dungannon (08687) 24029 between 0930 and 1200 (Mon-Thur) or after 1830 any evening

■ Dressler active antenna, ARA-30 200kHz to 40MHz, as new. Purchased Feb '87 cost £122, bargain at £80. Tel: Kirkham 683098, Lancs

■ TV-DXers! Are you interested in TV-DX? If so, *Screen Europe* is the newsletter for you! It covers all aspects of long distance TV reception with logs, photos, programme schedules, articles and much more! For a free sample copy and full subscription details send an SAE to O Anderson, 2 Burry Rd, Silverhill, St Leonards, East Sussex TN37 6QX

■ R2000 Trio with VC10 + CW filter, offers over £500 for this super receiver. 100kHz to 174MHz. New model has come so need space. Tel: after 6pm (0706) 218290

■ 3 Pye Motophones, high band AM, £40 each or £110 for the 3. One high band Burndept FM unit, no mic or I/spkr, squelch fault, £50. Bags of 100 new mixed components, £2.50 each. Xtals type T71K asst freq's, £1.00 each or 10 for £8.00. Buyer to pay post and packing. Tel: C R Cooper, (0705) 386254

■ Goldring Lenco GL75 stereo, 4 speed transcription, turntable, in teak case with Shure M55E cartridge. No rubber turntable mat. Also Eddy-stone type 820 FM tuner. Tel: (0730) 62049

■ Trio 9000 2 metre t/ceiver, boxed. Trio dc power supply, PS20. Base unit BO-9. Also peak reading wattmeter 5, 20, 200 watts. Offers to George GI4OHI. Tel: (0232) 860243

■ Geared tuning condenser for HRO receiver, good condition, mains transformer, 230/250 in, 115V out. Genuine Ericsson BBC headphones (vintage), Burroughs tape cassette drive module, 150 untested (cased) home-brew ATU for amateur bands, transmit, receive, transformer ex CR100, working, offers. Borthwick, 92 Linglie Road, Selkirk, Selkirkshire TD7 5BD

■ Solartron regulated power unit 2 x 6.3V, 5 amps, 20-500V, variable 300mA, 0-170V negative line. Built like a tank. Offers. Almost complete 19 set MKIII, free to good home. Sinclair Mk14 with improved keyboard and display tape interface, manual and book *Understanding Micros with MIC14*, £35. David, 160 Thoday Street, Cambridge CB1 3AX. Tel: (0223) 210722

■ Hewlett Packard 1415A time domain reflectometer (pulse test set) in 140A oscilloscope, with manuals, £15. Or swap 1415A module for 'scope timebase module. Phone Alan (0342) 312329, after 6pm

■ HP-41CX calculator, perfect condition, £125. Also CWR-610 RTTY decoder, £100. Microwave Modules MTV435 TV-Tx, £100. Diawa IR mobile mic, £15. 250A 100piv diodes, £3 ea. PT100 temp controller, £10. 100 kilowatt valve type RS-3150CS, offers. This item very heavy, prefer buyer collect. Contact Iain GM1PSU. Tel: (0506) 857262

■ Sony ICF6700D, mint in box with PSU, £95. Apple 80 col card, £15. Will swap for SX200N with cash adjust. Phone New Milton, Hants (0425) 616490

■ Tristar 747 120 channel AM, FM, USB, LSB, will convert to 10m, £40 ono. 6 amp 13.8V PSU, £12 ono. Write to S R Mohan, 75 Pennine Road, SK13 9UL

■ Yyoko UHF/VHF system B/G/I TV for British and Continental, unwanted present, offers. NATO 2000 for sale, suitable to convert to 10MHz, offers. R2000 memory, 3 months old, £375. Tel: (0283) 221870

■ Iwatsu 20MHz dual beam 'scope, excellent condition, manual probes, £200. No offers, worth over £300. Or exchange for Cortex computer

(working), preferably with disc support, or exchange for Amstrad or Commodore + disc, or cassette units. Enclose stamp for reply. Technics SL10, linear tracker t/table, needs new perspex inlay and stylus, otherwise immaculate, worth when new £250+, definitely good buy at £150. No offers. Write with stamp first to: Millhouse, 7 Bentinck Street, Mansfield, Notts NG18 2QQ

■ R107, stored last 20 years, don't know if it works! £20. Also SX27 VHF, £20. Trio MC60A desk mike, as new. Buyer collects. Tel: (0908) 313507, Milton Keynes

■ Trio TS820 with digital frequency readout equal to TS820S. Complete with YG-88C CW filter and MC35S noise cancelling mic. Modified for Amtor use and also for operation on 10MHz. Recent new driver and 6146B PAs. Excellent condition, £440. Will deliver for cost of petrol. Also ICs FAX-1 decoder. Requires G/C receiver and Epson compatible printer, £200. G3RDG. Tel: 01-455 8831 QTHR

■ FRG9600, all mode scanning receiver, modified 60-950MHz, no gaps, as new, £325 ono. Icom AH-7000 super wideband omnidirectional antenna, stainless steel discone, covers 25-1300MHz. Tel: 01-472 9056 after 6pm, £45 ono

■ Panel mounting meters, mostly MA: 0 to 10MA, 0 to 15, 0 to 20, 0 to 50, 0 to 100, 0 to 1A, £3 each. Will sell separately. Please write for details. Bewlet, 26 Summerfield House, Guilden Sutton, near Chester, Cheshire CH3 7SW

■ FRG7700 receiver with FRT7700 ATU and service manual, both as new, £285. *World Radio and TV H/book*, 1987 edition, £9.00. Bound volume 1973/4 *Radio and Electronics C/structor*, good condition, offers. *TV Explained* by Miller and Spreadbury, 1957, Band I/III, offers. *DX-TV Reception* by Roger Bunney, offers. Geared tuning condenser for HRO, good condition, offers. T/former 115V out, offers, buyer collects or pays carriage. Borthwick, 92 Linglie Road, Selkirk, Selkirkshire TD7 5BD

■ Yaesu FRG9600 Mk2. Coverage 100kHz 950MHz using ADK HFC1 HF converter antenna socket, with PA4C ac adaptor. 5 months old, four hundred pounds or near offer. Jack Wingrove, 114 Wakehurst Road, London SW11 6BT. Tel: 01-228 4835

■ MM 70cm transverter 2mtr i/p, £110. Rig frame store kit 3 PCB with memory chips, 18 other chips plus nearly all RC switches, etc, £45. Electronic multimeter with 50/75 ohm RF probes with leads, etc, £27. JVC 3 inch b/w TV/rad TV bands 1/3/5, suit DX-TV with ac PSU, £60. Atari games, various from £2. Atari ham progs Morse, Maidenhead, calcs £3.50 disc/cass. Tel: Ben (0562) 743253

■ Tentec Argosy HF transceiver, with PSU, calibrator, audio filter inbuilt, xtal CW filter. Mobile leads, manual plus Tentec ATU, all vgc, £450. Original boxes. Yaesu FRG7 Rx with external freq counter and details, manual, vgc, £120 ono (in original boxes). HF beam TB3 MK2, £100 ono. G4GWE. Tel: Milton Keynes 511129

■ Trio R1000 receiver, AT1000 ATU, royal blue froled dipole, £240. Sony Air-7 scanner, boxed and in mint condition, £180. Paul. Tel: Northampton (0604) 413131 after 5.30pm

■ Scanner users, I have photocopies of service manuals for the following scanners: Tandy, Realistic, Pro 30, Pro 31, Pro32 and Pro2021, Yaesu, FRG9600 and combined AOR 2001-2002 (UK) version, all at £6.00 inc P&P. Phillips. Tel: 01-743 0811

■ WKS1001 Tx/Rx, £60 ono. Also magazines April 1985 to December '85 except July '85 *Radio Communication*, and January '86 to December '86 *Radio Communication*. Also January to July '87 *Radio Communication*, January '85 to December

'85 except February '85 *Amateur Radio*. And January to February '86 *Amateur Radio*, February to June '85 *Practical Wireless* and June '84 to December '84 *Radio Electronics*, January '85 to December '85 *Radio Electronics*, and January '86 to December '86 except July '86 *Radio Electronics*. Also January to July '87 *Radio Electronics*. Finally February, April, June and July 1985 *Ham Radio Today*, and February and May '85 *Short Wave Magazine*. All in good condition. Sensible offers only. Mr Martin Fuller, 37 Greenfield Close, Eccles, Nr Maidstone, Kent ME20 7HU. PS have just found the July *Radio Electronics*!

■ Free: Large quantity of components, including some transistors, just send stamp. Some larger items, £1 post. Not just electronic parts but some photographic items too. Send stamp for list. All by post only. Mr Lawrence, 7 Griffin Crescent, Littlehampton, Sussex

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Radio & Electronics World

The communications and electronics magazine

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313. 5-sub miniature micro switches
316. 1-round pin kettle plug with moulded on lead
453. 2-2 1/2 in 80ohm loudspeakers
454. 2-2 1/2 in Bohm loudspeakers
463. 1-mains operated relay with 2 sets c/o contacts
464. 2-packets resin filler/sealer with cures
465. 3-5A round 3 pin plugs will fit item 193
466. 4-7 segment I.e.d. displays
470. 4-pc boards for stripping, lots of valuable parts
473. 1-5" 4ohm speaker with built in tweeter Radio mobil
480. 1-3A double pole magnetic trip, saves repairing fuses
498. 4-1000uf 25V axial electrolytic capacitors

3" DISCS For our £27.50 F.D.D.—Amstrad 664, Einstein, etc, pack of 10 £25, ref 25P3 or sample £3, ref. 3P24.

COMPACT FLOPPY DISC DRIVE For Only £27.50

As used in the Amstrad 664/6128, the Einstein and other popular computers. Drives the new standard disc, only 3" but with a capacity of 500k per disc, this is equivalent to the 5 1/4" disc. Other features are:

1. It has the shugart compatible interface (34 way edge connector).
2. It is plug compatible with the 5 1/4" disc, the recording method, data transfer rate and rotation speed are the same as 5 1/4".
3. Is fitted with long life brushless motor and uses steel band driving for reliability and assessing at 3ms.
4. Its touch loading mechanism makes easy handling and disc slot protects against dust.
5. The back of the disc in use can be seen, and up to four drives may be daisy chained.

We include the operator's manual and other information showing how to use this with popular computers BBC, Spectrum, Amstrad etc. Brand new and at only £27.50 including post and VAT.

Data available separately £2, refundable if you purchase the drive.

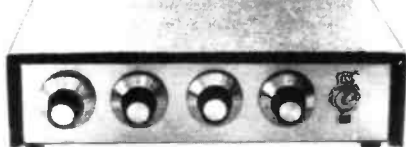


Ex-Electricity Board Guaranteed 12 months.

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.

SOUND TO LIGHT UNIT



Complete kit of parts of 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 1/2" sockets and three panel mounting hole provides proper thyristor protection. A four pin plug and socket facilitate ease of connecting lamps. Special price is £14.95 in kit form.

NEW ITEMS

Some of the many described in our current list which you will receive with your parcel.

RE-WIRING*

Here's a bargain for you - M.E.M. 3 circuit splitter 45A switch with 3x15A rewirable fuses normal cost over £10, but yours for only £5. Our ref SP100.

AUTO TRANSFORMER BARGAIN

200W 230/115V encapsulated into a very neat unit, size 4x4x1 1/2" approx. Only £3, plus £2 post. our ref 3P22.

HOW ARE YOU GOING TO KEEP YOUR CHILDREN OUT OF MISCHIEF THIS SUMMER?

Why not buy them a computer, they can have fun and be learning at the same time. We have a real bargain the "Acorn Electron" it comes complete with mains adaptor, TV lead, starter cassette and two handbooks. The only extra you need is a cassette recorder. It's ideal for all the family and Dad, while the kids are not playing their games on it you can even do some of your office work with it. This computer as its 300 page handbook shows can do most things that the BBC computer can do but will only cost you a fraction of the price only £39.50 plus £2 post.

SOFTWARE

To go with the Acorn, £1 each or 5 for £4.00.

- Desk Diary Hopper
- Business Games Sphinx Adventure
- Starship command Arcadians
- Chess Boxer
- Snapper

9" VDU

Ideal to work with computers or video cameras uses Philips black and white tube ref M24/306W. Which tube is implosion and X-ray radiation protected. VDU is brand new and has time bases and EHT circuitry, requires only a 16V d.c. supply to set it going. It's made up in a lacquered metal frame work but has open sides so should be cased (if you are hands-on a drill and file you could make a case out of two of our 6 1/2" speaker cabinets). The VDU comes complete with circuit diagram and has been line tested and has our six months guarantee. Offered at a lot less than some firms are asking for the tube alone only £16 plus £3 post. We also have some that failed the line test again brand new but offered without guarantee at £8 plus £3 post.

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 which we guarantee is ten times more powerful than other popular kits. Price includes case and instructions. £9.50 plus £2.00 post.

TELEPHONE BITS

- Master socket (has surge arrester - ringing condenser etc) and takes B.T. plug..... £3.95
- Extension socket..... £2.95
- Dual adaptors (2 from one socket)..... £3.95
- Cord terminating with B.T. plug 3 meters..... £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
- 100 meters 4 core telephone cable..... £8.50

J & N BULL ELECTRICAL

Dept. R.E., 250 PORTLAND ROAD, HOVE, BRIGHTON, SUSSEX BN3 5QT

MAIL ORDER TERMS: Cash, P.O. or cheque with order. Orders under £20 add £1 service charge. Monthly account orders accepted from schools and public companies. Access & B/card orders accepted. Brighton 0273 734648. Bulk orders: write for quote.

£2 POUNDERS*

- 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
- 2P6 -100W mains to 115V auto-transformer with voltage tappings
- 2P8 -Mains motor with gear box and variable speed selector. Series wound so suitable for further speed control
- 2P9 -Time and set switch. Boxed, glass fronted and with knobs. Controls up to 15 amps. Ideal to program electric heaters
- 2P10 -12 volt 5 amp mains transformer
- 2P12 -Disk or Tape precision motor - has balanced rotor and is reversible 230V mains operated 1500 rpm
- 2P14 -Mug Stop kit - when thrown emits piercing squawk
- 2P15 -Interrupted Beam kit for burglar alarms, counters, etc
- 2P17 -2 rev per minute mains driven motor, ideal to operate mirror ball
- 2P18 -Liquid/gas shut off valve mains solenoid operated
- 2P19 -Disco switch motor drives 6 or more 10 amp change over micro switches supplied ready for mains operation
- 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
- 2P26 -Counter resettable mains operated 3 digit
- 2P27 -Goodmans Speaker 6 inch round Bohm 12 watt
- 2P28 -Drill Pump - always useful couples to any make portable drill
- 2P31 -4 metres 98 way interconnecting wire easy to strip
- 2P32 -Hot Wire amp meter - 4 1/2 round surface mounting 0-10A - old but working and definitely a bit of history
- 2P34 -Solenoid Air Valve mains operated
- 2P38 -200 R.P.M. Geared Mains Motor 1" stack quite powerful, definitely large enough to drive a rotating aerial or a tumbler for polishing stones etc.
- 2P43 -Small type blower or extractor fan, motor inset so very compact. 230V
- 2P46 -Our famous drill control kit complete and with prepared case.
- 2P49 -Fire Alarm break glass switch in heavy cast case
- 2P51 -Stereo amplifier, 3w per channel
- 2P55 -Mains motor, extra powerful has 1 1/2" stack and good length of spindle
- 2P62 -1 pair Goodmans 15 ohm speakers for Unix
- 2P64 -1 five bladed fan 6 1/2" with mains motor
- 2P66 -1 2Kw tangential heater 115v easily convertible for 230V
- 2P67 -1 12v-0-12v 2 amp mains transformer
- 2P68 -1 15v-0-15v 2 amp mains transformer
- 2P69 -1 250v-0-250v 60 mA & 86.3v 5A mains transformer + 50p post
- 2P70 -1 E.M.I. tape motor two speed and reversible
- 2P72 -1 115v Muffin fan 4" x 4" approx. (s.h.)
- 2P75 -1 2 hour timer, plugs into 13A socket
- 2P82 -9v-0-9v 2 amp mains transformer
- 2P84 -Modem board with press keys for telephone redialler
- 2P85 -20v-0-20v 1/2A Mains transformer
- 2P88 -Sangamo 24 hr time switch 20 amp (s.h.)
- 2P89 -120 min. time switch with knob
- 2P90 -80 min. time switch with edgewise engraved controller
- 2P97 -mains transformer 24V 2A upright mounting
- 2P98 -20m 4 core telephone cable, white outer
- 2P99 -500 hardened pin type staples for telephone cable
- 2P101 -15V mains transformer 4A upright mounting
- 2P105 -capillary type thermostat for air temperature with c/o switch
- 2P108 -mains motor with gear box giving 110rpm
- 2P109 -5" wide black adhesive pvc tape 33m, add £1 post if not collecting

OVER 400 GIFTS YOU CAN CHOOSE FROM

There is a total of over 400 packs in our Baker's dozen range and you become entitled to a free gift with each dozen packs.

A classified list of these packs and our latest "News Letter" will be enclosed with your goods, and you will automatically receive our next news letter.



£4 POUNDERS*

- 4P9 -Ace Prestel Unit new but less most ICs. Contains useful Modem. Add £1 post
- 4P14 -Mains transformer upright mounting 43V 3.4V output, add £2 post
- 4P15 -Motor with gearbox final speed 60rpm very powerful would operate gate etc.
- 4P17 -Unselector 3 pole 25 way, as used on automatic telephone exchange etc.

£5 POUNDERS*

- 5P1 -12 volt submersible pump complete with a tap and switch, an ideal caravan unit.
- 5P2 -Sound to light kit complete in case suitable for up to 750 watts.
- 5P6 -12V alarm bell with heavy 6" gong, suitable for outside if protected from direct rainfall. Ex GPO but in perfect order.
- 5P12 -Equipment cooling fan - mini snail type mains operated.
- 5P15 -Unselector 4 pole, 25 way 50 volt coil
- 5P18 -motor driven water pump as fitted to many washing machines
- 5P20 -2 kits, matchbox size, surveillance transmitter and FM receiver
- 5P23 -miniature (appr. 2 1/2" wide) tangential blow heater, 1.2kw
- 5P24 -1/2 hp motor, ex computer, 230V, mains operation 1450rpm. If not collect add £3 post
- 5P25 -special effects lighting switch. Up to 6 channels of lamps can be on or off for varying time periods
- 5P41 -5" extractor fan, very quiet runner (s.h.), gntd 12 mths.
- 5P48 -telephone extension bell in black case, ex-GPO
- 5P52 -mains transformer 26V 10A upright mounting, add £2 post
- 5P54 -mains motor with gear box, final speed 5rpm
- 5P58 -Amstrad stereo tuner FM and LM. AM
- 5P62 -2 1/2 kw tangential blow heater, add £1.50 post if not collecting
- 5P73C high pressure mains operated gas or water valve with tube connection suitable soldering
- 5P82 -1 25rpm mains 60w motor with gearbox
- 5P84 -1 delay time switch, adjust 0-20 seconds
- 5P89 -1 light box size 14" x 12" for circuit tracing pcb's. Add £3 for postage and packing
- 5P81 -1 stepper motor bi-directional, 7.5" steps 12-14V coil
- 5P88 -1 24V 5A mains transformer in waterproof case, ideal for garden lighting, pond pump etc. Add £2 post.
- 5P90 -18" tangential blower with mains motor
- 5P91 -14" tangential blower with mains motor in centre
- 5P92 -10 metres twin screened computer co-ax
- 5P93 -6" alarm bell 24 volt d.c. on 50V a.c.
- 5P94 -Current transformer 1 amp thro. primary=14V
- 5P95 -Photo magic-original "vintage" photo cell

LIGHT CHASER KIT motor driven switch bank with connection diagram, used in connection with 4 sets of xmas lights makes a very eye catching display for home, shop or disco, only £5 ref 5P56.

BIO-FEEDBACK ACCESSORIES

A METER MOVEMENT which can be built into your bio-feedback monitor to make it a completely self-contained instrument. Don't worry if you've already drilled the terminal holes - the meter will cover them up!

SENSITIVE METER MOVEMENT ONLY £1.90 + VAT

SPARE ELECTRODES AND GEL

5 sets of electrodes (10 electrode pads) and a sachet of conductive gel. all for **£2.90 + VAT**



LEDs

RECTANGULAR LEDs

Green rectangular LEDs for bar-graph displays

50 for **£3.50 + VAT**
500 for **£25 + VAT**



DIGITAL AND AUDIO EQUIPMENT LEDs

Assorted 3mm LEDs: red, green, yellow and orange. 25 of each (100 LEDs) for **£6.80 + VAT**

BIO-FEEDBACK

FEATURED IN ETI DECEMBER 1986

A complete parts set for the ETI bio-feedback monitor, including meter. Originally offered from limited stocks at £14.55 (without meter), this sensitive GSR monitor has proved so popular that we have decided to make it a permanent feature of our catalogue



The complete parts set includes case, PGB, all components, leads, electrodes, gel, meter and full instructions

BIO-FEEDBACK PARTS SET ONLY

£11.50 + VAT

HI-FI POWER METER

FEATURED IN ETI MAY 1987

Measure the output power of your hi-fi with the ETI power meter. The meters can be back-lit for effect - the scale and 'power' legend will glow green to contrast with the red pointer. Two switched ranges give readings of 0-10W and 0-100W.



The parts set consists of meter movement, PCB, all components, range switch and full

MONO POWER METER PARTS SET

£3.90 + VAT

STEREO POWER METER PARTS SET

£7.20 + VAT

SUITABLE CASE **£7.50 + VAT**



TACHOMETER AND DWELL METER

FEATURED IN ETI JANUARY 1987

SPECIAL OFFER



Last fast to clear at only **£9.50 + VAT!** (Previously offered at £16.40.) The complete parts set includes case, printed circuit board, all components, plug, socket, switches, test leads and clips, meter and full instructions.

TACHOMETER AND DWELL METER PARTS SET ONLY

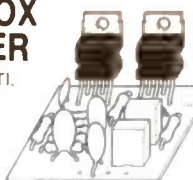
£9.50 + VAT

Offer applies only until stocks are exhausted

MATCHBOX AMPLIFIER

FEATURED IN ETI APRIL 1986

No ordinary amplifiers these. When our first customers took an interest, it was for the diminutive size (both modules will fit in a matchbox!), the total disregard for power supplies and speaker impedances, and the impressive power output from these little amplifiers. When they're ordered, it was for the sound quality.



Two amplifier modules were described, both based on the powerful L165V IC. The single IC version will deliver over 20 Watts with a suitable speaker and power supply. The bridge version can provide up to 50W! Although the specified supply voltage and speaker impedance must be used to achieve maximum power, both modules are quite happy to work from any voltage between 12V and 32V, and will accommodate any type of speaker. The bridge version is ideal for giving a boost to car hi-fi systems, driving two 4 Ohm speakers in parallel on each channel for best effect.

Both designer-approved parts sets consist of a roller-tinned printed circuit board and all components. The L165V ICs are also available individually, with a free mini-data sheet giving specifications and suggested circuits.

SINGLE IC MATCHBOX AMPLIFIER SET (20W into 4 Ohms) **£6.50 + VAT**

BRIDGE AMPLIFIER SET (50W into 8 Ohms) **£8.90 + VAT**

L165V IC with data **£3.90 + VAT**

KNIGHT RAIDER

FEATURED IN ETI, JULY 1987



The ultimate in lighting effects for your Lamborghini, Maserati, BMW or any other car, for that matter! Picture this: eight powerful lights in line along the front and eight along the rear. You flick a switch on the dashboard control box and a point of light moves lazily from left to right leaving a comet's tail behind it. Flip the switch again and the point of light becomes a bar, bouncing backwards and forwards along the rear. Press again and by one of the other six patterns. An LED display on the control box lets you see what the main lights are doing.

The Knight Raider can be fitted to any car (it makes an excellent fog light) or with low-powered bulbs it can turn any child's pedal car or bicycle into a spectacular TV-age toy!

The control box parts set consists of case, switches, LEDs, PCB, components, hardware and instructions. The sequence board includes PCB, ICs, power FETs, components, hardware and instructions.

KNIGHT RAIDER CONTROL BOX ONLY

£6.90 + VAT!

KNIGHT RAIDER SEQUENCE BOARD ONLY

£11.90 + VAT!

BRAIN WAVE MONITOR

FEATURED IN ETI, AUGUST 1987



ALPHA: HOW TO SUCCEED WITHOUT REALLY TRYING

This was the title of a recent QED television program which showed how life can be dramatically improved with aid of alpha training. Alisdair McBeth overcame his shyness with girls, others became more confident, improved their sporting abilities, learned to cope with stress and all without really trying!

Alpha monitors are not new, but good ones are hard to find. To detect a few uV of brain waves in the midst of noise that is tens of thousands of times as great is not easy! The ETI Alpha Monitor is probably the most powerful and effective design to be found outside an EEG laboratory. The sensitive circuit locks on to the all important alpha rhythm and helps you to strengthen and control it. Quickly. Then you put it to work for you, strengthening your confidence and abilities day by day.

Our approved parts set consists of EEG electrodes and headband, case, two PCBs, screening box, top quality P151 amplifiers, all components and full instructions (including training exercises). Assembly time is about five to six hours.

ALPHA MONITOR PARTS SET ONLY

£29.90 + VAT!

Complete Parts Sets for ETI Projects

MAINS CONDITIONER

FEATURED IN ETI, SEPTEMBER 1986

It is astonishing how many people buy or build top-flight hi-fi equipment, and then connect it to a noisy, spiky mains supply. Rather like buying a Ferrari and trying to run it on paraffin, you might think. Expecting crystal clear sound, the poor music enthusiast ends up with a muddy, confused mush, and feels that he has somehow been cheated. Is this hi-fi? My music centre sounded just as good!

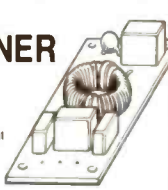
The domestic mains supply is riddled with RF interference, noise, transient spikes, and goodness knows what else. Computers crash, radios pop and crackle, tape recordings are spoiled and hi-fi sounds 'not quite right'. Why put up with it when the solution is so simple? The ETI mains conditioner is the lowest cost upgrade you will ever buy, and probably the most effective!

Our approved parts set consists of PCB, all components, toroid, enamelled wire, fixing lugs, fast response VDR, and full instructions.

ETI MAINS CONDITIONER PARTS SET

ONLY £4.60! + VAT

*Note: the toroid and VDR supplied are superior to the types specified in the article.



CREDIT CARD CASINO

FEATURED IN ETI, MARCH 1987

This wicked little pocket gambling machine measures only 3"x2"x1/2". It will play all kinds of casino games, including:

- Roulette
- Craps
- Pontoon

Our approved parts set comes complete with case, self-adhesive fascia, tinned and drilled printed circuit board, all components, hardware, full instructions and three different games to play!

CASINO PARTS SET ONLY

£5.90! + VAT



Five extra games FREE with every order!

MAINS CONTROLLER

FEATURED IN ETI, JANUARY 1987

Have you ever wondered what people do with all those computer interfaces? Put your computer in control, say the ads. The Spectrabeeb has eight TTL outputs. What on earth can you control with a TTL output? A torch bulb?

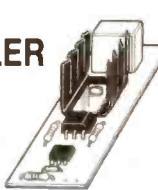
The ETI Mains Controller is a logic to mains interface which allows you to control loads of up to 500W from your computer or logic circuits. An opto-coupler gives isolation of at least 500V, so the controller can be connected to experimental circuits, computers and control projects in complete safety. Follow your computer interface with a mains controller and you're really in business with automatic control!

The mains controller connects directly to most TTL families without external components, and can be driven by CMOS with the addition of a transistor and two resistors (supplied).

Your mains controller parts set contains: high quality roller-tinned PCB, MOC3021 opto-coupler, power triac with heatsink, mounting hardware and heatsink compound, all components, including snubber components for switching inductive loads, transistor and resistors for CMOS interface, full instructions.

MAINS CONTROLLER PARTS SET

ONLY £6.20 + VAT!



POWERFUL AIR IONISER

FEATURED IN ETI, JULY 1986

Ions have been described as 'vitamins of the air' by the health magazines, and have been credited with everything from curing hay fever and asthma to improving concentration and putting an end to insomnia. Although some of the claims may be exaggerated, there is no doubt that ionised air is much cleaner and purer, and seems much more invigorating than 'dead' air.

The DIRECT ION ioniser caused a great deal of excitement when it appeared as a constructional project in ETI. At last, an ioniser that was comparable with (better than?) commercial products, was reliable, good to build and fun! Apart from the serious applications, some of the suggested experiments were outrageous!

We can supply a matched set of parts, fully approved by the designer, to build this unique project. The set includes a roller-tinned printed circuit board, 66 components, case, mains lead, and even the parts for the tester. According to one customer, the set costs 'about a third of the price of the individual components'. What more can we say?

DIRECT ION PARTS SET ONLY

£9.50 + VAT



PROJECT BOX

PROJECT CASE WITH PP3 BATTERY COMPARTMENT

ONLY £2.60! + VAT



LM2917 EXPERIMENTER SET

Consists of LM2917 IC, special printed circuit board and detailed instructions with data and circuits for eight different projects to build. Can be used to experiment with the circuits in the 'Next Great Little IC' feature (ETI, December 1986).

LM2917 Experimenter Set £5.80 + VAT

RUGGED PLASTIC CASE

suitable for mains conditioner and mains controller.

ONLY £1.65 + VAT



SPECIAL OFFER

Our best selling ioniser kit is now available with an elegant white case.

WHITE IONISER PARTS SET ONLY

£9.80! + VAT

Prices shown are exclusive of VAT, so please add 15% to the order total. UK postage is free on any order. Carriage and insurance for overseas orders £1.50. Please allow up to 14 days for delivery.

Specialist SEMICONDUCTORS LIMITED

FOUNDERS HOUSE
REDBROOK
MONMOUTH
GWENT