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Radio & Electronics

The communications, electronics & computers magazine **World**

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**OSCAR 10
HOW TO GET STARTED**

**AMPLICON DIGITAL PANEL
PRINTER REVIEW**

**BUILDING THE
FORTOP TVT 437**

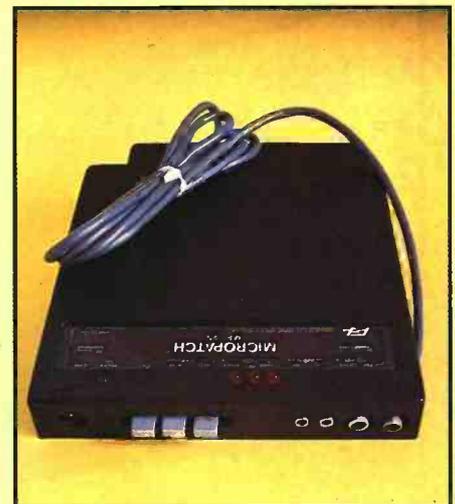
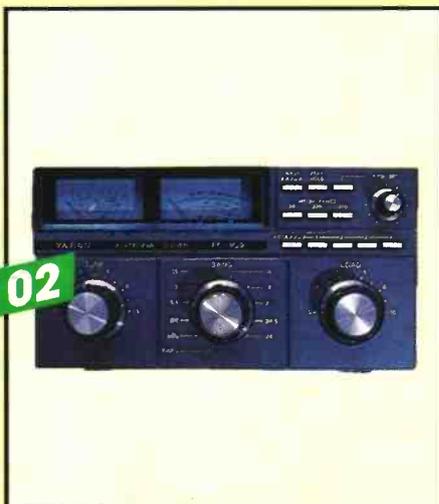
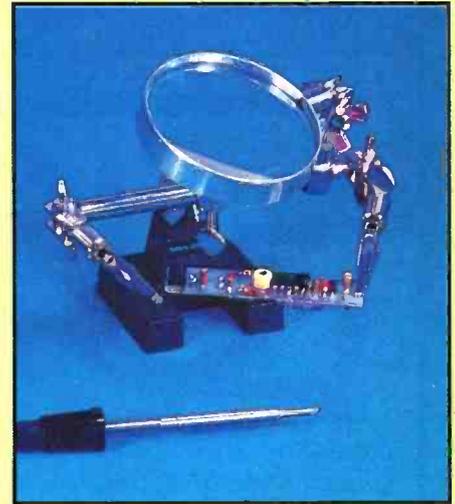
**DATA FILE —
AUDIO POWER AMPS**

**REVIEW OF THE YAESU FC102
ANTENNA TUNING UNIT**

**VLF CONVERTER FOR
FREQUENCIES BETWEEN
0 and 700 KHz**

**MULTIFUNCTION TEST
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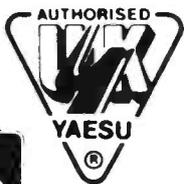
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Radio & Electronics

The communications, electronics & computers magazine **World**

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Editor DENNIS PADFIELD G1 AJQ

Advertisement Manager NICOLA DYER
Advertisement Executive ANNE BRADY

Subscriptions 01-684 3157

Accounts CLARE BRINKMAN

Publisher PETER WILLIAMS
General Manager ALAN GOLBOURN

ON SALE: Second Thursday of the month preceding cover date

NEXT ISSUE: Cover date August 1984 on sale 12 July 1984

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

PRINTED: In England

ISSN: 0262-2572

NEWS TRADE SALES BY: Seymour Press Ltd, 334 Brixton Road, London SW9 7AG Tel: 01-733 4444

SAFETY IN THE SHACK

Some of the constructional projects described in *R & EW* and other magazines refer to additions or modifications to television receivers, communication equipment and other items that may be under guarantee by the manufacturer. Please remember that any alterations or addition to the circuit may invalidate the guarantee.

We prefer that each constructional project contains its own power supply or battery. A constructional project will occasionally describe how the power supplies of any equipment may be used to supply the circuit of that project. In these circumstances, please ensure that the power unit in the equipment is adequate to provide the additional load current that will be necessary and, in all cases, check that the equipment mains fuse is correctly rated to protect the apparatus from damage.

Safety in the shack, please, at all times. Use good practice in your constructional work as we want you to be around to enjoy *R & EW* in the future! Thank you for reading this caution, now go ahead and build one of your projects



COVER PICTURES

- Top left: Amplicon Digital Panel Printer
- Top right: Helping Hands
- Centre left: Yaesu FC-102 courtesy of Arrow Electronics
- Centre right: Micropatch
- Bottom: Talking DFM

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

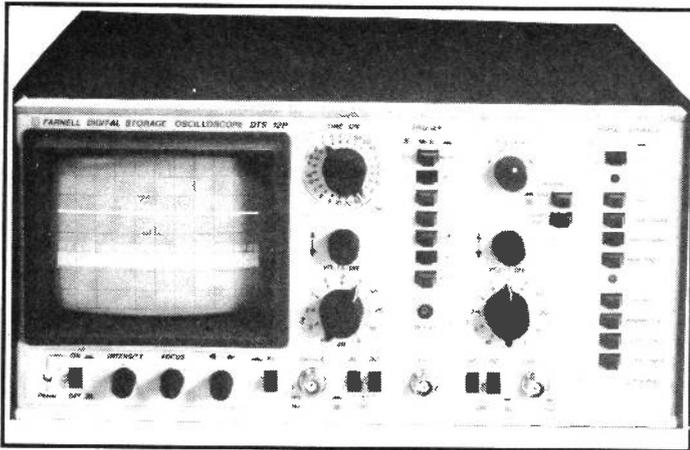
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Radio & Electronics World Magazines

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



EXTENDED OSCILLOSCOPE

The versatility and scope of the Farnell DTS12 dual trace, 12MHz bandwidth digital storage oscilloscope have been greatly increased by the introduction of an IEEE488 bus version and an X-Y plotter version.

The former enables the DTS12 to be interfaced to the bus, configured as a 'talker', so giving access to the 1Kbyte of data that represents the stored waveform. Connection is via a standard bus connector on the rear panel of the oscilloscope. This version, designated the DTS12B, is sold with the oscilloscope configured as bus address 5 (a talk only address - ASC11 character E) but, if required, this address can be changed by use of internal switches. Buyers are supplied with sample programs for use with popular minicomputers.

Analogue X-Y outputs are provided by the X-Y plotter

NEW SOLDERING IRONS

Astralux Dynamics Ltd has complemented its range of PCB assembly components with a range of lightweight, temperature-controlled, soldering irons with interchangeable tips.

version, the DTS12P, which allows the oscilloscope to interface with an X-Y or Y-T chart recorder thus giving a 'hard copy' of the stored waveform. Outputs are available via 4mm sockets on the instruments rear panel and consist of 'Plot Y', 'Plot X', 'Pen Lift' and OV signals. The 'Plot Y' output provides the calibrated amplitude of the stored waveform and the 'Plot X' output provides a calibrated timebase. The plotting speed of both outputs can be varied using the DTS12P's main timebase switch. When used in conjunction with the appropriate recorder input, the 'Pen Lift' output allows the pen to be automatically lowered and raised at the beginning and end of a sweep.

*Farnell Instruments Ltd,
Sandbeck Way, Wetherby,
West Yorkshire. LS22 4DH.
Tel: (0937) 61961.*

Designed for general-purpose use, JCB Pencil Line soldering irons feature a wide range of interchangeable long-life tips of various shapes for every PCB and connector soldering job in laboratories and repair work

shops, and on production lines. Every other part of each iron is also replaceable. Other features include a high-efficiency heating system in which the heating element is inside the tip.

The tips comprise a copper centre with a solid copper head for maximum heat transfer, and are iron clad. Oxidisation is minimised by a protective chromium-plated outer layer that covers the entire tip except the soldering surface which is pre-tinned.

Three sizes are available. The smallest, the 11-watt model 14N, reaches a temperature of 350°C in 50 seconds and weighs only 18.5 grams less cables, and 100 grams complete and packed. A 24W model, the LK 30 reaches 380°C in 50 seconds and has a total packed weight of 120 grams. The largest model, the 26W LK 40, reaches 410°C in 50 seconds and weighs 122 grams complete. A wide variety of accessories for cable work and soldering/desoldering integrated circuits is available.

*Astralux Dynamics Ltd, Red
Barn Road, Brightlingsea,
Colchester, Essex. CO7 0SW.
Tel: 0206 30 2571.*

RANGE OF CASES

BICC-Vero Electronics has introduced a new *Ambassador* range of cases which conform to IEC 297 and provide complete compatibility with all 19 inch equipment. The range has been designed to offer maximum flexibility combined with robustness and to satisfy modern demands for soft-line styling.

Eight standard sizes, ranging from 2U to 9U heights, are available within which are combinations of half width (42HP) or full width (84HP). Depths of 260mm or 360mm have been selected to match

user demand for this type of enclosure.

The *Ambassador* case features simplicity in assembly and ease of top access. The top and bottom covers are assembled to four corner mounting brackets by use of side infills which serve as carrying handles and make the covers captive upon tightening retaining screws. Top access is achieved by simply releasing the retaining screws which enables the top cover to be removed.

The rear panel and base are ventilated to allow for cross-flow cooling and the base cover is equipped with four non-slip feet, the front two of which have a tilt feature to improve front panel viewing.

*BICC-Vero Electronics Ltd,
Hedge End Industrial Estate,
Flanders Road, Hedge End,
Southampton SO3 3LG. Tel:
(04892) 81424/5.*

DIGITAL MULTIMETER

Electronic Temperature Instruments have a new 2800 Series Multi-meter which has a total of 28 different ranges for checking voltages, current, resistance, and includes a diode test.

There are six marked functions to choose from: dc and ac voltage, each with five ranges; dc and ac current, each with six ranges varying from 200 ohms to 20M ohms, and a safe diode test using a one milliamp current with a readout in millivolts. All of these functions and ranges are completely and automatically protected.

The instrument also has an overload fuse protection on its current range and can withstand a 3KV surge. Additionally, the resistance ranges are shielded against over-voltage and when the top limit of any chosen range is exceeded, the multi-meter

PRODUCT NEWS

automatically shuts down and signals over-range. It automatically indicates polarity when measuring dc, automatically zeros all ranges and automatically warns of low battery power.

A high contrast LCD gives an instant, straightforward readout in 12.5mm high numbers, with an accuracy which is usually half a per cent for the finer ranges and rarely exceeds one per cent even on the coarser ranges and that's an accuracy the instrument will maintain. Price £55.00 complete with case and test leads.

Electronic Instruments, Temperature Highdown Works, Highdown Avenue, Worthing, West Sussex. BN13 1PU. Tel: Worthing (0903) 690750.

SOLID STATE ILLUMINATOR

An advanced single chip solid state LED lamp which offers the advantages of a high on-axis luminous intensity together with a wide viewing angle and a colour choice of high efficiency red (MK9160) or yellow (MK9360) is available from United Components Limited.

The LED chip itself is fabricated from a high efficiency gallium arsenide phosphide/gallium phosphide material which emits a peak wavelength of 634nm (MK9160) and 585nm (MK9360). It is capable of providing 200 milli lumens (1400 microwatts) with a forward current of 100 milliamps. The lamps are supplied with a clear lens and the anode lead is longer than the cathode lead to identify polarity.

Maximum power dissipation at +25°C lead temperature is 300 milliwatts and overall operating temperature range is -40°C to +85°C. Peak forward current is 1 amp (max) and reverse voltage that can be tolerated is 6V (max).

United Components Ltd, Victory Electronics Division, Unit Seven, Crown Way, West Drayton, Middlesex. UB7 8PS. Tel: 01-573 6622.

TABLE TOP POWER SUPPLY

Canadian Instruments & Electronics Limited have been appointed the UK stocking representative for the

EPROM COPIER

With a recommended retail price of only £175.00 + VAT, the Memco 2000 is a cost effective stand-alone EPROM copier that is simple to operate and needs no specialist training. It is ideal for production use, service engineers and the home computer enthusiast.

Microprocessor controlled

and mains operated, it can copy the following EPROMS: 2716, 2516, 2732, 2732a, 2532, 2764 and 27128, with full check, copy and verify facilities.

L K S Systems Ltd., Building G, Abbey Mill, Abbey Mill Lane, St Albans, Herts. AL3 4HG. Tel: St Albans 55084.

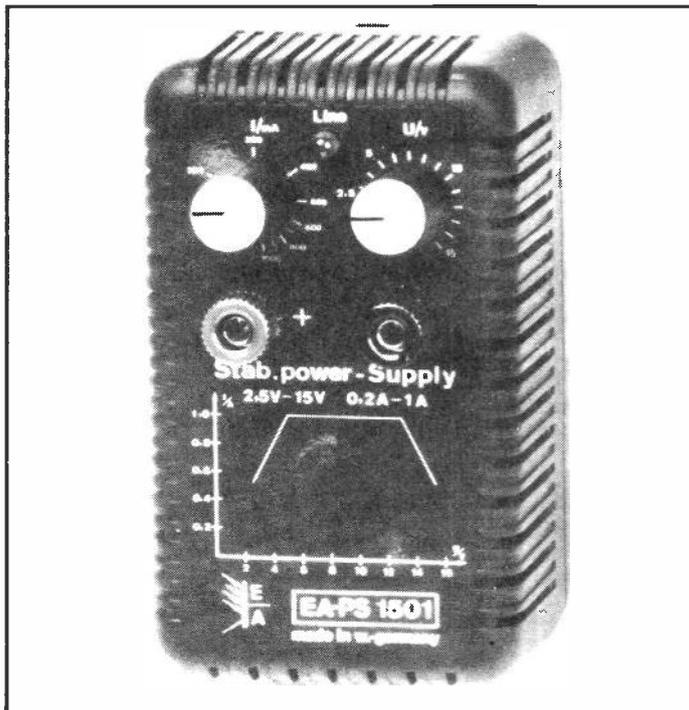


range of power supplies manufactured by Elektro-Automatik of West Germany. One interesting product from the range is the EAPS1501 Table Top Power Supply Unit. This unit, which measures 66 x 112 x 70 millimetres, has a full stabilised output variable between 2½ to 15V and 0.2 to 1 amps. It incorporates full electronic short circuit protection and operates off normal 240V 50/60Hz mains supplies. It is supplied complete

with 1½ metres of mains cable.

The EAPS1501 is ideally suited for the hobbyist, school or laboratory work; it is extremely robust and can also be used to charge NiCad batteries. The UK list price is £40.00 plus VAT.

Canadian Instruments & Electronics Limited, Harris-Bass House, Station Road, Ilkestone, Derbyshire DE7 5TX. Tel: Nottingham (0602) 302331.



POSITIVE TEMPERATURE COEFFICIENT RESISTORS

Murata Erie has introduced a complete range of Posistors[®] (positive temperature coefficient resistors) with a broad spectrum of applications in professional, industrial and domestic electrical and electronic equipment.

Fabricated from barium titanate doped with rare earth compounds, Posistors[®] can be used to sense temperatures, to protect against current over-load and as auto-regulating heating elements.

Posistors[®] exhibit a roughly constant resistance versus temperature characteristic up to their Curie point (CP). At the CP an abrupt change occurs and the resistance then increases rapidly, rates of rise lying between 15 and 60%/°C. This sharp change in the characteristic allows Posistors[®] to be used as replacements for relays in some applications thereby offering the circuit designer a component with greater reliability and lower cost.

Curie point and resistance/temperature characteristics are determined by both the type and the amount of dopant and also by the size of the barium titanate element. Characteristics can be modified by connecting external resistors in parallel or in series with the Posistor[®] and also by thermal accessories such as heatsinks.

Murata Erie Electronics UK Ltd., 100-102 Albert Street, Fleet, Hants. GU13 9RN. Tel: 02514 28585.

OVERVOLTAGE PROTECTION

RIFA announce a new hybrid device specifically designed to protect mains-powered electronic equipment from transient surges which result from disturbances such as lightning and similar phenomena.

Known as the Ericsson Hybrid Overvoltage Protector, this new hybrid module is capable of handling excessive transient surges on an ac mains power supply to otherwise sensitive electronic equipment, and limiting the dc mains input to a level which the equipment can withstand.

The hybrid overvoltage protector is a two-stage device: its first stage handles the energy component of the

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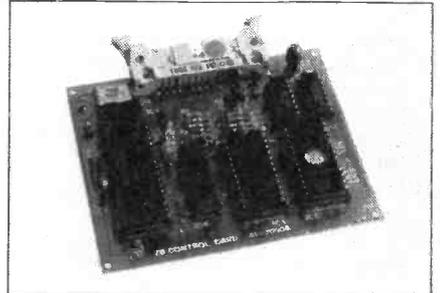
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25 way D Plug	10-25100	1.30
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20 up Eprom Eraser	40-82100	31.25
Z80 A Industrial Controller	40-82000	49.95
6802 Industrial Controller	40-68020	49.95
6502 Industrial Controller	40-65020	49.95
Z8 Basic/Debug Controller	41-00904	50.00

Nicad Batteries & Chargers

Minimum life 600 (300 PP3 size) full charge/discharge cycles. Batteries must be charged from a constant current source only. All batteries are supplied only with a residual charge and should be charged before used.

AA	1.2V	500mAH	01-12004	0.80	0.74
C	1.2V	2.2AH	01-12024	2.35	1.99
D	1.2V	4.0AH	01-12044	3.05	2.85
PP3	8.4V	110mAH	01-84054	3.70	3.50
CH1/22 PP3 Charger	11mA for 16 hours		01-00159		4.30
CH8/RX Multi-purpose Charger			01-02204		9.40

Will recharge AA, C, D and PP3 size cells with automatic voltage selection. Will recharge following combination: 6xD, 6xAA, 6xC, 2xPP3, 2xD+2xC, 2xD+2xAA, 2xD+1xPP3, 2xC+2xAA, 2xC+1xPP3, 2xAA+1xPP3.

Battery Adaptor 01-12001 0.96
Sold in pairs: one to convert AA size to C size and one to convert C to D size. Both may be used together to convert an AA to D size.

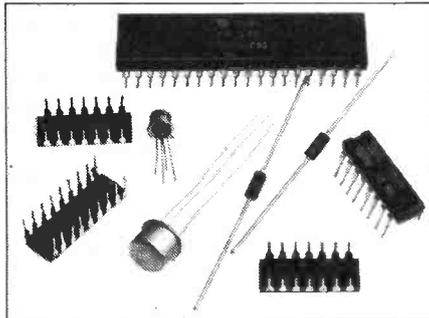
Semiconductors

Linear IC's

LM301AN	DIL version	61-03011	0.44
LM308CN	DIL version	61-03081	0.65
LM311CN	Popular comparator	61-00311	0.46
LM324	Low power quad op amp	61-03240	0.67
LM339N	Low power quad comparator	61-03390	0.68
LM346	Programmable quad op amp	61-00346	3.72
LF347	Quad Bi-FET op amp	61-00347	1.82
LM348	Quad 741 type op amp	61-03480	1.26
LF351	Bi-FET op amp	61-03510	0.49
LF353	Dual version of LF351	61-03530	0.76
LM380N	IW AF power amp	61-00380	1.00
NE555N	Multi-purpose low cost timer	61-05550	0.45

for a better service.

NE556N	Dual version of the 555	61-05560	0.50
uA741CN	DIL low cost op amp	61-07411	0.22
uA747CN	Dual 741 op amp	61-07470	0.70
uA748CN	741 with external frequency comp	61-04780	0.40
HA1388	18W PA from 14V	61-01388	2.75
TDA2002	8W into 2 ohms power amp	61-02002	1.25
ULN2283	1W max. 3-12V power amp	61-02283	1.00
MC3357	Low power NBFM IF system and detector	61-03357	2.85
ULN3859	Low current dual conversion NBFM IF and detector	61-03859	2.95
LM3900	Quad norton amp	61-39000	0.60
LM3909N	8-pin DIL LED flasher	61-39090	0.68
KB4445	Radio control 4 channel encoder and RF	61-04445	1.29
KB4446	Radio control 4 channel receiver and decoder	61-04446	2.75
ICM7555	Low power CMOS version of timer	61-75550	0.98
ICL8038CC	Versatile AF signal generator with sine/square/triangle OPs	61-08038	4.50
TK10170	5 channel version of KB4445	61-10170	1.87
HA12002	Protection monitor system for amps, PSUx, TXs etc	61-12002	1.22
HA12017	83dB S/N phono preamp 0.001% THD	61-12017	0.80
MC14412	300 baud MODEM controller (Eduro/US specs)	61-14412	6.85



Microprocessor & Memories

Z80A	Popular and powerful 8-bit CPU	26-18400	3.40
Z80AP10	2 port parallel input/output	26-18420	2.95
Z80A CTC	4 channel counter/timer	26-18430	2.90
Z8671	Z8 Micro comp. and Basic	26-08671	17.50
6116-3	16K (2Kx8) CMOS RAM 200nS	26-36116	6.68
Z6132-6	32K (4Kx8) quasi RAM 350nS	26-06132	15.00
4116-2	16K (16Kx1) 150nS	26-24116	1.59
2764	64K (8Kx8) 450nS	26-02764	9.50
2732	32K (4Kx8) 450nS	26-02732	5.70

Voltage Regulators

7805	5V 1A positive	27-78052	0.40
7812	12V 1A positive	27-78122	0.40
7815	15V 1A positive	27-78152	0.40
7905	5V 1A negative	27-79052	0.49
7912	12V 1A negative	27-79122	0.49
7915	15V 1A negative	27-79152	0.49

Transistors

BC182	General purpose	58-00182	0.10
BC212	General purpose	58-00212	0.10
BC237	Plastic BC107	58-00237	0.08
BC238	Plastic BC108	58-00238	0.08
BC239	Plastic BC109	58-00239	0.08
BC307	Complement to BC237	58-00307	0.08
BC308	Complement to BC238	58-00308	0.08

BC309	Complement to BC239	58-00309	0.08
BC327	Driver/power stage	58-00327	0.13
BC337	Driver/power stage	58-00337	0.13
MPSA13	NPN Darlington	58-04013	0.30
MPSA63	PNP Complement to MPSA13	58-04063	0.30
J310	JFET for HF-VHF	59-02310	0.69
J176	JFET analogue switch	59-02176	0.65
3SK51	Dual gate MOSFET-VHF amp	60-04051	0.60
3SK88	Dual gate MOSFET-Ultra lo noise	60-04088	0.99
TIP31A	Output stage	58-15031	0.35
TIP32A	Complement to TIP31A	58-15032	0.35
VN66AF	VMOS Power FET	60-02066	0.95
ZTX3866	E-line version 2N3866	58-03866	0.45
IN4001	Rectifier diode	12-40016	0.06
IN4002	Rectifier diode	12-40026	0.07
IN4148	General purpose silicon	12-41486	0.05

Silicon Controlled Rectifiers

BRY55-100	100V .8A	52-55100	0.50
C106DI	400V 4.0A	52-00106	0.70
C122DI	400V 8.0A	52-00122	1.45

3mm Diameter LEDs

V178P	Red	15-01780	0.15
V179P	Green	15-01790	0.16
V180P	Yellow	15-01800	0.18

5mm Diameter LEDs

CQY40L	Red	15-10400	0.12
CQY72L	Green	15-10720	0.15
CQY74L	Yellow	15-10740	0.15

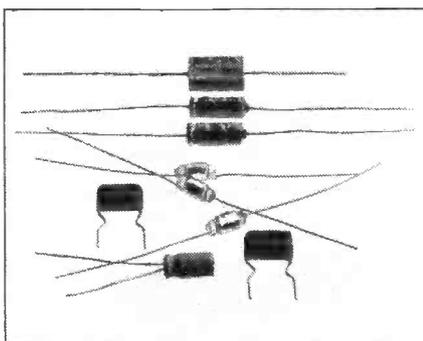
Infra-Red LEDs

CQY99	Emitter	15-10990	0.56
BPW41	Detector	15-30410	1.51

Tri Colour LED

V518	Orange-Green-Yellow	15-05180	0.60
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Capacitors



Aluminium Electrolytics Radial PCB Mounting

10u	16V	05-10606	0.24	Pack of 4
47u	16V	05-47606	0.28	
47u	25V	05-47607	0.28	
470u	6.3V	05-47705	0.36	
470u	16V	05-47706	0.48	

Tantalum Beads

1uf	35V	05-10501	0.18	Each
10uf	16V	05-10601	0.28	
47uf	6.3V	05-47601	0.45	
47uf	16V	05-47602	0.92	

Monolithic Capacitors

1n	04-10204	0.39	Pack of 3
10n	04-10304	0.42	
100n	04-10404	0.45	

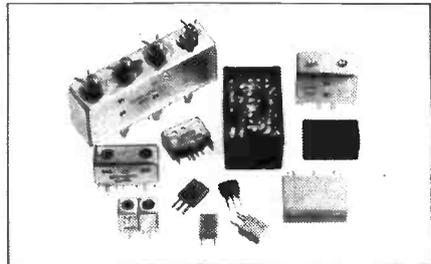
Low Voltage Disc Ceramic

1n	04-10203	0.20	Pack of 5
10n	04-10303	0.20	

Polyester (C280)

10n	04-10305	0.18	Pack of 3
47n	04-47305	0.24	
100n	04-10405	0.24	
470n	04-47405	0.51	
1uF	04-10505	0.66	

R F Components



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PRODUCT NEWS

pulse and the secondary stage limits the voltage to that acceptable by the associated electronic equipment. The first stage may be used either as an independent device or in combination with the plug-in secondary stage which is available in six peak voltage classes, ranging from 5V to 70V.

RIFA AB, Market Chambers, Shelton Square, Coventry, Tel: 0203 27259.

POWER SUPPLIES

MCD Limited have been appointed as sole distributor for the range of C Itoh Power Supplies.

The range offers a wide selection of types of power supplies and switching-regulators from single output devices ranging from 15W at 5V to 300W at 24V, plus multiple output devices with a versatile variety of output combinations. In addition to this wide range of models, MCD can offer customisation, which covers all requirements, from mini's to micro's.

All the C Itoh power supplies are of compact design and are supplied open framed or covered. They are built to meet most of the national and international standards.

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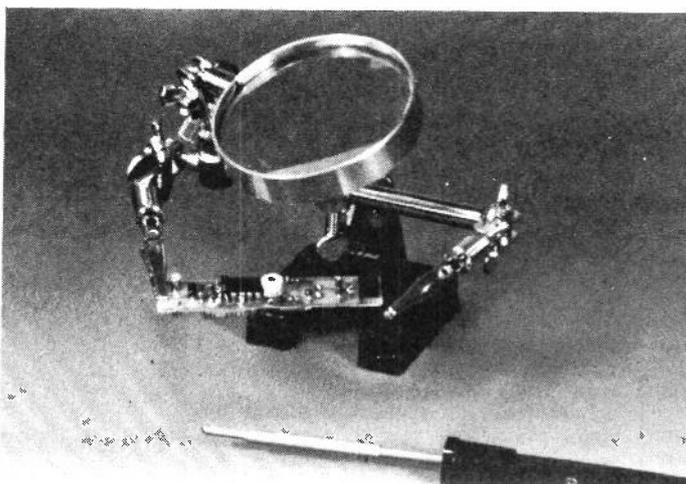
Prices start with the multiple output device CIE 001 at £25.00.

Measurement Control & Displays Limited, 8 North Street, North Square, Guildford, Surrey, GU1 4TD. Tel: (0483) 574659.

HAND-HELD LED VOLTAGE TESTER

An inexpensive and versatile LED voltage tester, the Master Check-3, aimed at hobbyists and professional users alike, is now available from Steinel (UK) Ltd. It is a two-terminal, hand-held instrument, which will measure ac and dc voltages in the range 6V to 415V rms with a LED array display.

The unit which is very safe and simple to use due to its construction comprises two probes connected by a cable, one containing the measurement electronics and display



WORKBENCH FACILITY

For those who often find themselves short-handed (and long-sighted) in the workshop, Litesold have a device called the 'Helping Hands'.

Supported on a solid, cast base it consists of a 115mm long support bar, fitted with two crocodile clips and a 5 dioptre glass lens. The support bar, clips and lens are all mounted on adjustable ball-joints, and can be set to any required position to hold

LEDs. This means that users keep their eyes on their hands, rather than looking at a separate meter. Surge rated voltage is 6KV and its input impedance is from 2 to 50 Kohms, PTC controlled, depending on the input voltage.

Applications for the Master Check-3 include the testing of domestic equipment and

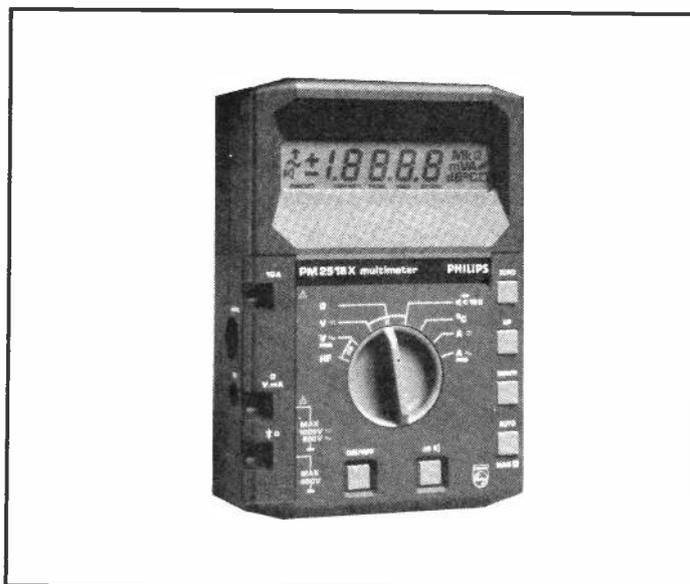
parts and assemblies for cleaning, adjusting, soldering and many other jobs, while giving a clean, magnified view. A really useful addition to any workbench.

The Helping Hands is available direct from Litesold at a special price of £7.45 which includes postage and VAT.

Light Soldering Developments Ltd., Spencer Place, 97/99 Gloucester Road, Croydon, Surrey, CR0 2DN. Tel: 01-689 0574.

hobby projects, battery testing and checking three phase motors. Its frequency range is from 0 to 100Hz and the peak current is 180mA at 380V.

Steinel (UK) Ltd, 17 Reddicap Trading Estate, Sutton Coldfield, West Midlands B75 7BU. Tel: 021-378 2820.



LOW-COST DESK CASES

A new range of low-cost desk cases is available from West Hyde. The Seville cases are made from ABS plastic in two screw-together halves in an attractive cream and tan colour scheme. The top panels are aluminium with a natural anodised finish.

The Seville range is designed for controls, intercoms, terminals and other equipment for desk or bench use. Three models are available, the largest of which has two split-angled panels. The smallest case will accept a single Eurocard whilst the larger ones hold one double or two single Eurocards.

The Seville is supplied complete with plug-in PVC feet and is available ex-stock from West Hyde Developments.

West Hyde Developments Ltd, Unit 9, Park Street Industrial Estate, Aylesbury, Bucks HP20 1ET. Tel: Aylesbury (0296) 20441.

SCREEN PHOSPHORS

Electrohome has extended the range of tube types available for their 15in and 17in monochrome monitors to include P31 (green), P38 (amber), P39 (green-long persistence), P134 (amber-long persistence) and PC115 (yellowish white) in addition to the normal P4 phosphor.

The EVM 1519 (15in screen) and EVM 1719 (17in screen) feature central and corner resolutions of 1000 and 800 TV lines respectively at 300 lux. The screens have a 4:3 aspect ratio and the display is switchable from 105% to approximately 85% of full picture size. The units can operate at scan rates from 18KHz to 22.5KHz allowing them to be used with a wide variety of equipment.

Monitor cabinets are constructed from two-tone beige/earth Steltex textured steel for durability. All primary and major secondary controls (including A-B and VTR switches, vertical/horizontal holds, focus, height, brightness and contrast) are accessible from the front panel which also contains a life LED pilot light. The cabinets are flat-sided to facilitate rack or stack mounting if required.

Standard features include an internal or external sync, common mode rejection better than 40dB up to 6V p-p,

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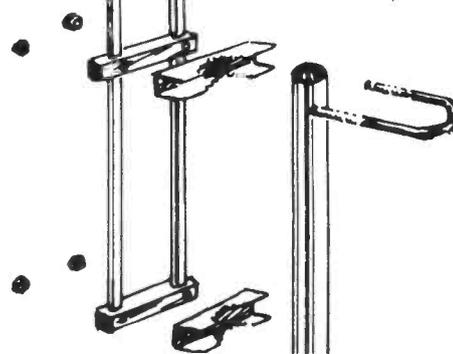
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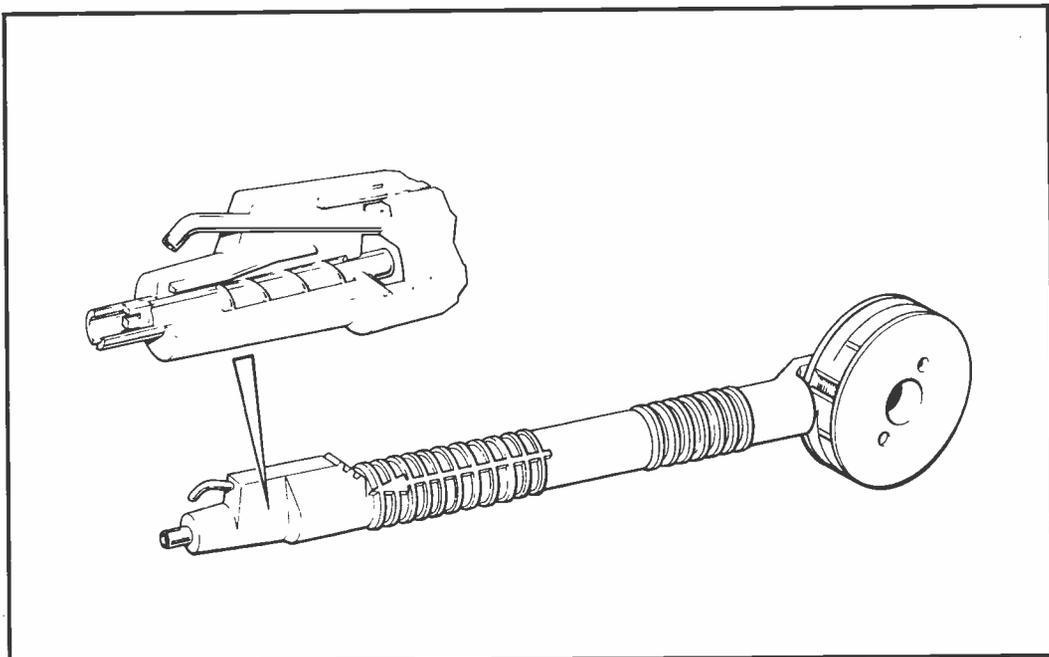
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PRODUCT NEWS

excellent black level stability, 18MHz bandwidth, universal ac interlock (110/220/240V operation) and an ac cord winder. The operating temperature range is 0°C to 50°C, up to 90% RH non-condensing.

Electrohome can supply a variety of optional accessories for the monitors including mobile stands, rack-mount kits, wall-mount adaptors and a ceiling-mount adaptor for the 17in EVM 1719. Conversion to interface with IBM 3278 terminals, audio facility, one to one raster ratio, and custom cabinet colours can be requested.

Electrohome Limited, 7 Civic Way, Ellesmere Port, Cheshire. L65 0AX. Tel: (051 356) 1365.



NEW SPEEDWIRE PEN

The new Speedwire SL wiring pen, now available from BICC-Vero Electronics, has dramatically upgraded both the reliability and the wiring density capability of the popular Speedwire system.

Wire breakage figures as low as 0.04% are possible due to the new design which allows free movement of the

wire within the guide slot to enable the wire to find its own central position between the tines of the Speedwire insulation displacement terminals. A typical test carried out by four different operators using 30AWG Kynar insulated wire resulted in 16,000 continuous joints with only six breakages (0.04%). The test pieces were then subjected to random tests as already specified for

pull off and wire bend without a single failure.

The new SL pen increases the Speedwire system wiring density capability by 150%. A retractable spring loaded stainless steel outer sleeve, incorporated in the new design, allows five wires to be laid between the terminals compared with two wires for the previous pen design.

Another feature is an extra

deep wire guidance slot in the outer sleeve which combines with a larger diameter feeder tube to minimise friction on the wire and give the SL pen improved controllability.

BICC-Vero Electronics Ltd, Hedge End Industrial Estate, Flanders Road, Hedge End, Southampton SO3 3LG. Tel: (04892) 81424/5.

TALKING FREQUENCY METER

WPO Communications, specialists in kits for the amateur market, primarily in the HF region, are now making many of their designs available as ready built and aligned PCB modules, leaving only the external components to be wired in by the constructor.

As an example, the popular DSB80 and 160 series QRP transceivers can now be purchased as ready built and aligned modules for £56.45 inclusive, and their new Audio Speech Processor for £18.50 inc. Also available will be their range of PLL Synthesised VFO's, including a new 2 metre design, and their 2 metre FM Transceiver, plus 6 metre converter. This new service will meet the requirements of those people who want to have some element of home construction in their station, but lack the confidence to build from kits.

The company is also re-introducing its Talking Frequency Meter for the visually handicapped amateur. This is

designed to assist blind amateurs in determining their transmit frequency, although the unit can be used for any of the applications a normal frequency counter could be put to, including frequency readout under difficult operating conditions. It covers 500KHz to 150MHz (minimum) in two ranges, with a resolution of 100Hz between 500KHz and 40MHz, and 1KHz between 20MHz and 150MHz.

Speech is of good quality from a unique circuit, through its own built-in speaker, and the meter features either manual or automatic repeat operation, with selectable 2, 4 or 6 digit groups of figures spoken. The new unit has improved sensitivity at HF, and reverse polarity plus input protection. It operates from a 12V external supply and is supplied ready built and tested. It is priced at £179 including VAT and post.

WPO Communications, 20 Farnham Avenue, Hassocks, West Sussex BN6 8NS. Tel: Hassocks (07918) 6149.

HAND-HELD MULTIMETER

The new Philips PM 2518X is the first hand-held multimeter to be offered with a 'backlite' for its large LCD.

The multimeter display automatically illuminates when the ambient light level falling on the display's light sensor is too low. With the backlite illuminated, the PM 2518X still has a battery life of some 200 hours - about ten times that of conventional LED instruments.

A battery saver circuit automatically shuts down the backlite when the multimeter has not been used for 30 seconds, illuminating the display again when the next measurement is made.

PM 2518X uses a microprocessor with the Philips/Intel I² C (Inter Integrated Circuit) bus linking its internal circuits. This design technology results in a number of advantages to the user - for example the PM 2518X is the first hand-held multimeter that can be interfaced to a computer for calibration checks.

The instrument's specification includes 0.1% basic dc accuracy, dc or true-RMS ac voltage and current measurements, together with resistance values up to 100 megohms. In addition to volts, amps and ohms, there are decibel (dB), diode forward voltage drop, continuity (with audible signal) and temperature measurement facilities.

Display indications plus autoranging help to make the PM 2518X easier to operate. The instrument provides high resolution and accurate measurements to meet the demands of testing today's high-technology products. The PM 2518X offers full four-digit display, true-RMS ac measurements, capability to measure ac volts up to 50KHz plus much more. The PM 2518X/01 standard version sells at £165 and the PM 2518X/11 'backlite' version costs £199.

Pye Unicam Ltd, York St, Cambridge. CB1 2PX. Tel: 0223 358866.

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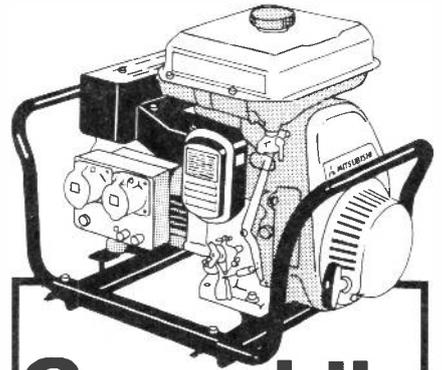
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depth mm x width mm	ad space	series rates for consecutive insertions			
		1 issue	3 issues	6 issues	12 issues
128 x 186 or 263 x 90	1/2 page	£420.00	£395.00	£375.00	£335.00
297 x 210	1 page	£810.00	£760.00	£730.00	£650.00

SPECIAL POSITIONS

Covers: Outside back cover 20% extra, inside covers 10% extra
Bleed: 10% extra [Bleed area - 307 x 220]
Facing Matter: 15% extra

DEADLINES

*Dates affected by public holidays

issue	colour & mono proof ad	mono no proof and small ad	mono artwork	on sale thurs
Aug 84	14 Jun 84	20 Jun 84	22 Jun 84	12 Jul 84
Sept 84	12 Jul 84	18 Jul 84	20 Jul 84	9 Aug 84
Oct 84	15 Aug 84*	21 Aug 84*	23 Aug 84*	13 Sept 84
Nov 84	13 Sep 84	19 Sep 84	21 Sep 84	11 Oct 84

CONDITIONS & INFORMATION

SERIES RATES

Series rates also apply when larger or additional
space to that initially booked is taken.
An ad of at least the minimum space must appear
in consecutive issues to qualify for series rates
Previous copy will automatically be repeated if no
further copy is received.
A hold ad is acceptable for maintaining your
series rate contract This will automatically be
inserted if no further copy is received
Display Ad and Small Ad series rate
contracts are not interchangeable

If series rate contract is cancelled, the advertiser
will be liable to pay the unearned series discount
already taken

COPY

Except for County Guides copy may be changed
monthly
No additional charges for typesetting or illu-
strations (except for colour separations)
For illustrations just send photograph or artwork
Colour Ad rates do not include the cost of
separations

Printed — web-offset

PAYMENT

All single insertion ads are accepted on a pre-
payment basis only, unless an account is held
Accounts will be opened for series rate advertisers
subject to satisfactory credit references
Accounts are strictly net and must be settled by
publication date

FOR FURTHER INFORMATION CONTACT

Radio & Electronics World, Sovereign House, Brentwood Essex CM14 4SE
(0277) 219876

Overseas payments by International Money Order.
Commission to approved advertising agencies is
10%

CONDITIONS

10% discount if advertising in both Radio &
Electronics World and Amateur Radio A voucher
copy will be sent to Display and Colour advertisers
only
Ads accepted subject to our standard conditions
available on request.

£600 + for the receiver performance of a £250 portable? There's a better way!

Fitting a preamplifier to Icom's IC 271 will degrade the dynamic performance of the transceiver to a level very similar to that offered by a FT290 fitted with our SLNA 145sb! Fitting our RPCB 271ub replacement front-end on the other hand will give you the same sensitivity (to within a small fraction of a dB) as the IC 271/Icom AG20 preamp combination, but with about 20dB better spurious-free dynamic range! The superiority of our approach will be best seen during contests and openings, where with our board you'll be able much more easily to hear the weak dx amongst the strong locals (assuming they have clean signals in the first place!), instead of a bandful of unpleasant noise! It does seem pointless to waste the excellent potential performance of this transceiver by fitting a preamp when there's a better way of going about it.

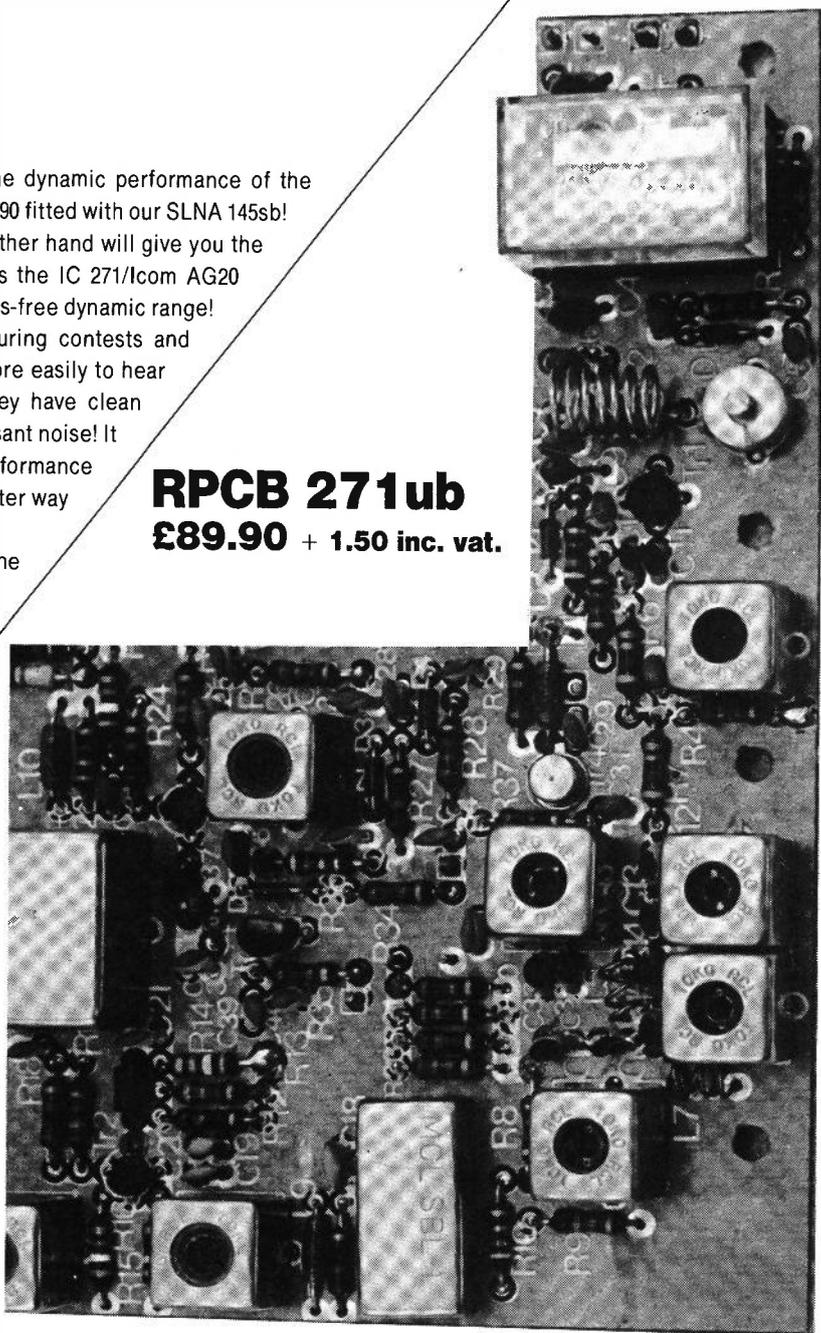
Incidentally, we did have a few teething problems with the interfacing of the RPCB 271ub to the IC 271. R+ was getting into Icom's mic preamp IC producing rather unpleasant ssb audio on transmit. This has now been cured, and of course where our customers have had problems we've been happy to put them right. We do care!

Stephen G4 SJP

P.S.

Our new TVHF 230c 2m to all 9 amateur hf bands transverter should be available in limited quantities at first by the time this appears in print. See it (and us) at the major rallies, or give a ring for more info.

RPCB 271ub
£89.90 + 1.50 inc. vat.



muTek limited — the rf technology company

Dept RW, Bradworthy, Holsworthy, Devon EX22 7TU (040924) 543





MICROWAVE MODULES LTD

AS IF YOU DIDN'T ALREADY KNOW . . .

Microwave Modules Ltd. is a full time professional organisation, established over **15 years** ago in **1969**, and currently employs over **30 full time**, on site staff based in our two modern, purpose built factories. In addition, a similar number of 'Outworkers' are involved in assembly and mechanical operations.

OUR EXTENSIVE RANGE . . .

Our product range now exceeds **50 individual items** in total and is the widest range available from any one manufacturing company. Our technical resources have enabled us to not only become the **largest and most successful** designer and manufacturer of R F Products, such as **Linear Amplifiers** and transverters, but also designers and manufacturers of **innovative** microprocessor and digital products such as **The Morsetalker**, MMSI, and the R TY to TV decoder, MM2001.

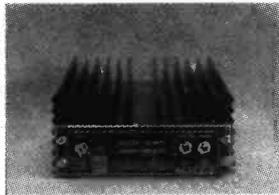
ALL BRITISH . . .

Every product in our range is designed and manufactured in the UK by our own employees, and wherever possible British Components are utilised.

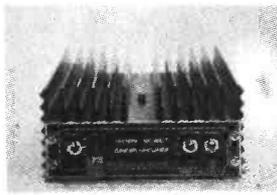
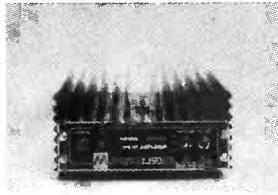
GUARANTEED . . .

All Microwave Modules Products are **Fully Guaranteed for 12 months**. This includes all semi-conductors and **PA Transistors**. We have built our reputation around our customer service and back-up and it is second to one.

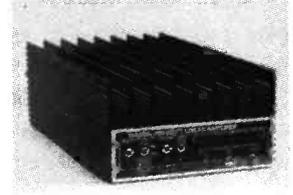
OUR RANGE OF LINEAR AMPLIFIERS . . .



MML144/30-LS



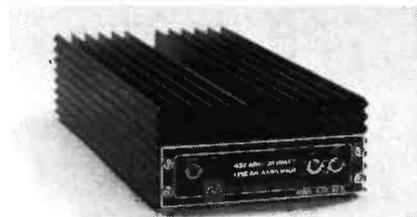
MML144/100-LS



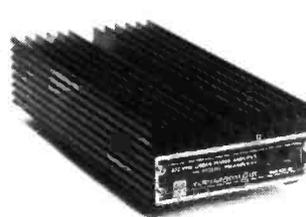
MML144/200-S

PRODUCT	INPUT POWER	OUTPUT POWER	MODES OF OPERATION	Pre Amplifier		POWER REQUIREMENTS	RF * VOX	PRICE INC VAT
				GAIN	NF			
MML144/30-LS	1 or 3W	30W	SSB, FM.	12dB	<1.5dB	13.8V @ 4A	\	£75 (p&p inc £3)
MML144/50-S	10W	50W				13.8V @ 6A	\	£92 (p&p £3)
MML144/100-S	10W	100W	CW.	AM		13.8V @ 12A	\	£149.95 (p&p £3.50)
MML144/100-HS	25W	100W				13.8V @ 12A	\	£149.95 (p&p £3.50)
MML144/100-LS	1 or 3W	100W				13.8V @ 14A	\	£169.95 (p&p £3.50)
MML144/200-S	3, 10 or 25W	200W				13.8V @ 30A	\	£245 (p&p £4.50)

* THE RF VOX CAN BE OVERRIDDEN AND HARDWIRED



MML432/30-L



MML432/50



MML432/100

PRODUCT	INPUT POWER	OUTPUT POWER	MODES OF OPERATION	PRE AMPLIFIER		POWER REQUIREMENTS	RF* VOX	PRICE inc VAT
				GAIN	NF			
MML432/30-L	1 or 3W	30W	SSB, FM, ATV, CW.	12dB	2dB	13.8V @ 6A	\	£139.95 (p&p £3.50)
MML432/50	10W	50W		12dB	2dB	13.8V @ 8A	\	£129.95 (p&p £3.50)
MML432/100	10W	100W		—	—	13.8V @ 20A	\	£245 (p&p £4.50)

* THE RF VOX CAN BE OVERRIDDEN AND HARDWIRED

CONNECTORS . . .

144MHz Products — Our standard connector on these products is SO239. We use a high quality PTFE socket of superior quality, but we are able to supply the choice of BNC or 'N' type at no extra charge. Please specify

432 MHz Products — The MML 432/30-L's fitted with BNC connectors, 'N' type available, please specify. The MML432/50 and MML432/100 both have BNC input sockets and 'N' type output sockets. If this is not to your preference please specify when ordering.

DATA SHEETS . . .

A full printed data sheet is available on each product, and is free on request.

CATALOGUE . . .

A copy of our latest catalogue can be obtained by sending a large SAE (23p) or by sending 40p in stamps to the address below.

RALLIES & EXHIBITIONS . . .

We shall be attending most of the 1984 rallies and exhibitions. Come and see our products for yourself.

AVAILABILITY . . .

Our products are normally available from stock either direct from ourselves or any of our 75 UK outlets.



WELCOME



MICROWAVE MODULES

BROOKFIELD DRIVE, AINTREE, LIVERPOOL L9 7AN, ENGLAND
Telephone: 051-523 4011. Telex: 628608 MICRO G
CALLERS AE WELCOME, PLEASE TELEPHONE FIRST

HOURS:
MONDAY-FRIDAY
9-12.30, 1-5.00
E & O.E.

PRODUCT NEWS

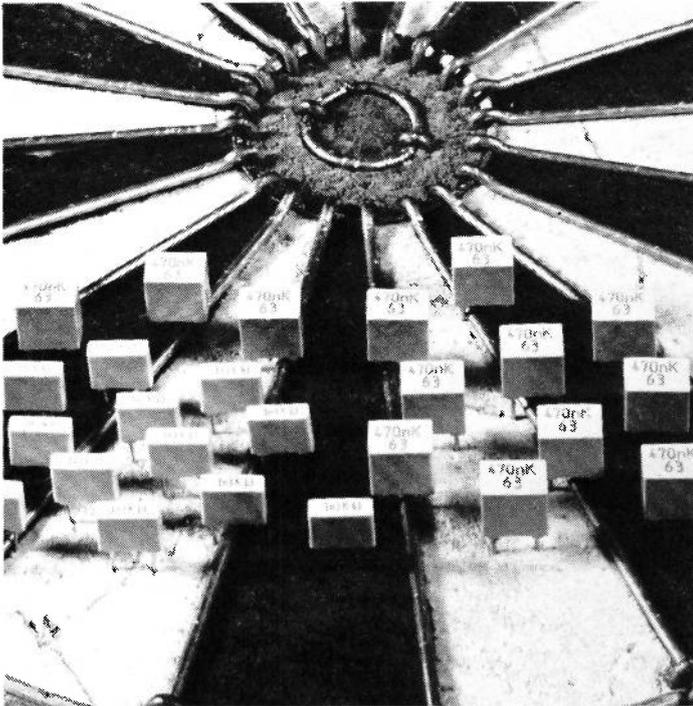
MINIATURE METALLISED POLYESTER CAPACITORS

Lowerdale Limited of Fleet have introduced a range of miniature polyester capacitors designed for general purpose use as decoupling capacitors. The insulated thermoplastic body has stand-off lugs to hold the capacitor away from the printed circuit board to facilitate solder flux removal.

Rated at 63V dc the capacitors are available from stock in a full range of values from 1nF to 470nF, all with 5mm

lead pitch. Ten per cent tolerance is standard with 5% being available to special order. For values up to 100nF the case size is 7.5mm wide x 6.5mm high x 2.5mm deep, 150nF and above the dimensions are 7.5mm x 8mm x 5mm. Operating temperature range is -40 to +85°C and stability is better than 5% after 1000 hours at 85°C.

Lowerdale Limited, 3 Fleet Road, Fleet, Hants. GU1 8QY. Tel: (02514) 20822.



NEW KITS AND MODULES

Cirkit has introduced a range of new kits and modules, which will cater for all electronic constructors, from the beginner to the professional.

The complete range will offer the constructor an exciting choice of projects, providing many practical applications around the home and in other aspects of everyday life.

The kits are graded student, enthusiast or professional and classified according to their applications, which include audio, test, radio, general and computing.

The more advanced kits require some test equipment for alignment, but the student kits need only a few handtools to produce a working unit.

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

NEW INTERFACE

Micropatch is a new low-cost, high performance Morse, Baudot and ASCII software/hardware computer interface package. Model MP-20 or MP-64 incorporates the complete MBATEXT software ROM for either the VIC-20 or Commodore 64 computers. All circuitry and software is incorporated on a single plug-in cartridge module which features 4 pole, Tschebyshev active filters; automatic threshold correction; 800Hz multi-stage active CW filter. Many other features are included, eg, automatic PTT; RTTY anti-space; sine generator for AFSK output. The unit has plus or minus CW keyed output and FSK keyed output. Price for MP-20 or MP-64 is £129.00.

ICS Electronics Ltd, PO Box 2, Arundel, West Sussex BN18 0NX. Tel: (024 365) 590.

COMPACT COLOUR NEWVICON CAMERA

A compact hand-held video camera, the WV-AQ1E, has been introduced by Panasonic. It is extremely versatile, simple to operate and can be used under almost any recording conditions. It incorporates numerous technologically advanced features including a 2 power zoom lens with MACRO function and the ability to film at very low lighting levels.

A primary consideration when buying a video camera is undoubtedly picture quality, so the WV-PA1E features a newly developed high sensitive 1/2 inch newvicon tube which provides the clarity and resolution of a 2/3 inch tube.

Filming under strong light is now possible as the 1/2 inch newvicon tube has been designed to eliminate the risk of burning, and the limitations of low light filming have also been overcome enabling filming at a minimum illumination of 7 lux. Colour shading and noise is extremely low with a horizontal resolution of 280 lines and an s/n ratio of more than 45dB.

The newvicon camera has been designed with comfort and human engineering in mind. It is self-contained, compact (193 x 160 x 236mm) and lightweight (only 1.1Kg excluding cable). A grip design handle allows manoeuvrability for difficult angles and ensures simple camera operation over a long period of time. Recording action is also improved as the start/stop button is conveniently located on the handle.

A convenient feature is a date setting time and stopwatch display, used for keeping a chronological record of

important events and a stopwatch function that is useful for the timing of athletic sports. A built-in alarm system will check to ensure that conditions are right for recording and alerts the user of poor batteries, misconnections, incorrect white balance or poor light. ● *For the creative home movie-maker there is a negative/positive picture reversal for added dramatic effect or negative film copying. A unidirectional boom microphone gives vivid sound reproduction and is removeable for silent recording.*

A built in VTR remote control allows remote control operation (play, slow, cue and review) on the attached portable VTR.

The motor driven 200mm lens is a 6 x (8.5 to 51mm) F1.2 type with an auto/manual iris control and a built in MACRO function which is ideal for close-up shots (to 5cm).

Other features include a built-in tube protection shutter which automatically shuts off external light whenever the camera is switched off; a built-in colour temperature setting for indoors/outdoors; rec review, with button for NV-100 portable VTR; auto/manual iris control; colour balance control; 1 inch electronic viewfinder - which doubles up as a 1in b/w TV monitor; back-up battery compartment for auto date/time and for white balance memory; 2.5 inch detachable camera cable and a stand-by switch used to conserve the power of a VTR battery, if recording is stopped for more than 5 minutes.

Panasonic UK Ltd, 300-318 Bath Road, Slough, Berkshire. Tel: Slough (0753) 34522.





ENFIELD ELECTRONICS

208 Baker Street, Enfield,
Middlesex. EN1 3JY. Tel: 01-366 1873



TRANSISTORS

AC125	30p	BC183C	12p	BF224B	20p	TIP29C	45p	2N1304	80p
AC126	30p	BC183L	12p	BF244B	20p	TIP30B	45p	2N1305	80p
AC127	30p	BC183B	12p	BF255	35p	TIP30C	45p	2N1307	70p
AC128	30p	BC184	12p	BF257	35p	TIP31A	40p	2N1613	35p
AC132	30p	BC184B	12p	BF259	35p	TIP31C	40p	2N2222A	30p
AC141	30p	BC186	12p	BF594	40p	TIP32A	40p	2N2369A	28p
AC142	30p	BC186	30p	BF594	40p	TIP32C	40p	2N2646	68p
AC175	30p	BC187	30p	BF595	30p	TIP36C	140p	2N2907A	30p
AC188	30p	BC212A	14p	BFR39	20p	TIP41A	50p	2N2926G	12p
AD149	80p	BC212L	12p	BFR79	30p	TIP41B	50p	2N2926R	12p
AD161	45p	BC213B	12p	BFR80	30p	TIP42A	50p	2N2928Y	12p
AD162	45p	BC213L	12p	BFX84	30p	TIP42B	50p	2N3053	30p
BC107	12p	BC214	12p	BFX86	30p	TIP120	80p	2N3054	75p
BC107A	14p	BC214L	12p	BFX88	30p	TIP121	80p	2N3055E	60p
BC108	12p	BC217	12p	BFX87	30p	TIP142	120p	2N3442	150p
BC108A	14p	BC237	18p	BFY50	28p	TIP2955	70p	2N3615	200p
BC108B	14p	BC238B	18p	BFY51	25p	TIS43	40p	2N3703	12p
BC108C	14p	BC307	18p	BFY52	25p	TIS90	30p	2N3704	12p
BC109	12p	BC308	14p	BFY90	80p	TIS91	30p	2N3705	12p
BC109B	14p	BC328	16p	BRY39	40p	1N10KMA	75p	2N3706	12p
BC109C	14p	BC337	16p	BSX29	35p	2N3707	12p	2N3707	12p
BC140	35p	BC338	16p	BU105	170p	2N3710	12p	2N3710	12p
BC141	35p	BC441	36p	BU205	200p	ZTX108	12p	2N3711	12p
BC142	35p	BC461	36p	BU206A	220p	ZTX109	12p	2N3711	200p
BC143	35p	BC477	40p	MJ2955	90p	ZTX300	15p	2N3772	200p
BC147	12p	BC478	40p	MJ340	50p	ZTX301	18p	2N3773	200p
BC148	12p	BC517	45p	MJE371	90p	ZTX302	20p	2N3819	25p
BC157	12p	BC547	15p	MJE2955	110p	ZTX303	20p	2N3820	45p
BC158	12p	BC548	15p	MJE305T	200p	ZTX304	20p	2N3823	50p
BC159	12p	BC549	16p	MPSA06	25p	ZTX305	35p	2N3866	100p
BC160	12p	BC556	20p	MPSA56	30p	ZTX500	60p	2N3903	100p
BC161	45p	BC557	16p	MPSU05	65p	ZTX501	18p	2N3904	15p
BC167	15p	BC558	16p	MPSU56	60p	ZTX502	18p	2N3905	15p
BC168	12p	BC559	16p	OC22	150p	ZTX503	18p	2N3906	15p
BC169	12p	BC570	20p	OC23	150p	ZTX504	30p	2N5172	30p
BC170	20p	BC571	20p	OC26	100p	ZTX531	30p	2N5194	80p
BC171	13p	BC572	23p	OC28	200p	ZTX550	30p	2N5457	42p
BC172A	12p	BD131	50p	OC36	220p	2N6956	35p	2N5458	48p
BC173	13p	BD132	50p	OC41	75p	2N6958	45p	3N128	85p
BC177	20p	BD133	60p	OC42	75p	2N6959	40p	3N140	85p
BC178	20p	BD135	50p	OC70	60p	2N706A	26p	3N141	85p
BC179	25p	BD136	40p	OC76	60p	2N7078	36p	3N163	110p
BC181	23p	BD137	40p	OC81	60p	2N714	30p	3N164	110p
BC182	12p	BD138	40p	OC82	60p	2N918	30p	3N202	125p
BC182B	14p	BD139	45p	OC84	50p	2N930	30p	40A06	80p
BC183	12p	BD140	45p	OC89	30p	2N1131	30p	40A07	80p
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BC183B	12p	BF195	14p	TIP29B	35p	2N1303	80p		

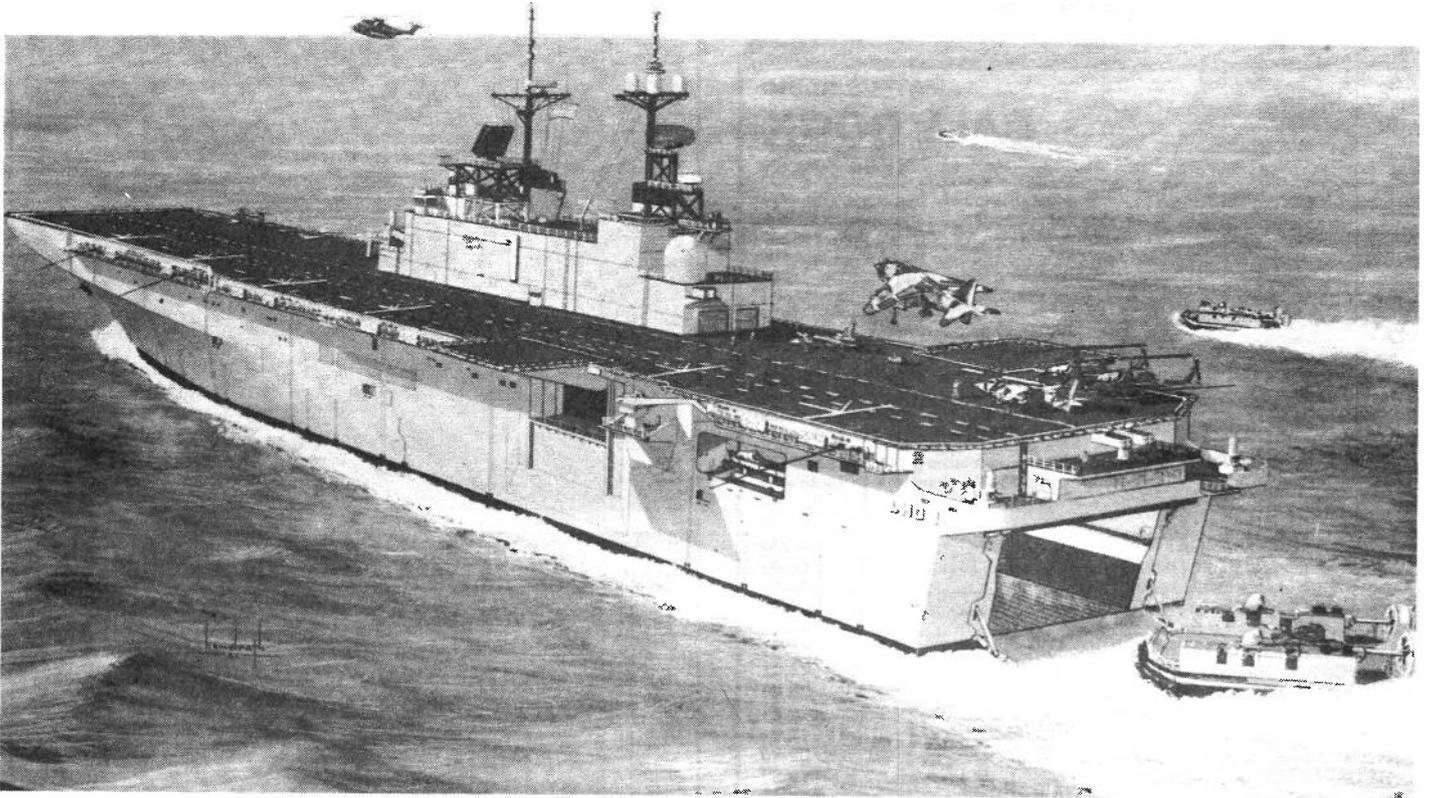
TTL

7400	18p	7417	28p	7447	75p	7486	35p	74119	70p	74160	65p	74190	58p
7401	18p	7425	28p	7448	55p	7489	140p	74121	35p	74161	55p	74191	55p
7402	18p	7426	28p	7450	21p	7490	37p	74122	41p	74162	46p	74192	55p
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7404	18p	7428	30p	7452	21p	7492	40p	74124	70p	74164	60p	74194	52p
7405	18p	7429	30p	7453	21p	7493	41p	74125	65p	74165	60p	74195	52p
7406	32p	7430	26p	7454	21p	7494	41p	74126	65p	74166	60p	74196	55p
7407	32p	7431	26p	7455	21p	7495	41p	74127	65p	74167	185p	74197	55p
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7410	25p	7434	26p	7458	21p	7498	41p	74130	65p	74170	185p	74200	60p
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7414	37p	7438	26p	7462	21p	7502	41p	74134	65p	74174	185p	74204	60p
7415	28p	7439	26p	7463	21p	7503	41p	74135	65p	74175	185p	74205	60p
7416	28p	7440	26p	7464	21p	7504	41p	74136	65p	74176	185p	74206	60p
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		7442	26p	7466	21p	7506	41p	74138	65p	74178	185p	74208	60p
		7443	26p	7467	21p	7507	41p	74139	65p	74179	185p	74209	60p
		7444	26p	7468	21p	7508	41p	74140	65p	74180	185p	74210	60p
		7445	26p	7469	21p	7509	41p	74141	65p	74181	185p	74211	60p
		7446	26p	7470	21p	7510	41p	74142	65p	74182	185p	74212	60p
		7447	26p	7471	21p	7511	41p	74143	65p	74183	185p	74213	60p
		7448	26p	7472	21p	7512	41p	74144	65p	74184	185p	74214	60p
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		7451	26p	7475	21p	7515	41p	74147	65p	74187	185p	74217	60p
		7452	26p	7476	21p	7516	41p	74148	65p	74188	185p	74218	60p
		7453	26p	7477	21p	7517	41p	74149	65p	74189	185p	74219	60p
		7454	26p	7478	21p	7518	41p	74150	65p	74190	185p	74220	60p
		7455	26p	7479	21p	7519	41p	74151	65p	74191	185p	74221	60p
		7456	26p	7480	21p	7520	41p	74152	65p	74192	185p	74222	60p
		7457	26p	7481	21p	7521	41p	74153	65p	74193	185p	74223	60p
		7458	26p	7482	21p	7522	41p	74154	65p	74194	185p	74224	60p
		7459	26p	7483	21p	7523	41p	74155	65p	74195	185p	74225	60p
		7460	26p	7484	21p	7524	41p	74156	65p	74196	185p	74226	60p
		7461	26p	7485	21p	7525	41p	74157	65p	74197	185p	74227	60p

LS TTL

74LS00	17p	74LS27	21p	74LS58	51p	74LS138	40p	74LS169	98p	74LS243	81p	74LS293	46p
74LS01	17p	74LS28	21p	74LS59	51p	74LS139	39p	74LS170	86p	74LS244	66p	74LS293	71p
74LS02	17p	74LS29	21p	74LS60	51p	74LS140	121p	74LS171	86p	74LS245	88p	74LS293	110p
74LS03	17p	74LS30	21p	74LS61	51p	74LS141	121p	74LS172	86p	74LS246	88p	74LS293	135p
74LS04	17p	74LS31	21p	74LS62	51p	74LS142	121p	74LS173	86p	74LS247	88p	74LS293	160p
74LS05	17p	74LS32	21p	74LS63	51p	74LS143	121p	74LS174	86p	74LS248	88p	74LS293	185p
74LS06	17p	74LS33	21p	74LS64	51p	74LS144	121p	74LS175	86p	74LS249	88p	74LS293	210p
74LS07	17p	74LS34	21p	74LS65	51p	74LS145	121p	74LS176	86p	74LS250	88p	74LS293	235p
74LS08	17p	74LS35	21p	74LS66	51p	74LS146	121p	74LS177	86p	74LS251	88p	74LS293	260p
74LS09	17p	74LS36	21p	74LS67	51p	74LS147	121p	74LS178	86p	74LS252	88p	74LS293	285p
74LS10	17p	74LS37	21p	74LS68	51p	74LS148	121p	74LS179	86p	74LS253	88p	74LS293	310p
74LS11	17p	74LS38	21p	74LS69	51p	74LS149	121p	74LS180	86p	74LS254	88p	74LS293	335p
74LS12	17p	74LS39	21p	74LS70	51p	74LS150	121p	74LS181	86p	74LS255	88p	74LS293	360p
74LS13	17p	74LS40	21p	74LS71	51p	74LS151	121p	74LS182	86p	74LS256	88p	74LS293	385p
74LS14	17p	74LS41	21p	74LS72	51p	74LS152	121p	74LS183	86p	74LS257	88p	74LS293	410p
74LS15	17p	74LS42	21p	74LS73	51p	74LS153	121p	74LS184	86p	74LS258	88p	74LS293	435p
74LS16	17p	74LS43	21p	74LS74	51p	74LS154	121p	74LS185	86p	74LS259	88p	74LS293	460p
74LS17	17p	74LS44	21p	74LS75	51p	74LS155	121p	74LS186	86p	74LS260	88p	74LS293	485p
74LS18	17p	74LS45	21p	74LS76	51p</								

NEWS DESK



United States naval communications

Marconi Communication Systems Ltd, of Chelmsford, is to supply a complete radio communication system to the United States Navy...the first time a British company has done so.

Consisting of radio equipment for the LHD-1, the first of a new class of amphibious landing assault ships, the contract is expected to be worth about US \$15 million and is a version of the already well-proven ICS3 radio. This has already been fitted in 41 ships, including those of the Royal Navy, Royal Netherlands Navy and Greek Navy.

£100m air force order

Marconi Defence Systems Limited of Stanmore, Middlesex, has also secured what is believed to be one of the largest orders ever placed with a single European company for an airborne electronic warfare systems package comprising an advanced, fully-integrated electric countermeasures system known as Zeus for RAF Harrier GR5 jump jets.

Zeus uses an American

transmitter made by Northrop and the commonality between the US AV8B and the UK GR5 Harrier increases the possibility of USA sales.

The Zeus project is a rare example of real collaboration between British and American industry, which can be expanded into additional trans-Atlantic projects.

The order will provide work for up to 500 people within MDSL, both at Stanmore and at the company's Broad Oak manufacturing plant in Portsmouth, and for many more who work for the hundred plus suppliers who will be working on the project.

RSGB News

NASA will shortly be considering proposals from the amateur community for the next amateur radio shuttle mission. The next licensed amateur in space is Dr Tony England. W0ORE and, like W5LFL, he hopes to be able to take some amateur radio equipment with him in space (with a name like his, the omens for the Society's headquarters station having a contact with him must be good!)

Whilst the publicity aspects of the STS-9 mission were generally satisfactory and, from the Society's point of view, profitable, there is no doubt that the impact of a few words directly from space to the Society's headquarters station with the media in attendance would have been enormous. It would have been the final icing on the publicity cake and would have demolished the lingering impression gained by the media that, for all the effort and energy put into the mission, the results were not outstanding from a pragmatic point of view.

The Society made several requests (in fact they were more like pleas) before the mission for a brief scheduled exchange with W5LFL but we were informed that NASA had a strict 'no sked' policy - which, to our knowledge, dissuaded several elements of network television from giving more coverage to the mission and to some extent diluted the force of the TV coverage which was given. In the event, of course, technical difficulties of various kinds restricted W5LFL's

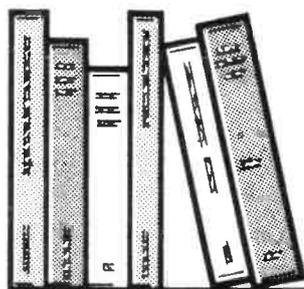
operating quite considerably and during the mission we again suggested that a sked would do a great deal of good: however, NASA would not budge from their position.

The Society has already written to NASA with suggestions for future missions. If any members have any suggestions for operating or experiments, the Society's Secretary would be pleased to hear from you. A number of experiments have already been suggested by amateurs in the USA. W0ORE expects to be in space in March 1985, which leaves precious little time or any ideas to be developed: however, any comments would be appreciated.

Northern computer fair

The third Northern Computer Fair - the only established microcomputer market place for all buyers of micro's and related products in the lucrative northern area, is to be held at Belle Vue, Manchester, from 22-24 November.

The timing of the show ensures that it falls within the pre-Christmas spending period.



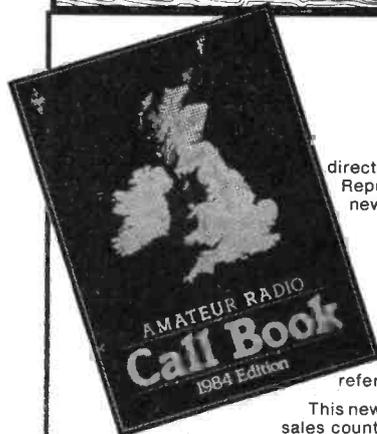
RSGB BOOKS

AMATEUR RADIO CALL BOOK 1984 edition

Published annually, this comprehensive directory of amateur radio stations in the UK & Republic of Ireland, incorporates over 18,000 new call signs and over 10,000 amendments. All notified by the Department of Trade and Industry between August 1982 and February 1984. It also includes lists of RSGB affiliated societies, groups and special call signs.

For most entries, the address published is the station location. This gives the VHF/UHF enthusiast an easy reference for beam directing purposes.

This new edition is available now from the RSGB sales counter price **£5.89**, or by post price **£7.14**.



OTHER RSGB PUBLICATIONS

	Inc p/p
A guide to Amateur Radio (19th edn).....	£3.44
Amateur Radio Awards (2nd edn).....	£3.41
Amateur Radio Operating Manual (2nd edn).....	£5.22
HF Antennas for All Locations.....	£6.91
Microwave Newsletter Technical Collection.....	£6.83
Morse Code for Radio Amateurs.....	£1.31
Radio Amateurs' Examination Manual.....	£3.42
Radio Communication Handbook (paperback).....	£10.91
Teleprinter Handbook (2nd edn).....	£13.84
Television Interference Manual.....	£2.23
VHF/UHF Manual (4th edn).....	£10.31

Logbooks

Amateur Radio Logbook.....	£2.77
Mobile Logbook.....	£1.14
Receiving Station Logbook.....	£2.72

Maps

Great Circle DX Map (wall).....	£2.12
QTH Locator Map of Western Europe (wall).....	£1.43
World Prefix Map in full colour (wall).....	£2.17

OTHER PUBLICATIONS

Active Filter Cookbook (Sams).....	£12.71
Amateur Single Sideband (Ham Radio).....	£5.46
Amsat-UK Technical Manual (Amast-UK) Incl. Oscar 10 data.....	£14.37
Antenna Anthology (ARRL).....	£3.83
ARRL Antenna Book (Hardback for p/b price while stocks last).....	£8.78
ARRL Electronics Data Book.....	£4.47
Complete Shortwave Listener's Handbook (Tab).....	£12.21
FM and Repeaters for the Radio Amateur (ARRL).....	£4.30
G-QRP Club Circuit Handbook.....	£4.19
Hints and Kinks for the Radio Amateur (ARRL).....	£4.47
How To Troubleshoot and Repair A.R. Equipment (new stock).....	£10.47
Radio Amateurs Handbook 1984 (ARRL).....	£11.65
Satellite Experimenters Handbook (ARRL).....	£9.90
Secrets of Ham Radio DXing (TAB).....	£7.92
VHF Propagation Handbook (Nampa).....	£3.75

The RSGB is the national society representing all UK radio amateurs. Membership is open to all interested in the hobby, including listeners. The Society publishes a range of books, log books and maps for the radio amateur. A large selection of other radio and electronics books also stocked, a full list is available on request. Contact the membership services section for more information about amateur radio, the RSGB and its publications. All publications sold by the RSGB are available at discounted prices to members.



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30	3v-30v	0-120	6.00	0.91	1.03	7.95
50	3v-30v	0-120	6.65	2.00	1.30	9.95
80	3v-30v	0-120	7.25	2.00	1.38	10.63
120	3v-30v	0-120	8.00	2.00	1.50	11.50
160	3v-30v	0-120	9.00	2.00	1.65	12.65
225	3v-30v	0-120	11.50	2.50	2.10	16.10
300	3v-30v	0-120	13.50	2.50	2.40	18.40
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The promotional budget will not only include the normal television, radio and local press advertising, but has been increased to include national press and a large poster campaign.

Small-dish breakthrough to the USA

SatStream – the small-dish satellite business communications service of British Telecom International – can now operate to the USA.

This results from the decision made on March 30 by the Federal Communications Commission – the US regulatory authority for telecommunications – allowing small-dish earth terminals to operate to international Psatellites.

SatStream North America – opened in February this year to Canada – will shortly be extended to the eastern States of the USA, with increased coverage when new satellites are launched in 1985.

BTI is installing small-dish earth terminals, with antennas between 3.7 and 5.5 metres in diameter, in key city centres throughout the UK to provide access for customers. The first is already operational at West Ealing, London, using a 5.5m diameter antenna designed by British Telecom to give improved performance.

SatStream earth terminals may also be located on customers' own premises for their exclusive use.

Research fellowship in satellite antennas

British Aerospace Dynamics Group's Space and Communications Division, based at Stevenage, has announced the establishment of a research fellowship at the University of Kent, Canterbury, to investigate novel techniques in the design of multi-frequency satellite antennas.

One way of exploiting the full potential of communications satellites is to equip a single platform with a number of communications payloads covering several frequency bands. Using conventional antennas, this means providing a satellite with one antenna for each frequency band – a method that carries cost and design penalties which make multi-frequency band satellites with con-

ventional antennas unattractive.

A solution to the problem may be found in designing an antenna configuration with several sub reflectors of a special type, stacked one behind the other. These sub reflectors have frequency selective surfaces (FSS) and they are transparent or reflective to individual frequency bands, thereby performing spatial frequency diplexing. This technique enables a common main reflector to be used for many bandwidths to beam transmissions to earth and receive signals from ground stations.

In a joint study, the University of Kent will work on the physics and fundamental problems of the operation of multiply-stacked FSS arrays, and British Aerospace will develop the technology of manufacture and perform detailed experimental evaluation of FSS arrays.

This project, which is fully funded by British Aerospace, is an example of the close relationship that exists between BAe and the universities, particularly in researching advanced engineering concepts and technologies.

British Amateur Television Club

The Rugby Post House Hotel was the place to be on Sunday May 13th for the growing band of TV enthusiasts in the British Amateur Television Club.

This annual convention is the major event in the ATVer's calendar, and demonstrations of equipment by traders and 'home-brewers' showed a range of TV-related activities, from transmission to computer graphics to the latest developments in microwave TV repeater stations.

The Club was founded in 1949 to inform, instruct and co-ordinate the activities of amateur radio enthusiasts experimenting with television transmission, and has grown to represent the interests of both fast scan and slow-scan TV operators.

The BATC provides various services to its members, notably its quarterly magazine 'CQ-TV' issued free to members. This features circuits, constructional articles, photos and news items to stimulate and develop both the 'old-hand' and the newcomer.

The Club organises television contests to help promote activity and has various awards for 'on-the-air' achievement.

For details of membership contact D Lawton, G8ANO, 'Grenehurst', Pinewood Road, High Wycombe, HP12 4DD.

Special event station at Liverpool

The IBA and Radio City have responded to an invitation from the Merseyside Development Corporation to provide a 'special event' medium-wave broadcasting facility for Liverpool's International Garden Festival.

Until October, a temporary IBA medium-wave transmitter on 1530kHz (196 metres) is providing traffic and parking information and Festival announcements from the studios of Radio City, the Liverpool ILR station.

The broadcasts can be received throughout the 250-acre site and beyond. It has been specially authorised by the Home Office/DTI on condition that no advertising announcements are broadcast.

The IBA installation at Birkenhead, across the water from the Festival site, uses one of its emergency containerised transmitters with an easily-erected 74ft metal-cored, glass-reinforced-fibre vertical 'whip' aerial and a buried earth-mat. It has an effective-monopole-radiated-power of about 40W and the complete installation was erected in little more than 24 hours. The transmitter is a Redifon 1KW solid-state unit substantially under-run. The 1530kHz channel is a frequency ear-marked for a future north-country ILR station.

Laser graphics

Data Card has developed a dramatic new high speed plastic card identification system which utilizes laser technology to produce secure photo identification credit and cheque cards at a low cost.

The system uses a video camera to record live or photographic images while a computer keyboard permits the entry of other identification data. It makes the job of collecting data much easier and more secure, since the data input to the system is put into computer form and stored on magnetic media ready to process the cards. Laser and electro photographic film technology generates the high resolution images onto the cards which are then sealed with a protective security overlay. The system can process cards at the rate of 750 per hour.

The Laser Graphics System can provide the user with quick access to vital data whether it is for security purposes, updating identification cards or the re-issue of lost cards. Data is stored on a single computer medium for subsequent recall providing additional convenience, cost savings and security.

The applications for the Laser Graphics System are numerous since many different security features can be incorporated into the card including pictures, finger prints, signatures or a variety of other graphic data. The system will also take alphanumeric text data and put it in microform for an extra measure of security, referred to as micrographics. A magnetic stripe may be incorporated into the back of the card for other applications.

WELCOME BACK UOSAT – 2

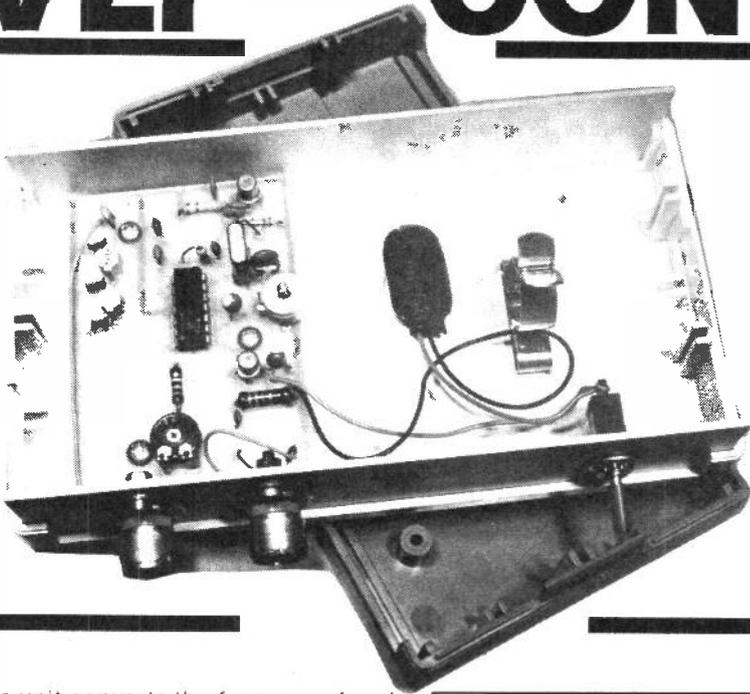
In the July issue of *R & EW* (Page 42), Dr Arthur Gee reported the failure of signals from UOSAT-2 during the third orbit of the satellite and described some of the tests that were made to detect even the weakest of its beacon signals.

Unfortunately, no signals were detected and it was speculated that UOSAT-2 may have suffered impact damage during the third orbit, rendering it permanently unserviceable.

However, terrestrial signals to the satellite have been continued in the hope that such damage did not occur and the satellite could be made to respond.

We are pleased to note that this perseverance has been rewarded and the satellite is again orbiting in the state 'all systems go.'

VLF CONVERTER



This article by Lionel Sear, G3PPT, describes an economically-priced unit that will provide a new experience for many readers – build it and become familiar with the world of the very low frequency spectrum.

This unit converts the frequency band between zero and approximately 700KHz to an equivalent frequency – spectrum accessible to a general coverage or amateur bands only receiver, depending on the frequency of a crystal oscillator. It may be built for less than £5.

Circuit description

The heart of the unit is the early FM demodulator IC, the SN76660, which consists mainly of a limiting amplifier and a double balanced modulator; the important factor for our application being that the latter section is accessible to the outside world.

The TBA120A is equivalent, but later marks of this IC should be avoided as they contain internal coupling capacitors.

Q1 is used in a standard Colpitts crystal oscillator configuration and its output fed via C5 into the limiting amplifier section of IC1, which then feeds the limited signal in quadrature to the double balanced modulator.

The actual frequency chosen is unimportant, but 4.000MHz is suggested as this is available cheaply with the HC18/U base. 10.000MHz is also feasible, with the added advantage that an output is available on the third harmonic at 30.0MHz for those with 10 metre only receivers. Crystals drastically outside of these limits may not oscillate with the component values shown.

The signal from the antenna is fed via C10 into the very crude low pass filter formed by L1, L2, C11, C12 and C13 which cuts off around 700KHz. The signal is then fed into the double balanced modulator at pin 7 to which pin is also fed an additional balancing current from RV1 and R6. The output appears at pin 8 and Q2 is directly coupled to this to prevent overloading by the receiver connected to the circuit via C9.

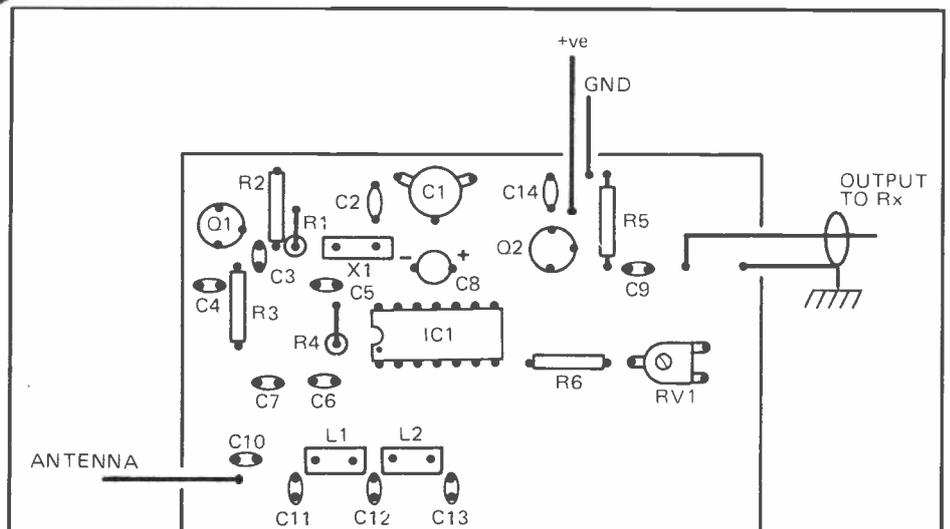


Fig 1 Component overlay

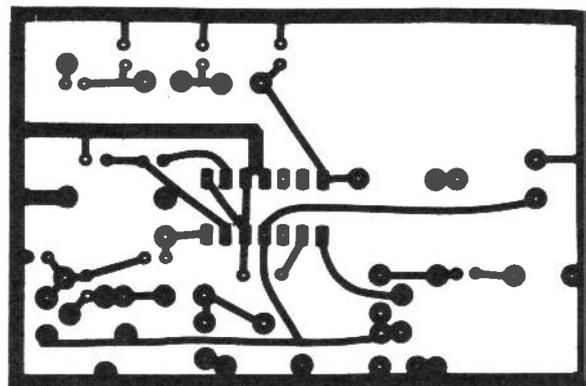


Fig 2 Foil pattern

VLF CONVERTER

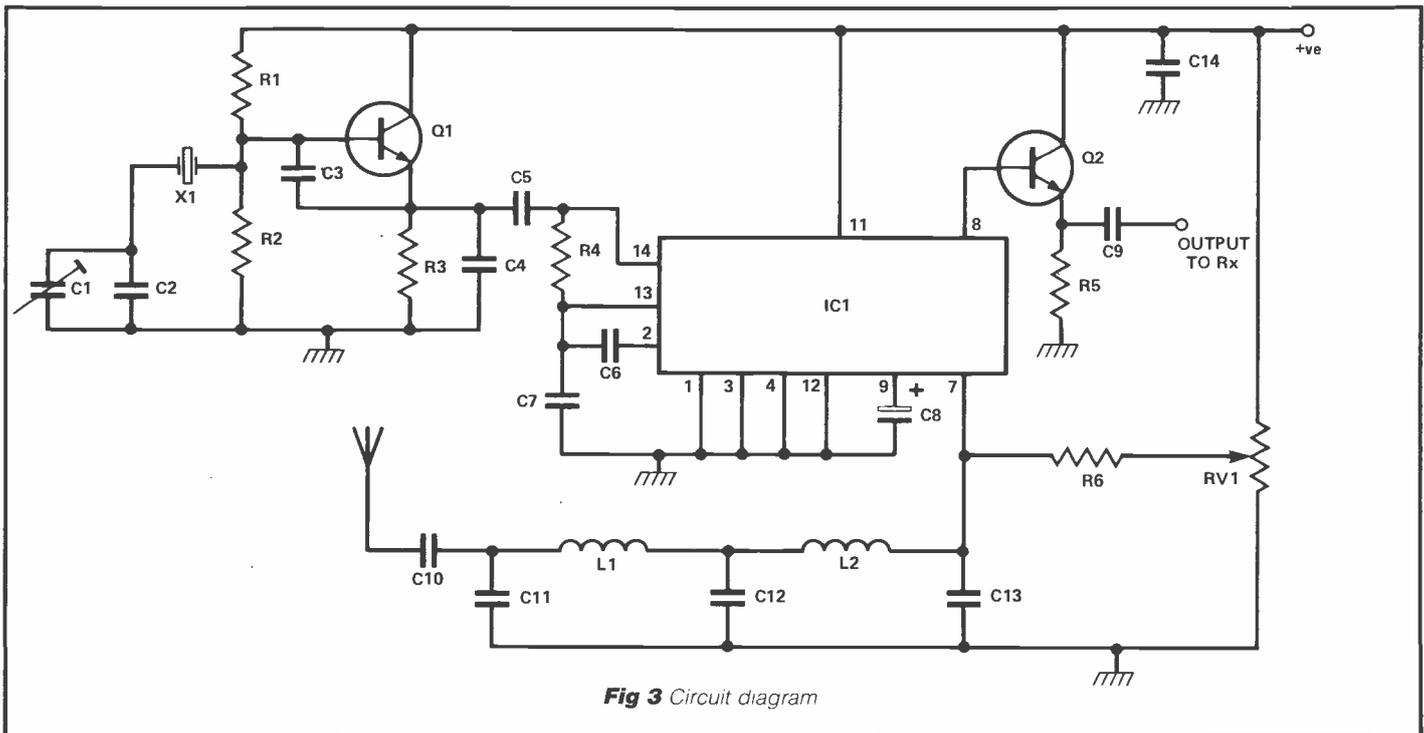


Fig 3 Circuit diagram

PARTS LIST

Resistors

R1	100K 1/4W 5%
R2	22K 1/4W 5%
R3,R5	3.3K 1/4W 5%
R4	1K 1/4W 5%
R6	330K 1/4W 5%
RV1	47K 10 MM Preset

Capacitors

C1	5-60pF Foil Trimmer
C2,C5,C9	30pF Ceramic Plate
C3,C4	150pF Ceramic Plate
C6,C7	10nF Monolithic
C8	2.2uF 35V Ta Bead
C10,C11	1nF Disc Ceramic
C12,C13	1nF Disc Ceramic
C14	100nF Disc Ceramic

Inductors

L1,L2	Toko 283AS-221 220uH Fixed Inductor
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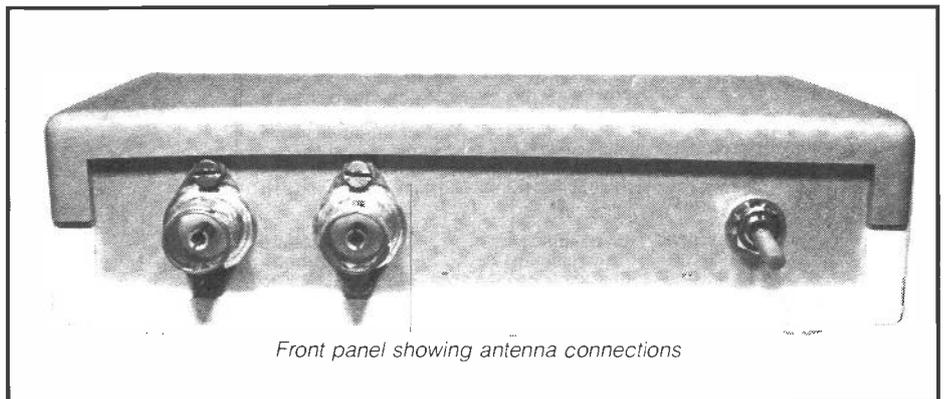
Semiconductors

Q1,Q2	Gen Purpose NPN BC107 etc
IC1	SN 76660
X1	HC18/U Base Crystal (see text)

IC1 is obtainable from a number of suppliers advertising in this magazine. The other components are also readily available.

Construction and testing

IC1 is a wide-band high gain device, but so long as the layout shown is followed, no instability should be encountered. After construction, connect the unit to a suitable receiver and power source, (9 to 12V at 20mA is required). The crystal oscillator should be tunable on the receiver and it's output



Front panel showing antenna connections

adjusted for minimum signal strength with RV1. The actual frequency may be trimmed slightly by adjustment of C1.

If a suitable antenna is connected, the correct functioning of the unit should be apparent with strong reception of BBC Radio 4 at the crystal frequency plus and minus 200KHz. A large antenna may overload the unit, and if this is suspected then place a small capacitor in series with the input. The unit itself may overload the receiver, in which case C9 should be reduced in value.

VLF reception

The minimum frequency receivable with this converter will depend on the characteristics of the main receiver, but most configurations should enable the pulses of the 'OMEGA' navigational system around 10KHz to be heard. It may also be possible to hear atmospheric phenomena such as 'whistlers', but bear in mind that in the urban environment the VLF spectrum tends to be heavily polluted with man-made interference from TV timebases etc., especially at night.

Tuning up through the range of the

converter one will encounter an assortment of FSK signals such as GBR on 16KHz, coded time signals such as MSF Rugby on 60KHz and navigational beacons etc.

The conventional Long Wave band needs no explanation, but between this and the Medium Wave lies the marine band with a plethora of marine and aircraft navigational beacons between 280 and 400KHz. A nautical almanac such as 'Reeds' gives full information about these.

Further suggestions

With a suitable microphone or transducer having the required high frequency response connected to the input, it should be possible to listen to the sounds emanating from bats, but, since this has to be done outside, be careful that this does not cause the neighbours to think that you are some sort of 'listening Tom', monitoring bed-spring harmonics!

Short range communication may be feasible using a modulated ultrasonic carrier and the type of transducer used for burglar alarms.



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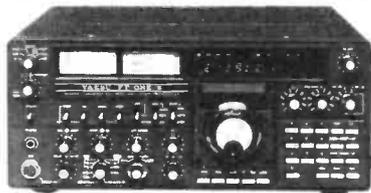
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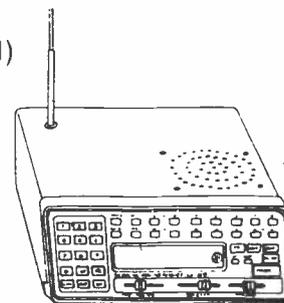
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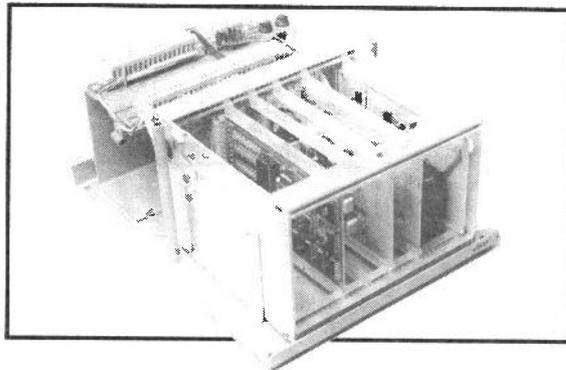


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— OSCAR-10 —

FIRST IMPRESSIONS AND HOW TO GET STARTED

by Arthur C Gee G2UK

OSCAR-10 is not the sort of satellite one would recommend the newcomer to amateur radio satellite communications, to cut his teeth on!

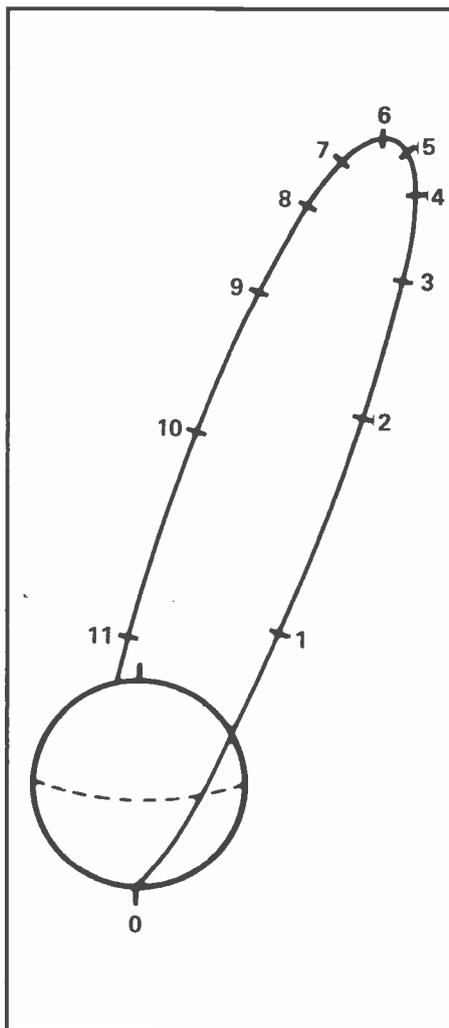
Listening on the air, and in correspondence and conversations with those interested in getting going on OSCAR-10, one soon learns that even those who have had experience on the earlier satellites run into many new problems.

In this article, the writer hopes his experiences may help others to get going on OSCAR-10, so that they can enjoy the quite unique experience of communicating with DX amateur radio stations throughout the world via this sophisticated satellite.

Attention has been confined to the Mode B transponder, ie 435.025 to 435.175 MHz up and 145.975 to 145.825 down links. The other transponder channel, Mode L, with an uplink of 1269.050 to 1269.850 MHz and 436.950 to 436.150 MHz down link presents treatment of its own as it is a speciality of the microwave enthusiasts.

As indicated in Terry Weatherley's article in the March 1984 issue of *R & EW* 'OSCAR-10, a look at its Orbit' the orbit of this satellite is very different from that of previous amateur radio satellites. Whereas previous satellites in the OSCAR and Russian RS satellite series were in more or less circular orbits, OSCAR-10 is in a very marked elliptical orbit.

The circular orbits of these earlier satellites were in what is known as low-polar orbits, ie about 2400 Km or 1500 miles in altitude. At such altitudes a maximum communications range of about 10,000 Km (6000 miles) is possible. Only a few passes per day occur and the satellite is travelling at such a speed that only 20 minutes or so of time is available



The position of a satellite with a 12-hour period at hourly intervals showing its speed variations

for contacting it. This makes contacts with it quite a test of physical co-ordination; the antenna direction has to be controlled, the receiver has to be tuned, the transmitter switched on and off, Doppler Shift allowed for and so on.

The elliptical orbit into which OSCAR-10 has been launched, gives a far better orbit for amateur radio type communications. It has an apogee of 35,000 Km, positioned as far north as possible, with a perigee of 1500 Km altitude over the southern hemisphere.

As explained in Terry Weatherley's article, this type of orbit gives a great speed variation to the satellite, such that at the 'top' of the orbit, the speed is at its slowest, thereby giving the maximum communication time. This type of orbit is known as a 'Molniya' orbit. It gives a much longer period of time per orbit during which communication can be sustained and far greater distances can be covered.

More complex

However, the calculation of these orbits is a much more complex matter than with the simpler circular ones. One solution to this problem is the use of a personal computer, and it has not taken long for the boffins of home computer programming to come up with satisfactory software capable of working out the necessary information in various and often very ingenious ways. The computer buffs are having a real ball in this field!

I spent some time getting myself initiated into this system, but soon came to the conclusion that there are simpler ways of getting the information required for quickly setting up one's gear for reliable communications. One of these is to use the *Orbital Predictions* published

OSCAR-10

regularly by AMSAT-UK. From these, one can see at a glance just what is required. They are presented in the following form:

elevation of the satellite does change very markedly from only just above the horizon to way up to 53 or more degrees. It should be noted that this change of

inclination of its polar axis. If you are doing your own orbital predictions with a computer, you will need a considerable amount of data to cover these movements.

These are known as Keplerian Elements and they are given out in the news bulletins from AMSAT-UK on the air and in the appropriate journals, as they change. We will not deal with them here, as they are the province of the computer boys! This article is intended to show how one can use OSCAR-10 in the simplest possible way.

It is very useful to know just where on its orbital path, the satellite is. If you take the computer path into orbital prediction, you can get software, which will produce a map of the world on your screen and actually show you how the satellite progresses. This is, one must admit, truly remarkable!

But there are other ways. The beacons on OSCAR-10 give out telemetry signals in morse code, which at each half hour, give amongst other information what is called the Mean Anomaly – it follows the orbit number and is expressed as 'MA' and a number. This number is given as a proportion of the number 256, eg MA 160/256. These 'MA' numbers are arranged around the orbit as shown in the drawing reproduced here.

AMSAT-UK OSCAR-10 CALENDAR. APRIL / MAY 1984.

01:APR:84 602 0001 160 0610 151 51 0955 131	01:APR:84 604 2305 160 0540 138 48 0910 124	02:APR:84 606 2225 149 0505 126 44 0825 116	03:APR:84 608 2150 135 0430 116 39 0740 109	04:APR:84 610 2125 116 0350 106 33 0650 103
05:APR:84 611 1145 296 1210 297 1 1330 302	05:APR:84 612 2105 99 0310 98 28 0600 96	06:APR:84 613 0950 284 1125 290 5 1455 302	06:APR:84 614 2100 84 0225 89 22 0510 90	07:APR:84 615 0840 276 1045 282 10 1530 295
07:APR:84 616 2105 72 0145 82 17 0420 83	08:APR:84 617 0740 268 1000 275 16 1550 280	08:APR:84 618 2120 64 0100 74 11 0320 76	09:APR:84 619 0645 261 0920 267 21 1545 260	09:APR:84 620 2145 59 0015 67 6 0215 70
10:APR:84 621 0550 254 0835 258 27 1520 240	10:APR:84 622 2230 56 2330 59 1 0045 62	11:APR:84 623 0500 247 0800 250 32 1450 221	12:APR:84 625 0415 239 0720 240 38 1415 203	13:APR:84 627 0325 233 0650 230 42 1335 192

●The top line gives the date and the orbit number.

●The second line is the time when the satellite 'appears over the horizon', ie the time when it can first be heard; the Access of Signal or AOS as it is called. This line also gives the bearing to which the antenna should be directed to hear the signal.

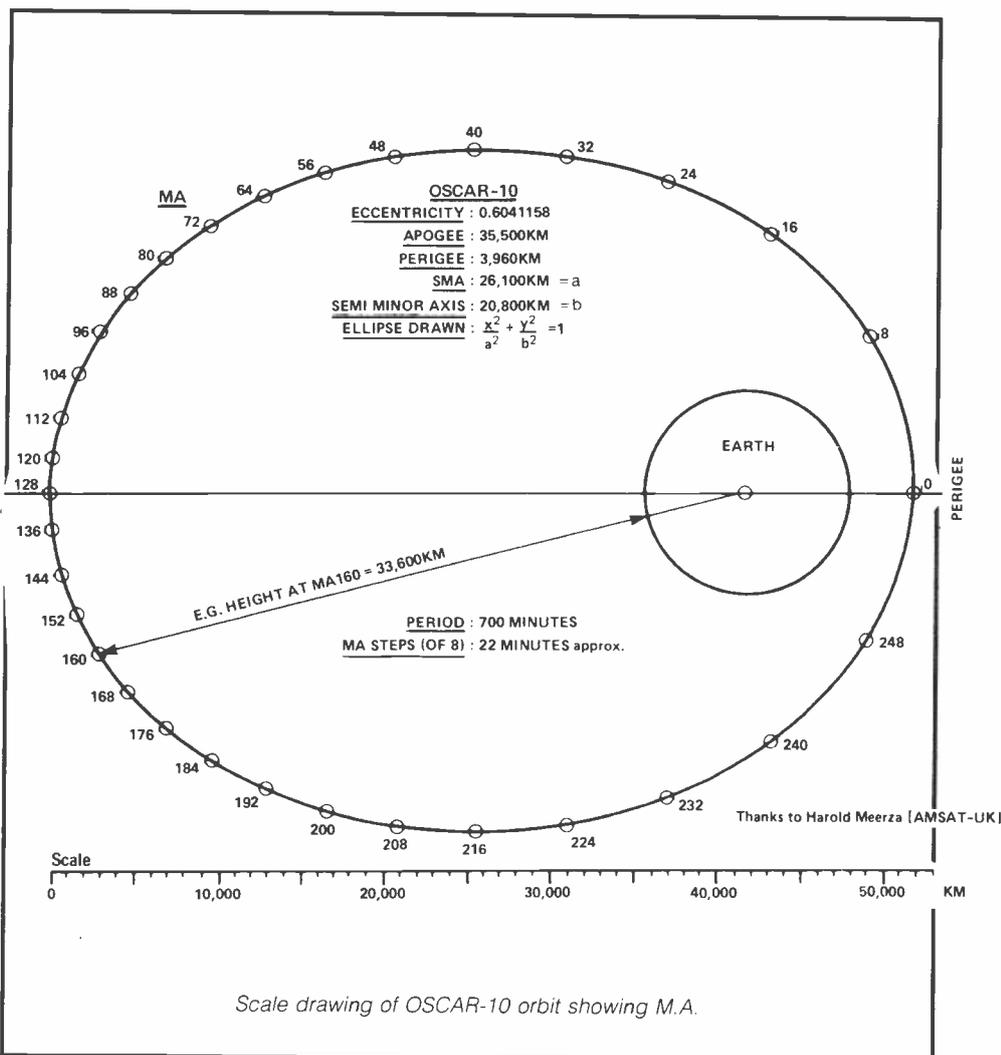
●The third line is the time and bearing of the satellite at its maximum elevation during that particular orbit and the last figure in this line is the maximum angle of elevation reached during that orbit.

●The fourth line gives the time of descent below the horizon and the bearing of this Loss of Signal or LOS. So, for example, if we take the figures for say 02:APR:84, we see that the Orbit Number is 606. It appears above the horizon and can thus be first heard at 2225 hrs GMT at a bearing of 149 degrees for the antenna. It will be audible throughout the night until 0825 hrs GMT the next morning, when LOS will occur on an antenna bearing of 116 degrees. This is a somewhat 'unsocial hours' orbit!

April 8 was a much more convenient day for working OSCAR-10 – if you happen to be at home! Here, on orbit number 617, AOS was at 0740 hrs GMT and LOS at 1550 hrs GMT. This gave 8 hours and 10 minutes of communication time. During this period, the bearing of the antenna only needs adjusting through 268 to 280 degrees – not very much, and this can be easily adjusted by turning the antenna for maximum signal.

In practice, it has been found that the elevation of the antenna system is of importance. We shall have something more to say about this later, but in passing we can note that the maximum

elevation is not due to any movement of the plane of the satellite's orbit, which stays constant in space, but to the rotation of the earth and changes in



OSCAR-10

Zero on the 'MA' scale is over the point of perigee, as shown. So listening to the half-hourly telemetry, you can record the 'MA' number and see straight away just where on the orbital path the satellite is. It is useful to know this, as we shall see later. But now, let's see what is needed in the way of equipment.

The transmitter

Before OSCAR-10 was launched, a great deal of speculation was published, suggesting much greater power would be needed on the transmitting side to work into OSCAR-10 than had been needed in the case of the earlier satellites. Experience has shown that this is not the case. What is necessary, however, is a really effective antenna system, preferably directional in both azimuth and elevation, but in view of the difficulty of providing for the latter this can be ignored, as we shall discuss later.

Your antenna system must provide for the transmission on 70cms and reception on 2 metres. So your transmitting gear must give you 70cms output, with a variable frequency facility. The most popular way of going about this, is to use an existing transceiver or multiband transmitter to give 28MHz output and feed this into a 28/435MHz converter. This in turn feeds a 435MHz linear amplifier. The power of the latter required is directly related to the antenna system one proposes using. More on this later.

The receiver

On the receiving side, some means of receiving the downlink 2 metre signals is required. You can use the receiving side of your station transceiver with a 2 metre converter, but this does present problems such as switching and tracking and it is far simpler to use a separate receiver for this purpose.

Either a SW receiver with a 2 metre converter or an independent 2 metre receiver from, for instance, the VHF system most folk have in the shack. I ended up using the station HF transceiver for the transmit facility and a separate 2 metre receiver for the downlink. Fortunately, the writer's transceiver – a Yaesu FT-707 – has facilities for cutting out the final transmitting section, so that the VFO and frequency multiplying stages provide RF drive only on 28MHz. At the same time, the CW tone monitor can be made inoperative by putting a 'blank' phone jack into the phone terminal socket.

The 2 metre receiver is a STE ARAE 182 10/2 metre receiver, which has seen a lot of use on the Mode A OSCAR satellites.

A WPO OSCARBOX 2 metre receiver has also been used successfully on OSCAR-10. Both worked well without preamplification. Whatever you use, remember OSCAR-10's signals are CW or SSB – *not* FM. Lots of trouble was experienced at first from harmonics from the transmitting system, which was ultimately overcome by the use of appropriate filters.

The antenna system

As we have said, this is the most important part of the whole system. Unfortunately, such factors as size, cost, difficulties of mounting in an unobtrusive position and objections on the grounds of appearance, etc, make the erection of the ideal antenna system virtually impossible. Its got to be a compromise.

Two factors immediately present themselves for discussion and decision. First the question of whether means should be provided for giving variable elevation of the antenna must be considered. As azimuth control must of course be provided, elevation control adds both considerable cost and constructional difficulties to the system. If elevation control is to be provided it must give control from more or less horizontal to just short of vertical. Azimuth control must provide the full circle.

If you can provide for elevation control, do so, be it by means of a proper rotator or simply a system of cords or gearing. However, if its going to produce too many problems such as undesirable weight at the top of a slender pole or expensive additional control cables etc then don't worry. Set the antenna boom

at a fixed angle of about 25 degrees, of elevation. This appears to be about the optimum for OSCAR-10.

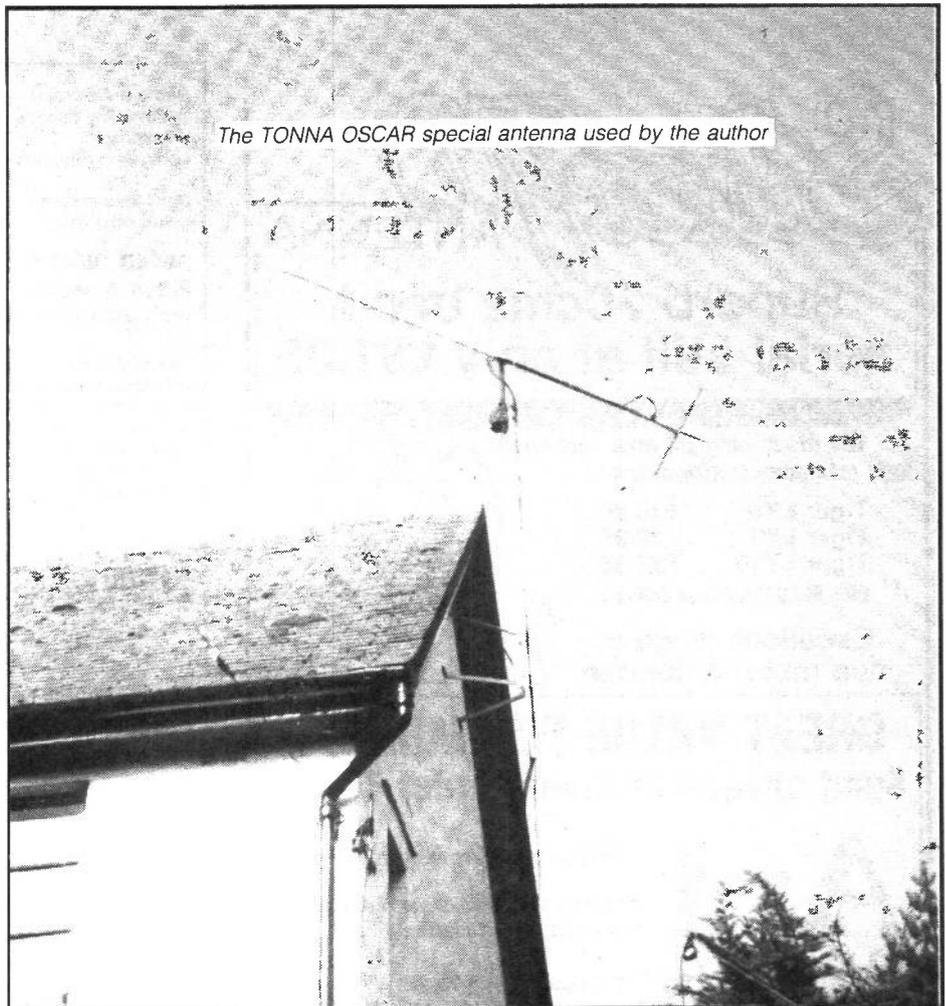
In my case, there were good reasons for making the antenna 'unobtrusive' and as near in appearance to a domestic TV antenna as possible! So I decided to get one of the Tonna OSCAR Special antennas.

This has nine, 2 metre elements and nineteen, 70cm elements, interspaced in Yagi configuration on a single boom. Its a very nice light-weight antenna and has worked excellently.

High grade coaxial cable was used for the feeders. Good reliable signals with 50 to 75W from the 70cm linear can be had when the satellite is in a 'maximum elevation' of between 15 to 40 degrees but outside these limits, signal strength drops off rapidly. It is interesting to note just how signals do drop down once the satellite's elevation passes out of the beam of the antenna.

The other question one must decide is whether it is necessary to provide for altering the polarisation facilities of the antenna, ie should it be right hand, left hand, circular or linear or what?

The 'official' recommendation is that right hand polarisation should be provided for. However, experience suggests



The TONNA OSCAR special antenna used by the author

OSCAR-10

that whilst attention to the polarisation, and making provision for changing it, will undoubtedly give better and more consistent results, and enable one to get good signal strength with much less RF from the linear amplifier than the 75W suggested above, very acceptable results can be had from an antenna in which this facility is not provided. Omitting such a facility certainly does ease the construction problems and the cost of the antenna system.

As has been indicated above, the more elaborate you make your antenna, the better will be your results. From multi-element phased Yagi arrays and helical antenna systems provided with elevation control, you'll get the best results, but you can get perfectly acceptable results from a simple antenna system such as mine.

There is one feature of OSCAR-10 signals which makes it very characteristic, viz the 'wow', which is audible in some degree at all times, though it is much worse over some parts of the orbital path, than others.

This feature was said at first to be due to possible damage to the aerials on the satellite at the time of the launch. Then it was said to be due to phase changes between the aerials as the satellite rotates. Its said to be much less in evidence, if phase control is provided on the receiving antenna and this is

switched to give the best result. In my case it is most troublesome from a MA of about up to position 76 from AOS and from 176 round to LOS. From 76 round through apogee to 176 it is almost unnoticeable. When it is bad, it makes CW almost undecipherable and SSB quite unreadable. Note too, that there are times when both the transponder and the beacon is turned off. For instance, they are off during passage over perigee and the Mode B transponder is off when the Mode L transponder is on. These times vary according to the schedule being operated at the time.

A very interesting model was recently described in *Oscar News* by J R Miller, G3RUH. (*Oscar News*, Number 44, October 1983; OSCAR 10 - Earth Model). This gives an excellent visual indication of OSCAR-10's orbit and the relationship of the orbit to the earth. It brings out in a very clear way, just how far out into space OSCAR-10 goes at perigee.

Model

I made up a half size model of that described by G3RUH, which is a little more manageable in size, by using two of the half-spherical covers from 'Airwick' Deodorisers, glued together to form a sphere and painting a map of the world on it. It is illustrated here. A lot of information can be obtained from this model and those who like making up

such pieces of equipment are advised to consult G3RUH's original article.

In conclusion perhaps one should mention that the Oscar 10 Orbital Prediction Calendar mentioned earlier is supplied free - along with the orbital predictions for the other satellites at present operational - to members of AMSAT-UK. Membership details can be obtained from:- AMSAT-UK 94 Herongate Road, Wanstead Park, London, E12 5EQ.

HEADLINE PHOTOGRAPH

The model in the photograph incorporated in the headline of this feature was home built by the author. It shows the relative positions of orbit and earth and the scale of the distances involved.

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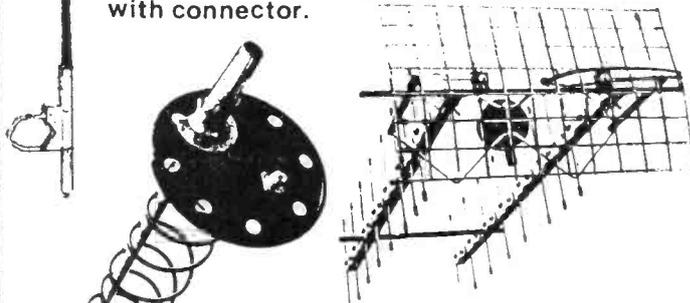
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A Teleprinter Terminal Interface

This article by Michael G Bancroft describes an effective and economical modification that enables a telegraph terminal unit and its teleprinter to accept input signals from any TTL source

For many years I have been interested in design and construction of various electronic and or electro-mechanical projects, and at times I have had to rebuild a complete system because I wanted it to do something else.

This can be very expensive, so it was necessary to find a more economical method of pursuing these interests.

Youngsters who were half my age told me that I needed a computer but I could not see why and they could not convince me that they were right. However, I did eventually obtain a microprocessor chip and a few support ICs, but these did not satisfy my needs and the whole bag of tricks was put on the shelf to collect dust.

The teleprinter and terminal

Then one day, whilst reading adverts in the technical press, I saw a Creed teleprinter Type75 (like new) for £15 and a TT11, which is a teleprinter terminal, for the same price. When these two items were purchased, it started a whole new ball game for me because I now had a use for the previously redundant microprocessor. More importantly I was still able to play radio and electronics, which were my main interests.

The TT11 Terminal Teleprinter Broadcast, to quote its correct title, converts incoming keyed tone teleprinter signals to double current dc pulses suitable for operating the electro-magnet of a teleprinter. Use of the TT11 permits low level AF signalling to be adopted between a receiver and a teleprinter,

thus obviating the transient interference that is often induced in neighbouring circuits by dc signalling. The TT11, which has an input impedance of 600 ohms, operates with 1KHz input from levels of -10dBm to 0dBm, and accommodates keying speeds exceeding 100 bauds. A simple internal adjustment allows a choice of tone-on for mark or tone-on for space keying sense. A phone jack is provided for monitoring incoming signals, a facility is available for the audio reception of morse signals and an internal bell is fitted to operate in conjunction with the normal bell contacts of the associated teleprinter.

The system is complete for the reception of broadcast teletype traffic and in itself, could introduce readers to the fascinating world of RTTY. Also doors, or perhaps gates, are opened into the field of hard copy of satellite telemetry.

The interface

This is an interface which will permit signals of logic levels ie 0 to +5V to control the TT11 unit. A complete circuit of the TT11 may be available if requested when the unit is purchased, but the modification is only concerned with a small part of the circuit, ie that which is around the transistor marked as VT32 on the TT11 chassis. It is the pulse converter and is the stage where the 1KHz modulated tone is demodulated by two diodes and fed into the base of transistor VT32. This is the point where we need to feed the signal in from the interface unit.

Carefully lift the base wire off, and take it to a SPDT switch, then connect one pole of the switch to the point where the base wire was previously connected. The other pole is wired to the interface unit and connected to 12V, which is supplied by the TT11.

Note that it is a positive earth and fit an input socket. The work is now complete.

The before and after modification circuit diagrams are shown as *Figures 1 and 2*. The system can now be driven from any TTL level source.

After modification

At this stage the dust was removed from the microprocessor and a program was written to drive the teleprinter. During this process I realized that the whizz-kids had made a valid point for not only was the amount of hardware quite small, but I found that when I needed to add or change a function, it was only necessary to alter the program. This was a vast difference from rebuilding the whole set-up which I have done in the past. I have been very impressed with the versatility of my new set-up and strongly recommend using a microprocessor in other similar projects. It really can do all the things our young friends tell us and by persevering with the unfamiliar terminology I can assure readers that understanding does come in time. Remember, words like superhetrodyne, logarithmic, spectrum analyser and many more are now common household words.

TELEPRINTER TERMINAL INTERFACE

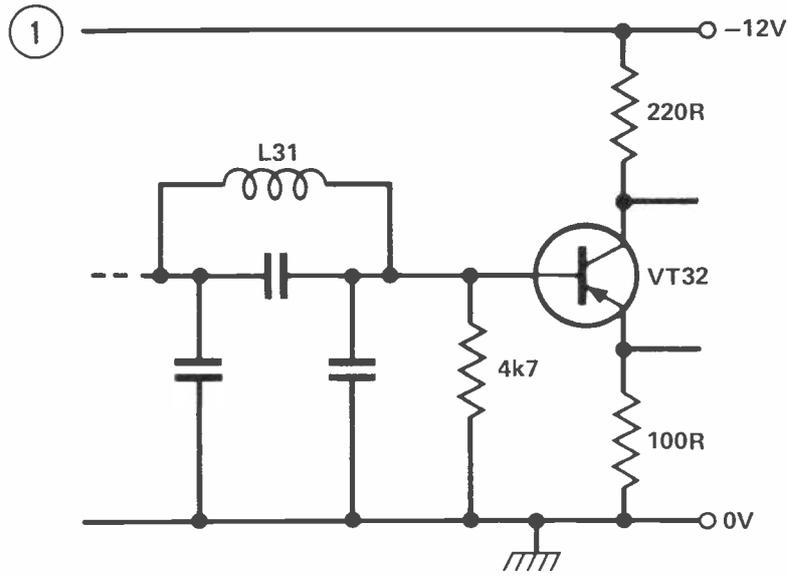


Fig 1 Unmodified TT11

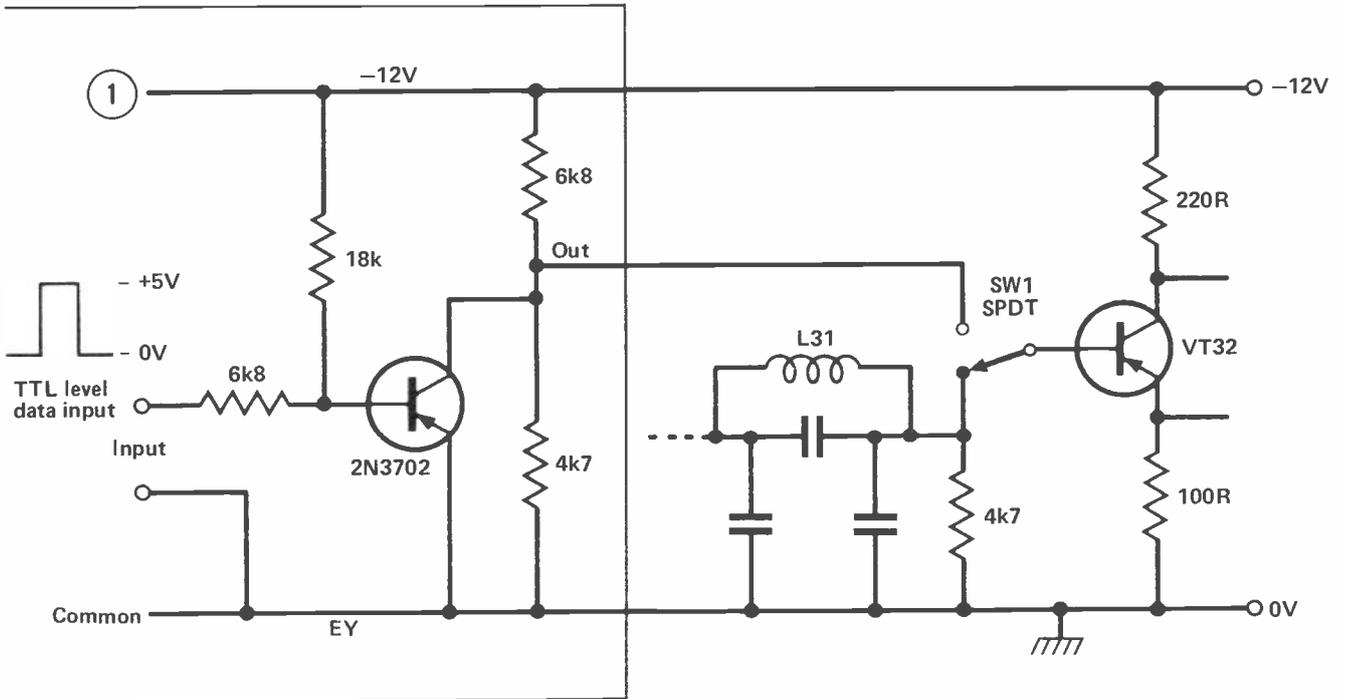


Fig 2 Modified TT11

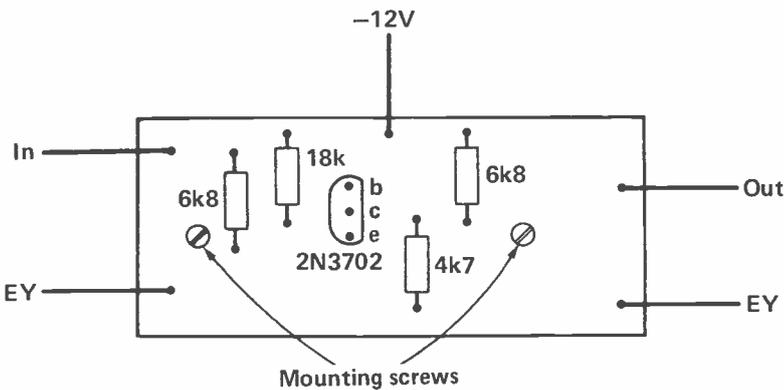


Fig 3 Full size component side

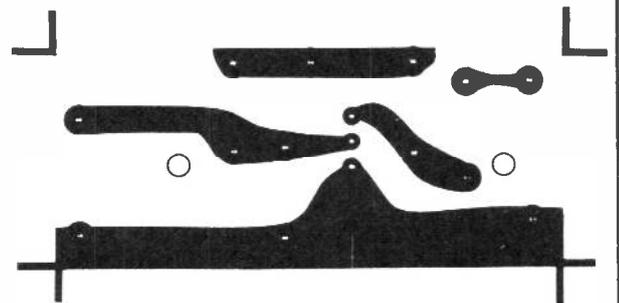


Fig 4 Full size copper side

What price!

HF Equipment

IC-751	All band AM.FM.SSB CW - Gen Cov Rxx	32 Memories	1049.00	HM7	Hand microphone with pre amp	14.95	IC-25H	45W FM mobile high power version of old IC25E	359.00	EX310	Voice synthesizer unit	39.00
PS35	Internal switched mode power supply	149.00	EX202	LDA unit for use with AT100 500	13.50	BU1	Memory back up unit for mobiles	24.50	SM6	Desk microphone	34.50	
SM6	Desk microphone	34.50	EX203	CW audio filter	14.00	IC-45E	DC leads (flat pin or square 6 pin)	4.50	IC-45E	FM mobile 10 watts 5 memories	329.00	
HM12	Hand microphone with up down scanning	16.50	EX195	Transverter unit	17.00	BU1	DC Sockets (flat 4 pin)	3.00	BU1	Memory back up unit for mobiles	24.50	
EX310	Voice synthesizer module	39.00	FL44	455KHz SSB filter 2.4KHz	79.00	IC-2E	DC Sockets (flat 4 pin)	3.00	AG1	Spare DC leads (flat 4 pin or square 6 pin)	4.50	
RC10	Frequency controller unit	29.95	FL45	9MHz CW filter 500Hz	45.00	IC-02E	Synthesized hand held keypad entry	169.00	AG1	DC plugs & sockets (flat 4 pin)	3.00	
CR64	High stability xtal unit	49.95	FM04	FM unit Tx & Rx	49.00	ML1	10 watt booster unit for 2E	229.00	AG1	Most head ore amp for 471 451 490	49.00	
FL32	9MHz CW RTTY filter 500Hz	39.00	IC-720A	No longer available. Accs still available	119.00	BP2	Standard battery pack	69.00	IC-04E	Synthesized hand held k pad entry LCD	219.00	
FL63	9MHz CW RTTY narrow filter 250Hz	39.00	PS20	External power supply with speaker 20 amps	176.00	BP3	Low volts high capacity (long life)	25.00	FA3	Flexi 1 4 wave antenna	7.50	
FL33	9MHz AM filter 6KHz	32.50	CF1	Cooling fan for PS20	24.00	BP4	Empty battery pack takes 6 x AA size cells	38.00	IC-402	Accessories same as IC2E 02E	39.00	
FL70	9MHz SSB wide filter 2.8KHz	35.50	SM5	Desk microphone	34.50	BP5	High volts high capacity high power!	7.95	IC-402	SSB portable - CW 3 watts output	257.00	
FL52a	455KHz CW RTTY filter 500Hz	79.00	FL32	CW narrow filter	39.00	BP7	High volts high capacity (for use with O2E ONLY)	48.00	BC15E	AC charger 240v	41.80	
FL53a	455KHz CW RTTY narrow filter 250Hz	79.00	FL34	AM xtal filter	34.00	BP8	Low volts high capacity	59.00	BC20	DC charger 13.8v	41.80	
IC-745	All band SSB.CW AM(Rx only) Gen Cov Rx 16 mems	839.00	BC10	Memory back up unit	5.95	DC1	12v regulator pack (2E ONLY)	49.00	LC25	DC lead	1.75	
PS35	Internal switched mode power supply	149.00	FM03	FM unit Tx & Rx	89.00	DC1	12v regulator pack (2E ONLY)	12.50	LC25	Carrying case	8.25	
SM6	Desk microphone	34.50	IC-R70	General Coverage Receiver 0.1 30MHz	549.00	CP1	12v charger lead for cigar lighter	4.95	IC-120	FM mobile 1 watt output	439.00	
HM12	Hand microphone with up down scanning	16.50	EK257	FM unit	32.50	FA2	Helical antenna	7.50	BT23E	40MHz coverage mems	179.00	
EX310	Voice synthesizer unit	39.00	FL63	CW narrow filter	39.00	LC1	Leatherette case (BP5)	5.00	IC-551	Bit Zero 23e 1296MHz linear fw in 7.8w out	179.00	
EK242	FM unit Tx & Rx	32.50	FL44a	455KHz SSB filter	79.00	LC2	Leatherette case (BP4)	5.00	IC-551	Multimode base station supplied SSB CW only	379.00	
EK241	Marker unit	15.95	CK70	DC cable kit	5.75	LC3	Leatherette case (BP3)	5.00	EX106	FM unit	112.00	
EK243	Curtis keyer unit	39.00	IC-R71	Interface unit to transceive with IC720A	97.50	LC11	Case for O2E (BP3)	5.00	EX107	VOX unit	49.00	
FL45	9MHz CW filter 500Hz	45.00	RC11	All mode Gen Cov Rxx k pad entry	649.00	T11	Heavy duty leather case (all batt packs)	21.27	EX108	Pass band tune unit	97.50	
FL44a	455KHz SSB narrow filter 2.4KHz	79.00	IC-2KL	Remote control unit for above	49.00	BC25E	240v wall charger for 2E	6.69	IC-505	Multimode portable 3.10watt supplied SSB only	382.00	
FL52a	455KHz CW RTTY narrow filter 500Hz	79.00	2KLPS	Complete with	1303.33	BC25U	110v wall charger for 2E (USA)	6.69	EX282	FM unit	28.50	
FL53a	455KHz CW RTTY narrow filter 250Hz	79.00	IC-AT100	Power supply to run 2KL linear	269.00	BC16E	240v wall charger for O2E (BP8 BP7)	9.95	IC-505	NCad pack	59.00	
FL54	9MHz CW/RTTY narrow filter 270Hz	39.00	IC-AT500	100Watt Automatic antenna tuner	369.00	BC30	Desk top drop in charger (fast and slow) old packs	56.35	BC15	Charger unit	6.50	
IC-740	No longer available. Accs still in stock		IC-PS30	500Watt Automatic antenna tuner	369.00	HM9	Desk charger all packs new & old (fast slow)	56.35	LC10	Carrying case	22.50	
PS740	Internal switched mode power supply	149.00	IC-AH1	Systems power supply, 25 amps continuous	229.00	IC-202S	SSB Portable - CW 3 watt output	199.00	Mobile Mounting Brackets			
SM5	Desk microphone	34.50	IC-AH1	Mobile antenna 3.5MHz 30MHz	199.00	BC15E	AC Charger 240v	41.80	MMB5	Mount for 251E 451E 720A 730	12.50	
EK241	Marker unit	15.95	VHF Equipment			BC20	DC Charger 13.8v	41.80	MMB6	Mount for 240	12.50	
EK242	FM unit	32.50	IC-271E	Multimode base station 25w 32 memories	629.00	HM9	Telescopic antenna	1.50	MMB7	Mount for 245E	12.50	
EK243	Curtis keyer	39.00	SM6	High power version of above 100w	789.00	LC25	Leatherette carrying case	8.25	MMB8	Mount for 255E 260E	12.50	
FL44	455KHz SSB filter 2.4KHz	79.00	IC-PS30	Internal receive pre-amp	49.00	FA1	Helical screw in antenna	7.50	MMB9	Mount for 290E 490E	12.50	
FL45	9MHz filter 500Hz	45.00	EX310	Desk microphone	34.50	IC-471E	Multimode base station 25watts	699.00	MMB10	Mount for 25E 45E 120	12.50	
FL52	455KHz CW/RTTY filter 500Hz	79.00	AG20	25W Multimode mobile 5 memories scanning mc	469.00	IC-471H	High power version of above 75watts	879.00	MMB11	Mount for 27U 24G	12.50	
FL53	455KHz CW/RTTY narrow filter 250Hz	79.00	SM6	25W FM mobile 9 memories multi function display	319.00	PS25	Internal switched mode power supply	89.00	MMB12	Mount for R70 740 271E 471E	12.50	
FL54	9MHz CW/RTTY narrow filter 270Hz	39.00	IC-290D	Voice synthesizer unit	25.00				MMB16	Mount for 2E 4E O2E O4E	6.95	
IC-730	10.80 Mtrs compact transceiver	659.00	IC-27E						MMB18	Mount for 751	T B A	
PS15	External power supply 20amps	119.00	UT16						SS1	Shoulder strap for handhelds	7.50	
PS20	External power supply with speaker 20 amps	176.00										
SM5	Desk microphone	34.50										



IC-27E, £319.

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

Brief features:- 25/1 Watt output, green LED readout, scanning (memories and programmable limit band scan), priority scan, programmable duplex splits, 25 and 5 KHz tuning steps, 10 memory channels with lithium back up cell, normal and reverse repeater switch, dual VFO, internal speaker and optional speech synthesizer. Just ask for a leaflet and we'll be glad to send you one. Price 299.00 and 39.00 for the optional speech synthesizer.

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RSGB NATIONAL

10,000 VISITORS MAKE IT THE "BEST EVER"

Arriving at the entrance to the convention at about 9.30am on Saturday, a large queue of approximately 2,000 had already formed. Memories of last year's long queue and even longer wait were quickly dispelled when the doors opened at 10.00am. The organising committee and the NEC appeared to have solved the problems of last year.

Once inside the exhibition hall, the first impression gained was that there was a less claustrophobic feel to the exhibition. There was even more space between the exhibitors' stands.

Another improvement over last year was the inclusion of more areas where the visitor could sit and renew old acquaintances, this was sadly lacking last year.

Lectures

Besides being an opportunity for the average amateur to obtain a bargain or to see the wide range of equipment available, the convention's other main aim is to assist with the furtherance of the education of the amateur in all aspects of radio and communication. This is done by the series of wide-ranging lectures.

These lectures proved to be very popular, with each of the rooms packed with interested listeners. This proves that it is not only the possible bargain that brings the visitor to the convention.

Major dealers

All of the major dealers in amateur radio equipment were represented at the exhibition. Looking around at the various stands and the large number of interested visitors and seeing a great many leaving at the end of their visit with large cardboard boxes, indicated that the dealers were doing well.

BNOS Electronics were attracting much attention with their new 70cm Linear/Pre-amplifier the LPM 432-10-50,

which was on display with the rest of their range.

WPO Communications had displayed their latest kit, the HF SSB/CW transmitter, and their display also included many of their other kits.

A great deal of interest was shown in Scarab Systems interfaces and programs for the popular micro-computers. This was proving to be a fairly inexpensive method of getting into RTTY.

Wood and Douglas had an impressive layout of their kits and were very helpful and informative.

R Withers Communications were attracting interest at their stand by offering a fitting service for the muTek front end to the FT290 and also converting to 10m whilst the visitor waited. They also had on display their new portable 2m antenna, called the Travelling Jim, which is based on the popular Slim Jim design.

Arrow Electronics attracted interest in the Yaesu FT290 which they were selling with or without the muTek front end fitted, although most items sold well.

Waters and Stanton seemed to have attracted a great deal of attention in their range of ARRL publications, whilst their range of 70cms equipment sold well.

A new closed circuit television system on sale at the MB Radio stand, was creating a lot of interest.

Flea Market

Another successful part of the convention was the rather misnamed 'Flea Market.' There appeared to be nothing

small about this year's market and it was as popular as the main exhibition.

The variety of stands and the items on sale, showed that there was a great deal of interest in the 'home brew' side of the hobby. Component firms such as Bonex Ltd, were present with a wide range of components on sale.

Garex Electronics were found to be doing a great deal of business with their popular range of scanners, monitors and similar equipment.

Another popular stand was Norton Engraving, who offered an 'on the spot' badge engraving service. It seemed to be so popular that, at one time, they had an hour or so's work built up.

Duckbill Anchors, a new firm, were demonstrating their new ground anchor. This was based on a very simple idea and proved to attract much attention.

The societies

As well as the main dealers of equipment being present, it also provided a chance for the various societies and committees to attract new members.

The RSGB was busy over both days at its stand. Their membership section dealt with nearly 250 new memberships, whilst the book shop was extremely busy. All of the books and items sold well, with the new call book being popular.

The HF, VHF and Microwave committees, with their contest divisions were present along with the propagation studies group.

A display which attracted a great deal

WPO COMMUNICATIONS would like to thank all those customers both old and new who visited our stand and made the Exhibition such a success for us.

As a result of demand, we are pleased to announce that some of our modules are NOW AVAILABLE READY BUILT AND TESTED. All you need to do is add switch connections etc and case up. For example, our very popular DSB80 or DSB160 QRP Tx/Rx is priced at £56.45 inc Post/VAT, the MINISYNTH HF PLL VFO at £48.20, our new Speech processor £18.50, Multi-stage Active Filter £24.50, 2 metre Rx (6 channel) at £61 and matching 1 watt Tx at £49.75. Also the DSB2 QRP Tx/Rx at £53 (needs VFO, or use the Minisynth). Phone for details and availability. Also see main Ad.

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EXHIBITION 1984



of attention was the West Midland RAYNET Group. They illustrated the role of RAYNET and also dealt with many enquiries regarding membership.

The British Amateur Radio Teleprinter Group had various types of teleprinters on display and were answering many questions on their activities. With the

micro-computer now readily available and easily adaptable to receive and transmit RTTY, it was encouraging to find that by Sunday afternoon the Group had enrolled almost 150 new members. The Group also provide a service for PCB's and kits through their newly formatted magazine Datacom.

The British Amateur Television Club also attracted new members with their display of PCB, books, and items related to ATV.

The G-QRP club were busy giving displays and giving information. There appears to be a genuine interest in this area of radio operation. The Club's president was on hand during both days of the convention, and was in the chair at the 'home-constructors' forum.

The Microwave Society was represented by Glen Ross G8MWR who, with members of the society, was kept busy setting up various pieces of microwave equipment, as well as recruiting interest in the amateur frequencies above 10GHz.

During their stay at the NEC they enrolled 57 new members, which brought their total membership to over 300, from 8 countries.

The Radio Amateurs Invalid and Blind Club were also represented, along with their talking magazine for the blind. It was encouraging to see that the disabled amateur was not forgotten.

In general, the RSGB National Convention once again has proved to be very successful and a vote of thanks should be given to the organising committee of, Norman Miller G3MNV (Chairman), Les Hawkyard G5HD, Robin Hewes G3TDR, Gillian Tong G8ENO, William McClintock G3VPK, Martin Shardlow G3SZJ and Ron Kingstone G4HHB.

Next year

It appears that after this year's successful event and within 48 hours of its closing, the organising committee had received over 40 bookings for next year's exhibition.

This seems to prove that the National Convention has lost nothing by its move to Birmingham, and all we can finally say is 'that we hope to see you there next year.'

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20,000 ohms/volt.
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50 ohms Centre Scale.
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BATTERY SCALE &
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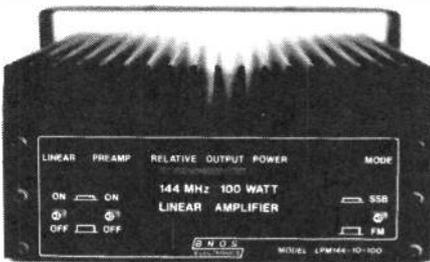
Over 40 years of design experience has gone into what is fast becoming acclaimed as the biggest break-through in linear technology. Performance and reliability have been designed in, which gives us the confidence to offer a free 5-year warranty. Why not take a closer look at our products and see where value for money really counts.

The LPM144 Range

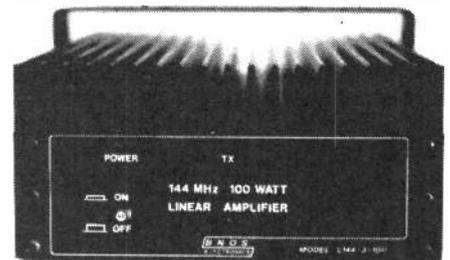
This sophisticated, but simple to use, range of amplifiers have performance characteristics and extra features previously not available in the UK. The pre-amplifier uses the highly regarded BF981 MOSFET, and an LED bargraph power meter is provided, to highlight only two of the amazing number of features.

The L144 Range

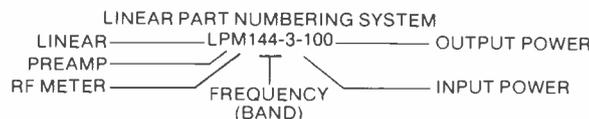
To complement the LPM range, we have introduced the L series linear-only versions for the amateur who may already be equipped with a good pre-amplifier and power meter. The excellent linear performance is maintained and both RF Vox and hard-wired changeover are standard.



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- Unique over-drive protection circuit
- Mobile mount on all 100 Watt models



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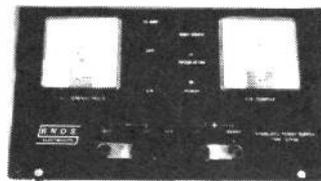
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A REVIEW OF THE SOMMERKAMP YAESU ANTENNA TUNER FC102



by Anthony Stokes G3ZRH

Readers of the advertisements in recent issues of *R&EW* or *Amateur Radio* magazines, may well have noticed references to the FC-102 High Power Short-wave Antenna Tuner. Having had a tuner of this type in use on all bands 1.8-29.7MHz, I can now report on its quality of performance compared with others.

The simple 'black box' exterior masks an amazing complexity of circuitry, and contains an eight transistor and three IC 'peak hold unit' so that the power forward meter may be switched to indicate either the usual carrier wave RMS, or peak envelope power for SSB output.

When the optional FAS-1-4R remote antenna selector is installed, there are a further four relay switches with attendant diode/capacitor control circuits, so that the normal choice of two antennas (one PL259 and one either 'long wire terminal' or PL259 connection) becomes increased to a choice of five – four coaxial and one either co-axial or single wire.

Front panel

On the front panel are the two meters – one adjustable for the purpose of displaying standing wave ratio (range unity to 10:1), and the other calibrated 20W, 200W and 1200W full scale deflection for indicating power through.

The tuner comprises two variable capacitors VC1 and VC2; and a fixed inductance, the value of which is preset by switch to a particular value for each band 160-10 meters, and has fixed value capacitors across it to ensure approximate tuning to each amateur band for the 50 Ω transceiver input source. This circuitry is common amongst present generation HF band tuners – eg with the Yaesu FC902 and Trio AT-230. The tuner was designed for use with the FT102 transceiver, but will work well with other equipment, such as the author's TS430S.

With older transceivers, such as the FT102ZD with its valve PA – it was found that no external ATU was required in order to obtain a satisfactory match into

a 60 metre long wire on all amateur frequencies at the 100W level from 3.5-29MHz, but with current fully transistorised equipment – there is only a fixed 50 Ω output, and therefore an external ATU is much more likely to be needed.

Impedance

The manufacturer states the impedance matching range to be 10-250 Ω from 50 Ω on 3.5-2.8MHz, and 16-150 Ω on 1.8MHz. This was not sufficient to accommodate the author's long wire antenna on all bands, and therefore various additional means had to be found to further extend the impedance matching range. The quality of construction of the FC102 is very good, with quite wide spaced air dielectric variable capacitors, silver plated tapped coil on ceramic former, and ceramic high temperature resistant fixed capacitors soldered across the silver/ceramic wafer switch.

Obviously the construction is sufficiently robust for the 400W PEP or 100W carrier power output permitted by the British licence – but not necessarily at the much higher levels available in some foreign countries, unless the SWR is kept very low. During the course of experimentation it was found that if a good impedance match was not achieved, then the power dissipated within the FC102 tuner circuit could be quite enough to break down fixed value capacitors across the wafer switch, which then needed replacing; but if tuning is done at a lower power level and high power not applied before a really good match is achieved, there will be no difficulty.

This antenna tuner requires an external 12V dc source to activate the relay antenna switching, panel meter lights and PEP indicating circuitry, and there is a choice of either of two input sockets in addition to the choice of five outputs. A peculiarity noted was that on some bands at the desired impedance match – the supply of RF power through the ATU caused a diminution in panel light

brilliance: the RF energy getting into the meter light circuitry in such a way as to oppose the lighting.

On top band (1.8L range) was found necessary the cutting out of C2, a 1000pf fixed ceramic capacitor across the input of the tuned inductance, in order to match a 60 metre long wire across 1.8-2.0MHz, and on the HF bands 10-17 metres it was generally found necessary to switch the pre-set inductance to one extra turn more than the manufacturers front-panel labelling would have suggested; – though the front panel labelling was found correct for 50-75 Ω coaxial fed antennas.

On 21MHz a good match to a coaxial fed antenna was easy, but to match the 60 metre higher impedance wire necessitated soldering an extra inductance into place in the lead between the tapping on the silver coil and the band setting wafer switch.

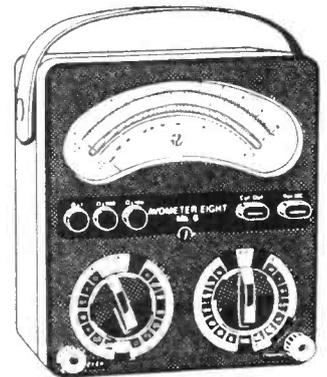
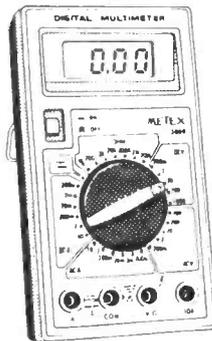
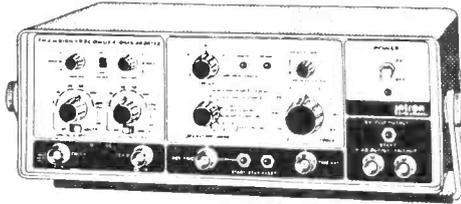
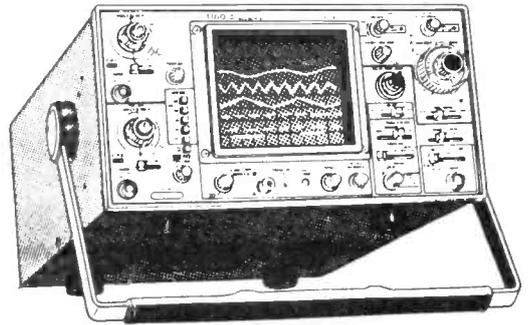
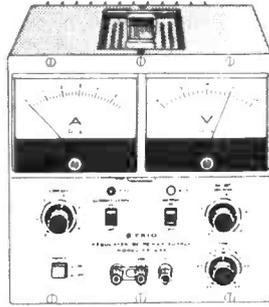
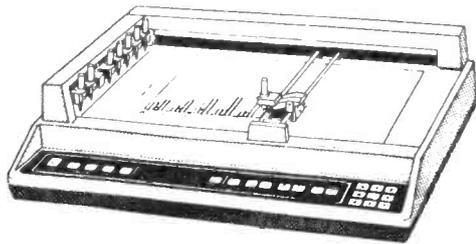
Useful

At power levels of below 200W there seems little reason to prefer the FC102 to the much simpler, lighter and less expensive Kenwood AT230 which actually matched higher impedances more readily, and the Yaesu FC902 is also simpler and less costly, yet capable of accepting the normally maximum permissible power for the British shortwave radio amateur.

On the other hand the feature of a PEP measuring circuit was felt to be useful, enabling one to see at a glance – during normal speech – the peak envelope power of SSB transmission, so that lengthy whistling into the microphone becomes unnecessary.

The chassis construction is of robust steel, so that the FC102 is physically strong and may have other equipment stood on top without damage. The accompanying data specification illustrates such additional features as the reader may need to know before deciding whether this ATU is the one most ideally suited for his station.

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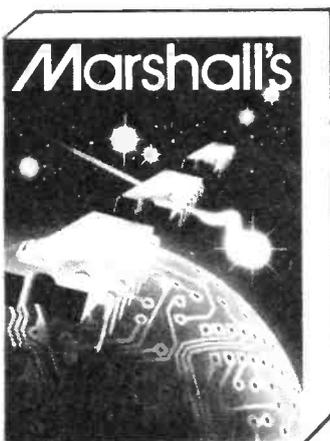
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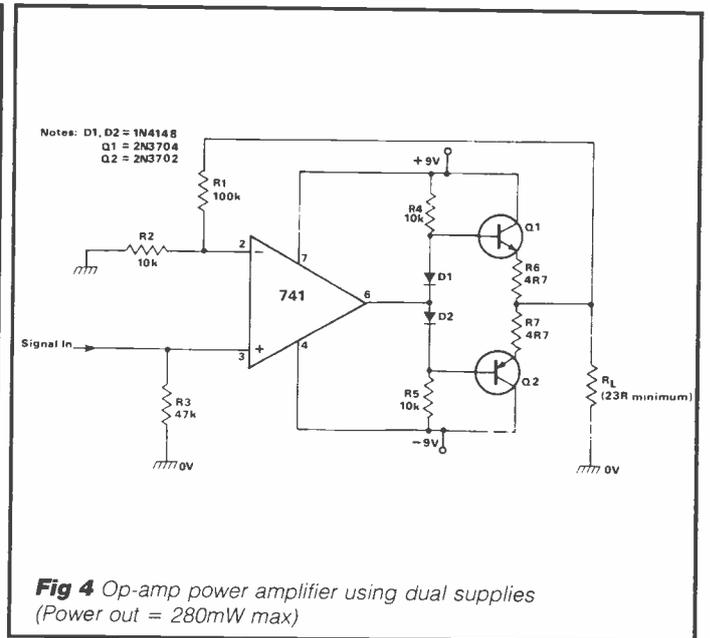
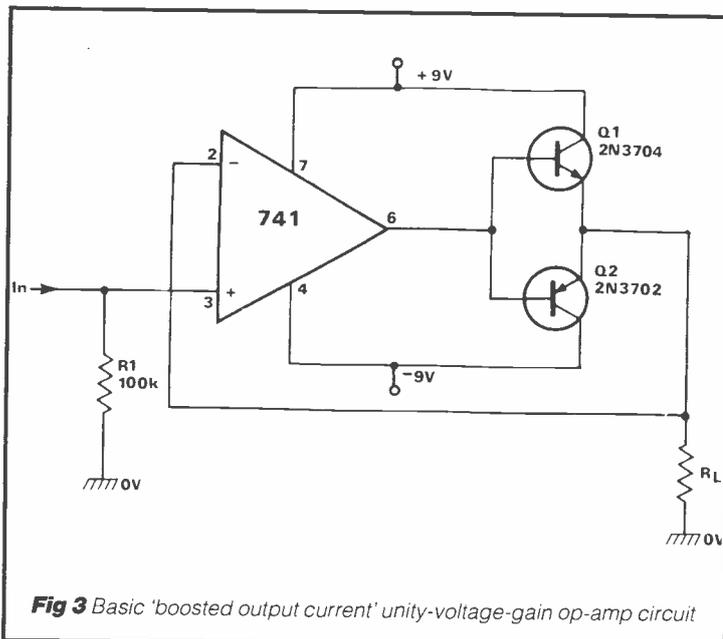
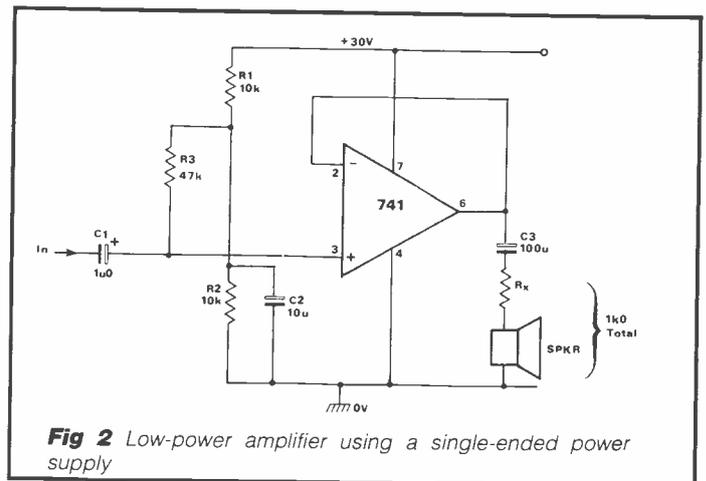
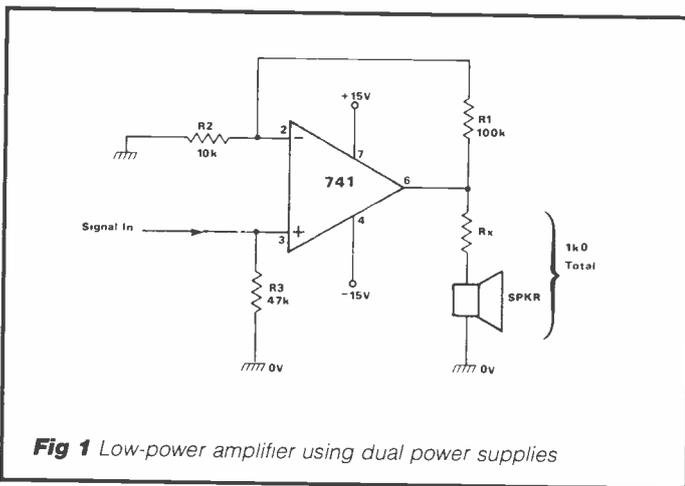
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DATA FILE

Ray Marston presents a wide selection of practical IC audio power amplifier circuits in this special 2-part feature.



An 'ideal' audio power amplifier can be simply defined as a circuit that can deliver audio power into an external load without generating significant distortion, and which does so without overloading or consuming excessive quiescent current. In practice, circuits that come very close to this ideal can easily be built, using modern integrated circuits.

Simple audio power amplifiers with outputs up to only a few hundred

milliwatts can be easily and cheaply built using little more than a standard op-amp and a couple of general-purpose transistors.

For higher power levels, a wide range of special-purpose 'single' or 'dual' audio power amplifier ICs are available, and can provide maximum outputs ranging from a few hundred milliwatts to roughly 20W.

The specific IC chosen for a given application depends mainly on the

constraints of the available power supply voltage and on the required output power level or levels. We look at a wide selection of practical IC-based audio power amplifier circuits in this and next month's edition of 'Data File'.

Low-power 'op-amp' circuits

The popular general-purpose 741 operational amplifier can supply peak output currents of at least 10mA, and can provide peak output voltage swings of at

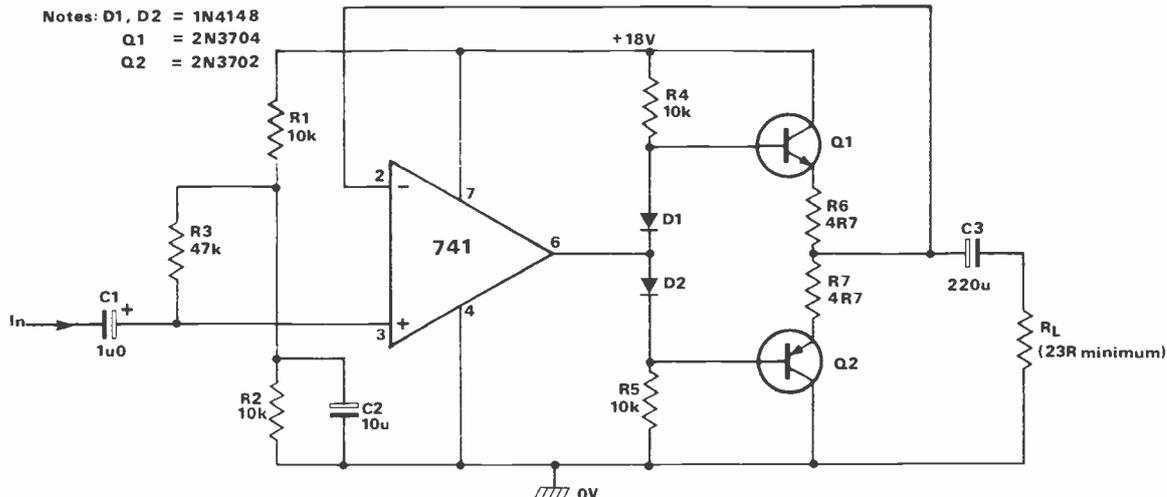


Fig 5 Op-amp power amplifier using a single-ended supply

least 10 volts into a 1KΩ load when powered from a ±15V power supply. The IC can thus supply peaks of about 100mW into a 1KΩ load under this condition, and can easily be used as a simple low-power audio amplifier, as shown in *Figures 1 and 2*.

Figure 1 shows how to use the 741 op-amp as a low-power amplifier in conjunction with a dual power supply. Here, the external load is direct-coupled between the op-amp output and ground, and the two input terminals are ground-referenced. The op-amp is operated in the non-inverting mode, and has a voltage gain of $\times 10$ ($=R1/R2$) and an input impedance of 47K ($=R3$).

Figure 2 shows how to use the circuit with a single-ended power supply. In this case the external load is ac-coupled between the output and ground, and the output is biased to a quiescent value of half-supply volts (to give maximum output voltage swing) via the R1-R2 potential divider. The op-amp is operated in the unity-gain non-inverting mode, and has an input impedance of 47K ($=R3$).

Note in the above two circuits that the external load must have an impedance of at least 1KΩ. If the external 'speaker'

has an impedance lower than this value, resistor R_x can be connected as shown to raise the impedance to 1KΩ value: R_x inevitably reduces the amount of power reaching the actual 'speaker'.

Boosted-output op-amp circuits

The available output current (and thus power) of a standard op-amp can easily

be boosted by simply wiring a complementary emitter-follower between its output and its non-inverting input terminal, as shown in *Figure 3*.

Note here that the circuit is configured to give an overall voltage gain of unity, but that the base-emitter junctions of Q1 and Q2 are both wired into the negative-feedback loop of the circuit, so that their

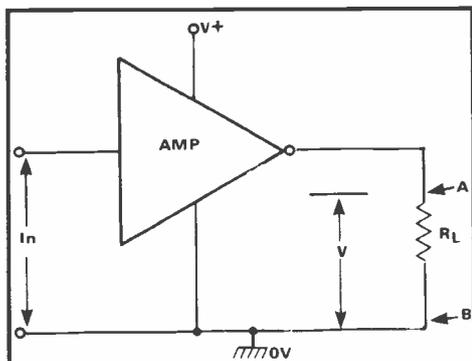


Fig 6 An amplifier connected in the 'single ended output' mode gives a peak output of V^2/R Watts

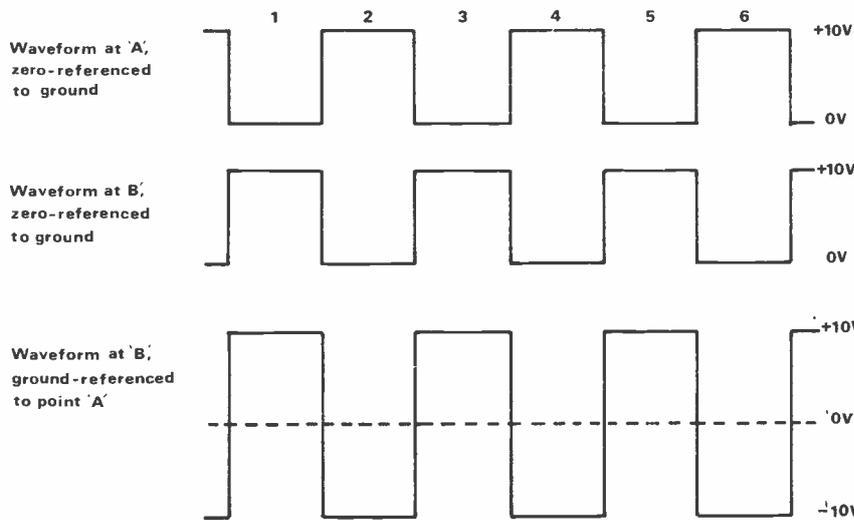
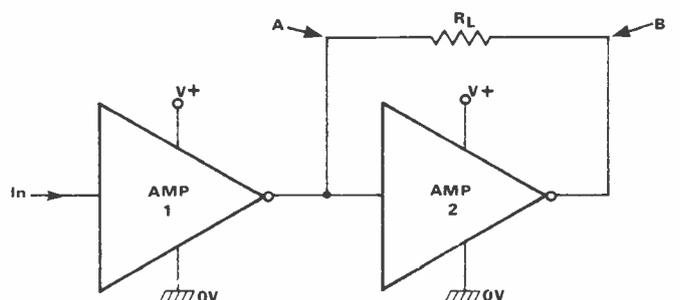
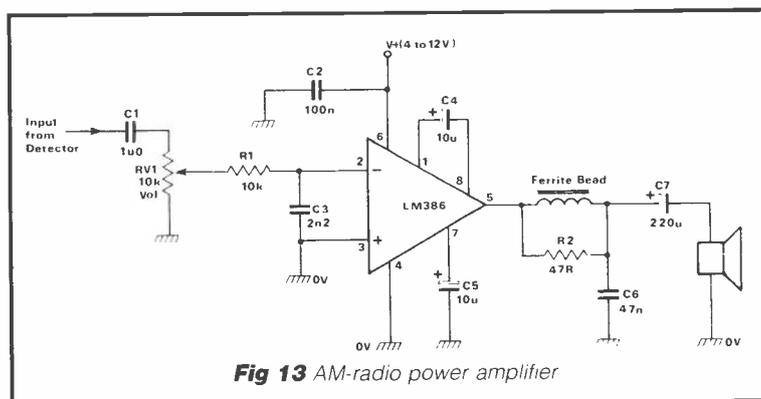
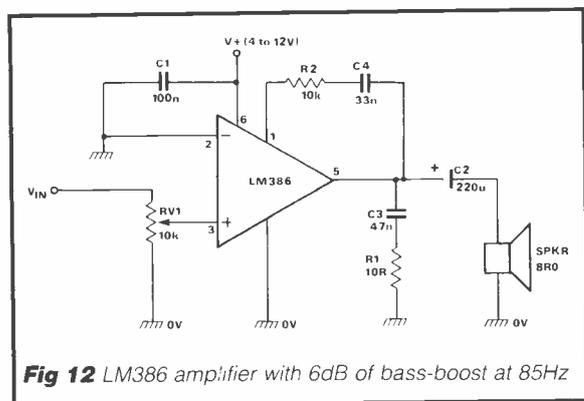
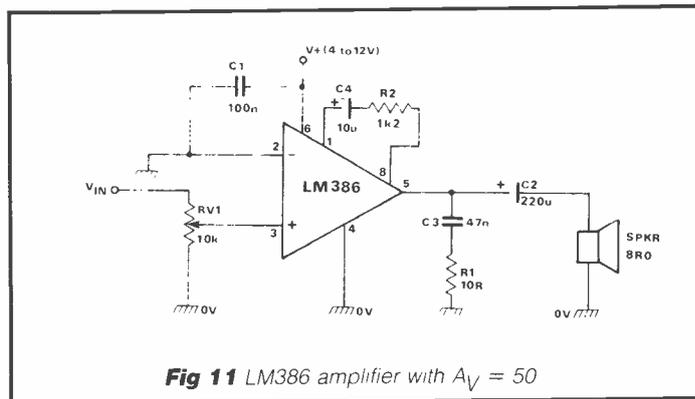
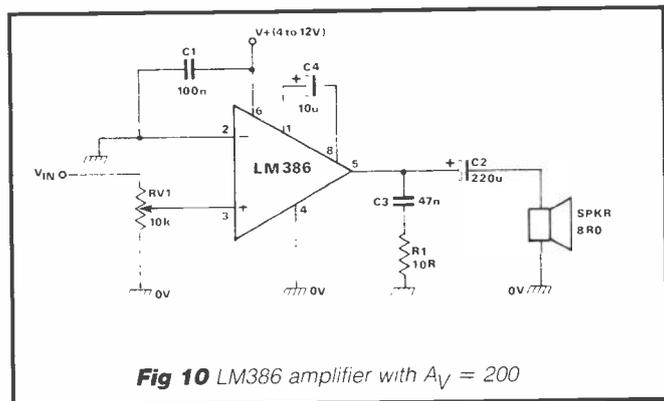
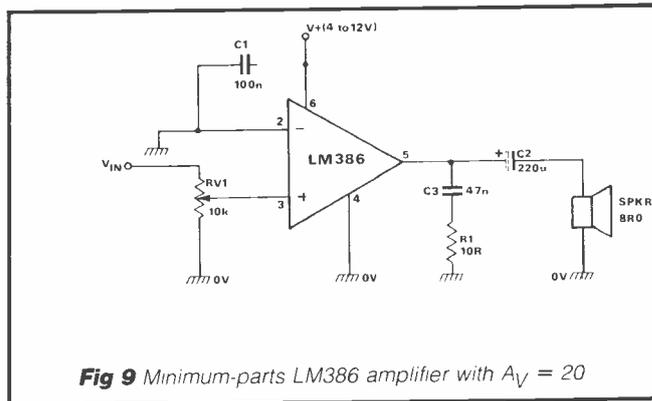
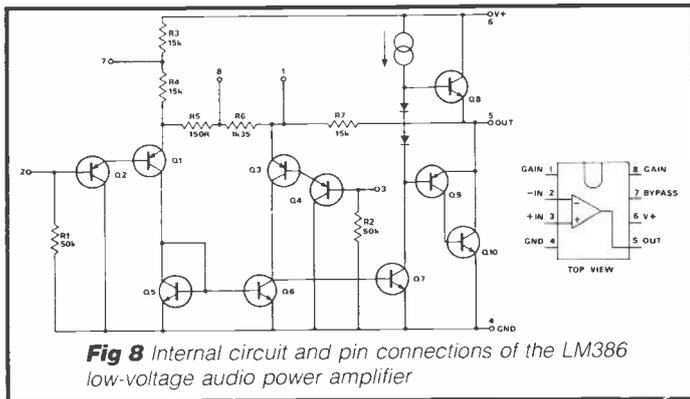


Fig 7 A pair of amplifiers connected in the 'bridge' mode give a peak output of $2V^2/R$ Watts, ie four times the power of a single-ended circuit



effective forward-voltage values (approximately 600mV) are reduced by a factor equal to the open-loop voltage gain of the op-amp. Thus, if the open-loop gain = 10,000 the effective forward voltages of Q1 and Q2 are each reduced to a mere 6uV, and the circuit generates negligible signal distortion.

In practice, the open-loop voltage gain of an op-amp actually falls off at a rate of about 20dB/octave, so that although the signal distortion of an amplifier of the Figure 3 type may be insignificant at 10Hz, it may rise to quite objectionable levels at (say) 10KHz. This problem can be overcome by applying a small amount of forward bias to Q1 and Q2, as shown in Figure 4 and 5, so that their forward-voltage values are reduced to near-zero and distortion is minimised.

The specific circuits of Figure 4 and 5 are designed to produce output currents up to 350mA peak or 50mA rms, into a load

of 23R minimum, i.e., to produce powers up to 280mW rms into such a load. These limitations are determined by the current/power ratings of Q1 and Q2, and by the power supply voltage values.

The Figure 4 circuit is designed for use with dual power supplies, and gives a voltage gain of x10. The Figure 5 circuit uses a single-ended supply, and gives unity-voltage gain.

IC power amplifier basics

If output powers in the approximate range 200mW to 20W are needed, the most cost-effective way of getting them is to use a dedicated IC to do the job. A wide range of such ICs are available, in either 'single' or 'dual' form. Most of these ICs take the effective form of a simple op-amp with a complementary emitter-follower output stage (like Figures 3 to 5): they have differential input terminals and can provide high

output current/power, but consume a low quiescent current.

When an IC power amplifier is connected in the single-ended output mode, as shown in Figure 6, the peak available output power equals V^2 / R_L , where 'V' is the peak available output voltage. Note, however, that available output power can be increased by a factor of four by connecting a pair of amplifier ICs in the 'bridge' configuration shown in Figure 7, in which the peak available load power equals $2V^2 / R_L$. This power increase can be explained as follows:-

In the single-ended amplifier circuit of Figure 6, one end of R_L is grounded, so the peak voltage across R_L equals the voltage value on point 'A'. In Figure 7, on the other hand, both ends of R_L are 'floating' and are driven in anti-phase, and the voltage across R_L equals the difference between the 'A' and 'B' values. Figure 7 shows the circuit

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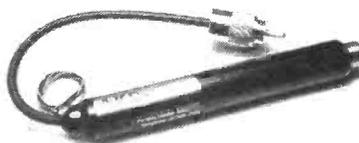
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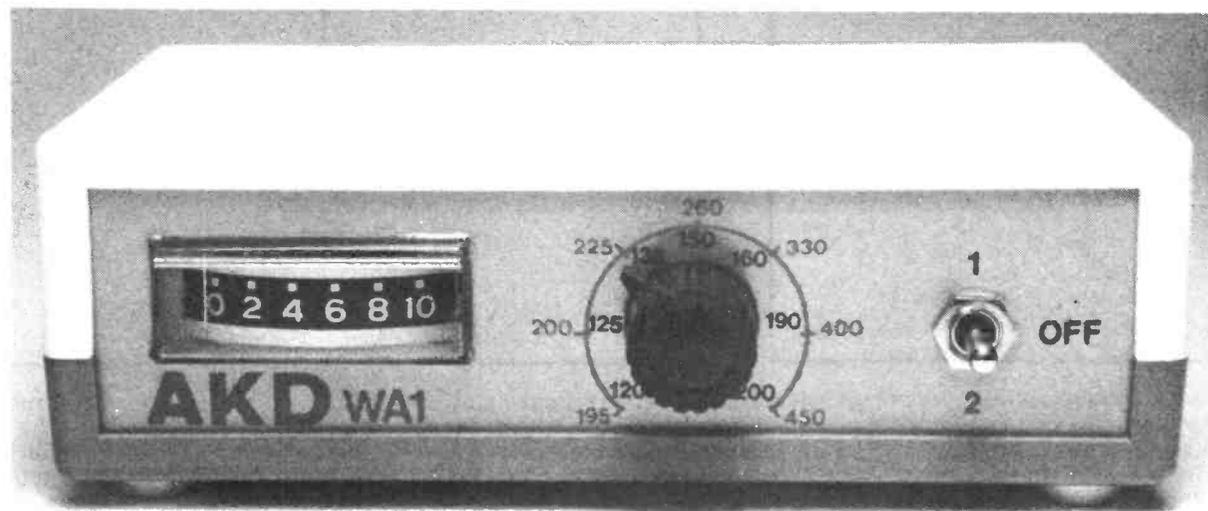


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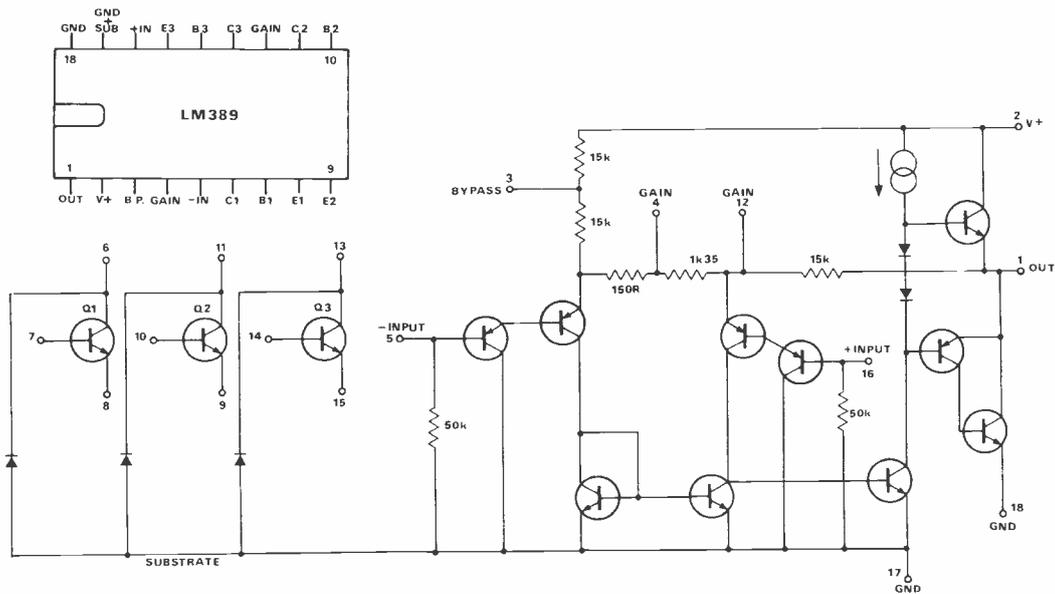


Fig 14 Circuit and outline of the LM389 low-voltage audio power amplifier with NPN transistor array

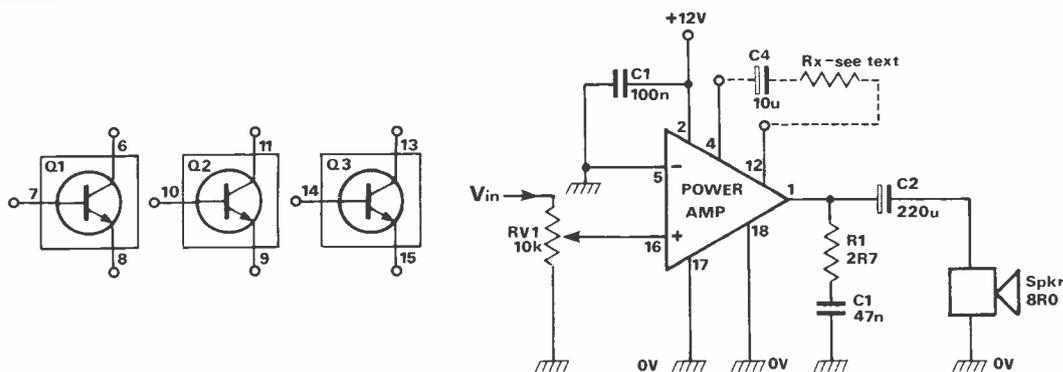


Fig 15 Basic circuit connections of the LM389 IC

waveforms applied to the load when fed with a 10V peak-to-peak square-wave input signal.

Note that although waveforms 'A' and 'B' each have a peak value of 10V relative to ground, the two signals are in anti-phase (shifted by 180°). Thus, during period '1' of the drive signal, point 'B' is 10V positive to 'A' and is thus seen as being at '+10V'. In period '2', however, point 'B' is 10V negative to point 'A', and is thus seen as being at '-10V'. Consequently, if point 'A' is regarded as a 'zero voltage' reference point, it can be seen that the point 'B' voltage varies from +10V to -10V between periods '1' and '2', giving a total voltage change of 20V across R_L . Similar changes occur in subsequent waveform periods.

Thus, the load in a 10V bridge-driven circuit sees a total voltage of 20V peak-to-peak, or twice the single-ended input voltage value, as indicated in the diagram. Since doubling the drive voltage results in a doubling of drive current, and power is equal to the $V \cdot I$ product, the bridge-driven circuit thus

produces four times more power output than a single-ended circuit.

LM386 basics

The LM386 audio amplifier (manufactured by National Semiconductor) is specifically designed for operation with power supplies in the 4V to 12V range. It is housed in an 8-pin dip package, consumes a quiescent current of only a few mA, and is ideal for use in battery-powered applications.

The voltage gain of the IC is variable from 20 to 200 via external connections, and its output automatically centres on a quiescent value of half-supply voltage. The device can feed several hundred milliwatts into a 8R0 load when operated from a 12V power supply. Its differential input terminals are both ground-referenced, and have typical input impedances of 40K.

The internal circuit of the LM386 is shown in *Figure 8*. Here Q1 to Q6 form a differential amplifier in which both inputs are tied to ground via 50K resistors (R1 and R2) and the output

(from Q3) is direct-coupled to the input of common emitter amplifier Q7. The collector signal of Q7 is direct-coupled to the output terminal of the IC via Class-B unity-gain power amplifier stage Q8-Q9-Q10 which, to minimise the internal volt-drops and maximise the available output power, is not provided with overload protection circuitry.

LM386 applications

The LM386 is a very easy IC to use. The voltage gain of the IC is equal to the value of the pin-1 to pin-5 impedance (15K in *Figure 8*), divided by the impedance between the emitters of Q1 and Q3 ($=R5+R6$ in *Figure 8*). Thus, the IC can be used as a minimum-parts amplifier with an overall voltage gain of x20 by using the simple connections shown in *Figure 9*. Here, the load is ac-coupled to the IC output via C2, and the input signal is connected to the non-inverting terminal via RV1. Note that C1 is used to RF-decouple the +ve supply pin (pin 6), and R1-C3 is an optional Zobel network to give HF output-loading stability.

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CK1100	Stereo P/A 100+100 WPC	£151.00
MC2K	M/C Kit for CK1010	£25.00
PSK	Pre-amp power supply	£20.00

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AA117	0.09	BC157	0.06	BD222	0.31	BU108	1.00	OC72	0.50	TIP29C	0.25	3N.143	0.65	2SA473	0.37	28 pin	0.20	PCL84	0.50	LM723	0.32	LED 5mm	
AA119	0.09	BC159	0.06	BD225	0.31	BU110	1.10	OC200	1.80	TIP30	0.16	IN.914	0.02	2SB54	0.25	40 pin	0.25	PCL85	0.55	LM741 DII	0.15	YELLOW	0.10
AA132	0.09	BC182	0.06	BD232	0.31	BU111	1.40	OC271	1.00	TIP31A	0.24	IN.4001	0.04	2SB77	0.32			PCL86	0.55	LM741		LED 5mm	
AC107	0.26	BC182L	0.06	BD237	0.21	BU126	0.70	ORP12	1.00	TIP32	0.24	IN.4002	0.04	2SB337	1.20	VALVES		PCL805	0.55	Met	0.45	GREEN	0.10
AC126	0.17	BC183	0.06	BD238	0.21	BU204	0.75	ORP60	1.00	TIP32A	0.24	IN.4003	0.04	2SB405	0.22	DY87	0.53	PFL200	0.85	LM3900	0.25		
AC127	0.15	BC183L	0.06	BD443	0.28	BU205	0.70	ORP61	1.00	TIP33	0.50	IN.4004	0.04	2SC460	0.21	DY802	0.45	PL36	0.80	NE555	0.15		
AC128	0.15	BC184	0.06	BD437	0.28	BU208	0.75	R2008B	0.80	TIP34	0.50	IN.4004	0.04	2SC495	0.80	ECC82	0.40	PL508	0.95	NE556	0.40	BRIDGE	
AC128K	0.23	BC184L	0.06	BD535	0.38	BU208A	0.80	R2010B	0.80	TIP41A	0.22	IN.4005	0.04	2SC733	0.40	ECC83	0.43	PL508	1.90	BYX55/		RECTIFIERS	
AC141K	0.23	BC212	0.06	BD536	0.38	BU208D	1.20			TIP41C	0.25	IN.4006	0.04	2SC1161	1.10	ECC84	0.40	PL508	1.90	BYX55/		1A/50V	0.16
AC142K	0.23	BC212L	0.06	BD537	0.40	BU209	0.85			TIP42A	0.22	IN.4007	0.05	2SC1172Y	1.50	ECC85	0.40	PL508	1.90	BYX55/		1A/100V	0.18
AC153K	0.23	BC213	0.06	BD538	0.40	BU405	0.85	SA S560	1.10	TIP42C	0.25	IN.4148	0.02	2SC1279	0.24	ECH81	0.49	PL508	1.90	BYX55/		1A/200V	0.19
AC176	0.18	BC213L	0.06	BDX32	1.00	BU407	0.75	SA S570	1.10	TIP47	0.40	IN.5400	0.09	2SC1306	1.00	ECH84	0.52	PL508	1.90	BYX55/		1A/400V	0.21
AC176K	0.20	BC214	0.06	BDX65	0.80	BU408	1.00	SN76033N	1.40	TIP48	0.40	IN.5401	0.10	2SC1307	1.00	ECH84	0.52	PL508	1.90	BYX55/		1A/600V	0.23
AC187	0.15	BC214L	0.06	BF180	0.18	BU500	1.10	SN76013N	1.40	TIP49	0.40	IN.5402	0.10	2SC1520	0.25	ECL82	0.59	PL508	1.90	BYX55/		1A/800V	0.28
AC187K	0.20	BC237	0.07	BF181	0.18	BU526	0.80	SN76023N	1.40	TIP110	0.47	IN.5403	0.11	2SC1969	1.30	ECL84	0.57	PL508	1.90	BYX55/		2A/100V	0.35
AC188	0.17	BC238	0.07	BF183	0.20	BY126	0.06	SN76033N	1.50	TIP112	0.54	IN.5404	0.11	2SC2029	1.20	ECL85	0.57	PL508	1.90	BYX55/		2A/200V	0.36
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP115	0.45	IN.5405	0.12	2SC2078	1.20	ECL86	0.49	PL508	1.90	BYX55/		2A/400V	0.42
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP117	0.56	IN.5406	0.13	2SC2122A	2.00	EF80	0.31	PL508	1.90	BYX55/		2A/600V	0.54
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP115	0.45	IN.5405	0.12	2SC2078	1.20	EF85	0.34	PL508	1.90	BYX55/		2A/800V	0.58
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP117	0.56	IN.5406	0.13	2SC2122A	2.00	EF89	0.43	PL508	1.90	BYX55/		3A/200V	0.66
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP115	0.45	IN.5405	0.12	2SC2078	1.20	EF85	0.34	PL508	1.90	BYX55/		3A/400V	0.68
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP117	0.56	IN.5406	0.13	2SC2122A	2.00	EF89	0.43	PL508	1.90	BYX55/		3A/600V	0.78
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP115	0.45	IN.5405	0.12	2SC2078	1.20	EF85	0.34	PL508	1.90	BYX55/		6A/200V	1.00
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP117	0.56	IN.5406	0.13	2SC2122A	2.00	EF89	0.43	PL508	1.90	BYX55/		6A/400V	0.80
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP115	0.45	IN.5405	0.12	2SC2078	1.20	EF85	0.34	PL508	1.90	BYX55/		25A/100V	1.80
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP117	0.56	IN.5406	0.13	2SC2122A	2.00	EF89	0.43	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP115	0.45	IN.5405	0.12	2SC2078	1.20	EF85	0.34	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP117	0.56	IN.5406	0.13	2SC2122A	2.00	EF89	0.43	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP115	0.45	IN.5405	0.12	2SC2078	1.20	EF85	0.34	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP117	0.56	IN.5406	0.13	2SC2122A	2.00	EF89	0.43	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP115	0.45	IN.5405	0.12	2SC2078	1.20	EF85	0.34	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP117	0.56	IN.5406	0.13	2SC2122A	2.00	EF89	0.43	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP115	0.45	IN.5405	0.12	2SC2078	1.20	EF85	0.34	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP117	0.56	IN.5406	0.13	2SC2122A	2.00	EF89	0.43	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP115	0.45	IN.5405	0.12	2SC2078	1.20	EF85	0.34	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP117	0.56	IN.5406	0.13	2SC2122A	2.00	EF89	0.43	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP115	0.45	IN.5405	0.12	2SC2078	1.20	EF85	0.34	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP117	0.56	IN.5406	0.13	2SC2122A	2.00	EF89	0.43	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP115	0.45	IN.5405	0.12	2SC2078	1.20	EF85	0.34	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP117	0.56	IN.5406	0.13	2SC2122A	2.00	EF89	0.43	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP115	0.45	IN.5405	0.12	2SC2078	1.20	EF85	0.34	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP117	0.56	IN.5406	0.13	2SC2122A	2.00	EF89	0.43	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP115	0.45	IN.5405	0.12	2SC2078	1.20	EF85	0.34	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP117	0.56	IN.5406	0.13	2SC2122A	2.00	EF89	0.43	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP115	0.45	IN.5405	0.12	2SC2078	1.20	EF85	0.34	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP117	0.56	IN.5406	0.13	2SC2122A	2.00	EF89	0.43	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP115	0.45	IN.5405	0.12	2SC2078	1.20	EF85	0.34	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP117	0.56	IN.5406	0.13	2SC2122A	2.00	EF89	0.43	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP115	0.45	IN.5405	0.12	2SC2078	1.20	EF85	0.34	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP117	0.56	IN.5406	0.13	2SC2122A	2.00	EF89	0.43	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP115	0.45	IN.5405	0.12	2SC2078	1.20	EF85	0.34	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP117	0.56	IN.5406	0.13	2SC2122A	2.00	EF89	0.43	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP115	0.45	IN.5405	0.12	2SC2078	1.20	EF85	0.34	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP117	0.56	IN.5406	0.13	2SC2122A	2.00	EF89	0.43	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP115	0.45	IN.5405	0.12	2SC2078	1.20	EF85	0.34	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP117	0.56	IN.5406	0.13	2SC2122A	2.00	EF89	0.43	PL508	1.90	BYX55/			
AC188K	0.23	BC300	0.16	BF183	0.20	BY127	0.06	SN76110N	0.70	TIP115	0.45	IN.5405	0.12	2SC2078	1.20	EF							

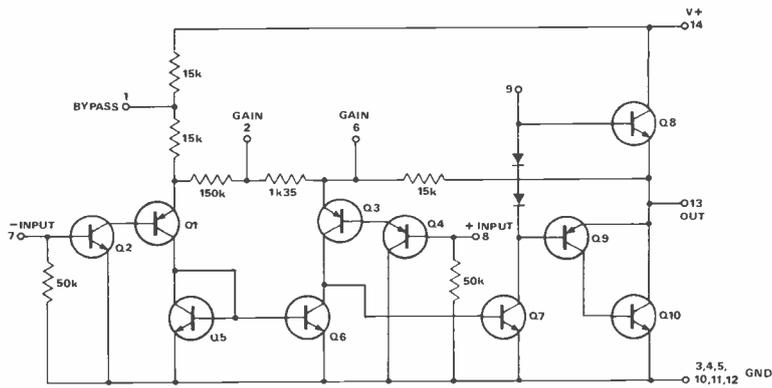


Fig 18 Internal circuit and pin connections of the LM388 1.5W audio power amplifier

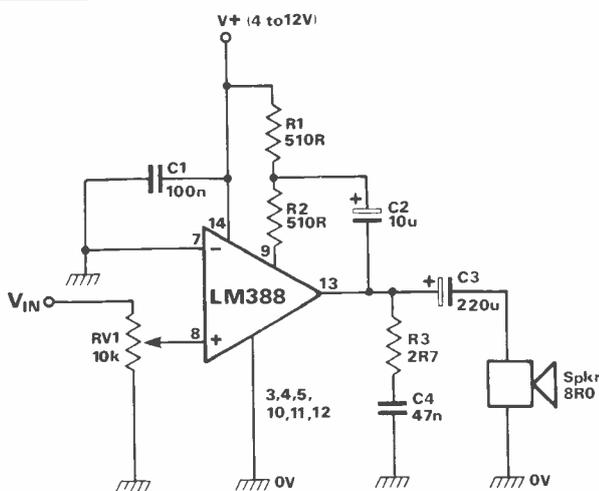


Fig 19 LM388 with a gain of x20 and load returned to ground

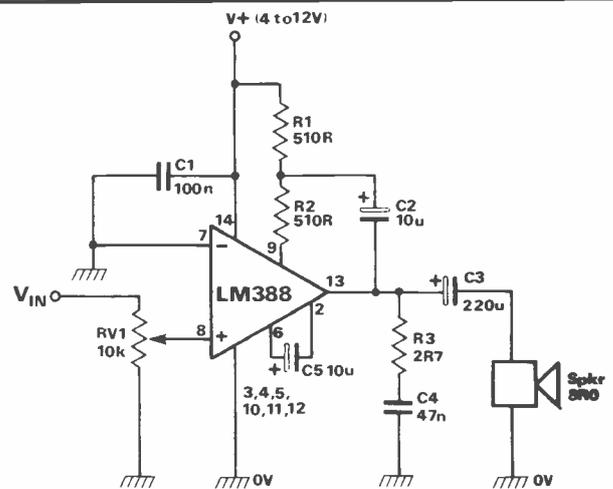


Fig 20 LM388 with a gain of x200 and load returned to ground

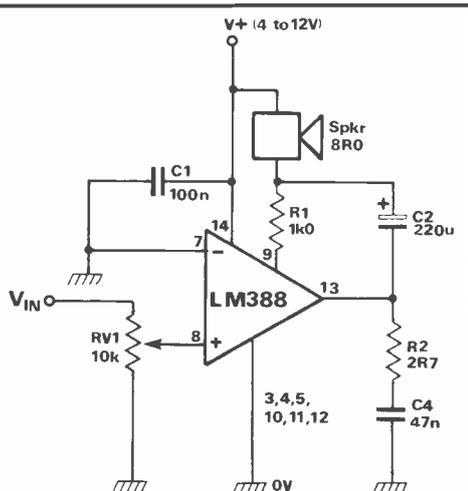


Fig 21 LM388 with a gain of x20 and load returned to +ve supply

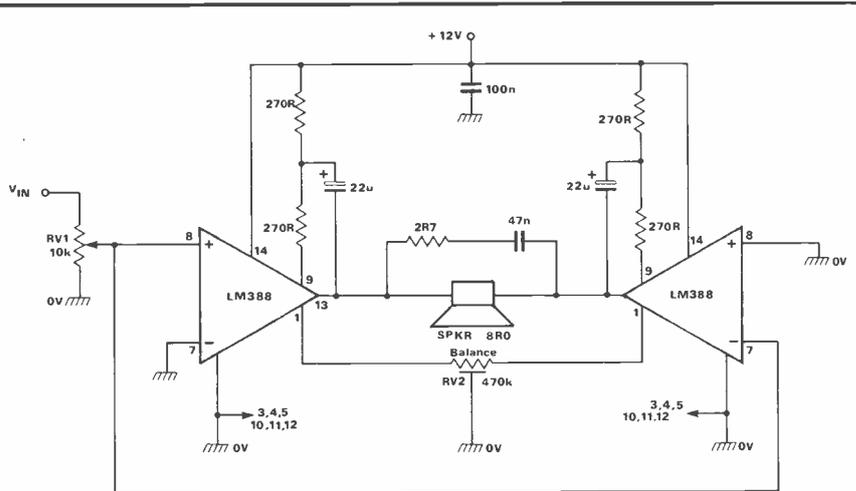


Fig 22 LM388 bridge amplifier delivering 4W to 8R0 load

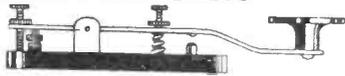
the ac-impedance of R2 (and thus the voltage gain of Q7) to a value far greater than its dc value. The overall voltage gain of the LM388 is determined in the same way as in the LM386, and equals x20 in the Figure 19 circuit. Figure 20 shows how

the gain can be increased to x200, by simply wiring C5 between pins 2 and 6. Figure 21 shows an alternative way of using the LM388. Here, dc current is fed to pin-9 of the IC via the speaker and R1. Note, however, that the 'low' end of the

speaker is ac-driven by the output of the amplifier, thereby bootstrapping R1 and providing R1 with a high ac impedance value. This circuit gives a performance similar to that of Figure 19, but does so with a saving of two components.

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PRECISION MORSE KEYS



Well designed beginners key. Fully adjustable. Dims: Base 82mm x 45mm. O/No. VP 122. **£1.85**



Double-paddle, squeeze action. Body dims: 83 x 65 x 35mm. Weight 150g. O/No. VP 123. **£20.00**



Vertical action. Robust ABS body weighted with heavy metal plate. Screw terminals. Silver contacts. Usual adjustments. Body dims: 150 x 75 x 50mm. Weight 0.5kg. O/No. VP 124. **£21.00**

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Co-axial switch for one transceiver to two antennae or one antenna to two transceivers. Dims: 86 x 55 x 32mm (Body). O/No. VP 113. **£4.50**
As above but 3-way. O/No. VP 114. **£4.75**

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CB/TV. High pass filter. Reduces unwanted signals picked up by antenna. Dims: 45 x 25 x 17mm. O/No. VP 115. **45p**

LOW PASS FILTER

Designed to reduce harmonics on the VHS and TV band. Cut-off frequency: 30MHz. V.S.W.R.: Less than 1.2 to 1. Insertion loss: -0.2dB @ 27MHz. Impedance: 50ohms. Dims: 80 x 55 x 40mm. O/No. VP 116. **£2.75**

ANTENNA COUPLER

Transceiver/car radio antenna coupler. With co-axial cables. One co-axial terminates in antenna plug and the other in PL259 plug. Dims: 67 x 46 x 30mm. O/No. VP 117. **£2.00**

TAPE RECORDER SWITCH

Unit to control motor of tape recorder. 1.8m cord and 2.5mm plug attached. On/Off switch. Dims: 55 x 20 x 20mm. O/No. VP 127. **£1.00**

DC-DC POWER SUPPLY

DC to DC adaptor. Plugs into car cigar lighter aperture. Output 3, 4.5, 6, 7.5, 9, 12V @ 800mA. Has universal output spade plug, also 9V battery snap and polarity reversing facility. O/No. VP 119. **£2.45**

SPEAKER PROTECTOR

Limits voltage to speaker or to the permissible max., by automatically introducing a resistor in series with speakers. When excessive voltage is reduced the unit resets itself. Electronic voltage-sensing relay circuit. Spring terminals. Cut-off level adjustable from 10W-120W. Full instructions included. Dims: 85 x 74 x 25mm. O/No. VP 118. **£9.95**

ELECT & PIEZO BUZZERS

PIEZO
Miniature round piezo electronic buzzer. White plastic. Low consumption. Frequency 4kHz approx. Output 70dB (A) @ 1m typ. Power: 12Vdc 4mA. Dims: 22 (dia) x 11.5mm. Fixing Centres 26.5mm. O/No. VP 107. **95p**

PIEZO
Piezo buzzer. White plastic. 90mm leads for use on a.c. mains. Frequency: 3.5kHz approx. Output: 85dB (A) @ 1m typ. Power: 240Vac 5mA. Dims: 32 (dia) x 14mm. Fixing centres 38mm. O/No. VP 108. **£1.15**

ELECTRONIC
Miniature electronic buzzers. Solid state ivory plastic. 150 leads. Frequency 500 Hz approx. Dims: 22 x 16 x 15mm. Output: 82dB (A) @ 1m typ. Fixing centres 26mm. 3V 25mA. O/No. VP 82. 6V 25mA. VP 83. 9V 25mA. O/No. VP 84. 12V 25mA. VP 86. **80p each**

SUB-BOX

A neat swivelling disc provides close tolerance substitution resistors of 36 preferred values from 50ohms to 10kohm. Simply fix clips into circuit and swivel until optimum result is achieved. O/No. VP 112. **£4.75**

MINIATURE VICE

Miniature plastic and metal vice with strong suction base for portability. Single action to secure or release suction. Plastic jaws with rubber pads. 20mm wide, open out to 40mm. Dims: 85 x 65 x 60mm approx. **FANTASTIC VALUE**
O/No. VP 95 ONLY **£1.60**

LEARN A LINGO!

PILLOW SPEAKER
Slim under pillow unit. 8ohms 2" speaker. 1.5m lead with 3.5mm mono jack plug. Black. Dims: 65 (dia) x 17mm. O/No. VP 88. **£1.25**

METRIC & BRITISH MEASURES

Steel tapes in sturdy ABS plastic case. Silk wrist strap. These yellow coated convex tapes inch and metric graduations. Automatic push-button return. 2m long x 13mm wide. O/No. VP 89. **£1.00**
3m long x 13mm wide. O/No. VP 90. **£1.50**
5m long x 16mm wide. O/No. VP 91. **£2.00**

BATTERY TESTER

Tests all types of battery including standard, NICAD, Alkaline etc. Takes all standard sizes including 6V lantern batteries and watch/hearing aid cells. Also tests fuses and lamps by means of internal 9V (PP3) battery. Can also be used to recharge NICAD batteries by means of external 3.12Vdc power supply (not included). Full instructions provided. Dims: 185 x 103 x 30mm (approx). O/No. VP 101. **£7.00**

FM MONITOR

FM monitor for 2 metre band. All metal. Attached earphone PL259/SO235 connectors. 144MHz 10W maximum. Dims (Body) 55 x 30 x 23mm. O/No. VP 120. **£4.20**

DUMMY LOAD

50 ohms 30W UHF co-axial plug fitting (PL259). O/No. VP 121. **£5.20**

PICK-UP COIL

Large telephone pick-up coil for high sensitivity. Suction pad to stick to telephone. 90cm lead to 3.5 jack plug. Connects direct to cassette recorder. Dims: 32 (dia) x 17mm (body) 36mm (dia) sucker. O/No. VP 87. **£1.00**

VALUE PACKS

Pak No.	Qty	Description	Price
VP1	300	Assorted Resistors Mixed Types	£1.00
VP2	300	Carbon Resistors 1/2 Watt Pre-Formed	£1.00
VP3	200	Assorted Capacitors All Types	£1.00
VP4	150	1 Watt Resistors 100 ohm-1M Mixed	£1.00
VP5	200	Assorted Capacitors All Types	£1.00
VP6	200	Ceramic Caps Miniature - Mixed	£1.00
VP7	100	Mixed Ceramics Disc 1/4 - 50pF	£1.00
VP8	100	Mixed Ceramic Disc 50pF - 0.15pF	£1.00
VP9	100	Assorted Polyester/Polystyrene Caps	£1.00
VP10	60	C280 Type Caps Metal Foil Mixed	£1.00
VP11	100	Electrolytics - All Sorts	£1.00
VP12	80	Bead Type Polystyrene Min Caps	£1.00
VP13	50	Silver Mica Caps Ass 5.6pF - 150pF	£1.00
VP14	50	Silver Mica Caps Ass 180pF - 4700pF	£1.00
VP15	50	High Voltage Osc Ceramic 750V - 8kV Mixed	£1.00
VP16	50	Wirewound Res 9W (avg) Ass 1 ohm - 12k	£1.00
VP17	50	Metres PVC Covered Single Strand Wire Mixed Colours	£1.00
VP18	30	Metres PVC Covered Multi Strand Wire Mixed Colours	£1.00
VP19	40	Metres PVC Single/Multi Strand Hook-Up Wire Mixed	£1.00
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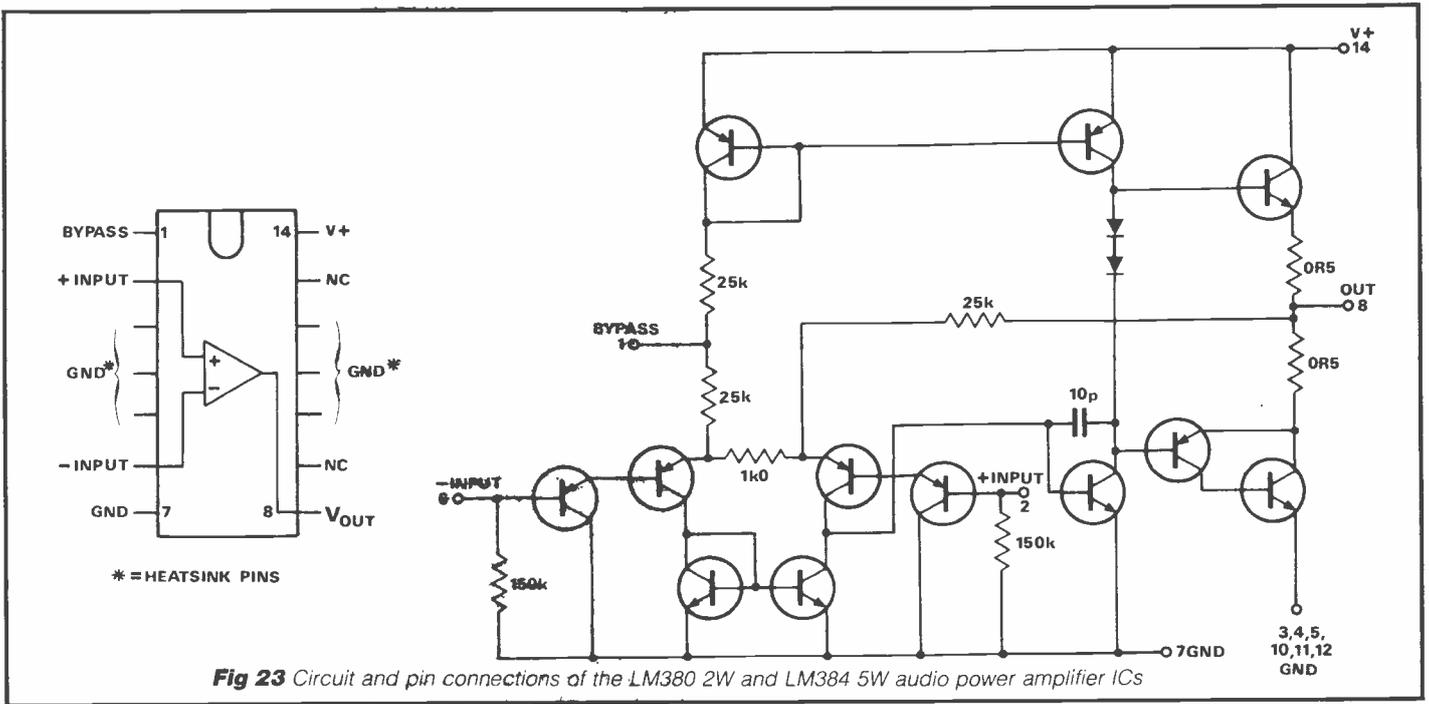


Fig 23 Circuit and pin connections of the LM380 2W and LM384 5W audio power amplifier ICs

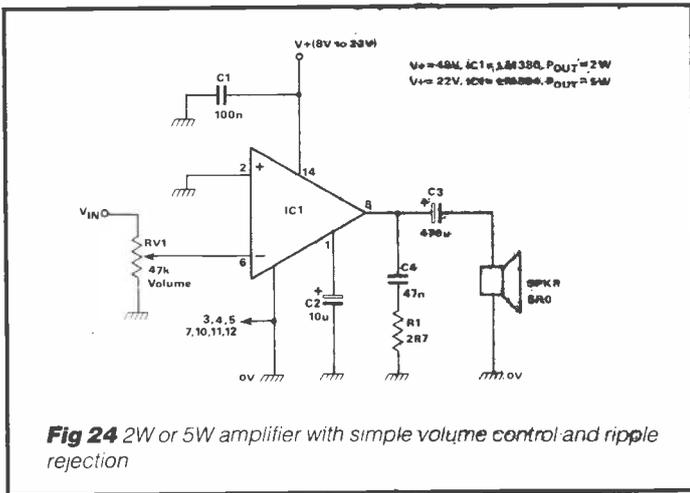


Fig 24 2W or 5W amplifier with simple volume control and ripple rejection

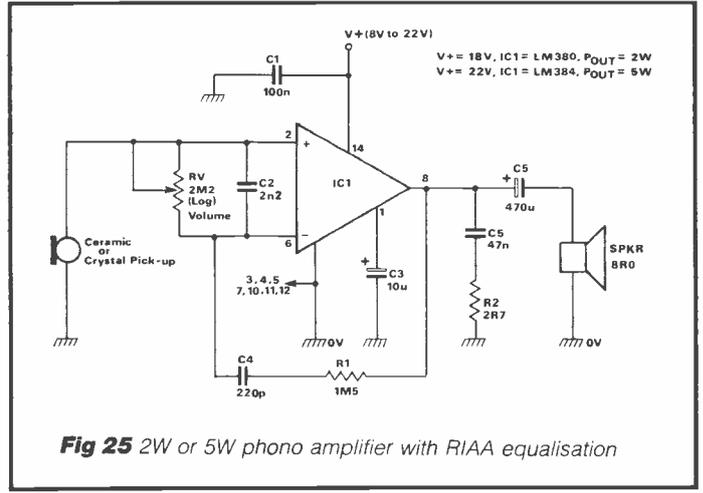


Fig 25 2W or 5W phono amplifier with RIAA equalisation

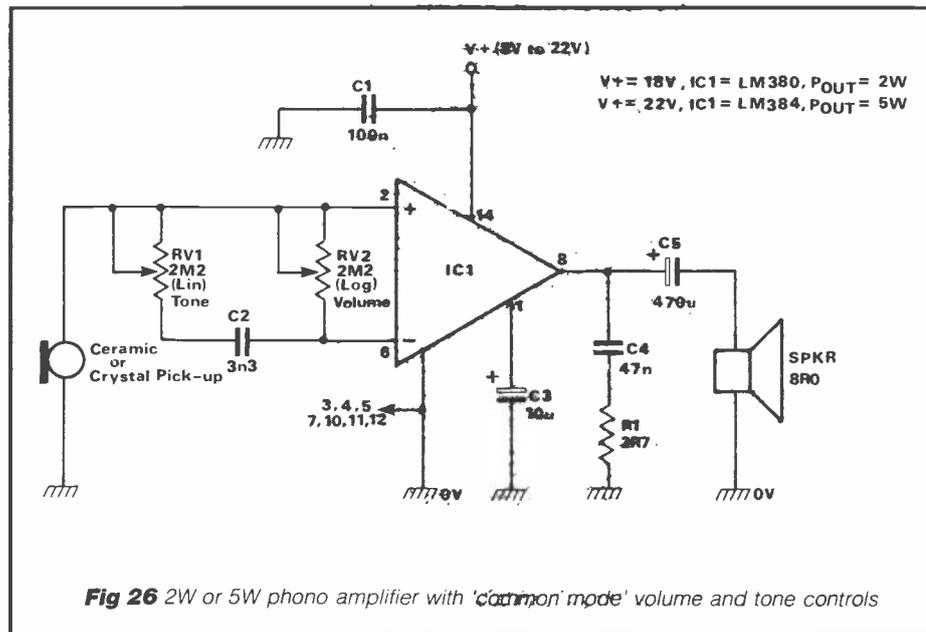


Fig 26 2W or 5W phono amplifier with 'common mode' volume and tone controls

Finally, *Figure 22* shows how to connect a pair of LM388 ICs in the bridge configuration, to provide 4W of drive to a direct-coupled 8R0 speaker load when using a 12V power supply. Pre-set pot RV2 is used here to set the quiescent output of the two ICs at identical values, to minimise the quiescent current consumption of the circuit.

Before leaving the LM388, it should be noted that this IC has a fairly poor supply line ripple rejection performance, and if any problems are met in this respect they can usually be overcome by wiring a 10uF (or larger) capacitor between pin-1 and ground.

LM380/LM384 circuits

The LM380 (*Figure 23*) is probably the best known of all power amplifier ICs. It can work with any supply voltage in the range 8V to 22V, and can deliver 2W into an 8R0 load when operated with an 18V supply (but needs a good external heatsink to cope with this power level). Its differential input terminals are both

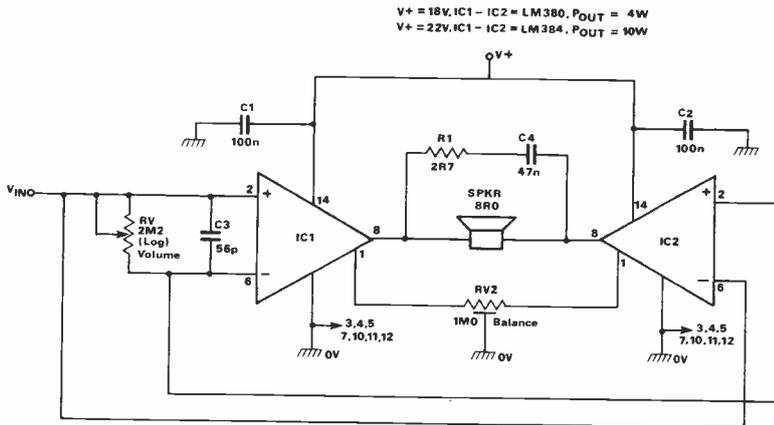


Fig 27 4W or 10W bridge-configured amplifier.

volume control (via RV1). Alternatively, Figure 25 shows how to use either IC as a phono amplifier with RIAA equalisation (via R1-C4), and figure 26 shows how to modify the circuit for use with so-called 'common mode' volume and tone controls.

Finally, Figure 27 shows how to use a pair of these ICs in the 'bridge' mode, to give an output of either 4 or 10W.

ground referenced, and the output automatically sets at a quiescent value of half-supply volts. Its voltage gain is fixed at x50 (= 34dB), the output is short-circuit proof, and the IC is provided with internal thermal limiting.

The LM384 is simply an 'up rated' version of the LM380, capable of operating at supply values up to 28V and of delivering 5W into an external load. Both

types of IC are housed in a 14-pin DIL package, in which pins 3, 4, 5 and 10, 11, 12 are intended to be thermally coupled to Pan external heatsink.

To conclude, Figures 24 to 27 show some practical applications of these two audio power amplifier ICs. Figure 24 shows how to use either IC as a simple (x 50) amplifier with enhanced (via C2) ripple rejection and a very simple form of

In next month's concluding part of this special series Ray Marston looks at more applications of power amplifiers IC's. Including 'dual' types

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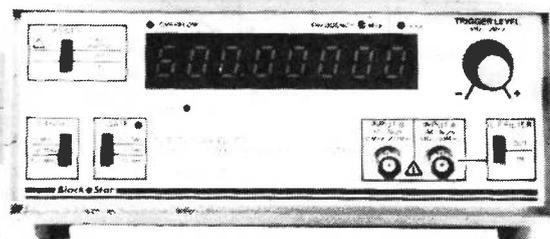
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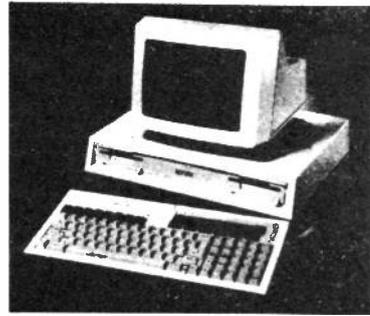
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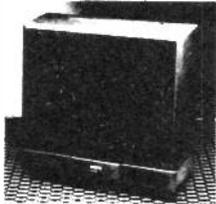
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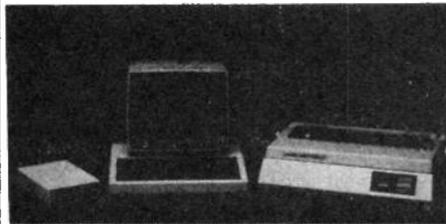
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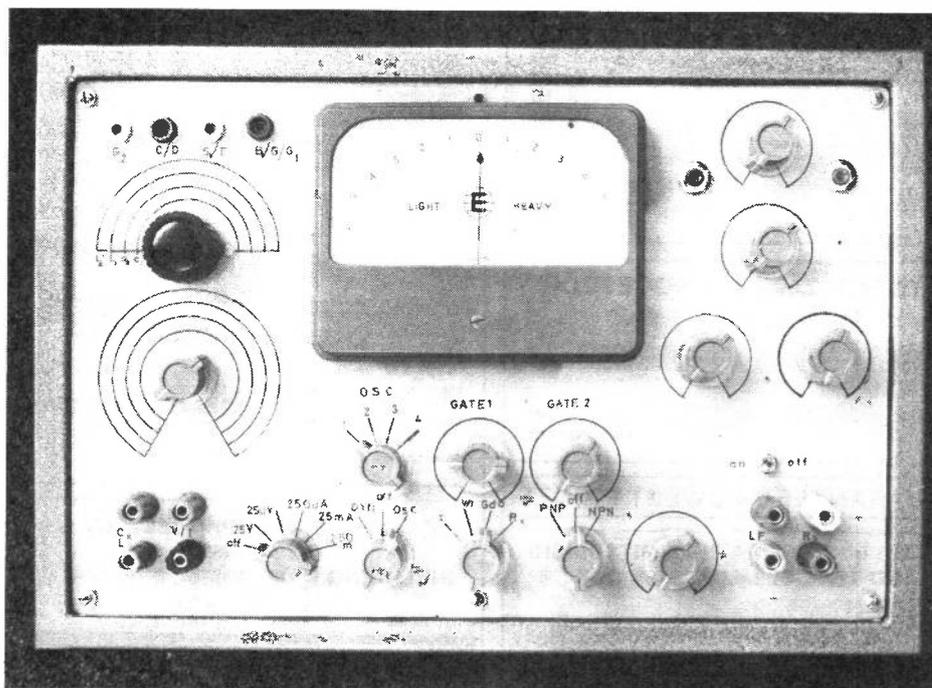


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The function control and selector switches

There are five function selector switches. Referring to Figure 2:

SW1 This is the oscillator range selector. The ranges should be marked on the dial scale of VC1.

Control 1. This is RV7, and is marked 'GATE 1' indicating that positive or negative 0 to 3V bias is being applied. Setting this control to the mid-position applies zero bias to the gate of a FET, the G1 of a MOSFET and to the base of a transistor under test. The dial scale should be calibrated in 'volts', 3-0-3 in either direction.

Control 2. This is RV6 and is marked 'GATE 2'. It is similar to RV7 except that it applies +3-0-3V bias to G2 of a MOSFET under test.

SW2. This is the voltage and current range selector. The instrument has been marked, OFF, 25V, 250V, 250 μ A, 25mA, 250mA, but ranges can be selected according to personal preference and the meter used.

SW3. Marked 'DYN', OFF, OSC/Tx. Explanation given in text;

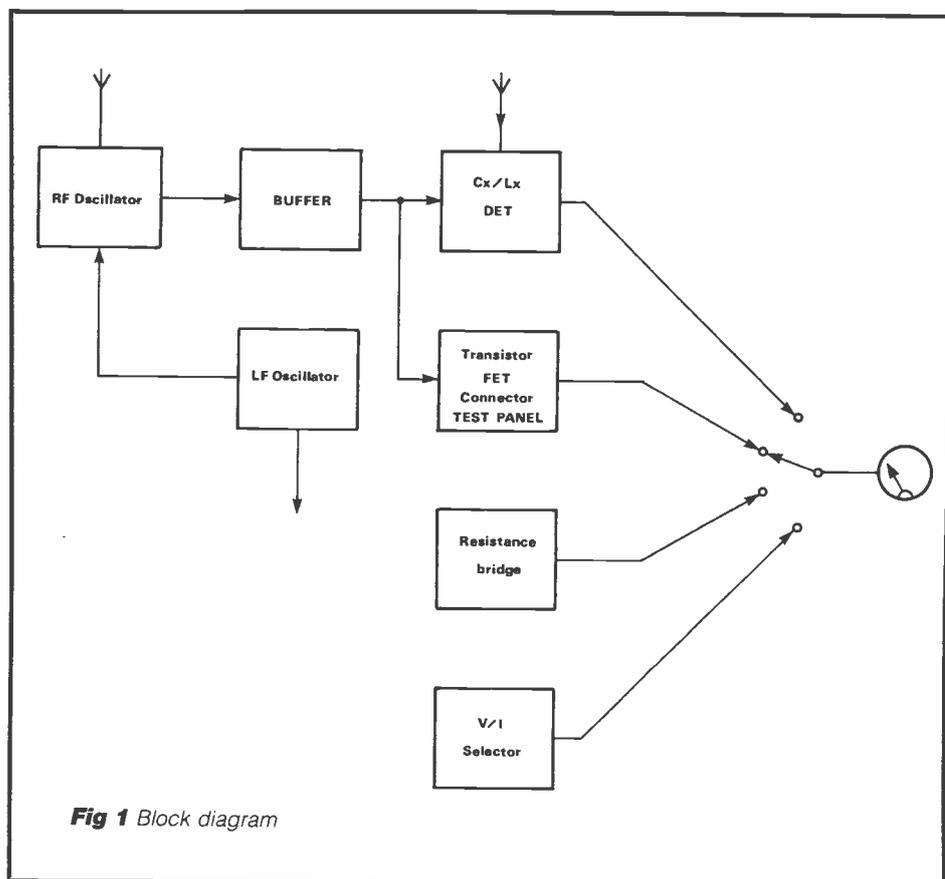


Fig 1 Block diagram

TEST INSTRUMENT

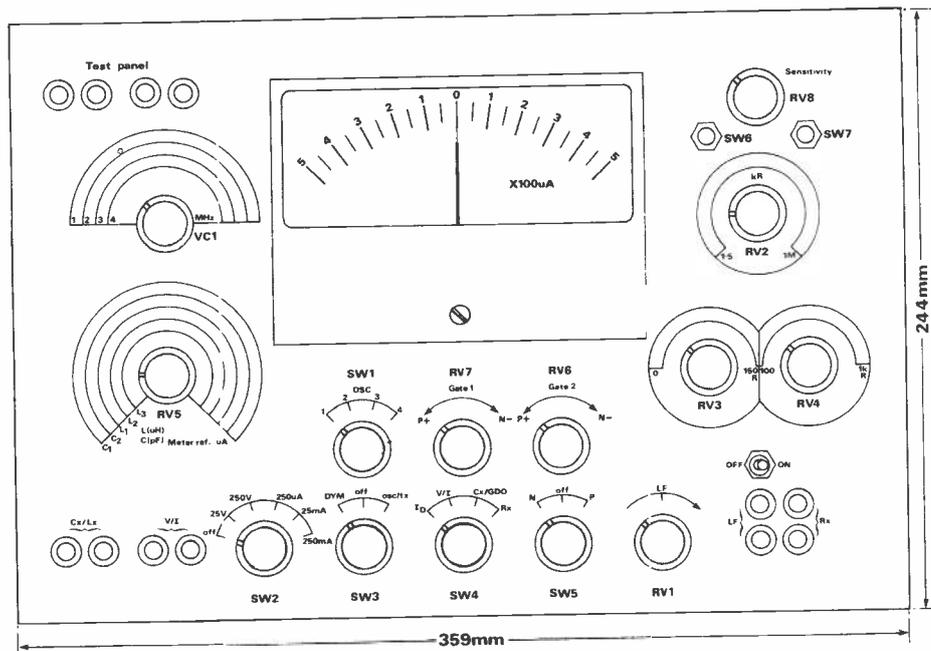


Fig 2 Front panel layout

SW4. Marked Id (for drain and collector current, meter readings).
 V/I (for voltage and current ranges, meter readings); Cx/GDO (includes Lx); Rx (for resistance measurements).
 SW5. Marked N--OFF--P. (applies the correct B1 battery voltage polarity when testing transistors etc.(refer to text).
Control 3. RV1 is the LF oscillator On/Off and output amplitude potentiometer for audio tests, and when required for setting the % modulation depth of the RF oscillator.

General Comments

Battery operation was selected in order to make the instrument completely portable. It is very easy to operate. Clearly one function switch could have been used, but a switch with the requisite number of poles was not readily available.

A solder-tag strip mounted vertically is used to hold the meter series and shunt resistors. A similar method can be adopted to hold the B1 battery, 6.3V Zener, C16 and R19.

It is recommended that the two oscillators be assembled on separate paxoline boards measuring 3in x 2in for the RF oscillator and 2.5in x 2in for the LF oscillator. Most of the components are readily available, for example, on the surplus market and the total cost was approximately £15 thus a figure of £25 need not be exceeded. In comparison with similar commercially available instruments, this seems a very economical alternative.

dc V & I measurements

The dc voltage and current measurements are made with the V/I input terminals connected to the voltage or current source and the switches set to the following positions.

SW4 set to V-I (position 2) and SW2 (V/I selector) to the highest range. SW2 may

then be reduced from the highest range if the reading obtained will not exceed FSD on the next lowest range. Under these conditions, the meter is connected to the multipliers R23, R24 via SW4a on position 2. Similarly with SW4a in this position, SW2b will select the highest range meter shunt, R25 (if this is the higher value) when in position 4.

The values of the multipliers and shunts are not given because they depend on the meter that is available. They can be calculated as follows:

In order to read dc volts using a milliammeter, one must use a resistor, known as a 'multiplier', in series with the meter. The value of the multiplier depends on the required voltage FSD and can easily be calculated using Ohm's law. For example, suppose you have a 0-5mA meter and wish to use it to read voltage up to a maximum of 50V (ie 50V is to be the FSD).

From Ohm's law:

$$\text{Multiplier value, } R = \frac{V}{I} = \frac{50}{0.005} = 10,000 \text{ ohms or } 10k$$

Please note however, that the accuracy of your newly 'acquired' voltmeter, and, more importantly, its safety, depends on the accuracy of the resistor used as the multiplier. It is vital to use only high stability, low tolerance (typically 1%) types. If, for example, you were to use a 20% type and it is in its worst case 20% low (ie 8K), then the FSD would now be only 40V and risk of damage to the meter is high.

Similarly, your milliammeter (or microammeter) can have its range extended by using another resistor, known as a 'shunt', but this time wired in parallel with the meter. High stability, close tolerance types are again vitally important.

The meter resistance R_m , must now be taken into account, and the required

resistance of the shunt to carry the excess current, is given by:

$$\text{Shunt value: } R_{\text{shunt}} = \frac{R_m}{n-1}$$

where 'n' is the scale multiplying factor (eg to increase the FSD reading of 1mA to read 10mA, $n = 10$).

For example, if a milliammeter of 10Ω resistance and a FSD of 1mA is to be used to measure .10mA, the shunt resistance will be:

$$R_{\text{shunt}} = \frac{10}{10-1} = 1.1\text{ohm}$$

Resistance measurements

Set SW4 to the R position (position 4) which applies 6V to the bridge circuit which forms a Wheatstone Bridge where RV3 and RV4 are adjusted so that the bridge is balanced. This is observed when no current passes through the meter (ie adjusting RV3 and RV4 is equivalent to setting the zero). When balance is reached $RV2/R13 = RV3 + RV4/R$ thus enabling R to be determined. The unknown value resistor is connected to the Rx terminals and forms part of the bridge circuit. When using a resistance bridge, balance will be reached after a short time. Thus the meter sensitivity should initially be set to minimum and progressively increased to maximum by means of SW6 and SW7 in this order. Because the low value resistance end of the 0-1M scale is cramped, it was decided to include a 0-100R scale and a 0-1K scale. Calibration of all three scales can be undertaken by using a few known value resistors and marking the scales accordingly. For each resistor, adjust either RV2, RV3 or RV4 to make the meter read zero. The scales not in use must remain at zero. Resistance measurements are made by adjusting the appropriate control to read zero and the value of the resistance read from the appropriate scale. All three scales can be used for measurement purposes if required.

Capacitance and inductance measurements

Set SW3 to DYN 3 and SW4 to Cx/GDO. To calibrate the Cx and Lx scales on RV5, a minimum of five scale ranges will be required for the values shown.

- L_2 wound on top of L_1
- range 1 - 3 turns on top of 5 turns
- range 2 - 4 turns on top of 7 turns
- range 3 - 5 turns on top of 10 turns
- range 4 - 9 turns on top of 40 turns

The upper limit of Lx measurement is set by the self capacity of the inductance. This is because the integrator-detector circuit, D1-D2, C14, RV5, is really indicating the total impedance at the particular frequency of the oscillator, VC1.

True measurement of inductance requires the use of a bridge circuit to enable cancelling of the capacitive reactance and resistive components of inductor under test. However, the inexpensive method employed in this instrument is quite suitable and sufficiently accurate for inductances

TEST INSTRUMENT

A = flexible lead approx 3ins long B = small insulated crocodile clips

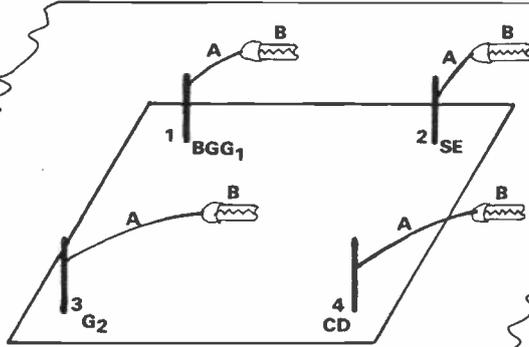


Fig 5 Alternative transistor/FET test panel

- B = Base - transistor, diode
- G = Gate - FET
- G = Gate 1 MOSFET
- G = Gate 2 MOSFET
- S = Source - FET, MOSFET
- E = Emitter - transistor
- C = Collector - transistor
- D = Drain - FET, MOSFET, diode

RV1 is fed for audio testing to two terminals on the front panel, marked LF. RV1 also provides the modulating signal to the RF oscillator. Being permanently connected in either role, it can be switched on-off separately because RV1 has an integral on/off battery supply switch.

THE GRID-DIP OSCILLATOR (GDO)

The name grid-dip oscillator is a relic from the early all-valved test equipment days but the term is still used and the basic conception in use is the same. The rectified output of the oscillator indicated by the meter will suddenly fall or 'dip' in value when the unknown L is tuned to the same frequency as the oscillator. This is a widely used method when winding and matching coils for use in multi-stage tuned circuits.

The oscillator coil L1/L2/L3 is attached to the underside of the small platform upon which the inductance to be tested will stand in order to ensure adequate coupling between the two. A short must be placed across the two Cx/Lx terminals. With switches SW3 set to OSC and SW4 set to Cx/GDO when VC1 is varied through its range, the meter pointer will

between $2.2\mu\text{H}$ and $330\mu\text{H}$.

Calibration

Use a few known values of capacitance and inductance and adjust RV5 to give a suitable reading of the meter. Mark the RV5 scale accordingly. Also note the reading chosen as the calibration reference and mark this on the scale; this then becomes the meter reference. The meter must now be adjusted by RV5 when measuring unknown values of C or L which can then be read direct from the scale.

THE LF OSCILLATOR

This well tried fixed frequency circuit uses a BC107B transistor although many other general purpose transistors are suitable. Adjustable amplitude output by

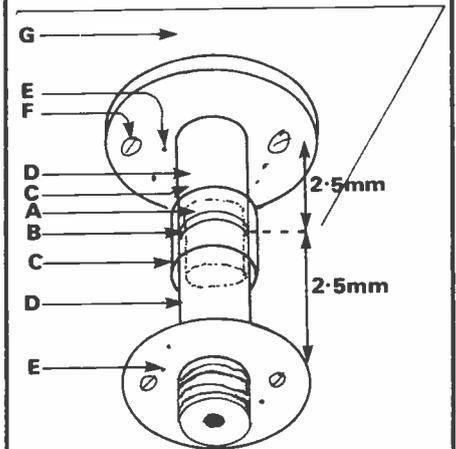
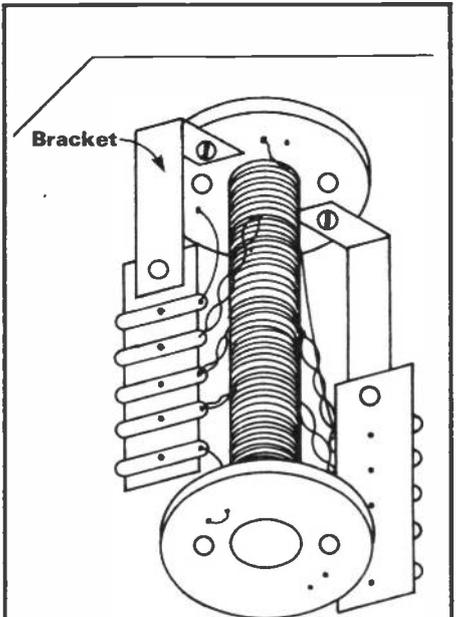
give a downward kick when Lx is tuned through the frequency of the oscillator.

TRANSISTOR/FET/MOSFET/DIODE DC AND DYNAMIC TESTING

DC testing

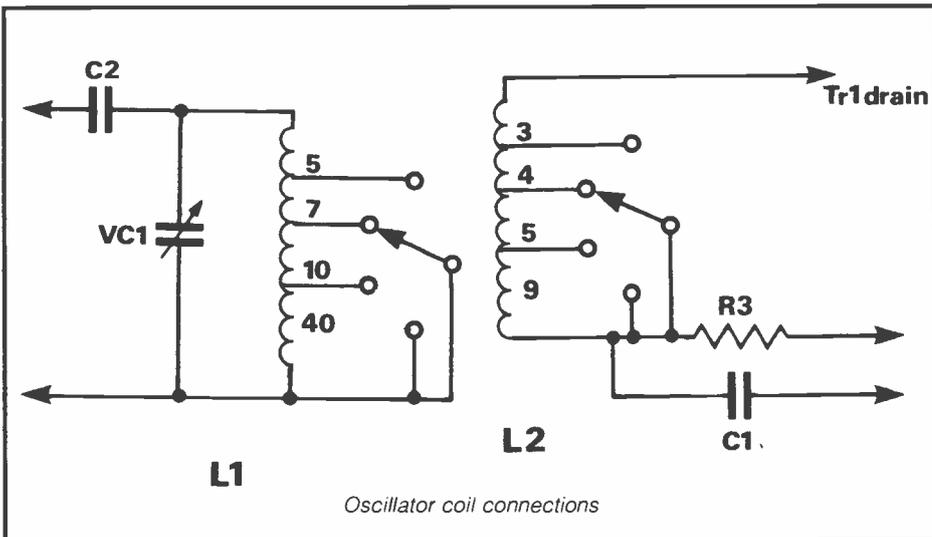
Set SW4 to ID (drain/collector current). Set the two bias controls RV6 and RV7 to give voltages according to the manufacturers published figures. The item to be tested is connected to the test panel via small insulated crocodile clips (see Figure 5 for alternative panel).

R18, the meter shunt for these tests



- A - Core (no gap) Maplin LB43W
- B - Adhesive (optional)
- C - Single layer adhesive tape
- D - Maplin LB18U - OD: 10mm
- E - Former holes to secure wire
- F - 6BA bolts
- G - GDO platform

Coil construction



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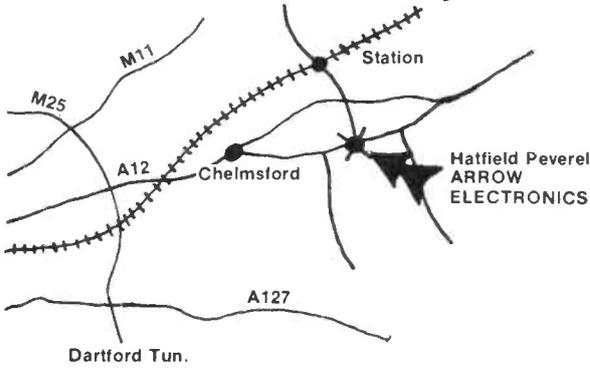
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TEST INSTRUMENT

should be chosen to give a meter FSD of 10 mA.

The NPN-PNP switch SW5, is set to the appropriate position. Drain and collector current will flow when the correct polarity is applied. If no current flows or current flows on both settings of SW5, the device is faulty.

Dynamic testing

Comparing the dynamic performance of two or more devices is common enough, because these differ from one to another by varying degrees. The dynamic testing facility at any frequency between 3-30MHz is, therefore, a very useful feature.

Set SW3 to 'Dyn', SW4 to Cx/GDO and put a shortening strip across the two Cx/Lx terminals. Again ensure that RV6/RV7 are set according to the manufacturer's quoted figures.

Adjust the pre-set capacitor C7 to a value that prevents the RF oscillator TR1 overdriving TR2 and also the unit under test. I use a meter reading of up to 6µA for small RF signal devices eg 40673, 2N3819, 2N3906, MPF102, BC107, 3SK88. Readings of this order are obtained

when the correct voltages are applied by RV6 and RV7.

OSCILLATION TRACING

Set SW3 to OSC/TX and SW4 to Cx/GDO. Using a length of co-axial cable connected to the two Cx/Lx terminals, the instrument can be used as an adjustable sensitivity RF probe. RV5 is set to the minimum capacity end of the two Cx scales for maximum sensitivity.

Additionally, transmitter radiated carrier output can be monitored by connecting a short length of rod or wire to the 'hot' (non-eathy) Cx/Lx terminal. See Figure 4.

RECEIVING AERIAL AND FEEDER TUNING, POLAR DIAGRAM PLOTTING, RECEIVER LINING-UP

The oscillator output has sufficient gain to enable these tests to be made by connecting a dipole to the two aerial terminals, or a vertical rod to either one of them. Connect the other terminal to

the chassis/earth terminal.

To keep costs to a minimum, a separate modulator stage has not been included. The oscillator, TR1, is modulated by TR3, the level being adjusted by RV1. The modulated output will contain AM and FM components. The oscillator can be calibrated in several ways but the easiest is probably by taking a number of readings from a calibrated receiver with the BFO switched on. The accuracy of calibration will not be up to commercial signal generator standard, but will be adequate for most applications undertaken.

The four ranges are approximately:-

1. 2.8 - 4 MHz
2. 3.5 - 6.5 MHz
3. 6.5 - 12.5 MHz
4. 12.5 - 31.0 MHz

The amplitude of the RF output can be monitored by shorting the two Cx/Lx terminals and setting SW3 and SW4 to Cx/GDO. For economic reasons and as this is not a signal generator, 3-ply wood can be used for the case.

SW2

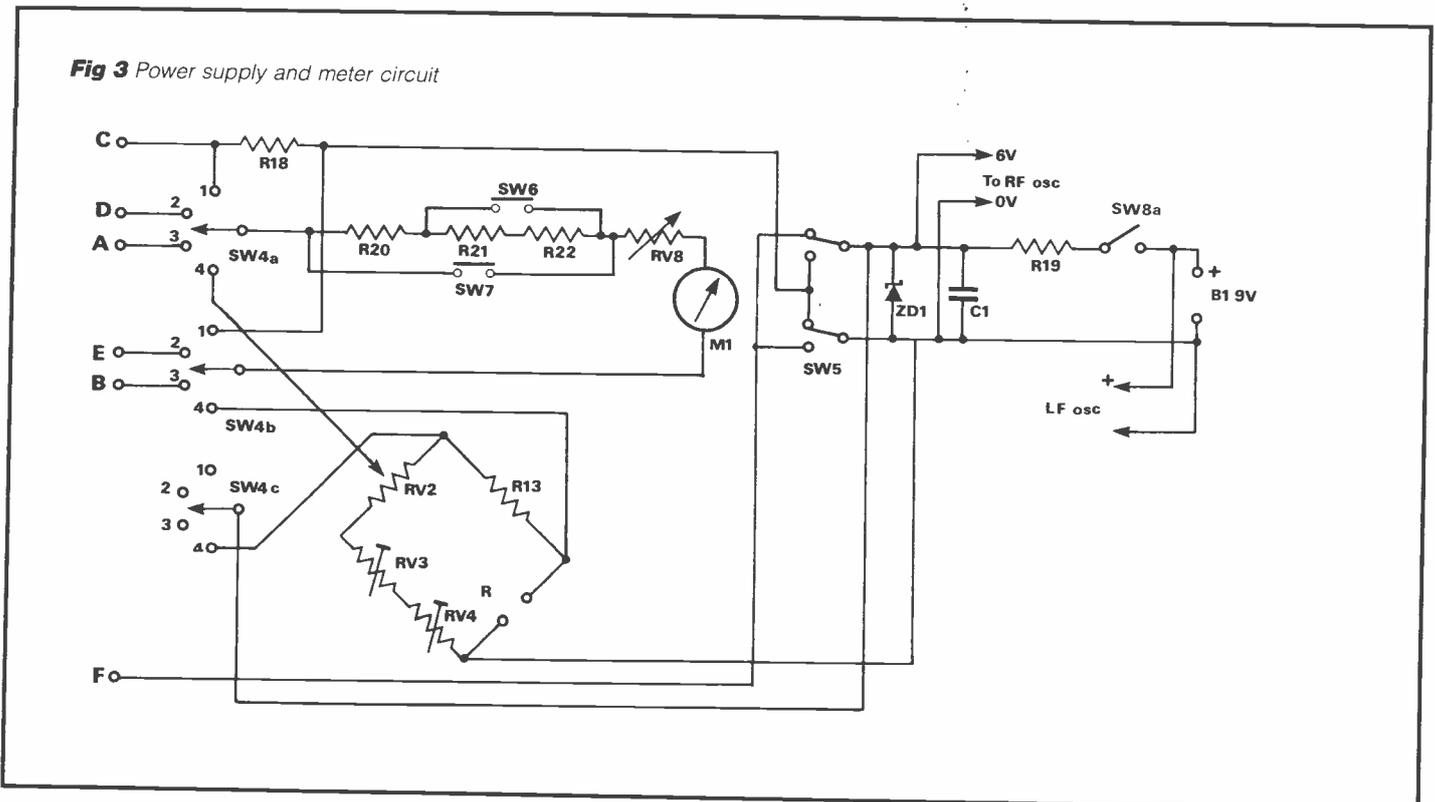
Pos.	Function
1	Off
2	Voltage measure
3	
4	Current measure
5	
6	

2 pole 6way

SW4

Pos.	Function
1	Transistor / FET
2	
3	
4	

3 pole 4way



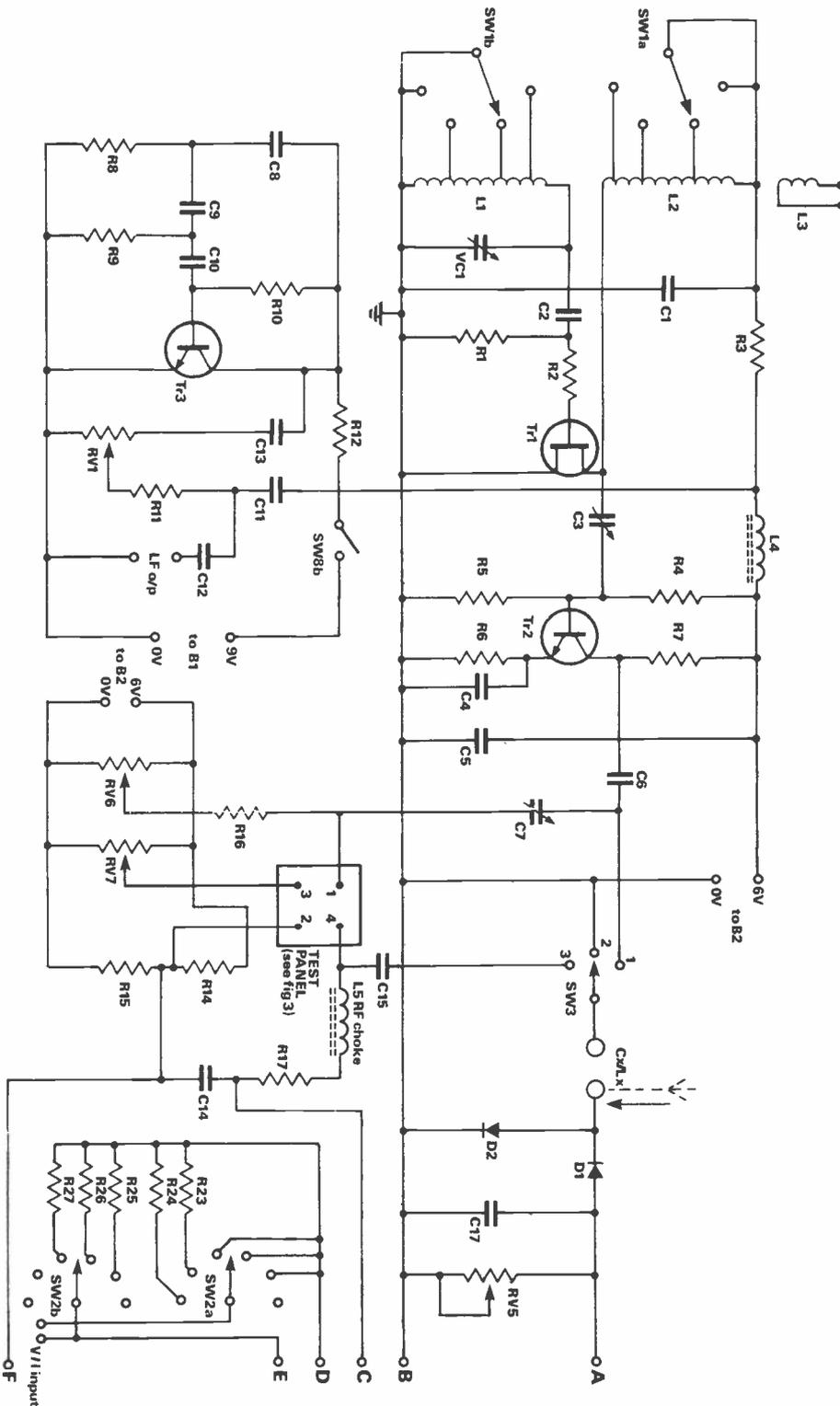


Fig 4 Circuit diagram

PARTS LIST

Resistance

R1, 16	100K
R2	50R
R3	270R
R4	87K
R5, 13, 14, 15	47K
R6	750R
R7	1K
R8, 9	4K7
R10	470K
R11	51K
R12	24K
R17	100R
R19	500R

R18 Value to suit meter. See text
 R20, 21, 22, 22K Meter sensitivity circuit. See text
 R23, 24, 25, 26, 27 To suit meter ranges. See text

VR1 100K Lin with dpst
 VR2 50K w/w Maplin FX18U
 VR3 1K w/w Maplin FW93B
 VR4 100R w/w Maplin FX98G or FW71N

VR5 470R log
 VR6, 7 100K lin
 VR8 33K w/w

Capacitors

C1, 4, 5, 14 0.1 μ F polyester
 C2 100pF ceramic
 C3, 7 22pF preset
 C6, 15 0.01 μ F ceramic
 C8, 9, 10, 11, 12, 13 0.047 μ F disc ceramic

VC1 250 μ F or 365 μ F with 6:1 reduction gear Maplin RX42V

Inductors

L1, 2, 3 See dia 5a,b,c
 L4 LF choke Maplin HW27E
 L5 15 turns on 3/4in balun core. Neosid Ltd, Welwyn Garden City, Herts

Semiconductors

D1, 2 OA81
 ZD1 6.3V Zener
 TR1 MPF102
 TR2 BC107

Switches

SW1 2p4w
 SW2 2p6w
 SW3 1p3w
 SW4 3p4w
 SW5 2p2w
 SW6,7 Push to Make
 SW8 Spdt

Misc

Meter 500-0-500 μ A panel meter Maplin RW99H
 Terminal/sockets 12 off to suit
 Battery connectors B1 (PP1 6v type)
 B2 (PP6 9v type)
 Knobs 14 off to suit
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6800 480p	741 14 pin 45p	* Draw your artwork on 0.1" grid	A range of top quality inverter suitable for a wide range of applications: Home, Caravan, Boats, Farming, Garage, Camping Power Cuts etc. Suitable for use with TV, Hi-Fi, Video, Electric Drills, Domestic Appliances, Lighting (Filament and Fluorescent).
6800 290p	747 75p	* Transfer to copper board using carbon paper	
6800 450p	748 45p	* Burnish the Alfacc transfers to the board using a spatula using carbon marks to assist in accurate alignment	
6802 345p	AY-3-1270 750p	* Use Alfacc chemical eraser to correct mistakes	
6809 750p	AY-3-1350 350p	* Etch in Ferric Chloride EC900/1 0.1" Edge Connector EC902/1 0.156" Edge Connector	
6809 1150p	AY-3-8910 480p	EC908 0.063" Pads EC910 0.094" Pads EC911 0.189" Pads EC940 0.018" Lines EC941 0.031" Lines EC942 0.039" Lines EC943 0.049" Lines EC944 0.061" Lines EC945 0.079" Lines EC946 0.100" Lines EC947 0.121" Lines EC950/1 0.031" 90° Bends EC951/2 0.061" 90° Bends EC951/1 0.031" 30°, 45°, 60° Bends EC352/2 0.061" 30°, 45°, 60° Bends	
6809 995p	AY-3-8912 550p	MC1310P 75p	
6810 120p	AY-3-8912 550p	MC1455 75p	
6821 230p	AY-5-1230 450p	MC1456 135p	
68521 350p	C3048 80p	MC1458 45p	
68522 350p	CA3306E 75p	MC1496 75p	
68B40 500p	CA3130E 90p	MC3242A 630p	
6844 1295p	CA3140E 75p	MC3302 95p	
6845 795p	CA3240E 120p	MC3340 160p	
6850 140p	LA4422 295p	MC3401 65p	
6852 350p	LF355 95p	MC3403 70p	
6854 480p	LF356 100p	MC3480 580p	
6875 600p	LF357 110p	MC3481 58p	
8T26A 120p	LM301A 35p	MC3482 58p	
8T2B 120p	LM307 50p	MC3483 58p	
8T95 110p	LM308A 95p	MC3484 58p	
8T96 110p	LM311 75p	MC3485 58p	
8T97 110p	LM324 45p	MC3486 58p	
8T98 110p	LM339 50p	MC3487 58p	
8035L 400p	LM339 50p	MC3488 58p	
8038L 400p	LM348 75p	MC3489 58p	
8080A 350p	LM358 70p	MC3490 58p	
8085A 450p	LM380 120p	MC3491 58p	
8155 450p	LM381 170p	MC3492 58p	
8202A 225p	LM386 95p	MC3493 58p	
8212 155p	LM393 100p	MC3494 58p	
8216 100p	LM393 100p	MC3495 58p	
8224 100p	LM393 100p	MC3496 58p	
8226 195p	LM393 100p	MC3497 58p	
8228 250p	LM393 100p	MC3498 58p	
8273A 14p	LM393 100p	MC3499 58p	
8251 300p	LM393 100p	MC3500 58p	
82C55 18.80p	LM393 100p	MC3501 58p	
8253 450p	LM393 100p	MC3502 58p	
8257 450p	LM393 100p	MC3503 58p	
8259 450p	LM393 100p	MC3504 58p	
8279 450p	LM393 100p	MC3505 58p	
75107 90p	LM393 100p	MC3506 58p	
75108 90p	LM393 100p	MC3507 58p	
75110 90p	LM393 100p	MC3508 58p	
75112 160p	LM393 100p	MC3509 58p	
75182 95p	LM393 100p	MC3510 58p	
75450 85p	LM393 100p	MC3511 58p	
75451 30p	LM393 100p	MC3512 58p	
75452 30p	LM393 100p	MC3513 58p	
75453 72p	LM393 100p	MC3514 58p	
75461 40p	LM393 100p	MC3515 58p	
75491 70p	LM393 100p	MC3516 58p	
75492 70p	LM393 100p	MC3517 58p	
75493 70p	LM393 100p	MC3518 58p	
75494 70p	LM393 100p	MC3519 58p	
75495 70p	LM393 100p	MC3520 58p	
75496 70p	LM393 100p	MC3521 58p	
75497 70p	LM393 100p	MC3522 58p	
75498 70p	LM393 100p	MC3523 58p	
75499 70p	LM393 100p	MC3524 58p	
75500 70p	LM393 100p	MC3525 58p	
75501 70p	LM393 100p	MC3526 58p	
75502 70p	LM393 100p	MC3527 58p	
75503 70p	LM393 100p	MC3528 58p	
75504 70p	LM393 100p	MC3529 58p	
75505 70p	LM393 100p	MC3530 58p	
75506 70p	LM393 100p	MC3531 58p	
75507 70p	LM393 100p	MC3532 58p	
75508 70p	LM393 100p	MC3533 58p	
75509 70p	LM393 100p	MC3534 58p	
75510 70p	LM393 100p	MC3535 58p	
75511 70p	LM393 100p	MC3536 58p	
75512 70p	LM393 100p	MC3537 58p	
75513 70p	LM393 100p	MC3538 58p	
75514 70p	LM393 100p	MC3539 58p	
75515 70p	LM393 100p	MC3540 58p	
75516 70p	LM393 100p	MC3541 58p	
75517 70p	LM393 100p	MC3542 58p	
75518 70p	LM393 100p	MC3543 58p	
75519 70p	LM393 100p	MC3544 58p	
75520 70p	LM393 100p	MC3545 58p	
75521 70p	LM393 100p	MC3546 58p	
75522 70p	LM393 100p	MC3547 58p	
75523 70p	LM393 100p	MC3548 58p	
75524 70p	LM393 100p	MC3549 58p	
75525 70p	LM393 100p	MC3550 58p	
75526 70p	LM393 100p	MC3551 58p	
75527 70p	LM393 100p	MC3552 58p	
75528 70p	LM393 100p	MC3553 58p	
75529 70p	LM393 100p	MC3554 58p	
75530 70p	LM393 100p	MC3555 58p	
75531 70p	LM393 100p	MC3556 58p	
75532 70p	LM393 100p	MC3557 58p	
75533 70p	LM393 100p	MC3558 58p	
75534 70p	LM393 100p	MC3559 58p	
75535 70p	LM393 100p	MC3560 58p	
75536 70p	LM393 100p	MC3561 58p	
75537 70p	LM393 100p	MC3562 58p	
75538 70p	LM393 100p	MC3563 58p	
75539 70p	LM393 100p	MC3564 58p	
75540 70p	LM393 100p	MC3565 58p	
75541 70p	LM393 100p	MC3566 58p	
75542 70p	LM393 100p	MC3567 58p	
75543 70p	LM393 100p	MC3568 58p	
75544 70p	LM393 100p	MC3569 58p	
75545 70p	LM393 100p	MC3570 58p	
75546 70p	LM393 100p	MC3571 58p	
75547 70p	LM393 100p	MC3572 58p	
75548 70p	LM393 100p	MC3573 58p	
75549 70p	LM393 100p	MC3574 58p	
75550 70p	LM393 100p	MC3575 58p	
75551 70p	LM393 100p	MC3576 58p	
75552 70p	LM393 100p	MC3577 58p	
75553 70p	LM393 100p	MC3578 58p	
75554 70p	LM393 100p	MC3579 58p	
75555 70p	LM393 100p	MC3580 58p	
75556 70p	LM393 100p	MC3581 58p	
75557 70p	LM393 100p	MC3582 58p	
75558 70p	LM393 100p	MC3583 58p	
75559 70p	LM393 100p	MC3584 58p	
75560 70p	LM393 100p	MC3585 58p	
75561 70p	LM393 100p	MC3586 58p	
75562 70p	LM393 100p	MC3587 58p	
75563 70p	LM393 100p	MC3588 58p	
75564 70p	LM393 100p	MC3589 58p	
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TWO TECHNICAL HANDBOOKS FROM FERRANTI

THE SOT23 TECHNICAL HANDBOOK (volume 4)

This book provides comprehensive specifications for SOT23 – the internationally standardised semiconductor package for hybrid and surface-mounted assembly of transistors and diodes.

The handbook contains full data sheet information for each product in the extensive range together with selector guide, OS/CECC approved product listing and type code identification tables.

A section of the handbook deals with the established quality and reliability aspects of the Ferranti SOT23 NPN & PNP transistor and diode ranges.

THE FERRANTI SUPER E-LINE 95 PAGE PRODUCT GUIDE (volume 1)

This contains full data on the ranges of Super E-line (2 amp), medium power E-line (1 amp) and high voltage E-Line (to 300V) plastic encapsulated transistors.

The handbook is in five sections, the largest of which contains technical data. The Super E-line chip and package is described. A product index lists commercial and quality assured products. Selector tables detail device types within application groups and are arranged to highlight important characteristics in an easy-to-use format. Technical data and application notes cover typical examples of circuits using Super E-line transistors.

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NEW FROM GRANADA

HOW TO GET THE BEST FROM THE ELECTRON!

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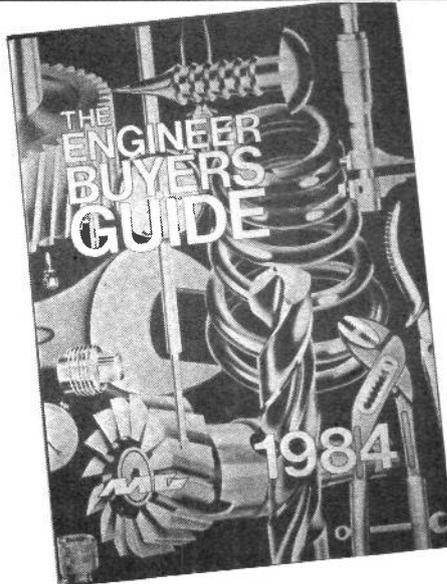
memory capacity of your micro to cope with complex tasks.

This book sets out a detailed treatment of the 6502 instruction set, addressing modes and the use of vectors. Multi-byte handling, direct screen addressing and exploiting the resident operating system routines are discussed in depth with particular application to graphics. Macros and conditional assembly are also treated. A number of fast sorting routines (called from BASIC) are described, capable of handling integers, floating point and strings within single and two-dimensional arrays.

Many examples are provided, not only to illustrate the techniques, but also to put to practical use. These include ultra-fast machine code programs for alphabetical and numerical filing and indexing; smooth flickerless animation effects; and many others which will delight you.

MAKE YOUR ELECTRON REALLY USEFUL!

Now you have an Electron you will want to put your machine to work. Here are fourteen useful and highly practical programs to help you every day.



Programs include: Budget – a useful accounts program; Info File – a versatile database with hundreds of applications for busy people; Stock Take – to help you check your supplies; Super-sound – to help you compose effective sounds; Cash Flow – a simple spread-sheet program to predict the state of your finances during the coming 14 months; Space Plan – use mobile graphics to plan the layout of your house, garden or office; Index – produces an alphabetically ordered list; Characters – a novel program to make it easy to design your own graphics characters; Gottit! – helps the student learn and recall facts for examinations; What Next? – a program to help you make the best possible decisions, in private life, in business or in your career. Full instructions and suggested applications are provided.

THE KEY TO CREATIVE GRAPHICS AND SOUND EFFECTS

This is a practical guide which includes many examples for you to enjoy as you learn. It shows you all you need to get the best from the Commodore 64's excellent graphics and sound facilities.

The book explains how to draw lines to construct any shape you want and how to build up pictures. You are also shown how to use colour to the best advantage, and how to make use of the Commodore's sprites and design your own characters. The book explains how to apply high resolution graphics, draw and use graphs and charts of various kinds, and goes on to explain animation – essential for video games – and how to create perspective and three-dimensional effects. You are shown how to produce sound effects and music – one of the most fascinating applications of computers – and very many practical programs are provided for you to try out.

21 QUALITY GAMES FOR YOUR ORIC!

Here is a compendium of twenty-one exciting games with something for all the family. The selection comprises a combination of old favourites such as Alien Invaders, Squash and Bobsleigh, and exciting new ideas including Commando Jump, Across the Ravine and Sheepdog Trials.

There are also computer implementations of the traditional pastimes, Noughts and Crosses and Dice, a challenging board game, Capture the Quark, and a conversational game in which you can talk to your Oric. Full use is made of the Oric's colour graphics, its sound and its special facilities. All the programs are fully tested and crash-proofed, and listed straight from working versions.

The special feature of this book is that it aims to develop your own programming techniques at the same time as providing you with a selection of high quality BASIC games. To this end each program is well documented with a clear outline of its subroutine structure and an explanation of the special techniques

employed. This book not only shows you how to play the games and enjoy them, it enables you to improve your BASIC programming by letting you in on 'trade secrets' professional programmers use.

Granada Publishing Ltd, 8 Grafton Street, London W1X 3LA. Tel: 01-493 7070.

BABANI BOOKS

20 PROGRAMS FOR THE ZX SPECTRUM & 16K ZX81

All the programs in this book have been especially written to run on both the Sinclair ZX Spectrum and the 16K ZX81 machines. Notes are given to help non-Sinclair machine owners who are familiar with their particular dialect of the BASIC language to modify the programs to run on their own machines, which should have at least 5K of RAM.

Included with most of the programs is a detailed flow chart and a description of what happens, which is useful in understanding how a program works and very helpful should you wish to modify or try and improve upon it. This kind of information is also extremely helpful when adapting a program to run on other micros.

The programs range from card and other games, through sorting and filing applications to uses in statistics and engineering, so it is hoped that there will be something of interest for all computer enthusiasts.

SECRETS OF THE COMMODORE 64

This book is intended as a beginner's guide to the Commodore 64. In it, we will be giving you masses of useful information and programming tips as well as describing how to get the best from the powerful sound and graphics facilities. The only assumption we have made is that you already have a copy of the Commodore 64 User's Manual (which comes free with the computer anyway!)

The book gets under way in Chapter 1 with a brief look at the way the memory is organised and how much of it is available to you from BASIC. Chapter 2 is all about random numbers and ways of generating them. This is important

because random numbers have endless roles to play in both entertainment and serious programming applications. Chapter 3 is another general chapter, this time on two very useful and often misunderstood BASIC facilities - PEEK and POKE. Our look at the Commodore 64's special facilities begins in Chapters 4 and 5 with a description of low resolution graphics, colour and simple animation. Chapter 6 takes us into the more advanced world of animation and looks at Sprites. Chapter 7 explains the mysteries of high resolution graphics, including plotting points and drawing lines and circles. Chapter 8 describes the use of the fabulous sound facilities, including using them for both music and sound effects. And to finish we have two very useful chapters dealing with machine code. Chapter 9 is concerned with machine code programs in general on the Commodore 64, and then Chapter 10 presents a machine code program which extends the BASIC on the

machine by adding nine additional statement keywords which can be used in any BASIC program.

AN INTRODUCTION TO PROGRAMMING THE ACORN ELECTRON

The Electron was developed from the very popular and successful BBC microcomputer, and it has most of the features of that machine, including almost unlimited scope for expansion. It has an excellent version of the BASIC computer language which makes it ideal for anyone wishing to learn computer programming.

However, Electron BASIC includes a large number of instructions, and learning to program this machine proficiently can be a daunting prospect for a beginner, but provided things are taken one step at a time mastering the Electron is not as difficult as it might at first appear.

In this book programming is taken one step at a time, with many examples being used to demonstrate not just what

various instructions and functions do, but just as importantly, how they can be applied in practice. In this way the reader can, with reasonable ease, gain a practical understanding of most aspects of BASIC programming on the Electron.

The text is divided into the following chapters: 1, Variables and Arrays; 2, Print Formatting and Tab; 3, Input, Inkey and Get; 4, Procedures and Functions; 5, Sound Generator; 6, Hexadecimal and Binary; 7, Graphics 1 - Modes and Colours; 8, Graphics 2 - Lines and Shapes; 9, Graphics 3 - Soft Sprites; 10, Interfacing; 11, Data File Handling.

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Philips 210 (no link)		.47 1000V						Philips 570	6.50
Philips 210 (with link)		.47 1000V						Philips 570	6.50
PYE 725 3R3		.47 1000V						Philips 570	6.50
UMc B69 6BL - 56R		.47 1000V						Philips 570	6.50
PYE 725 - 56R - 3R		.47 1000V						Philips 570	6.50
RRI 823 56R - 68R		.47 1000V						Philips 5	

Building the Fortop TVT - 437

Andy Emmerson, G8PTH, accepted Fortops challenge to build their 437MHz exciter unit. He was favourably impressed by the results and describes his experiences in the following review

In many ways, building your own equipment is more satisfying than buying 'plug and play' boxes off the shelf. It also tends to be cheaper.

When it comes to amateur TV transmitters a fair amount of skill is required - particularly in laying out components to operate at UHF frequencies - and if you are not initiated in this art a kit or part-constructed module is a welcome solution.

For someone like myself, with no real skill or experience of making wirelesses work, a kit makes the difference between a sporting chance of success and a disaster!

There have been several products aimed at the ATVer who is prepared to do a partial assembly job: I myself used to import the PC Electronics modules from California until the exchange rate made them too expensive, and since then the excellent Wood and Douglas kits have appeared.

Most recently the Fortop team have brought out a kit version of their 70cm TV exciter, which is also used in their ready-built transmitters. They kindly sent along a review sample with a challenge that I construct it, so how could I refuse?

The specification

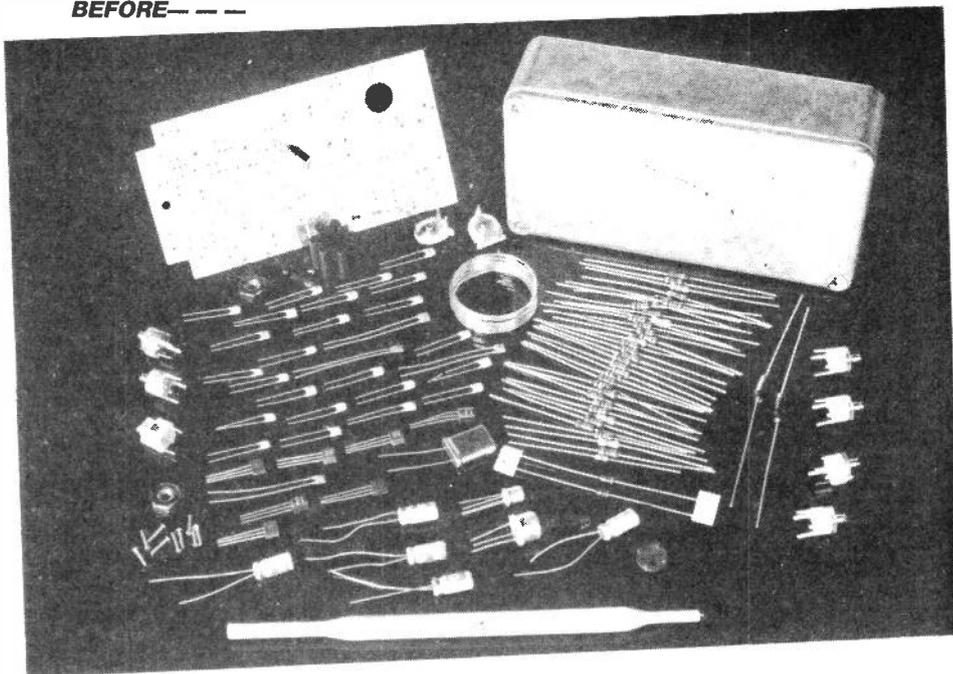
The kit in question is called the TVT-437 and costs £33.50 plus 90p postage. You can also buy it from them at mobile rallies. For this sum you get a complete set of parts to build the transmitter: the PCB and all electronic components are included as well as a die-cast box. All you need supply are the connectors.

Power output is 250mW on 437MHz, which is ideal for driving a linear amplifier to get around 10W or so. Fortop supply such a linear, or you could use other equipment, possibly surplus.

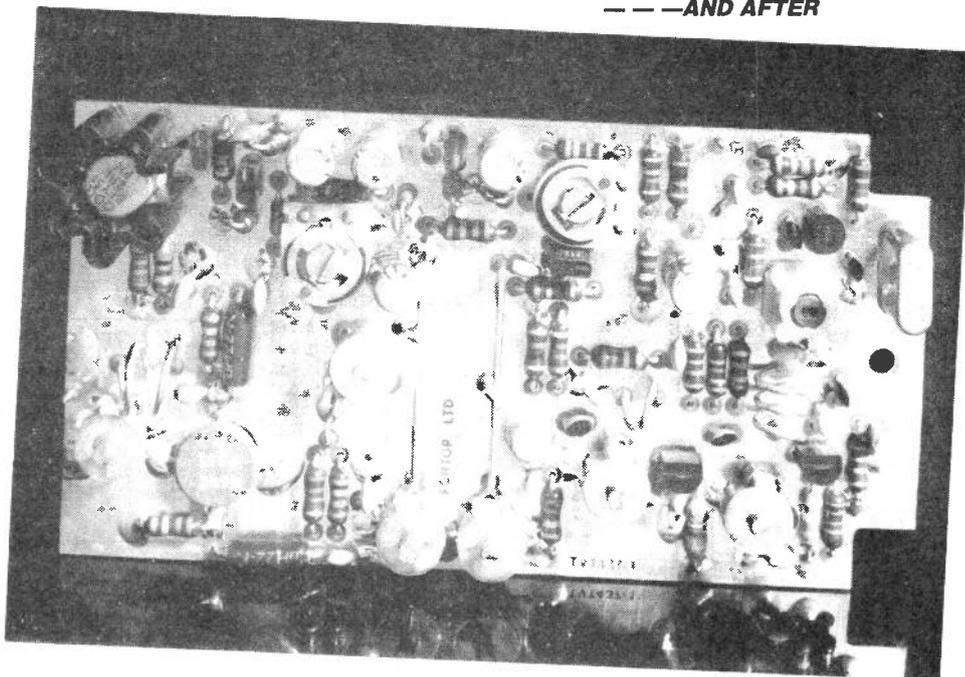
Other potential uses for this building block are as a test generator, as a portable 'creepy peepy' transmitter or as a signal source for multiplication to higher frequencies. Fortop say it is a simple task to change the oscillator into a buffer, running the unit without modulation and using it to feed a tripler to 24cm. The flexibility of the module is limited only by your own imagination and ingenuity.

So if you wish to build your own

BEFORE---



---AND AFTER



BUILDING THE FORTOP TVT-437

transmitter, tailor-made to your own design requirements, why not try a TVT-437?

It requires a power source of 11 to 13.8V at 250mA and fits on a PCB dimensioned 95 by 50mm.

On board controls look after black level and video gain, and the transmitter contains a very effective sync pulse clamping circuit which ensures that the sync pulses are transmitted with the full output power, regardless of video content and front panel control settings.

The supplied crystal is for 109.250MHz; not only does this keep signals out of the two-metre band but it will also reduce interference to FM repeater users around 434MHz.

Getting going

The write-up says you can build a high-quality transmitter in around three hours, so full of expectation I switched on the soldering iron. Normally I try to avoid studying instructions – only idiots need to read them – but on this occasion the time was well spent. In fact you get plenty of paperwork with this kit: a circuit diagram and description, assembly instructions and alignment information, and the parts list and layout diagram.

The first thing to do is open the bag of components and check them against the list; life being too short I just took a quick glance and decided they were all there except the track pins. In fact the track pins *were* there (they are just a bit small) and nothing turned out to be missing. In fact, I had several capacitors over.

Next I gave the tinning on the PCB a quick clean-up with a glass-fibre brush, just in case there was any oxide to inhibit the flow of solder later on. The board is double-sided but not through-hole plated, which means some components have to be soldered to the ground-plane on the upper surface. This includes the two preset resistors: it is easy to forget these.

Mounting the components

The order of fixing the components is given and is pretty straightforward, except that resistors R20, 24 and 28 are never fitted according to the instructions. I did fit them, on the assumption

that they would not have been supplied if they were not necessary. Some of the coils are pre-wound, the others are to be formed from the silver plated copper wire supplied.

A nice bonus is that you are given a genuine Radiospares trimming tool, which doubles as a former for winding the coils. I feel that the instructions for winding these coils could have been made more explicit with little drawings; I had no trouble but a newcomer might not know exactly what was intended.

I feel the instructions for fitting the main power transistor are too brief. You are merely told to cut the leads and solder in place, without identifying which leads are which. In fact the designer means you to *shorten* (not cut right off) the vanes, and the collector is identified by a diagonal cut. Old hands will know what is meant and have a transistor data book to hand, but someone who has only just passed the RAE might be foxed.

The instructions say nothing either about whether heatsinking is necessary; as it was, I decided to drill a hole in the base of the die-cast box and screwed the stud of the transistor through this, having first smeared plenty of heatsink paste around it. Finally, C15 is not shown on the layout plan; it should be at the 'bottom' of L4.

The instructions were right!

The foregoing points will all be obvious to the experienced constructor and merely serve to emphasise how easy it is to get so familiar with your own handiwork that you cannot detach yourself.

In terms of technical quality this kit is excellent; the standard of components and PCB design are first-rate. Assembly was therefore an easy and enjoyable task, though it did take all of the three hours forecast. The final sentence of the assembly instructions reads: 'The transmitter should work first time if care is taken when assembling the kit'. I cannot disagree, though I have to suppress a snigger when I read such words! With me, assembly is always far easier than debugging, though this kit did not give me too much trouble.

From an RF point of view my construction worked first time and tuned up very easily. This is no doubt – thanks to the precise instructions given for coil sizes. Tuning up is very simple and can be done by monitoring the tuned circuits with a frequency counter and tuning for maximum current drawn by the transmitter. When I put a 'scope to the output test point to check the modulation, I was less happy – nothing there! This was easy to cure thanks to the comprehensive documentation supplied. The 1N4148 diode had been inserted back to front (it had a coloured band at each end) and the earthy pins of the presets had not been soldered to the ground plane. Once these points had been attended to everything worked fine.

Test generator

I decided to use this unit as a high-class test signal generator, so I set about drilling the box for UHF video socket and BNC aerial connector. I also put a 270 degree DIN socket for power connection; much equipment seems to use these nowadays so I can quickly unplug some other unit and use the power lead to feed this generator. To finish things off, I sprayed the box gloss black (aren't car aerosols useful?) and labelled it with white Letraset (looks more professional than Dymo tape!). A 17.5cm long piece of wire and a right-angle BNC plug were soldered up to make a quarter-wave antenna for 70cm, and now I have a handy mini-transmitter for testing TVs and converters.

Verdict

All in all, the TVT-437 is a useful and very satisfactory transmitter, and considering its completeness and ease of assembly, good value for money. It is a little more expensive than the rival 500 mW offering from Wood & Douglas, but that does not include the die-cast box as far as I know. (The difference in power outputs is pretty insignificant for most users, given that it will be used as a driver for PA which should have ample gain).

FOOTNOTE: Since this review was written we have heard that a revised instruction leaflet has been printed.



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IMPROVEMENTS TO INDOOR AERIALS

Ivor Nathan describes his methods of achieving improved reception without using an aerial amplifier

The author's location at Southgate, North London, is not favourable to DX (long-distance) reception of radio and television signals because, although this part of London is quite high, the area is extremely hilly.

To make matters worse, the house is situated in a dip, adjacent to hills, and there are numerous buildings nearby which make line-of-sight reception at VHF and UHF extremely difficult. Reception of UHF television signals from the

four transmitters at Crystal Palace is so patchy that many viewers in Southgate and the surrounding areas now use Group C/D aerials for reception of the recently-installed local relay station at Alexandra Palace, rather than Group A aerials for Crystal Palace.

Adjusting the aerial position

The 'family' television in use receives all four Crystal Palace transmissions at adequate signal strength, using a

carefully-placed Yagi UHF aerial located in the loft roof-space.

However, for DX work, another receiver, with continuously-variable tuning from channel 21 to 69 rather than four pre-set push-buttons is used in another ground-floor room. The latter receiver could be diplex-fed from the Yagi aerial in the loft but, because the aerial was positioned for optimum reception of Crystal Palace transmissions, other channels are barely receivable.

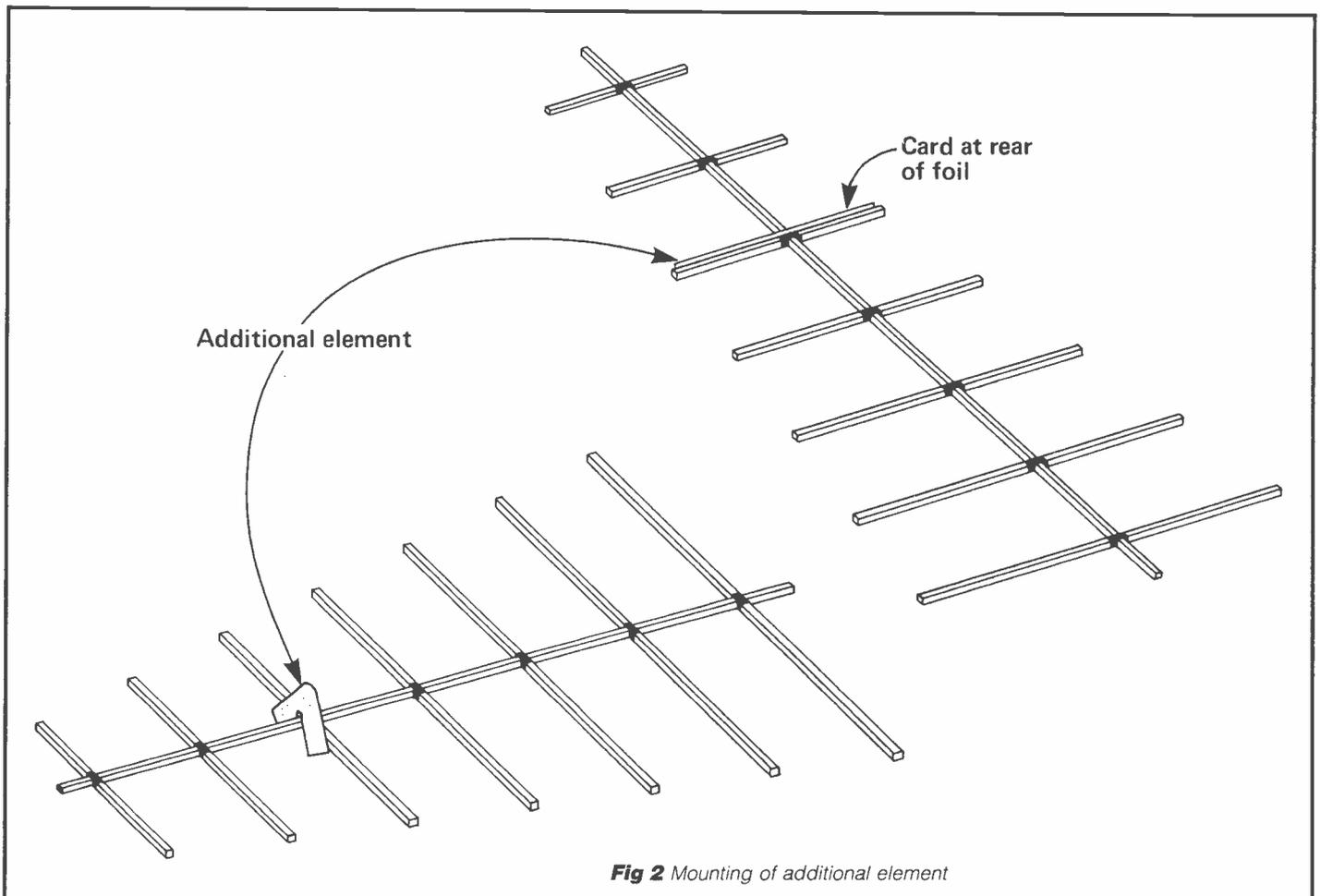
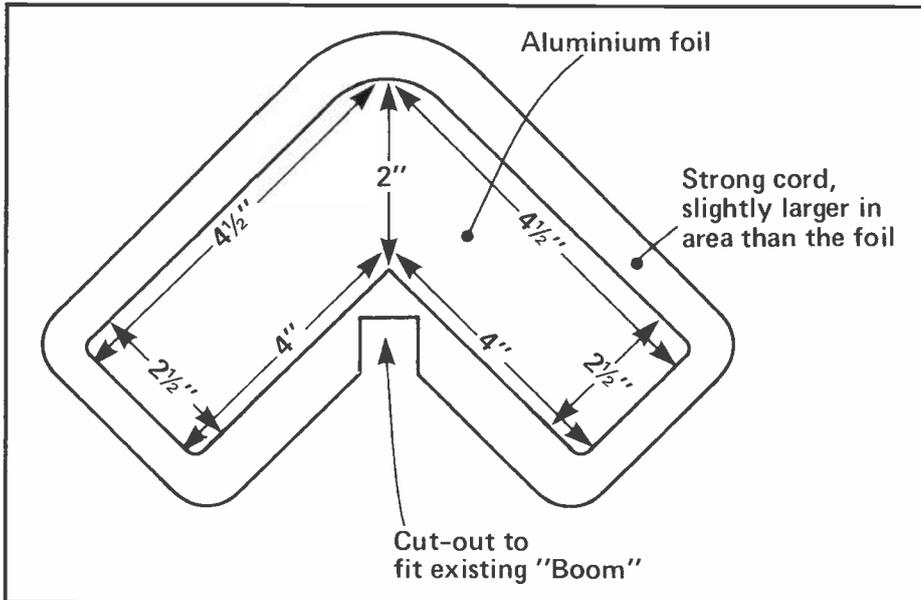


Fig 2 Mounting of additional element

IMPROVEMENTS TO INDOOR AERIALS



It should be noted that the new element must not be placed such that it screens existing elements which are shorter in length, or a loss will occur instead of a gain. Also, correct polarization (i.e. vertical or horizontal) of the whole array must be observed so that the aerial matches the polarization of the signals that are to be received.

Fig 1 (left) The additional element

Fig 3 (below) Three-turn coupling loop assembly

It was then decided to experiment with a commercially-made indoor aerial of the log-periodic type with a wide bandwidth to cover all UHF channels currently in use. The coaxial cable was extended to allow the aerial to be moved along the southwest-facing window sill and connected to the receiver using the 'safety' isolating co-axial plug fitted to the indoor aerials to avoid the possibility of electric shock. A position was found where all four Crystal Palace transmissions were satisfactorily received. Then, after tuning to channel 42, the position was readjusted with the aerial pointing due south and, observing the same horizontal polarity, TVS (Television South) was received, although with poor signal strength.

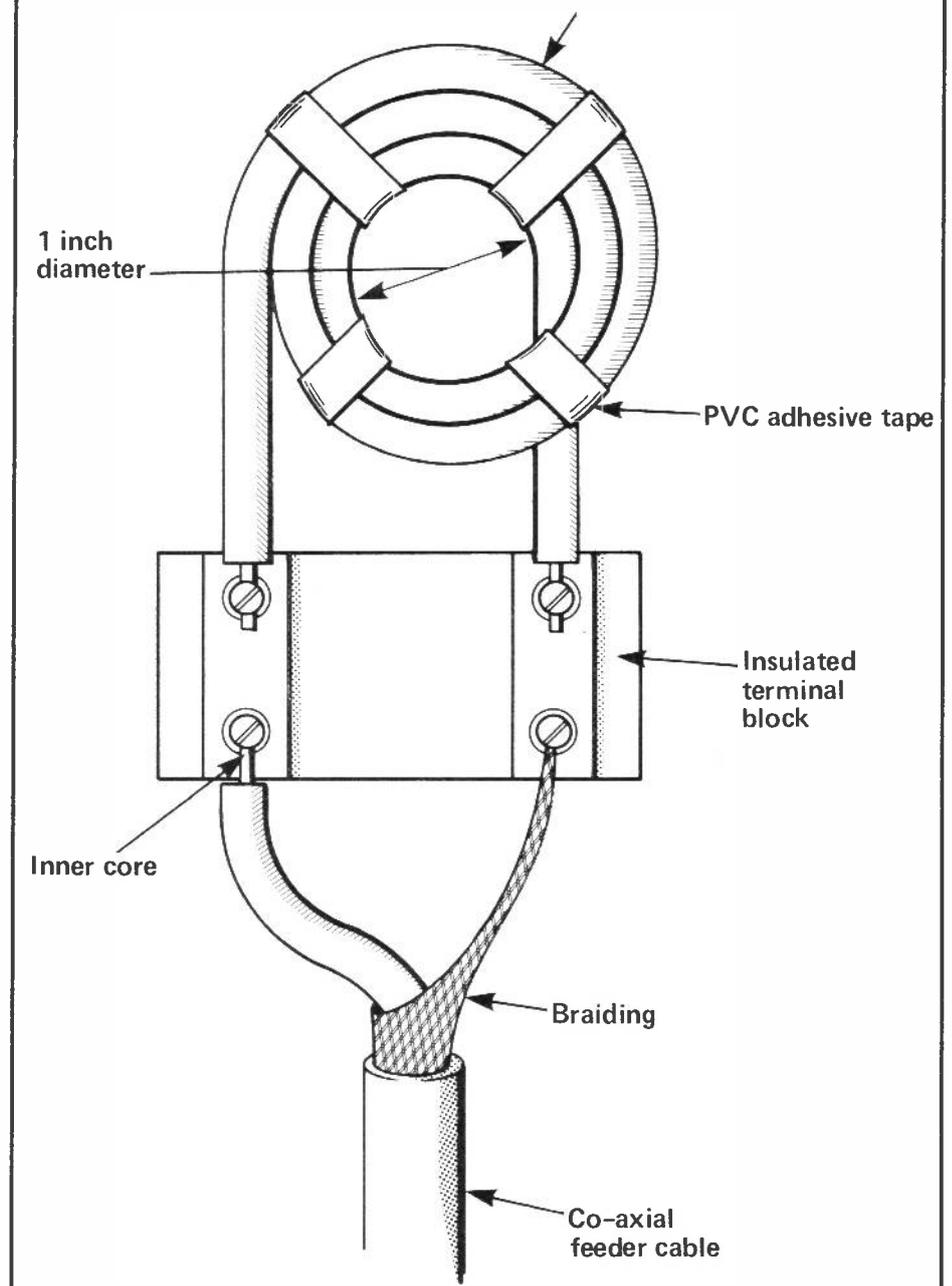
Modifying the aerial

In order to improve the signal strength without using an aerial amplifier, an additional element was added to the aerial. This is easily constructed using aluminium foil and stout card. It is mounted on the aerial, insulated from all existing elements and connections.

The shape of the element is based upon that of the 'bow-tie' UHF aerial, and is cut from aluminium foil (baking foil is ideal) and pasted (on all of one surface) to a piece of card cut slightly larger in area than the foil so that it will act as a combined insulator and mounting-piece when it is added to the existing aerial.

The dimensions shown in *Figure 1* were found to be optimum for channel 42, with the new element mounted in front of the third element at the 'shortest' end, and with the card (not the foil) in contact with the existing element *Figure 2*.

The modification provided a marked improvement in the gain of the aerial and several other distant channels were also receivable but with lower signal-strength than those mentioned. However, the use of an aerial amplifier in addition to this modification would probably improve these signals to a usable strength.



AMATEUR RADIO WORLD

Compiled by Arthur C Gee G2UK

Our hobby has the misfortune of having a most undeserving title. It started off with an even worse one than it usually enjoys today, viz., 'Ham Radio'. The writer always understood that the word 'Ham' was a derogatory Americanism frequently used in theatrical circles for the less talented members of the acting profession. A 'Ham Actor' was one whose ability did not come up to professional standards. A 'Radio Ham' became the term for one not professionally engaged in the then new technology of wireless – or radio. The term 'Ham' possibly also had something to do with the enthusiasm usually shown by participants and amateur actors were usually pretty enthusiastic about their activities, as were amateur radio buffs.

To ease the derogatory nature of this title, strenuous efforts have been made over the years to discourage the use of the term 'Ham Radio' and get the term 'Amateur Radio' used in its place. After about fifty years or more trying, this title has at last become almost universally accepted! But now the word 'Amateur' has become suspect!

Sophisticated

The story is going the rounds that a professor in one of our universities, engaged in a very sophisticated project which was much involved in participation with amateur radio, did not wish to be thought to be so involved, because of the term 'amateur' radio.

This provoked some response from the RSGB and an excellent editorial in the February 1984 issue of *Radio Communications* which concluded with the thought:- 'Perhaps we should run a competition to find a better name!' It produced some response!

The April issue of *Radio Communications* contained some interesting correspondence. Heaven forbid we should use the term 'radio sport', and 'experimental radio' hardly represents the activities of the majority of the participants in our hobby these days. The writer feels that the terms 'Amateur Radio' and 'Radio Amateur' are here to stay. Our language is full of illogicalities. It appears to be quite acceptable to describe someone as being 'an expert amateur photographer' and the amateur astronomers do not seem to mind much



Part of the Control Centre for the UOSAT satellites at the University of Surrey. After being 'out of action' for some time UOSAT-2 is now back in business. See 'Newsdesk' pages.

Picture by courtesy of University of Surrey. Audio Visual Aids Unit

about their title. So, let's not worry too much about our name. Generally speaking, its credibility is at a pretty high level these days.

RTTY speeds

When RTTY first started in this country some 25 years ago, the only equipment available was some surplus GPO Creed Type 3 teleprinters. Great fun was had rebuilding them and making a good one out of two or three 'gash' ones! The speed at which these machines worked was what is known in RTTY circles as '50 bauds'.

After we had been going for a while, RTTY QSO's between this country and overseas began to take place. Particularly popular were contacts with the USA. Unfortunately the teleprinter speed in the USA was 45.5 bauds, so the equipment used by the American radio amateurs, which was of course American surplus, did not match ours. A 'right royal battle' ensued over the coming months, and in the end it was agreed to adopt the American standard and to modify our machines to run at the American speed.

At present the majority of RTTY enthusiasts in this country and overseas, still use machines running at 45.5 bauds. However, since those early days, an international agreement has been reached amongst the professionals, that 50 bauds was to be the International Standard for Telex. This has now come into general useage, which means that surplus teleprinters, which are still the main source of machines for the amateur, are now mostly for 50 bauds.

Recently moves have been made by a number of RTTY enthusiasts to get the 45.5 baud speed changed to 50 bauds as the 'accepted' amateur radio RTTY speed. At the IARU Region 1 conference in Brighton in 1981, the matter came up and caused quite a stir! The conference agreed that although they would not recommend making the change immediately mandatory, every endeavour should be made to encourage a change to 50 bauds.

BARTG, who put out a news bulletin on Sundays on RTTY, made a start in encouraging this proposal by transmitting an additional run of the bulletin in

AMATEUR RADIO WORLD

the London area at 50 bauds after the normal 2 metre 45.5 baud transmission.

The Dutch National Radio Society, VERON, took similar action in that they started to use 50 bauds for their news bulletin from their station PA0AA.

The matter has come up again at the latest IARU Region 1 conference held in Sicily in April last. BARTG presented a paper which stated: 'Considering that the situation concerning telegraph speeds has changed and that a move away from the old American domestic speed of 45.5 bauds has taken place, BARTG recommends that speeds of 50, 75 and 100 bauds should be recommended by the IARU as an International Standard and that Region 1 be asked to liaise with Regions 2 and 3 to coordinate the adoption of these speeds.'

It is interesting to note the results of a survey on the subject carried out amongst members of BARTG a year or so ago. Most respondents to the survey indicated that they were able to use both 45 and 50 bauds. However, the most commonly used speed was 45.5 bauds and in my experience this is by far the most used speed for international QSO's.

An unexpected result from the survey, revealed that, when asked what speed they would prefer to standardize on, most preferred 50 bauds! Maybe this is due to the recent availability of Creed

444 machines, which are geared up for 50 bauds! It will be very interesting to see what the Region 1 conference comes up with this time.

Requests for drugs via amateur radio

If you live in a country which does not enjoy the benefits of NHS you may be hard pressed to acquire some of the modern drugs which are so effective in treating disease. This has resulted in requests being made via amateur radio stations to stations in the more fortunate countries to supply these drugs. Whether these requests are genuine or whether they are from Black Marketeers is anyone's guess! A lot of confusion and ill-feeling has arisen because of them.

To allay some of this, the British Red Cross has outlined the proper procedure for dealing with such requests. They should be referred to them, but they can only be accepted if they come through the national Red Cross Society of the country of origin.

If radio amateurs in this country receive such requests over the air, they should advise the person to pass the request via the Red Cross Society or its equivalent in his own country.

World Amateur Radio Day

The World Amateur Radio Day organised by IARU, appears to have gone off very well and received due publicity from

the media.

One such effort, heard by your scribe, was on BBC Radio 4 *Woman's Hour* programme broadcast the day before. An xyl operator was heard in QSO with LX1TL, which went off nicely. This demonstration of xyl's in QSO was followed by an interesting account of what it was that attracted the feminine sex to what is often thought to be a decidedly male interest. One said that she was intrigued by hearing her husband working his gear. She felt she'd like to do the same. In spite of finding the exam somewhat difficult, she did get through and has been a keen radio amateur ever since.

Interest

Another got her interest from being a SWL. From SW broadcast stations she progressed to listening to radio amateurs and then obtained her own transmitting licence.

Another was attracted by the opportunities for travel and meeting people. Yet another said she was fascinated by building amateur radio equipment. On the male side, the 'Day' certainly stimulated activity on most bands. One station was heard to say that he had never managed to work New Zealand, so he got up really early and made a serious effort to work this bit of DX. Disappointingly, he was not successful!

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NOTES FROM THE PAST

Centre Tap comments on service engineers with 'green fingers', the lack of YL constructors and the anodising of aluminium and its alloys. These comments on the world of radio were originally written 25 years ago

A young man fresh from a Technical College, who has recently started in the industry, told me in a conversation of his surprise to find so much ignorance of mathematics and higher theory among radio servicing engineers. When I pressed the point he admitted that many of them were highly successful trouble-shooters. Personally I should be inclined, despite all his theory and advanced maths, to put my money on some of the trouble-shooters I have met in a time-limit servicing competition with him – chaps, too, who might easily flounder in the simpler examinations. The highly trained youngster would, of course, track down faults, but he would do so by complex conscious reasoning. The far less technical veteran would probably put his finger on it half-instinctively in much less time.

Natural flair

Such men, and I have met a fair number despite a rather limited acquaintance with servicing engineers generally, are like the green-fingered gardeners. They have a natural flair for it. Many of them can, with particular makes of sets with which they are familiar, spot quite obscure and unusual faults almost instantly. They cannot explain how they do it nor can they teach anyone else. They just have a 'feeling' that a certain thing is not quite right, possibly picked up from some clue such as the form of distortion, the sort of hum, or a trace of melted wax in the corner of the chassis.

When I was with the Services we had one such chap who had previously run a successful one man repair business. If it had been a private firm, and not the Army, he would have had the sack before the first week was up. He was hopelessly lost with strange and complicated apparatus, but within a few weeks he was doing the 'sticky' ones – those in the corner over which a lot of time had already been unsuccessfully spent, and had been put aside until we were less busy. Once they got there, by the way, nobody else liked to take them on unless driven to it. He

explained it quite simply by saying he had now got the 'feel' of the sets. Most of us will know just what he meant by the 'feel', but it baffles a more scientific description. True to form, he usually did badly on the various courses on which he was sent, and I believe he even flopped in his first attempt on the trade test.

YL constructors

I have a new fan for this column. Every reader can judge for himself whether that fact is noteworthy or not, but this time it *is* rather remarkable. She is a young lady! She's eighteen and prefers radio to boyfriends, *and* buys her own RC every month. There is no question of borrowing or sneaking it from a male member of the family – she hasn't any brothers and her father is not radiominded. She has been interested in radio since she was 15, and started off by repairing the discarded family receiver for use in her bedroom when pop bought the new one. She asks me not to publicise her name as her mother already thinks her interest in the hobby to be a deplorable lapse in femininity.

Perhaps, after careful scrutiny, she is not really a fan of this column after all. In fact, to be quite honest she doesn't even say she reads it. All she asks is whether I know of any other YL constructors.

As she is only 18 she probably does not know I am supposed to be an Old Timer. If I run true to form I ought, after stroking out my long white beard, to mutter a few trite remarks on the unmaidenliness of the modern young woman. Only last year they had a Women-cricketers Test team here from Australia. We shall be having women servicing engineers next, then women radio designers and before I know where I am some pushful young woman will take over my column!

The first

With my characteristic truthfulness I can only say she is the first YL reader who has written to me, although I know of well over a dozen YL's who hold British Transmitting licences. The number has

risen sharply in recent years. I have also QSO'd with a Danish, an Austrian and one American YL op, and I believe there are quite a number in the States. I have met three of them, all British, but none had built her own gear. I was disappointed to find that the three I have met did not have the sort of glamour I admire. (Now I must be more careful than ever to preserve my anonymity).

I have several times commented on the many and varied activities to which our interest in radio leads us. The latest I have run across is the anodising of aluminium and its alloys. The method is one which uses AC and is fairly simple for home use, being in no way inferior to the DC process. It also has the advantage of doing two pieces (or two groups of small pieces) at the same time. Each piece, or group, is used as the opposing electrode, the terms anode and cathode being, of course, inapplicable to AC.

The voltage is drawn from the AC mains supply via a 6 Amp transformer, giving 15 volts increaseable by tapping down a resistor to 25 volts. Pleasing decorative effects are obtainable by the use of ordinary household packet dyes, which give a 'fast' colour that cannot be washed off with boiling water.

Beginners

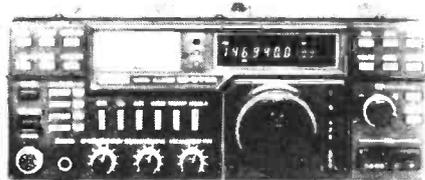
For the benefit of beginners I might explain that the anodic oxidation of aluminium consists of depositing a film of aluminium hydroxide on the surface. While it gives considerable protection from corrosion, its protective value is often over-estimated for outdoor uses – such as in the elements of beam aerials, etc. True, it does give protection against atmospheric corrosion under normal indoor conditions, but its protection is far less permanent out of doors where it is subject to frosts and rain. The process is more frequently valued because it gives a greatly improved appearance by preserving highly polished surfaces. The anodic film, too, readily absorbs ordinary dyes, while it also provides an excellent surface to 'take' cellulose lacquers.



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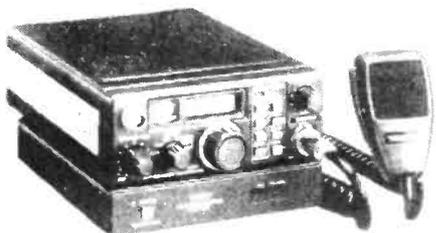


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CW Filter	option	no	RF PWR Control	continuous	Hi Low
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Squelch	all modes	FM only	VOX	no	yes
Memory Channels	11	10	CW Semi break-in	yes	yes

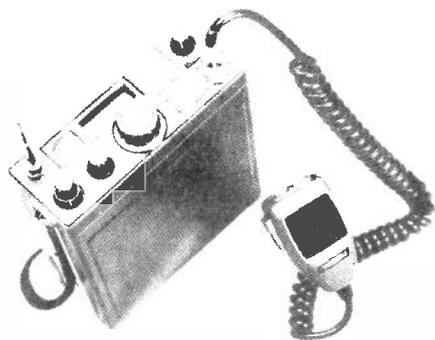
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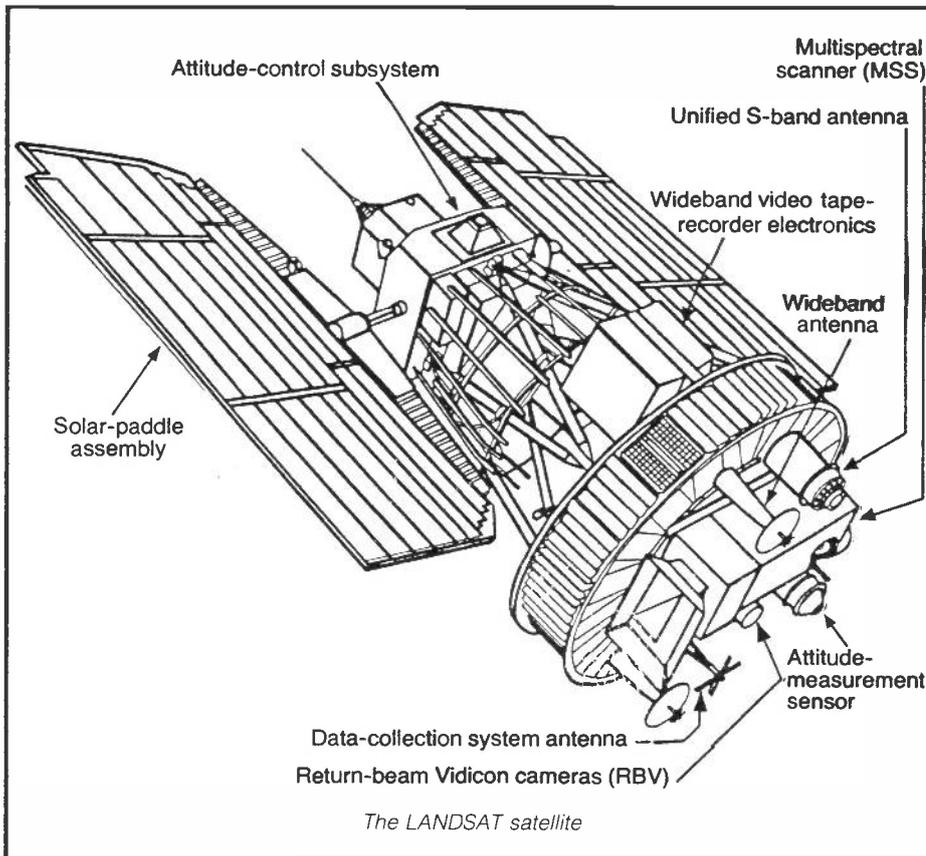
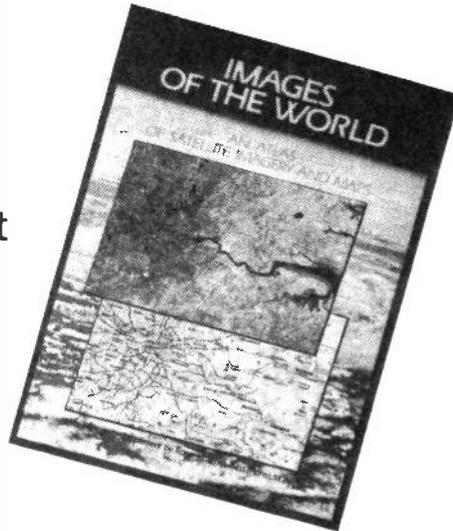
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AMATEUR RADIO EXCHANGE LTD

IMAGES OF THE WORLD

by Terry Weatherley

This review describes a new publication that will interest the satellite enthusiast



'Images of the World' is the title of a new atlas by Collins-Longman. It is a selection of 124 satellite images with the corresponding full-colour maps. Most of the images are from *Landsat* but one or two are from *Skylab*, *Soyuz 22* or *U2* aerial photography.

The launch of *Landsat 1* on 23 July, 1972, opened a new era in the discovery and mapping of the Earth's resources. The images and data received since then has enriched mans knowledge of the planet above and beyond the dreams of even the scientists closely involved in

the project. For the first time large areas of the globe could be mapped in detail. Existing maps could be updated and revised without recourse to time consuming and expensive ground based survey.

The Landsat system

The system is deceptively simple in concept. *Landsat* orbits the earth in a near circular sun-synchronous polar orbit with a period of 103 minutes, giving almost global coverage every eighteen days. *Landsat* itself is approximately 3

metres high and 1.5 metres across, with solar panels extending to a total of four metres (Figure 1). There are three sensors sensing the red, green and infrared, together with a five-channel multispectral scanner. Two channels operate in the visible spectrum, two in the near infrared and one in the thermal infrared.

Data from the sensors is recorded in digital form. Each scan line contains 3240 pixels having a ground resolution of 56 x 79 metres and a single *Landsat* scene contains nearly eight million pixels.

The received data

Data from *Landsat* is received by a chain of receiving stations around the world. Data is supplied from the Earth Resources Data Center in a variety of forms including black and white photographs and false colour composites.

It is the false colour composites that are the most exciting. Each ground condition has a typical colour associated with it as follows:-

- vegetation - red to magenta and purple
- clear water - dark blue to black
- bare soil - blue
- sand - yellow to white
- cities - blue to grey
- clouds and snow - white

Features of the atlas

The images used in the atlas are based upon the false colour composites but the colours have been changed to give a more 'normal' appearance.

Thus green vegetation appears green and agricultural areas range from green to brown and orange. Urban areas show up as red. Each satellite image is accompanied by the corresponding conventional map allowing easy and instant correlation of features and the selection of the pictures covers a wide range of diverse areas of the world, both urban and rural.

Every image is striking and both the cartographical student and the satellite enthusiast will find much of interest. For example, a *Landsat* picture showing Mount Kilimanjaro is used to illustrate vegetational succession. The permanent snow cap can be clearly seen with the rocks down to the tree line, followed by the tropical montane forest, the lower cultivated slopes and the savanna. The accompanying map actually records the crops growing in the fields.

The atlas also contains a detailed section about *Landsat* and the images with a supplement by Roger M Smith about interpretation of the pictures which is particularly worthwhile.

Collins-Longman have a winner here, not just for the school or college student, but also the satellite enthusiast.

'*Images of the World*' will have pride of place on my bookshelf. I can recommend it highly.

'*Images of the World*' an atlas of Satellite Imagery and Maps is published by Collins-Longman ISBN 0 00 360205 2 and 0 582 00056 4. It is now available from booksellers.

T.V. SOUND TUNER SERIES II

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In the cut-throat world of consumer electronics, one of the questions designers apparently ponder over is "Will anyone notice if we save money by chopping this out?" In the domestic TV set, one of the first casualties seems to be the sound quality. Small speakers and no tone controls are common and all this is really quite sad, as the TV companies do their best to transmit the highest quality sound. Given this background a compact and independent TV tuner that connects direct to your Hi-Fi is a must for quality reproduction. The unit is mains operated. This TV SOUND TUNER offers full UHF coverage with 5 pre-selected tuning controls. It can also be used in conjunction with your video recorder. Dimensions: 10½" x 7½" x 2½".

Also available with built-in headphone amp. £32.50 + £2.00 p&p. E.T.I. kit version of above without chassis, case and hardware. £16.20 plus £1.50 p&p.

PRACTICAL ELECTRONICS STEREO CASSETTE RECORDER KIT



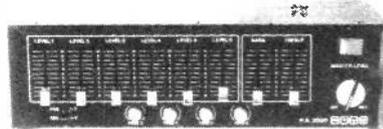
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Kit includes tape transport mechanism, ready punched and back printed quality circuit board and all electronic parts, i.e. semiconductors, resistors capacitors, hardware top cover, printed scale and mains transformer. You only supply solder and hook-up wire.
Featured in April issue P.E. Reprint 50p. Free with kit.

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MONO MIXER AMP

Ideal for Church halls & Club houses. £45.00 + £2.00 p&p.

50 WATT Six individually mixed inputs for two pick ups (Cer. or mag.), two moving coil microphones and two auxiliary for tape tuner, organs, etc. Eight slider controls - six for level and two for master bass and treble, four extra treble controls for mic. and aux. inputs. Size: 13¼" x 6½" x 3¾" app. Power output 50 watts R.M.S. (cont.) for use with 4 to 8 ohm speakers. Attractive black vinyl case with matching fascia and knobs. Ready to use.



125W HIGH POWER AMP MODULES

KIT £12.00 + £1.15 p&p
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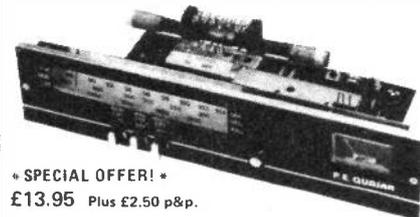
The power amp kit is a module for high power applications — disco units, guitar amplifiers, public address systems and even high power domestic systems. The unit is protected against short circuiting of the load and is safe in an open circuit condition. A large safety margin exists by use of generously rated components, result, a high powered rugged unit. The PC board is back printed, etched and ready to drill for ease of construction and the aluminium chassis is preformed and ready to use.
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ACCESSORIES: Stereo mains power supply w/transformer £10.50 + £2.00 p&p. Mono version, £7.50 + £2.00 p&p.



SPECIFICATIONS:
Max. output power (RMS). 125W.
Operating voltage (DC): 50 - 80 max.
Loads: 4 - 16 ohms.
Frequency response measured @ 100 watts. 25Hz - 20KHz.
Sensitivity for 100 watts: 400mV @ 47K.
Typical T.H.D. @ 50 watts, 4 ohms: 0.1%.
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VHF STEREO TUNER KIT



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£13.95 Plus £2.50 p&p.

This easy to build 3 band stereo AM/FM tuner kit is designed in conjunction with Practical Electronics (July '81 issue). For ease of construction and alignment it incorporates three Mullard modules and an I.C. IF. System.
FEATURES: VHF, MW, LW Bands, interstation muting and AFC on VHF. Tuning meter. Two back printed PCB's. Ready made chassis and scale. Aerial: AM - ferrite rod, FM - 75 or 300 ohms. Stabilised power supply with "C" core mains transformer. All components supplied are to strict P.E. specification. Front scale size: 10½" x 2½" approx. Complete with diagram and instructions.

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12", 65W, impedance 4 ohms. Frequency response: 35 - 6,500Hz. Magnet: ¾" x 4 ½" dia. Foam surround, vinyl laminated cone. For use in Hi-Fi systems up to 65 watts. Bass/Midrange.



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7" 60 watt Bass/Midrange speaker. 8 ohm impedance. Frequency response: 40 - 6,000Hz. 4" x ½" magnet.



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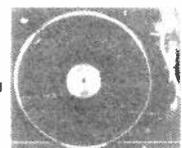


GOODMANS TWEETERS
8 ohm soft dome radiator tweeter (3¾"sq.) for use in up to 40W systems, £3.95 each plus £1.00 p&p, or £6.95 a pair plus £1.50 p&p.



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3 speed, auto, set-down; with auto return. Fitted with viscous damped cue, tubular aluminium counter-weighted arm, fitted with ADC magnetic head. Ideally suited for home or disco use.
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— DATES FOR — — YOUR DIARY —

Dates for your Diary is updated every month.
Club secretaries and organisers are requested to send information of
forthcoming events as early as possible
to **Radio & Electronics World**, Dates for your Diary, Sovereign House, Brentwood, Essex CM14 4SE

Date	Function	Location	Contact
14 June	Electronic Music Demonstration	Edgware & District Radio Society	G3MNO
15 June	Latest Developments on Top Band Direction Finding Techniques by Dave Holland G3WFT	Manchester Radio Club	G3FVA, G3UHF, G8SMR
17 June	Royal Navy AR Society Mobile Rally DF Hunt	HMS Mercury nr Petersfield Wirral and District AR Club	A Walker G4DIU G Scott G8TRY
18 June	G8ELA on Packet Radio	Leighton Linlade Radio Club	P Brazier G6JFN
19 June	Spring sale of surplus equipment	Biggin Hill AR Club	I Mitchell G4NSD
20 June	Longleat Final Briefing	S Bristol AR Club	G4KUQ/G4RZY
22 June	VHF NFD Planning Mid Summer 1.8MHz direction finding competition followed by barbecue	Dunstable Downs Radio Club S Manchester Radio Club	P Morris G6EES G3FVA, G3UHF, G8SMR
24 June	Longleat Rally	Longleat Park, Warminster	
24 June	Car boot sale	Dunstable Downs Radio Club	P Morris G6EES
27 June	Rig Tweaking Night The Eileen Medley Challenge Cup DF Hunt Outside Activity Night on 70cm and 23cm TV	S Bristol AR Club Wirral and District AR Club The Home Counties Amateur Television Club	G4SDR Mark G Scott G8TRY P W Andrews G6MNJ
	VHF Field Day Preview	Farnborough and District Radio Society	P Taylor G4MBZ
27 June	Junk sale	Lincoln Short Wave Club	G5FZ/G6COL
29 June	An introduction to operational amplifiers by Chris Ward G4HON	S Manchester Radio Club	G3FVA, G3UHF, G8SMR
2 July	Electrical and Electronic Tool Aids for the Radio Enthusiast, by Mike Wells of AB Engineering Co Ltd	Leighton Linlade Radio Club	P Brazier G6JFN

DATES FOR YOUR DIARY

4 July	Lecture-RSGB BBQ	S Bristol AR Club Wirral and District AR Club	G4FRG/G4ROX G Scott G8TRY
6 July	Preparation for VHF NFD contest at weekend	S Manchester Radio Club	G3FVA, G3UHF, G8SMR
7-8 July	VHF NFD 4 band club entry VHF National Field Day	Wirral and District AR Club Farnborough and District Radio Society	G Scott G8TRY P Taylor G4MBZ
8 July	Radio Rally	West Manchester Radio Club	Alan Nixon
9 July	Quiz, round three at MK and DRS in Newport Pagnell	Leighton Linslade Radio Club	P Brazier G6JFN
10 July	Visit IBA Transmitter Site at Emley Moor	Bury Radio Society	B Tyldsley G4TBT
11 July	70cms night	S Bristol AR Club	G4EIA Martin
13 July	The synthesis of the elements by Mike Ellis G4ROM	S Manchester Radio Club	G3FVA, G3UHF, G8SMR
15 July	D F Hunt	Wirral and District AR Club	G Scott G8TRY
17 July	QRP Operating Christopher Page G4BUE	Biggin Hill AR Club	I Mitchell G4NSD
18 July	Computer night	S Bristol AR Club	G1DBH Brian
21 July	Radio & Electronics Fair, Open 9.30am-5pm	Royal Victoria Hall, S'borough	W Kent AR Society
22 July	Home Counties Mobile Rally at McMichael Sports and Social Club, Bells Hill, Stoke Poges, Bucks		
29 July	Scarborough AR Rally, The Spa, Scarborough		
5 Sept	Satellite Communication	Fareham & District AR Club	Brian Davey G4ITG
19-23 Sept	The Personal Computer World Show - Olympia 2		
23 Sept	Lincoln Hamfest, Lincolnshire Showground	Lincoln Short Wave Club	G5FZ/G6COL
7 Oct	Annual Rally, the Community Centre, Great Lumley	Great Lumley AR Society	G4OCQ
13 Oct	Midlands VHF Convention at BT Training College, Stone, Staffs		Peter Burdem G3UBX
19-22 Nov	Canadian Computer Show and Conference, International Centre of Commerce, Toronto		
22-24 Nov	The Northern Computer Fair, Belle Vue, Manchester		

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D13-47GH/26 55.00	M23-112GW 55.00	V5002L 65.00
D13-47GH/34 55.00	M23-112GW 55.00	V5004GR 59.00
D13-47GH 85.00	M23-112KA 55.00	V5004LD 59.00
D13-51GH/26 85.00	M23-112LD 55.00	V6001GH 65.00
D13-51GM/26 85.00	M23-112W 55.00	V6006GH 65.00
D13-45GM/01 55.00	M24-120GM 55.00	V6006GR 65.00
D13-47GH/26 55.00	M24-120GR 55.00	V6007GP 65.00
D13-550GH 65.00	M24-120LC 59.00	V6008GH 59.00
D13-60GM 59.00	M24-120WAR 59.00	V6008W 65.00
D13-610GH 59.00	M24-121GH 59.00	V6034WA 59.00
D13-610GM 55.00	M24-121LC 59.00	V604CLA 59.00
D13-611GH 59.00	M24-121WA 59.00	V604J 49.00
D13-611GM 59.00	M28-11LA 49.00	V604RH 65.00
D13-630GH 65.00	M28-12GH 55.00	V6052GH 65.00
D14-120GH08 65.00	M28-12LC 49.00	V6052GR 65.00
D14-121GH09 75.00	M28-13LC 49.00	V6064BLA 65.00
D14-150GH 75.00	M28-13LG 49.00	V6064BP31 55.00
D14-170GH/84 59.00	M28-13GR 55.00	V6064CLA 55.00
D14-172GR 55.00	M28-13WA 49.00	V6068GH 59.00
D14-172GV 55.00	M28-131GR 55.00	V6068W 65.00
D14-173GH 55.00	M28-132GM 55.00	V6070P31 49.00
D14-173GM 55.00	M28-133GM 55.00	V7016A 65.00
D14-181GH/62 65.00	M31-100GH 55.00	V7030 59.00
D14-181GM 65.00	M31-101GH 55.00	V7031GH 59.00
D14-181G 55.00	M31-182GR 55.00	V7032 49.00
D14-181GM 55.00	M31-182GV 55.00	V7037GH 45.00
D14-181GM 55.00	M31-183W 55.00	V8004GR 65.00
D14-181GM 55.00	M31-184W 55.00	V8006GH 65.00
D14-181W 55.00	M31-184GH 65.00	V8010A 65.00
D14-182GH 59.00	M31-184P31 15.00	V8011 15.00
D14-182GM/98 65.00	M31-185GH/VR 65.00	1CPB1 15.00
D14-200E 89.00	M31-186W 65.00	2BP1 9.00
D14-200CA/50 75.00	M31-190GH 55.00	3BP1 13.50
D14-210GH 75.00	M31-190GR 55.00	4EP1 30.00
D14-270GH/50 75.00	M31-190LA 55.00	3H/OBM 55.00
D14-310W 110.00	M31-190W 55.00	5BP 9.00
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AC127 0.20	BC174 0.09	BD201 0.83	BF363 0.38	R2323 0.66
AC128 0.28	BC174A 0.09	BD202 0.65	BF371 0.20	R2540 0.48
AC129K 0.32	BC177 0.15	BD203 0.78	BF394 0.19	RC416334 0.90
AC141 0.40	BC178 0.15	BD204 0.70	BF420 0.32	RC416335 0.90
AC141K 0.34	BC182 0.10	BD205 0.70	BF457 0.32	SK5EF 1.45
AC142K 0.30	BC182BL 0.10	BD223 0.48	BF458 0.36	TIP29 0.40
AC176 0.22	BC183 0.10	BD225 0.48	BF467 0.68	TIP29C 0.42
AC176K 0.31	BC183L 0.09	BD226 0.35	BF495 0.23	TIP30C 0.42
AC187 0.28	BC184BL 0.09	BD233 0.35	BF591 0.25	TIP31C 0.42
AC187K 0.28	BC204 0.10	BD234 0.35	BF639 0.23	TIP32C 0.42
AC188 0.25	BC204 0.10	BD236 0.13	BF640 0.23	TIP33B 0.75
AC188K 0.37	BC208B 0.13	BD237 0.40	BF641 0.28	TIP34B 0.75
AD142 0.79	BC212 0.09	BD238 0.40	BF681 0.25	TIP41A 0.45
AD143 0.82	BC212L 0.09	BD241 0.40	BF688 0.30	TIP41C 0.45
AD149 0.70	BC212LA 0.09	BD242 0.50	BF690 1.50	TIP42C 0.45
AD16 0.39	BC213 0.09	BD246 0.60	BF691 1.75	TIP47 0.85
AD162 0.38	BC213L 0.09	BD276 0.70	BF742 0.28	TIP120 0.60
AD161/2 0.90	BC214 0.09	BD410 0.55	BF743 0.28	TIP125 0.65
AF106 0.50	BC214C 0.09	BD434 0.55	BF929 0.85	TIP142 1.75
AF114 1.95	BC214L 0.09	BD437 0.50	BF929 0.85	TIP146 2.75
AF121 0.60	BC237B 0.09	BD438 0.60	BF964 0.32	TIP161 2.95
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AF125 0.35	BC238 0.12	BD538 0.65	BF966 0.30	TIP3055 0.55
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AC/VP2 4.00	EAF42 1.20	EF812 0.85	HL42DD 3.50	R19 2.50	V240C/2K 225.00	3A167M 10.00	6BE6 0.72	657GT 1.50	30M12 1.00
AC/S2 PEN 8.50	EB34 1.50	EF820 0.72	HL33 4.00	R21 1.20	V241C/1K 195.00	3A2 3.95	6BF5 1.60	657GT 1.50	30M12 1.00
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AH238 39.00	EB34 1.50	EF820 0.72	HL33 4.00	R23 2.50	V339 3.50	3A4 1.10	6BG6G 3.00	657GT 1.50	30M12 1.00
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AN1 14.00	EB34 1.50	EF820 0.72	HL33 4.00	R25 2.50	V397 3.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
ARP12 0.70	EB34 1.50	EF820 0.72	HL33 4.00	R26 2.50	V416 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
ARP34 1.25	EB34 1.50	EF820 0.72	HL33 4.00	R27 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
ARP35 2.00	EB34 1.50	EF820 0.72	HL33 4.00	R28 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
BS63 2.00	EB34 1.50	EF820 0.72	HL33 4.00	R29 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
BS450 67.00	EB34 1.50	EF820 0.72	HL33 4.00	R30 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
BS14 55.00	EB34 1.50	EF820 0.72	HL33 4.00	R31 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
BS14 55.00	EB34 1.50	EF820 0.72	HL33 4.00	R32 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
CIK 19.00	EB34 1.50	EF820 0.72	HL33 4.00	R33 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
C3JA 21.00	EB34 1.50	EF820 0.72	HL33 4.00	R34 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
C112G 70.00	EB34 1.50	EF820 0.72	HL33 4.00	R35 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
C1108 2.00	EB34 1.50	EF820 0.72	HL33 4.00	R36 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
C1134 32.00	EB34 1.50	EF820 0.72	HL33 4.00	R37 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
C1148A 115.00	EB34 1.50	EF820 0.72	HL33 4.00	R38 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
C1149/1 130.00	EB34 1.50	EF820 0.72	HL33 4.00	R39 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
C1534 32.00	EB34 1.50	EF820 0.72	HL33 4.00	R40 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
CCA 2.80	EB34 1.50	EF820 0.72	HL33 4.00	R41 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
CC3L 0.90	EB34 1.50	EF820 0.72	HL33 4.00	R42 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
CCW3 2.00	EB34 1.50	EF820 0.72	HL33 4.00	R43 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
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EC8010 12.00	EB34 1.50	EF820 0.72	HL33 4.00	R46 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
EC32 3.50	EB34 1.50	EF820 0.72	HL33 4.00	R47 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
D61 1.20	EB34 1.50	EF820 0.72	HL33 4.00	R48 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DA41 22.50	EB34 1.50	EF820 0.72	HL33 4.00	R49 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DA42 17.50	EB34 1.50	EF820 0.72	HL33 4.00	R50 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DA100 125.00	EB34 1.50	EF820 0.72	HL33 4.00	R51 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DAF91 0.45	EB34 1.50	EF820 0.72	HL33 4.00	R52 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DAF91 0.70	EB34 1.50	EF820 0.72	HL33 4.00	R53 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DC70 1.75	EB34 1.50	EF820 0.72	HL33 4.00	R54 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DC90 1.20	EB34 1.50	EF820 0.72	HL33 4.00	R55 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DCX4-1000 12.00	EB34 1.50	EF820 0.72	HL33 4.00	R56 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DCX4-5000 25.00	EB34 1.50	EF820 0.72	HL33 4.00	R57 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DET16 28.50	EB34 1.50	EF820 0.72	HL33 4.00	R58 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DET18 28.50	EB34 1.50	EF820 0.72	HL33 4.00	R59 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DET23 35.00	EB34 1.50	EF820 0.72	HL33 4.00	R60 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DET24 39.00	EB34 1.50	EF820 0.72	HL33 4.00	R61 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DET25 22.00	EB34 1.50	EF820 0.72	HL33 4.00	R62 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DF91 0.70	EB34 1.50	EF820 0.72	HL33 4.00	R63 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DF92 0.80	EB34 1.50	EF820 0.72	HL33 4.00	R64 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DF96 0.85	EB34 1.50	EF820 0.72	HL33 4.00	R65 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DF97 1.00	EB34 1.50	EF820 0.72	HL33 4.00	R66 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DH63 1.20	EB34 1.50	EF820 0.72	HL33 4.00	R67 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DH77 0.90	EB34 1.50	EF820 0.72	HL33 4.00	R68 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DH79 0.56	EB34 1.50	EF820 0.72	HL33 4.00	R69 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DH149 2.00	EB34 1.50	EF820 0.72	HL33 4.00	R70 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DK91 0.90	EB34 1.50	EF820 0.72	HL33 4.00	R71 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DK92 1.20	EB34 1.50	EF820 0.72	HL33 4.00	R72 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DK96 2.50	EB34 1.50	EF820 0.72	HL33 4.00	R73 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DL35 2.50	EB34 1.50	EF820 0.72	HL33 4.00	R74 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DL63 1.00	EB34 1.50	EF820 0.72	HL33 4.00	R75 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DL70 2.50	EB34 1.50	EF820 0.72	HL33 4.00	R76 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DL73 2.50	EB34 1.50	EF820 0.72	HL33 4.00	R77 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DL91 5.00	EB34 1.50	EF820 0.72	HL33 4.00	R78 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DL92 0.95	EB34 1.50	EF820 0.72	HL33 4.00	R79 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DL93 1.10	EB34 1.50	EF820 0.72	HL33 4.00	R80 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DL94 2.50	EB34 1.50	EF820 0.72	HL33 4.00	R81 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DL96 2.50	EB34 1.50	EF820 0.72	HL33 4.00	R82 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DL10 13.50	EB34 1.50	EF820 0.72	HL33 4.00	R83 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DL16 10.00	EB34 1.50	EF820 0.72	HL33 4.00	R84 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
DM70 1.95	EB34 1.50	EF820 0.72	HL33 4.00	R85 2.50	V421 4.50	3A5 0.95	6BH6 1.95	657GT 1.50	30M12 1.00
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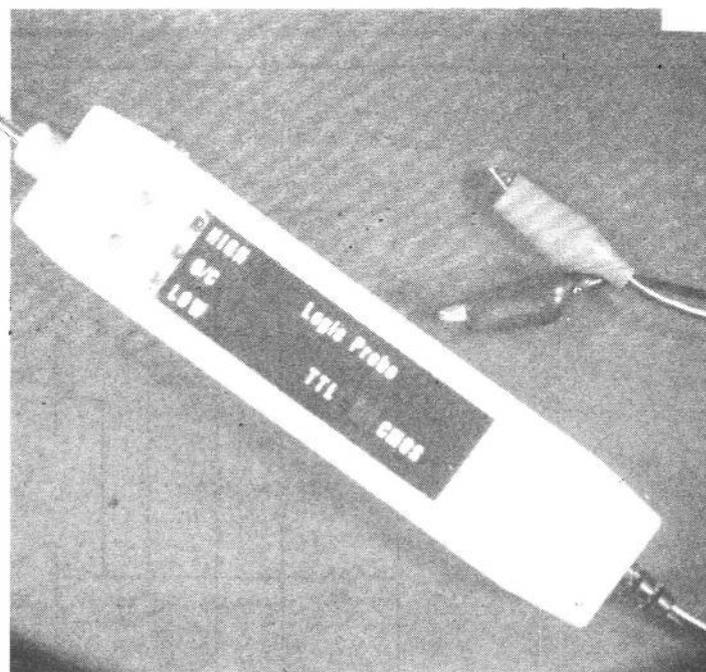
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ONE NIGHT'S WORK

A dual purpose Logic Probe

This addition to your test gear is a useful logic probe for checking CMOS & TTL groups and was designed and built by C. Oddy



I searched through various magazines for the circuit diagram of a full function logic probe that gives a true picture of the logic state for both CMOS and TTL families but, having no success, decided to produce the 'home-brewed' probe that is described in this article.

However, the logic thresholds for TTL and CMOS are quite different and this circuit uses two pairs of references for CMOS and TTL logic thresholds so giving a true picture (see figure 1).

As well as displaying the *high* and *low* states a 'floating' indicator is also included to show particularly open circuit or fault conditions.

The probe also includes the usual 'pulse' indicator which operates on both rising and falling edges, also operating a 'memory' latch. It is capable of working to the full CMOS speeds and will 'catch' pulses to at least 300 nanoseconds.

The circuit will, believe it or not, fit inside a GSC Probe case (which are very

good to handle) and the prototype was built on Veroboard.

Circuit operation

The circuit diagram is shown in Figure 2 and operates as follows: The thresholds for the two logic facilities are set up on two resistor dividers and are selected by a slide switch (S1). These form references for two comparators of an LM339 quad comparator (IC1).

A further potential divider adds bias to the input so that when the probe is on open circuit the 'float' LED is enabled. The respective voltages are shown in Figure 3.

The remaining two comparators of IC1 are used to drive the 'high' and 'low' LED indicators, using part of the TTL reference to bias the inverting inputs at 2V and the 'float' state is detected by NANDing the *high* and *low* outputs with IC2a.

The *high* and *low* outputs are then

stretched by two monostables, formed around IC3a,b and IC3c,d to a visible length. The stretched signals are then ANDed by IC2b to generate a pulse signal (whenever there is a logic change, both outputs will be high for a short time). This pulse signal is used to drive the 'pulse' LED and to set an RS latch IC2c,d the output of this latch drives the 'memory' LED.

The latch is cleared by a touch switch (S2) on the side of the probe case, this is far more convenient than a cumbersome push button switch which takes up a lot of room.

A simple regulator circuit (Figure 3) is used to maintain an approximate 4V supply to the LED's so that they maintain a constant brightness at all voltages. Unfortunately, TR1 may have to dissipate 300mW if a pulse train is fed to the probe on a 15V supply (ie three LED's on at once), hence a small heat sink needs to be fitted.

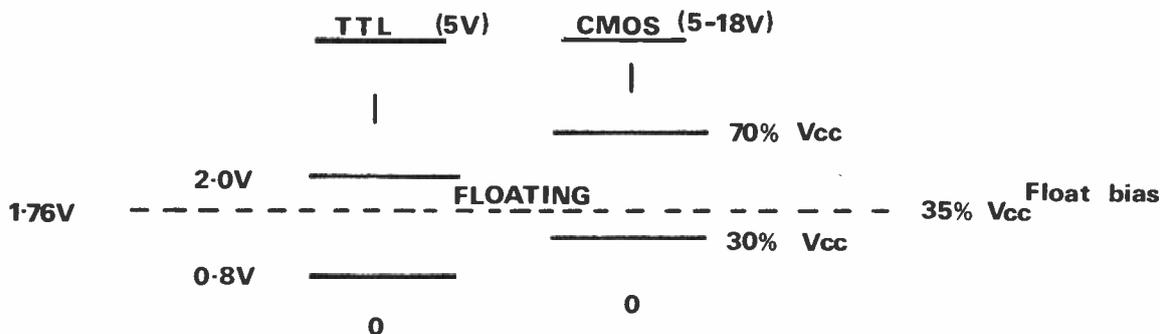


Fig 1 The different thresholds for both CMOS and TTL families

ONE NIGHTS WORK

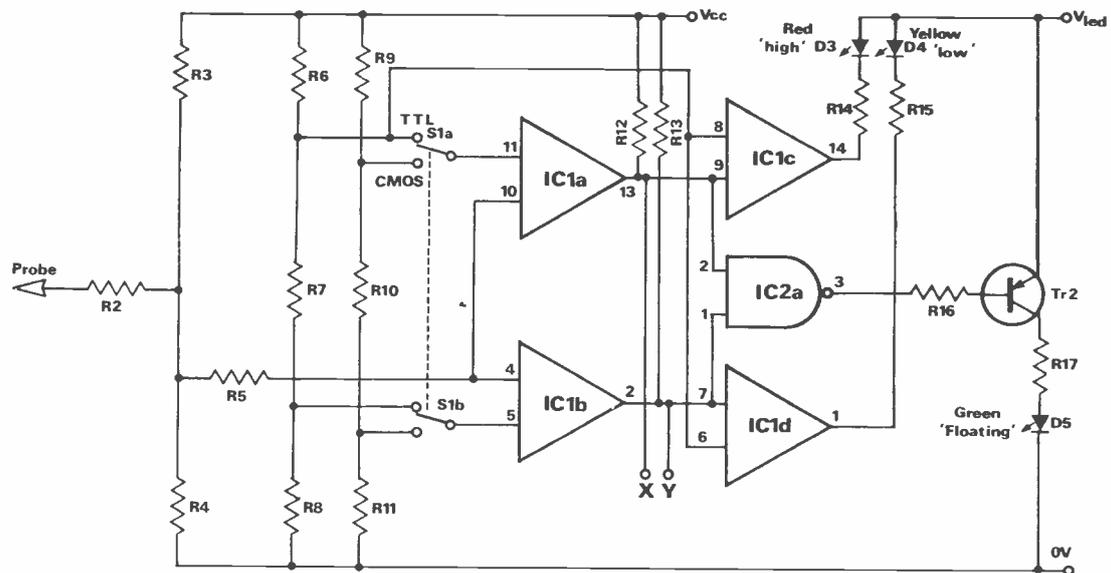


Fig 2 The Logic Probe circuit diagram

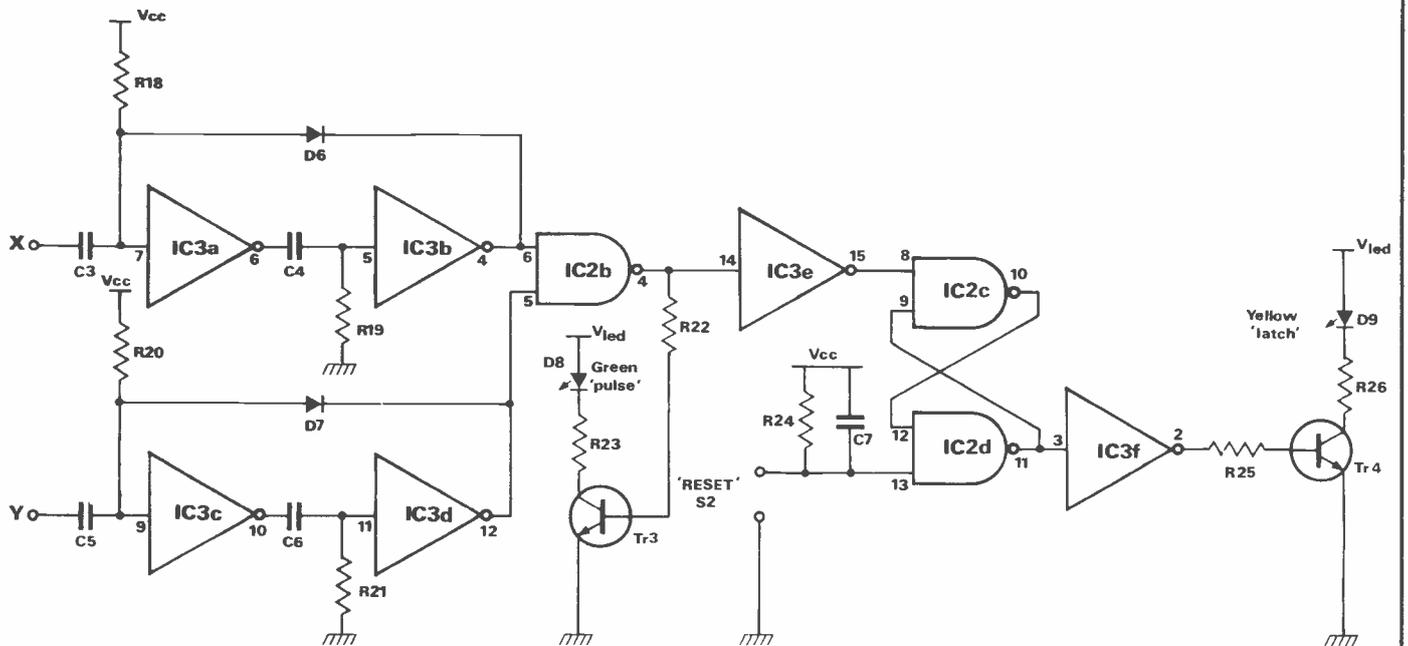


Fig 3 The respective voltages

ONE NIGHTS WORK

D1 gives brute force reverse polarity Pprotection and C1, C2 decouple the supply voltage.

Most of the components are straightforward to obtain, all should be as small as possible to fit inside the specified case.

The exception is TR1 which really has no equivalent because it has to be metal for best heat transfer to the heatsink. The heatsink was machined from a small aluminium block to fit inside the end of

the case so as not to use valuable space and it does not make the case 'top heavy'.

The touch switch (S2) is made of two cage jacks which just protrude the side of the case. These are mounted by drilling 'push-fit' holes and then fixed with a small amount of glue.

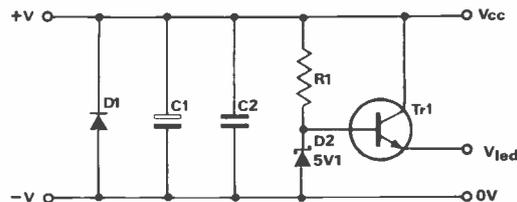


Fig 4 The regulator circuit

PARTS LIST

Resistors (all 1/4W, 5%)

R1 1K2	R14 180R
R2 1K	R15 120R
R3 330K	R16 4K7
R4 180K	R17 180R
R5 1K	R18 1M
R6 8K2	R19 470K
R7 3K3	R20 1M
R8 2K2	R21 470K
R9 12K	R22 4K7
R10 15K+1K	R23 150R
R11 12K	R24 10M
R12 4K7	R25 4K7
R13 4K7	R26 220R

Capacitors

C1	1uF/35V Tantalum bead
----	-----------------------

C2	100nF Monolithic
C3	120pF Polystyrene
C4	100nF Monolithic
C5	120pF Polystyrene
C6	100nF Monolithic
C7	10nF Monolithic

Semiconductors

D1 IN4004
D2 5V1 400mW Zener
D3 3mm Red LED
D4 3mm Yellow LED
D5 3mm Green LED
D6 IN4148
D7 IN4148
D8 3mm Green LED
D9 3mm Yellow LED

Semiconductors

TR1 2N222A
TR2 2N2907 (BC308)
TR3 BC108 (BC238)
TR4 BC108 (BC238)
IC1 LM339
IC2 4011
IC3 4049UB

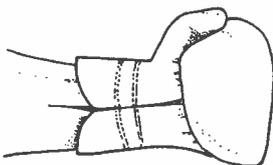
Others

(AMBIT EQUIV)
Probe case GSC CTP-1, No 10-0003 (or RS 508-217)
Miniature DPDT slide switch (S1)
2 off Cage Jack CG1 for touch switch (S2) (Ambit Stock Nos 10-06001 (2,3)
IC sockets, heatsink (TR1)

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- *Automatically adjusts to the level of your voice to give precise clipping levels.
- *Four selectable clip levels in approx. 6dB steps.
- *Automatically turns itself off when not in use.
- *9 or 12 Volt operation, onboard voltage regulator.
- *Suitable for high or low impedance mics (will even work with an IC251 etc. with a simple mod, we can give you details).
- *Simple to build, with only one adjustment for output level to make.
- *Full instructions, parts list, circuit etc.

KR £14.80, assembled PCB module £19.80

DeRx DIRECT CONVERSION COMMUNICATIONS RECEIVER

This kit is reviewed in the May issue of "Shortwave Magazine" by G3RJV. The article says a lot more than we can in this space. Suffice to say these are very popular with both beginners and experienced operators.

- *Single band versions for 3.5, 10 and 14MHz.
- *12 Volt operation.
- *1 Watt output into an 8 ohm speaker or phones.
- *Only one adjustment to make to align the module.
- *All coils ready wound for repeatable results.
- *Balanced FET mixer, FET VFO.

The unit only requires a couple of 50pF tuning capacitors by way of external components to function. We can supply suitable air-spaced devices at £1.50 each while stocks last. DeRx Kit £13.95, assembled PCB module (aligned) £18.90. Don't be put off by the low price, this receiver works well and is capable of world-wide reception.

PA/15 2M LINEAR AMPLIFIER 15 Watt

Do you have a 2M hand-held that could do with a boost? Suitable for mobile or base station use this unit will give a 10dB gain with any hand-held having up to 1 1/2 Watts output. Easy to build, with preformed inductors for simplicity, this unit is also suitable for 1 Watt SSB rigs. An RF switched (or PTT operated) change-over unit is available type C01, see below.

PA2/15 Kit £18.90, assembled PCB module £22.80

PA2/30 2M LINEAR AMPLIFIER 30 Watt

This unit gives approx 8dB gain for use with an IC202, FT290 etc. It puts out a clean signal with margin against overdriving with these popular radios. The PA2/30 includes preformed inductors and PTFE output trimmers for good performance. 13.8 Volt operation. The C01 change-over unit can be used with this item.

PA2/30 KR £22.90, assembled PCB module £26.90

C01 RF or PTT SWITCHED CHANGE-OVER UNIT

This unit is designed to switch a linear, preamp, or both in and out of line. Suitable for all bands 160 to 2M, with an RF sensitivity of 1/2W for switching. Will switch up to 100W RF output from a linear, 25W max from the rig. Suitable for many uses apart from switching our PA Series Linears.

KR £8.90, assembled PCB module £11.90 (includes a switched bias output on TX and provision for a TX LED indicator).

XM1 CRYSTAL CONTROLLED FREQUENCY MARKER

This very useful piece of test equipment is reviewed in the June issue of "Amateur Radio". A good quality design, this calibrator will help you meet the amateur licence frequency measurement requirements, it can also be used to calibrate almost any receivers' dial. Check that digital display is telling the truth, they often don't! The XM1 has marker outputs at 1MHz, 100kHz, 25kHz and 10kHz intervals, these are usable from longwave up to 70cm. This design features a pulsed ident facility that enables you to distinguish markers from off-air signals on crowded bands. A worthwhile addition to the shack.

KR £15.50, assembled PCB module £19.50

ST2 CW SIDE-TONE UNIT or PRACTICE OSCILLATOR

The ST2 provides a nice sounding sinewave note, either from your key, or from the output of your rig by RF sensing. The unit will work with positive or negative keying, up to 15 volts, and by direct connection to the antenna feeder of an HF or 2M rig up to 25W. The unit can also function with a pick-up antenna without direct connection as long as it is near enough to the radiating piece of wet string or whatever. With inline connection the unit will work with QRP rigs of as little as 1/2W output on the HF bands.

KR £6.20, assembled PCB module £8.90

If you would like further information on any product, simply drop us a line enclosing an SAE, we have an information sheet on each item. We aim to keep everything in stock and delivery within 7 days.

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73, Dave, G4KQH, Technical Manager

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ATV on the Air

Presented by Andy Emmerson, G8PTH



More ATV loonery as Jon G4MDU and Andy G6LTZ (complete with backpack transmitter and aerial) try to take ATV to the masses. In front of law-abiding shoppers in busy central Milton Keynes they performed a number of ingenious antics – all in the name of 'self-training in the art of wireless telegraphy'!

Most AVTers make an annual pilgrimage to the Post House for the ATV convention mainly, I suspect, for the trade stands but also to listen to the lectures and see the displays of members' equipment.

This year was the first at the new location at Crick, and being nearer to London, should have been better attended. (These words were written before the event; we columnists have to contend with timewarp as well...)

European activity

Earlier this year, however, I had the privilege to visit an ATV convention in Germany. It is interesting how they do things abroad.

If you are on the air with ATV you will probably have had a few contacts with foreign stations – in France, Belgium, Holland or possibly Germany. Despite this contact on the air I guess most of us are unaware how ATV is organised in these countries.

I believe Germany has the largest number of active ATVers in Europe, and like us they have a separate club. It is known as AGAF, which translates more or less as the activity group for amateur television. ATV is well established in Germany, somewhat less so in Holland (where they have some problems with QRM from/with voice repeaters on 70cm) and in Belgium and France. Apart from BATC and AGAF, there are no other ATV clubs or groups in Europe to my knowledge.

Entente cordiale

In view of this it is not surprising that there are links between AGAF and the

BATC, though they were ripe for development.

For a number of years the German ATV club and the BATC have exchanged publications, but contact has not gone much further than that, which is silly when you consider we both share common goals and interests.

Like us the German club holds an annual convention and this year the BATC decided it was high time we made ourselves known and paid them a visit. Two volunteers, Trevor Brown G8CJS and yours truly, offered their services and were despatched to Bremen as ambassadors of the BATC.

In Bremen we were delighted to find transport and an English speaking host waiting for us. In fact the German club excelled itself in hospitality – everything from transport to hotel rooms was laid on, and we were thus able to enjoy every minute of our all too short stay without having to worry about domestic arrangements.

Lecture topics

The venue for the convention, however, was the modern university – in a building which also holds the local ATV repeater. A comprehensive lecture programme lasting from 10am to 5pm had been arranged, with topics which read like the state of the art in ATV. A quick rundown of the topics covered should give you a flavour of what went on:

- Introduction to FM-ATV
- Reception of the Russian Ghorizont satellite
- First ATV repeater with 12cm output
- 24cm ATV transverter from simple modules

– Video film of the construction of the Bremen TV repeater

– Meteosat reception techniques

The lectures were of a very high standard, with plenty of video tape and slide illustrations.

Adventurous display of work

Before we set out we guessed that the convention might be different from our British operations, and this turned out to be true.

Commercial activities are not permitted, so there was no flea market. On the other hand there was a superb demonstration of members' constructions and this put our own shows to shame. The Germans have developed home-brewing almost to an artform, and well-nigh every project looked like a set-piece out of 'VHF Communications'.

Trevor enthused over beautifully machined 10GHz horns with Gunn diodes incorporated, while I swooned at superbly machined and plated metal-work for 4 tube PAs for 24cm.

Also on show were all manner of Yagi antennas for all frequencies, many made out of hobby brass tubing and looking deceptively simple to copy. There were also several combiners to link vision and audio transmitters into a common aerial, and some beautifully machined filters.

Not all the aerials were horns and yagis either; several quad-loops with panel reflectors were in evidence plus some omnidirectional antennas based on stacked dipole technology. For the higher frequencies there were some very technical slot-arrays in waveguide.

Despite the exotic nature of these constructions the materials used were mainly very plain. A lot of heavy-gauge, double-sided printed circuit board was used for cases and panels where we might have expected to use brass or a die-cast box.

Similarly, brass tubing as sold in model aircraft shops was used extensively in antenna construction, for the elements, boom and struts. Araldite was used to insulate the active dipole, the other elements being soldered to the boom. Obviously these techniques are second nature to the Germans and might well be copied by us.

Black boxes too

Obviously there was 'black box' equipment there too; the Germans tend to excel in RF matters and pay little attention to the video side.

There were no electronic testcard generators or non-camera picture sources. We saw plenty of expensive looking colour TVs, cameras and VCRs but no valve monitors or old black and white surveillance cameras! This may have something to do with different priorities or perhaps with a higher standard of living. All the homebrew projects were made of new components and instrument cases – no surplus re-used.

The AGAF had a club sales stand where they sold magazines, handbooks and stickers, and they kindly allowed us to sell some of our wares as well. As a result we got rid of no small number of

ATV ON THE AIR

These happy looking chaps are F1EDM (rock-crushing signal every UHF lift) and F1EGN, 'somewhere in France'. I am not sure whose QTH the photograph shows, but the shack is in an agreeable state of confusion. Just like mine in fact and, of course, it's only by having everything out that you can find things when you need them.



magazines, books and stickers, and even signed up a few subscriptions. The German club is somewhat smaller than ours – around 850 members – but nearly 200 turned up to the convention.

At 5 o'clock the convention turned into an AGM and various topics of interest were discussed. How to deal with members who did not renew their subs? Should double points be scored in

contests for mobile TV contacts? What if both stations are mobile? Is it even legal? Does the vehicle have to be moving to count? Is it right to have TV repeater outputs on 70 cm in Germany, and can they be turned off during openings to avoid blocking the band for the Dutch? Why do the Dutch put out strong TV signals but apparently never listen on two metres?

Flying the flag

Without a doubt we found the experience enjoyable and illuminating. We were made to feel most welcome and I believe our visit achieved real progress in forging international relations and co-operation for ATV.

A Dutch contingent was also present and we all swapped addresses and phone numbers in order to consult each other on matters of common interest, such as coexistence with other users of the 70 cm band.

We also agreed to set up a European TV working group for standards; we now have a start in Germany, Britain and the Netherlands, and must establish links with other countries too.

To sum up, it was a pleasure to fly the BATC flag at our first international event in recent years. I hope the Germans will be able to visit us in due course and we shall all descend on the Dutch at their VHF convention this autumn!

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DX-TV RECEPTION REPORTS

Compiled by Keith Hamer and Garry Smith

Meteor shower, Sporadic-E and Auroral activity were all forms of DX propagation well represented throughout March. Jsettled weather spelt disaster for any hopes of the type of tropospheric openings which we were accustomed to during 1983. There were, however, reports of minor trop activity around the middle of the month.

Several enthusiasts are increasing their vigilance in Band 1 now that it is relatively quiet with some main 405-line transmitters having closed completely. This may, however, be the lull before the storm. After this year the proposed 6-metre band may pose a problem especially to channel R1 on 49.75MHz. The remainder of the band is likely to be re-engineered for PMR.

Graham Angel of Sheffield tells us that since the introduction of Viking Radio on 103MHz at the beginning of April, the police services in the Humberside area have been relocated to 'the old BBC 405-line channels'. We do not have any information regarding exact frequencies or whether it is a trend which is likely to spread.

Conditions during the month

At Derby extra vigilance to the south on channel E3 proved that Spanish signals could be seen regularly. In fact reception was possible on no fewer than 12 days throughout March. Most signals were via meteor shower (MS) activity and the increased use of TVE's GTE colour test card helped considerably with positive identification.

The Cottbus transmitter in East Germany on channel E4 was logged at least five times and fortunately this was during test transmission periods.

March 14th was an eventful day with at least six countries noted within the space of half an hour. These were: Russia

on channels R1 and R2 with a news programme: CST (Czechoslovakia) on R1 and R2 with their RS-KH electroic test card; NRK (Norway) operating on channel E4 using the PM5534 test card and Kongsberg transmitter location details; ORF (Austria) on E2a with the PM5544 carrying the usual ORF FS 1 identification; TV P (Poland) with the dark PM5544 without identification on channel R1; TVE (Spain) with two co-channel signals on channel E3 consisting of the GTE pattern with the inscription 'tve 1' competing with colour bars carrying the identification TVE ARAGON. The colour bar pattern is easy to spot as it consists of a standard display with superimposed identification in white on a dark oval background which has a serrated edge.

On the 6th a mystery PM5544 appeared via MS on channel E4 at the relatively late hour 1844. The aerials were directed to Lopik in the Netherlands at the time and a few minutes later Dutch programmes fluttered up suggesting that the test card was from somewhere a little more exotic. A strong contender is RUV Iceland since programmes begin late.

Evening Auroral activity affecting Band 1 was noted by Iain Menzies (Aberdeen) on the 27th. Nothing was positively identified but there was a possible 525-line signal with dark basketball players presumably on 55.25MHz (channel A2, system M). This sounds all very interesting and other reports of this sighting would be appreciated.

On the 24th TVE appeared via Sporadic-E from 12 noon until 12.30 with colour reception of motorcycle racing and skiing. This was the 'first true SpE of the season' according to Iain.

It's amazing what one's local signal can hide. Now that Mendlesham channel B11 is off the air, Clive Athowe (Blofield, Norwich) is able to resolve channel H

signals on a daily basis from the Radio Telefis Eireann transmitter at Kippure near Dublin. This is a reception path of some 330 miles. His new aerial system for Band III obviously helps and several European transmitters are now more readily received. The array consists of a wideband 13-element Triax covering channels E5 to E12 and is installed at a height of just over 62 feet.

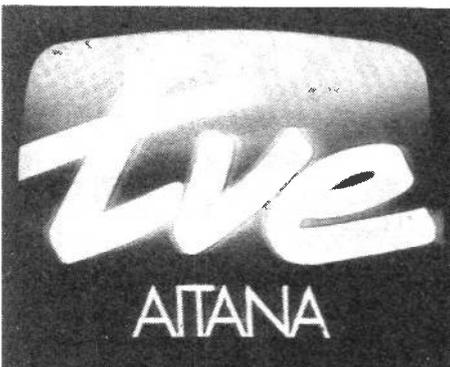
Sporadic-E openings during March were as follows:

Russian programmes from TSS on channel R1 on the 7th; TVE Spain on the 9th with the GTE test card on E2; TSS with programmes on R1 on the 20th; NRK Norway on the 26th with the PM5534 from Melhus (channel E2), Steigen (also E2) and Hemnes (E3); TVE on the 27th with the test card followed by regional news programmes on channels E2, E3 and E4. Signals from Ceskoslovenska Televize (CST-Czechoslovakia) were seen via meteor shower propagation on channel R6.

Mystery DX

Running a receiver on channel E5/R6 often produces interesting DX. On the 12th, 20th and 29th the distinctive RS-KH test card from CST was seen via MS while on March 1st the East German pattern emerged from the noise for all of 20 seconds. East Germany was seen again on E5 on the 11th and 17th but this time via improved tropospherics with the test card and programmes. On the 22nd various UHF outlets were noted including the French-language service in Belgium radiating the RTBF TELE 2 PM5544. At 0928GMT the 525-line AFRTS outlet at Shape in Belgium was received with a colour bar pattern.

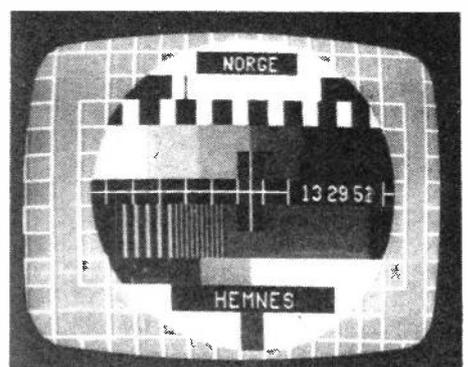
Kevin Jackson in Leeds managed to log French transmissions at reasonable strength from Dunkirk on channels E39 (Antenne 2 network), E42 (TF1) and E45 (FR3). From Belgium came reception of the Flemish and French speaking services from the Egem transmitter on channels E43 and E46 respectively. On the 17th French Abbeville outlets on E57 (Antenne 2), E60 (FR3) and E63 (TF1) were seen, plus the Dutch Weiringermeer transmitters on E39 and E45 with NOS 1 and NOS 2 respectively. Many British stations appeared and a surprise was the IBA Channel 4 pattern from Aldeburgh on E30. This was floating with a signal from Crystal Palace.



Spanish TV identification caption from Aitana received during March



Alternative identification caption used by TVE in Spain during regional transmissions



PM5534 electronic test card from NRK with 'Hemnes' transmitter identification

Dave Lauder (Barnet) has recently been working in Austria. He has commented on the use of the monochrome Telefunken TO5 test card used by the ORF 2nd network. This normally carries the identification ORF FS 2. Apparently signals from neighbouring Czechoslovakia are present all the time although at a low level.

In preparation for the 1984 DX season, Bob Brooks of Great Sutton in South Wirral has purchased a JVC CX610GB multi-standard colour portable. This should prove to be a great asset especially if a notch filter is used to remove the effect of strong adjacent channel signals which is an all too common problem during hectic openings. For amateur television reception (ATV) a Microwave Module type MMC/435/600 converter has been pressed into service. Bob already owns a receiver covering 2-metres so he can listen to the ATV talk-back on 144.750MHz. Although his DX-TV receivers are wideband he has produced an excellent meteor shower reception log for March which we are featuring this month.

DX log for March

2/3/84: CST (Czechoslovakia) on channel R1 with the CST 01 FuBK test card at 0730; unidentified programme at 0824 on E2.

3/3/84: BR (Bayerischer Rundfunk in West Germany) E2 on FuBK test card with GRÜNTEN transmitter location identification at 0850.

5/3/84: ORF (Austria) E2a on ORF FS 1 PM5544 at 0803.

8/3/84: SR1 (Sweden) E2 on TV 1 SVERIGE PM5544 test card at 0736; TVP (Poland) R1 with PM5544 at 0750; SRG1 (Switzerland-German language service) E2 with the +PTT SRG 1 FuBK at 0805; BR E2 on GRÜNTEN test card at 0835.

9/3/84: BR E2 at 0838; SR1 E2 on PM5544 at 1505.

11/3/84: ORF E2a on test card at 0820.

12/3/84: Unidentified colour bars on E2 at 0730; SR1 on E2 at 0900 with a clock caption and 'UR' identification.

13/3/84: SR1 E2 on PM5544 at 0715; ORF E2a at 0732 on test card.

14/3/84: TVP R1 on test card at 0736; ORF E2a at 0740 with the PM5544.

15/3/84: CST R1 on RS-KH test card at 0722; SR1 on PM5544 at 0729 on E2; TVP R1 on test card at 0807.

16/3/84: BR on E3 from the Kreuzberg transmitter showing a 'ZDF-ARD' slide at 0859. Incidentally, ZDF is the Second network in West Germany and joins forces with the 1st network of ARD during the morning.

18/3/84: Unidentified programmes on channel E2.

19/3/84: SR1 E2 on TV 1 SVERIGE PM5544.

21/3/84: ORF E2a radiating the monochrome Telefunken TO5 test card at 0728; BR on E2 at 0748 with the FuBK test card; ORF E2a at 0753 on PM5544 colour test card.

22/3/84: SR1 E2 at 0729; NRK (Norway) E2 on PM5544 with MELHUS transmitter identification at 0735; TVP R1 on PM5544 with a dark background and without identification at 0751.

23/3/84: ORF E2a on Telefunken test card; SR1 E2 on PM5544.

25/3/84: SR1 with the PM5544 on E2; ORF on E2a with the ORF FS 1 test card (PM5544).

26/3/84: SR1 at 0718 on PM5544.

27/3/84: SR1 radiating the test card at 0734; ORF E2a with the PM5544 at 0739; TVE (Spain) on E2 with the GTE colour test card noted during an SpE opening from 1248 onwards.

28/3/84: SRG1 E2 at 0811 with the +PTT SRG 1 FuBK test card.

30/3/84: ORF E2a on PM5544 at 0737; TVP R1 on test card at 0740.

The log above, from Bob Rooks, shows just what can be received in the early morning period during a typical month.

Service information

Spain: We mentioned briefly last month that Television Espanola (TVE) have rearranged their test transmission schedule and we have further details this month. The GTE test card is now radiated for most of the time, judging from our own recent observations, rather than the customary 15 minutes prior to programme commencement. The test card carries the identification TVE across the upper portion and tve 1 in the lower segment. The various bar patterns with local transmitter identification seem to have disappeared thus making positive identification more difficult.

On March 27th a Sporadic-E opening from 1210 to 1320 produced strong and stable signals from the Aitana transmitter on channel E3. The GTE test card was radiated until 1251 at which time a

regional studio caption appeared (see *Figure 1*). The caption was poorly positioned and attempts to correct it failed. The camera panned around the caption room revealing behind-the-scenes activity. The caption re-appeared, but this time it was more off-centre than ever. A further attempt at alignment finally improved the display!

France: There are at least three new electronic test patterns in use on the new VHF channels. These are fairly simple designs consisting of a circle enclosing frequency gratings and a greyscale. The surrounding area is made up of a cross-hatch. The new patterns may well only be experimental ones but they are certainly more welcome than the ubiquitous PM5544 which seems to be used by just about every TV network. We hope to feature these patterns in the near future.

Belgium: Several months after the demise of the Wavre transmitting mast carrying the aerials for UHF services on E25 and E28, it seems that the channel E25 Flemish service is now back on the air but with reduced power.

Poland: TV signals received from the Russian TSS network via the Gorizont satellite are being rebroadcast from low-power relays. Similar relays are also operating in Hungary.

West Germany: Süddeutscher Rundfunk (SDR) have recently introduced stereo TV test transmissions. Previously only ZDF radiated such tests.

East Germany: From February 3rd, DDR: F have been inserting station identification every 15 minutes during programme hours, presumably in an effort to prevent illegal copying or re-transmission. West Germany TV networks have included similar inserts for some time.

Austria: On very rare occasions the ORF PM5544 test card has been noted with the regional identification Landesstudio Burgenland on a black band towards the top of the picture.

The old monochrome EBU Bar is radiated by ORF on channel E34 from studios in Vienna with the identification ORF Wien.

Service Information this month was largely supplied by Gösta van der Linden (Rotterdam, Netherlands) and Tele-audiovision (Munich, West Germany) for which we thank them very much.

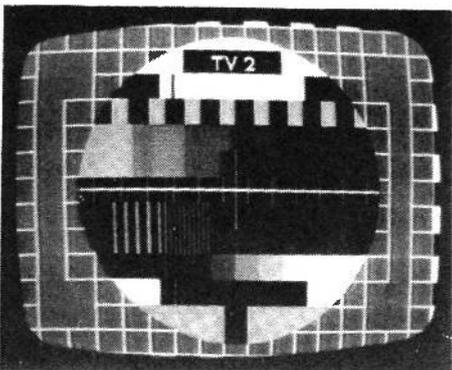


Fig 4 Test card received from Sveriges Radio, Sweden

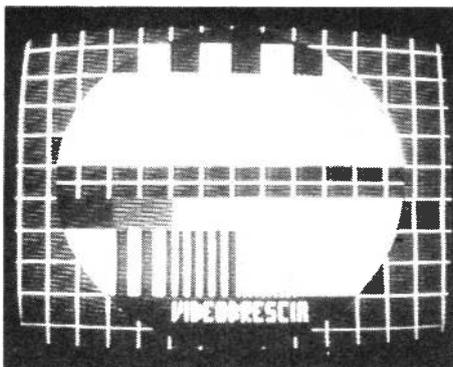


Fig 5 An unusual colour electronic test card used by the Italian private TV network 'VideoBrescia'

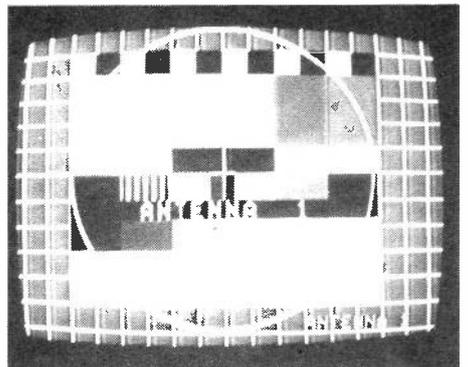


Fig 6 Electronic test card radiated by Antenna 1 in Modena. Italy Photograph courtesy of Paolo Venturi

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Do you have an opinion to air? Do you know the answer to something which puzzles, or a tip that might help, fellow enthusiasts? Have you something to add to a feature or review?

Your letters are invaluable in helping us to develop the magazine for you

Write to Letters to the Editor, **Radio & Electronics World**, Sovereign House, Brentwood, Essex, CM14 4SE. £2 will be paid for each letter published

Talks on AMTOR

Ian Wade, G3NRW, is editor of the British Amateur Radio Teleprinter Group's data communications magazine 'Datacom', and is available to give a talk on 'How AMTOR works' to clubs within a 50-mile radius of Bedford.

The talk, which is fully illustrated with flipcharts, models and tape recordings, starts with a brief outline of some of the problems of conventional RTTY, then shows in detail how AMTOR overcomes these problems.

Interest in the mode is growing rapidly now that more people are beginning to understand where AMTOR's characteristic 'chirrup chirrup' signals come from.

Club secretaries are invited to contact me to arrange a booking. My address is 7 Daubeney Close, Harlington, Dunstable, Beds., and evening telephone number is 05255 4760.

BARTG also organises other talks, and supplies specialist components and publications to those interested in all kinds of data communication by teleprinter or computer.

Ian Wade, Dunstable

ARTAC INTERNATIONAL

There can be few British radio amateurs who have not, at some time, been in a situation where they would have liked to ask the station with whom

they were communicating to, for example, call his town information centre for details on a point of history, send a short greetings message to a friend whom they haven't seen for years and happened to work in the same office or, just ask simple route directions for a friend in the radio shack. For British amateurs this is designated, by the licensing authorities, as 'third-party' and is, in general, forbidden!

British amateurs have to be careful to avoid mentioning over-the-air anything which could remotely be considered 'third-party' for fear of repercussions from the authorities.

Australian amateurs shook off the third-party restriction shackles some three years ago, took a breath of the fresh air, and never looked back.

ARTAC International would like to hear from anyone interested in the removal of this unnecessary restriction on the British Amateur Radio Service.

The address is ARTAC International, 38 Wattle Drive, Watsonia, 3087, Australia.

A D Tregale, Watsonia

IT'S REALLY THE BEST

I would like to take this opportunity to wish you good luck in the publication of *R* & *EW* - it's really the best. Please

continue to give us information regarding the amateur world.

Anthony Spiteri, Malta

SATISFIED CUSTOMER

I recently purchased a Yaesu FT 102 transceiver with the FC102 antenna unit, and MMT 144/28MHz linear and transverter, not forgetting a 2 metre antenna MV-ZZC.

This all happened on a Thursday. During the next few days we had the 2 metre antenna fitted up and, of course, my transceiver and ATU were fitted to a long wire. On the following Thursday we came to fit the 2 metre transverter in line (it was dead). Also, later that night, we noticed the ATU metre was developing condensation and was impossible to read.

Friday, I returned the goods to where I purchased them, Amateur Electronics (UK) Ltd, Birmingham.

The service I received was fantastic. I was immediately offered a new ATU or did I wish the two new meters. It took only 30 minutes to replace the ATU and, while waiting, was served with excellent coffee. As for the transverter, they had not another in stock but said they would have Microwave Modules Ltd send me one direct.

The following Tuesday it arrived at my door. Excellent service.

K Wood, Tamworth

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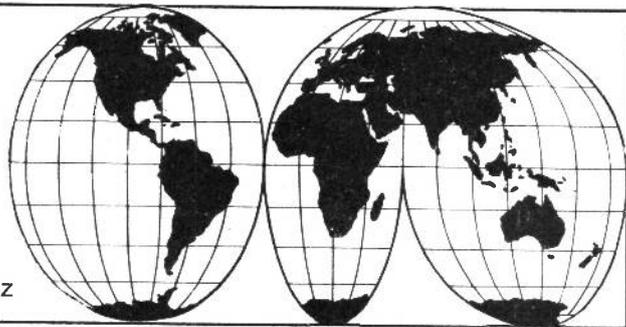
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SHORT WAVE NEWS FOR DX LISTENERS

BY Frank A Baldwin

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



On 90 metres

Continuing with the review of some of the Latin American stations transmitting on the 90 metre band (**3200 to 3400**) which may, with the right conditions, be logged by DXers here in the UK. We commence with Ecuador.

Radio Pastaza in El Puyo is on **3315** with a power of 2.5KW and is scheduled from 0110 (Sunday from 1200) to 0400 (Saturday until 0300) and is fairly often mentioned in the SWL press.

On nearby **3325** there is a mix of two Brazilians, a Guatemalan and an Ecuadorian with the latter predominating on most occasions according to the total number of times it is reported. The Brazilians are Radio Liberal, Belem at 5KW and Radio Difusora Universitaria, Guarulhos at 1KW, the Guatemalan being Radio Maya de Barillas in Huethuetenango at 1KW and the Ecuadorian being Ondas Quevedenas in Quevedo at 1.5KW. R Liberal is on the air around the clock, R Dif Universitaria from 0800 to 0300, R Maya de Barillas from 2200 to 0400 and Ondas Quevedenas the full 24 hours.

With that lot, a decipherable station identification is imperative and this is where a tape recorder becomes indispensable, being used to replay the announcement several times in order to confirm or conversely deny, ones original claim.

In Huanuco, Peru, the 0.5KW Radio Ondas del Hualaga is on **3330** from mid mornings and closes at 0500. Despite the low power it is often reported in the American SWL press but as one would expect not that frequently in the UK DX press.

More often mentioned are the two Brazilians on **3335**, these being Radio Clube da Conquista, Vitoria da Conquista operating from 0800 to 0300 at 1KW and Radio Alvorada in Londrina which is scheduled from 0800 to 0300 (Sunday 1000 to 0200) at 1KW.

The rarely heard Radio 27 de Diciembre sited in Villa Montes, Bolivia has a 1KW transmitter and may be found, if you are lucky on **3349** working to the schedule 2230 to 0200, but on Sunday until a variable closing time around 0015. I have never succeeded yet with this one despite many attempts, although I have on several occasions logged La Voz de Nahuala in Nahuala, Guatemala, with a power of 1KW on **3360** from 2130 to 0230. Likewise, the Brazilian Radio Cultura in Araraquara on **3365**, which, is timed from 0800 to 0300 at 1KW.

Slightly higher up the band at **3370** is the Guatemalan Radio Tezulutlan in Coban which is a market town mainly dealing in coffee and the Peruvian tree bark trade. When not in the market or elsewhere, the staff put the station on the air from 1100 to 1530 and from 2100 to 0230. I have not logged them on this channel, but have several times heard them on the parallel **4835** frequency. Also being co-occupant on this QRG is Radio Florida in Samaipata in Bolivia at 1KW; it closes at 0200 but is not so often reported despite the fact that each have equal power.

On **3375** we have a couple of Brazilians, the very often mentioned Radio Dourados in Dourados with a 5KW signal and which closes at 0400 and Radio Nacional in Sao Gabriel da Cachoeira which closes at 0100 but at 1KW.

In Chiquimula, Guatemala, there is Radio Chortis which is on the air from 2200 to 0300 at 1KW on **3380** but unfortunately more often than not covered by the co-channel Radio Iris based in Esmeraldas, Ecuador, with its 10KW signal, this latter one being a common entry in my logbook.

As a change from the Spanish and Portuguese languages emanating from South America there are the French speaking announcers and performers in program-

mes from RFO (R France Outremer) in Cayenne, French Guiana, operating on **3385** and consistently reported by DXers. Part of the schedule is from 2100 to 0100 (Friday until 0330 and Saturday until 0300). The rarely mentioned Brazilian Radio Congonhas at 2.5KW from 0900 to 2100 is also on this frequency.

The Bolivian Radio Camargo in Chuquisaca is on **3390** from 2230 to 0200 (Sunday until 0100) with a power of 1KW, whilst just 5KHz up the band there is the very often heard Radio Zaracay sited in Santo Domingo, Ecuador, with its 12.5KW transmitter on **3395**.

This completes the 90 metre band review.

AROUND THE DIAL

Tune around your dial or along your scales otherwise alter the digits such that the frequencies indicated agree with those which follow and at the times mentioned you should log these transmissions.

AFRICA

Benin

Cotonou on **4870** at 0615, OM with the station identification in French, announcements, drums. Benin is on the air from 0400 (Saturday, 0550) to 0800, from 1300 (Saturday, 1100) to 2400 and on Sunday from 0600 to 2400 continuously. The power is 30KW. Verification is by QSL card and the address is BP 366, Cotonou, Benin.

Botswana

Gaborone on a measured **4848.5** at 1932, OM with a talk in SeTswana in a transmission of the Home Service which uses both the local language SeTswana and English during the schedule 0400 to 0630 and from 1420 (Monday to Wednesday from 1500) to 2100. The power is 10KW and they do not QSL.

Central African Republic

Bangui on **5035** at 0443, drums then OM's with a short discussion in Sango - the local language - more drums in typical African style. Verification is by letter and the address is Radio-diffusion-Television Centafricaine, BP 940, Bangui. The schedule is from 0430 to 0700 and from 1630 to 2300 and the

power is 100KW. The frequency can vary from **5033** to **5038** so tune around the nominal **5035** until located. Listen for the news in French at 1830 or 2200 for positive identification.

Egypt

Cairo on **9805** at 2213, YL with a talk on the history of Ancient Egypt in an English programme, timed from 2115 to 2245 daily, and directed to Europe. If you want to know all about Amenophis III (the Magnificent) father of the heretic Ankenaten, or the warrior Thutmose III then this is the station to which you should tune your receiver.

Cairo on **9850** at 2009, YL with some songs backed by a local orchestra in a musical programme in the Domestic Service for Europe, the Middle East, North Africa and North America, timed from 1800 to 2345 on this channel.

Libya

Tripoli on **9890** at 1249, OM with songs, local music during a Voice of the Greater Arab Homeland programme scheduled on this frequency from 1745 to 0430.

Tripoli on **15450** at 1946, OM with Probe, this time all about the history of Namibia in the English transmission for

SHORT WAVE NEWS FOR DX LISTENERS

Europe listed from 1900 to 2000 daily. The address given was - Voice of Africa, 333, Tripoli.

Morocco

Tangier on **17595** at 1435, mixed choir with songs, local music in a relay of the Home Service directed to the Middle East, West Africa, Europe, South Morocco and Mauritania and timed from 1100 to 0100 on this channel.

Nigeria

Ibadan on **4932** at 0612, OM with a newscast of local events followed by some announcements, all in English.

This frequency is assigned to the Educational Service and the newscast would be a relay of the Radio Nigeria, Lagos programme. The schedule on this channel is not known at the time of writing but Ibadan Domestic Service is listed from 0400 sign-on until 2300 sign-off on **6050**, perhaps these times coincide.

Lagos on **15120** at 2120, interval signal of drums then OM with station identification during an English programme intended for Europe and North Africa and timed from 2100 to 2200 daily.

Senegal

Dakar on **4890** at 0610, OM with recitations from the Holy Quran.

According to my information this one is on the air from 0600 to 0900, from 1155 to 1600 and from 1800 to 0100 with a power of 100KW.

South Africa

Johannesburg on **9585** at 2105, OM with a newscast of local and African events in an English transmission to Europe and West Africa, scheduled from 2100 to 2200 daily.

Togo

Togblekope on **5047** at 0609, OM with announcements in French followed by OM with songs in a vernacular. Togblekope is on the air from 0530 to 0800 and from 1700 to 2400 in French and local vernaculars. The power is 100KW and they do QSL, the address being Radiodiffusion-Television

Togolaise, BP 434, Lome. Listen for the English news at 2000.

AMERICAS

Brazil

Emisora Rural, Sao Francisco, on **4945** at 2124, YL with a local pop song and OM with announcements in Portuguese, then OM with station identification at 2127.

This one is scheduled from 0800 to 0300 with a power of 2KW.

Radio Nacional, Rio de Janeiro, on **9705** at 0035, OM with a 'futebol' (football) commentary in Portuguese. The power is 10KW, schedule unknown.

Colombia

Ondas del Meta, Villavicencio, on **4885** at 0427, OM with a talk in Spanish about Colombian affairs. The schedule is from 1000 to 0500 and the power is 1KW.

Costa Rica

Faro del Caribe, San Jose on **5055** at 2135, YL's with a folk song then OM with announcements in Spanish. Faro del Caribe (Lighthouse of the Caribbean) is on the air from 1045 to 1600 and from 2300 to 0430 with an English programme from 0300 to 0400 (Monday until 0430). The power is 5KW.

Cuba

Havana on **9550** at 2058, chimes interval signal then YL with station identification at the start of the French programme for Europe, timed from 2100 to 2200. This is, however, a relay via the USSR.

Havana on **9895** at 0711, OM with a talk about world affairs during the Spanish transmission for the Mediterranean area and Africa, scheduled from 0630 to 0730.

Direct from Cuba, but suffers QRM from Hilversum co-channel at this time with an English programme from 0700 to 0720 directed to Asia, Europe, the Middle East and West Africa.

Dominican Republic

Radio Clarin, Santo

Domingo on **11700** at 2217, OM with a local pop song in Spanish, local music, OM announcer. Radio Clarin is scheduled from 1100 to 0500 with a power of 50KW.

Ecuador

HCJB Quito on **9655** at 0727, OM with a religious talk in an English transmission for Europe timed from 0645 to 0830 (Saturday and Sunday from 0700) then OM with the station identification at 0730.

ASIA

Afghanistan

Kabul on **11755** at 1909, YL with some news of internal affairs in an English programme for Europe, timed from 1900 to 1930 and also logged in parallel on **9665**. Both are relays via the USSR.

China

Xinjiang PBS, Urumqi on **5440** at 0039, OM with a talk in Kazakh in the Home Service programme.

The schedule is from 0050 to 0230, from 0530 to 0700, from 1200 to 1720 and a Foreign Service transmission in Russian from 1800 to 2055.

Radio Peking on **9860** at 1559, interval signal then OM with station identification and the news during the English presentation for East and South Africa on this channel from 1600 to 1700 daily.

Radio Peking on **9900** at 2014, YL with a talk during the Standard Chinese programme to Europe, North and West Africa, scheduled from 2000 to 2100.

India

AIR Delhi on **9665** at 1957, OM with announcements, frequencies etc, then YL with a newscast in the English transmission from the UK and West Europe which can be heard on this channel from 1845 to 2230. Also logged in parallel on **9755**.

AIR Delhi on **17875** at 0957, interval signal, YL with station identification and announcements at the start of the English programme to Australasia and North East Asia, timed from 1000 to 1100.

Japan

Tokyo on **17870** at 0810, OM

with news about Japanese internal events in the English programme for Europe, scheduled from 0800 to 0830 daily.

Korea - south

Seoul on **9870** at 1628, YL with a talk about Korean wild flowers then OM with the station identification at 1630 during the English session for Africa, Europe, the Far and Middle East, timed from 1600 to 1700.

Pakistan

PBC Rawalpindi on **5005** at 0049, OM with recitations from the Holy Quran in a transmission on the Home Service, scheduled on this frequency from 0045 to 0400 (Friday until 0500) and from 1500 to 1800. The frequency is variable to **5010**.

Philippines

Radio Veritas, Manila, on **9605** at 1250, OM with a talk in the Korean programme for Korea, timed from 1230 to 1255. Some local music and sign-off at 1255.

United Arab Emirates

Dubai on **21695** at 1040, YL with news of both local and world events in the English programme for Europe and North Africa scheduled from 1030 to 1100. A review of the local press followed.

USSR

Alma Ata, Kazakh SSR, on **5260** at 0042, YL with a folk song in Russian, complete with accordion backing. This is Alma Ata 2 with programmes in Kazakh from 0300 to 1800 and in Russian from 2300 to 0300.

Radio Tashkent on **9600** at 1227, YL with the station identification at the close of the English transmission for South Asia scheduled from 1200 to 1230, this being followed by OM with the Urdu programme to South Asia timed from 1230 to 1300.

EUROPE

Albania

Tirana on **9500** at 0647, YL with the news during the English programme for Europe which may be heard on this channel from 0630 to 0700.

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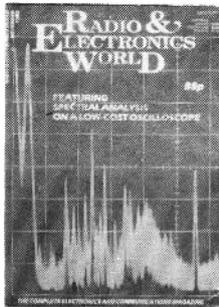
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NOVEMBER 1983

Designs — Communications Building Blocks (Front Ends); Poor Man's Spectrum Analyser; Wideband FM Stereo Tuner Module Part 2; 4 Channel Audio Mixer Part 3; Three Digit Timer. **Features** — Squelch Systems; Expansion Bus (First add-on — A light pen); A Guide to HF Coils Part 2; Data Brief — NE564 PLL Tone Decoder. **Reviews** — Meteor 100, 600, 1000 (All-British Frequency Counters); Personal Pearl (For text and information manipulation)



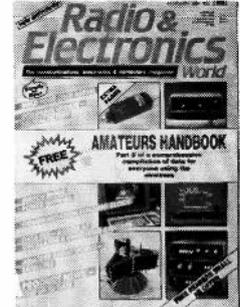
DECEMBER 1983

Designs — Poor Man's Spectrum Analyser Part 2; Communications Building Blocks Part 2; A 4001/4011 Tester; Continuity Tester. **Features** — Inside the Sinclair Flat TV. An in-depth probe: A Circuit Designers Guide to Batteries; Data File on Op-Amps Part 1; Metal Detectors in Warfare; Data Brief 1-LM1821S Video IF PLL Synchronous Detector; Data Brief 2-SL6270 Gain Controlled Audio Amplifier; An RS232C Interface for Your Dragon 32. **Reviews** — ALDEN Weather Chart Recorder Kit; Digithurst MicroSight 1.



JANUARY 1984

Designs — Communication Building Blocks (Active Antennae); FAX Receiver; RGB Interface for the Ferguson TX-90; A Couple of Voltage Detectors; LCD Capacitance Meter; Cymar Q-meter (An aid to winding coils); Zener Diode Checker; A Drinker's Delight; LCD Display Option for the Rewbichron II. **Features** — A Novel Receiver (Sony); Capacitors for Coupling, De-coupling and Filtering; Data File on Op-Amps Part 2; Farewell to Test Card 'F'; A Soundboard for the Jupiter Ace; Data Brief — MC1377 Colour Signal Encoder.



FEBRUARY 1984

Designs — Switched Mode Power Supplies; Crowbar Protection Circuit; Switched Step Attenuator; Universal NiCad Charger; Communications Building Blocks (IF Amplifiers); Real Time Calendar Clock. **Features** — Data File on Op-Amps; Six Antennas from Three Wires (Double your directions without doubling your cost); Designers Update (Helical Filters); Moving Pictures from Wax — 'Phonovision'; Computers, Communications and Applications; Data, Brief — Low cost, wide range varicap diodes.



MARCH 1984

Designs — Modifying the Pye PF1 Pocketphone Receiver; Communications Building Blocks (IF Amplifiers); One Night's Work (Audio-Amp); 200W PEP Transmatch. **Features** — Sony ICF 7500D Receiver; Data File on Op-Amps; UOSAT-B; AKD Absorption Wavemeter; Data Brief — Hitachi HA 1197 AM Tuner; Oscar 10 and its Orbit Parameters; Programmable Sound Generator (the AY8910 family); Random Morse Computer Program; ICOM World Clock.



APRIL 1984

Designs — One Night's Work (IF Oscillator); HF Linear Amplifier; The Piano Keyer — only £5 for Perfect Morse; Peak-Reading LED RF Wattmeter; Speech and the Computer — Make the Beeb Micro Talk!; 2 Metre Tiger Antenna. **Features** — Hall Effect Devices — Exploiting Magnetisms: Effect on Conductors; Data File — CMOS Bilateral Switches and Multiplexer/Demultiplexer ICs; Data Brief-TD 2002A Linear IC



MAY 1984

Projects — One Week's Work (VHF/UHF Frequency Meter); Spectrum Analyser Update; Assembling a Logic Probe Signal Generator; 2 Metre J-Stick Aerial; SX-200 Relative S-Meter. **Features** — Data File — 4046B Phase-Locked Loop CMOS IC; Hamey HM203-4 Oscilloscope review; A Beginners Guide to Meteor Scatter Propagation; High & Low Measurements — A Guide to Measuring Outside the Conventional Ranges



JUNE 1984

Projects — Microprocessor Controlled Dot Matrix Printer; One Night's Work — Replacement Plug-in Module for 2532 EPROM; A low-cost Frequency Standard; Radio Frequency Bridge; Modifying the RGB Interface for the Ferguson TX90. **Features** — High Speed Data Transmission; Trio-Kenwood TS-430S Transceiver; ZX Spectrum Data Transmission Program; Data File — National Semiconductors LM Range of Dual Audio-Preamplifier ICs; Data Brief — MC 1648 (SL 1648) Voltage Controlled Oscillator; HP41CX Calculator Review

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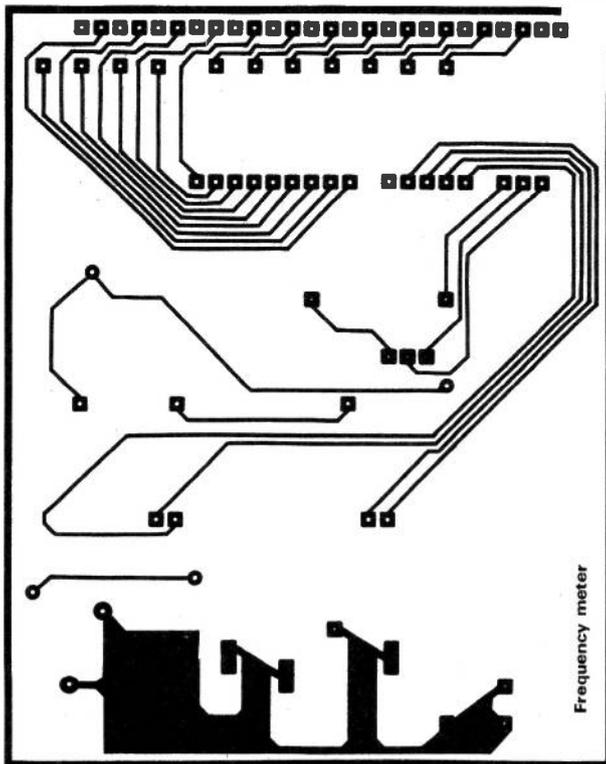
CORRECTIONS AND MODS

Whilst every effort is made to minimise errors in diagrams we will correct these as they come to our knowledge and we also appreciate the co-operation of our readers in notifying these.

We occasionally receive suggested modifications from readers who have constructed projects from *Radio & Electronics World* and we will publish those that would interest other readers.

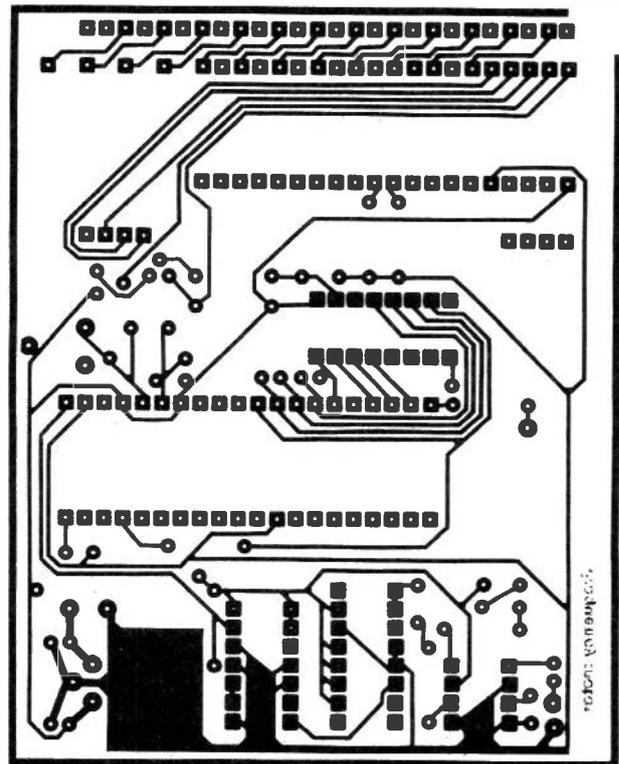
For example, it may be possible to extend the use of a particular item by minor circuit changes or re-arrangement only. If this can be done for minimal cost and the idea has been proved in practice, others may benefit from the information.

Write to Corrections and Mods, *Radio & Electronics World*, Sovereign House, Brentwood, Essex, CM14 4SE



Frequency Meter (May, 1984 issue)

We regret the omission of the connecting pads for the switch on the PCB. The corrected foil patterns are shown here.



MICROPROCESSOR - CONTROLLED DOT MATRIX PRINTER (June, 1984 issue)

Because in some copies of this issue a part of the computer print-out was illegible, we reproduce that section below.

```

28 ASSEMBLER VER.1.4
1      ****ARC.SRC**DOT MATRIX PRINTER PROGRAMME
2      (C)G.P.MOORE 2.12.83
3 0000
4 0000
5
6 0000
7 0020
8 0004
9 0005
10 000E
11 0000
12 0000
13 0000
14
15 0000
16 0003
17 0004
18 0004 004C
19 000E
20 0008
21 000E
22
23 000E
24 000C
25 000C
26 000C 8F
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27 0000 E6F856      LD      P014+#2(2)01010110  ;ADDRESS ACTIVE.
28
29 0010 E6F600      LD      P2M+#2(2)00000000  ;INT STACK PO I/P
30 0013 E6F7C1      LD      P3M+#2(2)1000001  ;P2 ALL O/P
31
32 0014 E6F500      LD      PRE0+#2(2)00001101 ;PRE=3-MOD N
33 0019 E40006      LD      S+0                ;GET BAUD RATE
34 001C 5606F0      AND     6+#%F0             ;MASK LOW NIBBLE
35 001F E406F4      LD      70+5              ;LOAD BAUD RATE
36 0022 E6F3B4      LD      PPE1+#2(2)1111010 ;PRE=46=50US
37 0025 E6F10F      LD      T1+#15            ;15*50US=750US
38 0028 E6F103      LD      THR+#2(2)00000011 ;START SID CLOCK
39 002B E6FB98      LD      IMR+#2(2)00001000 ;EN SINT
40 002E E6FFB0      LD      SFL+#26C
41 0031 8004      CLF
42 0033 56FCFE      AND     LASTCHR
43 0036 E60420      AND     FLAGE+#2(2)11111110 ;CLEAR OVERFLOW
44 0039 E60520      LD      SILIN+#SIL0
45 003C E60200      LD      SILOUT+#SIL0
46 003F E60300      LD      L+0
47 0042 9F        LD      2+#0              ;RESET SOLENOIDS
48 0043 3103      LD      3+#0              ;RESET CONTROLS
49
50 0045      SFF      #0
51 0045
52
53 0045      ;PROGRAM STARTS
54
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66
67
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FOR SALE

■Commodore 64 microcomputer with power supply, Data Cassette, Joystick, Two game cassettes, plus Introduction to Basic Part one and users handbook, only a few months old and still under warranty. In excellent condition £175. Philip Cole, 20 Paultow Road, Bedminster, Bristol, BS3 4PS. Tel: 0272 632400 after 2pm.

■Techt-Ronix 453 'Scope DC-50MHz incl. manual covers probes etc £300 or swap multimode 2M transceiver. Ex IhtL P39 phosphor monitor with 20MHz+ bandwidth, £60. QRO linear 2M pair 4CX250B's 2KV etc as per SWM design 1973, full metered and fused, as seen £135 or swap FM mobile rig. G8BZN QTHR. Tel: 0530 62649.

■Solar Scope model CD 523S.2. Large oscilloscope with manual. Very heavy. Buyer must collect. No reasonable offer refused. This is ex-gout and must have cost a lot to make. Band, 4 Temple Park Crescent, Edinburgh, EH11 1HT. Tel: 031 228 1569.

■A.V.O.: Taylor 45 and 45D: Mullard high speed valve testers/Eddystone S770R VHF receiver/Hallicrafters S27 VHF receiver/A510 Tx, Rx and accessories (HF phone and CW)/various valves SAE for requirement. Hohn Baker, 13 Burrard Rd, NW6. Tel: 01-794 0823.

■Xtal calibrator LF 10x7x7in, 5 valves, takes HC6U, B76 Xtals, mains operation: £9. Osker block 'Dinky' SWR, FSM, 5x1½x1in, 2 off SO 239 sockets, 1 din socket: £5. 'Eagle' footswitch, 3in square x 1in deep, single pole, biased off, inc. cable: £2. 2 metres, ¾ wavelength ring plane mobile antenna plus boss, 30ft coax cable: £15. Meters, 100 micro amp (2), 5mA, 15mA, 50mA; thermocouples 2.5A to 3A; moving coil, etc: £1.50 to £4. All collect, or add postage. A W McNeill, 40 Turnpike Road, Newbury, Berks. RG13 3AS. Tel: Newbury 40750.

■RTTY and Morse reader. 'AEA' MBA-RO with 32 character display and mains unit. Cost £170 new, will accept £90 + £3 carriage. Tony West, 136, Bierley Lane, Bradford, West Yorks. BD4 6AS. Tel: Bradford 683896.

■Complete Racal Rx system comprising, RA117E receiver, aerial tuner/protector, five position aerial switch, synthesiser with power supply, RA218 single side band unit, contained in glass fronted rack system console. Sold complete with spare valves, crystals and manual £550. Buyer to collect. Brian Robinson Tel: 0543 74521.

■HF linear amp, PSU items 813 ceramic bases £6 pair, 813 fil, trans 10V10A £6 each, Chokes £5 each. Capacitors £3 each. Plate trans 3000V CT 300MA + 1290VCT 400MA oil filled 10in x 10in £18 each. All items cont ratings. Buyer pay carr. Tel: Scotland 0955 2292 (evenings or weekends).

■Three tone buzzers 12v dc will work from 9 to 24V on PC board 3 x 1¼in 4 terminals one common. Very well made and all new. I have about 30 for sale at £2 each free postage. Also still have some pots for sale 22K lin 10 for £1. Some packs of resistors / capacitors / transistors mixed + some other devices 100 + £2, 95% new one or two bits might be ex equipment. Please hurry, not much left now. D Martin, 29 St Johns Close, Leatherhead, Surrey.

■Yaesu FT-102 AM/FM in immaculate condition £550 ono. A Reid, 29 Thorney Flat Dr, Ayr, Ayrshire, Tel: 0292 267679

■FT-290 two metre multi mode, carrying case, as new, Dry batteries, £150. E Lockyear, 142 Crescent Drive, Petts Wood, Kent. Tel: 0689 35815.

■Yaesu FRG7 Rx, good condition, £150 ono. MM2001 RTTY to TV converter, less than year old, £150. 12in portable TV, ideal monitor for MM2001 £35. Power supply unit 5amp £10. Prefer buyers collect. John Raynes, 267 Pelham Road, Immingham, South Humberside.

■FT901 DM £400. FV901DM £100. SP901P exten

speaker with patch £30. KW trap dipole, balun, 40M coax cable £30. Custom built desk for above £50. A R Cooper, 41 Kingsway Ave, Paignton, Devon TQ4 7AA. G60QB. Tel: 0803 843350.

■Oscilloscope, Cossar 1035, 6MHz, dual beam. In working order, £10. Buyer collects. A Dolby, 32 First Ave, Walton-on-Thames, Surrey. Tel: 0932 225694.

■Collectors Item: HMV 650, 10 valve table grand broadcast receiver. 5 bands, LW, MW, 3 SW, 107.0 to 4.85 metres. With service manual. Circa 1937. All fixed valve capacitors have been replaced some years ago. Shortage of space compels me to seek a good home for this Rx. Offers when seen, or exchange for something useful in radio shack. Tel: 0875-610778.

■Eddystone 960 solid state HF receiver plus manual, £100. Also Eddystone 770R VHF receiver plus manual, £80. Tel: (084428) 448.

■16K ZX81 with inverse video, full travel professional keyboard and Aszmic built in assembler/monitor, set in Eprom 144 x 255 hires graphics/file handling etc. All manuals, leads, PSU, £70 ono. All offers considered. Tel: M Welch, Disley 3937 after 4.30pm.

■Atom programs. Utility commands, space attack, word proc., M/C monitor, Morse practice and many more. SAE for full list. Progs. @ £4 each. Also: some practical low cost mods and extensions for the Atom, eg extra memory, Eprom program etc. SAE for list. Dave Locke, 45 Rhymney Court, Thornhill, Swmbran, Gwent. NP44 5SG.

■Transformers oil filled 110V-230V primary 500 0 500 secondary 425 VA £8, 320 0 320 130mA 6.3V 6A 5V 3A £5. Choke 5H 600 mA £5, Choke 13H 120 mA £3. Collect, or carriage extra. L R K Gregory, The Well House, The Downs, Herne Bay, Kent. CT6 6JP. Tel: 02273 4774.

■Two Ampex reel to reel tape recorders £25 plus carriage. Both need some attention so only suitable for someone prepared to give this attention. 20X 1800ft Ampex ¼inch tape £1 per reel plus carriage. P Rae Shepherd, 5 Barnard Close, Chislehurst, Kent BR7 6PQ. Tel: 01 467 2023.

■Ultra violet PCB case, PCB drill and jigsaw, stand and PSU as new. £80 ono. Mr Cox, 6 Birchwood Drive, Heathfarm, Shrewsbury. Tel: 987 27606.

■ZX81 + 16K Ram. As new, all leads, manual, several tapes, offers. Wanted - Pye PF1Tx/Rx wkg RBO or simplex freqs. 34 Cornbury Crescent, Downhead Park, Milton Keynes, MK15 9AS.

■ZX81 + 16K Ram. With programs and all leads and manuals, including loading aid book, offers. ORIC1 48K Ram with leads and manual and programs offers. Chatter Box and Big Ears speech control system, new - offers £40 each. J Taylor, Tel: 0689 35353, evenings only.

■Icom IC22A two metre FM transceiver. SW/1SW output. R0-R7, S10, S14-S21. Ideal for new licensee £70. Write to Simon Luttrell, 358-360 Camden Road, Islington, London N7 8LT.

■DST 100. 50KHz to 30MHz with speaker and circuit details £65. Buyer collects. T R Salkeld, 8 Milne Street, Castleton, Rochdale, Lancs. OL11 3AN. Tel: 0706 345650.

■Sharp MZ 700 computer. Built-in data recorder plus assorted games software £200. Mini sensory chess challenger £20. Datong Morse tutor £50. Consider Px for FT77, FRG7/7700 or similar, or dual trace scope in good order. Also require freq. counter and assorted test/construction gear W.H.Y.? No sensible offer ignored! Your UHF/VHF multimode also considered. Can collect/deliver anywhere in Northern England/Wales. Tel: Arthur on Halifax 0422 68021, Evenings after 8pm or weekends.

■Tequipment S32A 'Scope (10MHz) in nice condition, just been realigned, £45. Handbook and circuit available. Tel: Leeds 0532 866897.

■Robot 400 slow scan TV converter. As new £350. Tel: Ron, 01-462 2222.

■HRO 5T Receiver with mains PSU and complete set of nine general coverage coils 50KHz to 30MHz in container (wooden) clean working condition with handbook £60. Buyer to collect or will exchange for Trio 9R-59DS with handbook and speaker or B40 and handbook. Mr K Pullen, 210 Hollett Rd, Penfilia Est. Treboeth, Swansea. SA5 9ER.

■H/B 70cm Linear, 4CX250, self-contained PSU, some 10 years old but still produces the power, complete with MM 28-432 transverter and leads. £95 or exchange 2M FM mobile. Slim crank up, tilt over, mast 22ft-38ft wall mounting £130. Ham 'M' rotator will hold and turn anything, with 60ft control cable £90. Tel: Jim, 0202 518828.

■Daiwa search 9 two metre FM receiver. VFO for 144 to 146 MHz. Xtal for Uosat. Two months use only. As new in box. £35. Contact G1ERM on 0297 33068, evenings.

■Of interest to collectors, Vintage and early Post War radios. Some working most for restoration. Also valve tester, needs re-letters, mikes, spare parts. Hundreds radio mags 1968 to date. All must go in one collection due to shortage of time. Moving to new QTH. Inspect collect. You require van or large car. No reasonable offer refused. Please Phone or write: Charles Hooper, 63 Sandy Lane, St. Ives, Ringwood, Hants. BH24 2LE. Tel: Ringwood 5717.

■Marconi 801Sig-gen 10-470MHz AM/CW, good worker + manual £100. Normende UHF sweeper, good worker, no manual, £100. Marconi 1101 VHF sweeper + manual, working but needs some attention £70. Solartron Autorange DMM bench type + manual, excellent condition, £50. Eddystone 770Rx with manual, non worker but complete. Needs tuning cap, £30 or exchange any/all for good solid state, dual beam, delay TB, 20MHz oscilloscope, plus manual. 2N5179 transistors, new, full spec, 65p each, 10 for £6, BB105B varactors as above, 10p each, 10 for 75p. Hundreds bought to obtain matched sets. Must sell remainder. Lewis, 1 Wilton Terrace, Pelynt, Cornwall. Tel: 0503-20832.

■Sony ICF-2001 communication receiver, Keyboard entry, in good working condition; operating manual and mains supply unit included. Owner needing cash to upgrade to advance model. Will consider sending by COD to buyer. £99 ono. Yusof Choksy, Tel: 0224 26277 ext 35 (office hours).

■Yaesu FT 1012D Mk 1 mike, fan dc-dc converter dc leads manual, £400 (no offers) also Video Genie EG3003 with internal cassette deck and accompanying software, £250 ono. Gareth, Tel: 061 766 3466.

■Yaesu FT707 transceiver, FP707 power supply FV707 antenna tuner unit. All in good working order, £490. Brian G1D1J. Tel: 061 865 2955.

■Codar AT5 with power supply, £25. 20m (new), 15m, 10m, Reyco traps, £25 the set. Hatfield RF bridge LE300A, £15. Collector's surplus Morse keys (over 50 available), list sae please. Adana 5 x 3 printing machine with type (needs new rollers), £40. G3IRM, 2 Briarwood Avenue, Bury St Edmunds, Suffolk IP33 3QF. Tel: (0284) 4318.

■Exchange my new Icom IC24G 2M synth. mobile rig with two mounts, power leads, and Bantex ¾ whip, perfect working order for any 40 or 40/80 track single sided disc drive 5¼ inch, suitable for BBC model B. Must be perfect working order. Paul Martin, 3 Birch Close, Broadstairs, Thanet, Kent. CT10 2NF. Tel: Thanet (0843) 61448 or 20592.

■Standard C8800 2M FM synthesized Tx/Rx 1W/10W. Complete with mobile mount and original packing, £170. Tel: Taunton (0823) 54826.

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£82 ono. Prefer buyer inspects and collects Blackpool area, postage extra. Tel: Martin 0253 45431.

■ ZX81 + 16K RAM £29. JWR 10M FM rig £25 or swop for ST5 terminal unit, general coverage RX or 2M linear. Barry Stone G6SRE Tel: Ashford Kent (0233) 25991.

■ Skyleader 35MHz FM radio control outfit one power model with engine plus one glider two engines both boxed, one new plus other bits and pieces all good condition £200. Also super 8 movie outfit, Manimex compact camera sound projector £70 both or would exchange for 70cms multimode ATV TX plus camera or would exchange model goods for 2M synth hand held with nicads and charger. Melfyn Allington, 13 Bronallt, Groes, Denbigh, Clwyd, LL16 5RT. Tel: 074 570 469 GW1AKT.

■ 2M FM amplifier by Catronics Ltd 11.5W in 40W out plus spare new 11.5 in 40 out transistor and circuit etc £25 two meter speech processor with plug to fit a Yaesu transmitter £15. Tel: Nelson 68548.

■ BBC model B micro-computer OS1. 2 mint condition boxed and guaranteed cost £400 will sell for £320 with £80 software. Tel: Bolton 391954.

■ RAF Xtal monitor, provision for 6 internal, 1 external 10X xtals, requires 120V. HT, 2V LT transit case: £6. Type 10 warbling xtal marker, requires 350V HT, 12V (or 3V) LT: £7. Unused R1155 replacement coil unit, geared drive: £3. RAE, 75ohm, 100W, dummy load, plus power meter: £9. Heathkit SWR meter, 'Tatty' case, but in good order: £8. Pye 'Cambridge' 4 metre amateur band transceiver, crystallised 70.26, 70.365, 70.400 MHz, plus PTT mic, or mobile or base station, requires 12v DC: £25. Aldis lamp in case with filters and mini morse key: £4. Mics, xtal, hand type: £4. 'Bullet-head' desk type: £2.50. Aluminium box with matching leather case, suitable homebrew 'handheld' project: £2. All items, collect or add postage/carriage. A W McNeill, 40 Turnpike Road, Newbury, Berks. RG13 3AS. Tel: Newbury 40750.

■ Yaesu FT780R 70. CMS XCVR, brand new cond boxed. £300 ono. D M Williamson, 30 Merlins Hill, Haverford West, Dyfed, SA01 1PQ. Tel: 0437 67256.

■ Sanyo RP8880G 9-Band receiver. Excellent condition, £85.00. Also R1155 wartime receiver need attention. New valves fitted. Buyer collects £5. Tel: Byfleet 40468.

■ FRG7 boxed with manual, plus MGC7 LED neg display unit plus perspex dust cover. Little used. Absolutely mint condition. £145 ono. Tel: Dronfield (Derby) 0246 410545 (evenings).

■ Alpine stereo cassette deck, very good condition, with instruction manual, £30 (post included). Also HAC two valve short wave receiver, with instructions and headphones. Requires HT and LT batteries or power supply. Ideal for beginner SWL'er. Good results. £12 (post included). David Wyatt, 6 Whittington Road, Oswestry, Shropshire, SY11 1HY.

■ Yaesu FT290. Very good condition. Nicads, 5/8 whip magmount, pre-amp. £190. GW6CEL. Tel: 023 987 548.

■ Circuit diagram and/or workshop manual for GEC communications receiver type BRT400D. Good price paid or will pay for loan of same. Tel: 0526 7222.

■ Fully protected PSU 13.8V 30A £40. Iambic Keyer £11. Electronic Keyer £6. Pye Cambridge £10. Creed paper tape reader type 6S6 £4 R1155 receiver no valves but I believe comp £6. I have two tuners made by Acoustical one is AM, the other FM, need at £3 each. 2KV PSU for linear £25. ELC10 43-05 TV tuners 50p TV type crystals 50p. Tel: 0664 500228.

■ Drake units wanted. All types but particularly model MN4C L7E, L75E, L4E, TR4CW, TR5, TR7, TR7A, MN2400, MN7. Also all noise blankers and units for TR4 or TR7 line UPS. Tel: 0742 666169 after 7pm, or write to B G Havenhand, 410 Manchester Road, Sheffield S10 5DR.

■ Trio R600 communication receiver, good working order, few marks on case, otherwise, good condition, with instruction manual, dc operation kit. £150 ono. Tel: 654 1882 (Croydon).

■ BBC model B computer complete with wordwise disc - doctor basic 1 + basic 2 £300 also G3LIV RTTY terminal unit complete with software £55. G S Beynor GW3WSU QTHR 04468 261 Bungalow No 1 Racial - Decca TX Station Llancafán Barry S Glam CF6 9AE.

■ Exchange AVO 9MkII multimeter. Eagle RF signal generator 120KHz to 500MHz Lernakit oscilloscope CR70A communications receiver for HF transceiver Tel: Leeds 732295 after 6pm.

■ Good double beam scope wanted, fair price paid - Tel: 0560 21180 (Ayrshire)

■ Marconi generators, TF801D £55, TF1064B £75, teletype 33TC £40, heathkit H14 line printer RS232 cost £250 accept £110, Eddystone EB35 £30, Seafarer RT100 VHF marine transceiver £75, twin cassette telephone answering machine £65, LCD digital multi-meter £20, Grundig 26 inch CTV £30, all one or why? Tel: Bill 0222 617245

■ Operating handbook or instruction manual for Shibaden model FP-71K CCTV camera with electronic viewfinder will buy or copy. Tel: 0935 25225.

■ BBC model B in exchange for Jobo CPA2 colour processor or could be interested in test gear. Tel: South Ockendon 857248 (days) or Purfleet 6859 (evenings or weekends)

■ 2m mobile with SSB. F Petzing, 70 Barnet Way, Mill Hill, London NW7 3AN Tel: 01 959 7908.

■ Cash waiting for following Icom equipment: IC751, SM6, PS30 or similar, AT500, SP3, IC2KL 2KLPS and IC290D. Contact GW4 MTY QTHR or ring 0269 844061 anytime.

■ Yaesu FP707, FC902, MD1B also FDK 750E and SEM50 linear/preamp 2m gear. Contact GW 4 MTY at QThr or ring 0269 844061 anytime.

■ Good HF TRX all WARC bands eg FT 101 ZDMK III, ICOM 740, FT 101E MKIII etc. Tel: Felixstowe 282526. William Baker, 5 Princes Gardens, Felixstowe, Suffolk IP1111 7RH.

■ VHF wavemeter, VSWR meter, and power meter required by amateur setting up station. Chris Wheeler Tel: Reigate (07372) 41510.

■ General coverage receiver. Must be good cash on hand and will pay carriage. Arthur Lockpont, Crog Ganol, Llanedinen, Menai Bridge 713764 Anglesey, N Wales.

■ Trio TS120V or TS130V HF transceiver. Cash waiting. A Stone, 122 Stradbroke Road, Lowestoft, Suffolk NR33 7HX.

■ B40 receiver circuit or service manual required. Also circuit etc for B28/CR100 receiver. B Riseley, GPO Box 215C, Hobart 7001, Tasmania, Australia.

■ I/O port or software for Sharp MZ700 computer in exchange for electronic exposure meter for darkroom. Mr R Mackay, Broch-Robbie, Brora, Sutherland, Scotland KW9 6NE.

■ Collector seeks very old transistor types. Good prices offered for rare specimens, especially point contact transistors. List of wanted types available on request, or list what you have for offer. Old semiconductor data books and sheets also wanted. Mr Andrew Wylie, 18 Rue de Lausanne, 1201 Geneva, Switzerland.

■ Ferrograph 8 1/4 inch spoke type clip on tape spool in good condition. Will exchange Eagle RF field strength meter type RF45, never used. Or cash. A G Rose, 23 Midhurst Rd, Kings Norton, Birmingham 30. Tel: 021 458 5374 evenings.

■ Any 13.8V PSU more than 15 amps fully protected. Please state condition and price required. Please ring between 6pm and 9pm only or write to Colin Mitchell (G6TDV) 61 Weeping Cross, Stafford, ST17 0DQ. Tel: 0875 661771.

■ Early Amateur Radio Equipment up to around 1935; Clandestine 'Spy-Set' radios, Paraset, type A Mk1, type A MkII, Mk122, Polish and American, also manuals, accessories and incomplete sets for spares, 1920; early 1930's wireless, Amateur Radio magazine and trade catalogues for reference, research, pre-1930 valves for collection and restoration. Tel: John Baker, 01-794-0823 anytime.

■ YIG tuned oscillator 2-4GHz, also HP851 8551B Spectrum Analyser. Tel: 0202 709037.

■ Sweeper data, plug-ins, accessories for Telonic SM2000 sweeper. HF amateur bands transmitter. Must be cheap. Faulty unit OK if with data. If anyone has a Maplin modem working on a Nascom II please contact me. Ralph Taylor, GW2 HCJ, Bwlch Glas, Penrhyndeudraeth, Gwynedd LL48 6RU. Tel: 0766 770637 evenings.

■ Any CCT diag: using INT CCT TMS 1000 MP0096 as door chime. And/or data sheet of TMS 1000 MP0096. Mr S C Kinnoo, M.I.E. Reduit, Mauritius. Tel: 6-1239.

■ Any of the following valves (boxed) 6BA6, 6BA7, 12AT7, 6DC6, 6AQ5, 12AX7, 6AL5, 5Y3GT, OA2, 12AU7. Tel: Manningtree 4336.

■ Would like to know of any books or illustrated magazine articles which takes beginner from zero knowledge to shortwave receiver construction without assuming any technical knowhow on beginner's part. Practical not theoretical bias. Preferably each part should be clearly illustrated. I Barrow, Flat One, 1 Newman Ave, Carnegie, Vic. 3163, Australia.

■ Circuit diagram of any valve operated cassette recorder would consider purchase handbook, magazine or book containing circuit mono or stereo. E J Scudder, 'Lynwood', Blinckrake, Cockermonth, Cumbria CA13 0QP. Tel: 0900 822388.

■ Information on the Hammerlund-Super Pro receiver. HF 1250Kc-40MHz, which I hope with your help to repair. I require circuit diagrams and need to know of any spares that are available. Actual

FREE SMALL ADS

We are pleased to be able to offer readers this free Small Ad Service to enable you to sell unwanted equipment or advertise for your 'wants'.

Simply complete the order form below, although we will accept ads not on our order form. Feel free to use an extra sheet of paper if there is not enough space on the order form. Send to: **Radio & Electronics World** Small Ads, Sovereign House, Brentwood, Essex CM14 4SE.

DEADLINE

We will endeavour to include all ads received by 19 January 1984 in the March issue. Ads received after this date will be included in the next available issue.

CONDITIONS

We will not accept trade advertisements. We reserve the right to exclude any ad.

WANTED

■ 934MHz CB Transverter with or without antenna. Please state price required. All replies received to this AD will be answered. M Marsden, 205 Moss Lane, Burscough, Nr Ormskirk, Lancs L40 4AS.

■ FT707 FM or FT77 FM and FP700 FC700. I have cash and standard C8900 2M FM 5 mem. 10W scan, mic and safety mic plus gutter mount and 7/8 whip. All perfect. Phone Keith, (G40CH) QTHR, 0543 376366 (West Mids) (Weekends). Keith Dickens, 26 Knaves Castle Ave, Brownhills, West Mids WS8 7PN.

■ RAE course 'ICS'. Others also considered. Tel: Peterborough 222552 (evenings).

■ TV game tank battle based on the AY-3-8710 chip came out in 1978. Also car race TV game wanted and CB sets. Please write with details to D Martin, 6 Downland Garden, Epsom, Surrey KT18 5SJ.

■ For Drake R4C. 4-NB noise blanker. Also 4KC or 6KC AM filters. Plus any extra crystals or any bits and pieces for R4C. For Eddystone 1004-RE1 receiver filter 3 and range switch knob and tuning knob Brian Tel: 01-736 6581 (evenings) or 01-736 4656 (mornings)

■ Fairmate AS32320 scanning receiver. A Blair, 55 Burnopfield Road, Rowlands Gill, Tyne and Wear, NE39 1QQ. Tel: 0207 544342

FREE CLASSIFIED ADS

WANTED

model not known, willing to refund any expenses incurred. Contact Keith Stokes, 33 The Crescent, Boney Hay, Walsall, Staffs WS7 8PA.

■Collins 51S-1 + National HR0500 including low frequency preselectors. Eddystone 880/2 and handbook. Racal RA17 including SSB and Panoramic Adaptors also any information or handbooks on Racal receiving equipment and accessories. WHY? - Private or Dealers to arrange shipping to Australia. Terry McGrath, 43 Ivanhoe Street, Bassendean. W.A. 6054, Australia.

■Will pay hard cash for QSL cards from Antarctic bases, islands. No Falklands please. All such cards welcome whether ancient or modern. I also buy Pitcairn cards particularly pre-war examples and can offer at least £3 each for these. Old real photo type picture postcards used or not showing interesting village scenes or events also needed. Send on approval and postage repaid. John Heys, G3BDQ, Whitefriars, Friars Hill, Guesting, Near Hastings, TN35 4EP.

■Prinzound Stereo Radio, model T2200, must be OK on AM, wanted for spares for AM. Range OSC coil required. Carriage cost and cost of item will be paid. Mr P Trayers, 6 Woodfield Road, Bebington, Merseyside, L63 3DX. Tel: 051 334 5109.

■25 watt RF module for Icom IC255. Device number SC1011. GW6KZU. 26 Traffwll Road, Caergeiliog, Holyhead, Gwynedd LL65 3NE. Tel: (0407) 741702.

■Good mains transformer for Solartron CD1016 oscilloscope, or complete non-worker with working PSU. Phone for details. Tel: 0503-20832.

■Cabinet and front panel for AR88LF would exchange Pye based station aerial or high speed 8 channel paper tape reader. Tel: West Drayton 441031.

■Can anyone build or supply me with a body worn RF detector to detect bugs. A kit or design would

do. Also needed a meter which will record small voltage fluctuations on telephone lines to detect phone taps. D Ram, Gas House Lane, Maudlin Park, Tavistock, Devon PL19 8ED. Tel: 0822 3242.

■FC902, AT230, IC720 (A) plus PSU. TS430 plus PSU. Clive. Tel: 0279 28857.

■Recent model, Professional Rx Racal 1218 or similar. Will inspect and collect within 50 miles. Tel: Taunton: 75776.

■Have AOR 245 1-5 watt 2m handheld (similar to IC2E), 140-150MHz in 5KHz steps, repeater shifts, helical and telescopic whips, mobile and base chargers, PSU's etc. Swap for ICF 2001 or similar (CR2021, DX400) etc. P Bridges G6DLJ, Tel: Southampton 0703 891975.

■Datong D70 morse tutor. 40 foot telescopic lattice tower. P Sullivan, Tel: Manningtree 4336.

■Aircraft generator input 24V output 80V 1600tHz. Also R9/APN4 Lorán receiver. J Brown, 57 Mountbatten Road, Braintree, Essex. Tel: 0376 45023.

■Palm IV or TR3200. Anything for 70cms band. Portable or mobile - ex commercial Starphone mobile, Pye, Storno or Motorola rig. Want to get something going - write with detail and price. Will collect at own cost in UK. Richard, 50 Roper Lane, Queensbury, Bradford, West Yorkshire. BD13 2DQ.

■Please help, badly needed, info on Racal RA17L receiver and companion unit 'Selector-Protector'. Workshop manual, circuit diagrams, operators handbook etc. Also data for associated equipment like RA63 etc. Your price paid for above data in good condition. Selling, Yaesu RX ATU, 500KHz filter, Ham International MMII, conversion to 10M?. 2KV PSU for 813 linear. Phone Eddie any eve or weekend. Eddie Green, 53 Holden Road, London N12 7DP or phone 01 445 0528.

■Buy or borrow for copying, manual and/or circuit diagram for Storno VHF radiotelephone, type CQF 13C-36M. J Pell, 42 Mulgrave Street, Scunthorpe, South Humberside. DN15 6DQ. Tel: Scunthorpe 854286.

■Circuit diagram for Telequipment S42 Service scope. Reward for any one who can help. M C Walker, 96 Sunny Bank, Hull, North Humberside, HU3 1LF.

■Dartmoor prisoner doing 5 years is in need of a battery operated Stereo Record Player. Cannot afford much but will endeavour to save up in excess of £10. Condition not important and need not be in working order. Write only to J51721 Freeborn, c/o H M Prison Dartmoor, Princetown, Yelverton, Devon.

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DEADLINE AND CONDITIONS

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