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1976

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PRACTICAL WIRELESS

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BRITAIN'S PREMIER MAGAZINE FOR THE DO-IT-YOURSELF RADIO AND ELECTRONICS CONSTRUCTOR

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Stereo separation 30db
Supply required 20-30v
at 90 Ma max.

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A top quality stereo pre-amplifier and tone control unit. The six push-button selector switch provides a choice of inputs together with two really effective filters for high and low frequencies, plus tape output.

Frequency Response + 1dB
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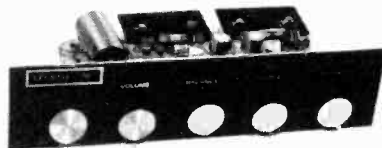
- Sensitivity of Inputs:
1. Tape Input 100mV into 100K ohms
 2. Radio Tuner 100mV into 100K ohms
 3. Magnetic P.U. 3mV into 50K ohms
- P.U. Input equalises to R1AA curve within 1dB from 20Hz to 20KHz. Supply 20-35V at 20mA. Dimensions—290mm x 80mm x 35mm.

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MK60 AUDIO KIT:
Comprising: 2 x AL60's 1 x SPM80, 1 x BTM80, 1 x PA100, 1 front panel and knobs. 1 instruction booklet. **COMPLETE PRICE £27.55 plus 62p postage.**

TEAK 60 AUDIO KIT:
Comprising: Teak veneered cabinet size 16 1/2" x 11 1/2" x 3 1/2", other parts include aluminum chassis, heatsink and front panel bracket plus back panel and appropriate sockets etc. **KIT PRICE £8.20 plus 62p postage.**

STEREO 30 COMPLETE AUDIO CHASSIS



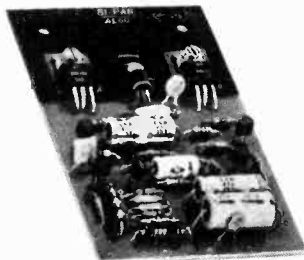
7 + 7 WATTS R.M.S.

The Stereo 30 comprises a complete stereo pre-amplifier, power amplifiers and power supply. This, with only the addition of a transformer or overwind inputs i.e. high quality ceramic pick-up, stereo tuner, stereo tape deck etc. Simple to install, capable of producing really first class results, this unit is supplied with full instructions, back front panel, knobs, mains switch, fuse and fuse holder and universal mounting brackets enabling it to be installed in a record plinth, cabinets of your own construction or the cabinet FI performance with a minimum of installation difficulty (can be installed

TRANSFORMER £2.45 plus 62p p & d

TEAK CASE £3.65 plus 62p p & d.

£15.75 P & P 45p.



AL 60

25 Watts (RMS)

VAT ADD 12 1/2%

- Max Heat Sink temp. 90C.
- Frequency response 20Hz.
- Distortion better than 0.1 at 1kHz.
- Supply voltage 15-50v.
- Thermal Feedback.
- Latest Design Improvements.
- Load—3,4,5, or 16ohms.
- Signal to noise ratio 80db.
- Overall size 63mm. 13mm.

Especially designed to a strict specification. Only the finest components have been used and the latest solid-state circuitry incorporated in this powerful little amplifier which should satisfy the most critical A.F. enthusiast.

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Stabilised Power Supply Type SPM80

SPM80 is especially designed to power 2 of the AL60 Amplifiers, up to 15 watts (r.m.s.) per channel simultaneously. With the addition of the Mains Transformer BMT80, the unit will provide outputs of up to 1.5A at 35V. Size: 63mm, 105mm, 30mm. Incorporating short circuit protection.

INPUT VOLTAGE 33-40V. A.C.
OUTPUT VOLTAGE 33V. D.C. Nominal
OUTPUT CURRENT 10mA-1.5 amps
OVERLOAD CURRENT 1.7 amps approx.
DIMENSIONS 105mm x 63mm x 30mm
TRANSFORMER BMT80 £2.60 + 62p. postage

£3.00

equipment mono and other modules for Stereo

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35^{RMS} W power Amp!

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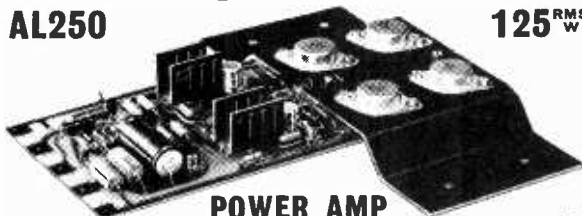
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Maximum supply voltage	15-60v
Power output for 2% THD	35 watts R.M.S.
Harmonic distortion	0.1%
Load impedance	3-8-16 ohm
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Sensitivity for 25 watts O/P	280mV R.M.S.
Max. Heat sink temperature	90°C
Dimensions	102mm x 64mm x 15mm
Mounting	2, 4BA fixing holes in heat sink
Fuse requirements	1.5A

AND for those who need more P-O-W-E-R

AL250



POWER AMP

Specially designed for use in—
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Hi-Fi, Sound reinforcement systems

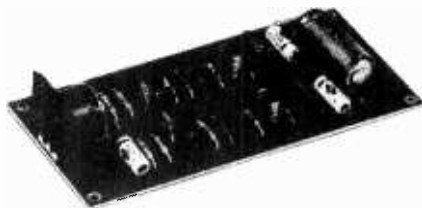
SPECIFICATION:

Output Power: 125 watt RMS
Continuous
Operating voltage: 50-80
Loads: 4-16 ohms
Frequency response: 25Hz-
20kHz Measured at 100 watts
Sensitivity for 100 watts output
at 1kHz: 450mV
Input impedance: 33K ohms

Total harmonic distortion
50 watts into 4 ohms: 0.1%
50 watts into 8 ohms: 0.06%
S/N ratio: better than 80dBs
Damping factor, 8 ohms: 65
Semiconductor complement: 13
transistors 5 diodes
Overall size: Heatsink width
190mm, length 205mm, height
40mm

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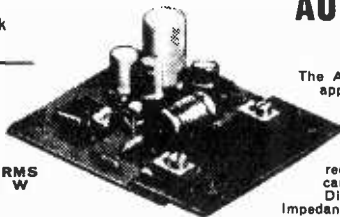
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f = 1KHz 75mV. R.M.S. Size: 75mm x 63mm x 25mm.

AL20: 5w R.M.S. **£2.65** AL30 10w R.M.S. **£2.95**



PA12 £6.50

NEW PA12 Stereo Pre-Amplifier completely redesigned for use with AL20-30 Amplifier Modules. Features include on/off volume, Balance, Bass and Treble controls. Complete with tape output.
Frequency Response 20Hz-20KHz (-3dB)
Bass and Treble range ± 12dB
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Supply requirements 24V. 5mA
Size 152mm x 84mm x 33mm

PS12

Power supply for AL20-30, PA12, S450 etc. Input voltage 15-20v A.C. Output voltage 22-30v D.C. Output Current 800 mA
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AC volts: 0 to 1.5, 0 to 500 in 10 ranges. DC volts: 0 to 0.5, 0 to 500 in 12 ranges. DC current: 0 to 25 µA, 0 to 10/10 amps 10 ranges. Resistance: 0 to 100 ohms, 0 to 10/10 meg ohms in 4 ranges. Decibels: -20 to +62 db in 10 ranges. Size: 64 x 44 x 24 inch.
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BARGAIN PROJECT BOX

A plastic box with moulded extrusion rails for PC or Chassis panels with metal front plate fitted with four screws (all supplied).
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All built and tested, mounted on a plain aluminium chassis which measures 18" x 9 1/2" x 4" and which you can mount into a cabinet of your choice. Four controlled inputs, master volume, treble, middle and bass controls. 8/6 protected output. 100 watts clean into 8ohm 1/8s. Ideal for disco, music groups, F.A. and clubs. A bargain at £42 + £1 carr. + 8% VAT.

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12-0-12 volt 500m/a
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fixing centres 75mm
Our Price £1.20 + 8%

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This compact adaptor enables a large range of battery powered radios, and calculators to be more economically operated off the mains (220-240V A.C.) Instantly switchable for 6, 7.5 or 9 Volts; current rating is 250mA. A polarity reversing coupler is incorporated into the 2 metre lead which is terminated by a unique 4 way plug offering connections by 2.1 and 2.5mm sockets, 3.5 and 3.5mm plug. The sealed moulded unit is fitted with a 2 pin 5 amp mains plug and measures 47 x 30 x 63mm. Nominal weight: 0.22 kg.
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Good quality tape in well made screw type cassettes. Presented in single plastic cases.
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Using standard phono plug connections. Input impedance: 50,000 ohms. Maximum input: 50 mv. Maximum output: 1.8v (at 1% distortion). Gain: 10mv input, 0.5v output. Frequency response: 30-20,000 Hz. S/N ratio: over 60 dB. Power supply: 240v AC. Dimensions: 101 x 63 x 40mm.
Our Price £5.50 + 12 1/2% VAT.



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Any 5-54p, 10-61-00, 50-64-50. Your choice from the list below.

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Colour Valves—PL508, PL509, PLS19, PY500/A. All tested. 30p each.

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Press Button UHF Tuners—4 Button Transistor—British made—£2.50 each.

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Aerial boosters can produce remarkable improvements on the picture and sound, in fringe or difficult areas.
B11 For TH stereo and standard VHF/FM radio.
B12—For the older VHF television—Please state channel numbers.
B45—For Mono or colour this covers the complete UHF Television band.

All boosters are complete with battery with Co-ax plugs & sockets. Next to the set fitting. £3.60

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All prices include VAT. P&P 20p per order. Please send uncrossed P.O. or Cheques for returning if we are out of stock of Bargain Packs or older types of new valves.

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Redifon G410 Tx/Rx 2-16MHz, 4 Xtal channels (no xtals) or ext. VFO. USB/LSB/CW/AM. Brand new chassis containing PA & Driver sections (no valves—needs Z759 & 2 6146, £19 extra). Complete front end, but 3 PC boards missing. Supplied with separate PSU, 12 or 24V input (state which). Tx O/P 100W. £40.00. Tx/Rx only, £32; PSU only, £16. Circuit diagrams supplied.

Redifon G450 Low Power Transmitter (Exciter). SSB/AM/CW 100mW output. Fully tunable 1.5-30MHz (Needs ext VFO). 10 switched channels xtal controlled (no xtals). All transistor construction. Standard mains supply voltage 240V 50Hz. Brand new units. Needs SSB filter. £40.00.

BUMPER BARGAIN PARCEL
25 kilos—yes, 3cwt. Clearing several stores to make room for more goods, mountains of miscellaneous items too time consuming to list, so we're disposing of it in this manner. You'll get a great variety of components and made-up units, contents too varied to describe, but excellent value at only £8.00.

71B BARGAIN PARCEL
Hundreds of new components—pots, switches, resistors, capacitors, PC Boards with semiconductors, loads of odds and ends. Amazing value at only £22.90.

CHASSIS OFFER
Limited quantity of these chassis containing the following: 44 x 2N 1613, 8 x ZT84, 44 multiturn trim pots, 2 x 1 way rotary switches, stacks of resistors, capacitors (inc tant) etc etc. Only £3.50.

FIBREGLASS PCB
Large quantity of offcuts, all usable pieces. 200 sq ins, single sided, double sided or mixed £1.40.

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All have mains primaries: 6-0-6V 100mA 95p; 9-0-9V 100mA £1.00; 12-0-12V 100mA £1.05; 6-3V 1½A £1.95; 6-0-6V 1½A £2.30; 9-0-9V 1A £2.55; 12-0-12V 1A £2.85; 12V 5A £3.45; 12V 5A £4.35; 30-0-30V 1A £3.80; Multitapped types: 0-12-15-20-24-30V 1A £3.20, 2A £4.50. Bell transformer in white case 0-8-12V 1A £1.80.

VEROBOARD
100 sq ins good size offcuts, all 0-1, all-15 or mixed. £1.30, 17 x 32" x 0-1 £2. Pins 1 or 15 single or double sided 40p/100.

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50V ceramic plate capacitors, 5% 10 of each value 220F to 10000F, total 210 caps. £2.70.
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Large quantity always available; 31b asstd. £1.75; 71bs £3.65; 561b £18. Pack with about 500 components inc. at least 50 transistors £1.00; Pack with 12 High quality panels, inc. IC's, power transistors, multiturn trim pots hundreds of small signal transistors, resistors, zeners, capacitors, etc. Only £2.75.
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Probably one of the lowest priced meters featuring a mirror scale, overload protection and 20000 ohms per volt sensitivity. A modern styled meter with unusually clear scale markings. Ranges: DC Volts 0-0.5-2.5-10-50-250-1000 A.C. Volts 0-10-50-250-1000 DC Current 0-50µA-25mA-250mA Resistance 0-50K-500K-5M (Mid Scale 300-3K-30K) db's 4 ranges —20db to +42dB. Size 130 x 90 x 42mm. £12.20.

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Case type 1410, 205 x 140 x 40mm £2.90
200 Miniature resistors, 1, 2 and 1W, mostly carbon film. £2.20
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Plastic Boxes—Professional quality, two tone grey polystyrene boxes with threaded inserts for mounting PC boards.
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200 miniature electrolytics, but many unmarked so only £1.90

5V 12A REGULATED POWER SUPPLY
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Contains 1lb Ferric Chloride, 100 sq ins copper clad board, DALO Quick Dri Etch, resist pen, abrasive cleaner, 2 miniature drill bits, etching dish and Instructions. £3.65

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Anhydrous technical quality in 1lb double sealed packs. 1lb £1.00; 3lbs £2.16; 10lbs £5.60; 100lbs £39.00.

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Miniature Plug-in types: 1250 ohm 4c/4p; 700 ohm 4c/5p, PO 3000 type 650 ohm with 6 heavy duty c/o contacts (Ex-equip) 75p; 10 for £4.90. 6 1" easily removable reeds in 3580 ohm coil 50p; Plug in relay, B76 Base 17mm dia x 42mm long 10k coil 1c/o contact 40p. Omron MK3P plug in relay. 230V AC coil, 3 sets 10Ac/o contacts. £1.20. Same with 12V coil £1.20. Bases 30p.

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Min. type, body length 1", 10 for 50p; 100 £5.50; 1000 £25.50.

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Edge Connectors, gold plated 0-1" 40 way single sided 60p; 78 way double sided £1.50. Heat shrink sleeving, 1m length 0-125" dia 10p. Spiral binding 3m x 3mm 20p. 100mfd 16V Tantalum Caps, 10 for 50p, 33k or 1.8k 1½ resistors, 20 for 25p. Polythene connector blocks, 12 way 2A or 5A 20p; 10+18p; 25+16p. Insulation tape—Red, Black, Blue, Yellow, Green, White or Brown. 5yds x 0.75" 16p per reel, 10+9p; 25+8p. 1½" Quick blow fuses 1, 1½, 2, 3, 5, 10 or 15A 30p per doz of one value, 10 doz mixed £2.50. 200mfd 10V capacitors vert mntg, long leads 14 for £1.80. 20 ohm GPO balanced armature telephone insert 30p. 250V 2½A bridge rect 50p. Ex-computer tape: 10½" NAB reels of high grade ½" magnetic tape, £2. 100 reels £13, 100 reels £75. Much cheaper to callers.
BC348S transistors—40V, 100mA, 300mW. Hfe 200 @ 2mA. 12 for 95p; 100 for £6.50.

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HY5 Pre-amplifier

The HY5 is a mono hybrid amplifier ideally suited for all applications. All common input functions (mag Cartridge, tuner, etc) are catered for internally. The desired function is achieved either by a multi-way switch or direct connection to the appropriate pins. The internal volume and tone circuits merely require connecting to external potentiometers (not included). The HY5 is compatible with all I.L.P. power amplifiers and power supplies. To ease construction and mounting a P.C. connector is supplied with each pre-amplifier.

FEATURES: Complete pre-amplifier in single pack—Multi-function equalization—Low noise—Low distortion—High overload—Two simply combined for stereo.

APPLICATIONS: Hi-Fi—Mixers—Disco—Guitar and Organ—Public address

SPECIFICATIONS:

INPUTS: Magnetic Pick-up 3mV; Ceramic Pick-up 30mV; Tuner 100mV; Microphone 10mV; Auxiliary 3-100mV; Input impedance 4-7k Ω at 1kHz.

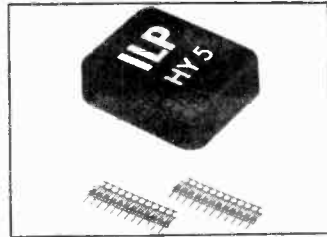
OUTPUTS: Tape 100mV; Main output 500mV R.M.S.

ACTIVE TONE CONTROLS: Treble \pm 12dB at 10kHz; Bass \pm at 100Hz.

DISTORTION: 0-1% at 1kHz. Signal/Noise Ratio 60dB.

OVERLOAD: 38dB on Magnetic Pick-up. **SUPPLY VOLTAGE** \pm 16-50V.

Price \pounds 4.75 + 59p VAT P&P free.



HY30 15 Watts into 8 Ω

The HY30 is an exciting New kit from I.L.P. It features a virtually indestructible I.C. with short circuit and thermal protection. The kit consists of I.C., heatsink, P.C. board, 4 resistors, 6 capacitors, mounting kit, together with easy to follow construction and operating instructions. This amplifier is ideally suited to the beginner in audio who wishes to use the most up-to-date technology available.

FEATURES: Complete Kit—Low Distortion—Short, Open and Thermal Protection—Easy to Build.

APPLICATIONS: Updating audio equipment—Guitar practice amplifier—Test amplifier—audio oscillator.

SPECIFICATIONS:

OUTPUT POWER 15W R.M.S. into 8 Ω ; **DISTORTION** 0-1% at 1-5W.

INPUT SENSITIVITY 500mV. **FREQUENCY RESPONSE** 10Hz-16kHz—3dB.

SUPPLY VOLTAGE \pm 18V.

Price \pounds 4.75 + 59p VAT P&P free.

**Available
June '76**

HY50 25 Watts into 8 Ω

The HY50 leads I.L.P.'s total integration approach to power amplifier design. The amplifier features an integral heatsink together with the simplicity of no external components. During the past three years the amplifier has been refined to the extent that it must be one of the most reliable and robust High Fidelity modules in the World.

FEATURES: Low Distortion—Integral Heatsink—Only five connections—7 amp output transistors—No external components

APPLICATIONS: Medium Power Hi-Fi systems—Low power disco—Guitar amplifier

SPECIFICATIONS: **INPUT SENSITIVITY** 500mV

OUTPUT POWER 25W RMS into 8 Ω **LOAD IMPEDANCE** 4-16 Ω **DISTORTION** 0-04% at 25W

at 1kHz

SIGNAL/NOISE RATIO 75dB **FREQUENCY RESPONSE** 10Hz-45kHz—3dB.

SUPPLY VOLTAGE \pm 25V **SIZE** 105 50 25mm

Price \pounds 8.20 + 77p VAT P&P free.



HY120 60 Watts into 8 Ω

The HY120 is the baby of I.L.P.'s new high power range. Designed to meet the most exacting requirements including load line and thermal protection this amplifier sets a new standard in modular design.

FEATURES: Very low distortion—Integral heatsink—Load line protection—Thermal protection—Five connections—No external components

APPLICATIONS: Hi-Fi—High quality disco—Public address—Monitor amplifier—Guitar and organ

SPECIFICATIONS

INPUT SENSITIVITY 500mV.

OUTPUT POWER 60W RMS into 8 Ω **LOAD IMPEDANCE** 4-16 Ω **DISTORTION** 0-04% at 60W

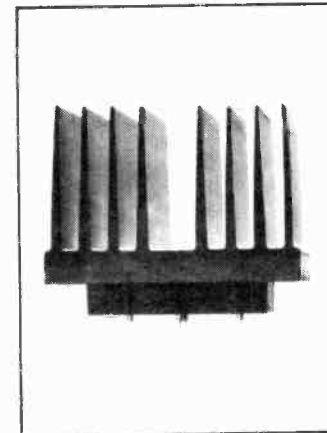
at 1kHz

SIGNAL/NOISE RATIO 90dB **FREQUENCY RESPONSE** 10Hz-45kHz — 3dB **SUPPLY VOLTAGE**

\pm 35V

SIZE 114 50 85mm

Price \pounds 14.40 + \pounds 1.16 VAT P&P free.



HY200 120 Watts into 8 Ω

The HY200 now improved to give an output of 120 Watts has been designed to stand the most grueling conditions such as disco or group while still retaining true Hi-Fi performance.

FEATURES: Thermal shutdown—Very low distortion—Load line protection—Integral heatsink—No external components

APPLICATIONS: Hi-Fi—Disco—Monitor—Power slave—Industrial—Public Address

SPECIFICATIONS

INPUT SENSITIVITY 500mV

OUTPUT POWER 120W RMS into 8 Ω **LOAD IMPEDANCE** 4-16 Ω **DISTORTION** 0-05% at

100W at 1kHz.

SIGNAL/NOISE RATIO 96 dB **FREQUENCY RESPONSE** 10Hz-45kHz—3dB **SUPPLY VOLTAGE**

\pm 45V

SIZE 114 100 85mm

Price \pounds 21.20 + \pounds 1.70 VAT P&P free.

HY400 240 Watts into 4 Ω

The HY400 is I.L.P.'s "Big Daddy" of the range producing 240W Into 4 Ω ! It has been designed for high power disco address applications. If the amplifier is to be used at continuous high power levels a cooling fan is recommended. The amplifier includes all the qualities of the rest of the family to lead the market as a true high power hi-fidelity power module.

FEATURES: Thermal shutdown—Very low distortion—Load line protection—No external components.

APPLICATIONS: Public address—Disco—Power slave—Industrial

SPECIFICATIONS

OUTPUT POWER 240W RMS into 4 Ω **LOAD IMPEDANCE** 4-16 Ω **DISTORTION** 0-1% at

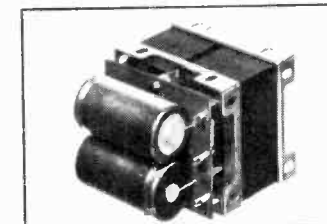
240W at 1kHz.

SIGNAL/NOISE RATIO 94dB **FREQUENCY RESPONSE** 10Hz-45kHz — 3dB **SUPPLY VOLTAGE**

\pm 45V

INPUT SENSITIVITY 500mV **SIZE** 114 x 100 x 85mm

Price \pounds 29.25 + \pounds 2.34 VAT P&P free.



POWER SUPPLIES

PSU36 suitable for two HY30's \pounds 4.75 plus 59p VAT. P/P free.

PSU50 suitable for two HY50's \pounds 8.20 plus 77p VAT. P/P free.

PSU70 suitable for two HY120's \pounds 12.50 plus \pounds 1.00 VAT. P/P free.

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POWER AMPLIFIER MODULES 30—240 WATTS



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- Distortion typically 0.2%
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- Response 30HZ-30KHZ
- Fully short & open circuit proof
- Sensitivity suits most mixers.
- Built-in surge suppression & compensation
- Twin D.C. & output fuses.
- Top-grade components throughout.

30 Watts rms	60 Watts rms		120 Watts rms		240W rms
SA308 30W rms/ 8 ohms £9.50	SA604 60W rms/ 4 ohms £12.50	SA608 60W rms/ 8 ohms £13.50	SA1204 120W rms/ 4 ohms £14.50	SA1208 120W rms/ 8 ohms £21.00	SA2404 240W rms/ 4 ohms £25.50

POWER SUPPLIES FOR THE ABOVE MODULES—READY WIRED & FUSED ON GLASS FIBRE PCB

PM301	PM601/4	PM601/8	PM1201/4	PM1201/8	PM1202/4	PM1202/8	PM2404/1
For 1/2 SA308 £9.90	For 1/2 SA604 £12.50	For 1/2 SA608 £12.50	For 1 SA1204 £12.50	For 1 SA1208 £12.50	For 2 SA1204 £19.50	For 2 SA1208 £19.50	For 1 SA2404 £19.50

DISCO MIXER MODULES Mono or Stereo (with Auto Fade)



Printed circuit module assembled & tested with all components ready mounted.

Mono £19.50 Stereo £29.50

* Front panel to suit £3.50

- Mixes two decks, tape and mic.
- Wide-range bass & treble controls on mic. & music channels.
- Variable autofade (mic. override)
- Ample headphone power.
- Needs only front panel* knobs and selector switch.
- Push-pull monitor circuit.
- 20HZ-20KHZ—Noise -77dB
- Comprehensive wiring details provided
- Perfect for incorporation in your system

ALL PURPOSE CUSTOM—MIXER MODULES (Mono or Stereo)



- Using these modules, mixers may be built to your specification up to 20 Channels, mono or stereo, or a combination of both. System 7000 custom-mixer modules have monitoring facilities too!

INPUT MODULES

- Accept low/high 2 mics, ceramic & magnetic cartridges, all musical instruments & line signals
 - Low-noise circuitry—high grade components
 - Wide-range bass & treble controls (23dB)
 - 20HZ-30KHZ Noise -80dB
 - Echo sound/return etc easily fitted
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Stereo—IM7001S

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- Only one required per mixer track whether mono or stereo
- Feeds up to ten power modules
- Complete with 1W monitor amplifier
- Accepts up to 20 input modules
- Will match any other make of amplifier

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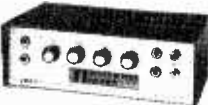
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*Ready to plug in & use
* Mono or Stereo

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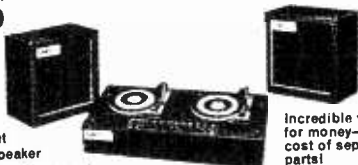
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- Twin BSR decks with autostop & lift arm



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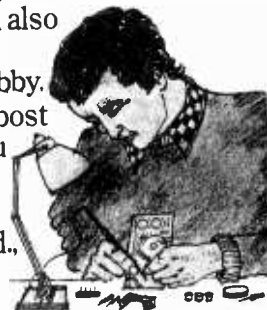
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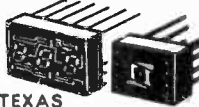
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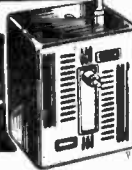
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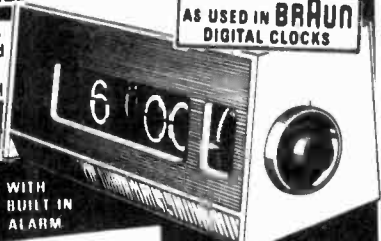
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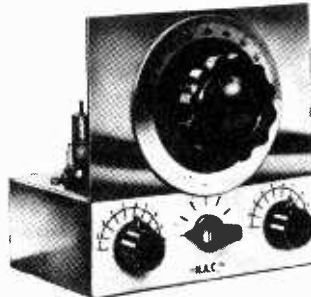
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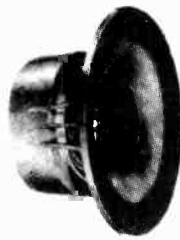
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WITCH HUNT

THE Home Office has withdrawn permission from Amateurs to use the double sideband suppressed carrier (DBSC) mode of transmission. The excuses, I hesitate to call them reasons, are both puzzling and illogical. For example, the Radio Regulatory Division has suddenly discovered that DBSC is not authorised by International radio regulations. The fact that Amateurs have been permitted this mode for some time, that Amateurs in other countries will continue to have this privilege, does not seem to have been discovered by the Home Office—yet.

Perhaps the funniest excuse given by Whitehall Bureaucracy is that DBSC is difficult to monitor unless special equipment is used. If the Home Office stands by this, then it is quite plain that it does not understand DBSC and not much else about the reception of radio signals, either. Amateurs have been able to receive DBSC using their ordinary communications receivers so perhaps the professionals should ask the Amateurs for guidance and technical tuition?

This is not the first time that the white-collar brigade has found itself embarrassingly inferior. Back in 1968 many Amateurs were sent an official communication asking them to send morse more slowly! They were sending CW faster than the licence permitted, too fast for the professionals to read!

Certainly the RSGB has received protests on the subject. The Society position is that it will simply not accept the ruling and it has reopened the matter with the Home Office. The point is put that Amateurs do not deserve to lose privileges, but unless complacency is replaced by keen interest they are going to lose more. Remember, there is a major international communications conference due in 1979. Frequency space is precious; why waste it on Amateurs? Take it away, they're complacent, they won't do anything.

Ah! you may cry, what about all that valuable "self training" which government is so keen Amateurs should have? And the simple reply is, "What self training?" How many Amateurs today construct their own transmitters or receivers? Very, very few. Many trot out and purchase black boxes for a few hundreds of pounds. Are not those who do this helping to reduce the Amateur Radio spectrum to Citizen Band status?

Let us not, then, throw brickbats at the Home Office. Instead, let us approach it with solid, well founded arguments. Don't let's bitch at the RSGB for "doing nothing". Any Society will act on instructions from its members. So let us instruct. The ball is firmly in our court. If we don't play it, the pendulum may well continue to swing towards less and less privileges for the individual and then towards fewer and fewer rights. LIONEL E. HOWES—Editor

VACANCY ON PW

A vacancy exists on PW for a Technical Sub-Editor. Applicants should have a good knowledge of modern radio and electronic techniques. The work is very interesting consisting mainly of the preparation of articles for publication. Previous experience of this work is desirable. Write with brief personal details to the Editor, **Practical Wireless, Fleetway House, Farringdon Street, London EC4A 4AD.**

NEWS...

Laskys move north

WELL Scotland, you need never feel as though you are missing out on something ever again. Laskys—that well known southern emporium of HiFi fame has spread its wings north of the border. Two new shops have recently been opened—one at 53 High Street, Ayr, and the other at 133, King Street, Kilmarnock.

Both shops previously traded under the name of Valley Electronics who earlier this year were taken over by Audiotronics, the brand name of Laskys.

Up, Up and Aiwa

AIWA, who despite the economic climate of late, claim an ever increasing growth rate in the UK Hi-Fi market, have decided to consolidate their sales and service network in this country. To this end, they have established a new subsidiary company—Aiwa Sales and Service (UK) Ltd.

This new organisation, the seventh overseas venture to be set up by the parent company, came into official existence from the 1st August 1976. The address of the new company is:—8 Grey Cain Road, Watford, Herts.

Walls have ears

YOU all know about those wires that run around the walls of houses and whose owners are 'paid one shilling a year, or something like that, for the privilege of letting the company use their bricks for support. Well most are owned by British Relay who use the lines for their cable TV network. Now it seems, British Relay are making these cables available to local authorities and community groups wishing to operate local radio stations.

The offer is said to be restricted to areas where the

NEWS...

NEWS...

NEWS...

cables are not already fully loaded with local and national BBC programmes and independent radio channels. In offering to make its cable network available, British Relay says its charges will not be too high as the company does not wish to make a profit for as long as the programmes remain experimental and are run as a social service.

Why not invade?

AT a loose end? Live in Hastings? Then trot along to the Hastings Electronic and Radio Club, where they will welcome any people interested in amateur radio, HiFi, television, digital techniques etc.

The club meets at the Social Centre Hall, Middle Street, Hastings, on the third Wednesday of each month at 7.30 p.m. At the present moment, there are about 50 members, but the more that join, according to the club's publicity officer Martin Oliver, the more diverse the activities within the Electronics field could become.

We apologise . . .

It appears that the address given for information concerning the RAE Courses, published in October was incorrect. The correct address is as follows:—J. Brett (Principal), Cove School, St. John's Road, Farnborough, Hants.

Kiddy calc

ISUPPOSE it was inevitable really, that after just about every adult has a calculator to play with, a company would have the rather dubious "bright idea" of producing a calculator for the—wait for it—6 to 9 age group.

Manufactured by Texas Instruments, the "Little Professor" calculator is described as being more of a learning aid, with up to 16,000 pre-programmed basic maths

problems. Apparently the child selects the type and degree of difficulty of the problem and then leaves the rest up to the machine. An answer is then made—if correct the complete equation appears for one second, and then the next problem appears. How-



ever if an incorrect answer is given the problem reappears. Three wrong answers are allowed, after which the machine senses that its user is not quite with it, and automatically displays the correct answer.

After ten problems, this little monster—sorry "professor"—will display a score out of ten, which would swiftly be followed by the next ten problems. How's that for progress?

Read-all-about-it

IT'S not often the chance of a free booklet comes up, but Marconi Instruments are offering a 12-page illustrated booklet explaining the TF2008 AM/FM signal generator. This generator is claimed to be suitable for measurements on almost every type of communication and broadcast receiver operating up to 510MHz, and for specialized receivers such as those used for navigational aids. It has eleven tuning bands covering 10kHz to 510MHz and possesses the ability to be used as a sweep generator.

The booklet describing this signal generator is entitled "All in

One Package" and is available from *Publicity Department, Marconi Instruments, Longacres, St. Albans, Herts. Tel: St. Albans 59292.*

Go on—have a go!

JUST starting for the fifth successive year is the 3M Young Poet Awards Scheme. This scheme requires school-children to compose poems and record them onto open reel tape or cassettes.

Last year, nearly 2,000 tapes were entered by schools throughout the United Kingdom, and this year's contest (1977) will again be for entries in three categories. The three categories are as follows:—

- (a) Junior—7 to 11 year olds. (no more than 20 lines)
- (b) Secondary—12 to 15 year olds. (no more than 30 lines)
- (c) Senior secondary—16 to 18 year olds. (no more than 30 lines)

To make the contest more attractive, 3M will be awarding trophies, a heavy duty Wollensak cassette recorder for the winners' schools, plus individual prizes for the winners and runners-up. Judging will be by a panel comprising poets and educationalists, while entries will be judged on originality, technique, command of English and oral presentation. An unusual rule in this contest is that poems will be accepted in standard English or a local dialect.

Full details and entry forms are now available from Nigel Cobb, 3M United Kingdom Limited, 3M House, Wigmore Street, London W1A 1ET. Tel: 01-486 5522. Closing date for receipt of entries is January 26th 1977.

Capacitance Meter PW Sept. 76

SEVERAL readers have contacted us because they have had difficulty in locating the FET, type 2N5485. Stocks are available from: C.T. Electronics, 270 Acton Lane, Chiswick, London W4 5DG. Tel. No. 01-994 6275.

SIMPLE

VHF CONVERTER

F. G. RAYER G3OGR

THE usual specialised VHF converter, such as may be employed for 2m reception, employs a crystal-controlled oscillator and there will often be multiplier and RF stages present. These features assure a high degree of frequency stability and high sensitivity, but they add considerably to the cost and complication of the unit and the fixed frequency oscillator also imposes limits on the VHF bands which can be received.

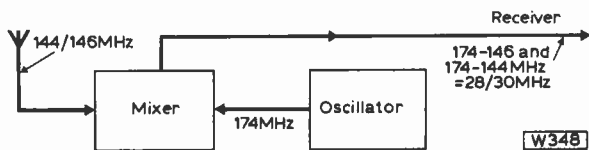


Fig. 1: Simple diagram illustrating the method of changing frequency in the converter.

A converter with a tuned oscillator, and no RF stage, is by comparison very inexpensive and straightforward. It has the great advantage that it is readily adjusted for a whole range of reception and output frequencies. Naturally frequency stability cannot equal that of a converter with a crystal-controlled oscillator but many popular VHF receivers use a capacitor tuned oscillator and are able to perform satisfactorily. So the converter described here has no RF stage (which does not contribute very greatly to sensitivity in any case) and a tuned oscillator. If it is enclosed in a metal box as described, and placed to the side or back of the receiver out of the way, no hand-capacitance or similar troubles will be found to arise.

COVERAGE

The converter may be used from about 70MHz up to a limit which depends somewhat on transistors and other details but may exceed 200MHz. The relationship between received, oscillator and output frequencies for 2m reception is shown in Fig. 1. Here, the oscillator is HF of signal frequency and set to 174MHz. The difference between oscillator and aerial frequencies is 28 to 30MHz, so tuning the receiver over this band provides reception on 144 to 146MHz. The reception frequency need not, of course, be that given, but will depend on the signals required.

The output frequency, to which the receiver is tuned, need not be 28 to 30MHz. However, a band around 24 to 30MHz or so will usually have the advantage of reduced breakthrough of unwanted

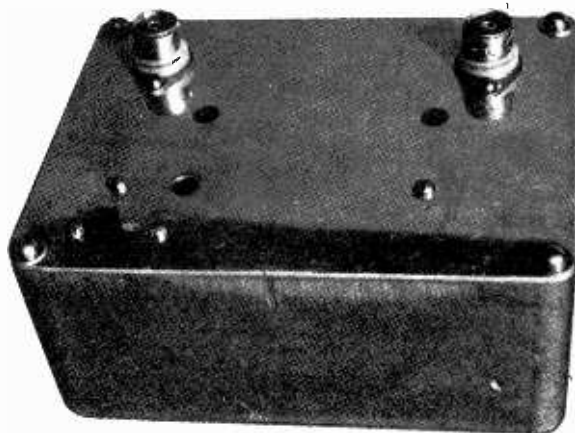
signals. It is not necessary that a 2MHz segment be tuned as reception is obtained outside this limit, with a consequent increase in the width of the band upon which reception is possible. It is general not to use a receiver frequency of lower than 4MHz.

For the oscillator, frequency is determined by the converter input and output frequencies (e.g., the range tuned by the receiver, and the frequency of the wanted VHF signals). The oscillator is either higher in frequency, or lower in frequency, than the wanted VHF signals. The frequency difference equals the receiver frequency. This will be clear from Fig. 1. In practice, it will be found easy to tune the oscillator until the wanted signals are heard with the receiver. However, Fig. 1 will be of aid in working out a convenient way to obtain coverage of a wanted VHF band.

THE RECEIVER

Such a converter is normally used in conjunction with a short-wave communications-type receiver which will usually tune up to about 30MHz. It will also have a metal case which will keep down unwanted signals such as broadcast or other interference, and the receiver will usually have an RF amplifier.

Reception obtained depends on the facilities on the receiver. Many VHF signals are AM and will be received in the usual way, but for CW or SSB reception, the receiver must have the capability for



Not a very prepossessing box! But after adjustments it can be placed out of the way.

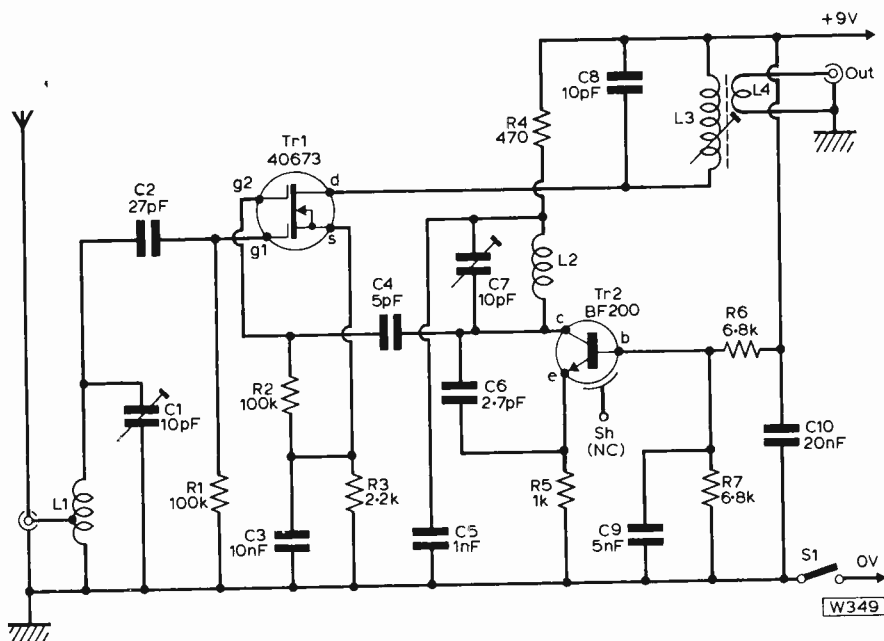


Fig. 2: Complete circuit of the converter. Trimmer C1 peaks the signals while trimmer C7 sets the operating frequency. The maximum frequency of operation will depend largely upon the characteristics of the transistor Tr2, a BF200.

this mode. Other VHF signals will be FM, but whether or not these can be tuned in satisfactorily depends on the receiver selectivity, as reasonable FM detection may be possible by tuning the signal on to the slope of the IF passband. Good quality or high fidelity FM reception should not be expected by this means.

CONVERTER CIRCUIT

This is shown in Fig. 2 where L1 is the mixer aerial coil, and L2 the oscillator coil. Core-tuned coils are commonly employed but here tuning is effected by the small presets C1 and C7. This greatly eases band modification, because L1 and L2 are merely self-supporting coils soldered to pins and so can be changed in a few moments.

A co-axial socket is provided for the aerial. Many signals can be obtained by a short rod or stout wire,

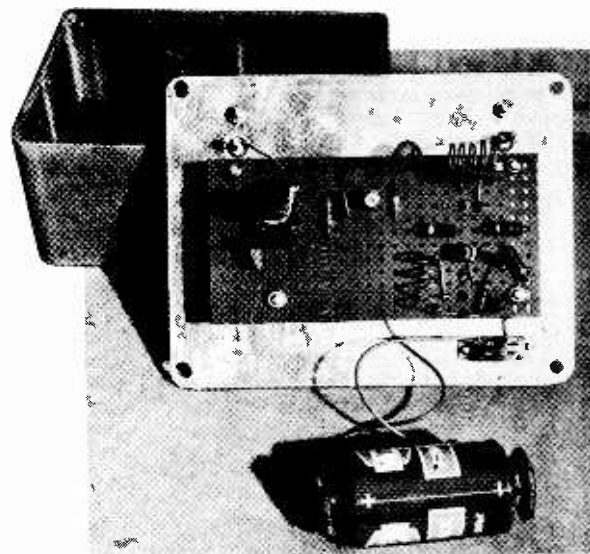
projecting vertically from this socket. Naturally an improved aerial will greatly increase range and volume, while the use of a co-axial lead from it to the converter reduces capacity effects which can be present with the rod. For 2m the aerial can be simple dipole about 993mm (38½in) overall, either wire or self-supporting tube, with a feeder from the centre. Such an aerial is easily made to fit on a light wooden post. It will also give reception over quite a wide range of frequencies.

Transistor Tr1 is the mixer with injection from the BF200 oscillator Tr2 via C4. In the converter constructed, the grounded base oscillator Tr2 functioned up to 230MHz.

The mixer drain feeds the resonant circuit L3 which is broadly tuned to the receiver frequency and it has a coupling winding L4. This allows a co-axial lead to be used to the receiver, to avoid unnecessary pick-up of interfering SW signals.

★ components list

Resistors	
R1 100kΩ	R5 1kΩ
R2 100kΩ	R6 6.8kΩ
R3 2.2kΩ	R7 6.8kΩ
R4 470Ω	All ½ or ¼W 5%
Capacitors	
C1 10pF trimmer (Jackson 'Tetter')	C6 2.7pF
C2 27pF	C7 10pF trimmer, as C1
C3 10nF	C8 10pF
C4 5pF	C9 5nF
C5 1nF	C10 20nF
All fixed capacitors are ceramic	
Semiconductors	
Tr1 40673	Tr2 BF200
Miscellaneous	
Metal box about 125 x 100 x 50mm (5 x 4 x 2in.) Plain veroboard 0.15in. matrix 95 x 48mm (3¾ x 1¾in.) Slide switch. Battery and clips. Coaxial sockets 2. Former 7mm with core. 6BA nuts and bolts.	



The finished board is bolted to the lid of the box and wires taken to the coaxial sockets and the on-off switch.

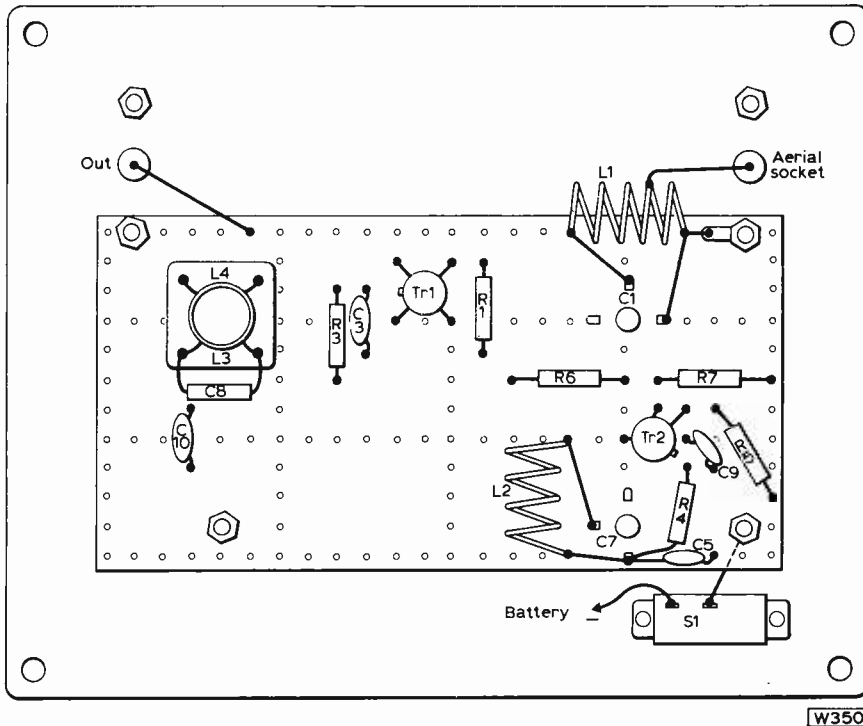


Fig. 3: Layout of components on top of the board. The coils are soldered to pins in the board thus enabling the coils to be changed easily if necessary. Details of the coils are given in the text. The tap on L1 should be about a third of total number of turns up from the "earthy" end.

CONSTRUCTION

The metal box used is slightly under 125 x 100mm (5 x 4in) and is about 50mm (2in) deep. Components are assembled on a 0.15in matrix perforated board about 95 x 48mm (3³/₄ x 1⁷/₈in), Fig. 3. First drill both board and box top together for the four 6BA mounting bolts and also fit the two co-axial sockets and on-off switch. The bolts are long enough to allow about 15mm clearance between board and box top. Components are mounted on both sides of the board, as in Figs. 3 and 4. Short connections are used and the by-pass capacitors can be small disc ceramic types. Pins are fitted as shown to take L1 and L2. If trimmers other than those listed are used take the upper or rotating part to the earth line for C1, or C5 for trimmer C7. The tags MC are connected to the metal box through the mounting bolts. When the board has been wired, fit it as in Fig. 3, and connect co-axial and switch leads. Holes match with L3 and the trimmers.

INDUCTORS

The output coil L3 is wound on a 7mm cored former and has 15 turns of 26SWG enamelled copper wire close wound. Core adjustment allows this to be tuned around the 28 to 30MHz region. L4 is 4 turns of insulated wire, overwound on L3, at the "earthed" end (C10). To cater for a receiver tuned over the 14 to 16MHz range the coil may have 28 turns of 32SWG enamelled copper wire, with a 22pF parallel capacitor instead of the 10pF shown. L4 is then 7 turns.

For 70MHz a coil covering about 65 to 95 MHz can be wound with 20SWG wire. Use 9 turns, with an outside diameter of 10mm and with turns spaced to occupy 20mm. For 144MHz a coil covering about 115 to 150MHz is suitable and this can have 5 turns, 9mm outside diameter and 20mm long. For frequencies over about 175MHz, two turns, 8mm outside diameter and 18mm long, may be used.

Reception frequency is of course critically depen-

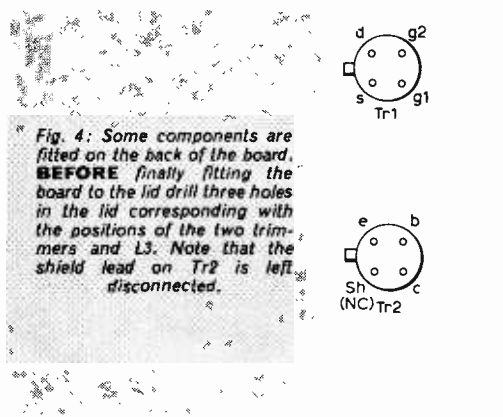
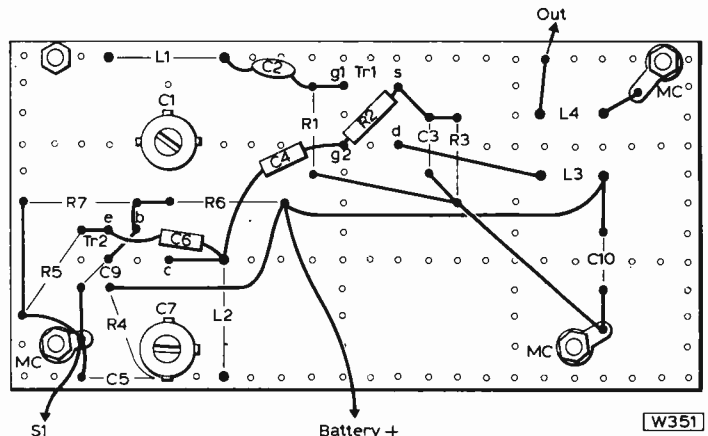


Fig. 4: Some components are fitted on the back of the board. BEFORE finally fitting the board to the lid drill three holes in the lid corresponding with the positions of the two trimmers and L3. Note that the shield lead on Tr2 is left disconnected.

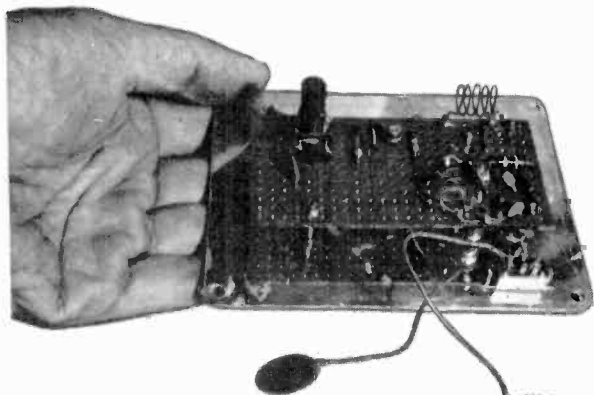


dent on L2 and C2. Here, an oscillator range of about 85 to 115MHz can be obtained with 6 turns, 9mm outside diameter and 9mm long. For 2m a smaller coil is necessary and it can have 4 turns, being 8mm outside diameter and 17mm long, for a coverage of about 140 to 185MHz. The smallest coil found able to sustain oscillation was 1 turn, 9mm outside diameter, which covered from 190 to 230MHz.

TUNING ADJUSTMENTS

The core of L3 is peaked up for best reception at about the middle of the range to be tuned on the receiver (as example, say 29MHz). This can be done with any signal received through the converter or by temporarily placing an insulated lead from the short-wave aerial against the drain lead to L3 and tuning L3 for best reception of a signal in the actual receiver band.

L1 tuning is extremely flat and can simply be peaked up when some VHF signal of about the wanted frequency is heard. Very flat tuning here does not indicate any fault. To find the wanted signals, slowly rotate C7 throughout its range. When set, tuning is carried out on the receiver. The tuning of L2 is critical and slight re-adjustments will move the VHF signals up and down the receiver scale, which may be useful to dodge troublesome SW breakthrough.



Another view of the converter. Initial testing can be done with it out of the box. Final frequency adjustments must be made with the converter and battery in the box. Ensure the battery cannot move about inside the box.

C6 was found to provide oscillation over the ranges described. Oscillation is not occurring if a milliammeter in series with R4 shows no change in current when L2 is touched with the fingers. In these circumstances reception through the converter is impossible. With other transistors, it may be worth modifying C6, but the value necessary here is very small.

Tuning the receiver over a wider band gives greater VHF coverage, but if the receiver is tuned too far from the frequency to which L3 is set, sensitivity will be reduced unnecessarily. As signals at the converter aerial circuit may be either above or below the oscillator frequency, strong signals will break through on the second channel. This is unlikely to matter unless the receiver is used at a rather low frequency. For example, wanted and second channel aerial frequencies will be separated by 60MHz if the receiver is tuned to 30MHz, but only by 8MHz if the receiver is used on 4MHz. **PW**

TELEVISION

DECEMBER

● THE ART OF ALIGNMENT

Many people are shy about receiver alignment. Amongst possible causes are the absence of any standard work on the subject, the confusing instructions so often found in service manuals, and the fact that if you don't know what you're doing you can end up in a right mess. Harold Peters sets out to cure this state of affairs, giving a down to earth account of the principles along with practical examples and hints.

● THE PHILIPS G8 COLOUR CHASSIS

We are often asked about the popular Philips G8 colour chassis introduced in 1970. A. Denham describes the fault conditions he has commonly encountered on the various versions of it.

● TV SOUND CIRCUITS FOR THE CONSTRUCTOR

It is sometimes desirable to be able to monitor the TV sound through a separate system to that in the set. Recent TV sound i.c.s. make the construction of a complete TV sound channel particularly simple - using just one i.c. and a handful of components. A practical, tested design is given, also an output stage which can be used to replace obsolete i.c. sound output stages.

● SERVICING TELEVISION RECEIVERS

Les Lawrey-Johns reports on his experiences with Philips 320 solid-state monochrome chassis.

● MINIATURE VHF AERIALS

When Bands I and III are re-engineered the question of new v.h.f. TV aerials will arise. Need they be such massive structures as the present generation? Recent developments indicate that much smaller types are practicable. Pat Hawker reports.

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LIGHTS MINDER

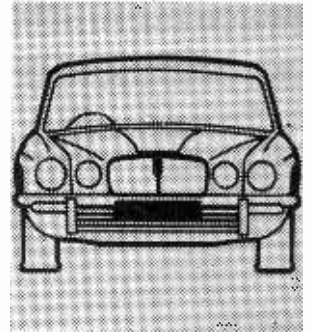
E. VAUGHAN



HAVE you ever left your works in the evening, returned to your car and found the battery flat because you forgot to turn off your lights when you got out of the car that morning?

Probably very few can say they haven't at least left the lights on, even if the result wasn't a flat battery, and the approaching dark mornings must increase the chances of repeating the mistake, or, for the lucky ones, making it for the first time.

Now a simple electronic device will ensure that your memory isn't the last line of defence.



Theory of operation

The unit functions by looking at the state of the car's lights and of the ignition. When both are off the unit is happy, when both are on the unit is happy but when the lights are on and the ignition off then the unit complains by giving an audible note.

There are, of course, times when it is required to accept the condition of lights on only and, to avoid an unpleasant noise, an override is provided. However, when the override has been used it has to be cancelled when the ignition is switched on again or the unit complains once more with its audible note.

Circuit operation

The schematic for the unit is given as fig 1. In the circuit, which is an audio oscillator, the transformer and C2/R2 provide the phase shift and determine the frequency of operation. Because the tone isn't critical a wide range of capacitor and transformer types and values can be used. Those given in the parts list proved quite successful.

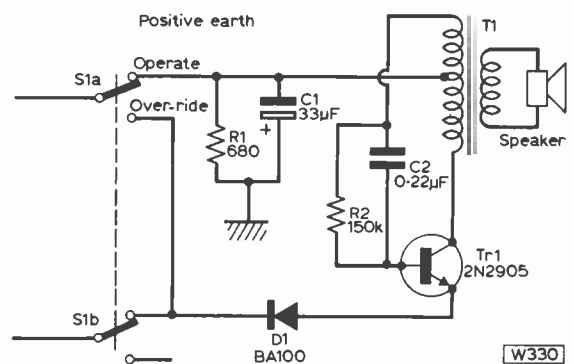
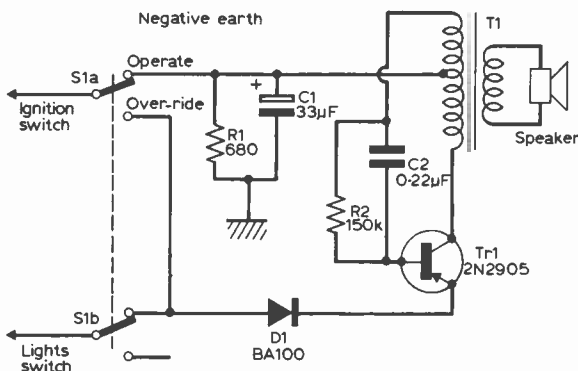
Resistor R1 provides a DC return path under certain circumstances and capacitor C1 acts as an AF bypass for it, preventing any of the audio being lost.

The unit derives its power from the car's battery but it can be via either the ignition switch and earth or the light switch and earth depending on the mode of use.

Switch operations

With the selector switch S1 at normal, the ignition off and the lights off there is no supply to the unit

Fig. 1. The schematic diagram of the unit for both negative and positive earth systems. Please note that Tr1, in the positive earth unit, should be BC107 as per parts list.



W330

★ components list

R1	=	680Ω 10% ½W
R2	=	150kΩ 5% ½W
C1	=	33μF, 25V, electrolytic
C2	=	0.22μF, any material
D1	=	OA90, or equivalent
Tr1	=	2N2905, for Negative Earth BC107, for Positive Earth
T1	=	Transformer, miniature transistor output, 1.2kΩ primary, 8Ω secondary
S1	=	Double pole, Double throw, toggle, lever or slider
Speaker	=	To suit the output transformer
Miscellaneous,	=	Perforated board, Board pins, Transistor Socket (if required), Switch Bracket

and it remains dormant. When the ignition is switched on, but the lights are not, there is a path to earth for the ignition voltage, via R1, but the remainder of the circuit is inoperative.

When the ignition and the lights are both on, the collector and emitter of Tr1 are at equal potentials so the circuit does nothing. If the ignition is turned off whilst the lights are on, the collector of Tr1 is returned to earth through R1 and the emitter is supplied with the battery voltage. Under these conditions the circuit will oscillate and produce the alarm.

With the selector switch in the override position, the supply from the light switch is left open circuit irrespective of the lights being on or off. The potential at the ignition switch is applied to the emitter of Tr1 through D1.

If the ignition is off, then, under this switch position, the unit is not energised and all is quiet even though the lights are on. However, when the ignition is switched on the battery potential is applied to the emitter of Tr1 and, since its collector is returned to earth via R1, the circuit oscillates and the alarm sounds as a reminder to return the system to normal. The alarm will, of course, stop when the switch is returned to the operate position.

Construction

The method used for mounting the components and the unit itself will depend to a large extent on the space available in the car and on the preferred mounting position.

In the author's case, sufficient space existed behind the dash panel so the components were mounted on a small piece of perforated board and bolted into a box. The box, less the normal/override switch, was bolted behind the dash. The switch was mounted on the dash handy to the ignition switch and wires run between the two.

If space permits, the board can be mounted on an aluminium bracket and the complete unit fastened into its resting place by the switch locking nuts.

The supply for the lamps is probably most conveniently taken from the switched side of the light switch itself, although if the location of the unit warrants it, it could be tapped off the lamp connector. The supply can be wired to either the parking lights or the headlamps. In the latter case make sure the headlamp flasher doesn't operate the warning. PW

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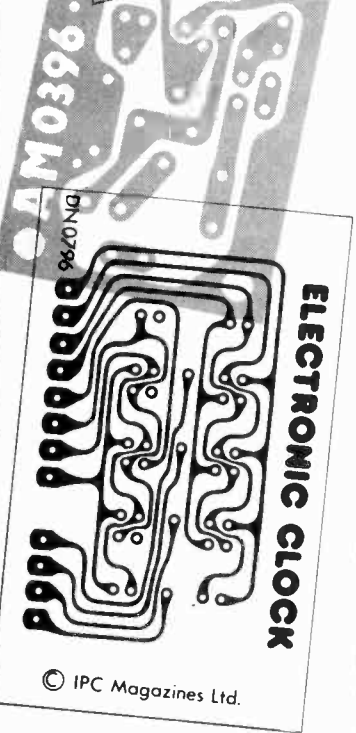
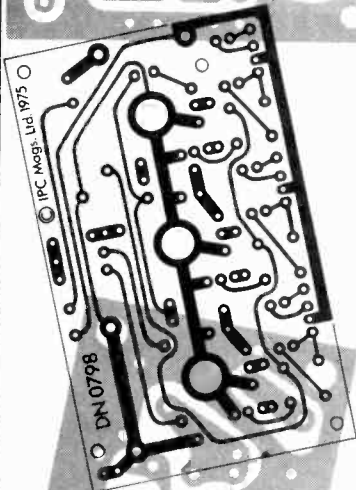
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AM 03



HOT LINES

FLAT PICTURE

Pilgrimages can be rather long, but perseverance can make all the difference. One person who is quite definitely persevering is a German researcher in Dortmund. His pilgrimage is to the shrine of the flat television tube. And he thinks his journey could be over within the next couple of years.

Already, this gentleman has built a prototype pocket television receiver with a 12×9 centimetre display—flat screen, of course. The prototype is black-and-white, but already there are plans to build a colour display. The favourites at the present state-of-the-art are electroluminescence and liquid crystal.

Don't think it's just a theoretical dream either. Quite apart from building a prototype, an automated system to produce the flat screens has been worked out and is not terribly expensive. Part of the system involves laying down thin film transistors directly on to glass in order to drive the screen.

One last thought. The researcher thinks that the system of the minute pocket television could be employed in a midget projection TV system. Presumably, boring programmes will be eyed at 12×9 cm while the Miss World contest would be projected on to the outside wall of the nearest freshly "Snowcemed" house.

EYE, EYE!

Bet you've often heard the expressions 'A backward glance', or having 'eyes in the back of your head'. American researchers are coming close to doing just that—they're trying to give blind people an 'eye' in the middle of their back!

Numerous systems are under current investigation, some showing greater promise than others. Perhaps the most obvious is the implantation of minute electrodes into the brain. The signals come from a tiny television camera and are converted into impulses which the brain would normally receive from the eye had it been working. Some success has been reported here but obviously the system is intricate and complex. One cannot just plug into the brain.

The newer research is tackling the problem differently and in a very intriguing manner. The researchers argue that the skin is sensitive to various pressures. So why not have some form of sensor system which simply feeds its output to a matrix of "pins" held in close contact with a patient—say to his/her back?

And it works! After about one month of training, a blind person is able to read one-inch high characters. With further training, very much smaller characters can be "read". One person who has tried out the system can get to work quite unaided. He uses public transport and walks a fair distance, too.

Admittedly this method does not allow the patient to see in the exact way that sighted people can, but the training to translate the electrode or needle sensations into 'visual' images seems to work and most certainly works in practice. Again, it doesn't involve any surgery and no insertion of probes into the brain.

Another researcher in this field also pursuing somewhat similar lines has an array of 1,024 electrodes which are held in contact with the stomach. By feeding it with signals from a vidicon attached to a microscope on a production line, a completely 'blind' operative can perform assembly tasks equal to more fortunate, sighted operators.

Some interesting facts have come to light during the experiments. For example, the minimum number of points needed to evoke 'sight' is 1,400. The human eye offers a resolution of some 20,000 points and admittedly when this comparison is made the experimental system does appear inadequate. But these are early days—look at the development of integrated circuits.

CENTRALLY HEATED ZENER

Whatever will those semiconductor manufacturers get up to next? This time they've fixed their beady little eyes on the zener diode. This device is commonly used to provide a stable voltage reference. In theory, all one needs is a zener plus a suitable series resistor and a stable voltage is

made available. As you've doubtless guessed, nothing is ever that simple. The zener diode has a weakness—it is sensitive to temperature variations and this thermal sensitivity alters the diode's stability. The semiconductor whizz kids decided to do something about the problem—they've built a chip to house a zener diode and a tiny heater which keeps the zener at a constant temperature. The result is that the tiny chip holds variations to $1\text{ppm}/^\circ\text{C}$ (one part per million per degree centigrade).

When winter comes and you're cold, just think of all those zeners sitting comfortable by their own little fires. Ain't life beautiful?

SOAPY MAGNETS

Bubbling with enthusiasm, that's a fair description of one Japanese company. It's excited about its latest product—a bubble memory. The industrious orientals have managed to cram 256,000 bits into a 9mm square chip. Each individual memory cell measures a tiny 16 micrometres and the 'bubbles' in the memory have slimmed down to only 4 micrometres.

The 'bubbles' are really minute magnetic domains. Thus a bubble is either magnetised or not magnetised, or is either a north pole or south pole orientated. This gives the yes or no, one or nought pattern suitable for memories.

MINIFLOPPY . . .

Talking about memories, have you heard about floppy discs. These are very thin discs of material which can be magnetised by a head as it spins round and stops etc rather like the pick-up arm and gramophone record.

Well, it just had to happen. Someones brought out a midget version called the Minifloppy (I like it, I like it). The storage of information has been carried out by using cassettes in many areas and the Minifloppy is aimed at that area of the market. This includes the microcomputer hobby market, according to the manufacturers.

Ginsberg

PRODUCTION LINES

bill tull

A well balanced pair!

Fresh from its debut at Audio '76 is Goldring's new turntable unit, the L90. This new model is belt driven and features an illuminated stroboscope together with an electronically controlled speed adjustment and shut-off mechanism. A redesigned ultra lightweight pick-up arm is also part of this new package, as is the wooden plinth and smoked Perspex cover.

To match the full potential of this new deck, Goldring have introduced a new cartridge called the G900E. Weighing in at less than 5 gms. it is claimed to track with precision at 1 gm.

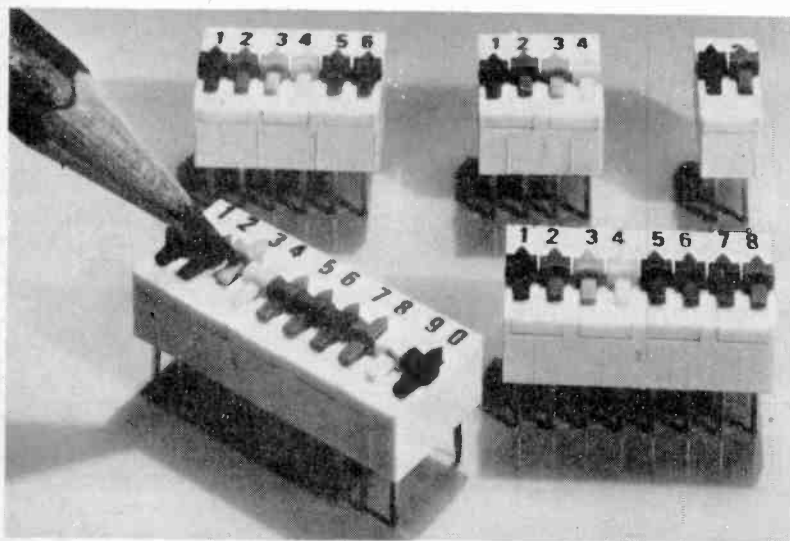
Also, just arrived from Goldring is the latest in Music Centres—the Lenco L3000. Units incorporated comprise an AM/FM tuner with stereo decoder, belt driven turntable unit, a stereo cassette tape recorder, and finally a high quality stereo amplifier. Price of the L90 turntable is £148.00, and for the L3000 £298.00 including

speakers or £252.00 excluding speakers. All prices are exclusive of VAT.

Goldring Lenco (Dept. PW), Angllan Lane, Bury St Edmunds, Suffolk. IP32 6SS.



Multi-DIL Switches for PCB mounting

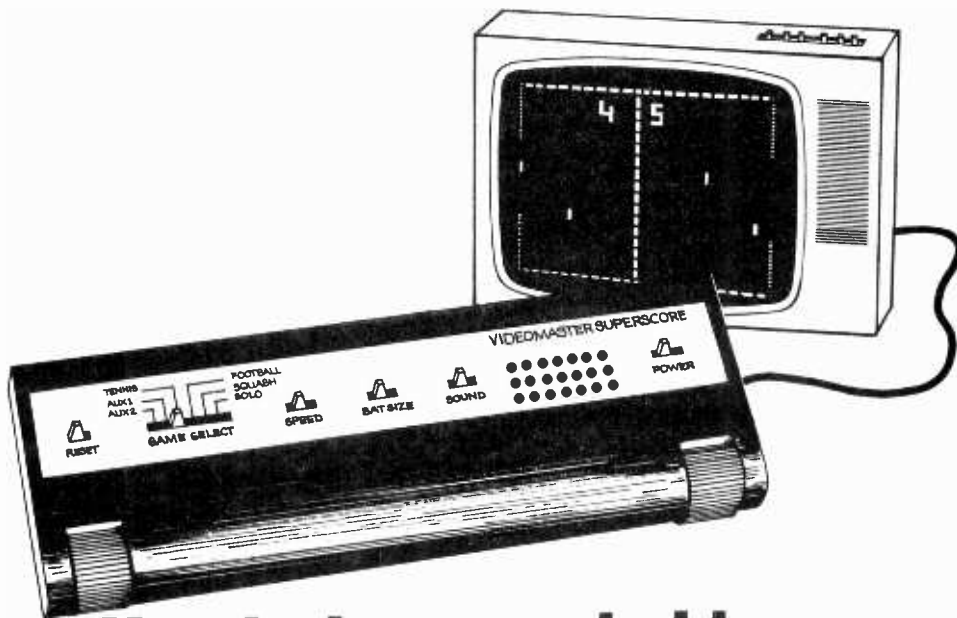


Erg Components have recently announced an entirely new range of Dual-in-Line switch modules called 'SpectraDIL'. These switches are available in 2, 4, 6, 8 and 10 pole versions, and range from 5 to 25mm in length. The basic single throw style has a white case with laterally operated arrow shaped sliders, coloured in accordance with the international colour code.

Features include gold plated spring loaded wiping contacts suitable for microvolt to low power switching and a typical resistance of 10milliohms. Useful life of these switches is claimed to be in excess of 10,000 operations at full 10VA rating.

Prices start from 10p per pole per switch per 100, and as all types are held in stock, the firm claim that despatch is immediate.

Erg Industrial Corporation Ltd., (Dept. PW), Luton Road, Dunstable, Beds. Tel: 0582 62241.



Here's the remarkable new **VIDEOMASTER™** Superscore Home TV Game Get it together for only £24.95

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ball speeds, automatic serving and much more. It runs on six 1½ volt SP11 type batteries (not supplied).

The Videomaster Superscore kit costs only £24.95 including VAT (recommended retail price of the ready built model is over £40.00) and comes complete with ready-tuned UHF or VHF modulator, circuit board with printed legend, all resistors, transistors and diodes, built-in loudspeaker, socket for mains adaptor, and, of course, the TV game chip itself.

Easy to put together the Superscore has full assembly instructions, circuit diagram and circuit description. Don't miss this chance to own the newest electronic game at such low cost.

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Dear Sir,



CB oggler!

In the July issue of *Practical Wireless* you wrote a most interesting article called "One flew over the Citizen's Band". Firstly let me say that to someone like myself, and many others who are eagerly awaiting the advent of a CB licence being available in this country, oh! what joy to be able to read those dreaded words "CB" in your magazine. Yes, for far too long many organisations and many individuals have looked down their noses at this mention of CB. So somewhere along the line at long last it has reached *PW*, and we can hope the Government departments concerned.

I agree all the way that we do not want a carbon copy of the US style jumble in and around the big cities, and I know that frequency allowance is the big, big problem. I am only a short-wave listener, no more, and have tape contacts in the States, who have sent recordings of CB-ers at work, so I know the jumble that results in over-crowding of the air-waves. Just tune in any time to the 25, 31 metre bands etc.

But can you give any idea of where and when, or who, or what concern motivated the idea of CB in the UK? I know you said that the problems were—"when, where and how?" But over the last few years any attempt to ask about CB and it being allowed here only resulted in a form being sent—so I could go to tech for a couple or more years and sit for my Radio Amateur licence—which is what I do not want! OK you can say that I'm wanting the easy way out, getting on the air for the cost of a licence over the nearest post office counter, but if it can happen not only in the USA, but

Canada, and Germany, Sweden, and even some eastern European countries—then why not here? So please—you have whet not only my appetite, but many of my friends too.

By the way, just for the record, I am 39 this year, so it is not the case of a kid getting on the air for a giggle, oh no. For far too many years I've oggled my pals CB-rigs fitted in cars, shacks etc, plus the genuine usefulness it can hold to the serious user. Many lives would be saved in Snowdonia for example, if the poor unfortunates had carried a small walkie-talkie with them, the limits are endless. So keep up the good work, and many thanks for your article.—**M. B. Walker** (Coventry).

Text book *PW*?

In reply to your leader article in the September issue of *PW* titled "Wireless or What?"

I have been receiving *PW* monthly for about 5 years and have always found it extremely good value for money. However, there seems to have been a gradual drop in the number of constructional projects which the reader of "modest means" can build. Even the Take 20 seems to have disappeared.

My suggestion is that each month there are three types of project. One could be a part of a more complex project, eg tele-tennis, etc. The second type could be a fairly complex project which could be featured in one month's *PW* and costing less than £20, and the final type should be similar to the Take 20 showing construction details of projects costing less than £5. The latter group would enable either the beginner or a reader of limited budget to build something regularly. Any or all of the projects in any one month could be "wireless" or "electronic" which would give plenty of scope.

Another suggestion is that each month there could be an article which would enable readers who would like to transmit to reach the City & Guilds radio amateur examination standard. Then more simple 2m equipment projects could be included. This may revive the almost unused 2m band.
D. Jewitt (Hull).

No Justice

To answer Nick Moyes and his friends, *PW* October 1976. Thousands of people such as farmers, climbers, boat owners and hikers want CB, people who have no knowledge or interest in the mechanics of radio, but who could make good use of a system which could possibly save their lives. It seems to be a strange state of affairs, where anybody can bang out 1.5W on 27MHz to play with a toy boat or plane, but radiate 100mW from a 'walkie talkie' on the same frequency, and you are in line for a £400 fine and/or six months in prison.

I agree that when CB comes to this country (and the sooner the better) there is a need for strict control, a licence to be produced before the purchase of equipment etc., but surely we are in a first rate position in this country to learn from the mistakes that have been made in other countries as regard to frequencies and licensing conditions. I think that anybody who has ever listened to US truck drivers on CB will agree that it makes far more entertaining listening than the only too predictable talk of the weather, and what dipole is being fed from which valve that radiates from our SW friends.—**Peter Jones** (Swansea).

No honestly!

On reading Mr. Dodd's letter in the September issue of *PW* criticising your magazine, I couldn't help but reply in defence.

May I point out to Mr. Dodd that without all this so called "electronic gimmickery" he talks of, the articles could so easily become boring. Magazines like *PW* must move with the times or be left behind in a rut. If it is valves you want, look through all your back issues for there are plenty to be found. As for "wireless", only my Grandfather calls it that now! (How about P.R. eh!)

I am sure there is enough radio (the modern term for the device which does the same, but a better, job as the wireless), to satisfy any enthusiast. Anyhow,

there are limitations beyond which the entire topic of radio can go no further without issuing all readers with an electronics degree. As PW publishes three or four articles twelve times a year, surely this point would soon be reached.

Perhaps the electronic (ugh) "gimmickery" will teach the old fashioned the new religion of semiconductors, and show them how infinitely more interesting, convenient and versatile they are than the outdated valve.

The revolution is well on the way to victory, and being a young man yourself Mr. Dodd, surely you can appreciate the advantages of semiconductors and adapt to their strange world easier than many. Being eighteen, I have bypassed valves and started on semiconductors (including I.C.'s) and found PW invaluable as a source of knowledge and practical, sound advice. I should hasten to add that I am not completely ignorant of valves (thanks to the "valveless" PW) and I know which I prefer!

If as you say PW is catering for the under twenties, good luck to them, for that is where their future custom is coming from. As to the oldies (i.e. over twenties, nowadays if you are over forty you are senile apparently) stop grumbling about what you are missing and turn on to the new kind of electronics, it's more fun, honestly! **Stephen A. Hill** (Leeds).

Bionic RSGB

With reference to W. M. Miller's (Cambridge) comments on my letter to yourselves, May issue, regarding the RSGB's attitude to publishing articles for the beginner.

Mr Miller states that in Technical Topics section of the Radio Communication, there have been many simple articles published. Well I have been receiving the Journal of the RSGB since the days of the "Bull" and the amount of articles printed for the beginner, certainly does not amount to many.

He also states that the RSGB is not a publishing house. This statement is a little odd, for if they can print articles on linear amplifiers, tunnel diodes, active and passive phasing techniques, etc, they can also print articles

for the novice. Not all the newly elected members of the RSGB, Mr Miller, are Electronic Wizards nor do they possess a Steven Austin Bionic Brain, they just want suitable articles dealing with the first steps of our wonderful hobby.

I can assure Mr Miller I am a fully paid up member of the RSGB, unlike G4CEX (although I share his views), I also greatly appreciate the very good work the Society does on behalf of the radio fraternity, but come on RSGB please cater for the beginner, for, after all, today's beginners are tomorrows licenced Amateurs. If Mr Miller wants a copy of my letter to the RSGB handing out Bricks and Bouquets I will gladly send him one. **A. J. Lees** (Bournemouth).

Toothless dog

Your comments in the editorial of the July PW are most unfair. You conclude the editorial by saying: "isn't that why we voted these people into Parliament—or have I got democracy all wrong?" Indeed you have got democracy wrong, Mr. Flowers, for you advocate compulsory membership of the RSGB who are in no way democratic and represent the minority of amateurs and an even minute minority of the general public. So how can you now speak of democracy?

If you believe that the government is not democratic then the RSGB must be less democratic, for on any major policy it does not take a vote or a general opinion, even within its own membership. For example, who wants repeaters on the 2m band? The RSGB don't really know, as the membership has never voted on it or even had a survey done. Also, what of the opinion of non-members? It is, I am afraid, a classic case of the very, very, noisy minority again. So if the RSGB follows this lead who wants to be a member and worse still a compulsory member?

The next statement is, "but the RSGB fights for the amateur bands." Oh! no it does not, only as a toothless dog. For it has no power or enforcement to back it up. It may well do better if it allowed, as trades unions do, some equal say from official

branches (not clubs) with a set voting system on major issues, to include non-members also.

I hope you publish this letter for it is very rare that anyone writes against the RSGB. However, I feel the time has come for some sensible comments to be made and questions asked.—**A. Leaver G4ECB** (Colne).

Too true

Mr. Alexander Dodd makes several statements in his letter "Valves" published in the September issue of PW one of which absolutely must be challenged. He complains about the lack of "Wireless" in a magazine of that title, purely on the basis that there are no valves to be found in the circuits, and that there is therefore no "Wireless". Surely, Mr. Dodd, you are aware that the first wireless sets used semiconductors in the form of crystal detectors and the valve was a later intruder. Thank goodness, I say, we have got rid of those nasty new-fangled valves and gone back to good old semiconductors.

He has, however, got a point when he queries the existence of the twin "Practicals", Wireless and Electronics. An example may be found in the issue in which his letter appeared, the PW "Easy-build Video Writer". Now had this article been about the display of characters using "Wireless Telegraphy", i.e. Teletext, then no-one could complain. Since, however, no "Wireless Telegraphy" is involved, Mr. Dodd's point is sustained, though not for the reason he states.

That is not so say that there is not room for more general articles. I for one am quite happy with the present content as my interest does not lie with wireless. Others may have different views, of course. I feel that the title of "Practical Wireless" is misleading for historical reasons. Of course "Wireless World" has a similar problem, and indeed both of these publications would have very limited appeal if they stuck purely to "Wireless Telegraphy". I can't think of a better title, though, and I suspect we will have to live with status quo. **R. I. Harcourt B.Sc** (Thornton Heath).

(Ronald J. Portugal)



Dear Practical Wireless Reader

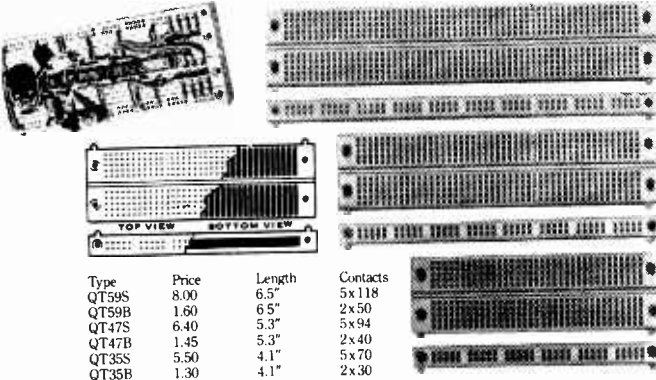
It is with great pleasure that I offer, for the first time in Great Britain, this selection of high quality test and circuit-building equipment. Continental Specialities has earned a high reputation in USA, and our goods are bought again and again, not only all over the States, but also in Canada, Australia and many other countries.

The reason for our success is simple. All our equipment is carefully designed to make life easy for the user, and then manufactured to a very high standard, to satisfy both the professional engineer and the enthusiastic hobbyist.

And at today's prices, we think the value is unbeatable.

QT Sockets

Circuit-building and testing at its easiest! Forget the soldering-iron; with these sockets and bus-strips you won't need it. Each socket is made up of rows of 5 contacts, connected transversely at the back, and each bus-strip has two rows of contacts, connected lengthways. You can plug in and out almost any component you can think of; DIL ICs (6-40 leads), TO5s, discretes with any lead diameter from .015 to .032 inch. Component inter-connections are made with standard solid insulated wire. The contacts are solid Silver-Nickel alloy, with contact resistance only 0.4 milliohms, spaced at standard 0.1 inch pitch. The bodies are made of high-temperature plastic (so if you do decide to solder the heat won't hurt it); the reverse side, with the connecting strips, is covered by a peelable, tough vinyl insulation, and each socket unit has a snap-lock mechanism for easy mating to its neighbour.



Type	Price	Length	Contacts
QT59S	8.00	6.5"	5x118
QT59B	1.60	6.5"	2x50
QT47S	6.40	5.3"	5x94
QT47B	1.45	5.3"	2x40
QT35S	5.50	4.1"	5x70
QT35B	1.30	4.1"	2x30

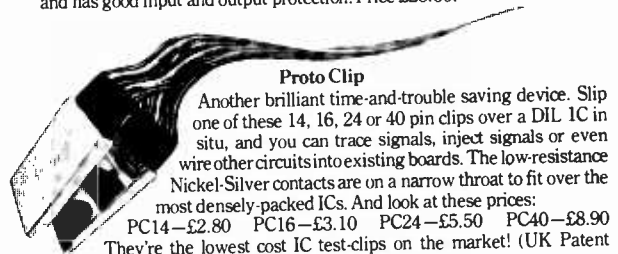
Proto Boards

Another great idea for easy circuit building, based on the QT socket and bus strip concept. These Proto Boards come as complete kits, which you assemble in a few minutes, ready for immediate use. PB6, £10.45, includes one QT47S socket and two QT47B bus strips, four 5-way building posts, a base-plate with rubber feet and all the necessary assembly hardware. PB100, £13.20, gives you two QT35S sockets, one QT35 Strip, two binding posts, base plate and assembly hardware. Try the QT and Proto Board system once and you'll never want to be without it.



Logic Probe LPI

A really low-cost, circuit-powered logic probe. Hardly bigger than a fountain pen, but amazingly versatile. It shows logic-state high, low or inoperative for any node of a TTL, HTL or CMOS device. (100KΩ input impedance). It detects and displays pulses as narrow as 50 nanosec, and level transitions (both +ve and -ve) at frequencies up to 10MHz, or even higher. (The pulse LED blinks continually 3 times a second for all input frequencies over 3Hz). And you can switch to memory, to store and display (until reset) single pulses, transitions or transients. LP1 works on any power supply, 5-15V, and has good input and output protection. Price £28.60.



Proto Clip

Another brilliant time-and-trouble saving device. Slip one of these 14, 16, 24 or 40 pin clips over a DIL IC in situ, and you can trace signals, inject signals or even wire other circuits into existing boards. The low-resistance Nickel-Silver contacts are on a narrow throat to fit over the most densely-packed ICs. And look at these prices:

PC14-£2.80 PC16-£3.10 PC24-£5.50 PC40-£8.90
They're the lowest cost IC test-clips on the market! (UK Patent Pending No. 33948/75).

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It's easy. Give us your name and full postal address, in block capitals. Clearly state the type-number and quantity ordered for each item. Send ordinary UK bank cheque or international money order (from any post office) made out in UK currency. Goods will be despatched air mail, direct from factory; allow 2-3 weeks from posting your order. (All prices shown are in UK Pounds Sterling).

Type	£Price	QTY	TOTAL	Type	£Price	QTY	TOTAL
QT59S	8.00	£		PB-6	10.45	£	
QT59B	1.60	£		PB-100	13.20	£	
QT47S	6.40	£		PC-14	2.80	£	
QT47B	1.45	£		PC-16	3.10	£	
QT35S	5.50	£		PC-24	5.50	£	
QT35B	1.30	£		PC-40	8.90	£	
				LP-1	28.60	£	

Name _____

Address _____

Dealer enquiries invited. Note. Any UK taxes or duties chargeable are solely the responsibility of the buyer.

That's all for this month. But we'll send a catalogue full of good things to everyone writing to us, or you can use the enquiry service. Best wishes, and happy circuit-building!

Yours sincerely,



AMATEUR RADIO SATELLITES

R.F. STEVENS G2BVN

RECENT articles in *Practical Wireless* have described professional communications satellites and their applications. It is the object of this article to provide basic information concerning amateur radio satellites and when and how they may be heard. Radio amateurs have been interested in space phenomena since the appearance of Sputnik 1 in 1957. Prior to the actual launch the journal of Soviet radio amateurs published information to aid amateurs in receiving signals from the satellite. By this means reporting on a scale far beyond professional capabilities was made available.

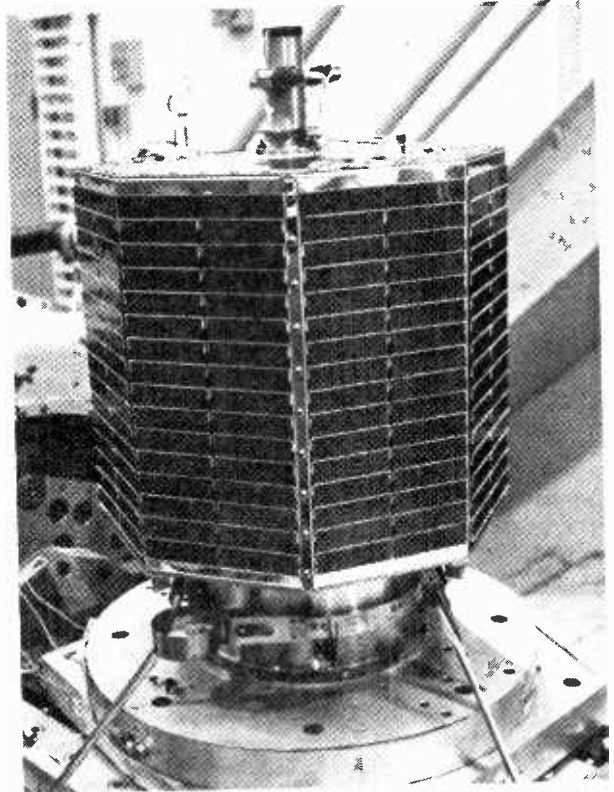
HISTORY

In 1960 a group of radio amateurs on the West coast of the USA formed the Project Oscar Association. OSCAR is an acronym for Orbiting Satellite Carrying Amateur Radio. The object was to design and build satellites for use in the amateur bands to enable radio amateurs everywhere to make contributions to space technology. Early satellites, both Soviet and American, were devices transmitting telemetry and beacon-type signals. The communication era had not yet arrived.

The first Oscar was placed into orbit by a Thor-Agena vehicle launched from the Vandenberg air force base in December 1961. The 10lb satellite transmitted information about its internal temperature for 277 revolutions. OSCAR 3 was launched into a polar orbit in March 1965 and was the first amateur communications satellite. In addition to a translator in the 144MHz band it also transmitted information about battery voltage and spacecraft temperature.

The *Radio Amateur Satellite Corporation* was formed early in 1969 to co-ordinate space projects both nationally and internationally. AMSAT, as it is known, now has national organisations in many countries throughout the world, including the UK. The first satellite project carried through by AMSAT was OSCAR 5, designed and built by students at Melbourne University in Australia. This was a beacon-type device launched in early 1970 as a secondary payload on a Tiros-M mission carrying a weather satellite.

OSCAR 6 is a communications satellite launched aboard a Thor-Delta vehicle, again carrying a weather satellite as the primary payload. OSCAR 6 satellite carries a translator and an advanced telemetry and message storage system. It has long exceeded its anticipated life and this has been achieved only by continuous ground control enabling the spacecraft batteries to satisfy the demands made upon them. Solar cells can only be charged when the satellite is in sunlight and therefore a careful balance between charge and discharge,



The OSCAR 7 satellite undergoing vibration tests prior to launch. The solar cells form the outside skin of the package.

caused by usage, must be maintained. This requirement is the reason for the reduced operating schedule shown in the accompanying table.

OSCAR 7 is also a solar powered satellite but carrying two frequency translators, beacons and an advanced telemetry system. Launched aboard a Delta vehicle with two professional satellites, it was placed into an orbit similar to that of OSCAR 6. OSCAR 7 was built by radio amateurs in Australia, Canada, W. Germany and the USA. It was the culmination of a four-year project and its professional equivalent would have cost about two million dollars. Funds came from individuals and organisations sympathetic to the project and aerospace companies donated space-qualified components and equipment.

In addition to the many thousands of contacts made through the translators of the two satellites by radio amateurs, students in all parts of the world have been able to study space science with the aid of OSCARS 6 and 7.

SUMMARY OF SATELLITES LAUNCHED 1961-1970

	OSCAR 1	OSCAR 2	OSCAR 3	OSCAR 4	OSCAR 5
Launched	12 December 1961	2 June 1962	9 March 1965	21 December, 1965	23 January 1970
End of radio life	1 January 1962	20 June 1962	24 March 1965	16 March 1966	15 March 1970
Orbit	inclined 81° at equator	inclined 73° at equator	polar	inclined 26° at equator	inclined 102° at equator
Initial apogee	450km	417km	975km	elliptical 200-35000km	1500km
Type of radio equipment carried	telemetry beacon	telemetry beacon	repeater	translator	telemetry beacon
Frequency (MHz)	144.98	144.99	144/145	144 input 431 output	144.05 and 29.45
Aerial	monopole	monopole	four monopoles	four monopoles	1/4 monopole (vhf) dipole (hf)
Results	more than 5000 reports received from 600 stations in 28 countries	more than 6000 reports received	Some 100 stations in 16 countries communicated through the satellite including two-way trans-Atlantic contacts	about a dozen two-way contacts including the first direct satellite communication between the USA and the USSR.	the first amateur satellite to:— (1) be ground controlled. (2) be self-stabilised (3) have multi-channel telemetry

LISTENING TO OSCAR

Complicated equipment is not needed to listen to the two satellites. The two basic essentials are a shortwave receiver covering the amateur 10 metre band (28 to 30MHz) and a receiving aerial. Most modern receivers of the general coverage type cover the amateur 10m band and it is then only necessary to check the calibration to ensure that you are listening for OSCAR signals at the right spot on the dial. You will see from the details of OSCAR 6 and 7 that the 10m frequencies are not precisely the same for each satellite. You should also note that the beacon frequencies are different. The beacon of OSCAR 6 is often quite weak but you should have no problem at all in hearing the beacon of OSCAR 7 on 29.502MHz. The beacon will often be heard when there are no communication signals being received by the satellite receiver.

With some of the older general coverage receivers the sensitivity on 10m may be sufficient for you to hear only the strongest signals through OSCAR. In these circumstances a small 10m pre-amplifier is recommended and this should be connected between your aerial and your receiver. A pre-amplifier made specially for OSCAR use is available from Hamgear Electronics of Norwich, or it is a relatively simple matter to construct such a unit from published information.

The receiver should have a beat-frequency oscillator (BFO) to enable single-sideband (SSB) and morse (CW) transmissions to be correctly received. Almost all the radio amateurs who communicate through the satellite by telephony use SSB. For both OSCAR 6 and 7 your receiver control should be in the upper sideband (USB) position. When the signals are first heard from the satellite it will probably be 3000 to 3500 kilometres away. In the overhead position the distance of the satellite will be only about 1460km. Therefore, the signals from the satellites can be expected to be relatively weak at first, increasing in strength as the satellite comes towards your receiving system and then gradually dropping in signal strength as the satellite goes

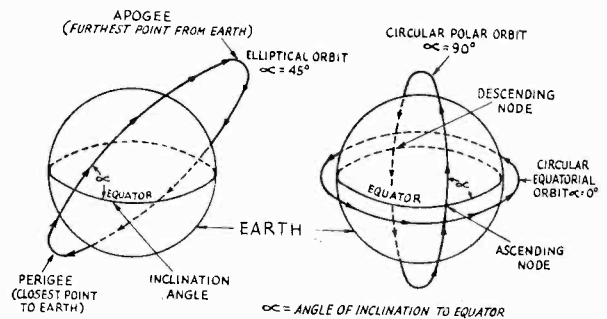
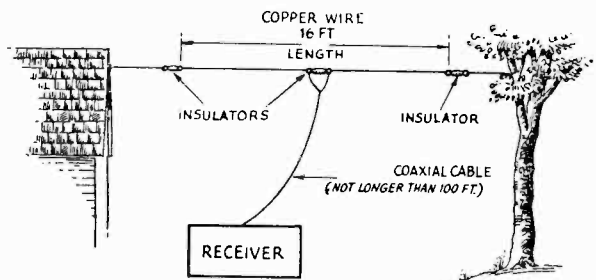


Illustration of terms used to describe satellite characteristics.



A simple OSCAR receiving system.

away to the north. Due to an effect known as "doppler shift" you will find it necessary to adjust the frequency of your receiver by a small amount during the passage of the satellite.

WHEN TO LISTEN

The Table shows some suggested times when it will be convenient for most people to listen to the OSCAR satellites. Of course, OSCAR 7 can be heard during the morning periods when it is on the north-south path but at this time most people will be otherwise engaged. Once the satellite has

SUMMARY OF SATELLITES NOW IN ORBIT

	OSCAR 6	OSCAR 7
Launched	15 October 1972	15 November 1974
Orbit	inclined 101° at equator	inclined 101° at equator
Apogee	1456km	1450km
Perigee	1451km	1450km
Period	114.994 minutes	114.944 minutes
Velocity	7.111km/sec	7.136km/sec
Longitude increment	28.74° per orbit	28.73° per orbit
Beacon	29.45MHz	29.502MHz (mode A) 145.972MHz (mode B) 435.100MHz (mode A)
Translator (MHz)	145.90 to 146.00 input/29.45 to 29.55 output	145.85 to 146.95 input/29.40 to 29.50 output (mode A) 432.125 to 432.175 input/145.975 to 145.925 output (mode B)
Satellite availability	Mondays, Thursdays and Saturdays ascending mode passes in later afternoons and evenings	Every day except Wednesdays. Satellite is in mode A on odd days of the year; mode B on even days.

WHEN TO LISTEN FOR THE OSCAR SATELLITES

OSCAR 6 (29.45 to 29.55MHz)

Day	Date	Orbit number	equatorial crossing	listen between
Thursday	11 November	18635	1952 at 356°	2000 and 2015
Saturday	13 November	18660	1947 at 354°	1955 and 2010
Monday	15 November	13685	1942 at 353°	1950 and 2005
Thursday	18 November	13722	1837 at 337°	1845 and 1900 (overhead at 1854)
Saturday	20 November	13747	1831 at 336°	1840 and 1855 (overhead at 1849)
Monday	22 November	13772	1826 at 334°	1835 and 1850 (overhead at 1843)
OSCAR 7 (29.4 to 29.5MHz)				
Friday	12 November	9122	1947 at 346°	1955 and 2010 (overhead at 2004)
Sunday	14 November	9147	1941 at 345°	1950 and 2005 (overhead at 1958)
Tuesday	16 November	9172	1935 at 343°	1945 and 2000 (overhead at 1952)
Thursday	18 November	9197	1928 at 342°	1935 and 1950 (overhead at 1945)
Saturday	20 November	9222	1922 at 340°	1930 and 1945 (overhead at 1939)
Monday	22 November	9247	1915 at 338°	1925 and 1940 (overhead at 1932)

The satellites will be on a South-North path during all of the above orbits. All times are GMT.

been heard it will re-appear approximately 115 minutes later at a position 28° further west. If you are interested in listening to orbits in addition to those shown in the Table then a calendar of orbital predictions is obtainable from AMSAT-UK whose address is given later in this article.

Before the end of the year a booklet will be available which will give all the orbits of OSCARs 6 and 7 for the whole of 1977. However, with the availability of pocket calculators it is a very simple procedure to determine the time and crossing of satellite orbits once a reference orbit is available as a starting point. Any of the figures in the column headed "equatorial crossing" in the Table may be used as reference orbits and as a starting point for calculations. Remember to add 28° and 115 minutes for each successive orbit.

The satellites are at an altitude of approximately 1460km and terrestrial stations can be received up to 4000km away from the satellite. Two stations each at the extreme range of the satellite i.e. 4000km can communicate through OSCAR thus giving a total possible range distance of about 8000km. The satellites are constantly moving along their orbital paths and therefore stations located in different parts of

the world come in and are heard through the satellite, disappearing some minutes later when new stations will be heard. As an example of what can be done G3IOR has effected two-way communication with stations in nearly 80 countries through the OSCAR satellites.

FURTHER INFORMATION

The amount of literature now available on space science is vast. However a great deal of it relates to professional projects and is often difficult to follow by a person not a specialist in these matters. The Radio Society of Great Britain publishes a booklet entitled *Keeping Track of Oscar* which contains a great deal of basic information and costs 40p (post paid). The address of RSGB is 35 Doughty Street, London, WC1N 2AE. Available from the same source is the polar stereographic map, necessary if one is interested in plotting the OSCAR orbits, which costs 35p.

If one is interested in obtaining the basic details of the behaviour of space satellites, which applies to both amateur radio and professional devices,

continued on page 674

Vagaries of VHF (Contd.)

Ron HAM F.R.A.S.*

VHF National Field Day is an important event in the RSGB's Contests Calendar. Normally held in September, this year it was held on July 3/4 fortunately coinciding with a mild tropospheric opening giving that "something extra" to a normally exciting competition.

According to the writers trusty barograph, the roots of this opening can be traced back to midnight on June 23rd when the atmospheric pressure began a gradual rise from 30.2" to 30.35" by noon on the 28th, where it remained until noon on the 30th. Around 1800 on the 30th, the pressure began falling, the most vulnerable time for a VHF/UHF disturbance, and reached 30.1" around 2000 on July 3rd, see Fig. 1.

Signs for Field Day looked good on July 2nd, when, at 0839, the writer, at his home in Sussex, received a 559 signal from GB3EM (432.91MHz.) with only a dipole feeding the receiver, and by 2300 this signal was 599. This may well have been the first VHF NFD to take place with temperatures up in the 90's.

The opening eased on the 4th while the pressure remained steady (30.1"), but things livened up between the 5th and 8th coinciding with a further gradual decline in pressure to 30.0" at noon on the 8th. Signals from the Emley Moor beacon were heard on the 5th, 6th and 7th and up to a dozen Continental FM broadcast stations were heard in Sussex between 88-100MHz each day.

SPORADIC-E

July is accepted as the third month of the sporadic-E "season", and like previous years there have been frequent upsets to terrestrial radio signals in the 4m and 6m bands. The most prominent disturbances were during the early morning of the 1st and 17th, the early evening of the 23rd and the afternoon and early evening of the 25th. On each

occasion the writer checked 65 to 73MHz using an Eddystone 770R, fed with a horizontal dipole, and received strong signals from east-European broadcast stations.

Strong signals on the R1 television frequencies (Vision 49.75MHz, Sound 56.25MHz) were prominent at the least hint of a sporadic-E disturbance and signals from E2 sound (53.75MHz) were heard on July 2, 11, 16, 22, 23, and 25 while the usual crop of continental RT stations were heard disturbing Band 1.

10M BAND

A 599 signal from the German beacon DL0IGI was heard on the 17 days indicated in Fig. 2, and it is worth noting that this signal is mainly heard during the early morning. The signal from 5B4CY was heard less frequently and averaged about 559. Both of these beacons are a valuable indicator for the prevailing condition on "ten".

AUGUST

THE writer's Hammarlund HQ-180 spends most of its working life idling around the beacon frequencies in the 10m band and reference to Fig. 3 will show that signals from beacon stations were heard on eight days during August, DL0IGI on each day except the 10th and 5B4CY on days 5, 10 and 22. Suddenly, at 0745 on the 22nd a very strong burst of solar noise swamped the 10m band for several minutes proving how right it is to leave a receiver monitoring the band to catch the unexpected. Later, around midday, the writer was on the South Downs using a low-band Cambridge in his capacity as an ATC radio instructor, when a massive burst of solar noise, lasting for 16 minutes, came from the speaker, and this with only a rod aerial on top of the vehicle. On arrival home the radio

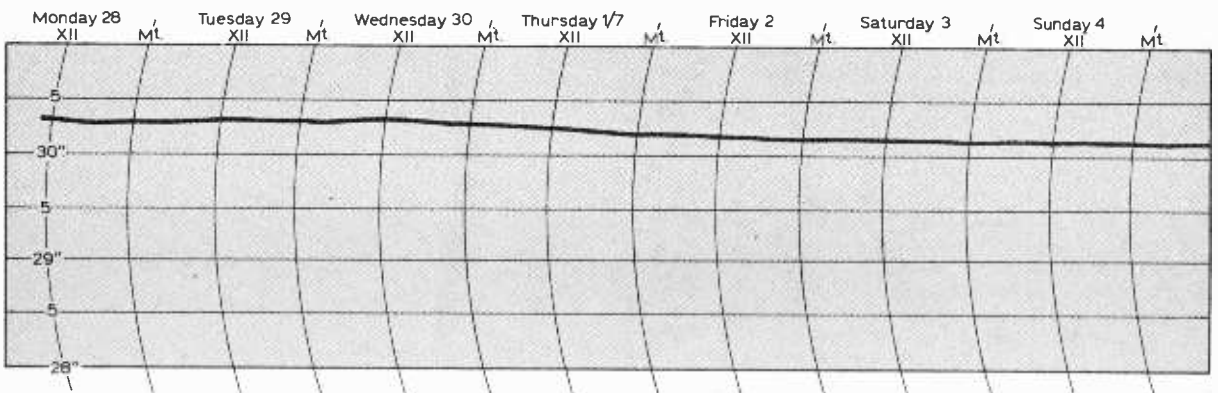


Fig. 1. Barograph chart covering period of National Field Day in July when conditions were above normal.

W345

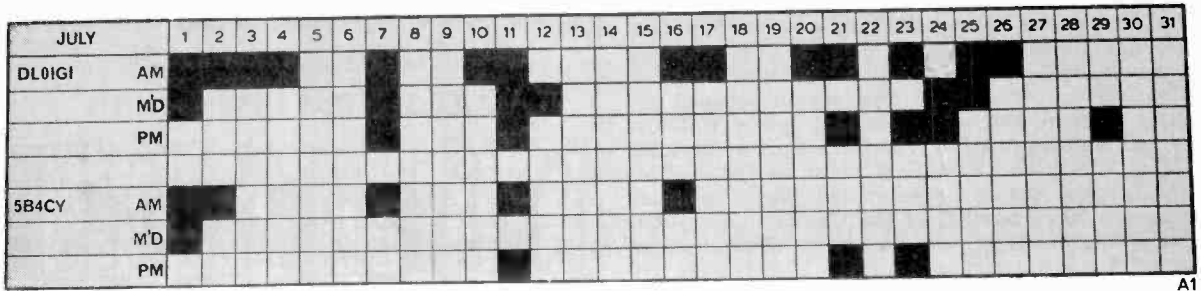


Fig. 2. Reception of the 10m beacon stations DL0IGI and 5B4CY provides a good guide to conditions.

telescope charts were examined and this hefty burst had been recorded at both 95 and 136MHz.

Although this was an isolated event the solar noise storm which began on July 31st continued for 11 days, Fig. 3, during which time several individual bursts were recorded in addition to the high radio noise level. This noise storm was the first since the end of March and was associated with a large sunspot which may well have been the first of the new solar cycle.

DX FOR BREAKFAST

The daily routine listen on Band II around 0730 revealed that a VHF lift lasting for two or three hours occurred every morning between the 10th and

18th inclusive, bringing strong signals from between four and fourteen continental broadcast stations into southern England between 88 and 100MHz. During the same early morning periods, except for 10th and 17th, a picture was received in Sussex from the Midlands (IBA Ch.8) on 189MHz with only a dipole feeding the receiver. It is always worth the DXers while to take an early morning listen around Band II when the atmospheric pressure is high and the weather is hot and settled, which was the case over the southern half of England and parts of Europe for most of August.

The stage was set for a tropo-opening when the atmospheric pressure, already high, began to rise around 0100 on the 18th, Fig. 4, then dithered around 30.4" for about 24 hours before it started a gradual

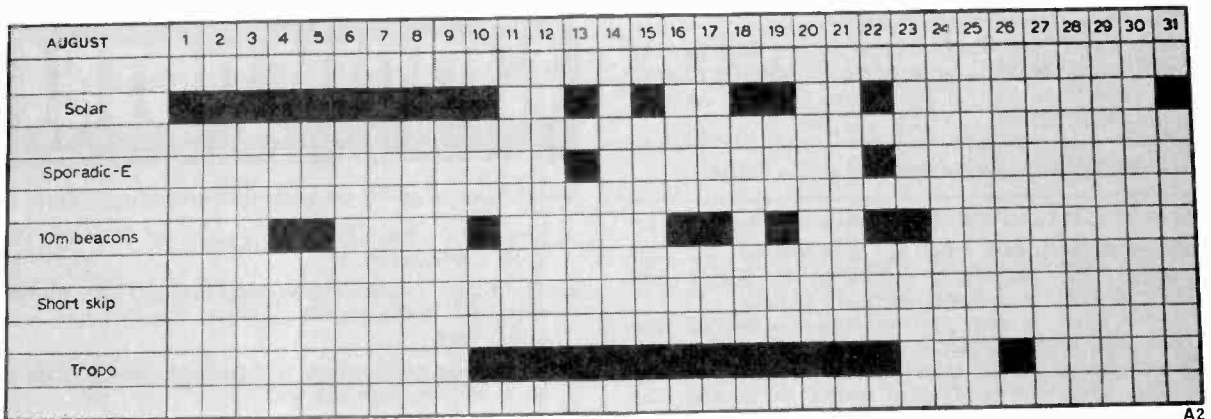


Fig. 3. Summary chart of several types of VHF activity during August.

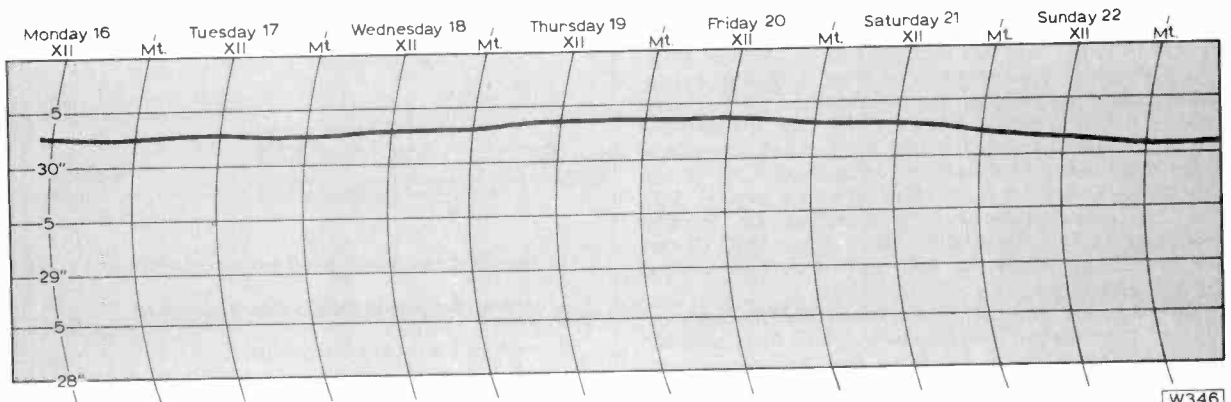


Fig. 4. Chart of barometric pressure in August, the effects of the changes being described in the text.

fall. Early on the 19th, the VHF's opened up and Band II was the first to suffer as signals from Continental broadcast stations poured into southern England, often overpowering the UK stations!

The reader will see the relationship between the falling pressure and the increase in numbers of continental stations in Band II if he compares the table in Fig. 3 with the barograph chart in Fig. 4. This tropo-opening was on a predominant north/east path because a large number of the Continental stations were of German origin and further proof came in the 2m band when a 589 signal from DL0PR (144.910 MHz) was heard from the evening of the 19th to the early hours of the 21st. UK radio amateurs took advantage of the good conditions to work some Continental DX on 2m.

An almost identical opening, with German FM in Band II accompanied by a 599 signal from DL0PR occurred during the early morning of the 26th and lasted for a couple of hours. Periodically on days 19, 20 and 21 strong signals were received on 70cm from GB3SC (432.89MHz) and GB3EM (432.910MHz) with only a dipole feeding the receiver.

SPORADIC-E

Apart from minor disturbances to signals in the 4m and 6m bands during the mornings of the 13th and 22nd, the amateurs who use the 4m band should have had a peaceful month, free from the upsets caused by sporadic-E.

**Faraday, Greyfriars, Storrington, Sussex RH20 4HE.*

Readers experiencing unusual reception of stations on the VHF/UHF bands of the nature described by Ron Ham in the first two articles are invited to send brief reports to him at the above address. NOT to the Editorial offices!

If there is sufficient response a regular feature could be compiled for inclusion in PW—Editor.

AMATEUR RADIO SATELLITES—contd. from page 671 then recommended reading is *Artificial Satellite Observing* by H. Miles, published by Faber and Faber in 1974 at a cover price of £5.50.

AMSAT-UK is the national organisation of the Radio Amateur Satellite Corporation and is the means of exchanging information on radio amateur satellites between interested users. It is also the basis of the UK satellite construction group. Further information may be obtained from P. Gowen, G3IOR, 17 Heath Crescent, Hellesdon, Norwich, Norfolk, NR6 6XD. Any enquiries should be accompanied by a s.a.s.e. The address of the USA organisation is AMSAT, PO Box 27, Washington, DC 20044, USA.

Up-to-date information regarding satellite availability and orbital data can be obtained by listening to the RSGB News Bulletins which are transmitted in the 2/80m amateur bands on Sunday mornings. Also on Sunday mornings at 1015 local time is the AMSAT-UK net on 3780kHz SSB when orbital data for the following week is transmitted. On Sunday evenings at 1930 local time there is an OSCAR net on 144.28MHz with the net control station located in SW London.

So why not have a listen for OSCAR? Irrespective of propagation conditions you will hear stations from Africa, Asia, N. America and Europe in communication through a satellite built by amateurs for amateurs. Good listening! PW

PW TECHNICROSS PUZZLE

Solution to No. 16

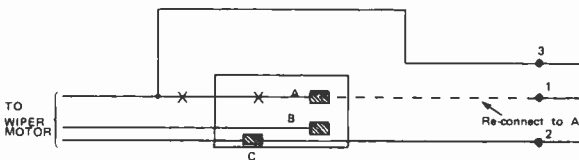
presented last month



'Interwipe' Car Electronics project sheet, Oct. 76

1. The Doram box should be numbered 509-989 (114 x 55 x 64mm).
2. The relay contacts RLA1 N/O and N/C are shown reversed on the circuit diagram. The PCB drawing is correct.
3. Fig 6—connections to a 3-contact switch should be as the drawing below:—

AMENDMENT TO INTERWIPE SWITCH DRAWING
INCORRECTLY DRAWN ON P.W. PROJECT SHEET.



1. Remove Contact A from Switch and connect to Contact 3 of Relay.
2. Connect Contact 1 of Relay to Contact A of Switch.
3. CONTACT B IS LEFT UNTOUCHED.
4. Connect an extra lead from Contact C of Switch to Contact 2 of Relay.

play your

PRINTED CIRCUIT DISC'S

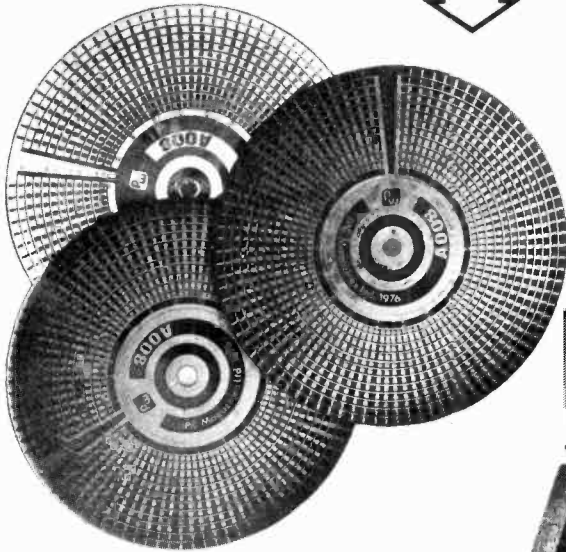
IN NEXT MONTH'S

PRACTICAL WIRELESS

on our



ELECTRONIC POLYPHON



Remember your first thrill on hearing a musical box? Remember your disappointment when the reeds broke?

Now you can recapture that authentic Polyphon sound for yourself or your family knowing that there are no reeds to fail and, with a little practice, you can create and play your own tunes.



also:

OSCILLOSCOPE CALIBRATOR VOLTAGE REFERENCE SOURCE

PW 'ICELERT' BLACK-ICE WARNING DEVICE

ON SALE IN DECEMBER



CHROMACHASE

PART 1

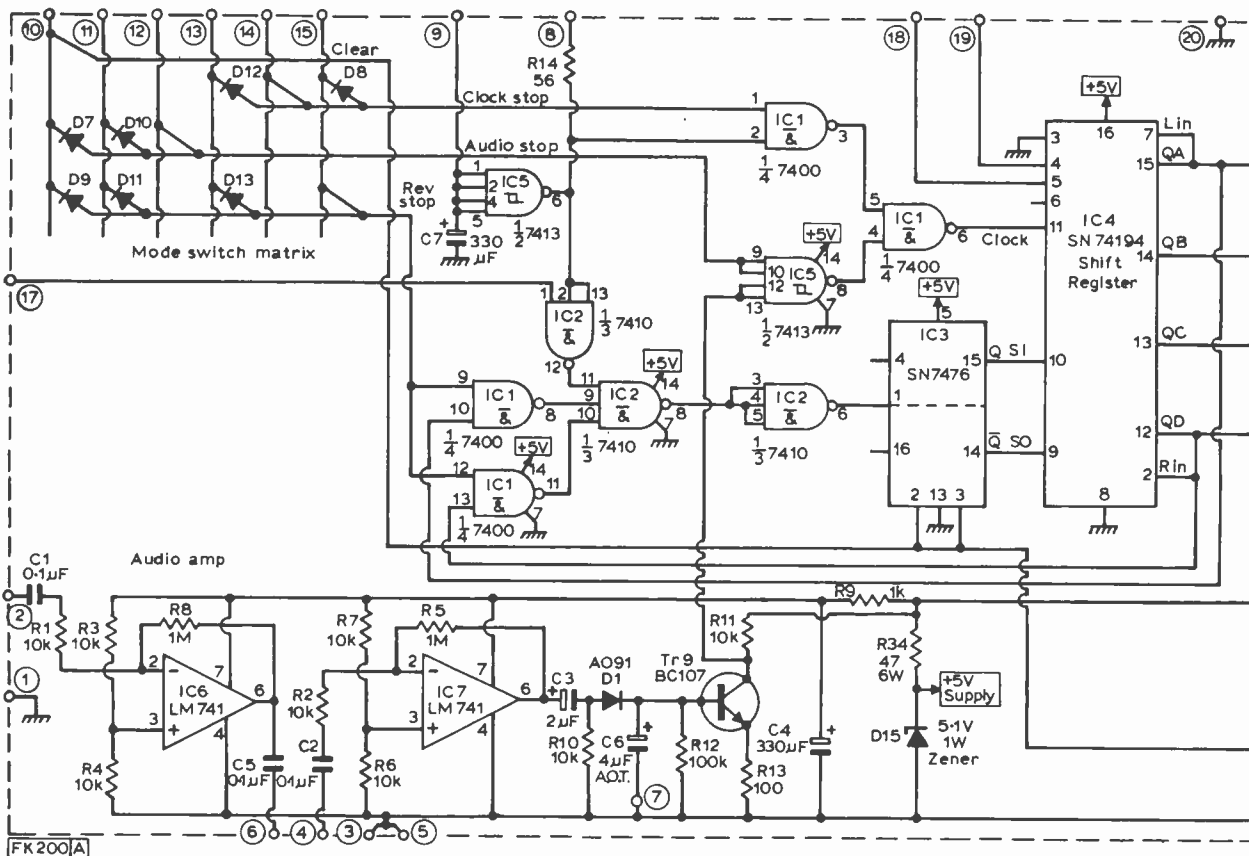
WILLIAM BEAN

LIGHT chasers are the latest generation of sound to light display units to appear at parties and discotheques. This chaser, in common with many of the others, owes its existence to the advances in TTL (Transistor-Transistor Logic) modules. The unit has four light channels, four light sequences and can be triggered by five different modes. The chase can be initiated by an external audio signal, including microphone and stereo speakers, or from an internal clock which can vary the speed of the chase from one step a second to 20 steps a second.

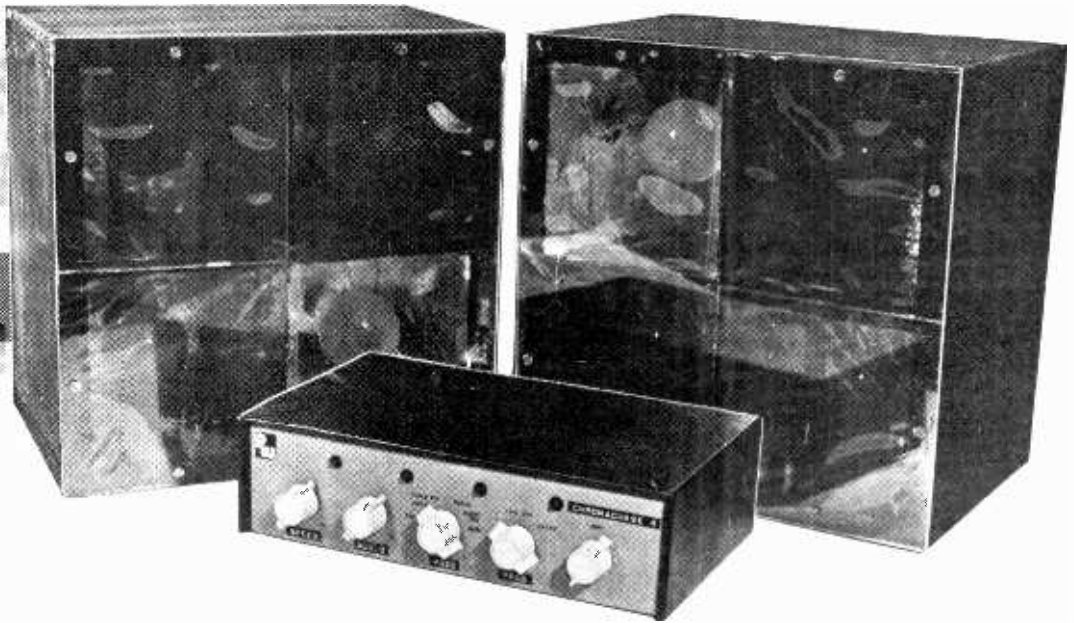
One advantage of the chaser over the more

familiar sound-to-light unit is that the chaser does not vary intensity with sound or frequency, but provides movement or colour changes to music. This means that if the music stops the hall is not plunged into darkness.

Although the control unit is essential, the main attraction is the display and some thoughts on displays are given later in the article. The design load for each channel is 1 kilowatt and the unit will deliver that load indefinitely but, to keep the mains current to manageable levels, a maximum of 750 watts per channel is recommended.



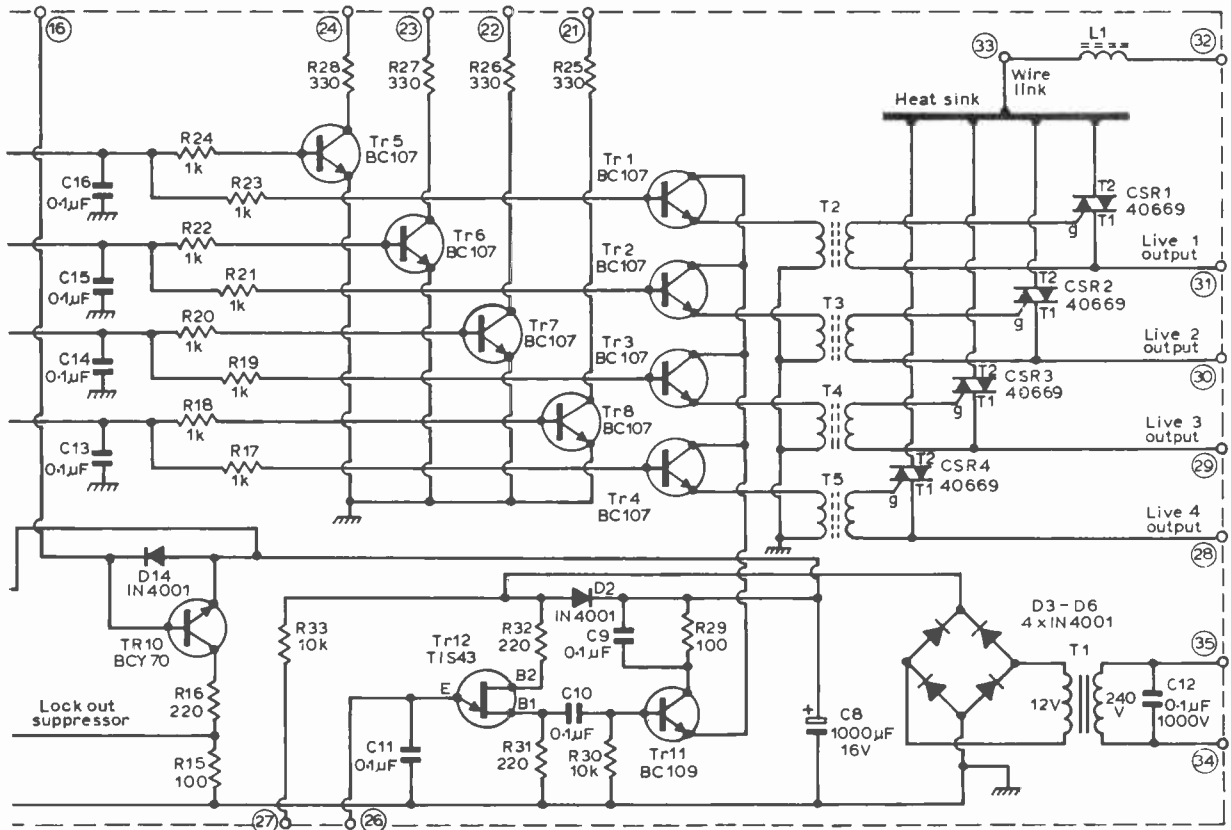
4



CIRCUIT OPERATION

Reference to the block schematic, Fig. 2, shows that the circuit could be split into two sections, one dealing with the electronic programme generation and the other with lamp driving and monitoring.

Fig. 1. The circuit diagram of the components on the PCB. The numbers in circles refer to pins along the side of the board. The external connections to these pins are shown in Figs. 5 and 7.



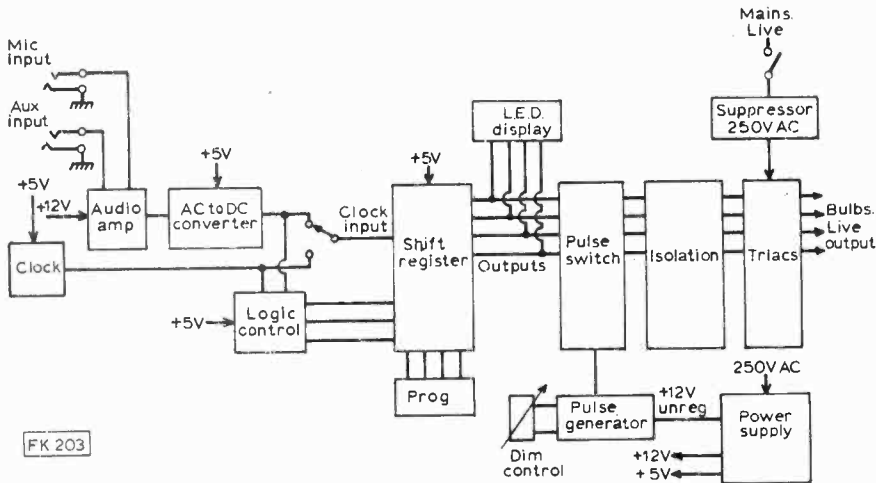


Fig. 2. The block schematic of the complete unit, excluding the lamp displays.

Consider the lamp driving and monitoring first. Fig. 1, shows that the four output lines of IC4, (QA, QB, QC, and QD) drive transistors Tr5, 6, 7 and 8 which, in turn, drive the panel mounted LEDs. These LEDs therefore give an indication of the state of the output lines of IC4. Apart from following the lamps during operation they play a significant part in the setting-up procedure.

In addition to driving the LED transistors, the output lines of IC4 enable or inhibit Tr1, 2, 3 and 4. If it is assumed for the minute that the Dim control is at maximum, then the pulse transformers, T2, 3, 4 and 5, will pass or not pass current depending on the condition of the bases of Tr1, 2, 3 and 4. The secondaries of the pulse transformers are used to trigger the Triacs CSR1, 2, 3 and 4 and the Triacs switch the mains to display lamps.

It was assumed in the previous paragraph that the Dim control was set to maximum. The action of the control and the Pulse Generator are considered next.

The section of Fig. 1 involved is Tr11, Tr12 and their associated components. A unijunction device, Tr12, provides the active element in the generation of the pulses. By connecting its B2 lead to an unsmoothed supply rail the output pulses are locked to the mains. Phase shift is achieved by varying VR3, the Dim control. R33 prevents the emitter of Tr12 being connected to the supply rail when VR3 is at its minimum setting. The output of Tr12, at B1, is coupled to Tr11, which conducts for a period depending on the setting of VR3. The output of Tr11 is fed, in parallel, to the gating transistors Tr1, 2, 3 and 4 and if any of them have the enabling input on its base, current flows in the primary of the associated transformer.

For the remainder of the circuit, reference to Fig. 2 shows that there are two options for driving the shift register (being from an internal clock or from an external audio source), a logic section for selection of the mode of operation, a programme switch

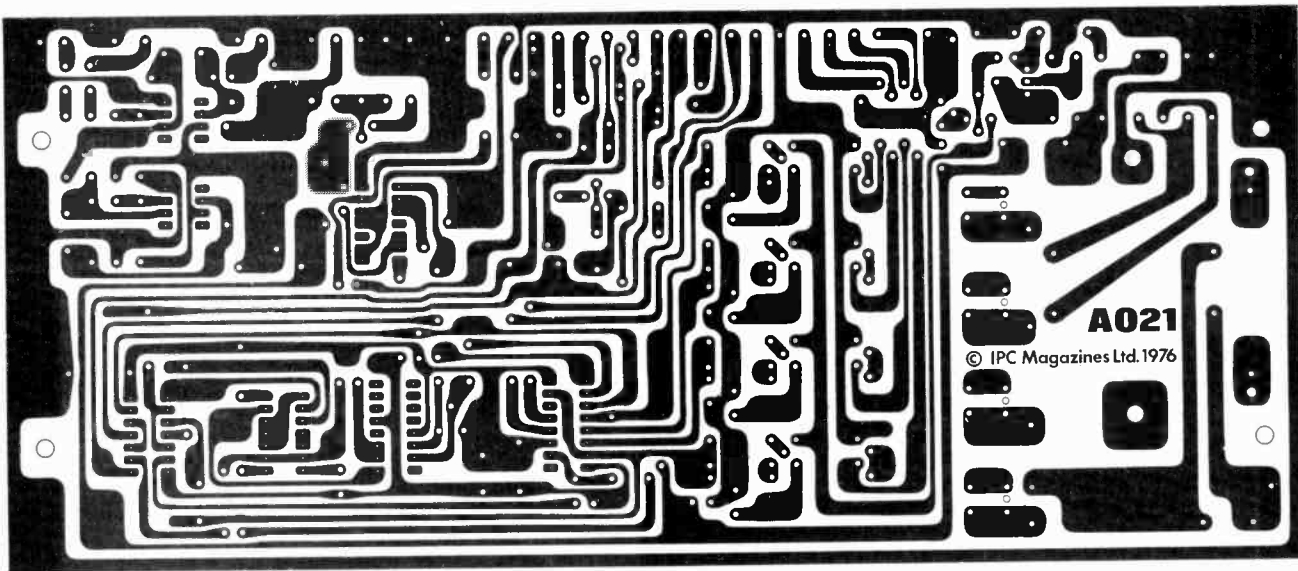
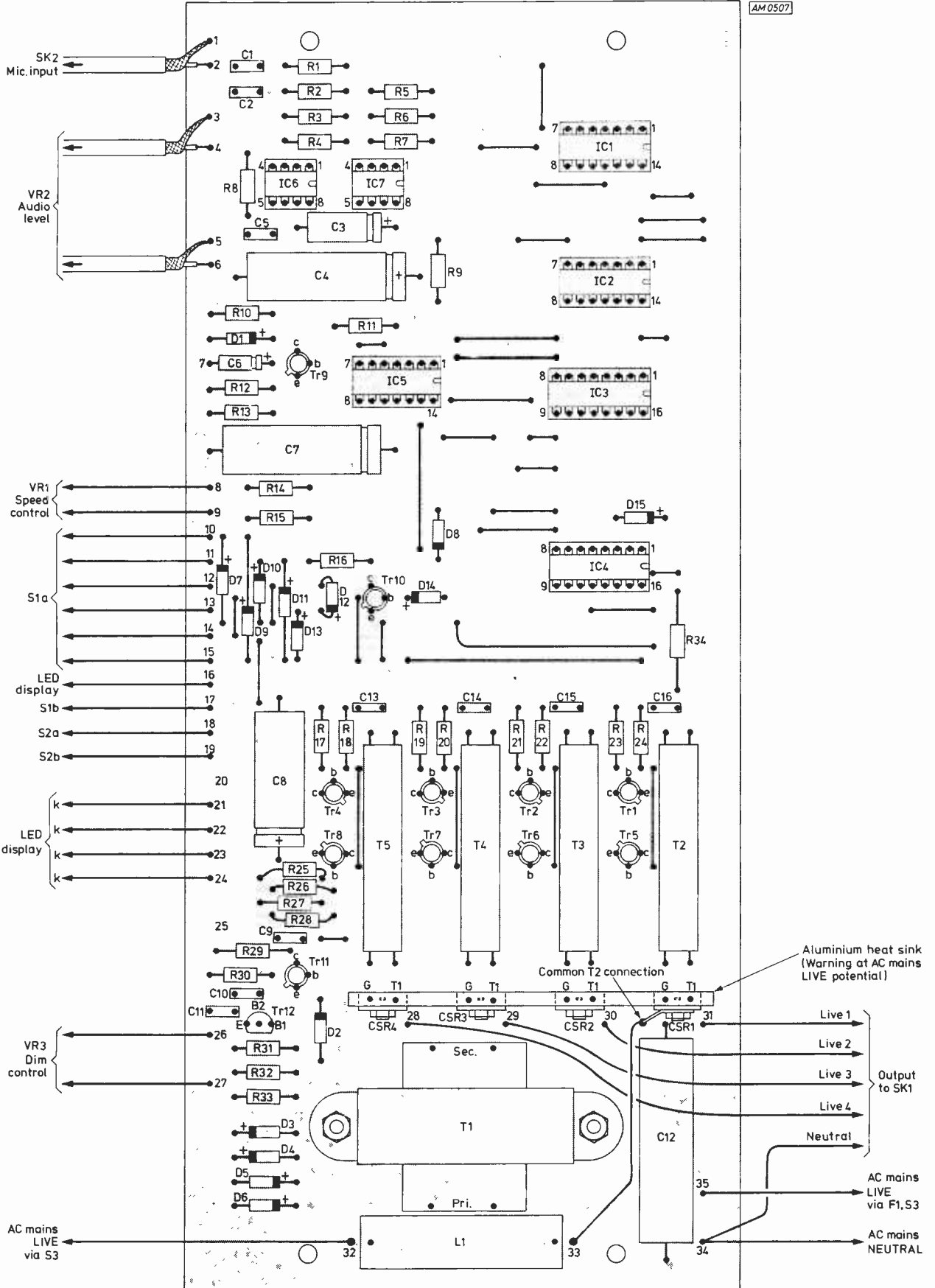


Fig. 3. The wiring pattern of the PCB. Note that this drawing is not full size. For scaling up, the true size is 10½ins by 4½ins.

Fig. 4. The component overlay showing location and orientation of the components on the board. The wiring pattern is shown to assist assembly.



Aluminium heat sink (Warning at AC mains LIVE potential)

and a reversible shift register.

The internal clock is made up of one half of IC5, a schmitt trigger, and VR1 with C7. The time constant of VR1/C7 determines the repetition rate of the clock since it fixes the time taken to pass the switching points of IC5. Because the charging current is taken from the output of IC5, which performs an inverting function in addition to its schmitt action, the circuit performs as a realistic clock.

The audio amplifier consists of the two linear amplifiers, IC6 and IC7, together with their associated components. VR2 is an audio level control between the two stages, each of which has a gain of +40dB. The output of IC7 is fed to a positive sensing, time constant network of D1, C6, Tr9 and R13, with D1 and C6 performing the sensing and with C6 and R13 giving the time constant. Although R12 is across C6, its effect is not significant in determining the time constant. The value of C6 may need to be adjusted to achieve optimum sensitivity but 4uF was found to be satisfactory in the units built by the author and this has been called for in the parts list. The DC produced is used to switch Tr9 and the output of Tr9 is shaped by the second half of IC5. The input to this half of IC5 is gated with the output of the Mode switch, S1, and the resultant output fed to pin 4 of IC1.

Similarly, the output from pin 6 of IC5 is gated with output of S1 (pin 2 and 1 of IC1) and its output fed to pin 5 of IC1. This section of IC1 acts as an "or" gate and is used to drive the clock input of IC4.

The QA and QD outputs of the reversible shift register, IC4, are gated with S1 by the remaining two sections of IC1, pins 9/10 and 12/13 respectively. The output of the internal clock, pin 6 of IC5, is gated with S1b in a section of IC2, pins 1, 2 and 13, and the output of this gate, together with those at pins 8 and 11 of IC1 are themselves gated by IC2, pins 9, 10 and 11. The output of this gate, appearing at pin 8, is inverted by the remaining section of IC2 and the inverted output provides the clocking pulses for IC3, a JK Preset Flip-Flop. The Q and Q outputs of IC3 are directly coupled to pins 10 and 9 of IC4 and determine the direction of progression of IC4. Thus, each pulse applied to pin 1 of IC3 will reverse the direction in which the chase goes.

★ components list

Off board items

Case, to suit, Type RB4 from Marshalls Ltd., or Type P.J.5 from Watford Electronics. (Size 280mm x 150mm x 75mm = 11" x 6" x 3"). PCB, from Readers PCB Service (see ad.), Variable Resistors; VR1, 1kΩ lin; VR2, 100kΩ log; VR3 100kΩ lin with switch. Switches; S1, 2 pole 6 way, rotary; S2, 3 pole 4 way, rotary (only 2 poles used). Panel mounting fuse holder. 1A fuse to suit holder. Sockets; SK1, International Octal; SK2, mono jack socket; SK3, stereo jack socket. Plugs; PL1, International Octal; PL2, mono jack; PL3, stereo jack. Indicators, 4 LEDs, 0.2" Dia., with fixing washers. 5 knobs to suit controls. 4 rubber feet for case. 13A mains lead. Rubber grommet to suit mains lead. Metal strip for heat sink, 75mm x 20mm x 3mm (3" x ¾" x ¼"). Crystal microphone insert, Acos type 43. 4 stand-offs, 6BA x ¾".

★ components list

On the board

Resistors

R1	10kΩ
R2	10kΩ
R3	10kΩ
R4	10kΩ
R5	1MΩ
R6	10kΩ
R7	10kΩ
R8	1MΩ
R9	1kΩ
R10	10kΩ
R11	10kΩ
R12	100kΩ
R13	100kΩ
R14	56Ω
R15	100Ω
R16	220Ω
R17	1kΩ
R18	1kΩ
R19	1kΩ
R20	1kΩ
R21	1kΩ
R22	1kΩ
R23	1kΩ
R24	1kΩ
R25	330Ω
R26	330Ω
R27	330Ω
R28	330Ω
R29	100Ω
R30	10kΩ
R31	220Ω
R32	220Ω
R33	10kΩ
R34	47Ω 10%, 6W

Capacitors

C1	0.1μF
C2	0.1μF
C3	2μF, 16V
C4	330μF, 16V
C5	0.1μF
C6	4μF, 16V
C7	330μF, 16V
C8	1000μf, 16V
C9	0.1μF
C10	0.1μF
C11	0.1μF
C12	0.1μF, 1000V
C13	0.1μF
C14	0.1μF
C15	0.1μF
C16	0.1μF

All 0.1μF capacitors, except C12, have 4mm pin centres. Items coded B37449 from A. Marshall Ltd. are O.K. All resistors, except R34, are 5%, ½W.

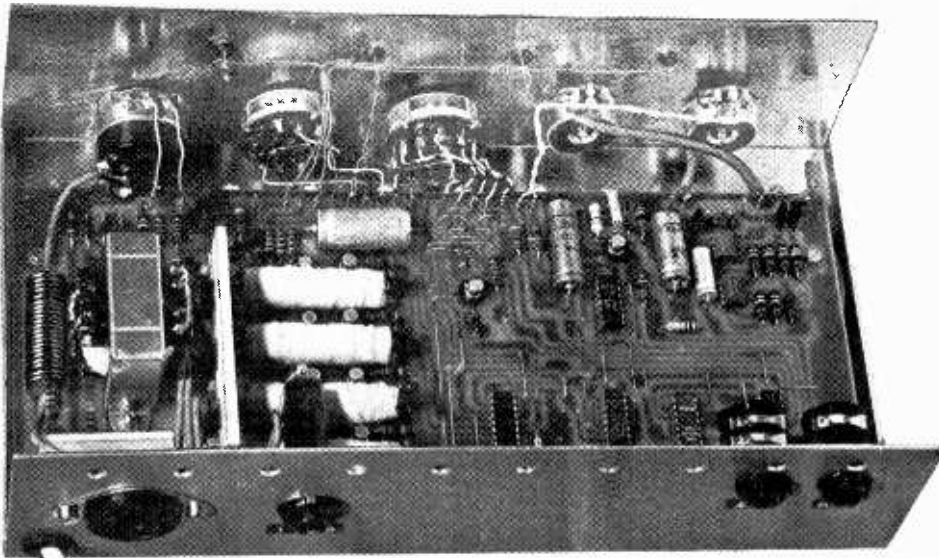
Semiconductors

D1	OA90	Tr1	BC107
D2	1N4001	Tr2	BC107
D3	1N4001	Tr3	BC107
D4	1N4001	Tr4	BC107
D5	1N4001	Tr5	BC107
D6	1N4001	Tr6	BC107
D7	any	Tr7	BC107
D8	cheap	Tr8	BC107
D9	silicon	Tr9	BC107
D10	diode,	Tr10	BCY70
D11	e.g.	Tr11	BC109
D12	1N914,	Tr12	T1S43
D13	1N4148.		
D14	1N4001	IC1	SN7400
D15	Zener, 5.1V,	IC2	SN7410
	1W	IC3	SN7476
CSR1	Triac,	IC4	SN74194
CSR2	Type	IC5	SN7413
CSR3	40669,	IC6	LM741
CSR4	by RCA	IC7	LM741

Triac 40669 has been recoded by RCA and is now T2800D. Devices may be supplied with either code and either can be used.

Wound components

T1	Mains transformer. Secondary, 12V at 0.5A, fixing centres 53mm Doram code 980-675 and 980-681 are O.K. (Wire 675 in series and 681 in parallel).
T2	Pulse transformer. Home made. Primary and secondary each 25 turns of 28 standard wire-gauge, enamelled copper wire on a 35mm (1½") by 10mm (¾") ferrite rod.
T3	
T4	
T5	
L1	Suppression choke. Home made. 20 turns or 14 SWG, enamelled copper wire on a 35mm by 10mm ferrite rod.



Photograph of the inside of the completed unit showing the positioning of the major items and the inter-connection of the front panel controls to the board pins.

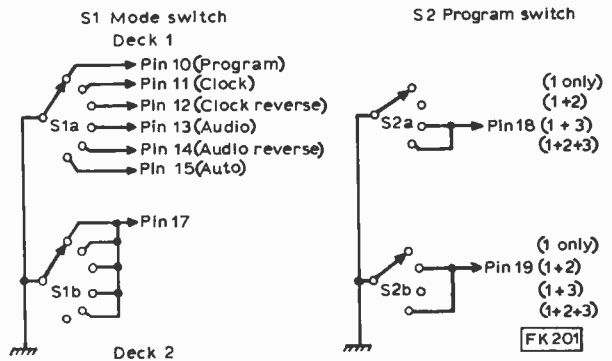
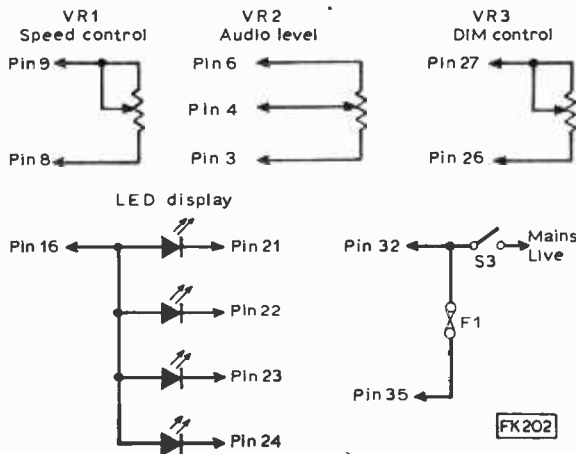


Fig. 5. The wiring of the front panel controls and their connections to the PCB.

POWER SUPPLY

There are two power supplies for the unit, one being the mains and the other being low voltage DC.

The mains is fed to the lamps in the display via the Triacs and, in order to prevent switching spikes being imposed on the mains, a suppression choke is included in series with the line supply.

To provide the low voltages required for the electronics, the mains is stepped down by transformer T1. The 12V secondary output is bridge rectified by diodes D3, 4, 5 and 6. The unsmoothed, pulsating DC is used for Tr12, giving mains synchronisation of the dimming control. Initial smoothing for the rest of the circuitry is by D2 and C10, this being satisfactory for Tr11. Further smoothing is provided by R9 and C4 for use with the audio amplifiers. Finally R34 and D15 set the 5V required by the remaining ICs.

CONSTRUCTION

The assembly has been kept as simple as possible by producing a PCB with the majority of the inter-component wiring in its pattern. (See Fig. 3.)

Since most of the components are mounted on the board, and Fig. 4 shows the locations and orientation of them, construction should present no difficulties. It is suggested that the wire links are inserted and soldered first and components added according to size (i.e. transformer last).

Do not connect the Triac heat sink to L1 at this stage.

Interconnections from the board to the various case mounted items should be easy using Fig. 5 but the photos should also help. If the wires from board to case are kept short the unit will look more attractive but the assembly into the case will be more difficult.

A full size print of the wiring pattern on the PCB is available. To obtain a copy please send a large stamped addressed envelope and a cheque or postal order, value 25p, to Practical Wireless (Chroma-

chase), Fleetway House, Farringdon Street, London EC4 4AD.

This article will be concluded next month.

**NEW
SERIES**

S-DeCnology

DAVID GIBSON



THIS MONTH



'Guardian Angel'

THIS series of articles is based on the S-DeC solderless breadboard. Components are simply plugged into holes on the DeC by their own leads. The holes are connected together underneath the surface by sockets wired up in a pattern shown on the upper surface of the DeC.

When you have constructed the project you can either unplug the components and use them again, or purchase a piece of Super Solder Board for 30p. The Super Solder Board has holes and connecting copper tracks, and the pattern exactly matches those on the S-DeC. If you want to keep your project working and/or put it into a case, then simply transfer the components from the S-DeC to exactly the same holes on the Super Solder Board, turn the Board over and solder the components permanently into place.

This first project is called Guardian Angel. The title derives from a kindly angel who *always* watches over sleeping children. However, the project does have other applications.

become dimmer and dimmer until finally it goes out completely.

Circuit details

The circuit employed is extremely simple using only five components plus a battery, although a small power supply would probably be advisable if the project is to be wired permanently.

The three transistors are connected in a very high gain compound configuration. The last of these, Tr3, drives the small cycle bulb LP1. The first transistor has its base connected to a capacitor the other end of which goes to the positive side of the battery. Since transistor Tr1 is directly connected to Tr2, which in turn has its emitter directly fed to Tr3, then the base of Tr1 is the point which determines what happens in the rest of the amplifier.

At switch on, the bulb immediately lights to its full brilliance. The input voltage applied to the

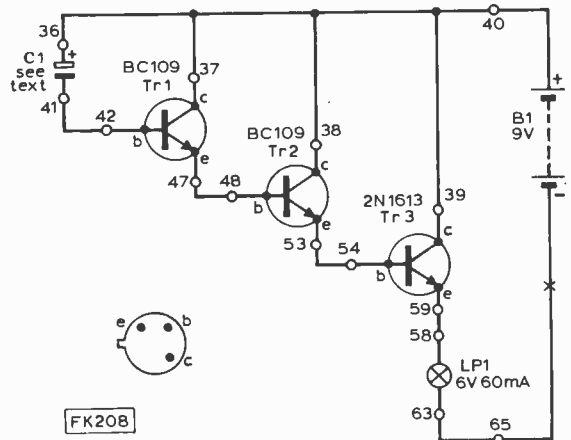


Fig. 1: Circuit diagram, showing the simple nature of the Guardian Angel. A 6V 60mA bulb is suggested for LP1 in order that Tr3 runs cool.

Wasted power

A common problem with many young children is that they want a light left on before they will even attempt to get to sleep. This light is commonly switched off again by a parent on retiring for the night. The majority of lights left on for children are ordinary household bulbs—say 40W. Also, this remains on from early evening (bedtime) until 11 or 12 o'clock when the parent goes to bed and remembers to switch it off. The majority of children are asleep within half an hour or so of going to bed, which means that power used by the 40W "night light" is wasted.

The Guardian Angel changes all that. Basically it comprises a small torch/cycle bulb plus some very simple electronics. Upon switching the device on, the bulb will glow to its full brilliance. Gradually—so gradual as to be virtually imperceptible, the bulb will

you will need . . .

Tr1	BC109	C1	4.7 μ F tantalum
Tr2	BC109	L1	6V 60mA bulb
Tr3	2N1613	B1	9V battery (PP9)
One S-DeC and one Super Solder Board.			

amplifier can only reach the base of Tr1 via the capacitor C1. As the amplifier draws its very tiny current, capacitor C1 gradually charges up. Note that the positive side of the capacitor is connected directly to the positive 9V line while the negative side goes to the base of Tr1.

With the base of Tr1 at some positive potential the lamp will glow because the transistor Tr1 is biased "on". But as the capacitor gradually charges up, the base side, the negative side of C1, gets more and more negative thus the base of Tr1 becomes less and less positive causing the current through the bulb to get less and less.

It might be easier to consider the capacitor plus the first two transistors as being replaced by a potentiometer across the positive and negative rails and with its wiper arm connected to the base of Tr3. The charging of C1 would then be analogous to simply turning the wiper of the pot away from the positive rail and downwards thus making the base of Tr1 more and more negative.

S-Dec holes

Referring to the circuit diagram of Fig. 1, the clear circles with numbers are the numbered holes on the S-DeC which the relevant component(s) are plugged into. For example, the bulb is plugged into S-DeC holes 58 and 63. The last transistor, Tr3, is

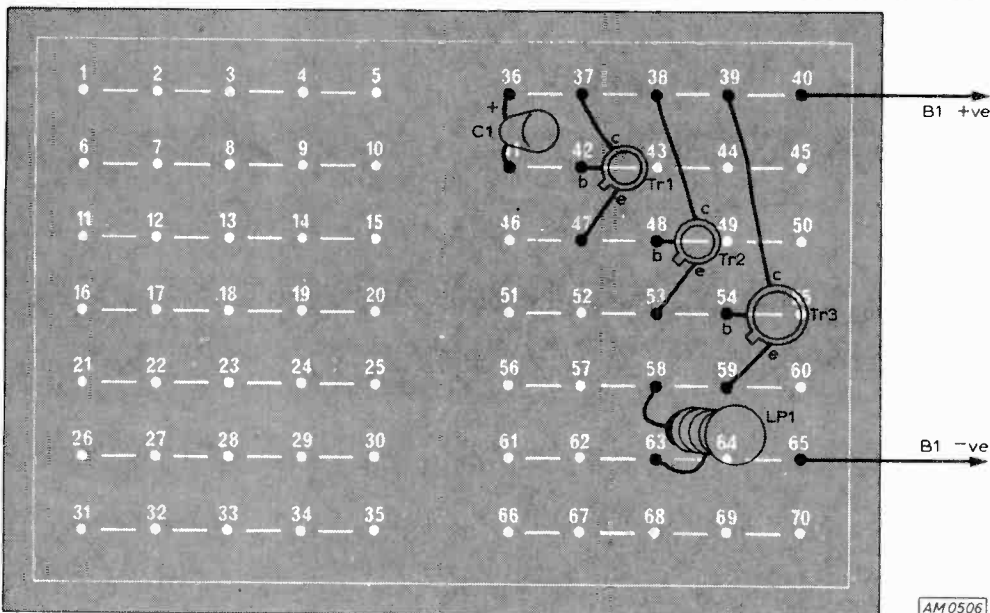


Fig. 2: Full size drawing of the S-DeC, giving the connection points for the three transistors, C1 and LP1.

plugged into S-DeC holes 39 (collector), 54 (base) and 59 (emitter). Once these two components have been plugged in, the connections below the surface of the S-DeC will automatically connect the emitter of Tr3 to one side of the bulb.

The time which the light remains on, or rather the time which it takes to go out is determined by

the value of the capacitor C1. In the prototype a 4.7 μ F was used. Provided this was a tantalum capacitor, then the light would gradually dim and go out over the period of one hour. Electrolytic capacitors did not give reliably repeatable times due, no doubt, to their leakage being greater than that of tantalums. Using two electrolytics marked 22 μ F gave widely different times.

Other time periods can be easily achieved by simply altering the value of C1. Just unplug the 4.7 μ F capacitor from holes 36 and 41, and plug a different capacitor into exactly the same holes.

Note: tantalum capacitors have a positive and negative lead. It is essential that they are inserted into the circuit the correct way round. If a tantalum capacitor is inserted in the wrong polarity (i.e. the wrong way round) it is easily damaged.

Power requirements

Using a 6V supply, other capacitor values tried gave time periods as follows: 1 μ F (10 minutes); 0.22 μ F (6 minutes); 0.1 μ F (2 $\frac{1}{4}$ minutes).

The circuit was found to work well on either 6V or 9V. Under no circumstances should more than 9V be used with this circuit nor should bulbs with current ratings greater than 100mA be used. The battery used in the prototype was a large 9V unit (PP9) and the bulb was a 6V 60mA cycle bulb. On test a 6V 100mA bulb was found to work well and these are commonly obtainable from most cycle stores. It is suggested that a 6V 60mA bulb is preferred since these will draw less current and Tr3 will run cooler.

The actual lead identification on the three transistors is identical. Looking at the underside of the transistors and counting from the pip/protrusion clockwise the leads are emitter, base, collector,

A last thought. To switch the light back on again and restart the cycle, simply short the two leads of C1 together for a moment—just a touch will do.

Good luck with the first project. Next month there's a special S-DeC project for Christmas: A Christmas Pudding Saver which can also be usefully employed as a Pubometer.

One of these could make a new man of you

Take a look at the labels.
Each one a formula
for making you forget
the stresses and strains
of modern living.

The message of each name is:
make something.
Make a digital clock . . .
make a coffee table . . .
make some new sounds.
The sheer concentration
involved in constructional
projects like these
smoothes away
the tensions.

Any one of these
"Practical" magazines
packs so many hours
of creative satisfaction
that it could make
a new man of you.

TELEVISION

December issue
The art of alignment,
audio circuits
for the constructor
and servicing the
Philips G8 Colour Chassis
and the Philips 920.
OUT NOVEMBER 15

PRACTICAL ELECTRONICS

December issue
Projects for
constructing a Gamesmachine
that produces
random numbers for Dice,
Roulette and the Pools
and a Metal Locator
that is ideal for the
home improvement enthusiast.
OUT NOVEMBER 12

PRACTICAL WIRELESS

December issue
How to make a Chromachaser
for flashing lights at discos,
a VHF Converter
Start of a new
'S Deck Projects' series.
OUT NOVEMBER 5

PRACTICAL HI-FI & AUDIO

December issue
Ten loudspeakers
undergo the ultimate
test - live versus
reproduction.
A buyers' guide to
music centres and
complete audio systems.
A new series starting
on choosing
a hi-fi system.
OUT NOVEMBER 12

PRACTICAL WOODWORKING

December issue
Contents include a
variety of Christmas gifts
to make, a toy farm
and a timber wagon
for modellers,
a stereo storage stand
to build
and a carving project.
OUT NOVEMBER 19



Pick up a 'Practical' and be a new man

PW 'Easybuild'

VIDEO-WRITER

PART 5

M. J. HUGHES M.A., C.Eng. MIERE

This, the last major board of the project, contains a number of different circuits. It accepts the signals that have been generated elsewhere and combines them to produce the final video output signals that generate the character information for display on the screen.

As on the previous boards, the intercomponent wiring is by etched tracks on both sides of copper clad epoxy resin board. Fig. 22 gives the main body of the wiring whilst the remaining sections are on the component side, as shown in Fig. 23. Connections between the two sides are made by means of stakes. Before assembly starts the construction notes for the previous boards should be read.

ICs 38 to 44 are MOS devices and subject to damage from static electricity. **Do not remove them from their protective packing until required** and make sure that your body is discharged of any static before handling them. It is highly recommended that sockets are used for these devices.

RANDOM ACCESS MEMORY

Perhaps the most significant circuit is that associated with the memory section which is shown in Fig. 24. The main Random Access Memory comprises six integrated circuits (IC38-IC43). Each of these packages will store 1,024 binary bits of information—in other words each unit contains what amounts to 1,024 flip flops which can be individually set or reset.

We use six separate circuits because each ASCII code that has to be memorised is made up of six bits. Each of the RAM circuits looks after ONE bit of the ASCII code—for example you will see that bit 1 from the keyboard is fed to the data input of IC38, bit 2 to the identical input of IC39 etc. In effect we apply the six bit ASCII code from the keyboard to all six memory ICs in parallel for memorising. As each circuit has 1,024 memory locations we can thus record 1,024 separate "6 bit" codes each of which describes a single character that is to be displayed.

Our display has a capacity for 512 characters (16 lines each having 32 characters) and so we have enough memory capacity for TWO full pages of text. More will be said about this later. Clearly we cannot have 1,024 separate inputs for each of the "flips flop" memory locations in each chip so we

★ components list

Memory Board

Resistors

- R8 100Ω 10%, ½W
- R9 330Ω 10%, ½W
- R10 470Ω 10%, ½W
- R11 330Ω 10%, ½W
- R12 330Ω 10%, ½W
- R14 330Ω 10%, ½W

Capacitors

- C3 10μF, 12V, Tubular, wire ended
- C4 47μF, 12V, Tubular, wire ended

Semiconductors

- IC38 } Intel 2102-2 or Texas Instruments TMS4034
- IC39 } Random Access Memories.
- IC40 } NOTE. These are 650nS access time devices.
- IC41 } Although faster devices may be used, on no
- IC42 } account try to use slower devices.
- IC43 }
- IC44 } General Instruments RO-3-2513 Read Only
- Memory Character Generator
- NOTE. There are other character generator
- ICs on the market but they may not have the
- same power requirements or pin connections
- and their access times may be different
- IC45 SN74174
- IC46 SN74151
- IC47 SN7410
- IC48 SN7474
- IC49 SN7404
- IC50 SN7400
- IC51 SN7430
- IC52 SN7430
- IC53 SN7430
- IC54 SN7430
- IC55 SN7410

Miscellaneous. Printed Circuit Board, See Readers PCB Service ad. DIL sockets, 1 off 24 pin, 8 off 16 pin, 9 off 14 pin Board pins. Tinned copper wire for staking

Fig. 22. The primary side of the circuit board comprising the majority of the wiring pattern. The balance is on the component side.

D004

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Memories, Cursor, Keyboard Interface, Video

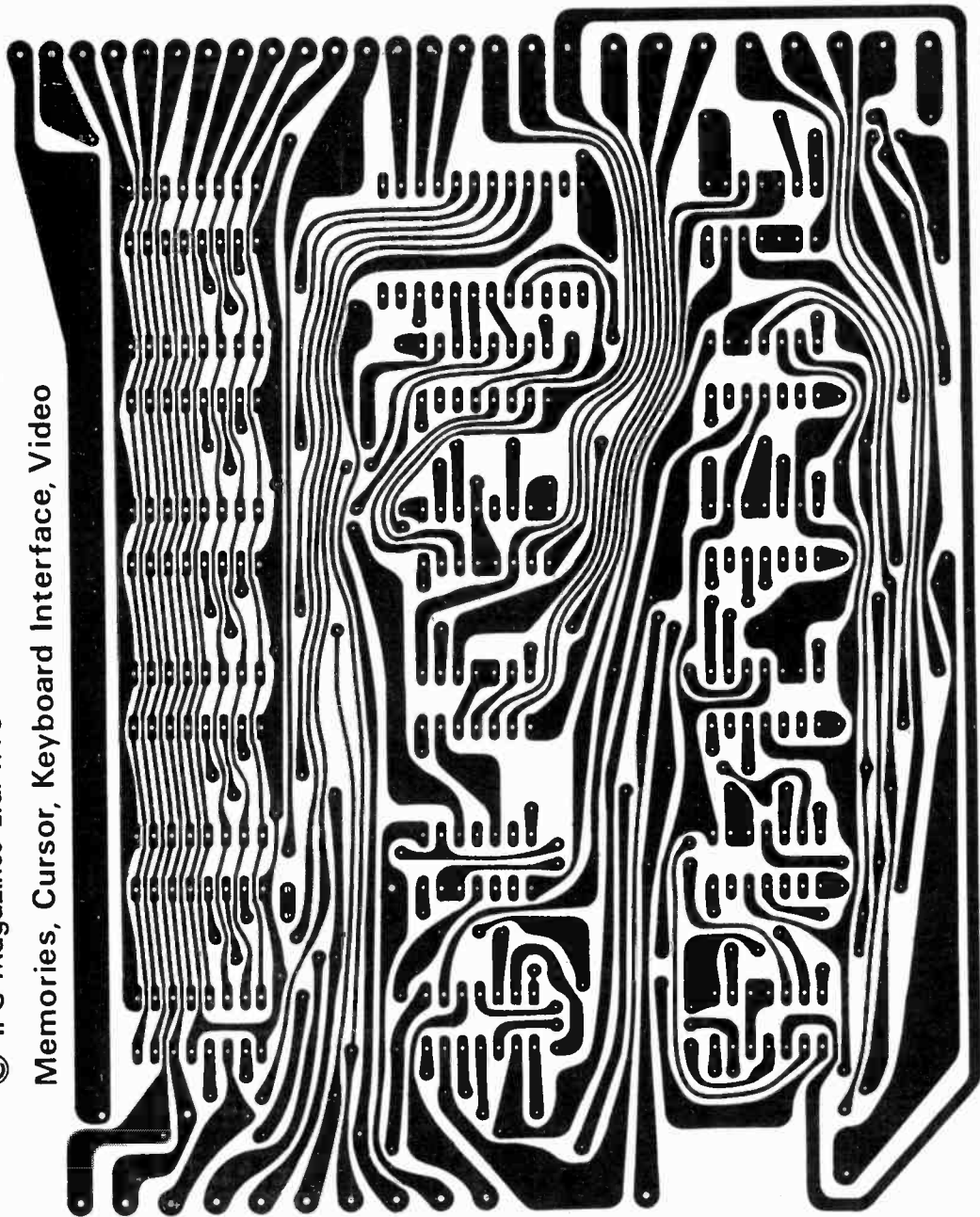
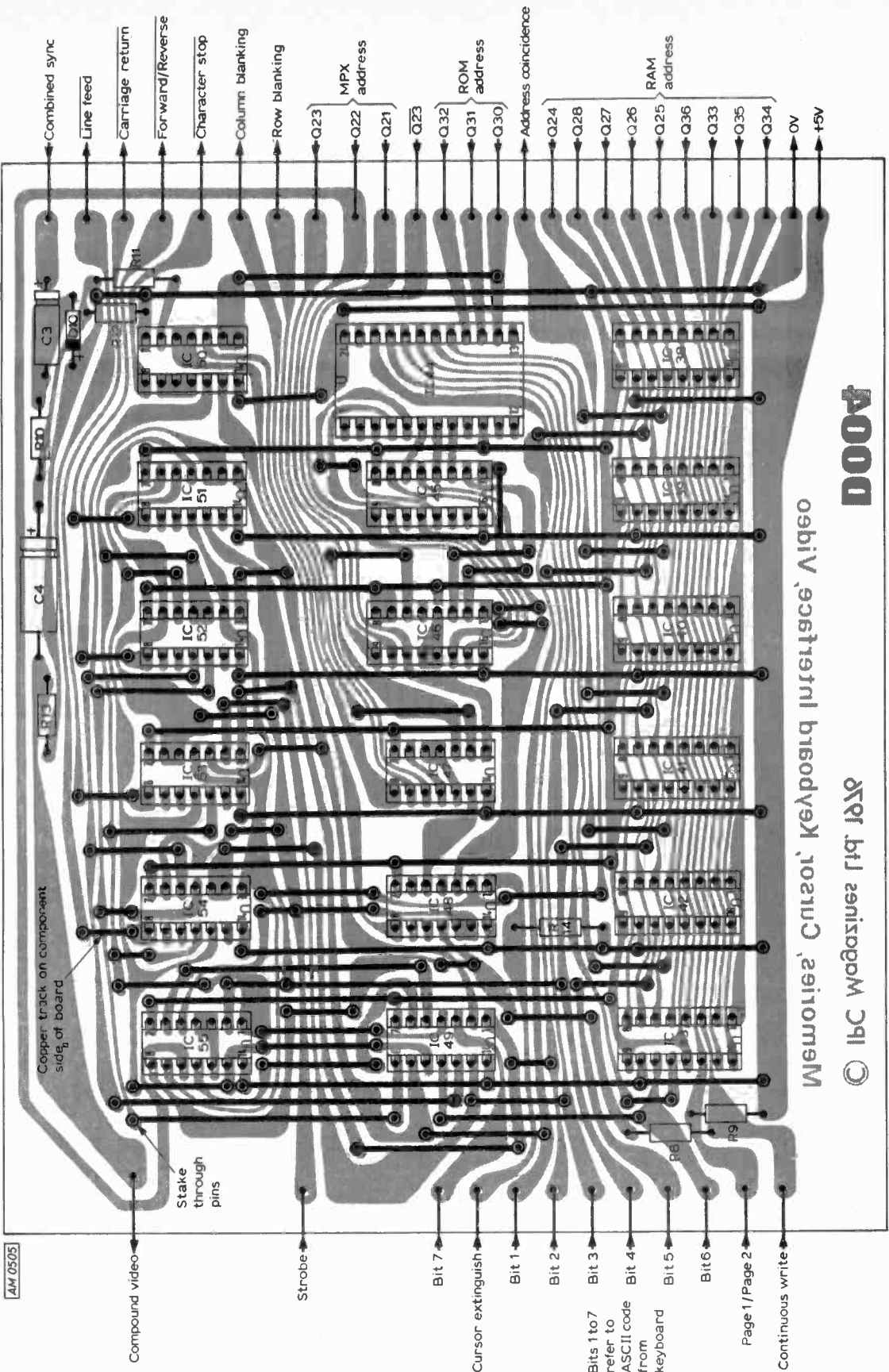


Fig. 23. The component side of the board. Note the polarity of C3 and C4 and the reversed orientation of IC44.



Memories, Cursor, Keyboard Interface, Video

DOOV

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use the principle of Addressing that has already been described. By using an Address Word we can activate any of the flip flops to accept data that is fed into the common data input.

To describe 1,024 separate memory locations we need a binary code that has a capacity of counting up to the number 1024. Those that have an understanding of binary numbers will appreciate that this needs 10 binary bits. For example the code 0000000001 represents 1, 0000000010 represents 2 and so on up to 1111111111 which is 1,023. We get 1,024 codes by using an address of "All Zeros" to make up the full complement.

The inputs which accept the address codes can be clearly seen in Fig. 24 and as mentioned previously the codes are generated by the Address Counter. The following table shows the pin designations for the RAM address inputs with reference to our specialised address codes:

ADDRESS CODE BIT	PIN NUMBER
Column Addresses	
Q24 (least significant bit)	8
Q25	4
Q26	5
Q27	6
Q28	7
Row Addresses	
Q33	2
Q34	1
Q35	16
Q36	15
Page 1/Page 2 Address (Most sig. bit)	14

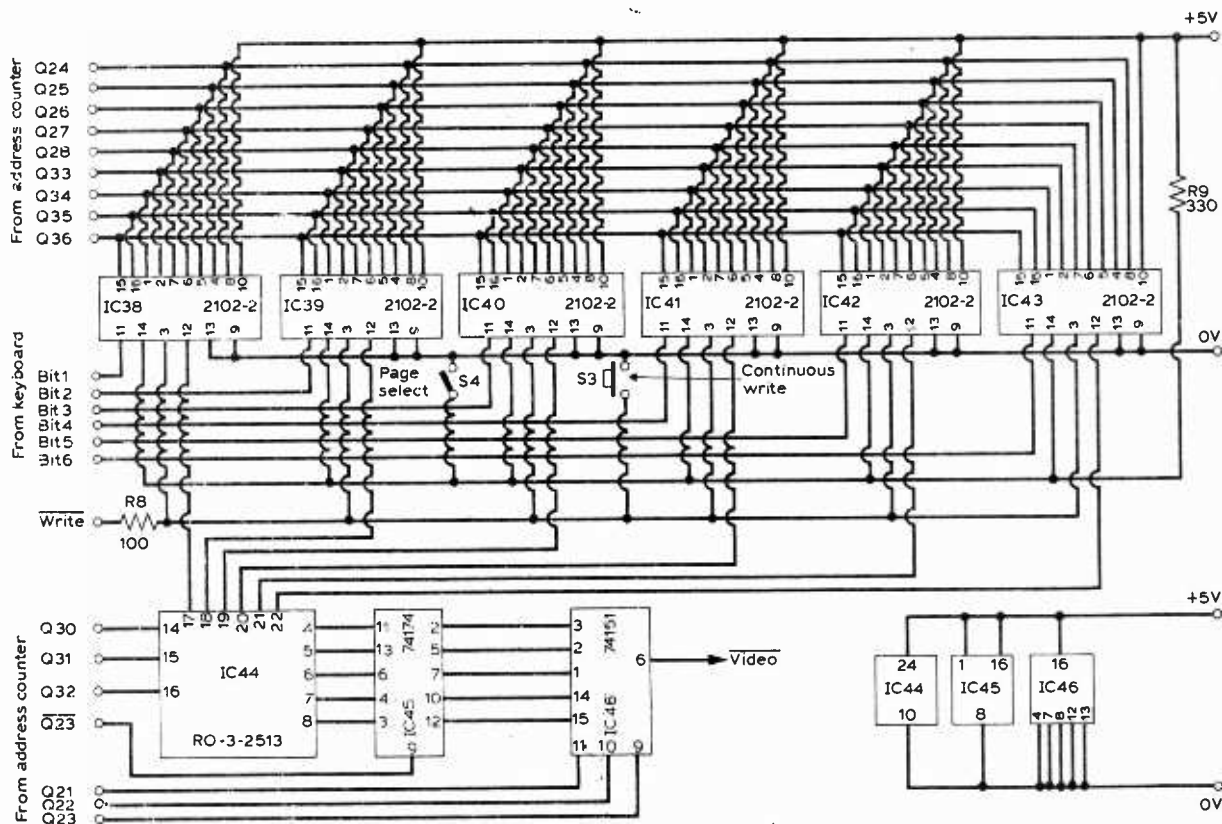
Notice that we only generate nine address lines from the counter. The permutations of these codes make up a total of 512 character addresses (sufficient to describe one full page of text) and we use a manually generated tenth code (Page 1/Page 2) to select one or the other group of 512 depending on which "Page" of data we wish to operate on. This latter code is generated by the switch S4.

We feed the identical address codes to all six integrated circuits because, of course, we shall be requiring to record or read six bits at the same time to make up the proper ASCII code.

Apart from the power supply inputs to the memory chips at pins 9 and 10 there are only three other connections that ought to be understood. These are Read/Write at pin 3, Chip Enable at pin 13 and Data Out at pin 12.

When the Read/Write input is held at "1" any data on the input of the RAM is prevented from entering the memory. Only when this signal goes to "0" will the state of the data be read into the location of the memory that is being addressed at that time. Under normal circumstances the Write signal entering this part of the circuit is at logic level "1" as the memory is usually in "Read" mode —outputting data for display purposes. Only when a keyboard character is depressed does the Write signal go to "0" which allows the data to be written into the memory location that is being addressed at that moment of time.

Fig. 24. The RAM addressing and the Read circuitry.

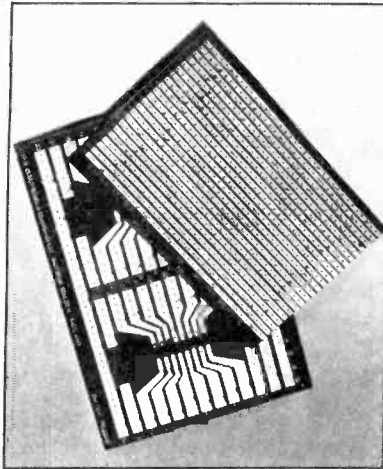


W339



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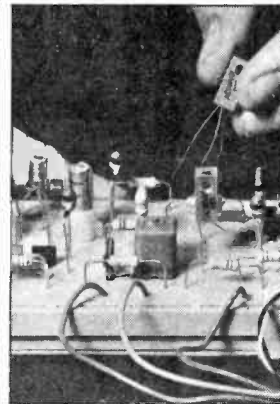
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ZB3V 3.75 x 5	£0.46	£1.14	ZB41C 4.75 x 7.5	£0.85	£2.13
ZB4V 10 x 6	£1.51	£3.78	ZB81C 9.5 x 7.5	£1.70	£4.26
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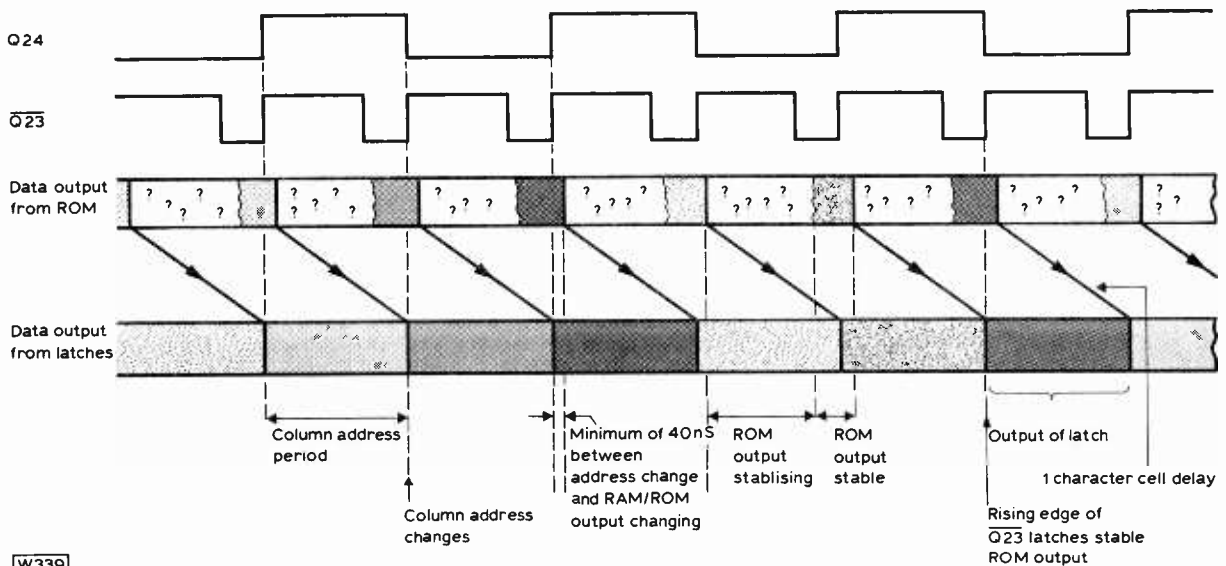
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W339

Fig. 25. Diagrammatic representation showing how the slowly stabilising ROM output is caught by the latches on receipt of Q23 and given a character cell delay.

CHIP ENABLE

The Chip Enable input would normally be used if several RAMs were connected in parallel at each significant bit of the ASCII word—this technique would be used if the memory needed extending. In this application we do not need to select one of several chips so this input is kept permanently at logic level "0".

DATA OUT

The outputs of each of the six significant bits of memory (pin 12 of each RAM) are fed to the six data inputs of the Read Only Memory (IC44) where the code is converted to give a five bit output word that describes the state of each picture point of a character cell row. The row in question is selected by the ROM Address code—Q30, Q31 and Q32—which comes from the Address Counter.

DISPLAY DELAY

It has been mentioned previously that there is a significant delay between accessing the right location in the RAM and obtaining the five bit output of the ROM. It is therefore necessary for the memory "Accessing" to be carried out a finite period of time BEFORE we start to display the character information on the screen. By using the MEDIUM SPEED RAM that is specified (NOTE THAT SLOWER CHEAPER VERSIONS OF THE 2102 MIGHT GIVE RISE TO PROBLEMS!) the 1.5µS of a character cell width is more than enough time thus we address the RAM during the time of the character cell immediately prior to the time of the cell in which we want it to appear.

To produce this single cell delay we make use of five D Type latches in IC45. The outputs of these latches will take up the state of the inputs when the input clock makes a "0" to "1" transition. Note, with reference to Fig. 25, that the Q23 signal makes this transition at the end of a cell and thus is an ideal clock signal.

Some people might query that this clock edge is changing at the same time as the address of the RAM is changing and that this might give rise to ambiguities. In theory this is true but in practice there is a minimum of 40ns between the input address to the RAM changing and the output following suit. The rise time of Q23 is much faster than this so we are guaranteed to catch the data of the "previous" address each time. The output data from IC45 is held valid for a complete character cell width until Q23 comes round for the second time.

LATCH SERIALISATION

The stable five bits from the latch then have to be serialised in the right sequence to give a time sequential pattern of picture points to make up the character cell row. They are fed to the inputs of the multiplexer (IC46).

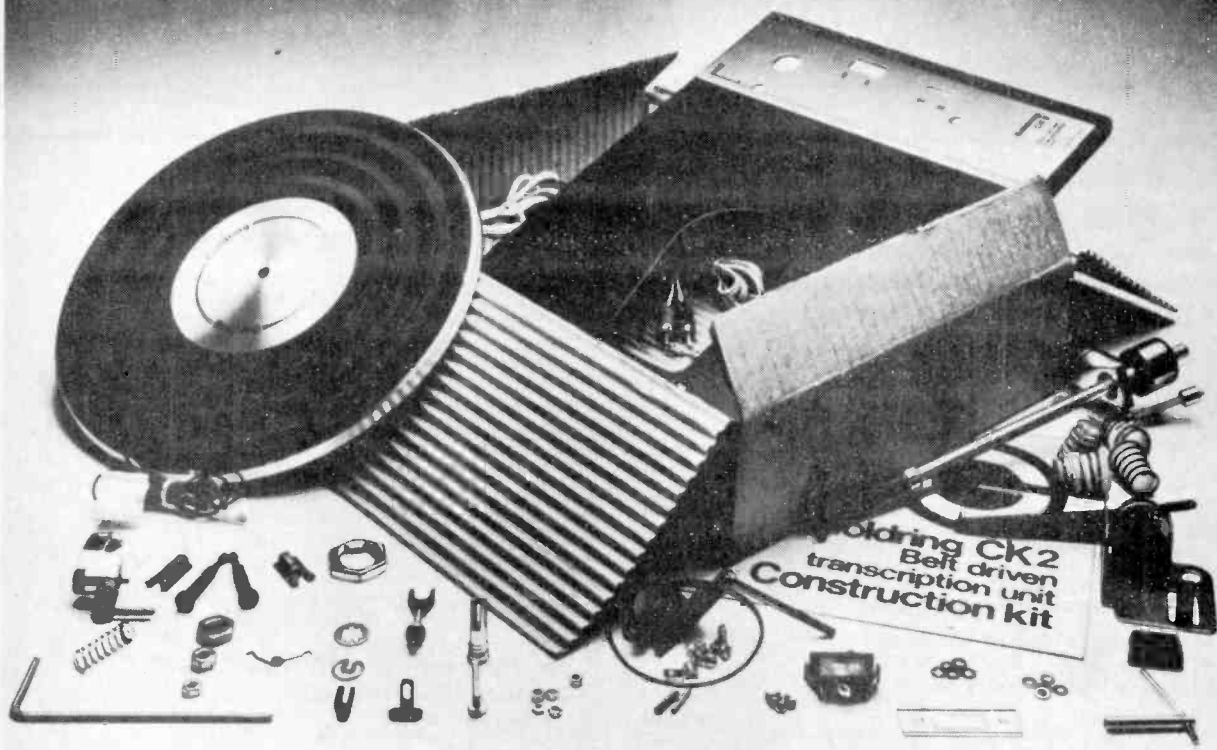
Remember, however, that the first picture point in every character cell row must be a blank as this forms the gap between adjacent characters (it also prevents any truncation of active picture point data which might otherwise occur during the time the latches are stabilising). We therefore make sure that the first bit of data to be serialised by the multiplexer is a "0". A permanent zero level is applied to the input of pin 4 (shown connected to ground in the inset to Fig. 24).

Pins 3, 2, 1, 15 and 14 carry the five variable data bits and these are serialised in that order. The two remaining unused inputs of the multiplexer (pins 12 and 13) are connected to ground as is the strobe input (pin 7). The sequence of selecting the data inputs is carried out by the Multiplexer Address lines (Q21, Q22 and Q23).

The SN74151 multiplexer IC has two possible outputs; one has the same sense as the input data while the other provides the data in inverted form. We use the latter output because we need to "OR" the video information, so produced, with the Cursor signal which is generated in a later part of the circuitry. We therefore call the output of IC46 Video.

The design details for the remaining circuits on this board will be given in the January issue

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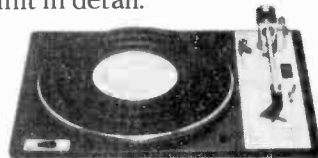
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Tuner	100mV	>70dB	10KΩ
Tape	100mV	>70dB	10KΩ
Auxiliary	1-100mV	60dB- 70dB	200KΩ



Magnetic i/p overload 33dB;
Distortion 0.04% at 1KHz; Output 1v r.m.s.
into 10KΩ;

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Description: This is a general purpose 2 channel pre-amplifier suitable for use with gramophone, tape, microphone or tuner inputs. It requires no external components other than the potentiometers for the bass, treble, balance and volume controls and the input selector switch. The unit is internally protected against accidental reversed supply connection.

AMPLIFIER: CP2-15-20 PRICE: £12.85
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or 15W r.m.s. + 15W r.m.s. into 8Ω, 2 channel
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0.04% at 15W; Supply Voltage ±18v nominal;
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AMATEUR BANDS

by Eric Dowdeswell G4AR

UNFORTUNATELY I was not able to get along to the RSGB Show at Alexandra Palace and to judge from my correspondence I missed meeting some of you, for which my sincere apologies. Seems the Show didn't quite get airborne! Seems ridiculous that a difference of opinion between the RSGB and the Amateur Radio Retailers Assoc. as to whether the traders would support the Show or not could not have been settled earlier, to enable it to have been cancelled, if necessary. As usual, those that pay the money, to the RSGB or to the traders, suffered!

Right chaps! Summer's over so let's get down to some serious listening for the next few months. You should have been out in the glorious sunshine putting up new aerial systems and polishing up the old ones. Get an ATU if you haven't already got one and make sure that the long wire is pulling its weight on all the HF bands. Get that countries prefix list up-to-date so that you won't be astonished when that AC4 turns out to be in W-land.

A crystal calibrator providing check points on 100kHz and 10kHz is invaluable and might stop some of you having implicit faith in your set's dial readings, which is very unwise even with the best of sets. I haven't yet had the chance of laying hands on any of the new receivers that are being advertised but I must admit to being aghast at one which has triple conversion! It has long been my contention that the only answer for a quiet receiver with virtually no spurious responses is single conversion at a high IF, probably around 9MHz where filters are available. I had hoped that we had heard the last of double and triple conversions a long time ago. Now it's all back and in solid state. UGH! This month's puzzle! Why was 9MHz, and sometimes 5.5MHz, chosen for the IF in some amateur HF band transceivers? Try juggling with the two frequencies.

John Moore of Leicester sends what may be his last log and letter for quite a while. He's getting hitched but it's good to see he is sticking to his guns 'til the last minute! Strangely, he made a 15m converter for his home-made 20m set and then found the band to be pretty dead, apart from a few S. Americans and Africans. John commented on the bad

behaviour of certain stations in the pile-ups but, as I have told him, a lot depends on the DX op. If he takes control of the situation and works stations only on the frequency he nominates then all should go well.

In Colne, Lancs., Richard Berry A8994 has been on 2m quite a bit, but bemoans the lack of SSB signals. Local lads tried to convince him that "FM is best" but he notes that they all have smart little commercial rigs, so perhaps they are biased! Michael Walker of Leeds hopes to start an RAE course this autumn. He had thoughts about CBing then decided, very wisely, to get on and get a proper licence! He has a CR70A and has been playing around for about a year before making his mind up. You won't regret it, Michael.

Our first "first timer" this month is Graham Carington who hails from Hucknall, Notts., where he uses a Trio 9R59DS and a long wire on 160m, doublets for 20 and 15m and a trapped job for 10m. He is another looking forward (?) to taking the RAE 'ere long. Alan Doherty sends in his last log for a while as he lowers his aerials and departs for New Zealand, as reported last month. Just as well, he says, with Force 8 to 9 Atlantic gales just down the road in Portrush, Co. Antrim!

Stephen Budd A8713 just missed last month's issue with his news that the WWV standard frequency station is to close down! It's not quite so bad OM, I understand it is certain propagation forecasts, useful to amateurs, that are being cut out. Could be worse! Stephen is busy filling out some 2000 QSL cards when he has nothing else to do. He's chasing the CQ Counties Award. When you get your ticket OM you can try working them!

The autumn newsletter of DADARS, Derby and District ARS, is full of juicy dates for the winter

BROADCAST BANDS

Short Wave Reports by the 15th of the month to Derek Bell, c/o Practical Wireless, Fleetway House, Farringdon Street, London, EC4A 4AD.

Medium Wave Logs to Charles Molloy, 132 Segars Lane, Southport, PR8 3JG.

AMATEUR BANDS

Logs covering any amateur band/s in band/ alphabetical order by the end of the month to Eric Dowdeswell G4AR, Silver Firs, Leatherhead Road, Ashted, Surrey, KT21 2TW.



season with technical matters nicely leavened with cheese and wine evenings and Ladies' Nights. Always a good idea to look after those that sharpen our pencils and bring us coffee during field days and contests! So trot along any Wednesday night to 119 Green Lane, or contact my old friend Fred Ward G2CVV, 5 Uplands Avenue, Littleover, Derby, for more details.

Another old friend, R. Holmay G2DYM, is going into business selling aerial systems, including those particularly suited to the SWL. He has some pretty definite ideas about aerials that keep down the QRM from colour TV timebases, which could interest some readers of this column. Write to G2DYM at The Old Saw Mills, Whiteball, Wellington, Somerset. **Robin Bayley** (Albrighton) was unlucky to find himself as the only candidate on the local RAE course, consequently cancelled. Good to know he is busy looking down at the CW end of the bands and finding some interesting DX there. Could use some more CW reports for a change. Robin uses a Marconi R1475 set with a long wire. **Martin Sole** A9065 runs a Trio JR310 in Peterborough plus a 66ft. end-fed aerial and a helical whip, with a preselector in between. He hopes to be on 2m also very soon. He admits failing the RAE but promises success in December. We'll be rooting for you OM!

In Harrogate **Steve Cottis** A8961 is proudly admiring his first award, the ISWL ITU Zones Award. He bemoans the 20p cost of IRC's from the PO! Certainly can get very costly, collecting awards these days. **P. W. Turner** BR336843 in Bishops Stortford is another we must wish well in the next RAE. He enjoyed the RSGB 2m contest and hopes to come well up in the lists. Sorry I cannot comment on your score but suggest you look up the results of the previous similar contest.

The Pioneer Radio Club GM4AVH was pleased with the little plug I gave them last year so let's do it again! Present project in hand is a transceiver for the club station so if you are in the Edinburgh area why not pop in to the Gilmerton Church Hall in Ravenscroft Street any Tuesday evening around 7.30 or write to Sec. R. Henderson GM4DTJ at 2 Burdiehouse Avenue, Edinburgh EH17 8AW.

Our sympathies must go out to **David Peck** of Cambridge whose house was gutted by fire but he and the family got out safely. He now has an FRG7 and 130ft. aerial at his new QTH and has resumed listening. The last epistle of the month is from Steve Budd, again, and tells the sad news of the ill-health of Geoff Watts of DX News Sheet fame. Unless he can reduce the 80hrs/week work load it will certainly have to fold, which would be a great loss.

Log Extracts (All SBB)

R. Bayley:—80m CW F18CE PY7PO UA9CM 40m KL7KV LU2BB 20m AP2AD CT2AP EA6CF FP8DH VE8RE.

M. Sole:—20m EP2HE HC1QRC 15m CE3IF KV4AD YB2SV/4U ZS2ND 10m F0CFB/FC OY1A.

S. Cottis:—20m HZ1TA JT1AS KL7BVB TA2BK VE8ML VP2SV VR4DX 15m VQ9HCS 5Z4QQ 9V1SV.

P. W. Turner:—2m GW8IZS/P DJ9DX/LX/P GD3SLH/P GW3WRA/P.

J. Hodgson:—20m CT2BB HI8EL HK4BTY VP9HM 7X4MD.

S. Budd:—80m FG7AR/FS7 HZ1AB (now RIP, I'm sorry to report) VP1MPW VP2AA 9M2PV 40m HK4DEG KZ5HP VK7GK ZL1-2-3-4 6W8FP 20m FO8EX HL9TJ JW7FD (Bear Is.) VR3AK VS6DA 15m VQ9DF YB0ACG ZB2FX 9X5AV 2m ON6UG PA0CIS.



SHORT WAVE BROADCASTS

by *Derek Bell*

EMBARRASSMENT is defined in many ways; to Radio Norway it is the puff of black smoke that put their new 250kW transmitter off the air during recent high power tests! So reports **Robin Bayley** of Albrighton, Wolverhampton. Thus it is that Radio Norway is now on reduced power but running its normal schedule. "Get well soon" cards can be sent to Radio Norway, Oslo 3, Norway! Meandering into "Charles Molloy" land we find our second definition of this state of mind in the offices of the local radio station who found that the newspapers that were to be scanned to provide material for a "Weekly review of the local press" had been sent to the local fish and chip shop!

NHK Japan has produced a colourful set of leaflets that are well worth sending for. NHK have services in English from 0630 to 0830 on 15325 and 15430 but if you are one of those DXers that like the unusual then try for their North, Central, South American and Hawaiian service in English on 15195, 15420, 17725 and 17825 from 0100 to 0300. These are obviously not beamed to Europe but under certain conditions this winter it may be possible to pull them in.

Nicholas King of Rangiora, New Zealand, who belongs to the North Canterbury Amateur Radio Club, has built the General Coverage RX featured recently in *PW* and finds that he cannot buy the coils required to finish the set. This to me seems unusual since surely the inhabitants of NZ do not all build coil-less radios! However, that is the situation and Nicholas now has his set languishing on the shelf for want of these components. So can any of you "Home Brew" specialists assist and tell us the name of a firm that can supply coils to fit the RF stage of a mute Kiwi Receiver? (*Why not try Denco, as stated in the article, at 357 Old Road, Clacton, Essex?—AED.*)

Roy Patrick of Derby highlights one of the phenomena of summer propagation in his log of the signals pulled in by his National R1400 portable while the set was on holiday with him in Wales:—

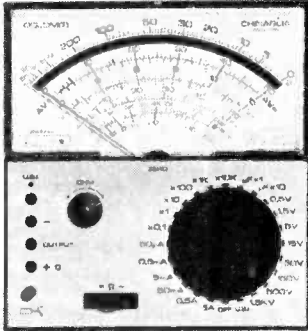
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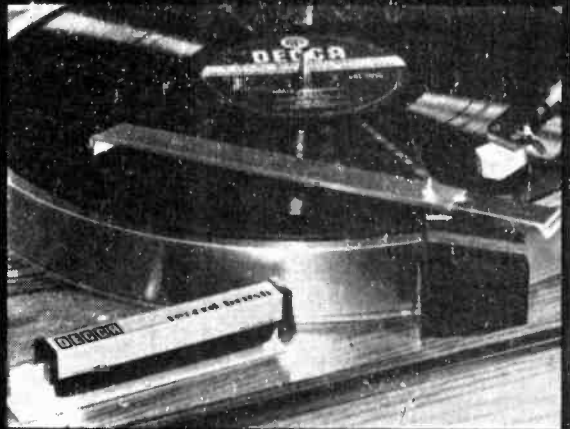
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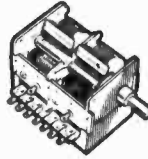
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Roy mentions that while he had an excellent signal in Wales from SBC the same station, despite its high power transmitters, was not heard in Derby. M. G. Hayman, of London, has logged Radio Kiev on the 9485 freq. at 1940 using a HAC Mk2 receiver hanging on the end of a 70ft long wire with a 20ft one on the side and an old TV aerial to fill in the gaps. Similarly **Jim Coombs** of Walsall logged Kiev on the 49 metre band on his 1950's built Armstrong that sucks in the signals via 100ft long wire. That must be some garden! Jim is seeking information on the ex-RAF 1392D set, in order to put right a fault in the circuit.

Our final item this month concerns the 10th birthday of the Radio Berlin International DX Club. During November they are to broadcast the 250th DX club programme and issue three special QSL cards to mark the occasion. I may have a go for them myself, being somewhat of a nut for commemorative cards, but, with my luck, I will probably get all of one sort! Be that as it may we must say "Happy Birthday" to RBI, there cannot be many stations whose DX shows go so far back. The address for RBI is 116 Berlin Nalepastrasse 18-50 DDR. They run transmitters ranging from 5 to 500kW, at Leipzig and at a town that rivals that one in Wales (and you wont get me to quote it!) called Konigswusterhausen!

With that I will declare the meeting closed for this month and wish 73s to you and yours.



MEDIUM WAVE DX

by Charles Molloy

THE winter DX season on the medium waves starts with a good bag of readers' letters. **John Wildey** (Doncaster) has a Grundig Satellit 2000 and a 30ft longwire aerial which is strung between house and garden shed. With this combination he logged WOR on 710kHz, WINS on 1010 and WNEW on 1130, all three stations being in New York City. John gives details of the programmes heard which should be of interest to DXers who have never heard North America on the medium waves and do not know what to expect. On WOR at 0200 John heard a talk on psychology, on WNEW at 0235 a baseball match "Cardinals v. Mets", adverts for a finance company, an interview programme and a weather

report. From WINS at 0300 came the stock market report; WINS is an all-news station.

Ian Rennison mentions that North American has started early this year, CJON being heard at quite good strength on most evenings. His list of catches to date includes CBN on 640kHz, CKVO on 710, WABC 770, CJON 930, CHNS 960, WINS 1010, WBZ 1030, MNEW 1130, CBT 1140, WCAU 1210, WKLX 1350, WMEX 1510 all heard on a Trio 9R59D receiver with loop and differential amplifier. Ian says that this year is the first time he took advantage seriously of Ramadan for DXing and he sends a list of 25 DX stations logged which include Bonabe, Iran on 634kHz, Amman, Jordan on 800, Kikuk, Iraq on 1360 and Libya (either Sabha or Benghazi) on 1570.

Finally, Ian refers to his tape recorder which he finds invaluable for DXing. He wonders how many readers find themselves busy writing details for a reception report when their pens run dry or they run out of paper. All you have to do is to note the times when the tape was switched on and off. Important identifications that were missed can be replayed until they are clear. Ian, like the writer, always has a tape recorder coupled to the receiver when DXing.

Old timer **F. F. Shortridge** writes again from Llandudno Junction to say that his AR88 needs attention and while waiting for a repair he has been trying for North America with a small Vesta Vixen 6 transistor portable which he obtained from a department store. This receiver has sockets for Aerial and Earth and when joined to a 200ft outdoor aerial which is shaped into a square, it pulled-in WINS 1010, CJON 930, WNEW 1130 and CHNS 960. He says that there are so many stations on the band these days that QRM makes it impossible to receive North American DX as it was 40 years ago. At that time he

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heard KTMS in Hot Springs, KSL Salt Lake City, KNX Hollywood, WSM Nashville and WENR Chicago. (KSL and WSM are still heard occasionally in the UK.)

Ricky Henman (Sheffield) asks "do you need a good receiver designed for DXers to DX on the medium waves?" The previous log from F. F. Shortridge illustrates the value of a really good aerial which, if connected to a simple receiver, will produce at least some DX. A good receiver will help too. Not everyone has the space to put up an outdoor aerial. **John Timms** (London) who lives in a bed-sitter is constructing a medium wave loop which is a good alternative to a longwire and in some respects is superior.

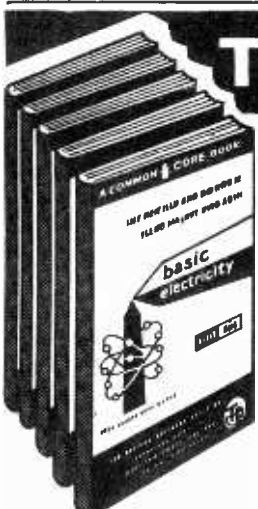
Fifteen year old **Paul Boyd** (Carlisle) is a newcomer to the band, with his Realistic Astronaut 4 connected to a 100ft long wire he pulled-in Trans World Radio in Monte Carlo on 1466 and the Voice of America in Rhodes on 1259. A good start, Paul! With your aerial you should be able to hear North America when the long winter nights are here. Try around 2300 for CJON in St John's Newfoundland on 930kHz.

Alan Spencer who lives at Ryhall, in Lincolnshire, has finished building a loop which he uses with a Bush TR90C receiver. Stations logged include VOA

Rhodes on 1259kHz, the Deutsche Welle relay in Malta on 1570 and AFN outlets on 872, 935, 1106 and 1142. Being able to null out stations on the same frequency is a great advantage reports Alan and he continues "I have been listening regularly to Radio Sweden in English on about 1330kHz. This frequency is not listed in the World Radio Handbook nor is it announced at the end of the programme, which starts at 1100". Has any reader heard this transmission? It might be a spurious signal of some sort as the Swedish Foreign Service has a shortwave transmission in English from 1100 to 1130.

Roy Patrick has been on holiday at Towyn, in Wales, and like a good DXer took a receiver with him, a National R1400 portable. This is one of the better type of portables which has an RF stage and an "S" meter and is quite a powerful DX tool on the medium waves. Using this receiver with its internal aerial Roy pulled in the Trans World Radio high power station at Bonaire in the Netherland Antilles, which lie off the north coast of South America. The station is on 800kHz with a power of 500kW. There is a lot of interference on 800 which can be nulled-out with a loop or a ferrite rod aerial.

David Bellmer asks if there is a DX club in operation in Lancashire. Can readers in Lancashire help? David's address is 21 Brabazon Place, Marsh Green, Wigan, Lancs. **Robin Bayley** of Kingswood School, Allbrighton, uses a Marconi Tuner Amplifier with an outdoor aerial and a Grundig "Prima Boy" with internal aerial for his DXing. Stations logged include Riyadh in Saudi Arabia on 587kHz, and CX10 in Montevideo, Uruguay, on 730. Robin is a regular listener to Sweden Calling DXers which is broadcast in English every Tuesday on 1178kHz at 2315.



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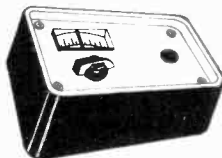


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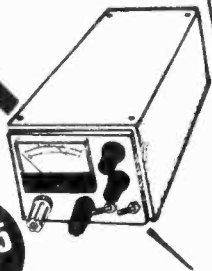
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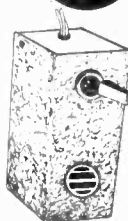
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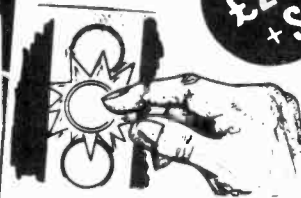
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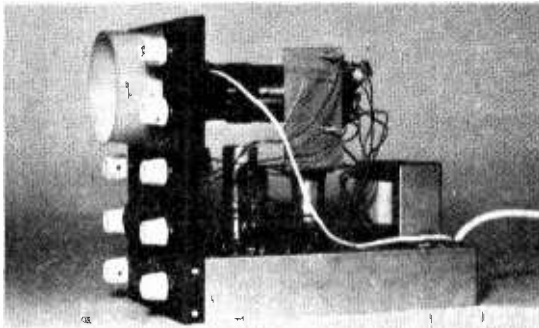
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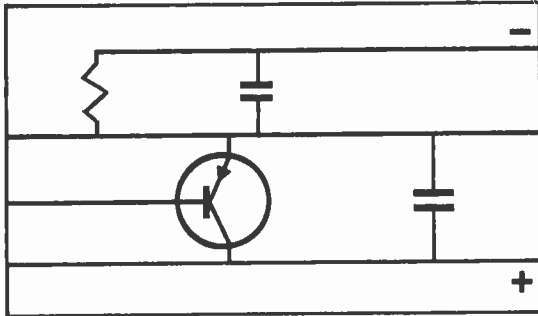
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An Electrocomponents Group Company.



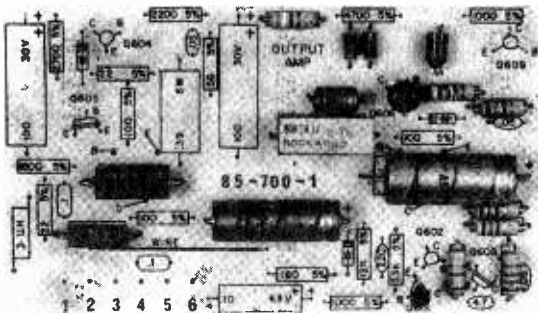
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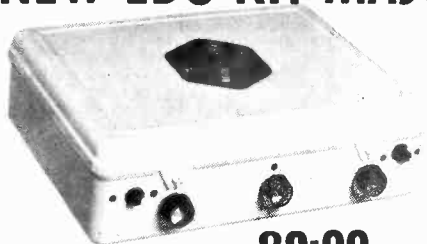
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Total Building Costs **£9.00**

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- ★ 4 Transistor Earpiece Radio
- ★ Signal Tracer
- ★ Signal Injector
- ★ Transistor Tester NPN-PNP
- ★ 4 Transistor Push Pull Amplifier
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- ★ 7 Transistor Loudspeaker Radio MW/LW
- ★ 5 Transistor Short Wave Radio
- ★ Electronic Metronome
- ★ Electronic Noise Generator
- ★ Batteryless Crystal Radio
- ★ One Transistor Radio
- ★ 2 Transistor Regenerative Radio
- ★ 3 Transistor Regenerative Radio
- ★ Audible Continuity Tester
- ★ Sensitive Pre-Amplifier

Components include: 24 Resistors ★ 21 Capacitors ★ 10 Transistors
 ★ 3 1/2 Loudspeaker ★ Earpiece ★ Mica Baseband ★ 3 12-way connectors
 ★ 2 Volume controls ★ 2 Slider Switches ★ 1 Tuning Condenser ★ 3 Knobs
 ★ Ready Wound MW/LW/SW Coils ★ Ferrite Rod ★ 6 1/2 yards of wire
 ★ 1 Yard of sleeving, etc. Complete kit of parts including construction plans.

VHF AIR CONVERTER KIT

Build this Converter Kit and receive the Aircraft Band by placing it by the side of a radio tuned to Medium Wave or the Long Wave Band and operating as shown in the instructions supplied free with all parts. Uses a retractable chrome plated telescopic aerial, Gain Control, V.H.F. Tuning Capacitor, Transistor, etc.

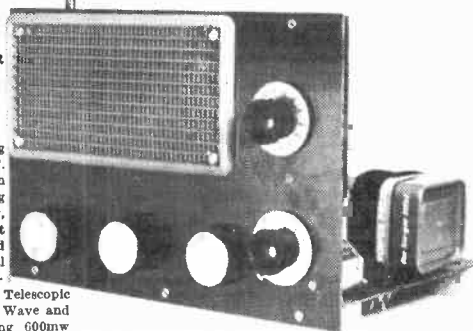


All Parts Including Case and Plans. **£3.95**
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 13 TRANSISTORS AND FIVE DIODES
 QUALITY 5" x 3" LOUDSPEAKER

WITH Multiband V.H.F. section covering Mobiles, Air, T.V. Sound, Local V.H.F. Stations, etc., and Multiband A.M. section with Airspaced Slow Motion Drive Tuning Capacitor for easier and accurate tuning, covering M.W.1, M.W.2, L.W. Three Short Wave Bands S.W.1, S.W.2, S.W.3, and Trawler Band. Built in Ferrite Rod Aerial for Medium Waves, Long Wave and Trawler Band, etc., Chrome Plated 7 section Telescopic Aerial, angled and rotatable for peak Short Wave and V.H.F. reception. Push Pull output using 600mw Transistors. Gain, Wave-Change and Tone Controls. Plus two Slider Switches. Negative Feedback circuit and SPECIAL POWER BOOSTER SOCKET AND RESISTOR, to virtually double gain if required. Powered by P.P.9 9 volt battery. Complete kit of parts including carrying strap. Building Instructions and Operating Manuals.

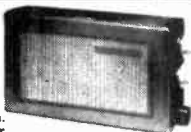


£13.99 Including Post and Packing

Case Enclosure Kit (if required) £1.80 inc. P & P.

POCKET FIVE

NOW WITH 3" LOUDSPEAKER
 3 Tuneable wavebands, M.W., L.W., and Trawler Band, 7 stages, 5 transistors and 2 diodes, supersensitive ferrite rod aerial, attractive black and gold case. Size 5 1/2" x 1 1/2" x 3 1/2" approx.

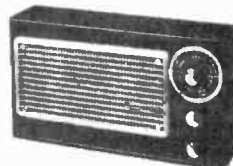


Total Building Costs **£3.60**

All Parts Including Case and Plans. P & P + Ins. 60p.

NEW Everyday Series

Build this exciting new series of designs.



E.V. 5. 5 Transistors and 2 diodes. MW/LW. Powered by 4 1/2 volt Battery. Ferrite rod aerial, tuning condenser, volume control, and now with 3" loudspeaker. Attractive case with red speaker grille. Size 9" x 5 1/2" x 2 1/2" approx. All parts including Case and Plans.

Total Building costs **£4.30** P & P + Ins. 40p.

E.V. 6. Case and looks as above. 6 Transistors and 3 diodes. Powered by 9 volt battery. Ferrite rod aerial, 3" loudspeaker, etc., MW/LW coverage. Push Pull output.

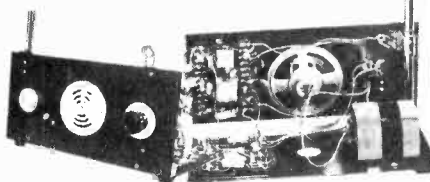
All parts including case and plans. Total Building costs **£4.95** P & P + Ins. 65p.

E.V. 7. Case and looks as above. 7 Transistors and 3 diodes. Sl. wavebands, MW/LW, Trawler Band SW1, SW2, SW3, powered by 9 volt battery. Push Pull output. Telescopic aerial for short waves. 3" Loudspeaker.

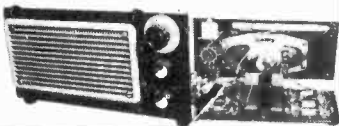
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ELECTRONIC CONSTRUCTION KITS

ECK 2 Self Contained Multi-Band V.H.F. Receiver Kit. 8 Transistors and 3 Diodes. Push/Pull output. 3" Loudspeaker, Gain Control. Superb 9 section swivel ratchet and retractable chrome plated telescopic aerial, V.H.F. Tuning Capacitor, Resistors, Capacitors, Transistors, etc. Will receive T.V. Sound, Public Service Band, Aircraft, V.H.F. Local Stations, etc. Operates from a 9 Volt PP7 Battery (not supplied with kit). Complete kit of parts including construction plans **£7.95** P & P + Ins. 70p



ECK 4 7 Transistors, 6 tuneable wavebands, MW, LW, Trawler Band, 3 Short Wave Bands. Receiver Kit. With 5" x 3" Loudspeaker. Push/Pull output stage, Gain Control, and Rotary Switch. 7 Transistors and 4 Diodes. 6 section chrome-plated telescopic aerial. 8" Sensitive Ready Wound Ferrite Rod Aerial. Tuning Capacitor, Resistors, Capacitors, etc. Operates from a 9 Volt PP7 Battery (not supplied with kit). Complete kit of parts including construction plans. **£7.25** P & P + Ins. 70p.

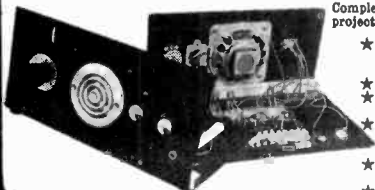


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 - ★ 3 Transistor Earpiece Radio Medium Wave Coverage.
 - ★ 4 Transistor Medium Wave Loudspeaker Radio.
 - ★ Electronic Noise Generator
 - ★ Electronic Metronome.
 - ★ 4 Transistor Push/Pull Amplifier.
- All parts including Loudspeaker, Earpiece, MW Ferrite Rod Aerial, Capacitors, Resistors, Transistors, etc. Complete kit of parts including construction plans.

£6.55 P & P + Ins. 60p



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20x20 Watt STEREO AMPLIFIER

Superb Viscount IV unit in teak-finished cabinet. Black fascia with aluminium rotary controls and pushbuttons, red mains indicator and stereo jack socket. Function switch for mic, magnetic and crystal pick-ups, tape, tuner, and auxiliary. Rear panel features two mains outlets, DIN speaker and input sockets, plus fuse. 20+20 watts rms, 40+40 watts peak.



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+ p & p £2.10

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For only £80, you get the 20+20 watt Viscount IV amplifier; a pair of our 12-watt-rms Duo Type 11b matched speakers; a BSR MP 60 type deck complete with magnetic cartridge, de luxe plinth and cover.

£80.00
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SYSTEM 2

Comprising our 20+20 watt Viscount IV amplifier; a pair of our large Duo Type III matching speakers which handle 20 watts rms each; and a BSR MP 60 type deck with magnetic cartridge, de luxe plinth and cover.

£92.00
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SPEAKERS Two models—Duo 11b, teak veneer, 12 watts rms, 24 watts peak, 18 1/2" x 13 1/2" x 7 1/2", approx.

£34 PER PAIR
+ p & p. £6.50

Duo III, 20 watts rms, 40 watts peak, 27" x 13" x 11 1/2"

£48 PER PAIR
+ p & p. £7.50

TURNTABLE Popular BSR MP 60 type, complete with magnetic cartridge, diamond stylus, and de luxe plinth and cover.

£24.00
+ p & p. £3.50

VALUE



DIY 30x30 AMPLIFIER KIT



Specially designed by RT-VC for the experience constructor, this kit comes complete in every detail. Same facilities as Viscount IV amplifier. Chassis is ready punched, drilled and formed. Cabinet is finished in teak veneer. Black fascia and easy-to-handle aluminium knobs. Output 30+30 watts rms, 60+60 peak.

£29.00
+ p & p. £2.10

STEREO CASSETTE DECK KIT

Again, this kit is specially designed for the experienced constructor—for mounting into his own cabinet. Features include solenoid-assisted AUTO-STOP, 3-digit counter, record/replay PC board, mains transformer and input and output controls. AC BIAS AND ERASE.

£32.50
+ p & p. £1.50

DELUXE ACCESSORY KIT

Comprises of a matched pair of dynamic mics, and two replacement slider level controls. P & P FREE WHEN PURCHASED TOGETHER.

£3.95
+ p & p. £1.00



DIY STEREO SYSTEM

COMPLETE WITH SPEAKERS

Here's real value in DIY! Comprises ready-built amplifier module, 3-speed Garrard auto-return deck, and teak-veneered simulate cabinets with clear plastic top. Easily built by hobbyists.

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FANTASTIC SAVING. A build-it-yourself stereo power amplifier with latest integrated circuitry, 10W RMS per channel output, full short-circuit and overheat protection.

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TOURIST IV PUSH BUTTON CAR RADIO KIT

(Motor Top 10 Award)

Complete with speaker, baffle and fixing strips. The Tourist IV—for the experienced constructor only. The Tourist IV has five push buttons: four medium band and one for long wave band. The tuning scale is illuminated and attractive spun aluminium control knobs are used for manual tuning and volume control. The modern style fascia has been designed to

blend with most car interiors and the finished radio will slot into a standard car radio aperture. Size approx. 7" x 2" x 4 1/2". Power Supply: Normal 12 volts positive or negative earth (alterable internally). Power Output: 4 watts into 4 ohms.

£10.50 + p & p. £1.50



35-WATT DISCO AMP

Here's the mono unit you need to start off with. Gives you a good solid 35 watts rms, 70 watts peak output. Big features include two disc inputs, both for ceramic cartridges, tape input and microphone input. Level mixing controls fitted with integral push-pull switches. Independent bass and treble controls and master volume.

£27.50 + p & p. £1.50

70 and 100 WATT DISCO AMPLIFIERS

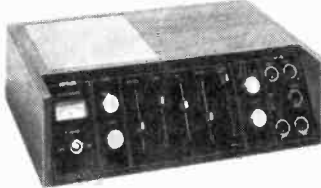
Brilliantly styled for easy disco performance! Sloping fascia, so that you can use the controls without fuss or bother. Brushed aluminium fascia and rotary controls. Five smooth-acting, vertically mounted slide controls—master volume, tape level, mic level, deck level.

PLUS INTER-DECK FADER for perfect graduated change from record deck No. 1 to No. 2, or vice-versa. Pre-fade level control (PFL) lets YOU hear next disc before fading it in. VU meter monitors output level. 70 watts rms, 140 watts peak output.

£49.00
+ p & p. £3.00

All the big features as on the 70-watt disco amplifier, but with a massive 100 watts rms, 200 watts peak output power.

£65.00
+ p & p. £4.00



PORTABLE DISCO CONSOLE with built-in pre-amplifiers

Here's the big-value portable disco console from RT-VC! It features a pair of BSR MP 60 type auto-return, single-play professional series record decks. Plus all the controls and features you need to give fabulous disco performances. Simply connects into your existing slave or external amplifier.

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EASY-TO-BUILD, WITH ENCLOSURE

Specially designed by RT-VC for cost-conscious hi-fi enthusiasts, these kits incorporate two teak-simulate enclosures, two EM1 13" x 8" (approx.) woofers, two 3 1/4" (approx.) tweeters and a pair of matching crossovers. Easily constructed, using a few basic tools. Supplied complete with an easy-to-follow circuit diagram, and crossover components. Input 15 watts rms, 30 watts peak, each unit. Cabinet size 20" x 11" x 9 1/2" (approx.).

£25.50 + p & p. £5.50
PER PAIR

15-WATT KIT IN CHASSIS FORM

When you are looking for a good speaker, why not build your own from this kit. It's the unit which we supply with the above enclosures. Size 13" x 8" (approx.) EM1 woofer, 3 1/4" (approx.) tweeter, and matching crossover. Power handling capacity 15 watts rms, 30 watts peak.

£7.50 + p & p. PER SET

DECCA 20 WATTS STEREO SPEAKER

This matching loudspeaker system is hand-made, as only Decca know how, built to a specification, not down to a price.

The kit comprises of two 8" diameter approx. base drive unit, with heavy die cast chassis laminated cones with rolled P.V.C. surrounds. Two 3 1/2" diameter approx. domed tweeters complete with crossover networks.

Our price per stereo pair **£30.00**+£4.00 P & P

DIY SPEAKER KITS

'COMPACT' FOR TOP VALUE

How about this for incredible bookshelf value from RT-VC! A pair of high efficiency units for only £7.50—just what you need for low-power amplifiers. These infinite baffle enclosures come to you ready milled and professionally finished. Each cabinet measures 12" x 9" x 5" (approx.) deep, and is finished in Rosewood. Complete with two 8" (approx.) speakers for max. power handling of 7 watts.

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FLEXIBLE HEATER STRIP, 240V a.c., 150W, approx. 1 metre long (insulated with fibreglass) with mains connector block. Many, many uses, 60p each.

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2N3055 type Transistors, O.K., but unmarked, 5 for £1.

110V NEONS, SCREW-IN-TYPE, 4 for 50p.

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SIDE CUTTERS, high quality, £3-70 + VAT in pairs 30p.

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PROGRAMMERS (magnetic devices). Contain 9 microswitches (suitable for mains operation) with 3 rotating cams, all individually adjustable, ideal for switching disco lights, displays, etc. or industrial machine programming. (Need slow motion motor to drive cams, not supplied) 9 switch version £1-50.

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6Y51 Transistors, 4 for 50p.
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PNP audio type TOS Transistors, 12 for 25p.
BF152 (UHF emp/mixer), 3 for 50p.
2N3818 Fet, 3 for 90p.
BA121 (Silicap Diodes), 4 for 50p.
1N914 diodes, 10 for 25p.

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HEAVY DUTY RELAYS, 24V d.c. operated (will work on 18V) 3 heavy duty make contacts (around 10A rating) + 4 change over contacts - 1 break contact. New, complete with mounting bracket (ideal for switching HT on Lines). Many uses for this high quality unit. £1-50 each.

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I.C.s, some coded, 14 DIL type, untested, mixed, 20 for 25p.

Mobile Converters, 24V DC input 13-8V at approx. 3-4A DC output, fully stabilised, £3-50 each (ideal for running 12V car radio from 24V lorry battery).

We now stock SpiraLux Tools for the electronic enthusiast. Screwdrivers, Nut Spanners, BA and Metric sizes, pop rivet guns, etc. S.A.E. for list.

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Dubilier Electrolytics, 100µF, 275V, 2 for 50p.
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Plessey Electrolytics, 1000µF, 180V, 40p each (3 for £1).

Dubilier Electrolytics, 5000µF, 35V, 60p each
Dubilier Electrolytics, 5000µF, 50V, 60p each
ITT Electrolytics, 8800µF, 25V, high grade, screw terminals, with mounting clips, 50p each.
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Plugs and sockets sold separately at 25p each. Bulgin Round Free Scks, 3 pin, for mains input on test equipment, etc., 25p each.

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SP15D 15W £3 + VAT (24p)
SP25D 25W £3 + VAT (24p)
SP25DK 25W + dia, etc. kit £3-85 + VAT (31p)
SP40D 40W £3-44 + VAT (28p)
BENCH STAND with spring for Marksmen irons, £2-22 + VAT (18p)

SPARE BITS
MTB for 15W, 40p + VAT (4p).
MT4 for 25W, 30p + VAT (3p).
MT10 for 40W, 42p + VAT (3p).

TCP1 TEMPERATURE CONTROLLED IRON. Temperature controlled iron + PSU, £20 + VAT (£1-60)
SPARE TIPS
Type CG single flat; Type K double flat fine tip; Type P, very fine tip. £1 each + VAT (8p).
MOST SPARES AVAILABLE

MULTICORE SOLDER
Size 5 Savbit 18 a.w.g. in alloy dispenser, 32p = VAT (3p).
Size CISAV18 Savbit 18s.w.g., 60p + VAT (4p).
Size 12 SAVBIT 18s.w.g. on plastic reel £1-80 + VAT (18p).

Terms of Business: CASH WITH ORDER. MINIMUM ORDER £1. ALL PRICES INCLUDE POST & PACKING (UK ONLY). SAE with ALL ENQUIRIES Please. PLEASE ADD VAT AS SHOWN. ALL GOODS IN STOCK DESPATCHED BY RETURN. CALLERS SATURDAYS ONLY 9.30-12.00, 1.30-5.00.

Dolby™ Noise Reducer Kit



Trademark of Dolby Laboratories Inc.

The latest addition to our exclusive range of matching high fidelity units.

The Dolby Noise Reduction System is designed to reduce background noise on open reel or cassette tape recorders. Used in the signal path to and from the tape recorder, the unit will encode (Dolbyise) signals during recording, and, during playback, may be used to decode either your own encoded material, or commercially available Dolby encoded cassettes.

Featuring:

- switching for both encoding (low-level h.f. compression) and decoding
- a switchable f.m. stereo multiplex and bias filter
- provision for decoding Dolby f.m. radio transmissions (as in USA)
- no equipment needed for alignment
- suitability for both open-reel and cassette tape machines
- check tape switch for encoded monitoring in three-head machines

The kit includes:

- complete set of components for stereo processor
- regulated power supply components
- board-mounted DIN sockets and push-button switches
- fibreglass board designed for minimum wiring
- solid mahogany cabinet, chassis, twin meters, front panel, knobs, mounting screws and nuts

Calibration tapes are available for open-reel use and for cassette (specify which) **PRICE £2-00 + VAT***

S-2020TA STEREO TUNER/AMPLIFIER KIT

PRICE: £53-95 + VAT

SOLID MAHOGANY CABINET

A high-quality push-button FM Varicap Stereo Tuner with Interstation mute combined with a 20W r.m.s. per channel Stereo Amplifier.



Please add VAT at 12½% unless marked thus * when 8% applies
We guarantee full after sales technical and servicing facilities on all our kits

Please send SAE for complete lists and specifications
Portwood Industrial Estate, Church Gresley,
Burton-on-Trent, Staffs DE11 9PT
Tel. Burton-on-Trent (0283) 215432. Telex 377106

INTEGREX LTD.

THD < 0.1% @ 20W
Tuner S/N 300dB @ 1-2µV
(mono)
Toroidal Transformer

Access
Barclaycard

Stirling Sound

QV* MODULES FOR COST-CONSCIOUS CONSTRUCTORS

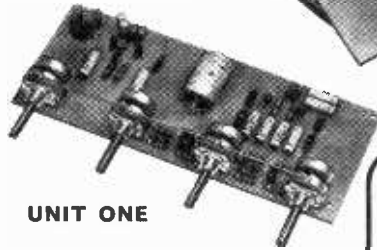
STIRLING SOUND policy is to ensure customer satisfaction by designing and making their products in their own factory in Essex and selling direct. Production control-checked throughout. All QV Modules are compatible within the range and with much other equipment.

UNIT ONE PRE-AMP/TONE CONTROL UNIT

Combined pre-amp with active tone-control circuits. ± 15 dB at 10KHz treble and 30 Hz bass. Stereo. Vol./balance/treble/bass. 200mV out for 50mV in. Takes 10-16V. **£7.80**

SS.100 Active tone control, stereo. ± 15 dB on bass and on treble **£1.60**

SS.101 Pre-amp for ceramic cartridges, radio, tape. Stereo. Passive tone control circuit shown in data supplied **£1.60**



UNIT ONE

SS.102 Stereo pre-amp for low output magnetic P.U.s. R.I.A.A. corrected. Linear feedback facility. **£2.65**

POWER AMPLIFIERS

SS.103 3 watt r.m.s. mono I.C. with built-in current, short, and thermal protection **£1.75**

SS.103-3 Stereo version of above **£3.75**

SS.105 5 watts r.m.s. into 4 ohms, using 12V **£2.25**

SS.110 10 watts r.m.s. using 24V and 4 ohm load **£2.75**

SS.120 20 watts r.m.s. into 4 ohms, using 34V **£3.00**

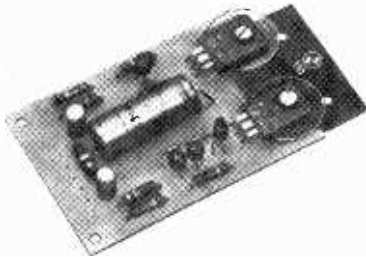
The above all measure 89 x 50 x 19mm (3 1/2 x 2 x 3/8 ins) Suitable power supplies will be found in the accompanying range.

FM TUNING MODULES

SS.201 Front end tuner, slow geared drive, two gang, A.F.C. facility. Tunes 88-108 MHz **£5.00**

SS.202 I.F. amplifier. Metering and A.F.C. facilities **£2.65**

SS.203 Stereo Decoder for use with the above or other FM mono tuners. A LED may be fitted **£3.85**



SS.110



SS.102



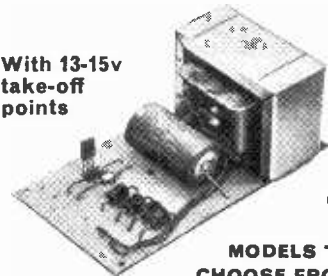
SS.140

100 watt r.m.s. into 4 ohms using 45V supply such as SS345. Ideal for small discos and P.A. 101 x 76 x 19mm (4" x 3" x 3/4")

£3.95

TODAY'S BEST VALUE IN POWER SUPPLY UNITS

With 13-15v take-off points



7
MODELS TO CHOOSE FROM

Complete with mains transformers and low volt take-off points. (except SS.300) All at 8% V.A.T. rate. Add 50p for p/p any model.

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SS.318 18V/1A **£4.15***

SS.324 24V/1A **£4.60***

SS.334 34V/2A **£5.20***

SS.345 45V/2A **£6.25***

SS.350 50V/2A **£6.75***

SS.300 Power stabilising unit 10-50V adjustable for adding to unstabilised supplies. Built-in protection against short circuit (p/p 35p) **£3.25**



SS.310/50 Stabilised power supply with variable output from 10 to 50V/2A. Built-in protection against short circuit. **£11.95***

SS.300

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add 35p for p/p unless stated otherwise. V.A.T. add 12 1/2% to total value of order unless price is shown * when the rate is 8%. Make cheques, etc. payable to Bi-Pre-Pak Ltd. Every effort is made to ensure correctness of information at time of going to press. Prices subject to alteration without notice

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means Stirling Sound's guarantee of QUALITY AND VALUE to give you to-day's best value all round.

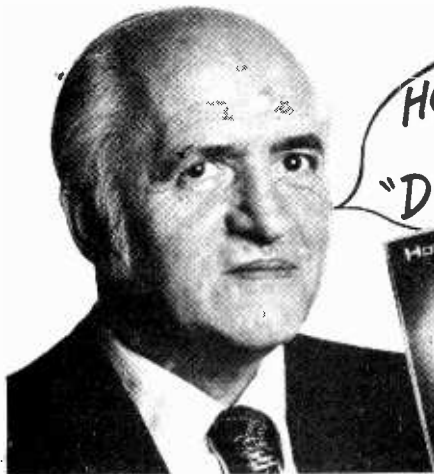


A member of the Bi-Pre-Pak group

220-224 WEST ROAD, WESTCLIFF-ON-SEA, ESSEX SS0 9DF

Telephone: Southend (0702) 46344

PERSONAL CALLERS WELCOME



HOME RADIO
have a
"Double Feature"



Perhaps you have to be of my vintage to know the phrase "a Double Feature", but up to a few years ago cinemas always ran a main film and a supplementary film. I was reminded of it because with their new catalogue Home Radio Components are now giving away a supplementary catalogue of bargain lines.

It sounds a very practical and sensible idea. After all, most electronic component firms accumulate surplus stocks of various items, and rather than dispose of them, why not offer them to customers at exceptionally low prices? I'm told that this bargain list will continue for several months and be updated from time to time.

No constructor should be without the Home Radio Components Catalogue (it contains 5,000 items clearly listed plus about 2,000 illustrations) but now you have a double incentive for buying one. In addition to getting one of the finest component catalogues available, you also receive a list of bargains at unbelievably low prices. For example, Gemini Mains Transformers: normal price £11.48, bargain list price £5, saving £6.48! This means that with a single purchase from the bargain list you can save the price of your catalogue several times over!

Please write your Name and Address in block capitals

NAME.....

ADDRESS.....

HOME RADIO (Components) LTD., Dept. PW
234-240 London Road, Mitcham, Surrey CR4 3HD

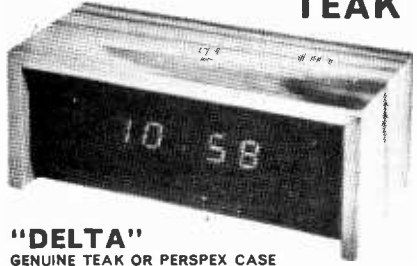


By the way, the price of the catalogue is £1 plus 48p for postage and packing. Why hesitate? Send off your cheque or Postal Order for £1.48 today, together with the coupon on the left.

(Regn. No London 912966) The price of £1.40 applies only to customers in the UK and the BFPO Addresses.

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ALARM
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Including P & P

"DELTA"
GENUINE TEAK OR PERSPEX CASE

DELTA DATA: 4 Radiant Red 1/2 inch high LEDs. 12hr display with AM/PM indication. Beautiful Burma Teak Case or Pretty Perspex in White, Black, Blue, Red, Green. Power failure is indicated by flashing display.

MODULES: Kits can be bought without case: Non Alarm £9.00 Alarm £12.50 inclusive.

READY BUILT: Buy a working tested module and fit your own case. Non Alarm £9.50. Alarm £13.00. Or put it with our case parts @ £4.32 and save on complete clock price.

ALARM FEATURES: Complete Clock ready built. 2 yr guarantee. Non Alarm £13.50 Alarm £16.50. Pulsed tone. Tilt operated 10 minute 'Snooze' period. Single switch setting Optional extra mercury switch (45p) allows Alarm reset by tilting clock. Digit brightness is automatically controlled to suit lighting level.

"ALPHA" CHRISTMAS OFFER
4 Glowing Green 1/2 inch high digits 12 or 24 hour. Non Alarm. Built & Tested module plus perspex case. **£11.00 inc.**

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850: £6.75 6030: £21.00

Send payment with order. SAE for complete range of clocks, calculators and components.

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Elstree, Herts.
Tel. 01-953 9724 or 01-207 0520

Opening shortly Trade Counter at 3 High Street, Elstree where there will be a MAD MAD sale incl. Valves, TV Panel Boards, L.O.P.T.S., Tuners, Droppers, Condensers, Telescopic aerials, Cabinets and a host of other components and accessories.

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AC 127	18p	BD 124	78p	BY 238	11p
AC 128	18p	BD 131	40p	OA 90	8p
AC 188	13p	BD 132	40p	2N1711	30p
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BC 159	13p	BY 127	14p	SN76013ND	£1.00p
BC 187	18p	BY 164	40p	ETTR6016	£2.80p

(Many other transistor devices available)
(Colour Triplers from £4.20)

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Discounts given on 100 lots or 100 mixed lots. Certain stock lines available at generous discount. Enquiries invited.

ALL GOODS BRANDED OF HIGH QUALITY AND NEW
Please add 12 1/2% for V.A.T. Minimum order £3.00. Under £10.00 please add 25p P & P. Terms of business C.W.O.

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240v-50Hz from your 12v car battery
 25 watt-£4.75 300 watt (12v)-£33.08
 40 watt-£8.27 400 watt (24v)-£39.05
 75 watt-£12.03 500 watt (24v)-£48.18
 150 watt-£21.27 1 Kw (50v)-£127.00
 300 watt (24v)-£26.45 1.5 Kw (110v)-£140.80

All above invertors are in kit form but may be purchased built up in metal case and ready for use. Price list sent on receipt of s.a.e. Prices include p. and p.

P.W. AUTOMATIC EMERGENCY SUPPLY

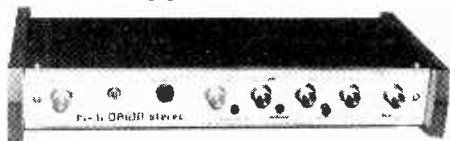
240v-50Hz-150 watt inverter with built in battery charger. In event of power failure switches over automatically from battery charging to inverter operation. Cct. as appeared in Dec. 72 P.W. Complete kit of parts (excluding meter) £24.50 plus £1.70p.

FLUORESCENT LIGHT INVERTER KIT 8
 watt-12v-Fluorescent light, suitable for tents, caravans, houses, boats and secondary lighting for factories, hotels, &c.
 12"-8 watt £3.00 + 35p p. & p. Built up £4.90 + 35p p. & p.
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Both high volume and small order capacity available.
 Special offer. Miniature mains transformer 0-0-6v-6VA. 85p + 10p p. & p.

P.E. ORION STEREO AMPLIFIER



20 + 20 Watts r.m.s. into 8 ohm load. Distortion less than 0.01% 100Hz-10kHz. Frequency response ± 1dB 20 Hz to 20kHz. Hum level virtually nil with volume full on.

This is a power amplifier of superb quality incorporating the very latest design features. Professional hi-fi enthusiasts have classed it as fantastic and real value for money. The CCT incorporates a low flux transformer and inputs for disc, tape, tuner, etc.

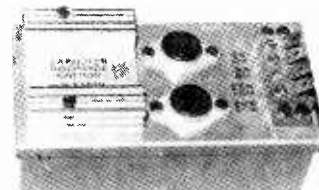
Complete kit of parts including slim line bookend case, silk screened front panel and knobs £47.30 inc. VAT and p. & p.

The bookend case, I.C's and semiconductors, P.C. board, Transformer, etc. may be purchased separately if desired. Send S.A.E. for further information.

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Bookend Amplifier and attractive styled Instrument Cases available. Send S. and A. envelope for Price List.

ASTROIGNITION



ASTRO IGNITION SYSTEM

Complete kit of parts for this proven and tested system £10.45 inc. VAT Ready built with only two connections to alter £13.75 inc. VAT. Thousands have used this system both home and abroad. Consider these advantages—more power, faster acceleration, fuel economy, excellent cold starting, smoother running, no contact breaker burning. Also because of the high energy spark the fuel mixture can be made weaker giving further economy and fewer plug problems. Fitting time when built 5 minutes approx. Please state whether positive or negative earth.

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IMPORTANT NEWS!

WE ARE PLEASED TO ANNOUNCE THAT THE "MANTA" — ONE OF THE HIGHEST QUALITY IGNITION UNITS AVAILABLE — IS NOW SUPPLIED IN KIT FORM

CONSTRUCT THIS TOP PERFORMANCE IGNITION UNIT AND BENEFIT FROM IMPROVED PETROL CONSUMPTION, SMOOTHER RUNNING AND INSTANT STARTING FOR YOUR VEHICLE.

KIT PRICE (INCLUDING POSTAGE AND PACKING, V.A.T., FULL ASSEMBLY AND INSTALLATION INSTRUCTIONS)

ONLY £16.50

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4006	0.31	4042	0.93	4086	0.80	14508	3.08
4007	0.20	4043	1.12	4089	1.74	14510	1.51
4008	1.07	4044	1.04	4093	0.89	14511	1.74
4009	0.80	4045	1.56	4094	2.08	14512	1.03
4010	0.80	4046	1.48	4095	1.18	14514	3.47
4011	0.20	4047	1.01	4096	1.16	14515	3.47
4012	0.20	4048	0.89	4097	4.13	14516	1.31
4013	0.80	4049	0.80	4098	1.22	14517	4.02
4014	1.12	4050	0.80	4099	2.03	14518	1.39
4015	1.12	4051	1.04	40101	1.76	14519	0.57
4016	0.80	4052	1.04	40102	2.16	14520	1.39
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4018	1.12	4054	1.29	40104	2.26	14522	2.15
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4020	1.24	4056	1.46	40108	6.18	14527	1.76
4021	1.12	4057	29.81	40109	2.21	14528	1.22
4022	1.07	4059	6.20	40181	4.30	14529	1.72
4023	0.20	4060	1.24	40182	1.73	14530	0.95
4024	0.87	4061	25.60	40194	2.26	14531	1.74
4025	0.20	4062	10.10	40237	2.26	14532	1.39
4026	1.82	4063	1.22	40700	1.75	14534	8.15
4027	0.80	4066	0.89	7083	4.25	14536	4.00
4028	1.00	4067	4.13	14160	1.18	14537	13.17
4029	1.27	4068	0.24	14161	1.18	14539	1.24
4030	0.80	4069	0.24	14162	1.18	14541	1.62
4031	1.46	4070	0.65	14183	1.18	14543	1.82
4032	1.19	4071	0.24	14174	1.08	14549	4.10
4033	1.55	4072	0.24	14175	1.04	14552	10.50
4034	2.11	4073	0.24	14194	1.17	14553	4.66
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Terms: C.W.O. Add VAT to all prices at 8%. Post etc. U.K. 25p + 2p = 27p per order. All orders processed same day. Official Govt. 'Varsity, Poly etc. orders (written or telephoned) welcome.

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Wire Wound Resistors. Our selection of mixed values. 30 for £1.40. 100 for £3.90.

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Varicap Control Selector. 4 way 25K. £1.50. 5 way 14.5K. £2.00.

Mains Droppers. 10 mixed values £1.00.

Edgewise Level Meters. 200µA. Size 1" overall 50p.

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Ferguson Stereogram Chassis. Model 3357. All transistor. Med/LW. FM. 3 watts per channel S/M. With connection data. Less tuning scale. £18.00. P/P free.

Ferguson Stereogram Chassis. MW. LW. FM. With tuning scale (5+5 watts sine wave) 15 ohms £28.25. P/P free.

Copper Clad Laminate. 8" x 7"-3 boards £1.00 + 8%.

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Crystals HC6U. (MHz) 12700; 12801.6; 9455.55; 9530.55; 9087.5; 9456.25; 52.01887; 52.02500; 37.7628; 51.66887; 52.03333; 9090.52; 9531.94; 9533.33, 50p each.

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Try our parcel of small capacitors 20 mixed values £1.50 + post.

Miniature Presets—Selection of various values 10 for 65p.

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Slider Volume Controls. 1K Lin; 100K Log; 1 Meg Log; 25K Lin. 25K Log; 10K/100K Log; 100K/100K Log; 50K Log. 35p each.

Aluminium Chassis. 7 1/2" x 5 1/2" x 2 1/2" 65p. 10" x 7 1/2" x 2 1/2" 75p. 11" x 7 1/2" x 2 1/2" 85p + 8%.

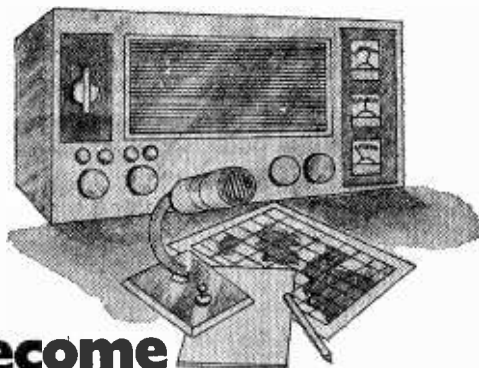
Thorn TA/28. Slide synchroniser for 4 track reel to reel recorders. 6 pin DIN socket models. £4.50.

BSR Single Play Decks with Cue. Fitted stereo cartridge. P146 £11.00. P153 £12.00.

Please add 30% P.P. Unless stated free P/P. VAT 12 1/2% to be added to total order unless stated 8%. No goods despatched outside U.K.

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ADDRESS _____ (Block caps please)

Ham re-born with Record-breaking Antenna!

The JOYSTICK VFA (Variable Frequency Antenna—a six band, patented omni-directional antenna of extreme flexibility) is a MUST for confined locations—at the worst it can stand in the corner of the shack and still do its stuff! But space problem or no... what you need most is EFFICIENCY.

Ex-G3IYQ is making a come-back after nearly 16 years off the air. He has a "System A" Joystick and tuner and describes himself, at present, as a "receiver-designing SWL". In his rather unfavourable QTH, the System A gives up to 4 S-points over any other antenna and he looks forward to getting his ticket back to test the JOYSTICK on transmission. (You won't be disappointed, OM!)

Alan also enthuses about recently hearing, courtesy of the Joystick, a GC working all over G, G1, GM & GW. The GC was coming in like a bomb and in almost all cases both sides of the SSB QSO's were logged Q5., and this on Top Band in late afternoon!

ALREADY IN USE BY AMATEUR TRANSMITTING AND SWL STATIONS WORLD-WIDE AND IN GOVERNMENT COMMUNICATION.

SYSTEM 'A' £32.40

250 w.p.e.p. OR for the SWL.

SYSTEM 'J' £38.60

500 w.p.e.p. (improved 'Q' on receive).

PARTRIDGE SUPER PACKAGE

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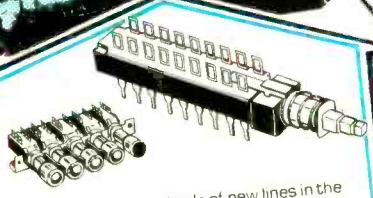
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