PRACTICAL WIRELESS

AUGUST 1973

20p

Student' OSCILISCOPE



also:

MINI-COMM RECEIVER VHF BAND LOCATOR

YOUR COMPLETE AUDIO-ELECTRONIC STORES

More of everything at the right price. All your electronic requirements within 200 yards - call and see for yourself.

BUILD I

RELIABILITY AND EASE OF CONSTRUCTION.
FACILITIES. On/off switch indicator, headphone socket, separate treble, bass, volume and balance controls, scratch and rumble filters, mono/stereo switch, linput selector; Mag. P.U. Radio Tuner, Aux. Can be altered for Mic., Tape, Tape-head, etc. (Parts list Ref. 20 on request).
Constructional details Ref. No. 21 30p

LOW COST HI-FI SPEAKERS

Uses Mullard Module. Slow motion tuning. Built in battery, Ferrice aerial. Overall 64-85, Post 15p. All parts sold separately. Leaflet No. 6

"BANDSPREAD" PORTABLE TO BUILD

PRICE

P & P 45p

COMPLETE WITH FREE TEAK CABINET

20 + 20 WATT INTEGRATED I.C. STEREO AMPLIFIER



DESIGN WITH Overall chassis size 14½" x 6" x 2" high

ELECTRONIC KITS
Henry's introduce new huge
range of audio and electronic
kits now in stock, everything
supplied, tremendous value.
Detailed list Ref. No. 14 on
request.

IC RECEIVER
ZN414 Radio integrated
circuit as featured in Practical
Wireless, January 1973.
Article Reprint Ref. No. 19
10p. Price £1-20.

BATTERY TAPE DECK Garrard 9 volt Tape Deck with heads, etc. As previously advertised. Limited quantity. £9:50, post 30p.

LEARN A LANGUAGE Recorded Cassettes with step by step phrase books. French, German, Spanish Italian. £1-36 per course. £5-00 per set of four.

DISCO SPOTBANK
3 channel Disco Spotbank
for use with any psychedelic
lighting display.
£12.75, p. & p. 35p.

HI-FI EQUIPMENT
Warehouse prices with
BIG DISCOUNTS plus
demonstrations (for call-ers) and GUARANTEES,
FREE-24 page detailed
brochure (Ref. No. 17)
You can see the savings!

HIGH QUALITY
CASSETTES
The best UK low noise tapes
but at a special price.
'Living Sound' cassettes meet
the highest international
standard (IEC 94A). Fantastic
price savings.

	for	6 for	for	
C60 C90	1 . 33	1 - 80	4 . 20	

Full guarantee. Post paid Made by EMI especially for Henry's.

ULTRASONIC TRANSDUCERS
Operate at 40kc/s up to 100
yds. Ideal remote switching and signalling. Complete with data and new I.C. circuits.
£5.90 per pair. Post 10p.

MARRIOT TAPE HEADS 4 TRACK MONO or 2 TRACK STEREO 17' High Impedance £2.00 18' Med. Impedance £2.00 18' Med. Low Imp. £3.50 Frase Heads for above 75p 163' 2 track mono— Hi Imp. £1.75

Hi Imp. £1-75
'43' Erase Head for above 75p

7 SEG & NIXIE TUBES
(Post 15p per 1 to 6)
XN3, XN13, GN6 0-9 side
view with data, 85p.
GNP-7, GRP-8 0-9 side view
with decimal points and data,
95p.
3015F 7 seg £2 each. £7 per
4 with data

4 with data.

12 and 24 hour clock circuits
Ref, No. 31 15p.

Miniature Amplifier

5 transistor, 300mW o/p. Fitted volume and sensitivity control, 9 volt operated. £1.75 each P/P 15p.

Quality Slider Controls 60mm stroke singles and ganged. Complete with knobs. 5K, 10K, 25K, 100K, 250K, 500K. I meg, Log and Lin, 40p each, 10K, 25K, 50K, 100K, 250K, Log and Lin ganged.

FREE TEAK CABINET with complete kits!

FEATURES. New slim design with 6 - IC's, IC Sockets, IO silicon transistors, 4 rectifiers, 2 zeners. Special Gardeners low field slim line transformer. Fibre glass PC panel. Complete chassis work. HIGH QUALITY & STABILITY ARE PREDOMINATE FEATURES—DEVELOPED BY TEXAS ENGINEERS FOR PERFORMANCE, RELIABILITY AND EASE OF CONSTRUCTION.

SPECIAL £28-50

30

114/15

RADIO LTD.

ML-3 MW/LW

Printed circuit all transistor design using Mullard RF/IF Module. Medium and Long Wave bands plus Medium Wave Bandspread for extra selectivity. Also slow motion geared tuning, 600 mW push-pull output, fibre glass PVC covered cabinet, car aerial. Attractive appearance and performance.

TOTAL COST TO BUILD £7-98 p.p. 32p. (Battery 22p).

TUNER to BUILD

Designer approved kits distributed by Henrys!

TEST EQUIPMENT Just a selection! TEST EQUIPMENT Just a selection!

SE2508 Pocket Pencil Signal Injector £1.90

Fill Signal Tracer £1.50

Signal Tracer £1.50

30 K/V Multimeter £4.55 with case £4.95

SOWH Pour Case £10.50

With leather case £10.50

SOW/Multimeter £4.20. With case £9.50

L4341 AC/DC Multimeter £8.50. With case £9.50

L4341 AC/DC Multimeter with transistor tester with steel

E20D Ac/DC Multimeter with transistor tester with steel

E20D TE21D

E20D TE21D

Audio Generator 120KHz-200MHz £17.50. Carr. 35p

TE35

TE65 Valve Voltmeter 28 ranges £17.50. Carr. 40p

ALL NOMBREX MODELS IN STOCK

E.M.I. Size 134" × 84" Large Ceramic Magnet.
TYPE 150 6 watt, 3, 8 or 15
ohms £2 20, Post 22p.
TYPE 150 TC Twin cone version £2.75. Post 22p.
TYPE 450 10 watt with twin tweeters and crossover, 3, 8 or 15 ohms. £3-50. Post 25p.
TYPE 350 20 watt with tweeter and crossover. 8 and 15 ohms.
£7.50: Post 28p.
POLISHED CABINETS (8 ohms)
SERIES 6 (Assembled 150 T/C) per pair £16-50. Post 70p
SERIES 8 (Assembled 450) per pair £16-50. Post 70p **PA-Disco-Lighting**

UK's Largest Range—Write phone or call in, Details and demonstrations on request.

ઌઌ૽ૢ૽૱ઌ૽ઌ૽૽૱

demonstrations on request.

DI30L 3 Channel sound to light unit, 1KW. £29-50

DI40L 3 channel mic (built-in) to light, 3KW. £38-75

DI70S 70 watt Disco amp/mixer. £49-75

DISCOAMP 100 watt amp/mixer. £49-75

DI50S 30 watt Disco amp/mixer. £32-25

Anti-Feedback Quality Mic. £11-50

DI50S 50 watt PA Amplifier £43-95

DI70S 70 watt £2-75

DI10OD 100 watt £63-00

GROUP 30D 150 watt rms "Group" Valve Amplifier £86-00

FIBRE OPTICS LIGHTING. — MICS. EFFECTS. PROJECTORS.

SPOTS. DIIMMERS. STANDS. MIXERS. SPEAKERS.

Everything for PA — Disco — Lighting.

FREE Stock List Ref. No. 18

PORTABLE DISCOS — DETAILS ON REQUEST

CREDIT TERMS FOR CALLERS

BUILD THIS VHF FM TUNER
5 TRANSISTORS 300 kc/s BANDWIDTH, PRINTED CIRCUIT, HIGH
FIDELITY REPRODUCTION. MONO
AND STEREO
A popular VHF FM Tuner for quality
and reception of mono and stereo.
There is no doubt about it—VHF FM
gives the REAL sound. All parts sold
separately. Free Leaflet No. 3 & 7.
TOTAL £6.97, pp. 20p. Mk. I Decoder Kit £5.97.
Built IC Decoder £6.50. Tuning meter unit £1.75.
Mains unit for Tuner and/or Decoder PS6/12 £3.25. Post 20p

CATALOGUE

Fully detailed and illustrated covering every aspect of Electronics—plus data, circuits and information. 10,000 Stock lines at Special Low Prices and Fully Guaranteed.

PRICE 55P Paid (40p FOR CALLERS)

PLUS! FIVE 10p

VOUCHERS

Send to this address— HENRY'S RADIO LTD. (Dept. PW) 3 ALBEMARLE WAY, LONDON, E.C.I.— for catalogue by post only. All other mail and callers to "303" see below.

SINCLAIR PROJECT 60 MODULES SAVE POUNDS!

Z30 £3.57; Z50 £4.37 STEREO 60 PZ5 £3.97 £7-97; PZ8 £4-77 PZ6 £6-37;

Transformer for PZ8 £2.95 Active Filter Unit £4.45 Stereo FM Tuner £16.95 IC12 £1.80; Q16's £15 pr. Post etc. 20p per item

3000 8 8 8 8

PACKAGE DEALS

2xZ30, Stereo 60, PZ5 £15 95 2xZ30, Stereo 60, PZ6 £18 00 2xZ50, Stereo 60, PZ8 £20 25 Transformer for PZ8 £2.95 PROJECT 605 KIT £19 95

E. & O.E.

All prices are exclusive of 10% VAT which must be added to all orders inc. carr/packing. (Note: Catalogue is not subject to VAT).

RADIO

LIMITED **EDGWARE ROAD, W2**

404-406 Electronic Components and Equipment 01-4028381 | Open: 9 am-6 pm 354-356 High Fidelity and Tape Equipment 01-4025854/4736 | 6 days a week (309 PA-Disco-Lighting High Power Sound 01-7236963 | 303 Special offers and bargains store | All mail to 303 Edgware Road, London W2 1BW | All stores open all day Saturday

See earlier page of this magazine for transistors, I.C.'s and Semi Conductor

prices-latest list Ref. no. 36 on request.

PRACTICAL

VOL. 49 NO. 4 **ISSIIF** 798 AUGUST 1973

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

EDITOR

Morris A. Colwell

ASSISTANT EDITOR

Lionel E. Howes, G3AYA

ART EDITOR

Peter Metalli

TECHNICAL EDITOR

Eric Dowdeswell, G4AR

PRODUCTION & NEWS Colin R. Riches EDITOR

SECRETARIAL Jenny Maunder Jill Alflatt

Telephone 01-634 4292

ADVT. MANAGER

Roy Smith

Telephone 01-634 4293

CLASSIFIED ADVTS.

Colin R. Brown

Telephone 01-634 4301

SUBSCRIPTIONS

Subscription Rates for one year to any part of the world £2.65 including postage. Enquiries to Subscription Department, IPC Magazines Ltd., Carlton House, 68 Gt. Queen Street, London, WC2 5DD. Phone 01-242 4477 Binders (£1-10) and Indexes (11p) can be supplied by the Binders Dept at the same address.

BACK NUMBERS

We regret that we are unable to supply back numbers of Practical Wireless. Readers are recommended to enquire at a public library to see copies. Requests for specific back numbers of Practical Wireless and Television only can be published in our CQ Column.

NEWS & COMMENT

- 312 THE SMALL PRINT—Leader article and September preview
- 313 NEWS...NEWS...NEWS
- 320 BOOK REVIEWS-New books reviewed
- 322 TELEVISION-This month's attractions
- 329 HOTLINES on recent developments-Ginsberg
- 330 Looking at the London ELECTRONIC COMPONENTS SHOW -a visit to Olympia
- 335 NEXT MONTH in Practical Wireless
- 342 ON THE AIR-Reports on Broadcast Bands
- 342 Short Wave-Malcolm Connah
- 345 Medium Wave-Charles Molloy
- 345 VHF/FM-Simon David
- 346 Amateur Bands, Short Wave/VHF-David Gibson G3JDG
- 366 PRODUCTION LINES—Products reviewed by Colin Riches

CONSTRUCTIONAL

- 314 MINI COMM RECEIVER-F. G. Rayer
- 325 LOW POWER CLASS A AMPLIFIER-R. A. Pen
- 326 CASSETTE RECORDER IN THE CAR-M. Vlietstra
- 333 LIGHT OPERATED SWITCHES and alarms—R. Penfold
- 336 P.W. 'STUDENT' OSCILLOSCOPE, Part 1-G. A. Cozens
- 356 VHF BAND LOCATOR for 2 metres—A. Sydenham
- 357 TAKE 20 No. 51 Touch Sensitive Switch-David Andrews

OTHER FEATURES

- 321 I.C. OF THE MONTH, LP1000 Stored Energy Regulator-L. A. J. Ireland
- 349 CALIBRATING SHORT WAVE RECEIVERS—M. Connah
- 353 GOING BACK Equipment of yesteryear-

Colin Riches and Arthur Dow

361 MAGNETIC AMPLIFIERS, Part 2-1, R. Sinclair

Published by IPC Magazines Ltd., Fleetway House, Farringdon Street, London EC4A 4AD. Telephone: 01-634 4444.

COPYRIGHT AND QUERIES

© IPC Magazines Limited 1973. Copyright in all drawings, photographs and articles published in "Practical Wireless" is fully protected and reproduction or imitation in whole or in part is expressly forbidden. All reasonable precautions are taken by "Practical Wireless" to ensure that the advice and data given to readers are reliable. We cannot, however, guarantee it and we cannot accept legal responsibility for it. Prices are those current as we go to press.

We regret that we cannot answer technical queries by telephone nor can we provide information or advice on manufacturers' products other than that given in the magazine. We will endeavour to assist readers who have queries relating to articles published but we cannot offer advice on modifications to our published designs. All correspondents expecting a reply should enclose a stamped addressed envelope.

PACKAGE PRICE R.S.C. STEREO PACKAGE OFFERS

HIGH FIDELITY UNITS

PACKAGE £108-25 Carr. PRICE

ONLY £39:99

Carr. £1.00 Or deposit £6.95 and 9 monthly payments £4.22 (Total #44-98)



SAVE £30 approx. MONARCH GOLDRING

'SUPER 30' AMP

SPIOI HIGH FIDELITY PLAYER UNIT

HIGH FIDELITY LOUDSPEAKER UNITS

Cabinets latest style Satin Teak veneer. Acoustically lined or filled acoustic damping. Ported where appropriate. Credit terms available.

DORCHESTER (Illustrated) Size 16×11×9in. appr. Range 45-15,000 c.p.s. Rating 8-10 watts. Fitted High flux 13×8in. 49-45 c.arr. 40p. Duat Cone speaker. Imp. 3 or 16 ohms.

HI-FI SPEAKER ENCLOSURES MODERN DESIGN Teak veneer finish. Acoustically lined. Sizes approx. Carr. 35p. per enc JE8 Size 16" × 11" × 9". SE8 For optimum perform-Pressurised. Gives pleasing ance with any 8in. results with any \$1.50 Hi-Fispkr. results with any 8in. Hi-Fi speaker. 45.50

SE10 For outstanding results with 10in. Hi-Fi speaker and tweeter speaker and tweeter. Size 19×10±29 in. SE12 For excellent performance with 12in. Hi-Fi speaker and tweeter.

Comprising Goldring G101 hi-fi single player unit fitted high fidelity free field magnetic stereo cartridge with diamond stylus. Belt driven Attractive design super-slim plinth and 'roll-over' transparent tinted plastic cover. Or Deposit £4-95 and 9 Monthly Payments of £3-75 (Total £38-70) Excellent value.

c.p.s. Rating 0-10 wates. Fitted right nur 13 x 0 in. 19.45 Carr. 40p.

MONARCH Size 19 x 10 i x 9 in. approx. Rating 10 watts. Inc. 13 x 8 in. apeaker with highly flexible P.V.C. cone surround, long throw voice coil and 10,000 line magnet. High flux pressure tweeter. Handsome design cabinet. Range 35-20,000 c.p.s. Imp. 8 ohms. Gives amooth realistic sound output.

See 'package offers' for illustration.

Carr. 50p

FOR ILLUSTRATED UNITS

Or deposit £15:00 and monthly payments £8:78 (Total £120:36)

GOLDRING GL72 Tran cription Turntable + P.U. GOLDRING G800 Magnetic Cartridge DE-LUXE PLINTH with Roll-over Cover Pair R.S.C. MONARCH LOUDSPEAKERS R.S.C. SUPER 30 Mk III AMPLIFIER Total value of individual items listed above \$138-14.

Individual Rec. Retail Prices:
LINEAR 505 5 + 5 Watt Amplifier
GARRARD 2025 Antochanger + K840A Cartridge
Teak Veneer Plinth with Transparent Plastic Cover
Pair A55 LOUDSPEAKERS (Inc 8" × 5" 10,000 text
TOTAL

SEND S.A.E. FOR **FREE COLOUR BROCHURE**

FANE 'MODE ONE' HIGH FIDELITY SPEAKER KIT

Incorporating a model 803 8" 13,000 Gauss Bass Speaker with ultra low resonance. P.V.C. surround cone. Printed circuit cross-over assembly with ferrite cored coils. Model 303 Pressure Tweeter, Acoustic damping material, Screws, Panels etc., and instructive diagrams, Frequency 49.96 post Response 25 Hz-20 kHz.

Or Dep. £2 & 9 mthly pymnts, £1:07 (Tot. £11:63)

Impedance 8-15 ohms. RSC G66 MkII 6+6 WATT high quality STEREO AMPLIFIER

Individual Ganged Controls: Bass, Treble, Volume and Balance. Printed



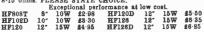
Individual Ganged Controls: Bass, Treble, Volume and Balance. Printed circuit construction employing 10 Transistors plus Diodes. Output rating I.H.F.M. Frequency range 20-20,000 c.p.s. Bass Control ± 12db.

Treble Control ± 13db. Selector switch for P.U. or Tape/Radio. For loudspeaker output impedances of 3 to 15 ohms. For standard 200-250v. A.C. mains operation. Attractive Black and Silver finished metal fascia plate and matching control knobs. COMPLETE HTT OF PARTS INCLUDING PULLY WIRED PRINTED CIRCUIT and OF FACTORY BUILT IN TEAK VENEERED CABINET.

Or FACTORY BUILT IN TEAK VENEERED CABINET. Carr. All DIOLEDING HEALTH STANDARD CARD.

AUDIOTRINE HIGH FIDELITY SPEAKERS

Heavy construction. Latest high efficiency ceramic magnets. Plasticised Cone surround. "D" indicates Tweeter Cone providing extended frequency range up to 15,000 c.p.s. Impedance 3 or 8-15 ohms. PLEASE STATE CHOICE.



TYPE BM1. An all-dry battery eliminator. Size 5½ ×4½ ×2in. approx. Completely replaces batteries supplying 1.5v and 90v, to battery radio where A.C. mains 200/250v.

50c/s is available. ASSEMBLED READY FOR USE £4. 5

FANE 807T HIGH FIDELITY SPEAKER

A full range 8in. 10 wait unit for excellent sound quality, in suitable enclosure. Cast chassls Roll P.V.C. cone surround and long throw voice coul to achieve very iow fundamental resonance of 30 c.ps. Tweeter cone is fitted to extend high note response. Frequency range 25 Hz to 15 KHz. Gauss 10,000. Impedance 3 or 8-15 D.
PLEASE STATE IMPEDANCE WHEN ORDERING
MODEL 803T 8" 15w. with parasitic Tweeter.

43-7

£3.70 £4.95 R.S.C. BATTERY/MAINS CONVERSION UNITS



with 10in. Hi-Fi speaker and spkr. Size 25½ × 16 × 9in. AUDIOTRINE HI-FI SPEAKER SYSTEMS

Consisting of matched 12in. 11,000 line 15 Watt 15 ohm high quality speaker, cross-over unit and tweeter. Smooth nigh quality speaker, cross-over unit and the transfer of the presence and extended frequency range ensure surprisingly realistic reproduction.

OR SENIOR 15 WATT INCLUDING 47.65 Carr. HI202 15,000 LINE SPEAKER

46.50 2379

47.65 2379

£7.95

AND THE RESIDENCE R.S.C. TA6 6 Watt HI-FI AMPLIFIER 0.00

200-250v. AC mains operated. Frequency Response 30-20,000 c.p.s. —2dB. Harmonic Distortion 0-3% at 1,000 c.p.s. Separate Base and Treble 'litt and cut' controls. 3 input sockets for Mike, Gram, Radio or Tape. Input selector switch. Output for 3-15 ohm spkrs. Max. sensitivity 5mV output raing I.H.F.M. Fully enclosed enamelled case, 9½×2½×5½in. Attractive brushed silver finish facis plate 10½×3½in. and matching knobs. Complete kit of parts with full wiring diagrams and instructions.

48.50 Carr. £8.50 Carr. OR FACTORY BUILT WITH 12 MONTHS' GUARANTEE £12.05

R.S.C. TRANSFORMERS, L.F. CHOKES & RECTIFIERS FULLY GUARANTEED. Impregnated and Interleaved where necessary.

MIDGET CLAMPED TYPE 21 × 21 × 21 in.

FULLY SHROUDED UPRIGHT MOUNTING
250-0-250v. 60mA. 6·3v. 2a., 0·5-6·3v. 2a. 21·55
250-0-250v. 100mA. 6·3v. 4a., 0·5-6·3v. 2a. 21·55
300-0-300v. 100mA. 6·3v. 4a., 0·5-6·3v. 3a. 22·45
300-0-300v. 130mA. 6·3v. 4a., 0·5-6·3v. 3a. 22·45
300-0-300v. 130mA. 6·3v. 4a., 0·5-6·3v. 1a.
For Mullard 610 Amplifier
350-0-350v. 100mA. 6·3v. 4a., 0·5-6·3v. 3a. 22·45
350-0-350v. 100mA. 6·3v. 4a., 0·5-6·3v. 3a. 22·45
426-0-425v. 200mA. 6·3v. 4a., 0·5-6·3v. 3a. 25·45
426-0-425v. 200mA. 6·3v. 4a., 6·3v. 3a., 5v. 3a. 55·50
450-0-450v. 250mA, 6·3v. 4a., ct., 5v. 3a. 28·00

TOP SHROUDED DROP-THRO' TYPE
1:10
21:16
220-0-220v. 70m.A. 6.3v. 2a., 0-5-6.3v. 2a. 11-49
250-0-250v. 100m.A. 6.3v. 2a., 0-5-6.3v. 2a. 11-49
250-0-250v. 100m.A. 6.3v. 2a., 0-5-6.3v. 2a. 11-81
250-0-250v. 100m.A. 6.3v. 2a., 0-5-6.3v. 2a. 18-11
252-0-250v. 100m.A. 6.3v. 2a., 0-5-6.3v. 3a. 22-45
300-0-350v. 100m.A. 6.3v. 4a., 0-5-6.3v. 3a. 22-45
22-95
300-0-30v. 100m.A. 6.3v. 4a., 0-5-6.3v. 3a. 22-85
22-95
300-0-350v. 100m.A. 6.3v. 4a., 0-5-6.3v. 3a. 22-85
22-95
300-0-350v. 100m.A. 6.3v. 4a., 0-5-6.3v. 3a. 22-85

FILAMENT or TRANSISTOR POWER PACK Types 6.3v. 1.5a. 55p; 6.3v. 2a. 60p; 6.3v. 3a. 85p; 6.3v. 6a. £1 45; 12v. 1a. 61p; 12v. 3a. or 24v. 1.5a £1.50,0.9-18v 1½a £1 25; 0-12-25-42v 2a£1 95.

CHARGER TRANSFORMERS 0.9-16v. 1½a. £1·10, 2½a. £1·25; 3a.21·40; 5a.21·80; 5a.£1·85; 3a.£2·20 AUTO (8tep UP/step DOWN) TRANSFORMERS 0·110/120v. 200·220·220v. 50·80 watts £1·25, 150 watts £2:10·250 watts £3·00; 500 watts £6·40

150 watts, 22·10·200 watts 23·00; 500 watts 26·40 OUTPUT TRANSFORMERS Standard Pentode 5.000 Ω or 7,000 Ω to 3 Ω 55 Push-Pull 5 watts 60·60 Ω or 7,000 Ω to 3 Ω 55 Push-Pull 10 watts 60°k, ECL66 to 3,6.8 or 15 Ω 50·10 watts 60°k, ECL66 to 3,6.8 or 15 Ω 10·12 watts 15·50 Push-Pull Ultra Linear for Mullard 510, etc. 22·45 Push-Pull 15·18 watts, sectionally wound 61.6, KT66, etc., for 3 or 15 Ω 22·20 Push-Pull 20 watt high quality sectionally wound EL34, 61.6, KT66 etc. to 3 or 15 Ω 33·65

SELENIUM RECTIFIERS F. W. (Bridged)

0

All 6/12v. D.C. output. Max. A.C. input 18v. 1a, 28p. 2a, 39p. 3a, 55p. 4a, 72p. 6a, 88p.

SMOOTHING CHOKES

CHOKES
150mA, 7-10H, 250
Ω 77p; 100mA,
10H, 200 Ω 68p;
80mA, 10H, 350 Ω
55p; 60mA, 10H,
400 Ω 28p.

R.S.C. MKIII SUPER 30 HIGH FIDELITY STEREO AMPLIFIER

For Magnetic

Output (per chan-

BUILD AN AMPLIFIER WORTH APPROXIMATELY DOUBLE THE KIT PRICE INCLUDING CABINET Only high grade components by leading manufacturers

- Push Button Selector Switching
- Jack Socket for Headphones Neon Indicator

- Neon Indicator
 Satin Silver Finish Metal Fascia
 Solid State Circuitry
 Twenty Silicon Transistors
 Four Diodes, Four Rectifiers
 Send S.A.E. for
 full descriptive leaflet.



into 8.0. Frequency Response 7 Hz to 70 KHz ± 1½ dB.

R.S.C. STEREO FM III TUNER, in cabinet
Visually matches
Super 30 Mk. III

41 th. £5 extra.
FACTORY BUILT UNIT INC.
CABINET with 12 months' guarantee. Or Dep. £7 and 9 monthly payments £4:54 (Total £47:86).

'YORK' HIGH-FIDELITY 3 SPEAKER SYSTEM

- ★ Moderate size only 25×14×10in. approx. **COMPLETE KIT**
- ★ Response 30-20,000 c.p.s. Impedance 15 ohms

* Performance comparable with units costing coasiderably more Carr. 65p

Consists of (1) 12in. 15 watt Bass unit with cast chassis, Roll rubber cone surround for ultra low resonance, and ceramic magnet.

(2) 3-way quarter section series cross-over system.

(3) 8 × 5in. high flux middle range speaker.

(4) High efficiency tweeter. (5) Appropriate quantity acoustic damping material. (6) Handsome Teak veneered cabinet.

(7) Circuit and full instructions. Terms: Dep. £4-60 and 9 monthly payments £2-64 (Total £28-36).







PACKAGE OFFER Units listed below

(a) 100w POWER AMPLIFIER
(b) PAIR OF HI-FI HEADPHONES

(c) MATCHING DYNAMIC
'MIKE' (attached to h'phone) (d) PAIR 50 WATT SPEAKERS
Black Rexine covered
Cabinets Size approx.
18" × 18" × 8" (e) RSC TDI DISCO CONSOLE

(a) (b) (c) (d) & (e) £145

Ferms Deposit £30 and 18 monthly payments of £8.00 (Total £174.00). BTDI DISCO

Incorporating twin Garrard SP25
Mk.III turntables and Sonotone or
Acos Cartridges with diamond stylii. Acos Ustringes with mamon symi. Separate Vol. controls for each turntable. Also MONITORING FACILITIES, plus Treble and Bass Controls. Separate input for 'mike' with vol. control switch. Black Vynide covered Cabinet with lid.

see illustration on left Or Dep. 210 and 9 mthly pyrmts 28-80 (Total 271-20)

FANE ULTRAHIGH POWER LOUDSPEAKERS

All power ratings are R.M.S. continuous. 2 YEARS' GUARANTEE High, dux ceranic magnets. ALL CARRIAGE FREE. 'POP' 100 | 'POP' 50 | 'POP' 50 15" 60 Watt

14,000 gauss



18" 100 Watt 14,000 gauss 8/15 Q £25.95

Den: £6 and 9

Dep. \$3-30 and 9 mthly payments monthly payments. 22-49 (Total 228-41) \$1-50 (Total \$16-80) FOR BASS GUITAR, ELECT. ORGAN, ETC

£14.75

12" 50 Watt 13,000 gauss 150 £11.99

Dep £2 and 9 monthly payments £1.88 ments £1-88 (Total £18-97) PAIR SUITABLE ALL PURPOSES

FANE SPEAKERS 'POP' 25/2 12 in. 25 WATT Dual Cone 15 Ω (for uses other than Bass Guitar or Electronic Organ). Carr. free or Dep. \$1.25 and 9 £7.95 or Dep. \$1.5 mthly paym (Total 29.26). payments 899

DISCO PACKAGE OFFER

Pair BSR MP60 T/tables GP91 PU Cartridges. FAL Disco Pre-amp. Total Rec. Ret. Price £50-11

Carr. £1

GROUP/DISCO EQUIPMENT P.A.L. PHASE 50 MK.III AMPLIFIER PR. FANE POP 28/2 98W L/8PEAKERS Terms: Deposit 57-30 and 9 monthly payments of 85-88 (Total 855-74)

F.A.L. PHASE 50 MK.III AMPLIFIER PR. FANE POP 50 L/SPEAKERS Terms: Deposit \$10 and 9 monthly payments of \$6.07 (Total \$64.68)

F.A.L. PHASE 50 MK.III AMPLIFIER PAIR L19/20 26W L/S in cabinets Terms: Deposit \$10 and 9 monthly payments of \$6.52 (Total \$68.68) F.A.L. PHASE 100/8 AMPLIFIER 4 FANE POP 60 L/SPEAKERS monthly

PACKAGE OFFERS PACKAGE PRICE £49.504116 458-85 PACKAGE PRICE 487-95

£57.50455 861 98 PACKAGE PRICE 487-95 496-80 £61 41 35

> PACKAGE PRICE £110 2

Terms: Deposit \$20 and 12 month payments of \$8.68 (Total \$128.56) \$117-81 HIGH QUALITY LOUDSPEAKER UNITS ALL TWO TONE REXINE AND VYNAIR FINISH L125 50 WATT Fitted pair of 12" 50 437.95 watt high flux speakers for conservative conservative rating. Impedance 8-15 ohms. Carr. £1-50 37.95 Cargust \$4.50 and 9 monthly parts. of \$4.27. Total \$49.98 L12/20 12" 20-25 WATT 13,000 lines 15 ohms Dep \$2.50 & 9 L12/20 10-15 Watt veneer lines 15 ohms beg \$2.50 & 9 L12/20 10-15 Watt veneer lines 15 ohms (Total \$15.88) (Carr. 55p.

464-95

£8.25

CREDIT TERMS AVAILABLE ON PURCHASES OVER (8 (Kits Excepted) INTEREST CHARGES REFUNDED ON CREDIT SALES Settled in 3 months

R.S.C. COLUMN SPEAKERS

AND PUBLIC ADDRESS All types 15 Ohms covered in Revine and Vynair
TYPE C4100 IS ALSO SUITABLE FOR BASS GUITAR OR ELECTRONIC ORGAN

TYPE C313 50 WATTS Low feedback how characteristic. Fitted two exceptionally efficient, low feedback how characteristic high first 13" x 8" 20 wat \$21.95 cone high first speakers with high power acteristic high first 23" x 8" 20 wat \$21.95 cone high first speakers with high power color size approx. 54" x 14" x 11". Dep \$5 x 9 milly pymths 23.54 \$23.72 (Total 236.86) Carr. 85p.

IDEAL FOR VOCALISTS

TYPE C4100 100 WATTS Inc. four 12° 50 watt speakers for conserva-tive rating. Extra heavy construction. Size approx. 38×16×10° Acoustically filled and pressurised. Terms: Dep. 311 and 12 mithly. pyts. 85-80 (Total 850). Carr. 41-50

MICROPHONE

R.S.C. AIO 30 WATT ULTRA LINEAR

HI-FI AMPLIFIER
Highly sensitive. Push-Pull bigh output, Hum level - 70dB. Response to 30-20,000 c/s. All high grade components. Valves EF86 EF86, EC083, EL34. EL84, GZ34. Reparate Bass and Treble Controls. Sensitivity 36 millivolts. For High Impedance microphones. For Clubs, Schools. Theatres, Dance Halls, Outdoor Functions, etc. For Electronic Organ, Guitar, String Bass, etc. Gram, Radio or Tape. Two separate imputs with vol. controls permit such as "mike" and Flok-up etc. for mixing purposes, 200-250v. 50 c/s A.C. mains. For 8 and 15 ohm speakers, Trin-handled perforated cover \$8-10.18 MONTRS' GUARANTEE. Care. Typ TERMS; Deposit 24 and 9 monthly payments of \$8-27 (Total \$84-48). Send S.A.E. for leaflet.

.A.L. DISCO PRE-AMPLIFIER

Designed for use with a pair of Player Units and Amplifier with Bass and Treble Controls. Incorporates MONITORING FACILITIES and Mic. input. The 4 inputs are ind. controlled. Detector switch Gram (1), (2), and Tape. For operation on 200-2500 A.C. Mains 50Hz. Size approx 16½ × 3″ × 4″ deep. Brush Silver finished fascia. Fully enclosed but can be mounted in cabinet.

FANE "CRESCENDO" SPEAKERS

FULL RANGE AVAILABLE AT ALL BRANCHES

FAL PHASE 50 Mk.III AMPLIFIER 50 WATT. Solid state. 4 Reparately controlled inputs Plus master vol-control. Ind. Bass and Treble Controls. Protective circuit to guard against damage from accidental shorts. Output for Speaker/s 3 to 30 ohms. Size 17 × 2° - 78°. 200-250v. A.C. mains. Output 50 watte mineio rating.

Or deposit \$7.25 & 9 monthly pay-ments \$8.92, Total \$42.53.



RSC PHANTOM 450' Combined 50W Amplifler and 12ln, Loudspeaker.

For Load Gultar, Mic., Grain, Radlo, Tape (Not for use with Bass Instruments), Inc. 3 inputs and 2 vol. controls plus Treble, Bass and Presence. Output Jack for additional 15 ohm Speaker, Attractively finished in back with aliver-finished fasels and triumings, Compact size. Fitted carrying handle, Terms: Deposit 88-95 and 12 monthly payments 48-98 (Total 867-88). Carr, Free SAE for leaflet UK Mainland

RSC BASS-REGENT 50 WATT AMPLIFIER

A powerful high quality all-purpose unit for lead, rhythin, base guitar, vocalists, grain, radio, tape. Pesk Output rating. Loudspeaker unit either horizontal or vertical mounting.

Two extra heavy duty 12lm. 50w Loudspeakers.

Loudspeakers.

Four Jack inputs and two Volume Controls for instant use of up to four pick-ups or "inites". Bass and Treble controls. Send B.A.E. for leafet.

Credit Terms: Deposit \$15
& 9 monthly payments of \$7:28. (Total \$79.98.) Carr. \$22



RSC GP30 HI-FI **AMPLIFIER**

For Guitar, Vocal or Instrumental Group

A 4 input, 2 vol. control Hi-FI 30 watt unit with Separate Base and Trebla control

30 watt unit with Separate Hase and Treble controls. Current valves, Per Controls to the Current Strong Resilience of the Strong Resilience of the

NOW FIVE NEW BRANCHES

BOLTON 23 DEANSGATE OPENS MID-JULY NOTTINGHAM 19/19A MARKET SUNDERLAND 5 MARKET SQUARE

STOCKPORT 8 LITTLE UNDERBANK COVENTRY IT SHELTON SQUARE

NEW LARGER PREMISES AT HULL, DARLINGTON & NEWCASTLE See



HI-FI CENTRES LTD. MAIL ORDERS & EXPORT ENQUIRIES TO: AUDIO HOUSE, HENCONNER LANE, LEEDS, 18. Tel: Pudsey (09786) 77681.

Tel: Padasy (09788) 77631.
TERMS C.W.O. or C.O.D. No C.O.D. under \$1.
POSTAGE 289 EXTRA UNDER \$2. 289 EXTRA
OVER \$3 OR AS QUOTED. TRADE SUPPLIED.
S.A.E. PLEASE WITH ENQUIRIES.

SUPPLIERS TO GOVT. DEPTS. H.M. FORCES. EDUCATION AUTHORITIES & HOSPITALS. Etc. MAIL ORDERS MUST NOT BE SENT TO SHOPS

R.S.C. BRANCHES OPERATE A 5-DAY WEEK OPEN ALL DAY SATURDAY

BRADFORD 10 North Parade (Closed Wed.). Tel. 28349
BOLTON 23 Deanagate Tel: 33312 Opene Mid-July
BIRMINGHAM 30/31 Great Western Arcade,
Tel. 021-235 1279 (Closed Wed.).
COVENTRY 17 Shelton Square, The Precinct
DERBY 28 Oemaston Rd., The Spot (Closed Wed.).
Tel. 41361

19 Northgate (Closed Wed) Tel 88043

101 Lothian Rd. (Closed Wed.). Tel. 229 9501 GLASGOW 326 Argyle St. (Closed Tues.). Tel. 248 4158

HULL 7 Whitefriargate Tel. 20505
LEICESTER 32 High Street (Closed Thurs.). Tel. 56420
LEEDS 5-7 County (Mecca) Arcade, Briggate
(Closed Wed.). Tel. 28252
LIVERPOOL 73 Dale St. (Closed Wed.). Tel. 283 3573
LONDON 238 Edgware Road, W.2. (Closed Thure.).
Tel. 723 1629
MANCHESTER 60A Oldham Street, (Closed Wed.).
Tel. 236 2773
MIDDLESBROUGH 105 Newport Rd. (Closed Wed.).
NEWCASTLE UPON TYNE
191. 47098
24 Newgate Shopping Centre (Closed Wed.). Tel. 43068
NOTTINGHAM 19/19A Market Street (Closed Thurs.).
Tel: 48068 HULL 7 Whitefriargate Tel. 20505

Tel: 48088
SHEFFIELD 13 Exchange Street (Castle Markt Blda.)
(Closed Thurs.), Tel. 20716
STOCKPORT & Little Underbank, Tel: 480-0777.
SUNDERLAND & Market Sq. (Closed Wed.) Tel. 70573

DU CAN EARN £50 p.w. lus an exciting life and a secure future.

Get into the fabulous Computer Industry now. On the ground floor. While industry, commerce, science and governments are desperately seeking trained personnel. Give us only four to six weeks and we can train you in any one of the three vital careers in computers: (1) Programming (men and girls). (2) Operating (men and girls). (3) Key Punching (girls exclusively).

We are the only training organisation able to make this offer. And our teaching methods succeed because they combine specially prepared courses with equipment such as the unique Eduputer, exclusive to us.

Thanks to our methods, people from all walks of life have exchanged boring, underpaid, insecure jobs for careers that have meaning, prestige and security.

Past performance counts for nothing. Provided you have the aptitude (which we can discover quite simply), there is no reason why you should not get out of the rut and into Tomorrow's World—the fascinating world of Computers.

The moment you qualify—and we will help you do just that—one of our own exclusive appointments agencies will introduce you to opportunities galore. Worldwide. At no cost to you. All part of our continuing service.

What have you to lose by enquiring? Information and advice are yours for the asking. Post the coupon TODAY for full details FREE and without obligation.

London Computer Training Services

R65, Oxford House, 9-15 Oxford Street, W.1. Telephone: 01-437 9906 127 The Piazza, Dept. R65, Piccadilly Plaza, Manchester 1. 061-236 2935

Please send me your free illus-
trated brochure on training for
Computer Programming
(men and girls)
Computer Operating
(men and girls)
77 79 41

(men and girls)	
Key Punching (girls exclusively [
(tick appropriate box)	

Name		 	
Address		 	
	• • • • •	 • • • • •	
	• • • • •	 	
	Tel.	 	

B.H. COMPONENT FACTORS LIMITED

D. FI. CUTIFUTENI FACIUKS LIMITED

SPECIAL RESISTOR KITS (†W 5% or †W 5% CARBON FILM)
10E12 Kit: 10 of each E12 value, 10 ohms—IM, a total of 610, £3·10 net
25E12 Kit: 25 of each E12 value, 10 ohms—IM, a total of 1,525, £7·20 net
POLYESTER CAPACITORS MULLARD C280 250V
μF: 0·01, 0·015, 0·022, 0·033, 0·047, 3†p each; 0·068, 0·1, 0·15, 4‡p each;
0·22, 5†p; 0·33, 8p; 0·47, 9p; 0·68, 11p; 1·0, 15p; 1·5, 22p; 2·2, 25p.

MULLARD POLYESTER CAPACITORS C296 SERIES
160V: (μF) 0·01, 0·015, 0·022, 2†p; 0·047, 0·068, 3†p; 0·1, 0·15, 4†p;
0·22, 5p; 0·33, 6p; 0·47, 7†p; 0·68, 11p; 1·0, 12‡p.
400V: (μF) 0·001, 0·0015, 0·0022, 0·0033, 0·01, 2†p; 0·015, 0·033, 3†p;
0·068, 4†p.

700V: (μρ) 0.001, 0.0015, 0.0022, 0.0033, 0.01, 2½p; 0.015, 0.033, 3½p; 0.068, 4½p. MINIATURE ELECTROLYTIC MULLARD C426 SERIES (6p each) (μF/ν) 1/63, 4/40, 8/40, 10/40, 10/64, 16/40, 20/64, 25/25, 32/10, 40/16, 64/10, 80/16, 80/25, 100/6-4, 125/16, 200/6-4, 200/10, 320/6-4, 125/10, MULLARD C437: (μF/ν) 64/64, 10p; 160/25, 10p; 160/40, 12p; 640/6-4, 10p; 160/6-4, 16p.

B0/10, 80/25, 100/6-4, 13716, 200/10-7, 200/1

Veroboard 2† x 5in 2† x 3½in 3½ x 5in 3½ x 5in 3½ x 1in 2† x 1in 2† x 5in (plain) 5 x 3½in (plain) 1 nsertion tool	 59p	0·15 28p 19p 33p 28p 7p 14p 12p 22p 59p	IN4001 IN4002 IN4003 IN4004 IN914 µL914 OC71 OC75 OC83	61p 71p 9p 91p 7p 35p 13p 17p 20p	SPEC QUO PROJ	ARE A	TY DIS ULK BU VAILA ON FO AND S.C.R. 29p 33p 50p	JY PR BLE B R LA TRA	ICES Y RGE
Pins, pkt. 25 2 pin DIN Plug,	10p	10p Skt.	5creened Twin scre Stereo s.	eened c. wir	l wire, e, m	m ,.			. 10p . 10p
10p, 3 pin DIN			Connecti						

10p, 3 pin DIN Plug, 13p; Skt., 10p. 5 pin DIN Plug, 180°, 15p; Skt., 12p. Tran-sistor Equiv. Book, 40p. Carbon pots 5K-2M log, & lin, single 16½p, single with switch 26p, dual 46p. Neon bulb 90V wire ended.......5 for 24p Preset skeleton pots IK-IM6p ALL PRICES INCLUDE V.A.T.
C.W.O. only. P. & P. 10p on orders below £5.
Discount: £10—10 %, £20—15 %.
Export Order enquiries welcome (VAT free)

Dept. P.W. 61, CHEDDINGTON ROAD, PITSTONE
Near LEIGHTON BUZZARD, BEDS. LU7 9AQ
Tel.: Cheddington 668446 STD. (0296)
Inquiries—S.A.E. Catalogue FREE. Callers please phone first.



BAKER 12" MAJOR £9.90

30-14500 cps. Double cone woofer and tweeter combination. Baker ceramic magnet assembly flux density 145000 gauss. Bass resonance 40 c.p.s. 20 watt RMS.

MAJOR MODULE KIT £12.50

30-17000 cps. with tweeter, crossover and baffle.

Major 12" 20W £9-90 Deluxe 12" 15W £11

Baker Loudspeakers 28-80 | Superb | 2°20 W £ 16 · 50 | ALL PRICES | 10° 90 | Grp. 25 | 2°25 W £8-80 | FILL PRICES | INCLUDE VAT

Baker Loudspeaker Co., Bensham Manor Passage, Thornton Heath, Surrey. Tel. 01-684 1665 Loudspeakers Catalogue and Enclosure plan 5p

ELECTROKIT

12 Lauderdale Road, London, W.9 Telephone 01-286 0011

LIGHT DIMMER. Kit contains all parts including circuit and construction data, 480 watts, fully suppressed.

Price £2:10

SCORPIO IGNITION SYSTEMS (P.E. Nov. 1971), £9:50. This kit includes all the parts for the assembly of this popular and reliable system. The hardware and the construction data are included.

Send for details of kits available (please enclose S.A.E.). All kits sent POST FREE within the limits of the U.K.

Please note, prices shown do not allow for V.A.T. Please add 10% to your order.



The Japanese have a Yen for it.

in case you are not familiar with Japanese:

Our distributors in Japan are telling their customers about the importance (when soldering I.C.'s and transistors) of the low leakage of our Model X.25 soldering irons.

Model X.25 –25 watt sells at £1.75 + P & P 8p VAT18p Model G –18 watt £1.95 + P & P 5p V.A.T. 20p Model CCN –15 watt miniature iron £1.95 + P & P 5pVAT 20p

Ask your usual wholesaler or retailer for Antex irons or if you have any difficulty, send the coupon to us direct.

Please send the following:	From radio or electrical dealers. car accessory shops or in case of difficulty direct from: ANTEX LTD. FREEPOST PLYMOUTH PLI 1BR (no stamp required) Tel 0752 67377. Please send the ANTEX colour catalogue.
Lendose cheque/P.O./Cash (Giro No. 258 10	
NAMEADDRESS	PW 8

Reg. No. 393594



Consisting of a Fane Model 803 ultra-low resonance 8" speaker unit with PVC cone surround, and a Fane Model 303 high frequency pressure tweeter together with a printed

HIGH FIDELITY **LOUDSPEAKER KIT**

Model 303

circuit cross-over assembly with ferrite cored SPECIFICATION OF UNITS
Model 803

Overall Diameter	8"	3"
Natural resonance	30Hz	_
Main resonance	*35Hz	1200Hz
Magnet Pole Diameter	1"	3"
Magnet Flux Density	13,000 gauss	10,000 gauss
Frequency response	30Hz-8kHz	10kHz-17kHz
Impedance	8-15 ohms	8-15 ohms
Power Handling	*15 watts	*15 watts

Very easy to assemble, this boxed kit comes with acoustic foam damping material, panels, screws, wire, wiring diagrams and instructions to provide a remarkable loudspeaker assembly—a pair is ideal for stereo.

CABINETS for the 'Mode One' are available in Teak veneer finish. SIZE $15\frac{\pi}{4}$ " x $10\frac{\pi}{4}$ " x 9".

*When used with above cabinet.

Distributors to the wholesale

LINEAR PRODUCTS LTD.

Electron Works, Armley, Leeds LS12 3SA Tel. 630126

Manufactured by

FANE ACOUSTICS LTD.

Hick Lane, Batley. Yorkshire.

Tel. Batley 6431

CAPACITOR DISCHARGE **IGNITION KIT**



A comprehensive kit of parts with detailed constructional details, ready drilled diecast case, screws, leads, terminals etc.

Available in both 6 and 12v versions. State whether positive or negative earth. £9.62 incl. p. & p. U.K. only.

De-coupling kit for impulse tachometer and interference suppression. £1 10 incl. p. & p. U.K. only. All our kits use guaranteed quality components and have been approved by the Author.

MAGTOR LTD.

68 DALE ST., MANCHESTER M1 2HS 061-236 3031

EX COMPUTER PC PANELS

2 x 4 in. packed with semiconductors and top quality resistors, capacitors, diodes etc.
Guaranteed min. 35 transistors plus data. 10 boards 50p (9p)

SPECIAL BARGAIN PACK

25 boards for £1 (25p). Panels with 4 Power transistors sim OC28

50p (9p)

ELECTROLYTICS 68,000 μ 16, $4\frac{1}{2} \times 2$ in. dia., 25,000 μ 25v, 20,000 μ 30v, 5,000 μ 9v, 35,000 μ 15v, 8,000 μ , 4 $\frac{1}{2} \times 3$ dia. 50p (15p) 15,000 μ (5v, 10,000 μ 35v, 4 $\frac{1}{2} \times 2$ in. dia. 30p (10p), 2,000 μ 25v wire ends 15p (5p), 12 for £1/50 (15p)

20A DIODES 4 for £1 (7p) 3A DIODES 4 for 50p (5p) 8 BLACK TOGGLES dpst 50p (8p) 250 MIXED CAPACITORS 60p (8p) 250 MIXED RESISTORS 60p (8p) 150 HI-STAB RESISTORS 60p (8p) 200 SI PLANAR DIODES 50p (5p) SUB. MIN. CO-AX PLUGS & SKTS. 4 pairs 50p (5p) REED RELAYS, MIXED 10 for 50p (5p)

MICRO SWITCHES 8 for 50p (8p) ASSORTED RELAYS 8 for £1 (12p) MIN. GLASS NEONS 12 for 50p (5p) 10 WAY TERMINAL BLOCKS

10 for 55p (5p) PAPST EXTRACTOR/BLOWER FANS 100 cfm 4½ x 4½ x 2 in £3.50 (28p) Q-H BULBS 12v 55w 50p (5p)

Postage and package shown in brackets. Please add 10% VAT to prices.

KEYTRONICS

(Mail Order only)

44 EARLS COURT ROAD LONDON W8. 01-478 8499

GEIGER COUNTERS



(FOR MAINS OR PORTABLE BATTERY USE)
Latest lione Other
release and probably the
last, of this well known
Contamination Meter No. 1

last, of this well known contamination Meter No. 1 this very useful Instrument is used for the measurement of Radio-Activity. Indicated on an Internal Meter scaled 0-1 to 10 milli Rontgenyfitour, a socket is also provided for additional sound Monitoring on Headphones. This Instrument is housed in a Strong light Alloy Case, sack with shoulder stranged in a carrying Haver-Hand Hand held Probe. Instruction maining Cable and Hand held Probe. Instruction maining Cable and Hand held Probe. Instruction maining Cable and the stranged of the str

TRANSCEIVERS



TRANSCEIVERS
Due to warehouse clearance we have for disposal,
few only Transreceivers
No. 62 Mk. 2, made by
f'ye for the Navy and
Army. Using a total of 11
valves. 1 RF and 2 1.F.
stages. Av.C., BFO, covering 1-5 Mofs. to 10 M/cs.
in two switched bands. Can be used on RT or CW
M.O. or Crystal. A very good internal ATU made
of a rotating silver wire coil, tunable over the complete range, suitable for aerials 4ft. to 100ft.,
internal F.U. for 12 volt D.C. A meter is fitted for
checking politages. Av.C. etc. Housed in a metal
waterproof case, approx. size 18 x 104 x 124 x
Supplied in as new new condition, being either
rebuilt by Army Signals or afore-soiled new set,
suitable hand telephone with spring
carriage 22. Suitable hand telephone with spring
coil plus transmitter switch in handle. Modern.
£1-50.

JOHNS RADIO

424 BRADFORD ROAD, BATLEY, YORKS.
Phone: Batley 7732



100 WATTS!



* NO EXTERNAL COMPONENTS

* MECHANICALLY & ELECTRICALLY ROBUST

* INTEGRAL HEATSINK

* HERMETICALLY SEALED UNIT

* ATTRACTIVE APPEARANCE

* LOW COST

* BRITISH BUILT

With the development of the HY200, ILP bring you the first COMPLETE Hybrid Power Amplifier.

COMPLETE: because the HY200 uses no external components!

COMPLETE: because the HY200 is its own heatsink!

By the use of integrated circuit technique, using 27 transistors, the HY200 achieves total component integration. The use of specially developed high thermally conductive alloy and encapsulant is responsible for its compact size and robust nature.

The module is protected by the generous design of the output circuit, incorporating 25amp transistors. A fuse in the speaker line completes protection.

Only 5 connections are provided, input, output, power lines and earth.

OUTPUT POWER: 100 watts RMS; 200 watts peak music power. INPUT IMPEDANCE: 10kΩ. INPUT SENSITIVITY: 0Dbm (0.775volt RMS). LOAD IMPEDANCE: 4-16Ω. TOTAL HARMONIC DISTORTION: less than 0.1% at 100 watts, typically 0.05%. SIGNAL: NOISE: better than 75Db relative to 100 watts. FREQUENCY RESPONSE: 10Hz-50KHz ±1Db. SUPPLY VOLTAGE: ±45volts. APPLICATIONS: P.A., Disco, Groups, Hi-Fi, Industrial. PRICE: £14-90 inc. VAT & P&P. Trade applications welcomed.

CROSSLAND HOUSE · NACKINGTON · CANTERBURY · KENT

CANTERBURY 63218

Please note we reserve the right to substitute at our discretion updated versions of advertised designs where applicable.

You'll hardly be able to believe your ears!



Mail orders to Acton. Terms C.W.O. All enquires Stamped Addressed Envelope Goods not despatched outside U.K.

VISCOUNT IIIoost in the output,

VISCOUNT III now gives you an imposing 20 watts per channel—and the price quoted is actually INCLUSIVE OF VAT!

The money's important, of course, but not nearly so important as value for money! And that's something you get in abundance with VISCOUNT III. We design it . . . we make it . . . we sell it direct to you—passing on all the economies that come from cutting out middle-men! That's

it direct to you—passing on all the economies that come from cutting out middle-men! That's the only way you can get so much quality for so little money! The unique VISCOUNT Ill amplifier, plus the Garrard SP25 Mk III deck, plus the magnificent Duo Type III matched speakers (or Duo Type II for a small room) give you an audio installation that will prove unbeatable for listening pleasure! And the teak finish will harmonise and enhance virtually any style of interior decor! On the brushed aluminium front panel of the amplifier you'll find all the facilities you need—volume, bass treble and balance controls, plus switches for mono/stereo, on/off function and bass and trable filters. Plus headphone socket on the back

on the back. The heart-stopping timbre of Tom Jones at his most virile . . . the last lingering harmonics of a solo performance by Heifetz or Menuhin. . . , the pathos and the panache of Liza Minelli . . the majestic sonorities of the brass band and the elfin subtlexies of the virtuoso clavichordist—hear every nuance with a fidelity that you have never experienced before! Come and hear VISCOUNT III! If it's inconvenient to travel, buy by post in the confidence that you won't be disappointed (and with a 24-carat Money-Back Guarantee to give you extra experience). Don't extella for expend-heat! on the back.

that you won't be disappointed (and with a 24-carat Money-Back Guarantee to give you extra reassurance). Don't settle for second-best! SPEAKERS: Duo Type II Size approx. 17 in \times $10\frac{1}{2}$ in \times $6\frac{1}{2}$ in. Drive unit 13 in \times 8 in with parasitic tweeter. Max. power 10 watts 8 ohms. Simulated Teak cabinet. £14-00 a pair + £2-20 p. & p. Duo Type III Size approx. $23\frac{1}{2}$ in \times 11 $\frac{1}{2}$ in \times 9 $\frac{1}{2}$ in. Drive unit approx 13 $\frac{1}{2}$ in \times 8 in with HF speaker. Max. power 20 watts, 8 ohms. Freq. range 20Hz to 20kHz. Teak veneer cabinet. £32-00 a pair + £3-30 p. & p.

PRICES: SYSTEM I Viscount III R 102

amplifier £24·20 + £1 p & p 2 Duo Type II speakers £14·00 + £2·20 p &p Garrard SP25 Mk III with MAG

with MAG. cartridge £18.00 + £1.75 p & p /plinth & cover

£56-20 total £49.00 + £3.50 Available complete for only

PRICES : SYSTEM 2

Viscount RIO2
amplifier
2 Duo Type III speakers £32·00 + £3·30 p & p
Garrard SP25 Mk III with

MAG cartridge

£18.00 + £1.75 p & p plinth & cover £74 · 20

Available complete for £65.00 +£4

THE TOURIST PUSH-**BUTTON CAR RADIO**

KIT £6.60 The Tourist PB is suitable for 12 volt working on both negative and positive earth vehicles. It covers the full medium and long wave bands. It is permeability tuned and sturdily constructed. Output is a full 2.5 watts into an 8 ohms speaker. But the Tourist

watts into an 8 ohms speaker. But the Tourist
PB will operate into any loud-speaker from 8 to 15 ohms.
Apart from the output stage, which is an integrated circuit, the only other electronic components that need soldering are some capacitors, resistors, etc. The kit includes a pre-built RF tuner unit, and fully modulised IF stages which are pre-aligned before despatch. As well as electronic components this kit also contains 2 diamond-spun aluminium knobs, elegant matching front panel, dial, washers, screws and wire.
The Tourist PB can be mounted in any standard size dash panel and it has an illuminated tuning scale. Chassis size is: 7in wide, 2in high and 4½ in deep. Circuit diagram and comprehensive instructions 55p free with parts.
Fully retractable and lockable car aerial £1-37 post paid.

CAR RADIO KIT £6-60 p. and p. 55p. Speaker with baffle and fixing strips £1-65, +23p p. & > post free if bought with the kit. Send stamped addressed envelope for leaflet. If you can solder on printed circuit board, you can build this push-button car radio kit. It's simple—just follow the step-by-step instructions.



SOUND 50
Output Power: 45 watts R.M.S. (Sine Wave). Frequency Response 3dB points 30Hz and IBKHz. Total Distortion: less than 2% at rated output. Signal to noise ratio: better than 60dB. Bass Control Range: 13dB at 60Hz. Treble Control Range. 12dB at 60Hz. Treble Control Range. 12dB at 60Hz. Treble Control Range. 12dB at 60Hz. Inputs: 4 inputs at 5mV into 470K. Each pair, of inputs at 5mV into 470K. Size: 19½ x 10½ x 8ins. Amplifier 231:35 output for 3, 8 and 15 ohm speakers.



Viscount III



RELIANT MK IV

POG

ONLY £7.64 + 55p. p & p For the man who wants to design his own stereo—here's your chance to start, with Unisound—pre-amp, power amplifier and control panel. No soldermaging just simply screw together. 4 watts per channel into 8 ohms. Inputs: I20mV (for ceramic cartridge). The heart of Unisound is high efficiency I.C. monolithic power chips which ensure very low distortion over the chips which audio spectrum.



IN-CAR ENTERTAINMENT

With this elegant stereo 8 track add on unit, audio enthusiasts now have the opportunity to extend their systems to include the playto extend their systems to include the pay-ing of 8 track cartridges. Simply select your channel, by push button, four digital lamps indicate channel selected. The Viscount III,

the fabulous Stereo 21 and the Unisound Modules £9.90 plus p. & p. will accept this unit, simply connect up.

MAPLIN ELECTRONIC SUPPLIES



RD EDITION NOW AVAILABLE

Send for your copy of this beautifully produced fully illustrated catalogue and we will forward it to you by return of post. Please send 9p in stamps.

Everything guaranteed brand new marked by manufacturer

POST SERVICE

★RETURN OF

MAPLIN: Projected site of London's

RESISTORS RESISTORS Carbon film 5% from 1Ω to $1M\Omega$, 10% from $1M\Omega$, 10% from $1M\Omega$, $1:2M\Omega$ to $10M\Omega$, E12 series, $\frac{1}{2}$ W $\frac{1}{2}$ $\frac{1}{2}$ D. Metal Oxide $\frac{2\%}{6}$ 10 Ω to $1M\Omega$, E24 series $\frac{1}{2}$ W $\frac{1}{2}$ $\frac{1}{2}$ W, $\frac{1}{2}$ $\frac{1}{2}$

7 SEGMENT DISPLAY Minitron 3015F £1:98 each.

POTENTIOMETERS

Miniature carbon Miniature carbon track with $\frac{1}{4}$ in. spindles. $5k\Omega$, $10k\Omega$, $25k\Omega$, $50k\Omega$, $100k\Omega$, $250k\Omega$, $500k\Omega$, $100k\Omega$, $250k\Omega$, $500k\Omega$, $1M\Omega$, $2M\Omega$. Log or lin (and $1k\Omega$ lin), 12Ω . Log or lin with switch 23n. Log or li switch 23p. Dual gan oual gang switch 38p. less

THE OTHER DAY WE RECEIVED A WIRE

It was too long + Stop + so we cut it with a pair of our 5 inch diagonal nippers + stop + fully insulated handles + stop + then we had to strip to the bare copper without a nick + stop + our fully adjustable strippers will strip cleanly any size wire from 12 S.W.G. to 26 S.W.G. with no nicked wires even if its stranded + stop + real value at only 54p a pair + stop + finally the wire had to come to an end so we terminated it with our 5½' long nosed wiring pliers + stop + their slender jaws are gap free and the fully insulated handles are gently tensioned apart by leaf springs + stop + irresistable at only £199 a pair + stop + so the next time you get a wire you'll know what to do, won't you?

8 pin Dil Op Amp 741C 36p. 14 pin 741C 4Sp. 70V r.m.s. I 8A full wave bridge recti-

REC 41A £1-06 DIODES IN914 4p, BAX13 5p, IN4001 6p, IN4002 6‡p IN4003 7p, IN4004 IN4005 8p. IN4006 8 p, IN4007

SEMI-CONDUCTORS We stock a large range of transistors and I.C.s, for details please se our catalogue. LOOK! These popular de-vices at amazingly low prices. BCI0778! 9 10p each. BCI69C 12p. BFYS1 16p. 17543 (5S43) 28p. 2N706 10p. 2N2646 45p. 2N3055 49p. 2N3819 24p.

DIN PLUGS. 3 pin, 9p. 5 pin A (180°), 5 pin B (240°), 10p each. DIN SOCKETS. 3 pin, 5 pin A, 5 pin B,

7p each. DIN LOUDSPEAKER. 2 pin plug, 8p. DIN LOUDSPEAKER. I pin plug, 8p. JACK PLUGS standard ‡in plastic barrel, 13p, Stereo, 25p. Bright metal barrel, 17p. Stereo, 29p. Jack sockets standard ‡in open type 10p, Moulded 2 break 13p, Moulded stareo 3 break 18p.

ROTARY SWITCHES Adjustable stop. I pole 2-12 way, 2 pole 2-6 way, 3 pole 2-4 way, 4 pole 2-3 way. Only 24p each.

SPECIAL IC, for organ builders, 7 stage frequency divider in one 14 pin DIL package, £2 63 or special price for pack of 12, £25.

Why not ask us to slip a data sheet in with your catalogue.

NUDES!

Clothe those naked projects with our superb instrument cases. We are sole distributors of the Community of the Community of the professional market, now available to you et special low prices. S.A.E. please for free Illustrated leaflet.

HARDWARE

Wide range of nuts and bolts, platted brass and nylon types plus solder tags, shakeproof washers, etc. SOLDER 10 metres of 22 gauge multicore, 20p. Insulating sleeving 3 sizes, 6 colours.

SEE OUR CATALOGUE for details of how you can obtain £1 worth of com-ponents.

ABSOLUTELY FREE

MISCELLANEOUS

MISCELLANEOUS
LT700 Eagle sub-miniature O/P transformer 1200/50 200mW max., 35p.
Slide switch DPDT, 12p Miniature
Push to make non-locking switch 12p.
Silicon grease in special dispenser,
20ml, 38p.

V.A.T. Please add 10% V.A.T. to final total. Orders and enquiries for catalogues to MAPLIN ELECTRONIC SUPPLIES. P.O. Box J, Rayleigh, Essex SS6 8LR

Postage and packing FREE in U.K. But we have to ask you to send a 10p handling charge with order under 50p.

000 become RADIO-AMA

learn how to become a radio-amateur in contact with the whole world. We give skilled preparation for the G.P.O. licence

free!

Brochure, without obligation to

BRITISH NATIONAL RADIO & ELECTRONICS SCHOOL P.O. Box 156, JERSEY

ADDRESS : _

W883 BLOCK CAPS please

PLUGS & LEADS

Pluge Pack 107 5 pin Din Pack 108 3 pin Din Pack 135 ½" Jack Pack 130 ½" Jack Stereo Pack 103 Loudspeaker Plug Pack 100 Phono Plug Pack 230 3 pin Socket Pack 234 Loudspeaker Pack 234 Loudspeaker Socket	22 p 20 p 27 p 50 p 17 p 7 p 25 p 33 p
Ready-made Leads 3 pin to 3 pin Din 3 pin to open end 5 pin to 5 pin Din 5 pin to open end 5 pin to open end 5 pin to 4 phono plugs £l	70p 55p 90p 70p
Extension lead Din plug to socket 12ft. All leads approx. 6ft. in len DIAMOND STYLI (Send SAE for complete 8TA; 9TAHC; GI ST4; ST9; EV26; GCB.All at	70p gth list)
Orbit NM22 £4 Shure 75/6 £6 Sonotone 9TAHC (Dia) £2 Sonotone 8T4A (Dia) £1	00 00 00 00 50
All prices include VAT	-

RECORD CARE

Cecil Watts Dust Bug £1-20 45p Parastatic Disc Preener 20p Antistatic Fluid Dust Bug Spares (Brush Roller) 15p

CASSETTE TAPES Audio-Magnetic C60

Qty 3 6 10 20 Price £1:00 £1:90 £3:20 £6:30 Cassette Caddy £1-20 Cassette Head Cleaner

ZONAL ILFORD TAPE Standard 600ft

5½" Standard 900ft 7" (Plain boxed) 1200ft 60p (Westminster Boxed) 800ft £1-25 1800ft 7" Reel of Leader Tape (Blue 75p

25p

or green) HEADPHONES

£10.60 Sennheisser HD414 £6:50 £35:00 Beyer DT48S

MICROPHONES AKG D109 AKG D202EI £39 · 50 £17 · 00 AKG DI90C AKG DI90E AKG D224 €50 -00 Sennheisser MD211N Sennheisser MD413N Sennheisser MD421N £45 · 00 £27 · 00 £35.00 Audio RMS7F Radio Mike £210.00

SPEAKERS

E.M.I. 350 Kit 80hms E.M.I. 450 Kit 80hms £8-20 £4-50

J. J. Francis (Wood Green) Ltd

MANWOOD HOUSE, MATCHING GREEN, HARLOW, ESSEX CM17 ORS Telephone; Matching 476

Cool lighting for hot parties.

Velvet dim to full brightness at a touch of the finger. Off/on and infinitely variable.

Beta light glow makes switch easy to find in the dark and consumes no current.



Economical too!

As the light is progressively dimmed, so the current consumption drops - think of it as an electric tap. 300 watt capacity, straight replacement for standard light switch.







Complete kit of parts £2.80 or







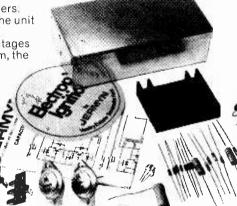
n for cold mornings.

The Jermyn capacitor discharge ignition system.

Instant starting in all weathers: Even with a near flat battery, the unit will produce a full sized spark

Just one of the many advantages of an electronic ignition system, the others are:

High energy spark even at maximum revs.



Smoother running. Less strain on battery and starter. Lower petrol consumption.

Long plug life with infrequent adjustment (typically 20,000 miles, gapped at .050").

No contact breaker arcing giving long life and less adjustment (typically 20,000 - 25,000 miles)

STATE + or - earth when ordering.



Complete set of parts to build it vourself for only £7.75, as described in Practical Wireless and fully

approved by the author.

Save 55p Buy both for £10.00

Reprints of the two part feature are available at 25p.

To Jermyn Industries, 93 Vestry Estate, Sevonoaks, Kent.	All Prices Exclusive of V.A.T.
Please despatch return of post light dimmer kit light d	startituer.
BLOCK CAPITALS	JERMYN
NAME	
ADDRESS	

NELSON-JONES FM TUNER KIT



as in 'W.W.' June '73

Now available for the first time to readers of 'Practical Wireless'. The Nelson-Jones tuner was originally made available by this company in May 1971, and consequently all 'bugs' have been 'ironed out' of this highly successful kit.

A recent design addition has used variable capacitance diodes and a Push Button Unit with 6 positions. AFC disable is incorporated as well as a pointer for each button showing tuning position in the range 87.5-108MHz.

Our complete metalwork system is supplied with nuts, bolts, board standoffs, push button mains on/off and stereo mute assembly, sockets, fuse and holder. Printed and Anodised Front Panel and Veneered Teak case. Power supply kits are supplied with complete kits of parts, or separately.

Prices for complete kits start at £23.75 + 45p pp. + VAT for mono tuners, (phase locked decoders are also available to fit in the cabinet). Please send large SAE for complete details of special offers and our complete lists.

TEXAN AMPLIFIER

The Cabinet of the Nelson-Jones Tuner is specially designed to match the Texan amplifier cabiner, see photographs, so that owners of Texan's are assured of compatibility, both in superb performance and appearance.

Texan amplifier kits are available at £28-50 + 45p pp. + Vat. Worried about tuner alignment? then let our alignment service take over.



INTEGREX LIMITED, Dept. P.W., P.O. Box 45, Derby, DEI 1TW. Tel. Repton (028389) 3580



NEW STEPHENSPEAKERS

A new range of loudspeaker kits and cablnets with a style and specification for every purpose. You'll be cheating a bit if you tell your friends "made it myself". We supply superb craftsmen built fully finished cabinets in beautiful stain and scuff resistant vinyl in white or teak.

Just fit the speaker cloth (supplied) and screw in your speaker.

HIGH QUALITY AT LOW COST

Send for our free booklet "Choosing a Speaker"





STEPHENSPEAKERS, WILMSLOW AUDIO, Dept. 'PW', Swan Works, Bank Square, Wilmslow SK9 1HF

ALL PRICES INCLUDE VAT

BARGAIN PARCELS 14lb at £1 60 plus 35p p.p.; 28lb at £3 00 plus 57½ p.p.; 56lb at £4 95 plus £1 37½ p.p. Contain pots, Res. Valves, Diodes Tagboards, Chassis, Valveholders, etc. Good value save £££s. Lucky Dip Service.

FANTASTIC BARGAIN. New 6 inch tubes. E450 4/B/16 4VH. medium Persistance, green. Ideal scope tube.

Also 7BP7. All unused as new. Price £1:55 post paid.

NEW HEAVY COAX CABLE dia. 1" 70 ohms approx. 50ft. lengths £1.55, p. & p. 321p. 100 ft. lengths £2.97, p. & p. 55p.

AERIALS. New Condition Whip Type, 4ft. 22p; 11ft. 82½p. all collapsible type. P. & p. 4ft. 10p, 11ft. 15p. New bases on adjustable clamp for the above, 67½p. p. & p. 27½p.

CRYSTALS AS NEW. Hc 6u, 5,345; 5,030; 4,945; 4,875; 4,840; 4,795; 4,580; 4,660; 4,520; 4,510; 2,295 Kc/s. 55p each plus 8p p.p.

OUR SELECTION OF 6-Ex. Equ. METERS consisting of 3in., 2\frac{1}{2}in., 2in., mill amps, volts, amps. Mixed at the bargain price of \(\frac{2}{2}\)20 P. & P. \(27\frac{1}{2}\)p. minimum order of six.

ANY HEIGHT AERIAL TUBULAR SECTIONS $\frac{1}{4}$ " dia. \times 3ft. long. Brass screw in ends, copper coated and painted. Good condition. $22\frac{1}{2}p$ p. & p. 5p each. Minimum order 6.

AS NEW AERIAL TUNER UNIT No. 6 RF, consisting of 1½ inch 500 mico/ampmeter 3 gang tuner 75 PF geared BNC type socket size $5\frac{1}{4}$ " \times 5". Price £1.65, p. & p. $27\frac{1}{2}$ p.

NEW AERIAL WIRE ON BOARDS 7/22 UNCOVERED 90ft 50p, 100ft. 60p, p. & p. 22p.

AERIAL POLES 4ft high 2" in diameter push-in type as new 75p each p. & p. 25p each minimum four.

AERIAL MAST POLES approx. 5ft high 2" dia. Interlocking ends. Minimum order three. New condition, £1·10 each section. Carriage 37½p each section. 4" 75 ohms Coax in 50ft coils with BNC plugs good condition. Price £1·10 + 32½p p.p.

AS NEW 500ua PENNY SIZE METERS complete with jack plug price ${\bf f1\cdot 10}$ each, p. & p. 10p.

COMMUNICATION RECEIVER PCRS price £10, post paid.

C.W.O. CARRIAGE CHARGES MAINLAND ONLY

WOULD CUSTOMERS PLEASE ENSURE THAT ALL ORDERS ARE PRINTED IN BLOCK CAPITALS AND INCLUDE YOUR ADDRESS.

A. H. THACKER & SONS LTD.

Radio Dept., High Street, Cheslyn Hay, Nr Walsall, Staffs.

THIS IS THE FIRST PAGE OF THE GREAT BI-PAK

BRAND NEW FULLY GUARANTEED DEVICES

			DKANL	INEW	OLL!					Tupe Price p
or reference	Type Price p AC107 22 AC115 26 AC115 26 AC117 22 AC118 26 AC117 22 AC129 19 AC129 19 AC129 19 AC129 19 AC129 18 AC128 19 AC121 18 AC141 19 AC151 22 AC156 22 AC156 22 AC156 22 AC156 22 AC156 22 AC157 22 AC168 22 AC168 22 AC168 22 AC168 22 AC168 32	Type Price p AD161 37 AD162 37 AD161 & 61 AD140 55 AF114 27 AF115 27 AF116 27 AF116 27 AF118 39 AF125 28 AF125 31 AF127 31 AF127 31 AF127 31 AF129 33 AF178 35 AF178 35 AF188 50 AF188 50 AF188 50 AF189 41 AL03 72 AF199 28 AF178 55 AF189 50 AF189	Type Price p RC145 50 50 RC147 11 RC149 13 RC182 RC152 RC152 RC152 RC154 RC168 RC167 RC168 RC167 RC168 RC167 RC168 RC167 RC168 R	Tupe Price p BD1333 72 BD1335 44 BD1336 44 BD1336 55 BD1339 61 BD1405 88 BD175 68 BD177 72 BD180 77 BD180 83 BD190 83 BD190 83 BD190 84 BD197 94 BD197 94 BD198 105 BD200 105 BD200 105 BD200 105 BD200 105 BD200 110 BF115 77 BF116 77 BF116 77 BF117 50 BF117 50 BF117 55 BF117 55	Type Price p BF182 44 BF183 48 BF185 33 BF188 44 BF186 13 BF196 18 BF290 51 BF292 105 BF293 86 BF253 94 BF273 39 BF271 33 BF273 39 BF271 33 BF273 39 BF273 39 BF274 39 BF275 30 BF288 24 BFX86 24 BFX86 24 BFX87 32 BFX86 24 BFX87 32 BFX87 3	Type Price p NAT190 21 MAT191 22 MAT191 24 MPF102 48 MPF104 41 MPF105 41 MPF105 41 MPF105 42 MPF106 42 MPF107 42 MPF107 43 MPF107 44 MPF107 45	Type Price p 20309 39 20309 39 20339 22 20339A 18 20344 20 20345 18 20371 18 20371 18 20371 18 20371 19 20373 19 20378 18 20381 1	Type Price p 2N:2148 63 2N:2160 66 2N:2193 39 2N:2193 39 2N:217 24 2N:2219 22 2N:2219 22 2N:2219 22 2N:221 22 2N:2368 19 2N:2368 19 2N:2368 19 2N:2368 19 2N:2368 20 2N:211 23 2	Type Price p 2N3053 19 2N3053 19 2N3050-4 51 2N3050-5 55 2N3391 18 2N3391 18 2N3392 16 2N3393 16 2N3393 16 2N3394 16 2N3395 19 2N3403 23 2N3404 23 2N3404 34 2N3405 46 2N3416 17 2N3416 17 2N3416 17 2N3416 17 2N3416 10 2N3707 12 2N3703 11 2N3703 11 2N3707 12 2N3708 10 2N3707 12 2N3708 10 2N3707 12 2N3708 10 2N3709 10 2N3707 12 2N3708 3 2N3709 10 2N3709 10 2N3709 31 2N3900 33	Tupe Price p 2N4059 11 2N4060 13 2N4061 13 2N4061 13 2N4061 13 2N4061 13 2N4062 13 2N4061 19 2N4285 19 2N4286 19 2N4286 19 2N4286 19 2N4287 18 2N4290 11 2N4290 11 2N4290 11 2N4290 11 2N4290 12 2N4290 13 2N4290 14 2N4290 15 2N4290 16 2N4290 17 2N4290 18 2N4290 19 2N4
ss out and keep for	ACY17 8 22 ACY19 22 ACY19 22 ACY20 22 ACY21 22 ACY22 21 8 ACY27 20 ACY29 31 ACY30 31 ACY31 41 ACY31 41 ACY31 41 ACY31 41 ACY40 40 ACY40 40 ACY41 40	RC107 10 BC108 10 BC109 11 BC113 11 BC114 17 BC115 17 BC116 17 BC118 11 BC118 13 BC126 20 BC126 20 BC132 10 BC134 10 BC134 10 BC135 11 BC18 11 BC19 44 BC19 44	EC908 12 EC908 13 EC919L 12 EC919L 12 EC914L 16 EC926 28 EC926 39 EC926 39 EC930 27 EC930 EC93	BF125 50 BF152 55 BF152 50 BF154 57 BF156 67 BF156 68 BF156 68 BF158 66 BF160 44 BF160 44 BF161 44 BF162 44 BF163 74 BF163 74 BF163 74 BF163 75 BF173 33 BF173 33 BF181 33	BSY27 17 BSY28 17 BSY29 17 BSY39 20 BSY39 20 BSY39 20 BSY41 31 BSY41 31 BSY95 A 14 BSY95	OC171 28 OC200 28 OC201 31 OC202 31 OC203 28 OC204 28 OC205 39 OC205 39 OC205 39 OC205 39 OC206 39 OC705 39 OC705 39 OC705 39 OC705 39 OC714 48 OC714 48 OC714 49 OC714 44 P346A 42 P346A 42 P347 46 BT140 14 BT141 19 BT1843 33 UT46 30 UT46 30 UT46 30 UT46 30 UT46 30 UT46 30 UT46 30 UT46 40 UT46 30 UT46 40 UT46	2N.713 22 2N.714 42 2N.914 18 2N.914 33 33.21929 23 2N.929 23 2N.929 23 2N.929 23 2N.929 24 2N.929 24 2N.929 24 2N.929 24 2N.939 44 2N.939 45 2N.939 46 2N.939 47 2N.939 48 2N.939 48 2N.9		DES AND RECTII BY133 23 BY164 55 BYX38/30 46 BYZ10 39 BYZ11 33 BYZ12 33 BYZ12 33 BYZ13 28 BYZ16 44 BYZ10 39 BYZ18 39 BYZ19 31 CG62 COA91 Eq.) 6 CG651 COA70-OA79 CA9 OA5 39 OA45 23 OA10 39 OA47 8	PIERS OA70 8 OA79 8 OA81 8 OA85 10 OA90 7 OA91 7 OA91 7 OA920 8 SD10 6 SD10 6 SD19 6 SD19 6 SD19 6 SD19 6 SD19 6 SD19 7 OA914 7 IN914 7 IN914 7 IN916 7 IN916 7
nades	Ma Ota	MPONENT	Description		MIXE	UMBO COMPONE DELECTRONIC rs, capacitors, p lls plus many ott	components ots, electrolytics		S.G.S. EA 1 ULE * G uara	

NEW COMPONENT PAK BARGAINS

Plus much moresend now for the **BI-PAK** "component catalogue"

5p to cover postage, etc.

JUMBO COMPONENT PAKS

MIXEDELECTRONICCOMPONENTS Resistors, capacitors, pots, electrolytics and coils plus many other useful items. Approximately 31bs in weight. Price incl. P. & P. 21-65 only.

Exceptionally good value



R.M.S. ONLY £2·89 each

Module Tested and Guaranteed.

Qty. 1—9 £2:89: 10—25 £2:60 Price each. Larger quantities quoted on request. Full hook-up diagrams and complete technical data supplied free with each module or available separately at 10p each.

12 STEREO STEM

Each Kit contains two Amplifier Modules, 3 watts RMS, two loudspeakers, 15 ohms, the pre-amplifier, transformer, power supply module, front panel and other accessories, as well as an illustrated stage-by-stage instruc-ONLY tion booklet designed for the beginner. Further details available on

request.

NEW LOW PRICED TESTED S.C.R.'s

PIV 1A							
							3TO48
50 0 · 26	0.28	0.39	0.39	0.52	0.55	0.59	1.27
100 0 · 28	0.37	0.52	0.52	0.55	0.64	0.70	1.54
200 0 39	0.41	0.54	0.54	0 63	0.67	0.83	1.76
400 0 48							
600 0 - 59							
800 0 . 70	0.77	0.88	0.88	0.99	$1 \cdot 32$	1.65	4 · 40

SIL. RECTS, TESTED

mA 750mA	1 A	1.5A	3 A	10 A	36 A	
	0.06	0.15	0.18	0.26	0.83	
	0.07	0.16	0.22	0.27	1.10	
	0.08	0.22	0.30	0.41	1 - 38	
	0.11	0.26	0.38	0.50	2.05	
	$0 \cdot 12$	0.28	0.41	0.61	2.20	
	0.16	0.33	0.51	0.70	2.75	
0 - 37	_	0.42	0.63	0.83	_	
	4 0·06 4 0·07	4 0.06 0.06 4 0.07 0.06 6 0.10 0.07 0.15 0.08 8 0.18 0.11 1 0.19 0.12 0.28 0.16	4 0.06 0.06 0.08 4 0.07 0.06 0.15 6 0.10 0.07 0.16 7 0.15 0.08 0.22 8 0.18 0.11 0.26 8 0.19 0.12 0.28 2 0.28 0.16 0.33	4 0.06 0.06 0.08 0.16 4 0.07 0.06 0.15 0.18 6 0.10 0.07 0.16 0.22 7 0.15 0.08 0.22 0.30 8 0.18 0.11 0.26 0.38 1 0.19 0.12 0.28 0.41 2 0.28 0.16 0.33 0.51	4 0.06 0.06 0.08 0.16 0.23 4 0.07 0.06 0.18 0.16 0.23 6 0.10 0.07 0.18 0.22 0.27 7 0.15 0.08 0.22 0.30 0.41 8 0.18 0.11 0.26 0.38 0.50 1 0.19 0.12 0.28 0.41 0.61 2 0.28 0.16 0.33 0.51 0.70	4 0.06 0.06 0.08 0.16 0.23 0.66 4 0.07 0.06 0.15 0.18 0.26 0.83 6 0.10 0.07 0.18 0.22 0.27 1.10 7 0.15 0.08 0.22 0.30 0.41 1.38 0.18 0.18 0.10 0.20 0.38 0.50 2.05 1 0.19 0.12 0.28 0.41 0.61 2.20 2 0.28 0.16 0.33 0.51 0.70 2.25

	TR	IACS	51 77
VB0	M 2A	6 A	10A
	TO-5	TO-66	TO-48
	£р	£p	£p
100	83	55	83
200	55	66	99
400	77	821	1.21

DIACS TRIACS BRIOG WITH BR100 (D32) 41p each

FREE

One 50p Pak of your own choice free with orders valued £4 or over.

BRAND NEW TEXAS GERM. TRANSISTORS Coded and Guaranteed

Pak	N	0.	EQVT
T1	8	2G3713	OC71
T_2	8	D1374	OC75
Т3		D1216	OC31 D
T4	8	2G381T	OC81
T5	8	2G382T	OC82
T 6	8	2G344B	OC44
T7	8	2G345B	OC45
T8	8	2G378	OC78
Τ9	8	2G399A	2N1302
T10	8	2G417	AF117

All 55p each pak

D1699 NPN SILICON DUAL TRANSISTOR ilar to 2N2060; 25 10 0.28 0.26 0.23

ND 120 NIXIE DRIVER TRANSISTOR.
Suitable replacement for BSX 21, C 407, 2N 1893 120veb.

0·19 0·17 0·18

Sil. trans. suitable for P.E. Organ. Metal TO-18 Eqvt. ZTX300 5 p each. Any Oty

GP 100 TO3 METAL CASE GERMANIUM Vebo=80V. Veco=50V. I.C.=10 amps. Ptot= 30W. hfe=30-170. 30W. hfe=30-170. Replaces the majority of Germanium power tran-sistors in the OC, AD and NKT range. 1 25 100+ 0.48 0.44 0.40

GP 300 TO3 METAL CASE SILICON Vebo-100V. Veo-60V I.C. =15 anips. Ptot=115W. hfe=20. 1004T. = 115W. Sitable replacement for 2N 3055. BDY 110 TBDY 20. 1 25 100+0.55 0.58 0.58 0.58

1 25 100+ 0·55 0·53 0·51

FULL RANGE ZENER DIODES VOLTAGE RA OF E RANGE #ANGE 2-33V. 400mV (DO-7 Care) 15p ea. 1½W (Top-Hat) 20p ea. 10W (SO-10 Stud) 33p ea.

O amp POTTED **BRIDGE RECTIFIER** on heat sink. 100PIV. 99p each

2 Amp. BRIDGE RECTS. 50 v RMS 35p each 100 v RMS 41p ... 400 v RMS 51p ... Size 16 mm × 16 mm

UT 48 UNIJUNCTION TRANSISTORS TRANSISTORS
Direct replacement for
T18 43rand BEN 3000
also electrically equivalent to 2N2646
1 25 100+
0.30 0.28 0.22

CADMIUM CELLS

ORP12 48p ORP60, ORP61 44p each

GENERAL PURPOSE NPN STLICON SWITCH-ING TRANS. TO-18 SIM. TO 2N706/8. BSY-SIM. TO 2N706/8. BSY-27/28/953A. All usable devices no open or short circuits. ALSO AVAIL-ABLE in PNP SIM. to 2N2906, BCY70. When ordering please state preference NPN or PNP.

		£₽
20	For	0.55
50	For	1.10
100	For	1.92
500	For	8.25
1000	For	14-30
100 500	For For	1-9 8-2

SIL. G.P. DIODES 2p 300mW 30.0.55 40PIV(Min.) 100.1:65 Sub-Min. 500.5-50 Full Tested 1,000 9:90 Ideal for Organ Bullders.

R 2400 TO3 NPM SILICON HIGH VOLTAGE Vebo = 250V, Vceo = 100V, I.C. = 6 amps. Ptot = 30W, hfe = typ.20 (T = 5MHz Ptot = 30W. hfe = typ. fT = 5MHz. 1 25 100+ 0.55 0.50 0.44

2N3055

115 WATT SIL POWER NPN KING OF THE PAKS Unequalled Value and Quality | QUALITY TESTED SEMICONDUCTORS

SUPER PARS NEW BI-PAK UNTESTED | 120 Red spot transistors PNP

Money back refund if not satisfied

Pak	No.	Description	Price
U 1	120 (Glass Sub-Min. General Purpose Germanium Diodes	£p
U 2		Mixed Germanium Transistors AF/RF	0.55
U 3		Germanium Gold Bonded Sub-Min. like OA5, OA47	0.55
U 4		Germanium Transistors like OC81, AC128	0.55
U 5		200mA Sub-Min. Silicon Diodes	0.55
U 6		Bli. Planar Trans. NPN like BSY95A, 2N706	0.55
U 7		311. Rectifiers TOP-HAT 750mA VLTG. RANGE up to 1000	
17 8		Bll. Planar Diodes DO-7 Glass 250mA like OA200/202	0.55
U 9	20 h	Mixed Voltages, 1 Watt Zener Diorles	0.55
U10	20 I	3 A Y50 charge storage Diodes DO-7 Glase	0.55
U11		PNP Sil. Planar Trans. TO-5 like 2N1152, 2N2904	0.55
U12		bilicon Rectifiers Epoxy 500mA up to 800 PIV	0.55
U13		PNP-NPN Sil. Transistors OC200 & 28 104	0 - 55
U14		fixed Silicon and Germanium Diodes	0.55
U15		NPN Sil. Planar Trans. TO-5 like BFY51, 2N697	0.55
U16	10 3	Amp Silicon Rectifiers Stud Type up to 1000PIV	0.55
U17	30 G	dermanium PNP AF Transistors TO-5 like ACY 17-22	0.55
U18		Amp Silicon Rectifiers BYZ13 Type up to 600 PIV	0.55
U19		Ilicon NPN Transistors like BC108	0.55
U20		5 Amp Silicon Rectifiers Top Hat up to 1000 PIV	0.55
U21		F. Germanium Alloy Translators 2G300 Series & OC71	0.55
U23		IADT's like MHz Series PNP Translators	0.55
U24		ermanium 1 Amp Rectifiers GJM Series up to 300 PIV	0.55
U25		00 MHz NPN Silicon Translators 2N708, BSY27	0.55
U26		ast Switching Silicon Diodes like IN914 Micro-Min.	0 . 55
U27		IPN Germanium AF Transistors TO-1 like AC127	0.55
1729		Amo 8CR's TO-5 can, up to 600 PIV CR81/25-600	1.10
U30		lastic Silicon Planar Trans. NPN 2N2926	0.55
U31		ilicon Planar Plastic NPN Trans. Low Noise Amp 2N3707	0.55
U32		ener Diodes 400mW DO-7 case 3-18 volts mixed	0.55
U33		lastic Case I Amp Silicon Rectifiers IN4000 Series	0.55
U34	30 Si	ilicon PNP Alloy Trans. TO-5 BCY26 28302/4	0 55
U35		ilicon Planar Transistors PNP TO-18 2N2906	0.55
U36		ilicon Pianar NPN Transistors TO-5 BFY50/51/52	0.55
U37		ilicon Alloy Transistors SO-2 PNP OC200, 28322	0.55
1138		ast Switching Silicon Trans. NPN 400 MHz 2N3011	0.55
U39			0.55
U40			0.55
U41			$0\cdot 5 5$
U42			
U43			0.55
U44			0.55
U45		N SCR. TO66 up to 600PIV	1.10

Code No's, mentioned above are given as a guide to the type of device in the pak. The devices themselves are normally unmarked.

SILICON PHOTO TRAN-SISTOR. TO-18 Lens end NPN Sim. to BI' × 25 and P21. BRAND NEW. Full data available. Fully guaranteed. Qty. 1-24 25-99 100 up Price each 49p 44p 38p

F.E.T.'S

44p 66p 41p

NEW 6th EDITION

TRANSISTOR EQUIVALENTS TRANSITOR EQUIVALENTS
BOOK. A comblete cross reference
and equivalents book for European,
American and Japanese Transistors. Exclusive to BI-PAK 99p
each.

A LARGE RANGE OF TECHNICAL AND DATA BOOKS ARE NOW AVAILABLE EX. STOCK. SEND FOR FREE LIST.

C=10 amps. Ptot=50W. BIP 19/20 Matched Pair. 1 25 0 68 0 61 100 + 0·55

Pak No.

Price 0.55

-1	Q.I	20 Red spot transistors PNP U	. 99
J	Q2	16 White spot R.F. transistors PNP . 0	- 55
1	Q3		. 55
4	Q4	6 Matched transistors OC44/45/81/81D 0	E.
γ	Q5	4 OC 75 transistors	
1			- 55
1	Q6	5 OC 72 transistors 0	· 55
1	Q7	4 AC 128 transistors PNP high gain 0	- 55
1	08		- 55
1	09		
1		7 OC 51 type translators	• 55
1	Q10		- 55
1	Q11		
ı			- 55
ı	012		- 55
١	013		
1	014	o Ar 117 type translators	- 55
1			- 55
ı	Q15		
å		mixed colours 0	- 55
Ĭ	QI6	2 GET880 low noise Germanium	00
ı	4	transistors to Holse Germanique	
1	Q17		55
1		5 NFN 2 × ST.141 & 3 × ST.140 0	- 55
ì	Q18		
ı		120 0	- 55
Į	Q19	3 MADT'S 2 × MAT 101 & 1 × MAT	•••
1			- 55
ĸ	020		
ŀ		4 OC 44 Germanium transistors A.F. U	- 55
ı	Q21	4 AC 127 NPN Germanlum transistors 0	- 55
ı	Q22		- 55
ı	Q23		- 55
1	Q24	8 OA 81 diodes 0	55
ı	Q25	15 IN914 Silicon diodes 75 PIV 75mA 0	- 55
ł	Q26	8 OA95 Germanium diodes sub-min	00
ŀ	4=0		
ŀ	008	IN69 0	55
l	Q27	2 10A PIV Silicon rectifiers IS425R 0	55
ł	Q28	2 Silicon power rectifiers BYZ 13 0	55
ı	Q29	4 Silicon transistors 2 × 2N696,	
ı			55
ı	Q30	7 Silicon switch transistors 2N706	-
ł	400		55
ļ	001	# 6101 14 1 4 1 1 000mm	99
ı	Q31	6 Sillcon switch transistors 2N708	
ŀ		NPN 0	55
ì	Q32	3 PNP Silicon transistors 2 x 2N1131,	
ı			55
ł	Q33		55
1	Q34	7 Silicon NPN transistors 2N2369.	50
ı	494	FOOMIT- 41- Decr.	
Ī		500MHz (code P397) 0	55
ı	Q35	3 Silicon PNP TO-5. 2 × 2N2904 &	
ŀ		1 × 2N2905	55
ı	Q38	7 2N3846 TO-18 plastic 300 MHz NPN 0.	KK
ı	Q37	3 2N3053 NPN Silicon transistors 0.	
ľ	Q38	7 NPN transistors 4 × 2N3703, 3 ×	00
١	400	OMOTOD AND SERVICE OF X 203/03, 3 X	
ĺ		2N3702 0-	0.5
Г			-

ELECTRONIC SLIDE-RULE

ELECTRONIC SLIDE-RULE

The MK Slide Rule, designed to simplify Electronic calculations features the following scales:—
Conversion of Frequency and Wavelength.
Calculation of L, C and fo of Tuned Circuits.
Reactance and Self Inductance. Area of Circles.
Volume of Cylinders. Resistance of Conductors.
Weight of Conductors. Decibel Calculations.
Multiplication and Division. Squaring, Cubing
and Square Roots. Conversion of kW and Hp.
A must for every electronic engineer and enthusiant. Size: 22 cm × 4cm. Complete with case and
instructions.

INTEGRATED CIRCUIT PAKS

Manufacturers "Fall Outs" which include Functional and Part-Functional Units. These are classed as 'out-of-spec' from the maker's very rigid specifications, but are ideal for learning about I.C's and experimental work.

i	Pak No. Contents	Price	Pak No. Contents	Price	Pak No. Contents	Price
ļ	UIC00 - 12 × 7400	0.55	UIC46-5×7446	0.55	UIC86-5×7486	0 - 55
İ	UJC01 = 12 × 7401	0.55	UIC47 = 5 × 7447	0.55	UIC90 = 5 × 7490	0.55
ì	UIC02-12×7402	0 55	UIC48 = 5 × 7448	0.55	UIC91-5×7491	0.55
i	UIC03 = 12 × 7403	0.55	UIC50=12×7450	0.55	$UIC92 = 5 \times 7492$	0.55
ı	UIC04 = 12 × 7404	0.55	UIC51 = 12 × 7451	0.55	U1C93 = 5 × 7493	0.55
ł	U1C05 = 12 × 7405	0.55	U1C53=12×7453	0.55	$U1C94 = 5 \times 7494$	0.55
ı	UIC06 - 8 × 7406	0.55	UIC54 = 12 × 7454	0.55	UIC95 = 5 × 7495	0.55
	UIC07-8×7407	0.55	U1C60 = 12 × 7460	0.55	UIC96 = 5 × 7496	0.65
	$UIC10 = 12 \times 7410$	0 - 55	UIC70 = 8 × 7470	0.55	UIC100 = 5 × 74100	0.55
	UIC13 = 8 × 7413	0.55	UIC72 = 8 × 7472	0.55	UIC121 = 5 × 74121	0.55
i	UIC20-12×7420	0.55	UIC73 = 8 × 7473	0.55	UIC141 = 5 × 74141	0.55
ı	UIC30=12×7430	0.55	UIC74 = 8 × 7474	0.55	UIC151 = 5 × 74151	0.55
i	UIC40 = 12 × 7440	0.55	UIC75 = 8 × 7475	0.55		
ŀ	UIC41 = 5 × 7441	0.55	UIC76 = 8 × 7476	0.55	UIC193 = 5 × 74193	
ľ	UIC42 = 5 × 7442	0.55	UIC80 = 5 × 7480	0.55	UIC199 - 5 × 74199	
Î	UIC43 = 5 × 7443	0.55	UIC81 = 5 × 7481	0 55	010100 0 7 74100	0 00
ı	UIC44=5×7444	0.55	UIC82 = 5 × 7482	0.55	UICXI = 25 Assorte	d
١	UIC45 = 5 × 7445	0.55	UIC83 = 5 × 7483	0.55	74'8	
ì					. , , , ,	7 00

Packs cannot be split, but 25 assorted pieces (our mix) is available as PAK UIC X1.

BI-PAKS NEW COMPONENT SHOP NOW OPEN WITH A WIDE RANGE OF ELECTRONIC COMPONENTS AND ACCESSORIES AT COMPETITIVE PRICES— 18 BALDOCK STREET (A10), WARE, HERTS. TEL. (STD 0920) 61593.

OPEN MON.-SAT. 9.15 a.m. to 6 p.m., FRIDAY UNTIL 8 p.m.

Please add 10p postage and packing per order. Cash with order please. Orders to BI-PAK SEMICONDUCTORS, P.O. BOX 6. WARE, HERTS.

AD161/162 PNP M/P COMP GERM TRANS. OUR LOWEST PRICE OF 60p PER PAIR

-the lowes

74 Series T.T.L. I.C's

							(112		
BI-PAK	STILL	LOWES	T IN PRICE. F	ULL SE	ECIFIC	ATION	The state of		- 1
GUARAI	TEED.	ALL F	AMOUS MANU	FACTU	RERS		111111	1	1
	1	25	100+	1	25	100+	1.11	25	100+
BN7400	0.17	0.16	0.13 SN7450	0.17	0.16		N74141 0 74	0.71	0.64
BN7401	0.17	0.16	0 13 SN7451	0.17	0.16		N74145 £1 · 65	£1 54	£1 · 43
BN 7401	0.17	0.16	0·13 SN7453	0.17	0.16		N74150 £3 · 30	22.97	£2 · 75
8N7403	0.17	0.16	0.13 SN7454	0.17	0.16		N74151 £1 · 10	£1 · 05	0.99
BN7404	0.17	0.16	0.13 SN7460	0.17	0.16	0.138	N74153 £1 - 82	£1 21	£1 · 05
BN7404	0.17	0.16	0 13 SN7470	0.32	0.29		N74154£1 · 98		£1.76
8N7406	0.39	0 34	0 31 8N7472	0.32	0 - 29	0.278	N74155 £1 - 54	£1 · 43	£1 32
BN7407	0.39	0.34	0.31 SN7473	0.41	0.39	0.358	N74156 £1 · 54	£1 · 43	£1 82
BN7408	0.20	0.19	0.18 8N7474	0.41	0 - 39	0.35 8	N74157 £2 · 09	£1 98	£1.87
BN7409	0.20	0.19	0-18 SN7475	0.50	0.48	0.46 S	N74160 £1-98		£1 · 76
BN7410	0.17	0.16	0 18 SN7476	0.44	0.43	0.428	N74161£1-98		£1.76
8N7411	0.28	0.27	0.26 SN7480	0.74	0.71		N74162 £4 · 40		£3·85
BN7412	0.39	0.34	0.31 BN7481	£1 · 32	£1-27		N74163£4·40		£3 85
8N7413	0.32	0.29	0-27 SN7482	0.96	0.95		N74164 £2 · 43		£2·31
8N7416	0.48	0.44	0-42 SN7483	£1.21	£1·16		N74165 £2 · 48		£2·37
BN7417	0.48	0.44	0.42 BN7484	£1·10	£1 · 05		N74166 £3 · 85		£3.30
BN7420	0.17	0.16	0·13 SN7485	£3.96	£3-85		N74174 £2 · 53		£2 31
BN7422	0.55	0.53	0.50 SN7486	0.35	0 - 34		N74175 £1 · 78		£1 54
8N7423	0.55	0.53	0.50 SN7489	£6-05	£5.78		N74176 £2 - 75		£2·53
8N7425	0 - 55	0.53	0.50 SN7490	0.74	0.71		N74177 22 · 75		£2 53
SN7426	0.50	0.46	0.44 SN7491		£1 · 05		N74180£2-20		£1.54
SN7427	0.50	0.46	0.44 SN7492	0.74	0.71		N74181 £8 · 05		£5 · 23
BN7428	0.77	0.72	0.66 SN7493	0.74	0.71		N74182 £2-20		£1.76
BN7430	0.17	0.16	0·13 SN7494	0.85	0.82		N74184 £8 85	£3 58	£3 30
8N7432	0.50	0.46	0.44 SN7495	0.85	0.82		N74190 £2 · 15		£2·04
8N7433	0.88	0.83	0.77 SN7496	0.98	0.93		N74191 £2 09		£1 98
8N7437	0.71	0.68	0-66 SN74100		£1 76		N74192 £2 · 16		£2·04 £1·93
SN7438	0.71	0.68	0.66 SN7410		£1 · 04		N74193 £2 · 20		£2.75
8N7440	0.17	0.16	0·13 8N7410		£1 04		N74194 £2 · 97		£1 98
8N7441	0.74	0.71	0.64 SN7410		0 42		N74195 £3 · 20		21 76
8N7442	0.74	0.71	0.64 SN74110		0 59		N74196 £1 98		£1.78
8N7443	£1 · 43	£1 · 38	£1 · 32 8N7411		£1.27		N74197 £1 · 98		24 95
BN 7444	£1 · 43	£1 · 38	£1 32 8N74118		£1 · 05		N74198 £8 · 05 N74199 £3 · 05		£4 95
BN7445	£1 · 98	£1 95	£1 93 SN7411		£1 · 38		Terminal Pos		
SN7446	£1 · 07	£1.04	0.97 8N7412		0.41	0 38 3	lastic O/P 1.5	Ampa (4 A 7805
SN7447	£1·10	£1 · 07	£1 05 SN74125	56.127	£1 · 43 £2 · 97	20 00 F	V, & μΑ7812	10 V 81	78 aach
SN7448	£1·10	£1 · 07	£1 05 8N7412	323.08	Tr. Al	ZE 90 3	v. & p-A (012	15 7. 51'	IO DACII

LINEAR I.C's-FULL SPEC.

		Price	
Type No.	1-24	25-99	100 up
BP 201C-8L201C	70p	59p	50p
BP701C-8L701C	70p		50p
BP 702C—8L702C		55 p	
BP 702—72702	59p	50p	44p
BP709—72709	40p		33p
BP 709P—μA709C	40p		33p
BP 710-72710	50p		44p
BP 711— μ A711	50p		44p
BP 741—72741	55p	50p	
μA703C	31p	29p	27p
TAA 263	77p		61 p
TAA 293	99p	83p	77p
TAA 350 £1	l-87p	£1.74p	£1·65p
S.G.S. EA1000 22	90p		

ROCK BOTTOM PRICES LOGIC DTL 930 Series I.C's

Type	Price		
No.	î	25	100 +
BP930	130	12p	11p
	14p	13p	12p
BP932			12p
BP933	14p	13p	
BP935	14p	13p	12p
BP936	14p	18p	12p
BP944	14p	13p	12p
BP945	28p	27p	24p
BP946	13p	12p	11p
BP948	285	27p	24p
BP951	72p	660	61p
BP962	13p	12p	11 _D
BP9093	445	42p	39p
BP9094	44D	42p	89p
BP9097	44p	42p	39p
BP9099	44p	42p	39p
Devices may be min	red to	quali	ly for
quantity price. Larg	er qua	ntity	
on application. (DTL	930 8	eries	only).

NUMERICAL INDICATOR TUBES



MODEL	CD66	GR116	3015F Minitron
Anode voltage (Vdc)	170min	175min	5
Cathode Current (mA)	2.3	14	8
Numerical Height (mm)	16	13	9
Tube Height (mm)	47	32	22
Tube Diameter (mm)	19	13	12 wide
I.C. Driver Rec.	BP41 or 141	BP41 or 141	BP47
PRICE EACH	£1.87	£1.70	£1.50

All indicators All indicators 0.9 + Decimal point. All side viewing. Full data for all types available on request.

RTL MICROLOGIC CIRCUITS

		Price each	
Epory TO-5 case	1-24	25-99	100 uj
uL900 Buffer	38p	36p	29p
uL914 Dual 2i/p	-00-	0.0-	00-

29p 38p 36p uL923 J-K flip-flop 55p 51p 49p Date and Circuits Booklet for IC's Price 8p. PROF. TYPE No. TSO 14 pin type TSO 16 ,, ,, 1-24 25-99 100up. 33r 30p 28p 39p 35p 33p LOW COST No. BPS 14 BPS 16 15p 16p

DUAL-IN-LINE SOCKETS. 14 & 16 Lead Sockets for use with DUAL-IN-LINE 1.C's. TWO Ranges PROFESSIONAL & NEW LOW COST.

BI-PAK DO IT AGAIN! **50W** pk 25w (RMS)

0.1% DISTORTION! HI-FI AUDIO AMPLIFIER

THE AL50

- ★ Frequency Response 15Hz to ONLY 100.000--1dB,
- ★ Load—3, 4, 8 or 16 ohms.
- ★ Distortion-better than 1% at 1KHz.
- ★ Signal to noise ratio 80dB.

£3.58p each

- ★ Supply voltage 10-35 Volts.
- ★ Overall size 63mm × 105mm × 13mm.

Tailor made to the most stringent specifications using top quality components and incorporating the latest solid state circultry and ALSO was conceived to fill the need for all your AF, amplification needs.

FULLY BUILT — TESTED — GUARANTEED.

STABILISED POWER **MODULE SPM80**

AP80 is especially designed to power 2 of the AL50 Amplifiers, up to 15 watt (r.m.a) per channel simultaneously. This module embodies the latest components and circuit techniques incorporating complete short circuit protection. With the addition of the Mains Transformer MT80, the unit will provide outputs of up to 1.5 amps at 35 volts. Size: 63mm × 105mm × 30mm. These units enable you to build Audio Systems of the highest quality at a hitherto unobtainable price. Also ideal for many other applications including:—Disco Systems, Public Address. Intercom Units, etc. Handbook available, 10p PRICE £3.25

TRANSFORMER BMT80 £2.15 p. & p. 28p.

STEREO PRE-AMPLIFIER TYPE PA100

Built to a specification and NOT a price, and yet still the greatest value on the market, the PA100 stereo pre-amplifier has been conceived from the latest circuit techniques. Designed for use with the AL50 power amplifier system, this quality made unit incorporates no less than eight silicon planar transistors, two of these are specially selected low noise NPM devices for use in the input stages.

Three switched stereo inputs, and rumble and scratch filters are features of the PA100, which also has a STEREO/MONO switch, volume, balance and continuously variable base and treble controls.

SPECIFICATION

Frequency Response Harmonic Distortion

Inputs: 1. Tape Head
2. Radio, Tuner
3. Magnetic P.U.

Bass Control
Treble Control
Filters: Rumble (High Pass)
Scratch (Low Pass)
Bignal/Noise Ratio

Input overload Supply Dimensions

20Hz - 20KHz \pm 1dB better than 0·1% 1·25 mV into 50K Ω 35 mV into 50K Ω 1·5 mV into 50K Ω

All input voltages are for an output of 250mV. Tape and P.U. inputs equalised to RIAA curve within \pm 1dB. from 20Hz to 20KHz.

± 15dB at 20Hz ± 15dB at 20KHz ± 15dJ 100Hz 100Bz 8KHz better than - 65dB + 20dB + 35 volts at 20mA 292mm × 82mm × 35mm ONLY £13:15

SPECIAL COMPLETE KIT COMPRISING 2 AL50's, 1 SPM80, 1 BMT80 & 1 PA100 ONLY £25 30 FREE p. & p.

Giro No. 388-7006 All prices quoted in new pence Please send all orders direct to warehouse and despatch department

P.O. BOX 6, WARE · HERTS

Postage and packing add 10p. Overseas add extra for airmail. Minimum order 50p. Cash with order please.

Guaranteed Satisfaction or Money Back



See for yourself the range of wonderful new kits that Heath have presented in the latest catalogue. We now offer something for everyone, including stereo hi-fi equipment, radios, intercoms, calculators, automotive testers, shortwave and amateur radio, testers and instruments for technicians and hobbyists . . . all at moneysaving prices. And payment is so easy-choose cash or our low deposit terms (starting at £2 per month for up to £40 credit).

You can build a Heathkit model using only a soldering iron and a few simple hand tools. Foolproof assembly is guaranteed using the step-by-step construction manual included with every kit.

Add to this a technical consultant service both before and after purchase and you will see why kit building the Heathkit way is so popular all over the world.

Send now for your free copy of the Heathkit electronic kit catalogue-and if your friend is likely to borrow it, fill his name and address in below and we'll send him a copy too!

NAME	
HEATH	HEATH (GLOUCESTER) LTD., DEPT. PW/08/7;
Schlumberger	BRISTOL ROAD, GLOUCESTER GL2 6EE
Please	c send me a FREE Heathkit Catalogue
	t to know more about your Cash and Low
	Deposit Terms, without obligation.
NAME	
ADDRESS _	
HEATH Schlumberger	HEATH (GLOUCESTER) LTD DEPT. PW/08/7. BRISTOL ROAD. GLOUCESTER GL2 6EE

Multicore Solder Cream for high quality joints in the Electronics Industry

New Multicore Solder Cream was designed for jobs where second best will just not do. Like manufacturing diodes for instance. Or making a tuner chassis, or soldering thick-film circuits. Multicore Solder Cream, a finely graded solder alloy powder in a thixotropic organic vehicle, is easier quicker, more economic and more reliable than conventional techniques.

Multicore Solder Cream is different. It doesn't spit or need stirring. It can be applied by syringe, automatic dispensers or screen printinggiving instant soldering with

good spread, strong joints with low contact angles. Suitable as a temporary adhesive during assembly, the clear colour flux residue-without solder globules-makes inspection easier. There are three types of Multicore Solder Creamone of them may be just what you're looking for.

For full information on this or any other Multicore products, please write on your company's letterhead





Multicore Solders Ltd., Maylands Avenue. Hemel Hempstead. Herts. HP2 7EP. Tel: Hemel Hempstead 3636. Telex: 82363.

PADGETTS RADIO STORE OLD TOWN HALL, LIVERSEDGE. YORKS WF15, 6PO

TEL. HECKMONDWIKE 4285

THE T.V. GRAVEYARD OF THE NORTH, AS SEEN ON T.V. CLOSE TO THE MOTORWAY. PLENTY OF FREE PARKING SPACE. EST. 1935.

SPECIAL OFFER SPECIAL OFFER
1000 PYE 19" 13 Channel T.V. Sets. Brilliant Picture, Extra Slim
Bench Tested. Sold with Money Back Guarantee. Hurry, have a
second set at the price of £5.50. Plus carr. and ins. £1.80.
FAMOUS R. & A. 7×4" Speakers ex T.V. 3 Ohm 2½ Watt 50p. FAMOUS R. & A. 7> Post and Packing 12p.

COMPLETE UNTESTED T.V. SETS. With back and all valves, BBC I and ITV 17" 90° Tubes £1 10. 17" 110° Tube £2 20. 19" £3.30. Carr. and ins. on any set £1.75.

Reclaimed T.V. Tubes. All with 12 Months Guarantee, AW43/88 £1 65, MW43/69 £1 10, AW43/80, £1 65. Carr. and ins. on any tube £1.75.

† Cwt. of ex Government Scrap Resistors, Panels and Gears, etc. 30p. Carr. 80p.

SPEAKERS REMOVED FROM T.V. SETS, all 3 Ohm $2\frac{1}{4}$ Watts, $7\times4''$, $6\times4''$, $8\times2\frac{1}{4}''$. All at 27p. Post and packing 12p.

TOP QUALITY TAPE. Reel to Reel 5" ST, 44p 5" LP 55p. 5½ LP 60p. 7" ST 66p. 7" LP 80p. Cassette Types C60 35p. C90 45p. C120 55p. Post on any tape 12p.

Jap Earriece 8 Ohm Magnetic 3-5 12p.

Ex Equipment Valves all tested on our Mullard Valve Tester

before despatch. 3 months guarantee on all valves. Single Valves Post 3p, over Post Free

ARPI2	6р	PCF80	6р	PY82	10p
EB91	5 p	PCC84	6p	PY33	20p
EF80	10p	PCL82	14p	UI9I	20p
EBF89	15p	PCL83	15p	6BV77	Ī2p
ECC81	12p	PCL84	15p	6B W7	12p
ECC82	12p	PL82	10p	6U4	20p
EF91	5p	PL83	10p	6F23	15p
EY86	22p	PL36	17p	20PI	12p
EF183	20p	PY81	I0p	20P3	12p
EFI84	20p	PY801	17p	30F5	20p
		PY800	17p	30FLI	

ABOVE PRICES INCLUDE V.A.T.

ADVERTISEMENT



designed for the discerning mind

Everything you need in the way of Discotheque equipment. Our 4 Disco Studio Centres with full light and sound facilities offer a comprehensive range of DJ Electronics equipment —

apart from being appointed stockists for AKG, Reslo Sound, Beyer, etc., etc.

Our equipment is designed to provide maximum flexibility of operation. We have a range of versatile component units suited for the enthusiast and professional alike.

In fact you decide the specification and we provide the system. Amplifiers — Speaker Systems — Microphones — Discotheques — Sound to Light Units — Effects Projectors — Strobes. All you need including a wide range of sliders with ready cut panels.

Send for our new catalogue — you can mail order with no-deposit credit terms.

Our Studio Centres are open Monday to Saturday.

DISCOSCENE

536 Sutton Road, Southend, Essex - (0702) 611577

DISCOSOUND

122 Balls Pond Road, London, N.1 — (01) 254 5779

HENRY'S DISCO

309 Edgware Road, London, W.2 - (01) 723 6963

DISCOSOUND

90-98 Shaftesbury Avenue, London, W.1. — (01) 437 5832

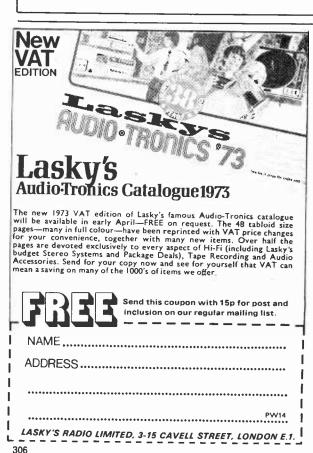
WEYRAD IMPORTANT ANNOUNCEMENT

IT IS WITH GREAT REGRET THAT WE HAVE TO STATE THAT OWING TO REVISED COMPANY POLICY WE SHALL NO LONGER BE PRODUCING COMPONENTS FOR AMATEUR CONSTRUCTORS OR SMALL QUANTITY USERS.

THIS CHANGE WILL COME INTO EFFECT IMMEDIATELY AND WE ARE UNABLE TO ACCEPT FURTHER ORDERS FROM THE TRADE OR INDIVIDUAL CUSTOMERS. EXISTING ORDERS WILL BE COMPLETED WITH A MINIMUM OF DELAY.

WE ARE SORRY TO HAVE TO TAKE THIS STEP WHICH HAS BEEN FORCED UPON US BY INCREASES IN THE COST OF LABOUR AND MATERIALS WHICH NOW MAKE ANY FORM OF SMALL SCALE PRODUCTION HOPELESSLY UNECONOMIC. IN CLOSING THIS PARTICULAR FACET OF OUR BUSINESS WE SHOULD LIKE TO THANK ALL OUR PAST AND PRESENT CUSTOMERS FOR THEIR VALUED SUPPORT OVER MANY YEARS.

WEYRAD (ELECTRONICS) LIMITED





BRITISH INSTITUTE OF ENGINEERING

I DOCKYARD, STATION ROAD, OLD HARLOW. ESSEX Phone Harlow 37739

P/P 10p. Price list S.A.E. (Saturday callers welcome) ALL PRICES INCLUDE VAT

E C £19.50 ELECTRONIC DIGITAL CLOCK



This 4 digit 24 hour clock is available to readers at this special price. Parts would normally cost over £25. Kit of parts includes twelve IC's, indicators, and a smart white plastic

74 Series TTL

	1	25	1	1	25		1	25		1	25
SN7400	16p	15p	BN7423	55p	50p	SN7450	16p	15p	8N7489	6 · 05t	5.85p
8N7401	16p	15p	8N7425	55 p	50p	SN7451	16p	15p	8N7490	741	720
			8N7427	49p	46p	8N7453	16p.	15p	BN7491	1 10	1 · 04 p
8N7402	16p	15p			72p	8N7454	16p	15p	8N7492	741	
SN7403	16p	15p	SN7428	77p					8N7493	741	
8N7404	16p	15p	8N7430	16p	15p	SN7460	16p	15p			
SN7405	16p	15p	8N7432	49p	46p	SN7470	33p	29p	8N7494	851	
SN7406	38p	35 p	SN7433	94p	82p	SN7472	33p	29p	BN7495	851	
8N7407	38p	35p	8N7437	72p	69p	8N7473	41p	39p	8N7496	951	92p
				72p	69p	8N7474	41p	38p	SN74100	1 - 801	1 75n
SN7408	20p	18p	8N7438					470	SN74104		
SN7409	20p	18p	8N7440	16p	15p	SN7475	50p				
SN7410	17p	15p	SN7441	74 p	70p	BN7476	44p	43p	BN74105		
8N7411	27p	25p	8N7442	74 p	70p	SN7480	73p	70p	8N74107		
8N7412	38p	35p	8N7443	1 · 43p		SN7481	1 · 32p	L · 26p	SN74110	611	р 59р
		29p	8N7444	1 · 43p		SN7482	97p	95p	SN74111	1 · 371	o 1 · 27 o
SN7413	32p					8N7403	1 · 20p :		SN74118		
SN7416	47p	43p	8N7445	2 · 00p					8N74119		
8N7417	47p	43p	SN7446	1 07p	1 · 02p	SN7484	1 10p				
SN7420	16p	15p	8N7447	1 10p	1 · 03p	8N7485	3 96p 3	3·85p	8N74121		
SN7422	55p	50p	SN7448	1 10p	1 03 p	SN7486	36p	35p	SN74122	1 54	o 1·43p
DE11422	GOD	COD	01.7440	- rop .	op						

* Devices may be mixed to qualify for Price Breaks * 100 Plus less 10% off 25 plus break

Linear Integrated Circuits

1			_		
301	DIL	50p	723c	DIL	99p
301	TO99	55p	723c	TO99	95p
301	8 PIN DIL	46p	741c	8 PIN DIL	38p
301 A	DIL	69p	741c	14 PIN DIL	39p
301A	TO99	69p	741c	TO99	41p
301 A	8 PIN DIL	66p	747c	DIL	46p
307	DIL	69p	748c	DIL	39p
307	TO99	69p	748c	TO99	41p
307	8 PIN DIL	66p	1437	DIL	1.27p
308	TO99	6 · 45p			1 270
308A	TO99	6 40p	1458	TO99	
709c	DIL	35p	3046	DIL	84p
709c	TO99	31p	7503	DIL	1 · 27p



Electrolytic Capacitors

4 VO	LI	10 00		40 V C	
47μF 100μF 220μF 330μF 1000μF 4700μF	6½p 6½p 6½p 6½p 13p 29p	15µF 33µF 68µF 150µF 220µF 680µF 1000µF 1500µF 2000µF	6 1 p 6 1 p 8 p 9 p 17 p 17 p 25 p 43 p	47μF 100μF 150μF 220μF 470μF 680μF 1000μF 2200μF	6 ½ p 9 p 10 p 11 p 19 p 25 p 25 p 44 p
		ĺ			
33μF 68μF	6 ½ p	25 VO	LT		
470µF	11p				
680µF	13p	22μF	6∮p		
1500µF					
		100µF		63 VO	LT
3300μΓ	Zep	220µF		1μF	6 1 p
		470µF	I3p	2-2µF	6 1 P
		680µF			6 <u>‡</u> p
					6∮p
					6 1 p
		3000µ1	TOP		ΙÓρ
	8p	,		100µF	HP
330µF	10p	_			13p
470µF					19p 22p
					26p
		33μF		1000µF	44p
	47µF 100µF 220µF 330µF 1000µF 4700µF 6 3 VC 33µF 150µF 470µF 1500µF 2200µF 3300µF 100µF 220µF 100µF 220µF 3300µF	47μF 6 p 100μF 6 p 100μF 6 p 330μF 6 p 139μF 139μF 6 p 150μF 139μF 139μF 1500μF 139μF 1500μF 189μF 150μF 6 p 150μF 189μF 150μF 6 p 100μF 19μF 150μF 19μF 100μF 10μF 10μF 10μF 10μF 10μF 10μF 1	47μF 64μ 15μF 15μF 150μF 122μF 150μF 122μF 150μF 15μF 15μF	47μF 64μ 15μF 64μ 15μF 64μ 15μF 64μ 15μF 64μ 150μF 64μ 15μF 15μF 64μ 15μF 15μF 64μ 15μF 15μF	47μF 64μ 15μF 64μ 100μF 150μF 33μF 64μ 16μ 16

BARGAIN PACKS

Unmarked Packs Pack of 25 IN4148 55p

Pack of 10 BC108 BC107 (Plastic can)

Pack of 10 Plastic BC109 55p

Pack of 10 BC169 (unmarked) but tested 2N2646 (unmarked) 83p sach

Pack of 10 55p 2N2926G unbranded but tested

Unmarked but fully tested 2N3055

FULLY MARKED TYPES

10 plus

AD161, AD162 M/P 1-9 10 plus 59p 53p BC107-BC108 BC109 1-9 0-99 100 plus Bip

BC 182L:-3-4-212-4 9p 8p 10 plus

AC127 or AC128 1-9 13 10 plus 12 100 plus 11

ZENER DIODES 400 M/W 5%

Miniature BZY 88 Range All voltages 3.3-33 Volt 9p each

1 watt 5% All voltages 6-8-200 Volts 14p each

10 watt 5% All Voltages 7.5 - 100 Volts

Transistors

V		D.111.00 00	0044 14-1	D: 1 1
AC107 16p	BC138 36p	BF260 29p BF329 18p	OC44 14p OC45 14p	
AC126 14p	BC142 33p BC143 33p	BF329 18p BF330 18p	OC70 23p	Rectifiers
AC127 13p AC128 13p		BF390 37p	OC71 14p	1N914 Bp
AC128 13p AC142K 22p		BFX84 28p	OC72 14p	IN916 Bp
AC141K 20p	BC145 26p BC147 9p	BFX85 35p	OC81 14p	1N4148 Bp
	BC148 9p	BFX86 22p	OC83 22p	1844 10p
AC176 15p AC187 13p	BC149 9p	BFX87 28p	OC84 28p	1N 4007 22p
AC187K 20p	BC153 16p	BFX88 26p	TIP29A 53p	18113 17p
AC188 13p	BC154 17p	BFY50 21p	TIP30A 64p	18120 17p
AC188K 20p	BC157 13p	BFY51 17p	TIP31A 64p	18121 15p
ACY17 24p	BC158 12p	BFY52 17p	TIP32A 73p	18130 9p
ACY18 21p	BC159 14p	BFY64 39p	TIP33 £1.05	18131 11p
ACY19 25p	BC167 13p	BFY90 72p	TIP34A	18132 13p
ACY20 22p	BC168 11p	B8X20 19p	£1·54	18920 Sp
ACY21 23p	BC169 11p	C407 22p	TIP35A	18922 9 p
ACY22 18p	BC177 15p	C426 83p	£2 53	18923 13p
ACY 39 68p	BC179 15p	C428 31p	TIP36A	18940 Bp
AD140 40p	BC182L 9p	C450 17p	£3·19	AA119 11p
AD142 44p	BC183L 9p	MP8111 35p	TIP41A 79p	AA129 11p AAZ13 11p
AD143 39p	BC184L 9p	MP8112 42p	T1P42A 91p	AAZ15 14p
AD149 38p	BC186 33p	MP8113 35p	2N706 13p	AAZ17 14p
AD150 60p	BC212L 11p	MP8121 33p	2N930 23p 2N1131 22p	BA100 18p
AD161 29p	BC213L 11p	MP8122 44p MP8123 50p	2N1131 22p 2N1132 28p	BA102 25p
AD162 29p	BC214L 11p	NKT211 28p	2N1613 22p	BA115 Sp
AD M/P 50p	BC258 9p BC259 9p	NKT212 28p	2N1711 26p	BA144 14p
AF114 14p AF115 14p	BC259 9p BC267 14p	NKT214 25p	2N2904 40p	BA145 22p
AF115 14p AF116 14p	BC268 15p	NKT217 55p	2N2904A	BA154 14p
AF117 14p	BC300 40p	NKT261 23p	44p	BAX13 14p
AF118 92p	BC301 32p	NKT271 20p	2N2905 46p	BAX16 14p
AF124 27p	BC302 30p	NKT274 20p	2N2924 18p	BAY18 19p
AF139 39p	BC303 50p	NKT275 25p	2N2926 10p	BAY31 9p
AF239 41p	BC304 40p	NKT40371p	2N3053 26p	BY100 19p
AL100 77p	BCY70 17p	NKT40583p	2N3054 55p	BY126 18p
AL102 66p	BCY71 37p	NKY603F	2N3055 52p	BY127 19p
AL103 55p	BCY72 17p	66p	2N3405 44p	BYX10 24p
ASY26 31p	BD123 66p	NKT613G	2N3663 57p	OA5 19p
ASY27 40p	BD130 50p	33p	2N3702 9p	OA9 11p
AU103 99p	BD131 68p	NKT674 26p	2N3703 9p	OA10 24p
AU110 £1-10	BD132 90p	NKT677G	2N3704 9p	
AU111 77p	BD135 42p	24p NKT71332p	2N3705 9p 2N3706 9p	OA47 9p
BC107 9p	BD136 50p	NKT773 27p	2N3707 9p	OA70 Sp
BC108 9p	BD141 £1-87 BD142 50p	OC19 55p	2N3708 9p	OA73 11p
BC109 9p	BF159 33p	OC20 55p	2N3709 9p	OA79 8p
BC113 154p BC116 16p	BF173 29p	OC23 33p	2N3710 9p	OA81 9p
BC125 16p	BF177 28p	OC25 28p	2N3711 9p	OA85 11p
BC126 25p	BF178 29p	OC28 33p	2N3794 17p	OA90 Sp
BC132 16p	BF179 85p	OC29 33p	2N3819 28p	
BC134 16p	BF194 15p	OC35 38p	40361 50p	
BC135 16p	BF195 17p	OC36 38p	40362 50p	OA95 Sp
BC137 16p	BF244 27p	OC41 14p	40636 50p	OA200 11p
	_			

MULLARD POLYESTER'S

MULLARD POLYESTER CAPACITORS C280 SERIES 250V P.C. mounting: 0-01μF, 0-015μF, 0-22μF, 3 jp. 0-33μF, 0-047μF, 0-068μF, 4p.0-1μF, 4 jp. 0-15μF, 0-22μF, 5 jp. 0-33μF, 7p. 0-47μF, 8 jp. 0-68μF, 12p. 1-0μF, 14p. 1-5μF, 22p. 2-2μF, 27p

MULLARD POLYESTER CAPACITORS C296 SERIES $400 V : 0.001 \mu F, 0.001 \mu F, 0.002 \mu F, 0.002 \mu F, 0.003 \mu F, 0.002 \mu F, 0.003 \mu F, 0.004 \mu F, 0.015 \mu F, 0.002 \mu F, 0.003 \mu F, 0.015 \mu F, 0.01$

RECTIFIERS

IN4001 44p IN4002 44p IN4003 54p IN4004 64p IN4005 8p

1N4006 9p 1N4007 10p

BRIDGE RECTIFIERS

P.I.V. 1 AMP 2 AMP 5 AMP 10 AMP

53p 57p 60p 64p 66p

1.5 AMP PL4001 8p

PL4001 8p PL4002 9p PL4003 10p PL4004 10p PL4005 13p PL4006 15p PL4007 20p

£1.76p £2.20p

£2 31p £2 42p £2 75p

£1 98p £2 15p £2 42p

44

200 300 400

PIV. LAMP

VOLUME CONTROLS
Potentiometers
Car of Department of Depar

SLIDE POTENTIOMETERS

58mm, TRACK SINGLE GANGED, LOG or LIN 1k to 1M. 45p each TWIN GANGED, LOG or LIN 1k to 500k. 66p each.

CARBON SKELETON PRESETS Small high quality type (linear only). All valves 100-5 meg ohms. -1 watt 51p each -2.5 watt 61p each

0·1 Matrix 26p 28p 28p 28p 32p 0.15 Matrix VEROBOARD | Matrix | M

SLIDE SWITCH SPST 11p each. D.P.D.T. 13p each. BP MINIATURE NEON LAMPS

240V or 110V 1-4 5p, 5 plus 41p each MINITRON DIGITAL INDICATOR TYPE 3015F Reads 0-9 and decimals (Data Sheet on request)
ONLY £1.50
16 DIL Socket 33p
Driven by 7447 £1.05

RESISTORS

1 Amp 28 3 Amps 44 7 Amps —

33p 35p 37p 40p 44p 49p

THYRISTORS

50 100

200 400 600

800

PIV

watt 5% carbon 1p each ½ watt 10% carbon 1p each 1 watt 10% carbon 2½p each Range 10 ohms to 4.7 meg. ½ watt m/o 2% 3p each Range 10-1 meg ohms

discount warehouses



F	ec. Relail	Comet
STEREO AMPLIFIERS	Price £ p 87.45	Price € p 64-95
STEREO AMPLIFIERS AKAI AAS200 AKAI AAS500 AKAI AAS800 AKAI SS1 Quadraphonic Decoder ALBA UA 700 AMSTRAD 8000 MK. II AMSTRAD IC 2000	. 87·45 . 109·45	80 - 95
AKAI AA5800AKAI SS1 Quadraphonic Decoder	164 · 45 54 · 45	121 · 95 42 · 95
ALBA UA 700.	. 41.72	27 95 16 50
AMSTRAD IC 2000	50.88	28 - 25
FERROGRAPH F307 Mk. II (cased	. 39·05) 74·80	23 95 49 95
AMSTRAD 8000 MK, II AMSTRAD IC 2000 AMSTRAD Integra 4000. FERROGRAPH F307 Mk, II (cased GLIXOR MW3000, 15 watts RMS per channel GOODWIN RH 25 25 JVC Nivico VN 300 VN 700 SEA	. 54·45	25 95
GOODWIN RH 25 25	65-95	49 · 95 55 · 95
JVC Nivico VN 300 VN 700 SEA VN 900 SEA MCA 1042. 4DD5 Demodulator for CD4 MCA VSF/VNSSO Quadraphosis	140.25	112 95
MCA 104Z	. 169·40 . 93·50 . 67·10	135 · 95 74 · 95
4DD5 Demodulator for CD4 MCA V5E/VN550 Quadraphonic	67-10	52 95 83 95
4DD5 Demodulator for CD4 MCA V5E/VNS50 Quadraphonic MCA V9E/VNS80 Quadraphonic VN 990 Quadraphonic KELETRON KSA 700 Mk. II KELETRON KSA 700 Mk. II LEAK Delta 30 (cased) LEAK Delta 70 (cased) METROSOUND ST20 Mk. II METROSOUND ST40 METROSOUND ST40 METROSOUND ST60 PHILIPS RH 520 RH 521 PIONEER SA500A SA600 SA600 SA1000	170·50 236·50	136 · 95 189 · 95
KELETRON KSA 700 Mk. II	34 10	21 - 95
LEAK Delta 30 (cased)	45 · 10 76 · 89	29 · 50 50 · 95
LEAK Delta 70 (cased) METROSOUND ST20 Mk II	94·49 46·20	63 20 32 95
METROSOUND ST40	59·40 77·00	42·95 50·95
PHILIPS RH 520	85.00	66 - 95
PIONEER SA500A	119 · 90 55 · 96 113 · 43	89 · 95 38 · 95
SA600 SA800	113 - 43 150 - 34	73 · 95 103 · 95
SA1000	185 · 12 114 · 40	121 · 95 78 · 95
SA800 SA1000 SA6200 SA7100 SA8100 SA8100 QL800A Quadraphonic	144-10	99 - 95
SA8100	202 · 40 248 · 60	139 · 95 171 · 95
QL600A Quadraphonic Convertor	141 - 32	96 95
OD210 Quedranhonio		33 - 95
decoderQA800A Quadraphonic QC800A Pre-amp Quad-	249 92	172 95
	178 - 31	122 95
raphonicQM800A Pow. amp. Quadraphonic	212 - 14	146 - 95
Reverberation 202w	65·25 57·20	44-95 37-95
RANK ROTEL 310	86 · 35 116 · 05	56 - 75
RANK ROTEL RA 1210	141-90	78-95 96-50
(cased)	63 - 25	49 95
ROGERS Ravensbourne Ravensbourne (cased) SINCLAIR 2000 3000 SOLABNO 20 10 costs RMS	77 · 00 82 · 50	59 50 64 95
SINCLAIR 2000	38 · 50 49 · 50	26 · 95 34 · 95
SOLARVOX 30. 15 watts RMS per	43 95	26 95
Charvot 30. 15 watts RMS per channel SOLARVOX MA801 2 x 8 watts RMS plus MATRIX 4 channel SOLARVOX MA813 2 x 18 watts RMS plus MATRIX 4 channel TANDBERG TA3000 (Teak) TANDBERG TA300M (Teak) WHARFEDALE Linton amplifier All take both ceramic and magnet TUNERS	51 65	35 95
RMS plus MATRIX 4 channel SOLARVOX MA813 2 x 18 watts	42 · 30	29 75
RMS plus MATRIX 4 channel	56 - 52	42 - 95
TANDBERG TA300M (Teak)	96 - 24	67 · 95 79 · 95
WHARFEDALE Linton amplifier All take both ceramic and magnet	71 - 50 ic cartride	51 95 ses.
TUNERS AKAI AT550 AM/FM/MPX/FET AT580 AM/FM/MPX/MOS FET AMSTRAD Multiplex 3000 FM JVC Nivico MCT V5E/FT500 AM/FM VT 700 LEAK Delta FM	84-10	64-95
AT580 AM/FM/MPX/MOS FET	131 · 09 1 37 · 90	02-95
JVC NIVICO MCT V5E/FT500 AM/FM	82 50	23 · 95 65 · 95
MCT V7E AM/FM	126·50 1 115·25	94 - 95
LEAK Delta FM Delta AM/FM METROSOUND FMS 20 M/F III	74 · 43 83 · 79	52 · 95 62 · 25
Delta AM/FM METROSOUND FMS 20 MKk II FMS 40	54 · 45 56 · 10	38 - 95
PHILIPS RH 690	45.66	40 · 62 33 · 50
PHILIPS RH 690 RH 621 PIONEER TX 500A AM/FM TX600 AM/FM TX6200 TX7100 TX8100	103 · 06 79 · 72	78 · 80 54 · 95
TX600 AM/FM TX6200	110·39 94·60	75 · 95 65 · 50
TX7100 TX8100 TX9100	111-10	76 - 95
TV0100	204 - 60 1	03 · 95 39 · 95
RANK ROTEL 320	55·91 87·86	36 · 20 59 · 95
ROGERS Ravensbourne Series II	61 - 05	47 - 50
Ravensbrook Series II	46 75	36 - 95
(cased) SINCLAIR 2000	42-44	28 95
All the above Tuners are complete w	42·44 ith MPX S	28 95 1ereo
TUNER/AMPLIFIERS		
AKAI AA9030		99 · 95 28 · 50
AKAI AS8100S Quadranhonic	243.85 1	89.95
AKAI 6300 AUTOMATIC RADIO CHX 9912 AM/FM: MPX stereo tuner/ampli- fler with built-in stereo cassette	129 - 21	69 · 95
AM/FM: MPX stereo tuner/ampli- fler with built-in stereo cassette		
recorder	107-25	49 - 95

All prices quoted in t		
Re	c. Retail Price	Come
TUNER/AMPLIFIERS-continued	£p	Æ ı
GOODMANS Module 80, 35w. RMS	87.55	60 - 2
Module 80 Compact	158 · 16 112 · 04	112 · 5/ 75 · 7
Module 110 FM/MW/LW/SW/		
100w. RMS GOODMANS Module 110, Compact JVC Nivico 4MM 1000 Quadraphonic	130 - 86	88 - 50
JVC Nivico 4MM 1000 Quadranhonic	230 - 65	169 · 9:
TVR 1995 Quadranhonic with	. 101 13	120 0.
	229 35	183 - 50
VR 5501 AM/FM and SEA VR 5521L AM/FM and SEA 4VR 5414 Quadraphonic SEA 4VR 5445 Quadraphonic SEA KYOTO 1000 AM/FM Tuner/Amplia	108 · 35 172 · 70	85-91 138-91
4VR 5414 Quadraphonic SEA	229 - 35	183 - 50
4VR 5445 Quadraphonic SEA	308 - 00	246 - 50
fler with built in Stereo Cassette Recorder. Complete with two		
speakers and two microphones	79-90	57 - 95
	163 83	112 95
PHILIPS RH 702	90.38	67-95
PIONEER SX 424 AM/FM/MPY	202 · 41 116 · 70	152 · 95 78 · 50
PIONEER SX525 AM/FM/MPX	148-36	101 - 95
PIONEER SX626 AM/FM/MPX	203 · 21	138-95
LEAK Delta 75 AM/FM MPX PHILIPS RH 702 PHILIPS RS 424 AM/FM/MPX PIONEER SX 424 AM/FM/MPX PIONEER SX525 AM/FM/MPX PIONEER SX626 AM/FM/MPX PIONEER SX727 AM/FM/MPX PIONEER SX727 AM/FM/MPX PIONEER SX828 AM/FM/MPX	244-63 313-74	168 - 95
PIONEER OX 4000 Quadranhonia	313.14	216 95
AM/FM/MPXPIONEER QX 8000A Quadraphonic	238 - 50	164-95
AM/FM/MPX	222 22	
AM/FM/MPX PIONEER QX 9900 Quadraphonic AM/FM/MPX ROTEL RX 150A ROTEL RX 200A	339 - 23	233 - 95
AM/FM/MPX	473 - 26	327-50
ROTEL RX 150A	65 - 68	45 - 95
ROTEL RX 200 A	84·10 101·01	60 · 95 69 · 95
	140-01	98 95
ROTEL RX 800A ROTEL RX 154A Quadraphonic	178-07	126 - 25
ROTEL RX 154A Quadraphonic	121-68	86 - 95
SOLARVOX TAM 1105 2 x 5 watts RMS AM/FM Multiplex comp.		
with 2 speakers and featuring		
Matrix 4 channel	37·06 112·20	29.75
Matrix 4 channel TANDBERG TR200 MPX (Teak) TANDBERG TR1000 FM MPX (Teak) TANDBERG TR1010 AM/FM MPX	112 · 20 163 · 71	93.95
TANDBERG TRICTO AM/FM MPY	103.11	138 - 95
(Teak)	177:33	148 - 95
(Teak) TELETON CR55 WHARFEDALE LINTON WE40	116 - 63	64 95
	107.66	70.05
All the above take magnetic carl	rldaes	excent
AM/FM MPX All the above take magnetic cart Kyoto 1000 and Automatic Radio C	HX 9912	which
take ceramic only. All include MPX S	tereo De	ecoder.
TURNTABLES		
CONNOISSEUR BD1 Kit Chassis	12.65	10 50
CONNOISSEUR BD2 Chassis	31·02 39·16	24 · 95 32 · 25
GARRARD SP25 Mk. III Chassis	15.25	9.05
GARRARD 40B Chassis	12.85	9 · 50
CONNOISSEUR BD2 Chassis CONNOISSEUR BD2 P/C/SAU2 GARRARD SP25 Mk. III Chassis GARRARD 40B Chassis GARRARD SL65B Chassis GARRARD SL65B Chassis	18 78	12.95
GARRARD 401 Chassis	46 - 40 40 - 43	30 · 60 25 · 95
GARRARD SL72B Chassis	30.73	20 - 25
GARRARU AP/b Chassis	26 82	16 - 95
GARRARD Zero 100A Chassis GARRARD Zero 100S Chassis	51 · 57 47 · 44	33·25 30·70
GOLDRING G101P/C	31-35	21 - 50
GOLDRING GL72 Chassis	34 - 65	23.95
GOLDRING GL72P	45 87	31 - 50
The following Turntables are con	nplete_v	vith

The following Turntables are comp	lete with
base, plinth, cover and cartridg	e. Fully
wired and ready for use.	
McDONALD MP60 with	
G800Sp. Pr	Ica 15.05
McDONALD HT78 with	
G800Sp. Pr	Ca 20-95
GARRARD 2025 TC with	.00 20 73
Sonotone 9TAHC ceramic Sp. Pr	Ica 12-10
GARRARD SP25 Mk, III	
with G800 Sp. Pr.	ce 15.95
GARRARD AP76 with G800 Sp. Pr	ica 25.05
GOLDRING GL72 with G800E Sp. P.	100 23 95
GOLDRING GL75 with G800E Sp. P.	00 41.05
GOODMANS TD100 with	100 41.83
G800E cartridge 77 · 2	9 52-95
JVC Nivico SRP 473 with Nivico	9 32.93
magnetic cartridge 71-5	0 56-95
LEAK Delta deck with	0 36.83
Shure Cartridge 65.0	7 49 95
PHILIPS GA407 with GP400	48.82
mag. Cartridge 45-0	34 - 95
PHILIPS GA212 Electronic	34.82
with GP400 cartridge 64-9	5 50-95
PIONEER PLASS with PC50 Mag-	30.50
netic Cart 100-6	1
THORENS 160/C with Ortofon	32 69-95
	78 95
M15E Super cartridge 99 00 THORENS TD125 AB Mk, II with	18.82
Ortofon M15E Super Cart, 154-0	
WHARFEDALE Linton with	0 122.50
WHARFEUALE LINTON WITH	
Shure Cartridge 35-11	25.95

11.317.527		
Re	c. Retair	Comet
TURNTARIES—continued	Price £ p	Price £ p
GOLDRING GL75 Chassis	43 89	29·95 38·95
GOLDRING GL78 Chassis with		
GOLDRING GL78P/Cover with	30 40	36 - 95
GOLDRING GL85P/Cover with auto	76 - 89	52.95
Stop	98 - 34	65 - 95
McDONALD MP60 Chassis McDONALD 610 Chassis McDONALD HT70 Chassis McDONALD 710 Chassis McDONALD 810 Chassis	13·96 17·71	8 · 40 11 · 50
McDONALD HT70 Chassis McDONALD 710 Chassis	19·49 33·44	12·50 21·50
McDONALD 810 Chassis PIONEER PL12D with base and cov	41 · 80	27 · 50 35 · 95
PIONEER PL12D with base and cover PIONEER PL61 with base and cover THORENS TD125 Mk. II Chassis THORENS TD125 Mk. II Chassis	180 - 33	124-95
THORENS TD125AB	109-04	66 · 50 72 · 50
TP 16 arm THORENS TD 165/C Including base	126 50	99-95
THORENS TD 165/C Including base and cover	60-50	48 - 50
and cover	71 - 50	56 95
	71.30	30.93
SPEAKERS AMSTRAD ACOUSTA 1500 (Pair) ACOUSTA 2500 (Pair)	44 - 00	27-95
ACOUSTA 2500 (Pair)	55 · 00 28 · 60	31 95 13 95
R and W Model 70	175 · 45 65 · 89	125 · 95 46 · 95
B and W DM4	46.75	35 - 95
CELESTION HADLEIGH (pair)	55 · 99 43 · 34	41 · 95 30 · 95
	48 · 44 36 · 95	34 · 95 26 · 50
Ditton 15 Ditton 25 Ditton 44 Ditton 66	71·50 59·40	51 - 50
Ditton 66	108 · 90 104 · 50	40 50 78 75
FERROGRAPH S1 Inc. stand GOODMANS Minister (pair)	46·33 53·77	74 · 50 31 · 75
Magister		34 · 95 42 · 20
Double Maxim (pair)	63.45	42 · 25 25 · 60
Magnum K2	50 · 82 60 · 50	32 40 39 50
Double Maxim (pair) Mezzo 3 . Magnum K2 Goodwood Dimension 8 PLANAX 2 Teak or White DIN 20 NT Kit (pair) KELETRON KS4 (pair) KS6 (pair)	79 - 68	51 - 50
DIN 20 NT Kit (pair)	46·20 22·95	32 · 95 16 · 50
KELETRON KS4 (pair)	22·66 28·16	13 · 95 17 · 50
K56 (pair) K58 (pair) K510 (pair) K515 (pair) K520 (pair)	36 - 30	22·75 29·95
KS15 (pair) KS20 (pair)	46 · 86 69 · 85	43.50
KS20 (pair) LEAK 150 (pair) LEAK 250 (pair)	78 · 76 46 · 82	49 · 25 35 · 95
LEAK 250 (pair) LEAK 600	60·86 54·45	46 · 50 38 · 50
MARSDEN HALL	35 - 20	23 - 95
NH150 (Pair) NH200 (Pair) NH300 (Pair) METROSOUND HFS 103 (pair)	42·90 53·90	28 95
NH300 (Pair)	99.00	35 · 95 64 · 95
METROSOUND HFS 103 (pair)	27 · 50 23 · 65	19·25 16·95
202 Duplex 15 Duplex 25 PIONEER CS53 ROGERS Ravensbourne Compact	35-20 61-60	26 95 42 95
PIONEER CS53 Compact	56 52	38 - 95
(pair) Compact	61 - 60	49-95
(pair) SINCLAIR Q16 SOLARVOX TK19S twin speaker 20 watts Teak (pair) TANDBERG TL 12 Teak (pair) TL 25 Teak (pair) TL 30 Teak	8 · 47	6 · 20
20 watts Teak (pair)	40·65 55·80	29 · 95 45 · 95
TL 25 Teak (pair)	75·16 79·70	60-95 61-95
	31-85	19.50
TG200 (pair)	46 · 15 61 · 55	28 · 50 34 · 50
WHARFEDALE Denton Mark II	39 - 33	27 - 95
(pair) Linton Mark II (pair) Triton III (pair)	48 · 69 60 · 85	33-95 41-95
Melton Mark II	38·50 52·25	26 95 35 95
Unit 3 speaker kit (pair)	23 - 40	16 - 50
Unit 3 speaker kit (pair) Unit 4 speaker kit (pair) Unit 5 speaker kit (pair)	41 · 80 60 · 50	29 · 25 42 · 50
CHASSIS SPEAKERS		
GOODMANS Twin-Axiom 8 Twin Axiom 10	8·58 9·47	6 25 6 90
Axiom 401	19·45 5·17	13·95 3·75
Audiom 10P	5.62	4 · 10 10 · 40
Audiom 15P.	14·30 23·10	16 - 50
Audiom 18P	39 · 27 13 · 20	27 · 95 9 · 50
Twin Axiom 10 Axiom 401 Audiom 8P Audiom 10P Audiom 12P Audiom 12P Audiom 18P Audiom 18P Audiom 180 AUDiom 100 ARU 172 Axent 100 Midax 550	39·27 13·20 4·95 7·59 14·95	3·60 5·40
	14·95 4·10	9·60 2·95
	8·55 4·44	5·95 3·20
WHARFEDALE 8 In. Bronze/RS/DD Super 8/RS/DD Super 10/RS/DD		5 · 75
Super 10/KS/DD	13 11	9 · 45

OVER 1000 ITEMS ALWAYS IN STOCK

All items brand new and fully Guaranteed and backed by after-sales service

- latest models in manufacturers' sealed cartons



COMET for after-Sales Service THROUGHOUT THE UK

Service Departments at Hull, Birmingham, Bridlington, Dagenham, Doncaster, Edinburgh, Eastleigh, Goole, Mackbridge, Nayrs, Jarrow, Leeds, Leicester, Nottingham, Rentrew, Rochdale, Rochester, Sheffield, Teeside, Wigan.

Rec. Relail Comet	Rec. Retail Comet	Rec. Retail Comel Price Price
Price Price	Price Price Price Price Price Price	TABLE DECORDEDS -continued for f. f.
CARTRIDGES E P E P	75:02 10:25	FERROGRAPH 702/704 220:00 167:95
CARTRIDGES ADC 10E Mk. IV	PIONEER SE 30A 9 37 6 40 PIONEER SE 20A 12 52 8 50 PIONEER SEL 40 20 71 14 25 PIONEER SEL 40 7 15 3 10	FERROGRAPH 722/724
AUDIO TECHNICA UM35F for CD4 53:36 39:50	PIONEER SEL 20	GROSVENOR 900 8-track record.
*CONNOISSEUR SCU1 5.78 4.75		play-back deck 51 15 36 95 GRUNDIG TK 121 (twin-track) 52 95 38 95 GRUNDIG TK 141 (4-track) 58 47 43 95
GOLDRING G800 Boxed	WHARFEDALE DD1 13-75 9-75 WHARFEDALE Isodynamic 21-95 16-50	GRUNDIG TK 141 (4-track) 58-47 43-95
AUDIO TECHNICA AT 66 . 5-98 37-50 AUDIO TECHNICA UM35F IOF CD4 53-36 39-50 *CONNOISSEUR SCU1 . 5-78 4-75 GOLDRING G800 Soxed . Sp. Price 4-20 GOLDRING G800 Boxed . Sp. Price 6-90 GOLDRING G800 Super E. Boxed Sp. Price 10-95	I DIEL CTEREN SYSTEMS-COMPLETE	GRUNDIG TK 147 (4-track auto) 92-87 72-95 GRUNDIG TK 148 (4-track auto
GOLDRING G800 Super E. Boxed Sp. File 10 GOLDRING G820 11-00 7-50	Δ1 B Δ 852 37·87 27·95	0
GOLDRING G820E . 16 · 50 11 · 40 GOLDRING G820 Super E . 22 · 00 15 · 20 EMPIRE 1000ZE/X 58 · 87 37 · 95 EMPIRE 1000ZE/X 42 · 05 · 26 · 95	BUSH A1005 66.25 47.93	GRUNDIG TK 246 4-track stereo deck 126 78 94 95
GOLDRING G820 Super E 22:00 13:20 58:87 37:95	DANSETTE 4010 58 25 39 95	GRUNDIG TK 3200 Hi-Fi (Battery) 135:15 99:05 MARCONI 4248 4-track, 2 speed 49:66 35:95
EMPIRE 999VE/X	QANSETTE 4005	PHILIPS 4416 4-track stereo recorder 137-45 99-95
EMPIRE 999TE/X 24-73 16-25 EMPIRE 999TE/X 19-98 12-70	DANSETTE 4020 43 95 47 95	PHILIPS 4418 4-track stereo 189 39 137 93
EMPIRE 9995E/X	DANSETTE 4020 45 50 29 95 DECCA SOUND 613 53 95 47 95 DECCA COMPACT 2 with radio 96 03 72 95 DECCA COMPACT 3 with radio 127 09 99 95	TANDBERG 3321X 2 track stereo deck (Teak)
EMPIRE 909E/X	DECCA COMPACT 3 with radio. 127-09 99-95 DECCA 403 54-45 42-95	TANDBERG 3341X 4-track stereo
EMPIRE 90EC/A	FERGUSON 3450 B with Radio	deck 137-38 114-95 TANDBERG 6041X 4-track stereo 187-62 153-95
SHURE M3D 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(new Model) 75.40 55.50 FERGUSON 3451 B with Radio	TANDBERG 9021X 2-track stereo
SHURE M44-7 7-52 4-25	(new Model)	TANDBERG 9041X 4-track stereo
SHURE M44E 8-18 4-60	FERGUSON 3454	deck
SHURE M55E 9·24 5·25	Radio 94-81 67-95	THORPE GRENVILLE TD145 8-track player deck
SHURE M/56 SHURE M/56 (S) 8-18 4-95	FIDELITY UA2 Music Master 41-23 27-95	TARE RECORDERS (CASSETTE)
SHURE M75B	FIDELITY UA3 incl. stereo radio 59 73 41 95 FIDELITY Stereo Nine	AKALCS35D tane deck
SHURE M75EJ		AKAI CS35 Stereo incl. Speakers 105-71 77-95
SHURE M75E/95G	GROSVENOR MPX 8400 AM/FM/	AKAI GXC 40D tape deck 89.74 62.95 AKAI GXC 40 105.71 73.95 AKAI GXC 40T recorder, tuner/
SHURE M44E 8.18 4.60 SHURE M55E 9.24 5.25 SHURE M75G 14.00 7.90 SHURE M75G 8.18 4.95 SHURE M75G 12.95 7.34 SHURE M75B 14.66 8.30 SHURE M75EU 18.10 10.25 SHURE M75EU 5.95 SHURE M75EU 18.10 9.20 SHURE M75EU 18.10 9.20 SHURE M75EU 37.52 24.95 SHURE V15-11 39.00 28.95 *SONOTONE 9TAHC Diam/Saph 3.58 1.30 Starred cartridges above are ceramic—all others	MPX Tuner/Amplifier, magnetic input, built-in 8-track cartridge	AKAI GXC 40T recorder, tuner/
SHURE V15-Mk. III	player with speakers 65 75 33 95 HMV 2451 115 70 89 95	AKAL CYC 45D tane deck 112-28 83-95
*SONOTONE 9TAHC Diam/Saph 3.58 1.30 Starred cartridges above are ceramic—all others		AKAI GXC 46 Dolby tape recorder 143:30 98:95 AKAI GXC 46D Dolby tape deck. 131:09 91:95
are magnetic	HMV 2455	
I MASES AND COVERS	I.T.T. KB1025 with 662 speakers 45 65 33 93	dack 145 18 101 95
CONNOISSEUR COVER 3-96 3-20	radio	BUSH ARENA C440 58-11 46-95 BUSH Discassette DC70 19-55 11-95
CONNOISSEUR P.U. Mount Board 0.00 0.10	I.T.T. KB2250 with 659 speakers and radio	BUSH TP 66 Battery/Mains 26-70 18-95
GARRARD WB1 Base		BUSH RTP 100 Radio/Cassette Recorder 41-66 29-50
GARRARD SPC1 Cover 3'4/ 2'60	PHILIPS 825	
GARRARD SPC4 Cover	PHILIPS 835 with radio 65-88 46-59	FERGUSON 3253 (mains) 41 15 26 95 FERGUSON 3256 (mains) 36 61 23 95 FERGUSON 3257 53 45 37 95
	PHILIPS 836 with radio 90.05 62.95	FERGUSON 3250 (mains)
and 3500	ULTRA 6027 54 55 39 50 ULTRA 6028 56 85 41 50	FERGUSON 3257/7 speakers for
fit McDONALD MP60 and 610 Sp. Price 3-50	IIITRA 6450 B (new model) with	GEC CROM AM/FM Cassette/Radio.
fit McDONALD MP60 and 610 Sp. Frice 3 90 GOLDRING Plinth 75 12:87 8:90 GOLDRING Plinth 72 11:22 7:80 GOLDRING Covers for 72P 4:62 3:20 Cover for 75P De Luxe 5:28 3:64 Cover for 75P De Luxe 7:26 5:00 Cover for 85P 7:26 5:00	III TRA 6451 75-40 54 95	■ Rattery/Mains with slide controls Sp. Price 34.93
GOLDRING Covers for 72P 4-62 3-20		GRUNDIG C210 Battery/Mains 46:00 32:95 GRUNDIG C250 60:65 46:95
Cover for 75P De Luxe 5-28 3-64 7-26 5-00	ULTRA 6455	HANIMEX 3030 cassette batt/mains
Cover for 85P 7-26 5-00	AKAI 1721L 93 87 66 95	WILL AMILE Concetto AMIEM
McDONALD Plinth for 710/810 9 35 6 50 McDONALD Cover for 710/810 4 40 2 95	AKAI 4000 DS	Radio (battery/mains)
McDONALD Cover for 710/810 4 75	AKAI X1810 215-18 159-95	I.T.T. KB SL53 31:00 23:95
THORENS IXII Cover	ULTRA 6454. 30-80 39-30 ULTRA 6455. 39-20 29-95 TAPE RECORDERS AKAI 1721L. 93-87-66-95 AKAI 4000 DS 168-30 123-95 AKAI X201D 168-30 123-95 AKAI X1810 215-18 159-95 AKAI X2021D 215-18 159-95 AKAI GX221D 215-18 159-95 AKAI GX290D 224-57 166-95	1 radio 48.95 39.30
SME Plinth System 2000 with motor- board	AKALGY370D 328 95 244 95	J.T.T. KB Studio 60
I MOTOPPOARDS only 3'31 4'00	I AKAI CRROD R-track stereo tabe deck /9'90 33 33	57:84 39:95
SME P1 Spacer 0-92 0-70	AKAI CR80DSS Quadraphonic 149-88 103-00	JVC Nivico 1710 Radio/Cassette, AM/FM
HEADPHONES AKG K180		PHILIPS RR 322 AM/FM Radio/
10.30 3.13	Alf Al Chart Street cartridge	
ANCTRAD HPS5A 8-25 3-95	stereo recorder and tuner/ amplifier	PHILIPS 2204 battery/mains 28-25 20-95
HPS6A with volume control 11 77 6 95 KOSS HV1 22 00 16 95	amplifier	PHILIPS 2211, with built-in micro-
I KOSS ESP-9 Electrostatic /5'90 36 23	AKAI CR81 102 89 71 95 AKAI CR81D 84 10 58 95 FEDUSON 2058 A-track 66 85 45 50	phone 27 50 50 95
KOSS ESP-6 Electrostatic		PHILIPS 3302 20 24 13 95 PYE 9116 Stereo 65 80 47 95 20 24 14 50
	FERROGRAPH 702/T04 Dolby 267-30 226-95 FERROGRAPH 702H Dolby 278-30 235-95 FERROGRAPH 702H Dolby 305-80 258-95	
KOSS PRO-4AA	FERROGRAPH 722/724 Dolby 305-80 258-95 FERROGRAPH 722H Dolby 316-80 268-95	WHARFEDALE Dolby DC9 Mk. II 111-41 82 50
KOSS KO-727B 18-15 13-75 KOSS 747 22-00 16-50	Comica If in day	ht ack us Price list on request.
KOSS K-711	Compt guarantees that all prices guoted are genuine.	All offers subject to availability. Make cheques, Money
KOSS K6	Orders payable to 'COMET'.	nastana packing and insurance all other goods sent
KOSS K6/LCQ Quadratone 22.00 18.30	ORDERING INSTRUCTIONS cartridges—add 22p for via Securicor Delivery—add £2-15 to each complete or	postage, packing and insurance, all other goods sent der for Securicor Delivery
PIONEER SE 50 26 02 17 95	via Securical Delivery - and az 10 to dadi dominate of	

HIGH FIDELITY **DISCOUNT WAREHOUSES**

BIRMINGHAM: BIRMINGHAM: EDINBURGH: GLASGOW: GRIMSBY: GRIMSBY:
HURROW:
LEEDS:
LEEDS:
LONDON, Dagenham;
LONDON, Hackbridge:
(Nr. Croydon)
LONDON, Rochester:
NORWICH:
NOTINIGHAM:
READING
ROCHDALE:
SHEFFIELD:
SOUTHAMPTON
STOCKTON:
WIGAN: Heeley Road, Selly Oak, B29 6EY
Tivoli Shopping Centre, 1570-1572 Coventry Road, Yardley B26 1BJ
1 Newhaven Road, EH6 5QZ
Blythswood Trading Estate, Argyle Avenue, Renfrew, RA4 9EL
389 Victorla Street, DN31 1ER
Reservoir Road, Clough Road, HU6 7QD
56/64 Ellison Street, Jarrow NE32 3MT
78 Armley Road, LS12 2EF
Syston Street
Rainham Road South, Dagenham, RM10 8ST Syston Street
Rainham Road South, Dagenham, RM10 8ST
Rainham Road, Hackbridge, Wallington, Surrey
For Phone Order Service

For Phone 6
Silverdale Road, Pump Lane, Hayes
Maidstone Road, Rochester
Roundtree Way, Norwich NOR9 4P
121, Town Street, Sandiacre, Nottingham NG10 5DW
121, Town Street, Sandiacre, Nottingham NG10 5DW
Monarch House, 175-81 Caversham Rd., Readling RG1 8AP
Corner of Well I' th' Lane and Queensway
The Mill. 1 Loxley Road, Malin Bridge, S6 4TN
Chickenhall Lane, Eastleigh S05 27 518 2RH
4-7 St. Thomas Street, Sunderland, SR1 1HR
Wharl Mill, Princess Street, WN3 4EZ

Tel: 021-472 6181
Tel: 021-706 0684
Tel: 031-554 4454 (9 lines)
Tel: 041-706 0684
Tel: 031-554 4454 (9 lines)
Tel: 0472 59623
Tel: 0472 59623
Tel: 0532 892211
Tel: 0533 52236
Tel: 0533 52236
Tel: 0533 52236
Tel: 0533 52236
Tel: 01-659 2271/0106
Tel: 01-659 2271/0106
Tel: 01-6543 8989
Tel: 01-573 1841
Tel: 0603 411831
Tel: 0603 411831
Tel: 0734 59991
Tel: 0734 59991
Tel: 0734 59911
Tel: 0632/65215
Tel: 6132/65215
Tel: 4722
Tel: 66132/65215
Tel: 320167631



SECURICOR within 72 hours. ALL GOODS FULLY INSUREO AGAINST

OPEN DAILY TO THE PUBLIC FROM:

9am-8pm Monday 9am-1pm Tuesday 9am-8pm Wednesday 9am-8pm Thursday 9am-8pm Friday 9am-5.30pm Saturday

TRANSISTORISED F.M. tuner head with A.M. gang, slow motion drive. 88—108Mcs, with circuit diagram. £2 30p. PINNACLE LOW NOISE CASSETTES C60-50p/C90-75p C120-£1. P-C BOARDS (not computer panels) 1 off 6 transistors single wave band 1 off 4 transistors andio 1 off 4 transistor £1 60 the three. Encapsulated bridge rectifier (itt usd 3 3mdh) 100 PIV 2 amps. 50p each, 3 for £1-35. Transistor F.M. Stereo Multiplex Decoder. Size: $5\frac{1}{4} \times 2\frac{1}{4} \times 1\frac{1}{2}$ As used in well known British stereo units with circuit. £3 · 75. GARRARD SP25 MK. II less Cartridge. £10 00. 10 VOLUME CONTROLS consisting of 2 off each. 100K log. ganged L/S—20K log. ganged L/S, 470K log. D/P Switch—10K lin. L/S—50K lin. L/S. £1-35. 4 PHONO SOCKETS ON PANEL. 10 panels for £1-25. 12 PLASTIC KNOBS. Chrome and Gold, 3 types--spring clip £1 .25. 10 COMPUTER PANELS packed with components including one panel with 2 Power Transistors. £1.00. SLIDER CONTROLS (less knobs) 25K Log of Lin single 30p. 10K—100K Log ganged 50p. 100K—100K Log ganged 50p. LIGHT DEPENDENT RESISTORS (RCA sq3536) 30p each 4 for £1.00. CRYSTAL CALIBRATOR No. 10 crystal controlled heterodyne wave-meter covering 500 KHz-10MHz (harmonics up to 30MHz) power required 300V. DC. 15mA. 12V. 0·3A·DC. Test equipment for 62T M/RC. £2·50 each. ALL ITEMS INCLUDE VAT

All items post paid in GREAT BRITAIN

216 LEAGRAVE ROAD, LUTON, LU3 1JD, BEDS

PHOTOELECTRIC

CONTENTS. P.C. Chassis Board, Chemicals, Etching Manual, Infra-Red Photo-transistor, Latching Relay, 2 Transistors, Dfode, Resistors, Gain Control, Terminal Block, Elegant Case, Serews, etc. In fact everything you need to build a Steady-Light Photo-Switch/Counter/Burgiar Alarm, etc. (Project No. 1) which can be modified for modulated-light operation with a few additional components.



PHOTOELECTRIC KIT £2.85

Postage and Pack. 15p (U.K.) Commonwealth SURFACE MAIL 25p AIR MAIL £1-40 Australia, New Zealand, S. Africa, Canada and U.S.A. Also Essential Data Circuits and Plans for Building 10 advanced Designs

INVISIBLE BEAM OPTICAL KIT

Everything needed (except plywood) for building: I Invisible Beam Projector and 1 Photocell Receiver (as illustrated). Suitable for all Photoceletric Burglar Alarms.

Counters, Door Openers, etc.

CONTENTS: 2 lenses, 2 mirrors, 2 45-degree wooden blocks. Infra-red filter, projector lamp holder, screws, nails, brackets, building plans, etc. Price £1.45. Postage and Pack. 10p (U.K.). Commonwealth: Surface Mail 20p, Air Mail 50p.

LONG RANGE INVISIBLE BEAM OPTICAL KIT

CONTENTS: As above. Twice the range of standard kit. Large Lenses, Filte etc. Price £2:10. Postage 15p (U.K.) Commonwealth: Surface 20p. Air Mail £1:15.

Tunable, General-Purpose. Interference-Rejecting Differential Amplifier for experimental investigation of signals produced by the brain, heart and muscles. When used with an oscilloscope, or aural indicator, it enables you to monitor your brain-waves, learn to relax, meditate, etc.

CONTENTS: All Capacitors, Resistors, Pots, Semiconductors, I.C., Electrodes, Leads, Chassis, Case, Batteries, Plans and Instructions. Price £4:75 postage and pack.

25p (U.K.). Commonwealth: Surface 30p. Air Mail £1.

ALPHA-BETHA-THETA BRAINWAVE MONITOR KIT

Aural Brainwave Indicator for use with a Biofeedback Amplifier. Converts subsonic brain frequencies into audible signals for easy recognition.

CONTENTS: Resistors, Plots, Capacitors, Transfstors, Diodes, Leads, Chassis, Case, Earphone, Battery, Plans and instructions. Price £3.25, postage and pack. 16p (U.K.) Earphone, Battery, Plans and instructions. Commonwealth: Surface 25p. Air Mail 75p

YORK ELECTRICS Mail Order Dept. 335 BATTERSEA PARK ROAD, LONDON, S.W.11 Send S.A.E. for full details, a brief description of all Kits and Projects.



The Catalogue you MUST have!

Details of our popular Credit Account Service and our Easy Ordering System are included in the catalogue.

Only 55p.

plus 22p PACKING

POST THIS COUPON with cheque or P.O. for 77p.

The price of 77p applies only to catalogues purchased by customers in the U.K. and to BFPO addresses.

Name	 	 L/U
Address	 	

HOME RADIO (Components) LTD. Regd. No. 912966 London Dept. PW, 234-240 London Road, Mitcham CR4 3HD

ENTERTAINMENTS LTD

NEW & SECONDHAND MUSICAL INSTRUMENTS.
DISTRIBUTORS FOR A.K.G. HIGH QUALITY MICROPHONES.

Announcing our improved range of constructor modules

FOR DOMESTIC & COMMERCIAL USE

New Versions using 3A 'Plastic Power' Driver Transistors Now Available. To meet demand, we have To meet demand, we have included a more powerful module in our well-established and proven range. These power amplifiers are carefully assembled, tested and guaranteed. They offer every halfs for reliability superb value for reliability and versatility



35 watts RMS. Uses 7 transistors and 7 diodes Carr. paid.

£4·45

A NEW ADDITION IS THE

SA50 at £5.65

Carr. paid. A rugged, well built unit, capable of 50 watts R.M.S. out, with all the advantages of Saxon Amplifier design and quality. Ready now.

makes an ideal unit in SA100 makes an ideal unit in £10.90 real glutton for work

Reliable, tough and compact. 11 transistors, 6 diodes. Carr. paid.

BRIEF SPEC. FOR ALL THREE MODULES

All modules Incorporate OPEN AND SHORT CIRCUIT PROTECTION, plus proof against over-dissipation and faulty inductive loads in the SA.100.

Circuits, connecting instruction and application data are supplied free with all modules.

POWER SUPPLIES FOR THE SA25/35 & SA100 AUDIO MODULES

Unstabilized supply for 2 SA25/35 £4.9 Unstabilized supply for one or two SA100 PU45 PU70 £7-75 carr. 40p Stabilized module for 2 SA25's or two SA35's £3-50 carr. free Transformer for above, heavy duty £2 85 carr. 20p P\$45 Transformer for above, heavy duty
Transformer for unstabilized supply
rectifier diodes mounted

£3.50 carr. free
£2.85 carr. 20p

£3.50 carr. 20p MT45 MT30 rectifier diodes mounted
Stabilized supply module for one or two SA100's
£4.90 carr. free
Transformer for PS70
£4.90 carr. 40p PS70 MT70 Transformer for PS70

ALL MODULES ARE BUILT ON GLASS FIBRE P.C. BOARD AND SUPPLIED FULLY TESTED

TWO NEW PA/MIXER CONTROL UNITS

Using grouped pairs of inputs and outputs (high Z and low Z inputs) with individual bass, treble and volume controls on each pair, plus master control. These low-noise units will feed all makes of amplifiers, making them ideal for clubs, discos etc. Standard jack sockets. Compact design. In strong metal cases. All units guaranteed for 3 vears.

•M.4H

4 high Z, 4 low Z inputs, 4 sets of controls. Case 14"×8"×2\frac{1}{2}" Carr. pd.

£18.50 + V.A.T.

M.6 HL Case 18"×8"×2⅓" 12 inputs (6 high Z, 6 low Z).

£27.50 + V.A.T.

Channel section modules, for building your own mixer. Gain—16 x (24dB). mixer. Gain—16 x (24dB). Tone controls—18dB swing. Carr. pd. £3:50 + V.A.T.

SAXON CONTROL UNITS Mono (as shown)

Carr. 20p. £6.50

Stereo, Carr. 30p.

£15.80

output stage



Two decks, and full headphone monitoring. The unit is mains operated and measures 17; x 3 x 4 deep and is finished with a smart white on black facta. The controls are: Left/Right deck fader, volume, bass, treble, Headphone Selector and volume. Microphone volume, bass, treble, mains on/off. treble, Headphone Selector and volume, Microphone volume, bass, treble, mains on/off.

COMPARABLE TO UNITS AT OVER TWICE THE PRICE. (N.B.—Stereo only has mic Input.)



with power \$27.50 (Carr. 50p)

120 WATT HEAVY DUTY MODULE

Rugged class A driver stage, this module will run from all our mixers, etc., and most other makes. Delivers 120 watts into an eight ohm load and employs 4 T03 can (115 watt) output transistors. These are the modules where extra power is demanded.

Power output 120 watts into 8 ohms Freq, response 20-20,000 HZ ± 2dB Input sensitivity 200 mV into 10K Construction Fibreglass board Size 8" x 4" x 4" (5" with supply)

distortion parallel push-pull

Module only £13.90 (Carr. 20p)

Module & £18-95 power supply (Carr. 40p)



SOUND AND LIGHT UNITS

Our popular 3 channel model handles up to 3KW (3000 watts) of lighting and incorporates versatile sound control arrangement to enable professional standards to be achieved. Both units are excellent examples of Saxon quality and value.



Includes bass, middle and treble as well as master controls. 2 amplifier sockets eliminate need for split leads. Up to SKW lighting load. Smartly finished steel case. Carr. 30p. **£19-75**

SINGLE CHANNEL UNIT

Operates from 5 to 100 watt amplifiers. Supplied for bass note operation, is easily adapted for treble or mid-range at a cost of about 5p.

£8.30 Carr. pd.

COMPLETE AMPLIFIERS

CSE 100. £34.90 carr. free

This versatile unit is now available in a black vynide case and so represents even better value than ever delivering speech and music powers of up to 100 watts RMS and continuous signal outputs of 70 watts. Two Individually controlled inputs with wide range bass and treble controls.

SAXON 100 £48-50 carr. free





With an RMS output of 120 watts speech and music, 100 watts continuous power, four individually controlled FET input stages and wide range bass and treble controls, this amplifier has established tiself as a unit offering quality and reliability at low

600 Watt 3 colour Ligh Boxes Smart Res

12° 25 watt 8/15 ohms £5° 95 carr. 30p. 15° 50 watt 8/15 ohm £14° 50 carr. 50p. 12° 40 watt 15,000 gauss magnet system 8/15 ohm £11° 50 carr. 40p. A.K.G. MICROPHONES

LOUDSPEAKERS British made bargains!!

D11 DHL IDEAL DISCO MIKE ONLY £9-45 (rrp £11-00)

Prices quoted do NOT include V.A.T. 10% must be added on to total value of order for V.A.T. S.A.E. for special price list.

Orders and personal shoppers to:

SAXON ENTERTAINMENTS LTD., 327 Whitehorse Rd., W. Croydon, Surrey. CRO 2HS.

Telephone 01-684 6385

Hours 9.30 a.m.-5.30 p.m.

TRADE & EXPORT ENQUIRIES INVITED

TERMS OF BUSINESS

Cash with order (C.W.O.) For C.O.D. please add 35p extra, cash by regd. letter, please

THE SMALL PRINT

A T some time or other, in hire purchase agreements, forms of guarantee, or simple purchases, most people encounter a moment of uncertainty and often wonder if the forms are really worth the paper they are printed on. What are the buyer's rights under signed guarantees or the

Supply of Goods Act?

To go some way to tidying up the situation the "Supply of Goods (Implied Terms) Act 1973" has been introduced. The purpose is to make it a criminal offence to use misleading or invalid guarantees or exclusion clauses in any contract or guarantee, including hire purchase, credit sales and cash sales. Goods must compulsorily correspond with their descriptions, whether in advertisements or on the package, be of merchantable quality and "fit for the purpose intended". The phrase in quotes is often a disputable factor and does not sufficiently define how it is to be applied to technical products. If the magistrate is presumably the deciding authority in the event of such a case being brought to court, he will need authoritative technical advisors to sort this one out, but it is very common for suppliers to exercise their initiative in offering substitute components if the requested item is not currently available. These often serve to enable a project to be made operational but will not necessarily guarantee the optimum performance as achieved with quoted component types. It can be found that faulty conditions occur in a circuit which can cause chain reaction damage to other components. If substandard or substitute components are used, one takes this risk, but the constructor has no redress on the supplier unless the supplier has stated that the substitute component is suitable for that project.

The act stipulates that where redress is justified, the onus is on the seller, usually the retailer. The manufacturer is only responsible for supplying the seller with products that correspond with their trade descriptions. If such a description is inadequate then it is the responsibility of the purchaser to satisfy himself that the goods are what he

wants.

Exclusion clauses are made void but not illegal, so that customers should not be led to think that his rights are adversely influenced by such statements. Guarantees should now make clear to the consumer that additional rights are being given; no guarantee that offers less than the implied rights of the Supply of Goods Act will be valid.

M. A. COLWELL-Editor.

The September issue, on sale 3rd August, will be the first of our special series of Autumn issues. Special attractions include the very easy-to-make two-i.c. radio that uses a choice of popular speakers from 8 to 16 ohms, and only a handful of other components; no complicated alignment is needed. Also featured will be a multi-purpose low voltage power regulator and a short-wave converter for insertion between aerial and receiver to convert signals in the short-wave bands into one fixed frequency of 1600kHz or 190 metres on the MW band. Also in the September issue there will be a special announcement on Q4 and other extra attractions for Issue Number 800.

Further details on page 335.

NEWS...

Practical Wireless and Television in Berlin

Wireless and Television will be taking part in an overseas exhibition at the end of August. The "International Radio and TV Exhibition," to be held in Berlin August 31 to September 9, is one of the largest commercial and public exhibitions of its kind. Of special significance is the celebration of 50 years since the first German radio station began transmitting officially in the former Reich capital.

This will be the 29th national and second international exhibition organised by the "Division Radio and Television" in the German Electrical and Electronic Manufacturer's Association

(ZVEI).

There will be 88,000 sq metres of space in 23 halls and 4 pavilions, as well as 40,000 sq metres of open-air grounds. The truly international flavour is due to participation by 20 countries including Hong Kong, South Korea, China, Norway, U.S.A. and several European countries.

Displays will embrace all aspects of electronic home entertainment systems including associated equipment for servicing, studios and transmission installations. Programmes will also be transmitted from a 2,100 seat hall that will be converted into a tele-

vision studio.

Practical Wireless and Television magazines will participate in the Technical Press section and visitors will be able to see much of the recent work that these two magazines have published as well as some new ideas 'for the autumn.

We cannot possibly tell you everything about this gigantic operation in just a few lines but we hope to be able to publish much of the exciting events that will take place in a future issue. So if you are around West Germany about that time we cordially recommend a visit to this show.

Texas Instruments Seminar

EXAS Instruments Ltd. held their successful Interface 73 technical seminar at the Talk of the Town, London on June 12, 13 and 14.

Richard Mann of "Texan" amplifier fame introduced delegates to the programme. Bob Spoeneman, Marketing Manager (Northern European Semiconductor Div.) then gave a short talk entitled "Market Overview."

A lecture on the TTL system followed and Mick Mimmack and Bob Parsons reviewed new TTL products especially the range of low power Schottky devices.

The next talk was given by Roger Banks, Senior Product Marketing Engineer for military ICs, who spoke on Beam Lead ICs.

Adrian Tarr, Product Marketing Engineer for Metal Can Power Products and Bryan Norris, Applications and Contracts Manager lectured on Power Devices and discussed practical applications of Plastic Power, and High Voltage Transistors, SCRs and Triacs.

A lecture on Optoelectronics followed. This was presented by Millis Miller, a specialist in optoelectronics who also gave a demonstration of solid state targets for low light level TV applications.

Lunch followed at 13.05 and when delegates had finished their steak and tutti fruitti, the lectures continued.

All delegates were presented with a data pack which comprised:

Semiconductor Circuit Design vol. 2, over 200 pages hard bound.

A totally new TTL Data Book providing comprehensive coverage of Texas Instruments 5 families of 54/74 TTL ICs. 640 pages hard bound.

A Seminar Data wallet containing a selection of the very latest product information, together with a book reproducing all the Seminar Slides.



Delegates being presented with data packs, by Mrs Gina Penman.

BSR Award

BSR Limited of Warley, the manufacturer of record changers has received an award for the 810 transcription turntable.

The "Component Design Award" presentation was made recently at a conference held at the Excelsior Hotel, Birmingham Airport. Viscount Caldecote, Chairman of the Design Council presented the Design Award Certificate to Mr. G. R. Wooldridge, Director of BSR Limited.

BSR introduced the 810 transcription turntable into the range of Hi-Fi record changers in late 1971. Its pre-programmed sequential cam system introduces a new experience in featherlight pushbutton operation.

Logic design for Digital systems

A one week residential Vacation School intended for practising engineers scientists and teachers, who need have no previous knowledge of, but are interested in the fundamentals of logic circuit design is being organised by the Electronics Division of the Institution of Electrical Engineers. The School "Logic design—for digital systems" is intended to give an appreciation of both formal techniques and their application in practice and will be held at the University of Kent at Canterbury from 23-28 September 1973.

Lectures will cover the following subjects: historical and mathematical background; design of memoryless (combinational) circuits; design of circuits with memory (sequential); introduction to automata theory; microcircuit logic; array networks; complete design of a system; CAD techniques; testing and diagnostics; and recent advances in logic design.

Further details are available from Senior Divisional Secretary (Electronics), IEE, Savoy Place, London, WC2R 0BL.

Northern Hi-Fi

THE Northern International Hi-Fi Festival, called "Audio 73" will be held at the Hotel Majestic, Harrogate, from August 31 to September 2.

Mobile rally diary

August 19—The Bristol "Mobile Picnic" will be held at Ashton Court, Bristol.

August 19—Preston Amateur Radio Society will be holding their rally at Kimberley Barracks, Deepdale Road, Preston, Lancs. There will be a free car park, trade stalls, bring-and-buy stalls and refreshments. Talk-in stations will be operating on Top Band and 2m. All the gen from G. W. Earnshaw, G3ZXC, 12 Withy Parade, Fulwood, Peston, Lancashire, PR2 4JN.

August 26—The Town and Country Festival Mobile Rally will be held at the National Agricultural Centre, Kenilworth, Warwickshire.

313

EGRAYER RECEIVER

You do not have to leave this receiver behind when going camping, caravanning, or when pressed for space, as it is small in size, with internal battery and loudspeaker. Despite this, it has a very good performance for the reception of AM, CW and SSB on the short wave bands, in addition to normal medium wave reception.

CIRCUIT

Fig. 1 is the complete circuit, except for the BFO which is necessary for receiving CW and SSB. As this section is not required for general listening it is wired as a separate unit.

Sockets A1 and A2 are alternative aerial input points. A1 is most suitable for a reasonably long wire aerial, while A2 is better for a telescopic rod or short aerial. The "Blue" aerial coil is tuned by its own 365pF variable capacitor VC1, so that it can always be peaked up for best results with any aerial, no separate trimming being needed with this arrangement.

Tr1 is the OC170 RF amplifier, with the RF gain control VR1. The "Yellow" mixer coil is tuned by VC2, which is one section of a 2-gang tuning capacitor. The panel trimmer VC4 allows this circuit to be trimmed when coils are changed, or at any point of the band covered.

The "Red" oscillator coil is tuned by the second section of the ganged capacitor, VC3. VC5 is the bandspreading capacitor, which greatly simplifies

accurate tuning on the congested SW bands. A 3-gang component, giving simultaneous tuning of aerial, mixer and oscillator circuits could have been used, but was felt to be unnecessary because aerial and mixer circuits can be peaked up for any setting of VC5, by means of VC1 and VC4, if necessary. There is thus no loss of efficiency with this simplified arrangement—in fact, all circuits can be tuned for best results at any frequency.

Bands are covered by inserting a set of three coils for each waveband. Provision is made for four wavebands. The "Red" oscillator coils require series padders of 350pF, 1000pF (or 1100pF) and 3000pF for the lower frequency ranges, and a direct connection for the highest frequency range. These padders, CP1, CP2 and CP3 are wired to separate holder tags



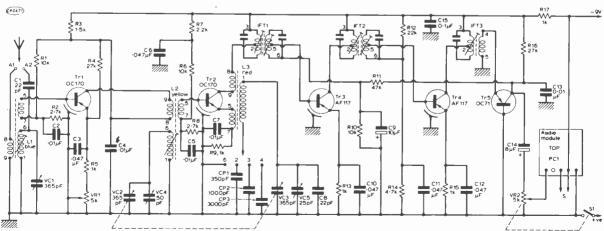


Fig. 1: Circuit of the Mini-Comm receiver. The circuit of the optional BFO is shown in Fig. 6. The photograph above shows the complete receiver, the speaker being mounted on the righthand side panel.

as in Fig. 1, so the correct padder is automatically included in circuit when the "Red" coils are changed.

The 2-stage IF amplifier has five tuned circuits in all, and although more complicated amplifiers were tried, this one was adopted on the grounds of easy construction, good gain and selectivity. Transistor Tr5 is a grounded base emitter detector with AGC fed from the collector through R11 to Tr3.

A 150mW packaged audio amplifier is fed from the volume control VR2 and gives sufficient output for most circumstances using the small internal speaker. A panel jack allows headphones to be plugged in when preferred.

Using the circuit in Fig. 1, the receiver gives AM reception over all usual short wave and medium wave bands. For the reception of CW and SSB signals on amateur or other frequencies a beat frequency oscillator has to be added, and this is covered later. Should CW/SSB reception be omitted, two panel holes for the BFO "pitch" capacitor and AM-CW/SSB switch will not be necessary.

Capacitor VC1 is mounted with three countersunk 4BA bolts, washers or spacers about 1 8in. thick being placed between the capacitor and panel, the spindle passing through a 3 8in. or 1 2in. dia. clearance hole. Take care that the bolts do not penetrate beyond the thickness of the capacitor front frame. Before mounting VC1, solder a lead to its rotor (chassis) tag, to go to a tag MC bolted at the "Blue" coil holder as in Fig. 2.

Gang VC2/3 is mounted in the same way and two leads are soldered to its central rotor tag. One runs directly to a tag at the "Yellow" coil holder and the other to a tag at the "Red" coil holder. The small drive used for VC5 is fixed to the panel with two 8BA bolts while VC5 itself is fixed to a bracket cut from scrap. Drive and capacitor should be lined up carefully.

The controls are positioned as in Fig. 3. As mentioned, S2 and VC6 will be required for the BFO only so if these items are not wanted VR1 can be moved to the VC6 position, for a symmetrical layout.

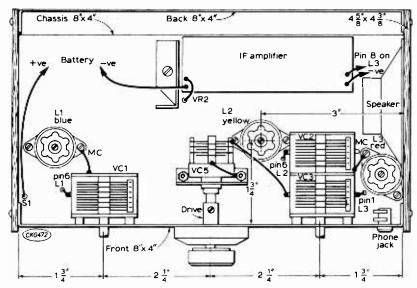


Fig. 2: Layout of the major components on top of the chassis.

GENERAL CONSTRUCTION

The receiver chassis is an 8 x 4in. "universal chassis" flanged member punched to take the coil-holders as in Fig. 2. A second 8 x 4in. flanged member forms the panel. The end flanges of the chassis member are cut so that they fit inside the flanges of the panel and bolts pass through the front flange to secure the chassis at a height of 11_4 in.

Both sides are $^{1}8$ in. or similar hardboard, $^{43}8$ x $^{45}8$ in. Bolts hold the sides to the chassis and panel flanges. The right side has an aperture for the speaker with perforated zinc or speaker material placed behind the opening. It is as well to leave the speaker off until construction is otherwise finished.

The case back is a third 8 x 4in. member. A bracket is cut from scrap or a spare member so that a PP9 battery can be placed as shown. Both top and bottom are 8 x 4^{1} 2in. and can be metal or other material such as hardboard, paxolin sheet, or plywood. Self-tapping screws hold these parts to the front and back flanges.

As there is not much spare space under the chassis, the panel holes for these items come almost against the front flange of the chassis. In order that the controls are not tilted by this, it is necessary to fit one or more washers on each bush and to cut the flange to clear these. Alternatively, use five washers such as those punched out for the coil holders and cut a flat on each to clear the chassis flange.

Most of the wiring in Figs. 2 and 3 can then be done, mounting resistors and capacitors directly on the coil holder tags, as shown. Some 20 or 22swg tinned copper wire is suitable for other connections, with insulated sleeving.

The leads from Tr1 and Tr2 are left almost full length. It may be preferred to use coloured sleeving on the wires say green for emitter, blue for base, and orange for collector, with the shield wire bare or red.

The small circuit board in Fig. 3 carries the components shown in Fig. 4 and is wired separately. For external connections, insert Veropins or leave a projecting wire.

★ components list

Resi	stors					
RI	10ks2	R8	2.7ku	R	5	1kΩ
R2	2-7kΩ	R9	1ko	R1	6	27ks:
R3	1-5kΩ	R10	10ks2	Rt	17	1kO
R4	27kQ	R11	47ks2	R1	8	1kO
R5	1kΩ	R12	22kt)	R1	9	22ks1
R6	10k11	R13	1ko	R	0	4-7ks
R7	2-2k0	R14	4-7ks)	R2	11	3900
		All	10% 4	watt		
VR	5ku linea	r	VR2/S1	5ku lo	g. ·	with switch
Capa	citors					
C1	22pF SM			0.047pF		
C2				0-01 pF		
	0-047 ₂ F			BuF 6V	W	
	0-01 pF			0-1#F		
C5	0-01 µF			0-1 _# F		
	0-047µF			0-01 ₄ F		
	0-01µF			0.01 aF		
C8	22pF SM		C19	5pF SM		
C9	10 F 6VW		CP1			
C10			CP2	1000pF		
C11	0-047µF		CP3	3000pF	SN	•
VCt	ROCKERS PROBLEMS		(Jacks	on type	C	with slov
WOO	mation dr		and the	***		
VCZ	/3 365 36			(Jackso	n	type O with
VC4	slow moti			01		
VC5						
VC6						
			Jackson	type Ce	304	,
	onductors				Ш	
			AF117			C71
172	OC170	Tr4	AF117	Tr6	00	C45
Di	Zener diod	e 6-8	٧			
	laneous					
L1/2/	3, Transist	or m	iniature	plug-in	-C4	oils, 'Blue'
Yelk	ow' and 'R	ed' f	or rang	es requ	ire	d (Denco)
L4, B	FO coil (De	enco	IFT14).	Valveho	old	ers B9A for
	CEL DUNIO	200.00	terio Di	T (NOW	ma	rket). Slow

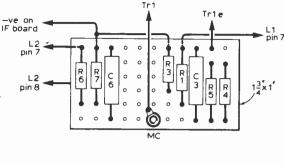
SSB switch, 2 pole 2-way wafer. Speaker, 24in.

30-60:). Veroboard 0-15in, matrix. Universal flanged

chassis members, 8 × 4in. (Home Radio). Hard-board, knobs, etc. IFT1/IFT2 (Denco IFT18/465).

A 12in. 6BA bolt is fixed to the chassis in the position shown in Fig. 3 and an extra nut put on it, so that the board will be clear of the metal. The board is then placed as in Fig. 3, and fixed with a further nut.

The tag MC (Fig. 4) under the board is the chassis return.



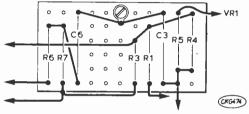


Fig. 4: Layout of the RF board.

IF AMPLIFIER

A piece of Veroboard is cut having 7 rows of holes one way, and 23 rows the other way, or $3^1_2 \times 1^1_8$ in. Components and leads can then be placed exactly as in Fig. 5 with the minimum of difficulty.

Drill holes for 6BA bolts to fix tags MC, place the board on the chassis as in Fig. 2, and drill matching holes in the chassis. Holes have to be drilled for the

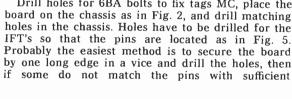
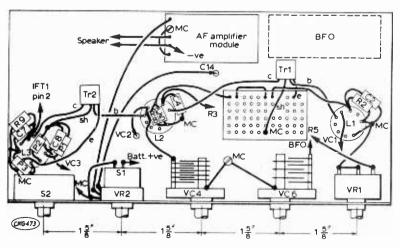


Fig. 3: Arrangement of parts and wiring underneath the receiver. Top centre is seen the audio module and to its right the BFO board. The board at centre right carries some of the RF components and wiring.

IFT3, (Denco IFT14/465).



accuracy, to use a very small round file to enlarge the holes until the IFT's fit. A central hole is necessary under IFT1 and IFT2 to reach the lower

Components can then be placed as in Fig. 5. In most places the wire ends of resistors and capacitors are long enough, so they are bent over, soldered and snipped off. Sleeving is put where needed to avoid shorts. The tags MC are secured tightly with ¹2in. 6BA bolts and nuts and one screening can tag of each IFT must also be wired to this earth circuit.

Fit four Veropins or wires as shown. At the righthand end of the board "9V negative" has a black flexible lead and negative battery clip. A lead from C14 positive will run to VR2, as shown. At the other end of the board, IFT1 pin 2 will be connected to tag 8 of the "Red" coil holder. A wire from the pin "negative for RF and mixer" will run to R3 and R7 on the under-chassis board.

Pieces of sleeving about ³gin. long on the transistor wires will prevent shorts here and raise them a little above the board. Solder these wires directly to the points in Fig. 5 and snip off excess wire.

The IF amplifier can be tested by connecting a battery and phones (or AF amplifier) and injecting a signal at pin 2 of IFT1 from a signal generator. As the IFT's are pre-aligned by the maker, the cores should be left as they are until proper results are obtained, and only touched up as required afterwards.

The IF amplifier is mounted with lock nuts, making sure that there is no possibility that leads or joints will touch the chassis. Leads can then be connected as shown.

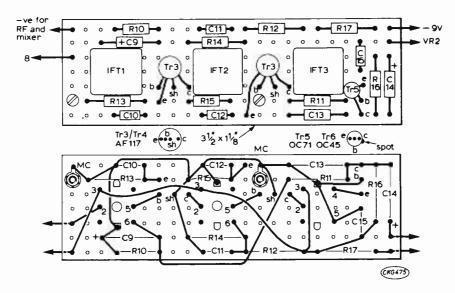
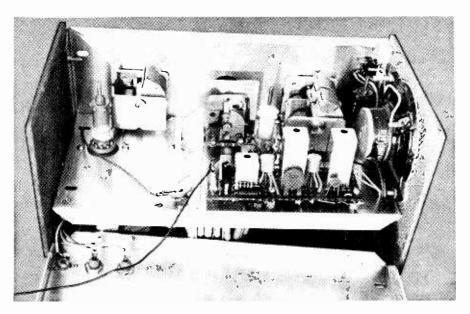
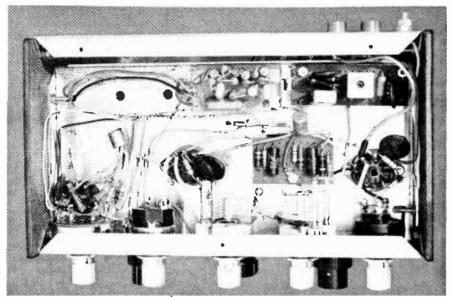


Fig. 5. Details of the wiring and construction of the IF strip. This can be tested and roughly aligned before being fitted into the chassis.



A useful view of the receiver with the back removed to enable the IF strip to be seen.



Most components shown in Fig. 3 can be identified in this photograph of the underside of the receiver.

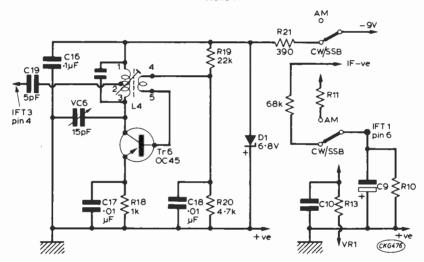


Fig. 6: The circuit of the optional BFO. The leadout connections for the OC45 can be found on Fig. 5.

AF AMPLIFIER

Figs. 1 and 3 show the packaged amplifier from the top. It is mounted clear of the chassis by a ¹2in. 6BA bolt with extra nuts, also securing a tag which forms the positive or chassis return connection as in Fig. 3.

Run the lead to VR2 slider (centre tag) against the chassis. Take two blue wires as shown for the speaker circuit. The one connecting point here also has a black lead, which passes to the 9V negative pin of the IF board, and thus to battery negative.

IF ALIGNMENT

This is carried out with a weak but stable signal, from a signal generator, or from a BBC MW station. VR2 should be at maximum, but signals can be reduced with VR1 so that the AGC action does not mask adjustments.

Adjust each core, if necessary, using a properly fitting tool (such as the Denco TT5 trimmer tool). Each core should have a quite sharp peak, but much adjustment ought not to be necessary.

Once this has been done, no further adjustment to the IF amplifier is necessary.

TUNING

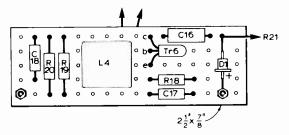
As the coil cores are screwed right in for packing purposes they require adjusting so that some length of brass thread projects. Band coverage is set by means of the core of the "Red" coil. This adjustment is made at the low frequency end of the band.

Tune in a signal near the high frequency end of the band, and rotate VC4 for best volume. Now tune to a signal near the LF end of the band. Leave VC4 untouched and rotate the core of the "Yellow" coil for maximum volume. It should then be found that VC4 will require only a little adjustment, for best

volume, at any frequency in the band. To retain dial calibration, the core of the "Red" coil is locked with a 6BA nut.

In all cases VC1 should peak up signals when in a similar position to VC2/3. Adjust the core of the "Blue" coil at the LF end of the band so that this condition is obtained. It is then only necessary to keep VC1 approximately in step with VC2/3, while tuning, and to adjust VC1 for maximum signal strength with the wanted station, or for the narrow band of frequencies to be tuned by VC5.

The listed single capacitor VC1 and 2-gang capacitor VC2/3 have integral reduction drives and direct and slow-motion $^{1}4$ in. shafts. An "Electrovalue" type CK4 knob was fitted to the direct drive part of each spindle, by tapping out the metal insert or disc. A type JV18 knob was then fitted to the slow-motion part of the shaft. An alternative is to fit pointers to the direct drive part of each shaft, or to use direct drive (not slow motion) capacitors, with pointer knobs or scales.



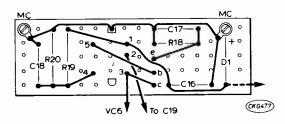


Fig. 7: The two sides of the board for the BFO components.

Coverage of the sets of "Blue", "Yellow" and "Red" coils is approximately as follows, and only those coils necessary for the frequencies wanted need be obtained.

Range 2T 515—1545kHz (580-195m) Range 3T 1·67—5·3MHz (180-57m) Range 4T 5—15MHz (60-20m)

Range 5T 10·5—31MHz (28-9·7m)



BEAT FREQUENCY OSCILLATOR

The circuit for this is shown in Fig. 6. When switched on, it produces an oscillation which can be tuned to approximately the receiver's intermediate frequency by the panel control VC6. This signal is coupled into the IF amplifier.

When CW is being received VC6 is adjusted so that the difference between the signal received and the BFO frequency will produce the wanted audio tone. With VC6 tuned to the receiver IF, no tone is produced. Moving VC6 either way produces a tone which rises in pitch. In some cases placing the BFO one side or the other of the IF may give greater freedom from interference.

When receiving SSB (single sideband) the BFO frequency is adjusted with VC6 so that it simulates the carrier which was removed before transmission. The speech will then be resolved. For this purpose, VC6 has to be adjusted carefully as required, for if the BFO (or carrier oscillator) is the wrong side the SSB signal, the latter cannot be resolved.

As the receiver has no separate product detector, it is essential to keep the level of the received signal down on SSB, as required, by means of the RF gain control VR1. For AM reception, VR1 will usually be at near maximum, while volume is controlled by VR2. But for SSB, VR2 will usually be at maximum (except when using phones) and gain will be reduced by VR1. (An exception is when strong AM signals cause cross-modulation of other AM signals, when VR1 should be turned back.)

The stabilising diode D1 is not absolutely necessary but as the current drawn by the AF amplifier varies considerably with audio level this can tend to cause modifications to the oscillator frequency due to fluctuations in oscillator voltage. A 100μ F or 250μ F capacitor from battery negative to chassis will help reduce this. For a similar reason, connections to Tr2 can be modified so that this stage is supplied from the regulated 6.8V line, though this again is not by any means essential.

BFO CONSTRUCTION

Fig. 6 shows wiring and components on the small BFO board. This is positioned as in Fig. 3, so that a short, stiff lead can run from pin 3 of the BFO coil to VC6. When first setting up the BFO, tune in a weak but stable AM signal. Put VC6 half closed, switch on the BFO, and rotate the VFO coil core until a strong audio heterodyne is produced, which is then adjusted to zero. Turning VC6 either way from this position should then cause an audio tone which rises in pitch.

When the BFO is in use, this produces some AGC voltage which reduces the IF gain. The second pole of the 2-way switch is wired as in Fig. 6 to avoid this. R11 is disconnected from the pin of IFT1 and colour coded leads are run from R11 and pin 6 through the chassis. A $68k\Omega$ resistor is added at the IF board, connected to the IF board negative line. These circuits are connected as in Fig. 6 so that AGC is only applied to the first IF amplifier when the switch is in the AM position.

At the same time R13 can be disconnected from the positive line and a lead can be soldered on to run to VR1, as also in Fig. 6. This gives manual control of the gain of both the RF and the IF stages.



BBC ENGINEERING 1922-1972
By Edward Pawley, OBE, M.Sc.Eng., C.Eng.,
CIEE
Published by the British Broadcasting
Corporation,
35 Marylebone High Street, London, WIM 4AA.
569 pages 10 × 7‡in. Price £7.00

THIS book is one of those "Bibles" that should be on the bookshelf of any man whose interest is in the earlier days of radio.

Chapter 1 explains what broadcasting is and takes the reader through the pioneering days of radio transmission. Chapter 2 tells of the period between 1922 and 1926 and is sub-divided into sections which include such things as transmitters and reception, studios, outside broadcasts, international relations and the Keston Receiving Station.

The years 1927 to 1939 are covered in chapter 3 and such items as the forming of the Corporation and short wave broadcasting are covered together with the story of the regional scheme of transmitters and the beginnings of television. There is also a section covering the BBC's preparation for the war.

The whole of chapter 4 is devoted to the war years and chapter 5 covers the post-war reconstruction of the BBC from 1946 to 1955.

The sixth and final chapter is entitled "The Years of Expansion" (1956-1972) and tells how the Corporation has progressed to the present day. A rather interesting section in this chapter deals with research and development.

Mr. Pawley has comprehensively covered the growth and progress of broadcasting throughout the six chapters of this book and traces the history from the experiments of Hertz, Marconi, Oliver Lodge and other great pioneers right through to the present day.

This is a text that it is well worth putting on the "birthday present" or "Christmas present" list as it will, I am sure, provide many many hours of interesting reading to anyone who regards radio as his hobby.

TELEVISION INTERFERENCE MANUAL By B. Priestley G3JGO Published by Radio Society of Great Britain 35 Doughty Street, London, WC1 92 pages, $8\frac{1}{4} \times 6$ in. spiral bound. Price: 80p

THE average transmitting amateur in this country is beset by two major problems—the complaints of neighbours who will persist in wanting to watch interference-free TV programmes and, having reluctantly agreed that the neighbours have a point, finding the relevant technical information to enable him to fix his transmitter and/or the TV set and live in peace ever more.

Unlike the United States, TV set manufacturers here are under no legal obligation to fit any kind of filter to their sets so the poor amateur is forced to do a PR job for them by visiting the complainant and, hopefully, finding a solution. The amateur soon finds out that every TV set has its own particular problems and that the filter that clears the X model set is useless on the Y model. So far, information on the subject for the amateur has only appeared in dribs and drabs, mainly in "Radio Communication" the monthly magazine for members of the RSGB and not on general sale. However, this new RSGB publication, long overdue, is a welcome collation of such information from many sources on just about every method of TV interference suppression that has ever been tried on transmitters and TV sets.

The eight chapters of the manual are packed with practical information ranging from an all-important explanation of the nature of TV signal through preliminary investigation of TVI to the design of transmitters. With the deluge of hi-fi gear that has now descended on the populace the amateur is often faced with the problem of audio breakthrough and this has been given a chapter to itself. The author makes much, and rightly so, of the great tact and diplomacy needed between the parties involved if there is to be a successful conclusion to TV breakthrough investigations. The Radio Interference Service of the Post Office usually comes into the act and their actions and responsibilities when investigating complaints are very clearly laid down in this manual.

So far, very little concerted effort has been made to form effective TVI investigation groups among the amateur fraternity and those that do exist are no doubt sitting on masses of useful information. For the amateur who must go-it-alone, this excellent manual will be his greatest ally. With some 18,000 licensed amateurs in the UK the RSGB should be able to sell at least that number of copies without any trouble at all.

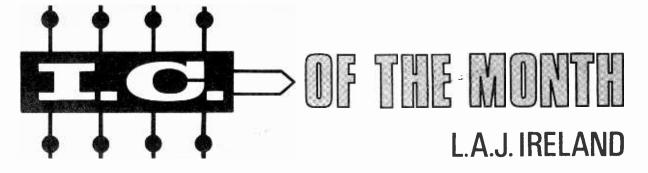
STARTING IN THE OCTOBER ISSUE...

...a new series of articles devised specially for readers who want to experiment with simple circuits to find out how they work and how to alter their functions. This series is an entirely new approach to learning for P.W. readers: you actually make up simple projects that demonstrate circuit principles. It takes the tedium out of theory by getting you directly involved in practical work. For those readers who lack experience with delicate components, now is your chance to get started the easy way. This series will be fully illustrated and employs common components. No extra construction work before you start—you buy your components and dive straightin!

Since this is a continuing series, we strongly recommend students and teachers to order now—don't miss the first part. And don't forget the free P.W. Datacards to help you.

OCTOBER ISSUE ON SALE SEPTEMBER 7th.

320



Number 40

LP1000 STORED ENERGY REGULATOR

ISUAL power indication in battery operated equipment is usually absent so as to conserve power, except in the case of equipment incorporating high capacity or re-chargeable batteries. In some cases the power drain from a small filament incandescent bulb would be greater than the total consumption of the set. With the advent of the LED with its far greater light output efficiency it was possible in some cases to incorporate these as visual indicators but even here a 30mW or so power drain would be quite typical.

An alternative approach to reduce power drain even further to a mere 300 microwatts or so would be to pulse operate the LED every few seconds in addition to keeping it in operation only for a specified portion of the peak pulse thereby giving rise to maximum light output for minimum energy consumption.

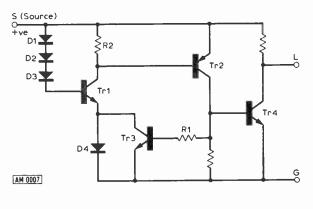
A new monolithic integrated circuit type LP1000 manufactured by the Lithic Systems Inc. Co. of America performs just this function and is described as a 'Stored Energy Regulator' or 'Miser' for short, due to its extremely low power drain. This, however, is only one of a number of very interesting applications of this particular IC to be considered this month.

Circuit

A circuit diagram of the LP1000 IC together with a functional block diagram is illustrated in Fig. 1. Power for the device is usually obtained through a resistor capacitor network. The output power gate consisting of Tr4 is kept biased off as long as Tr1 is kept in a non-conducting state set by the voltage drop across D4 which is in series with the D1-D3 diode chain. As soon as Tr1 conducts the voltage drop produced across R2 saturates Tr2 which in turn forces the power gate Tr4 to change state.

The feedback signal to the base of Tr3 via R1, reduces further the voltage drop across D4 as it saturates Tr3 which is connected in parallel with D4 and this accentuates the turn-on time resulting in a sharply rising output pulse at the collector of Tr4.

As the LP1000 then discharges the capacitor C1 through the load, the voltage across C1 begins to drop but before it can reach zero level Tr3 will be biased off giving rise to an equally abrupt turn-off pulse. The peak and valley voltages for the LP1000



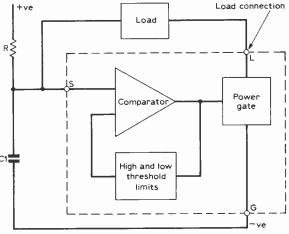


Fig. 1 : Circuit diagram of the LP1000, together with a functional block diagram. The IC is produced in a TO-18 package.

lie between 2·4·1·9V so peak power is only consumed with the inherent advantage of maximum efficiency. This sequence of events continues so long as power is suppled to the device with the flashing rate set by the external RC time constant.

A high intensity light flash visible even in direct sunlight is possible using a 500μ F capacitor. However, as the maximum voltage applied across this capacitor is in the region of 3 volts, the actual physical dimensions of the capacitor can be kept quite small. Less intense flashes are produced with

smaller value capacitors with a corresponding increase in the flashing rate provided the charging resistor remains constant.

Other uses

Due to the built in load resistor in the collector circuit of Tr4 the IC can also act as a free-running multivibrator with the frequency again controlled by the RC time constant. Frequency rates from as low as one cycle per minute to as high as 20kHz are possible using this simple arrangement with a typical power consumption of a mere 500 microwatts. Fig. 2 shows the LP1000 connected as a 1kHz oscillator.

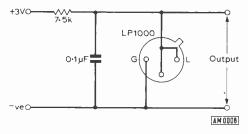


Fig. 2: LP1000 in a multivibrator circuit at 1kHz.

A further development from the oscillator application above is to power the IC from a solar cell giving rise to a self-contained unit which could find interesting applications as an aid to the blind. By replacing the load resistor with a miniature earphone an audible tone is available as a light indicator with the frequency of the note indicating the intensity of the light. Turning the cell towards brighter areas will be reflected by a corresponding increase in the pitch of the note. Solar cells capable of delivering 500 microwatts are relatively inexpensive and the light-to-sound indicator could prove to be a invaluable asset to any blind person, Fig. 3.

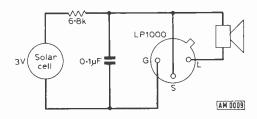


Fig. 3: Circuit using the LP1000 in a light-to-sound indicator.

Finally the last application to be considered is again a rather unusual one but the experimental possibilities it opens up are intriguing. If the load is replaced by a small step-up transformer voltages as high as 90 volts or so are obtainable. Naturally the available current from such a source is small but it does offer the possibility of trickle charging small capacity batteries from solar energy in a pretty efficient manner.

The Lithic Systems Inc. Co. have also recently released one of the first monolithic microtransmitters—a complete radio transmitter on a single chip with a 100 mW output. In the near future it is hoped that an article featuring this IC type LP2000, will be published in this column.

TELEVISION

AUGUST ISSUE

RECEIVER DEBUGGING

When you've built a TV receiver and tested it you will probably find all sorts of faults present. The aim of this new series is to run through the likely faults and to pinpoint the areas where action needs to be taken. The series will aid the understanding of fault-finding generally of course, and is a follow up to our series earlier this year on assessing receiver performance. In the first part the operation of the timebases is considered and the resons for non-linear scanning outlined.

UHF FAULTS

When a dual-standard set is first switched over to 625-line operation all sorts of unsuspected faults are often encountered. George Wilding runs through the common ones and their causes, and the action necessary. Reception on u.h.f. has proved to be rather more troublesome generally than at v.h.f.

VALVE AND TRANSISTOR SUBSTITUTION GUIDE

It is not always necessary, and sometimes impossible, to fit exact valve and transistor replacements. This guide has been compiled to indicate generally what can and can't be done, list numerous helpful substitutes and lay down guidelines for the more difficult situations.

SERVICING TELEVISION RECEIVERS

This month Les Lawry-Johns deals with problems on the final GEC group dual-standard chassis, the GEC/Sobell 2032/1032 series.

SBF AERIAL FOR BAND V

Following the great interest shown in his short back-fire aerial for the lower u.h.f. channels Reg Roper presents a design suitable for the higher channels.

PLUS ALL THE REGULAR FEATURES

(Name of Newsagent)
Please reserve / deliver the AUGUST issue of TELEVISION (20p), on sale JULY 16 and continue every month until further notice
NAME
ADDRESS

LARGE STOCKS ATTRACTIVE DISCOUNTS DEPENDABLE SERVICE

Everything brand new & to makers specs.

ELECTROVALUE

Electronic Component **Specialists**

TRANSISTORS BY SIEMENS AND NEWMARKET

2N3055 npn silicon power 80p
ACISSK pnp germanium low power 82p
ACI76K npn germanium low power 32p
AD161 npn germanium medium power 42p
AD162 npn germanium medium power 42p
AD162 npn germanium medium power 42p
AD162 npn germanium UHF 48p
BC 107 13p; BC108 12p; BC109 13p;
BC177 21p; BC178 19p; BC179 21p;
BC257 12p; BC178 19p; BC179 21p;
BC257 12p; BC258 11p; BC259 13p
BC257 12p; BC258 12p; BC259 13p
BC257 12p; BC258 12p; BC259 13p
BC257 12p
BC 2N3055 npn silicon power 60p

Full lists and technical data will be found in Catalogue No. 6. See also amendments list.

SIEMENS' THYRISTORS

0.8A 400V 56p, 600V 70p 3A 400V 60p, 600V 88p

ZENER DIODES full range E24 values: 400mW: 2·7V to 36V, 14p each; 1W: 6·8V to 82V, 21p each; 1·6W: 4·7V to 75V, 48p each. Clip to increase 1·5W rating to 3 watts (type 266F) 4p.

ELECTROLYTIC CAPACITORS

AXIAL LEAD Rated voltage:		6-8V	10V	16₹	25V	40V	63 V	100₹
	0 V	0.01	101	104	201	401		
Capacity µF							10p	7p
0-47						10p	rop	70
1.0					10-	Tob	7 p	8p
2.2					10p			7p
4-7				10p	_	7p	8p	
10			_	_	7p	8p	7p	8p
22			7 p	7p		7p	7 p	9p
4'7	7 p		8p	7p	8p	7p	9p	12p
100	8p	7p	7p	7p	7p	9p	11p	19p
220	7p	8p	8p	8p	₽ p	10p	17p	27p
470	8p	9p	9p	10p	12 p	17p	24p	43p
1000	10 ₀	12p	12p	17p	20p	24p	40p	
2200	14 _D	17p	22p	25p	86 p	40p		
4700	25p	28p	87p	41p	54p	-		
10.000	40p	43p						

Polycarbonate -5% Tolerance

250V up to 0.1µF: 100V/0.1µP and above. 0.01: 0.012; 0.015; 0.018; 0.022; 0.027; 0.033; 0.047; 0.058; each 4p. 0.068; 0.082; 0.1; 0.12; 0.15 each 4p. 0.088; 0.082; 0.1; 0.12; 0.13 satisfies 0.18; 0.22; each 5p. 0.27; 0.33; 6p, 0.39 7p, 0.47 8p, 0.58 10p, 0.68 11p, 1μ F 13p. Prices subject to amendment by the manufacturer.

SILVERED MICA non-polarised capacitors in 34 values from 2.2 pF to 680 pF, each 6p

RESISTORS 10%, 5%, 2%

Power	Tolerance	Range
1/20W	5%	82 Ω-220K Ω
1/8W		4·7 Ω-470K Ω
1/4W	5%	4·7 Ω-10M Ω
1/2W	5%	4·7 Ω-10M Ω
1 W	5%	$4.7 \Omega - 10 M \Omega$
1/2W	2%	10 Ω-1M Ω
1W	$10\% \pm 1/20 \Omega$	$0.22 \Omega - 3.9 \Omega$
3 W		1 Ω-10Κ Ω
7 W	5%	1 Ω-10K Ω
	1/20W 1/8W 1/4W 1/2W 1W 1/2W 1/2W 1W 3W	1/20W 5% 1/8W 5% 1/4W 5% 1/2W 6% 1/2W 5% 1/2W 5% 1/2W 1/2W 5% 1/2W 2% 3W ± 1/20 Ω

-carbon film, high stability, low noise. O—metal oxide, Electrosii TR5, ultra low noise W—wire wound, Plessey.

Values: E12 denotes series: 10, 12, 15, 18, 22, 27, 33, 39, 47, 56, 68, 82 and their decades. E24 denotes series: as E12 plus 11, 13, 16, 20, 24, 30, 36, 43, 51, 62, 75, 91 and their decades.

10 to 99 (see note helow) I to 9 100 wp Values available E12 8 0.9 0.9 0.75 nett 0.75 nett E12 E24 E12 E24 E12 0.9 nett 1.6 nett 2 nett E24 E12 E12 E12

Prices are in pence each for quantities of the same ohmic value and power rating. NOT mixed values. (Ignore fractions of one penny on total value of

* Please remember to add V.A.T. to your order.

DIN PLUGS & SOCKETS



LS-socket 10p; plug 12p. 3 way scr. sock plug 12p. 5 way scr. socket 12p; plug 15p. socket 10n:

TRANSISTOR **ACCESSORIES**

To3 cover 7p Heat sinks 1°C/w, type 6W1, undrilled 60p

SWITCHES

1011C SPST toggle 20p:
409 DPDT toggle
29p. (These are chronic plated
2-6A rating)
7201 Sub-miniature DPDT
250V a.c/2A 48p

ROTARY SWITCHES

Radiospares Miniature Maka-switch (in assembly kit form) Shaft 48p. Wafers, MBB-2P5W, 1P11W: BBM-1P12W, 2P6W, 3P4W, 4P3W, 6P2W, each, 8p.

WAVECHANGE **SWITCHES**

1P12W, 2P6W, 3P4W, 4P3W, each 24p



If you have already got your No. 6 catalogue and want to know latest additional items and price amendments, send S.A.E. for special supplementary list.

KNOBS

All grub screw fitting for 1" shafts. Black. For other types—see Catalogue No. 6, P.54

















IT'S ALL IN THE LATEST

ELECTROVALUE CATALOGUE

No. 5 (4th printing) contains details of 100's of semi-conductors; ICs with circuit diagrams, R's and C's of practically every kind, accessories, components, tools, materials, etc. information and equivalent tables, etc. Well Illustrated (96 pages 5½' × 8½') 25p. post free with refund voucher for 25p. allowable on orders over \$5 or more.

with 25p refund voucher

POTENTIOMETERS











Rotary carbon track, double wiper SINGLE P20 1in 100 Ω to 2:2M Ω 129, P20 109 4.7K Ω to 2:2m Ω 129, P20 109 4.7K Ω to 2:2m Ω 129 JP20 Log, 4.7K Ω to 2:2m Ω 129 JP20 Log, 4.7K Ω to 2:2m Ω 429; Logiantilog, 10 to 2:2m Ω 429; Logiantilog, 10 K, 22K, 47K, IM Ω only 42p; Dual antilog, 10K only, 42p, Any type with 2A D.P. mains switch, 139 extra. Only decades of 10, 22 & 47 svallable in rance quoted.

Only decades of 10, 22 & 47 available in ranges quoted.

DUAL CONCENTRIC DP20 in any combination of P20 values, 80p; with switch, 72p.

SLIDER

builder by the builder by builder by builder by builder by builder bui 10p each.

Control knobs: blk/white/red/yel/ gr./blue/dk. grey/lt. grey, each 5p.

CARBON SKELETON PRE-SETS
Small high quality, PR lin: 100 Ω
220 Ω, 470 Ω, IK, 282, 487, 106
22K, 47K, 100K, 220K, 470K, 1M,
2M2, 5M, 10MΩ, Vertical or
horizontal mounting, 5p each.

All items offered for sale in accordance with our stated terms of business, copy of which available on request. Prices quoted DO NOT include V.A.T. Orlers from U.K. customers must be accompanied by an additional 10% of nett value for V.A.T.

DISCOUNTS Not allowed on nett price items. 10% on orders for 25 or more, 15% on orders for £15 or more. Prices subject to alteration without prior notice. PLEASE SEE LATEST AMENDMENT LIST. SEND S.A.E.

POSTAGE AND PACKING FREE

SURCHARGE 10p on small mail orders under £2. Overseas orders carriage and insurance charged at cost.

ELECTROVALUE

(Dept. P.W. 8) 28 ST. JUDES ROAD., ENGLEFIELD GREEN, EGHAM, SURREY, TW20 OHB Telex 264475 Tel.: Egham 3603 Hours: 9-5.30: Sat. 1 p.m.

EEG. REG. NO. 1047768, R.O. 28 ST. JUDES ROAD, ENGLEFTELD GREEN, EGHAM, SURREY. TW20 0HB

SURPLUS BARGAINS

BLOWER MOTORS small double ended blower will work on 6 to 28v DC, outlet size 11 sq: new boxed £1-79. HEAD/ MIKE SETS for 19 set m.c. type new boxed £1.70. PANEL METERS 4 different for £1 25. MULTICORE CABLE 25 core coloured new in 5'9" lengths 2 for 86p. YAXLEY SWTS 4p 11w 4b with low value resistors and knob 76p. 4p 4w 2b with res. and knob 40p METER UNIT X pointer type dual 115 Ua for use with 1155 Rx new £1 58. TRIMMERS 20pf air spaced ceramic type new 10 for 55p, £4.40 per 100. JOY STICK CONTROL UNITS operate 4x micro swis 1p c/o £1-35. HEADPHONE MATCHING TRANS. & LEAD, high to low impedance 5ft lead with standard plug new 60p. LARGE TRANSISTOR PANELS with 2N560 transistors Sil N.P.N. type also conds. res. metal fittings etc. panel size 13' x 12" new cond. two panels for £1.50 with min. of 40 transis. PANEL LAMPS aircraft type suitable car inst. panel with 24v m.e.s. bulb red or green two for 33p. METERS 500
Ua scale 0 to 5 1½" OSD on panel with 3p 3w swt. £1 25,
WAVEMETER & OSC. UNIT covers range 150 to 230 Mc/s with charts, spares, instructions etc. new boxed £16-50. MINIATURE FUSE HOLDERS take ½" fuse 4 for 33p. PLUGS & SKS Belling Lee type with cover 25 way 33p, 12 way 22p, 8 way 16p. YAXLEY SWT UNIT with 4p 12w 4b & 2p 22p, 8 way 16p. YAXLEY SWT UNIT with 4p 12w 4b & 2p 12w 2b with shorting wafer part of xtal selector 64p. POWER UNIT I/P 115v 50c/s O/P variable 0 to 26v D.C. at 3 amps smoothed with circ. tested £7·70. C.R.T. type 7BP7A 7" dia. flat face tube 6·3v heater 7Kv E.H.T. emag focus and Def as Blue/Yellow phosfor suitable slow scan T.V. etc. new with base conn. £1·73. SILICON DIODES type ZR22 200 P.I.V. 8 amps 4 for 66p also 800 P.I.V. 750 Ma new 15 for £1·10. INDICATOR UNIT 266 with 6" tube green screen 18 valves, slow motion dial. tuning conds. etc. with outer cover £4·95. slow motion dial, tuning conds. etc. with outer cover £4.95. POT CORES miniature pot cores wax dipped $\frac{1}{2}$ x $\frac{3}{3}$ new 10 for 33p. RADIO TELEMETER UNITS with 6 valves, tape unit, speaker, low speed motors, can be converted to Radio 2 for use on 200/250v mains in new cond. with circ. and mods. £4·18. SELSYNS for Ae position Ind. etc. for use on 115v 50C/S supplied in pairs with a 360 deg. compass Ind. scale & pointer new £4. LAMPS aircraft type double filament with silvered reflector dual 14 watt 28v new 5 for 65p. NEONS wire ended type 1/25th watt 470K res. for 240v new 10 for 55p. PRESSURE GAUGE thought to be oil press vehicle type elec. operated scaled 0 to 120 21 dia. new boxed 44p. CODER UNIT part of IFF equip. American surplus contains 10 valves 12AT7, 6X4, 12AU7 etc. 13 miniature relays plug in type coil 550 ohm 2p c/o will work on 12/24v also 12 miniature micro swts. complete in case good quality unit £2 70. VIDICON CAMERA TUBES standard 1" type with base conn. etc. graded according to scan marks A £9, B £6. TAG STRIPS solder type 24 way new 10 for 30p. SPEAKER UNITS P.A. type made by Truvox 8 ohm with line trans. In case 9" x 9" x 8" semi weather proof new cond. £3:13. BAT-

case 9" x 9" x 8" semi weather proof new cond. £3:13. BATTERIES 6 volt 40 A/Hr. type metal cased new with filling inst. £3:19. XTAL OVENS with 12 type Hc6/u xtal holders these can be removed and used separate 76p. VALVES 5U4, 6X5, 6SN7, 6SL7, 85A2, 12AT7, 12AU7, 12AX7, 6AK5, 6BH6, 6H6, 6K7, 6SK7M, 6SA7, 6N7M, 5Y3G7, 6JG, 6K4, VC173, EF50, 6BA6, 6SA6, CV2179 (Sim N78) any 3 for 55p. BATTERY BOX will take 4x U2 cells connected for 6 volts 48p. POLARISED RELAYS as 2 coils of 25 ohm each 1p c/l new 33p each.

THE ABOVE PRICES INC. POST/CARR. & V.A.T. CHARGES

Carr. charges apply to mainland only, all goods ex equip unless stated otherwise, S.A.E. with enquiry.

A. H. SUPPLIES 57 MAIN ROAD, SHEFFIELD, S9 5HL

Phone 444278 (0742)

VISIT LONDON'S LIGHTHOUSE

our lighthouse keeper wants to meet vou!

Jim Roche has been Imhofs Eddystone lighthouse keeper for a good few years now - so who better than he to guide you into the right channel, for an Eddystone communications receiver:



Model 1001 - general purpose receiver with reception facilities for CW, MCW, AM and SSB Provision for crystal control on 10 channels

EC10 Mk II still 'Top of the Pops' in the modest price range of communication receivers. Embodies features usually only found in the more expensive designs



IMHOFS

112-116 New Oxford Street London WC1A 1HJ telephone 01-636 7878

Train for

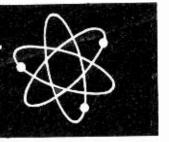
Course commences 5th September, 1973

This is your opportunity to train as a television and radio engineer on our full-time Two-Year College Diploma Course specially designed to cover the examinations of the City and Guilds Radio, Television and Electronics Technicians' Certificate. Full theoretical and practical instruction on all types of modern receivers-including the latest colour sets.

Minimum entrance requirements are Senior Cambridge or 'O' Level, or equivalent in Mathematics and English.

Please send free prospectus to:
Name
Address
THE PEMBRIDGE COLLEGE OF ELECTRONICS (Dept. PW5) 34a Hereford Rd., London W2 5AJ

EXPERIMENTERS CORNER



LOW POWER CLASS A AMPLIFIER

R. A. Pen

In some applications, such as in small pocket receivers, only comparatively small output powers are required, and small modern loudspeakers produce adequate volume for a small room from only a few milliwatts of power. In fact most miniature speakers have a maximum power handling capability of only 100-200mW.

While in the interests of battery economy class B amplification is usually used in the output stage of battery operated equipment, where only low output powers are involved, a simple class A circuit is quite suitable. Bearing these points in mind, the simple amplifier described below was constructed.

Circuit Explanation

A circuit diagram of the amplifier constructed by the author is shown in Fig. 1. This uses three inexpensive silicon n.p.n. transistors.

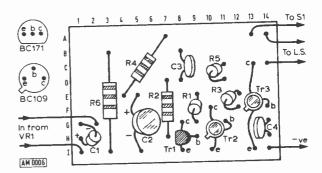
VR1 is the volume control, and C1 the input coupling capacitor. Tr1—Tr2—Tr3 are direct coupled. R2, and R5 bias the input transistor (Tr1) so that the voltage present at its collector (approximately 0.65V) is at the correct level to in turn bias Tr2. Likewise, Tr2 is biased to just the right level to produce a voltage at its collector which is suitable to bias the output transistor, Tr3. In effect Tr1—R1 form a potential divider which biases Tr2, and Tr2—R3 form a potential divider which biases Tr3.

As each transistor inverts the signal between its base, and collector terminals, the input and the output of the entire amplifier are 180° out of phase. The two biasing resistors, R2, and R5 being connected between the input and the output therefore introduce a considerable amount of d.c., and a.c. negative feedback. While the d.c. feedback is very

desirable as it gives stable biasing to a system which would otherwise be very critical, the a.c. negative feedback decreases the gain of the amplifier. This does however, give the amplifier improved quality (hi-fi).

The gain of the amplifier can be increased by connecting a capacitor of a suitable value between the junction of R2—R5, and earth. This decouples the a.c. signals through the biasing resistors, and virtually eliminates the a.c. feedback at audio frequencies.

A compromise between gain, and output quality can be achieved by placing a feedback limiting resistor in series with the decoupling capacitor. In Fig. 1, C3 is the decoupling capacitor, and R6 the feedback limiting resistor. The value of R6 is the highest one which gives adequate gain for the amplifiers intended purpose, a value of $22k\Omega$ being used on the prototype. Its value can be varied to suit individual requirements, the required value being found by experimentation.



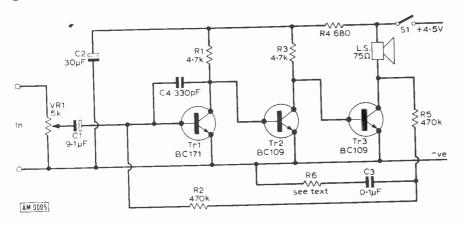


Fig. 2: Component layout on the Veroboard.

Fig. 1: The low power class A amplifier.

R4, and C2 are the supply decoupling components. The loudspeaker itself forms the collector load for Tr3. Speakers of other impedances can be used, but must have an impedance of at least 35Ω . Due to the large amount of d.c. negative feedback used in the circuit, altering the speaker impedance should not drastically change the operating parameters of the circuit.

The low value capacitor, C4, is required in order to reduce the upper frequency response of the circuit, and so maintain good stability. Without this component, direct pick-up of radio signals can become a problem.

S1 is the on-off switch, and can be ganged with VR1 if preferred.

The unit requires a 4.5V supply, an Ever Ready 1289 battery being a very economical source of power for the amplifier, although if small size is required, three U16 batteries connected in series can be used.

As the amplifier uses only a few components all

of which are of a small size, it is easily miniaturised. A diagram giving a suitable Veroboard layout for the unit is shown in Fig. 2. The prototype built to this layout measures only $1\cdot 4 \times 0\cdot 9 \times 0\cdot 75$ in. For obvious reasons miniature resistors, and components must be used. On the prototype a tantalum bead capacitor was used in the C1 position, but a miniature electrolytic of $8\cdot 10\mu F$ can be used providing it will fit into the available space.

There is only one break which has to be made in the copper backing strips, this being between the negative side of Cl, and the collector of Trl. A soldering iron with a fine bit is required when soldering the components to the board, and a continuity tester should be used to ensure that no excess solder is shorting two adjacent copper strips together.

One cannot expect too much in the way of output quality from the amplifier, mainly because such a small speaker is used, but the unit is economical to run, small, inexpensive to build, and sensitive, and is very useful for many purposes.

CASSETTE RECORDER IN THE CAR

N a long trip it is often desirable that one can play one's cassette tape-recorder, but then it's battery life becomes very short. Since most cars use a 12 volt battery, the tape recorder cannot be run directly from the car's electrical system. One often used method is to connect a heavy resistor in series with the tape-recorder, but on a radio-cum-tape-recorder this method does not work since the tape recorder draws far more current than does a radio.

This problem can be overcome by using a very simple stabilising voltaged supply consisting of only three components—a transistor, resistor and a zener diode. Before one selects any components, one must know exactly what one's requirements are—the figures given at the end of this article are for a typical cassette tape-recorder that draws a maximum of 350mA. It is however easy to modify one's design to cope with almost any portable tape-recorder.

Firstly, what is the voltage of the machine? This is easily determined by counting the batteries and multiplying by 1·5,—most recorders are either 6, 7·5 or 9 volts. Once the voltage has been determined, it is neccessary to find the maximum current that the machine will draw. To do this, remove one battery and solder wires onto the ends of it. Connect an ammeter in series with the battery and by dabbing the wires where the battery was and by playing the tape recorder with it's volume fully turned up, the maximum current can be determined.

Our next job is to choose a transistor. The only specifications that need concern us are it's power and current rating and it's current gain ($h_{\rm fe}$). For a tape recorder, a 2N3054 is normally sufficient, but for a large machine, a 2N3055 might be neccessary, while for a small radio, a 2N1611 might suffice. To determine the power rating, we use the formula Power = IxV

$$= I(V_{in} - V_{out})$$

The zener diode is a low power device (250mW) and it's breakdown voltage is the required output voltage plus 0.6 volts, the latter being the emitter-

M. Vlietstra

base voltage of a silicon transistor. The zener need not be specially selected, since a volt either way will have very little effect on the tape-recorder.

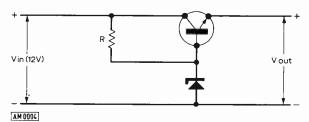


Fig. 1: Stabilising circuit for cassette recorders.

The resistor (R) is the most difficult to calculate. The current that passes through it performs two functions:

- i) A current of normally at least 5mA to maintain the voltage across the zener diode.
- ii) The base current of the transistor. As a rule of thumb, this should be twice the maximum required output current divided by the current gain of the device.

Adding these two we get that the current through the resistor is $(5+2 \ I_{out}/h_{fe})$ mA and assuming that the car uses a 12 volt battery, the value of the resistance, using Ohm's Law, is found to be:

$$R = \left(\frac{(12 - V_{out} + 0.6)}{(5 + 2 I_{out}/h_{fe})}\right) k\Omega \left(R = \frac{V}{I}\right)$$

The components given below are for a typical tape-recorder that draws 350mA. No list of prices is included as a person who can't build this for less than £1 just isn't trying!

Components.	6V	7·5V	9V
Resistor (12W)	330Ω	270Ω	180Ω
Zener diode	$6 \cdot 6V$	$8 \cdot 1V$	10V
Transistor.		2N3054	

Build yourselfaTRANSISTOR RADIO

ROAMER 10 WITH VHF INCLUDING AIRCRAFT

10 TRANSISTORS. 9 TUNABLE WAVEBANDS. MW1. MW2, LW, SW1, SW2, SW3, TRAWLER BAND. VHF AND LOCAL STATIONS ALSO AIRCRAFT BAND

Built in Ferrite Rod Aerial for MW/LW. Retractable, chrome plated 7 section Telescopic Aerial, can be angled and rotated for peak short wave and VHF listening. Push Pull output using 600mw Transistors. Car Aerial and Tape Record Sockets. 10 Transistors plus 3 Diodes. Fine tone moving coil speaker. Ganged Tuning Condonser with VHF section. Separate coil for Aircraft Band. Volume on/off. Wave Change and tone Control. Attractic Case in black with silver blocking. Size 9" × 7" × 4". Easy to follow instructions and diagrams. Parts price list and easy build plans 30p (FREE with parts).

Total building cost

£9.35

P. P. & Ins. 52p (Overseas P. & P. £1-05)



ROAMER **EIGHT** Mk I

NOW WITH VARIABLE TONE CONTROL

7 Tunable Wavebands: MW1, MW2, LW, SW1, SW2, SW3 and Trawler Band. Built in Ferrite Rod Aerial for MW and LW. Retractable chrome plated Teleacopic aerial for Short Waves. Push pull output using 600m W transistors. Car aerial and Tape record sockets. Selectivity switch. 8 transistors plus 3 diodes. Fine tone moving coil speaker. Air spaced garged tuning condenser. Volume/on/off, tuning, wave change and tone controls. Attractive case in rich chestnut shade with gold blocking. Size 9 × 7 × 4m, approx. Easy to follow instructions and diagrams. Parts Price List and Easy Build Plans 25p (FREE with parts).

Total building cost £7-68 P. P. & (Operators P. & P. \$1.05) (Overseas P. & P. £1.05)

POCKET FIVE



3 Tunable Wavebands
M.W. I.W. Trawier Band
with extended M.W.
band for easier tuning
of Luxembours, etc.
7 stages—5 transistors and 2 diodes,
supersensitive ferrite rod aerial, fine
tone moving coil speaker. Attractive black an
case. Size 5\(\frac{1}{2}\) \text{ 1}\(\frac{1}{2}\) \text{ 3}\(\frac{1}{2}\) in Easy build plar
parts price list 10p (FREE with parts). build plans and

Total building costs £2.50 P. P. & Ins. 24p

ROAMER SEVEN MK IV



7 Tunable Wave-bands: MW1, MW2, LW, SW1, SW2, and Trawler Medium

SW3 and Trawler
Band, Extra Medium waveband provides easier tuning
of Radio Luxembourg, etc. Built in ferrite rod serial
for MW and LW. Retractable 4 section 24th. chrome
plated telescopic aerial for SW. Socket for Car Aerial,
Powerful push-pull output. 7 transistors and 2 diodes,
fine tone moving coil speaker. Alr spaced ganged
tuning condenser. Volume[on]off, tuning and wave
change controls. Attractive case with carrying handle
Size 9 × 7 × 4in. aipprox. Easy to follow instructions
and diagrams. Parts price list and easy build plans
25p (FREE with parts).

Total building costs 26.58 P. P. & Ins. 47p.

TRANSONA FIVE



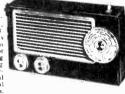
5 TRANSISTORS AND 2 DIODES

3 Tunable Wavebands. MW, LW and Trawier Band. 7 stage—5 transistors and 2 diodes, ferrite rod aerial. tuning condenser volume control, fine tone noving coil speaker. Attractive case with red speaker grille, Sige 6 ½ 4 ½ 1 ½ 11m. Easy build plans and parts price list 10p (FREE with parts).

Total building costs £2.75 P. P. & Ins. 25p

ROAMER SIX





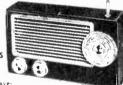
rite rod aerial and telescopic aerial for Short Waves.

3in. Speaker. 8 stages—6 transistors and 2 globes. Attractive black case with red grille, dial and black knobs with polished metal inserts. Size 9 × 5½ × 2½n. approx. Easy build plans and parts price list 25p (FREE with parts).

Total building costs £4.38 P. P. & Ins. 31p

TRANS EIGHT





and 3 DIODES

6 Tunable Wavebands: MW, LW, SW1, 8W2, SW3 and Trawler Band. Sensitive ferrite rod aerial for M.W. and L.W. Telescopic aerial for Short Waves. 3in. Speaker. 8 improved type transistors plus 3 diodes. Attractive case in black with red grille, dial and black knobs with polished metal inserts. Size 9 × 5½ × 2¼n. approx. Push pull output. Battery economiser switch for extended battery life. Ample power to drive a larger speaker. Parts price list and easy build plans 25p (FREE with parts).

Total building costs £4.95 P. P. & (Overseas P. & P. £1.05)



BUILD RADIOS, AMPLIFIERS, ETC..
FROM EASY STAGE DIAGRAMS. FIVE
UNITS INCLUDING MASTER UNIT TO
CONSTRUCT.
COMPONENTS INCLUDE:
Tuning Condenser: 2 Volume Controls: 2 Slider
Switches: Fine Tone Moving Coil Speaker: Terminal
Strip: Ferrite Rod Aerial: 2 Plugs and Sockets
Battery Clips: 4 Tag Boards: Baianced Armature
Unit 10 Transistors: 4 Diodes: Resistors.
Capacitors: Three j" Knobs. Units once
constructed are detachable from Master
Unit, enabling them to be stored for
future use. Ideal for Schools, Educational
Authorities and all those interested in
radio construction. Authorities and an those interested in radio construction. Parts price list and easy build plans 25p (FREE with parts).

All parts including 26-05 P. P. & Ins. 33p Case and Plans

Callers side entrance "Lavells" Shop FULL AFTER ? Open 10-1, 2.30-4.30 Mon.-Fri. 9-12 Sat. SALES PLEASE NOTE: ALL PRICES INCLUDE VAT SERVICE

EXCHANGE CO RADIO

61a HIGH ST., BEDFO Reg. no. 788372			52 36 ⁻
l enclose £ p	lease	send items marked.	4
ROAMER TEN		ROAMER SEVEN	
ROAMER EIGHT		TRANS EIGHT	
TRANSONA FIVE		ROAMER SIX	
POCKET FIVE		EDU-KIT	
Parts price list and plan	ns for		
Name			
Address			

PW55

SINCLAIR PROJECT AN Z30 £3-50 750 64.25 PZ5 £3.97 PZ6 £6-40 Project 60



tuner £16-80 AFU £4-50 2000 Amp £22:00 PZ8 £6-60 Transformer for PZ8 £2-95

EXECUTIVE CALCULATOR £50-00

PROJECT 60 KIT

C2:50
Our extremely popular kit contains the extra
capacitors, din plugs and sockets, cable and fuseholder needed to complete Project 60.

RADIO CHIP TBA651 The world's most advanced IC radio chip. Con-ness F Amp. oscillator, mixer, IF Amps, wide range AGC circuitry and voltage stabilizer. With data £2:16. Send S.A.E. for free leaflet. A kit of resistors, capacitors and IF filters is available to go with the chip for £1-75.

S-DECS AND T-DECS S-DECS £1-44 T-DECS £2 88 μ-DEC A £3.00 16 dil IC carriers £1-20



Max. supply volts 28. Power 6 Watts rms. Complete with free printed circuit board and 44 page instruction book.

SWANLEY IC TOMORROW

The World's most powerful IC amplifier. Similar to the above but operates at 35 volts max. supply and gives 12 Watts rms output. Manufactured for us by a leading semiconductor company. Supplied with our instructions and a 6 month guarantee, but no printed circuit.

KITS FOR IC12 AND IC TOMORROW Except for the power kits and speakers, all items suit both integrated circuits.

DELUXE KIT
includes all parts for the printed circuit and volume, bass and treble controls needed to complete the mono version £1-45. Stereo version with balance control £3-30. BASIC KIT

Contains components for the P.C. board and volume and simple tone controls. Mono version £1-25. Stereo version with balance control £2-90.

POWER UNITS FOR THE IC12 A set of components to construct a 28V 0-5 Amp power supply £2:27. Also suitable Sinclair PZ5 fully constructed £3:97.

POWER KIT FOR IC TOMORROW A set of components to construct a 35V 1 Amp power supply £2.97.

power supply £2.27.

LOUDSPEAKERS FOR THE IC12

Specially chosen for the IC12. 5" 8 ohm £1.00.

5" x 8" 8 ohm £1.45, 10" x 6" 15 ohm £2.27.

PREAMPLIFIER KITS
Type 1 for magnetic pickups, mics and tuners, with 3 position equalization switch. Mono model £1·20. Stereo model £2·20. Type 2 for ceramic or crystal pickups. Mono 60p. Stereo £1·20. SEND S.A.E. FOR FREE LEAFLET ON KITS

BATTERY ELIMINATOR BARGAIN £3 40

Introducing the most versatile battery eliminator ever offered with a high current output that makes it suitable for operating most battery tape recorders, record players, cassette recorders and

cassette recorders and shavers. Input 200/240V. Output voltage selected by front panel switch may be set to 3V, 4·5V, 6V, 7·5V, 9V and 12V at 500 ma. Housed in a very strong, attractive, plastic case and fully guaranteed for 12 months.

SWANLEY ELECTRONICS

32 Goldsel Rd., Swanley, Kent Post 10p per Item. Please add 10% extra to total cost of order for VAT. Official credit orders welcome from schools etc. Full itsts 10p post free. Mail order only, No callers please. H.A.C. SHORT-WAVE

WORLD-WIDE RECEPTION



Famous for over 35 years for Short-Wave Equipment of quality, "H.A.C." were the Original suppliers of Short-Wave Receiver Kits for the amateur constructor. Over 10,000 satisfied customers—including Technical Colleges, Hospitals, Public Schools, R.A.F., Army, Hams, etc.

NEW "DX" RECEIVER

NEW "DX" RECEIVER

Complete kit—price 25-85 (incl. p. & p. & V.A.T.).

Customer writes: "Australia, India and America
at loud volume ——I am 14 years of age and
have logged over 130 stations, plus countless
Amateurs from all over the world.

This kit contains all genuine short-wave components, drilled chassis, valve, accessories and full
mstructions. Ready to assemble, and of course,
as all our products—fully guaranteed. Full range
of other S.W. kits. including the famous model

"K" and "K plus" (illustrated above). All orders
deapatched by return. Send now for free descriptive catalogue, test report and order form
EXCITING COMPETITION for Short-Wave
listeners. Send stamped envelope for details.

"H.A.C." SHORT-WAVE PRODUCTS 29 Old Bond Street, London W.I

U.H.F. T.V. AERIALS



als now fitted with tilling bracket and 4 element reflector.
LOFT MOUNTING ARRAYS 7 element 2.25. 11 element 3.75. 14 element 3.75. 18 element 3.75. 18 element 3.75. 14 element 3.75. 18 element 3.75. 14 element 4.75. 18 element 3.75. 14 element 4.75. 18 element 3.75. 14 element 4.75. 18 element 3.75. 14 element 3.75. 14 element 3.75. 14 element 3.75. 16 element 3.75. 17 element 4.75. 18 element 3.75. 18 element 3.75. 18 element 3.75. 18 element 3.75. 19 element 3.75. Complete assembly instructions with every aerial. LOW LOSS coaxial cable 9np yd. KING TELEBOOSTERS from 3.75. LABGEAR PRE-AMPS 4.25.

BELLING LEE CONCORD BOOSTER V.H.F., F.M., U.H.F., mains operated 8-20. State clearly channel number required on all orders. P. p. on all aerials 50np. Accs. 15np. C.W.O. Min. C.O.D. charge 25np.

F.M. Radio Aerials

F.M. RADIO loft S/D 1-00 3 element 3-25, 4 element 3-50. Standard coaxial plugs 9np. Coaxial cable 5np yd. Outlet box 30np. P.p. all aerials 50np. Accs. 30np. Cyo. Min. C.O.D. charge 25np. Send 5np for fully illustrated lists.

> CALLERS WELCOMED OPEN ALL DAY SATURDAY

K.V.A. ELECTRONICS

40-41 MONARCH PARADE, LONDON ROAD, MITCHAM, SURREY Telephone 01-648 4884

LOUDSPEAKER BARGAINS

Fane Pop 100 watt 18" 8/15 ohm
Fane Pop 60 watt 12" 8/15 ohm
Fane Pop 50 watt 12" 8/15 ohm
Fane Pop 15 12" 15 watt 8/15 ohm
Fane Pop 15 watt 12" 8/15 ohm
Fane Pop 15 watt 12" 8/15 ohm
Fane Pop 100 watt 18" 8/15 ohm
Fane Pop 100 watt 15" 8/15 ohm
Fane Pop 15 watt 12" 8/15 o Fane 8" d/cone, roll surr. 8U/1 8 or 15 ohm Baker Group 25 3, 8 or 15 ohm Baker Group 35, 3, 8 or 15 ohm Baker De Luxe 12" d/cone Baker Major EMI 13 x 8 3, 8 or 15 ohm EMI 13 x 8 type 150 d/cone 3, 8 or £3.16 £6 · 00 £7 · 50 £9 · 62 €7.50 £2-25 £2 - 58 EMI 13 x 8 type 450 t/tw 3, 8 or EMI 13 x 8 type 450 t/tw 3, 8 or 15 ohm
EMI 13 x 8 type 350 8 ohm ...
EMI 6½" 93850 4 or 8 ohm ...
Elac 9 x 5 59RMLO9 15 ohm ...
Elac 9 x 5 59RML4 8 ohm ...
Elac 6½" d/cone 6RM220 8 ohm ...
Elac 6½" d/cone, roll surr. 6RM171 £3-85 €8 - 25 £2 80 €2 - 53 £2 · 53 €2 - 59 8 ohm ... Elac 4" tweeter TW4 8 or 15 ohm €3-22 Elac 4" tweeter TW4 8 or 15 ohm
Celestion PS8 for Unilex
Celestion MFL000 25 watt horn
8 or 15 ohm
Elac 5" 3 ohm
Elac 7" x 4" 3 or 8 ohm
Elac 8" x 5" 3, 8 or 15 ohm
Wharfedale Bronze 8 RS/DD
Wharfedale Super 8 RS/DD
Wharfedale Super 10 RS/DD
Goodmans 8P 8 or 15 ohm
Goodmans 10P 8 or 15 ohm
Goodmans 12P 8 or 15 ohm
Goodmans 12P 8 or 15 ohm
Goodmans 15P 8 or 15 ohm
Goodmans 15P 8 or 15 ohm
Goodmans 15P 8 or 15 ohm £1 21 £2 16 €10-45 £1 -75 £1.93 £5 · 50 £3 · 80 £4 · 49 £11 55 £17-05 Goodmans 18P 8 or 15 ohm Goodmans Twinaxiom 8... Goodmans Twinaxiom 10 £6:79 £7:61 Goodmans Axent 100 Eagle DT33 dome tweeter 8 ohm £6-60 £5-45 Eagle HT15 tweeter 8 ohm Eagle CT5 tweeter 8 ohm £1 -25 £3 -74 £2 -54 Eagle MHTIO tweeter Eagle CTIO tweeter Eagle FR4 €4 - 45 Eagle Xovers CN23, 28, 216 Kef T27 Kef T15 £1 · 15 £4 · 67 £5 50 Kef BIIO Kef B200 £7 · 42 £10 · 72 Kef BL39 Kefkit 2 £24 · 75 Allan 12" d cone 3 or Richard 15 ohm £2 · 27 €1 - 3A £1 - 38 65 21 64 ohm - 65 Speaker matching transformer 3, 8 or 15 ohm Adastra Hiten 10" 10 watt 8 or £1 - 10 15 ohm ... Adastra Top 20 12" 25 watt 8 or 15 ohm ... £2 · 80 €6.32 Stephenspeaker kits and cabinets—send for illustrated brochure and list of recommended speakers. ... £25.00 Carriage and insurance 25p per speaker. (Tweeters and Crossovers 15p each.) All prices quoted inclusive of V.A.T

WILMSLOW **AUDIO,** Dept. PW

Swan Works, Bank Square, Wilmslow, Cheshire, SK9 1HF

ON RECENT DEVELOPMENTS

A COMMON circuit arrangement in the popular construction journals is that which allows temperature to control something—a sort of electronic thermostat.

Perhaps the most featured circuitry is that which has some form of temperature sensor (say, a thermistor) followed by a transistor or two which, in turn, drives a meter (for temperature to be read from a pre-calibrated dial) or a relay to actuate some form of control circuit.

Out on to the electronics market has come a new type of reed switch which can perform this kind of function—and without the need for any further electronic circuitry.

Basically, the reed switch has two contact blades which form a simple on-off switch. Around the glass tube which houses these contacts is a coil. Energising the coil causes the contacts to open (or close) while remova of the energising source causes the blades/contacts to return to their original state.

The new devices have the glass capsule and reed relay blades. Instead of a simple coil of wire, the capsule is surrounded by torroidal magnets which are separated by a ferrite material. Because the ferrite material separates the magnets, it also has the effect of separating their individual magnetic fields.

However, the particular make-up of the ferrite employed is such that there is a certain critical temperature point called the Curie point. Below this point, the ferrite no longer isolates the magnetic fields of the separate magnets and thus the switch can be caused to activate.

Once the temperature rises above the Curie point, the magnetic fields are again separated. Thus there is a complete switching action actuated only by temperature, and the reed blades themselves can be used to form a switch. There are many uses which will come to mind; standard units in the range extend from 0°C to 100°C in 5°C steps.

LIGHTS UP

Turning to the "lighter" side of smoking, solar cells are being used in electronic lighters to keep the batteries charged. One set of experiments shows that some 50 cigarettes

a day can be lit for a month before the batteries need recharging by exposing the light-cells to a light source. It seems reasonable to assume that one could leave such a lighter out in the open for various periods of time and thus the batteries would remain charged for far longer than a month.

Work is proceeding to improve the efficiency of solar cells as a means of supplying energy from ordinary daylight, i.e. without any sunshine at all. This should be a useful project for people living in or around Manchester on a rainy day.

ALL TOGETHER

Electronic calculators have become very real practicalities over the past few years. Progressing from the realms of theory they are now offered by the van load in a wide variety of shapes and sizes. Many things have contributed to the progress of electronic calculators not the least of which is the development of the i.c. which does all the calculating. The aim has been to be able to boast "A calculator on a chip".

Well, the dream gets closer every hour. A company has now brought out a chip which very, very nearly achieves this title. The low power calculator circuitry is on the same glass panel as the liquid crystal display. Thus the thing is literally a complete calculator on a single substrate.

But what of the buttons or keys which input the information? Well, the manufacturers have thought of that too—yes, and it's on the same panel. The inter-digitised contacts are shorted by a conductive rubber button whenever a key is depressed. Standby power is only 12mW and the calculator runs for about 100 hours from a single pen-sized cell. Sorry, they are not for sale in the U.K. as yet.

VERY HIGH-BROW

Capacitors are one type of component which seems to be getting ever smaller. The photograph on this page shows five tantalum chip capacitors from the range manufactured by Union Carbide. The T400 series has nine case sizes; values range from 0·1µF and can withstand temperatures of up to 300°C. Those



shown in our photograph are for a very "high-brow" application — at least, "eye" think they are.

Down in the forest something stirred, so we're told. In a certain Bavarian forest it is more than stirring. Laser equipment, supplied by Siemens, measures the trajectory of survey satellites. Power of this laser is 100MW (100 megawatts or one hundred million watts). One wonders if, in the decades to come, this type of equipment will be towed away from Lisle Street shops as surplus stock by delighted Amateurs who may have just given £1.75 for them. If this happens one must ask whatever will replace such equipment?

LITTLE THINGS

Little things please little minds so we're told, but sometimes it's not that cynically simple, Cramming a few thousand semiconductors into a dual in-line package is a common occurrence today, but what of the devices which are very difficult to integrate? Items such as tuned circuits are a problem. However, solutions are on the way, in the form of subminiature inductors or "coils".

Described as monolithic chip inductors, these minute devices are made by stacking U-shaped conductor patterns which have been screened onto a special ferrite tape. The U-shaped patterns are stacked such that when the individual ends of each U are connected to the U's above and below, a continuous "coil" pattern is achieved. When this has been done, the complete stack is "fired" resulting in a monolithic structure.

Ginsberg

LOOKING AT THE

London ELECTRONIC COMPONENTSHOW

THE four-day London Electronic Components Show at Olympia, London opened on Tuesday 22nd May, the guest of honour at the inaugural luncheon being H.R.H. The Duke of Kent, who later made quite an extensive tour of the Show.

The Show's sponsors, the Radio and Electronic Components Manufacturers Federation, celebrating their 40th anniversary this year, managed to get no less than 480 companies to exhibit the very latest developments in electronic components and associated instruments, equipment and services.

Olympia's two main halls were utilised for this massive event and special preparations were made to receive and attend to the needs of the many visitors from abroad. Almost one-fifth of the stands belonged to exhibitors from overseas with representatives from more than sixteen countries including Australia, Austria, Belgium, Canada, Denmark, Hungary, Japan, West Germany, Spain, Sweden and the USA.

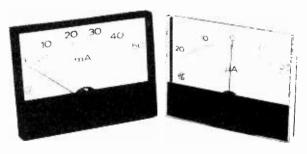
During the Show three discussion and question sessions were held outside at the Royal Westminster Hotel, being arranged jointly by the RECMF and the Institution of Electronic and Radio Engineers. The subject "European Component Survey" covered the aspects of component testing, evaluation and development.

Visitors to the Show were invited to try their luck in various competitions in which very attractive prizes such as an 8-track tape recorder, a £100 watch and even bottles of whisky could be won, not to mention a holiday for two in Rome!

All the components in the world would not be of much use if the many units into which they are fitted could not be connected together by means of efficient connectors. In 1971 over £22 million of the electronic components market was accounted for by the sale of just such connectors.

About every possible variation of connector was on show with Amphenol making them their main theme on their stand together with switches, lamps, relays and indicators. Ultra Electronic Components featured a new range of connectors and accessories for use with printed circuit boards as well as an improved version of their $0 \cdot \text{lin.}$ pitch modular edge connector. Other products on their stand included plugs and sockets, terminal blocks, rotary wafer switches and water activated batteries.

AMP of Great Britain also had a wide range of low cost pin and socket and flat flexible cable connectors. They manufacture just about everything needed in solderless, crimped terminations and can supply everything from a single terminal to computer-plotted wiring system components.

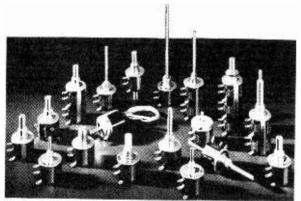


In spite of their long and world wide reputation for testmeters, only now have AVO Ltd. started producing a line of panel mounting meters.

Two of the new Dinline series are shown above.

AVO celebrated their Golden Jubilee with the introduction of their first-ever range of panel mounting meters. The new Dinline Fifty range marks, not only fifty years of Avo, but also their entry into Europe, with styling based on the rectangular JIN (IEC 51) specification. The matching series of eight models is available in two presentations, a moulded black finish and glass window or clear Macralon ensuring entirely shadow-free readings.

Sealectro's stand had their complete range of products which includes RF connectors, multi-pin connectors, plugboards, insulated terminals, rotary switches and punched card readers. Centre piece of this display was the new series of punched card readers, the new 4mm grid plugboard system and the new FR/SR series of two-piece insulated terminals. New items in the RF range include a high isolation coaxial switch and a range of 75 ohm connectors to



Spectrol Reliance Ltd. were justifiably proud of this large number of permutations of their Model 534 'Universal' potentiometer.

DIN 47295. Sealectro's technical staff demonstrated a miniature RF connector assembly using flexible and

semi-rigid cables.

Piher International Limited, were exhibiting in the United Kingdom for the first time. Piher are already among the world's leading suppliers of carbon film resistors with a daily output of some seven million resistors from their headquarters at Badalona near Barcelona. Over 90 per cent of their production goes to export markets, principally the United States, Germany and the United Kingdom. On Piher's stand could be seen many samples from their range of carbon film resistors, trimming potentiometers, small signal and medium power transistors and capacitors, and particular interest centred on a new range of preformed resistors.

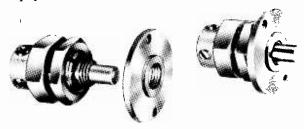


One of the Series C16 Cermet potentiometers by AB Electronic Components Ltd. Standard models range from 100Ω to $2^\circ5M\Omega$, linear, but special models down to 50Ω and up to $10M\Omega$ are available, with soldering tags or printed circuit terminals.

Hungary was represented by **Elecktromodul** who were showing components for telecommunication, engineering and electronics. Products on display included ferrites, electrolytic capacitors and ceramic capacitors.

Audax SA, from France, exhibited examples from a wide range of loudspeakers, while Societe Francaise de l'Electro-Resistance had on display metal film and hi-rel resistors, carbon and cermet track potentiometers and trimmers, plastics potentiometers and cermet film micro-circuits.

Cosmocord-Stolec Limited were showing, for the first time in the United Kingdom, a range of low-cost multimeters and insulation testers, plastics mouldings and audio transcription transducer equipment.



One item from the vast range of drives, dials and tuning capacitors from Jackson Bros. Ltd., a miniature ball drive with a 10:1 reduction, Type 5870.

New ranges of DIN plugs and sockets and instrument components were featured by **Tape Recorder Spares Limited.** Audio and electronic components, switches, mains units, wire measuring and storing equipment and wire cutting and stripping equipment were among other products shown.

Watson Anodising Limited had a range of nameplates, labels, instrument panels, plain and printed chassis as well as examples of the general printing they undertake for the electronics industry.

Rectifiers, thyristors and triacs from Raytheon-TAG Components Limited included glassivated and planar plastics encapsulated thyristors and triacs, plastics encapsulated 10A rectifiers to 1300V, fast turn-off rectifiers and diffused SCRs up to 35A and triacs up to 25A RMS.

Radiatron Components Limited stand had a display of components and accessories ranging from collet knobs, instrument cases and housings to relays, connectors, switches and automation modules.

For visitors to the show interested in television, AB Electronic Components Limited makers of the only touch tuner made in the United Kingdom, which, when announced last year was the only one made anywhere in the world, is perhaps the best known of their products. Connectors, potentiometers, switches and thick film microcircuits are among others. Sharing AB's stand was Wolsey Electronics, a division of AB, showing various aerials and their range of radio and television master aerial and amplifier systems.



This 25-turn preset potentiometer by AB Electronic Components Ltd. is of carbon composition construction intended for use with varicap tuners. Resistance ranges up to $100 k\Omega$ in linear, logarithmic or diode characteristic law.

Solder, one of the most important materials used in electronics, was shown in all its forms by Multicore Solders Limited. Cored solder, solder creams, bar solders as well as liquid fluxes and chemicals for hand and wave soldering were included in their display. Some 50 per cent of Multicore products are exported to 107 countries throughout the world—one-quarter of the exports going into the competitive U.S.A. market.

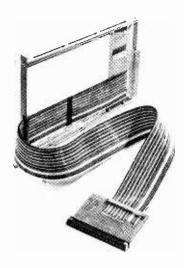
Soft solder, fluxes, chemicals, solder preforms and samples from a wide range of solder products were to be seen on the stand of **Enthoven Solders Limited**.

A heavy duty aerial rotator was among communications, marine, television and radio aerial equipment featured by J-Beam Engineering Limited.

Communications cables, instrumentation cables, equipment and connecting wires, winding wires, mineral insulated heating cables and thermocouples, solder coated copper wire, silicone insulated fine wires and connectors were displayed by **BICC**.

The wire-wound component is one of the oldest devices used in electronics and remains an important adjunct in the industry. **Gardners Transformers Limited**, who specialise in this field, have orders currently valued at £450,000—a quarter of which come from overseas. They were displaying transformers, inductors, filters, delay lines, inverters, converters, power supplies and modules.

Having recently merged with the Allen-Bradley Company of Wisconsin, USA, Morganite Resistors Limited had a wide range of resistors, potentiometers, switches, thin film and thick film networks, capacitors.



A Tekdata Ltd. flat flexible cable in FibaTEK p.v.c. material. This custom-made cable uses 7/0·193 and 14/0·193 wires.

filters and industrial controllers from both of their product lines. Not previously shown in the United Kingdom, the Morganite cermet single turn potentiometer, type 90, with a power rating of 0.5 watt and a resistance range of 10 ohms to 2 megohms, is designed for commercial and industrial applications. New from Allen-Bradley is the "Mod-Pot", a variable resistor available in single, dual, triple and quadruple construction plus potentiometers, line switches and vernier drive modules.

A. F. Bulgin & Company Limited commemorate 50 years as electrical and electronic component suppliers. During the last 12 months some 40 new products have been introduced, the complete range now containing over 15,000 items. Examples on show included fuses, fuseholders, knobs, switches, signal lamps, and plugs and sockets.

Custom-built specialists in MOS, bi-polar and hybrid thick film technologies, GEC Semiconductors Limited had a new phase control circuit for controlling triacs when driving small electric motors. One interesting device also on display was the MA1705, a MOS integrated circuit developed for use in electronic musical instruments and synthesisers. It generates four notes on an equally tempered scale by dividing successively by 1.0595



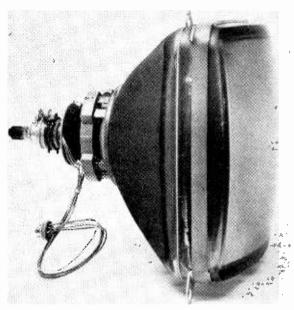
The Series 880 focus control has been specially designed by AB Electronic Components Ltd. for colour TV receivers and can be mounted on a metal chassis. The maximum continuous operating voltage is 10kV.

from a single master oscillator. Three packages can be cascaded to produce a complete octave of semitones, while further octaves can be generated by using compatible six-stage binary divider circuits.

Among new transistors by **Mullard** for use in highpower, high-quality audio amplifiers are families of complementary pairs that can give outputs of up to 100W. For example, in applications where an output of 6 to 15W is required, pairs from the transistor family BD433 to BD438 are suitable. (Odd numbers are n-p-n types, and even p-n-p.) These have a maximum V_{CEO} rating of 22 to 45V and a total dissipation of 36W.

Silicon power transistors type BD266 and BD267 form a complementary pair that can give a high-quality, audio output of 25W; they are also suitable for use in general purpose amplifiers and switching applications. Both are monolithic epitaxial-base Darlington transistors.

Other new Darlington devices seen were types BDX62 to BDX67, which are power transistors with TO-3 encapsulations. Complementary pairs selected from these for use in audio amplifiers will give outputs of 25 to 100W.

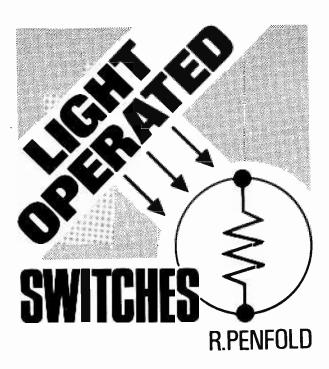


Rather large, but a component never-the-less! The A51-160X Precision In-Line colour TV tube assembly features a slotted shadow mask, integral neck components and factory-set static/dynamic convergence and purity adjustments. The June issue of our companion magazine Television featured a technical article on the new Thorn tube.

The use of Mullard circuit modules and integrated circuits can reduce the design costs and assembly times of good radio receivers, a.m. and f.m. Different arrangements, demonstrating the ease with which a variety of receivers can be designed, were shown.

New to the United Kingdom and exhibited by **Bird Electronic Limited**, was the Bird model 4370 wide-band Thruline wattmeter and model 4342 combined power meter and VSWR monitor. Coaxial load resistors, attenuators, coaxial switches, filters and calorimeters were also shown.

Included in the Spear Engineering Company Limited's display were power transistor holders, connectors, valve and tube base mouldings and printed circuit assembly fixtures.



IGHT operated switches are extremely useful devices which have a number of uses in burglar alarms, automatic parking lights, etc. Most designs for these switches work along the lines of the circuit shown in Fig. 1. The ORP12 photo-resistor is a device which in total darkness has a very high resistance (usually a few megohms), but when light falls upon it, the resistance will fall to a very low level (usually a few hundred ohms).

It will be seen that in the circuit shown in Fig. 1, when there is no light falling on the ORP12, there will be very little base current flowing. In consequence very little collector current will flow and so the relay will not operate. However, when a small amount of light falls on the photocell, its resistance will drop, and a larger base current will flow, causing a larger flow in collector current, which will operate the relay.

Latch on circuit

The relay will only remain on for as long as light is falling on the photocell. This renders this type of circuit unsuitable for many applications. For example, if a burglar alarm which is meant to be triggered by the light from the torch of an intruder is required, if the circuit of Fig. 1 is used, the alarm will only sound for the period the torch is aimed at the photocell. This is of course of no use. A circuit which will remain operative once it is triggered is required.

A suitable circuit is shown in Fig. 2, based on a bistable multivibrator. When the circuit is turned on, as there is a far lower resistance to the base of Tr1 through the relay and R2 than there is through R1 and R3 to the base of Tr2, Tr1 is switched hard

on. This causes the voltage at the collector of Tr1 to be at a very low level, and Tr2 receives only a very small amount of base current through R3. This means that Tr2 is turned off, and the relay will not operate.

When light falls on the ORP12, its resistance will decrease and it will have an earthing effect on the base of Tr1. This will cause a decrease in the current flowing through Tr1, and the voltage at the collector will swing to a high level. Tr2 can now obtain quite a heavy base current and will turn on, operating the relay. The voltage at the collector of Tr2 will now be at a low level, and it is Tr1 that is unable to obtain any appreciable base current, and will thus be turned off. Even if the light is now taken off the photocell, the circuit will still remain in the same state, as Tr1 will still be unable to draw sufficient base current due to the low voltage at the collector of Tr2.

The circuit may be reset by two methods. A pushbutton switch may be connected between Tr2 base and earth. When this is operated it will have the same effect as when light fell upon the photocell, except it will have the opposite result. Alternatively the unit may be turned off, and then turned on again.

A protective diode is connected across the relay in all the circuits shown. This is to prevent the high reverse voltage, which is induced into the relay coil by the collapsing magnetic field as the relay is turned off, from damaging the transistor. Almost any diode will work in this position.

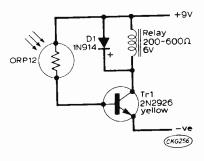


Fig. 1: Typical photoelectric switch.

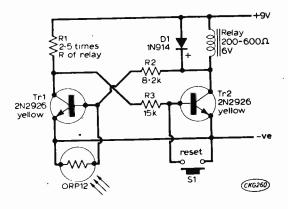


Fig. 2: Circuit suitable for applications where the relay must remain on once operated.

Higher sensitivity

The circuit of Fig. 2 does lack sensitivity and the ORP12 has to be almost fully illuminated before the relay is triggered. A more sensitive circuit is shown in Fig. 3. This circuit requires an extra transistor, and although BC183L is specified, the circuit should work equally well with any high gain, silicon, n.p.n. transistor.

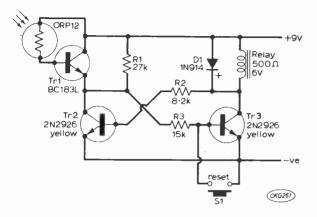


Fig. 3: Sensitive circuit using three transistors. A $25 \mathrm{k}\Omega$ potentiometer may be placed in series with the ORP12 to control sensitivity.

With no light falling on the photocell it will have a high resistance. Trl will receive very little base current, and will have a high resistance between the collector and emitter. Rl also has a fairly high resistance and this will prevent much current flowing to the base of Tr3. This transistor will cut off while Tr2 is turned on, as occurred in the circuit of Fig. 2 when a small amount if light falls on the photocell, its resistance will fall, causing the resistance of Tr1 to fall by a far greater amount.

When this resistance reaches a low enough value, the voltage at the collector of Tr2 will be at a fairly high level. A large base current will now flow, turning on Tr3, and operating the relay. The voltage at the collector of Tr3 will drop, turning off Tr2. If the light is now taken away from the photocell, the resistance between the collector and the emitter of Tr1 will again be very high. The resistance of Tr1 and R1 will be just sufficient to give enough base current to Tr3 to hold the relay on.

Broken light beam alarm

Another type of alarm sometimes used is one in which a beam of light is aimed from one side of a room, or a doorway, to a photocell the opposite side. If anyone then passes between the two, breaking the beam, the alarm is sounded. A suitable circuit for an alarm such as this is shown in Fig. 4.

This works in very much the same way as the two previous circuits. When light is falling on the photocell it will have a resistance very similar to that of R2 in Fig. 2, and the circuit will behave in the same way initially. When the light to the photocell is

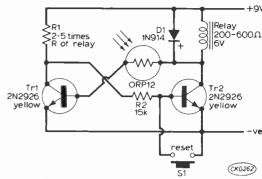


Fig. 4: Circuit for operating in a dark room.

interrupted, it will exhibit a high resistance. Trl will receive very little base current, the voltage at its collector will rise, Tr2 will be able to obtain a large base current, and will turn on. The voltage at the collector of Tr2 will drop and, even if light is now restored to the photocell, Tr1 will be unable to draw any appreciable base current. Thus Tr2 is able to draw a heavy base current and the relay remains on.

The circuit may be reset in the same way as the two previous circuits. For the circuit to function correctly, the room in which the photocell is situated has to be fairly dark, of course, or the light in the room will keep the relay off, regardless of the light beam.

These circuits are all fairly simple, and inexpensive, but should prove useful and interesting. With a little imagination a number of uses, other than those mentioned, may be found for the circuits.

OCTOBER IS ISSUE No.800

Will you be celebrating with us?

If so you will receive with your October copy of Practical Wireless the first pair of PW Datacards absolutely free. A special "Going Back" feature with reproductions from early issues of Practical Wireless; the introductory article in our new series on Q4; "Experimental Workshop" and many other special and regular features will also appear. Further details next month.

The October issue is on sale September 7th.

PRACTICAL WIRELESS

THE FIRST OF OUR SPECIAL AUTUMN ISSUES...

... will give full details of how to make our two-band, two-i.c. "pop" radio receiver, ... will give full details of the PW Datacard System announced elsewhere in this issue. ... will reveal the identity of Q4, ... will contain straightforward constructional

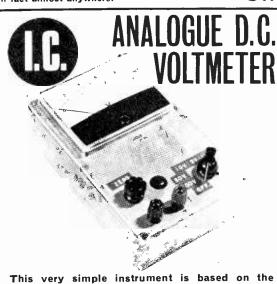
... will contain straightforward constructional projects designed around integrated circuits,



Specially designed to simplify construction, this smart looking radio uses two integrated circuits: a ZN414 for processing radio signals and an SL403D as the amplifier to drive an 8- or 15-ohm loudspeaker. Medium wave stations and Radio 2 (long wave) are covered with a very simple aerial coil; no alignment problems arise. The amplifier is designed to give 1 to 3 watts of output power and is ideally suited for a teenagers' room, kitchen, bathroom, in fact almost anywhere.



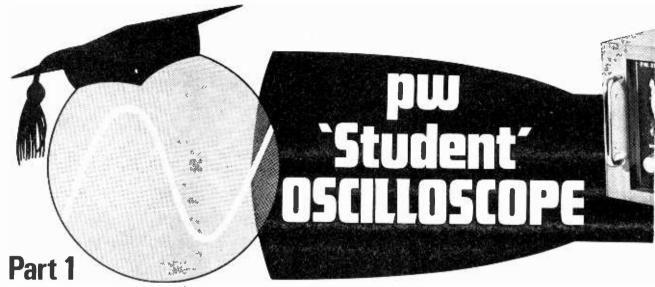
SIMPLE 2-BAND RECEIVER



This very simple instrument is based on the popular 741 i.c. and with a minimum of other components is capable of voltage measurements up to 100 volts d.c. in five ranges. Accuracy on low voltage ranges is very good and the input sensitivity is much greater than in the conventional multimeter.



DON'T MISS ANY ISSUE OF PRACTICAL WIRELESS • SEPTEMBER ISSUE ON SALE AUGUST 3rd



SIMPLE TO BUILD . INEXPENSIVE . ONE

Toccurred to the writer that many readers, being 'brought up' on transistors, would not have had the opportunity to learn about the oscilloscope from the 'bottom up' and that a basic transistorised design, with modern construction methods, would be welcomed.

An oscilloscope should be a substantial piece of equipment, and in view of the high voltages employed (700V for the e.h.t. and 300V for the deflection amplifiers) it must be emphasised that the rather solid nature of the model is deliberate.

Another feature is the simplification of the controls on the front panel, these being; brilliance, focus, Y attenuation (Y amp), Y shift, timebase coarse control in 6 ranges, timebase fine control (fine), timebase amplitude (X amp), and sync on/off.

There is a Y input socket and an external timebase input socket.

The writer has noticed that it is usually necessary to attenuate the input signal rather than amplify it, and with transistorised equipment the signal which is being examined can be dealt with quite effectively by an attenuator of the 'volume control' type. This makes it necessary to turn the Y attenuator down to zero before connecting a signal to the Y input socket but once this habit has been formed, the simplification of having just one continuously variable gain control with a d.c. amplifier is evident. The d.c. amplifier is necessary to maintain a good low frequency response, especially with square wave signals.

The Cathode Ray Tube

The cathode ray tube (c.r.t.) itself is a form of valve, having a heater and a cathode, a control grid and anode—which must be at a high positive potential (e.h.t.) with respect to the cathode.

For a 3in. c.r.t. the e.h.t. should be of the order of 900/1000V.

Between the control grid and the final anode are the first and focusing anodes. There are also two pairs of deflection plates, one pair—the Y plates—for vertical deflection, and the other pair—the X plates—for horizontal deflection. The deflection plates are usually operated in push-pull and with 1000 volts across the c.r.t. the push-pull voltage swing needs to be about 150V. This makes it necessary to have a 300V supply to the deflection amplifiers and the deflection transistors must be able to withstand this voltage.

The design utilises the 3BP1, c.r.t. which has a heater requirement of 6.3V at 0.6A. The c.r.t. has a 14 pin base with a locating spigot and the base connector should be obtained (if possible) when purchasing the c.r.t.

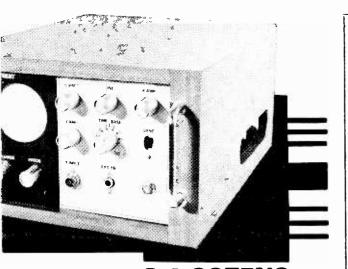
The tube gives a green trace of medium short persistence and a useful trace height is 5cms. The c.r.t. is approximately 10 inches in length including the base.

Cathode ray tubes are sensitive to stray magnetic fields, such as those produced by mains transformers, and even when a mu-metal shield is utilised to screen the c.r.t., transformers on the same chassis usually cause some interference to the spot. Mu-metal shields are quite expensive (when available).

In the present design, the mains transformers are fitted on a separate chassis, connected together by a multiway lead. By using this method, the problem of interference from the mains transformers was eliminated.

The Y (Vertical) Amplifier

The input to the Y amplifier is through a 'volume control' type attenuator VR1, and it is taken directly to the base of Tr1, which with Tr2 forms a boot-



G.A.COZENS ASSEMBLY BOARD

strapped amplifier with an input impedance of about $lm\Omega$. If the reader wishes, a $0 \cdot 1\mu F$ capacitor (Cx) can be inserted in the lead from the slider of VR1 to the base of Tr1, with a shorting switch across it, to give a.c./d.c. facilities, but it must be pointed out that this is a sensitive part of the circuit, and all leads must be kept as short as possible to avoid stray pick up.

The output from the signal amplifier is passed through a resistor network to the long tailed pair which form the vertical deflection amplifier Tr3 and Tr4. This stage performs two functions:

1. To give two outputs which are 180° out of phase and supply the push-pull voltages to the vertical deflection plates.

2. To provide a voltage swing of 150V at each

deflection plate.

When the base of Tr3 goes positive its collector goes negative. That is, the signal is inverted at Tr3 collector.

Also Tr3 emitter goes positive. This means that Tr4 emitter goes positive. The base bias of Tr4 is held at a fixed level by the bias network VR2 R15. As the potential difference between Tr4 base and emitter is decreasing the base of Tr4 is in effect going negative.

This causes the collector of Tr4 to move in a positive direction, which is the same as the original signal at Tr3 base. Thus Tr3 collector is the inverting output and Tr4 collector is the non inverting output.

The network R7, R8, R9 is designed to bias the base of Tr3 and prevent overloading, and the base bias of Tr4 is made variable to balance with Tr3 base and centre the trace on the screen. VR2 is therefore the Y shift. C2 by-passes any a.c. signals present at Tr4 base.

The collectors of Tr3 and Tr4 are connected directly to the Y plates. The values of the collector resistors were chosen by trial to balance the collector outputs, and the emitter resistors R11 and R14, and the coupling resistor R12, which controls the gain of

SPECIFIC	ATION
Y Signal	
Input via co-axial lead	
Attenuator continuously v	ariable
Input Impedance 1M Ω	* * * * * * * * * * * * * * * * * * * *
	100mV r.m.s. gives trace
height of 3cms p. to p.	
Bandwidth d.c. to 1MHz.	*/ *
Useful trace height 5cms.	3 ,
X Deflection,	* * . * . *
Sensitivity on external	timebase 100mV r.m.s.
gives trace width of 1ch	n p. to p
Useful trace width 5 cms.	
Timebase in 6 ranges.	*
Range;	• • •
1,10—100Hz	* ' . *2. ' . ' .
2. 32—170Hz	
3.150—550Hz	,
4. 520Hz—3·5·kHz	* *
5. 3·0-20kHz	***
6. 6·0-40kHz	
Controls	
Front Panel	
Brilliance	Y gain 🦨
Focus	" Y shift
Timebase fine frequency	1
Timebase range (course)	X Signal
Timebase amplitude	
Sync on/off	
Side of Chassis	William Control
X linearity	Astigmatism
X shift	

the stage, may also be altered to match the transistors. When the trace is centred and no signal is present the collector voltages should be 180V. The maximum height of the Y trace when using a 100mV input signal (VR1 at maximum) is 3cms.

The Timebase Generator and X Amplifier

The timebase waveform generator Tr7 is a unijunction transistor (TIS43) with Tr6 acting as a constant current device to regulate the charging of the timing capacitors (C5, C6, C7, C8, C9 and C10) and to give a linear rise time.

The fine frequency control (VR3) should be wirewound and it should be possible to steady the trace at any part of the frequency range without using synchronisation. There is some loss of amplitude on the upper timebase range.

The sawtooth signal is taken from the emitter of Tr7 to the base of Tr8, via a closed circuit jack JK1 and a 0.1μ F capacitor Cl2. The output signal from Tr8 collector is fed via capacitor Cl3 to the timebase amplitude control VR4.

The horizontal deflection amplifiers Tr9 and Tr10 are a long tailed pair with a common emitter resistor R31. Bias for Tr9 is by potentiometer network R28 R29 and as in the Y amplifier, the base bias of the second transistor Tr10 is made variable to act as a shift control to centre the trace on the c.r.t. screen. C17 by-passes any a.c. signals and stabilises the trace.

Synchronising

The purpose of synchronisation is to lock the timebase frequency to the Y signal and so hold a given number of complete waveforms steady on the screen.

The Y signal is taken from the emitter of Tr3 and is passed via C4 to the base of Tr5. Tr5 is driven hard by the Y signal and this produces a square wave at the collector of Tr5.

C3 and R16 form a pulse shaper and the diode D1 passes the positive going pulse to b2 of the uni-

junction sawtooth generator Tr7.

The d.c. potential to b2 is stabilised by the zener diode D2. R24, C11 and the decoupling resistor R23 all contribute to improved synchronisation of the timebase.

The Power Supplies

Five a.c. supplies are required from the mains transformers, they are:

1. 6.3V at 0.6A for the c.r.t. heater (T2)

2. 250V at 2mA for the e.h.t. multiplier circuit (T2)
 3. 15 to 22V at 500mA for the low voltage line (T3)

 250V at 50mA for the high voltage 300V d.c. line (T1)

5. 6.3V 0.6A for indicator lamps (T1)

The leads from the oscilloscope chassis are taken to the transformer subchassis and terminate in a multiway plug. It is suggested that constructors utilise a 10 way Jones plug and socket, for the inter-connection.

★ components list

Resis	tors		
R1	4·7kΩ	R25	10ΜΩ
R2	2·2kΩ	R26	12kΩ
R3	47kΩ	R27	12kΩ
R4	100Ω	R28	3·3MΩ
R5	8·2kΩ	R29	18kΩ
R6	1kΩ	R30	47kΩ 1W
R7	8 · 2kΩ	R31	120Ω
R8	2·2kΩ	R32	47kΩ 1W
R9	1 · 8kΩ	R33	3·3MΩ
R10	68kΩ	R34	2·2MΩ
R11	390Ω	R35	2·2MΩ
R12	56Ω	R36	10kΩ 1W
R13	82kΩ	R37	10kΩ 1W
R14	470Ω	R38	1-2kΩ 1W
R15	5 · 6kΩ	R39	390Ω 1W
R16	1ΜΩ	R40	1 · 2kΩ 1W
R17	22kΩ	R41	1 · 2kΩ 1W
R18	1·5 M Ω	R42	390kΩ 1W
R19	10kΩ	R43	8·2kΩ
R20	82kΩ	R44	1ΜΩ
R21	8·2kΩ	R45	680kΩ
R22	47Ω	R46	100kΩ
R23	470Ω	R47	100kΩ
R24	680Ω		

Transistors:

Tr1, Tr2, Tr5, Tr8 BC109 Tr3, Tr4, Tr9, Tr10 MJE340 Tr6 ASY26 Tr7 TIS43

Diodes:

D1 1N4148 or 1N914 D4, D5, D6 1N5054 or PL4007 D7, D8 400 p.i.v. 1A D2 12V 1W D3 18V 1W

Transformers:

T1, T2 Primary 200-250V 50Hz Sec. 250V 60mA, 6·3V 2A

T3 Primary 200–250 50Hz Sec. 18V 1 · 25A

Capacitors:

C1 100μF elect 25V 0.47µF 250V 0·1µF C3 0.022µF 0.68µF 0.1µF C6 C7 0.02µF 0.005µF C8 C9 0.001µF C10 0 0005µF C11 100μF elect 25V C12 0.1µF C13 100μF elect 25V C14 100μF elect 25V C15, C16, C17 0 47µF 250V C18, C19, C24 50µF + 50µF + 50µF elect 350V C20, C26 32µF + 32µF elect 350V C21, C22 500µF elect 25V C23, C25 250µF elect 50V C27, C28, C29, C30 0.47µF 1000V Cx see text

Potentiometers:

 $\begin{array}{llll} \text{VR1} & 2M\Omega \ \text{carbon} \\ \text{VR2} & 2\cdot 5k\Omega \ \text{w.w. linear} \\ \text{VR3} & 50k\Omega \ \text{w.w. linear} \\ \text{VR4} & 25k\Omega \ \text{w.w. linear} \\ \text{VR5} & 25k\Omega \ \text{w.w. linear} \\ \text{VR6} & 250k\Omega \ \text{carbon} \\ \text{VR7} & 250k\Omega \ \text{carbon} \\ \text{VR8} & 250k\Omega \ \text{carbon} \\ \text{VR9} & 50k\Omega \ \text{carbon} \\ \text{VR9} & 50k\Omega \ \text{carbon} \\ \end{array}$

CRT: 3BP1

Switches:

S1 2 pole c/o slide S2 1 or 2 pole 6 way rotary. Only 1 pole used S3 On/off mains toggle switch

JK1 Closed circuit p.o. type jack

Miscellaneous:

Veroboard, 0·15in matrix 3½ins. x 17ins. Veropins. 2, 4, 6BA screws, nuts, washers and spacers, panel lamps, coaxial sockets, systoflex, cleats, grommets, chipboard, laminated plastic sheet, 4 instrument handles, 8 rubber feet, aluminium for metalwork.

339

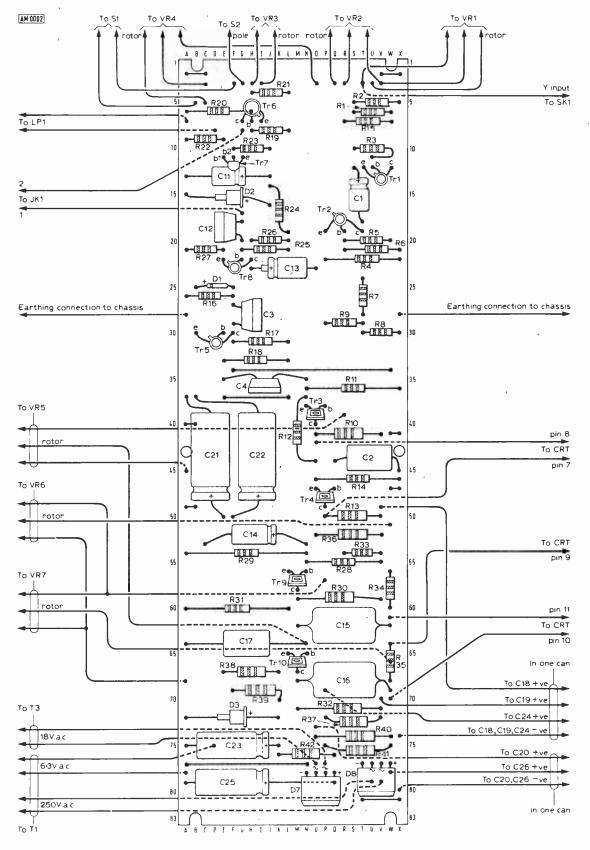


Fig. 2 The complete Veroboard layout for the oscilloscope.

The tube heater winding must withstand 1000V to the chassis. If the insulation breaks down it will put the whole e.h.t. voltage between heater and cathode of the c.r.t. The writer has not had this fault occur on any standard mains transformers that he has used. Well insulated twin flex of the type used for mains wiring is suitable for the c.r.t. heater leads.

Three rectifier diodes are used in the e.h.t. multiplier circuit. Although this type of circuit suffers from poor regulation, in this case, where the current required is only about 1mA it is quite stable.

The capacitors C28, C29 C30 help to maintain good regulation. The diodes are arranged to give a negative output, the positive end of the chain is at earth potential.

The circuit is so arranged that the 700V e.h.t. supply and the 300V line are in series. Therefore the voltage across the c.r.t. from the grid to the final anode, is equal to the sum of the two voltages.

The c.r.t. resistance network acts as a bleeder across the e.h.t. and the smoothing resistor R47 and the network should be fitted before the circuit is tested. It will limit the e.h.t. voltage and prevent possible damage to the smoothing capacitor C27.

The $1M\Omega$ resistor R44 may be included in the circuit if flyback blanking is to be added later. Because of the unusual layout of the e.h.t. multiplier circuit extra care must be taken in layout and wiring

The low voltage line is supplied from transformer T3 which gives an output of between 15 and 22 volts, the bridge rectifier being rated at 400V p.i.v. at 1A and the reservoir and smoothing capacitors at 50V. The smoothing resistor R42 has a value of 390Ω and the zener diode D3 stabilises the line at 18V. The Y amplifier and the timebase circuit have separate smoothing components to reduce inter-action.

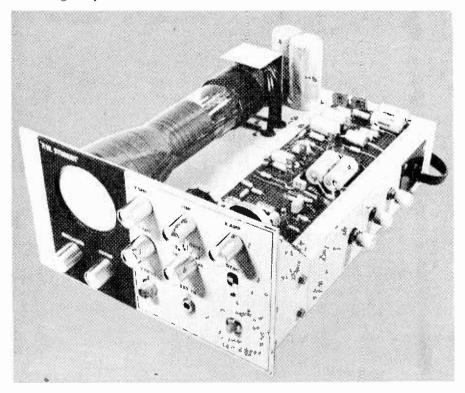
The high voltage 300V d.c. line is supplied by the bridge rectifier D8 which is rated at 400V 1A. The reservoir capacitor C26 is $32\mu F$ and is of the can variety. Each deflection amplifier has its own decoupling components to prevent crosstalk and the astigmatism and X shift potentiometers are in parallel across the 300V d.c. line and act as bleeders.

When the writer commenced his experiments with this oscilloscope, the method used for X and Y shift was similar to that employed in valved instruments, where the deflection plates were coupled to the valve anodes through capacitors and the shift voltages were determined by potentiometers across the positive end of the network. This method has been retained for the X deflection plates, the X amplifier being a.c. coupled throughout.

The Y amplifier is d.c. coupled and the Y shift is determined by the potential at the collectors of Tr3 and Tr4. This means that the signal level at Tr3 base must be matched by that at Tr4 base to keep the trace on the screen. The X shift can be set and needs no further attention, but the Y shift must be adjusted for positive or negative going signals and for changes in amplitude.

The Veroboard Panel

The Veroboard panel is 24 holes (or strips) wide and 83 holes long. This is cut from a standard 17in. x 334in. Veroboard panel. The matrix is 0·15in. When working on the panel it is essential to make all joints with the minimum of solder. Where flexible leads are taken to components on the Veroboard, Veropins or the wire ends of components already attached to the copper strips should be used as anchoring points.



Photograph showing the completed oscilloscope. The three controls on the right hand side of the chassis are X linearity, X shift and astigmatism.

-to be continued-





SHORT WAVE DX by MALCOLM CONNAH

JUDGING from some of the letters and enquiries that I receive it would appear that many of you do not know of the existence of The World Radio and TV Handbook.

The book contains a list, by countries, of all the Broadcasting stations in the world. Each entry shows details of the station schedule including frequencies and language used; other details given are the station address and its QSL policy. The interval signal of the station is given along with the opening announcement which is the easiest way of identifying the station.

The first section of the book has various articles on Broadcasting subjects, which are useful to beginners and experienced DXers alike. The final pages of the book contain a listing, by frequency, of all the stations complete with call-sign and transmitter power.

The book is available through most good bookshops, the price is £3 which is a small price to pay for such a mine of information.

DX News

BANGLADESH: Radio Bangladesh now starts the English service at 1700 instead of 1715 on frequencies of 11650 and 15520kHz.

GABON: Plans are afoot for the installation of several 300kW shortwave transmitters to be used by both ORTF and Radiodiffusion TV Gabonaise. Libreville has been heard on the new frequency of 7130 from 1230 to 1430.

GRENADA: Radio Grenada, formerly Windward Islands Broadcasting Service, has moved from 11930 to 15105kHz for its transmissions to the U.K. at 1945-2130.

MONGOLIA: Radio Ulan Bator now also broadcasts programmes in English and French to Africa at 2000-2030 on 17780 and 17860kHz. The programmes in English are broadcast every Wednesday and Saturday, and in French every Tuesday and Friday. There are also programmes in English daily, except Sunday evening and Monday morning, at 1200-1250 on 17780 and 17860, and at 2200-2230 on 11810 and 11860kHz.

Readers' Logs

The first log this month comes from **Roy Patrick** of Derby who returns to the page after a considerable absence, Welcome back OM. Roy's equipment consists of a Trio 9R59D receiver and an Eddystone 840. Stations logged included:

3240 R. Baghdad, Iraq in Arabic at 2000.

4945 R. Colosal, Colombia at 0700.

4980 Ecos del Torbes, Venezuela at 0605.

4995 R. Brazil Central at 2200.

11650 R. Bangladesh in English at 1700.

11710 RAE, Argentina noted at 2300.

11720 R. Nacional, Brazil, fair at 2100.

11725 R. Ceylon in English 1800-1830.

11790 R. Australia to SE Asia at 1800. 11800 R. Ceylon in Hindi, good at 1830.

Michael Johnson of Hockley in Essex describes his equipment as follows: "I use an ex-radiogram, 6 valve, Ferguson receiver; coupled with the dipole of an old 405 line TV aerial which works better than my 50 foot dipole on 31 metres!" This equipment

enabled him to hear the following stations:

6050 RAI, Italy in English at 1935.

6070 R. Sofia, Bulgaria in English at 1930.

6185 R. Norway in English at 1700.

6580 R. Pyongyang, N. Korea at 1900.

7290 Trans World Radio in English at 1045. 9545 R. Ghana, Accra in English at 2145.

9670 R. Trans-Europe in English at 2000.

0040 Vaine of Vietness at 1015

9840 Voice of Vietnam at 1915.

11880 Voice of Turkey, Ankara noted at 2200.

15185 R. Finland in English at 1800.

15415 R. Kuwait in English at 1645.

Messrs. Wormleighton and Fletcher of Rencomb College, Cirencester have sent in another excellent log using the following equipment: HRO with 8 metre folded dipole; Astrad-Altair with 150 foot longwire, Bush PB63 with 35 foot long-wire.

5990 HCJB, Quito, Ecuador in English at 0825.

6050 RAI, Italy in English at 2030.

7235 R. Australia in English at 1500.

9525 RSA, South Africa noted at 2215.

9710 HCJB, Quito, Ecuador in English at 0715.

9715 R. Nederland, Bonaire, English at 0845.

9805 R. Cairo, U.A.R., in English at 2200.

11745 HCJB, Quito, Ecuador in English at 0730.

11880 Voice of Turkey, Ankara. English at 2200.

11920 RNE, Spain in Spanish at 1300.

11945 R. Voice of the Gospel, Ethiopia at 1930.

11970 RSA, South Africa at 1900, News in English.

15415 R. Kuwait in English at 1730.

21545 R. Ghana, Accra in English at 1500.

21595 R. Canada International noted at 1640.

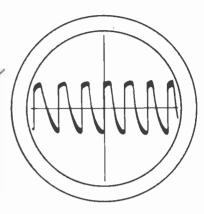
cold really mastered

electronics

... practical ... visual ... exciting!

no previous knowledge no unnecessary theory no "maths"







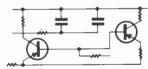
BUILD, SEE AND LEARN

step by step, we take you through all the fundamentals of electronics and show how easily the subject can be mastered. Write for the free brochure now which explains our system.

1/ BUILD AN **OSCILLOSCOPE**

You learn how to build an oscilloscope which remains your property. With it, you will become familiar with all the components used in electronics.

2/ READ, DRAW AND UNDERSTAND CIRCUIT DIAGRAMS



as used currently in the various fields of electronics.

RAPY

3/ CARRY OUT **OVER 40** EXPERIMENTS ON BASIC ELECTRONIC **CIRCUITS & SEE HOW** THEY WORK, including:

valve experiments, transistor experiments amplifiers, oscillators, signal tracer, photo electric circuit, computer circuit, basic radio receiver, electronic switch, simple transmitter, a c experiments, d c experiments, simple counter, time delay circuit, servicing procedures

This new style course will enable anyone to really understand electronics by a modern, practical and visual method-no maths, and a minimum of theory—no previous knowledge required !! will also enable anyone to understand how to test, service and maintain all types of electronic equipment, radio and TV receivers, etc.

or write if you prefer not to cut page

ADDRESS

NAME

To: BRITISH NATIONAL RADIO & ELECTRONICS SCHOOL,

P.O. Box 156, JERSEY. Please send your free brochure, without obligation, to: we do not employ representatives

BLOCK CAPS

PLEASE WL83

free gift also to all our

BENTLEY ACOUSTIC CORPORATION LTD.

7a GLOUCESTER ROAD, LITTLEHAMPTON, SUSSEX All prices include of V.A.T. Telephone 6743

												EF97	٠,
OA2	.33	6BH6	. 43	6N7GT	.40	128H7	.15	50CD6G	2.17	LEA50	.27	EF98 EF183	• !
OB2	. 33		.39	6Q7G	.35		. 23		- 55	EA76	. 88		
OZ4	.44			607GT	.43		. 24			EABC8			3
1A3	. 49		.79	6Q7(M)		128Q7	- 50		.48		.28		
1A7GT		6BR8	. 63			14H7	-48		-40	EAF42	.48		•
1B3GT	. 49		1.25		-55	1487	. 75		.59	EAF801			
1H5GT		6BW6	.72	6SA7M	. 85					EB34			1.0
1L4	. 14		.50	6SC7GT		19AQ5	. 24		L·70		. 20		• '
INSGT		6BZ6	.31		. 33	19G6	.50	150B2	.58	EB91	.10		- 4
1R5	.28					20D4	1.05	807	. 59	EBC41	- 48		!
184	.33	6C4	.28		. 53	20F2	. 65	5702	-80	EBC81	. 29		:
1U4	.44	6C9	20	68K7GT	. 35	20L1	. 98	5763	. 50	EBF80	. 80		1
1U5	. 80		1 00	08K7G1	.23	20P1	.50	7475	.70	EBF83	. 88		. 4
2D21		6CG8A		68Q7GT		20P3	. 76	AC/PEN		EBF89	. 26		
	.44			6U4GT	. 60	20P4	. 89	AC2/PE		EBL21	. 60		5
2GK5	- 55	6CH6	. 55	6 V 6 G	.17	20P5	1.00	DD	. 98	EC86	. 59		:
3A4	.36	6CL6	.43		. 27	25A6G	. 29	AC6PEN			.59		7
3D6	.19	6CM7	-50	6 X 4	. 20	25L6G	.20	AC/TH1		EC92	. 34	EM80	. 1
3Q4	.49	6CU5	.30	6X5GT	. 25	25 Y 5 G	.43	AC/TP	. 98				. 8
3Q5GT		6CW4	. 63		. 58	25Z4G	. 28	AL60	. 78	ECC35	- 95	EM83	. 7
384		6 D E 7	.50	7B7	. 32	25 Z 5	.40	ATP4	. 40	ECC40	. 68	EM84	. 8
4CB6	.55	6DT6A		7H7	. 28	25Z6G	.43	AZ1	. 40	ECC81	.16	EM85	1.0
5CG8	.55		. 55	7R7	. 65	30 A 5	.44	AZ31	. 46	ECC82	.19	EM87	. 4
5T4				7Y4	. 60	30C15	.55	AZ41	. 53	ECC83	.21	EY51	. 8
5U4G	.30		. 59	7Z4_	. 50	30C17	.74	CL33	. 90		. 28	EY81	. 2
5V4G	. 35	6F6G		9BW6	-50	30C18	- 69	CV63	. 53		. 32	EY83	. 5
5Y3GT		6F13		9D7	.78	30F5	.61	CYIC	. 55	ECC86	. 40		. 5
5Z4G	. 34	6F14		10C2	.49	30FL1	.58	CY31	. 29	ECC88	. 85	EY87/6	. 2
5Z4GT	88	6F18	. 45	10DE7	. 50	30FL2	.60	DAF91	. 22	ECC189	. 48	EY88	4
6/30L2	. 55	6F23	. 65	10F1	- 75	30FL12	.67	DAF96	.36	ECC807	00 1	EZ40	4
6A8G	.44	6F24	. 68	10 F9	.45	30FL13	.47	DC90	. 60	ECF80	.27	EZ41	. 4
6AC7			.51	10F18	. 35	30FL13	. 66	DF91	.14	ECF82	.25	EZ80	.1
6AG5	.27	6F28	.60	10LD11	. 53	30L15	.55	DF96	. 34	ECF86	. 64	EZ81	. 2
6AH6		6F32		10P13	.54	30L13	. 65	DH76	. 28	ECF804		GY501	. 7
6AJ5		6GH8A	. 50		L.08	30P4MR	. 65	DK40	. 55		.10	GZ32	. 8
6AK5		6GK5		12A6	.63	30P12	.69	DK92	.50	ECH21	. 63	GZ33	. 7
6AK6		6GU7		12AC6	.40	30P19/	.09	DK96	. 45	ECH35	.50	GZ34	. 4
6AM8A		6H6GT	.15	12 A D 6	.40	30P4	-65	DL92	.26	ECH42	.57	GZ37	. 6
6AN8		6J5GT		12AE6	.48	30PL1	.57	DL96	.38	ECH81	. 25	HABC8	
6 A Q 5		6J6		12AT6	. 23			DM70		ECH83	.38	HL23DI	
6AR5		6J7G		12AU6	. 21	30PL13	. 75	DM71		ECH84	. 34	HL41DI	D.9
		6J7(M)		12AV6	. 28	30PL14	. 75	DY87/6	.22	ECL80	.28	HL42DI	D. 5
6AT6		6JU8A		12BA6	.30	30PL15	.87	DY802	. 29	ECL82	. 28	HN309	1 - 4
6AU6		6K7G	. 12	12BE6	. 30	35.A3	. 48	E80CC 1		ECL83	. 52		
6AV6		6K8G	. 33	12BH7	.27	35115	.70			ECL84	.54	All goods	8 a1
6AW8A	. 54			12J7GT	. 33	351.6GT	. 42		.20	ECL85	.54	Cash or c	hec
6AX4		6L6GT		12K5	. 50	35W4	.23	E88CC		ECL86	.38	item 3p	ext
6B8G	.13			12K7GT		35Z4GT	. 24	E92CC		EF22	. 63	parcel ins	ure
6BA6		6L18		12Q7GT		35Z5GT	.80	E180F		EF40	.49	Business	ho
6BC8			1.38	12SC7		50B5	. 35	E182CC1		EF41	. 58	We do no	ot l
6BE6	. 20	6LD20	.48	128G7	99	50C5	.90	E1148	6.0	EF42	99	limited a	a

121.22	. 04	KT2 .25	PL81A .48			ACIDA	- ZZ	BCATA	.90	OA73	.17
EF85	.25				. 38		-28	BCY12	-55	OA79	.10
EF86	. 27	KT41 .98	PL8228		. 23		.22	BCY33	.22	OA81	.10
EF89	. 23	KT44 1.00	PL83 .80	U10	. 45	AC157	-28	BCY34	-25	OA85	-09
EF91	.17	KT66 .80	PL84 .28	U12/14	.38	AC165	-28	BCY38	.25	OA90	-14
EF92	.28	KT81 2.00	PL504/500	U19	1.73	AC166	-28	BCY39	.28	OA91	
EF97	-55	KTW61 .63	-60		.39	AC168	-42		.42		-10
EF98	. 65	KTW62 .63	PL508 .90		.65			BCZ11		OA95	.10
EF183		KTW63 .50	PM84 .31		.60		.61	BF158	.32	OA200	.10
	. 25	MHLD6 .75					.31	BF159	.28	OA202	.11
EF184	. 27	P61 .40			65	ACY17	28	BF163	.22	OC22	-42
EH90	.34		PY80 .38		.62		.22	BF173	-42	OC23	-42
EL32	-18	PARC80 .32	PY81 .24		.40		-21	BF180	-33	OC24	-42
EL34	- 48	PC86 .44	PY82 .23		. 33	ACY20	.20	BF181	-44	OC25	-42
	1.00	PC88 .44	PY83 .26		. 38	ACY21	·21	BF185	-44	OC28	-66
EL37	.74	PC95 .53	PY88 .81		.76	ACT22	.17	BF194	.17	OC29	-69
EL41	. 53	PC97 .36	PY800 .81		. 55	ACY28	.20	BFY50	-25	OC35	-35
EL81	.50	PC900 .29	PY801 .31	V P23	. 40	AD140	-40	BFY51	.21	OC36	-47
EL83	.38	PCC84 .27	PZ30 .48	VP41	.38	AD149	-55	BFY52	-22	OC44	-11
EL84	.21	PCC85 .24	QQV03/10	VT61A	. 35	AD161	.50	BY100	-20		-12
EL85	.40	PCC88 .89	1.20		.44	AD162	-50		20	OC46	
EL86	.38	PCC89 .42	QS75/20 .63		.60	ADT140		BY105			.17
EL91	.23	PCC189 .46	Q895/10 .49	VU120/				BY114	20	OC70	-14
		PCF80 .26		V 0 1202		AF106	∙55	BY126	.17	OC71	·12
EL95	. 32	PCF82 .30			. 35	AF114	28	BY127	.20	OC72	.12
ELL80	.75		R19 .28	W107	. 50	AF115	.17	BYZ10	-28	OC74	-25
EM80	. 37	PCF84 .40	8P61 .75	W729	. 60	AF117	-21	BYZ11	-28	OC75	-12
EM81	. 37	PCF86 .44	TH233 .98	X 65	.50	AF121	.33	BYZ12	-28	OC76	-17
EM83	. 75	PCF200 .67	TP2620 .98	X66	- 50	AF124	28	BYZ13	-28	OC77	-80
EM84	.81	PCF801 .28	UABC80.80	Transist	078	AF125	-19	CG12E	-22	OC78	-17
EM85	1.00	PCF802 .37	UAF42 .49	& Diode	3	AF126	-20	FSY11A		OC78D	-17
EM87	.49	PCF806 .55	UBC41 .45	2N404	-20	AF139	-72	FSY41A		OC81	-12
EY51	. 85	PCH200 .62	UBC81 .40	2N966	-58	AF178	-75	GD9	-22	OC81D	12
EY81	.35	PCL82 .29	UBF80 .33	2N1756	-55	AF180	-53	GET113		OC82	12
EY83	.54	PCL83 .54	UBF89 .33	2N2147	-94	AF186	-61	GET118		OC82D	12
EY84	.50	PCL84 .32	UBL21 .55	2N2297	-25	AF239					
EY87/6	.27	PCL805/85	UC92 .35	2N2369	24		-42	GET119		OC83	.53
EY88	.40	.37		2N2813		BA102	.50	GET573	42	OC84	-26
					-43	BA115	.15	GET587	.47	OC123	.25
EZ40	.40		UCC85 .33	2N3053	36	BA116	28	GET873	17	OC139	-25
EZ41	.42	PD500 1.44	UCF80 .31	2N3121		BA129	.14	GET887	-25	OC169	-25
EZ80	.19	PEN4DD	UCH21 .60	2N3703	.21	BA130	·11	GET897	.25	OC172	.39
EZ81	. 20	1.88	UCH42 .57	2N3709	-22	BA153	.17	GET898	-25	OC200	-24
GY501	.75	PEN45 .40	UCH81 .29	2N3988	-55	BC107	.14	M1	.17	OC201	.42
GZ32	. 29	PEN45DD	UCL82 .80	28323	-55		-14	OAS	-31	OC203	-33
GZ33	.70	.75	UCL83 .54	AA119	-17	BC113	-28	OA9	.14	OC204	-33
G Z 34	. 47	PEN46 .20	UF41 .50	AA120	-17	BC115	.17	OA10	-47	OC205	47
GZ37	.67	PEN453DD	UF42 .60	AA129	.17	BC116	28	OA47	·11	ORP12	-58
HABC80	.44	. 98	UF80 .85	AAZ13	20	MATCHE					
HL23DI		PENDD-	UF85 .34	AC107	17						FO
RL41DI		4020 .88	UF86 .63	AC113	28	LP15 (AC					.ogb
HL42DI		PFL200 .50	UF89 .27	AC126	.14	per pack.					
H N309 1				AC127	-19	1-0C44	& 2-	_OC45, ·	47p.	1-OC827	D. &
** ** ** ** *	. 20		ONAT 194		10	2-0082	·53p.	Bet of 3-	-OC8	33 ·72p.	

.46 UL84

.28 AC128 .83 AC132

are unused, boxed, and subject to the standard 90 day guarantee. Terms of business— que with order only. Despatch charge 9p per order up to three items, then each additional tra. Orders over £5:00 post/packing free. Same day despatch by first class mail. Any red against damage in transit for only 3p extra per order. Terms of business free on request, ours Mon.-Fri. 9-5:30 p.m. handle seconds nor rejects, which are often described as "New and Tested" but have a l unreliable life. No enquiries answered unless S.A.E. is enclosed for reply.

Electronic Ignition Kit Kil comprises EVERYTHING Case, cables, coil connectors. Silicon grease 8 page instruction leaflet

Fascinating to build. Fantastic improvement to your car's performance Complete Capacitive Discharge ignition system, fully proven, components fully guaranteed Printed circuit design All metalwork drilled ready. Fitted to car in 15 minutes when built

 Sustained peak performance.
 Up to 20% fuel saving. Instant all-weather starting. Faster acceleration, higher top speed. • Suitable for all engines up to 8 cyls. • Longer spark plug life. . Longer battery life. . Contact breaker burn eliminated. • Purer exhaust gas emission.

A new development from the manufacturers of Gunton ignition. Price £9.35 inc VAT and postage (12 volt only State Pos or Neg earth). Ready built unit also available £11.55 inc V.A.T. and postage GUARANTEED 5 YEARS

ORDER NOW-send P.O./Cheque direct to: ELECTRONICS DESIGN ASSOCIATES, Dept. PW8 82 Bath St., Walsall WS1 3DE. Phone: 33652

BROADWAY ELECTRONICS

92 MITCHAM ROAD, TOOTING BROADWAY, LONDON S.W.17 01-672 3984

CARTRIDGES—Stereo Sonotone 9TA H/C Diamond £2:47, Ronette \$105 Medium Output £1:40, \$106 High Output £1:40, Acos GP93/I Sapphire £1:95, GP94/I Sapphire £1:95, Japanese equivalent to B.S.R. TCBs £1:80.

CARTRIDGES—Mono GP91 Stereo Compatible £1-29, B.S.R. TC8H Jap. equivalent £1-29,

HI-FI STEREO HEADPHONES Padded ear cushions seal out room noise. Perfect coupling between reproducer and ears assure full response impedance 8 ohms, frequency range 20-20,000 Hg 61: cord and standard stereo plug. Only £3:57.





.75 HVR2 .58 PL36 .54 HVR2A .58 PL81

STEREO HEADPHONE JUNCTION BOX Simple unit connects direct to amplifier and speakers to give attenuated headphone output has 3 position switch to give headphones only, speakers only, speakers and headphones. Only £1-74.

VYNAIR Widths from 50 to 54in., 95p yd. off roll. ½ yard 57p. Send 5p stamps for samples. All prices inclusive of post and packing.

MASSIVE CLEARANCE BARGAINS

Bargain component parcels contain Resistors, Capacitors, Switches, Potentiometers, Knobs, IF's, Tag Strips, Drive Drums, Transistor Panels etc., etc. Save yourself £s on these well selected parcels 61bs net weight £1.00, p. p. 40p.

Assorted Electrolytic Capacitors. 6lbs net weight £1:00, p. p. 40p. Brand new Wire-wound Resistors. Good Selection. 100 for £1

Mullard Ferrice Bar Magnets 18" x 16" x 16", 100 for £1.25, p. p. 16p. Assorted Computer Panels. These panels are exceptionally good value and contain a minimum of 75 transistors, stacks of diodes plus Trim Pots, Polyester Capacitors, Resistors and include a few I.C.s. 10 panels for £1 · 00, p. p. 25p.

Mullard Ferrite Cores. LA3 up to 500kHz. 50p. LA4 up to 30kHz 75p. LA2100 up to 200kHz 50p.

Please include 10% V.A.T. to total cost of goods.

MAIL ORDER ONLY XEROZA RADIO

I, EAST STREET, BISHOPS TAWTON, DEVON



MEDIUM WAVE BROADCASTS by CHARLES MOLLOY

JOHN THORBURN (Glasgow) has used his Vasco Gold Star radio to hear CHER Sydney, Nova Scotia on 950kHz; WBT Charlotte, North Carolina on 1110kHz; Radio Bermuda 1340kHz; Voice of America Kavalla, Greece 791kHz; Radio Zagreb, Yugoslavia 1133kHz. John also logged the BBC local radio outlets at Blackburn on 850kHz. Sheffield 1034kHz; Leeds 1106kHz; Newcastle 1457kHz; Stoke 1502kHz; Bristol 1546kHz and Manx Radio, Isle of Man on 1594kHz.

Dominic Glynn (East Grinstead) has a Philips transistor receiver and a 100ft. longwire antenna. He reports hearing programmes in English from Radio Sweden 1178kHz at 2300hrs GMT; Trans World Radio Montecarlo 1466kHz at 2230hrs and Radio Berlin International 1511kHz at 1815hrs. Dominic has also logged Radio Tirana, Albania 1394kHz at 2230hrs and BBC Radio Stoke 1502kHz at 1045hrs.

From the BBC comes news that Radio Solent is now broadcasting on two frequencies, 998kHz and 1594kHz. The new outlet on 1594kHz brings the

service to Bournemouth, Poole and Wimborne Minster while the existing service on 998kHz for the Southampton and Portsmouth areas is unaffected

Medium wave DXers who go abroad for their holidays have the opportunity to try the band from a new location. In Spain there are many low power local stations, some of which would be rarities if heard in this country and even a pocket sized transistor portable will pull them in. For those interested in keeping in touch with events at home there is the BBC Radio 2 transmission on 200kHz (1500m) on the long waves which can be heard over a large part of Europe after dark. Visitors to Majorca can hear Radio Mallorca (EAJ13) on 800kHz; Radio Popular de Mallorca (EAK18) on 1268kHz; Radio Juventud de Palma Mallorca (EFJ45) on 1385kHz. On the Costa Brava there are Radio Barcelona (EAJ1) on 827kHz: Radio Juventud Barcelona (EFJ15) on 1025kHz; Radio*Espana de Barcelona (EAJ15) on 1124kHz; Radio Sabadell (EAJ20) on 1475kHz; Radio Gerona (EAJ38) on 1520kHz, At Benidorm there are Radio Popular de Alicante (EAK31) on 1394kHz; Radio Gandia (EAJ23) on 1457kHz; Radio Alicante (EAJ31) on 1520kHz and La Voz de Alicante (EFE8) on 1570kHz. Those going to the Costa del Sol have the opportunity to hear Radio Gibralter on 1484kHz which broadcasts in English and Spanish; Radio Ceuta (EAJ46) on 1106kHz which is located in a Spanish enclave in Morocco; Radio Juventud de Malaga (EFJ56) on 1133kHz; Radio Popular de Malaga (EAK11) on 1430kHz and Radio Costa del Sol (ECS15) on 1570kHz.

VHF/FM by SIMON DAVID

AVE you been suffering from "Sporadic—E" lately? If so we would like to hear from you. Sporadic—E is the name given to a disturbance in the "E" region of the ionosphere. It is most likely to occur in the summer months (U.K.) and gives rise to some odd goings-on on the v.h.f. bands up to about 100MHz.

Although almost impossible to predict accurately, such manifestations are in long distance reception, interference on television and radio and interaction between signals from one source and another, often several hundreds or even thousands of miles apart. Stations operating on close frequency allocations are susceptible and in particular those on v.h.f. mobile radio systems often fall victim.

Greetings in particular this month to listeners who can now pick up local radio on their portables and in cars in Leeds, Huddersfield, Barnsley, Dewsbury, Wakefield, Castleford, parts of Halifax, Bradford and Harrogate, Barnsley, Doncaster, Worksop, East Retford and Rotherham. In case you are not aware, you should now be able to drive to the lilt of BBC Radio Leeds (92.4MHz) or Radio Sheffield (97.4MHz).

The old Meanwood Park transmitter on 94.6MHz and Boston Park, Rotherham, transmitter on 95.05MHz have closed and all transmissions from these two stations now come from Holme Moss near Huddersfield. Sheffield listeners can still tune in on 88.6MHz, but all others tuning to 97.4MHz may need to turn their aerial round so that it is directed at Holme Moss (also home of BBC television). Aerials that are already rigged on the roof or chimney outside and directed at Holme Moss for Radios 2, 3 and 4 are likely to be suitable for the local radio stations also.

Some transmitters use slant polarisation to assist where vertical receiver aerials are used (such as on cars). One such is used for Radio Derby which is transmitted from Sutton Coldfield, Birmingham, on 96·5MHz. If you are not sure on the polarisation for your area you can ask at any local BBC radio offices or write to the Engineering Information Dept., BBC, Broadcasting House, London W1A 1AA; please enclose a stamped addressed envelope.

Now for some quick quotes from some of the letters received: W. F. Kitching in Shropshire has a Grundig "Yacht Boy" 210 with telescopic aerial and has picked up Radio Telefis Eirean 95.3MHz. He looks forward to police inactivity so that he can hear Radio Na Gaeltachta, Eire, on 97.0MHz.

On the other side of the Irish Sea, Des Walsh in Tipperary uses a Leak Troughline-3 and a BASF CC9300 Radio recorder and points a J-Beam FM6S and FM4S at South Wales and South West England. He has bagged Wenvoe, Haverfordwest, Blaen-plwyf, North Hessary Tor, Redruth and Radio Bristol. Turning north-east he can pick up Belfast and Radio Merseyside. Here's the crunch! With the help of tropospherics he can hear ORTF from N. W. France.

D.J. is a 14-year-old from Egham, Surrey, and is one of many who has heard the London Independent Radio transmissions on Radio Classic 94·4MHz. Hope his parents won't get annoyed when they find out that he was listening to "an extra programme" at 01·05 Easter Sunday morning. Was this a "Jolly Roger" operation?

Anybody heard broadcasts from the North Sea Radio Telephone Company? **Graham Wilson** has in Bordon Hampshire and wonders who was responsible. The transmission was heard on much of the 88-108MHz band (but was strongest at 91MHz) on March 5th.





SHORT WAVES by DAVID GIBSON, G3JDG

T'S getting hotter in more senses than one. The summer season brings great hotness with it and it is known in this scribe's shack as the Equinox of the molten ear'ole—a disease common to all wearers of headphones during periods of great warmth.

The other sense is a rumour to ban a.m. from the Amateur bands, notably the l.f. regions of 1.8 and 3.5MHz. What do readers think about this? Shall we settle for s.s.b. and c.w. only?

A staggering piece of news for professional callsign changers. The latest act in the callsign circus is to change it just for a particular contest. The result is CR6 becoming CQ6 (a really clever choice—CQ) for the WPX contest. A little bird also tells me that MP4TEE is now A6XF.

Best piece of news on the callsign front, and one for some genuine rejoicing in Amateur circles, is that the People's Republic of China will probably be allowing/issuing callsigns in the not too distant future. It'll make the bands even more crowded but



a big welcome to the Chinese Amateurs as and when they appear on the bands.

In the April issue, mention was made of photographs showing readers' stations. First person to take up the gauntlett is **Graham Bleakley** who is 15 and lives in Cumbernauld New Town, Scotland. The gear shown is a "trusty old CR100". Graham is the one on the left with all the hair, and the CR100 is on the right, with all the knobs. No mention of what the tape recorder is for but Graham does say he reckons to become a G8 with a bit of help from the May 1974 RAE. No word of the antenna, but whatever it is, it pokes out of the windows of 82 Ash Road.

Info from G3RPJ that the Stratford on Avon Radio Club will have rigs working on $1.8 \mathrm{MHz}$, $14 \mathrm{MHz}$ and $144 \mathrm{MHz}$ (a.m. f.m. and r.t.t.y.) at the Town and Country Festival on August 25/26/27. Place is the Royal Showground, Stoneleigh, Kenilworth, Warwickshire. The stations will stay on the air in the evenings after the show.

Karl Muller (Mbabane, Swaziland) has a JR-500SE 7MHz inverted V and a lot of patience. Rewards for same has given him 148 countries heard on 7MHz. On 7MHz c.w. Karl bagged; CE3ED, CE5HP, CX1BBL, CX9BT, FC9VN, FG7TG, FH8CY, KØALL, KH6AQ, KH6RS, SV1DO, TI2PZ, VP9GR, WN3TGR, WNØHYN, ZP5AL, 4K1A, 9F3USA, 9L1GC. On s.s.b., the latest log reads; CT2AJ, KC6SK, MP4BJP, OY7BD, WB6VGI/VQ9, ZC4EJ, ZD9GC, 4W1AF, 6W8DY.

Before going on with logs, I see that the May 1973 issue of Radio Communication, the journal of the RSGB, publishes a full list of intruder stations complete with all sorts of information; frequency, date, location, source etc. This seems a useful coincidence in view of previous remarks made in this column. Single copies of the journal are available to nonmembers at 30p plus postage.

J. Wright (Loughborough) homebrew converter, 960 receiver, 3-element beam at 30ft. sends in a log for 70MHz (Yippee). Stations bagged include: G3CDG/P, G3HCW/P, G3HVI, G3LVP/P, G3NQV/P, G3ONP, G3SFT/P, G3TOM/P, G3VER/P, G3VPF/P, G3VPK, G3WMR/P, G3ZVK, G4ALE/P, G4BEZ/P, G4BLQ, G4BPY, G4BZO, G5DF, GD2HDZ, GW3MHR, GW30BD/P, GW3WOS, GW4ABR/P, GW4BGG/P.

P. Newman (Thame) sends in a "Heard in the 144MHz and 70cm Contest" log. Pickings on 70cm; GBDOR/P, G88GHR/P, G3NNG/P, G5DF, G8FBG/P. Two meter goodies were; G8DWC/P, G2DRT/A, G8CIB/P, G8GSX/P, G8GTD, G8FBG/P, G8FTL, G8FZL/P, G3FZL/P, G3KIN/P, G3OSS, G3NNG/P, GW4ABR/P.

Contests for the month of July include: July 7/8, v.h.f./u.h.f. Jubilee contest (R.S.G.B.); 14/15, s.s.b. field day; 15, DF qualifying round at Coventry; 22, 432MHz portables contest; August 4/5, YO DX Phone and c.w. contest; August 5, DF qualifying round (Salde).

BROADCAST BANDS

Short Wave Reports by 15th of the month to Malcolm Connah, 59 Windrush, Highworth, Swindon, Wiltshire, SN6 7DT.

Medium Waves Logs to Charles Molloy, 132 Segars Lane, Southport, PR8 3JG. VHF/FM Reports to Simon David, c/o Practical Wireless, Fleetway House, Farringdon Street, London, EC4A 4AD.

AMATEUR BANDS Short Wave/VHF

Logs in alphabetical order please by 15th of the month to David Gibson, G3JDG, 12 Cross Way, Harpenden, Hertfordshire.

ZN414

£1.25 POST

The I.C. Radio in a TO18 can. Supplied complete with data sheet No. 10 which contains specification, circuit and details and prices of components such as ferrite rods, compression trimmers etc.

I.C. Sockets

Dual-in-line or Zig-Zag (Quil), 14 and 16 pin Our Price 1p per pin

Slider Pate

-	1461 7 0	. •
Single	Dual	log
10K	10 + 10K	or
25 K	25 + 25K	lin
50K	50 + 50K	
100K	100 + 100K	Knobs
30p	50p	10p.

NEW LISTS	
LOUDSPEAKERS	No. 4
COILS AND INDUCTORS	No. 5
TRANSFORMERS	No. 6
(postage 5p)	

Diodes & Rectifiers

BA156 15p BA243 56p OA47 10p OA79 9p OA90 7p OA90 7p OA200 10p BY100 15p BY126 15p	BY176 £1 50 BY182 £1:50 BY250 23p IN4001 6p IN4002 7p IN4003 8p IN4004 8p IN4005 10p IN4006 12p
BY127 15p	IN4007 15p
	BA243 56p OA47 10p OA79 9p OA90 7p OA91 7p OA200 10p BY100 15p BY126 15p



operation. OUR PRICE £6-25 oder £4-97

VDR's & Thermistors

	A15B 75p	E298 ED/A258	10p	VA1005	15p
И	CZ1 15p	E298 ZZ/06	10p	VA1026	13p
Į	CZ4 13p			VA1033	10 p
ı	CZ13A13p			VA1034	10 p
П	LCZ19 13p			VA1039	
ı	GL16£1 00			VA1040	10 p
İ	GL23£1-00			V A1053	
İ	R53 £1-32 R54 £1-46			VA10555	
ı	R54 £1 46			VA1077	13p

Resistors

3 watt 5% Carbon Film — Iow noise Hi-Stabs
All £24 values 1p each plus p. & p. 7p for up to 50 Resistors and a further 2p for each additional 50. Deduct 331% for 100 of one type or 25% for mixed orders over £1 in value.

1 W 10% Carbon Composition 3p each 2 W 10% Carbon Composition 5p each 2,1 W 5% Wire wound 9p each 5 W Wire wound 9p each 10 W Wire wound 10 peach plus p & p. 7 p for up to 25 resistors plus 1 p plus p. & p. 7p for up to 25 resistors plus 1p for each additional 25



Potentiometers



				٠
TOR TOG	TOK BITTING	1033 3441(CI)	400	
10K log	10K antilog	less switch	40p	
log only			52p	
	switch 10K	, 100K & 1M		
		4000 0 444	40p	
dual less	ewitch		40p	
log or lin	with switch		24p	
		(& 1KΩ lin)	12p	
25ΚΩ	250KΩ	2ΜΩ		
10ΚΩ	100 K Ω	1 M Ω		
5ΚΩ	50K Ω	500K Ω		

Eliminators



6 volt or 50mA	£1.50
9 volt or 50mA	£1.50
6 • 6 volt, 50mA	£2.50
9 + 9 volt, 50mA	£2.50
7½ volt for cassette recorders	£2.00
6, 7½, or 9 volt	£3.00
3, 4½, 6, 7½, 9, 12 @ 500mA (illus.)	£3.99
Car Battery Converter fully stabili	sed to
provide 6, 7½ or 9 volts	£4.99
(p. & p. 15p on all types)	

Presets

Vertical or Horizontal 0-1 watt 5p 0-25° 100 1K Ω 10K Ω 250 2-5K Ω 25K Ω 500 5K Ω 50K Ω 0·25 watt 7p 10Κ Ω 100Κ Ω 25Κ Ω 250Κ Ω 50Κ Ω 500Κ Ω

Capacitors

-01μF 18v	5p	0·1µF 30	
022µF 18v	5p	0 22µF 6	/ 5p
047µF 12v	5p	0·47µF 31	/ 5p
ceramic p	ate	30 V	
1000pf	10p	4700pf	10p
2200pf	10p	10,000pf	10p
Ceramic -	plate	63V (C333	1)
1-8pf	8-2pf	33pf	120pf
2-2pf	10pf	39pf	150pt
3:3pf	12pf	47pf	180pf
3-9pf	15pf	56pf	220pt
4:7pf	18pf	68pf	270pf
5-6pf	22pf	82pf	330pf
6-8pf	27pf	100pf	
all 5p. each	1		
mular film		1001/	

-0	5μF 3p
polystyrene	160 V
10pf to 10,000pf in n	nultiples of 10, 15, 22, 33,

-068uF

1000pf 2000pf

47 & 68.			3р	each	
metallised p	olyester	25	0V (C280))	
01μF 3p	068µF	31p	47µF	8p	
-015µF 3p	1 µF	4p	68uF	11p	
022μF 3p	15µF	4p	1 µF	13p	
033µF 3p	22µF	5p	1-5µF	20p	
047μF 3p	33µF	6½p	2-2µF	24p	
metallised a	polvester	4	00V (C2	81)	
01 µF 41p	047µF	6p	-22µF	10p	
015µF 43p	-068µF	6p	33µF	14p	
022µF 43p	-1µF	7p	47uF	15p	
033µF 51p	-15µF	8p			

silvered mica 1% (>5	0pf) 500V	
2 · 2pf—820pf 7p	4 · 7nF5600pf	
1nF—2·2nf 9p	6800pf 01μF	29p
2 7nF-3 6nF 16p		
mixed dielectric	600V	

022μF 7p 033μF 7p 068μF 8p

electronics

Our Price £3-99 Less quantity dis-

PRICES DO NOT INCLUDE V.A.T.

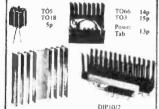
MAIL ORDERS: Where no p. & p. charge is shown, a minimum of 7p applies, p. & p. on overseas orders us charged at cost ADDRESS TO: Component Dept. 56, Fortis Green Road, London N10 3HN Telephone 01-883 3705

-1μF -22μF -47μF

HI-K 750V 1000pf 1500pf

Ceramic 12KV.d.c.

Heat Sinks



DIP10/2 for \$1.403D 15p

Veroboard

		perciaa	* 141111
	0.1"	0.15"	0.15
2½" x 1" 2½" x 3¾" 2½" x 5" 3¾" x 3¾" 3¾" x 5" 17" x 2½"	6p 20p 24p 24p 27p 67p	6p 16p (9) 21p (7) 21p (8) 27p (10) 50p	10p 12p 17p 37p
17" x 3%" 17" x 5"	90p	70p	52p 75p
Spot-face Cutt- Pin Insertion T Terminal Pins	ool 47p	er pack of 3	6

NEW LISTS BOXES, CHASSIS, etc. No. 7 TRANSISTORS, I.C.'s, etc. (soon) (postage 5p)

Aluminium Boxes

No.	L.	W.	D.	Price	р. & р.
(7)	2%"	x 5%	" x 1½"	35p	8p
(8)	4"	x 4"	x 1½"	35p	8p
(9)	4"	x 2¾'	' x 1½"	35p	8p
(10)	4"	x 54'	" x 1½"	40p	8p
11	4"	x 21/2"	' x 2''	35p	8p
12	3"	х 2"	x i"	32p	9p
13	6"	x 4"	x 2"	50p	q01
[4	7"	x 5"	x 2½"	58p	12p
15	8"	x 6"	к 3"	75p	18p
16	10,,	x 7"	x 3"	85p	20p

Transistors & Integrated Circuits

AC107	25 p	BC147	10p	BF196	15p	OC81	19p	2N1304	22p	2N5172	15p
A C126	17p	BC148	10p	BF197	15p	OC140	20 p	2N1711	25p	LO05TI	€1 - 50
A C127	15p	BC149	10p	BF272	53p	OC170	23p	2N1893	30p	LO36TI	£1-50
A C128	15p	BC157	12p	BFY50	24p	OC171	30p	2 N2926	all 10p	LO37TI	£1-50
A C176	15 p	BC158	10p	BFY51	21 p	ZTX107	15p	2N3053	23p	M C1303L	£1 75
A C187	25 p	BC159	12p	BRY39	36p	ZTX108	12p	2 N 3 0 5 4	50p	M C1330	80p
A C187K	25p	BC159	15p	BSX21	26p	ZTX109	15p	2N3055	49p	MC1350	75p
AC188	25 p	BC268	15p	B\$Y95A	14p	ZTX300	12p	2N3702	12p	MC1351	£1-00
AC188K	25 p	BD115	67p	BU105/02	£1.75	ZTX301	15p	2N3703	12p	MC1352	£1 00
ACY20	20 p	BO131	70 p	MJE340	67p	ZTX302	20p	2N3704	10p	MF C4000	
AD140	40p	BD132	70p	MPF192	40 p	ZTX303	20 p	2N3705	10p	MFC4010.	A 55p
AD149	40p	BD131/28	и, P.	MPF103	37 p	ZTX304	25 p	2N3706	16p	LM380	£1 -45
AD161)			149p	MPF104	37 p	ZTX341	20 p	2N3707	15p	PA234	£1-99
AD162	60p	BF160	21 p	MPF105	40p	Z TX500	15p	2N3708	12p	SL403D	£1 50
AF114	18p	BF167	20 p	MPF106	45p	ZT x 501	15p	2 N3709	12p	TAD100	£1:50
AF115	18p	BF173	20p	O C 28	40p	ZTX502	20p	2N3710	12p	FILTER	£1.50
AF116	18p	BF180	25 p	O C 35	40p	ZTX503	17p	2N3711	12p	FE 111/2	
AF117	19p	BF181	30 p	OC44	15p	ZTX504	50 p	2N3819	35p	μΑ709C	34p
AF139	28 p	BF184	25p	OC45	15p	ZTX531	25 p	2N3903	15p	μ Α710	45p
BC107	10p	BF185	25p	OC71						μ Α723C	95p
					11p	2N697	18p	2N3904	17p	μΑ741C	47p
BC108	10p	BF194	15p	OC72	17p	2N706	12 p	2N3905	21 p	μ Α748 C	60p
BC109	10p	BF195	15p	OC76	15p	2N 708	15 p	2N3906	12p		



Complete Kit (inc. Teak Case) £28.50 P&P

20 Watts per channel integrated stereo amplifier developed by engineers of 'Texas Instruments Ltd. 20 wats per channel integrated steero amplitter developed by engineers of "Lexas Instruments Ltd.

This designer approved kit, has a state-of-the-art specification, including distortion of only 0.09% at 20 Wats into 8 ohms and a bandwidth of 5 = 35.000 at = 3db. The semiconductor compliment of this superb kit includes no less than 6 integrated circuits. 10 Silicon transitors, 4 rectifiers and 2 zeners. Controls include - bass; treble; volume; balance; on/off; 'on' indicator, headphone sockets; scratch filter; rumble filter; inputs for magnetic phono, tuner; aux or tape; tape nead etc., input, selector; monofstero switch.

The construction of this kit was featured in 'Practical Wireless' May - Aug. 1972.

12KV. 10pf 15pf 22pf 68pf 82pf 100pf 120pf 140pf 150pf 180pf 8KV.d.c. 200pf 9p 220pf 9p 250pf 9p 270pf 9p 300pf 9p 750V DISC 470pf 5p 1000pf 5p 1500pf 2000pf 3000pf 5000pf 10,000pf feed-through 5p 5p 5p 5p 5000pf 10,000pf 1000pf

8KV.d.c

Mullard B Siemens Electrolytics VOLTAGE 63 1.5 2.2 3.3 4.7 6.8 10 15 22 33 47 68 100 150 220 330 6p 6p 6p 6p

	10	_	_	-	_	op	_	6 D	
	15		-	-	6 p	_	8р	60	
	22	_	_	6р	_	6p	_	6p	
	33	_	6 p	_	6p	_	60	_	
	47	6р	_	6р	_	6р	бр	6р	
	68		6p	_	6p	_	_	10p	
	100	6p	_	6 p		6p	6р	12p	
	150	_	6p	-	6p	8p	10p	12p	
	220	6p	_	6p	6p	10p	12p	18p	
-	330	6p		6р	10p	***	_	21p.	
ч	470	_	6p	10p	-	12p	18p	40p	
	680		10p	-	12p	18p	21p		
	1000	10p	-	12p	18p	21p	40p	60p	
- 1	1500		12p	18 p	21p	_		_	
	2200	_	18p	21p	40p	45p	56p	93p	
	3300	_	21p	_	-	-	_	_	
ı	4700	21p	-	_	60p	75p	93p	_	
Į	CAP			1	OLT/	AGE			
1	μF				18	25	40	64	
	500						33p	40p	
- 1	1250						50p	_	
1	1600						_	75p	
	2000				40p	50p	-	_	
-1	2500				_	_	75p	93p	
ц	3200				50p	_	_	-	
1	4000					75p	93p	-	
1	6400				75p	93p			
1		Quantity Price	ee on	nonlic	etlan				

Hi~Volt Electrolytics

ı	1: 2: 4. 8µF 450V	14p	32µF 450V	20p
ì	16µF 450V	15p	50 µF 350V	20p
ł	8 - 8 pF; 450 V.W	18p	32 + 32 µF, 350 V.W	250
ŀ	8 16µF; 450 V.W	20p	32 32 µF; 450 V, W	43 ₀
ı	16 + 16 µF: 450 V W	25p	50 - 50 uF - 350 V W	350

Why pay more-look at our Fantastic Bargain Offer!

PENTHOUSE

A COMPLETE AUDIO SYSTEM

An all "White" Hi-Fi Stereo System to blend with modern furnishings. Solid state, fully transistorised tuner/amplifier with Stereo Multiplex Decoder. 4 wavebands Long/Medium/Short/YHF. 8 watts per channel (music power) output. The latest BSR C129 4 speed Mono/Stereo record changer. Two white matching bookshelf speaker units.



Credit terms £5.00 deposit plus £2.00 p. & p. followed by 12 payments of £4.80. Total Credit Terms £62.60 SEND £7.00 TODAY.

BENSON

BENSON MW/FM/MPX TEREO 8 TRACK

AM/FM radio with decoder for stereo radio with integral 8 track cartridge player. Portable for operation from internal batteries or A.C. mains or 12V Car/Boat cigar lighter socket. Unit divides

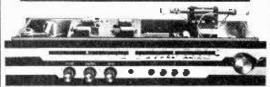


UNIT DIVIDES TO GIVE 2 SEPARATE STEREO SPEAKERS

into two for stereo reproduction

Our price £39.95. Credit terms £5.00 deposit plus 12 monthly payments of £3.40 (Total £45.80), p. and p. £1.00. Send £6 Today!

THE AVON AUDIO S



The uncabineted system is ideal as an economical replacement for an outdated chassis. The Stereo Tuner Amplifier with medium, long and short wavebands provides Worldwide coverage, even the weakest continental stations can be received with superb clarity. Push button band selection, 10 watts total output. Frequency response 25-18000 Hz BSR 4 SPEED STEREO/MONO

RECORD CHANGER plays all types or 7th., 10th., and 12th. Mono of Stereo records. Manual r automatic play.

TWIN ELLIPTICAL SPEAKER. These low impedance, perma-nent magnet units have been specially selected to provide the fullest range of audio reproduction



EASY TO INSTALL-NO TECHNICAL KNOW-LEDGE REQUIRED. List Price 45-74, OUR PRICE 435-00. Credit Terms £3-50 deposit plus £2 Post & Packles (Total Credit Terms £4-70) (Total Credit Terms £40-70) Don't miss this bargain,

SEND £5-50 TODAY

ALL EQUIPMENT COVERED BY 12 MONTHS FULL GUARANTEE

CALLERS WELCOME Please send me free details of your range Post coupon NOW for Name Address....

FREE leaflets

LEWIS radio 100. Chase Side London N Tel: 01 - 886 3733/9666 PW 8/73 100, Chase Side London N.14

FIRST TIME EVER at £42.50

Solartron CD711S.2
Double Beam
Oscilloscope d.c.—9MHz; 3mVcm; trigger delay; crystal call/
brator; 4in flat faced tube. In
good working condition. Carriage
£1-50.

SOLARTRON CT 315 (D300 range)
DC to 6 mes. 3" tube. TB up to 0.75 micro secs per centimeter. Built in calibrator. Size 8\frac{1}{2}" x 11" x 20". Price £22.50. Carr. £1.50

MARCONI VALVE

WARCONI VALVE VOLTMETER type TF 958 (CT298) DC to 100 mcs. 5" mirror backed meter complete with probe, leads etc. £12:50. Carr. £1:25.

GRATICULES. 12cm x 14cm in High Quality plastic. 30p ea. P. & P. 5p. MODERN TELEPHONES type 706. Two tone grey. £3-75 ea. The same but black, £2-75 ea. P. & P. 25p ea. Also TOP-2 X YELLOW £4-50 ea. P. & P. 25p ea. Also TOP-2 X YELLOW £4-50 ea. P. & P. 25p. STANDARD GPO DIAL TELE-PHONE (black) with internal bell, \$7p ea. P. & P. 5p. Two for £1-50. P. & P. 75p. All telephones complete with bell and dial.

2012 to 2004 Hz WB

SINE AND SQUARE GENERATOR
FOUR TRANSPORT STANDERS. Independent amplitude

SINE AND SQUARE GENERATOR Four ranges. Independent amplitude controls, thermistor stabilised. Ready to use. 9V supply required. £8-85 each. P. & P. 25p. (Not cased, not calibrated.)
MOTOR MIN SYNCHRONOUS
SIze 12*x 2" x 2* 240V operation 3-6 RPM 25p each. P. & P. 5p.
5 MOVING COIL METERS various £2 P. & P. 370.

WOBBULATOR
Sweeps 8 to 45MHz ready to use.
6:3V a.c. required. £9 each. P. & P.
25p. (Not cased, not calibrated.)
CAPACITOR PACK—50 Brand new
components only 50p. P. & P. 17p.
POTS—10 different values. Brand
new—50p. P. & P. 17p.
COMPONENT PACK consisting of

COMPONENT PACK consisting or 2-2 pole 2 amp push on/off switches; 4 pots, various, brand new; 250 resistors and 4 wett, many high stabs, etc. Fine value at 56p per pack. P. & P. 17p. P.C.B. PACK S & D. Quantity 2 sq fl—no tiny pleces. 56p plus P. & P.

-no tiny pleces. 50p plus P. & P. p. FIBRE GLASS as above £1 20n

20p. FIBRE GLASS as above £1 plusP. & P. 20p. 5 CRYSTALS 70 to 90kHz. Our choice, 50p. P. & P. 15p. Matched pairs, 50p per pair. P. & P.

Matched pairs, 59p per pair, P. & P. 15p.
TRIMMER PACK, 2 Twin 50/200pF ceramic; 2 min strip with 4 preset 5/20pF on ceramic seach; 3 air spaced preset 30/100pF on ceramic base, ALL BRAND NEW, 25p the lot, P. & P. 10p.
ELECTRONIC TIMER UNITS—wall or bench mounting—2 Hybrid timer boards may be removed leaving excellent 12V battery charger; d.c. Power supply, etc. Price only £2:59 incl. carriage.

incl. carriage.
AMERICAN SCOPE type USM24. AMERICAN SCOPE type USM24.
A 10 meg scope—all min valves complete with circuit diagram. Maine input 115 volt 50 cycles therefore £20-90. With Step-down transformer £22-50. Carr. £1-50.
LIGHT EMITTING DIODES (Red) from Hewlett-Packard. Brand New 33p ea. Holder 1p ea. Information 5p. PHOTOCELL equ OCP71—13p ea. PHOTO-RESIST type Clare 703. Two for 58p.

DELIVERED TO YOUR DOOR 1 cwt of Electronic Scrap chassis, boards, etc. No Rubbish. FOR ONLY £3-50.

PLEASE ADD 10% V.A.T.

7/9 ARTHUR ROAD, READING, BERKS. Tel.: Reading 582605/65916

(rear Tech. College)

VALVES

SAME DAY SERVICE **NEW! TESTED! GUARANTEED!**

SETS 1R5, 185, 1T4, 384, 3V4, DAF91, DF91, DK91, DL92, DL94.
Set of 4 for £1-20, DAF96, DF96, DK96, DL96, 4 for £1-85.

1R5	.30	30FL12	.60	EBC90	-22	EY51	.24	PCL85	-87	UAF42	-50
185	-25	30FL14	-65	EBF80	-32	EY86	-29	PCL86	-87	UBC41	-45
1T4	-20	30L1	.29	EBF83	-89	EY87	.29	PCL88	-80	UBF80	-84
384	-80	30L15		EBF89	.29		-89	PCL800	-89	UBF89	-82
3V4	-47	30L17	.70	ECC81	-20		-89	PCL805	-87	UCC84	-88
5U4G	-81	30P4	-54	ECC82	.21	EZ80	-21	PENA4	.77	UCC85	-85
5V4G	-85	30P12	-69	ECC83	-85	EZ81	-22	PEN36C	.70	UCF80	-80
5Y3GT	-80	30P19	-54	ECC85	-84		-25	PFL200	-46	UCH42	-58
5Z4G	-85	30PL1	-56	ECC804		GZ30	-84	PL36	-48	UCH81	-80
6/30L2	-50	30PL13		ECF80		GZ32	-40	PL81	-48	UCL82	-88
6AM6	-16	30PL14	-80	ECH35	.55	KT41	-77	PLSIA	-47	UCL83	-85
6AQ5	-24	35W4	-25	ECH42	.59		-65	PL82	-81	UF41	-52
6AT6	.20	35Z4GT	-25		-29	KT66	-78	PL83	-88		-20
6AU6	-20	50CD6G	-68	ECH83		LN319	-56	PL84	-80	ŬL41	-68
6BA6	.20	807	-55	ECH84		LN329	-80	PL500	-58	UL84	-80
6BE6	.21		1.00	ECL80	-80	LN339	-65	PL504	-58	UM84	-22
6BJ6	.41	AC/VP2		ECL82	-29		1.05	PM84	-30	UY41	-87
6BW7	-50	B349		ECL86	-85	PABC80	-31	PX 25	-95	UY85	-88
6F14	-85	B729	-54	EF37A	-95	PC86	.44	PY32	- 52	VP4B	.77
6F23	-68	CCH35	-67	EF39	-45	PC88	-44	PY33	- 52	W77	-48
6F25	-50	CY31	-28	EF41	-67	PC96	-42	PY81	-25	277	-88
6J5GT	-20	DAF91	-25	EF80	-23	PC97	-85	PY82	-26	~	-
6J7G	-24	DAF96		EF85	-28	PC900	.29	PY83	-26	Transis	tors
											-17
6V6GT	.28	DF91	.20	EF86	-80	PCC84	-29	PY88	-88	AC107	-17
6V6GT 6X4	·28	DF91 DF96	·20	EF86 EF89	-80 -26	PCC84 PCC85	·29	PY88 PY800	·88 ·\$1	AC107 AC127	-18
6V6GT 6X4 6X5GT	·28 ·80 ·28	DF91 DF96 DH77	-20 -36 -20	EF86 EF89 EF91	-80 -26 -16	PCC84 PCC85 PCC88	·29 ·28 ·88	PY88 PY800 PY801	-88 -81 -81	AC107 AC127 AD146	-18 -87
6V6GT 6X4 6X5GT 10P13	·28 ·80 ·28 ·58	DF91 DF96	-20 -36 -20 -30	EF86 EF89 EF91 EF92	-80 -26 -16 -80	PCC84 PCC85 PCC88 PCC89	-29 -28 -88 -48	PY88 PY800 PY801 R19	-88 -81 -80	AC107 AC127 AD146 AF115	-18 -87 -20
6V6GT 6X4 6X5GT 10P13 12AT7	·28 ·80 ·28 ·53 ·20	DF91 DF96 DH77 DK91 DK92	-20 -36 -20 -80 -48	EF86 EF89 EF91 EF92 EF98	-80 -26 -16 -80 -70	PCC84 PCC85 PCC88 PCC89 PCC189	·29 ·28 ·88 ·48 ·48	PY88 PY800 PY801 R19 R20	-88 -81 -80 -70	AC107 AC127 AD146 AF115 AF116	-18 -87 -20 -20
6V6GT 6X4 6X5GT 10P13 12AT7 12AU7	·28 ·80 ·28 ·58 ·20 ·21	DF91 DF96 DH77 DK91	-20 -36 -20 -30 -48 -45	EF86 EF89 EF91 EF92 EF98 EF183	-80 -26 -16 -80 -70 -27	PCC84 PCC85 PCC88 PCC89 PCC189 PCC805	·29 ·28 ·88 ·48 ·48 ·70	PY88 PY800 PY801 R19	-88 -81 -81 -80 -70 -70	AC107 AC127 AD146 AF115	-18 -87 -20 -20 -20
6V6GT 6X4 6X5GT 10P13 12AT7 12AU7 12AX7	·28 ·80 ·28 ·53 ·20 ·21 ·22	DF91 DF96 DH77 DK91 DK92 DK96	-20 -36 -20 -80 -48	EF86 EF89 EF91 EF92 EF98	-80 -26 -16 -80 -70 -27 -29	PCC84 PCC85 PCC88 PCC89 PCC189 PCC805 PCF80	-29 -28 -38 -48 -48 -70 -26	PY88 PY800 PY801 R19 R20 U25	-88 -81 -80 -70	AC107 AC127 AD146 AF115 AF116 AF117	-18 -87 -20 -20
6V6GT 6X4 6X5GT 10P13 12AT7 12AU7 12AX7 19BG6G	·28 ·80 ·28 ·58 ·20 ·21 ·22 ·75	DF91 DF96 DH77 DK91 DK92 DK96 DL92	-20 -36 -20 -30 -48 -45 -30 -47	EF86 EF89 EF91 EF92 EF98 EF183 EF184 EH90	-80 -26 -16 -80 -70 -27 -29 -86	PCC84 PCC85 PCC88 PCC89 PCC189 PCC805 PCF80 PCF82	-29 -28 -38 -48 -48 -70 -26 -28	PY88 PY800 PY801 R19 R20 U25 U26	-88 -81 -80 -70 -70	AC107 AC127 AD146 AF115 AF116 AF117 AF125	-18 -87 -29 -30 -30 -17 -17
6V6GT 6X4 6X5GT 10P13 12AT7 12AU7 12AU7 19BG6G 20F2	·28 ·28 ·58 ·20 ·21 ·22 ·75 ·67	DF91 DF96 DH77 DK91 DK92 DK96 DL92 DL94 DL96	-20 -36 -20 -30 -48 -45 -30 -47 -28	EF86 EF89 EF91 EF92 EF98 EF183 EF184 EH90 EL33	-80 -26 -16 -20 -70 -27 -29 -86 -65	PCC84 PCC85 PCC88 PCC89 PCC189 PCC805 PCF80 PCF82 PCF86	-29 -28 -38 -48 -70 -26 -38 -46	PY88 PY800 PY801 R19 R20 U25 U26 U47	-88 -81 -80 -70 -70 -78 -78	AC107 AC127 AD146 AF115 AF116 AF117 AF125 AF127	-18 -87 -80 -80 -80 -17 -17 -18
6V6GT 6X4 6X5GT 10P13 12AT7 12AU7 12AX7 19BG6G 20F2 20P3	·28 ·80 ·28 ·53 ·20 ·21 ·22 ·75 ·67 ·75	DF91 DF96 DH77 DK91 DK92 DK96 DL92 DL94	-20 -36 -20 -30 -48 -45 -45 -30 -47 -22	EF86 EF89 EF91 EF92 EF98 EF183 EF184 EH90 EL33 EL34	-80 -26 -16 -80 -70 -27 -89 -86 -65	PCC84 PCC85 PCC88 PCC89 PCC189 PCC805 PCF80 PCF86 PCF86 PCF80	-29 -28 -38 -48 -70 -26 -38 -46 -58	PY88 PY800 PY801 R19 R20 U25 U26 U47 U49	-88 -81 -80 -70 -70 -64 -78	AC107 AC127 AD146 AF115 AF116 AF117 AF125 AF127 OC44	-18 -87 -29 -30 -30 -17 -17
6V6GT 6X4 6X5GT 10P13 12AT7 12AU7 12AX7 19BG6G 20F2 20P3 25L6GT	·28 ·80 ·28 ·20 ·21 ·22 ·75 ·67 ·75	DF91 DF96 DH77 DK91 DK92 DK96 DL92 DL94 DL96 DY86	-20 -36 -20 -30 -48 -45 -30 -47 -22 -22	EF86 EF89 EF91 EF92 EF98 EF183 EF184 EH90 EL33	-80 -26 -16 -80 -70 -27 -29 -86 -65 -50	PCC84 PCC85 PCC88 PCC89 PCC189 PCC805 PCF80 PCF82 PCF86	-29 -28 -38 -48 -70 -26 -38 -46 -58 -28	PY88 PY800 PY801 R19 R20 U25 U26 U47 U49 U52	-88 -81 -80 -70 -70 -78 -78 -78	AC107 AC127 AD146 AF115 AF116 AF117 AF125 AF127 OC44 OC45	-18 -87 -20 -30 -80 -17 -17 -18 -18
6V6GT 6X4 6X5GT 10P13 12AT7 12AU7 12AX7 19BG6G 20F2 20P3 25L6GT 25U4GT	·28 ·80 ·28 ·58 ·20 ·21 ·22 ·75 ·67 ·75 ·19 ·57	DF91 DF96 DH77 DK91 DK92 DK96 DL92 DL94 DL96 DY86 DY87 DY802	-20 -36 -20 -30 -48 -45 -30 -47 -22 -22 -30	EF86 EF89 EF91 EF92 EF98 EF183 EF184 EH90 EL33 EL34 EL41 EL84	-80 -26 -16 -80 -70 -27 -29 -86 -65 -50 -52 -23	PCC84 PCC85 PCC88 PCC89 PCC189 PCC805 PCF80 PCF82 PCF86 PCF86 PCF86 PCF860 PCF800 PCF801 PCF802	-29 -28 -38 -48 -70 -26 -38 -46 -28 -28 -38	PY88 PY800 PY801 R19 R20 U26 U47 U49 U52 U78	-88 -81 -80 -70 -70 -78 -78 -78 -80	AC107 AC127 AD146 AF115 AF116 AF117 AF125 AF127 OC44 OC45 OC71	-18 -87 -29 -29 -80 -17 -17 -18 -18
6V6GT 6X4 6X5GT 10P13 12AT7 12AX7 12AX7 19BG6G 20F2 20P3 25L6GT 25U4GT 30C1	·28 ·28 ·58 ·20 ·21 ·22 ·75 ·67 ·75 ·19 ·57 ·26	DF91 DF96 DH77 DK91 DK92 DK96 DL92 DL94 DL96 DY86 DY87 DY802 EABC80	-20 -36 -20 -48 -45 -30 -47 -22 -22 -30 -82	EF86 EF89 EF91 EF92 EF98 EF183 EF184 EF184 EL34 EL34	-80 -26 -16 -80 -70 -27 -89 -85 -50 -52 -23 -24	PCC84 PCC85 PCC88 PCC89 PCC189 PCC805 PCF80 PCF82 PCF86 PCF800 PCF801	-29 -28 -38 -48 -70 -26 -38 -46 -58 -28	PY88 PY800 PY801 R19 R20 U26 U47 U47 U49 U52 U78 U191	-88 -81 -80 -70 -70 -64 -78 -78 -80 -80	AC107 AC127 AD140 AF115 AF116 AF117 AF125 AF127 OC44 OC45 OC71 OC72	-18 -87 -89 -89 -17 -17 -18 -18 -18
6V6GT 6X4 6X5GT 10P13 12AT7 12AU7 12AX7 19BG6G 20F2 20P3 25L6GT 25U4GT 30C1 30C15	·28 ·28 ·58 ·20 ·21 ·22 ·75 ·67 ·75 ·57 ·26 ·58	DF91 DF96 DH77 DK91 DK92 DK96 DL92 DL94 DL96 DY87 DY802 EABC80 EAF42	-20 -36 -20 -30 -48 -45 -30 -47 -22 -30 -32 -50	EF86 EF89 EF91 EF92 EF98 EF183 EF184 EH90 EL33 EL34 EL41 EL41 EL90	-80 -26 -16 -80 -70 -27 -29 -86 -65 -50 -52 -23	PCC84 PCC85 PCC89 PCC89 PCC805 PCF80 PCF802 PCF86 PCF800 PCF801 PCF802 PCF805 PCF805 PCF805	-29 -28 -38 -48 -70 -26 -38 -46 -58 -28 -39 -57	PY88 PY800 PY801 R19 R20 U26 U47 U49 U52 U78 U191 U193 U251 U301	-88 -81 -80 -70 -70 -64 -78 -70 -81 -80 -81 -81	AC107 AC127 AD146 AF115 AF116 AF117 AF125 AF127 OC44 OC45 OC71 OC72 OC75 OC81	-18 -37 -20 -20 -17 -17 -18 -18 -18 -18 -18
6V6GT 6X4 6X5GT 10P13 12AT7 12AX7 12AX7 19BG6G 20F2 20P3 25L6GT 25U4GT 30C1	·28 ·28 ·58 ·20 ·21 ·22 ·75 ·67 ·75 ·19 ·57 ·26	DF91 DF96 DH77 DK91 DK92 DK96 DL92 DL94 DL96 DY86 DY87 DY802 EABC80	-20 -36 -20 -48 -45 -30 -47 -22 -22 -30 -82	EF86 EF89 EF91 EF92 EF98 EF183 EF184 EL33 EL34 EL41 EL41 EL84 EL90 EL500	-80 -26 -16 -80 -70 -27 -89 -86 -65 -50 -52 -23 -24 -62	PCC84 PCC85 PCC89 PCC89 PCC805 PCF80 PCF802 PCF86 PCF800 PCF801 PCF802 PCF805 PCF805 PCF805	-29 -28 -38 -48 -70 -26 -38 -46 -58 -28 -37 -56	PY88 PY800 PY8001 R19 R20 U26 U49 U49 U52 U78 U193 U251 U193 U251 U193 U251 U301 U301	-88 -81 -80 -70 -70 -64 -78 -70 -81 -80 -81 -88 -68	AC107 AC127 AD146 AF115 AF116 AF117 AF125 AF127 OC44 OC45 OC71 OC72 OC72 OC75 OC81 OC81D OC82	-18 -27 -20 -20 -20 -17 -12 -12 -12 -13 -13 -13
6V6GT 6X4 6X5GT 10P13 12AT7 12AX7 19BG6G 20F2 20P3 25L6GT 25U4GT 30C1 30C15 30C17 30C17	·28 ·30 ·28 ·53 ·20 ·21 ·22 ·75 ·67 ·75 ·19 ·57 ·58 ·76 ·57	DF91 DF96 DH77 DK91 DK92 DK96 DL92 DL94 DL96 DY86 DY86 DY87 DY802 EABC80 EAF42 EBC33	-20 -36 -20 -30 -48 -45 -30 -47 -38 -22 -30 -32 -45	EF86 EF89 EF91 EF92 EF98 EF183 EF184 EH90 EL33 EL34 EL41 EL84 EL90 EL500 EM80	-80 -26 -16 -80 -70 -27 -89 -86 -50 -52 -23 -24 -68	PCC84 PCC85 PCC88 PCC89 PCC189 PCC805 PCF80 PCF80 PCF800 PCF801 PCF801 PCF802 PCF805 PCF805 PCF808 PCF808	· 29 · 28 · 48 · 70 · 26 · 28 · 46 · 58 · 57 · 56 · 55 · 55 · 55	PY88 PY800 PY801 R19 R20 U26 U47 U47 U49 U52 U78 U193 U251 U193 U251 U301 U301 U301	-88 -81 -80 -70 -70 -64 -78 -79 -81 -80 -81 -61 -88 -66	AC107 AC127 AD146 AF115 AF116 AF117 AF125 AF127 OC44 OC71 OC72 OC72 OC75 OC81 OC81D OC82 OC82D	-18 -20 -20 -20 -17 -17 -18 -18 -18 -18 -18 -18
6V6GT 6X4 6X5GT 10P13 12AT7 12AU7 12AX7 19BG6G 20F2 20F3 25L6GT 25U4GT 30C1 30C15 30C17	·28 ·28 ·28 ·20 ·21 ·22 ·75 ·67 ·75 ·19 ·57 ·26 ·58 ·76 ·57 ·64	DF91 DF96 DH77 DK91 DK92 DL96 DL92 DL94 DL96 DY87 DY802 EABC80 EAF42 EB91	20 -86 -20 -48 -45 -47 -88 -22 -22 -30 -12 -45 -49	EF86 EF89 EF91 EF92 EF98 EF183 EF184 EH90 EL33 EL34 EL84 EL90 EL500 EL500 EM81	*80 *26 *16 *80 *27 *27 *86 *65 *50 *50 *28 *86 *86 *86 *86	PCC84 PCC85 PCC88 PCC89 PCC189 PCC805 PCF80 PCF80 PCF800 PCF801 PCF801 PCF802 PCF805 PCF805 PCF808 PCF808	· 29 · 28 · 48 · 70 · 26 · 28 · 46 · 58 · 57 · 56 · 55 · 55 · 55	PY88 PY800 PY8001 R19 R20 U26 U49 U49 U52 U78 U193 U251 U193 U251 U193 U251 U301 U301	-88 -81 -80 -70 -70 -64 -78 -70 -81 -80 -81 -88 -68	AC107 AC127 AD146 AF115 AF116 AF117 AF125 AF127 OC44 OC71 OC72 OC72 OC75 OC81 OC81D OC82 OC82D	-18 -27 -20 -20 -20 -17 -12 -12 -12 -13 -13 -13

READERS RADIO

85 TORQUAY GARDENS, REDBRIDGE, ILFORD. Tel. 01-550 7441.

PRICES ARE INCLUSIVE OF VAT, ONLY POSTAGE IS EXTRA

Minimum post/packing on I valve 7p., on each additional valve, (3p. per. valve extra)
Any parcel insured against damage in transit 3p extra.

CAUBRATING M.CONNAH SWIRECEIVERS

ITH the Short Wave Bands becoming more crowded every year it becomes increasingly necessary for the listener to be able to determine the frequency to which his receiver is tuned. Conversely, if the receiver is accurately calibrated the listener is able to tune to a desired frequency to listen for a particular station.

Aerial coils RF coils (if fitted)

VC1

VC2

VC3

VC5

TC1

VC4

17pF

TC2

VC5

17pF

TC3

VC6

17pF

AM 0010

Bandspread added

Fig. 1 Circuit showing the bandspread ganged capacitor added to the existing circuit.

The latter part of this article deals with a method of receiver calibration which costs less than a pound. The only requirement is that the receiver has a band-

spread control with a reasonable scale. The first part of the article, therefore, deals with adding a suitable bandspread control to a receiver which is lacking in this respect.

ADDING BANDSPREAD

The addition of a bandspread control to a receiver which does not have this facility is probably the most effective, yet simple. method of improving the performance of the set. The total cost is little more than £1 so the project is well within the means of the average listener.

All superhet receivers have a main tuning control which is either a two or three gang variable capacitor. This is shown as VC1/VC2/VC3 in Fig. 1. The bandspread control required for the project is a two or three gang (depending upon the number of gangs of the main tuning) miniature variable capacitor each section having a capacitance of approximately 15 to 20pF. The most suitable type is that often used for the tuning of v.h.f. receivers, usually having a capacitance of 17pF per section.

The bandspread control is represented by VC4/VC5/VC6 in Fig 1. Each section of the bandspread

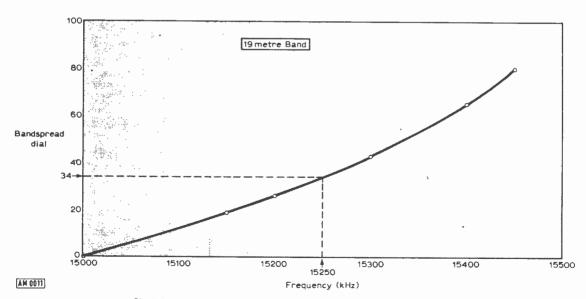


Fig. 2 A typical calibration chart produced by the method described in the article.

capacitor is wired in parallel with a section of the main tuning control. The new control should be mounted as near as possible to the existing variable capacitor with the wiring as short and straight as possible. In order to retain the previous calibration of the receiver, the bandspread control should be half closed and the trimmers TC1/TC2/TC3 unscrewed slightly to compensate for the additional capacitance of the bandspread control.

BANDSPREAD CONTROL

The bandspread control should be fitted with a knob which has a 0 to 100 scale; the larger the knob that can be accommodated on the receiver the better the tuning performance will be. A knob with integral slow motion is better still.

CALIBRATION

The lowest cost method of calibrating a receiver is by drawing calibration charts for the various frequency ranges of interest, using the bandspread control. The best graph paper to use is that which has each large division sub-divided into ten smaller divisions. A separate chart should be drawn for each band but some of the wider bands will require two charts as the bandspread control will not cover the entire band with one setting of the main tuning.

The main tuning is adjusted so that the band-spread will cover the band being calibrated. This position of the main tuning is noted by sticking a piece of tape on the dial or by reference to the receiver's logging scale if one is fitted. As an example, the author's receiver was calibrated on the 19 metre band, being fitted with a 0-100 logging scale, and with the main tuning set at 37 the band-spread control covered the whole band.

The next stage is to do some concentrated listening on the band, trying to hear those stations of which the frequency is known and plotting these on a graph similar to Fig. 2. The stations heard by the author were as follows:

Station	Frequency	Bandspread Setting
WWV	15000 kHz	0
Radio Cairo	15150 kHz	19
RSA, S. Africa	15200 kHz	26
VOA, Tangier	15300 kHz	43
RAI, Rome	15400 kHz	65
Radio Moscow	15450 kHz	80

When all these points have been plotted a smooth curve is drawn between them giving the result shown in Fig. 2. This procedure is repeated for all the bands required by the listener.

The method of calibration by plotting frequencies is tedious but, once done, the graph can be used again and again very simply. One of the basic ideas behind the article was that the minimum of expense was involved. The reader will have to spend some time drawing up the graphs but will have spent very little money.

The use of a crystal calibrator would, of course, speed up the process of drawing the charts. The The 3-range Crystal Marker by R. F. Graham was published in the February 1973 issue of PW and this is ideal for the job, being both simple and inexpensive.

USING THE CHARTS

It is possible to use the charts by simply returning the main tuning to the marked position from which the chart was drawn. This is not very accurate however, and the following method is recommended. When returning to a given band a search is made for one particular station the frequency of which is known, say 15250 kHz. Reference to the graph shows that this should appear at 34 on the bandspread scale. Both the main tuning and the bandspread are then adjusted until the station appears at this bandspread setting. The controls are now set for accurate listening on the band.

Having set up the receiver it is possible to use a chart in two ways. First, it is possible to determine the frequency of a station which has been tuned in by converting the bandspread reading to frequency, secondly, it is possible to tune to any particular frequency, to look for a station, by determining the correct bandspread setting for that frequency and adjusting the control accordingly.

PRACTICAL DATA(ARD WIRELESS SYSTEM 1973

Practical Wireless will be launching a new series of PW Datacards in the autumn. These will provide the radio, television, audio and electronics constructor with some of the background information he needs to understand his subject.

The first series of six cards will be printed in full colour and will be given away absolutely free of charge to purchasers of the autumn issues of *Practical Wireless*. To make sure that you do not miss this unique opportunity you should have an order placed with your newsagent at least for the October, November and December issues.

PW Datacards will be inserted in pairs in each of these issues; the first pair in October issue will help all newcomers and established constructors to see at a glance how to read resistor and capacitor values and will show how to determine combined values of two or more of these components quickly. The second pair of PW Datacards in the November issue will appeal to all audio enthusiasts.

PW Datacards are designed specially to fit into a jacket pocket, stand on the work bench, hang on the wall, use as a place mat, or even as a bookmark. No other radio or electronics magazine has given such a comparable free service to its readers.

Further details on all of these **PW Datacards** will be given in next month's issue of P.W. September issue on sale August 3rd; October issue on sale September 7th.

BSR LATEST SUPERSLIM STEREO AND MONO

Plays 12", 10" or 7" records, Auto or Manual. A high quality unit backed by BSR reliability with 12 months' guarantee. AC 200/250v. Size 13; × 11; in. Above motor board 3in.
Below motor board 2in.
With STEREO and MONO XTAL 28-25 Post 25p.



PORTABLE PLAYER CABINET Modern design, black rexine covered, silver front grille. Suitable for above player. Motor board cut for BSR deck.

£4.50 Post 25p

E.M.I. WOOFER AND £5.75



SPECIAL OFFER SMITH'S CLOCKWORK 15 AMP TIME SWITCH Single pole two-way.

Single pole two-way.

Maker's last list price \$4.50.

Brand new and fully guaranteed.

Surface mounting with fixing screws.

Will replace existing wall switch to give light for return home, garage, automatic anti-burgiar lights, etc. Variable knob. Turn on or off at full or intermediate seitings. TWO TYPES AVAILABLE 0 TO 60 MINUTES OR TO 6 HOURS OUR PRICE \$1.66, P. & P. 159 OR 23 PAIR. (STATE TYPE A OR B WHEN ORDERING.)

WEYRAD P50-TRANSISTOR COILS

P51/1 or P51/2..... 86p P50/3V Mullard Ferrite Rod 8 × lin. 20p, 6 × lin. 20p.

VOLUME CONTROLS | 80 Ohin Coax 4p. yd.

5 K. ohms to 2 Meg. LOG or LIN. L/S 15p. D.P. 25p. STEREO L/S 55p. D.P. 75p. Edge 6 K.S.P. Transistor 25p Ideal 225 & colour

8in & 10in ELAC HI-FI SPEAKERS

Dual cone plasticised roll surround. Large ceramic magnet. 50-18,000 cps.

Bass resonance 55 cps.

8 ohm coil.

10in. 12 watt.

10in. 12 watt music power.



music power.

E. M.I. $13\frac{1}{2} \times 8$ in. SPEAKER SALE!

With twin tweeters and crossover, 10 watt. State 3 or 8 or 15 ohm.
(As illustrated)

Post 25p

With flared tweeter cone and ceramic with nared two less magnet. 10 watts.
Bass res. 45-60 cps. £2-75 Bass res. 45-60 cps.
Finx 10,000 gauss.
State 3 or 8 or 15 ohm.
BOOKSHELF
CABINET £5.50 Post 25p



16 × 10 × 9in.

BRITISH MADE STEREO MULTIPLEX DECODER

Brand New. 7 transistors plus integrated circuit. Fibre glass printed circuit board, Size 2½ × 6½ × ½n. Fre-aligned. Complete with stereo beacon indicator. 12% d.c. operation. 400mV output for 100mV input. Full instructions for any FM Tuner. Some technical experience 26.95 70st essential.



BLANK ALUMINIUM CHASSIS 16 s.w.g. 2in. sides. 6×4 in 45p; 9×7 in. 60p; 11×7 in. 70p; 13×9 in. 90p; 14×1 1in. 95p; 16×1 4in. 99p; 11×3 in. 50p; 16×1 0in. 21. ALUMINIUM BOX $6 \times 4 \times 4$ in. 29p. ALUMINIUM PANELS 18 s.w. 20. 2×4 in. 29p; 2×6 10in. 210in. 210in. 210in. 210in. 210in. 210in. 210in.

ANOTHER RCS BARGAIN! 4 Transistor Mono Amplifier

Powerful 3 watt output, 15 ohm, AC mains operated with transformer, 3-Controls, volume, treble, bass and On'Off switch with knobs. Ready made on printed circuit board. Fused inputs and outputs. Famous make. Size 8in. wide × 4 in. deep × 3in. high.

Suitable 7" × 4" speaker, £1. PRICE £5.95 Post 25p

R.C.S. STABILISED POWER PACK KITS RI.C.S. SIABLISED FOWER FACER RISE
RISES Rectifiers and Double Wound Mains Transformer
inpit 260/240v. AC. Output voltages available 6 or 9 or
12 or 15 or 18 or 20v. DC at 100mA or less.
PLEASE STATE VOLTAGE ERGUIRED. \$2.20
POST
Details S.A.E. Size 3½ × 1½ × 1½in.

GENERAL PURPOSE TRANSISTOR PRE-AMPLIFIER BRITISH MADE

Ideal for Mike, Tape, P.U., Guitar. Can be used with Battery 9-12v or H.T. line 200-300v D.C. operation. Size 1½" × 1½". Response 25 c.p. s. to 25 Kcjs. 28db şain. For use with valve or transistor equipment. The first relations supplied. Details S.A.E.

NEW ELI	ECTR	OLYTIC CONDE	NSERS	
2/850V	14p	250/25V 14	4p 50 + 50/350V	35
4/850V	14p	500/25V 20	Op 60 + 100/350V	58
8/450V	14p	1000/25V 88	5p 82 + 32/250V	18
16/450V	15p	1000/50V 47	7p 82 + 82/450V	88
32/450V	20p	8+8/450V 18	8p 350 + 50/325V	50
25/25V	10p	8+16/450V 20	Op 32 + 32 + 32/35	0V 48
50/50V	10p		5p 100 + 50 + 50/8	50V 48
100425V	10p	82 + 82/850V 28	5p	

LOW VOLTAGE ELECTROLYTICS
1, 2, 4, 5, 8, 18, 25, 30, 50, 100, 200mF, 15V, 10p, 500mF, 12V, 15p; 25V, 20p; 50V, 30p, 100JmF, 12V, 17p; 28V, 35p; 50V, 47p; 100V, 70p, 200JmF, 6V, 25p; 25V, 42p; 50V, 57p, 250JmF, 50V, 62p; 300JmF, 25V, 47p; 50V, 65p, 500JmF, 6V, 25p; 12V, 42p; 25V, 75p; 35V, 85p; 50V, 95p, 500JmF, 6V, 25p; 12V, 42p; 25V, 75p; 35V, 85p; 50V, 95p.

CERAMIC 1pf to 0.01mf, 4p. Silver Mica 2 to 5000pf, 4p PAPER 350V-0.1 4p, 0.5 13p; 1mf 15p; 2mf 150V 15p. 500V-0.001 to 0.05 4p; 0.1 5p; 0.25 8p; 0.47 25p. 500V-0.001 to 0.05 4p; 0.1 5p; 0.25 8p; 0.47 25p. SILVER MICA. Close tolerance 1y, 22-250pf 8p; 500-2,200 pf 10p; 2,700-5,800pf 20p; 6,800pf-0.01m F 30p; each. TWIN GARG. "0-0" 280pf +175pf, 56p; 500Pf standard 45p; 385+385 with 28+25pf Slow motion drive 50p. SHORT WAVE, SINGLE 1.0pf 30p; 25pf 55p; 50pf 55p. NEON PANEL INDICATORS. 250V AC/DC Amber 20p. RESISTORS. 1w.; 1w. 1, 1w. 1p; 2w. 5p1 0.0 hms to 10 meg. HICH STABILITY. 1w. 2% 10 ohms to 6 meg., 10p. Ditto 5% Preferred values 10 ohms to 10 meg., 4p. WIRE-WOUND RESISTORS. 5 watt, 10 watt, 15 watt 10 ohms to 100K 10p each; 24 watt, 1 ohm to 82 ohms 10p. TAPE OSCILLATOR COIL. Valve Type 36p.

COMPACT PORTABLE STEREO HI-FI

Two full size loudspeakers $13 \ \times \ 10 \ \times \ 3 \ \text{fin}$. Player unit clips to loudspeakers making it extremely compact, overall size only $13 \ \times \ 10 \ \times \ 3 \ \text{fin}$. 3 watts per channel, plzys all records $33 \ \text{rpm}$, $45 \ \text{rpm}$. Separate volume and tone controls. $240 \ \times \ \text{M}$ mains. Attractive Brown colour, weight $13 \ \text{lbs}$.

BRITISH FM/VHF TUNING HEART

88 to 108 Mc/s British made. 2 Transistors ready aligned—requires 10.7 Ms/s 1F. Complete with tuning gang. Connections supplied but some technical experience essential.

Our Price £3.95 Post 20p.

MAINS TRANSFORMERS ALL POST 25p each 25p each 90p

FACTORY ACT! MAINS ISOLATING TRANSFORMER Pr.mary 0-110-240 v. Secondary 0-240 v. 3 amps. 720 wests. Insulated terminals. Varnish impregnated. Fully enclosed in steel case with fixing feet. Famous make. Value 210. OUR SPECIAL PRICE £ 10 Carriage IDEAL FOR COLOUR TV. IDEAL FOR COLOUR TV 50p.
Can be used as 800 watt Auto Transformer 240-110V.

ALL MODELS "BAKER SPEAKERS" IN STOCK Hi-Fi Enclosure Manual containing 20 plans, designs, crossover data and cubic tables. 42p. Post Free

BAKER 12in. MAJOR £10



P. & p. 25p
80-14,500 c.p.s., 12in. double
cone, wooler and tweeter cone
together with a BAKER
ceramic magnet assembly
having a finx density of
14,000 gauss and a total flux
of 145,000 Maxwells. Bass
resonance 40 c.p.s. Rated 20
watts. MOTE: 3 or 8 or
15 ohms must be stated.

Module kit, 80-17,000 c.p.s with tweeter crossover, baffle and instructions. £12.50 P. & p. 25p.

BAKER "BIG-SOUND" SPEAKERS 'Group 35' 'Group 25'

P. & p. 25p 'Group 50'

TEAK VENEERED HI-FI SPEAKER CABINETS
For 12in. or 10in. dis. speaker 20 × 18 × 9in. 49-90 Post 25p
For 13 × 8in. or 8in. speaker 16 × 10 × 9in. 25-50 Post 25p
For 8 × 5in. speaker 16 × 8 × 6in. 44-40 Post 25p
For 6in. and tweeter 12 × 8 × 8in. 24
LOUDSPEAKER CABINET WADDING 18in. wide, 15p ft.

GOODMANS 6½in, HI-FI WOOFER £4
8 ohm, 10 watt. Large ceramic magnet.
8pecial Cambric cone surround. Frequency
response 30-12,000 cps. Ideal P.A. Columns,
Hi-FI Enclosures Systems, etc.
8uitable Cabinet 12 × 8 × 6, 24-00.
8uitable Cabinet 12 × 8 × 6, 24-00.



FLAC CONE TWEETER

The moving coil diaphragm gives a good radiation pattern to the higher frequencies and a smooth extension of total response from 1,000 cps to 18,000 cps. Size \$\frac{3}{2} \times 2\times 100 \text{ diaphragm gives }\frac{3}{2} \times 2\times 100 \text{ diaphragm gives} \frac{3}{2} \times 2\times 100 \text{ diaphragm gives a good radiation of the plant gives a good radiation of the pl

CISBOVER, 68p.

E.1-7U Post 10p

CISBOVER, 68p.

E.1-7U Post 10p

CISBOVER, 10W 8 ohm or 15 ohm \$1-96.

De Luze Horn Tweeters 2-18 Kc/s, 15W, 15 ohm \$3.

TWO.WAY 8000cps CROSSOVERS 3 or 8 or 15 ohm \$3.

TWO.WAY 8000cps CROSSOVERS 3 or 8 or 15 ohm \$95.

LOUDSPEAKERS P.M. 3 OHMS. 7×4in. 21-25; 64in. 21-50;

8×5in. 21-60; 10in. 22-00; 8in. 21-75; 10×6in. 31-90; 10in.

22-00; SPECIAL OFFER: 80 ohm, 24in.; 24in., 36 ohm, 2in.

3in., 25 ohm, 24in. is, 3in. dis., 5in. dis. 2 EACH

15 ohm, 34in. 21s.; 34in.; 5in. dis., 6×4in. 8 ohm \$1-50;

RICHARD ALLAN TWIN CONE LOUDSPEAKERS.

8in. dismeter 4 watt; 10in. 5 wat; 12in. 6 watt 3 or 8

or 15 ohm models \$2.20 each. Post 15p.

VALUE OUTPUT TRANS. 25p; MIKE TRANS. 50:1 25p.

WALUE OUTPUT TRANS. 25p; MIKE TRANS. 50:1

WALUE OUTPUT TRANS. 25p; MIKE TRANS. 50:1

WALUE OUTPUT TRANS. 25p; MIKE TRANS. 50:1

MAIOR 100 WATT **ALL PURPOSE GROUP AMPLIFIER**

All transistorized 4 inputs, speech and music. 4-way mixing. Output 8/15 ohm. A.C. 200/250v. Separate Treble and Bass controls. Guaranteed. Details S.A.E.

£49 Post.

BARGAIN AM TUNER. Medium Wave.
Transistor Superhet. Ferrite aerial. 9 volt.

Add CHANNEL TRANSISTOR MONO MIXER.
Add musical highlights and sound effects to recordings.

Will mix Microphone, records, tape and tuner
with separate controls into single output. 9 volt.

STEREO VERSION OF ABOVE £5.95

BARGAIN FM TUNER 88-108 Mc/s Six Transistor. 9 volt Printed Circuit. Calibrated slide dial tuning.
Walnut Cabinet. Size $7 \times 5 \times 4$ in. BARGAIN FM TUNER as above less cabinet. £9.85

BARGAIN 8 WATT AMPLIFIER. 4 Transistor 24-50 Push-Pull Ready built, with volume control, 8v.

COAXIAL PLUG 10p. PANEL SOCKETS 10p. LIME 18p. CUTLET BOXES, SURFACE OR FLUSH, 25p. BALANCED TWIN RIBBON FEEDER 300 chms 5p yard. JACK SOCKET 8id. open-circuit 14p, closed-circuit 28p. Chrome Lesd Socket 45p. Phono Plugs 5p. Phono Socket 5p. JACK PLUGB 8id. Chrome 15p; 5 mm Chrome 12p, DlM SOCKETS Chassis 3-pin 10p; 5-pin 10p. DlM SOCKETS Lead 8-pin 18p; 5-pin 26p. DlM PLUGB 3-pin 18p; 6-pin 26p. VALVE HOLDERS, 5p; CERAMIC 8p; CAMS 5p.

TWO RPM GEARED MOTOR 240v. A.C. mains. Ideal for displays/disco lightwheels.

95p post 25p. £1.00

E.M.I. GRAM MOTOR 120v. or 240v. A.C. 2,400 rpm. 2-pole 70mA. Spindle # × # in. Size 2 # × 2 #

× 2 lin. Post 25p, DELUXE 4 POLE MOTOR 1400 rpm. 42W size 31" × 8". post 25p. £1 95.

RADIO COMPONENT SPECIALISTS

337 WHITEHORSE ROAD, CROYDON Open 9-6 Wed. 9-1 Sat. 9-5 (Closed for lunch 1.15-2.30) Brochure Buses 50, 68, 159 Rail Selhurst. Tel. 01-684-1665. Minimum post 15p. Radio Books & Components Lists 10p. Illustrated Colour Brochure

Would you spend an hour a day to earn more money in Electronics-Television-Rad

If you're willing to give up one hour or more a day we can help you get into the lucrative growth industries of electronics, television, radio.

And if you're already in, we can help you get on!

With our know-how and our wide experience in teaching, plus your determination to study, we can turn your interest into the technical knowledge you need for success. Once you've got the qualifications you need, you'll be in a good position to take full advantage of the opportunities which exist today in all fields of electronics - in television (colour and black/white) and in radio. (We teach you the theory and practice of valve and transistor portable circuits while you build your own 5 valve receiver, transistor portable and high grade test instruments).

With ICS you study at home – at your own pace, when you choose, in the time you've got available. Your ICS tutors will give you all the help and encouragement you need to pass any exams you want to take.

Don't waste another day. Take your first step now towards a better paid, more assured future. Send for your FREE Careers Guide today.

your key to the door of opportunity

Tick or state subject of interest and post to: International Correspondence Schools, Dept. 232S. Intertext House, Stewarts Road, London SW8 4UJ.
Subject of interest
Society of Engineers Graduateship (Electrical Engineering) C & G Telecommunications Technicians Certificates C & G Electrical Installation Work C & G Certificate in Technical Communication Techniques
MPT General Certificate in Radio Telegraphy Audio, Radio & TV Engineering & Servicing Electronic Engineering, Maintenance, Engineering
systems, Instrumentation & Control systems Computer Engineering and Technology Electrical Engineering, Installations, Contracting, Appliances Self-build radio courses
Name
Address
OccupationAge

GLADSTONE RADIO

66 ELMS ROAD, ALDERSHOT, Hants GU11 1LP

No export. Min. order 50p. Prices include VAT.

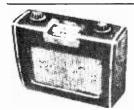
Closed Wednesdays



F.M. TUNER-AMPLIFIER for 88-102 MHz. Self. powered for 200-250v. a.c. double wound mains trans. Valves ECC85, EF89, EF80, rects. Chassis $10'' \times 6'' \times 6''$. Audio module output stage giving 3W into 16-ohms, Price \$12 (p. & p. 65p).

MAINS TRANSFORMERS, 240-250v. input. Deduct 10% for more than two transformers. Trade enquirles invited.

- B. Charger 12v. at 11A, 66p (20p post)
- E. 250v. at 50 m.a., & 6.3v. at 11A, 55p (20p)
- H. 90v. at 100m.a., & 220v. at 50m.a. 38p (20p) J. 37v. 2A, 24-0-24v. 150m.a. £2:75 (70p)
- K, 250-0-250v, 150m.a. 20v. ‡A. 15v. 1A. 6-3v, 5A. 43-30 (70p)
 M, 110v, input; 200-0-200v, 50m.a. 6-3v, 1‡A, 60p (25p)
- P. Driver, 5 to 1 + 1 suitable 50W. amp. 42p (20p)
- Q. 100v. 100ma, 25v. 250ma, 6·3v. A1. double shrouded 55p (25p) R. 230v. 60ma. 6·3v. 2¼A. 60p (35p)
- S. 260-0-260v. 60ma. 6.3v. 2‡A. 75p (35p) 100 Resistors ‡W. & ‡W. 27p (10p)
- 100 Silvered Mica 40p (10p) 100 Diodes AEI - CG62 = OA90 \$3 (10p)
- 100 Ceramics 60p (10p)
- 100 High Stabs. 50p (12p) 1 lb Tag Strips 2 to 10 way £1 (10p).
- 100 Shakeproof washers 1" clear i.d. 25p (5p)



MW/LW TRANSISTOR RADIO

Complete set of parts for this MW/LW Transistor Radio, Coverage 192-555m + 173n181807 Radio. Coverage 192-05511 T 1070-1870m. 9 volt 6 transistor superhet using 3 AF117 in RF and IF stages powered by a two stage AF amplifier using × AC128. Output approx. 500MW. Also works off car-serial. Ply case, rexine covered. Requires PP7 battery, price 27p extra. 31in high-quality speaker.

P. C. BOARDS



FOR P.W. PROJECTS REVERGERATION UNIT'S WATT AMPLIFIER & PRE-AMP
LOUDHAILER PRE-AMP & SIREN GENERATOR
VISRASONIC GUITAR PRE-AMP
DIGITRONIC DIGITAL CLOCK

AND ALSO FOR MANY P.E. PROJECTS SEND AN S.A.E. FOR OUR FREE LIST (and with all enquiries please) P.S. We also have components for most of the PCBs.

P HONOSONICS

DEPT PW8, 25 KENTISH ROAD, BELVEDERE, KENT, DAIT 5BW MAIL ORDER ONLY

NEW VALVES!

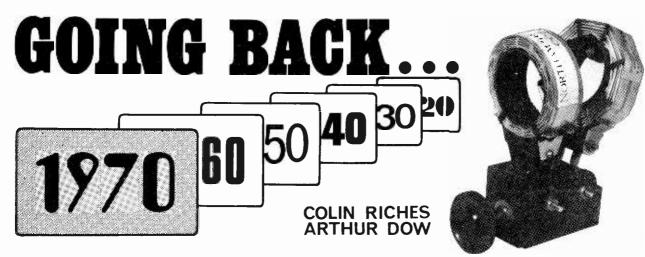
GUARANTEED AND TESTED

24-HOUR SERVICE

PRICES INCLUDE VAT

1R5 ·28	30P19 ·53	ECC81	15	EL33	- 63	PCF86	-44	PY801	-80
185 23	30PL1 -54	ECC82	.17	EL41	- 47	PCF801	-27	R19	-27
1T4 ·18	DAF91 -23	ECC83	.21	EL84	- 20	PCF802	-38	U25	-68
384 -28	DAF96 -35		-31	EM80	-85	PCF805	-55	U26	-84
3V4 -46	DF91 ·18		-48	EM81	-35	PCL82	-28	U191	-54
6/30L2 ·48	DF96 -35		-56	EM84	.30	PCL83	-53	U251	-60
6AT6 18	DH77 ·18		-26	EY86	-27	PCL84	-81	U329	-65
6AQ5 -23	DK91 ·28		.27	EZ80	-19	PCL85	-86	UABC80	-29
	DK92 -47	ECL82	.27	EZ81	-21	PCL86	-35	UBF89	-28
			-32	KT61	-63	PFL200	-45	UCC85	-82
6F1 ·57	DK96 -48							UCH42	-56
6F23 -64	DL92 ·28		.43	KT66	.75	PL36	-45		
6F25 -49	DL94 ·46		-56	N78	£1.00	PL81	-41	UCH81	.28
12AU7 ·17	DL96 -38	EF80	-22	PC86	-42	PL82	-29	UCL82	-80
25L6GT ·18	DY86 -21	EF85	-26	PC88	-42	PL83	·81	UF41	-49
30C15 -56	DY87 -21	EF86	-27	PC97	-34	PL84	-28	UF89	-28
30C17 ·78	DY802 -28	EF89	.24	PC900	-28	PL500	-56	UL41	-52
30C18 ·55	EABC80 -28		-15	PCC84	-27	PL504	-56	UL84	-27
30F5 60	EBC33 ·43	EF92	-26	PCC89	-41	PY81	.23	UY41	-85
30FL1 -59	EBC41 -47	EF183	-25	PCC189		PY82	.23	UY85	-22
						PY800	-80	W77	-42
30FL14 ·63	EBF89 .27			PCF80					_
Post/Packing o	n I valve 7p.	plus 3p. pe	r val	ve on ea	ch extr	a valve. A	ny p	arcel insu	red
against damage	in transit 3p	extra. Off	ice se	idress, n	o caller	8.			
aamas	union op		***						

GERALD BERNARD 83 Osbaldeston Road, Stoke Newington, London N. 16



R. J. TURNER tells us that he managed to purchase a Marconiphone model V2 receiver at a local auction. He has restored it to working order and it performs very well—especially on long waves. Tuning is accomplished by sliding in various ebonite slabs—each covering a different range. Each contains an "embedded" coil which is tuned by copper "spades." There is a "regenerator unit" which does not seem to fulfil any useful purpose and Mr. Turner would like to hear from any readers who can comment on this. The valves are of the D.E.R. type (dull emitters). The h.t. supply is 90V and l.t. 3V. The set still bears its original transfers and is in very good condition throughout. Inside the lid there is an ivorine plate giving the serial number of the set as "installation no. S/A 2535.

Mr. Turner would like any information on this set that readers could supply.

We found a reference to the V2 in a catalogue kindly lent to us by Dr. Brodribb—another vintage radio collector. It reads: "The Marconiphone V2 gives excellent results as a long-range instrument. By its reflex circuit, two valves do the work of three. It holds a remarkable record of results from overseas stations, including America. Cost of upkeep is comparatively negligible, and is perfectly simple to operate."

In c1926 the V2 could be obtained from Upfield and Sons (Motors) at Hastings, for the sum of £10.5s.

The receiver complete with accessories, including two D.E.R. valves cost £14.11s.2d and a dry cell combination including two D.E.3. valves cost £14.13s.8d. There was also a Marconi royalty of £1.5s to pay.

Our old friend Chris Petsikopoulos from Greece tells us he has recently returned from holiday and writes:

"During that time I had the opportunity to make a great search which brought great finds, the most important of all was a French radio-set of the era 1917-1918, made by "DUCRETET", Paris, providing a 100 watt spark Transmitter and crystal detector receiver connected in a common tuning circuit through a change-over switch.

The tuning circuit consists of an Oudine coil with a slider for the aerial and a variable capacitor used only for reception, this meaning that the transmitter works on a standard wave length (450m). The whole unit is housed in a compact wooden case 17×12 inches, and is in nice condition. In the case are housed the tuning coil, variable capacitor, send-receive switch, mica condenser, high tension coil with interrupter, and a 10 amp. meter. Also connectors for key and headphones. On top of the set are aerial-earth connectors, crystal detector, and spark-gap. Connectors for 12V d.c. are on the right side of the case.

Connecting a 12V battery, a 100 foot aerial and an earth, the set was able to work. The aerial was

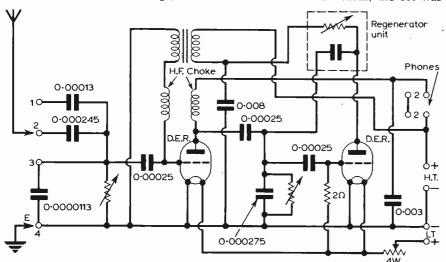
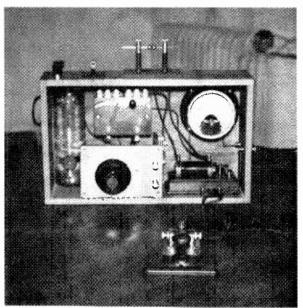


Fig. 1: The circuit of the Marconi V2 receiver re-drawn from the information supplied by Mr. J. Turner.



Chris Petsikopoulos' "Ducretet" Tx/Rx.



The "Thomson-Houston" receiver.

tuned with the slider for maximum current, 5-6 amp. giving a nice audible buzzing signal in a range of about 5-8 miles depending on the position of the car which was used for checking the range. The receiver has a range from 250-600m and the reception of several broadcasting stations was able with good volume, the only difficulty being in finding a sensitive position on the crystal although the change-over switch provides a third position where the tuning circuit is off and the buzzing of the interrupter is then used to adjust the detector.

Shown are pictures of the above set and of a 1922 two valve Heterodyne made by "Thomson-Houston", Paris, valves are type R-5 of "La Radio-technique" still working. The set is accompanied with a band switching frame aerial covering a wave length from 400m to 3,000m in three ranges"

Mr. H. E. Hunt, 68 Oundle Road, Thropston, Northants, quotes some prices he noticed for making one's own components.

"Your feature "Going Back" has caused me to reach for Vol. IV of "The Amateur Mechanic" whose mildewed covers contain the inspiration that set me building my first "Wireless Telegraph" set (1920-21).

There is no "Components List" because there were no components in those days but a "Specification of Materials" and I quote that portion for the variable condenser only:—

S.	d.
l sq. ft of 14 inch teak (to make box)	6
1 sq. ft. of thin sheet zinc	2
2 small nuts and bolts	2
1 knob (off rubber stamp or screwdriver)	-
2 small brass terminals	3
8 ins. electric light flexible wire	2
6 old quarter plate negatives	-
**	

Total cost 1 3

(The last item was for di-electric, not P.C.Bs.) These were the days of ebonite, teak, brass turning and 2lb. soldering irons (gas heated).

Such was the success of this "Long Distance Receiver"—Poldhu, Eiffel Tower and numerous spark transmitters were received—using a 6ft. twin spreader aerial, 50ft. long and 30ft. high, that I was able to obtain parental financial backing (30/-) to build a single valve receiver.

The valve was an ungettered one of Dutch manufacture (15/-) which not only furnished sufficient light to work to but formed the nucleus of a receiver that occupied one half of the work bench.

But what a new world it opened up, the Hague concerts on Sundays, and England's first and unsurpassed compere P. P. Eckersley from 2.MT. at Writtle, Essex on Tuesday evenings.

There were also at this time some excellent telephony transmissions from local Northampton amateurs (2.TV.-5XH-5XG).

I started using the d.c. mains for h.t. long before eliminators were on the market, except that one had to put up with a complete loss of signals every time a tram passed 200 yards away.

One could write a book on the early days of amateur "wireless' but for myself I must hurry off to change an under-rated thyristor in the speed control of my wheel chair (or something like that). Tempus fugit!!

FUTURE PLANS

Let us tell you why you should know about some of our future plans in *Practical Wireless*.

First, our autumn issues are being planned as the best yet; secondly, we will be doing what no other magazine has ever done before; thirdly, if you don't find out about these and order your copies in advance, your newsagent is very likely to sell out before you get there.

Naturally, we cannot tell you everything now, but we can tell you what to look for next month, and in the following issues. Want to know more? Then keep your eyes on our "Leader" page and turn to pages 320, 334, 335 and 350 for further details in this issue.

YOUR COMPLETE AUDIO-ELECTRONIC STORES

More of everything at the right price. All your electronic requirements within 200 yards - call and see for yourself.

INTEGRATED CIRCUITS

Why buy alternatives when you can buy the genuine article from us at competitive prices from stock. BRANDED FROM TEXAS I.T.T FAIR-CHILD







OA

1000

	• •		1
Type	1/11 12/24 25/99	Type 1/11 12/24 25/99	Туре 1/11 12/24 25/99
	p p p	ррр	p p p
8N7400	0 20 0 18 0 16	8N7450 0-20 0-18 0-16	8N74145 1.50 1.40 1.30
BN7401	0.20 0.18 0.18	SN7451 0 20 0 18 0 16	SNT4150 3-35 2-95 2-15
BN7402	0.20 0.18 0.16	SN7453 0 20 0 18 0 16	8N 4151 1 10 0 95 0 90
BN7403	0.20 0.18 0.16	SN7454 0 · 20 0 · 18 0 · 16	8N74153 1 35 1 27 1 20
BN7404	0.20 0.18 0.16	8N7460 0 20 0 18 0 16	SN"4154 2:00 1:75 1:55
8N7405	0.20 0.18 0.16	SN7470 0.30 0.27 0.25	8NT4155 1 55 1 47 1 35
SN7406	0.30 0.27 0.25	8N7472 0-30 0-27 0-25	SN74156 1-55 1-47 1-35
8N7407	0.80 0.27 0.25	SN7473 0 · 40 0 · 37 0 · 35	8N74157 1 80 1 70 1 50
SN7408	0 20 0 19 0 18	BN7474 0-40 0-37 0-35	SN74160 2 60 2 40 2 25
BN7409	0-45 0-42 0-35	SN7475 0-55 0-52 0-50	8N74161 2 60 2 40 2 25
8N7410	0 20 0 18 0 16	8N7476 0-45 0-42 0-39	8N74162 8-40 3-25 2-70
8N7411	0.23 0.22 0.20	8N7480 0-80 0-75 0-67	8N74163 3 40 3 25 2 70
8N7412	0-42 0-40 0-35	SN7481 1 25 1 15 1 10	8N74164 2 75 2 30 2 10
BN7413	0 30 0 27 0 25	8N7482 0 87 0 80 0 70	8N74165 4 00 3 50 3 00
BN7416	0.80 0.27 0.25	SN7483 1.00 0.90 0.85	8N74166 4:00 8:50 3:00
BN7417	0.80 0.27 0.25	SN7484 0-90 0-85 0-80	8N74167 6 25 5 60 5 10
BN7420	0.20 0.18 0.16	8N7486 0-45 0-41 0-38	8N74170 4:10 3:55 3:05
SN7422	0.48 0.44 0.40	SN7490 0.75 0.70 0.65	SN74174 2 00 1 75 1 30
8N7423	0 48 0 44 0 40	8N7491AN1 00 0 95 0 90	8N74175 1 35 1 27 1 15
SN7425	0.48 0.40 0.35	8N7492 0.75 0.70 0.65	8N74176 1 60 1 85 1 20
BN7427	0 42 0 39 0 35	SN7493 0.75 0.70 0.65	8N74177 1 · 60 1 · 85 1 · 20
BN7428	0 50 0 45 0 42	8N7494 0 80 0 75 0 70	8N74180 1-55 1-30 1-20
BN 7430	0 20 0 18 0 16	8N7495 0.80 0.75 0.70	8N74181 7:00 8:00 5:50
BN7432	0 42 0 39 0 35	8N7496 1:00 0:97 0:95	8N74182 2:00 1:80 1:60
BN7433	0.70 0.61 0.44	SN7497 6 25 5 50 5 00	8N74184 2 40 2 00 1 80
8N7437	0 65 0 60 0 50	SN74100 2 50 2 30 2 00	8NT4185A 2-40 2-00 1-80
BN7438	0.65 0.60 0.50	BN74104 1 45 1 35 1 20	8N 4190 1 95 1 85 1 75
BN7440	0 20 0 18 0 16	SN74105 1 45 1 35 1 20	SN:4191 1-95 1-85 1-75
8N7441A	N 0 75 0 72 0 70	8N74107 0-50 0-45 0-40	BN74192 2-00 1-90 1-80
SN7442	0 75 0 72 0 70	8N74110 0.80 0.70 0.60	SN74193 2-00 1-90 1-80
BN7443	1 00 0 95 0 90	SN74118 1-00 0-95 0-90	8N74194 2 50 2 25 1 90
8N7445	2.00 1.75 1.60	8N74119 1-90 1-78 1-65	SN14195 1 85 1 70 1 60
		8N74121 0-60 0-55 0-50	8N74196 1.50 1.40 1.30
BN7446	2.00 1.75 1.60	8N74122 1 35 1 25 1 10	8N74197 1 50 1 40 1 30
8N7447	1 75 1 60 1 45	SN74123 2 70 2 55 2 47	8N74198 4-60 3-70 3-35
SN7448	1.75 1.60 1.45	SN74141 1-00 0-95 0-90	8N74199 4 60 3 70 3 35

PRICES OF 7400 SERIES ARE CALCULATED ON THE TOTAL NUMBER ORDERED REGARDLESS OF MIX

LARGER QUÂNTITY PRICES PHONE (01) 402 4891

HIGH POWER SN 74 HOO Now in stock—send for list No. 36

A SELECTION OF SEMI-CONDUCTORS FROM STOCK

										••••	
AAY30	10p	BC147	12p	BU105	2.25	00044	15p	TIS43	35p	2N3055	55p
AAY42	15p	BC1690		BY100	15p	OC45	15p	V405A	25p	2N3440	
AAZ13	10p	BC182	10p	BY126	15p	OC57	50p	ZTX10		2N3442	
ACT07	85p	BC214	15p	BY127	15p	OC71	15p	ZTX 300	12p	2N3525	75p
AC126	25p	BCY32	75p	BYZ13	35p	OC72	25p	ZTX 30	15p	2N3614	
AC127	25p	BCY34	35p	C106D	65p	OC77	45p	ZTX 302	18p	2N3615	75p
AC128	25p	BCY39	1.00	GET11	1 55p	OC81	25p	ZTX 34	20p	2N3702	10p
AC176	25p	BCY42	30p	GET11		OC83	25p	ZTX 500	15p	2N3704	10p
AC187	25p	BCY43	25p	GET88	0 45p	OC140	55p	ZTX50;	17p	2N3705	100
AC188	25p	BCY55	2.50	LM 309		OC170	25p	2G301	30p	2N3714	
	30p	BCY70	15p	(T03)		OC171	30p	2N404 -	20p	2N3771	
	20p	BCY71	20p	MAT12	125p	OC200	45p	2N527	35p	2N3773	
	20p	BCY72	15p	MJE34		OC201	75p	2N696	15p	2N3790	
	55p	BCY87	2 99	MJE370		OC202	80p	2N697	15p	2N3819	
	50p	BCZ11	50p	MJE52		OC203	50p	2N706	10p	2N3820	
	50p	BD124	80p	MJE29		OCP71	1.25	2N930	20p	2N3866	
	35p	BD131	75p		1.10	ORP12	50p	2N937	45p	2N3903	
	35p	BD132	80p	MJE30		ORP60	40p	2N1131	25p	2N3906	
	20p	BF115	25p	3557114	75p	P346A	20p	2N1132	25p	2N4061	
	50p	BF167	25p	MPF10		RAS310		2N1302	18p	2N4062	
	25p	BF173	25p	NKT21		Biorno	45p	2N1304	22p	2N4126	
	30p 40p	BF179 BF180	30p	NKT21 NKT21	0 4 Up	RA8508		2N1305	22p	2N4871	
	40p	BF194	30p	NKT40		TAA263	55p	2N1307	25p	2N5457	30p
	30p	BF194	15p 15p	NKT40		TIL209		2N1308 2N1613	25p 20p	2N5777 28001	
	25p	BF861	25p	OA5		TIP29A			1.00	28001	1.00
	30p	BF898	25p	OA10	50p 35p	TIP30A		2N2147	75p	28012	6.25
BA115	7p	BFX13	25p	OA81	10p	TIP31A		2N2160	59p	28026	8.90
	15p	BFX34	75p	OA91	7p	TIP32A		2N2317	25p	28301	50p
BAX13	5p	BFX37	30p	OA200	70	TIP33A	100	2N2221	20p	28303	65p
BAX16	7p	BFX88	20p	OA202	10p		1.00	2N2222		28324	95p
	10p	BFY50	20p	OC16	75p	TIP34A		DI. CBLL.	25p	40250	50p
	10p	BFY51	20p	OC20	95p		1.50	2N2369	\	40360	40p
	10p	BFY52	20p	OC23	85p	TIP35A			15p	40361	40p
	12p	BFY64	50p	OC25	40p		2.50	2N2906	20p	40362	50p
		BFY90	59p	OC28	65p	TIP36A		2N2926	(all	40408	50p
	15p		8.00	OC35	50p		3.00	cols)	10p	40486	75p
	20p	BSX 20	15p	OC36	65p	TIP41A	75p	2N3053	20p	40636	1.10
BC143	35p	BSY27	15p	OC42	40p	TIP42A	85p	2N3054	50p	40430	1.00

VAT Prices DO NOT include Value Added Tax. From 1st April, 1973 10% must be added and shown separately to your total order (incl. carr/packing). Help us to help you receive your order without delay. E. & O. E.

TIP42A 85p 2N3054 50p 40430 1.00
QUANTITY DISCOUNTS
10% 12+; 15% 25+ 20% 100+; 26% 250+ TYPE
From above sections except Integrated Circuits and Special Offers where dis- counts are included.
Minimum order value 21 please. Postage 7p on all orders.

SEMI-CONDUCTORS 90 59p 2N2926 10 1000 MC/S All Colours 25 + 50p 100 + 45p 25 + 9p 100 + 8p

SPECIAL OFFERS!

500 + 40p	500 + 6p 1000 + 5p
AFI17 Mullard 25p 25 + 17p 100 + 15p 500 + 12p	2N3819 Texas 35p 25 + 30p 100 + 25p 500 + 20p 1000 + 15p
OC170 Mullard 25p 25 + 20p 100 + 18p 500 + 15p	BC107, BC108, BC109 10p each All Makes

25 + 20p 100 + 18p 500 + 15p 1000 + 13p	All Makes 25 + 8p 100 + 7p 500 + 6p 1000 + 5p
BY127 Mullard 15p 25 + 12p 100 + 10p 500 + 9p 1000 + 8p	AD161, AD162 35p each 25 + 32p 100 + 28p
1000 + 8p	500 + 25p

100 500 1000	+++	101 91 81		25 100 500	+++
202			10p	1000	+
25	+	8р	TOP	2N3053	
100 500	+	7p 6p		100	++
1000	+	5p	1	500	÷

OC35 Mullard 50p
25 + 45p
100 + 40p
500 + 35p
1000 + 30p

ZENER	LINEA	
100 + 40p 500 + 35p 1000 + 30p	100 + 500 + 1000 +	
25 + 45p	25 +	

400 M/W 5% Miniature BZY 88 Range
All voltages 3·3 - 33 Volt 10p each.

DIODES

25 + 100 +	
500 + 1000 +	
Any one type.	

11 Watt 5%
Wire Ends
Metal Case
All voltages
6-8 - 100 Volts
20p each

Op each	
25+ 100+ 500+ .000+	18p 16p 12p 10p
lnw one tune	

3 Watt Plastic Wire Ends 5% 3EZ Range All voltages 6.8-100 Volts 30p each.

SILICON RECTIFIERS WIRE ENDED PLASTIC

1	Туре	P.I.V.	1-11
	1 amp	niniatu	re
	IN4001	50	6
3	IN4002	100	7
- 1	IN4003	200	8
-	IN4004	400	8
_	IN4005	600	10
	IN4006	800	12
1	IN4007	1000	15
	1.5 amp	minia	ture
-	PL4001	50	8
-	PL4002	100	9
1	PL4003	200	10
4	PL4004	400	10
-1	PL4005	600	12
1	PL4006	800	15
ı	PL4007	1000	16

LINEAR (O/P AMPS)

500

2N3055

200 18p 15p 12p 10p

55₀

50p 45p 38p 33p

(0/.	~	,
702C	TO5	75p
709C	TO99	35p
709C	D.I.L.	35p
723C	TO99 4	1.00
723C	D.I.L.	95p
725C	TO99 £	4.50
741C	TO99	
741C	D.I.L.	55p
747C	TO99 £	1.10
747C	D.I.L.	
	£	1.10
727411	D.I.L.	60p

72748P D.I.L. 60p SINCLAIR SINCLAIR
IC12 £180
TOSHIBA
TH9013P
20 WATT AMP
£4.47 POST PAID
TH9014P Pre Amp
£1.50

DATA AND CIRCUITS REF. 42 10p FREE WITH PURCHASES

TRANSISTORS IC's, TRIACS, BRIDGES. SCR's, LDR's



NEW FREE BOOKLET (No. 36) OVER 1500 TYPES-Send todayl for

PLESSEY INTEGRATED CIRCUIT 3 Watt Amplifier SL403D Complete with 8-page booklet, circuits and data

£1.50 each



TRIACS

TUD	WITH AC	CESSOR	IES 16
ype	Volts		**
	P.I.V	. 1-11	P
	RANGE		(()
C35A		75p	
C35B	200	79p	
C35D		85p	100
	RANGE (
C40 A	100	85p	9
C40 B	200	90p	3 Amp
C40D		£1.00	
C40E		£1.20	T048
	P RANGE		
C 45 A	100		





5 15 Amp T048

NEW BRIDGE

RECTIFIERS SMALL SIZE AND LOW COST

Type	Volts	
	P.I.V.	1-11
HALF AM	P	
BO5/05	50	20p
BO5/10	100	25p
ONE AMP	1 × 1	H
TUBULAR		
B1/05	50	25p
B1/10	100	25 p
B1/20	200	80p
B1/60	600	35p
ONE AMP	(G.I.)	
TUBULAR		
W005	50	30p

TUBULAR	()	
W005	50	301
W01	100	351
W02	200	401
W06	600	45
TWO AMP	S I H ×	ł I
× ti		
B2/05	50	851
B2/100	100 -	401

B2/100	100
B2/200	200
B2/600	600
B2/1000	1000
FOUR AM	IPS
⅓H × ⅓L	
B4/100	100
B4/200	200
B4/400	400
	000

B4/800 B4/800 800 SIX AMPS 1H × 1L × B6/100 B6/200



400



B6/400

CRS 3/20 200
CRS 3/40 400
CRS 3/60 600
FIVE AMP (TO66)
CRS 5/400 400
SEVEN AMP (TO48)
CRS 7/100 100
CRS 7/200 200
CRS 7/400 400
CRS 7/600 600
SITTEEN AMP SIXTEEN AMP BCR 16/100 100 BCR 16/200 200 BCR 16/400 400 SCR 16/600 600



80;

M

60p

85p 70p 75p

3 Amp T048

RADIO LIMITED **EDGWARE ROAD, W2**

404-406 Electronic Components and Equipment 01-402 8381 354-356 High Fidelity and Tape Equipment 01-402 5854/4736 309 PA-Disco-Lighting High Power Sound 01-723 6963 303 Special offers and bargains store All mail to 303 Edgware Road, London W2 1BW

Open:- 9 am-6 pm 6 days a week (309 closed Thursday) All stores open all day Saturday

TAKE 2® DAVID ANDREWS

No. 51 TOUCH-SENSITIVE SWITCH

A series of simple transistor projects, using not more than twenty components.

Towadays there is a tendency to veer away from electro-mechanical switches to electronic versions which have no moving parts. The reason is twofold; first there is less likelihood of failure and secondly there is a strange fascination in setting something in motion or switching on something without any apparent mechanical intermediary. This is already happening in applications such as lift control buttons and desk calculator keying so why not in a few domestic situations, or as a replacement for the Morse operator's key?

This month's circuit is a very simple way of providing touch sensitive keying and is capable of several types of output including an output that illuminates a low voltage lamp but the circuit can be quite easily modified to provide a relay drive

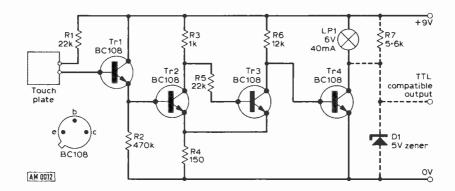
(rather negating the original sentiment of avoiding mechanical components!) or, better still, a logic (TTL) compatible output.

Operation

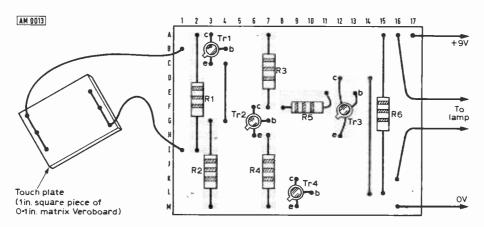
Touch sensitivity is achieved by detecting the minute current that passes through the finger when a pair of contacts is bridged by the touch of the operator. The touch transducer in the prototype was made from a 1 in. square of $0\cdot 1$ in. pitch Veroboard, with alternate copper strips paralleled together to form a contact pattern.

A more attractive touch plate could be made by printed circuit techniques and if this is done it is better to use a fibre-glass base. In either case the copper contacts need some protection from corrosion and this can be effected by lightly tinning the strips with solder.

The touch plate is connected between the supply



Circuit of the touch-sensitive switch, with alternative TTL output circuit.



Layout of components on the Veroboard with details of the touch plate.

rail (through R1) and base of Tr1 which should have low leakage current (beware of cheap "reject" transistors). When the plate is touched a very small current flows in the base/emitter circuit of Tr1 and this in turn permits a much higher current to flow between collector and emitter. Tr2 and Tr3 are connected as a Schmitt Trigger circuit; the emitter current from Tr1 flows mainly into the base of Tr2 and turns it on; this causes Tr3 to turn off and the potential at its collector starts to rise until base current in Tr4 is established. When this occurs the lamp LP1-lights. Alternatively, considering the TTL version, the output level falls to "0".

★ components list

R1	22kΩ	1p
R2	470kΩ	. 1p
.R3	1kΩ	1p
R4	150Ω	1p
R5	22kΩ	1p
R6	12kΩ	1p
Tr1	BC108	10p
Tr2	BC108	10p
Tr3	BC108	10p
Tr4	BC108	10p
LP1	6V 40mA,	10p
Verob	oard	20p

	•	76p

checked carefully before ordering.

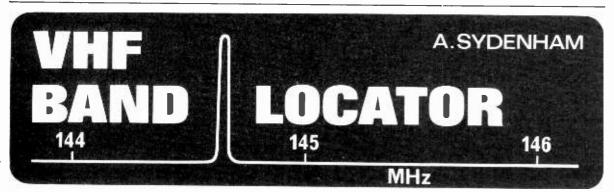
Removing the finger from the touch plate causes the base current to stop flowing in Tr1; current into the base of Tr2 thus stops and the latter starts to turn off. As this occurs Tr3 starts to draw base current through R3 and R5 and begins to turn on. As this happens the potential at Tr3's emitter starts to rise slightly and this (due to the feedback inherent in a Schmitt Trigger) causes Tr2 to turn off faster. At the same time the potential at Tr3's collector falls until sufficient base current into Tr4 can no longer be maintained. Tr4 thus turns off and the lamp goes out. Alternatively the TTL output goes to a logic level "1".

TTL Output

To obtain the TTL output version R7 and zener diode D1 should be in circuit and lamp LP1 omitted For relay operation LP1 should be replaced by a 6 volt relay. The components list has not taken the alternative versions into account.

Note

A word of warning—the touch plate should not be used out of doors or with wet fingers because droplets of moisture bridging the conductors will provide sufficient current to make the circuit switch. Possibly this problem could be overcome by carefully painting in the gaps between the strips with a good quality water repellent paint having a high gloss finish.



The easily built unit to be described is used to provide a signal in the 2 metre Amateur band (144-146MHz). When constructing or modifying apparatus for 2 metre use it can be very difficult indeed to locate the band or any part of it. Indeed in some areas, amateur activity is so low that many hours of experimenting may be wasted in tuning for non-existent transmissions. Experienced constructors will know to their cost that at v.h.f. finicky adjustments are often required and in the case of a tuning coil for example just one half turn too little or too much may result in the circuit being so far off frequency as to be useless for the purpose required. To overcome problems such as these this unit was quickly assembled—and at small cost.

The circuit of the device is shown in Fig. 1; it is by no means unique but rather the practical outcome of some earlier experiments. Basically a crystal-

controlled oscillator—Tr1 and associated items—provide harmonic output which is lightly audio modulated due to Tr2 circuitry. The modulating section is by no means essential but it does enable the user to aurally recognise the v.h.f. signal being generated which is, in the case of the 6025 kHz crystal utilized, the twenty-fourth harmonic ($6025 \times 24 = 144.6 \text{MHz}$). Whether or not the final generated frequency is exactly at this figure is not too important provided it is in the 2 metre amateur band.

Inductor L1 is tuned by trimmer TC1 to the crystal harmonic frequency, L2 merely being a low impedance untuned output link closely coupled to L1. In the f.e.t. source circuit inductor L3 is tuned to the crystal frequency by capacitor C1, final fine tuning being accomplished by means of the dust core which when once set can be so left. The drain current taken by Tr1 when oscillating correctly is approximately 2mA from a 9V d.c. supply.

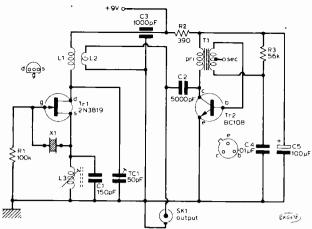


Fig. 1: Circuit of the complete unit.

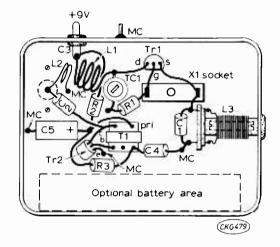


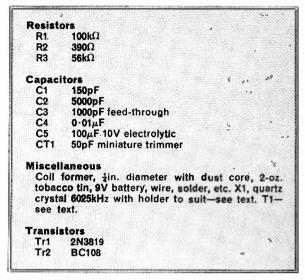
Fig. 2: Component Jayout and wiring.

The circuitry around Tr2 enables audio oscillations to be generated, transformer T1 providing the required collector-base feedback. The transformer used is a sub-miniature type driver transformer removed from a defunct broadcast band receiver. Such items are not difficult to come by and in any case the type is not critical provided the primary and secondary windings have measured resistance values approximating to 500 and 150 ohms respectively. If difficulty exists in finding a suitable surplus transformer for T1 a readily available item is the Ardente type T1079 interstage model. In some cases—and particularly if the Ardente transformer is used-it may be necessary to increase the value of resistor R3 to say $100k\Omega$. The frequency due to the audio generator is of little consequence provided it is recognizable.

Constructional

Since it is essential to screen the apparatus the ubiquitous 2-oz tobacco tin provides a cheap and convenient housing which also leaves sufficient internal space for a small battery if desired. The location of components is shown in Fig. 2 which is

* components list



self-explanatory. As will be appreciated only the crystal, output socket and supply connectors exist outside when the tin lid is placed in position. In the prototype the negative supply lead is soldered direct to the case, the nearby positive supply being taken inside via a small feed-through capacitor.

The inductors are home-made, L1 consisting of 3 turns of 24 s.w.g. copper wire wound on to a ³8in. diameter 'former' and allowed to spring off; L2 is similarly made using but 1½ turns. Both windings are spaced wire thickness. Some 24 turns of fine d.s.c. wire (30-38 s.w.g.) are close-wound on to a ½in. dust-cored former to make L3.

Testing

With one end of R2 temporarily disconnected and a crystal plugged in, a meter set to read 0-10mA placed in series with a 9V battery supply may initially read full scale or thereabouts, this indicating, as is likely, a non-oscillating condition. The core of L3 is then carefully adjusted until the current being monitored falls suddenly to around 2mA, this indicating correct functioning.

With R2 reconnected the current reading obviously increases whereupon the secondary winding of T1 is briefly short-circuited with a metal blade whilst carefully noting the test meter pointer. If no current change is detected as the short-circuit is made and broken the audio oscillator is not working and it will be necessary to reverse the connections to either the primary or the secondary windings of T1—but not both—to phase the feed-back correctly.

If a short rod aerial is then plugged into the output socket, SK1, and is brought close to a 2-metre receiver—or as is more likely a 2-metre converter working with a receiver—a signal due to the unit should be tunable whereupon trimmer TC1 may be peaked for maximum output.

Thereafter crystals in the frequency range of 6005-6083kHz may be used to give harmonic output between 144-146MHz. Alternatively crystals in the frequency range of 8005-8111kHz may be utilized provided inductor L3 is retuned to this region thus affording eighteenth harmonic output.



MULLARD AMP

Sensational 'Once in Life-time Offer a Life-time Unrepeatable once are cleared.

stocks are cleared. The amplifier is made by Mullard. Carries maker's Guarantee. In neat case. May be used for Mono of the chase we send copy of Mullard booklet DIY reo. \$1.80.



DRILL CONTROLLER

NEW IKW MODEL Electronically changes speed from approxi-mately 10 revs. to maximum. Full power at all speeds by finger-tip control. Kit includes all parts, case, everything and full instruc-tions. 21-86. 13p post and p. up model also available. 22 48.

MIGHTY MIDGET

the finest possible radio, as described al Wireless, January 73. All electronic Probably the parts \$2.20 post paid.



TIME SWITCH

Smith's mains driven clock with 15 amp switch, also notes showing how you can wake up with music playing, kettle boiling or come home to a warm house, warn off burglars, keep pets warm, halve your heating bill, etc. 21 85.

I CHIP RADIO Ferranti's latest device ZN414 gives results better than superhet. Supplied complete with technical notes and circuits. £1 38 each. 10 for £11:11.

HI-Q TUNER COMPONENTS

HI-Q TUNER COMPONENTS
For experimenting with the ZN314.
KIT NO. 1. Plessey Miniature Tuning Condenser
with built-in LW switch and 3" Ferrite slab and
litz wound MW coil, 72p.
KIT NO. 2. Air spaced tuning condenser 6"
ferrite rod litz wound MW and LW coils, 94p.
KIT NO. 3. Air spaced TC with slow motion
drive 8" ferrite rod, with litz wound LW and MW
coils, 21-10.

office 5° ferrite rod, with the wooding Lov and more coils, £1·10. KIT No. 4. Permeability tuner with fast and slow motion drive and LW loading coils. 45p.



12 VOLT I AMP POWER PACK

This comprises double wound 230/240V main

wound 230/240V mains framsformer with full wave certifier and 2000 me of smoothing. Price 22 20, the 200 me of smoothing price 22 20, the 200 me of smoothing price 22 20. The 200 me of packing adjustable from 15-40V in steps — maximum load 250W—that is from a map at 40V to 15mm at 10V. This really is a high power heavy duty unit with dozens of workshop uses. Output voltage adjustment is very suick- simply interchange pulp on leads. Silicon rectifiers and smoothing by 3,000mF. Price 26/33 plus 65p post.

MICRO SWITCH

5 amp changeover contacts, 11p each 10 for 99p, 15 amp, 5p Model 15p Changeover 15p cach.

MAINS RELAY BARGAIN



RELAY BARGAIN

Special this month are some single,
double and treble hole change-over
relays. Contacts rated at 15 amps.
Operating coil wound for 240V A.C.
Good British Make, Unused. Good British Make. Un Size approx. 14" > 1". Open struction.

struction.
Single pole 28p each 10 for £2:48
Treble pole 39p each 10 for £3:57

MAINS OPERATED SOLENOIDS



MAINS TRANSISTOR **POWER PACK**

POWER PACK
Designed to operate transistor sets and amplifiers
Adjustable output 6., 9%, 12 volts for up to
500mA (class B working). Takes the place of any
of the following batteries: PPI, PP3, PP4, PP6,
PP7, PP9, and others. Kit comprises: mains
transformer rectifier, smoothing and load resistor
condensers and instructions. Real snip at only
\$1:10 plus 20p postage.

DESK TELEPHONES

Ex G.P.O. Black standard model with dialting dial but no internal bell. Supplied with connection diagram 94p each-post, etc. 40p for single then 65p per pair. Ditto, with bell but without dialling dial 98p each plus 40p post for single then 65p



PAPST MOTORS

Est. 1/40th h.p. Made for 110-120 volt working, but two of these work ideally together off our standard 240 volt mains. A really beautiful motor, extremely, quiet running and reversible. 21-65 each. Postage one 23p, two 33p, 230V model 48.80.

10 AMP DIMMER CONTROL

For the control of lighting on stage or in a studio or for control of portable equipment in workshops, etc. This has two 13 amp socket outlets each is controlled by a 5 amp solid state regulator. The overall length it 17in. width 34in, and depth 14in. In the end is fitted a master On/Off switch indicator, lamp and fuse. Price £8 25.

STANDARD WAFER SWITCHES

Standard size 14" wafer- silver-plated 5 amp contact, standard 1" spindle 2" long - with locking washer and nul. No. of Poles 2 way 3 way 4 way 5 way 6 way 8 way 9 way 10 way 12 way 1 wa

1 pole	44p	44p	44p	44p	44p	44p	44p	44p	44p
2 poles	44D	44p	44p	44p	44p	44p	44p	77p	77p
3 poles	44p	44p	44p	44p	77p	77p	77p	£1 04	
4 poles	44p	44p	44p	77p	77p	77 p			£1.32
5 poles	44p	44p	77p	77p	£1.04			£1.80	
6 poles	44p	77p	77p	77p		£1.04			
7 poles	77p	77p	77p						£2·15
8 poles	77p	77p	77p						£2·42
9 poles	77p	77p	£1 04	£1.04	£1.80	£1.60	£1.80	£2.70	£2.70
10 pole∢	77 p	77p							£3.00
11 poles	77p					£1 87			
12 pales	77p	£1 04	£1.04	£1.32	£1.87	£1.87	£1.87	£3 52	£3.52

CAPACITOR DISCHARGE CAR IGNITION



ELECTRONIC ESITION

This system which has proved to be amazingly efficient and reliable was first described in the Wireless World about a year ago. We can supply kit of parts for an improved and even more efficient version (Practical Wireless, June). Price 26-55 plus 30p post. When ordering please state whether for positive or negative systems. Also available, ready made ignition systems for 6V, vehicles \$7-95 plus 20p.

MULLARD UNILEX

This D.I.Y. Stereo Amplifier is still available complete at \$7:00 for the four Mullard Modules or Modules can be bought separately as follows:-This D.I.Y. Stereo Amplifier is still available complete at £700 for the four Mullard Modules, or Modules can be bought separately as follows:

4 watt amplifier module (2 required) Mullard Ref. No. E.P.9000—£1.60.

Pre amp nor ule Mullard Ref. No. E.P.9001—£1.98 each.

Power Module—Mullard Ref. No. E.P.9002—£2.53 each.

In addition and made to Mullard specification we offer:

Standard Control Unit with escutcheon and knobs—£3.30 knobs—£6.41.50

Knobs- Set of 4 - 50p.

Special offer the complete Uniley with control panel at Pre VAT price 210-00 post paid.

ZPM MODULATION MOTOR

Could also be used to be no ventilators, doors, valve, damper, etc. particularly suitable for remote control. Made by Satchwell Essentially a reversible geared motor littled with internal limit switches to stop it at the end of its travel. Size approx. 6in. x 6in. x 5in. and weighing approx. 10 lb. This is extremely powerful and would lift a heavy door or open a long line of ventilators. To operate this motor you put the 50 cycle supply through a changewore with. For instance a thermostat with changeover contacts could automatically regulate the temperature in a growing house, chicken hatchery, etc. Au indicator on the motor graduated 0-10 shows the state of open or close. Also internally fitted is a variable revision, wires from this to a voit meter would give a remote indication of the open or close position. A very expensive motor if both direct from Satchwell, our price complete with step down Transformer is £16 50. step down Transformer is £16 50.

CENTRIFUGAL FAN

Mains operated, turbo blower type, Pressed steel housing contains motor and impeller. Motor is 1/10th h.p. giving considerable air flow but virtually no noise. Approx. dimensions 102 in. wide < 12 in. dia, outlet into tranking 103 × 4/2 in. 2655 plus &1 post and insurance.



THIS MONTH'S SNIP

TAPE PLAYBACK UNITS

Mams operated Mall by Rediting the famous use in background people." These are complete units realy to work and no inderstand that they are in good going order. We have not tested their back would exchange any that do not work properly. These have a sale-iror motor divinity wheat to matter the tain through the apparance and also an even equally useful valvariability with 11.84 out at 1, in a steel case with carrying hampless from good one seem 8.65 on and somewhat used at \$3.50 raige in C. 200 m less than 30p jor 1300 offes extra -



24-HOUR TIME SWITCH

Made by Smiths, these are AC mains operated, NOT CLOCKWORK, ideal for mounting on rack or shift or can be built into box with 13A socket. Two completely adjustable time periods per 24 hours, 5A changeover contacts will switch circuit on or off during these periods, 22 76 jost and ins. 25p. Additional time contact 55p pair.

MULLARD AUDIO AMPLIFIERS

All in module form, each ready built complete with heat sinks and connection tags, data supplied. Model 1183 800mW power output 729.
Model 1172 750mW power output 949.
Model EP8000 4 wait power output 94 80.
EP8001 twin channel or stereo pre amp. 21-99
10°s, discount if 10 or more outbred.



NEW ITEMS THIS MONTH

MINIATURE SEALED RELAY

American male. Our REI. REL A.1. Measures only 4" wide × 1" thick and 4" high and it's a double change over, we don't know the contact rating but estimate this at 3/5 amps. The coil resistance is 600 ohms and 9-12 volt will close it. Ideal for motable and ministerioral contacts. ideal for models and miniaturised equipment. It's a plug in relay but we supply with base. Price 28p including base.

SUB. MINIATURE MICROSWITCH

Made by Burgess, their ref. V4T6 -our ref. M8. A1. These measure only 2" × 2" × 4" thick—have change over contacts and tag connection. Price 16p each or 10 for £1-44.

3 CORE MAINS FLEX

3 CORE MAINS FLEX
Metric size -5mm which is approx, equivalent to
the old 14/36 rating. Suitable therefore for
mower or similar portable tools. Corea are
colour coded to the new European standard.
Brown—Bive: Blue—neutral: Yellow/Greenearth, Grey P.V.C. covered overall. 100m coils \$5.
50m coils \$23 and 25m coils \$21.75, Post 40p on
100m, 25p for 50m coils and 20p for 25m coils.

PANIC SWITCHES

Tough enough to be foot switches and elegant enough to be panel switches. Bakelite construction with white push rod. Price 40p less quantity discounts. Switch is rated 250v-2 amp.

20 WATT CAMPING LIGHT

20 WATT CAMPING LIGHT
Also makes good car emergency light. This uses a standard 2 ft 20 wast tube and operates from a 12v car battery drawing approx. IA. This gives illumination per amp/hour of battery life far in excess to flament lamps and in fact to the miniature 8-13 watt camping lights often offered. Complete unit rearly to operate, in strong white enamelled netal frame. These would normally sell at \$8 are unused but slightly solled and we offer these at \$250 plus 40p post and packing.

6 MAINS TRANSFORMERS

6 MAINS TRANSFORMERS
Our Ref.: MTM1 27 volt at 8 amp. Upright
mounting fully shrouded—flying leads—fully
tapped primary. Price \$3.30.
Our Ref.: MTM2 12v at 1 amp. Upright mounting
with fixing lugs, tag connection. 240v primary—
12v 1 amp secondary. Price 82p.
Our Ref.: MTM3 63v 2 amp upright mounting
with fixing lugs, tag connections. 240v primary
63v 2 amp secondary. Price 77p.
Our Ref. MTM4 18v-1 amp with thermal cut-out,
upright mounting with fixing lugs-tag connections.
Primary 240v—secondary 18v at ½ amp. Price
88p.

ooy. Mains Isolation MTM5 350 watts earth shielded-

flex leads—upright mounting lugs for fixing. Price \$4.40 each.

6 VOLT RELAYS

Our ref.: REL MI. Removable clear plastic enclosed two screw fixing. Have a 6 volt D.C. operated coil but two change-over contacts each rated to make and break 240v A.C. at 15 amps. Price 66p each.

P.O. TYPE 3000 RELAY

Our ref.: REL M2-100 ohms coll and 2 pair normally open heavy duty contacts. Price 75p

6 DIGIT COUNTER Resettable, 440 ohm coil up to 25 impulses per second, Ex-equipment but

guaranteed perfect. \$2.20

COMBINATION SWITCH

This comprises of 12 mintature change - over micro
switches. Joined in banks of
and mounted on frame
with four digital numbered
thumb wheels and a removable lever for locking the
thumb wheel aperates 3 hanks. Over 4,000 combinations
are possible but by re-wiring the switch connections underneath then thousands more
variations are possible. If you are making
equipment which you don't want switched on
accidentally or without authority then this is a
switch to consider—this can also be used as a
coding switch for many other operations. Very
neat and compact and measuring approx. 4" >
1;" × 1;" sleep. Priced at 23-03.

PUSH BUTTON SWITCH

PUSH BUTTON SWITCH

Type 14 D.M.G. A very fine switch made by Honeywell. The switch is intended for mounting on panel through oblong hole. No screws required for fixing its sprung clips secure it quite firmly. The operating button is approx. 17 dia. round and dished for ease of operation. Has 2 sets of 10 amp change-over contacts. Spring loaded, returns to normal when pressure is released, ledeal for instrument or quality gear. Price 509 each, 10 for £450, 100 for £40.

PHOTO-MULTIPLIER TUBE

American R.C.A. type No. 4555. These tubes have a gain of a million or more. Regular Pricehave a limited quantity and offer

J. BULL (ELECTRICAL) LTD. TERMS: 10°, discount if ten of an item ordered, send postage where quoted other items, post free if order for these items is £6 00 otherwise add 20n.

(Dept. P.W.) 7 Park Street, Croydon CRO IYD Callers to: 102'3 Tamworth Road, CROYDON

Fully guaranteed	TRANSISTORS, ZENER DIODES etc. ALL val	ves
Individually packed	OA5 20p OC71 12p IN823A £1-80 3N154 95p BC108 10p GET115 45p	
VALVES	OA70 10p OC73 30p IZMT5 85p 8FR5 45p BC118 20p GEX.66 £1.50 OA71 10p OC75 25p IZMT10 33p 12FR60 73p BCY72 15p NKT222 20p 6J4W 65p 1.547 40p 6060 OA73 7p OC76 25p IZT5 67p 40954 £1.25f BF115 25p NKT304 50p 6J5 35p [457 70p 6064	50p 45p
B12H \$1.75 ECH84 40p OA2 38p CY31 40p ECL90 40p OB2 35p DAF96 40p ECL82 31p PABC80 35p	P OA74 7p OC81 20p IZT10 63p 40595 21.25 BF173 20p RAS310AF 6J5GT 30p 19AQ5 40p 6065 P OA79 (6D15 OC81D 20p 2G385 51p 40636 21.25 BFY51 20p 33p 6J6 25p 19G3 25.75 6080	65p £1·55 £1·75
DF96 40p ECL83 63p PC97 41p DK96 47p ECL86 36p PC900 42p	DOARI 80 OC82 250 2N918 370 40669 21.40 BS 450 5D928 310 6J7M 350 19H4 25.25 8020 3 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	£3.75 15p
DL92 32p EF36 50p PCC84 36p DL94 45p EF37A 85p PCC89 45p DL96 40p EF40 50p PCC189 49p	P OA200 7p OC83 25p 2N1306 25p AC127 25p BSY29 25p SD94 21p 6K7 40p 25L6GT 45p 8003 OA202 10p OC83B 15p 2N1307 25p AC128 20p BU100 21.80 SD988 48p 6K7G 17p 30C15 70p 9003	40p 45p 12p
DI.96 40p EF40 50p PCC189 49p DM70 40p EF41 65p PCE800 75p DY86 29p EF80 25p PCF80 25p	P OA210 30p OC122 50p 2N2411 \$1.50 ACY17 25p BYZ16 63p Z2A51CF 78p 6K25 70p 30C18 75p 9006	12p
DY87 28p EF83 60p PCF82 27p DY802 30p EF85 31p PCF84 54p	P OAZZO1 50p OC140 40p 2N2989 \$4.00 AD149 50p CR81/20 38p ZR21 46p 68A7 40p 30FL1 70p C.R. Tub	
£1 08 EF89 25p PCF200 601 EF91 27p PCF201 601	D OC28 25p OC172 37p 2N3054 50p AD162 35p CRS1/40 48p 6807 40p 30L15 80p VCR517	£4·00 B £5·00
E180CC 37p EF92 31p PCF801 40p E181CC 90p EF95 31p PCF802 46p E182CC EF183 26p PCF805 80p	D OC29 60p OC201 75p 2N3731 22.75 AF139 30p CR83/20 38p ZENER 68J7GT 28p 30P12 75p OC35 50p OC206 95p 2N4172 50p AF178 48p CR83/30 43p DIODES 68L7 45p 30P12 70p VCR517	
£1 08 EF184 31p PCF806 65p EA50 18p EFL200 67p PCF808 85p	OC36 58p IN91R 30p 83303 60p AF186 40p CR525/055 All preferred 68N/GT 35p 30PL13 90p 88D voltage voltage 17025 60p 3F100 68p A8Y26 25p 55p Voltage 17025 1702 1702 1702 1702 1702 1702 1702 1702	£8-10 £8-10
EABC80 27p EL34 45p PCH200 65p EAF42 46p EL41 55p PCL81 40p EB91 20p EL84 21p PCL82 30p	D OC45 12p 1N677 12p 3N128 87p A8Y67 48p C82A 65p 1W 0.87 68Q76T 32p 33L64T 50p 88L D OC45 12p 1N677 12p 3N139 £1.75 BAW19 28p CV102 25p 1.5W 0.25 6V6G 15p 35W4 30p	£8·10
EBC33 45p EL85 37p PCL83 60p EBC41 50p EL86 36p PCL84 35p	p VY800 35p VAF42 50p VY85 35p 3Q4 55p 6AH6 50p 6BA6 25p 6X5G 25p 50CD6G £1.10	£2·50
ECCRI 31p EL90 31p PCL85 35r EBF80 36p EL95 31p PCL86 43r EBF83 36p EL500 76p PFL200 60r	P Q Q V Q 3-10 UBF80 35p V R 150/30 35p 3V4 48p 6AK8 30p 6BG6G 47p 6Y6G 75p 75 50p 6097C	£5.00 £16.00
EBF89 27p EL504 76p PL36 50p ECC81 27p EM31 22p PL81 40p	p R17 45p UCC85 35p Z801U 21.40 5B/255M 6AL5W 35p 6BQ7A 43p 6Z4 40p 78 50p R19 35p UCF80 60p Z803U 21.10 23.10 6AM6 35p 6BR7 85p 7B7 50p 80 55p Special V	
ECC82 25p EM80 36p PL82 35p ECC83 27p EM84 31p PL83 36p ECC84 27p EM87 62p PL84 30p		£18-00
ECC85 36p EY51 36p PL500 62p ECC86 75p EY86 36p PL504 62p	p 28.20 UCL83 55p 184 30p 5 Y 3 GT 35p 6 A 86 30p 6 C 8 20p 12 A 76 35p 807 50p 1 T 1 2 3 86 UF 80 30p 185 30p 5 Y 4 G 35p 6 A 76 30p 6 C H 6 55p 12 A 77 35p 813 4 4 00 K 3 1	285-00 £4-50 E11-00
ECC88 40p EY88 40p PL509 21.00 ECC189 55p EZ41 45p PL802 95p	5 U26 70p UL41 60p 1X2A 86p 5Z4 75p 6AX4GT 50p 6D6 15p 12AV6 40p 866A £1.25 K308 4	E14-50 E14-50
ECF80 31p EZ80 22p PX4 22-50 ECF82 31p EZ81 24p PY33 551 ECF82 67- GZ34 52p PY80 851	0 U191 650 UU5 65p 3A4 40p 6AB7 25p 6B7 35p 6F33 £1-35 12BE6 35p 955 35p	£3·15
ECF801 56p KT66 22.35 PY82 23	Description Description	£1·35
ECH81 25p KT88 22.25 PY83 301 ECH83 40p N78 21.60 PY88 321	TEXAS INTEGRATED CIRCUIT SN 76131N Stereo 12K7GIT 45p 5933 \$1.00 7343 \$2	835 00 822 00 £3 60
V.A.T. —	pre-amp 20.65. VACUUM CONDENSERS 12, 50, 12Q7GT 40p 6057 55p 725A 4	E22·50

Please add 10% to all orders

METERS

‡Full List of our very large stock of meters on request. TEXAS INTEGRATED CIRCUIT SN.76131N Stereo pre-amp £0-65. VACUUM CONDENSERS 12, 50, 55pF each 20,000v.£1-50. P. & P. 20p. 4, 5 and 8 bank 25 way uniselectors, 24V, guaranteed perfect, £3-75; £4-59; £6-87 respectively. MODULATION TRANSFORMERS made by COLLINS. Freq. resp. 200-5000 CPS; Pri. 6000/CT 3000 TV Sec. 60000/2 3000 TV Audio power 20W.£1-25. Post and packing 25p.

Colomor (Electronics) Ltd.

170 GOLDHAWK ROAD, LONDON W12. **RETAIL**: 743 4946 TRADE: 743 0899 Open 9-12.30, 1.30-5.30 p.m. Thursday 9-1 p.m.

Give us six months, and we'll turn your hobby into a career.

You have a hobby for a very good reason. It gives you a lot of pleasure.

So if you can find a job that involves your hobby, chances are you'll enjoy your work more, and you'll do better work.

Now CDI can help you find such a job. A job where you'll be responsible for the maintenance of a computer installation. A job that pays well too. If you're interested in mechanics or electronics (without necessarily being a mathematical genius), have a clear, logical mind and a will to work, then we can train you to be a Computer Engineer inside six months.

So give us a call. CDI. We're the Training Division of one of the world's largest computer manufacturers. And we have the experience to know if you can make it. A ten minute talk with us, and you could be on the way to spending the rest of your life with your hobby.

01-637 2171

between 9 a.m. and 9 p.m. and ask for Mr PRENTIS

It's quicker and easier to phone, but if you prefer, send this coupon to: Control Data Institute, Wells House, 77 Wells Street, London, W.1.

Please give me further information.

Name

Address

Age

PWS

CONTROL DATA
INSTITUTE

Phone



The Training Division of one of the world's largest Computer manufacturers.

MAGNETIC AMPLIFIERS

PART 2

I.R.SINCLAIR

SELF-SATURATING MAGNETIC AMPLIFIERS

(continued)

If the control current is zero, the core is taken through a small magnetisation cycle and has an inductance determined by the average flux contributed by the secondary current. If the control current is in the *opposite* direction, the flux due to control current opposes it and the core can be made to change from negative to positive saturation when signal current flows. In this state, flux change is maximum and inductance is large so that the voltage drop across the secondary winding is large.

In a core operated in this way, the amplification obtained depends mainly on the shape of the magnetisation B—H curve, and a steep sloped curve with a very low value of saturation magnetic field strength is desirable. To obtain this shape of curve, cores are usually made by winding tapes of suitable material (permalloy etc.) round a former to form a toroid and winding the coils round these cores.

When such materials are used in such a core, the B—H curve is of the type shown in Fig. 6, where the scales of the graph are such that the values of B are large and those of H small. Saturation occurs at

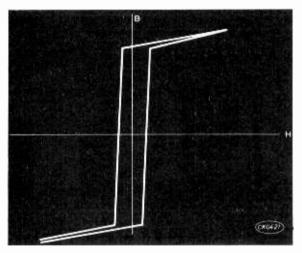


Fig. 6: B-H curve for material used for cores of magnetic amplifiers.

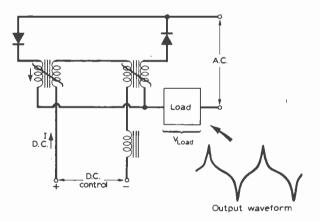
such a low value of flux (measured in milliamps of current X turns of coil) that the cores will saturate with the output current even with no control current applied, and so the control current must be applied so that its flux always opposes the output flux.

The circuit of a full-wave self-saturating magnetic amplifier is shown in Fig. 7. Since the secondary current in each core must be in one direction, a

rectifier is used in series with each secondary winding and two windings are used so that control can be exerted over the whole of one cycle. Note that the voltage across the load is alternating, despite the rectifiers. The output waveform of such an amplifier is also shown in Fig. 7; except for the value of voltage at minimum signal, the waveform is similar to that obtained from a thyristor circuit.

The transfer characteristic (voltage out plotted against *current* in control winding) is shown in Fig. 7. The precise form of this curve can be calculated if the B—H curve for the core in use is known, and it is one of the considerable achievements of core manufacturers that cores and core materials can now be made with reproducible values of B—H curve. The greatest sensitivity can be obtained if the control current is biased to the point 0 on this control curve, and for this purpose, if the bias signal cannot be obtained from the source, a separate bias winding may be used.

The self-saturating magnetic amplifier will give an a.c. voltage output across a load almost independent



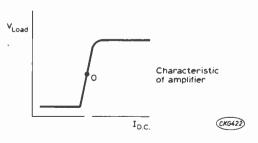


Fig. 7: Circuit of fullwave self-saturating magnetic amplifier with output waveform and amplifier characteristic curve.

of load impedance and determined only by the d.c. control current, so that a d.c. signal at the control winding produces an amplified a.c. output. The output power obtained depends on the size and type of core used.

DC OUTPUT FEEDBACK

The magnetic amplifiers described so far give an a.c. output for a d.c. input. Where the load of the amplifier must be supplied with d.c., or where one magnetic amplifier feeds a second (as when very large power amplification is required) the output of the magnetic amplifier must be rectified. This may be done by taking the output terminals to a bridge rectifier and connecting the load across the other two terminals of the rectifiers (Fig. 8a). A more economical method is to make use of the rectifiers which feed the cores, and add two more to form a bridge rectifier circuit (Fig. 8b) or to use a centre tapped transformer as power source and use the core rectifiers to provide the d.c. output (Fig. 8c).

When linearity of control is particularly important, this may be improved by feedback. To apply feedback to a magnetic amplifier a direct current must be obtained from the output and applied to a feedback winding in the direction opposite to the current in the control winding. The feedback ratio which by the usual feedback theory is approximately the new gain of the amplifier, is the ratio of control winding ampere-turns to the feedback ampere-turns.

DESIGN AND CONSTRUCTION OF PRACTICAL AMPLIFIERS

Because magnetic materials vary so much, it is not easy to give a "circuit" for a magnetic amplifier for home construction; it is rather like giving a circuit for a radio in which all the transistors had to be made at home as well! We can, however, outline the steps in design, so that the experimenter can construct reactors, determine their characteristics and make use of them in the circuits shown earlier. Since commercially obtainable reactors are £10 and upwards, there is a strong incentive for home construction!

CORES

The type of core material which can be used depends on the power available to drive the control winding. When large powers (about 1kW) are being controlled, and several watts can be used to drive the amplifier, an old transformer core can be rebuilt, provided that the transformer was rated to take such power loads. This requires some trial and error unless the core material is known and information on it is available. If this is not the case, the best cut-and-try method is to keep the original windings on the bobbin and reassemble the core with no gap, by replacing the E and I sections facing alternatively in opposite directions. The inductance of the main winding should then be checked for saturation point; this is easily done if an oscilloscope is available by feeding the winding from an a.c. supply through a large variable resistor and checking the voltage across the winding with an oscilloscope. As the current is increased, the voltage waveform becomes flat-topped when saturation point is reached, and the current flowing at this point is saturation current (the saturation current here is peak current= $1\cdot4\times$ rms meter reading). Alternatively an a.c. voltmeter and ammeter can be used and voltage plotted against current on a graph, saturation being when the graph becomes flat-topped. Note that the a.c. current must be varied by a resistor, if a constant voltage source such as an auto-transformer is used, the *current* waveform will be the one which appears distorted.

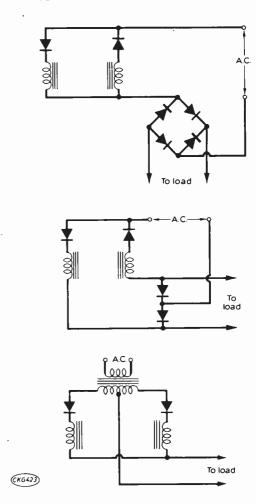


Fig. 8a, top, shows rectifiers needed to rectify AC output of amplifier when the load requires a DC supply. Fig. 8b, centre, and Fig. 8c, bottom, illustrate alternative methods of achieving DC output.

Once saturation current in the main winding is known, the saturation current in the other windings can be calculated, for it is inversely proportional to the voltage of the winding when used as a transformer. For example, if the saturation current in a 250V winding is 100mA the saturation in a 350-0-350

winding, total 700V is
$$100 \times \frac{250}{700}$$
 mA = 36mA

and this 700V winding can be used as the control winding. If the control winding has resistance of 100Ω , the voltage across it at saturation is 36V and this will be able to control currents of $\pm 100 \text{mA}$ at 250V in the other winding. The voltage gain in this case is not impressive, but the power gain is fairly high and is achieved at less cost than many comparable devices.

SUPPLIERS OF SEMI-CONDUCTORS THE

COMPLETE TELEPHONES



EX. G.P.O. NORMAL HOUSEHOLD TYPE

ONLY £1-05

POST & PACKING 45p EACH



TELEPHONE DIALS Standard Post Office type Guaranteed in working order

ONLY 27'p

POST & PACKING 161p

	TESTE	D AND GUARANTEED PAK	s
879	4	IN4007 Sil. Rec. diodes. 1,000 PIV lamp plastic	55p
881	10	Reed Switches, I' long, Figure	55p
899	200	Mixed Capacitors. Approx. quantity, counted by weight p.	55p
H4	250	Mixed Resistors. Approx. quantity counted by weight P.	55p
H7	40	Wirewound Resistors, Mixed types and values.	55p
H9	2	OCP71 Light Sensitive Photo Transistor	55p
H28	20	OC200/1/2/3 PNP Silicon uncoded TO-5 can	55p
H30	20	I Watt Zener Diodes, Mixed Voltages 6.8 – 43V.	55p
H35	100	Mixed Diodes, Germ. Gold bonded, etc. Marked and Unmarked.	55p
H38	30	Short lead Transistors, NPN Silicon Planer types.	55p
H39	10	Integrated Circuits, 6 Gates BMC 962, 4 Flip Flops BMC 945	55p
H 40	20	BFY50/2, 2N696, 2N1613 NPN Silicon uncoded TO-5	55p
H41	2	Sil Power transistors comp pair BD131/132	55p
	UNP	IARKEO UNTESTEO PACKS	
844	150	Germanium Diodes Min. glass type	55p
883	200	Trans. manufacturers' rejects all types NPN, PNP, Sil. and Germ.	55p
884	100	Silicon Diodes DO-7 glass equiv. to OA200, OA202	55p
884	100	Sil. Diodes sub. min. IN914 and IN916 types	55p
888	50	Sil. Trans. NPN, PNP equiv. to OC200/I 2N706A, BSY95A, etc.	55p
81	50	Germanium Transistors PNP, AF and RF	55p
H6	40	250mW. Zener Diodes DO-7 Min. Glass Type	55p
ЙD	20	3 amp. Silicon Stud Rectifiers, mixed volts	55p
H15	30	Top Hat Silicon Rectifiers, 750mA. Mixed volts	55p
H16	15	Experimenters' Pak of Integrated Circuits, Data supplied	55p
H20	20	BY126/7 Type Silicon Rectifiers I amp plastic. Mixed volta.	55p
H34	15	Power Transistors, PNP, Germ. NPN Silicon TO-3 Can.	55p

MAKE A REV COUNTER FOR YOUR CAR

The 'TACHO BLOCK'. This encapsulated block will turn any 0-ImA meter into a linear and accurate rev. counter for any car with normal coil ignition system.

£1.10 each



OVER

We hold a very large range of fully marked, tested and guaranteed transistors, power transistors, diodes and rectifiers at very competitive prices. Please send for free catalogue.

600,000 Silicon planar plastic transistors. Unmarked, untested, factory clearance. A random sampling showed these to be of remarkably high quality.

Audio PNP, similar to ZTX500, 2N3702/3, BCY70 etc.

Audio NPN, similar to ZTX300, 2N3708/9, BC107/8/9, BC168/9 etc.

Please state Audio NPN or Audio PNP when ordering.
ALL AT 500 for £3-30, 1,000 for £5-50, 10,000 for £44 P. & P. 11p/1.000.

OUR VERY POPULAR 4p TRANSISTORS

TYPE "A" PNP Silicon alloy, TO-5 can.
TYPE "B" PNP Silicon, plastic encapsulation.
TYPE "B" PNP Germanium AF or RF.
TYPE "F" NPN Silicon plastic encapsulation.
TYPE "G" NPN silicon similar ZTX 300 range
TYPE "H" PNP silicon similar ZTX 500 range

8 VARIOUS TYPES £1 P & P 27

Our famous PI Pak is still leading in value for money.

Full of Short Lead Semiconductors & Electronic Components, approx. 170. We guarantee at least 30 really high quality factory marked Transistors PNP & NPN, and a host of Diodes & Rectifiers mounted on Printed Circuit Panels. Identification Chart supplied to give some information on the Transistors. Please ask for Pak P.I. Only 55p. I p P & P on this Pak

A CROSS HATCH GENERATOR FOR £3.85 !!!

YES, a complete kit of parts including Printed Circuit Board. A four position switch gives X-hatch, Dots, Vertical or Horizontal lines. Integrated Circuit design for easy construction and reliability. This is a project in the September edition of Television.

This complete kit of parts costs £3.85, post paid.

A MUST for Colour T.V. Alignment.

STEREO DECODER £4.95

A ready built unit, ready for connection to the I.F. stages of your existing FM Radio or Tuner Unit. A tell-tale light can be connected to show the presence of a Stereo transmission and correct operation of the Unit. The Unit is in the form of a small printed circuit, and no further alignment is necessary, as all preset adjustments have already been carried out at the factory. It is recommended that a L.E.D. is used as the indicating light and a suitable device is available from us @ 344p.

Supplied with necessary instructions and written guarantee.

FREE CATALOGUE FOR



TRANSISTORS. RECTIFIERS, DIODES, INTEGRATED CIRCUITS. FULL PRE-PAK

100,000

NOW IN TWO RANGES

These are 40W and 90W Silicon Plastic Power Transistors of the very latest design, available in NPN or PNP at the most shatteringly low prices of all time. We have been selling these successfully in quantity to all parts of the world and were proud to offer them under our Tested and Gusranteed erms. Range I. VCE. Min 15. M. 15 2 1. 3. 3. 4. 4.0

40 Watt 1-12 13-25 26-50 90 Watt 31p 31p 25p 26-50 90 Watt 31p 31p 25p 26-50 Complementary pairs matched for gain at 3 amps. 11p extra per pair. Please state NPN or PNP on order.

INTEGRATED CIRCUITS
We stock a large range of I.Cs at very competitive prices (from IIp each). These are all listed in our FREE Catalogue, see coupon below.

METRICATION CHARTS now evailable
This fantastically detailed conversion calculate
carries thousands of classified reference between
matric and British (and U.S.A.) measurements
length, area, volume, liquid measure, weights etc.
Pocket Size 15p. Wall Chart 18p.

LOW COST DUAL IN LINE I.C.

14 pin type at 164p each Now new fow profile 16 pin type at 18p each type

BOOKS We have a large selection of Reference and Technical Books in stock. These are just two of our popular lines:

40 p

75 p

B.P.I Transistor Equivalents and

Substitutes;
This includes many thousands of British
U.S.A., European and C.V. ecuivalents.

The Iliffe Radio Valve & Transistor Data Book 9th Edition; p. & o. 234p. Characteristics of 3,000 valves and tubes, 4,500 Transistors, Diodes, Rectiflers and Interested Circumstances. Integrated Circuits.

> Send for lists of publications N.B. Books are void of V.A.T.

,			
Please send me	the FREE	Bi+Pre-Pck	Catalogue.

ADDRESS

ALL PRICES INCLUDE 10% VAT MINIMUM ORDER 50p. CASH WITH ORDER PLEASE. Add 11p post and packing per order OVERSEAS ADD EXTRA FOR POSTAGE

DEPT. D, 222-224 WEST ROAD, WESTCLIFF-ON-SEA, ESSEX SSO 9DF TELEPHONE: SOUTHEND (0702) 46344

* * * * * * * *

NEVER AGAIN

after Mr. Rising Price emerges from the 'fridge, will an opportunity like this recur!!!

Partridge Package prices are actually LOWER than the Pre-VAT prices of the items purchased separately.

Phone your order - we send the goods just give name, address, Access or Barclay-card No. — that is all!!!

* * * * * * * \star

The Space Age WORLD RECORD award winning 7' 6" long All Band JOYSTICK VFA Antenna-JOYMATCH A.T.U.-TRIO RECEIVER or TRANSCEIVER-Match-HEADPHONES-A COMPLETE STATION IN ONE COMPACT PACKAGE—THE FLAT DWELLER'S DREAM !

★ JOYSTICK VFA £12.54 (A) : JOYMATCH ATU III or IIIA £12.54 (B) : JOYMATCH ATU LO-Z500 £18·10 (C).

COMMUNICATIONS HEADPHONES £2.86 (D)

(All including carriage, packing, accessories and insurance)

PARTRIDGE PACKAGE No. 1
9R59DS receiver ... £54 45
*Items (A); (B); (D) above £12 10
Complete Gen. Coverage
Station £66 55

PARTRIDGE PACKAGE No. 3 JR599 receiver... ... £176.00 *Items (A); (B); (D) above FREE Complete Amateur RX Station ... £176.00

PARTRIDGE PACKAGE No. 4 TS/PS515 Transceiver 180W £231 00

BARCLAYCARD - ACCESS - PERSONAL LOANS!!

ALSO: SPSD SPKR. £4.95; OA2 MAINS STABILISER 74p.

NEW TO U.K.: TR7200, SUPERB 2M CAR TRANSCEIVER £142-45; TR2200 £87-45.

NEW: World-wide reception on the amazing "DX—CRYSTAL SET" £2.20 including unique aerial.

NEW: INSTRUMENT CASES, easily drilled in Strong black rigid polystyrene. $5\%\% \times 3\%\% \times 2\%$. ONLY **20**p.

PARTRIDGE BUDGET LINE-

ARTIFICIAL EARTH—SOLVES YOUR EARTH PROBLEMS 45 28; AERIAL BANDSWITCH—TUNED AERIAL £5 28; A.T.U. KIT—FULL COVERAGE TX/RECEIVER £5 28; ASSEMBLED £6 38.

(All including carriage, packing, accessories and insurance) Send 3p stamp for full illustrated details of Partridge Products.

TRIO brochures (state which) 3p stamp extra.

ALL PRICES INCLUDE V.A.T. AT 10% NO V.A.T. ON OVERSEAS ORDERS

CARRIAGE AND INSURANCE EXTRA OVERSEAS

BOX 5,



Phone: 0843 62535 or 62839 cheap periods



Mail Order Only



PRACTICAL WIRELESS

ELECTRONIC IGNITION SYSTEM

This Capacitor-Discharge Electronic Ignition System was recently described in Practical Wireless and has proved extremely popular. We are able to offer the kit in two forms; the standard kit containing the electronic components only, enabling the customer to tailor these to his own layout, or the de-luxe version containing a ready-drilled roller-tinned printedcircuit board and fully machined die-cast case with A.M.P Electrical Spade Connector Block. Each kit is supplied with a custom wound transformer, first grade components and full constructional details.

The original circuit employed Germanium Power Transistors for the negative earth version. WE NOW SUPPLY SILICON P.N.P. POWER DEVICES AT NO EXTRA COST! All components available separately. Case size 4½" x 3½" x 2". Complete assembly and wiring manual 25p, supplied with deluxe kit only, refundable on purchase of kit.

Suitable for 12v systems with Pos. or Neg. earth.

Price: Standard Kit£7-97 U.K. Post Free De-Luxe Kit£9 62 U.K. Post Free Quantity Discounts: 1-5 Nett 6-9 Less 10% 10-49 Less 15% 50-99 Less 20% 100-999 Less 25% 1000 up Less 30% Trade and Overseas Enquiries Invited

PLEASE STATE POS. OR NEG. EARTH WHEN ORDERING.

DABAR ELECTRONIC PRODUCTS

98A LICHFIELD STREET, WALSALL, STAFFS. WS1 1UZ Tel. Walsali 34365

COMPARE OUR PRICES

COLIL MILE 4	JOIL I ILICES
Speaker Bargains	ACOS GP101 COMP. CRYS65
E.M.I. 13 x 8 In 3, 8 & 15 OHMS	19-TI SONOTONE STEREO
PLAIN £2.00	CRYSTAL 80
WITH TWEETER €2-25	POSTAGE 5p per CARTRIDGE
TWIN TWEETER £3-50	Microphone Bargains
Type 350-20 watt with Tweeter	CM 20 Crystal Hand 45
B. OHM p. & p. 37p £7·25 8 x 5 ln 3, 8 & t5 OHMS £1·10	DX143 Oynamic, cassette-
61 (93850) 8 ohm £2.20	type stick £1:00
8" (14A/1000) 8 ohm 10 wat! £4 00	CM70 PLANET stick metal.
E.M.I. 31 TWEETER C/	switch crystal £1-45
MAGNET 8 ohm £1:00	DM160 Dynamic uni-dir, ball
FANE 7 x 4 In 3 & 8 OHMS . 90	metal, £3·75
8"8, OHM DUAL CONE £2-10	UD130 50K/600 OHM unl-dir,
CELESTION 8" 15.OHM £1.40	ball metal £4-50
BAKER GROUP 25 12" 25	TW209 LESSON DUAL IMP
WATT 8 or 15.OHM £6.00	ball metal, unl-dir. £5.75
5" 8 ohm C/MAGNET 80p	CONDENSER MIKE uni,-dir. 600 OHM £7.95
p. & p. 10p	600 OHM £7.95 GUITAR MIKE 45
	LAPEL TYPE, crystal 40
POSTAGE 25p per SPEAKER	POSTAGE 17p each.
Kit-Form Cabinets Teak	TOOTHOL TYP CACH
(17" x 10" x 6") with a 13" x 8"	Battery Eliminators
or 8" CUT OUT £2.95	240v input 6 or 9v d.c. output
for EMI 350 £3 95	at 150 mA £1·99
(12" x 12" x 6") with a 8" x 5" or	12v d.c. input (for cars, fits in
8" CUT OUT £2 25	lighter socket) 6, 7½ or 9v
(PLEASE SPECIFY CUT OUT)	d.c. output at 300 mA £2-50
Add 35p per Cabinet for p. & p.	P. & P. 10p
Cartridges with standard fittings &	Tapes "MYLAR" base finest
styli	quality British made.
ACOS GP91/2SC or GP91/	5" 600 ft 36p 51" 1800 ft #5p
3SC STEREO COMPAT-	5" 900 ft 45n 7" 1200 ft 55n
IBLE 90	5" 1200 ft 60p 7" 1800 ft 80p
ACOS GP94 STEREO CER. £1-50	5#" 900 ft 49p 7" 2400 ft 95p
ACOS GP95 STEREO CRYS. £1 15	5‡" 1200 ft 55p
ACOS GP96 STEREO CER. £1 50	POSTAGE 9p each.
9THAC SONOTONE STEREO	
CERAMIC (DIAMOND) £1.70	PLASTIC LIBRARY CASES
9THAC/G SONOTONE	for 5in Reels 16p
STEREO CER. (DIAMOND)	5}in Reels 19p 7in Reels 21p
SLIMLINE £1-70	

ACOS GP67/2C MONO CRYS. 65 P. & P. 5p each

THIS MONTH'S SPECIAL OFFER

E.M.I. Loudspeaker Enclosure kit. (LEK 450/8) comprising 2 EMI 450
Speakers (8 ohm 10 watt 7/Tweeter, plus cross-over) and 2 EMI Cabinet
kits 18' × 10' × 11' plus Acoustic Wadding, Glue, Screws, Instructions.
Recom. Retail Price £2' 20. Bargain at £18' 00 inc. V.A.T., plus 50p p.Ap.

SEND 25p FOR COMPLETE CATALOGUE Add 10% VAT on prices, inc. P. & P.

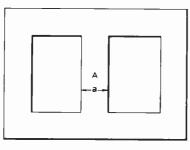
RIVERSDALE ELECTRONICS

Mail Order Department W8/73, P.O. Box 470, Manchester M60 4BU ALL OUR MERCHANDISE IS FULLY GUARANTEED

FROM SCRATCH

Much more efficient magnetic amplifiers can be obtained by designing from scratch. If the control power is more than about 200mW, transformer steel cores (such as Hypersil) can be used either in tape or C-core (with no gap) form, for lower powers a μ -metal or permalloy core is available. For any core, the power which can be controlled is approximately

equal to $\frac{D^2ABf}{200}$ where D is the diameter of the whole core (in cm), A the area of cross section of core



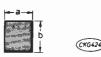


Fig. 9: The cross sectional area of the core can be obtained by multiplying 'a' and 'b' measured in cms.

(in sq.cm) in the bobbin, B is the saturation flux density of the core in Teslas (Weber per sq.m) and f is the frequency in Hertz (cycles per second).

The wire size may then be selected if the output current is known. Using a table of wire size which shows area in "circular mils" choose a wire size of about 1 circular mil for each milliamp of output current. The number of turns for the voltage required

at the output is then $\frac{25V}{A}$ where the area of

cross-section of the core (Fig. 9) in sq.cm and V is the voltage of the winding in volts.

After this, the design depends on the core material used, whose characteristic must be known. The ampere-turns for control should be obtained from the maker's information, and the control winding designed to suit amplification required and to fill the available bobbin shape.

In the case of a commercial design, considerably more would be done to calculate leakage flux, winding thickness, etc. but a cut-and-try approach is better for the amateur who is more interested in making a working device than in establishing a production line.

FINAL NOTES

Voltage gains are of the order of 8-40 with straight saturating circuits and up to 1200 with self-saturation. Feedback lines should include a choke to prevent a.c. feedback.

The frequency of the input signal should not be more than one-tenth of the frequency of the operating a.c.; for 50Hz operation, the input signal bandwidth is d.c. to 5Hz.

BUY YOURS NOW!



want to know about valves, integrated circuits, semiconductors, picture tubes and other components. It also contains equivalents and comparables lists.

The Mullard Data Book 1973/74 is now available from your bookseller, or direct, cash with order, from the Selray Book Co Ltd, 60 Hayes Hill, Hayes, Bromley, Kent BR2 7HP.



M54

PRODUCTION LINES colin riches

STEREO 21

I didn't think it was possible, but, for the amazingly low price of £17.95, Radio and TV Components are marketing a stereo record playing outfit.

In kit form, it comprises a BSR C129R 3-speed record deck with cartridge, a pre-assembled amplifier module, giving 2.7W per channel, two 8in. x 5in. speakers, easy-to-assemble woodwork for the plinth, cover and speaker cabinets and all the wire, nuts and bolts, etc.

The "Stereo 21" is particularly suitable for beginners to home construction because no soldering is required. All electrical connections are made through push-on tags. The plinth and speaker enclosures employ pre-mitred, wood grain covered chipboard sections, the mitres being cut in such a manner that a hinge is formed. Glue is applied to the mitred sections which are then simply folded over to form a cabinet.

Another new item from the R & TV stable is an 8-track cartridge player retailing at £9·90. Housed in a smart wooden cabinet, the unit claims a frequency range better than 50-10kHz. Four track-indicator lights show which track is being played and the unit switches automatically from one channel to the next. This unit can easily be played through the Stereo 21 system, making it a comprehensive good-value-for-money stereo set-up.

Further information by sending s.a.e. to Radio & TV Components (Acton) Ltd., 21 High Street, London, W3 6NG.

ADVANCE TIMER/COUNTER



Mentioned last month, the TC17 measures frequencies from d.c. to 50MHz with resolution of 0·1Hz.

GL78/P/C

This is the latest addition to the range of Goldring/Lenco Turntable Units. The Model GL78/P/C incorporates an automatic shut-off switch which stops the motor at the end of the record and simultaneously raises the pick-up. A manual override control is built in, in case the shut-off facility is not required. Goldring Ltd., 10 Bayford St., Hackney, London, E8 3SE.



NEW 'TERRY' CLIPS

The picture shows the range of 'clipco' securing clips. 'Clipco' is versatile, easily fixed and no screwing is required. It is made of unbreakable, resilient rust-free nylon, which prevents damage to articles. 'Clipco' solves many fixing problems around the home and is a specially designed dual purpose plug which ensures efficient fixing to walls, tiles, wood and pegboard etc.

The clips are available in three choices of visual blisters, containing 8, 9 or 10 clips dependent on size and shape. The recommended retail price of blisters is 21p to 23p. They are also available in bulk—100 at £2 18p. Herbert Terry and Sons Ltd., Redditch, England.

S.W. CRYSTAL SET

Partridge now market a short wave crystal set (see picture). Further information from: Partridge Electronics, Broadstairs, Kent.



VACUUM RECORD CLEANER

The manufacturers, R.I. Audio, claim that their new "Groovac" record cleaner is the only unit available which removes dust from records by vacuum cleaning.

A tracking force of only 0.7 gram has been achieved by using a lightweight design with lubricated-for-life bearings throughout. This is considerably below the 3 to 6 grams force of simple brush cleaners. Low tracking force allows fine hairs to be incorporated in the Groovac cleaning nozzle which ensure efficient removal of dust from the bottom of record grooves-most brush cleaners have hairs with a diameter which is larger than the width of the record grooves. Low tracking force also means an almost immeasurable reduction in turntable speed, a reduction which is at least 3 times less than that caused by brush cleaners.

The Groovac consists of a precision lightweight arm, and a suction



unit which is acoustically isolated in a special enclosure. The suction unit has been designed to be inaudible at a distance of 2 metres; it has a mains switch and indicator, and is attractively finished in teak. Price is £6.90p plus V.A.T. and it is available from hi-fi retailers or direct from RI Audio, Kernick Road, Penryn Cornwall.



BRITAIN'S FASTEST SERVICE!

ALL	ITE	MS	ARE	BRA	ND NE	W A	ND FL	ILLY (SUAR	ANTEE	D	
AA11	9	6р	BCY38	30 p	CA3035	£1:52	NKT406	62p	1N4004	10p	2N4491	46;
AC10 AC12 AC12 AC12	7	50 p	BCY58 BCY70	18p	CA3043 CA3044	£1.73	NKT713 NKT773	29 p	1N4005	12 p	2N524	5 45
AC12	7	250	BCV71	30 p	CA3044	86n	NKT 781	290	1N4006 1N4007	15 p 19 p	2N545	7(MPF103) 49
AC12	8	24p	BCY72	15p	CA3048	£2 34	NTGD1	40p	1N4148	4p	42N54	58(MPF10)
AC12	8/A L 1/	6	BD124 BD131	75 p	CA3052	£1-80	OA47	8p	1N5400	14p		491
AC15		20 n	IBD132	750	CA3065 CA3088E		OA79 OA81	8p 8p	1N5404 1N5408	18P 25P	2N545	9(MPF105) 46i
AC15	2	25 p	BD131/1	32 €1-50	CA3089E	£2·19	O A90	6 p	1544	4p	2N577	7 45
AC15	2 3 6 3/176K	26p	BDY20 BF115	92p	CA30900 CD4001	£4-70	O A 91	5 p	1S920 1S940	7p 6p	2N602	7(D13T1) 45 j
AC15	3/176K	52p	BF163	35p	CD4009 A	ÀE £1:16	OA90 OA91 OA95 OA200	6p	1S5009	80p	3N84	€1.3
AC187	7 K	17p	BF167 BF173	25 p	CD40114	E 54p	OA202	7p	1S5012	80 p	3N128	73 p
A C 18	7/188K	40p	BF177	29p 25r	CD40127	16 34P	OC20	97 p	1S5015 1S5018	75 p 75 p	3N140 3N152	92 ₁ 92 ₁
ACY1 ACY1 ACY1	7	27p	BF178	31 p	CD4009 A CD4011 A CD4012 A CD4013 A CD4015 A CD4017 A CD4018 A CD4020 A	LE €2 92	OC28	70 p	1\$5024	75 p	3015F	£2·0
ACY1	8	20p 20p	BF180 BF194	35p	CD4017	AE £2.92	OC29	76 p	1S5047	75 p	3015G	€2.0
ACY2	0	20p	BF195	150	CD40187 CD40207 CD40247	E £3 25	OC36	63n	2N404 2N696	23 p 15 p	7400 7401	16 ₁
ACY2 ACY2		19p	BF196	15p	CD4024	E £2:09	OC41	40p	2N697	17p	7402	201
AD140	5	55p	BF200 BF254	35p	CR1/051	C 50p	OC42 OC44	40 p 20 p	2N698 2N706	30p 10p	7403 7404	201 25
AD149	9	50 p	BF255	15p	CRS3/05	AF	OC45		2N706A	12p	7405	25
AD161 AD161		37p	BFX13 BFX29	25p	CRS3/40	£1.08	OC71 OC72 OC75	20 p	2N708	16p	7408	25 25
AD161	1/162	74p	BFX84	250	oli	ິ້£1·53	OC72	20 p 25 n	2N911 2N914	50 p 20 p	7409 7410	25 20
AF106 AF114		32p	BFX85	34 p	CZ6	15p	OC76	25p	2N918	42p	7413	30
■ AF115		25p	BFX86 BFX87	23 p	D10 (NT	40n	OC77	40p	2N929 2N930	25p 28p	7420 7425	20
AF116 AF117	,	25n	BEX88	24p	IRT84	£2 90	OC75 OC76 OC77 OC81 OC81D OC83 OC84	20 p	2N1131	24p	7430	30 20
AF117		25p	BFY50 BFY51	15p	IR2160 IR C20	95p	O C83	23p	2N1132	24p	7440	24
AF124		25p	BFY51 BFY52	15p	JA424	£2.08	OC84	25 p 25 p	2N1302 2N1303	17p 17p	7442 7443	£1:1 £1:4
AF125 AF126		24 p	BFY53 BFY90	17p £1⋅05	LIC709C	5 42p	OC139 OC170 OC171 OCP711	25 p	2011304	24p	7444	£1·4
AF139	, ,	47p	BP101	750	LIC 709C	/8 42p /5 €1:02	OC171	30p	2N1305	24 p	7445	£2·0
AF186		40p	BPX66	£1:35	LIC723C	14 £1 - 00	ORP12 ORP60	v 42 p 50 p	2N1306 2N1307		7446 7447	£1·4 £1·2
AF239 AF279		50p	BRY39 BSX19	40p	JA424 LIC709C LIC709C LIC723C, LIC723C, LIC741C, LIC741C, MC1303L MC1305P MC1307P	5 45p	ORP60	4 U D	12 N 1308	34p	7450	20
ASY2	5 :	25n	BSX20	16p	MC1303L	£1.75	ORP61 ORP69	40p	2N1309	34p	7451	20(
ASY2	7	30p	BSX21 BSY27	20p	MC1305P	£2-80	PN70	9 p	2N1559 401C)	60p	7453 7454	20 20
ASY2	9 :	30p	BSY29	20p 25p	MC1307F MC1310F	62.95	ENTA	УP	2N1613	15p	7460	201
BA138	1	15p	BSY95A	. 12p	MC1330F	80 p	DNIIO	7 p	2N1711 2N1893	15p	7470 7472	45 ₁ 32 ₁
BAX10 BB103		8p.	BY100 BY127	20p 22p	MC1352F		PN109	7 p	2N2218	33p	7473	45
BB104		28p	BTY79/4	00R 92p	MC1466L MC1468L	£4 20	PN3819	2N3819)	2N2218	A 44p	7474	461
BB105					MFC4000			£ 2-90	2N2219 2N2219	38p 4 53p	7475 7476	45) 45)
BC107 BC107	/BC177	13p	BZY88C	£1·20 3V3 13p 3V6 13p 3V9 13p 4V3 13p 4V7 13p 5V1 13p	MC4024F MC4044F	£2 20	SC146D ST2	28p	2N2368 2N2369	17p	7480	45) 67)
		33p	BZY88C	3V9 13p	MFC6030	64.63	SIAORA	(Best)	2N2369 2N2369	17p	7482	87(£1:3
BC108	/BC178	12p	BZY88C	4V3 13p	MFC6040 MFC8010 MFC8040 MFC9020	£1:15	1	60 p	2N2484	42p	7483 7486	331
	, 50.70	28p	BZY88C	5V1 13p	MFC8040	£1-24	SL803A SL403D	80p	2N2646	45p	7490 7491 A	33 ₁
BC109	/BC179	13p	BZY88C	5V6 13p		£2 12	(IC Am	p.) £1-50	2N2904 2N2904	44 p 411 p	7491 A 7492	£1:21 85p
	,001/9	33 p	BZY88C	6V8 13p	MJE371 MJE520	68 p 65 p	TAA263	75 p	2N2905	65 p	7493	75₁ £1·1:
BC109 BC117	C 1	4p	BZY88C	7V5 13p	MJE521	62 p	TAA293	97p	2 N2905	A 75p 18p	7494 7495	£1·1:
BC140		30 p	BZY88C	8V2 13p 9V1 13p	MJE2955 MJE3055	£1:06	TAA320 TAA320 TAA861 TAD100 TAD110	75p	2N2925	20p	7496	£1 · 4
BC147	1	10p	BZY88C	10V 13p	MJ480	66p 97p	TA A861	45 p	2N2926 2N3053 2N3054	10 p	74100	£1 6
BC148 BC149	1	9p l0n	BZY88C1	11V 13p 12V 13p	MJ481	£1 25	TADIIC	£1-97	2N3053	24 p 65 p	74107 74121	52 g 43 g
BC157 BC158	i	2p	BZY88C1	13V 13p	MJ491 MJ802	£1:35 £4:12	TIL112 TIL209	£2-00	2N3055	65 p	74141	
BC158 BC159		11p	BZY88C1	15V 13p 16V 13p	MJ802/M	J4502		35p	2N3228 2N3391		74150 74151	£3:3
BC147	/157 2	22p	BZY88C1	8V 13p	MJ900	£8-56 £1-80	TIP31 A TIP32 A TIP41 A	70p	2N3525 2N3702	£1.04	74153	£3 3 £1 10 £1 3 £2 0 £1 5
BC148 BC149	/158 2	0p	BZY88C2	20V 13p	MJ1000	£1:50		85p	2N3702 2N3703	10 p	74154 74155	£2:00
BC167	1	11p	BZY88C2	22∨ 13p 24∨ 13p	MJ4502	£4 44	TICAS	30-	2N3704	10p	74156 74190	£1 5
BC168 BC169		0р	BZY88C: BZY88C: BZY88C: BZY88C: BZY88C: BZY88C: BZY88C: BZY88C: BZY88C: BZY88C: BZY88C: BZY88C: BZY88C: BZY88C: BZY88C: BZY88C: BZY88C: BZY88C: BZY88C: BZY86C	7V 13p	MPF102 MPF103(2		VA1066: VA1039	15p	2N3705	10 p	74190	£1.8(
BC169	c i	1 p	BZY88C3 BZX61C3	30V 13p 7V5 23p		49 p	VA1040	15p	2N3706 2N3707	10p	74191 74192	£1:80 £1:74
BC177	2	0p	BZX61C8	V2 23p	MPF104(2			15p	2N3708	8p	74192 74193	£1:74
BC178 BC179	1	6p	BZX61C9 BZX61C1	V1 23p	MPF105(2	N5459)	W005 W01	30 p	2N3709 2N3710	10p	74196 74197	£1:50 £1:50
BC182	ī	0p	BZX61C1 BZX61C1 BZX61C1 BZX61C1	1V 23p		46 p	W/02	32 p	2N3711	10 n	40250	66 p
BC1821	L 1	0p	BZX61C1	2V 23p	NKT0033 NKT211	96 p	W04	33p	2N3773	£2:50	40309	40p
BC183 BC1831	L 1	9p	52X61C1 BZX61C1	3V 23p 5V 23p	NKT212	25 p	W06 W08	35 p	2N3819 2N3820	28 p 60 p	40310 40311	60 p 42 p
BC1831 BC184 BC1841 BC212					NKT213	25p	ZTX107	12p	2N3823E	20p	40312	62 p
BC1841	_ 1	2p	BZX61C1	8V 23p 0V 23p	NKT216 NKT217	50 p	ZTX108	11p	2N3826	64.44	40320	42 p
BC2121	Li	2p E	BZX61C2	2V 23p	NKT218	25 p	ZTX302	18p	2N3904	28p	40360	45p
BC238 BC238	1200 2	0p	BZX61C1 BZX61C2 BZX61C2 BZX61C2 BZX61C2	4V 23p	NKT223 NKT271	27p 18p	ZTX107 ZTX108 ZTX300 ZTX302 ZTX303 ZTX304	15p	2N3866 2N3904 2N3906 2N4058 2N4060			56p 45p 45p 52p
BC257				OV 230	NKT274	18p	ZTX314	23p	≥N4058 2N4060	13p	40406 40407	
BC258 BC259		8p	CA3004 CA3005 CA3011	£2 25	NKT275	20p	ZTX320					
BC259 BC307	1	9p (CA3005		NKT279 A NKT281	12p 29p	ZTX330	18p	2N4062 2N441		40409 40410	62p
BC308	i	0p (CA3013	£1 30	NKT351	75 p	ZTX500 ZTX501	15p	1N4001	70	40430	£1·13
BCY30	2	5p (CA3014	£1.52	NIKT#01	71p	ZTX502 ZTX503	180	1 N4002	7p	40432	£1-60
BCY32	5	Op (CA3018 CA3018A	£1 19	NKT402 NKT403 NKT404	77p 65p	ZTX503 ZTX504	1/p 45 n	1 N4003 2 N4444	£2:20	40468 A 4051 1	. 44p £1⋅92
BCY31 BCY32 BCY33 BCY34	2	0p (CA3011 CA3013 CA3014 CA3018 CA3018A CA3020 CA3028A	£1-55	NKT404	60p	1N914	4p	2N4444 2N4871	£2.20 40p	40512	£1.88
BCY34	2	op!(CA3028A	4 88p	NKT405	79p	1N3754	20p	2N4990	66p	40575	£1·54
		_										
		7				1 1		DEDT	DW :	0. 74	COD	TEOLD

ELEC	TROLYTIC	AXIA	L LEA	DS	
Mfd.	Working Voltage	Price	Mfd.	Working Voltage	Price
1 0	40v	7p	100	16v	6p
1.0	100v	5p	100	25v	6p
2.2	25v	7p	100	40v	7p
2.2	63v	5 p	100	63v	10p
4.7	40v	5 p	220	25v	8p
10	25v	5 p	220	40v	9p
10	63v	6p	470	25v	12p
22	25v	6p	1000	25v	16p
22	40v	6p	2200	25v	30 p
47	25v	6p	4700	16v	33p
47	40v	6p		-	

47	404	eb.	
CAPA	CITORS-	METALLISE	POLYESTER
Stock val	lues: MFD		Price each
0.01, 0.01	5, 0.022, 0.033		3 p
0.047, 0.0			4p
0 150, 0 2	220		5p
0.33			70
0.47			\$p
0.68			11 0
1-0			140
1.5			20p
2.2			24p
Order as	"Polyesters" +	- Capacitance.	
0404	OITODO	DOL WOTWE	

Axial leads, Clear encapsulation, 5% Tolerance. 160 volt work	
	rice
100pF, 150pF, 220pF, 330pF, 470pF, 560pF, 680pF, 820pF.	each
1000pF, 1500pF, 2200pF, 3300pF, 4700pF, 5600pF, 6800pF,	3p
Order as: "Polystyrenes" + Capacitance.	

ALUMINIUM HEAT SINKS

10DN 34p (Plain All undrilled) 10DDR 43p (Plain All drilled 2 x To3)

NEW LOW PROFILE IC HOLDERS

14 pin Dil 18p, 16 pin Dil 26p, 8 pin Dil 10p.

NYLON NUTS AND BOLTS

	Cheese hea	ad screw bolts	. Nuts with	integral wash	er. Moulded		
	in high density nylon, Ideal for mounting "live" assemblies,						
	power transistors, etc.						
	power transistors, etc. Each pack consists of four nuts and four screw bolts. Pack No. Thread Length Quantity Pack Price HSN1 6BA \$" 4 10p						
	Pack No.	Thread	Length	Quantity	Pack Price		
ı	HSN1	6BA	1 "	4	10p		
ı	I HSN3	6BA	1"	4	10p		
ı	Order as "1	Nuts and Bolts"	+ Pack No				

OPTO ELECTRONICS—3 devices from our range—OCP71—42p, ORP12—50p, TIL209 Red led 35p

TEST PROBES

Probably the best test probes ever made. When you push a plunger a spring steel forked longue pushes out and holds the components, wrise etc., while you take readings etc. It won't let go until you release it.

KLEPS 30 Black and Red, per pair £1:30

RESISTORS-METAL OXIDE

Metal Oxide resistors by Electrosii. Ultra low noise, † Watt, 2%. Available in the range E24 between 10 ohms and 1 Meg. E24 series = 10, 11, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 43, 47, 51, 516, 62, 68, 75, 82, 91, and their decades. Type No. TRS

Order as "Metox" + value.

RESISTORS-CARBON FILM

A range of miniature high stability resistors with very low noise characteristics and long life. Tolerances, ranges and waitages as indicated. (Wattage ratings are at max. limiting voltage).

li	Type No.	Wattage	Tol.	Range	Series	Price
1	UPM050	0.5	5%	10E-1M	E12	1p each
1	UPM050	0.5	10%	1M -4-7M	E12	1p each
1	UPM075	0.75	5%	10E-1M	E12	1p each
1	UPM075	0.75	10% 10%	1M -4·7M	E12	1p each
1	UPM100	1.00	10%	10E-1M	E12	2 p each

PROMI SERVICE PLUS

10% DISCOUNT OVER £4. NO POSTAGE AND PACKING. TOP QUALITY PROD-UCTS ALWAYS BY RETURN

COMPREHENSIVE CAT. >>

Important Notice "All prices are exclusive of V.A.T. Please add 10% V.A.T to the final total of your order after deducting any discount which may be due'

DEPT. PW 8; 7 COPTFOLD ROAD **BRENTWOOD FSSEX**

Pocheque Arout Codrendado , enclose Hame

Ω (radio) L

TS60 POCKET MULTIMETER

High-precision at low-cost. Ranges: D.C. 15V, 150V, 1,000V (10,000 opv). A.C. 15V, 150V, 100V (1,000 opv). D.C. Current 150mA. Resistance 100k ohms. 41-85. Post 15p.



AUDIOTRONIC MODEL ATM.

AUDIOTRONIC MODEL AT Top value 1000 o.p.v. pocket multimeter. Ranges: 0/10/50/250/1000. AC and DC DC Current 0-1mA/100mA. Resistance 0/150k ohms. Oeclbels -10 to +22dB 8ize 90 × 60 × 28mm. Complete with test leads. 42.50. Post 15p.



LT601 MULTIMETER

New style 20,000 o.p.v. pocket multi-meter. 5/25/50/250/ 500 / 2500 V. D.C. 10 / 50 / 100 / 500 / 1000/ A.C. 50µA / 250mA. 6K / meg ohms. — 20 to + 22 dB. 43-78. Post 20p.



MODEL TH-12

20,000 o.p.v. Overload protection. Bilde switch selector 0 / 25 / 2-5 / 10 / 50 / 250 / 1000 V. D.C. 0 / 10 / 50 / 250 / 1000 V. A.C. 0 / 50 / 250 / 250 M.A. D.C. 0 / 3 / 30 K / 44-97, Post 15p.



RUSSIAN 22 RANGE MULTIMETER

| Model U437 10,000 op.v. | A first class versatile instrument | U.S.B.R. | to the highest standards. Ranges: 25/10/50/250/500/1000v D.C. 2-5/10/50/250/500/1000v D.C. 2-5/10/50/250/500/1000v A.C. | DC | Current | 100wA|I/100 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Coursel | 100wA|I/10 | Co DG Current 100wA/1/10/ 100mA/1A, Resistance 300 ohns/3/30/300K/βm Ω. Complete with batterles, test leads, instructions and sturdy steel carrying case. OUR PRICE 25-97. P. & P. 25)



HIOKI MODEL 730X

30,000 O.P.V. Overload protection. 6/30/80/300/ 800/1200 VDC. 12/60/120/ 600/1200 VAC. 60/µA/30 nA/300 nIA. 2K/200K/2 megohn. --10 to +63db. \$7-50. P. & P. 15p.



70k Ω/Volt D.C. 8k Ω/Volt AC. Mirror scale.
6/3/12/30/120/600 V.
D.C. 8/30/120/600 V.
A.C. 80/600μA/80/600
un. 10/100K/1 Meg/10
Meg Ω - 20 to + 46db. Meg Ω -20 to +50 46-97, P. & P. 12p.

MODEL PL436



MODEL 500

30,000 O.P.V. with over-load protection intror scale 0/-5/2-5/10/25/100/250/500/



U4312 MULTIMETER

04312 MULTIMETER
Extremely aturdy instrument electrical use, 667 o.p.v. 0/-3/1-5/7-5/30/60/150/300/600/900 VDC and 75mV 0/-3/1-5/7-5/30/60/150/300 600/900 VAC.



HIOKO MODEL 700X

100,000 O.P.V. Overload protection. Mirror scale. -3/-6/1-2/1-5/3/6/12/30/60/ 120/300/600/1200V DC 126/300/600/1200V DC 1-5/3/6/12/30/60/150/300/600 1200 V. A.C. 15/30µA/3/6/30/60/150/300m 6/12 AMP. DC. 2K/200K/2 Meg/20 Meg ohm -20 to +63dB. £13-50. P. & P. 20p



MODEL C-7080 EN

MODEL C-7080 EN Glant 6° mirror scale 20,000 cp.v. 0 / -25 / 1 / 2-5 / 10 / 50 / 250 / 1000 / 1000 / 5000 V. D.C. 0 / 2-5 / 10 / 50 / 250 / 1000 / 5000 V. D.C. 0 / 50 / 4 / 1/ 10 / 100 / 5000 M / 10 amp. D.C 0 / 2K / 200K / 20 meg 2 / 1000 / 250 / 200K / 20 meg 2 / 1000 / 25 / 1000 £18.95. Post 35p.



370 WTR MULTI-METER

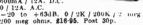
Features A.C. current ranges 20,000 o.p.v. 0/-5/2-5/10/50 250/500 1000 V. D.C. 250/500 1000 V. D.C. 0/2-5/10/50/250/500/1000V AC 0/50uA/1/10/100mA/1/10 Amp. D.C. 0/100mA/1/10 Amp. AC 0/5K/50K/500K/5 MEG/ 50



MEG



MULTITESTER
High sensitivity tester
200,000 o.p.v. Overload protection. Mirror scale. Range0/-06/-3/-3/-30/-120/-600
1200V. Dc.
0/3/12/-60/-300/-11.200V.
A.C.
0/64A/-1-2mA/-120mA/600mA/-12A. D.C.
0/12A. A.C.
-20 to 4-63dB. 0/2K/-200K/-2
200 meg ohms. \$16.95. Post 30p.



TMK LAB TESTER.



Model S-100TR MULTIMETER TRANSISTOR TESTER

TRANSISTOR TESTER
100,000 o.p.v. mirror scale/
overload protection. 0/12/
4/3/12/30/120/600 V DC
0/6/30/120/600 V AC. 0/12:
6/00µA/ 12/300mA/12 AMP
DC. 0/10 K/1 MEG/100MEG.
-20 to +50db. 0-01-2 PP/
Transistor tester nessures
Alpha, beta and Ico. Complete
with batterles, instructions
and leads. \$18-50. P/P 25p.



KAMODEN HM.350 TRANSISTOR TESTER

KAMODEN HM 350 TRR High quality instrument to test Reverse Leak current and DC current. Amplification factor of NPN, PNP, transistors, diodes, SCR's etc. 4" > 24" clear scale meter. Operates from internal batteries. Complete with instructions, leads and carrying handle, £12-50. Post 30p.



MODEL 449Å IN CIRCUIT TRÂN-SISTOR TESTER Checks true A.C. beta in / out. Checks Icbo. Checks diode-in / out. Checks SCR, etc. Beta HI 10 - 500,

H1 10 = 500, LO 2 = 50, 1cbo 0-5000μΛ, 220/240 V A.C. batteries, instruc-tions, £19.95, Post 30;

LB3 TRANSISTOR TESTER

Tests ICO and B. PNP / NPN. Operates from 9v hattery. Complete with all inplete with all instructions, etc. £8-95. P. & P. 20p.



MODEL U4311 SUB-STANDARD MULTI-RANGE VOLT AMMETER

TE-65 VALVE VOLTMETER
28 ranges. D.C. volts
1:5-1;500v. Resistance up
to 1;000 negohms. 200/
240v. A.C. operation.
Complete with probe and
instructions.
\$17:50. P. & P. 30p
Additional probes available: R.F. \$2:12\frac{1}{2}; H.V.
\$22:50.



- 20 to + 62dB 0/5K/50K/500K/5meg 500meg chms. £14.95. Post 30p

TE-40 HIGH SENSITIVITY A.C. VOLTMETER

10 meg. input 10 ranges 01/003/·1/·3/1/3/10/30/100/ 300V. R.M.S. 4cps.-1-2 Mc/s-Decibels - 40 to +50dlS. Supplied brand new complet-with leads am! instructions Operation 230V. A.C. \$17-50 Carr. 25p.



TME MODEL 117 P.E.T. ELECTRONIC VOLTMETER

WOLTMETER
Battery operated. 11
neg input. 26 ranges.
Large 42" (uitror scale.
8ize 64" x 44" x 24".
DC VOLTS 0.3-1200 V
AC VOLTS 3-300 V
RMS. 8-0-800 V P-P.
DC CURRENT 1212MA. Realstance up
to 2000M ohn. Decibers 20 to 51dB. (Complete with leads/instructions. \$17.50.)
P. & P. 20p.

MODEL L-55 FET V.O.M.

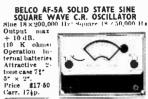
Input impedance 10 meg ohms. 0 / 3 / 1 · 2 / 6 / 30 / 120 / 600V. D.C. 0 / 3 / 12 / 60 / 120 / 600V. A.C. 0 / 120µA / 120mA D.C. 0 / 1K / 100K / 10 meg /100 meg ohtus \$15-97. Post 15p.



KAMODEN HMG-500 INSULATION RESISTANCE TESTER

Range 0-1000 Meg-ohms, 500 Volt. Battery operated. Wide range clear meter 4!" × 4". Complete with deluxe carrying case, batteries, instruc-

Attractive 2-tone case 7%" 5" × 2". Price £17-50 Carr. 174p.



CI-5 PULSE

OSCILLOSCOPE OSCILLOSCOPE
For display of pulsed and periodic waveforms in electronic circuits VERT, AMP, Bandwidth 10MHz, Sensi-

width 10MHz. Bensi-tivity at 100KHz. Vr.Ms. mm. -1-25, HOR. AMP. Bandwatth 500KHz. Sensitivity at 100KHz. V. RMs/mm. -3-25. Preset triggered awep 1-3,000uscc; free running 20-200,000Hz in nine ranges. Calibrator pips. 220 × 360 × 430mm. 115-230V. AC operation. \$39-00. Carr. paid.

115-230V. AC operation. \$39-00, Carr. p. 10-3 PORTABLE OSCILLOSCOPE
3in. tube, Y amp. Sensitivity
0-1v p-p/CM. Bandwidth
1-5 cps-1-5 MHz. Input imp.
2 meg Ω 25pF X amp. sensitivity
0-9v. p-p/CM. Bandwidth
1-5 cps-4-00kHz. Input imp.
2 meg Ω 20pF X amp. Sensitivity
0-9v. p-p/CM. Bandwidth
1-5 cps-4-00kHz. Input imp. 2 meg Ω 20pF
Time base. 5 ranges 10 cps.
300 kHz. Synchronization.
Internal/external. Illuminated
scale 140×215×330 mm. Weight 15.
220/240V. A.C. Supplied brand new whandbook. \$47.50. Carr. 50p.



RUSSIAN CI-16 DOUBLE BEAM OSCILLOSCOPE 5 mc/s Pass Band, Separaty Y1 and Y2 amplifier-Rectangular 5in. × 4in C.R.T. Calibrated trig

C.R.T. Calibrated trig gered aweep from '2 u/sec. to 100 milli-sec. per cm.

Free running time base 50 c/s-1 mc/in time base calibrator and a calibrator. Supplied complete accessories and instruction manual sector. Care Paid amplitude with a £87, Carr, Paid.

MODEL AT201 DECADE ATTENUATOR

Frequency range 0-200KHz. Attenuator 0-11ldb, 0-ldb step. Impedance 600 ohms. Max. input power 30dbm. Size 180 × 90 × 55mm 212.50. Post 37p.



ARF-300 AF/RF SIGNAL GENERATOR.

ARI transistorised, compact, fully portable. AF sine wave 18 Hz to 220 KHz. AF square wave 18 Hz to 100 KHz. Output to 100 KHz. Output sine / square 10v. P-P. RF 100 KHz to 200 MHz. Output Iv. maximum. Operation 220/240v. AC. Complete with instructions and leads. \$29.95. and lead Post 50p.



TE-20D RF SIGNAL GENERATOR

Accurate wide range signal Accurate wide range signal generator covering 120 Kc/s 500 Mc/s on 6 bands. Directly calibrated Variable R.F. attenuator, audio output. Xtal socket for calibration. 220/240V. A.C. Brand new with instructions £17-50. Carr. 374p. Size 140 × 215 × 170 mm.



TE22 SINE SQUARE WAVE AUDIO GENERATORS

Sine: 20cps to 200 kc/s on 4 bands. Square: 20cps to 30 Square: 20cps to 30 kc/s. Output impedance 5.000 ohns. 200/220V. A.C. operation. Supplied brand new sind guaranteed with instruction manual leads. \$27.50. Carr. 374p.



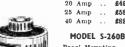
"YAMABISHI" VARIABLE VOLTAGE TRANSFORMERS

Excellent quality at low cost. All models—Input 230V. 50/60 c/s. Variable output 0-260V.



MODEL S-260 GENERAL PURPOSE BENCH MOUNTING

1	Amp	 £7-00
-5	Amp	 £8-05
5	\mathbf{Amp}	 £11.75
8	\mathbf{Amp}	 £15·90
10	Amp	 £22.50
12	Amp	 £23 60
20	Amp	 £49 00
25	Amp	 #58-00
n1	Amn	#82-50



LWI	iei mo	untn	ıĸ.
1	Amp		£7:00
2.5	Amp		£8-05

Carriage and Packing Extra

AU	TO	TRA	NSF	ORM	ERS
50 V	Stor	117	OF	eten	do

0/115/250	V.	Step up	or step	p	dow	n.	Fully
shrouded.							
80	W	£2-1	lO P.	ðι	Ρ.	18p	
150	W	£2.7	0 P.	å	P.	18p	
300	W	£3-6	30 P.	å	P.	23p	
500	W	£5-2	85 P.	&	Ρ.	33p	
1000	W	£7-5	0 P.	&	Ρ.	38p	
1500	W	£10-2	0 P.	å	P.	43p	
2250	w	£17·2	5 P.	æ	P.	50p	
5000	W	£35-0	0 P.	å	P.	£1	

MCA. 220 AUTOMATIC VOLTAGE STABILISER

Input 88 125 VAC or 176, 250VAC. Output 120VAC or 240VAC, 200VA rating. \$11.97, Carr. 50p.



50

PS.200 REGULATED P.S.U.



Solid state. Variable output 5-20 volt D.C. up to 2 amp. Independent meters to monitor voltage and current. Output 220/240 V. A.C. Size 7; * × 5; * × 3; *. £19.95, P. & P. 25p.



PS.1000B REGULATED POWER SUPPLY

Solid state. Output 6, 9 or 12 volt DC up to 3 amps. Meter to monitor current. Input 220/240v AC. Size 4" × 3½" × 6½". £11 97. P. & P. 25p.

230V/240V SMITHS SYNCHRONOUS GEARED MOTORS

Built in gearbox, All brand new and boxed, 30 RPH CW; 2 RPH CW; 20 RPH CW; 2 RPH ACW; RRH CW: 50n each Post 12n.



POWER RHEOSTATS



High quality ceramic construction. Windings embedded in vitreous enamel. Heavy duty brush wiper. Continuous rating. Wide range available er-stock, Single hole fixing, Ilin dia, shafts. Bulk quantities available.

25 WATT, 10/25/50/100/250/500/1000 ohms. 95p, P. & P. 10p.

50 WATT. 10/25/50/100/250/500/1000/2500 or 5000 ohms. £1-85. P. & P. 10p.

100 WATT. 1/5/10/25/50/100/250/500/1000 or 2500 ohma. £1.95. P. & P. 15p.



240° Wide Angle ImA Meters MW 1-6 60mm square \$8.97 MW 1-8 80mm square \$4.97 P. & P. extra



230 VOLT A.C. 50 CYCLES RELAYS

Brand new. 3 sets of changeover contacts at 5 amp rating. 50p each. P. & P. 10p (100 lots \$40) Quantities available.

£3.90

504A

50-0-50μ. A 100μA 100-0-100μA 200μA

500μA 500-0-500μA

1mA ... 1-0-1mA 2mA ...

10mA

20mA

50m A

100mA 150mA

USED EXTENSIVELY BY INDUSTRY, GOVT. DEPTS., EDUCATIONAL **AUTHORITIES, ETC.**

Over 200 ranges in stockother ranges to order. Quantity discounts available. Send for fully illustrated brochure.

Type SW 100 100 v 80 mm

50μA	£4·15	100000000000000000000000000000000000000
50-0-50µA	£8:95	and and reduced the said
100μΑ	£3·95	
100-0-100µA	£8 90	B
500μA	£3.70	Later Street
lm.A	£3.60	ASSESSMENT OF THE PARTY OF THE
20V. D.C	23 60	ESTATION AND A STATE OF
50V. D.C	£3 €0	5 amp. D.C. £3 6
300V. D.C.	£3-60	300 V. A.C £3.7
l amp. D.C.	£3.60	VU Meter 24-8

Type SD.830 82.5mm x 110mm Fronts

	10mA	£8·10
Water .	50m A	£3·10
CANCEL MA	100mA	£8-10
an I	500mA	£8·10
	1 amp	£3·10
	5 amp	£3·10
	10 amp	£3-10
50μA £3 40	5 V. D.C	£3·10
50-0-50/ A £3.40	10V. D.C	#3-10
100µA 23-85	20V. D.C	£3·10
100-0-100µA £3:35	50V. D.C	£3·10
200μA 23-30	300 V. D.C.	28 10
500μA 28-15	15 V. A.C	28-30
lmA \$8:10	300V. A.C	£8-80
5mA £3:10	VU Meter	£3.50

Type SD.640	63.5m	ım x 85mm	Fronts
u.A	£3 05	500mA	£2·90
-0-50μA	£8.05	1 amp	\$2.90
Αμθ	£8.00	5 amp	£2.90

DU-U-DUμA	28.02	1 amp	\$5.80
100μA		5 amp	£2.90
100-0-100µA	#8 00	10 amp	#2.90
200μΑ	. #8.00	5 V. D.C	£2·90
500µA		20V. D.C	£2.90
1mA	. 42.90	50V. D.C.	#2-90
5mA	£2·90	300 V. D.C.	£2.90
10mA	#2-90	15V, A.C	£8-00
50mA	. £2.90	300 V. A.C	28-00
100m A	40.00	WIT Motor	49.16

Type SD.460 46mm x 59.5mm Fronts

DULLA	EE.00	I amp	EE.OU
50-0-50µA	£2·80	5 amp	£2-60
100μΑ	£2-75	10 amp	£2-60
100-0-100µA	22-75	5 V. D.C	#2.60
200μΑ	£2.70	10 V. D.C.	£2-60
500μA	£2-55	20 V. D.C	£2 60
1mA	\$2.60	50V. D.C	£2-60
5mA	₹2.60	300V. D.C.	£2·60
10mA	22.60		
50mA	£2-60	15 V. A.C	£2 70
		300 V. A.C	£2·70
100mA	£2-60	3001. A.C	25.10
500mA	#2·60	VU Meter	£2-90



"SEW" EDGWISE METERS

Type PE.70.		32in. x 1 15/3:	2in. x
	2∄in.	deep	
50μA		500μA	£8-20
50-0-50μA 100μA	£8-60 £8-60	1mA	£3·20
100-0-100µA	£3.50	300 V. A.C	£3·25
200μΑ	£8-40	VU Meter	£8-85

*MOVING IRON-

ALL OTHERS MOVING COIL

Please add postage

Type MR.85P. 41in. x 41in. fronts 50mA 100mA 500mA ... £3.90 ... £3.90 ... £3.90

lamp... 5 amp.

1	7.	-			•
1		1	24	٠,	2
ŧ	100		70	и.	7
1	49	œ.	ার	2 0	8)
	a	и.	×	48	ĸ.
-8	23	М.		м	Æ
- 21	138	m			ь.

198801114011	100	ə amp	23.80
	25.0	15 amp	£3.90
ADDRESS.	100	30 amp	£3.95
1000	27.1	20 V. D.C.	£3.90
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		50V. D.C.	£3-90
50μA	£4-40	150V. D.C.	£3.90
50-0-50µA	£4-25	300 V. D.C.	£3.90
100 µ A	£4.25	15 V. A.C	£3 95
100-0-100uA	£4-05	300 V. A.C	£3.95
200μΑ	£4.05	S Meter 1mA	£3-90
500μA	£3.90	VU Meter	£4-55
500-0-500µA	£3.90	1 amp. A.C.*	£3-90
1mA	23.90	5 amp A.C.*	£3-90
I-0-1mA	£3.90	10 amp. A.C.*	£3-90
5mA	£3.90	20 amp. A.C.*	£3.90
10 m A	£3.90	30 amp. A.C.*	£3.90

Type MR.52P. 2in. square fronts 50μA £8-50 | 10V. D.C. .. £2-50

50-0-50μA	£3.05	20 V. D.C #2·5
100μA	£3.00	50V. D.C £2 5
100-0-100µA	£2-95	300 V. D.C. #2.5
500µA	£2·65	15V. A.C 22-6
1mA	£2-50	300V. A.C £2-6
5mA	£2.50	S Meter 1mA #2-6
10mA	£2.50	VU Meter 28-6
50mA	£2·50	1 amp. A.C. * \$2-50
100mA	£2.50	5 amp. A.C. # \$2-5
δ00mA	£2.50	10 amp. A.C. * £2-5
1 amp		20 amp. A.C. * \$2.50
Kamp	40.50	20 orns A C # 40.54

Type MR.65P. 3fin. x 3fin. fronts

i	50μA	£8:70	10V. D.C 22-60
İ	50-0-50µA	£8·15	20V. D.C #2-60
	100μΑ	£8-15	50V. D.C 22-60
	100-0-100µA	£3·10	150V. D.C. #2-60
İ	200μΑ	£3-05	300 V. D.C. #2 60
l	500μA	£2.75	15V. A.C #2-80
l	500-0-500µA	42 60	50V. A.C £2.80
	1mA	£2-60	150 V. A.C #2-80
	5mA	#2-60	300 V. A.C 22-80
ĺ	10mA	#2-60	500V. A.C. 22:80
ı	50mA	£2.60	8 Meter 1mA #2-85
ı	100mA	42.60	VU Meter 43.70
	500mA	£2-60	50m A A.C. * £2.60
	1 amp	£2.60	100mA A.C. * #2.60
	5 amp	£2-60	200mA A.C. * #2-60
	10 amp	£2.60	500mA A.C. * £2-60
	15 amp	£2 60	1 amp. A.C. * £2-60
	20 amp	£2-60	5 amp. A.C. * #2.60
	30 amp	£2·80	10 amp. A.C. * #2.60
	50 amp	£2-90	20 amp. A.C. * £2.60
	5 V. D.C	22-60	30 amp. A.C. * \$2.60

"SEW" EDUCATIONAL **METERS**



Type ED.107. Size overall 100mm x 90mm x 108mm

A new range of high quality moving coll instruments ideal for school experiother

meter movement is easily accessible to the mother and other to the mother movement is easily accessible to the mother movement working. Available in the following movement working.

in the followir	ig rang	es:
50µA		20V. d.c £5.95
$100\mu A$		50V. d.c £5.95
1mA		300V. d.c 25-95
50-0-50μA		
1-0-1mA	£5.95	Dual range
1A d.c	£5.95	500mA/5A d.c. 27-00
5A d.c	£5.95	5V/50V d.c. 27.00
10V d.c	£5.95	

Type MR.38P. I 21/32in. square fronts



-	100mm	20.00
- ()	l amp	
e de la companya de l	2 amp	£2.25
16 67	5 amp	£2.25
	10 amp	£2.25
	3V. D.C	£2.25
£2 55	10V. D.C	£2-25
£2-50	15 V. D.C	£2-25
£2.45	20 V. D.C	£2-25
22.40	50V. D.C	
£2.25	100 V. D.C.	£2-25
£2-25	150V. D.C.	£2-25
£2·25	300 V. D.C.	£2-25
£2 25	500 V. D.C.	£2-25
£2.25	750V. D.C.	£2.25
£2·25	15 V. A.C	£2.80
£2.25	50V. A.C	£2-30
£2·25	150V. A.C	£2-30
£2·25	300V. A.C	£2-30
£2·25	500V, A.C	£2·30
£2-25	8 Meter 1mA	£2·30
£2.25	VU Meter	£2.65

Type MR.	n. square fronts	
50μΑ	£2·70	5 amp \$2.40
50-0-50LA	£2.65	10V. D.C 22 40
100μΑ	£2·60	20 V. D.C 22-40
100-0-100µA	£2-50	50V. D.C 22:40
200μΑ	£2-50	300V. D.C. #2 40
500μA	£2.45	15 V. A.C 22-40
500-0-500µA	£2-40	300V. A.C 22.40
1mA	£2·40	8 Meter 1mA \$2.50
5mA	£2·40	VU Meter #2.70
10mA	£2·40	1 amp. A.C. * \$2.40
50mA	£2 40	5 amp. A.C. * \$2.40
100mA	£2·40	10 amp. A.C. * 22 40
500mA	£2·40	20 amp. A.C. * #2.40
1 amp	£2-40	30 amp. A.C. * #2-40

"SEW" BAKELITE PANEL METERS

Type MR.65. 31in. square fronts



AND DESCRIPTION OF THE PERSON NAMED IN		v amp	EZ OC	,
	-	15 amp	£2.60	۱
V 5000000000000000000000000000000000000		30 amp	£2 60	
The state of the s				
The state of the s		50 amp	£2·60)
1176/117 0 1 76 177 1	-	5 V. D.C	£2.60	j
	-	10V. D.C	£2 60	
Company of the Company				
		20 V. D.C	£2 60	
		50 V. D.C	£2-60	ì
THE RESERVE OF		150V. D.C.	\$2.60	i
2.11				
l		300 V. D.C.	42-60	
	4-60	50mV. D.C.	£2.90	ı
50/. A £	8.55	100mV. D.C.	£2-90	ŧ
	3.05	30 V. A.C. *	£2-65	
	3.00	50 V. A.C. *	£2.65	
100-0-100µA &	3.60	150V. A.C. *	£2.65	i
	2.70		£2.65	
	2.70			
		500mA A.C. *	£2.60	
	2-60	1 amp. A.C. *	£2.60	į
l-0-1mA £	2-80	5 amp. A.C. *	22.60	
	2 60	10 amp. A.C. *		
	2 30	20 amp. A.C. *		
50mA £	2-80	30 amp. A.C. *	£2 60	
	08.9	50 amp. A.C. *		
500mA £	2-60	VU Meter	23.00	

1 amp..... £2-60 5 amp..... £2-60

Type \$-80 80 mm. square fronts

50µA	£3.50
50-0-50µA	£3-40
100μΑ	£8-40
100-0-100µA	£3-30
500µA	£3-05
1mA	£8:00
20V. D.C	£3.00
50V. D.C	£3.00
300 V. D.C.	£3-00

l amp. D.C.



£8 00 £3 70 £3.00

-Ww JOSTY KIT

AF20	Mono Transistor Amplific	- 64.00
	Mono Translator Ampline	61.24.90
AF30	Mono Transistor Pre-	
	Amplifier	£2-61
AF310	Mono Amplifier (for	45 01
AFSIO		
	Stereo use two)	£5.91
AT5	Automatic Light Control	1 #2-58
AT30	Photo Cell Switching Un	it £5.70
AT50	400 Watt Triac Light	
	Dimmer Speed Control	£4.80
AT55	1,300 Watt Triac Light	
	Dimmer Speed Control	£5.70
AT56	2,200 Watt Triac Light	
	Dimmer Speed Control	£6-90
AT60	Psychedelic Light Contro	ì.
	Single Channel	£7-80
AT65	Psychedelic Light Contro	1,
	3 Channel	£14.55

	Bingle Channel	£7·80	
AT65	Psychedelic Light Control		
		£14.55	
HF61	Medium Wave Transistor		
	Radio	£3.38	
HF65	F.M. Transistor Transmitt	er	
		£2.70	
HF75	F.M. Transistor Receiver	£2.88	

	HF330	Stereo Decoder for use	
		with HF310 or HF325	£9.96
	HF395	Aerial Amplifier for AM/F	M
		Bands I, II and III	£1.77
	GP310		
	l	with 2, AF310	£21.27
ı	GU330	Tremolo Unit for guitars,	
		etc.	£7.50
	NT10	Power Supply 100 m/a	
		9 V Stab., 12 V Unstab.	£6·15
	NT300	Professional Stabilized Po	
ı		Supply 2 × 30 Volt, 2.2 at	
			£12·51
	NT305	Transistor Converter 12/1	5 V,
		AC/DC to 6 V, 7 5 V, or	
		9 V DC	£4.50
ı	NT310	Power Supply 240 V AC to	
ĺ	NOTE	2 × 18 V DC at 2 amps	£4 ·80
ı	NT315	Power Supply 240 V AC t	
		4·5—15 V DC 500 m/a	£9·57
٤.	ne TEn m.	- 1-14	

HF310 F.M. Tuner Unit \$15.81 HF325 De Luxe F.M. Tuner Unit \$24.12

Post and Packing 15p per kit. Complete with comprehensive, easy to follow instructions and covered by full guarantee.

SEND SAE FOR NEW 8
PAGE LIST OF SEMI
CONDUCTORS & VALVES

ALL PRICES ARE SUBJECT TO 10% VAT



LT (RADIO)

UNR 30 RECEIVER



4 Bands covering 550 kc/s·30 mer B.F.O. Built-in Speaker 220/240 v A.C. Brand new with instructions Our £15.75 Carr. 37p

UR-IA RECEIVER



4 Bands covering 550 ke/s-30 me/s-FET, 8 Meter. Variable BFO for SSB. Bull-in Speaker, Band-spread, Sensitivity Control. 220/ 240 v. A.C. or 12 v. D.C. 12§in. v. 4§in. 7 in. Brand new with instructions. instructions

Our £25.00 Carr.

SKYWOOD CX203 RECEIVER



Solid state, 3 bands covering 200-420 KHz and 55 to 30 MHz. Illuminated slide rule did, Band-spread, Aerlal tuning, BPO, AVC, ANL, '8" meter, AM/CW/88 B, Integrated speaker and phone scoket. 220/240 v. AC, or 12 v. D.C. 81ze 528 × 266 × 156 nm. Complete with instructions and elreuit

Our £32.50 50p

LAFAYETTE HA-600 RECEIVER



kejs:30 mejs, FET front end. 2 mech. filters, product detector, variable B.F.O., noise limiter, wariable B.F.O., noise mana-variable Bandispread, RF Oain, 15in. x 9iin. x 8iin. 18 ib. 220/240 v. A.C. or 12 v. D.C. Brand new with instructions, Carr.

Our £50.00 50n

TRIO 9R59DS RECEIVER



4 bands covering 550 ke/s to 30 me/s continuous and electrical bandspread on 19, 15, 20, 40 and 80 metres, 8 valve plus 7 diode circuit. 4/8 ohm output and phone jack, 88B-CW, ANL, Variable BFO, 8 meter, Sep. bandspread dial, 1F frequency 445 ke/s, andio output 1-50. Variable RF and AF gain controls 115/250 v. A.C. 81ze; 7ln. x 13ln. x 10in. with instruction manual. 4 bands a ering 550 kc/s to 30

Carr. Our £49.50 Carr. Paid. FULL RANGE OF TRIO STOCKED



EMILIOUDSPEAKERS

Model 350, 13" × 8" with single tweeter/ crossover, 20-20,000

with single tweeter/crossover. 20-20,000 Hz. 15 watt RMS. Available 8 or 15 ohns. 27.25 each. 17. & P. 371. Model 450. 13" × 8" with twin tweeter/crossover. 55-13.000 Hz. 8 watt RMS. Available 8 or 15 ohns. 23.62 each. P. & P. 25p.



SPECIAL OFFER! SPEAKERS

Matched pair of stereo bookshelf speakers Debuxe teak

Delive teak venceredfinish. Size 144" × 9" 74", 8 ohms, watt. BMS. watt peak. Complete with DIN

Our £12.95 Carr. 50p

HA-10 STEREO HEADPHONE



AMPLIFIER VII slileor transistor amplifier op-rates from magnetic. ceramic

with twin steres inputs headphone outputs and separate volume controls for each channel. Operates from 9v battery. Inputs 5MU/100MU. Output 50MW.

£5.97 P. & P. Our Price

1021 STEREO LISTENING STATION



For bal-ancing and gain selection loud aneaker.

speakers with addition a life famility for stereo awitching, 2 gain controls, speaker on-off side switch, stereo head-phone sockets, 6" × 4" × 2\frac{1}{2}".

Our £2.25 P. & P. Price

MP7 MIXER PREAMPLIFIER



5 Imlero gain con trols enabl

trols enables are trols enables. Battery operated, 91" x 5" x 3". Inputs Mics: 3 x 3mV 50K; 2 x 3mV 600 ohm. Phono mer. 4mV 50K. Phono creamic 100mV 1 meg. Output 250mV 100K.

Our £8.97 P. & P.

HAND HELD 2-WAY WALKIE TALKIES

industrial quality in robust metal cases. Battery operation, Volume and squelch controls. Call button and press to talk button. Tele-scopic aerial. Complete carrying

cases. 100mW £24.95 pair. Packing &

Licence required for operation in U.K.

TRONIC

RANGE OF HIGH QUALITY

Audiotronic Products are manufactured exclusively for the Audiotronic Audiotronic Fronces are maintacture activately in the trace of the group of Companies and as a member of the group we are pleased to offer you this fabulous range of high quality equipment. Made to our own specifications each item provides outstanding performance and reliability at a value for money price!

ACR.14 Battery Cassette Recorder

Portable twin track mono recorder with automatic recording leve control. Bu Built Earpiece socket, Input for radio or record player Fast forward



and rewind. Output 500mW. AC 220/240v or 6v DC operation. Complete with remote control microphone, mains lead, earpiece and batteries.

OUR PRICE £10-50 P. & P. 50p.

AR.1000 Sportsman AM/FM Portable Radio

wavebandcovering AM 535 1065 KHz FM 88-108MHz AIR 108 135MHz PB 147 174MHz WB 162 5MHz.



5MHz.
Large horizontal silde that with logging scale. Silder volume and squelch controls. 7 section telescopic aerial for FM and built in ferrite bar for AM. AFC. 3in. speaker. Earpiece socket. Green leatherette covered cabinet with metal side panels. Size 152 × 79 × 219mm. Battery/mains operation.

OUR FRICE £11.50 P. at .P 35p.

AMR-9000 Global AM/FM Portable Radio 10 waveband-



covering
AM: 5351605 kHz.
LW: 150380 kHz.
MB 1-64-00 MHz. 00 MHz. W1: 4-0-MHz. W2: 8-0-SW1 SW2: 8:0 1:6 MHz. SW3: 16 18-

8W3: 18-24 MHz. P8B1: 30-50 MHz. P8B2: 148-174 MHz, FM 88-108 MHz. AIR: 108-136 MHz. Features time zone map and timing dlal. Large clear scale. timing disl. Large clear scale. Telescopic aerial and built in aerial. APC or FM. 6" × 4" speaker and personal earpiece. Battery/mains operation. Size: 345 × 133 × 305mm.

OUR. 236.00 P. a.P. 50p
PRICE 436.00 P. a.P. 50p

Stereo Headphones

LSH 20 Individual volume controls Stereo mono switch, 8 ohms, 40 19,000 Hz, £3:50 P & P 30p



LSH.30 Open back type, Individual tone and volume controls, 8 ohns, 30-20,000 Hz. 25.50 P & P 30p

LSH.40 Two way speaker system. Individual volume controls, 8 ohms. controls, 8 ohms 20-20,000 Hz. £6.95 P & P 30p



Mains | ACD.660 Stereo Cassette



styled 4 track stems deck with an outstanding speci-fication offered at a remarkably low price. Incorporates a host of features including switchable noise filter normal/chrome tape selector, twin VU meter, sibler record/laphack level controls, front panel headphone socket, recording indicator lamp, phono/Din line input sockets, 3.5mm inRg-input sockets etc. etc. Frequency response 100-8KHz (100-12KHz Cr02) S/N-45dB, Crosstalk 45dB, Separation—35dB, Noise limiter-6dB at 10KHz. Complete with phono connecting leads. price. Incorporates a host of

Our **£39.50** Carr. &1 Ins.50p.

AUDIOTRONIC DOLBY 'B' **NOISE REDUCTION UNITS**

Reduce tape hiss by 3dB at 600Hz. 8dB at 1200Hz and 10bB for all frequencies above 3000Hz. Size $16\frac{\pi}{3}''\times8''\times31'''$. AC 200/250c.

PROCESS TWO

PROCESS TWO
For use with cassette and tape recorders, Freq. res. 30Hz-20KHz
± 2dB. Off tape monitoring. Switchable multiplex filter. Two Dolby calibration meters. 8/N better than 70dB.

Supplied with test cassette or tape as required.

Price

£34.50 P&P

LOW NOISE TAPE CASSETTES



TYPE Tape Head Cleaner 30p £1.29 £3.62 £8.59 £4.48 £10.63 £1.85 £2.29

ACP-8 8 TRACK

Attractive black and silver fluish, 12v neg, earth, Slider controls for Volume, Tone and Balance, Channel selector button with red pilot lamp. Complete with speakers, mounting brackets and instructions.

ONLY £12.50 P & P



ACR1 PUSH BUTTON

Pash button tuning of one LW and five MW stations of your choice, 12v pos. or neg, earth. Complete with speaker, mounting brackets and Instructions. P&P

50p

Our £8.95

AHP-8D 8 Track Stereo Tape Deck

Can be used - with most hiff amplifiers Push button track selector and illuminated track



ndicators. Attractive cabiner black and silver trim. Output level 750mV. AC 220/240v.

OUR #11.95 P. & P. 50p.

AHP-8A 8 Track Stereo Tape Player



Incorporates built in amplifiers giving $4\frac{1}{2} + 4\frac{1}{2}$ watts rms output. Push button track selector, illuminated track indicators, slider controls for volume, balance and tone. Attractive cabinet with black and silver trim. Output impedance 8 ohms. AC 220/240v.

OUR PRICE £17.25 P. & P. 50p.



PROCESS FOUR For use with semi-profe-For use with semi-processional tape recorders. Freq. res. 30Hz-20KHz ± 2dB. S/N better than 70dB. Full source tape monitoring. Record/Replay intering. Switch-able multiplex filter. Supplied with

test tape Our **£50.00** P & P





tunner Medium or neg

Long waves 12v pos, or neg earth. Complete with speaker mounting brackets and Instruc-tions.

Our £6.50 50p



Our Price £5.95

P & P 50p

O 33% OR

RECORD DECK PACKAGES RECORD DECKS



Carriage and Packing	75p		
Complete units with 8	Stere	о са	art
ridge ready wired in p	linth	CO	rer
GARRARD			
2025 TC/9TAHCD		£10	-85
SP25 111/G800		£15	
8P25 111/M44E		£16	
8P25 111/M44E 8P25 111/M44-7		£16	
		£16	
8P25 111 Module/M75-	-6	£18	.98
AP 10/G800		£23	
AP76/G800E		£25	95
AP76/M44E		£24	
AP76/M55E		£25	
AP76/M75ED		£31	
AP76/M75EJ		£27	
AP76 Module M75-6 AP96 Module M75-6		£26	
7 P.D.O. 1000 M. 1. 1. ///		£30	
ZERO 1008 Module/M9	3 E	£41	85
B.S.R. McDONALD			
210/SC7M		£6	85
MP60/G800		£15	-50
MP60/TPD1/G800		£15	20
MP60/M44-7		£16	60
HT70/TPD1/G800		£18	60
GOLDRING			
		£30	00
OT BELOWA		£33	
OT TO WHOOF		£36	
GOODMANS	• •	Z-uo	10
TD100/G800 Teak			
TD100/G800 White		£46	
		£48	GÜ
LEAK			
Delta/M75-6		£43-	95
PHILIPS			
GA105/GP200		£13-	80
GA160/GP200 Teak		£19.	
GA212/GP400	:	£45.	25
	;	£23-	95
GA308 P.U	:	£32-	75
PIONEER			
PL12D (Less cartridge)	- 1	£29-	ദര
PL15C (Less cartridge)	- 4	E41 -	
PL4ID (Less cartridge)	- 1	295	
PL50 (Less cartridge)		89	
PL61 (Less cartridge) .	. £1	02	
PLA35 (Less cartridge).	. ź	88-	30
THORENS			



TD160C/Ortofon M15ES
TD125 AB/11/Ortofon
M15E Super . . . £104-25
TD165/Ortofon M15E

Super ..

WHARFEDALE

Linton/M44-7 Teak Linton/M44-7 White

£59-80

Z30 Stereo 60/P/Z5 £15.95 P. & P. 37p. Z30/Stereo 60/PZ6 £18-00. P. & P. 37p.

Z50/Stereo 60/PZ8 \$20.25. P. & P. 37p.

Transformer for PZ8 23-65. Active Filter Unit 24-45. Pair of Q16 Speakers £10.70 Project 60 FM Tuner £14.95 Sinclair Project 605 £20.97. P. & P. 37p.

All other Sinclair Products in stock 2000 Amplifler #22.95 3000 Amplifier £28.95 2000/3000 Tuner £26-30 Q830 Speakers £23.98 pair

P. & P. 50p each of above items



Carriage and	Dankin	- FO-	
B.S.R. McDC	PRCKIN	g oup	
C114 Mini	MALL		£3·95
C129 Mono			£5.50
C137			£7.00
510/TPD1			£13.95
610			£9.90
610/TPD1			£14-85
710			£19-20
810	• • •		£24.50
MP60			
MP60/G800	٠.		£7.65
MP60/TPD1			£12 60
MP60/TPD2			£11 25
HT70/G800			£10.97 £13.60
HT70/TPD1			
CONNOISSED	TD		£15·95
BD1 Kit			00.0*
BDI Chassis			£8.65
BD1/SAU2/P	lines in		£10.75
BD2/SAU2/C	hamilyee	ver	£26·15
BD2/SAU2/P	1188819		£22:70
GARRARD	mun/Co	ver	£28.20
2025 T/C Ste			
SP25 III	reo		£6-40
SP25 III Ac	os GP1	0.40	£8·50
8P25111/9800	OR CULT	04C	£8.50
SP25/M75-6			£10.95
AP76			£13-90 £15-40
SL65B		• •	£11-15
8L72B			£17.75
SL95B			£25-25
401			£23·50
ZERO 100A			£30.30
ZERO 1008			£27.95
GOLDRING			##1.A9
G99			£16.85
G101P/C	• •		\$16.85
GL69/2			215.75
GL72			£17-85
GL72/P	• •		£23-20
GL75			£23.75
GL75P			£29-30
GL78P/C			246.55
GL85P/C			£49.50
			W.50.00
_		-	-
-		_	



10251 speed autochanger unit fitted ith stereo ceramic cartridge. Our 44.95 Carr. Fice 50p with stereo Our Price 50n

SP25 III WITHACOS **GP104**

SP25 MK.II. 4 speed single record player fitted with Acos GP104 stereo ceramic cartirdge. Our £8.50 Carr.

Audiotronic AMB.500

Multiband Radio



5 wavebands covering MW 535-1605KHz and FM 88-175MHz All transistor.
Battery or
mains operation. Built in
aerial and 3 section telescopic serial. Complete with batteries, shoulder strap and earpiece.

OUR £6.95 P&P 35p PRICE



CASSETTE RECORDER with a pair of OSS8 Speakers. List £96-10.

OUR PRICE £56.50 P & P 50p GXC40D Deck ... GXC40 Recorder GXC40T Deck/Receiver

CARTRIDGE (P. & P. 50p) CR81 Deck with amps. £6 CR81D Deck . . . £5 TAPE (P. & P. 75p)

\$82.50 £108.20 X201D Deck GX220D Deck GX 221 D GX221D GX280D Deck ... GX370 Deck .. £211-50 TAPE/CASSETTE (P. & P. 75p) GX1900D Deck

MICROPHONES (P. & I ADM.11 Dynamic (pair) STEREO RECEIVERS (P. & P. 75p)

AA8500 65+65 watt .. £150 50 STEREO AMPLIFIERS (P. & P. 50p) AA5200 20+20 watt AA5500 30+30 watt AA5800 45+45 watt €61-75 .. £78-50

 STEREO TUNERS (P. & P. 50p

 AT550 AM/FM ...
 260-50

 AT580 AM/FM ...
 294-50

 £94-50

4-CHANNEL UNIT (P. & P. 50p) SS1 Synthesiser .. SPEAKERS

SW155 (each) STEREO HEADPHONES

£4·75 £7·30 £8·25 A8E20

HOMER INTERCOMS



home, office, tores, factories, plete with batteries, cable and plete with batteries, cable ar instructions. 2 Station 22.97, P. & P. 15p. 3 Station 25.25, P. & P. 16p. 4 Station 26.82, P. & P. 17p.

SH628 STEREO HEADPHONES



Outstanding value. Soft value. Soft ear-pads, adjustable headband. 8-16 ohm

ldeal for

20 - 20,000 Hz. Complete with lead and stereo plug. Our £1.87 P. & P.

LHO2S STEREO HEADPHONES



Price

Lightweight headphones with padded earpieces. 4-16 ohms, 20-20,000 Hz. Complete with

30n

6 ft. cord and plug. Our £1.95 P. & P. 30p Price

TEI018 DE-LUXE MONO HIGH IMPEDANCE HEADSET



Sensitive magnetic headset with soft earpads. Impedance 2,600 ohms (d.c. 600 ohms). Fre-

Our P. & P. Price 30p

BH.001 HEAD SET AND BOOM MICROPHONE



Our

Moving Coil. Ideal moving Coil. Ideal for language teaching, com-munications. Headphone imp. 16 ohms. Microphone imp. 200 ohms.

£4.95 P. & P. 30p



SISTOR HIGH QUAL-

output to feed most amplifiers.
Operates on 9V battery. Coverage
88-108Mc/s. Ready built ready for
use. Fantastic value for money.
Our
Price
45-95
P. & P.
12p

Stereo multiplex adaptors £4.97

SPECIAL PURCHASE! FERGUSON EXPORT MODELS



FERGUSON 3408 STEREO TUNER AMPLIFIER
Covers FM 88-108 MHz. Five push
button tuning scales. 8+8 watts
rms. Inputs for stereo ceramic
cartridge and tape etc. Separate
bass treble, balance and volume

controls. Our £31-50 P. & P.



3416 STEREO TAPE DECK 4 track. 7‡, 3‡, 1‡ i.p.s. Stereo/ mono reccrd/play. 7" reels. Inputs for dynamic mikes, radio, gram. Complete with cover.

£41.95 P. & P. Our Price 75 p



SEND LARGE S.A.E. FOR FULL HI-FI DISCOUNT LIST

ALL MAIL ORDERS TO UNIT 4, THE HYDE INDUSTRIAL ESTATE, THE HYDE, LONDON NW9 6JJ **TELEPHONE 01-205 3735**

PERSONAL CALLERS WELCOME AT ANY OF OUR RETAIL BRANCHES

CENTRAL LONDON . Fottenham Court Rd. Old Compton Street. Liele Street, W.C.2. Liele Street, W.C.2. Edgware Road, W.2. Edgware Road, W.2. Edgware Road, W.2. Tel: 01-437 9155 Tel: 01-723 9789 Tel: 01-723 6211

Tel: 01-636 3715 Tel: 01-680 3739 Tel: 01-437 9369 Tel: 01-437 8204

Tel: 01-262 0387 Tel: 01-723 4194 Tel: 01-353 2833 Tel: 01-286 9530 102.3. Flest Street, E.C.4. 378. Harrow Road, W.S. ESSEX 86. South Street, Romford, Tel: Romford 20218 SURREY 1046, Whitgift Centre, Groydon. 27 & 21, Eden Street, Kingston. 32, Hill Street, Richmond.

ALL BRANCHES OPEN 9 a.m.-6 p.m. MONDAY TO SATURDAY





CREDIT TERMS FOR CALLERS (£50 and over)

ALL EQUIPMENT IS BRAND NEW FILLY **GUARANTEED AND** OFFERED WITH FULL AFTER SALES SERVICE All items and prices are correct at

but subject to change without notice. F & N F



parts for **PRACTICAL** WIRELESS projects

After many requests, Electro Spares are now supplying lists of components for ALL the projects featured in "Practical Wire-, commencing this month. Just forward an S.A.E. (Preferably 9" x 4" minimum) stating which project is of Interest to you—we will forward an individually priced list of components required. No need to buy a full kit-you need only purchase the parts you require at any one time.

All Electro Spares supplied components are new, branded products of reputable manufacturers and carry full makers guarantee.

We regret we cannot supply lists for projects published before this issue.

"ONE SOURCE" BUYING MAKES SENSE—IT CAN SAVE YOU TIME, MONEY AND POSTAGE.

"p.e." f.m. varicap stereo tuner

Electro Spares offer a kit of high quality parts to the published specification for this remarkable tuner, featured in "Practical Electronics" May 1973.

Features include push button "Spot On" tuning, with up to 5 pre-set stations (no difficult tuning dial and drive cord). Easy o pre-set stations (no difficult tuning dat and drive cold). Easy "no problem" construction, requiring only a few simple setting up adjustments with a D.C. Voltmeter. Uses NEW pre-set modules for R.F. and I.F. Circuits—no circuit alignment. High efficiency Integrated Circuit Phase Lock Loop Decoder for perfect stereo reception, with stereo lamp indicator. Fibre Glass P.C. Board, neat slimline cabinet with brushed aluminium front panel, push buttons etc. etc.

IDEAL FOR USE WITH THE "TEXAN," "GEMINI" AND ANY GOOD QUALITY STEREO AMPLIFIER

Please send large S.A.E. for full details.

"p.e. gemini" stereo amplifier QUALITY HI-FI FOR THE HOME CONSTRUCTOR

30 Watts per channel into 8 ohms! Total Harmonic Distortion 0.02%! Frequency Response (-3 dB) 20Hz-100kHz!

We are still continuing to supply components for this fabulous Amplifier, which is now recognised as practically the ultimate in High Fidelity. We know of no better unit for the Home Constructor—we can supply a Booklet containing full specification, complete constructional information wiring diagrams, fault finding guide, etc. etc. Price 55p, plus 4p postage.

Our New Low Price List is supplied with each booklet, or supplied separately on receipt of a large S.A.E.

FOR PEOPLE WHO REQUIRE THE BEST, IT HAS TO BE THE "p.e. gemini".

Note Our New Address-With New Mail Order Department For Quick, Efficient Service.

PLEASE PAY US A CALL—VISITORS WELCOME.
NO PARKING PROBLEMS

Electro-Spares

SHEFFIELD, S11 8PE

"THE COMPONENT CENTRE OF THE NORTH"

D.I.Y. **FLECTRONIC** ORGAN

In use throughout the world by professionals



★Portable—4 octave keyboard with 10 voices, 3 pitches—vibrato, £145 29. ★ Console—5 octave keyboard with 10 voices, 3 pitches. Keyboard can be split into solo and accompaniment. Vibrato, built in amplifier and speaker £250.93. ★Console—2 × 4 octave keyboards and 13 note pedal board, 29 voices. Vibrato, Delay Vibrato, Sustain, Reverberation, Percussion, Wah Wah, £406.00. ★Console —2x5 octave keyboards and 32 note pedal board, 32 voices. Vibrato, Delay Vibrato, Systain, Reverberation, Percussion, 3 Couplers, etc., at £572-55.

V.A.T. please add 10%—show separately on order. ALL COMPONENTS CAN BE BOUGHT SEPARATELY.
SEND 50p FOR LATEST CATALOGUE WHICH INCLUDES SPECIALIZED COMPONENTS, HI-FI EQUIPMENT, ELECTRICAL HOUSEHOLD APPLIANCES AND MUSICAL INSTRUMENTS.

ELVINS ELECTRONIC MUSICAL INSTRUMENTS

YOU ARE WELCOME TO VISIT THE ONLY D.I.Y. ELECTRONIC ORGAN CENTRE IN EUROPE AT 12 BRETT RD., HACKNEY E8, TEL. 986 8455

CASED AMPLIFIERS



Polished wooden cabinet $14 \times 13 \times 9$ " with hinged lid containing a sensitive $(20\mu V)$ 4-valve amplifier with tone and volume controls, giving about 3 watts output to the 7 imes 4" 3Ω speaker. Also a non-

etc. Supplied in good working condition with circuit diagram. Mains operated. Only £3 (£1 up to 200 miles, £1 20 over). Special cassettes £1 (25p). Spare heads 40p. Damaged machines from £1.50 to callers only.

COMPUTER PANELS

Type A: 4 OC35, 4 GET103, etc. 50p; Type C: 2 OC35, 2 OC76, 6 OC42, etc. 30p; Type D: 4 OC36, 8 GET103, etc. 60p. (5p ea). Parcel of 12 top quality boards £2 (25p). 7lb of lower quality including some broken £2 (40p), 56lb £12 (c.p.). Boards from Endo callers. 5p to callers.

71b BARGAIN PARCELS

Hundreds of new components—capacitors, resistors, switches, crystals, pots, PC boards, etc. Outstanding value

£1 65 (35p). 500 assorted resistors, good selection £1 (15p); 40 asstd pots £1 (25p); 300 asstd capacitors, all types £1 (25p). Heavy duty heat sinks $6 \times 5 \times 3$ ". Wt. 3lbs with 2 power transistors, OC36 or 2N1146A £1 (25p). Large selection of panel meters for callers. Audio oscillator 50Hz-20kHz, BFO No. 8 £10; RF Signal generator Marconi TF144G 85kHz-25MHz from £12. 741C TO99 28p; BC107-9 14 for £1; 2N3055 35p. Veroboard in stock. Post in brackets, small parts 3p. VAT NOT INCLUDED. SAE List, details.

GREENWELD ELECTRONICS (PW3)

24 Goodhart Way, West Wickham, Kent. SHOP AT 21 Deptford Broadway, SE8 (Next to old cinema). Callers most welcome. Tel: 01-692 2009.

MANUFACTURERS OF ELECTRONIC AND AMPLIFICATION EQUIPMENT SPECIALISTS IN QUALITY TRANSISTOR EQUIPMENT OPEN 6 DAYS A WEEK. 9.00 a.m. - 6.00 p.m.



TRANSISTOR UNIVERSAL AMPLIFICATION COMPANY LTD. 163 MITCHAM ROAD, LONDON SW17 9PG 01-672 3137/9080

PRE-AMPLIFER €4.22



All Tuac audio modules are constructed on glass fibre P.C. board, are ready assembled and fully tested. Low noise silicon and FET transistors together with H.S. carbon film resistors are sed throughout. Extensive research has gone into the various wide range tone control circuits, producing superb sound quality from any sirand. Previous range still available. 40V dc.; 30m o/p. VA08 — Vol. Treb. Mid and Bass Controls. HI £4.22 IMP. FETJP. Suitable Mic. Guitar, Radio. Crystal/Ceramic P.U. Sensitivity 4mV. P. & P. 20p Treb + 358 + 36ktz, Mid + 420-156B at IkHz, Bass + 20-1048 at 40ktz. Vol. Treb dd Bas 26ktz, Mid + 420-156B at 12kHz, Treb + 28 + 28 + 26 + 12kHz. MVA01— Vol. Treb dd Bas 26ktz 40ktz. With the sensitivity. Treb + 28 + 28 + 28 + 12kHz. MVA01— Vol. Tone, Vol. Tone Controls, Ideal for 24 + 30 — Disco. Suitable for Mic I/P. Sensitivity P. & P. 20p 2mV. Tone range + 25dB at 12kHz. AMF01— Auto Mic Over-ride for Disco use. Feed 24 + 40 — Deck and Mic Pre-amps in. Auto fade P. & P. 20p O/P to main Amp, 30mV operating level. Depth and Vol Controls.

POWER AMPLIFIER £15-18



POWER SUPPLY 49-10



100 W. R.M.S. sine. 200 W. R.M.S. square. £28.50 + p & p Trade & export enquiries wel-

Call for a demonstration

P\$100— 100 Watt Power Supply for one TP100W Module. Complete as illus above. P\$50 46-86 Power Supply for one TP50W Module. Similar to illus, above. Postage and Packing 50p each.

40V. 250mA. Pre-amp./Disco Mixer Supply. P. & P. 25p.

TP100W with RCA output transistors-150w device 2N6254 TP100W £15-18 P. & P.

100 Watts r.m.s. continuous sine wave into 8Ω, 30mV input into 3kΩ full power frequency response 10Hz-20kHz ± 2dB. Hum and noise better than —70dB. T.H.D. at 100 Watts 2%. This rugged circuit incorporates a special layer wound driver transformer to give increased reliability under all conditions. Short and open circuit proof. An external heatsink area is reliability under all conditions. Short and open circuit proof. An external heatsink area is required. Just bolt on the module. So Watts r.m.s. continuous sine wave into $8-15\,\Omega$. With IIS Watt RCA 2N3055 output transistors. Specification as TP100W.

Sleve £49-50 50 watt £41-25 P. & P. £1-00

ACCESS & BARCLAY CARDS ACCEPTED, JUST SEND US YOUR NUMBER. H.P. ARRANGED THROUGH PAYBONDS

DISCOTHEQUE MIXER FEATURING AUTO-FADE



Panel mounting Cut out 17 x 3 ins.

£22-00, P. & P. 50p. PSU £2-95
Designed for the discerning D.J.
of professional standard. Auto
Fade is fitted as atandard.
Controls: Mic Vol, Tone. Override depth, Auto Manual Sw.
Tape Vol, L & R Deck Faders.
Deck Volume. Treb. & Bass.
H. Phon Vol, Selector. Master
Vol, on/off sw.

HIGH POWER AMPLIFI-100 watt 460 · 50 100 watt



Suitable for Disco, P.A., Guitar etc. Rugged circuit, rug-ged case.

LIGHT MODULATORS
Triac controlled, Safety isolating input transformer. 0.5 Watt sensitivity with controls.

SILMB 3 1000 Watt outputs'
417-45 Bass, Mid & Treb.
52LMB 1 1800 Watt output,
46-47 Operates on all fre-& P. quencies. P. 8

ALL TUAC MODULES ARE READY ASSEMBLED ON GLASS FIBRE P.C. BOARD AND INDIVIDUALLY TESTED

ALL TUAC KITS ARE SUPPLIED COMPLETE WITH EASY TO FOLLOW WIRING INSTRUCTIONS AND CIRCUIT DIAGRAM. ALL PRICES INCLUDE VAT.

TP50W

S.A.E. WITH ENQUIRIES

SAVE TIME

LIST PRICE AND MONEY £6.87 | OUR PRICE £5:32

INCLUDING V.A.T



As supplied by us to SCHOOLS, TECHNICAL COLLEGES, SHOPS, OFFICES AND INDUSTRY. Sliver grey stove enamelled steel cabinet with Martines and the state of the supplied at an extra charge to enable each drawer to be sub-divided into six compartments. Transparent drawers allow swift selection of components at a glance and eliminates duplication of stock. A really first class time saving unit. Size of cabinets 21½ × 11½ × 6½. Size of drawers 6½ × 2½ × 1½°. Other sizes available. Callers welcome Mon.-Sat. 9 am.-1 p.m. 2 p.m.-6 p.m. NEW as illustrated OUR PRICE ONLY 25-32 plus 35p carriage on orders less than \$10. Money back guarantee. SEND FOR FREE

TRADE AIDS

(DEPT. PW13), III CHILTERN DRIVE, BERRYLANDS, SURBITON, SURREY

01-300 4383

100 yds. Berrylands Railway Station

TRANSFORMERS

DOUGLAS GUARANTEED Prices include 10% VAT & p. & p. 12 or 24 volts

12 or 24 volts	
Output V. & Amps Ref. No.	Price
12V × 1 250mA × 2 MT111C8*+	£1·15
$12V \times 2 = 500 \text{mA} \times 2 = MT213CT*+$	
12V × 2 1A × 2 MT71AT‡	
12V × 2 1A × 2 MT71AT‡ 12V × 2 2A × 2 MT18AT 12V × 2 3A × 2 MT70AT 12V × 2 4A × 2 MT108AT	
12V × 2 3A × 2 MT70AT	£8.34
12V × 2 4A × 2 MT108AT	£3.74
	£4.80
30 volts. All tapped at 0-12-15-20-30V.	£4.90
Output Output	
Amps. Ref. No. Price Amps. Ref. No.	Price
500mA MT112CT# £1-47 4A MT21AT	£4.02
1A MT79AT# \$1.99 5A MT51AT	
2A MT3AT #2.92	£5·73
3A MT20AT #3.89	
50 volts. All tapped at 0-19-25-33-40-50V. 500mA MT102AT# £1-92 3A MT105AT	
	£4 98
1A MT103AT 22.87 4A MT106AT 2A MT104AT 23.93 5A MT107AT	26 50
	£9·11
80 volts, All tapped at 0-24-30-40-48-60V.	
500mA MT124AT; \$2.03 2A MT127AT	24-12
1A MT126AT £2.94 3A MT125AT	£5.78
Power AUTO-WOUND RANGE	
output Winding tapped at Ref. No.	Price
20VA 0-115-210-240 XMT113CT	£1.28
75VA , XMT64AT	£2.32
150VA 0-115-200-220-240 XMT4AT	£2.85
200VA XMT65AT	23-84
400V Output at 50 HZ, Ref. ITSAT	Price
C-D Ignition System by R. M. Marston, Esq.,	11106
Wireless World	22.98
EQUIPMENT DANGE	22.80
Sec. output (r.m.s.) ARRIVATOR 3-0-3 V. 200mA MT238C8*† 9-0-9 100mA MT13C8*† 12-6-12 50mA MT239C8*† 20-0-20 30mA MT241C8*† 0-20 × 2 300 × 2 MT214CT** MT217CT** 0-15-20 × 2 50mA × 2 MT214CT** MT217CT**	Price
3-0-3 V. 200mA MT238C8*+	£1.59
9-0-9 100mA MT13C8*+	£1-24
12-0-12 50mA MT239C8*+	21.24
20-0-20 30mA MT241C8*†	£1 -24
0-20 × 2 300 × 2 MT214CT*‡	
0-8-9 × 2 500mA × 2 MT207CT*‡	£1.59 £1.87
0-15-20 × 2 500mA × 2 MT205AT •±	22.85
0-15-20 × 2 500mA × 2 MT205AT* 0-15-27 × 2 500mA × 2 MT203AT*	
0-15-27 × 2 1A × 2 MT204AT*	23.17
20-12-0-12-20 700mA (d.c.) MT221AT*	24.25
AT indicates open universal full a settle of the	£1.58
AT indicates open universal fixing with tags; CT is	open
U-clamp fixing with tags; CS is open U-clamp fixing	with
P.C. splils; with interwinding screen; tuntapped	240V
Primary; tapped at 210-240V; other Primarles t at 200-220-240V.	apped
Over 200 types in stock through agents or dir	ect.

Please send for lists DOUGLAS ELECTRONIC INDUSTRIES LTD.,
Direct Sales Dept. P.W., Thames Street, LOUTE, Lincs.
LN11 7AD

INTERCOM



tion no ne with this 4-Station Transistor Intercom system (1 master and 3 Subs), in de-luxe plastic cablinets for desk or wall mounting. Califatk/liter from Master to Subs and Subs to Master. Ideally suitable for Business, Surgry, Schools, Hospital, Office and Home. Operates on one 4V battery. On/off switch. Volume control. Compilets with 3 connecting wires each 64% and Complete with 3 connecting wires each 66ft. and other accessories. P. & P. 44p

MAINS INTERCOM NEW MODEL batteries—no wires. Just plug in the mains instant two-way, loud and clear communication. off switch and volume control. Price £16:95





Same as 4-Station Intercom for two-way instant communication. Ideal as Baby Alarm and Door Phone. Complete with 68ft. connecting wire. Complete with Battery, P. & P. 29p



clency with this next dible De-luxe Telephone Amblifter. Take down long relephone measages or converse without holding the hand-set. A useful office sid. Out off switch. Volume Control. Complete with Battery. P. & P. 24p. Full price refunded if not satisfied in 7 days.

WEST LONDON DIRECT SUPPLIES (PW.6)
169 KENSINGTON HIGH STREET, LONDON, W.S.

ESSENTIAL BOOKS FOR RADIO AMATEURS

A GUIDE TO
A MATEUR
RADIO
by Pat Hawker
by Pat Hawker
Extensively revised,
this new (15th) edition
tis an indispensable
is an all who want to
is an all who want
know more Specknow radio. Specamateur radio. Specamateur radio. Specamateur radio. Specamateur radio to
ially the newcomer
assist the newcomer
to the hobby.
to the post paid
gor

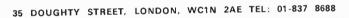
TELEVISION
ITELEVISION
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFERENCE
INTERFER

AMATEUR
RADIO
RADIO
TECHNIQUES
TECHNIQUES
TECHNIQUES
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pat Hawker
BY Pa

RADIO
COMMUNICATION
COMMUNICATION
HANDBOOK
HANDBOOK
832 pages of everything in the science of
tradio communication.
tradio communication.
The Handbook's easy
The ensures comorigin ensures comorigin ensures complete
availability complete
availability Complete
availability complete
availability complete
availability complete
availability complete
availability complete
fields.
EA.10 post paid

These are just four of a complete range of technical publications, log books and maps for the Radio Amateur. Send s.a.e. for complete list

RADIO SOCIETY OF GREAT BRITAIN





7 77 E								2000
VALVES 1A7GT 55 68B46 68B46 68B46 68B46 1N5GT 55 68B47 1R5 40 68B47 1R5 40 68B47 1R5 40 68B47 1R5 40 68B47 1R5 40 68B47 1R5 40 68B47 1R5 40 68B47 40	32 637M 75 637G A 55 646GT 55 647GT 70 687G 70 687G 70 6887G 35 688GT 45 688G 45 688G 45 688G 45 688G 46 688G 47 688G 47 688G 48 688G 48 688G 48 688G 48 688G 48 688G 48 688G 49 688G 40 688G	45 7 C6 72 76 70 70 70 70 70 70 70 70 70 70 70 70 70	128R7 50 37 148T7 50 50C5 50C5 50 50C5 50 50	50 DAF96 5 70 DCC90 £1- 60 DF33 666 £1-20 DF70 65 DF96 60 DH77 2 55 DK92 65 DK92 66 DK92 60 DK96 60 DL94 65 DK92 60 DL94 60 DL94 60 DL94 60 DL94 60 DL94 60 DL94 60 DL94 60 DL94 60 DL95 60 DL96 61 BAR £3-75 DL92 42 E88CC 64 DY87 65 EABC80 67 EABC80 67 EABC80 67 EBC33 68 EBC41 68 EBC41 68 EBC41 68 EBC41 68 EBC41 68 EBC41 68 EBC41 68 EBC41 68 EBC41 68 EBC41 68 EBC41 68 EBC41 68 EBC41 68 EBC41 68 EBC41 68 EBC41 68 EBC41	30 EBL31 £1-50 EC98 SC96 EC90 SC90 35 EL41 75 N108 40 E143 65 OA2 33 EL84 25 OC3 33 EL84 25 OC3 33 ELL95 21-00 PC86 40 EM80 45 PC88 40 EM81 60 PC97 63 EM84 35 PCC6 600 EY51 40 PCC6 75 EY86 40 PCC7 30 E235 40 PCF6 55 E280 75 PCP6 55 E281 75 PCP6 55 E281 75 PCP6 55 E281 75 PCP6 50 E281 75 PCP6 50 E281 75 PCP6 50 E281 75 PCP6 50 E281 75 PCP6 50 E281 75 PCP6 50 E281 75 PCP6 50 E281 75 PCP6 50 E281 75 PCP6 50 E281 75 PCP6 50 E281 75 PCP6 50 E281 75 PCP6 50 E281 75 PCP6 50 E281 75 PCP6 50 E381 75 P	45 PL802 80 PX4 8 80 PX25 4 50 PX33 4 40 PY81 9 50 PY83 8 9 50 PY80 9 10 30 PY80 9 12 35 PY80 9 10 50 PY80 1 16 60 R2 9 101 50 R19 1 102 50 R19 1 103 85 FY80 1 104 50 R2 9 105 80 R2 9 106 75 SP41 1 107 8 SP41 1 108 85 SP4 8 109 85 SP4 8 100 81 5 SP4 1 100 81 5 SP4	80 U403 70 80 U404 70 90 U404 70 90 U401 £1.18 1.60 UABC80 40 95 UABC80 40 95 UABC80 40 95 UABC80 40 95 UABC80 40 95 UABC81 45 30 UBF80 40 35 UCC94 43 38 UCC95 45 £1.00 UCF80 70 47 UCH42 70 50 UCH81 60 75 UCL82 35 £1.00 UCH82 85 £1.00 UCH83 65 £1.00 UCH83 65 £1.00 UCH84 43 UMP80 40 £1.00 UH9 50 £1.00 UH9 50 £1.00 UH98 40 £1.00 UH9 50 £1.00 U	
6AU6 30 6J5M 6B4G £1.00 6J5G		75 128H7 4 75 128J7 5	0 35Z4GT 75 CY3		1.00 EL32	50 MU14 75 PL8		80 Y68 £1-25 63 27590 M #3-50
6B8G 30 6J5G		70 128K7 5	0 35Z5 50 DA	C32 50 EBL21	60 EL33 £1		100	
Transistors 1N914 07 2N22 18113 25 2N23	AC128 ACY20 ACY39 ACY39 ACY39 ACY39 AD140 AD141 AD161 AF115 AD141 AF115 BC108 BC108 BC108 BC108 BF198	20 BY100 11 20 BY788 11 50 CR81-40 44 60 Db003 37 GET882 25 53 K81004 225 10 MJE302 10 MJE302 61 10 MJE305 61	S NKT713 25 OC4 S OA70 10 OC5 S OA81 08 OC5 S OA81 08 OC5 S OA81 07 OC7 OA2201 50 OC8 OA2201 50 OC8 OA2210 32 OC5 OA2210 32 OC5 OA2212 45 OC5 OA2224 45 OC5 S OA2242 23 OC5 S OA2242 23 OC5 S OC236 50 OC5 OC35 50 OC5 OC5 OC5 O	17 17 18 18 18 18 18 18 18 18 18 18 18 18 18	20 7411 20 7411 20 7412 20 7413 20 7416 20 7416 30 7420 30 7422 30 7422 45 7427 20 7428	7430 20 747 7432 42 747 7433 70 747 7433 65 748 23 7440 20 748 42 7441 N 75 748 30 7442 75 748 30 7450 20 748 42 7450 20 748 44 7450 20 748 48 7454 20 748 48 7454 20 748 48 7454 20 748 48 7470 30 748 48 7470 30 748 50 7473 40 748	5 55 74107 5 45 74110 0 80 74111 0 87 74118 3 \$1.00 74119 6 45 74122 0 75 74123 1.1 10 74141 3 75 74123 3 75 74150 5 80 74154 6 \$21.00 74155 7 \$6.25 74156	\$2.50 74157 a \$0.50 750 74170 \$4.10 \$50 74174 \$4.10 \$4.10 \$1.45 74174 \$1.35 \$1.40 74175 \$1.35 74.10 \$1.35 74190 \$1.95 74190 \$1

RST

VALVE MAIL ORDER CO. TELEX Open to callers 9am-5pm Mon-Sat' Closed Saturday from Ipm-3pm.

From 1st April 1973 all orders subject to V.A.T. at applicable rate. This must be added to your order including postage.

16a WELLFIELD ROAD, LONDON SW16 2BS Send large S.A.E. for list. Phone 677 2424 (4 lines) Express postage | p per transistor, over 10 post free. Integrated Circuits & Valves 5p, plus | p for each additional item, over £5:00 post free.

PRICES NOW INCLUDE VAT

SUPERSOUND 13 HI-FI MONO **AMPLIFIER**

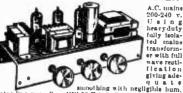


A superb solid state audio amplifier. Brand new components throughout. silicon transistors

silicon transistors plus 2 power output transistors in push-pult. Full wave rectification. Output transistors in push-pult. Full wave rectification. Output transistors in push-pult. As watts approx. 13 watts ± 3db. Fully integrated pre-amplifier stage with separate Volume, Bass boost and Treble cut controls. Suitable for 8-16 ohm speakers. Input for ceranic or crystal cartridge. Sensitivity approx. 40mV for full output. Supplied ready built and tested, with knobs, escutcheon panel, Input and output plugs. Overall size 3° high v 6° wide v 74° deep. AC 200/260V.

PRICE \$11.60, P. & P. 25p.

DE LUXE STEREO AMPLIFIER



fication giving adeamouthing with negligible hum.
Vaive line up: -2 × ECLAS Triode Pentodes. 1 × EZSO as rectifier. Two dual potentionseters are provided for bass and treble control, giving has and treble bonat and ent. A dual volume control is used, Balance of the left and eight hand channels can be adjusted by means of a separate 'Balance' control fitted at the rear of the chassis. Input sensitivity is approximately 300m/v for full peak output of 4 watts per channels (a watts mono), into 3 ohm expeakers. Fini negative feedback in a cerefully exclusivated circuit, allows bigh volume levels to be used with negligible distortion. Supplied complete with knobs, chassis size 11'w × 4''d. Overall height invinding valves 0''. Rearly built à tested to a high standard. PRIOE \$9.90 P. AP. 40).

POWER SUPPLY UNIT 200/240v, A.C. Input, Pour switched fully smoothed D.C. outputs giving dv. and 74v, and 9v, and 12v, at 1 amp continuous (Liamp intermittent).

built and tested. PRICE £5.00 P. & P. 35p.

BLACK ANODISED 18g. ALUMINIUM HEAT SINKS. For TO3, complete with inica's and hushes, Size 22 approx. 35p pair. P. & P. 5p.

HIGH GRADE COPPER LAMINATE BOARDS 8" - 4" 5 for \$5p P. and p. 13p.

BRAND NEW MULTI-RATIO MAINS TRANSFOR-MERS, Giving 13 alternatives, Phinary: 0-210-240v, Becondary connibilations 0-10-15 20-25-0-25-00-000, insit wave at I amp, or 10-6-10, 20-0-20-20-20-30v, at 2 amps full wave, Sire 3in, long 3 jin, wide × 3in, deep, Price £8-10 P. & P. 30p.

Price 38:40 F. e. F. copp.

MAINS TRANSFORMER. For translator power supplies.
Pri 200/240v. Sec. 0 G.0 at 560ma. 31.00. P. e. P. 32p.
Pri. 200/240v. Sec. 10 G.12 at 1 amp. 31.06 P. p. 2. 13p.
Pri. 200/240v. Sec. 10 G.10 at 2 amp. \$1.65, P. a. P. 30p.

ÖENTRE ZERO MINIATURE MOVING COIL METER. 100μA. Por balance or inning. Approx. size | " x | " x | " deep. Limited number. 88p. P. x P. 10μ.

GENERAL PURPOSE HIGH STABILITY
TRANSISTOR PRE-AMPLIFIER
FOR P.U. Tage, Mike, Initiar, etc. and sultable for
use with valve or transistor equipment, 9-18v,
hattery or from H.T. line 200 800 v. Frequency
response 1511z 26K Hz. (fain 20di), Rolld energy
sulation size 11° x 11° x 7° Brand new complete
with instructions, Price, £1°00 P. & P. 13p.

HANDBOOK OF TRANSISTOR EQUIVALENTS AND SUBSTITUTES

SUBSTITUTES

A must for servicemen and home constructors. Including many 1000's of British, I. S.A. European and Japanese transistors, ONLY 40p. Pust 5p.

8 Reference Encyclopedias for Electronic Engineers and Designers, covering between them transistor characteristics, dinde and transistor engineers. Many thousands of much date, European recovering between them to detect the constitution of much date. European recovering the constitution of much date. European recovering the constitution of much date. European recovering the constitution of much date. European recovering the constitution of much date. European recovering the constitution of much date. European recovering the constitution of the c up to date European types listed.

Diode Equivalents 80p 90p £1:15 Transistor Equivalente Transistor Characteristics POST FREE. All three together 42-80 RECORD PLAYER BARGAINS

Mains models, All brand new in maker's pecking. LATEST B.S.R. C109/C129 AUTOCHANGER UNITS with latest sterey/mamo compatible cartridge 27:60+ Jup P. & P.

GARRARD SP25 Mk III with heavy precision machined die cast turntable £10.56, carr. 50p.

PRECISION ENGINEERED PLINTHS

PRECISION ENGINEERED FLINTHS
Beautifully constructed in heavy gauge "Colorcoat"
plastic coaled steel. Resonance free. Designed to take
darrard 1025, 2000, 20025TC, 2500, 3000, 3300, 5100,
8P25 II and III, 8L668, AT60 etc. or B.S.R. C109,
C129, A21 etc. Black leatherette fluish. Size 121" <
142" × 34" high (approx. 74" high, including rigid
smoked acrylle covery.

EOW ONLY 24-95, P. & P. 35p.

LATEST ACOS GP91/180 mono compatible cartridge with to stylus for LP, EP, 78. Universal mounting bracket. £1.50 P. & P. 8p. SONOTONE STANC COMPATIBLE STEREO CARTRIDGE

T/O stylus Diamond Slereo LP and Sapphire 78.

ONLY £2-30 P. & P. 10p. Also available fitted with twin Diamond T/O stylus for Slereo LP. £2-80. P. & P. 10p. LATEST RONETTE T/O STEREO/COMPATIBLE CARTRIDGE for EP/LP/Stereo/78, \$1.63 P. & P. 10p. LATEST RONETTE TO MONO COMPATIBLE CART-RIDGE for playing EP/LP/78 mono or stereo records on mono equipment. Only \$1.50 P. & P. 10p.

QUALITY RECORD PLAYER AMPLIFIER MK II A top quality record player amplifier employing heavy duty double wound mains transformer, ECCS, ELSA, and rectifier. Reparate Bass, Treble and Volume controls, Complete with output transformer matched for 30 ohm speaker. Rize 7in. wide × 3in. deep × 6in. high. Ready built and tested, PRICE 84-40 P. 8 P. 40p ALSO AVAILABLE mounted on board with output transformer and sneaker. PRICE 86.85 P. 8 P. 40p transformer and speaker, PRICE 25-85 P. & P. 50p.

SPECIAL OFFER! HI-FI LOUDSPEAKER SYSTEMS

Beautifully made teak finish enclosure with most attractive Tygan-Vynair front. Size 10^4 high x 10^4 wide x 5^4 deep. Fitted with E.M.I. Cerando Magnet 13^2 x 8^4 bass unit, two H.F. tweeler units and crossover. Maximum power handling 10 waits Available 3 or 8 or 15 ohms impedance.

OUR PRICE £9.25 Carr. 70p

Cabinet Available Separately 24-95 ('arr 55p Also available in 8 chims with EMI 13° x 8° base speaker with parasitio tweeter 27-15 ('arr, 70p

HARVERSON'S SUPER MONO AMPLIFIER

HARVERSON'S SUPER MONO AMPLIPIER
A super quality gram simplifier using a double wound fully
lookisted mains transformer, rectilier and ECAS2 triode
pentode vaive as sudio amplifier and cower output
stage. Impedance 3 oins. Output approx. 3.0 watta.
Volume and tone controls. Chassis size only 7in. whice
× 3in. deep × 6in. high overall. AC mains 200/240v.
Supplied absolutely livand Naw completaly wired and
tested with good quality output transformer.

50in. 3 oins 1206, P. & P. Jip. 7 x 4in. Pintre 2.3.30

LOUDSPEAKER BARGAINS
5in. 3 oins 12.50, P. & P. Jip. 7 x 4in. 3 oins 12.15, P. & P.
20p. 10 × 6in. 3 or 10 ohm 12.90, P. & P. 30p. E.M.I.
8 × 0in. 3 ohm with high flux ceramic magnet with
marsaith tweeter 3. 8 or 15 ohm 28.90, P. & P. 20p.
E.M.I. 13 × 8in. 3, 8 or 15 ohm with two inhulit tweeters
and crossover network 48.65, P. & P. 30p.
E.M. Ceramic magnet heavy duty tweeter, Approx 34°.
Avsilable 3 or 8 or 16 ohm. 61.26 + 10p. p. & p.
BEAND NEW, 12in. 10w. H/D Steakers, 3 or 16 ohms.
Current production by well-known British maker. Now
with Hillinx ceramic ferrobar magnet assembly 27.80,
Guitar models: 25w. 27.80, 35w. 29.85. P. & P. 40p.



LIMITED NUMBER OF BRAND NEW ELAC 10" TWIN CONE LOUDSPEAKERS

With large ceramic magnet and plasticised cone surround. s ohm impedance. \$2.70, P. & P. 25p.

12sn. "RA" TWIN CONE LOUDSPEAKER, 10 watts peak handling, 3.8 or 15 ohm \$2.46, P. & P. 30p. 35 ohm SPEAKERS 3in, only 70p P. & P. 13p. "POLY PLANAR" WAFER-TYPE, WIDE RANGE ELECTRO-DYNAMIC SPEAKER Size 11; "x 14;" x 14;" at 14;" cap. Weight 180z. Power handling 20W r.m.s. (40W peak). Impedance 8 ohm only. Resubnas 40Hz-20kHz. Can be mounted on cellings, wails, doors, under tables, etc., and used with or without baffle. Send S.A.E. for full details. Only \$656 each. P. & P. 20p.

oanic Sent S.A.E. for juit outsits. Only 2006 caop, P. & P. 25p.

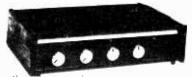
VYNAIR & REKINESPEAKERS & OABINET FABRIOS app. 54 in. wide. Our price 85p fd, length. P. & P. 15p per yd. (min. 1 yd.). S.A.E. for samples.

HI-FI STEREO HEADPHONES

Adjustable headband with coinfortable flexibanic ear-nums. Wired and fitted will standard stereo Jin Jack plug, Frequency response 30-15,000Hz, Matching injectance 8-16 ohns. Easily converted for Mono. PRICE 58-30, P. A. P. Jul.

HIGH IMPEDANCE CRYSTAL STICK MIKES. GUR PRICE \$1 15, P. & P. 10p

HARVERSONIC SUPER SOUND 10 4 10 STEREO AMPLIFIER KIT



SEW FURTHER IMPROVED MODEL WITH HIGHER OUTPUT AND INCORPORATING HIGH QUALITY READY DRILLED FIREE GLASS PRINTED DIRCUIT BOARD WITH COMPONENT IDENTIFICATION OF LEARLY MARKED FOR EVEN EASIER CONSTRUCTION

A really first-class Hi-Fi Stereo Amplifier Kit. Uses 14 transistors including Billeon Transistors in the first five stages on each channel resulting in even lower infine level with improved sensitivity. Integrated pre-amp with lass, Treibs and two valume Controls. Suitable for me level with improved sensitivity. Integrated pre-amp with lines, Treble and two Admine Controls. Sulfable for use with Ceramic or Crystal entrifices, Very simple to modify to suit magnetic cartridge, instructions included. Output stage for any speakers from 5 to 15 ohms. Compact (design, all parts supplied including drilled metal work, high quality ready drilled floreglass printed circuit board, smart browhed anodbed significant panel with matching knois, wire, solder, mits, bolts—no extrasto buy. Simple step by step instructions enable any constructor to build an amplifier to be proud of, Brief specification: Power output: 14 watts r.m.s., per channel Into 5 ohms. Frequency response ±AdB 12 30,000 Hz Bensitivity; better than 80nV Into IM Ω. Full power handwidth: ±AdB 12-10,000 Hz. Buss boost approx, to ±121B. Treble cat approx, to ±161B. Negative feedback 18dH over midh smp. Power requirements 35v. at 1.0 amp. Coveral Biss 12** x. 85*. x. 25*1.

Additive that the send 18p plus large Additive that the with kit or send 18p plus large Additive that the with kit or send 18p plus large Additive the Additive that the with kit or send 18p plus large Additive that the with kit or send 18p plus large Additive that the with kit or send 18p plus large Additive that the send 18

(Magnetic input components 33p extra)
POWER PACK KIT
CABINET
(Post Free if all units purchased at same time)
Full after sales are used to same time)
Also available ready built said tested \$23-10. Post Free.
Note: The above amplifier is suitable for freeding two mono
sources into inputs (e.g. mike, radio, twin record decks, sie.)
and will then provide mixing and fading facilities for medtum powered III FI Discotheque use, etc.



AMPLIFIER HAS ME II.
Designed for fil-Fi reproduction of records. A.C. Mains operation. Rendy built on

apeaker. Reparate volume countries and traveled for 3 ohm countries and traveled an

i, A.P. 40;

Fig. 19. 40;

Fig. 19. 40;

Fig. 20. 19. 40;

Fig. 20. 19. 40;

Fig. 20. 19. 40;

Fig. 20. 19. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

Fig. 20. 40;

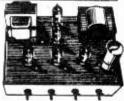
Fig. 20. 40;

Fig. 20. 40;

F tine, VAT) -

AMPLIFIER KIT

A stylishly finished monaural amplifier with an output of 14 watts from 2 EL84s in push-pull. Buyer reproduction Super reproduction of both music and speech, with negli-gible hum, Separate inputs for mike and gram allow records and announcements to follow each other. follow each other,



to follow each other. Fully shrouded section wound output transformer to match 3-16 Ω speaker and 2 independent volume controls, and separate base and treble controls are provided giving good lift and cut. Valve line-up 2 BLR4s, ECC83, EF98 and EZ80 rectifer. Simple instruction booklet $15\mu + 84.8$ (Free with parts). All parts sold separately, ONLY 83-80 P. & P. 50p. Also available ready built and tested £13-10 P. & P. 50p.

Open 9-5.30 Monday to Friday. 9-5 Saturday

Early closing Wed. I p.m. A few minutes from South Wimble-don Tube Station,

HARVERSON SURPLUS CO. LTD.

(Dept. P.W.) 170 H!GH ST., MERTON, LONDON, S.W.19 Tel.: 01-540 3985

SEND STAMPED ADDRESSED ENVELOPE WITH ALL ENQUIRIES

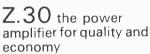
(Please write clearly) PLEASE NOTE: P. & P. CHARGES QUOTED APPLY TO U.K. ONLY. P. & P. ON OVERSEAS ORDERS CHARGED

Sinclair Project 60

Now-the Z.50 Mk.2

with built-in automatic transient overload protection

When originally introduced, the Sinclair Z.50 proved how it was possible to design and produce a popularly priced modular power amplifier having characteristics to challenge the world's costliest amplifiers. Many thousands of Z.50's are now giving excellent service day in, day out. But we have also learned that constructors do not always use their Z.50's ideally. That is why we have introduced modifications whereby risk of damage through mis-use is greatly reduced and performance further enhanced. The Z.50 Mk.2 has improved thermal stability, more accurately regulated D.C. limiting to ensure more symetrical output voltage swing and clipping and still less distortion at lower power. Z.50 Mk.2 is compatible with all other Project 60 modules, and may be incorporated to advantage in existing systems. Eleven silicon epitaxial planar transistors are now used, two more than in the original Z.50; circuitry has been re-designed, making this versatile high performance amplifier better than ever.





with free manual

The Z-30 provides excellent facilities for the constructor requiring a high fidelity audio system of less power than that available from Z-50's. Using a power supply of 35 volts. Z-30 will deliver 15 watts RMS into 8 ohms, or 20 watts RMS into 3 ohms using 30 volts. Total harmonic distortion is a fantastically low 0.02% at 15 watts into 8 ohms with signal to noise ratio better than 70 dB univergited. Input sensitivity 250mV into 100K ohms. Size 80 x-57 x-13 mm ($3\frac{1}{4}$ x-2 $\frac{1}{4}$ x- $\frac{1}{2}$) Z-30, Z-50 and Z-50 MK-2 modules are compatible and interchangeable.

Guarantee

If, within 3 months of purchasing any product direct from Sinclair Radionics Ltd., you are dissatisfied with it, you money will be refunded at once. Many Sinclair appointed Stocklsts also offer this same guarantee in co-operation with Sinclair Radionics Ltd.

Sinclair Radionics Ltd.
Each Project 60 module is tested before leaving our factory and is guaranteed to work perfectly. Should any defect arise in normal use, we will service it at once and without any charge to you, if it is returned within two years from the date of purchase. Outside this period of guarantee a small charge trypically £1.00 will be made. No charge is made for postage by surface mail. Air Mail is charged at cost.



Brilliant new technical specifications

Input impedance 100 K Ω Input (for 30w into 8 Ω) 400mV Signal to noise ratio, referred to full o/p at 30v HT 80dB or better Distortion 0.02% up to 20W at 8 Ω . See curve Frequency response 10Hz to more than 200 KHz \pm 1dB Max. supply voltage 45v (4 Ω to 8 Ω speakers) (50v 15 Ω speakers only) Min. supply voltage 9v Load impedance — minimum: 4 Ω at 45v HT Load impedance — maximum: safe on open



manual £5.48

0 2 0 4 0 7 1 2 1 6 6 10 20 10 50 70 100 WATTS INTO 80 AT 45 V HT

Typical Project 60 applications

System	The Units to use	together with	Units cost
Simple battery record player	Z.30	Crystal P.U., 12V battery volume control, etc.	£4.48
Mains powered record player	Z.30, PZ.5	Crystal or ceramic P.U. volume control, etc.	£9.45
12W. RMS continuous sine wave stereo amp. for average needs	2 x Z.30s, Stereo 60; PZ.5	Crystal, ceramic or mag. P.U., F.M. Tuner, etc	£23.90
25W. RMS continuous sine wave stereo amp. using low efficiency (high performance) speakers	2 x Z.30s, Stereo 60; PZ.6	High quality ceramic or magnetic P.U., F.M. Tuner, Tape Deck, etc.	£26.90
80W. (3 ohms) RMS continuous sine wave de luxe stereo amplifier. (60W. RMS into 8 ohms)	2 x Z.50s, Stereo 60; PZ.8, mains transformer	As above	£34.88
Indoor P.A.	Z.50, PZ.8, mains transformer	Mic., guitar, speakers, etc., controls	£19.43

SINCLAIR RADIONICS LTD., R.O. London Road, St. Ives, Huntingdonshire, PE17 4HJ (Phone St. Ives 4311) Reg. No. 699483 England

the world's most advanced high fidelity modules

Stereo 60 Pre-amp/control unit



Designed specifically for use on Project 60 systems, the Stæeo 60 is equally suitable for use with any high quality power amplifier. Since silicon epitaxial planar transistors are used throughout, a really high signal-to-noise ratio and excellent tracking between channels is achieved. Input selection is by means of press buttons, with accurate equalisation on all input channels. The Stereo 60 is particularly easy to mount.

SPECIFICATIONS—Input sensitivities: Radio — up to 3mV Mag. p.u. 3mV: correct to R.I.A.A. curve + 1dB 20 to 25,000 Hz. Ceramic p.u. — up to 3mV Aux — up to 3mV Output: 250mV. Signal to noise ratio: better than 7ddB. Channel matching: within 1dB. Tone controls: TREBLE+12 to — 12dB at 10MHz: BASS + 12 to — 12dB at 10MHz: BASS = 12 to — 12dB at 10MHz: BASS = 12 to — 12dB at 10MHz. BASS = 12 to — 1

Built, tested and guaranteed.

£9.98

Project 60 Stereo F.M. Tuner



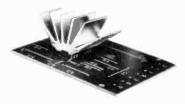
The phase lock loop principle was used for receiving signals from space craft because of its vastly improved signal to noise ratio. Now, Sinclair have applied the principle to an F.M. tuner with fantastically good results. Other advanced features include vancap diode tuning, printed circuit coils, an I.C. in the specially designed stero decoder and switchable squelch circuit for silent tuning between stations. In terms of high fidelity this tuner has a lower level of distortion than any other tuner we know. Stereo broadcasts are received automatically, a panel indicator lighting up as the stereo signal is tuned in. This tuner can also be used to advantage with most other high fidelity systems.

SPECIFICATIONS—Number of transistors: 16 plus 20 in I.C. Tuning range: 87.5 to 108MHz. Sensitivity: $7\mu V$ for lock-in over full deviation. Squelch level: Typically 2CµV. Signal to noise ratio: >65dB. Audio frequency response: 10Hz - 15KHz (± 1 dB). Total harmonic distortion: 0.15% for 30% modulation. Stereo decoder operating level: $2\mu V$. Cross talk: 40dB. Output voltage: $2\times150mV$ R.M.S. maximum Operating voltage: 25-30VDC. Indicators: Stereo on: tuning. Size: $93\times40\times207mm$.

Built and tested. Post free.

£25

Super IC.12 Integrated circuit high fidelity amplifier



Having introduced Integrated Circuits to hi-fi constructors with the IC.10, the first time an IC had ever been made available for such purposes, we have followed it with an even more efficient version, the Super IC.12, a most exciting advance over our original unit. This needs very few external resistors and capacitors to make an astonishingly good high fidelity amplifier for use with pick-up. F.M. radio or small P.A. set up. etc. The free 40 page manual supplied, details many other applications which this remarkable IC. make possible. It is the equivalent of a 22 tranmake possible. It is the equivalent of a 22 tranmake possible.

sistor circuit contained within a 16 lead DIL package, and the finned heat sink is sufficient for all recuirements. The Super IC.12 is compatible with Project 60 modules which would be used with the Z.50 and Z.30 amplifiers. Complete with free manual and printed circuit board.

SPECIFICATIONS

Output power: 6 watts RMS continuous (12 watts peak). 6-8Ω. Frequency Response: 5Hz to 100KHz±1dB. Total Harmonic Distortion: Less han 1%. (Typical 0-1%) at all output powers and frequencies in the audio band (28V) Load Impedance: 3 to 15 ohms. Input Impedance: 250 Kohms nominal. Power Gain: 90dB (1,000,000,000 times) after feedback. Supphy Voltage: 6 to 28V. Quiescent current: 8mA at 28V. Size: 22×45> 28mm including pins and heat sink.

Manual available separately 15p post free.

With FREE printed circuit board and 40 page manual.

£2.98 Post free

Power Supply Units The new PZ.8 Mk.3

The most reliable power supply unit ever made available to constructors. Brilliant circuitry makes failure from over load and ever direct shorting of the output impossible. This is due to an ingenious re-entrant current limiting principle which, as far as we know has never before been available in any comparable unit outside the most expensive laboratory equipment. Ripple and residual noise have been reduced to the point of almost total elimination. This is, of course, the perfect unit for Project 60 assemblies, particularly where the new

PZ.8 Mk.3---£7.98

voltage - 45

(Mains transformer, if required) £5.98

PZ.5 30v. unstabilised

(not suitable for Project 60 tuner) £4.98 PZ.6 35v. stabilised

Z.50 MK.2 amplifiers are used. Nominal working

(not suitable for IC. 12) £7.98

Project 605

the easy way to buy and build Project 60 without soldering



Project 605 in one pack contains one PZ.5, two Z.30's, one Stereo 60 and one Masterlink, which has input sockets and output components grouped on a single module and all necessary leads cut to length and fitted with clips to plug straight on to the modules thus eliminating all soldering.

Complete with comprehensive manual, post free All you need for a superb 30 watthigh fidelity stereo amplifier.

£29.95

Order form

Please send

l enclose cash/cheque/money order.

Name

Address

PW7

SINCLAIR RADIONICS LTD., R.O. London Road, St. Ives, Huntingdonshire, PE17 4HJ



ADD 10% V.A.T. ON PRICES ON PAGE OPPOSITE AND ABOVE

Practical Wireless Classified Advertisements

Classified advertisements 10p per word (minimum 12 words). Box No. 20p. Semi-display setting £8 per single column inch. Advertisements must be prepaid and addressed to Classified Advertisement Manager, PRACTICAL WIRELESS, IPC Magazines Ltd., Fleetway House, Farringdon Street, London EC4A 4AD. All cheques, postal orders, etc., to be made payable to PRACTICAL WIRELESS and crossed "Lloyds Bank Ltd."

Books and Publications

Handbk of Transistor Equiv and Substitutes 45p Handbook of Lested Transistor Circuits 45p Rad & Electr Colour Codes and Data Chart 20p Hi Fi. PA & Disco Amplifier Design Hob. Soys Bk of Crysta Sets and Simple of Cruits 23p Radio Servicing for Amateurs 45p Radio Servicing for Amateurs 45p Practical Tape Recording Handbook 35p Practical Stereo Handbook 35p Practical Stereo Handbook 35p Practical Stereo Handbook 35p Practical Stereo Handbook 35p Practical Radio Inside Out 45p Transistor Circuits Manual No. 1 20p Transistor Circuits Manual No. 1 20p Transistor Circuits Manual No. 1 20p Transistor Circuits Grant Manual No. 1 20p Transistor Circuits Grant Manual No. 2 20p Transistor Circuits Grant Manual No. 2 20p Transistor Circuits Grant Manual No. 2 20p Transistor Circuits Grant Manual No. 2 20p Transistor Circuits For Manual No. 2 20p Transistor Circuits Grant Manual 30p Transistor Test Equip and Servicing Manual 30p Modern Transistor Circuits for Beginners 45p Resistor Colour Code Disc Calculator 15p Manual Transistor Audio Amplifiers Book 1 25p Practical Car Radio Handbook 3 practical Car Radio Handbook 2 3 per Practical Car Radio Handbook 2 3 per Practical Car Radio Handbook 3 per Pract

DENCO CLACTON LIMITED 355.7.9 Old Road Clacton-on-Sea, Essex

All prices include postage & packing

FREE lists of other titles avail on request. Send to RADIO BOOK SERVICE 40 Elwill Way, Beckenham BR3 2RZ

> Catalogue 20p post paid S.A.E. all enquiries

TRANSISTOR DATA THE INTERNATIONAL TRANSISTOR DATA MANUAL

1973 EDITION is now ready. Data on upwards of 18,000 transistors of international origin. £5-25 plus 35p post & packing in the UK. Brochure available. Order direct from

SEMICON INDEX LTD., Freepost, Wokingham, Berks. RG11 2AY.

DIGITAL COMPUTER LOGIC Electronics. Four volume self-instructional course. £2-95 including p & p. Money back assurance. Cambridge Learning (PW), 8a Rose Crescent, Cambridge.

Service Sheets

SERVICE SHEETS, Radio, TV etc., 8,000 models. Catalogue 15p. S.A.E. enquiries. Telray, 11 Maudland Bank,

LARGE SUPPLIER SERVICE SHEETS

(T.V., RADIO, TAPE RECORDERS, RECORD PLAYERS, TRANSISTORS, STEREOGRAMS, RADIOGRAMS, CAR RADIOS) Only 40p each

"PLEASE ENCLOSE LARGE S.A.E. WITH ALL ENQUIRIES & ORDERS '

Otherwise cannot be attended to

(Uncrossed P.O.'s please, original returned if service sheets not available.)

PLEASE NOTE
We operate a "by return of post" service. Any claims for non-delivery should be made within 7-days of posting your order.

C. CARANNA 71 BEAUFORT PARK LONDON, N.W.11

We have the largest supplies of Service Sheets (strictly by return of post). Please state make and model number alternative.

Free TV fault tracing chart or TV list on request with order.

Mail order or phone 01-458 4882

SERVICE SHEETS for Televisions, Radios, Transistors, Tape Recorders, Record Players, etc., from 5p with free Fault-Finding Guide. S.A.E. orders/enquiries. Catalogue 15p. Hamilton Radio, 47 Bohemia Road, St. Leonards, Sussex. Telephone Hastings 29066.

Aerials

BAINES FOR HIGH FREQUENCY AERIALS BAINES FOR HIGH FREQUENCY AERIALS
VHF/UHF MULTIBEAMS BY J. BEAM. Postage paid
MBM 10 22-20, MBM 18 22-90, MIN 30 23-90, MBM 46
88-00, MBM 70 211-00, BBM 4 £4-80, BBM 6 £8-95,
75 to 390 ohm Balun £1-00, Aerial Rotators 222-00.
VHF/UHF Masthead Amplifiers—Gryphon complete with
power units. Postage paid.
A/1055 Single Stage £5-75. A/1059 Twin Stage £7-75,
A/1057 Wideband £7-75, A/1083 FM £5-75, FM2 Setback
£4-72 complete.

24.72 complete. Accessories: SAE for List. Co-ax 5p and 9p. Please add

11 DALE CRES., TUPTON, CHESTERFIELD S42 6DR Telephone 863755

For Sale

MORSE MADE EASY!!

FACT NOT FICTION. If you start RIGHT you will be reading amateur and commercial Morse within a month (normal progress to be expected).

Using scientifically prepared 3-speed records you automatically learn to recognise the code RHYTHM without translating. You can't help it, it's as easy as learning a tune. 18 W.P.M. in 4 weeks guaranteed.

Beginner's Section only £3.30, Complete Course £4.50 (Overseas£1.00 extra) details only, 4p stamp. 01.660 2896 G3HSC (Box 19), 45 GREEN LANE, PURLEY, SURREY

TV LINE OUTPUT TRANSFORMERS Tidman Mail Order Ltd., 236 Sandy-combe Rd., Richmond, Surrey. TW9 2EQ. 01-948 3702.

SEEN MY CAT? 5,000 items. Mechanical & Electrical Gear, and materials. S.A.E. K. R. WHISTON, Dept. PW, NEW MILLS, Stockport.

SPARES, new, for Philips and some other Cassette Recorders. SAE enquiries. Harvey, 94 Derby Lane, Liverpool L13 3DW.

BACK ISSUES Practical Wireless for sale May 1966-Oct. 1972. Complete £12 o.n.o. 01-223 1986 (London).

APPROXIMATELY Three Thousand new boxed valves as Lot For Sale. For details: write to Cosmo Television Services, 427 Shields Road, Glasgow S.1.

LARGE QUANTITY Test equipment, receivers, transceiver, meters, variacs, P.S.U.S. over 1,000 items for immediate disposal. S.A.E. Plus 25p refunded on purchase over £2 00. F. J. C. Colnemill, Alvington, Lydney, Glos.

Radiospares Components at Competitive Prices 3 W Audio Amp. IC £2-92 ea. (2 off for stereo).

Heat Sink for above 2ap ea. (2 on for stereo).
Stereo P.C. Board for above 63p
14 Resistors for above 29p
6 Potentiometers for above £2.44
30 Capacitors for above £4:16
Rectifier type 41A for above £1.18
Hygrade Fil. Transformer for above £1.95
8 ohm Longthrow speaker £4.55 ca. (2 off for stereo).
Audible warning device, 2.6 KHz mod. tone, 10-18V
£1·69
Stripboards—similar to Veroboard,
Type A 0-15 in. pitch 88p
Type B 0-10 in. pitch 96p
TO5 Voltage Regulator, 2-37 V at 150 ma. £1.76
Numerical Indicator Tube, 7 seg. filament, 5V £2-64
Transistors RC117 RF594 RC109
BC107, BC108
BF597, BC478, BFY50, BFY51, BFY52 24p ea.
BU105, Vec 1500v, 10W, ft 7.5 MHz £1.90 ca.
BU105/02 Vcc 1700v, 10W, ft 7 5 MHz £3 23 ca.
2N3054 (NPN Type) £1.06 ca.
2N3054 (PNP Type) £2.05 ca.
2N3055 (NPN Type) £1·18 ca.
214,000 (114 11 1,100) 11
2N3055 (PNP Type) £2 35 ca.

All R.S. COMPONENTS Available from M. A. Austin & Co.

Prices include VAT. Add 20p post and packing for orders under £5. Terms: Cash With Order Only

14A Grosvenor Square, Southhampton, Hampshire.

Wanted

TOP PRICES PAID for NEW VALVES popular T.V. and Radio types.

KENSINGTON SUPPLIES (C),

367 Kensington Street, Bradford 8, Yorkshire.

WE BUY New Valves, Transistors and clean new components, large or small quantities, all details, quotation by return. WALTON'S, 55 Worcester return. WALTON'S. Street, Wolverhampton.

P.W. October 1964 to October 1965 inclusive, Milne, 7 Healey Street, N.W.1.

CLASSIC MUSIC COMPOSER building a complicated electronic organ and synthesiser needs drawings and know-low for sustain, slew, formants, filters, other effects. Robert Lombardi, Rue Nagelmackers, 14 4000-Liege, Belgium.

TELEVISION TRAINING

(MONOCHROME AND COLOUR)

This private College provides theoretical and practical training in Radio and TV Servicing. Courses of 16 months' duration, with daily attendance, are available for beginners and shorter courses for men with previous training in Electronics and Radio. Next course commencing Sept. 10th, Training courses in Marine Radiocommunication and Radar are also available. Write for prospectus to: London Electronics College, Dept. A8/, 20 Penywern Road, Earls Court, London SW5 9SU. Tel. 01-373 8721

RADIO, TV, RTEB Certs., City and Guilds, Computers, Radio Amateurs Cert., Practical Electronics (with kit). Thousands of successes. Details of home study courses and illustrated book—FREE. BIET (Dept ZL BPW 29), Aldermaston Court, Reading RG7 4PF. Accredited by CACC.

CIE, AMSE, City & Guilds, etc. Thousands of exam successes. Postal courses in all branches of Engineering. Prospectus FREE. State subject of interest: BIET (Dept ZL BPW 40), Aldermaston Court, Reading RG7 4PF. Accredited by CACC.

GO TO SEA as a Radio Officer. Write: Principal, Nautical College, Broadwater, Fleetwood FY7 8JZ.

Situations Vacant

HARROW COLLEGE OF **TECHNOLOGY AND ART**

TECHNICIAN: SCHOOL OF PHOTOGRAPHY

Up to £1,980

A Technician/Engineer in television and sound is required for a new post in the Film and Television Department. Duties will include the technical operation and routine maintenance of a C.C.T.V. Studio requiring electronic and mechanical skills and knowledge in the television field. Relevant City and Guilds or H.N.C. qualifications are desirable and further inservice training will be considered.

Unless otherwise stated all the above positions involve a 35-hour week (Monday to Friday).

Application forms from The Registrar, Harrow College of Technology and Art, Northwick Park, Harrow, Middx. HAI 3TP (864 4411 Ext. 31).

Receivers and Components



For valve and transistorized recorders from £2 ea.

Send stamp for lists R.D.I. Ltd. Chilton Works, Garden Rd., Richmond, Surrey. TW9 4NS

INTEGRATED CIRCUIT and modules for construction of low-cost receivers, converters, pre-selectors, etc. SAE details.—P. R. Golledge, Glen Tor, Torrington, Devon.

PRECISION POLYCARBONATE CAPACITORS

Close tolerance. High stability. All 63V d.c. \$\frac{\pmathcal{\pmanhcal{\pmathcal{\pmathcal{\pmathcal{\pmathcal{\pmathcal{\pmathcal 1·0μF: 2·2μF: 4·7μF: 5·8μF: 10μF: 15μF: TANTALUM BEAD CAPACITORS—
Values available 0 ·1, 0·22, 0·47, 1·0, 2·2, 4·7,
6·8µF at 35V, 10µF 25V, 15µF 20V, 27µF
15V, 33µF 10V, 47µF 6V, 100µF 3V—all
at 9p each; 6 for 50p; 14 for 41. Special pack
6 off each value (78 capacitors) £5.

NEWI—TRANSISTORS. BCI07, BCI08, BCI09, All at 9p each; 6 for 50p; 14 for £1. All brand new and marked. Full spec. devices. May be mixed to qualify for quantity prices. AF178—35p each or 3 for £595.

SILICON PLASTIC RECTIFIERS 1.5 Amp Brand new wire-ended DO27, 100PIV at 8p each or 4 for 30p; 400PIV at 9p each or 4 for 34p; 800PIV at 14p each or 4 for 50p.

Sp post and packing on all orders below £5.
Please add 10% VAT to all orders.
MARCOTRADING
Dept. W.8. The Malkings, Station Road,
Wem, Salop

World-wide acclaim, the incomparable

GLOBE-KING V.H.F. & S.W. KITS

V.H.P. & S.W. NIIS

Precision standard, inexpensive, low-cost valve and transistor Kits for Short-Wave 10-350 m. V.H.F. 80-180 M/cs. Ideal for beginners with unique "Easy-Build" diagrams and simplified instructions. Send to-day for free literature price list and order form, kindly enclose stamped addressed envelope (Overseas: Int. Reply Coupon). Direct to the sole manufacturers:

JOHNSONS (RADIO) SHAW ST., WORCESTER. WR13QQ

Please note new address, city centre. Pioneers in DX radio—Established for over 30 years.

(A JOHN BANNER COMPANY)

TAPE-HEAD reconditioning Guaranteed satisfaction. Send worn head with £2 to: Sara Electronics, Fawkham Avenue, Longfield, Kent.

MINI MAINS TRANSFORMERS 30x30x MINI MAINS TRANSFORMERS 30x30x 37mm. Cool, quiet, British. Pri. 220/ 250V. Type MT3, 3-0-3V rms, 300mA, £1. MT7, 7-0-7V, 120mA, £1. VAT included. Use MT3 for 3V or 6V rectified d.c., MT7 for 9V or 18V. Circuits supplied. Mail order only, UK post 5p per order. Amatronix Ltd., 396 Selsdon Road, South Croydon, Surrey CR2 0DE.

TEXAN

NOW ON DEMONSTRATION



Designer approved Kit £28-50 Instructions only 35p

Pack 1. RESISTORS	
Pack 2. SMALL CAPS	
Pack 3, LARGE CAPS	
Pack 4. SUNDRIES	£2.50
Pack 5. SWITCHES	
Pack 6. CONTROLS	
Pack 7. SEMI COND	£8·25
Pack 8. TRANSFORMER	£4-95
Pack 9. P.C. BOARD	£2.50
Pack 10. CHASSIS, etc	£4·20

Post extra-parts available separately Send for list and technical spec.

Kits also available for

- * Radio Control Systems
- * Digital Clock Systems
- ★ Integrated Circuit Amplifiers (to 50W)
- ★ Hi-Fi Pre-amps
- * Stabilized Power Supply Units

TELERADIO HI FI, 325 Fore Street, Edmonton, London N.9 01-807 3719

CLOSED ALL DAY THURSDAY

BRAND NEW COMPONENTS by return. Electrolytics 16V, 25V, 50V—0.47, 1, 2·2, 4·7, 10mfds.—4p. 22, 47—4½p. (50V—5p.) 100—5½p. (50V—7p.) 220—6p. (50V—9p.). Subminiature bead-type tantalums 0·1/35V, 0·22/35V, 0·47/35V, 1/35V, 2·2/35V, 4·7/35V, 10/16V—8p. Mylar Film 100V—0·001, 0·002, 0·005, 0·01, 0·02—2p. 0·04, 0·05—3p. 0·068, 0·1—3½p. Polystyrene 63V. E12 series 10 pf.—1,000 pf.—2p. 1,200 pf.—10,000 pf.—3p. Miniature Highstab resistors, 5%, E.12 series—Carbon Film ½W 1Ω—10MΩ (10% over 1 Meg.) Metal Film ½w 10Ω—2·2mΩ and 1W. 27Ω—10MΩ all ¾p each. Postage 8p. The C.R. Supply Co., 127 Chesterfield Rd., Sheffield S8.

NEW MODEL V.H.F. KIT MK2
Our latest kit. Improved design and performance
plus extre amplifier stage, receives aircreft,
amateurs, mobile, radio 2, 3, 4, etc., this nevel
little set will give you endiess hours of pleasure
and can be built in one evening. Powered by 9 volth
battery, complete with easy to follow instruction
and built in jack socket for use with earphones or
amplifier.

amplifier.
Only £3-50 +p.&p 10p U.K. only. Illustrated catalogue of selected kits and components, 20p inc. VAT. P&P free.

ALL PRICES PLUS 10% VAT Galleon Trading Co, 12, Burrs Way, Corringham, Stanford-Le-Hope, Essex. SS17 9DE

Trampus electronia

ALL BRAND NEW, no rejects.
Money back warranty. 5V
DIGITAL INDICATOR. 0-9DP
socket and filter \$1.45. LEI
TYPE \$'' 0-9DP DIL \$2.25 ea.
LIGHT EMITTING DIODES. All
with data and panel clip.
TIL 209 \$'' dia. 24p. Red 1'' dia.
type \$3p, Green 75p. INFRA
RED beam LED \$1-10. T6S
GAS detector \$1.69. ULTRASONIC TRANSDUCERS \$2.
DALO PCB resist marking pen



GAS detector \$1.69. ULTRASONIC TRANSDUCERS \$2.

DALO PCB resist marking pen 67p. Copper board
12" × 6" SRBP 40p FeC etch PAK 19p.
INTEGRATED CIRCUITS: with data if required.
IC LITE SWITCH: Photo ampliftiger 40ma/11-20
relay or TIT 187p. Dif relay £1.01.

MOS/LS1 type 2" pin 4 or 6 digit 12/24 br. Chip
with socket £13, PCB £1.69. KIT £21-49. 741 Dif
spin 28p, 799 14p, Dif 28p, 748 28p, 710 33p. 555
TIMER mono/astable occ. clock 88p. Refu LATORS: 114-5 to 20V £1-49. 723 577.
RTORS: 114-5 to 20V £1-49. 723 77.
RTORS: 114-5 to 20V £1-49. 723 77.
RTORS: 115-5 to 20V £1-49. 724 77.
RTORS: 115-5 to 20V £1-49. 724 77.
RTORS: 115-5 to 20V £1-49.
RTORS: 115-5 to 20V £1-49.
RTORS: 115-5 to 20V £1-49.
RTORS: 115-5 to 20V £1-49.
RTORS: 115-6 to 20V £1-49.
RTORS: 115-6 to 20V £1-49.
RTORS: 115-6 to 20V £1-49.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1.
RTORS: 115-6 to 20V £1

2N3823E 19p. LABOUT.
1A 29p.
1A 29p.
TRANSFORMER | A 6/12V £1. Resistors 14p.
450 & 470 min 1 F transformers—Set 3 40p.
CAPACITORS: Disc 22pf to 0.1 vf 3p. Electrolytic
25V: 10, 50, 100 vf 5p, 1000 vf 15p. Presets 5p.
CARBON POTS: 11p ea. switch 4 11p. Dual 39p.

BIO # 8 12volt 279

8 wart fully built with diffuser. 13W 23.79.
1.T. You must add 10% (1/10) to all prices.
EE CAT. S.A.E. Data site. 8p ea. P.A.P. 8p CWO
P.O. BOX 29, BRACKNELL, BERKS.

BUILD THE TREASURE TRACER MK III Metal Locator A PE Weighs only 2202 Speaker and earphone operation Knocks down to only 17in Prebuilt search coil assembly Ministry approved design Thoroughly professional finish You only need soldering from, screwdiver pliers and snips Completely new design

Complete £9-80

Built lested and guaranteed £13.75

POST 35p

MINIKITS ELECTRONICS, 35a LANGLEY ORIVE, WANSTEAD,
LONDON E11 2LN. (Mail order only)

Send sale for leaflet

TRANSISTOR BARGAINS, High Quality, individually tested. Similar to BC107/8/9, BC168/9, 10 for 30p, 25 for 65p, 50 for £1.05. Package 5p. Mail Order Only, 305 Eccleshall Road, Staffard County ford, Staffs.

BRAND NEW FULL SPEC, DEVICES SATISFACTION OR YOUR MONEY BACK

OR YOUR MONEY BACK

U.K. ORDERS.—ADD 10% V.A.T. to total.
MICROCIRCUITS: 709 24p; 710 36p; 723 51p;
741 27p; 748 37p; PA230 60p; FET Op. Amp. £1-62.
SOLDERCON IC PIN SOCKETS 0:5p per pin.
SOCKETS: 14 pin DIL HI or LO 12p each.
RECTIFIERS 1A: 50V 34p; 100V 4p; 200V 4tp;
400V 5p; 800V 6p; 1000V 4p.
ZENERS: BZ 788C 2V7 7c 33V 8p each.
DIODES: 11916 4p; OA20 6p; 1148 4p.
LED Panel Lamp with Buss and Data 28p.
DALO PC RESIST N1976 8R.OWN 5p; 2N3053
15p; 2N3053 15p; 2N3702 10p; 2N3704 10p;
2N3053 15p; 2N3702 10p; 2N3704 10p;
2N308 12p; 8C 1097 8p; BC 1088 8p;
BC 1098 8p; 8C 1097 8p; BC 1088 8p;
BC 1098 8p; BC 1097 8p; BC 1076 15p; BFY5075/15/2
15p; OC44/45/71/72 12p; AF114/5/6/7 14p.
(Above prices on May 16th. Check our list.)

JEF ELECTRONICS (P.W.8)

York House, 12 York Drive, Grappenhall, Warrington WA4 2EJ

Mail Order Only. C.W.O. P. & P. at cost. 10p min. List free.

K-N-CHANNEL FETs 3819E-£1

Full specification devices complete with data and circuit details for building voltmeter, timer, ohmmeter, etc.

Send 10p for full list of field effect transistors and other top quality transistors available at bargain prices.

REDHAWK SALES LIMITED 45 Station Road, Gerrards Cross, Bucks.

TV'S COLOUR TV'S

Reserviced, perfect working order, repolished	d.
19in. DECCA £110	
19in, GEC 2028 £115	
19In. THORN 2000 £120	
25in. DECCA	
25in. RBM PHILIPS £130	
25in. THORN 2000 £135	
One month comprehensive written guarante	e.
These are cash and collect prices. Delive	гу
quotations by phone	-

MONO UHF

Fabulous TVs. No rubbish, from good source.
Repolished cabinets. Many working. Recent trang
sistorised models, incl.:
BUSH TV 148U, TV 168, TV 176
PHILIPS style 70 and 210
PYE & ECKO 868 chassis
THORN 950, 1400, GEC Concorde from

£12 each
Valve UHF models inc.:
BUSH push-button, THORNE 859,
SOBELL, 1000, etc. from £5

U.H.F. TUNERS

For FERGUSON 850, 900 chassis but adaptable for most D/STD chassis £2.50 each, cwo postage included. Send s.a.e. for lists of tubes, tvs, valves, etc. For England:

TRADE DISPOSALS, 1043 Leeds Road, Bradford. Tel. Bradford 665670 For Scotland:

TRADE DISPOSALS, Unit 5, Peacock Cross INDUSTRIAL ESTATE, 32 Burnbank Road, Hamilton. Tel. Hamilton 29511/2

COMPONENTS GALORE. Pack of 500 COMPONENTS GALURE. 1 across sur-mixed components manufacturers sur-plus plus once used. Pack includes capacitors, transistors, plus plus resistors, capacitors, diodes, I.C., gang, pots, etc. Tremendous value Send £1 + 10p P & P C.W.O. to Caledonian Components, Firs, Strathore Road,

TRANSISTOR AMPLIFIER 80p. Vol/Tone Control Panel 75p. 465 K/CS IF Panel 75p. Wavechange-OSC Panel 75p. LW-MW Rod Aerial 25p. Colour Television. Croma Panels £3.50. IF Panels £3.00. EHT Tripler Panel £1.08. Control Panel ON/OFF + Vol/Brightness Controls £1.00. Archer, 9 Pine Grove, Maidstone, Kent.

VALVE LIST

ALL VALVES FULLY TESTED

One valve postage 3p. Over 5 valves postage paid.

		pooragi	p an a		
DY86-87 EB91 ECC82 ECC85 ECL80 EF80 EF183 EF184 EH90 PC86 PC88 PC900 PC64 PCC84 PCC89 PCC805	12 p 15p 20p 7 p 15p 20p 15p 20p 15p 20p 15p 20p 15p 15p 15p 15p 15p 15p 15p 15p 15p 15	PCF80 PCF86 PCF805 PCL82 PCL83 PCL84 PCL85 PCL86 PFL200 PL300 PL504 PY800 PY800 PU191 U191 U26	5p 15p 25p 12+p 12+p 12+p 20p 17+p 20p 20p 20p 12+p 12+p	6/3012 1 30F5 1 30FLI 2 30PLI 2 30PLI 17 MANY MOR AVAILABLI S. & W. ELECTRONIC 14 Burnley Road Rawtenstal Rossendali	E

ELEVEN BAND RADIO. SW1-4 (4-30 MHz). Marine. LW, MW, FM. PB (76-86). Aircraft (108-136). PB (148-174). Battery/Mains. BFO. AGC. Squelch Control. Output: 1-3W. 15in x 10in x 51₂ in, f66. Eight Band Model, with BFO, £42. Four Band, MW. FM. Aircraft. PB. £15. SAE. Full Lists. Langtons Radio, High Street, ROCESTER, Staffordshire, Tel. 388.

SPECIAL INTRODUCTORY OFFER OF BRAND NEW & MARKED COMPONENTS ALL PRICES INCLUDE V.A.T.

TRANSISTORS: BC1078, BC108A/B/C, BC109B/C all at 84p; BYF50/5! 14p; 2N3055 38p. DIODES: IN4148 44p; IN914 44p. CARBON FILM RESISTORS: 4W 5% 4p each, 30p/50 any mix (220.-2-2M) E12.

(220.-2-2M) E12.

UNMARKED BARGAIN PAKS: These transistors have been properly tested and are guaranteed to have the specified his spreads. Pak of 5, Plastic BC108A his 125-240, 25p; Pak of 5, Plastic BC108A his 125-240, 25p; Pak of 5, Plastic BC179A his 124-240, 25p; Pak of 4, BFY51 20p; Pak of 4, 2N697 20p, D10DES: Pak of 5 OA200 20p; Pak of 12 IN4148 20p.

C.W.O. P. & P. 10p. on orders below £4. Overseas at cost. S.A.E. for lists. Mail Order only. Money back if not satisfied.

ADFONIC (Dept. PW), 18 YEW LANE ASHLEY, NEW MILTON, HANTS BH25 5BA

FIRREGLASS PRINTED CIRCUIT BOARD FIBREGLASS PRINTED CIRCUIT BOAR A-1/as SINGLE-5p per 12 sq. ins. 50p sq. ft. DOUBLE-8p per 12 sq. ins. 70p sq. ft. ANY SIZE CUT. NO EXTRA CHARGE NO VAT REQUIRED P. and P. 10p up 10 1 sq. ft. 25p up to 4 sq. ft. 57p up to 18 sq. ft. BRB

17, SOUTHBRECK RISE WORKSOP NOTTS S80 2UP

ROSLESS SERVICES

GUARANTEED SEMICONDUCTORS FAST SERVICE-LOW PRICES

AC126 13p BFX84 27p ZENER					
	AC127 AC128 BC107 BC108 AF114 AF115 AF116 AF117	13p 13p 9p 9p 18p 13p 13p	BFX85 BSX20 2N930 2N1132 2N1711 2N2904 2N2904 2N2905	34p 18p 22p 27p 25p 38p 42p 44p	DIODES 400mW 5% 3:3 to 33 volts 12p each 1 watt 5% all voltages 6:8 to 200 volts

ALSO CAPACITATORS RECTIFIERS, ETC.

PRICES INCLUDE CASH . W.O + P.P. 10p TO

ROSLESS SERVICES PARNDON HALL - HAMSTEL ROAD HARLOW ESSEX

UNUSED RESISTORS and Capacitors 250 of each. Including high stabs and electrolytics. Only £1.50. Trade enquiries invited. 676 Foxhall Road, Ipswich, Suffolk.

COMPONENTS AND HARDWARE, new and used, for P.W. circuits. S.A.E. for list. David Coulam, Tathwell, Louth, Lincs.

TUNBRIDGE WELLS, Components from Teleservice, 108 Camden Road, Tunbridge Wells, Kent. Telephone

Miscellaneous

"AT LAST YOU CAN TRANSMIT AND FORGET ABOUT LICENCE EXAMINATIONS"

PORGEI ABOUT LICENCE EXAMINATIONS."
because this Ministry approved transmitter/receiver kit does not use R.F. Your transmissions will be virtually SECRET since they won't be heard by conventional means. Actually it's TWO KITS IN ONE because you get the printed-circuit boards and components for both the transmitter AND receiver. You're going to find this project REALTY VIN-TO-BUILD with the EASY-TO-FOLLOW instructions. An extremely flexible design with quite an AMAZING RANGE—has obvious applications for SCHOOL PROJECTS, LANGUAGE LABORATORIES, SCOUT CAMPS, etc.

GET YOURS! SEND £5-80 (inc. VAT) NOW '(S.A.E. for details)' 'MAIL ORDER ONLY' TO: 'BOFFIN PROJECTS'

TO: 'BOFFIN PROJECTS'

DEPT. KW2010 4 CUNLIFFE ROAD STONELEIGH, EWELL, SURREY

Darned Electronic **N**izardry

by Dewtron (VAT extra).

Famous kits, e.g. waa-waa complete kit £2 95; Fuzz kit £4 75, autorhythm modules P & P 20p min Ring Modulator modules £8 and whole range of synthesiser modules, musical novelties, etc. Catalogue 15p from D.E.W. 14d, 34 Ringwood Road, Ferndown, Dorset

BEDFORD ELECTRONICS

2 Grove Place, Bedford Bedford 51961

YOUR LOCAL COMPONENTS SUPPLIER

BUILD IT in a DEWBOX quality cabinet. $2\text{in} \times 2^{1}\text{2in} \times \text{any length}$. D.E.W. Ltd., Ringwood Road, FERN-DOWN, Dorset. S.A.E. for leaflet. Write now-Right now.

ALUMINIUM SHEET to individual sizes or in standard packs, 3p stamp for details. Ramar Constructor Ser-vices, 29 Shelbourne Road, Stratford on Avon, Warwicks.

Remember the R & E "MEMORY"?

Invented 1971

You can leave your Detector to get on with it

Now Modified using latest IC/Solid State Technology (741C's or LSI Chip)

3 Circuits, details, numerous applications Baby Alarm-Burglar Recorder/Alarm, UFO All-night Detection: Micrologic Multi-purpose System Circuits, 75p. Numerous other systems, (detection), Map. Predictions, re 1.000 UFOs at Banbury, Details and List send 8AE - 5n (refundable with order).

R & E Publications

Highlands, Needham Market, Suffolk,

GLASS FIBRE P.C. BOARD. Large supplies available ',,in single sided one ounce copper 2p per 3 sq. inches (under 1 foot). 75p per sq. ft. (over 1 foot). ',in double sided one ounce copper 1p per sq. inch (under 1 ft.), £1 per sq. ft. (over 1 foot). Please add 10p per sq. foot postage and packing. We can cut to your size at 1p per cut. Solid State Lighting, The Firs, Smallworth Lane, Garboldisham, Diss, Norfolk.

CONSTRUCTION AIDS—Screws, nuts, spacers etc., in small quantities. Aluminium panels punched to spec. or plain sheet supplied. Fascia panels etched aluminium to individual requirements. Printed circuit boards—masters, negatives and boards, one-off or small numbers. Send 6p for list. Ramar Constructor Services, 29 Shelbourne Rd., Stratford on Avon, Warwks. Warwks.

EXPERIMENTERS! Hundreds of unusual items cheap. 1973 catalogue 5p. Grimsby Electronics, 64 Tennyson Road, Cleethorpes, Lincs. (Mail Order Only).

GW4AGG—The West of Scotland Amateur Radio Society, meets on Fri-day evenings at 8. Everyone welcome. 81 Virginia Street, Glasgow or Tel: Cumbernauld 26922.

AERIAL BOOSTERS-£3:25

We make three types of Aerial Boosters: B45-UHF 625, B12-VHF 405, B11-VHF RADIO

VALVE BARGAINS

ANY 5—50p. 10—75p. 50—£3 30: ECC82, ECL80, EB91, EB789, EF30, EF35, EF183, EF184, EV86, PCC84, PCC89, PCC189, PC97, PCF80, PCF86, PCF809, PC189, PC184, PCL84, PCL84, PCL85, PFL200, PL36, PL18, PL54, PV33, PY82, PY800, PY801, 30L15

19" UHF/VHF (BBC2) £6:00

Thorn-850 or Pye, with ast of spare valves. Carriage £2 00 (Untested).

100 MIXED RESISTORS-65p

to 2 watt—10 ohms to above 1m-ohms (our choice) 199 mixed Capacitors up to 500MFD—£1:10 (our choice).

BARGAINS PARTS

Translator UHF Tuners—£2-00, 500K-ohms V/C with Switch—29p. 50 mixed Tuner Valves—£2-25. Brand New Translators BF113, BF173, BC171, BC133, BC135, BC135, BC135, BC113, BC117, BC115, BA102, BA1

All prices include V.A.T. p. & p. 10p per order Money back guarantee. S.A.E. for leaflets.

ELECTRONIC MAILORDER (BURY) LTD.

62 Bridge St., Ramsbottom, Bury Lancs. Tel. Rams 3036

SINGLE CHANNEL SOUND-TO-LIGHT CONVERTER



WITH LIGHT DIMMER
Max. load 2kW. at 250v. A.C.
Price includes ready built and tested module, edge connector/mounting bracket, dimmer potentiometer, audio sensitivity botentiometer, full connecting data.

Price 27-90 inc. VAT

EXTRA FACILITIES. Push-button for Manual Pulsing 25p extra. Photocell for turning on the lights as the ambient light decreases, 75p extra.

3 CHANNEL FILTER UNIT

When used with three single channel modules this unit filters the sound into base, middle and top frequencies enabling three coloured light displays to be shown. Independent sensitivity controls on each channel. Ready built and testal.

Price £3:50 Inc. VAT

OIL WHEEL PROJECTOR

Build your own using our



MULTI-WHEEL AND MOTOR

Suitable for mounting on all Slide Projecvirtually tors.

Kit contains:

- ★ 6" dia. or 4" dia. OIL WHEEL (please state
- size required when ordering).

 * Suitable Miniature mains motor.
- Full instructions.
- ★ Full Instructions.
 For Professional Discotheque use or home enjoyment.
 Price £7:15 inc. VAT

- PAGE 173 INC. VAI

 ELECTRONIC COMPONENTS
 BARGAIN COMPONENT PACKS

 1 500 Carbon resistors, 1, 1, 1, 2 watt.
 2 100 Electrolyte Condensers.
 2 50 Ceranic, Polystyrene, Silver Mica etc. condensers.
 4 250 Polyester, Polycarbonate, Paper, etc.
- Condensers. co. secondel. 6 20 High-stab, 1%, 2%, 5% resistors, 7 50 Assorted Tagstrips. 6 11b wt. Assorted Nuts, bolts, washers, spacers, 8 11b wt. Assorted Nuts, bolts, washers, spacers,

- etc.

 9 25 Assorted switches, rotary, lever, micro, toggle,
- etc. 10 50 Preset Potentiometers.

ALL COMPONENTS NEW AND UNUSED. £1 + 25p p.p. per pack, £5 for 5 packs p/free

C. T. ELECTRONICS

Mail Order, Retail Shop, Components— 267 Acton Lane, LONDON, W4 5DG 01-994-6275 Warehouse, Test Equipment, Surplus Goods—20-24 Beaumont Road, LONDON, W4 Audio Accessory Shop, Components— 17 Turnham Green Terrace, LONDON, W4

D.I.Y. TECHNICAL BOOKS

RADIO RECEIVER SERVICING GUIDE £	1 - 90
	1 - 50
	1 - 40
RAPID I.V. REPAIR (224 pp)	1 - 30
ELECTRONIC GAMES AND TOYS YOU CAN BUILD	1 - 40
PAL RECEIVER SERVICING GUIDE (280 pp)	3 - 50
BASIC ELECTRICITY (5 VOLUMES, 630 pp. 600 ILLUS.)	5-10
ELECTRONIC DESIGNERS HANDBOOK	3 · 40
	5 - 10
ELECTRICITY, ELECTRONICS MADE SIMPLE Each	95-
1-2-3-4- SERVICING STEREO AMPLIFIERS (240 pp)	6 · 50
1-2-3-4- SERVICING STEREO AMPLIFIERS (240 pp) £	2 . 50
MAKING & REPAIRING TRANSISTOR RADIOS, ADVANCED	
RADIO CONTROL, EASY WAYS TO SERVICE RADIO RE-	
CEIVERS, BEGINNERS GUIDE TO T.V. REPAIR, PRACTICAL	
HAM RADIO PROJECTS, HI-FI PROJECTS FOR THE	
HOBBYIST Fach 6	1 - 00
HOW TO BUILD SPEAKER ENCLOSURES £	1.50
HI - FI STEREO SERVICING GUIDE, 99 ELECTRONIC PROJECTS.	
99 WAYS TO IMPROVE YOUR HI - FI Each £	
ELECTRONICS FOR THE BEGINNER, T.V. SERVICING MADE	1.20
LECTRONICS FOR THE BEGINNER, I.V. SERVICING MADE	
EASY, 101 QUES. & ANSWERS ABOUT AM, FM & SSB Each &	1 · 75
HOW TO REPAIR SMALL APPLIANCES	- 20
ADD 10% FOR POSTAGE AND PACKING	
WHEEL (PWJ), 41A ADELAIDE GROVE, LONDON, V	/12
THE CONTRACT OF THE CONTRACT O	114

ELECTROLYTIC CAPACITORS μ F/V 2000/50, 2500/50, 5000/50, 10000/50, 12500/50 All at 50p each, post paid. 5000 μ F, 70V $4\frac{1}{4}$ " \times $2\frac{1}{4}$ " 65p.

SPECIAL OFFER ERIE DISC CERAMIC CAPACITORS. $01\mu\mathrm{F}$ 500V. 10 on 20p. 100 on 21, 500 on 24, 1000 on 26.

PAPER/BLOCK/MOTOR-START CAPACITORS:

1μF 350V AC 1-5μF 360V R.M.S. Block 2μF 2500V D.C. Block 3μF 160V A.C. Polyester 3-5μF 250V A.C. 2½" × 1½" 4μF 250V A.C. 2½" × 1½" £ 0.80

PLESSEY VIBRATORS, Type 1214 50p

SUBMINIATURE PLUG-IN CRYSTALS FOR RADIO CONTROL, $26.985\,\mathrm{MHz}$ and $27.025\,\mathrm{MHz}$. $70\,p$ each, Add 10% V.A.T.

ELEKON ENTERPRISES

224a St Paul's Road, Highbury Corner, London N.1

G. F. MILWARD	369	Alum Rock Road, Birmingham B8 3DR. Tel. 021-327 2339
TRANSISTORS Output Transistors BD 112	- 1	Field Effect Transistors BFW 12/13/14 An aerosol spray providing a convenient means of producing any number of copies of printed circuit both simply and quickly. Method: Spray copper laminate board with light sensitive spray. Cover with trans DA 400/403/450/452 10p Light sensitive aerosol spray with developer, rinse and etch in normal manner. Light sensitive aerosol spray. £1-00 plus DA 400/403/450/452
Small Signal N.P.N. BC 108	10p 10p 10p	Infra-red Transmitters CQY 11A £1 CQY 12A £10 NEWER THAN NEW!! VEROBOARD Light-sensitive Trans.
Transmitting Types BFR 64	£5	Complementary Drivers, 2 watts (per matched pair) 30p. a pair. Sensitive lacquer enabling you to just the prototype printed circuits within five minutes. Sin x 3½ in x 0.15 in 22 in x 0.15 in 23 in x 0.15 in 24 in x 0.15 in 25 in x 3½ in x 0.15 in 25 in x 3½ in x 0.15 in 25 in x 3½ in x 0.15 in 25 in x 3½ in x 0.15 in 26 in x 3½ in x 0.15 in 27 in x 0.15 in 28 in x 0.15 in 29 in x 0.15 in 29 in x 0.15 in 29 in x 0.15 in 29 in x 0.15 in 29 in x 0.15 in 29 in x 0.15 in 20 in x 0.15 i
Microwave Varactor Diodes BXY 27/28/32/35/36/37/38/39/40/41 . Microwave Detector CAY 10	£1	TBA 510 Chrominance I.C.
Microwave Mixer CL 7331 Microwave Gunn Effect Oscillator	£20	7420 12p Copper-clad Fibre Board 45p Terminal Pins (0·1 or 0·15) 36 for 18p. 7440 12p 1/453 12p Copper-clad Fibre Board 45p Special Offer Pack consisting of 5 2 in 1 hobords and a Spot Face Cutter—50 7470 24p 1/472 12in × 6in 25p "ODDS & ENDS"—1p sq in.
CL 8380	£10	1473 32p
Microwave Tunnel Diodes AEY 13	£10	7480 \$5\$p -001\(\mu\) \(005\(\mu\) \(005\(\mu\) \(105\(\mu\) \) \\ \\ 10pf \\ 88pf \\ 560pf \\ 7491 \\ 78p \\ -001\(\mu\) \\ \\ 1002\(\mu\) \\ 1002\(\mu\) \\ \\ 1002\(\mu\) \\ \\ 1002\(\mu\) \\ \\ 1002\(\mu\) \\ \\ 1002\(\mu\) \\ \\ 1002\(\mu\) \\ \\ 1002\(\mu\) \\ \\ 1002\(\mu\) \\ \\ 1002\(\mu\) \\ \\ 1002\(\mu\) \\ \\ 1002\(\mu\
BF 180	20p 10p 20p TORS	5400 10p 19h 10p 10p 10p 10p 10p 10p 10p 10p 10p 10p
100 CÉRAMIC CAPACITORS 100 DIODES	K No.	TRANSISTORS VERO POSTAGE 15p PACK No. 3 POSTAGE 15p PACK No. 5 PACK No. 6 PACK No. 6
100 RESISTORS 100 CERAMIC CAPACITORS 100 POLYSTYRENE		100 RESISTORS 100 CERAMIC 100 CERAMIC SIGNAL TRACER KIT 1 TRANSISTORISED SIGNAL INJECTOR KIT (ASSORTED TYPES)
1 0011101		POSTAGE 15p PACK No. 4 POSTAGE 15p PACK No. 6 POSTAGE 15p PACK No. 10 POSTAGE 15p PACK NO. 10 POSTAGE

HARDWARE—Screws, nuts, washers and other useful items in small quantities. Sheet aluminium to individual requirements, punched/drilled. Send 6p for list. Ramar Constructor Services, 29 Shelbourne Rd. Stratford-on-Avon,

LADDERS 2414 ft £9.80. Carr 80p. (Please add 10% V.A.T. to total order). Leaflet. Home Sales Ladder Centre, (WLS) Haldane, Halesfield (1) North, Telford, Salop. Tel: 0952 586644.

POSTAGE (MINIMUM) 15P PER ORDER

R1155, B.F.L.N. R1392, R1475, B40, 52 Rx, R220, all 66p ea. R4187 Rx set of circs, etc. £1-10. R107 Rx 88p. R209 Rx circ. & notes £1-21, R210 £1-10, R216 £1.10, CR100 £1.10, 19 set 88p, 31 set 88p, 88 set 88p, Wavemeter D No. 2 £1.10 CT38 66p, Sig Gens TF144G 66p, TF801a 88p, Scope 13A 66p. CT316 (CD518) 66p, Cossor 1035 Mk 1, 2 & 3 all 66p ea. 1049 Mk 3a 66p, Scope CT52/84 with notes £1.32. CD513.2 3 shts £1.65, CD1014.2 3 shts £1-65, Rx3673 66p, Ind CRT26 66p.

AMERICAN types ARR-2 55p, RxInd/APN-9 55p, AR88D & AR88LF £1·10 ea, Tx/Rx BC634/5 88p, USM-24 £1-65.TS-34 88p, OS-8 66p, Dumont 208 66p, TS-382 88p, TS-413 £1.65, RX36736 6p, Ind CRT26 66p.

The above prices inc. post and VAT charges, where available values are supplied. Full manuals available on some of above, SAE with enquiry.

H. SUPPLIES

57 Main Road Sheffield S9 5HL Telephone 444278 (0742)

GETTING BORED WITH ELECTRONICS

Some things are repetitive, once you have built an astable multivibrator; they tend to gat boring—tried a 555 timer! It works in mone or astable modes for long or short pulses (%9p). How about building a radio tuner for your record player, the ZN414 chip makes this simple (£1.10). LEDs! We have a fantastic choice—LED lamps—TIL209 or HP480, 4 for £1, 50 for £10; large lamps (HP480), 35p each, LED displays—TIL302 (or similar) £2.00 each, LED displays—TIL302 (or similar) £2.00 each, LED displays—TIL302 (or similar) £2.00 each, LED displays—TIL302 (or similar) £2.00 each, LED displays—TIL302 (or similar) £3.00 each, LED £10.24 (or similar) £3.00 each, LED £10.24 (or similar) £3.00 each, LED £10.24 (or similar) £3.00 each, LED £2.00 each, LED £3.00 each, LED £2.00 each, LED £3.00 each, LED £3.00 each, LED £3.00 each, LED £3.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £5.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £5.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £5.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £5.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £5.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £5.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £5.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £5.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £5.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £5.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £5.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £5.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £5.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £4.00 each, LED £4

CLOCKS CLOCKS CLOCKS CLOCKS SWOOD is now foremost in the LSI clock chip market (who else has four different clock chips in stock with two more on order!). MM5311—the original—£11-30. MK5017AN with alarm or MK5017BB with calendar, either of these two is offered with a PCB, socket and suitable displays (4 DG12s) at £24.

Don't get bored, if none of the above fascinate you how about liquid crystal displays, DVM chips, etc? This technology, is here to stay, Bywood have got it or can get it—give us a try. VAT. All prices above EXCLUDE VAT, add 10% P. & P. Please add 10p post and packing.

You can have clock data sheets for a S.A.E. or our 1973 catalogue (2nd issue) for 15p. (And we havn't even mentioned our calculators yet—but they are in the catalogue).

You may phone us for help on 0442-62757 and you can use your ACCESS card for phone or personal purchase—Service from Bywood!



ELECTRONICS 181 EBBERNS ROAD, HEMEL HEMPSTEAD, HERTS. 0442 62757

STEREO IC DECODER

HIGH PERFORMANCE PHASE LOCKED LOOP (as in 'W.W.' July '72)

MOTOROLA MC1310P

EX STOCK DELIVERY SPECIFICATION:—Separation: 40dB 50Hz-15kHz. Distortion: 0·3%. I/P level: 560mV rms. O/P level: 485mV rms per channel. Input Impedance: 50kΩ. Power requirements: 8·12V at 16mA. Will drive up to 75mA stereo 'on' lamp or LED.

KIT COMPRISES FIBREGLASS PCB (printed and tinned), Resistors, I.C., Capacitors, Preset Potm. & Instructions.

ONLY £3.40

WHY PAY post free.

LIGHT EMITTING DIODE (Red)
Sultable as stereo 'on' Indicator. For above with panel mounting clip and instructions

ONLY

29p plus p.p.

MC1310P only £2-77 plus p.p. 6p NOTE:—As the supplier of the first MC1310P decoder kit, of which we have sold literally thousands, our customers can benefit from our wide experience, V.A.T.:—From April 1st add V.A.T. at the standard rate to all prices.

Fi-Comp Electronics

BURTON ROAD, EGGINTON, DERBY, DE6 6GY

If you have difficulty in obtaining

PRACTICAL

WIRELESS

Please place a regular order with your newsagent or send 1 year's subscription (£2.65) to:—

Subscription Department,

Practical Wireless,

Tower House, Southampton Street,

London, WC2E 9QX

FELSTEAD ELECTRONICS (PW 71) LONGLEY LANE, GATLEY, CHEADLE, CHES. SK8 4EE

FELSTEAD ELECTRONICS (PW 71)

LONGLEY LANE, GATLEY, CHEADLE, CHES. SK8 4EE

Selection from our List, sent free for stamped addressed envelope, (Free overseas, and with all orders on request). Cash with order only—No C.O.D. or Caller service. Charges (Min. 7p) in brackets after all items apply to G.B. and Eire only. Regret orders under 30p plus charges unacceptable. S.A.E. please for renuiries or cannot be replied to. Overbeas, including Eire and Channel Isles, orders less 10%, off prices below, which include V.A.T. RECORDING TAPE; Finest quality/shale British Mylar available; ISTANDARD 5° 6001. 40p. 51° 900ft. 55p; 71° 1200ft. 62p; LONG PLAY 5° 900ft. 55p; 59° 1200ft. 62p; 71° 1800ft. 41° 20° (Charges for 5° and 51°, singles 9p, two to four 8p cach; five and over 33p the lot. For 7°, one or two 11p each reel, 3, 4 and 5 reels 33p the lot. 6 reels and over 33p the lot. For 7°, one or two 11p each reel, 3, 4 and 5 reels 33p the lot. 6 reels and over 39p the lot.) Other sizes and accessories in list. CASSETTES. Two types, Both in Library Cases, C60 33p. C90 48p, C120 72p. Deluxe Types: C60 55p, C90 72p, C120 89p. (Charges for both types, under 5, 9p each. 5 for 17pp. All quantities over 5, 28p the lot.)

CARTRIDGES all with standard fittings and stylli. Stereo-compatible Mono GP91/8C 98p; STEREO GP93 21 43.S, Stereo Ceramic GP94 £17.5 (All at 7p each) Comparative shown in List, with more types inc. Sonotone 97AHC. Stereo Ceramic Diamond £170 (7p). DIAMOND STYLII: single tip types: Acos GP37, GP99, GP55/67, GP71, BRT TC2/LP/ST: COLLARO O.P. and DC284, GARRARD GC2, GC8, GCS10, GCE12, RONETTE BF40, O.P. and T. PHILIPS 3301 (306), 3066, 3302, 3304, 3304), 3010/12/13/16, SONOTONE 197/20T ALL AT 38p each (7p). SAPPHIRE 16p (7p) DIAMOND DUBLE TTP TURNOVER TYPES (78 sap. on other side). For ACOS GP73, GP91 (for cartridge GP33, GP94 etc.) GP918C (for stereo compat. types) GP104 BRR 874 (873, 873), 879 (GS38, GS45) and 56, GS56, GS58, K846A. K841B ETC. ALL AT 68p (7p). SAPPHIRE 300 GS10, GS55, GS58, K846A. K841B ETC. ALL A

OUR LIST (see heading) has added to the above items Cartridge and Stylli Comparison Special Non-repeatable Offers, Aerials, Dials. Transistors, Multi-Leals, Plugs, Socket of many types, Speakers, Vol. Controls, Multi-testers, Misc Inserts, Neons, Indicators STEREO Headphones, Pocket Screwdriver Testers, Tel. Pick-ups, Wire, Cable, etc., etc.

383

INDEX TO ADVERTISERS Fi-Camp Electronics 383 rancis, J.J. Ltd. ... 298 A.H. Supplies Antex Ltd. AdFonic 380 293 Galleon Trading Gladstone Radio Arrow Electronics 367 Greenweld Electronics ... Audionic ... 380 380 ... B.H. Component Factors Ltd. 292 378 379 Baines, R.... Baker Loudspeakers Ltd. . . . 375 Heath (Gloucester) Ltd. Henry's Radio Ltd. 304 355 Bedford Electronics 381 Cover ii, Bentley Acoustic Corporation Ltd. 344 352 Home Radio (Components) Ltd. 310 Bernard, Gerald B.I.E.T. ••• ... 306, Cover iii ... 301, 302, 303 I.C.S. ... I.L.P. (Electronics) Ltd. Bi-Pak Semiconductors Bi-Pre-Pak Ltd. 295 324 ... • • • ---... Boffin Projects 380 Imhof Integrex Ltd. ... British National Radio and Electronic 300 School Broadway Electronics ... Bull, J. (Electrical) Ltd. ... 288, 343 ... 344 lef Electronics ... 359 Jermnyn Industries Johns Radio ... 299 Bywood Electronics 382 Johnson (Radio) ... C.C.I.L. Ltd. 379 306 C.T. Electronics ... Caranna, C. ... 381 Chiltmead Ltd. 378 K.V.A. Electronics ... Kensington Supplies Chromasonic Electronics Colomor Electronics Ltd. ... Comet High-Fidelity Discount Ware ... 378 347 360 Lasky's Radio Ltd. 308, 309 306 Lewis Radio ... Linear Products Ltd. Control Data Institute ... 360 294 D.E.W. Ltd. 381 London Computer Operators Training Dabar Electronic Products Denco (Clacton) Ltd. Centre 378 London Electronic College Douglas Electronic Industries Ltd. 373 Magtor Ltd. 294 Maplin Electronic Supplies Electrokit 292 298 Electronic Mail Order ... Marco Trading Ltd. ... Milward, G.F. 381 Electronic Design Associates ... 382 Electrospares 372 323 Minikits Electronics Morse 378 Elekon Enterprises Multicore Solders Ltd. Elvins Electronic Musical Instruments Mullard Ltd.

elstead Electronics

Padgetts Radio S					304
Partridge Electr				•	364
Piccadilly	• • •	•••	••••		eriv
Pembridge Colle Phonosonics		•••	• • • •	• • •	324
rnonosonics	• • •	•••	• • • •	•••	352
R.D.I. Ltd.	• • •				379
R.E. Publications			•••		381
R.S. Component	s				378
Radio Compone	nt Spe	ecialists			351
Radio Book Serv					378
Radio Exchange	Co. L	td.			327
Radio & T.V. Čo	mpon	ents (A	cton) L	td.	
Dadta Caster (_			296,	
Radio Society of	Grea	t Britaii		•••	374
Readers Radio Redhawk Sales			• • •	•••	348 380
Riversdale Electi		124	•••	•••	
Rossless Services			•••	• • •	364 380
RSC (Hi-Fi Cent		 ed	•••	290,	
R.S.T. Valve Mail	Orde	r.Co			374
· · · · · · · · · · · · · · · · · · ·	0,40		• • • •	•••	3/4
S. & W. Electron	nics				380
Saxon Entertains	nents				311
Semicon Index L					378
Sinclair Radionic				376,	
Smith, G.W. & C		d. 36	8, 369	, 370,	
Surplectronics		• • •	•••	•••	310
Swanley Electron	nics	• • •		• • •	328
Teleradio Co. Lt	a a				379
Thacker, A.H. &		Ltd.	•••		300
Tidman Mail Ord			• • •		378
Trade Aids					373
Trade Disposals					380
Trampus Electro					380
Trannies			•••		307
Tuac Ltd.					373
14/ I I	_				
West London Di	rect 5	upplies		•••	373
Weyrad (Electro Wheel			•••	•••	306 381
Wheel Wilmslow Audio	•••	•••	•••	300,	
TTIIIISTOW Augio		• • • •	•••	300,	320
Xeroza Radio	•••	•••	•••		344
York Electronics					310
				• • •	
Z. & I. Aero Serv	/ices				384

Head Office and Warehouse 44A WESTBOURNE GROVE LONDON W2 5SF Tel: 727 5641/2/3

Z & I AERO SERVICES LTD.

Please send all correspondence and Mail-Orders to Head Office When sending cash with order, please include 12½np in £ for postage and handling MINIMUM CHARGE 15np. No C.O.D. orders accepted Please note that the valves offered below are not necessarily of U.K. origin

Retail Shop 85 TOTTENHAM COURT ROAD LONDON WI Tel: 580 8403 Open all day Saturday

TOOK A 40 | IIV 10 A 50 | DI 22 A 40 | TI 404 A 70

1			10701 0.05					EF95 0.	40 L	HK90 0.50	PL33 U	U,40 I		0.70
OA2 0.40	6A87G 0.85	6F13 0.50	10D1 0.65	First Qu	alles E	ully Guar	enteed !	EF97 0.	85	KT66 2.35	PL36 (0.55	U801 (08.0
OA3 0.48	6AT6 0.38	6F14 0.70	10D2 0.55	PIPST WU	alita L	ully Guel	GIILLAGO ;			KT77 1:00		0.50	UABC80	
	6AU6 0.80	6F15 0.65	10F1 0.75			-								0.40
		6F18 0.50	10F9 0.65	-	1	74870		EF183 0.		KT88 2.25		0.45		
OB3 0.70	6AV6 0.40				ARRESTON	1926	1	EF184 0.		N78 1.60		0.45	UAF41 (
OC3 0.40	6AW8A 0.65	6F23 0.90			A	120		EF804 1.	25	PABC800.40	PL84 (0.40	UAF42 (0.60
OD3 0.40	6BA6 0.28	6F24 0.80	10L1 0.60		#					PC86 0.60	PL302 (0.95	UB41 (0.65
1B3GT 0.45	6BE6 0.82	6F25 1.00	10LD110.70			U BR∕	MID						UBC41	
		6F26 0.35	10P13 0.75			PILE	IND			PC88 0.60		0.75		
1L4 0.25			12AB5 0.70					EL36 0.	50	PC92 0.50		0.90	UBC81	
1B4 0.50	6BH6 0.75	6.728 0.70		, ,	aeri			EL41 0.	75	PC97 0.50	PL509	1.10	UBF80 (0.40
1R5 0.45	6BJ6 0.55	6GK6 0.60	12AC6 0.60	A COLUMN					55	PC900 0.48	PL801	1.00	UBF89 (0.40
184 0.80	6BK7A 0.75	6J4 0.60	12AE6 0.60						50	PCC84 0.40		0.82		0.70
185 0.80	6BN5 0.48	6J5GT 0.40	12AL5 0.55		TRON	IC VA	LVES						UBL21	
		6J6 0.80	12AQ5 0.50	ELEU	TRON				25	PCC85 0.40		0.60		
1T4 0.80	6BN6 0.60		12AT6 0.40					EL85 0	48	PCC88 0.55		0.85		0.45
1U4 0.40	6BQ5 0.25	6J7 0.45		30C17 1.10	90 A G 2.40	DY86 0.35	ECC88 0.40	EL86 0	40	PCC89 0.55 !	PY33	0.68	UCC85 (
1U5 0.75	6BR8 0.75	6K4[] 0.60	12AT7 0.40			DY87 0.86	ECC89 0.50		42	PCC189 0.60	PY80 (0.40	UCF80	0.70
1V2 0.55	6BB7 1.85	6K6GT 0.75	12AU6 0.45	30C18 0.90					15	PCC805 0.95		0.80	UCH21	
1X28 0.55	6BW6 0.90	6K7 0.48	12AU7 0.88	30F5 1.00	90C1 0.75	DY802 0.37	ECC91 0.80					0.85	UCH42	
	6BW7 0.90	6K8G 0.45	12AV6 0.45	30FL1 0.80	90CV 2.40	E80F 1.85	ECC189 0.65		.50	PCC806 0.95				
2D21 0.40		6K25 0.75	12AV7 0.70	30FL12 1.10	807 0.50	E88CC 0.70	ECC807 1.00		.85	PCF80 0.80		0.88	UCH81	
8A4 0.45	6BX6 0.25			30FL14 0.90	813 4.00	E180F 1.00	ECF80 0.85	EM71 0	.80	PCF82 0.85	PY88	0.40	UCL81	
8A5 0.75	6BZ6 0.45	6L6GT 0.55	12AX7 0.88			E810F 2:90	ECF82 0.85		45	PCF84 0.60	PY500	1.00 i	UCL82	0.35 [
884 0.40	6C4 0.85	6L7 0.45	12AY7 0.75	30L1 0.40					.50	PCF86 0.60		0.47		0.65
3V4 0.70	6C5GT 0.55	6L18 0.50	12B4A 0.65	30L15 0.95	5642 0.70	EABC800.88	ECF8041.65			PCF87 1:10		0.50		0.65
	6CB6 0.40	6LD20 0.50	12BA6 0.45	30L17 0.95	6080 1.75	EAF42 0.60	ECH42 0.75		.85					0.60
5R4GY 0.75		6N7GT 0.55	12BA7 0.50	30P12 1.00	6146 1.60	EBC33 0.60	ECH81 0.80		.00	PCF801 0.50		0.88		
5U4G 0.40	8CD6GA		12BE6 0.50	30P19 0.95	6146B 2.50	EBC41 0.65	ECH83 0.45	EM87 0	.70	PCF802 0.50	QQVO2-			0.65
-5V4G 0.50	1.80	6P28 0.65		30PL1 0.95	6360 1.25	EBC81 0.38	ECH84 0.45	EN91 0	.40	PCF805 0.90	1	2.25		0.65
5Y3GT 0.45	6CG7 0.60	6Q7 0.50	12BH7 0.50			EBF80 0.40	ECL80 0.50		40	PCF806 0.75	QQVO3.	-10	UF43	0.65
5Z3 0.75	6CL6 0.60	68A7 0.45	12BY7 0.65	30PL13 1.10	6939 2.25				.75	PCF808 0.90		1.25	UF80	0.35
5Z4G 0.45	6CU6 0.80	68G7 0.45	12E1 8.00	30PL14 1.25	7199 0.85	EBF83 0.40	ECL81 0.50			PCH2000.70		8.80		0.40
	6CW4 0.70	68K7 0.50	12K5 1-00	35A3 0.60	7586 1,50	EBF89 0.32	ECL82 0.85		.40					6.40
6/80L2 0.90	6CY5 0.50	68L7GT0.45	12K7GT0.50	35A5 0.75	7895 1.50	EBL31 1.50	ECL83 0.70		.55	PCL81 0.50		4.00		0.65
6AB4 0.45		68N7GT0.45	1207GT0.45	35B5 0.65	A2293 2 20	EC53 0.50	ECL84 0.55		.40	PCL82 0.85		0.75		
6AF4A 0.60	6CY7 0.75			35C5 0.60	AZ1 0.60	EC80 2.65	ECL85 0.55	EY87 0	.43	PCL83 0.65		0.85		0.48
6AG5 0.25	6D3 0.55	68Q7 0.50	128R7 0.50		AZ31 0.55	EC86 0.60	ECL86 0.40	EY88 0	.48	PCL84 0.45	U26	0.85	UM84	0.30
6AG7 0.45	6DC6 0.80	68R7 0.50	20D1 0.60	35105 0.75			ECLL800		.50	PCL86 0.45	U31	0.70	UYIN	0.50
6AH6 0.60	6DK6 0.60	6T8 0.88	20L1 1.10	35L6GT0.75	CBL1 0.99	EC88 0.60						6.50		1.00
	6DQ6B 0.75	604GT 0.70	2071 0.50	35W4 0.40	CBL31 1.00	EC90 0.85	8.20		.75	PCL88 1.25		0.40		0.48
	6D84 1.25	6U5G 0:75	20P4 1.10	35Z3 0.75	CY1 0.50	EC92 0.45	EF37A 1.00		.28	PCL200 0.75				
6AK5 0.40			20P5 1.20	35Z4G 0.40	CY31 0.50		EF40 0.50		.29			0.40		0.50
6AK6 0.60	6EA8 0.65		25C5 0.60	35Z5GT 0.70	DAF96 0.50	EC93 0.60	EF41 0.65	GT1C 8	.00	PCL800 1.10	U78	0.40		0.40
6AL3 0.48	6EH7 0.80	6V6GT 0.45			DF96 0.50	ECC35 1.00	EF42 0.70		.70	PCL801 0.95	U191	0.75	W729	0.75
6AL5 0.22	6EJ7 0.85	6X4 0.40	25L6GT 0.50				EF80 0.80		.45	PCL805 0.50		0.50	XC12	0.60
6AM6 0.87	6EW6 0.70	6X5GT 0.45	25Z4G 0.85	50B5 0.70	DK92 0.70	ECC40 0.70								0.75
		6X8 0.65	25Z6GT0.75	50C5 0.60	DK96 0.60	ECC81 0.40	EF85 0.85	GZ31 0	.40	PD500 1.80	U281	0.55		3.60
6AQ5 0.42	6F1 0.75	6 Y6G 0.80	30A5 0.60	50CD6G1.20	DL96 0.55		EF86 0.80		.50	PF86 0.70		0.55		
6AQ6 0.70	6F5 0.75	7Y4 0.75	30AE3 0.40	50EH5 0.65	DM70 0.60	ECC82 0.88	EF89 0.28							4.50
6AR5 0.55				50L6GT 0.60	DM160 0.68	ECC83 0.88	EF91 0.37		.60	PF818 1.00		0.55		7.00
6AR6 0.65	6F6G 0.45	9BW6 0.70		85A2 0.55	DY51 0.55	ECC84 0.30	EF92 0.85	HABC80	0.55	PFL200 0.65	U403	0.70	Z803U	1,85
6A85 0.50	6F11 0.50	10C2 0.60	30C15 1.00	00.N3 V.D0	. 1/101 0:00	. 20004 0,00	22.02 0.00							
VALUE 0.00														

TRANSISTORS BD121 0.65									
TRA	VSI!	STOR	S						
	1011	40100	0.15	BD121	0.65				
2N696	0.15	AC128 AC132	0.15	BD123	0.80				
2N697	0.15		0.00	BD124	0.60				
2N698	0.80	AC153	0.20	BD131	0.75				
2N705	0.70	AC154	0.18	BD132	0.80				
2N706	0.10	AC157	0.17	BF115	0.20				
2N708	0.15	AC169	0.10	BF167	0.18				
2N753	0,25	AC176	0.17	BF173	0.20				
2N929	0.20	AC187	0.25	BF179	0.80				
2N980	0.20	AC188	0.25	BF180	0.80				
2N987	0.80	ACY17	0.25	BF181	0.80				
2N1131	0.25	ACY18	0.20	BF184	0.20				
2N1182	0.25	ACY19	0.25	BF185	0.20				
2N1184	1.25	ACY20	0.20	BF194	0.14				
2N1802	0.17 0.17	ACY21	0.20	BF195	0.14				
2N1803	0.17	ACY22	0.10	BF196	0.12				
2N1304	0.20	AD140	0.50	BF197	0.12				
2N 1805	0.20	AD149	0.45	BF200	0.85				
2N1806	0.25	AD161	0.85	BFW87	0.25				
2N1307	0.25	AD162	0.85	BFW88	0.20				
2N1308	0.25	ADZ11	1.25	BFW89	0.20				
2N1809	0.25	ADZ12	1.25	BFW91	0.20				
2N1613	0.17	AF114	0.17	BFX88	0.20				
2N1711	0.20	AF115	0.17 0.17	BFY17	0.40				
2N1756	0.75	AF116	0,17	BFY19	0.25				
2N2147	0.75	AF117	0.17	BFY50	0.20				
2N2180	0.80	AF118	0.80	BFY51	0.20				
2N2217	0.25	AF125	0.20	BFY52	0.20				
2N2218	0.20	AF127	0.20	BSY26	0.17				
2N2219	0.20	AF180	0.85	B8Y27	0.15				
2N2369A	0.15	AF181	0.85	B8Y28	0.17				
2N2477	0.65	AF186	0.40	BBY65	0.20				
2N2646	0.40	A F239	0.86	BBY95A	0.12				
2N2905	0.25	AFZ11	0.45	OC16	0.50				
2N2923	0.12	AFZ12	1.00	OC22	0.50				
2N2924	0.18	ABY26	0.25	OC23	0.60				
2N2926	0.10	A8Y27	0.80	OC24	0.80				
2N3053	0.20	A8 Y28	0.25	OC25	0.85				
2N3054	0.50	ASY29	0.80	OC26	0.25				
2N3055	0.60	ASY54	0.25	OC29	0.60				
2N3133	0.25	A8Z15	0.70	OC35	0.50				
2N3184	0.25	ABZ16	0.70 0.75 0.75	OC36	0.45				
2N3391	0.17	ABZ17	0.75	OC42	0.20				
2N3392	0.17	ASZ18	0.75	OC44	0.15				
2N3393	0.15	A8Z20	0.25	OC45	0.12				
2N3394	0.15	ABZ21	0.40	OC70	0.10				
2N3395	0.20	AUY10	1.00	OC71	0.12				
2N3402	0.15	BC107	0.10	0C72	0.12				
2N3403	0.15	BC108	0.10	OC73	0.80				
2N3404	0.82	BC109	0.10	OC75	0.15				
2N3414	0.20	BC113	0.10	OC76	0.15				
2N3415	0.15	BC118	0.20	OC78	0.25				
2N3417	0.25	BC134	0.20	OC781)	0.20				
2N3702	0.10	BC147	0.10	OC81	0.20				
2N3703	0.10	BC148	0.10	OC81D	0.20				
2N3704	0.12	BC149	0.12	OC83	0.20				
2N3707	0.12	BC152	0.15	OC139	0.80				
2N3709	0.10	BC158	0.15	OC140	0.85				
2N3710	0.10	BC175	0.20	OC141	0.60				
2N3819	0.85	BC186	0.25	OC170	0.25				
2N3906	0.25	BCY30	0.25	OC171	0.25				
28702	0.50	BCY31	0.80		0.80				
28746	0.25	BCY33	0.25	OC200					
AC113	0,15	BCY34	0.80	OC201	0.60				
AC125	0.80	BCY72	0.15	OC202	0.65				
AC126	0.20	BCZ10	0.80	OC203	0.40				
AC127	0.17	BCZ11	0.40	OC204	0.40				
20101		. AFTIMALL	0,40	, 00208					











MULTIMETERS MADE IN USSR

Prices of these exceptionally well made instruments range from £4.95 to £10.50. Please write for illustrated catalogue.

SYNCHROSCOPE TYPE C1-5



Made in USSR

DIODES OA81 OA85 OA86 OA90 OA91 OA6 OA7 OA10 OA47 OA70 OA79 0·18 0·15 0·20 0·08 0·07 0·07 OA95 OA200

Series BZX61 1-watt ZEFEE Diodes Available in: 7.5.8.2-11-15-16-24-27-30-38-36-62-68 volts, 20-20 each.

MINIATURE SILICON HALF-WAVE WIDE ENDED DECTIFIEDS

	MIKE-FIADED	WEG III IEIVG	
IN4002	100 p.i.v.	1.A	0-07
IN4004	400 p.l.v.	1A	0.08
1N4006	800 p.i.v.	1A	0.18
IN5399	1000 p.i.v.	1.5A	0.85
IN5408	1000 p.i.v.	3·0A 1·1A	0.15
BY101 BY105	450 p.i.v. 800 p.i.v.	1-14	0.15
BY127	(250 p.i.v.	iA	0.12
DD000	50 p.i.v.	500mA	0.15
DD006	400 p.i.v.	500mA	0.25
DD058	800 p.l.v.	500mA	0-85

VALUE ADDED TAX

THE ABOVE PRICES DO NOT INCLUDE V.A.T. WHEN REMITTING CASH WITH ORDERS PLEASE ADD 10% OF THE VALUE OF GOODS INCLUDING POSTAGE AND HANDLING. AS SOME OF THE ITEMS STILL CONTAIN THE PROPORTION OF PURCHASE TAX, BESPECTIVE AMOUNT WILL BE REFUNDED.

3-in tube fitted with telescopic viewing hood, giving bright display in full daylight. Sensitivity 10mV/mm (narrow band) to 30mV/mm (wide band). Bandwidth 10 c/s-10 mc/s. Trigered sweep pre-set at 1:2-5-10-30-100-300-1000-3000 µsec per stroke. Free-running time base 20 c/s to 200kc/s with built-in crystal calibrator providing timing marks at -05-2-1-5-20-100 µsec.
Amptitude calibrator directly calibrated in volts. Input attenuator 1:10-100.
Power supplies 127/230v AC.
PRICE \$39-00. Packing and carriage £1-50.

Over ISO This FREE 76 page book can put you on the road to success through a BIET Home ways to Study Course Choose your subject now! better future



find out how in just 2 minutes

That's how long it will take you to fill in the coupon. Mail it to B.I.E.T. and we'll send you full details and a free book, B.I.E.T. has successfully trained thousands of men at home - equipped them for higher pay and better, more interesting jobs. We can do as much for YOU. A low-cost B.I.E.T. home study course gets results fast - makes learning easier and something to look forward to. There are no books to buy and you can pay-as-you-learn.

Why not do the thing that really interests you? Without losing a day's pay, you could quietly turn yourself into something of an expert. Complete the coupon (or write if you prefer not to cut the page). No obligation and nobody will call on you . . . but it could be the best thing you ever did.

Others have done it, so can you

"Yesterday I received a letter from the Institution informing that my application for Associate Membership had been approved. I can honestly application for Associate Membership had been approved. I can honestly say that this has been the best value for money I have ever obtained – a view echoed by two colleagues who recently commenced the course".—Student D.I.B., Yorks. "Completing your course, meant going from a job I detested to a job that I love, with unlimited prospects".—Student J.A.O. Dublin. "My training with B.I.E.T. quickly changed my earning capacity and, in the next few years, my earnings increased fourfold"—Student C.C.P. Bucks

C.C.P., Bucks.

FIND OUT FOR YOURSELF

These letters - and there are many more on file at Aldermaston Court - speak of the rewards that come to the man who has given himself the specialised know-how employers seek. There's no surer way of getting ahead or of opening up new opportunities for yourself. It will cost you a stamp to find out how we can help you. Write to B.I.E.T. Dept. BPW07 Aldermaston Court, Reading RG7 4PF.

Practical Radio & Electronics Certificate course includes a learn while you build 3 transistor radio kit. Everything you need to know

> about Radio & **Electronics** maintenance and repairs for a spare time income and a *career* for a better future.

CUT OUT THIS COUPON-Tick or state subject of interest. Post to address below. Pos

MECHANICAL

A.M.S.E. (Mech.) |
Boiler Inspect.
& Operation |
C & G Eng. Crafts |
C & G Fabricat. |
Diesel Eng. |
Eng. Inspection |
Eng. Metallurgy |
Inst. Eng. & Tech. |
Inst. Motor Ind. |
Mainten: Eng. |
Mechanical Eng. |
Sheet Metal Work |
Welding | Man. Prod.—cont. Quality Control Salesmanship Storekeeping Work Study Works Management Constructional-cont Gonstructional-cont.
Building
Building Drawing
Build. Foreman
Carpentry & Join.
Civil & Municipal Civil & Municipe
Engineering
Constructional
Engineering
Construction
Surveyors
Institute
Cierk of Works
Council Eng.
Geology
Health Eng. DRAUGHTSMANSHIP
A.M.I.E.D. Design of Elec.
Machines
Die & Press Tool
Design Des Health Eng.
Hydraulics
Inst. of Builders
Inst. Works &
Highway Sup.
Painting & Dec.
Public Hygiene
Road Engineer.
Structural Eng.
Surveying ELECTRICAL & ELECTRONIC ship Gen. Draughts-ELECTRONIC
A.M.S.E. (Elec.)
C&G Elec. Eng.
C&G Elec. Inst.
C&G Elec. Tech.
Computer Elect.
Elec. Maths
Elec. Science
Electronic Eng.
Electrical Eng.
Install. & Wiring
Meters
& Measuring
Instruments manship Jig & Tool Des. Tech. Drawing Tech. Drawing
RADIO & TELECOMMUNICATIONS
COURTY
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Control
Cont GENERAL Agricultural Eng.
Council of Eng.
Inst. \Box Exam. Radio Servicing MANAGEMENT & MANAGEMENT & PRODUCTION
Auto. Control
Computer Prog.
Electronic Data
Processing
Estimating
Foremanship
Inst. Cost & Man
Accountants
Inst. Marketing
Management & Repairs
Radio & TV Eng.
Trans. Course
TV Main. & Serv. Maths
Refrigeration
Rubber Tech.
Sales Engineers
Tech. Report
Writing
Timber Trade
University Ent. AUTO & AERO Aero Eng. A.M.I.M.I. A.E.C. Cert. inst. Cost & Man
Accountants
Inst. Marketing
Management
Metrication
Motor Trade Man.
Network Plan.
Numerical Cont.
Operational
Research
Personnel Man.
Production Eng.
Production Eng.
Coesting for many moder serms A.E.C. Cert.
Auto Engineer.
Auto Repair
C & G Auto. Eng. G.C.E. 58 'O' & 'A' CONSTRUCTIONAL LEVELS SUBJECTS Over 10,000 Coaching for many major exams. including ONC, C & G, etc. group passes To B.I.E.T., Dept. BPW07 ON BPW07 Aldermaston Court, Reading RG7 4PF NAME Black C Block Capitals Please ADDRESS OTHER SUBJECTS AGE Accredited by C.A.C.C BRITISH INSTITUTE OF ENGINEERING TECHNO

Published approximately on the 7th of each month by IPC Magazines Limited, Fleetway House, Farringdon Street, London, E.C.4. Tel: 01-634 4444. Printed in England by Index Printers, Dunstable, Beds. Sole Agents for Australia and New Zealand—Gordon and Gotch (A/sia) Ltd.; South Africa—Central News Agency Ltd.; Rhodesia and Zambia—Kingston Ltd.; East Africa—Stationery and Office Supplies Ltd. Subscription rate (including postage); For operation and part of the world 22-65.

PRACTICAL WIRELESS is sold subject to the following conditions, namely, that it shall not, without the written consent of the Publishers first given, be lent, resold, hired out or otherwise disposed of by way of Trade at more than the recommended selling price shown on the cover, and that it shall not be lent, resold or hired out or otherwise disposed of in a mutilated condition or any unauthorised cover by way of Trade, or affixed to as part of any publication or advertising, literary or pictorial matter whatsoever.

WWW.AMPCICATIONISTORY.COM



EVERY PACKET CARRIES A GOVERNMENT HEALTH WARNING www.americanradiohistory.com