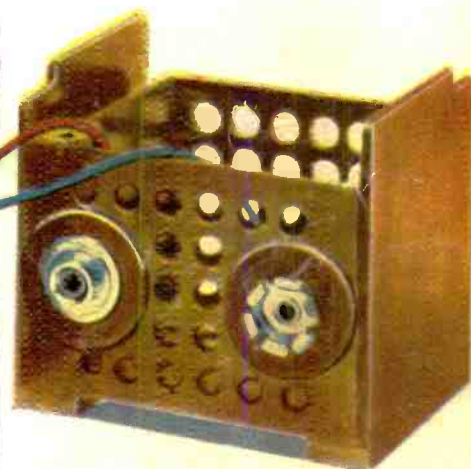


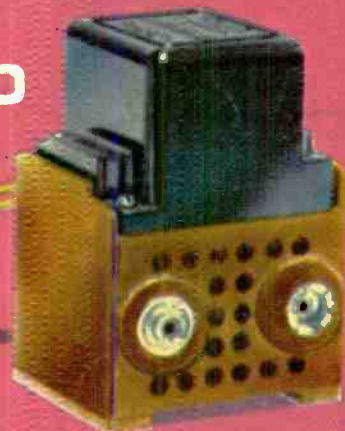
PRACTICAL WIRELESS

SEPTEMBER
1967

216



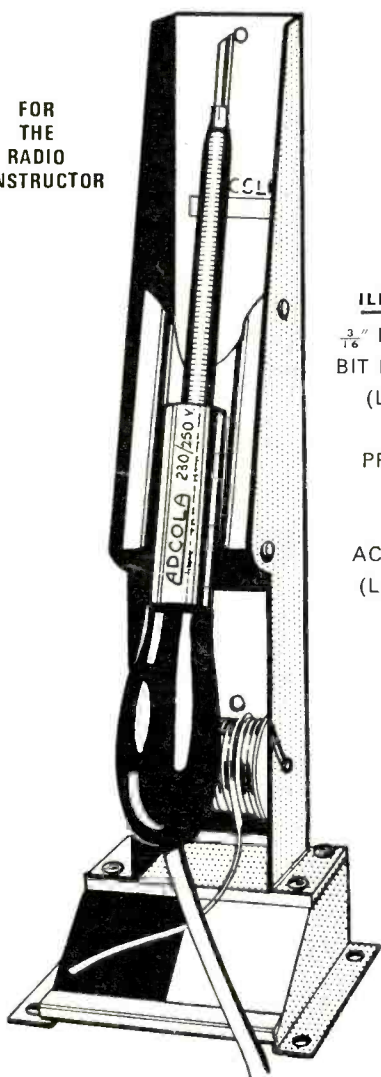
9V MINIATURE STABILISED POWER UNIT





SOLDERING EQUIPMENT

FOR
THE
RADIO
CONSTRUCTOR



ILLUSTRATED
 $\frac{3}{16}$ " DETACHABLE
BIT INSTRUMENT
(List No. 64)
IN
PROTECTIVE
SHIELD
WITH
ACCESSORIES
(List No. 700)

FOR CATALOGUES APPLY DIRECT

ADCOLA PRODUCTS LTD.
ADCOLA HOUSE
GAUDEN ROAD
LONDON, S.W.4

Telephones:
01 622 0291

Telegrams: "SOLJOINT" LONDON SW4

ERSIN



for quick
easy faultless
soldering

Containing 5 cores of non-corrosive flux, instantly cleaning heavily oxidised surfaces. No extra flux required. Ersin Multicore Savbit Alloy reduces wear of copper soldering iron bits.



SIZE 5 HANDY SOLDER DISPENSER

Contains 12 ft.
coil of 18 s.w.g.
Ersin Multicore
Savbit Alloy.
2/6 each



SIZE 15

21 ft coil of 60/40
Alloy, 22 s.w.g. in
a dispenser. Ideal
for small compon-
ents, transistors,
diodes, etc.
3/- each



SIZE 12

Ideal for home
constructors.
Contains 102 ft.
of 18 s.w.g. Ersin
Multicore Savbit
Alloy on a plastic
reel. 15/- each



BIB MODEL 8 WIRE STRIPPER AND CUTTER

Strips insulation
without nicking
the wire, cuts
wire and splits
plastic twin flex.
Plastic cushioned
handles. 8/6 each

From Electrical or Hardware shops. If unobtainable write to:
Multicore Solders Ltd., Hemel Hempstead, Herts.



17in.—£11.10.0

3 Star Guarantee
★ Tube ★ Valves
★ Components Carr. 30/-

**TWO-YEAR GUARANTEE
EX-RENTAL TELEVISIONS**

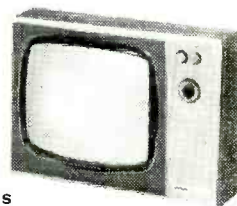
FREE ILLUSTRATED LIST OF TELEVISIONS

17" —19" —21" —23"
WIDE RANGE OF MODELS
SIZES AND PRICES
DEMONSTRATIONS DAILY

TWO-YEAR GUARANTEED TUBES 100% REGUNNED

14in.—69/6 17in.—89/6
21in. and ALL SLIMLINE TUBES 99/6
EXCHANGE BOWLS. Carr. 10/6

EX MAINTENANCE TESTED TUBES
17in.—35/- 14in.—15/- Carr. 5/- (not slimline)



COCKTAIL/STEREOGRAM CABINET £25



Polished walnut veneer with elegant
glass fronted cocktail compartment,
padded. Position for two 10in. ellipti-
cal speakers. Record storage space.
Height 35½in., width 52½in., depth
14½in. Legs 1 gn. extra.

STEREO RADIO- GRAM CABINETS £15

Superbly made and styled in
Veneered English Walnut
LIFT UP LID TO CHANGER AND
RECORD STORAGE COMPARTMENT
Position 8" x 5" Twin Speaker. Dimen-
sions: 45 x 15½ x 15½. Legs 1 gn. Carr. 30/-
Other Models—Send for List



DUKE & CO. (LONDON) LTD.

621/3 Romford Road E.12

Tel. 01-478-6001/2/3

PLEASE FILL IN THE COUPON FOR YOUR COPY OF

★ FLOG LIST

WE HAVE TO URGENTLY MAKE ROOM IN OUR MAIN 13,000 SQUARE FEET BRIGHTON WAREHOUSE FOR THE SUPERB NEW RANGE OF JASON ELECTRONIC KITS AND EQUIPMENT THE FIRST OF WHICH WILL BE ARRIVING SHORTLY.

★ A FEW
EXAMPLES!

★ QUANTITY
DISCOUNTS!

★ GUARANTEED
NEW GOODS!

★ $\frac{1}{2}$ MILLION NEW
VALVES SURPLUS TO
OUR NORMAL
REQUIREMENTS OFFERED
FOR LIMITED TIME AT
SILLY PRICES. DAF96 4/-;
UCH 81 4/6; 6K8G 1/9; ECC85
3/9; PCF86 5/-; EF85 3/6;
832 9/-; ETC., ETC., ETC.

1. Geloso 4000 Ω De Luxe Headphones Type H600 (Listed 3 Gns.) **19/6**
2. Geloso De Luxe Stethoset Headphone (Listed 3 Gns.) **19/6**
3. Geloso Desk Pen Mikes. Quality Xtal Mike with High Quality Ball Pen (Listed 6 Gns.) **19/6**
4. Toshiba Portable Record Player. 3 Speed with Variable Fine Speed Control, Ultra Modern Case, 200/250 V A.C., Excellent Volume and Quality (Listed 11 Gns.) **£6.19.0**
5. Raymor A.M./F.M. 9 tr. Radios. Japanese. Superior Quality Cabinet. Leather (Black) Finish. Model RM101. Highly Recommended (List 11 Gns.). Not a Midget! Size $7\frac{1}{4} \times 4\frac{1}{2} \times 2\frac{1}{4}$. **7 $\frac{1}{2}$ Gns.**
6. Taya 8 Transistor Radiogram. Portable 2-Speed Player plus Medium Wave Transistor Radio. Size $10 \times 6 \times 3$. Absolutely complete to Xtal Cartridge and Batteries. (Normally £12). Limited Stocks. **£7.19.0**
7. B.B.C. 2 Aerials, 5 to 22 Element Fringevision. De Luxe Finish. All with 6 Reflectors in Parabola for Peak Efficiency. For Callers Only. All Branches. **FROM 19/6**
8. Super Heavy Pointer Knobs. Black. Modern. (Normally 3/- each). **6 FOR 5/-**

AND 100's MORE !!!

SALE AT ALL BRANCHES COMMENCED 17 JUNE
SALE CONTINUING

JASON QUALITY TAPE ★

We offer you fully tennalised polyester/ mylar and P.V.C. tapes of identical quality hi-fi. wide range recording characteristics as top grade tapes. Quality control manufacture. They are truly worth a few more pence than acetate, sub-standard, jointed or cheap imports. TRY ONE AND PROVE IT YOURSELF.

Standard Play		Long Play	
3in.	150ft. 2/3	3in.	225ft. 2/9
4in.	300ft. 4/6	4in.	450ft. 5/6
5in.	600ft. 7/6	5in.	900ft. 10/8
5 $\frac{1}{2}$ in.	900ft. 10/8	5 $\frac{1}{2}$ in.	1,200ft. 13/-
7in.	1,200ft. 12/6	7in.	1,800ft. 18/6

Double Play		Triple Play	
3in.	300ft. 4/-	4in.	900ft. 13/-
4in.	600ft. 8/-	5in.	1,800ft. 25/-
5in.	1,200ft. 15/-	5 $\frac{1}{2}$ in.	2,400ft. 34/-
5 $\frac{1}{2}$ in.	1,800ft. 18/6	7in.	3,600ft. 44/-
7in.	2,400ft. 27/-		

Postage 1/- reel 3in. 600ft. 8/6

Post Free less 5% on three reels.
Quantity and Trade enquiries invited.
NOTE. Large tape stocks at all branches.

POST NOW FOR FREE "FLOG LIST"

To TECHNICAL TRADING CO., PARK CRESCENT PLACE, BRIGHTON

Please send free "Flog List", without obligation, to

NAME

ADDRESS

Block Capitals Please

OR WRITE IF YOU PREFER NOT TO CUT COUPON

PW 9 67

Stockists of Leak, Quad, Chapman, Goodman, Armstrong, Tripletone, Linear Rogers, Truvox, Ferrograph, Wharfedale, etc.
Post: 1 lb. 1/5, 1 $\frac{1}{4}$ lb. 2/6, 2 lb. 2/9, 4 lb. 3/3, 6 lb. 4/-, 14 lb. 5/8.

All Mail Orders to Brighton please

TECHNICAL TRADING

LONDON 10 Tottenham Court Road, W.1
Tel.: MUSEUM 2639
BRIGHTON Park Crescent Place
Tel. 680722
PORTSMOUTH 350-352 Fratton Road
Tel. 22034
SOUTHAMPTON 72 East Street
Tel. 25851
WORTHING 132 Montague Street
Tel. 2585

VIKING TRANSISTOR

40-50 WATT AMPLIFIER

OPERATING INSTRUCTIONS

GENERAL. An extremely reliable lightweight amplifier capable of giving 40-50 watts of undistorted sound, made possible by the use of the latest semi-conductors (transistors) and techniques which ensure space-age reliability under the most rugged conditions. It is designed as a general purpose amplifier particularly suitable for use with musical instruments that require exceptionally high treble response (not recommended for Bass Guitar). Tremolo facilities are available on Channel 1 only. **INPUTS—CONTROLS—CHANNEL 1 (Tremolo):** this contains two high gain input jack sockets controlled by **Volume Control 1** which is mounted directly above the two sockets marked tremolo. **BASS 1:** gives a controlled boost to the lower frequencies on Channel 1 only. **TREBLE 1:** gives a controlled boost to the high frequencies on Channel 1 only. **TREMOLO:** this operates on Channel 1 only and the variations of intensity and speed of the Tremolo beat is adjusted by the controls **DEPTH** and **SPEED**. A socket is provided in the rear of the amplifier so that the Tremolo may be switched on and off by the use of a footswitch plugged into the socket. If you wish the Tremolo to be used without the foot-switch, this is possible as the footswitch is only used to short out the effect. **INPUTS AND CONTROLS—CHANNEL 2 (Normal):** this contains two high gain input jack sockets controlled by **Volume Control 2** which is mounted directly above the sockets marked Normal. **TREBLE 2:** gives a controlled boost to the treble frequencies on Channel 2 only. **MAINS VOLTAGE:** fully adjustable, 200-250 volts, A.C. 50 cycles. **POWER OUTPUT:** 40-50 watts sine wave British rating. Very little distortion. **OUTPUT IMPEDANCE:** 3 ohms. Price 21 gas. plus £1 postage and packing.

MAINS TRANSFORMER, primary 200/250 volt, secondary 425/425 volt, 250 mA, 6.3 volt 4 amp, 5 volt 3 amp; fully shrouded, chassis mounting. Price £2.50 plus 7/6 postage and packing. Auto transformer step-up-step-down, 240/110 volt 400 watt. Price £1.50 plus 7/6 postage and packing.

MAINS TRANSFORMER 200/250 volt, secondary 250/250 volt, 70 mA, 6.3 volt, 3 amp drop through. Price 12/6 plus 4/6 postage and packing. Elac 10 inch, 10,000 lines ceramic magnet, 3 or 15 ohms, 7 watt, £1.9.6 plus 4/6 postage and packing.



POCKET MULTI-METER

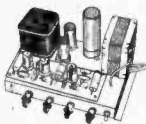
Size 3 1/2 x 2 1/4 x 1 1/2 in. Meter size 2 1/2 in. Sensitivity 1000 O.P.V. on both A.C. and D.C. volts, 0-15, 0-150, 0-1000. D.C. current 0-150mA. Resistance 0-100kΩ. Complete with test leads, battery and full instructions, 42/6. P. & P. 3/6. **FREE GIFT** for limited period only. 30 watt Electric Soldering Iron value 15/- to every purchaser of the Pocket Multi-Meter.

600 mW SOLID STATE 4-TRANSISTOR AMPLIFIER

Features NPN and PNP Complementary Symmetrical Output Stage. The elimination of transformer ensures maximum efficiency and frequency response. Automatic heat compensation. Combined AC/DC feed back. Class B output stage, i.e. output power is proportional to total current consumption, this ensures long battery life. Under no signal condition (I_Q) current drain is approx. 12mA at 9 volts (4mA in the output pair). Printed circuit construction, size 2 1/2 x 1 1/4 x 1 1/4 in. Speaker output impedance 12 ohms. Output power 600mW at 5% distortion, 400mW at 2.5% distortion, 750mW at 10% distortion. Supply 9 volts. Total current consumption at a reasonable listening level approx. 35-40mA at full power (speech and music), average 45mA. Sensitivity for 50mW output is 10mV. Frequency response—3dB points 90c/s and 12Kc/s. Price 15/-, plus 1/- P. & P.

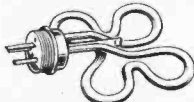
8-watt 4-valve PUSH-PULL AMPLIFIER & METAL RECTIFIER

Size: 9" x 6" x 1 1/4". A.C. Mains, 200-250V 4 valves. For use with Std. or L.P. records, musical instruments, all makes of pick-ups and mikes. Output 8 watts at 5 per cent of total distortion. Separate bass and treble lift control. Two inputs, with controls for gram. and mike. Output transformer tapped for 3 and 15 ohm speech coils. Built and tested, £4.4.0. P. & P. 11/-, 8" x 5" speaker to suit price 14/6 plus 1/6 P. & P. Crystal mike to suit 12/6 plus 1/6 P. & P.



GEC KETTLE ELEMENT

3,000W WITH AUTOMATIC EJECTION 200/240 v. Size of hole required 1 1/8". List Price 32/-. Our PRICE 15/- P. & P. 1/6.



RADIO & TV COMPONENTS (Acton) LTD

21c High Street, Acton, London, W3

Shop Hours 9 a.m.—6 p.m. Early Closing Wednesday

Goods not despatched outside U.K. Terms C.W.O.

All enquiries Stamped Addressed Envelope

Also at 323 EDGWARE ROAD, LONDON, W.2. Personal shoppers only. Early Closing Thursday. All orders by post to our Acton address.

8 VALVE STEREO RADIOGRAM CHASSIS

3-4 watts per channel.

By famous manufacturer

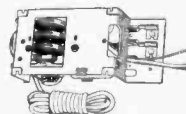
Superb new 8-valve chassis covering long, medium and short waves on AM, also VHF transmissions on FM. AM circuit's high sensitivity permits internal aerial for most stations. Well-known Gortler tuning heart in separate FM input. Tone and volume controls. Extra large illuminated dial. External AM and FM aerial inputs. Gram. pick-up socket. Standard 3 ohm speaker. 200/250 volts A.C. Size 17 x 7 x 5 1/4 in. deep.

£14.14.0

P. & P. £1

TRANSISTORISED 1 1/2 WATT AMPLIFIER

comprising Mullard 2AC128, 20C75 and 2AA129 separate bass and treble volume controls. Complete with Power Supply AC mains 240 v. Size 7 1/2 x 3 1/2 x 2". Price 50/- plus 2/6 P. & P.

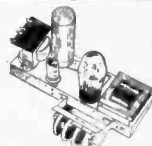


ANTI-THIEF CAR BURGLAR ALARM

The Melguard Safermatic consists of an electrical device housed in small metal box 4" x 2" x 1 1/4", which has been designed and developed to provide protection required by the average motorist at an economic cost. Using this system, an alarm and the immobilised condition is set automatically as soon as you park the car. Should you leave the key in the ignition, no one but you can drive the car away. Upon entering the vehicle the method of starting the car is by switching on the ignition, depressing two hidden switches and simultaneously operating the starter. Location of the switches is known only to you. Should the alarm be set off it can be stopped by following the normal starting procedure. For 12v. operation. List price 79/6, our price 29/6 plus 2/6 P. & P. Full easy-to-follow instructions supplied.

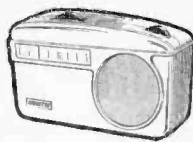
3 to 4 Watt AMPLIFIER

3-4 watt Amplifier built and tested. Chassis size 7 x 3 1/2 x 1 in. Separate bass, treble and volume control. Double wound mains transformer, metal rectifier and output transformer for 3 ohm speaker. Valves EOC81 and 6V6. £2.5.0 plus 5/6 p. & p. The above in Kit Form, £1.14.6 plus 5/6 p. & p.



"MUSETTE" 6-Transistor Superhet Portable Radio

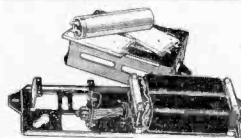
★ 2 1/2" Speaker. ★ 6 Transistor Superhet Output 200mW. ★ Plastic Cabinet in red, size 4 1/2 x 3 x 1 1/4" and gold speaker grille. ★ Horizontal Tuning Scale. ★ Ferrite Rod Internal Aerial. ★ IF 460 kc/s. ★ All components Ferrite Rod and Tuning Assembly mounted on printed board. ★ Operated from PP3 Battery. ★ Fully comprehensive instructions and point-to-point wiring diagram. ★ Printed Circuit Board. ★ Tunable over medium and long waveband. ★ Car aerial and earpiece socket.



Price 39/6, inc. carrying strap. Circuit Diagram 2/6 free with parts. P. & P. 3/6.

NEW TRANSISTORISED SIGNAL GENERATOR

Size 5 1/2 x 3 1/2 x 1 1/2 in. For IF and RF alignment and AF output 700 o/s frequency coverage 460 kc/s to 2 mc/s in switched frequencies. Ideal for alignment to our Elegant Seven and Musette. Built and tested. 39/6 P. & P. 3/6.



POWER SUPPLY KIT A.C. MAINS 200-250 V

Incorporating "C" core type mains transformer, full wave metal rectification and smoothing condenser. Smooth output 250 v. 250mA and 6.3v. 4 amp. for Heaters. 25/- P. & P. 0/6.

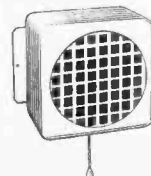


FIRST QUALITY P.V.C. TAPE

5 1/2" Std.	850ft.	9/-	5" L.P.	850ft.	10/6
7" Std.	1200ft.	11/6	3" T.P.	600ft.	10/6
3" L.P.	240ft.	4/-	5" T.P.	1800ft.	25/6
5 1/2" L.P.	1200ft.	11/6	5 1/2" T.P.	2400ft.	32/6
7" L.P.	1800ft.	18/6	7" T.P.	3600ft.	42/6
5 1/2" D.P.	1800ft.	18/6	4" T.P.	900ft.	15/-

P. & P. on each 1/6, 4 or more post free

EXTRACTOR FAN



AC Mains 230/250 v. complete with pull switch. Size 6" x 6" x 4". Price 27/6 plus 5/- P. & P.

GEC DOORBELL

Complete with mains transformer 240 v. AC & bell push. Price 12/6 plus 5/6 P. & P.



Elegant Seven Mk II A COMBINED PORTABLE and CAR RADIO

SPECIAL OFFER

Buy yourself an easy to build 7 transistor radio and save at least £10.0.0. Now you can build this superb transistor superhet radio for under £4.10.0. No one else can offer such a fantastic radio with so many de luxe star features.

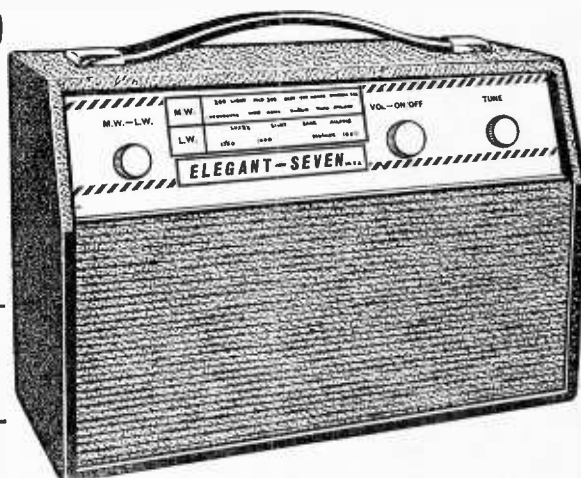
- ★ De luxe grey wooden cabinet size 12½" x 8½" x 3½".
- ★ Horizontal easy to read tuning scale printed grey with black letters, size 11½" x 2".
- ★ High 'Q' ferrite rod aerial.
- ★ I.F. neutralization on each separate stage.
- ★ D.C. coupled push pull output stage with separate A.C. negative feedback.
- ★ Room filling output 350mW.
- ★ Ready etched and drilled printed circuit board back printed for fool proof construction.
- ★ Fully comprehensive instructions and point-to-point wiring diagrams.
- ★ Car aerial socket.
- ★ Fully tunable over medium and long wave. 168-535 metres and 1250-2000 metres.
- ★ All components ferrite rod and tuning assembly mount on printed board.
- ★ 5" P.M. speaker.
- ★ Parts list and circuit diagram 2s. 6d. free with parts.

ONLY £4.4.0

Plus 7/6 P. & P. Parts List and circuit diagram 2/6 FREE with parts.

POWER SUPPLY KIT

To purchasers of 'Elegant Seven' parts, incorporating mains transformer, rectifier and smoothing condenser. A.C. mains 200/250 volts. Output 9v 100mA. 7/6 extra.



RADIO & TV COMPONENTS (ACTON) LTD.

All orders by post to be sent to our Acton address

323 EDGWARE ROAD, LONDON, W2

Personal shoppers only. Early closing Thursday.

21C HIGH STREET, ACTON, LONDON, W3

OPEN 9 a.m.—6 p.m. INCLUDING SATS. EARLY CLOSING WED.
GOODS NOT DESPATCHED OUTSIDE U.K. TERMS C.W.O.

All enquiries stamped addressed envelope

THE PEMBRIDGE COLLEGE OF ELECTRONICS FOR TRAINING IN RADIO AND TELEVISION

FULL-TIME COLLEGE COURSE IN RADIO AND TELEVISION

Our Course, of sixteen months' duration, provides a fundamental training for radio and television engineers. It includes theoretical and practical instruction on transistor television receivers, U.H.F. television receivers and colour television.

Exactly half the time is spent on practical work and the course provides excellent practical experience on valve and transistor radio receivers and high-fidelity equipment and all well known makes of television receivers.

The Course is recognised by the Radio Trades Examination Board (R.T.E.B.) for the Radio and Television Servicing Certificate examinations.

Next Course commences 5th September, 1967.

To: **The Pembridge College of Electronics (Dept. P11)**

34a Hereford Road, London, W.2.

Please send, without obligation, details of the Full-time Course in Radio and Television.

Name _____

Address _____

CMP 5

BRADFORD Tel. 25349
10 North Parade. (Half-day Wed.)

BRISTOL 14 Lower Castle
St. (Half-day Wed.) Tel. 22904

BIRMINGHAM 30/31 Gt.
Western Arcade, opp. Snow Hill
Station, CENTRAL 1279. No half-day

DERBY 26 Osmaston Rd.,
The Spot (Half-day Wed.)
Tel. 41361

DARLINGTON 13 Post
House Wynd (Half-day Wed.)

EDINBURGH 133 Leith
Street (Half-day Wed.)
Tel. Waverley 5766

GLASGOW 326 Argyle St
(No half-day) Tel. CITY4158

HULL 91 Paragon Street
(Half-day Thursday) Tel. 20505

R.S.C.
HI-FI CENTRES LTD.

MAIL ORDERS TO: 102
Henconner Lane, Bramley,
Leeds 13. No C.O.D. under
£1. Terms C.W.O. or C.O.D.
Postage 4/6 extra under £2.
5/9 extra under £5. Trade
supplied. S.A.E. with enquiries
please.

LEICESTER 32 High Street
(Half-day Thurs.) Tel.: 56420

LEEDS 5-7 County (Mecca)
Arcade, Briggate (No half-day)
Tel. 28252

LIVERPOOL 73 Dale St.
(No half-day) Tel. CENTRAL 3573

LONDON 238 Edgware Road,
W2 (London Thurs.) Tel. PAD
1629. 96 High Holborn, WC1
Tel. HOL 9874 (Half-day Sat.)

MANCHESTER (No half-
day) 60A-60B Oldham St.
Tel. CENTRAL 2778

MIDDLESBROUGH
106 Newport Road (Half-day
Wednesday) Tel. 47096

NEWCASTLE UPON TYNE
41 Blackett Street Opp Fenwicks
Store (Half-day Wed.) Tel. 21469

SHEFFIELD 13 Exchange
Street, Castle Market Bldgs.
(Half-day Thursday) Tel. 20716



AUDIOTRINE PLINTHS

for Record Playing units.
Teak finish cut for Garrard
1000, 2000, 3000, A76 Mk 2,
A760, SP25 or Goldring
GL68. Available with clear
Perspex cover as illustrated
£5.18.11. complete.

RECORD PLAYING UNITS All types available
on Credit Terms.
Ready for plugging in to Amplifier or Tape Recorder.
RP2 Consisting of Garrard SP25 fitted Goldring
CS90 high compliance ceramic Stereo/Mono
ctgrs with dmnst stylus, above Only **19½ Gns.**
plinth & cover. Normally £25. Carr. 15/-
RP3 As above but with Goldring Lenco GL68 Trans-
cription unit and CS90 Cartridge. **26½ Gns.**
Normally over £33. Carr. 15/- ONLY
RP3M with Pickering Magnetic Cart- **34½ Gns.**
ridge

RSC TAG 6 WATT HIGH FIDELITY TRANSISTORISED AMPLIFIER

SOLID STATE CONSTRUCTION

200-250v. AC mains operated
Frequency Response 30-
20,000 cps ±2dB. Harmonic
Distortion 0.3% at 1000 cps.
Separate Bass and Treble
'lift' and 'cut' controls. 3
input sockets for Mike, Gram. Radio or
Tape. Input Selector Switch. Output for
3-15 ohm speakers. Max Sensitivity 5mV.
Fully enclosed enamelled case. 91 x 21 x
5 1/2 ins. Attractive brushed silver face plate
10 1/2 x 3 1/2 ins. and matching knobs. Complete
kit of parts with full wiring diagrams
and instructions. Carr. 7/6
Or factory built with 12 mths.
guarantee £7.10.11.

**AUDIOTRINE HIGH FIDELITY
SPEAKER SYSTEMS**
Consisting of matched 12in.
12,000 line, 15 ohm high quality
speaker, cross-over unit and
Tweeter. Smooth response
and extended frequency range
ensure surprisingly realistic
reproduction. Standard 10
watt rating. Orion 20 watt
inc. Fane 12/10 speaker
7 Gns. Carr. 8/9.
Tweeters R.A. 3 ohm or 15 ohm 25/9

HI-FI CATALOGUE AVAILABLE 4/6.
Personal shoppers welcome. Open all day
Sats. except High Holborn branch.

**ALL LEADING MAKES OF HI-FI
EQUIPMENT STOCKED Cash or Terms**
Full range Hi-Fi Furniture

HI-FI LOUDSPEAKER ENCLOSURES

All types of pleasing modern design
acoustically lined and ported and
beautifully finished. High Teak or
Walnut veneer. Credit terms available
JES. Size 20 x 11 x 8in. Gives **£4.19.9**
pleasing results with any 8in.
Hi-Fi speaker. Carr. 7/6

SE8. For optimum performance
with any Hi-Fi 8in.
speaker. Size 22 x 11 x 8in.
15 x 9in. Carr. 7/6 **£5.19.9**
SE10. For 10in. Hi-Fi Speaker
with provision for tweeter.
Size 24 x 15 x 10in. **£6.19.9**
Carr. 10/-
SE12. For outstanding performance with
any 12in. Hi-Fi speaker. Cut **8 Gns.**
for tweeter. Size 25 x 16 x 10in. Carr. 10/-

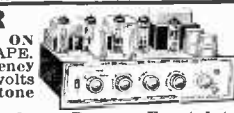
**NEW RANGE OF LINEAR
HI-FI AMPLIFIERS IN STOCK**



R.S.C. STEREO/TEN HIGH QUALITY AMPLIFIER
A complete set of parts for the construction of a unit giving 5 watts high quality
output on each channel (total 10 watts). Sensitivity is 50 millivolts. Suitable
all crystal or ceramic stereo heads. Ganged Bass and Treble Controls. Provision
is made for use as straight (monaural) 10 watt amplifier. Valve line-up ECC83,
ECC83, EL84, EL84, EZ81. Outputs for 2-3 ohm speakers. Point to point wiring
diagrams and instructions supplied. Send S.A.E. for leaflet.
Or supplied factory assembled with 12 months' guarantee for **11 Gns. £8.15.0**
Terms: Dep. 39/- and 9 monthly payments 25/5 (Total £18.4.0). Carr. 11/6

R.S.C. STEREO/20 HIGH FIDELITY AMPLIFIER

PROVIDING 10/14 WATT ULTRA LINEAR PUSH-PULL OUTPUT ON
EACH CHANNEL. SUITABLE FOR "MIKE", GRAM, RADIO OR TAPE.
Employing valves ECC83, ECC83, ECL86, ECL86, ECL86, EZ81. Frequency
Response: ±2dB 30-20,000 c.p.s. Hum Level: 65dB down. Sensitivity: 5 millivolts
maximum. Harmonic Distortion: (each channel): 0.2%. ★Four-position tone
compensation and Input Selector Switch. ★Stereo/Mono switch.
★Will amplify direct from Tape Heads. ★Neon panel indicator. ★Handsome Perspex Frontplate
★Separate Bass "Lift" and "Cut" and treble "Lift" and "Cut" controls. Output transformers are high-
quality sectionally wound to required specification. Output matching for 3 and 15 ohm spkrs
on each channel. Complete set of parts. point-to-point wiring diagrams and instructions.
Or factory assembled, tested and supplied with our usual 12 months guarantee. **19 Gns.**
Or Deposit £3 and 9 monthly payments 43/2 (Total £22.4.0). Send S.A.E. for leaflet. Carr. 12/6



14 Gns.

R.S.C. TFM1 TRANSISTORISED VHF/FM RADIO TUNER

Total cost of parts
with detailed wiring
diagrams and instructions.
Carr. 10/- **12½ Gns.**
Or factory built
15½ Gns. Or in Teak
finished cabinet as
illustrated 19½ Gns.
Terms: Deposit £5
and 9 monthly pay-
ments 39/-
Total £22.11.0

★ High-sensitivity ★ 200-250v. A.C. Mains
operation. ★ Sharp A.M. Rejection.
★ Drift-free reception. ★ Output ample
for any amplifier (approx. 500 m.w.).
★ Simple alignment instructions. ★ Output
available for feeding tuning meter.
★ Output for feeding Stereo Multiplexer.
★ Tuner head using Silicon Planar Tran-
sistors. ★ Designed for standard 80 ohm co-axial input.
Made to visually match our Super 15 and 30 amplifiers and of the same high
standard of performance and reliability. The pre-wired tuning head facili-
tates speed and simplicity of construction. Printed circuitry. Only first grade
transistors and components used. Our latest product giving you the best at
half the cost of comparable units. Stereo version available.

AUDIOTRINE HIGH FIDELITY LOUDSPEAKERS

Heavy cast
construction.
Latest high efficiency ceramic magnets.
Dual Cone for extended frequency range.
Plastic treated surround giving low
fundamental resonance. Res-
ponse 40-18,000 c.p.s., Impedance
3 or 15 ohms. Post free.

HF8HD 8in. 10 watt **£4.19.9**
HF10D 10in. 12 watt **£5.15.0**
HF100D 10in. 15 watt **8 Gns.**
HF12X 12in. 12 watt **£4.15.0**
HF12D 12in. 20 watt **£6.15.0**
HF12TD 12in. 30 watt **9 Gns.**

R.S.C. SUPER 15 HI-FI AMPLIFIER

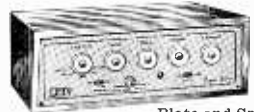
FULLY TRANSISTORISED 200/250v. A.C. Mains.
OUTPUT 15 WATTS R.M.S. cont. into 15 ohms.
15 WATTS R.M.S. cont. into 3-4 ohms.
Maximum instantaneous Peak power output 28 watts.
SOLID STATE CONSTRUCTION.
LATEST MULLARD TRANSISTORS. AD149, AD149,
OC127Z, OC81Z, OC44, OC44, OC81Z, OC44, AC107.
5 POSITION INPUT SELECTOR SWITCH
EQUALISATION to Standard R.I.A.A. and C.C.I.R.
Characteristics for Gram and Tape Head.
FULL TAPE MONITORING FACILITIES.
SENSITIVITIES: Magnetic P.U. 4 mV. Crystal or
Ceramic P.U. 400 mV. Microphone 4.5 mV. Tape Head
2.5mV. Radio/Aux or Ceramic P.U. 110 mV.
FREQUENCY RESPONSE: ±2dB 30-20,000 c.p.s.
TREBLE CONTROL: 15dB to -14dB 10 Kc/s.
BASS CONTROL: ±12dB to -15dB at 50 c/s. HUM LEVEL: -75dB.
HARMONIC DISTORTION at 10 Watts R.M.S. 1,700 c.p.s. 0.25%.
NEGATIVE FEEDBACK: 52dB.
Complete Kit of parts with full constructional details and
point to point wiring diagrams. Carr. 12/6
Supplied factory built 15½ Gns. Carr. 12/6. Terms: Deposit 49/- and 9
monthly payments 35/- (Total £18.4.0). Or fitted in beautiful walnut or
Teak veneered cabinet as illustrated, 4 Gns. extra.
ALL COMPONENTS ETC. ARE OF A HIGH STANDARD AND
SUPPLIED BY LEADING BRITISH MANUFACTURERS.

R.S.C. SUPER 30 STEREO AMPLIFIER

TECHNICAL
SPECIFICATIONS COMPARE MORE
THAN FAVOURABLY WITH SIMILAR
AMPLIFIERS AT TWICE THE COST

A DUAL CHANNEL VERSION OF THE SUPER
15. Employing Twin Printed Circuits. Close Tolerance
Ganged Pots. Matched Components.
CROSS TALK: -52dB at 1,000 c.p.s.
CONTROLS: 5 position Input Selector, Bass Control,
Treble Control, Volume Control, Balance Control, Stereo/
Mono Switch, Tape Monitor Switch, Mains Switch.
INPUT SOCKETS: (Matched Pairs): (1) Magnetic P.U.
(2) Ceramic or Crystal P.U. (3) Radio/Aux. (4) Tape Head/
Microphone. Operation of the Input Selector Switch
assures appropriate equalisation.
Rigid 18 s.w.g. Chassis. Size approx. 12in. Wide, 3in. High
and 8in. Deep. Neon Panel Indicator. Attractive Facia
and Ganging and Balance Control. apply also to Super 15.

THESE UNITS ARE EMINENTLY SUITABLE FOR USE WITH
ANY MAKE OF PICK-UP OR MICROPHONE (Crystal, Ceramic,
Magnetic, Moving Coil, Ribbon) CURRENTLY AVAILABLE.
SUPERB SOUND OUTPUT QUALITY CAN BE OBTAINED BY
USING WITH FIRST RATE ANCILLARY
EQUIPMENT. All required parts, point to point wiring
diagrams and detailed instructions. Carr. 15/-
Unit factory built 26½ Gns. or deposit £39/9 and 9 monthly payments 59/3.
(Total £34.17.0). Or in Teak cabinet as Super 15 30 Gns. Carr. 15/- or Deposit
£4.15.6 and 9 monthly payments 67/- (Total £34.18.6). Send S.A.E. for leaflet



11½ Gns.

LONDON-NEWCASTLE-GLASGOW

New branches now open—see addresses

AUDIOTRINE HI-FI TAPE RECORDER KIT

REALISM AT INCREDIBLY LOW COST: CAN BE ASSEMBLED IN AN HOUR.

Incorporating the latest Magnavox Tape Deck. The Audio Line High Quality Tape Amplifier with switched equalisation for each of 3 speeds. High Flux P.M. Speaker, empty Tape Spool, a Reel of Best Quality Tape and a handsome Portable Cabinet of latest styling finished dark grey leathercloth. Size 14 1/2 x 17 x 8 1/2 in. and circuit. Purchased separately would total approx. £34. Performance equal to units in the £50-£60 class. 4 gns. and 9 mthly paymts 59/6 (Total 291 gns.). 4 Track Model 3 gns. extra. Carr. 19/6



26 1/2 Gns.

LINEAR TAPE PRE-AMPLIFIER. Type LP/1 Switched Equalisation. Positions for Recording at 1 1/2 in., 3 1/2 in., 7 1/2 in. per sec. and Playback. EM84 Recording Level Indicator. Designed primarily as the link between a Magnavox Tape Deck and Hi-Fi amplifier suitable most Tape Decks. Terms available. 10 1/2 Gns.

R.S.C. 4/5 watt A5 HIGH GAIN AMPLIFIER

A highly-sensitive 4-valve quality amplifier for the home, small club, etc. Suitable for all crystal or ceramic P.U. heads and practically all "mikes". Separate Bass and Treble controls giving "lift" and "cut". Hum level 70dB down. Negative Feedback 15dB. Reserve power supply 300v 25 ma., 6.3v. 1.5a. for Radio Tuner or Tape Pre-amp. For A.C. mains 200-250v. Speaker output 3 ohms. Complete in every detail with fully punched enamelled chassis, point-to-point wiring diagrams and instructions. Or assembled ready for use 6 gns. plus 5/9 carr. £4.17.9



TAPE AMPLIFIERS 4-5 Watts output 200-250v. Mains A.C. Suitable for use with Magnavox 363 Decks. Switched equalisation. Originally 13 Gns. £6.19.11

R.S.C. A10 30 WATT ULTRA LINEAR HI-FI AMPLIFIER

Highly sensitive. Push-Pull high output, with Pre-amp./Tone Control Stages. Performance figures equal to most expensive amplifiers available. Hum level -60dB. Frequency response +3dB 30-20,000c/s. Specially designed sectionally wound ultra linear output transformer with 807 output valves. All first grade components. Valves EF86, EF86, ECC83, 807, 807, GZ34. Separate Bass and Treble Controls. Sensitivity 12 millivolts so that any kind of Microphone or Pick-up is suitable. Designed for Clubs, Schools, Bars, Halls, Dance Halls or Outdoor Functions, etc. For use with Electronic Organ, Guitar, String Bass, etc. Gram. Radio or Tape. Reserve L.T. and H.T. for Radio Tuner. Two inputs with associated volume controls so that two separate inputs such as Gram and "Mike" can be mixed. 200-250v. 50c/s A.C. mains. For 3 and 15 ohm speakers. Complete kit of parts fully punched chassis, point-to-point wiring diagrams and instructions. Supplied factory built with EL34 output valves. 12 months guarantee for 15 Gns. If required perforated cover with carrying handles can be supplied for 21/-, Send s.a.e. for leaflet. TERMS: Deposit 48/- and 9 monthly payments of 33/7 (Total £17.10.3)



LOUDSPEAKER CORNER CONSOLE CABINETS Attractive design With polished Model M for 10" speaker 59/11 Model S for 12" speaker and 5 Gns. walnut finish. Size 28 x 19 x 12 in. tweeter. Size 31 1/2 x 22 1/2 x 14 in.

R.S.C. A11 HIGH FIDELITY 12-14 WATT AMPLIFIER

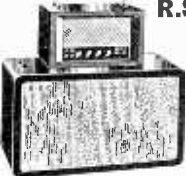
PUSH-PULL ULTRA LINEAR OUTPUT "BUILT-IN" TONE CONTROL PRE-AMP Two input sockets with associated controls allow mixing of "mike" and gram, etc., etc. High sensitivity. Valves ECC83, ECC83, EL84, EL84, EZ81. High quality sectionally wound output transformer specially designed for Ultra Linear operation and reliable small condensers of current manufacture. INDIVIDUAL CONTROLS FOR BASS AND TREBLE. Frequency response +3dB 30-20,000c/s. Six negative feedback loops. Hum level -60dB. SENSITIVITY 23 millivolts. Suitable for Crystal or Ceramic P.U.s. all types "mikes". Comparable with the very best designs. For Musical Instruments such as String Bass, Electronic Guitars, etc. Reserve Power provides 300v. 30mA. and 250v. 50 c.p.s. Output for 4 and 15 ohm speakers. Kit complete to last nut. Chassis fully punched. Full instructions and point-to-point wiring diagrams (or factory built £11.15.0). Metal cover with 2 handles available for 21/-. TERMS ON Carr. 11/6 ASSEMBLY UNITS. Deposit £3.15 and 9 monthly payments of 25/9 (Total £13.8.3). Send S.A.E. for illustrated leaflet of Cabinets, Speakers, Mikes, etc.



such as String Bass, Electronic Guitars, etc. Reserve Power provides 300v. 30mA. and 250v. 50 c.p.s. Output for 4 and 15 ohm speakers. Kit complete to last nut. Chassis fully punched. Full instructions and point-to-point wiring diagrams (or factory built £11.15.0). Metal cover with 2 handles available for 21/-. TERMS ON Carr. 11/6 ASSEMBLY UNITS. Deposit £3.15 and 9 monthly payments of 25/9 (Total £13.8.3). Send S.A.E. for illustrated leaflet of Cabinets, Speakers, Mikes, etc.

R.S.C. BASS-REGENT 50 WATT AMPLIFIER

AN EXCEPTIONALLY POWERFUL HIGH QUALITY ALL-PURPOSE UNIT For lead, rhythm, bass guitar and all other musical instruments. For vocalists, gram, radio, tape, and general public address. ★ **UNUSUALLY POWERFUL LOUDSPEAKER COMBINATION** consisting of a FANE HIGH FLUX 12 in. 30 watt unit PLUS a FANE 12 in. 20 watt unit with extended frequency response. ★ 4 Jack Inputs and two Volume Controls for simultaneous use of up to 4 pick-ups or "mikes". ★ Cabinets covered in two-tone Rexine/Vynair with gold trimming. Fitted carrying handles. ★ Separate Bass and Treble Controls giving "lift" and "cut".



49 1/2 Gns. Send S.A.E. for leaflet. Or call at one of our many branches and compare the Bass-Regent with units at three times the cost. Carr. 30/- Or deposit £7.17.6 and 9 monthly payments of £5.10.10. (Total £55 gns.)

B20 MULTI-PURPOSE AMPLIFIER especially suitable for Bass Guitar

Incorporating massive 15 in. high flux loudspeaker. Rating 25 watts. Individual bass and treble controls. Two jack inputs separately controlled. Substantial cabinet attractively finished in Rexine and Vynair. Size approx. 24 x 21 x 11 in. Send S.A.E. for leaflet. 29 1/2 Gns. Or Deposit £4.14.6 and 9 monthly payments of 66/- (Total £34.8.6). Carr. 17/6



G80 80 WATT AMPLIFIER

2 Channels, 6 inputs. Tremolo, 2 Columns and 1 Bass Speaker unit with two 15 in. H.D. Speakers. 99 Gns. Carr. £3

R.S.C. BATTERY/MAINS CONVERSION UNITS

Type BM1. An all-dry battery eliminator. Size 5 1/2 x 4 1/2 x 2 in. approx. Completely replaces battery supply in portable units. Operating 1.5v. and 90v. where A.C. mains 200/250v. 50c/s is available. Complete kit with diagram 47/9 or ready for use 59/11.



G15 15 WATT AMPLIFIER for Lead or Rhythm Guitar, Vocal Groups, etc.

High-fidelity output. Separate bass and treble controls. Twin separately controlled inputs so that two instruments or "mike" and pick-ups can be used at the same time. Heavy Duty 12 in. 20 watt Speaker. Cabinet covered in attractive Rexine/Vynair. Size 18 x 18 x 8 in. Deposit 3 gns. 19 1/2 Gns. Carr. 15/- (Total £22.15.3). S.A.E. for leaflet.

SELENIUM RECTIFIERS F.W. (Bridged)

All 6/12v. D.C. output. Max. A.C. input 18v. 1a. 3/11. 2a. 6/11. 3a. 9/8. 4a. 12/9. 6a. 15/9.

HEAVY DUTY SELENIUM RECTIFIERS 19/9

12v. 15 amps. F.W. (Bridged). Only

POWER PACK KIT

Consisting of Mains transformer. Metal Rectifier. Electrolytics, smoothing choke, chassis and circuit. 200/250v. A.C. mains. Output 250v. 60mA 6.3v. 2a. Supplied with case in lieu of chassis 26/11. Or assembled 39/11.

R.S.C. COLUMN SPEAKERS

Covered in two-tone Rexine/Vynair, ideal for vocalists and public address. 15 ohm matching. Type CS8, 15-20 watts. Fitted five 8 in. high flux speakers. Overall size approx. 42 x 10 x 5 in. Or deposit 44/- and 9 monthly paymts 34/9 (Total £18.1.6) Carr. 10/- Type CS2, 40 watts. Fitted four 12 in. 12,000 line 10 watt speakers. Overall size approx. 56 x 14 x 9 in. approx. Carr. 15/- Or Deposit £23.13.0 and 9 monthly payments of 50/- (Total £26.3.0).



30 WATT HI-FI AMPLIFIER

for Guitar, Vocal or Instrumental Group

A 4 Input, 2 volume control Hi-Fi unit with Separate Bass and Treble controls. Latest valves. Strong Rexine covered cabinet with carrying handles. Attractive black/gold perspex fascia. For 200-250v. A.C. mains. For 3 or 15 ohm speaker. 17 Gns. Carr. 12/6 for leaflet. Deposit £3 and 9 monthly payments of 37/5 (Total £19.16.9).



12 in. HIGH QUALITY L'SPEAKERS

In teak veneered cabinets. 10 Watt Model. Gauss 12,000 lines. 3 or 15 ohms. Carr. 7/6 5 Gns. 20 Watt Model. 15 ohm. Size 18x18x10 in. Gauss 12,000 lines. Rexine covered £1 extra. Carr. 10/6 8 Gns. Terms available on both.



FANE HEAVY DUTY HI-FI SPEAKERS

122/10A Dual Cone. 12 in. 20 watt. 15 ohms. Frequency range 40 to 18,000 c.p.s. Carr. 5/9 £5.11.9

LOUDSPEAKERS

Limited number at fraction of list price in ohms impedance. Brand new, guaranteed. Terms available. 12 in. HEAVY DUTY 30 watts £27.18.9 Normally Carr. 10/- 13 approx. 15 in. EXTRA HEAVY DUTY 40 watts £12 Gns. Carr. 15/- Massive units. Gauss 17,000 lines. Usually app. £18.

HIGH FIDELITY 12 in. 10 WATT SPEAKERS 59/11

Flux Density 12,000 lines. Impedance 3 or 15 ohms

R.S.C. GRAM AMPLIFIER KIT. 4 watts output. Feedback. Controls: Vol., Tone and Switch. Mains operation 200-250v. A.C. Fully isolated chassis. Circuit, etc. supplied. Only 49/11.

TRANSISTOR SALE Mullard OC71, OC72, OC81, 2/11, OC44, OC45, 3/11, OC75, 7/9. AF117 6/9. Post 6d. for 3.

JASON VHF/FM TUNER

Complete kit with valves. £6.19.11

MOVING COIL AMMETERS

Sangamo thermo-couple type 0-3.5a. Dia. 2 in. Each 8/9

R.S.C. MAINS TRANSFORMERS

FULLY GUARANTEED. Interleaved and Impregnated. Primaries 200-250v. 50c/s. Screened. MIDGET CLAMPED TYPE 2 1/2 x 2 1/2 in. 250v., 60mA, 6.3v. 2a. 14/11 250-250v., 60mA, 6.3v. 2a. 15/11 **FULLY SHROUDED UPRIGHT TYPE** 250-250v., 60mA, 6.3v. 2a. 0-5-6.3v. 2a. 19/9 250-250v., 100mA, 6.3v. 4a. 0-5-6.3v. 3a. 33/9 300-300v., 100mA, 6.3v. 4a. 0-5-6.3v. 3a. 33/9 300-300v., 130mA, 6.3v. 4a. c.t., 6.3v. 1a. For Mullard 510 Amplifier. 41/9 350-350v., 100mA, 6.3v. 4a. 0-5-6.3v. 3a. 32/9 350-350v., 150mA, 6.3v. 4a. 0-5-6.3v. 3a. 42/9 425-425v., 200mA, 6.3v. 4a. c.t., 5v. 3a. 87/9 425-425v., 200mA, 6.3v. 4a. 6.3v. 4a. 5v. 3a. 79/9 450-450v., 250mA, 6.3v. 4a. c.t., 5v. 3a. **TOP SHROUDED DROP-THROUGH TYPE** 250-250v., 70mA, 6.3v. 2a. 0-5-6.3v. 2a. 19/9 250-250v., 100mA, 6.3v. 3.5a. 21/9 250-250v., 100mA, 6.3v. 2a. 6.3v. 1a. 22/9 350-350v., 80mA, 6.3v. 2a. 0-5-6.3v. 2a. 23/9 250-250v., 100mA, 6.3v. 4a. 0-5-6.3v. 3a. 32/9 300-300v., 100mA, 6.3v. 4a. 0-5-6.3v. 3a. 33/9 300-300v., 130mA, 6.3v. 4a. 0-5-6.3v. 1a. Suitable for Mullard 510 Amplifier. 39/9 350-350v., 100mA, 6.3v. 4a. 0-5-6.3v. 3a. 32/9 350-350v., 150mA, 6.3v. 4a. 0-5-6.3v. 3a. 42/9 **FLATIRON or TRANSISTOR POWER PACK TYPE** 6.3v. 1.5a 6/9, 6.3v. 2a 7/9, 6.3v. 3a 9/9, 6.3v. 6a 19/9. 12v. 1a 8/9, 12v. 3a or 27v. 1.5a 19/9, 0-18-18v. 1a. 15/9. 0-12-25-42v. 2a 27/9. **CHARACTER TRANSFORMERS** 0-9-15v. 11a. 13/11 12a, 16/11, 3a, 18/11, 5a, 21/11, 6a, 25/11, 8a, 31/11 **AUTO (Step Up/Step Down) TRANSFORMERS** 0-110/120v.-200-230-250v. 30-80 watts, 14/9 150 watts, 29/11, 250 watts, 49/9, 500 watts, 99/9 **OUTPUT TRANSFORMERS** Standard Pentode 5,000 Ω or 7,000 Ω to 3 Ω 7/9 Push-Pull 8 watts EL84 to 3 Ω or 15 Ω 11/9 Push-Pull 10 watts 6V6 ECL86 to 3, 5, 8 or 15 Ω 21/9 Push-Pull EL84 to 3 or 15 Ω 10-12 watts, 28/9 Push-Pull Ultra Linear for Mullard 510, etc. 35/9 Push-Pull 15-18 watts, sectionally wound 6L6, KT66, etc., for 3 or 15 Ω 29/9 Push-Pull 20 watt high quality sectionally wound, EL34, 6L6, KT66, etc., to 3 or 15 Ω fully shrouded. 55/9 **SMOOTHING CHOKE** 150mA, 7-10H, 250 Ω 12/9. 100mA, 10H, 200 Ω 9/11. 80mA, 10H, 350 Ω 7/9. 60mA, 10H, 400 Ω 4/11.



Litesold

SOLDERING INSTRUMENTS

*With re-styled
moulded nylon handles*

- SEVEN SIZES, FROM 10 WATTS TO 55 WATTS
- REPLACEABLE BITS, COPPER & PERMATIP
- EXCELLENT TEMPERATURE REGULATION
- COOL, UNBREAKABLE HANDLE
- RAPID HEATING
- SIMPLE SERVICING
- LOW COST
- ALL VOLTAGES

BITLOOS anti-seize compound really does prevent bits sticking available in 2-oz. tubes

PLEASE ASK FOR NEW COLOUR CATALOGUE

LIGHT SOLDERING DEVELOPMENTS LTD

28 Sydenham Road, Croydon, CR9 2LL
Telephone: 01-688-8589 & 4559



NEW MART

Dept PW6
30/32, SHUDEHILL MANCHESTER 4.
Telephone: (061) 832 7710

FREE GIFT OFFER

OF A BRAND NEW WORLD FAMOUS E.M.I. FISK SOLARSCOPE VALUE £22 00 WITH EVERY ORDER VALUE 25 AND OVER. THIS UNIQUE INSTRUMENT WHICH IS A BOON TO SHORT WAVE LISTENERS CLEARLY SHOWS THE AREAS OF DAYLIGHT AND DARKNESS ALL OVER THE EARTH AT ANY GIVEN HOUR.

MINI-MOTORS 3V to 4.5V operation. Ideal for mini-racing cars, toys "Large" (1 1/8 x 7/16 x 1 1/2 in.) 3/11, Medium (1 x 3/4 x 1 1/2 in.) 3/9, Small (5/16 x 1/2 x 1 in.) 3/3. P. & P. 9d. each.

BRAND NEW! Why use Sapphire Stylus in your record-player when at very little extra cost you can have a first-grade GENUINE DIAMOND STYLUS at 7/11 plus 6d. P.P. Available as replacements for the following popular types only at present: BSR GOLF—BSR TCS STEEL—BSR TCS LP/STEREO—COLLARO STUDIO "Q" LP/ROSETTE—GARRARD GC8 LP—ACOS GP 65/67 LP—ROSETTE BF40 LP—GARRARD GC2 LP.

SPEAKERS. 12in. round high quality British fitted tweeter cone, 6 watts, in 3Q or 15Q, 29/6 P.P. 3/6. ROUND 12in. R. & A. 3Q 25/6, P.P. 3/6. 2 1/4" round speaker 3Q for your miniature equipment—4/- each, P. & P. 1/-. Many other speakers from 2in. to 13in. available. Extension type, with vol. control, attractive finish: includes 7 x 4in. speaker. 32/6, P. & P. 4/6. Attractive extension speaker with two Jacks to suit all transistor sets for home or car. 17/6, P. & P. 2/6.

TWEETER. 2 1/2in. Black plastic cone, round on Square Frame. E.M.I. 3Q—12/6, plus 1/6 P. & P.

MICROPHONES. LAPEL/HAND MIKE—1 1/2in. dia. Lapel Clip, ideal for tape recording. With lead. Very sensitive 7/6, P. & P. 1/-. CRYSTAL HAND MIKE. Robust and sensitive. Cream plastic case. Just the thing for tape recorders 8/6, P. & P. 1/6.

ACOS MIC 40—World famous Desk Mike, 13/9 plus P. & P. 1/3. ACOS MIC 45—Splendid Curved Hand Grip Crystal Mike, 14/6 plus P. & P. 1/6. ACOS MIC 60—"Stick" Type Crystal Mike 18/6 plus P. & P. 1/6. ACOS ROUND Crystal mike insert, 1 1/2in. dia. 7/6, P. & P. 6d.

TELESCOPIC FLOOR STAND, HEAVY BASE. Standard thread. 49/6, Carr. & Pkg. 2/6. TELEPHONE PICK-UP COIL. For recording or amplifying both sides of telephone conversation. Suction cup fitting to telephone, with lead, 7/6, P. & P. 1/-. INTER-COMM. DE-LUXE 2-WAY. Ideal for offices, workshops, theatres, etc. Highly efficient, safe BAY ALARM. No mains—works off PP3 battery, which lasts for months, obtainable everywhere. Buzzer call system, complete with lead, plugs, battery, in handsome carton. 55/-, P. & P. 2/6.

PICK-UP ARM. Lightweight, with T/O crystal cartridge and stylus for L.P. and 78 r.p.m. records on base with rest, 27/6, P. & P. 2/6.

4 TRANSISTOR 3W AMPLIFIER. Size 2 1/2 x 2 1/2 x 1 1/2, 3, 8 or 15Q output. 9 volt battery operated. Highly sensitive. Price (less battery) 52/6, P. & P. 1/6.

RECORD PLAYER DECKS. GARRARD SP25 DE-LUXE 4-SPEED SINGLE PLAYER £9 9 6 { All latest models. All fitted Mono Cartridge. MODEL 1000 4-SPEED AUTO-CHANGE 25 19 6 { Stereo 10/- extra. Carr. MODEL 3000 4-SPEED AUTO-CHANGE 27 19 6 { & Pkg. all models 7/6.

B.S.R. AUTOMATIC RECORD-CHANGER DECKS. LATEST MODELS. UA25—Very popular—4 speed. Cap. six 7in., 10in., 12in. records . . . 25 19 6 UA1688—Slim Design—first class 4 speed. Two-tone grey . . . 26 2 6 UA 15/888D—As above, but with low mass pln. arm, reducing record wear and heavier 10in. turntable, finished in pearl grey and black . . . 26 18 6 P. & P. on all above 7/6. Price includes Free Gift.

PLINTHS Already cut out to suit most record decks. In attractive simulated wood finish, 17 x 14 x 4in. 49/11. P. & P. 6/1.

MAGNAVOX "363" TAPE DECKS. LATEST MODELS. World-famous. Made to highest standards. Size 13 1/2 x 11 x 5 1/2in. below board. For 200/250V 50 cycles a.c. 3 speed, digit counter, piano key controls. 7in. reels. Every modern feature. Speeds 17 3/4 and 7 1/2 i.p.s. With 4 track Braunmuller heads . . . £10 10 0 With 1 track Marriott heads . . . £13 0 0 P. & P. 10/-. Price includes Free Gift.

PICK-UP CARTRIDGE REPLACEMENTS STANDARD FIXING FOR MOST RECORD-PLAYER ARMS. ALL TURN-OVER TYPES WITH STYLUS FOR L.P. & 78 R.P.M. ACOS GP/67-2 MONO 12/6 each. ACOS GP/73-2 STEREO 25/- each. ACOS GP/91-1 MONO-DE-LUXE 17/6 each. Postage and packing 9d. each.

Finest Quality British made MYLAR Recording Tape Fully Guaranteed. In Cartons. 3in. 240ft. Message . . . 5/- 5 1/2in. 1200ft Long Play . . . 12/6 5in. 600 Standard Play . . . 8/6 7in. 1800ft. Long Play . . . 19/6 5 1/2in. 850 Standard Play . . . 11/6 5in. 1200ft. Double Play . . . 15/- 7in. 1200 Standard Play . . . 12/6 5 1/2in. 1800ft. Double Play . . . 22/6 5in. 900ft. Long Play . . . 10/- 7in. 2400ft. Double Play . . . 24/- P. & P. 1/- per reel. Four reels and over post paid.

POCKET MULTI-TEST METER. 1000Ω per volt. Volts 0/10/50/250/500/1000 a.c. and d.c. Current: 0-1-100-500mA. Resistance: 0-100kΩ. Complete with test prods. instructions. 37/6. P. & P. 1/6.

TRANSISTORS: Some popular types from our range: OC44 and OC45 3/6 each. OC71 2/6. OC72 3/6. OC81 and OC81D 3/- each. OC169 3/6. OC170 3/6. AF117 4/-, OC26 7/6. GET8 5/6. General purpose (Approx. OC71) 1/- each.

NEW HIGH FREQUENCY TRANSISTORS. Sinclair ST140—4/-, ST141—6/- both capable of operating up to 700 Mc/s. ALSO MAT 100—7/6, MAT 101—8/6, MAT 120—7/6, MAT 121—8/6, ADT 140—15/-. High speed switching transistors—BSY 26 BSY 28, BSY 65—5/- each.

THYRISTORS. 100 PIV 5A: 12/6; 200 PIV 5A: 15/-. Postage 6d. up to 3. Over 12 sent P. & P. paid.

R.F. FIELD INDICATOR. Ideal for use with radio controlled models. Checks radiation from existing antenna. Tunes i to 250Mc in 5 bands. Sensitive 200mA meter movement. 5 section plug-in aerial. Phone jack and crystal carpiece for monitoring. No battery required. Powerful magnet for attaching to metal surfaces. Complete with instructions. 47/6. P. & P. 2/6.

TERMS. Cash with order. No C.O.D. Orders total £5 and over sent carriage paid (excepting Record player decks where carriage is shown). Guaranteed money refunded if goods returned perfect within 7 days of despatch.

REMEMBER THE NOVEL FREE GIFT EXCLUSIVE TO US!

Callers welcome—Very many more lines to choose from. Open 9.30 a.m.—6 p.m. Mon. Sat. STOCKISTS OF ALL SINCLAIR, CIR-KIT MARTIN KITS—DETAILS WITH PLEASURE.

MARCONI TEST EQUIPMENT

TP.144G STANDARD SIGNAL GENERATOR.
85 Kc/s. 25 Mc/s. 200/250 v. A.C. £25. Carr. 30/-
TP.329G "Q" METER Brand new with all accessories £75. T.F. 195M. BEAT FREQUENCY OSCILLATOR. 0-40 Kc/s. 200/250 v. A.C. £20. Carr. 30/-. All above offered in excellent condition fully tested and checked and offered at a fraction of original cost.



2-WAY RADIOS

Super quality. Brand new and guaranteed.

3 transistor £8.15.0 pr.
4 transistor £7.19.6 pr.
5 transistor £8.4.0 pr.
6 transistor £9.19.6 pr.
6 transistor De Luxe £17.10.0 pr.

10 transistor £22.10.0 pr.

13 transistor 500 MW £31.10.0 pr.

13 Trans. 1W £35.0.0 pr. Post extra.
These cannot be operated in U.K.

SINCLAIR TRANSISTOR AMPLIFIERS

Z12 Amplifier 89/6; Z12 Power Pack 79/6; Stereo 25 Pre-Amplifier £9.19.6; Micro FM Radio Kits £5.19.6; Micro 6 Radio Kit 59/6; Micromatic Radio Kit 59/6; Ready built 79/6. Post paid.

COSSOR 1035 Mk II DOUBLE BEAM OSCILLOSCOPES

Latest model using miniature valves. Perfect condition. £45. Carr. 30/-.

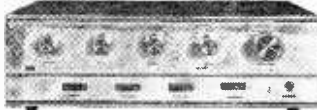
GARRARD RECORD PLAYERS

SRP22 Player mono £4.4.0; 1000 changer mono or stereo £5.15.6; 2000 changer mono or stereo £8.19.6; 3000 Changer mono or stereo £7.19.6; SR25 Player mono or stereo £9.19.6; SR25 with cast turntable £10.19.6; AT60 Changer mono or stereo £10.10.0; AT60 Mk II less cartridge £11.10.6; A70 less cartridge £19.19.0; LAB50 Mk II Stereo £25.0.0; 401 Transcription 28 gns. Brand new and guaranteed. All plus post and packing 5/-.

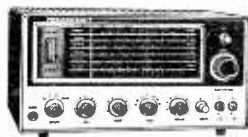
LAFAYETTE HI-FIDELITY SOLID STATE STEREO AMPLIFIERS

Latest 1967 models now available. Outstanding performance from modern semi conductors. Provision for all types of inputs and outputs and comprehensive tone controls. Attractive metal cased free standing units.

Model LA-224T 30 watt £25. Carr. 7/6. Model LA-60T 60 watt £37.10.0. Carr. 7/6. DETAILS ON REQUEST



LAFAYETTE MODEL HA-500 SSB/AM/CW 80 THROUGH 6 METRE RECEIVER



New outstanding Ham Bands only receiver covering the 80/40/30/15/10/6 metre bands. Incorporates 10 valves product detector two mechanical filters 8 Meter dual conversion on all bands crystal calibrator B.F.O. noise limiter aerial trimmer. I.F.'s 2-608 Mc/s and 465 Kc/s. Output 8 ohms and 500 ohms. Operation 220/240 volt. A.C. Supplied brand new and guaranteed with handbook. 42 gns. Carr. 10/- 100 Kc/s crystal 35/-.

★ TRANSISTORISED FM TUNER ★



6 TRANSISTOR HIGH QUALITY TUNER. SIZE ONLY 6in. x 4in. x 2 1/2in. 8 I.F. stages. Double tuned discriminator. Ample output

feed most amplifiers. Operates on 9 volt battery. Coverage 88-108 Mc/s. Ready built ready for use. Fantastic value for money. £20.17.6. P. & P. 2/6.

VARIABLE VOLTAGE TRANSFORMERS

Brand New—fully Shrouded. Input 230v. 50/60 c/s. Output 0-260 Volts.



1 Amp £4.10.0
2-5 Amp £5.17.6
5 Amp £9.0.0
8 Amp £13.10.0
10 Amp £17.0.0
12 Amp £19.10.0
20 Amp £32.10.0

Post extra.

AMERICAN TAPE

First grade quality American tapes Brand new. Discounts for quantities.

3in., 225ft. L.P. acetate 4/-
3in., 800ft. T.P. mylar 10/-
6in., 600ft. std. plastic 8/6
6in., 900ft. L.P. acetate 10/-
6in., 1,200ft. D.P. mylar 15/-
5in., 1,800ft. T.P. mylar 35/-
5in., 1,200ft. L.P. acetate 12/6
5in., 1,800ft. D.P. mylar £2/6
5in., 2,400ft. T.P. mylar 45/-
7in., 1,200ft. std. acetate 12/6
7in., 1,800ft. L.P. acetate 15/-
7in., 1,800ft. L.P. mylar 20/-
7in., 2,400ft. D.P. mylar 25/-
7in., 3,600ft. T.P. mylar 58/6
Postage 2/- Over £3 post paid.

CALLERS WELCOME!

Open 9 a.m. to 6 p.m. every day Monday to Saturday. Trade supplied. All items available as previously advertised.



TRANSISTORISED TWO-WAY TELEPHONE INTERCOM.

Operative over amazingly long distances. Separate call and press to talk buttons. 2-wire connection. 1000's of applications. Beautifully finished in ebony. Supplied complete with batteries and wall brackets. £5.19.6. P. & P. 3/6.

R.107 RECEIVERS

1-7-17.5 Mc/s. Mains or 12 volt D.C. operation. Perfect condition. £15. Carr. 30/-.

TYPE 13 DOUBLE BEAM OSCILLOSCOPES

5-5 Mc/s Bandwidth Perfect condition. £22.10.0. Carr. 30/-.

CATALOGUE

- ★ ELECTRONIC COMPONENTS
- ★ TEST EQUIPMENT
- ★ COMMUNICATIONS EQUIPMENT
- ★ HI-FI EQUIPMENT

We are proud to introduce our first comprehensive catalogue of Electronic Components and equipment. Over 150 pages fully illustrated, listing thousands of items many at bargain prices. Free discount coupons with every catalogue. Everyone in electronics should have a copy.



CLEAR PLASTIC PANEL METERS

First grade quality Moving Coil panel meters available ex-stock. S.A.E. for illustrated leaflet. Discounts for quantity. Available as follows: Type MR 38P, 1 21/32in. square fronts.

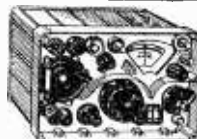


50µA 32/6
100µA 29/6
200µA 27/6
500µA 25/-
50-0-50µA 28/6

100-0-100µA 27/6
500-0-500µA 29/6
1-0-1mA 22/6
1mA 22/6
2mA 22/6
5mA 22/6
10mA 22/6
20mA 22/6
50mA 22/6
100mA 22/6
150mA 22/6
200mA 22/6
300mA 22/6
500mA 22/6
100V D.C. 22/6
150V D.C. 22/6
300V D.C. 22/6
500V D.C. 22/6
750V D.C. 22/6
1A D.C. 22/6
2A D.C. 22/6
5A D.C. 22/6
10V D.C. 22/6
100V A.C. 22/6
300V A.C. 22/6
500V A.C. 22/6
50V D.C. 22/6
50V D.C. 22/6
POST EXTRA. Larger sizes available—send for lists.

R209 MK. II COMMUNICATION RECEIVER

11 valve high grade communication receiver suitable for tropical use. 1-20 Mc/s. on 4 bands. AM/CW/FM operation. Incorporates precision vernier driver, B.F.O. Aerial trimmer, internal speaker and 12v. D.C. internal power supply. Supplied in excellent condition, fully tested and checked. £15.0.0. Carr. 20/-.



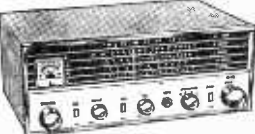
ADMIRALTY B.40 RECEIVERS



Just released by the Ministry. High quality 10 valve receiver manufactured by Murphy. Coverage in 5 bands 650 Kc/s.-30 Mc/s. 1/F. 500 Kc/s. Incorporates 2 R.F. and 3 I.F. stages, crystal bandpass filter, noise limiter, crystal controlled B.F.O., calibrator, I.F. output, etc. Built-in speaker, output for phones. Operation 150/220 volt A.C. Size 19 1/2 x 13 1/2 x 16 1/2 in. Wght. 114 lbs. Offered in good working condition. £22.10.0. Carr. 30/- With circuit diagrams. Also available B.41 L.F. version of above. 15 Kc/s.-700 Kc/s. £17.10.0. Carr. 30/-.

LAFAYETTE KT-340 COMMUNICATION RECEIVER SEMI-KIT

Build this wonderful receiver and save pounds. Supplied semi completed, main components ready mounted, R.F. section already wired and aligned. Full and precise instructions supplied. Specification—8 valves+rectifier, 4 bands covering 550 Kc/s.-30 Mc/s. Incorporates 1 R.F. and 2 I.F. stages, 'Q' multiplier, B.F.O., A.N.L., 'S' meter, bandspread, aerial trimmer etc. Operation 115/230 V. A.C. Price 25 gns. Carr. 10/-.

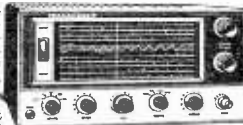


HAM-1, 4 BAND COMMUNICATION RECEIVER

4 wavebands covering 535 Kc/s. to 30 Mc/s. 5 valve superhet circuit. Incorporates 8 meter B.F.O., BANDSPREAD TUNING, BUILT-IN 4in. SPEAKER, FERRITE AERIAL and EXTERNAL TELESCOPIC AERIAL. Operation 220/240 v. A.C. Supplied brand new with handbook. £18.16.0. Carr. 10/-.

NEW LAFAYETTE MODEL HA-700 AM/CW/SSB AMATEUR COMMUNICATION RECEIVER

8 valves, 5 bands incorporating 2 MECHANICAL FILTERS for exceptional selectivity and sensitivity. Frequency coverage on 5 bands 150-400 Kc/s., 550-1,600 Kc/s., 1-6-40 Mc/s., 4-8-14.5 Mc/s., 10-5-30 Mc/s. Circuit incorporates B.F. stage, aerial trimmer, noise limiter, B.F.O., product detector, electrical bandspread, 8 meter slide rule dial. Output for phones, low to 2K Ω or speaker 4 or 8 ohms. Operation 220/240 volt A.C. Size 7 1/2 in. x 15 in. x 10 in. Supplied brand new and guaranteed with handbook. 36 GNS. Carr. 10/- S.A.E. for leaflet.



G.W. SMITH & CO

(RADIO) LIMITED

Phone: GERRARD 8204/9155
Cables: SMITHEX LESQUARE

3-34 LISLE STREET, LONDON, W.C.2

NEW -1967 edition of Radio & TV Servicing

Up-to-the-minute repair data for 1966-1967 popular Televisions, Radios, Radiograms, Car Radios and Record Reproducers.
One complete volume brings your repair library bang up-to-date!

You can't afford to be without this goldmine of money-spinning data for Radio and TV repair. It's packed with the Circuits, Diagrams, Alignment data and Repair hints you must have for the 1966-67 popular TVs and Radios. PLUS the very latest facts on COLOUR TV.

All this in one essential 496-page volume that will more than repay its low cost on one repair job alone.

Prove this for yourself. Send no money now—simply complete and post coupon today and this time-saving volume is yours to use for seven days WITHOUT OBLIGATION TO BUY. Apply now.

FOR THE FIRST TIME— COLOUR TV (PAL SYSTEM)

Compiled by W. A. Montgomery B.Sc.

Head of Advanced Development Group, Consumer Products Division, S.T.C.

This year, *Radio and Television Servicing* contains an essential reference section of advance data on Colour Television. Illustrated with 46 circuits, diagrams and graphs, this big 32-page section explains basic encoding and decoding processes which will be in use when Colour Television is introduced to Britain.

You will find this new section of absorbing interest—essential reference for every TV and Radio repair workshop.

It's yours on 7 days Free Trial



Vital Repair hints, Circuits and Data for all these makes

Alba - Baird - Bush
Cossor - Dansette
Decca - Defiant
Dynatron - Ekco
Ferguson - Ferranti
Fidelity - G.E.C.
Grundig - H.M.V.
Kolster-Brandes
Marconiphone
Masteradio - Murphy
National - Pam
Perdio - Philips - Pye
R.G.D. - Regentone
Roberts' Radio - Sanyo
Sharp - Standard
S.T.C. - Stella
Thorn - Ultra.

**496 PAGES
Nearly 270
Circuits**

Over 290 printed panel diagrams, layout diagrams and waveform graphs.

Strong maroon binding with gold lettering to match volumes previously published in this famous series.

To:
Buckingham Press
Ltd., Headington
Hill Hall, Oxford.

Please send *Radio & TV Servicing* (1966-67 Models) without obligation to buy. If you accept this application I will post 5/- deposit 8 days after receipt of book, then 10/- monthly for 8 months, paying 85/- in all—or return the book. Cash price in 8 days 80/-.

If under 21 your father must fill up coupon

Full name (BLOCK LETTERS) (Mr., Mrs., Miss)

Address

Occupation

Signature
RV/3040

Tick ✓ where applicable

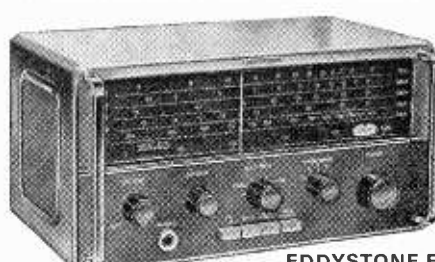
The address on left is—

My Property	
Rented unfurnished	
Parents' Home	
Furnished Accom.	
Temporary Address	



AMATEUR RADIO
CHAS. H. YOUNG LTD.

MIDLAND AGENTS FOR
EDDYSTONE
Receivers & Components



EDDYSTONE EC10

Sensational ALL-TRANSISTOR Communications Receiver, for use in the home, caravan, car or boat, etc.

Only £48. H.P. Facilities — Part Exchanges

Write for brochure & full details.

**170-172 CORPORATION STREET
BIRMINGHAM 4**
Telephone: 021-236-1635



Richard Allan
HIGH FIDELITY
Module

SPECIFICATION—Bass Unit: Natural resonance 40 c.p.s. Flux density 14,000 Gauss. Total flux 56,000 Maxwells. Tweeter Unit: Flux density 6,000 Gauss. Total flux 9,000 Maxwells. Overall: Height 11in. (28 cm), width 6 1/2in. (16.5 cm), depth 2 1/2in. (6.4 cm), weight 5 lb. (2.3 kg). Power handling 10 watts in recommended enclosure. Impedance 5, 8 or 15 ohms.

TECHNICAL DETAILS:
The unit is a compact and self contained loudspeaker system which only needs to be fitted into a simple cabinet of the recommended design to produce a high fidelity loudspeaker of the highest quality.
The unit consists of a 5in. bass unit, 4in. tweeter and crossover network mounted on a duralumin plate which forms the front panel of the complete enclosure.
The method of assembly of the module is unique in that the cone and synthetic rubber surround of the 5in. bass unit are mounted directly on to the duralumin front panel and the ceramic magnet is supported on substantial pillars attached to the panel. The conventional chassis with all its disadvantages is thus eliminated.
The tweeter is a special version of the 460T unit with a doped cambric surround and extremely light suspension system.
The crossover network is a five element circuit using ferrite cored inductors and reversible electrolytic capacitors mounted on a printed circuit board.
Free constructional details of the recommended cabinet are readily available from us.
Where larger power handling is required several units may be mounted in a larger cabinet, multiple units may also be mounted in a column enclosure to form a high power handling, high quality line source. The unit may also be mounted directly into existing equipment or in cavities in walls etc.
The unit forms the drive system of the 'Minette' enclosure, for details see separate leaflet. Patents applied for.

Price £8 plus £1.8.3 tax

For further details contact:
**RICHARD ALLAN
RADIO LIMITED**
Bradford Rd, Gomersal,
nr. Leeds, Yorks.
Tel: Cleckheaton 2442/3

Richard Allan

CODAR CR.70A

Communications Receiver 540-10 metres



The Codar CR.70A is an excellent general coverage communications receiver for the keen short wave listener. Very reasonably priced at just £19.10.0 the CR.70A is outstanding value for money. In four stable ranges, the receiver covers from 540 metres medium wave, right through the shipping and coastguard frequencies all the short wave and international amateur bands up to and including 10 metres, where the rapidly improving conditions that now prevail allow the regular reception of world-wide call-signs!

The CR.70A has a high 'Q' aerial input stage giving extremely high gain with low noise level. Double tuned, iron cored I.F. transformers produce high selectivity. Ready to plug into 200-250 volt AC mains, the CR.70A needs only your aerial and a 2-3 ohm loudspeaker. The cabinet measures only 13" x 5½" x 7½" and the control panel is finished in black and white with chrome trim knobs. Fully guaranteed for 12 months!

Buy your Codar equipment from your radio hobby store or direct from Codar. The order form will also bring fully descriptive leaflets (6d stamps appreciated).

UNBEATABLE AT ONLY

19.10.0

Carriage 7/6 extra. H.P. terms available.

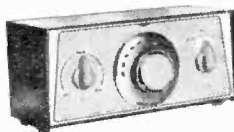
*Ideal for SWLs *5 valves (inc. two twin triodes) giving 7 valve line-up *Excellent on amateur and shipping frequencies *Calibrated signal strength meter (illuminated) *Automatic volume control *Separate B.F. oscillator for morse and S.S.B. signals *Two speed vernier tuning



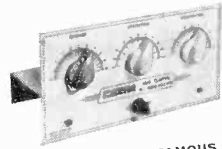
T25 RECEIVER FOR 160 & 80 METRES AMATEUR BANDS
9 transistors, bandspread 1.8-2Mc/s and 3.5-4Mc/s 12 volts, only 8" x 4" x 3½". Ideal portable, mobile or home receiver. Efficient BFO, printed circuits. ONLY £15.10.0. Carr. 4/6.



CR15 MAINS T.R.F. SHORT-WAVE RECEIVER
World wide reception. *Separate electrical band-spread. *3 slow motion drives. *Output 3 watts spread. *Valves ECC81, EL84, EZ80. for 2/3 ohm speaker. *CODAR-KIT CR.45K with 3 coils Size 12" x 5½" x 7". CODAR-KIT CR.45K with 3 coils (10-28, 25-75, 60-176 metres). £9.10.0. Carr. 6/-. or ready built CR.45 £11.7.0. Carr. 6/-. Extra coils 5/- each.



R.F. PRE-SELECTOR MODEL P.R.30
1.5-30Mc/s Provides up to 20dB gain plus substantial image rejection, improved signal/noise ratio 12nA H.T. activity. Power requirements 100-250 volts 12nA H.T. 6.3 volts, 3 amp L.T. Size 8½" x 5" x 4". Ready built complete with cables, plugs and instructions. £5.10.0. Carr. 4/6. Self-powered P.R.30x £7.4.0. Carr. 4/6.



MINI-CLIPPER—OUR FAMOUS SHORT-WAVE RECEIVER
* Can be built in one evening. * Complete with valve, one coil 25-75 metres and 4 page instruction manual. Price 39/6. Carr. 3/-. Extra coils 5/- each.

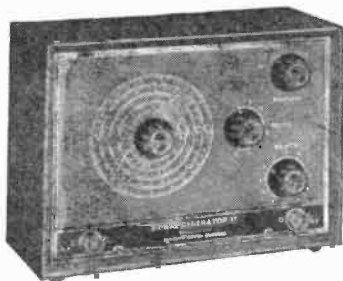
CRC **CODAR RADIO COMPANY**
BANK HOUSE, SOUTHWICK SQUARE, SOUTHWICK, SUSSEX. TEL: 3149
World-wide Mail Order Service

Please supply—
(tick as required)
☐ I enclose cheque/ M.O./P.O. value of £.....
☐ I should like H.P. details
☐ 6d stamp enclosed for leaflets

NAME _____
ADDRESS _____

POST ORDER FORM TODAY

NOMBREX INSTRUMENTATION



TRANSISTOR
R.F. GENERATOR
MODEL 31

£12.10.0

Post & Pkg.
6/6 extra

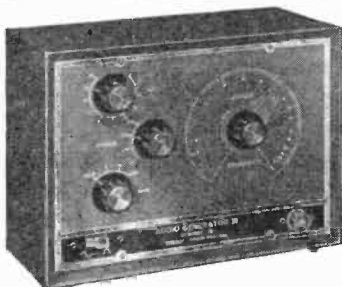
NEW 1967 MODELS ★ ★ ★

6d. stamp for leaflets of complete range

TRANSISTOR
A.F. GENERATOR
MODEL 30

£19.10.0

Post & Pkg.
6/6 extra



NOMBREX LTD EXMOUTH - DEVON

8 WATT. PUSH-PULL OUTPUT AMPLIFIER, 200-250 Volts A.C. EZ80, ECC83, 2-EL84. Base, treble, vol/on-off. £5.15.0 (7/6 P. & P.).

20 ELEMENT MAST CLIPPING BBC-2 OUTDOOR AERIAL. State Station required. 55/- (7/6 carr.). BBC-2 Coax Cable 1/6 yd.

FINAL OFFER OF AM/FM MONO RADIOGRAM CHASSIS. 6 valves, 5 push buttons. L.W., M.W., S.W., F.M.(VHF) and Gram. 15 x 6 1/2 x 9 1/2 in. Usually £15.15.0. LAST FEW AT £14.

3 WATT AMPLIFIER. 6 x 4 x 4 1/2 in. Metal rectifier. 6AM6 and EL84. Mains and output transformer for 3 ohm speaker. Tone, vol. and on/off. 67/6 (6/- P. & P.).

SPEAKERS. 20/- UNDER LIST. Heavy duty 12in. with cast aluminium frame 3 or 15 ohm. 45 Hz to 15 kHz. 20 Watt. 85/- (7/6 P. & P.).

6 TRANSISTOR "SUPER SIX". M.W. and L.W. kit. £4 (5/- P. & P.). Wooden cabinet 11 x 7 1/2 x 3 1/2 in. All parts may be purchased separately.

TESTED AND ASSEMBLED R.F. TRANSISTOR STRIP. 3 IFs (double tuned), osc., diode, 3-AF117, F.C. board 4 1/2 x 2 1/2 in., 470KHZ. 26/- (2/6 P. & P.).

GRAMOPHONE AMPLIFIERS. (1) UCL82, UY85, mains and O.P. Trans. 7 x 5 in. 3-ohm speaker. 57/6 (7/6 P. & P.). (2) UY85, UCC85, UL84, then as for (1), 67/6 (7/6 P. & P.).

COPPER CLAD BOARD. (A) 8 x 8 1/2 x 1 1/4 in. 3/- (Post 2/- any quantity). (B) 7 1/2 x 14 1/2 x 1/2 in. 5/- (Post 2/6 any quantity).

2 x 4 WATT STEREO AMPLIFIER. Printed circuit. Separate power pack. Metal rectifier, ECC83 and 2-EL84. Negative feedback. Vol., base, treble each channel. Muting switch and on/off. £5.10.0 (7/6 P. & P.).

9-12 VOLT TRANSISTOR AMPLIFIERS. (1) 200mW for 3 ohm speaker 30/- (2) 350mW with switch, vol. control, for 3 ohm speakers 40/- (3) 1-2 watt for 8 ohm speakers, 57/6. (2/6 P. & P. each type).

GLADSTONE RADIO

66 ELMS ROAD, ALDERSHOT, Hants.

(2 mins. from Station and Buses) FULL GUARANTEE Aldershot 22240
CLOSED WEDNESDAY AFTERNOON
CATALOGUE 6d.

surprise

surprise



R.S.T. VALVE MAIL ORDER CO.

144-146 WELLFIELD ROAD, STREATHAM, S.W.16

Mon.—Sat. 9 a.m.

—5.45 p.m.

Closed Sat. 1.30—2.30 p.m.

Open Daily to Callers

All valves
brand new
and boxed

Tel. 769-0199/1649

OA2 5/9	6BE6 4/6	6K7M 5/9	787 17/9	20F2 14/-	78 5/-	DH77 4/-	ECF82 7/-	EM81 7/-	PCC89 10/-	8130 25/-	UM90 6/-
OC3 5/-	6BH6 7/-	6K7G 1/9	7Y4 7/6	20L1 15/-	80 5/-	DK32 7/9	ECH21 12/6	EM84 7/-	PCC189 9/6	8P4 8/-	UU6 13/6
1A7 7/9	6BJ6 7/-	6K7GT 4/6	9BW6 7/-	20P4 17/-	85A2 7/3	DK91 5/-	ECH35 11/-	ESU150 20/-	PCF80 6/3	8P41 3/6	UU7 13/6
1D5 7/-	6BQ7A 7/-	6K8M 8/6	10C1 12/6	20P5 16/-	160B2 9/6	DK92 8/-	ECH42 9/-	EY61 7/-	PCF82 6/3	8P61 3/6	UU9 8/-
1H5 7/-	6B7 8/6	6K8G 8/-	10C2 12/6	25A6 5/9	180C4 7/6	DK96 7/-	ECH81 5/3	EY86 6/6	PCF84 8/-	8U25 18/6	UY21 9/6
1LD5 5/-	6BR2 5/6	6K8GT 7/-	10F1 9/-	25L6GT 5/6	801 6/-	DL66 15/-	ECH83 7/-	EZ35 4/6	PCF86 8/-	8U2150 12/6	UY41 6/3
1NSGT 8/-	6BR7 16/9	6K25 20/-	10F3 8/-	25Y5 6/-	807 7/-	DL92 4/9	ECL80 6/6	EZ40 7/-	PCF801 9/6	T41 15/-	UY85 6/-
1R5 5/-	6BW6 7/-	6L1 9/6	10F9 9/9	25Z4 6/3	813 75/-	DL93 3/6	ECL82 6/3	EZ41 8/-	PCF802 9/6	TDD4 10/-	VMP4G 17/-
184 5/-	6BW7 9/6	6L6G 7/-	10F18 9/9	25Z5 7/-	866A 13/6	DL94 5/9	ECL83 9/6	EZ80 5/6	PCF805 10/9	U10 7/6	VP4B 25/-
185 4/-	6C4 2/9	6L18 5/-	10L1 8/-	26Z6 8/6	854 4/6	DL95 6/6	ECL86 8/9	EZ81 5/6	PCF806 12/-	U14 7/6	VR105/30 5/-
1T4 3/-	6C3G 4/-	6Q7G 8/6	10LD11 15/-	28D7 5/-	1625 5/6	DL96 7/-	ECL800 8/9	EZ82 10/-	PCF808 11/6	U19 85/-	VR100/30 5/-
3A4 3/6	6C8 3/9	6Q7GT 8/6	10E3 14/-	30C1 6/3	4022AR 50/-	DM70 5/-	ECL800 8/9	EZ83 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
3Q4 6/6	6C8G 6/-	6SA7M 7/-	11E3 42/-	30C15 11/6	5763 10/-	DY86 6/-	ECL800 8/9	EZ84 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
3Q5 6/6	6CD6G 20/-	6SC7 7/-	12AT6 4/6	30C17 11/6	7193 2/-	DY87 6/-	EF9 20/-	EZ85 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
384 4/9	6CH6 5/9	6SG7 5/-	12AT7 5/-	30F5 12/-	7475 4/-	E88CC 12/-	EF9 20/-	EZ86 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
3V4 5/9	6CW4 12/-	6SH7 3/3	12AU6 5/9	30FL1 13/6	7475 4/-	E88CC 12/-	EF9 20/-	EZ87 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
5R4GY 8/9	6D6 2/9	6SJ7 5/-	12AU7 4/9	30L16 12/6	7475 4/-	E88CC 12/-	EF9 20/-	EZ88 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
6U4G 4/-	6E5 7/6	6SK7GT 4/9	12AX7 5/9	30L17 12/6	7475 4/-	E88CC 12/-	EF9 20/-	EZ89 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
6V4G 8/-	6F1 9/-	6SL7GT 4/9	12BA5 5/6	30P12 10/-	7475 4/-	E88CC 12/-	EF9 20/-	EZ90 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
5Y9GT 8/-	6F5G 8/-	6SN7GT 4/6	12BE8 5/3	30P19 13/-	7475 4/-	E88CC 12/-	EF9 20/-	EZ91 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
5Z4G 6/9	6F6G 4/-	6SQ7 6/-	12C8GT 4/6	30PL1 14/-	7475 4/-	E88CC 12/-	EF9 20/-	EZ92 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
6/30L2 10/-	6F8G 4/6	6U4GT 12/-	12E1 17/6	30PL13 14/-	7475 4/-	E88CC 12/-	EF9 20/-	EZ93 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
6A7 15/-	6F11 7/-	6U5G 7/6	12J5GT 2/6	30PL14 14/-	7475 4/-	E88CC 12/-	EF9 20/-	EZ94 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
6A8G 12/6	6F13 5/-	6V6M 8/-	12J7GT 7/-	35A5 12/6	7475 4/-	E88CC 12/-	EF9 20/-	EZ95 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
6AC7 3/-	6F14 12/6	6V6G 4/6	12K7GT 6/-	35L6 5/9	7475 4/-	E88CC 12/-	EF9 20/-	EZ96 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
6AE5 4/6	6F23 10/6	6V6GT 6/6	12K8GT 8/-	35W4 4/6	7475 4/-	E88CC 12/-	EF9 20/-	EZ97 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
6A15 3/-	6G6 2/6	6X4 3/6	12Q7GT 4/6	35Z3 10/-	7475 4/-	E88CC 12/-	EF9 20/-	EZ98 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
6AM5 2/6	6H6 2/-	6X5G 4/6	12S4GT 5/6	35Z4GT 5/6	7475 4/-	E88CC 12/-	EF9 20/-	EZ99 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
6AM6 3/6	6J5M 6/6	6X5GT 5/6	28G7 4/3	35Z5 5/6	7475 4/-	E88CC 12/-	EF9 20/-	EZ100 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
6AQ5 5/6	6J5G 2/6	7B6 10/-	12SH7 3/-	37 5/6	7475 4/-	E88CC 12/-	EF9 20/-	EZ101 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
6A87G 15/-	6J5GT 4/6	7B7 7/-	12S7 3/9	42 6/-	7475 4/-	E88CC 12/-	EF9 20/-	EZ102 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
6AT6 4/-	6J6 3/-	7C5 10/-	12SK7 4/9	50B5 6/6	7475 4/-	E88CC 12/-	EF9 20/-	EZ103 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
6AU6 5/6	6J7M 7/6	7D6 8/-	12SR7 5/-	50C5 5/9	7475 4/-	E88CC 12/-	EF9 20/-	EZ104 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
6BSG 2/-	6J7G 4/9	7D6 8/-	14H7 9/-	50C6G 8/1/-	7475 4/-	E88CC 12/-	EF9 20/-	EZ105 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
6R4G 15/-	6J7GT 6/6	7H7 6/-	19A45 5/-	50L6GT 6/-	7475 4/-	E88CC 12/-	EF9 20/-	EZ106 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-
6BA6 4/6	6K6GT 5/-	7R7 17/6	20D1 10/-	75 7/-	7475 4/-	E88CC 12/-	EF9 20/-	EZ107 10/-	PCF808 11/6	U26 10/6	VR100/30 5/-

SPECIAL 24 HOUR SERVICE

OBsolete TYPES A SPECIALITY

QUOTATIONS FOR ANY VALVE NOT LISTED

Postage 6d. per valve.

C.W.O. No C.O.D.

Manufacturers and Export Inquiries Welcome

**Special 24 Hour
Express Mail
Order Service**

SETS OF VALVES

DAF96, DF96, DK96, DL96 ... Set of 4, 25/6

BRAND NEW TRANSISTORS

AC127 7/6	OC26 11/-	OC71 4/6	OC81 4/-	OC82D 6/-
AF114 7/-	OC28 10/-	OC72 6/6	OC81m/pt 12/6	OC83 6/-
AF116 7/-	OC35 11/6	OC73 6/6	OC82 6/-	OC170 7/-
AF117 5/-	OC44 4/5	OC76 6/-	OC81D 4/-	OC171 3/-
	OC45 4/-	OC77 8/-	OC82 6/-	OC240 7/6

SEND S.A.E. FOR LIST OF 2,000 TYPES

Perhaps you will be as surprised as the pundits when you hear the facts* about the BSR C1 ceramic cartridge "... another milestone on the public right-of-way to high fidelity"—said *The Gramophone*.

You could even be surprised to know that the BSR UA70 manual/automatic turntable unit is fitted with such a splendid cartridge and that its all round performance is equal to such high standards.

But maybe not ... you could be one of those sensible people who knew all along that BSR don't just make a lot of autochangers but a lot of *very good* autochangers.

*If you'd like to read the independent test reports write to Arthur Nicholls at:

BSR Limited, Monarch Works, Old Hill, Staffordshire.



for better
sound reproduction

BSR UA70 SPECIFICATION

Turntable

Wow Less than .2%

Flutter Less than .06%

Long term speed variation

Less than .5%

(mains voltage $\pm 10\%$)

Rumble (ref.1kHz) —29 dB

Pick-up arm

Counterbalanced lightweight arm with calibrated tracking pressure control, integral cueing device and automatic lock.

Tracking pressure (depending on cartridge)
2 grams. min.

Cartridge

The now famous C1 ceramic

Compliance 5.2×10^{-6} cm/dynes

Frequency response

20-15,000 Hz

± 2 dB

Standard UA70 player £12.18.3*

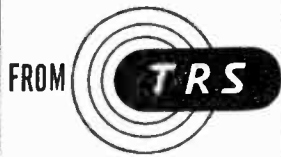
C1 Ceramic Cartridge

sapphire stylus £2. 7.0*

diamond stylus £3. 1.9*

*Inc. P.T. surcharge

BARGAIN OPPORTUNITIES



VEROBOARD—All standard sizes including 24in. x 6in. 3/8; 24in. x 3 1/2in. 3/4; 3 1/2 x 6in. 5/2; 3 1/2 x 3 1/2in. 3/8; 2 1/2 x 17in. 12/8. All accessories and tools in stock.

OUR NEW LISTS

feature more lines than ever at money saving prices. For latest issue, please send

6d.

Please include S.A.E. with all enquiries.

7 VALVE AM/FM RG CHASSIS

A superbly powerful high performance instrument for the keenest enthusiasts. Provides tuning on long, medium and P.M. wavebands. Excellent sensitivity. Permeability tuning on P.M. Large clear dial, A.V.C., good neg. feedback. Magic eye. 3 w. output. A.C. 200/250v. Circuit diagrams available. Aligned, tested and ready for use (Carr. and Ins. 7/6). S.A.E. brings full details. **£13.19.6**

GARRARD UNITS & PLINTHS

LM.3000 Record Player with 9T.A. Stereo Cartridge. Brand new as from factory .. 8 gns.

AT.60 Mk II De-luxe Auto-changer, die-cast turntable. Less cartridge. £10.19.6

SP.25 De-luxe single record player, die-cast turntable. Less cartridge. 8 1/2 gns.

Packing and carriage on any one of above 7/6 extra.

Garrard Plinth. Ideal mounting for the Garrard Units offered here. Will readily suit any hi-fi set-up. In fine Teak. Complete with useful soft plastic dust cover. Packing and carriage 5/- 75/-

Garrard clear-view rigid perspex cover (carriage 3/6) 57/8

Garrard Mono Cartridges from 15/-; Stereo from 25/-.

RESISTORS—Modern ratings, full range 10 ohms to 10 megohms. 10% 1/4 w. 4d. each, 20% 1 w. 6d. each, 2 w. 9d. each; 5% Hi-Stab., 1/2 w. 5d.; 1/4 w. 8d. each. 1/2 meg.-10 meg. 10% 1/4 w. 4d.; 1/2 w. 5d. each, 1% High-stab, 1/2 w. 1/6 each (below 100 ohms 2/- each).

WIREWOUND RESISTORS. 25 ohms to 10 K. 5 w. 1/6; 10 w. 1/9; 15 w. 2/3.

CONDENSERS Silver Mica. All values 2 pF to 1,000 pF, 6d. each. Ditto ceramics, 9d. Tub. 450 v. T.C.C., etc. .001 mFd to .01 mFd 10d. .1/350 v. 10d. .02 mF to 0.1 mF, 500 v. 1/-, T.C.C. 350v. .025 -1/9, 0.5-2/-.

CLOSE TOL. S/MICAS. 10% 5 pF-500pF 9d. 600-5,000 pF 1/-, 1% 2 pF-100 pF 11d.; 100 pF-250 pF 1/2; 270 pF-800 pF 1/-; 800 pF-5,000 pF, 2/. **ALUMIN. CHASSIS.** 18 g. Plain undrilled, folded 4 sides, 2in. deep, 6 x 4in. 4/6; 8 x 6in. 5/9; 10 x 7in. 6/9; 12 x 6in. 7/6; 12 x 8in. 8/-, etc.

TYGAN FRET or Vynair speaker fabric, 12 x 12in. 2/-; 12 x 18in. 3/-; 12 x 24in. 4/-, max. width 48"

BONDACOUST Speaker Cabinet Acoustic Wadding, approx. 1in. thick 18in. wide, any length cut 2/3 ft. 6/- yd.

All Sinclair kits and products in stock as advertised.

TRS MULLARD AMPLIFIERS

STEREO 10-10

Valve amplifier to exact Mullard spec. With pre-amp, tapped o/p transformer 3 & 15Ω, all controls, H.T. and L.T. outlet, mono, stereo and speaker phase switching. Complete with escutcheon, knobs, plugs, etc. Ready built (p. & p. 12/6) **£19.10.0**

5-10 MONO

5 valve, 10 watt basic amp kit complete. (p. & p. 7/6) **£9.19.6**
with passive control network and panel **£11.19.6**
2 valve pre-amp kit **£6.12.6**

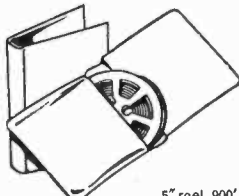
3-3 MONO

3 valve 3 watt amplifier with controls, absolutely complete kit including panel, knobs, etc. (p. & p. 7/6) **£7.10.0**

Kit form due shortly (p. & p. 12/6), **£17.10.0**

ONLY FROM T.R.S.

FREE LIBRARY WALLET WITH EVERY REEL



With each reel of this tape by an internationally famous manufacturer we give you a beautifully made wallet strongly made in simulated leather with space for a reel of tape each side. This is professional quality full frequency tape with metallised leader/stop folis. These library wallets solve once and for all the problems of storing tapes efficiently and tidily.

7" reel 1800' with wallet, **22/6**

5" reel 900' with wallet p. & p. 1/6 per reel

12/6

5 1/2" reel 1200' or 7" reel 1200' with wallet

17/6

TRS RADIO COMPONENT SPECIALISTS

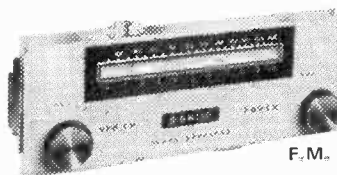
Established 1946

70 BRIGSTOCK ROAD, THORNTON HEATH, SURREY

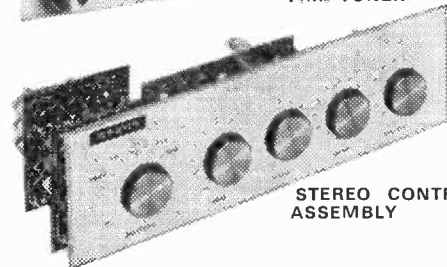
Tel.: 01-684 2188. Hours 9 a.m.—6 p.m. 1 p.m. Wednesdays
A few doors from Thornton Heath Stn. (S.R. Victoria section.)

PEOPLE PREFER MARTIN

FOR RELIABILITY, FOR QUALITY, FOR ADD-ON-ABILITY, FOR ECONOMY



F.M. TUNER



STEREO CONTROL ASSEMBLY

MARTIN AUDIOKITS are available for Mono, and can be doubled up for stereo, or as complete stereo units. 3 ohm and 15 ohm systems are available. There is a special pre-amp for low output pick-ups and escutcheon panels to suit the arrangement you choose. The tuner is styled to match.

You can do so much with MARTIN kits. The system of using pre-fabricated transistorised units which can be interlinked in a variety of ways enables you to assemble the combination of your choice and then extend it unit by unit until you possess a full stereo gramophone and radio assembly. When new units are produced, they can be added to existing equipment very easily with the advantage that you can continue to use equipment you already have,

so that your installation is always up to date. Most important of all is the power and quality which MARTIN Audiokits give you. Their sturdy construction assures compactness without sacrifice to quality or efficiency. They offer excellent value, are very easily installed and will give years of unfailing service. That is why people prefer MARTIN—it's simple to instal, good to listen to, and looks completely professional.

AMPLIFIER SYSTEMS • TUNERS • RECORDERS

MARTIN ELECTRONICS

154 High Street, Brentford, Middlesex

Please send Recordakit/F.M. Tuner/Audiokit Hi-Fi Leaflets. (Strike out items not wanted)

Name

Address

PW97

From Radio and Hi-Fi Stockists

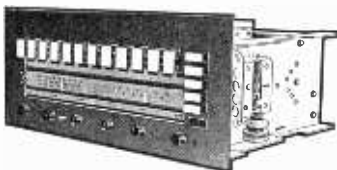
Trade enquiries invited

MARTIN ELECTRONICS LTD. 154/5 HIGH STREET, BRENTFORD, MIDDLESEX. ISLeworth 1161/2

Lasky's Radio

SPECIAL INTEREST ITEMS!

SOLID STATE MULTIPLEX STEREO AM/FM TUNER/ AMPLIFIER CHASSIS



Model T10E—made for U.K. use by famous North American manufacturer and originally installed in De Luxe Hi-Fi consoles costing several hundred pounds. The chassis is of outstanding appearance and quality and offers many unique features plus an extremely comprehensive specification.

Features • Separate transistorised AM and FM tuners • 3 AM wavebands—LW, MW and Continental T.R. band • full FM cover with 5 push button preselected stations (sep. tuning controls for AM and FM ranges) • built in multiplex decoder with unique FMX feature which provides automatic switching from mono to stereo when stereo signal is received and vice versa • unique split amplifier facility for simultaneous play of radio plus any other source • channel reverse • switched inputs for tape and auxiliaries (sep. sockets for tape in and out) • switched extension speaker outlet • thermal safety trip • socket for stereo headphones.

Tech. spec. Output 10 watts RMS per channel; output imp. 8 Ω p.c.; sensitivity 50mV for 8W output at 1Kc.; input imp. 100 K Ω p.c.; 12 unique turner type function controls, 8 push button wavechange and station selection controls, vol., bass, treble and balance controls, push button contour (loudness) control; illuminated tuning scale; AM ranges: MW 520-1640 Kc/s, LW 140-290 Kc/s, Continental T.R. 170-345 Kc/s; FM range 88-108 Mc/s with switched AFC. Operates on 200/250V A.C., 50 or 60 c/s. Size 17 1/2 x 8 x 12in.

LASKY'S PRICE 59 Gns Post & Packing 20/-

A range of Hi-Fi Console Cabinets by the same famous manufacturer are available at almost 1/2 list price and may be seen at our Hi-Fi Audio Centres.

TWO BAND TRANSISTOR CAR RADIO BARGAIN! THE ROYAL CR-62

A new high quality imported all transistor superhet car radio that really breaks the quality/price barrier. A unique feature of this set are the four M/W band station preselection buttons which you yourself set to your own four favourite stations—this is in addition to full M/W band cover over 535-1605 Kc/s and full L/W band cover over 150-300 Kc/s (IF frequency 455 Kc/s). Externally adjustable aerial trimmers ensure maximum output. Six transistor (including one drift type) and one diode circuit provides powerful 2W output. The set is adjustable for use on either positive or negative ground 12V systems (external line fuse fitted). Standard mounting size 6 1/2 x 5 1/2 x 2 1/2in.—front panel 1 1/2in. larger all round—finished in anodised aluminium with black push buttons. Complete with mounting brackets, full installation instructions and 2 baffle boards (for round or elliptical speaker). Fully guaranteed.

LASKY'S PRICE £19.96 Post 5/-

6 x 4in. elliptical 8 Ω dynamic speaker 17/6 extra—Post FREE.

SPECIAL OFFER—LOCKING CAR AERIAL Model 89003 five section 402 extension heavy chrome telescopic wing mounting type with unique locking device to protect the antenna when closed. Complete with mounting bracket, lead and plug and two "keys". **LASKY'S SPECIAL PRICE 39/6** Post Free with the Royal CR-62. Sep. Post 2/6.

MICROPHONE BARGAIN

STC MODEL 414

A high quality omni directional moving coil microphone—suitable for use with sound reinforcement and P.A. systems, tape recorders, transistor amplifiers etc. Attractive grey moulded case for free standing or hand held use—size 2 1/2 x 2 1/2 x 2 1/2in. Complete with 6ft. of screened cable. New and unused in makers cartons—fully guaranteed.

Type A low imp. 200 Ω

Lasky's Price £11.96

Post

Type B High imp. 50K Ω

Lasky's Price £2. 6.0

2/-



NEW INTERNATIONAL TAPE

FAMOUS AMERICAN MADE BRAND TAPE AT RECORD LOW PRICES

3in. Message tape, 150ft.	2 6	5 1/2in. Long play, 1200ft. Acetate	12 6
3in. Message tape, 225ft.	3 9	5 1/2in. Standard play, 360ft. PVC	11 6
3in. Message tape, 300ft.	7 6	5 1/2in. Long play, 1200ft. Mylar	15 0
3 1/2in. Triple play, 600ft. Mylar	10 0	5 1/2in. Triple play, 2400ft. Mylar	45 0
4in. Triple play, 900ft. Mylar	17 6	7in. Standard play, 1200ft. Acet. 12 6	
5in. Double play, 1800ft. Mylar	15 0	7in. Standard play, 1200ft. Mylar	12 6
5in. Long play, 900ft. Acetate	10 0	7in. Long play, 1800ft. Mylar	19 6
5in. Standard play, 600ft. PVC	8 6	7in. Double play, 2400ft. Mylar	28 6
5in. Triple play, 1800ft. Mylar	35 0	7in. Long play, 1800ft. Acetate	15 0
5 1/2in. Double play, 1800ft. Mylar	22 6	7in. Triple play, 3600ft. Mylar	50 0

P. & P. 1/- extra per reel. 4 reels and over Post Free

Musicaassettes—over 200 titles in stock Phillips, Mercury, Fontana, C.B.S., Pye. Reprise, W.B. Send S.A.E. for full list.

CONSTRUCTORS BARGAINS

THE SKYROVER De Luxe



LONG WAVEBAND COVER FOR THE SKYROVER

A simple additional circuit provides coverage of the 1100/1950M. band (including 1500M. Light programme). This is in addition to all existing Medium and Short wavebands. All necessary components with construction data.

Only 10/- extra Post Free.

This conversion is suitable for receivers that have already been constructed.

7 transistor plus 2 diode superhet, 6 waveband portable receiver covering the full Medium Waveband and Short Waveband 31-94M and also 4 separate switched bandspread ranges, 13M., 15M., 19M. and 25M., with Band Spread Tuning for accurate Station Selection. The coil pack and tuning heart is completely factory assembled, wired and tested. Superhet, 470 Kc/s. All Mullard Transistors and Diodes. Uses 4 U2 batteries. 5in. Ceramic Magnet P.M. Speaker. 500 mW Output. Telescopic and Ferrite Rod Aerial. Tone Control. Volume Control. Tuning Control and Waveband Selector. In wood cabinet, size 11 1/2 x 6 1/2 x 3in. covered with washable material, plastic trim and carrying handle. Car aerial socket fitted.

Can now be built for **£8.19.6** Post 5/- extra

H.P. Terms: 60/- deposit and 11 monthly payments of 12/8. Total H.P.P. £10.0.3.

Four U2 batteries 3/4 extra.

Data 8/8 extra: refunded if you purchase the parcel. All components available separately.

SPECIAL PURCHASE—VALVE UHF TV TUNERS

Well known British makers surplus stocks. Now available for the first time to the Home Constructors. Add 2/6 Post and Packing on each.

In metal case size 4 x 6 x 1 1/2in. Fully tuneable—complete with PC86 and PC88 valves.

LASKY'S PRICE 29/6 Without valves 7/6

NEW! LASKY'S CLEAR PLASTIC PANEL METERS

Precision made in Japan by HIOKI. Each meter boxed and fully guaranteed with all fixing nuts and washers. Sizes are of front panel. Add 1/6 Post on each.

Type KR-52 3 x 2 1/2in. (illustrated)

1 mA DC 32/6 300 V DC 32/6

5 mA DC 32/6 500 μ A 37/6

1 mA 8 Meter..... 39/6

Type MK-38A 2 1/2in. square

1 mA DC 22/6

5 mA DC 22/6

300 V DC 22/6

55 μ A 27/6

1 mA 8 Meter..... 29/6

Type MK-45A 1 1/2in. square

1 mA DC 25/-

5 mA DC 25/-

300 V DC 25/-

500 μ A 25/-

1 mA 8 Meter..... 35/-

Type KR-65 3 1/2 x 3in.

1 mA DC 36/-

5 mA DC 35/-

300 V DC 35/-

500 μ A 42/6

1 mA 8 Meter..... 39/6

Type MK-65A 3in. square

1 mA DC 36/-

5 mA DC 35/-

300 V DC 35/-

500 μ A 39/6

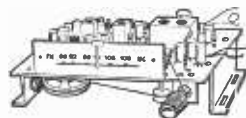
1 mA 8 Meter..... 37/6



TRANSISTOR FM TUNER CHASSIS

Fully tuneable—range 88 to 108 Mc/s. Completely wired on printed circuit. 10-3 Mc/s. I.F. 6 transistors and 3 diodes. Slow motion tuning drive. Size 6 1/2 x 4 x 2 1/2in. Operates from any 9v. D.C. source. Full data and circuit supplied.

LASKY'S PRICE £7.19.6 Post 5/- extra.



GORLER UT 340 FM/VHF TUNING HEART

Permeability tuned—covering 87 to 108 Mc/s. For use with one EOC85 valve. In metal case size 3 x 2 1/2 x 1 1/2in. Circuit supplied.

LASKY'S PRICE 15/11 Post 2/- EOC85 valve 9/- extra.

TRANSISTORS

ALL BRAND NEW AND GUARANTEED

GET 81, GET 85, GET 86 2/8; 873A, 874P 3/8; OC45, OC71, OC81D 4/8; OC44, OC70, OC76, OC81 5/8; (match pair 10/8); AF117, OC200 6/8; OC42, OC43, OC73, OC82D 7/8; OC201, OC204 15/-; OC205, PC206 19/8; OC28 24/8; OC75 8/-.

TRANSFILTERS

by BRUSH CRYSTAL CO. Available from stock.

TO—01B 465 kc/s. $\pm$ 2 kc/s.

TO—01D 470 kc/s. $\pm$ 2 kc/s.

TO—02B 465 kc/s. $\pm$ 1 kc/s.

TO—02D 470 kc/s. $\pm$ 1 kc/s.

TF—01B 465 kc/s. $\pm$ 2 kc/s.

TF—01D 470 kc/s. $\pm$ 2 kc/s.

9/6 each

Post 6d.

Branches

207 EDGWARE ROAD, LONDON, W.2 Tel.: 01-723 3271

33 TOTTENHAM CT. RD., LONDON, W.1 Tel.: 01-636 2605

Open all day Saturday, early closing 1 p.m. Thursday

152/3 FLEET STREET, LONDON, E.C.4 Tel.: FLEet St. 2833

Open all day Thursday, early closing 1 p.m. Saturday

ALL MAIL ORDERS AND CORRESPONDENCE TO: 3-15 CAVELL ST., TOWER HAMLETS, LONDON, E.1 Tel.: 01-790 4821

High Fidelity Audio Centres

42 TOTTENHAM CT. RD., LONDON, W.1 Tel.: 01-580 2573

Open all day Thursday, early closing 1 p.m. Saturday

118 EDGWARE ROAD, LONDON, W.2 Tel.: 01-723 9789

Open all day Saturday, early closing 1 p.m. Thursday

LOOK!

PRACTICAL!
VISUAL!
EXCITING!

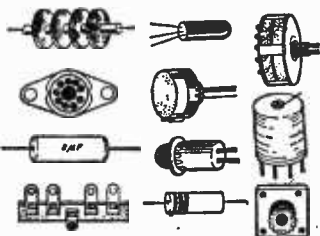


a new 4-way method of mastering
ELECTRONICS
by doing — and — seeing . . .

1

**OWN and
HANDLE a**

complete range of present-day **ELECTRONIC PARTS and COMPONENTS**



2

**BUILD
and USE**

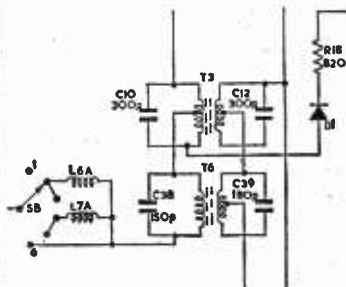
a modern and professional **CATHODE RAY OSCILLOSCOPE**



3

**READ and
DRAW and**

**UNDERSTAND
CIRCUIT DIAGRAMS**



4

CARRY OUT OVER 40 EXPERIMENTS ON BASIC ELECTRONIC CIRCUITS AND SEE HOW THEY WORK . . . INCLUDING . . .

- | | | |
|--------------------------|--------------------------|------------------------|
| ● VALVE EXPERIMENTS | ● PHOTO ELECTRIC CIRCUIT | ● A.C. EXPERIMENTS |
| ● TRANSISTOR EXPERIMENTS | ● COMPUTER CIRCUIT | ● D.C. EXPERIMENTS |
| ● AMPLIFIERS | ● BASIC RADIO RECEIVER | ● SIMPLE COUNTER |
| ● OSCILLATORS | ● ELECTRONIC SWITCH | ● TIME DELAY CIRCUIT |
| ● SIGNAL TRACER | ● SIMPLE TRANSMITTER | ● 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. It will also enable anyone to understand how to test, service and maintain all types of Electronic equipment, Radio and TV receivers, etc.

FREE

**POST NOW
for
BROCHURE**

or write if you prefer not to cut page

To: **BRITISH NATIONAL RADIO SCHOOL, READING, BERKS.** Please send your free Brochure, without obligation, to: *we do not employ representatives*

NAME **BLOCK CAPS**

ADDRESS **PLEASE PW9**

PRACTICAL WIRELESS

VOL 43 No 5

issue 727

SEPTEMBER 1967

TOPIC OF THE MONTH

Keeping In Touch

TRADITIONALLY this space should be devoted to the burning issues of the day. In fact it is normally used not only as a platform for editorial policy but also to air subjects open to controversy.

One objective is to provide the raw material for further discussion and to this end comments sometimes scarcely disguise the tongue in cheek. This policy sometimes backfires, as witness the overseas reader whose faith in the British character sank when we spoke of sending a gunboat down the Rhine in protest against the Hertz! Then there was the reader who darkly hinted at a despotic editor campaigning against pop-pirates against the will of the otherwise 100% pro-pirate staff. So there must be no mention here of the rhino whip used to control this mutinous bunch of editorial personnel otherwise there will be a protest march on Tower House. Down you dogs!

A lesson to learn here is that it matters not only what you say—but how you say it. The only certain thing is that you will not please everyone. And the same applies, on an extended scale, to the contents of the magazine. Not only the editor, but his browbeaten staff are constantly striving for the impossibility of pleasing everyone.

How, for instance, does one cater for minority tastes without incurring the rage of those with more mundane appetites? How does one devise a succulent menu to leave most readers happily gorged? We can only hope to succeed by supplementing our own judgment with the reactions of readers. Constructive criticism, comment and suggestion are always welcome; indeed are vital. Interests and tastes change from time to time and only by keeping a finger on the pulse of our readers can we gauge our progress. That is why we value your letters.

Judging from the continued high circulation of P.W. we seem to be doing nicely—but don't let us get complacent as we sit back polishing our haloes! In the end it all comes back to the wellworn truism, that by and large you get the magazine you deserve!

W. N. STEVENS—*Editor*

NEWS AND COMMENT

Leader	319
News and Comment	320
On the Short Waves <i>by John Guttridge and David Gibson, G3JDG</i>	328
Book Review	345
Practically Wireless <i>by Henry</i>	348
Club Spot—Cray Valley Radio Society, G3RCV	363

CONSTRUCTIONAL

Miniature Stabilised Power Supply Unit <i>by R. Leyland</i>	322
Switched F.M. Tuner, Part 2 <i>by W. Groome</i>	325
Four wave-band set for the Novice <i>by R. F. Graham</i>	340
Bulb Tuning Indicator <i>by A. J. McEvoy, B.Sc.</i>	346
Two Metre Transmitter <i>by F. G. Rayer, G3OGR</i>	351

FEATURES

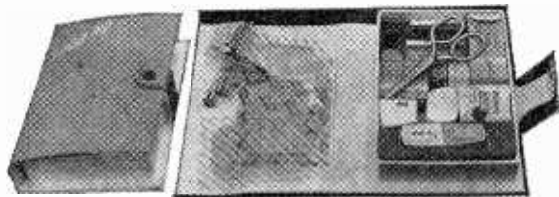
Repairing Radio Sets, Part VI <i>by H. W. Hellyer</i>	333
Connector Block Circuitry <i>by J. B. Willmott, A.I.P.R.E.</i>	344
Guide to Surplus Communications Receivers, Part 2 <i>by K. Adkins, B.Sc.</i>	359

OCTOBER ISSUE WILL BE PUBLISHED ON
SEPTEMBER 8th

All correspondence intended for the Editor should be addressed to: The Editor, "Practical Wireless", George Newnes Ltd., Tower House, Southampton Street, London, W.C.2. Phone: TEMple Bar 4363. Telegrams: Newnes London, W.C.2. Subscription rates, including postage: 36s. per year to any part of the world. © George Newnes Ltd., 1967. Copyright in all drawings, photographs and articles published in "Practical Wireless" is specifically reserved throughout the countries signatory to the Berne Convention and the U.S.A. Reproductions or imitations of any of these are therefore expressly forbidden.

NEWS AND COMMENT...

FIRST AID KIT FOR THE WORKSHOP



Ever burned yourself on the soldering iron or jabbed the screwdriver into your hand? Even if you are lucky and have not, it doesn't hurt to have a first-aid kit in the workshop or shack.

Illustrated above is a compact kit measuring $6\frac{1}{2} \times 4\frac{1}{2} \times 1\frac{1}{2}$ in. (shown closed on the left). It contains $\frac{1}{2}$ oz. cotton wool, burn dressings, lint dressings, adhesive plaster, bandages, antiseptic cream, Elastoplast and a pair of scissors.

It's a good idea to slip it into your pocket if you're going mobile too, so that it doubles up as a car first-aid kit!

Price is £1, postage is free and kits are obtainable from George Bros. & Mott, Gothic Works, 1 Hainault Road, London, E.11.

TRANSISTOR PROBES AID VETS.

A transistorised instrument to detect metal objects which accidentally get eaten by cows with fodder, has been designed at the Yerevan Veterinary Research Centre in Russia.

The portable device locates the object precisely and measures its size. The foreign body is then promptly extracted with a flexible magnetic probe. It operates on a flashlight battery lasting for 200 hours, long enough to treat over 2,500 cows.

VHF SOUND SERVICE FROM MADDYBENNY MORE

The v.h.f. sound service from the relay station at Maddybenny More, between Coleraine and Portrush, Northern Ireland, started on June 26. The three sound programmes are transmitted on v.h.f., horizontally polarized, on the following frequencies: Northern Ireland Home Service 93.1 Mc/s; Light Programme 88.7 Mc/s; Third Network 90.9 Mc/s.

OSCILLATOR IN TRANSISTOR CAN



A micro-oscillator, type F3185, has been developed by The Marconi Company. Completely sealed inside a tiny transistor can, this unit is the smallest in the Marconi range of oscillators.

The photograph shows the micro-oscillator with the cover removed. The deposited gold electrodes on the circular crystal have been left out in order to show the micro-circuit underneath.

ELECTRONIC REFLEX CAMERA

A miniature reflex camera with electronically controlled shutter speeds, said to be the first of its kind in the world market, has gone into serial production at the Pentacon camera and cine works of Dresden, East Germany.

Trade-named Praktica Electronic, the SLR camera is equipped with an electronic plane shutter speeded from 30 full seconds to 1/500th sec., with individual settings arranged in a geometrical series. The single shutter-speed setting does not rotate during exposure and positive-action settings are provided for each speed.

The electronic circuitry is powered by a Mallory PX 21 alkali-manganese cell. A change-over switch permits the adjustment of a mechanically controlled shutter speed of 1/60th second.

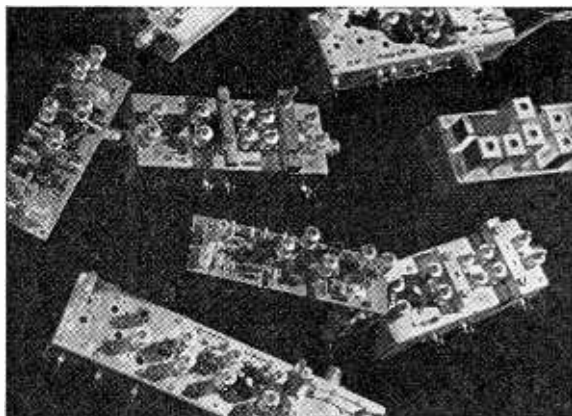
HALLICRAFTERS FROM ELECTRONIQUES

Electroniques (proprietors STC Limited) has augmented the 11,350 products it offers to radio and electronic hobbyists with a complete range of high-grade communications equipment.

An agreement has been concluded with the Hallicrafters Company of Chicago, whereby Electroniques will market the complete range of Hallicrafters radio communications products for amateur and commercial use. The agreement applies to the United Kingdom and is exclusive.

Hallicrafters amateur equipment includes high-performance receivers, transmitters and transceivers, and covers frequencies up to and including the v.h.f. bands. All apparatus is of compact, lightweight design offering the optimum performance and ease of use.

DESIGNS FOR VHF TRANSMITTERS



These v.h.f. transmitters have been designed by Mullard Applications engineers around two high-power silicon planar transistors, types BLY33 and BLY35. The circuits available are 8W, 80Mc/s a.m. transmitter; 7, 11 and 15W, 170Mc/s a.m. transmitter; 15W, 80Mc/s f.m. transmitter; 25-30W, 170Mc/s f.m. transmitter. The supply voltage for the 25-30W transmitter is 28V. All the other designs operate from a 13.8V supply.

NEWS AND COMMENT...

ALL-GOLD INSTRUMENT INSURED FOR £4,000



One of the most expensive electronic instruments — £ for lb. — at this year's RECMF was this portable differential voltmeter (right) with a gleaming 24-carat polished front panel and gold plating throughout.

The golden instrument weighs only 24lb. but is insured for over £4,000. It was the 10,000th of its type produced by the American specialists John Fluke and took pride of place on the stand of Livingston Laboratories Ltd. of Watford, where it is being displayed alongside the first British-made equivalent off the production line (left). The home produced version is lighter and more compact than its golden U.S. forerunner, has an accuracy of 0.02% and is solid-state throughout. It is also cheaper because it attracts no duty.

MONO PICKUP DESIGN

Following the announcement by EMI Records Limited of their intention to introduce stereo-only classical LPs from July next, the following statement has been issued jointly by BREMA and the RECMF:—

It is not practicable to specify any clear-cut performance figures for pickups and their cartridges which will be suitable for playing stereo records, but satisfactory results should be obtained if the pickup used is either one which has been designed for stereo reproduction (though it may be wired for mono) or is a type which has good vertical compliance, low mechanical resistance and a low tip-mass. Many mono pickups produced in the past will be satisfactory although they were not designed specifically for stereo; in future it is expected that most mono pickups will be suitable, and these will be identified: — 'This mono pickup will play stereo records'.

Although some high-output pickups used with single-stage amplifiers may not fully meet these conditions, they may still be acceptable if it is desired only to play the record monophonically and on that particular piece of equipment. The manufacturers of the equipment should be consulted if it is desired to know whether a particular type is suitable.

THE WRONG RAY

In the caption to the photograph in Club Spot on page 219 in July issue the two Rays were transposed. Ray, the SWL is on the extreme left and Ray, G3MWF is pictured fourth from the left. Our sincere apologies to both Rays.

INTERNATIONAL MOBILE RALLY

"Keep going straight on and you can't miss us". The congenial voice boomed out of the loudspeaker in the car. The time around 1045, frequency—1950kc/s and the voice was John—GB3USA. Fifteen minutes later we were at the entrance to the United States Air Force Base, R.A.F. Alconbury and we had arrived at the Eighth International Mobile Rally organised by the Amateur Radio Mobile Society and the Third United States Air Force.

What a day. The sun blazed down and the people flocked in. Estimates reckoned some 5000 people attended and certainly by 2 p.m. the huge runway was crammed with cars six deep.

Couldn't make it? Want to know what you missed? Well the big hanger looked like the annual RSGB Exhibition, with over 70 trade stands displaying just about everything from surplus equipment sales to commercial Amateur stations. Then there was the giant tombola, the numerous competitions—even one for the children, the Mid-Anglia police who demonstrated a radar trap, and a superb demonstration of radio controlled model aircraft which did just about everything except serve hot lunches on board. A popular event with the ladies was the demonstration by Helena Rubinstein beauty experts.

Perhaps the most significant factor in the tremendous success of the Rally was the wonderful hospitality of the Americans. There was "Bob" who served the most delicious hot-dogs direct from an open barbecue; and the man in sun-glasses smoking a cigar who drove a gaily decorated "train" round the base all afternoon to give rides to the children. The "train" by the way, was brought all the way over from Mildenhall. Out on the runways and roads round the Base men in uniform with white hats and gloves gave clear directions to all newcomers and directed them to the parking runway. They were still out there when we left at 5.30 p.m. The "Talking Bird", a huge aircraft which, inside, looked like a "baddies" communications centre in a James Bond film. Special buses were laid on to take us to see the Police dog display and for those who got thirsty, there was a nice long cool drink which had been kept in huge bins crammed with ice. With so much going on no wonder we were all so reluctant to leave. The weather was superb, and at half past five the sun was still blazing to attention patiently waiting for "permission to set Sir". If you missed the rally then—"like man you goofed". See you next year?

IRISH POLICE ON THE AIR

Ultra Electronics have received an initial order worth £19,000 from the Garda Síochána (Irish Police) for their new "Cub" Pocketset.

The purchase of the "Cub" by the Irish Police follows their declared policy to provide their force with the most efficient and up-to-date equipment currently available.

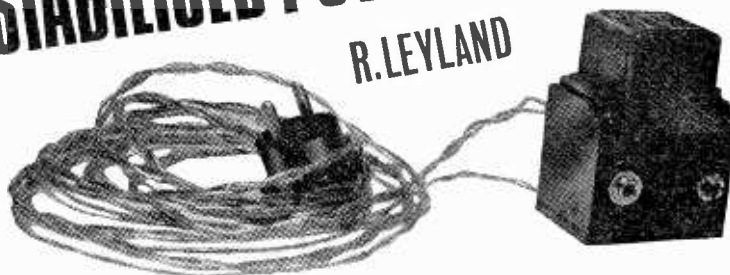
The equipment is already in quantity production for the Home Office and many industrial users.

Designed to meet the ever growing need for personal lightweight, 2-way radio communications equipment, the f.m. "Cub" weighs only 25ozs. It is the latest edition to the Vigilant range of portable equipment which is already used in large quantities by Police, Fire Services, public utilities and many commercial users throughout the United Kingdom and overseas.

MINIATURE

STABILISED POWER SUPPLY UNIT

R. LEYLAND



CURRENTS can be provided from this 9-volt supply of up to 100mA to work radio or other transistorised circuits. The output is kept in the region of 9 volts throughout the normal current range by a series stabiliser consisting of a power transistor and a 250mW zener diode. Beyond the stabilised range, a steep fall in voltage limits the short-circuit current to about 300mA. The steeply-falling characteristic belongs to the voltage-doubler rectifier system and is levelled out initially by the action of the transistor regulator, to give an output impedance of approximately 5Ω over its linear range.

Unlike most other types of power supply, it is not immediately damaged by overloads, but a short-circuit lasting for half-an-hour or more would cause the transformer to overheat. A midget bell transformer, it has an unusually large voltage drop on load. On open circuit, the secondary voltages are 50% above the nominal values obtained at the rated 3 volt-amperes output. Choosing the 5V section, about 18 volts appears across the voltage-doubling capacitors when no load is connected to the power unit. The excess voltage is dropped across the transistor, and only about 9 volts appears at the output. This is clearly shown in the graphs, Fig. 3, of the power unit before and after stabilisation.

Zener diode

The power dissipation in the transistor is low, and the small temperature rise in normal working is confined mainly to the transformer. The zener diode also works at well below its 250mW rating. The maximum zener current (approximately 17mA) occurs when there is no load on the power unit. At output currents above 100mA, the current in the zener diode decreases to zero, stabilising action ceases, and the voltage falls.

There is an appreciable production spread in zener diodes, e.g. $\pm 5\%$ or more. The nominal voltage of an OAZ207 is 9.1V, and the output should not exceed 10 volts with a diode at the upper end of the production spread. It would in fact be rather less, possibly 9.8V, owing to the base-emitter drop. A lower voltage than this could be guaranteed, if necessary, by using an OAZ206 with a nominal voltage of 8.2V.

The characteristic of any good quality zener diode shows hardly any current at voltages below the

stabilised voltage, but when the stabilised voltage is reached, any further slight increase of voltage causes a large current to flow. This current is passed through a resistance in series with the diode, causing any surplus voltage to be dropped across the resistance, leaving the voltage across the zener diode almost unchanged, and only slightly higher. The zener diode is thus enabled to preserve an almost constant voltage despite large changes in the supply voltage, and in the face of variable loading. The constancy of stabilised voltage depends on the amount of resistance into which the zener diode works. Here it is a 470Ω resistance, together with the input resistance of the transistor.

The base-emitter potential difference of the transistor will be between 0.2 and 0.3V according to the emitter current. Connecting the base of the transistor to the zener diode ensures that the emitter voltage will be within a fraction of a volt of the voltage across the zener diode. As long as the zener voltage is maintained, the output will be stabilised, and when with heavier loading, the zener current approaches zero, the voltage across the zener diode and the output voltage will both fall. The transistor functions as an emitter-follower, tying the output to the reference voltage, acting as a control amplifier to minimize the difference between them. The transistor handles a heavier current than the zener diode, a low wattage type, is able to control directly, and permits some improvement in stabilisation, by enabling the resistance in series with the zener diode to have a value as high as 470Ω .

A highly stabilised supply would have an output impedance that is only a small fraction of an ohm,

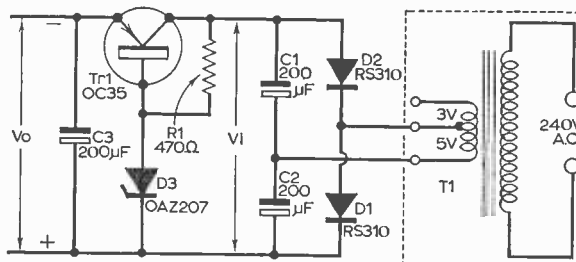
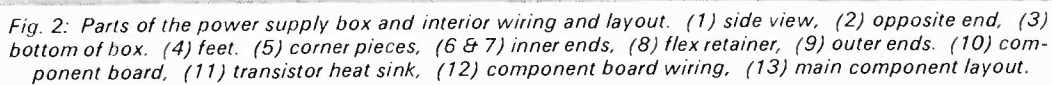


Fig. 1: Circuit diagram of the complete unit.



but this requires a multi-stage amplifier with temperature compensation. An output impedance of 5Ω compares quite well with that of a transistor radio battery.

Performance

After continuous working at 100mA for a long period, the only noticeable change is a small decrease in output voltage, less than 2%, due to warming up. The low output impedance and freedom from ripple make it a suitable power unit for Class B amplifiers with outputs up to 1 watt (see Fig. 3).

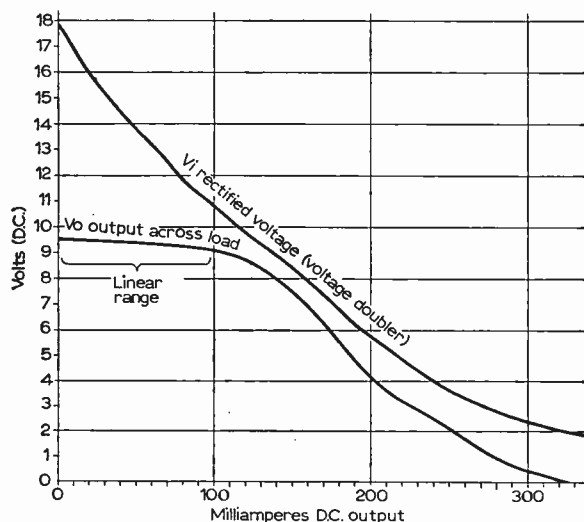


Fig. 3: Regulation curves of the power unit.

Construction

An all-insulated construction was considered necessary, with complete separation of the primary and secondary circuits. The transformer itself meets this requirement, and the other components are housed under the transformer in a box made from $\frac{1}{8}$ in. insulating material, perforated with $\frac{3}{32}$ in. dia. holes for ventilation. To prevent the holes in the bottom from being blocked, it is raised on feet consisting of two hardboard strips. Hardboard is also used for the inner end pieces to provide thicker edges for gluing. An impact adhesive should be used that gives strong joints without becoming brittle.

The outer ends of the box overlap the connector blocks of the transformer and at one end a flex channel is provided in the simplest manner by shaping the top of the hardboard and adding a piece of $\frac{1}{8}$ in. material on the inside to form the other wall of the channel.

Twisted plastic-covered flex, with the leads separated and uncrossed, fits into this channel, and the two leads are retained individually by the bends into the connector blocks.

At the other end of the transformer, fine plastic-covered stranded wire brings the input from the 5V secondary into the box, and similar wire is used

for the d.c. output connections. These connecting leads are several inches in length to enable the component assembly to be inserted easily into the box.

The output connectors are a pair of large type transistor battery press studs, glued in position over the two apertures at the front. The tags are bent back on the inside so as to remain clear of the component assembly. The d.c. leads are soldered to these bent tags in the interior.

A pair of 6BA bolts 1 in. long secure the transformer on top of the box containing the other components. These screw into 6BA nuts that are imbedded in the hardboard, $\frac{1}{4}$ in. from the top. To make this possible, the hardboard is thickened to $\frac{1}{4}$ in. by additional corner pieces glued on the inside. The vertical holes for the 6BA bolts occur at the joins, but with care, the holes can be drilled satisfactorily. If splitting occurs, this can be remedied with further gluing.

Before the outer $\frac{1}{8}$ in. material is glued on over the ends, holes are made at right angles through the doubled hardboard, $\frac{1}{4}$ in. from the top, for the 6BA nuts. These holes can be made rectangular by inserting a needle file after drilling. The 6BA nut is pushed in and positioned by screwing the 6BA bolt through it from the top. The nut is then fixed with plastic wood. Finally the outer pieces are glued on.

Component assembly

The earlier type of OC35 is thicker and will not fit into this power supply, although it is otherwise suitable.

The more recent type is only $\frac{1}{4}$ in. in depth (excluding the soldering pins).

The transistor is bolted on a small heat sink with 4BA nuts and bolts. A tag is fitted under the head of one of these bolts for the collection connection. The heat sink, of 18 s.w.g. aluminium, has two $\frac{1}{4}$ in. flanges. To one of these a small square of Veroboard is fastened at right angles to the heat sink by a pair of 10BA countersunk bolts with nuts.

The Veroboard measures 1.45 by 1.35 in. and is sawn from a larger piece. If necessary it can be filed a little at the edges to allow it to be fitted easily into the box when attached to the heat sink. A small gap is filed at the top edge to leave sufficient room for the leads to the transformer secondary.

Three breaks are made in the copper strips. Two of these are necessary to avoid contact through the 10BA bolts with the heat sink. Three jumper links of 24 s.w.g. tinned copper are added. These are inserted from the other side of the Veroboard and soldered to the respective copper strips.

Wiring the power unit presents no difficulty if the proper sequence is followed. The resistor R1 is connected between the collector tag and the base pin of the transistor. A wire is taken from the base pin to an adjacent point on the board as shown. A heat sink should be applied on the transistor pin when soldering. The emitter pin also connects to the components board, and a flying lead is taken from it for the negative d.c. output. The other leads are taken from the points on the board shown, and must be of fine flexible plastic-insulated wire to

—continued on page 343

switched fm tuner



Transistor lead identification is given with the respective pictorial diagrams. The 2N2926 has a central collector lead as shown in Fig. 8 (sketch A) and this must be bent (sketch B) to suit connections for Tr5, Tr6 and (sketch C) for Tr7. Sleeveing should be fitted to all transistor leads.

After careful checking the tuner may be tuned without the lid on the screened compartments. Connect dipole, 9V battery and crystal earpiece or amplifier. A rushing noise is normal in the absence of a signal and should disappear as a switched-in pre-set (TC1—TC3) is adjusted. If the entire capacitor range fails to bring in all three programmes adjust L4 by slight extension or compression to shift the resonant range. L1 and L2 are very broadly resonant and will not need adjustment at this stage, if at all, but L3 core should be adjusted half a turn at a time for every sweep with the tuning pre-set. When the three programmes have been located switch and tune all three pre-sets, then adjust L3 core for optimum performance over the band. Some adjustment of L2 (by slight extension or compression) may be necessary. Fit the screen lid and note the effect upon tuning. Adjust L4 to restore the range, a matter of a few trials before the lid is permanently attached by spot soldering in four or five places. Final adjustment is best achieved with a poor signal—from a split-flex indoor dipole, for example—so that you can tune L4 through the screen hole, and the pre-sets, for minimum background noise.

The excellent results obtained with a crystal earpiece suggest that the tuner can be used for "personal" listening, a far more enjoyable experience than plugging the earpiece into most transistor receivers. The audio output is more than ample and drives the author's 5-watt transistor amplifier (without pre-amplifier) and should therefore be enough for most fidelity needs. An output capacitor will be necessary if this protection does not exist at the input of the amplifier or pre-amplifier—up to 50 μ F and an appropriate working voltage for transistor equipment. The tuner requires a 9V, 11mA power supply and this can be supplied from other equipment provided the correct polarity is observed. A 12V supply (maximum) will increase the sensitivity, frequency stability and output if this is necessary. The frequency stability of the oscillator will tolerate some supply variations but cannot be expected to offset the effects of very poor regulation.

Although a single-pole three-way switch is sufficient the photographs show a three-pole type with the unused tags earthed. There seems to be a tendency for dealers to stock only three-pole types on

Second and final part — by W. GROOME

the grounds that these will do for one-, two- or three-pole use. Again, although dealers' stocks have become largely representative of the transistor era it is by no means easy to obtain switches smaller than those that have done service in valve circuits ever since the war. Because of this supply difficulty a standard-sized component has been specified. Despite all this, the tuner is small enough to fit into most fidelity housings very easily. Perhaps, when the required small components are readily available, I will cram the entire tuner into a fag-packet!

Note. Throughout this article the term "earth" means the positive line of the tuner.

CONSTRUCTION

Divide conductors as in Fig. 2, drill screw fixing holes in first (unused) conductor and through S21. Restore continuity here with bare-wire soldered connection S20 to S22. Drill hole at P30 to pass switch bush and fit platform with pre-set capacitors, secured by fitting switch. Connect insulated wire from mid-point of Q18 and Q19 to V32. Black connection from mid-point Z21 Z22 to mid-point M25 M26 and from there to M11. Make bare connection from T to S near hole 2. Make bare connection T25 U26 V27. Turn panel plain side upwards so that M1 is top left and switch is on right, then proceed as in Table 1.

TABLE 1 R.F. STAGE (FIG. 4)

M2	N2	C1	
S2	Q2	R2	
S3	Q3	C3	
	N1	} L1	See Fig. 3
	Q1		
M5	P5	R3	
S5	—	R4	wire-to-wire with R3
S6	—	C4	wire-to-wire with R4
—	N3	Tr1	emitter
—	N5	Tr1	collector
—	P4	Tr1	base
—	S4	Tr1	screen
S7	M7	C2	wire sleeved, flat on panel
—	M6	} L2	Fig. 3 Equi-distant from other components and panel edge
—	N8		
M10	M8	R1	Wire sleeved, bent close to resistor and panel
—	N9	} C5	
—	P9		
T1	—	—	This screen support wire can be left until screen is fitted

Check work already done with circuit and pictorial diagrams, then turn panel, again plain side upwards, so that switch is on left and M1 is lower right. Work then proceeds generally in the direction left to right as before.

Check work thoroughly before fitting screens. The shorter screen should lie along row T. Trial fit first to mark positions of small partitions—R.F. partition to stand between rows 9 and 10 with C5 on one side

TABLE II OSCILLATOR STAGE (FIGS. 5 AND 6)

M13	P13	R6	
S13	—	R7	wire-to-wire with R6
—	—	L3	short stiff wire connection from one tag to top wire of R6. C7 aids support; no further support needed
S12	—	C7	connect to second tag on L3
M14	—	C6	negative
—	S14	C6	positive. Wire sleeved, flat on panel
M16	N16	R8	
Q16	S16	C8	
P17	—	—	wire partition support, similar to T1
—	N17	} C10 to right of P17	
—	Q17		
—	Q18	} C9	
—	S18		
S19	Q19	R9	
—	N15	Tr2	collector
—	P15	Tr2	base
—	Q15	Tr2	emitter
—	S15	Tr2	screen
—	Q24	} C11	
—	S24		
—	—	—	Connect unused switch tags together and earth to S28
—	Q25	—	Insulated lead to switch selector tag. Press wire flat on panel and bend C11 clear of L4 area
M25	M23	R5	
—	N21	} L4	
—	Q21		
T24	—	—	Trial fit and bend ends to make coil stand about 3/16in. above panel, 1/2in. clear of panel edge and equidistant from other components. Refer to Fig. 3, Fig. 6 and photograph
T24	—	—	Partition support wire

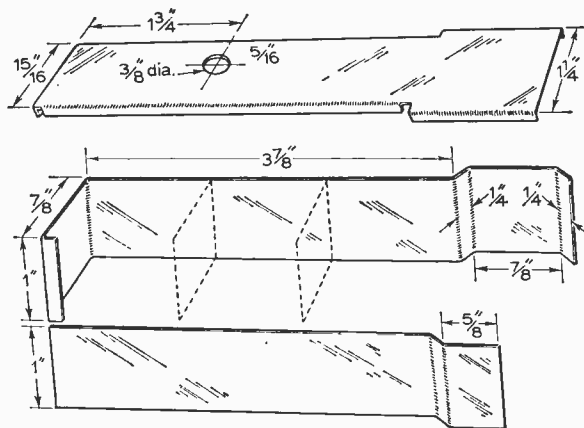


Fig. 9: Details of tinplate screens.

TABLE III I.F. STAGE (FIG. 7)

V33	X33	R10	—	X29	Tr3	collector	
—	X32	} C13	V25	W25	R15		
—	W32		U24	V24	R16		
—	X31	} C12	—	U23	} C15		
—	V31		—	V23			
—	Z30	C14	negative	Z22	Z24	R12	
—	V30	C14	positive	—	Y22	} C16	
Z27	X27	R13		—	W22		
Z26	Y26	R14		—	W24	Tr4	emitter
W26	W28	R11		—	X24	Tr4	base
—	V29	Tr3	emitter	—	Y24	Tr4	collector
—	W29	Tr3	base				

Fig. 8 (below): Discriminator and output. Sketches of 2N2926 show underside (A) as purchased, (B) joggled for Tr5 Tr6, (C) joggled for Tr7. (D) shows underside of OC71.

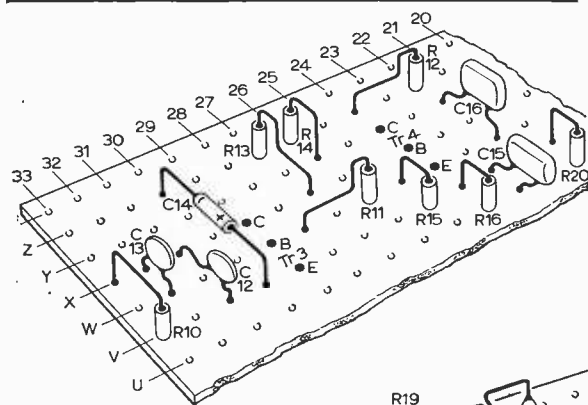


Fig. 7 (above): I.F. stage, plus underside view of XA102 transistor.

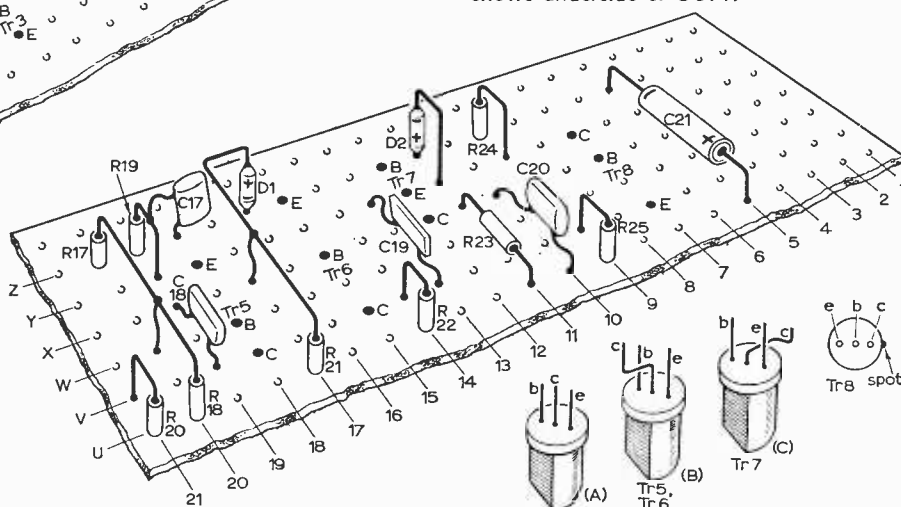


TABLE IV DISCRIMINATOR AND OUTPUT STAGES (FIG. 8)

U21	V21	R20
U20	W20	R18
Z20	—	R17 wire-to-wire with R18
Z19	Y19	R19 wire-to-wire with R18
Z18	—	C17 wire-to-wire with R19
—	X19	C18
—	V19	
—	Y18	Tr5 emitter
—	W18	Tr5 base
—	V18	Tr5 collector
U17	X17	R21
Z16	—	D1 wire-to-wire with R21. Note polarity in Fig. 8
U14	V14	R22
—	V13	C19
—	Y13	
—	Z15	Tr6 emitter
—	X15	Tr6 base
—	V15	Tr6 collector
—	U11	R23
—	X11	
—	U10	C20
—	X10	
—	Z11	Y11 D2. Note polarity in Fig. 8
—	Z12	Tr7 base
—	Y12	Tr7 emitter
—	X12	Tr7 collector
Z9	Y9	R24
U9	V9	R25
—	V7	Tr8 emitter
—	X7	Tr8 base
—	Y7	Tr8 collector
—	Z5	C21 negative
—	U5	C21 positive

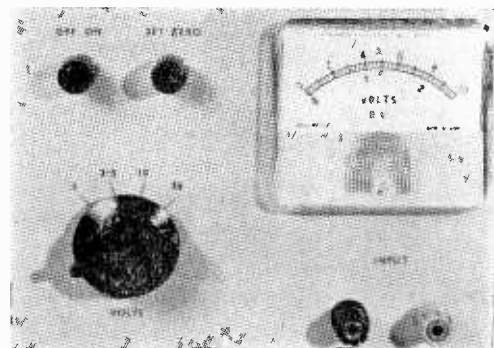
and R1 the other, oscillator partition between rows 16 and 17 with C8 R8 on one side and C10 the other. After soldering partitions to screen attach plastic adhesive tape to areas likely to touch components when fitted, then fit screen to panel by soldering to wire supports T1 T24 F17. Attach the other (long) screen by soldering lap joint, partitions (hot iron outside, cored solder to joint inside) and a spot joint to tinplate platform near switch. Lid to be spot soldered after final tuning adjustment, or may be omitted if tuner is eventually to be fitted in a screened housing.

Connect the following leads as in Fig. 2:

- Z1 negative, black flex. —9V.
- S1 or T1 positive, red flex. OV.
- M1 co-ax cable, core } to socket attached to
- S1 " braid } housing.
- Y1 a.f. output, via capacitor if this is not present in a.f. equipment input.

IMPORTANT. Observe polarity when connecting to other equipment. On no account must the positive line, the screens or the aerial be allowed to contact the earth or chassis of "negative earth" equipment. Next to a battery the simplest supply is a smooth, well-regulated —9V from transistor equipment with positive earth. With negative-earth equipment connect Z1 to equipment negative line and S1 (or T1) to +9V obtained by dropper resistor or bleeder from equipment positive line. ■

two voltmeters for the workshop



The comparatively recent inclusion of silicon devices into electronic circuitry has brought one of the most simple measurement problems into the foreground. This article describes the construction of a modern a.c. millivoltmeter and a d.c. voltmeter incorporating silicon transistors.

the music box a simple pre-set portable

Make this easy-to-build transistor portable receiver. Only three transistor stages to wire up. Utilises a cheap pre-wired audio strip with push-pull output stage. Tunes in the stations of your choice at the flick of a switch. Tagstrip wiring for ease of construction and only two controls. Full constructional details of case included.

economical speaker enclosure

The weakest link in many audio set-ups is the loudspeaker—or, to be more exact, its housing. Here is a simple and easy-to-build corner enclosure which should help to obtain better results from existing speakers.

PRACTICAL WIRELESS

October issue — on sale September 8th

RESERVE YOUR COPY NOW!

ON THE SHORT WAVES

MONTHLY NEWS FOR DX LISTENERS

Times in GMT
Frequencies in kc/s

THE BROADCAST BANDS

by JOHN GUTTRIDGE

MIDDLE EAST

Egypt: *Cairo Radio* (U.A.R. Broadcasting and TV, P.O. Box 1186, Cairo) uses the new frequency of 15,050 in parallel 15,475 to carry its main Arabic programme.

Iran: *Radio Iran* (Ministry of Information, Meidan Ark, Tehran) is again using 3,780 for its home service and giving an excellent signal around 1,800. The regional station *Radio Isfahan* gives a fair signal at 1715 on 7,890.

Iraq: *Radio Baghdad* (Salihiya, Baghdad) using additional frequencies to relay home service: On 15,400 from 0930-1200 and on 11,785 0530-0700 and 1200-2200.

Lebanon: *Radio Lebanon* (Ministry of Information, Beirut) transmits in its external service as follows: 1830-2030 on 17,750; 2300-0100 17,765; 0130-0400 11,965. Some reports give this last frequency as 11,760.

Syria: *Radio Damascus* (Ommayad Square, Damascus) is relaying its home service on 17,860 at 1300-2300 and on 15,165 1900-2300. English is beamed to Europe at 1600-1700 over 15,165.

AFRICA

Algeria: *Radiodiffusion-Télévision Algerienne* (21 Boulevard des Martyrs, Algiers) is to start shortly using a 1,000kW long wave transmitter. This will be the first long wave transmitter in Africa.

Ghana: *Radio Ghana* (Broadcasting House, P.O. Box 1633, Accra) is actually using 9,755 instead of the announced 9,760 for its 2000-2100 English transmission.

Nigeria: *Radio Nigeria* (Broadcasting House, Lagos) is now carrying its external service over 21,645/15,255/11,715/7,275. English is at 1500-1600, 1700-1900, 2100-2200.

South Africa: *Radio South Africa* (P.O. Box 8606, Johannesburg) is once again using the 11m.b. The transmission concerned is at 1000-1455 and frequencies are 25,730/21,495/17,805/15,200. Careful tuning will bring in the home programme around 2100 on 3,250.

ASIA

Afghanistan: *Radio Afghanistan* (Ansari Watt, Kabul) has a new transmission beamed to Europe at 1100-1200 over 17,825/15,340.

China (Taiwan): *Voice of Free China* (Taipei, Taiwan) now uses 17,890/17,780/17,720/15,345/15,125/11,825/7,130 for its 0200-0350 English transmission.

India: *All India Radio* (P.O. Box 500, New Delhi) has English as follows: 2245-0015 7,235/9,615; 2245-0115 9,740/11,760; 0030-0115 11,710/15,105; 1000-1200 15,105/15,165/17,705/17,890/21,615; 1330-1500 15,375/16m.b.; 1745-2230 7,215; 1745-2030 11,620; 1745-1945 15,230; 1945-2045 9,690/11,775; 1945-2230

9,912; 2045-2230 11,755.

Indonesia: *Radio Republik Indonesia* (P.O. Box 157, Djakarta) has English as follows 1900-2000; 2330-2400 9,865; 0900-0930 11,770; 1100-1200 9,865/11,770. A new home service outlet has been noted around 1100 on 5,065.

Japan: N.H.K. (Tokyo) frequency usage for English and Japanese service is 0100-0730 15,105/15,195/15,300; 0800-0930 15,300/15,195/9,505; 1000-1330 9,505/11,815/15,300; 1400-1630 9,505/9,560/11,815; 1700-2130 9,560/11,815/15,105; 2200-0030 15,195/15,300/17,785. Transmissions are every hour on the hour and last 30 minutes except for those at 1000, 1400 and 2300 which last 90 minutes.

Pakistan: *Radio Pakistan* (Broadcasting House, Bunder Road, Karachi) has a dictation speed English news broadcast at 1335-1350 on 15,100/17,812. The U.K. English TX at 1945-2030 is now on 11,672/15,365.

NORTH AMERICA

Canada: C.B.C. (P.O. Box 6000, Montreal) has replaced 21,460 by 21,595 at 1100-1215 and 1345-2152 and has replaced 15,365 by 15,320 between 1100 and 1830.

CENTRAL AND SOUTH AMERICA

Bolivia: *La Cruz de Sur* (Cajon 1408, La Paz) is reported fair at 0200 over CP75 on 4,985.

Brazil: *Radio Exelcior* (Rua Wenceslaur Brazil 78, Sao Paula) gives fair reception at 0100 on 9,585.

Costa Rica: *Radio Popular* (Apartado 341, San José) is now using the additional frequency of 4,784.

Uruguay: *Radio Oriental* (Olimar 1364, Montevideo) is fair at 0030 on 11,735 (CX47).

Venezuela: *Radio Maturin* (Maturin). YVQH has been noted on 5,040 with fair signals around 0100.

EUROPE

Germany: *Deutsche Welle* (Brueckerstrasse 1, Postfach 344, 5 Koln) has made frequency changes in the following English TX: 1550-1620 15,275/17,880; 1900-1910 15,405/17,785.

Greece: *Voice of America* (Washington, U.S.A.) has closed its G8 Thessaloniki and Rhodes relays to avoid censorship.

U.S.S.R.: *Radio Moscow* (Moscow) now has the following European English schedule: 0700-0730 9,700/9,710/11,830/11,890/15,300/15,360; 1200-1230 11,700/11,740/11,830/15,300/17,760; 1900-1930 1,322/9,710/9,770/11,830/15,170; 2000-2030 1,383/9,710/9,770 11,830/15,170; 2100-2200 1,443/9,710/9,770/11,830/12,060; 2200-2230 1,322/1,383/1,443/9,710/9,770/11,830

Thanks go this month to G. Coyne, M. E. Terry, R. J. Warner, the International Short Wave Club, and the Swiss Broadcasting Corporation.

A SOMEWHAT controversial month with some claiming things were so bad they were going to take up chess, while others lamented that there were not enough hours on the clock to log all the DX. At '3JDG things were about half and half, but most s.w.l.'s logged my best ones anyway and threw a few more in for good measure.

From letters received it is now certain that 8R is the new prefix for VP3. I reckon all people issuing a Countries List should give away a free pen with it for all the alterations that will arise while the darn thing is still in the post. I can hardly wait for instructions to change my call to VXY7JDG. (Many a true word!)

One or two have written in to ask about a competition or a table of some sort. If there are enough takers we might try this, any suggestions as to what form it should take?

Quite a heavy postbag this month so I'll replace my muzzle and press on with what others have heard.

LOW

Nothing extra special reported on topband other than hordes of G's and quite a large number of mobiles. Eighty fared a little better but surprise surprise—forty has been given a going over. John Wresdell (Yorks), logged ZL3IJ and ZL4LM on 80 s.s.b. so the DX is about on this band. John is 13 and takes the RAE in December. (Good luck OM).

R. Iball (Notts), AR88D, 80 ft. end-fed with 35 ft. 72Ω co-ax managed these on 7Mc/s c.w.—HI7JMP, HK4AOY, KZ5FX, PY2AXZ, 3C2ATD, 6Y5RM.

Paul Baker (S. Wales), HE30, 100 ft. end-fed 30 ft. up snapped this little lot up on 7Mc/s s.s.b.—CN8AW, CN8BV, CR6IV, DJ, DL, DK, DM, EA4JV, F, HA, HB9, II, MP4BEU, MP4TBO, OD5AR, OHØNI, OY7S, PY4FLR, PY7APS, PY7VKG, PY8QA, PZ1CF, TF2WKM, UA1KBX, UQ2KAJ, UW9AF, ZC4MO, ZD7CI, ZD8CX, 3A2CQ, 4X4VE, 9G1BF, 9H1AM, 9Q5SS. These were all received 2200-2400 GMT.

F. Simpson (Yorks), no rig quoted, must be pretty good headphones, got these on 7Mc/s phone—HK3BHV, K1GZL, K2ZKA, K4LYW, KP4CQY, PY4ND, PY7AKG, W3ADO, W4YWX, WA4MZI, WA9OIN, WB4FRL. Why is it all these stations never seem to be on forty when I listen. ('Tiz a conspiracy Jim Lad, Har that's what 'tiz).

A number of s.w.l.'s commented on the dozens of G stations who are about these days (and nights) on forty, so perhaps that 100kc/s will begin to buzz again. Why not give it a try this month?

HIGH

It looks like twenty is still top DX dog with fifteen and ten a close second.

David Henbry (Sussex) roamed twenty with that O-V-O of his. This is coupled into a "Joymatch" No. 2 and the antenna is a 7 ft. vertical at 30 ft. David logged these on s.s.b.—CR4BC, CR6HI, EL2AJ, HK5AZA, KG4AM, KL7EBK, KP4AXC, LU2DGO, LU9DM, MP4BEU, MP4TBO, MP4MAX, OA4MX, PZ1CF, UWØIE, VP2AA, VP6WR, VP8IU, VS9ARS, XW8CC, YS1CPI, ZD3I, ZD8RD, 5H3JR, 6O1GB, 6W8DX, 6Y5GG, 8R1S, 9G1GA, 9U5BB, 9Y4VT.

D. Fry (Glos) 52 set. λ/4 dipole (cool!), reports twenty lively especially late evenings. He scooped—HV3SJ, JA4DJO, KP4CRD, K7OEW/MM, PY1CAD, SVØWL, TI2PZ, UA3KND, UB5KIW, UWV3T, VQ9HJB, VS9MB, XW8CC, YV4QG, YV5ANF, 5A4TR, 6W8DX.

Is your name **Philip**, and do you live in the Langley Mill area of Nottingham? You've got an RX60 receiver and a 20 metre dipole in the loft, but you haven't got a second name! Anyway, on 20 a.m. and s.s.b. you logged—CE1AQ, CN8CS, CR4BC, CR6IV, CR7CH, EA8OG, EP2KW, HC1DX, HM5BF, HV3SJ, JA2BV, K8VWM/P/KG6, KA3FU, KA9LLE, KP4AST, KR6AB, KR6QG, KV4UA, LU3IQ, MP4BE, OD5EU, OY9IN, PY1CRI, PY7SM, TF2WKI, VE1AFY, VP9CP, VQ9HJB, VU2DKZ, VKØTO, VK7RE, WB2BWW, WB4BII, XW8BJ, YV3LA, ZC4TK, ZD3DM, ZD8RD, ZD9BI, ZE1AE, ZP5OG, ZS6AYI, 3A2CP, 5A1TV, 5A4TV, 5N2AB, 5R8AS, 5Z4KL, 7Q7LZ, 8R1C, 8R1S, 9H1AB, 9Q5BIG. Take a bow Philip—whoever you are.

B. Hughes (Worcs), AR88D, dipole, listened on 15 for—HK1KS, JA9BXL, KZ5AO, KV4CX, 4S7PB (Ceylon), 5R8AS, 9M2PO, 9V1NP, WAØDVT.

L. Rowland (Cheshire), 9R-59, 150ft. end-fed, switched in the b.f.o. on 15 and heard these on s.s.b. CE3DM, CN8FC, CP6GC (Bolivia), CR4BC, EL2AI, EL9A, HC1MW, HI8LAL, HK1OI, HKØAI (San Andres Is.), HP3PJ, HR1CN, IS1VAZ, JA1AEH, JA2ADH, JA3JEJ, JA4ABS, JA8BIU, KG4AN, KG6FAE (Guam), KH6BFU, KL7WAH, KR6GF (Okinawa), KP4CP, KV4CX, KZ5FW, LU1DAB, MP4MAW, OA4JR, OD5DJ, PY1TX, PY2SD, PY5BK, PY6NG, SVØWV, TI2JH, TJ1AG, TU2AY (Ivory Coast), VK4QM, VK9XI (Christmas Island), VR1AT, VS9ARS, W5PBH, W6CCP, W7MSI, YA1DAN, YN1BKC, ZB2AM, ZC4JU, ZD8CX, ZP5JB, ZS1BD, ZS4LI, ZS5NX, ZS6PZ, ZS8L, 4S7PB, 4X4BL, 5A1TV, 5A2TR, 5A3TG, 5A4TR, 5A5TV, 5H3JL, 5N2AAJ, 5Z4KK, 8R1S, 9H1AG, 9J2AB, 9L1JW, 9M2NF, 9Q5BD, 9V1FF. This is only three-quarters of the log too!

K. Jeeves (Yorks) CR70A, PC30, 80 ft. long wire, doesn't say what mode but heard these on 10—CN8BB, IT1ALG, UG6ARO, VE3FUG, VS9APW, ZE2JA, 3C3GCO, 5A1TK, 9H1X.

Signalman G. Gibson writes from Germany. He has an EC10, 50 ft. long wire, and a sharp pair of ears. On 10 a.m. he got—CT3AM, CX6AD, LU5DRC, PY2CK, PY8SV, UB5GUS, UL7OB, ZE1CS, ZE2JA, ZS2OM, 9J2DF, while on s.s.b.—CR6IV, CR7BF, EP2GI, OH2TI, PY2OY, ZD8CX, 4X4BL, 9J2VX, 9Q5DD.

D. Goodhall (Rugby), HE30, 40 ft. long wire hooked these in on ten, mostly s.s.b.—EA4JN, HG5CZ, LU3IAG, OZ6HP, PAØBK, PY2AFL, UA6JP, ZC4TY.

CONTESTS/RALLIES

This month the list includes—August 13th, Derby Mobile Rally, at Rykneld School, Derby. That's it, sorry, can't find any contest, and no sign of anything else for August. On September 2nd-3rd is the V.H.F./IARU contest. Deadline for logs is, as usual, the 20th.

LETTERS...

John Arminson Rouse — A Tribute

May I express, as a reader of PRACTICAL WIRELESS, the shock and sorrow at hearing the news of the death of Mr. John Rouse, G2AHL, who was General Manager and Editor of the RSGB. I am sure I speak for many readers, RSGB members or not, because John had a high regard for 'PW' and he and I often spoke about articles and readers' letters in it.

The much improved RSGB Bulletin, and the very fine Third Edition of 'The Amateur Radio Handbook' is seen, I know, by many more people than just RSGB members. Mr. Rouse made both these developments possible with his tremendous devotion.

We have lost a much loved worker in the field of Amateur Radio, and I for one and the small band of boys in the Radio Club I run, have lost a personal friend. We will miss his cheerful anecdotes and great encouragement.—Ken Smith, G3JIX (Walthamstow, E.17).

[I am sure that all readers will join with myself and the PW staff in Ken Smith's tribute to the memory of John Rouse. Many of us have lost a personal friend and PW, the RSGB and amateur radio in general will sadly miss his devotion and loyalty to the cause of amateur radio. We must spare a thought, too, for the wife and daughter he left, for John was still only a young man. Amateur radio can ill-afford such tragic losses.]—W. N. Stevens.

Why not tape them?

Whilst attempting to wind a coil on a cotton-reel which became very tedious, I sought after a faster method. I tried a sewing machine but was unsuccessful then in despair tried using a portable tape recorder. The cotton reel fitted on the rewind spool perfectly and by using a screwdriver I was able to guide the wire on to the cotton-reel while the recorder was on rewind. After a little experimenting this was found to be very much quicker and neater than winding by hand.—S. Cooke-Willis (Auckland, New Zealand).

No more excuses, please

When are these types going to run out of excuses as to why they should be exempt from the RAE and the morse test? I refer to Mr. T. Hawker's letter in the July issue, who seems to think that just because he uses radio telephones he should be given an amateur licence.

Let's put this in its right perspective, this equipment is all commercial gear which is approved by the GPO and is also crystal controlled. The only qualification to operate it being, the ability to press a button and speak the appropriate language. A child of five could do it.

He asks where is the sense in it? Maybe this question is the answer to why he failed the RAE, he may not have enough enthusiasm. After all the RAE and the morse tests are the only way in which we can weed out the person who just wants a new toy to play with, from the real enthusiast who would be a competent amateur.

When I look around at some of the Bedford Club members, I thank God that I have got all my human faculties as I don't think I would have the drive of these less fortunate types, there are no exemptions from the rule.

I have no time at all for the anti-RAE, the anti-morse, and the citizen band brigades, if these chaps were to spend a bit more time studying for these things and less time thinking up reasons why they should be exempt, in no time at all they would be on the air saying how easy it was.

No hard feelings old man, best of luck for the next RAE.—R. T. A. Brown, G3TOF, Hon. Secretary Harlow & District Radio Society (Harlow, Essex).

Fault-finding on a "dead" receiver

I would like to comment on the series of articles "Repairing Radio Sets" by Messrs. Hellyer and King. I was trained in HM Forces and although the equipment we use may be a lot more sophisticated, the basic principles surely still apply.

The way I was taught to fault-

find on a "dead" set disagrees with the method shown in the series. I was taught to start at the a.f. end and work towards the r.f. end, by applying a suitable signal to first the speaker and then to the a.f. stages, i.f. stages and back to the r.f. stages and aerial input. The output should then be heard after each step.

If no input signal is heard, then the section in which the fault lies is the first one you have applied the signal to and obtained no output from the speaker.—J. F. May (Gosport, Hampshire).

The Author Replies:

The stage responsible for complete failure of a radio set can be located quickly by adopting one of three methods: (i) applying suitable signal in turn to the stages starting from the aerial input, (ii) as in (i) but starting from the loudspeaker and (iii) applying a modulated signal at the aerial and then tracing the signal in the set from input to output.

Methods (i) and (ii) can be discussed at length in terms of relative merit! If the trouble is open-circuit of the aerial coupling coil, for instance, method (ii) would take as long as method (i) would take to find an open-circuit in the loudspeaker. It is well known that HM Forces recommend method (ii); but this does not mean that the other methods are less effective. Forces equipment has to be maintained to a higher level than ordinary domestic radios, and technicians are often surrounded with test equipment designed for matching the equipment to be serviced; and each repair usually demands a stage-by-stage performance check in terms of voltage sensitivity and so forth and, as stated by Mr. May, if a common output meter is employed, then each input can immediately be translated into input sensitivity voltage.

The various methods of faulty-stage locating have not yet, in fact, been dealt with at length in the articles. These are in hand for Part II, when the transistor set as a whole is put under the service microscope. The series commenced at the first stages, working to the audio section, because this is the normal direction of the signal. There was no other motive!

Build Your Own Heathkit Electronics

A kit for every interest—Home Workshop—Hi-Fi—Radio—Test—'Amateur'
Treat yourself to superb LW, MW entertainment with the
High-performance Car Radio Kit. CR-1.



Complete your motoring pleasure with this small, compact, high-performance car radio. It can be fitted to any make of car having 12 volt positive or negative earth system. Tastefully styled in neutral grey with matching black knobs and chrome trim to harmonise with any car colour scheme.

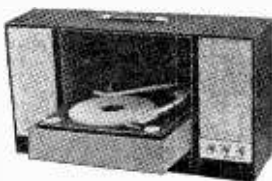
Features include:— Six transistor, 2-diode circuit. Completely pre-assembled and aligned tuning unit. High sensitivity, combined with wide range automatic gain control (AGC), minimises fading under weak reception conditions. Easy-tune dial. Push button long, medium, and tone selection.

The car radio is available for your convenience, in two separate units: RF Amplifier Kit CR-1T, £1.13.6 incl. P.T. IF/AF Amplifier Kit CR-1A, £11.3.6.

TOTAL PRICE KIT (excluding loudspeaker) £12.17.0 incl. P.T.
8 x 5in. Loudspeaker, Pt. No. 401-505, £1.16.1 incl. P.T.

New! Portable Stereo Record Player, SRP-1

Automatic playing of 16, 33, 45 and 78 rpm records. All transistor—cool instant operation. Dual LP/78 stylus. Plays mono or stereo records. Suitcase portability. Detachable speaker enclosure for best stereo effect. Two 8in. x 5in. special loudspeakers. For 220-250v ac mains operation. Overall cabinet size 15 $\frac{1}{8}$ x 3 $\frac{1}{8}$ x 10 $\frac{1}{2}$ in.



Compact, economical stereo and mono record playing for the whole Family—plays anything from the Beatles to Bartok. All solid-state circuitry gives room filling volume.

KIT £27.15.0 Assembled price on request.

Low-cost Stereo Amplifier, TS-23



Breaks the price barrier in quality transistor amplifier cost. Incorporates all the essential features for good reproduction from gramophone records, radio and other sources.

Output 3 watts rms (15 Ω) each channel. Good frequency response for outstanding fidelity. Compact slim-line styling. Ganged Bass, Treble and Volume controls. 6 position Selector switch for programme sources. Attractive perspex two-tone front panel. 16 transistor, 4 diode circuit. Handsome fully-finished walnut veneered cabinet. Outputs for 8 or 15 ohm loudspeakers. Printed circuit boards. Size 3 $\frac{1}{2}$ x 13 x 8in. deep.

KIT (including cabinet) £18.19.0

Assembled price on request.

Hi-Fi performance from a "Mini" speaker kit with the 'AVON' BOOKSHELF SPEAKER SYSTEM



The challenge to our acoustic engineers was to design a speaker occupying the minimum space consistent with first class reproduction. The result of our efforts was the AVON, a compact unit of exceptional quality.

Features two special speakers 6 $\frac{1}{2}$ in. BASS, 3 $\frac{1}{2}$ in. HF unit and cross over network. Good frequency response. Beautiful fully finished walnut veneered cabinet. Size only 7 $\frac{1}{2}$ x 13 $\frac{1}{2}$ x 8 $\frac{1}{2}$ in. deep. Supplied in two units.

Can be built for a total price

KIT £13.16.0 incl. P.T.

Our wide range of SERVICE INSTRUMENTS include:

3" OSCILLOSCOPE, Model OS-2

"Y" bandwidth 2 c/s to 3 Mc/s. Push-pull vertical and horizontal amplifiers. Wide range time-base generator 20 c/s to 200 kc/s. Automatic lock-in synchronisation. Mumetal crt shield. Printed circuit construction. Access to vert deflection plates—ideal for transmitter modulation monitoring.

Amazing value. Compact size 5" W. x 7 $\frac{1}{2}$ " L. x 12" deep. Outstanding performance. Fulfills hundreds of the routine requirements in servicing, etc.

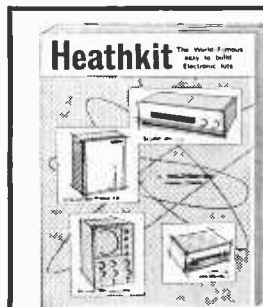
KIT £23.18.0 Assembled **£31.18.0**

5in. Oscilloscope 10-12U with 4.5 Mc/s bandwidth.

KIT £35.17.6 Assembled **£45.15.0**



- Many other models in wide range.
- Prices quoted are Mail Order, retail prices in general slightly higher.
- Full specification sheets of any model available upon request.



Send for this Catalogue it's FREE

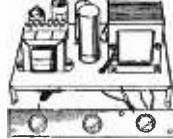
36 pages, many models in colour... Hi-Fi Audio, Radio... Amateur gear, Britain's largest selection of top quality, electronic kits.

HEATHKIT	
To	Please send FREE
DAYSTROM LTD., Dept. PW-8	Catalogue to my
GLOUCESTER, ENGLAND	friend
☐ Please send me FREE CATALOGUE	NAME
☐ Full details of model(s)	ADDRESS
NAME	
ADDRESS	
..... PW8	

MOST MODELS CAN BE SEEN AND DEMONSTRATED AT THE HEATHKIT CENTRE, 233 TOTTENHAM COURT RD. LONDON

HSL 'FOUR' AMPLIFIER KIT

A.C. Mains 200/250v., 4 watt, using EC083, EL84, EZ80 valves.



● Heavy duty double-wound mains transformer with electrostatic screen. ● Separate Bass, Treble and Volume controls, giving fully variable boost and cut with minimum insertion loss. ● Heavy negative feedback loop over 2 stages ensures high output at excellent quality with very low distortion factor. ● Suitable for use with guitar microphone or record player. ● Provision for remote mounting of controls or direct on chassis. ● Chassis size only 7 1/4 in. wide x 4 in. deep. Overall height 4 1/4 in. ● All components and valves are brand new. ● Very clear and concise instructions enable even the inexperienced amateur to construct with 100% success. ● Supplied complete with valves output transformer (3 ohms only) screened lead, wire, nuts, bolts, solder etc. (No extras to buy.) PRICE 79/6. P. & P. 6/-. Comprehensive circuit diagram, practical layout and parts list 2/6 (free with kit).

10/14 WATT HI-FI AMPLIFIER KIT

For super reproduction—see previous advertisements for full details. Kit 27/9.6. Ready built 29/5.0. P. & P. 8/6 each.

BRAND NEW TV U.H.F. TUNER AND SOUND AND VISION I.F. PANEL

By world famous maker. Suitable for use in conversion of TV sets to BBC2 (625 line reception). OFFERED (less valves) AT THE BARGAIN PRICE OF ONLY 27/6. Post paid. (The components are worth far more than our price for the complete unit and due to the very high value we regret that no correspondence can be entered into regarding this item.)

MAINS TRANSFORMER. For transistor power supplies. Pri. 200/240v. Sec. 9.0-9v. at 500 mA. 11/- P. & P. 2/6.

MAINS TRANSFORMER. For transistor power supplies. Tapped pri. 200-250v. Sec. 40-0-40 at 1 amp (with electrostatic screen) and 6.3v. at 5 amp for dial lamps etc. Drop thro mounting. Stack size 1 1/4 x 3 1/4 x 3 1/4 in. 27/6. P. & P. 4/6.

MATCHED PAIR OF 81 WATT TRANSISTOR DRIVER AND OUTPUT TRANSFORMERS. Stack size 1 1/4 x 1 1/4 x 1 1/4 in. Output trans. tapped for 3 ohm and 15 ohm output. 10/- pair plus 2/- P. & P.

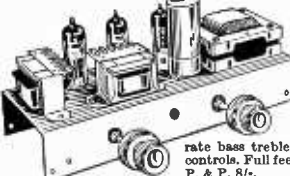
7-10 watt OUTPUT TRANSFORMERS to match pair of ECL 86's in push-pull to 3 ohm output. ONLY 11/- P. & P. 2/6.

Open all day Saturday
Early closing Wed. 1 p.m.
A few minutes from South Wimbledon
Tube Station.

ALL GARRARD & B.S.R. UNITS AVAILABLE AS ADVERTISED AUGUST

STEREO AMPLIFIER

Incorporating 2 ECL86s and 1 EZ80, heavy duty, double wound mains transformer. Output 4 watts per channel. Full tone and volume controls. Absolutely complete.



ONLY
£4.19.6

P. & P. 8/-

Super De-luxe version with ECL86 valves separate bass treble and balance controls. Full feed back 8 gns. P. & P. 8/-.

QUALITY RECORD PLAYER AMPLIFIER

A top quality record player amplifier employing heavy duty double wound mains transformer, EC083, EL84, EZ80 valves. Separate Bass, Treble and Volume controls. Complete with output transformer matched for 3 ohm speaker. Size 7 1/4 in. w. x 3 1/4 in. d. x 6 1/4 in. h. Ready built and tested. PRICE 69/6. P. & P. 6/-.

ALSO AVAILABLE mounted on board with output transformer and speaker ready to fit into cabinet below. PRICE 89/6. P. & P. 7/6.

DE-LUXE PORTABLE R/P CABINET

Uncut motor board size 14 1/2 x 12 in. Clearance 2 in. below, 5 1/4 in. above. Will take above amplifier and any B.S.R. or Garrard Autochanger or Single Player Unit (except AT90 and SP25). Size 15 x 15 x 3 in. Price 28/9.6. Carr. 9/6.

LATEST COLLARO MAGNAVOX 389 TAPE DECK DE LUXE. Three speeds, 2 track, takes up to 7 in. spools. 10 gns. Plus 7/6 Carr. & Ins. on each (Tapes extra).

QUALITY PORTABLE TAPE RECORDER CASE. Brand new. Beautifully made. Only 49/6. P. & P. 8/6.

Dual Purpose Bulk Tape Eraser and Tape Head Demagnetiser 35/- P. & P. 3/-.
ACOS CRYSTAL MIKES. High Imp. For desk or hand use. High sensitivity. 18/6. P. & P. 1/6.

ACOS HIGH IMPEDANCE CRYSTAL STICK MIKES. Listed at 42/-. OUR PRICE 21/-. P. & P. 1/6.

HARVERSON SURPLUS CO. LTD.

170 HIGH ST., MERTON, S.W.19

Tel.: 01-540 3985

SEND STAMPED ADDRESSED ENVELOPE WITH ALL ENQUIRIES

HIGH GAIN 4 TRANSISTOR PRINTED CIRCUIT AMPLIFIER KIT

Type TA1

● Peak output in excess of 14 watts.
● All standard British components.
● Built on printed circuit panel, size 6 x 3 in.
● Generous size Driver and Output Transformers.
● Output transformer tapped for 3 ohm and 15 ohm speakers.
● Transistors (GET114 or 81 Mullard OC81D and matched pair of OC81 o/p). ● 9 volt operation.
● Everything supplied, wire, battery, clips solder, etc.
● Comprehensive easy to follow instructions and circuit diagram 2/6. (Free with Kit.) All parts sold separately. **SPECIAL PRICE 45/- P. & P. 3/-.** Also ready built and tested, 52/6. P. & P. 3/-.

SPECIAL PURCHASE!

B.S.R. GU7

9-volt Battery Operated Record Player Units. 4 speeds. Automatic stop. Plays any size record. Complete with mono t/o head and sapphire stylus. ONLY 69/6. P. & P. 6/6. (With stereo cartridge 12/6 extra).



BRAND NEW TRANSISTOR BARGAINS

GET 15 (Matched Pair 15/-; V15/10p, 10/-; OCT1 5/-; OCT6 6/-; AF117 7/6).

Set of Mullard 6 transistors OC44, 2—OC45, OC81D matched pair OC81 25/-, ORP12 Cadmium Sulphide Cell 10/6. ALL POST FREE.

VYAIR AND KEXINE SPEAKER AND CABINET FABRICS. Approx. 54 in. wide. Usually 35/- yard. Our PRICE 18/6 per yard length. P. & P. 2/6 (min. one yd.). S.A.E. for samples.

BRAND NEW. 12 in. 15w. H/D Speakers, 3 or 15 ohm. Current production by well-known British maker. Offered below list price at 89/6. P. & P. 5/-. Guitar models: 25w. 25.5.0; 35w. 28.8.0.

E.M.I. PLASTIC CONED TWEETERS. 2 1/4 in. 3 ohm. Limited number 12/6 each. P. & P. 1/6.

(Please write clearly)

PLEASE NOTE: P. & P. CHARGES QUOTED APPLY TO U.K. ONLY P. & P. ON OVERSEAS ORDERS CHARGED EXTRA.

HOME RADIO LTD. 187 LONDON RD., MITCHAM, CR4 2YQ, SURREY Phone: MIT 3282

HERE COME THE CATALOGUES!

There are so many catalogues these days that at times it seems like an army on the march. Even in the field of radio and electronic components there are quite a number of productions.



We are convinced that the HOME RADIO Catalogue really does lead the way. But judge for yourself. How does one judge the merits of a catalogue? Just ask yourself these questions: 1. Is it really comprehensive? 2. Is it well indexed, well illustrated, well printed? 3. Is it backed by an extensive stock of the components listed? 4. Is ordering made clear and simple? 5. Is the service fast and efficient? The HOME RADIO Catalogue scores top marks on every point. Moreover, it is wonderful value (7/6 plus 1/6 postage and packing) and every copy contains five vouchers, each worth 1/- if used as directed. Send the coupon with your cheque or P.O. for 9/- ... today!

The Home Radio Catalogue lists some 6,000 quality components, over 1,000 of them illustrated. With each catalogue you also get a Bookmark, an order form and an addressed envelope.

Please write your name and address in block capitals

NAME

ADDRESS

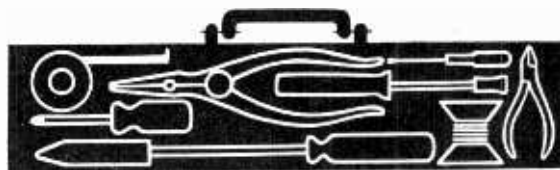
HOME RADIO LTD., Dept. PW, 187 LONDON ROAD, MITCHAM.
CR4 2YQ

repairing radio sets

PART 6

H. W. HELLYER

printed circuits



COPING with printed circuits is partly a matter of common sense, partly a matter of knowing how these aids to construction are designed, formed and used.

Contrary to idealist opinion, the printed circuit has not been employed—in many receivers—to eliminate the wiring. In some sets it seems to have further confused the issue. Certainly, printed circuits can make fault-finding much more difficult unless one unlearns the old procedures and gets acquainted with the new. In too many designs, the aim of printed circuit boards has been to reduce production costs, with no regard for servicing. In short—they can be a mixed blessing.

However, like the poor, they are with us—if not to stay, at least, for a very long time to come. So it behoves us to find out as much as we can about them.

★ BASIC PRINCIPLES

The technique of forming interconnecting wiring flat on a piece of insulating material began with guided missile research toward the end of World War II. Some of the insulating materials then in use were bulky, expensive and less effective than those available to us now. The principle remains the same, though the processes of manufacture have developed.

Basically, the printed circuit is a board or laminate of high quality insulant with the wiring between components and test points or connections to other parts of the equipment laid out in a pattern of thin copper strips. This copper, the foil, is bonded to the laminate and the component leads are inserted through holes and soldered to the foil. We thus have the three basic ingredients of the system, the board, the foil and the bond, to consider.

A common type of board for rigid mounting is phenolic paper laminate. This is made in various thicknesses. Alternative materials are used, particularly where some flexibility is needed, or higher voltages have to be handled, or higher currents passed than those with which we are at present concerned. Most interesting of the recent developments has been a film type of printed circuit, completely flexible, very thin and almost transparent!

A copper foil, perhaps as thin as one and a half thousandths of an inch, is bonded to the board. The method of bonding is often a trade secret, as jealously guarded as a Whitehall file, so that, after processing, the very fine lines of copper that form the circuit will not lift away from the board, especially as components are fixed and soldered.

Heat is the great enemy, and for this reason, con-

siderably more care must be taken when dealing with printed circuits than when soldering conventional wiring. There are two danger points; first, the foil itself can lift when the bond is destroyed by heat, leaving a weak portion that may later fail; and, second, the method of construction means that components will generally be affixed by much shorter lead-out wires than with conventional wiring, and excess heat can damage small components. This last factor applies especially to transistors, of course.

★ PHOTO-ETCH METHOD

Perhaps the most popular way of making a printed circuit is the "photo-etch" method. The design for the print is carefully made—this being the foundation on which the whole process is built. Components are laid out so that the "wiring" takes the desired path, with inter-connections taking the shortest path possible, and no leads crossing where they should not!

This last apparently elementary point is vital in high frequency work to avoid instability and other undesirable effects. Anybody who doubts the importance of this preliminary planning may gain a new respect for the "back-room boys" of the electronic industry by doodling out a few simple drawings of printed circuits for his own amusement!

It is no easy matter to compress a dozen or so components in a couple of square inches, make sure that there is room to bend leads and mount them, and ensure that transistor leads do not have to cross, then draw out the maze that will eventually be the print without allowing adjacent connectors to encroach too closely. I speak with feeling!

However, assuming someone else is carrying out this tedious task, after the doodle is perfected a master drawing is prepared. This is drawn to scale, much larger than the required board, and all the details are put in, including the holes for the component wires (which appear as white circles on the black lines of the print). This "black-and-white" master drawing is photographed and the negative brought down to the actual size of the required board.

The copper foil which covers the whole board is emulsified and the negative is "printed" on to the plate by light exposure. The holes are drilled where indicated on the pattern and the printing is treated with an acid resistant chemical.

★ FIXING COMPONENTS

Then the treated board is placed in an etching bath whose solution of iron perchloride dissolves the surplus copper and leaves the printed wiring

untouched. The acid resist is then cleaned away and the board made ready for soldering.

Components are fixed to the board and soldered into place—again a highly specialised process, often individual to the manufacturer. The principal methods are dipping or wave soldering. In the first method, the board, with the ends of the components crimped into place, is briefly dipped into a bath of molten solder and all the joints are made in one go. Surplus solder is shaken off and the cooled board treated with protective shellac.

The alternative method moves the board along the surface of a bath of molten solder which is made to “wave”, so that the copper foil and component wires skim through the wave.

There are other techniques, such as plating of circuits, silk-screen printing, double-sided bonding, where the print is made on both sides of the board, inter-connections being achieved by soldered “collars” that go through holes in the board, and spot-soldering methods that protect the wiring and solder only the joints. The details are extremely interesting but must not concern us here, as the treatment of such circuits, for fault-finding and repair, follows much the same general pattern.

★ TRACING FAULTS

Tracing faults on printed circuit boards can be difficult. Slight cracks, invisible to the naked eye, or dry joints that present a high resistance to the low-voltage, low-current circuit and are hidden under respectable looking mounds of solder, are common troubles.

One device that can be useful is a simple length of wire terminated at each end by a sharp probe and used as a temporary shunt to “prove” suspected wiring on certain ranges of transistorised radio and tape recorders where experience had taught us open circuits through flexing could be found.

Because it is not easy to remove or disconnect components to make proving tests, a different approach to fault-finding has to be made when deal-

ing with printed circuits. My colleague, Gordon J. King, has already had something to say on this subject, and will be underlining this point when we come to the servicing of transistorised equipment and all the special care that this entails.

For the present, let me make a few purely practical remarks about the removal and replacement of components and the treatment of printed circuits, just to lay the ground.

First, and most important, point is to keep the heat applied to the minimum. The maker of the printed circuit went to a lot of trouble to get a good bond of foil to laminate. No use our ruining this by leaving a hot iron too long at a crucial junction.

★ REMOVING COMPONENTS

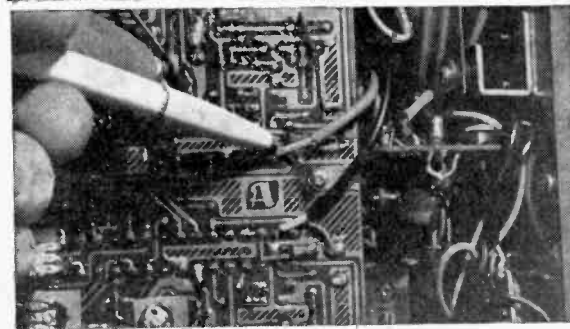
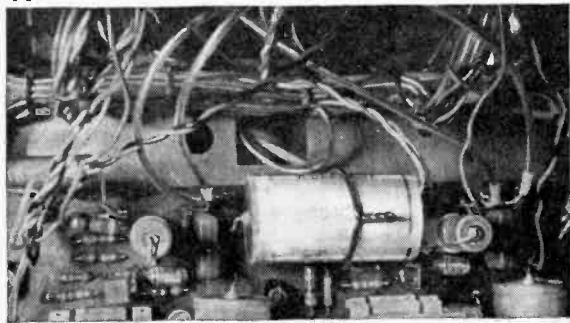
The practice of digging away at a joint to remove the end of a component wire, or the tag of a control, is one of the worst P-C offences. When removing a component whose wire end has been bent over, crimped or twisted, snip the lead *above* the board and allow the twisted end to drop away with the minimum of melting.

In many cases, even if the component is cut short, this technique will still allow enough wire end for a quick “straight-through” reconnection. If not—well, remember that the best way is to test and prove your fault first—*then* start hacking away at components.

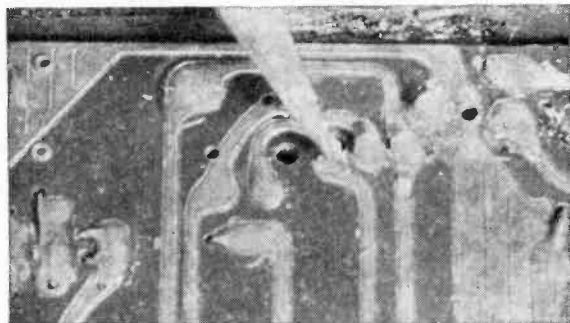
If it is essential to make proving tests at component junction points, but then by doing so the presence of the component affects the meter reading—as when a test for a leaky capacitor is spoiled by the shunting effect of a resistor—then it may be legitimate to break the circuit.

This can be done by cutting through the foil with a sharp blade, and lifting it slightly at the cut. Do not scrape and scratch a path wide enough to drive a bus through, and avoid making this type of test unless no other method avails.

After each test, remake the broken foil with a ‘bridge’ of solder. (Hence the need to avoid wide



◀ Printed circuits do not necessarily eliminate conventional wiring!



▲ Poor joint, where tag of potentiometer or switch is strained away from the print. Note proximity of fixing screws with printed foil; always check that insulating washers are refitted.

◀ Look for joints of flyleads with printed circuit.



*I should like a copy of the Electronics Hobbies Manual.
Enclosed is a cheque/P.O. for 10/6.*

NAME

ADDRESS

P.W.8.

Available now!

The enthusiasts' greatest-ever components guide!

Over 600 pages packed full of tips, kits and details of over 11,350 different parts from 85 leading manufacturers!

Whatever your particular interest in electronics, you'll find the Electronics Hobbies Manual a first-class investment.

It saves you time. No searching around for the parts you need. Every type of equipment—from stock components to sophisticated professional items—is here. Supplied by over 85 leading manufacturers, this equipment is *all* available by mail order on fast despatch.

It aids your projects. Complete designs, and details of kits available for beginners and experts, are all contained in the Manual. Inside, too, there's a wealth of technical data, practical tips and formulae to help you build with confidence.

It costs just 10/6 post free. And it puts the whole electronic industry at your service, including the specialised knowledge of Electronics. Behind this brilli-

ant new venture are the vast resources of STC and ITT, so you're assured of a first-class service!

Be sure of your Electronics Hobbies Manual. Clip the coupon, and send today—while stocks last!

Electronics (Prop. STC Ltd.)
Edinburgh Way, Harlow, Essex.
Telephone: Harlow 26777.

High-grade components for amateur communications

electroniques

OLRUS ELECTRONICS LTD.

PADDington 1515

9 NORFOLK PLACE (off Praed St.) LONDON, W.2

SCR-THYRISTORS

CRS105 1A 50PIV 7/8; CRS110 1A 100PIV 7/8; CRS120 1A 200PIV 15/8; CRS130 1A 300PIV 15/8; CRS135 1A 350PIV 16/8; CRS140 1A 400PIV 17/8; Unijunction 15/8; CRS305 3A 50PIV 8/8; CRS310 3A 100PIV 10/8; CRS320 3A 200PIV 13/8; CRS330 3A 300PIV 17/8; CRS350 3A 350PIV 18/8; CRS340 3A 400PIV 20/8; CR74 7A 400PIV 25/8.

Field Effect Transistor

2N3519 18/-.

Moulded reed switch 14/-.
Moulded magnet 5/-.
Miniature Neon Lamp 1/3.
Mains Panel Neon 8/-.

CONTIL CASES 21 SWG Steel

Smart electric blue finish with white panel—outside dimensions.

765	45/8	16127	98/8	
867	47/8	161275	139/8	P.P. inc.
975	47/8	191010	133/-	
1277	53/-	191010D	187/-	

Light Sensitive Switch

Kit 1 ORP12 Photocell-relay Transistor-circuit 87/6.
Kit 2 As above—Mains operation—Transformer Rectifier 47/6.
Kit 3 As Kit 2 + Lens + Cast Alu. box + Exciter lamp. + Folded beam operation 99/6 P.P. inc.

DO IT YOURSELF SECTIONAL CASE AND CHASSIS S.A.E. FOR LEAFLET

TRANSFORMERS

230v Prim. 6-10-15-18-30v 2A 32/-.
230v Prim. 6-10-15v 1A 22/- + P.P. 5/-.

EXPLORER KIT AM/FM VHF RECEIVER

Punched case and panel—2ADT 140+20C71 transistors—2 holders. £2.19.6 P.P. inc.

SINCLAIR

Z12 Int. 12W Ampl. and Preamp Built 89/6.
PZ3 Trans. Mains Power Unit Built 79/6.
Micromatic Built 79/6.
Micromatic Kit 59/6.
Micro FM Kit £5.19.6.
Stereo 25 Preamp. and Control Unit Built £9.19.6 P.P. inc.

TRANSISTORS - DIODES - ZENER - VALVES

FULLY GUARANTEED-FACTORY NEW. S.A.E. FOR FULL LIST. P.P. 2/- in £ 1/- min.

2N697	12/8	ASV26	6/8	NKT228	6/-	OAZ212	6/8	OC170	5/-	PC88	11/-
2N1304	6/-	BY28	6/8	NKT251	5/-	OAZ213	6/8	OC171	6/-	PC97	7/8
2N2926	5/8	ASZ20	7/8	NKT255	6/8	OAZ222	9/8	OC200	7/8	PC84	6/-
2N3819	18/-	ASZ21	12/8	NKT265	9/8	OAZ224	10/-	OC201	10/-	PC89	11/-
28002	10/8	ASZ23	30/-	NKT271	5/-	OAZ225	10/-	OC202	13/-	PC159	11/-
28003	9/8	BC107	7/8	NKT272	5/-	OAZ242	4/8	OC203	10/8	PCF86	8/8
28004	9/8	BC108	5/-	NKT273	4/-	OAZ245	4/8	OC204	15/-	PCF86	8/8
28012	20/-	BC109	7/8	NKT274	5/-	OAZ246	4/8	OC205	15/-	PCL82	7/8
28012A	35/-	BCY31	13/8	NKT275	5/-	OAZ247	4/8	OC206	22/8	POL83	8/8
28013	20/-	BFY17	9/8	NKT277	5/-	OAZ290	9/8	OC207	15/-	PCL84	7/8
28013A	25/-	BFY51	8/8	NKT278	5/-	OAZ291	9/8	OC208	8/8	PC155	9/8
28017	15/-	BFY53	7/8	NKT279A	4/-	OAZ292	9/8	DAF91	4/8	PC186	8/8
28018	17/8	BPY10	22/8	NKT304	8/-	OC16	20/-	DAF96	6/8	PL36	9/-
28103	20/-	B8Y27	9/8	NKT352	8/-	OC19	7/8	DF91	3/-	PL81	7/8
28301	12/8	B8Y31	7/8	NKT403	12/8	OC20	15/-	DF96	7/-	PL82	6/8
28320	9/-	B8Y32	7/8	NKT404	12/8	OC22	10/-	DK91	6/8	PL83	6/8
28322	7/8	B8Y38A	7/8	NKT453	12/8	OC23	12/8	DK92	8/-	PL84	9/8
28323	10/8	BY100	4/8	NKT453	12/8	OC24	15/-	DK96	7/-	PL500	13/8
28324	12/8	GET7	5/-	NKT675	6/-	OC25	9/8	DL92	5/-	PY32	8/8
28512	19/8	GET8	8/-	NKT676	5/-	OC26	7/8	DL94	5/9	PY81	6/8
28702	15/-	GET16	7/8	NKT677	5/-	OC28	12/8	DL96	7/-	PY82	6/8
AC107	10/-	GET20	10/-	NKT678	6/-	OC29	15/-	DY86	6/4	PY33	6/-
AC126	6/8	GET88	5/-	NKT713	7/8	OC35	12/8	EBC41	7/8	PY88	7/3
AC127	7/8	GET102	6/-	NKT773	6/-	OC36	12/8	EBC81	6/3	UBC41	7/6
AC127Z	9/8	GET103	4/8	NKT777	6/-	OC41	6/-	EBC90	4/3	UBC81	7/6
AC128	9/8	GET105	8/8	NKT0013	12/8	OC42	6/-	EBF89	6/9	UCB55	6/8
AC178	7/8	GET106	10/-	OC45	4/-	OC43	9/-	ECB81	4/8	UCB42	8/6
ACY17	9/8	GET113	5/-	OC47	4/-	OC44	9/-	ECC82	5/-	UCH81	6/8
ACY18	5/8	GET114	4/-	OC40	3/-	OC44M	5/8	ECC83	5/8	UCL82	7/3
ACY19	6/8	GET115	9/-	OC47	3/-	OC45	3/8	ECC85	5/-	UL41	8/8
ACY20	5/-	GET116	15/-	OC40	2/-	OC45M	4/8	ECF80	7/-	UL84	8/3
ACY21	6/-	GET171	5/-	OC43	2/8	OC46	5/8	ECH35	10/9	UX85	5/8
ACY22	3/8	GET182	6/-	OC49	2/8	OC70	9/-	ECB42	9/-	U25	9/8
ACY28	4/8	GET874	5/-	OC41	2/8	OC71	3/8	ECH81	5/2	U26	8/8
AD140	16/-	GET875	6/-	OC45	2/8	OC72	5/-	ECH84	8/10	6U46G	6/8
AD149	16/-	GET880	9/-	OC46	4/-	OC73	5/-	ECL80	7/-	5Y30T	5/8
AD161	11/-	GET882	6/-	OC49	2/8	OC75	6/-	ECL82	6/3	5Z40T	7/8
AD162	11/-	GET883	6/-	OC49	2/8	OC76	6/-	ECL86	9/-	6F23	10/8
AD171	15/-	GET885	5/-	OC45	3/8	OC77	5/-	EF80	9/-	6L6GC	7/8
AF102	18/-	NKT128	6/-	OC49	2/8	OC78	5/-	EF86	6/3	6V6GTB	7/8
AF114	6/8	NKT142	8/-	OC49	2/8	OC78D	5/-	EF183	6/4	6V8GT	6/8
AF115	6/-	NKT211	6/-	OC49	2/8	OC81	5/-	EF184	6/4	6X50GT	6/8
AF116	6/8	NKT212	5/-	OC49	2/8	OC81D	5/-	EL34	9/8	25L6GT	6/8
AF117	6/-	NKT213	6/-	OC49	2/8	OC81M	5/-	EL41	8/8	30C15	10/-
AF118	10/-	NKT214	4/-	OC49	2/8	OC81DM	5/-	EL84	4/8	30FL1	10/8
AF124	7/8	NKT216	7/8	OC49	2/8	OC81Z	5/-	EM84	7/8	30FL14	11/8
AF125	6/8	NKT217	8/-	OC49	2/8	OC82	6/-	EY81	7/-	30L15	11/-
AF126	6/-	NKT218	6/-	OC49	2/8	OC82D	5/-	EY86	6/8	30P12	9/-
AF127	6/-	NKT221	6/-	OC49	2/8	OC83	6/-	EZ40	7/8	30P19	13/8
AF139	12/8	NKT222	4/-	OC49	2/8	OC84	6/-	EZ80	6/-	30PL1	10/8
AF178	12/8	NKT223	6/-	OC49	2/8	OC122	15/-	EZ81	5/-	30PL13	12/-
AF186	17/8	NKT224	4/8	OC49	2/8	OC139	7/8	EZ90	4/8	35L6GT	6/8
AFY19	22/8	NKT225	3/8	OC49	2/8	OC140	9/8	EZ92	10/-	35Z5GT	5/-
AFZ11	12/8	NKT226	10/-	OC49	2/8	OC210	12/8	GZ34	10/-	50L5GT	6/8
AFZ12	12/8	NKT227	5/8	OC49	2/8	OC211	5/-	PC86	11/-		

FREE TO AMBITIOUS ENGINEERS

—THE LATEST EDITION OF ENGINEERING OPPORTUNITIES

Have you sent for your copy?

ENGINEERING OPPORTUNITIES is a highly informative 132-page guide to the best paid engineering posts. It tells you how you can quickly prepare at home for a recognised engineering qualification and outlines a wonderful range of modern Home Study Courses in all branches of Engineering. This unique book also gives full details of the Practical Radio and Electronic Courses, administered by our Specialist Electronics Training Division—the B.I.E.T. School of Electronics, explains the benefits of our Appointments Dept. and shows you how to qualify for five years promotion in one year.

SATISFACTION OR REFUND OF FEE

Whatever your age or experience, you cannot afford to miss reading this famous book. If you are earning less than £30 a week, send for your copy of "ENGINEERING OPPORTUNITIES" today—FREE.

BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY

344B, Aldermaston Court, Aldermaston, Berks.

Radio
Television
Electronics
Electrical
Mechanical
Civil
Production
Automobile
Aeronautical
Plastics
Building
Draughtsmanship
B.Sc.
City & Guilds
Gen. Cert. of Education
etc., etc.

PRACTICAL EQUIPMENT

Basic Practical and Theoretic Courses for beginners in Radio, T.V., Electronics, etc. A.M.I.E.R.E., City & Guilds
Radio Amateur's Exam
R.T.E.B. Certificate
P.M.C. Certificate
Practical Radio
Radio & Television Servicing
Practical Electronics
Electronics Engineering
Automation

INCLUDING TOOLS!

This specialist Electronics Division of B.I.E.T. NOW offers you a real laboratory training at home with practical equipment. Ask for details.

POST COUPON NOW!

Please send me your FREE 132-page "ENGINEERING OPPORTUNITIES" (Write if you prefer not to cut page)
NAME.....
ADDRESS.....
SUBJECT OR EXAM THAT INTERESTS ME..... 344B



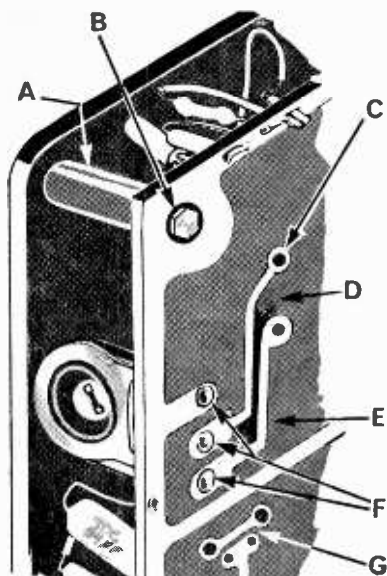
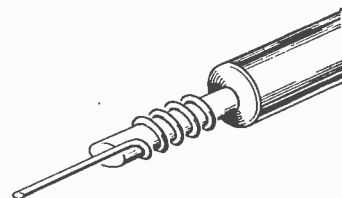
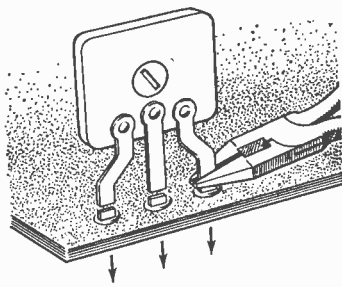


Fig. 4: Cut off lug ends and clean out holes to refit component.

Fig. 1: Printed circuit danger spots. A—strained board where large components are fitted; B—poor return path at fixing bolt; C—end of soldered part (dry joint); D—charred board between conductors; E—lifted foil; F—control mounting; G—narrow gap between conductors. Also hairline cracks.

Fig. 5: Make extension "bit" to reach awkward spots. Wire can also be looped around a meter probe to gain access to remote points.



breaks—the joint is always the weakest link in the circuit.)

★ BREAKS IN PRINT

Where there are breaks in the print, as can happen when a board is flexed or a component strained, these must be bridged strongly. If the break is the most common type, a hairline, simply scraping the foil clean at each side and soldering over the break should be sufficient. Try to avoid lifting the foil while doing so and do not apply the heat for too long. But where the break is more awkward, as, for example, when a burnout has charred adjacent regions of the board, other methods are needed.

A charred board may provide a conducting path for current, no matter how well you try to clean it. In this case, open circuit the print path at each side of the charred portion so that no current reaches it, then provide a wire link. These 'jumpers' are best fitted from existing joint to joint, rather than soldered to stretches of the foil, where the weight of the new wire may tend to lift the thin foil and break the bond.

A common place for breaks to occur is at the anchor post of a large component, such as a potentiometer or switch. The more physical movement that is applied to this portion of the circuit, the more it should receive close attention—no matter how good the print appears to the naked eye. This

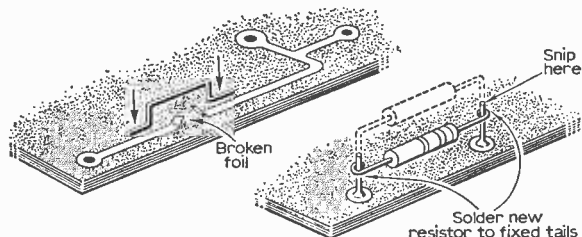


Fig. 2: Bridge joint with new section of wire. Avoid loose ends of foil and apply as little heat as possible to prevent broken ends from lifting.

Fig. 3: Solder new component to existing tail ends to avoid disturbing print.

is where the watchmaker's glass advocated in Part 2 comes in handy.

Fitting a new component can be awkward, especially in the last-mentioned case. Even the removal of the faulty part presents a problem. The technique with multi-tagged components is to melt the solder around the tag and, as it begins to cool, brush it away.

★ SOLDER TECHNIQUE

The trick is to catch it at just the right heat when the solder brushes away in a crystalline form that will not stick to other parts of the circuit. Let it get too hot—and you will have a short-circuiting streak across adjacent foil paths; not hot enough—it merely makes an unsightly mess around the tag.

When the surplus solder has been removed, the tags may be eased gently as heat is applied until the bond on all is broken. Then it should be possible to remove the component.

Of course, the correct way is to remove this surplus solder by the proper device, such as an aspirated solder gun, which Philips patented a few years ago, and which has proved such a boon to professional service engineers. But the average chap can hardly justify the expense for the odd occasion he may need it. In this case, he should weigh the cost of a new component, make sure the part he is removing is not needed again, and destroy it to make for easy removal!

This is not so daft as it sounds. It is far easier to remove the tail end of a resistor or capacitor, or the spade end of a switch or potentiometer lug, by first cutting the component away close to the top of the board, then melting the solder at the joint and withdrawing what is left. A good pair of pointed-nosed pliers or strong tweezers aid this operation.

When replacing a component on a congested board, it may be easier to fix the new one to the existing tail ends than to clean out joint holes and perhaps have force the new part in place.

An example is the larger resistor that takes the place of the maker's special miniature type that

has been proved faulty. Cut off this time with a slightly longer tail, twist the ends of the new component into anchor loops and quickly solder these to the tails.

It helps to tin the loops first, and perhaps scrape the tails to remove varnish or oxidation. Do not apply heat too long, or the joint where the tail is fixed may be weakened. This method is especially handy where it is difficult to get at the rear of the printed circuit board.

★ REPLACING COMPONENTS

Where there is insufficient room to mount the new component, consider the ruse of standing it vertically, with one end through the nearest convenient hole from which the old one has been taken, and the other end insulated by a short length of sleeving if necessary and bent to enter the other hole. Make sure there is enough 'headroom' for the board to be remounted—it is very easy to get caught in this way.

When it is possible to get at the anchor points and completely remove the old component, the next problem is in cleaning out the holes for the new one. Again, remove as much surplus solder as possible. Remember that solder once heated, cooled and reheated is much weaker than new.

Then sharpen a match-stick or, better still, an orange-stick from her ladyship's manicure set. Use the point to delve into the hole while heat is applied. As the solder cools, it will not stick to the wood, and a good, clear hole is left.

Refitting the component is a matter of convenience and taste. It may be found helpful to bend over the ends to make a more solid joint with the foil, but usually it is better to let the solder 'dome' over the tinned end of the lead-out wire. If removal ever becomes necessary again, you can save yourself a lot of snipping and avoid ruining components by adopting this method.

Ideally, the printed circuit joints, when remade, should be treated again with varnish to prevent corrosion, oxidation, etc, but this is a counsel of perfection—necessary on professional equipment; an added refinement at home.

★ VALVE BASES

Previously, we mentioned the device of easing out multi-tagged components by clearance of old solder.

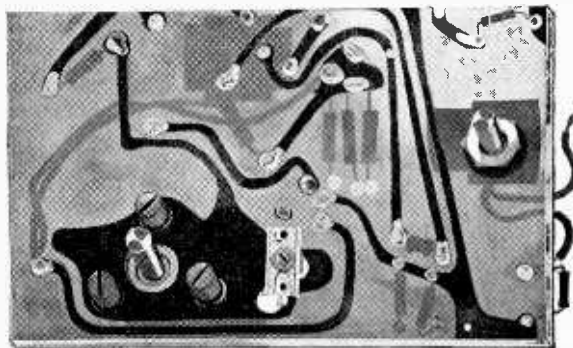


Fig. 6: A bench light can be used to aid circuit tracing—wired components will be seen "through" the panel. But avoid overheating components.

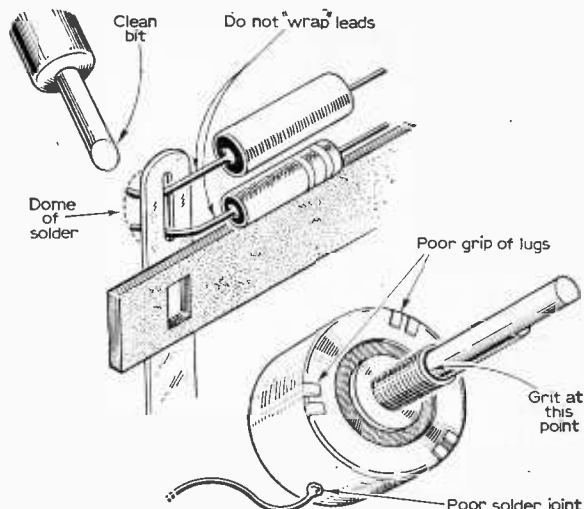


Fig. 7: Make straight joint through lug and allow solder to run on cleanly from a well-shaped iron bit.

Fig. 8: Look for poor jointing of potentiometer cases and, if necessary, make fresh chassis returns.

This may prove extremely difficult in—for example—the case of a damaged valve-base.

Here, a soldering iron that would melt all the tags simultaneously and allow us to lift the base clean away would be ideal. But as sizes of parts vary so much, marketing such a device would not be likely to excite great sales. Nevertheless, somewhat similar devices are on the market—but we can make our own for the odd occasion.

Use a fairly heavy gauge copper wire, bend it carefully to form a loop that touches the required joints, then bring up the end to loop in a coil around the bit of the soldering iron.

Heat is transferred from the bit to the copper wire loop and with a little practice, quite good clean removal jobs can be done. Similarly, where it is necessary to get between closely confined components, where the bit of the iron is likely to damage them, use a coiled length of copper wire, 16 or 18 s.w.g., and straighten the end to form a thin auxiliary bit.

★ SEE-THROUGH BOARD

When fault tracing, the tedious business of following twisting lines of print and identifying the components on the other side of the board, can be eased by using a light at the opposite side of the board and getting a kind of X-ray picture of the layout. Many boards of laminated phenolic construction lend themselves admirably to this practice. Older types are usually too opaque.

Often, when wiring in new components, the unavoidable difference in size and shape prevents us from following the set-maker's original layout. In these cases it is quite legitimate to make a 'suspended joint', where two components meet and are connected together. This, despite the cry of 'botchers' from so many practicing servicemen, who have been brought up on the method of ordering the exact replacement from some far-distant manufacturer and keeping the customer waiting while it is obtained.

No wonder some far-sighted firms make fortunes

by marketing "general replacement" parts. (Readers who have not seen the *Electroniques* manual may perhaps be surprised to know what a very wide range is covered.)

★ ANCHOR POINTS

Making soldered joints to tags, lugs and anchor points can be difficult, and the practice of wrapping lead-out wires twice around the gasworks and home before soldering is to be deprecated. Anyone who has had to dismantle many of these joints in congested equipment, where sleeving unravels like snow in the sunshine, will sympathise with this point of view.

A wire end put through the lug and perhaps bent over slightly to aid keeping it still while soldering is all that is needed. A good soldered connection is a good mechanical joint. The secret is to keep your iron clean, apply the right heat for the right length of time, and use a good resin-cored solder. Not—please not—the corrosive tinman's flux that dad left in the potting shed. Solder is cheap enough, and the little extra time and care at the preparation stage saves hours of fretting later.

★ CLEANING

Other odd chemicals that are to be shunned are the solvents and cleaning fluids that some folk appear to have used on printed circuits. Even carbon-tetra-chloride, which has a great many cleaning and degreasing uses, and was once the standby of all who wanted to 'lubricate' a volume control, can be dangerous. Apart from its toxic effect—fumes should *never* be inhaled—it can cause many types of plastic to soften and run.

For cleaning plastics, methylated spirit is safer, and in some instances an impregnated wadding (again borrowed from her ladyship's silver or brass-cleaning cache) will give a good burnish.

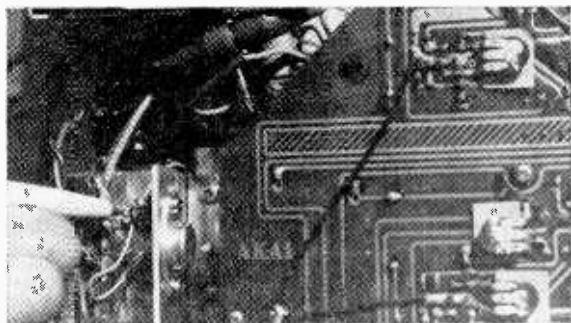
But for degritting controls and for cleaning switches, the proprietary chemicals that were mentioned in Part 2 simply cannot be beaten. If they will not do the job, the control is due for replacement anyway!

Sometimes, it is difficult to get at the inside of a potentiometer to apply the cleaner. Many plastic edge-type controls, for example, appear to be completely sealed. In these cases it is quite legitimate to drill a small hole in the side casing and inject through this. After allowing the necessary evaporation time, the hole could be resealed to prevent dust entering.

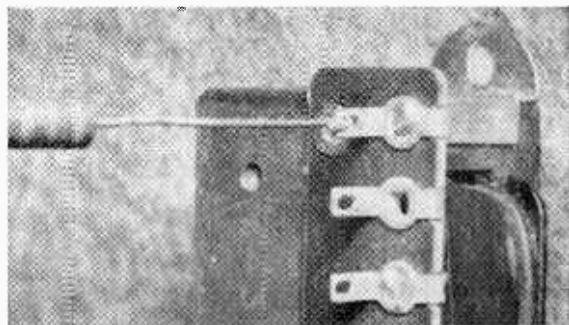
★ NOISE FAULTS

A popular place for noise faults is at the junction of spindle and bush of a 'conventional' volume control. One tape recorder manufacturer realised this very early on and provided a spring clip that separately earthed the spindle. Where movement noise is bothersome, a drop of switchcleaner run down the spindle at this point may help. Remember, only a drop—don't drown it.

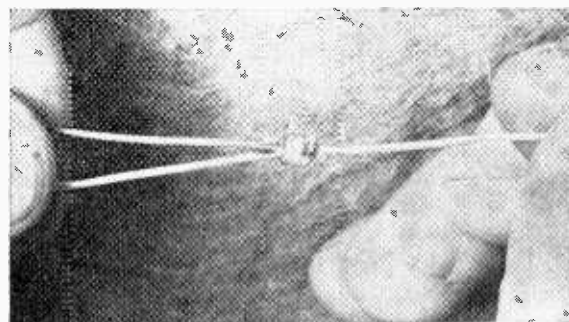
Another popular place for noise to originate is



Example of typical printed circuit layout, where the output transistors are mounted on a separate sub-chassis, which acts as a heat sink. Note the use of a jumper wire for interconnection of sections of the main printed circuit.



A simple hook is often more effective than a bulky, wrapped joint.

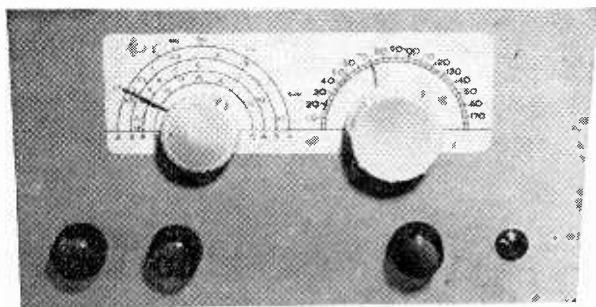


Wire ends of components can be joined firmly by inserting them in a twist or coil, where size of replacements precludes exact fitting.

at the 'earthing' point on the body of a control. This applies also to some types of switch. The connection may be firmly soldered, but if you inspect the control closely you will note that this is to a shell, and the shell makes contact with the bush by a bent-over clamp. And time and heat may have worked its insidious depredations at this point.

So clean off the control at the junction of parts and solder the contraption together. It is surprising how many hum troubles in audio equipment have been cured by this ruse.

This article concludes the first section of this series by H. W. Hellyer and Gordon J. King. The second section will begin publication in about three months time, when the emphasis will be on transistor equipment.



FOUR WAVE

R. F. G

THIS superhet receiver tunes approximately 10-600 metres in four bands. It has only three valves—frequency changer, regenerative 1.6 Mc/s i.f. amplifier and detector, and output stage. This, and the use of a panel aerial trimmer, practically removes any alignment or trimming difficulty, while providing good sensitivity. Tested at 14Mc/s, a 3 μ V signal at the aerial was just audible in the loudspeaker. Due to the relatively high intermediate frequency, there is good freedom from second channel interference from unwanted transmissions.

Fig. 1 is the circuit and a few points should be noted. VC1/VC2 is the ganged tuning capacitor, and though a value of about 315pF is specified a some-

at about half capacity. The panel trimmer VC3 is then adjusted as necessary for maximum signal strength. VC4 is for bandspreading, and useful for amateur and other congested bands. A 10pF, 15pF or 20pF capacitor is most suitable. Should a 2-gang capacitor be to hand, its sections can be connected in parallel with VC1/VC2.

OSCILLATOR PADDER

Each oscillator coil requires its own padder. Range 2 is approximately 515-1545kc/s and has a 100pF padder connected to tag 2 of the holder, range 3 is about 1.67-5.3Mc/s with 350pF padder to tag 3, range 4 is 5-15Mc/s with a 1000pF padder to tag 4,

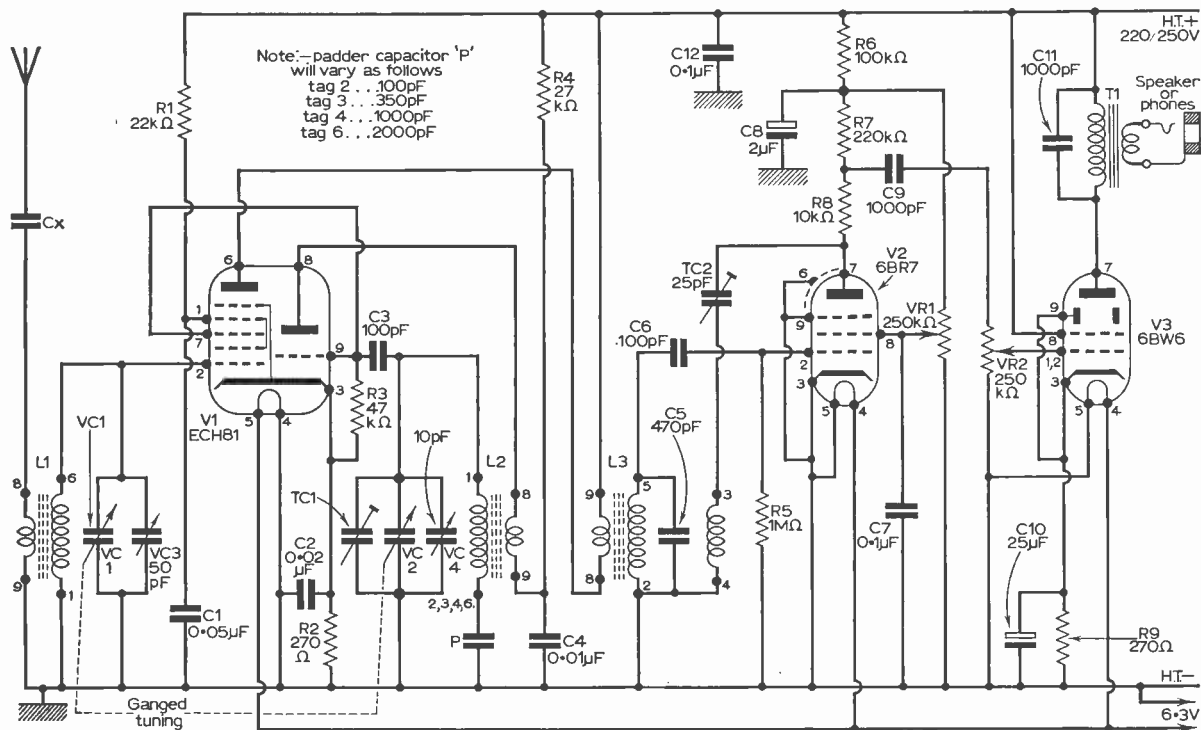


Fig. 1: Complete circuit of the receiver. The capacitor Cx is optional and is discussed in the text.

what larger value can be fitted with no loss of efficiency. The one fitted had an integral ball drive, but a separate drive and scale would be in order. Trimmer TC1 serves for all oscillator coils and is left

and range 5 10.5-31.5Mc/s with a 2000pF padder connected to tag 6. These values are easily obtained and not exactly as specified for the coils, but are suitable with TC1 and VC3 adjusted as explained.

BAND SET for the novice

AHAM

REGENERATIVE I.F.

The grid circuit of V2 is permanently tuned to about 1.6Mc/s. Regenerative feedback is applied through TC2, and controlled by VR1, and as the grid circuit is not variable tuned, frequent adjustment of VR1 is not required.

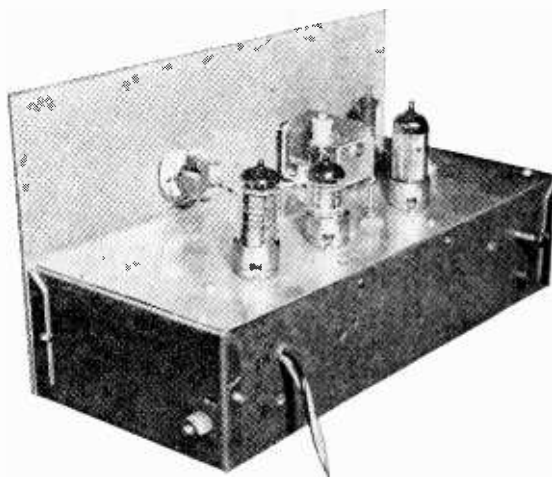
With V2 somewhat below the critical point at which oscillation nearly arises, the receiver has good general sensitivity and selectivity. As VR1 is advanced a point is reached where both selectivity and sensitivity to weak signals greatly increase—this is the optimum setting of VR1 for speech and music (telephony). Turning VR1 further causes a heterodyne, and allows reception of Morse (c.w.), single sideband (s.s.b) transmissions can also be resolved with some adjustment of VR1, unless rather powerful. If too strong, reducing sensitivity with VC3 helps.

VR2 is an audio gain control, and either speaker or phones can be plugged into the panel jack. The ratio of Tr1 is not correct for phones, but as V3 can provide much more power than wanted this does not seem important. Low or medium impedance headsets are best, but high impedance phones can be approximately matched by using a second output transformer (same ratio as T1), with low impedance winding connected to the jack plug, and high impedance winding to the phones.

The receiver runs from a separate power pack. Heaters require 6.3V at 0.9A and the h.t. drain is about 50-60mA, at 220 to 250V (max).

The power pack must have a mains transformer which provides h.t. and l.t., so that the receiver is completely isolated from the mains.

Positions of valveholders and other items can be seen from Fig. 2. Chassis dimensions could be modified somewhat. The large holes are best made by drilling a small pilot hole, and using a valve-holder punch. Mark through valveholder lugs and drill $\frac{1}{8}$ in. holes for 6BA bolts.



THE I.F. COIL

This is screened by the aluminium can in which it is supplied, and screening is essential. The bottom of the can is drilled to clear the threaded portion of the coil, and five small holes are also drilled $\frac{1}{4}$ in. from the bottom, so that leads may pass through as in Fig. 3. Capacitor C5 is wired across the pins inside the can.

The i.f. coil tunes about 1.4-1.7Mc/s by adjusting its core, and the best frequency is around 1.6Mc/s. A nut locks the core, as moving it alters tuning

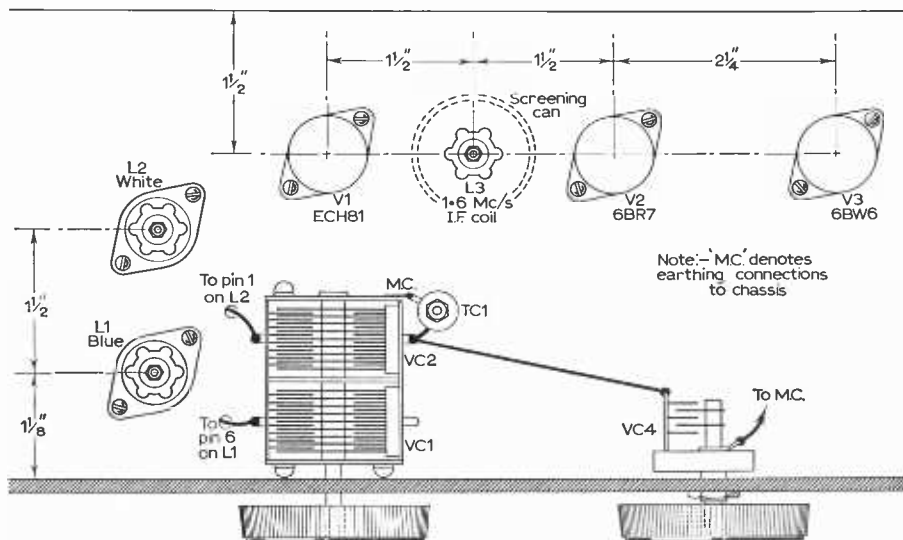


Fig. 2: Above-chassis layout and main drilling dimensions.

calibration. TC2 may be suspended by wiring if short, stiff leads are used.

For best results on range 5 (10.5-31.5Mc/s), leads to variable capacitors, V1, coil holders and the padder capacitor should be short and direct. The aerial socket must of course be insulated from the chassis, or an insulated flexible lead can be taken directly from tag 8.

By-pass capacitors C1, C2, C4, C7 and C12 could be modified somewhat, and the voltage rating is

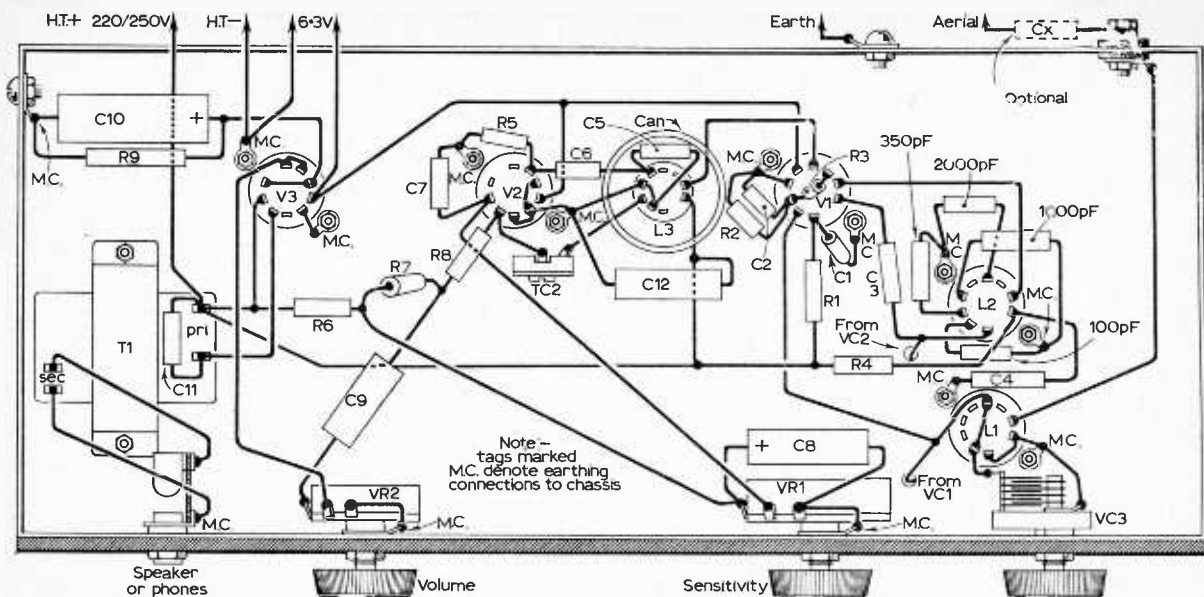


Fig. 3: Underside wiring diagram.

★ components list

Resistors:

R1 22kΩ 1W	R3 47kΩ	R5 1MΩ	R7 220kΩ	R9 270Ω 1W
R2 270Ω	R4 27kΩ 1W	R6 100kΩ	R8 10kΩ	

Capacitors:

C1 0.05μF paper	C8 2μF 250V electrolytic	VC1/VC2 315pF twin gang or similar
C2 0.02μF 150V paper	C9 1000pF mica	VC3 50pF variable
C3 100pF mica	C10 25μF 25V electrolytic	VC4 10pF variable
C4 0.01μF paper	C11 1000pF 350V paper	TC1 30pF air spaced trimmer
C5 470pF mica	C12 0.1μF 350V paper	TC2 25pF air spaced or ceramic
C6 100pF mica	Cx 25pF mica—optional	P Padder capacitors—100pF, 350pF, 1000pF and 2000pF silver mica 10%
C7 0.1 μF paper		

Inductors:

Denco miniature dual range coils (B9A)
 1 each ranges 2, 3, 4 and 5 (BLUE) aerial
 1 each ranges 2, 3, 4 and 5 (WHITE) 1.6Mc/s oscillator
 1 only range 3 (GREEN)
 T1 45:1 50mA output transformer (2–3Ω loudspeaker)

Miscellaneous:

VR1 250kΩ linear. VR2 250kΩ log
 V1 ECH81, V2 6BR7, V3 6BW6, three B9A skirted valveholders, two B9A non-skirted valveholders, chassis 12 x 5 x 3in. deep, panel 12 x 6½in., knobs, wire, etc.

unimportant, provided it is higher than the voltage present. C8 could be 8μF and C10 50μF if to hand. C9 can be 1000pF (0.001μF) to 0.01μF, but should be mica. VR2 may be 500kΩ, C11 may be 5000pF (0.005μF) or even 0.01μF.

Connections from tag 2 of V2 to C6 and R5 must be as short as possible and clear of heater wiring or hum may arise. Components and wiring associated with V2 and V3 are best close against the chassis.

ADJUSTMENTS

Insert V2 and V3 and VR2 at its maximum clockwise position. Temporarily place the aerial lead near the connection from pin 8 of the i.f. coil. Open TC2 fully, and adjust VR1 for maximum sensitivity. This is *not* the fully clockwise position,

but an intermediate one giving the most suitable G2 voltage, and will be shown by maximum background noise, or possibly reception of a transmission which can be tuned in by rotating the i.f. coil core. Close TC2 until oscillation just begins, which can be prevented by turning back VR1 slightly.

If TC2 is at too high capacity, oscillation arises with a much lower G2 voltage than optimum, so sensitivity is reduced. Rotate the i.f. coil core to find a spot where no transmission is received. If a signal generator is available, this can be found near 1.6Mc/s. Otherwise adjust the core so that all the brass thread is above the chassis, then slowly screw it down until a position is found which gives no direct reception at the intermediate frequency. Such reception is untunable during normal operation of the receiver, but is avoided by screening as described, and by keeping the aerial away from C6 and associated wiring.

VR1 and VR2 should be turned back somewhat, V1 and a pair of coils inserted, with TC1 set about half closed. Any transmission tuned in should peak up for maximum volume when VC3 is rotated. VC3 should be neither fully open, nor fully closed, this giving maximum efficiency on all frequencies.

If it is found that the required trimming adjustment falls outside that available by means of VC3, towards the low frequency end of any band (VC1/VC2 closed) adjust the coil cores until this is prevented. The best position is that which allows tuning from one end of the band to the other without any need to re-adjust VC3, except for optimum possible reception of weak signals.

If a signal generator is available, band coverage can be set by rotating the cores of the oscillator (white) coils. The aerial (blue) coils are then adjusted for best results. Should VC3 need to be fully open at the high frequency end of any band, this can be corrected by slightly screwing down TC1.

If the aerial is very long, results may be improved by placing a small capacitor (Cx) in series. A 25pF or 50pF pre-set capacitor should be satisfactory, or a small fixed component can be tried. This allows the aerial circuit to tune more sharply, and avoids overloading V1 or V2 with strong signals.

For normal reception, VR1 can be placed so as to give good results, and tuning carried out with VC1/VC2. But for weak signals it will be found that critical adjustment of VC3 and VR1 makes a considerable difference.

For general short wave reception range 4 is most suitable. Range 3 includes the 1.8-2.0 and 3.5-3.8Mc/s amateur bands, and other transmissions. Range 5 covers frequencies often capable of long distance results. Range 2 permits usual medium wave coverage, if wanted. A good earth improves reception, though long distance reception is possible without an earth.

MINIATURE STABILISED POWER SUPPLY

—continued from page 324

enable the component assembly to drop easily into place.

★ components list

R1	470Ω ±10% ½W
C1	200μF 16V electrolytic
C2	200μF 16V electrolytic
C3	200μF 16V electrolytic
Tr1	OC35 (recent manufacture)
D1	RS310
D2	RS310
D3	OAZ207 9-1V 250mW silicon zener diode (Mullard)
T1	Small bell transformer with 5V tap (Friedland Lilliput)
Veroboard, battery connectors, etc.	

One of the silicon rectifiers connects at its negative side to the collector tag. The flange on each rectifier corresponds to the cathode in a thermionic rectifier and is the positive end.

A red spot on the zener diode indicates the lead that is to be connected to the positive side of the supply.

The 200μF capacitors are mounted in line with the zener diode and rectifiers on the inside between them and the power transistor. The negative lead of each capacitor is bent over and brought down the side of the capacitor so that the two leads can be inserted into adjacent holes on the board. The capacitors should be insulated with plastic sleeves.

PRACTICAL ELECTRONICS

ELECTRONIC STOPCLOCK

Accurately measuring the interval of time elapsing between any two events or stimuli, this high precision stopclock has four switched ranges: 0-0.012; 0-0.12; 0-1.2 and 0-12 seconds. Capable of a wide variety of applications, with a novel design based on standard, ready made "Logic Blocks"

SCREENWIPER DELAY UNIT

An easy-to-make fitment for the motorist. Provides adjustable delay between each sweep of the wiper blades.

Special Features:

ELECTRONIC TELEPHONE EXCHANGES

MICROELECTRONICS—Pt. 2

SEPTEMBER ISSUE on sale AUGUST 11-2/6

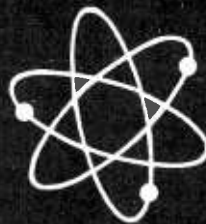
AN ANNOUNCEMENT

The field of television is an interesting and varied one. For enthusiasts with an inquiring mind, and this will include almost all our readers, we recommend the next issue of *Practical Television* which is on sale August 18th.

Practical Television features articles on aerials, signal boosters, test equipment and in fact just about everything in the field of television.

A current series of articles discusses colour television in down-to-earth terms. Articles in line for publication include a study of interference, reports on the latest colour TV receivers, and even how to connect headphones safely to your TV.

Practical Television costs only 2/- and is obtainable from your newsagent



CONNECTOR BLOCK CIRCUITRY

A PROBLEM which is very often encountered when assembling a radio receiver, amplifier or other piece of equipment, is that of quickly substituting differing values of resistors or capacitors, or making wiring alterations to one or more sections of the apparatus under construction in order to observe the effect and to achieve optimum working conditions. In the "Good Old Days" (actually a little before the writer was old enough to pursue this fascinating hobby of radio) when all components had large brass terminals and were connected up by means of thick chunks of copper wire, it was a simple matter to carry out alterations to components or wiring.

There is available to the constructor now a very suitable alternative form of "terminal" in the form of polythene connector blocks. These are available in various forms, the most popular being of 2 amp current carrying capacity, obtainable as blocks containing 2, 3, or 12 connections. Each connector comprises a small brass "coupling" into which wires can be pushed from either end, with two small grub screws provided to secure the wires. The whole is embedded in solid polythene, screw holes are provided in the polythene by means of which the blocks can be secured to any mounting surface, and as the polythene is an excellent insulator, these blocks can be secured directly to an aluminium chassis without any risk of short circuits. The "12 section" blocks can be cut with a sharp knife or razor blade to any desired length and hence the number of connector points adjusted to suit the constructor's needs of the moment.

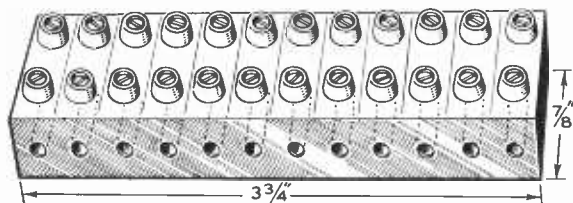


Fig 1: Typical 12-way connector block.

The obvious use for connector blocks is, of course, as a ready means of quickly connecting together the various separate units of a receiver or amplifier (where unit construction is adopted) such as the power supply unit and amplifier; provided the connections are plainly labelled on the chassis adjacent to the connector block, a ready means of feeding in heater and h.t. supplies from a power unit is provided.

A more novel use for connector blocks has

J. B. WILLMOTT, A.I.P.R.E.

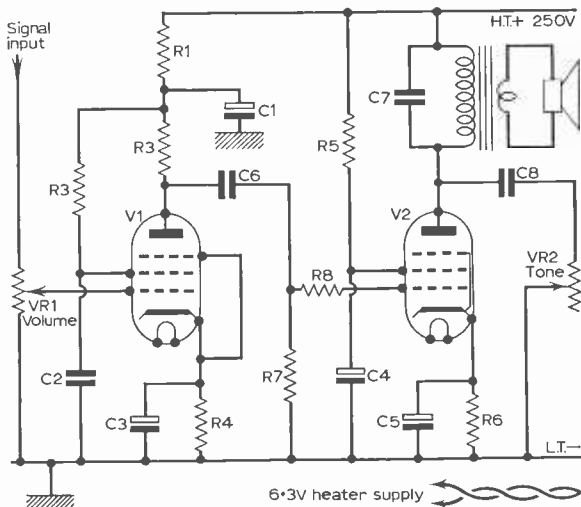
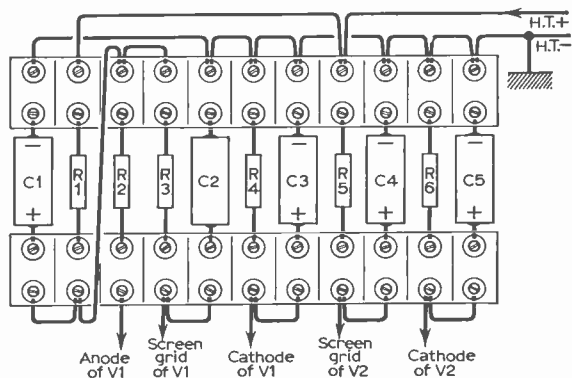


Fig 2: Theoretical circuit of simple audio amplifier

Fig 3: Suggested connector block layout of Fig 2. R7, R8, C6, C7 & C8 are not mounted on tagboard—see text.



recently been adopted by the author when constructing experimental gear; instead of using paxolin tagstrips or tagboards for securing resistors and capacitors, a double line of polythene connector blocks spaced some 1 1/4 in. apart forms a very effective substitute (see Fig. 3). The measurements of a 12-section connector block are 3 1/4 in. long by 7/8 in. wide, thus it is possible to place the two parallel blocks with 1 1/4 in. clearance between them in an overall space of 2 1/4 in., which in turn means that they

can be mounted on the 2½ in. deep side runner of the popular range of aluminium chassis, and leave just enough room for the external connections to the blocks without protruding above the level of the chassis walls.

Before attempting to wire up a piece of home designed equipment, work out carefully from the theoretical circuit diagram which components can be conveniently mounted on "tagboards" and hence the number of "ways" required on the tagboard(s). Remember, intervalve coupling components, grid resistors, grid stoppers and other similar signal carrying portions of a circuit should not normally be mounted on tagboards, as this introduces longer connecting leads and more risk of instability and interaction between wiring than can be tolerated. Such components should always be wired up by the shortest possible leads between the valveholders, etc. Decoupling components, bias resistors and by-pass capacitors can nearly always be mounted in groups without ill effect. A typical example is given in Fig. 2 of the circuit of a simple two-stage a.f. amplifier (no component values are given as obviously these will depend on the types of valves involved and the h.t. voltage supply available), and in Fig. 3 a suggested arrangement for mounting resistors and capacitors on a connector block "tagboard" of the type described, which it will be noted requires the use of an 11-way "board".

When the project has been completed, and found

to be in working order, experiments to find the optimum value of resistors (or capacitors) can be readily carried out, changing one component at a time. For example, if one started off with R1 a 1MΩ component, the effect of altering this "up" to 1.2MΩ or 1.5MΩ, or "down" to 68kΩ or 470kΩ for example, can be tried out. It is surprising what a difference in overall performance can be made in quite a simple piece of equipment by experimenting on these lines.

The connector blocks referred to can be obtained from several component suppliers advertising in this magazine, and also in good D.I.Y. shops and some chain stores.

Lastly, whilst the remarks in this article have been primarily concerned with valve circuits, there is no reason why similar principles should not be adopted in experimental transistor work (provided space is not of prime consideration). A very quick means of "hooking up" transistors and their associated components is afforded.

One final word, whilst it is not really intended that these connector blocks should replace tagboards, etc., in permanent equipment, the author has found that provided the grub screws securing the component wires, etc., are tightened firmly home, there has been no noticeable deterioration in performance as compared to equipment wired by conventional means with 100% soldered joints, even after long periods of use. ■

Book Review

MATHEMATICS FOR RADIO AND ELECTRONIC TECHNICIANS
By Dr. -Ing Fritz Bergtold. Published by George Newnes Ltd.
304 pages. 8½ x 5½ in. Hard Covers. Price 50s.

THE title is no idle boast. Too often, books on mathematics are the stale, rehashed collections of formulae—... *three men working for seventeen hours dig a trench twelve feet long by* ... This book aims squarely at the radio and electronic technician and hits bang on target. Every example, description of method, formula or fact has a bearing on the subject.

This second edition has been re-written in consultation with practising engineers and mathematicians, particularly in semiconductor development. Thus, we find technical terms relevant to our subject continually cropping up, being explained and subsequently worked into the text. Much hard cogitation has obviously gone into such styling.

Beginning with simple equations and the technique

of numbers and the use of symbols, the 24 chapters work through basic algebra, powers, curves and their uses, more detailed functions of x , logarithms, trigonometry, Fourier and other series, differentiation and integration, series, polar co-ordinates, vectors and complex calculus.

Right in the middle we find a brief refresher. Ch. 9 deals with "Some Peculiarities"—wise words of advice on the need for accuracy and the use of approximation, with handy notes on signs. The next chapter is a beautifully concise work on powers, exponents and the slide rule.

Intended as a supplement to the deeper textbooks in electronic technology, no specialist knowledge is needed. Taking the book as a course and reading for an average of a half-an-hour a day, the technician who has grown stale can refresh himself and should undoubtedly advance his knowledge at the same time.

The emphasis is on worked examples and these are directly aimed toward the student's chosen field. For the reader who thinks mathematics a dull and difficult subject, this book will come as a welcome relief.—H.W.H.

IN-LINE AUDIO A.G.C. UNIT

Two of the illustrations in the article describing an in-line audio a.g.c. unit, published in the July issue, were incorrect. In the circuit diagram (Fig. 2) on page 204 the emitter and collector symbols for Tr2 are reversed. The emitter should be towards the negative line as this is an n-p-n transistor, with the transformer as the collector load. The other error concerns the same transistor, but on the component layout (Fig. 3): the diagram is correct, but the letters identifying the collector and emitter are reversed.

Practical Wireless Binders

A first class magazine deserves first class treatment. Store your copies of *Practical Wireless* with a new Easi-binder, specially designed to hold 12 copies of the new large size. It has a special pocket for storing those blueprints and data sheets too. Yours for 14s. 6d. from: Binding Dept., George Newnes Ltd., Tower House, Southampton Street, London, W.C.2.

Note. Please state the volume number required otherwise a blank cover will be sent.

BULB TUNING INDICATOR



A.J. McEVoy B.Sc.

FOR many years the cathode ray tuning indicator has been the accepted way of presenting visually the amplitude of signals in valve circuits. The constructor will be familiar with its use in radio sets to indicate tuning accuracy, and in tape recorders where it provides a clear warning of any overmodulation of the tape by too strong a recording signal.

The device relies on the deviation of an electron stream by a grid whose voltage depends on the strength of the signal, with the result that the pattern of the glow produced when the stream falls on a phosphor like that of a TV tube, is shifted in proportion to the signal. Such a device is obviously unsuitable for applications in transistorised circuitry, where there is no heater supply available for a filament to emit the electrons, and no high voltages to focus them into a beam. Admittedly, a few transistorised tape recorders have obtained sufficient h.t. to operate a miniature cathode ray indicator (the DM70), most manufacturers have fallen back on the use of small meters.

The circuit to be described was developed to supply the need for a low-voltage low-current visual display of signal strength without resorting to a moving-coil meter. Since any system involving cathode rays is excluded by power requirements, some other light source is necessary. Photoemissive diodes are still too expensive, though very attractive from the point of view of circuitry, so the only possibility was the old-fashioned filament bulb. A system which merely varied the brightness of a bulb would not be a definite, or even attractive, indicator, and there is the additional disadvantage that the current drawn by a bulb would be twice that of the radio or tape

amplifier for which it served as indicator! It was therefore decided to develop a circuit in which the bulb would flash on and off at a rate depending on the signal strength. This holds the extra advantage that the current is reduced to a fraction of that of a continuously-glowing lamp. The familiar multivibrator circuit can be set up to switch the bulb on and off at a suitable rate, this frequency being controlled by the time constants of the R-C circuits in each leg of the device.

Circuit description

The circuit finally evolved is shown in Fig. 1. Tr2 and Tr3 will be recognised as the transistors forming the multivibrator, and it will also be noted that they are n-p-n types. Tr1, a p-n-p type, forms the resistive element in an R-C timing network with C2. The resistance to which Tr1 is equivalent, depends on the biasing current supplied at its base, which in turn is set by the input voltage applied through R1. In operation, therefore, the current available to charge C2 is the product of the bias current and the common-emitter current gain of Tr1. Therefore, the higher the bias current, the higher the charging current, and as a consequence, the shorter the time required to charge C2, and therefore the higher the repetition frequency of the multivibrator. Tr1 also functions as a buffer between the multivibrator and the signal source; otherwise there would be some direct connection between these, and as well as the reference voltage being supplied to the multivibrator, high harmonics of the multivibrator frequency, extending into and beyond the audio range, would be forced back into the reference circuit.

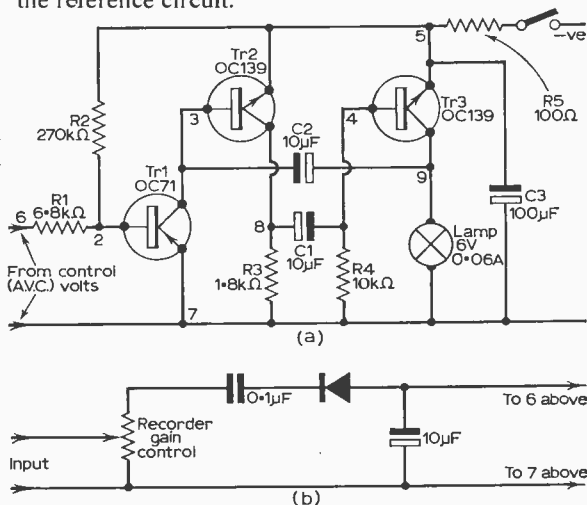


Fig. 1(a): Basic circuit of the tuning indicator unit (numbers denote tags on groupboard—see Fig. 2).

Fig. 1(b): Extra circuitry to obtain control d.c. in a tape recorder.

Most transistorised apparatus as yet available relies on germanium p-n-p transistors, and it is the positive line which is chosen conventionally as the earth line. This is the reason for the otherwise unusual choice of transistor polarities for the

multivibrator transistors. The signal to be indicated will usually be small and close to the potential of the earth line of the set. It will therefore be able to control directly the bias level of Tr1 only if this is a p-n-p device. Similarly, acting as a current amplifier, Tr1 can give Tr2 the necessary forward bias only if the latter is an n-p-n unit.

Control voltage

In the above remarks and in Fig. 1, it is assumed that the signal is applied to Tr1 in the form of a d.c. voltage proportional to the strength of the audio component in the circuit. This is the case in a radio set, in which the appropriate voltage to indicate is that of the a.v.c. line. This is obtained from the d.c. component of the output from the detector diode, which is arranged to be positive-going, beyond the potential of the earth line. The first i.f. amplifier, receiving its bias current from a potential divider connected to this line, is then biased back and its gain reduced. If Tr1 is then connected through R1 to this line, it follows that, when the set tunes in a signal and the a.v.c. voltage builds up, its base will go more positive, and its bias current will fall. Between collector and emitter it will then be equivalent to a larger resistor, since there is a lower current for the same applied voltage. The time constant is increased, and the frequency reduced. Visually, this means that, as a station is tuned in, the bulb will flash more slowly; if the constructor wishes, R1 may be reduced until it stops completely on the strongest local stations.

Audio equipment

It was also mentioned that the circuit is a suitable indicator for audio equipment and tape recorders; in these, however, there is not usually a convenient d.c. potential proportional to the volume level, analogous to the radio set's a.v.c. Fig. 1b shows the modification to the circuit of Tr1 to operate off the signal as it appears on the volume control of the recorder. According to the sense of the diode D1, the rate of flashing may be either increased or decreased. It is convenient with tape recorders to use for R1 a value of resistor which just suppresses flashing at the onset of overloading of the amplifier. This can be as clear and definite an indication as the closing of the display of a cathode ray device on a mains recorder. The constructor might choose to replace R1 with a preset potentiometer in order to achieve best results. Finally, should it happen that an indicator is required for a radio or amplifier using n-p-n transistors and a negative earth, it is only necessary to change Tr1 for n-p-n, and Tr2 and Tr3 for p-n-p types.

Construction

Construction of the indicator is simplicity itself, even for the beginner. Fig. 2 shows the arrangement of one prototype, on a ten-way group board. Even without miniature capacitors it measures only 1.5 x 1.2 x 0.5 inches. A decoupling resistor and capacitor are added in the supply line to prevent

★ components list

Resistors

R1	6.8k Ω	R4	10k Ω
R2	270k Ω	R5	100 Ω
R3	1.8k Ω		
All 10% $\frac{1}{4}$ W			

Capacitors:

C1	10 μ F 9V electrolytic
C2	10 μ F 9V electrolytic
C3	100 μ F 9V electrolytic

Semiconductors:

Tr1	OC71 general purpose p-n-p
Tr2	OC139 audio n-p-n
Tr3	OC139 audio n-p-n

Miscellaneous:

Lamp 6V 0.06A, miniature 5-way tag board, wire, etc.

any noise from the multivibrator, blocked by the buffer action of Tr1, from entering the audio amplifier through its power supply.

The circuit diagram is numbered corresponding to the tags on the board to assist in identification of the components during construction.

One final point deserves consideration—the

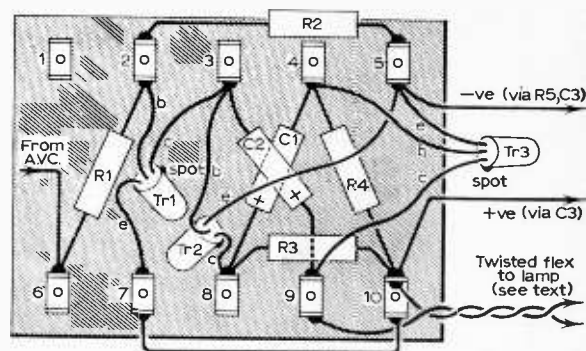


Fig. 2: Groupboard showing layout of components—note that C5/R3 are mounted externally but, this is not essential if a larger (ie. 12 or 14 way) groupboard is utilised.

mounting of the indicator in the set. The lamp-holder—a standard m.e.s. type—is fixed at some convenient position on the front of the set, so that the bulb is visible through an aperture which, for appearance's sake, may be covered with a coloured plastic disc. However, the leads from the unit to the lamp should be twisted, in the same way as heater leads in valve amplifiers, and for the same reason, namely to prevent noise being induced into signal circuits. The location of the group board is not critical, but should clicks be heard in the speaker as the lamp flashes, the cause is probably the proximity of the multivibrator to a tuned circuit, and relocation will solve the problem. For battery economy a switch may be built in to save the 15mA. of the indicator circuit when listening for long periods to a single station. At other times the circuit is switched in, if only to serve as a dial light.

practically wireless

commentary by HENRY

THERE is something impressively legal about the usual form of guarantee. With its archaic script, pretty red seal and clauses of small print, it is more suited to frame and hang on the wall than file in the bureau. And for all the good most of them are, they might just as well be used for decoration.

Nowadays, we are conditioned to want some sort of assurance that goods are better than we should deserve. The goggle-box nightly churns out these assurances. "Splosh washes cleaner", "Use Rubbit for the Deep-Down-Glow", "Pablum is better than ordinary bread". But . . . Cleaner than what—sand and pebbles? What if we only want a common surface shine? And, surely, this is ordinary bread?

We find the same thing in the press. The cleverer copy-writers cash in quickly with those intriguing advertisements that begin: "Well, perhaps we *DON'T* make the fastest petrol" or the intellectual ones that waffle on for half a page about something apparently irrelevant so that one congratulates oneself at the end for discovering the business of the advertiser.

So it is with guarantees. This week I broke my trusty electric shaver—trying to save the cost

of a visit to the barber by cropping some of that back-growth, my wife said. She brought me a packet of emergency wet-shaving blades and stark across the inevitable plastic cocoon was the glaring red slogan, "Guaranteed".

What would happen if I sent one of the treacherous things back because my pampered beard refused to succumb and supplied bloodstained skin shavings as evidence? Would the guarantee be honoured? Or would I be referred to some obscure item of small print that I had carelessly cast away with the wrapper?

This, roughly, is the position when one buys a bit of radio equipment. Twelve Months Guarantee, says the dealer, and we go off all unsuspecting. Then discover, if things go wrong, that the small print has absolved the maker from practically every hazard except an act of God.

Guarantees do not cover service charges. Time, trouble, labour, S.E.T. and other evils, make the dealer unduly avaricious. When we take our faulty radio back to his shop, he is perfectly entitled to charge a normal fee. Often he does not.

He has no hope of recouping losses from the manufacturer. Even the brand new models he has had to repair before he dare put them in his window carry no extra bonus for his service. Some makers talk airily about "discounts covering the cost of minor adjustment," and we can guess what our radio repair man says about that. Small wonder he sometimes describes himself as the manufacturer's final inspection department.

The contractual element enters more strongly when we buy our equipment directly from source.

"Provided the card is filled in and returned within seven days." Did we remember to date it correctly? Dare we update it, or will they check? Can they check?

Supposing we did remember to



Unfortunate experience with the cat.

post the darn thing off. "The Superspecial shall have been used strictly in accordance with the instructions." Does that exclude the time we lent it to Aunt Mabel who had that unfortunate experience with the cat? "The Superspecial must not have been tampered with, dismantled or subjected to misuse."

And, to cap it, we are solely responsible for packing charges—and insurance, it seems. We remember what happened to that Christmas parcel; the forms we had to fill in to convince the GPO that we had not been sending contraband. We recall the tales of hijacked goods wagons, of large-scale pilfering, the Great Train Robbery, flood damage, fire . . . In the end, we probably settle for a quick repair by the little man around the corner.

But fate still dogs us. When the set comes back it bears a label: "Three Months Repairs Guarantee." We congratulate ourselves on a new lease of life and when the thing goes wrong a week later march back with confidence oozing from our ears.

How sad! The guarantee covers only the work done—and this is a different fault, to be sure. Same symptoms, maybe, but a different fault. Sorry, Sir, you'll have to pay again. But you get another guarantee.



Cropping the back-growth.

CCTV CAMERA

Made by N.E.V. Portable, transistorised. Two models, 405 lines and 625 lines. Will work with normal T.V. receivers. Original price over £100 each. Brand new and unused. £29. Please specify 625 or 405 lines.

ACOS TYPISTS STETHOSCOPE

Made for use with Tape Recorder but equally suitable for radio or amplifier, or for a deaf person. 15/- each.

SIMMERSTAT

TY-X-FL and TY-X-FL both popular types fitted to many cookers. Suitable for 230/240v. up to 15 amps. Handy device to have around the workshop. 12/6 each.

SATCHWELL OVEN THERMOSTAT

Type TO. With capillary tube and sensor. 20 amp. A.C. type and as fitted to many cookers. Adjustable by control knob (not supplied) 12/6 each.

MESSAGE TAPES

150ft. Scotch Tape on 3in. spools. Normally 4/6 each. We offer 4 tapes for 10/-.

TAPE CASSETTE

books 2-3in. spools. Supplied with one empty spool only. Fits the "Arrow" and several other tape recorders. 7/- each or 3 for £1.0.0.

FANE 20 WATT HI-FI SPEAKER

This is a 12in. model with 2in. voice coil. Really fantastic performance which will do justice to the best amplifier. Heavy cast frame, normally these retail at £7 or £8 each. We can offer a limited quantity at £3.9.6. 15 ohm coil only. Carriage and insurance 7/6. Similar model, especially designed for guitar amplifiers, same price. Please specify when ordering.

WHITE CIRCULAR FLEX

Ideal for lighting drops, two made by BICC. Usually 8d. yd. 100 yd. coil for 30/-, plus 6/- postage.

EDGEWISE CONTROL

Morganite, as fitted many transistor radios. 2K or 6K with switch. 2/6 each or 24/- per dozen.

SCR's (THYRISTORS)

Pin	7/6	10/6	30/6	400V
1 amp	6/6	7/6	8/6	9/6
3 amp	7/6	8/6	9/6	10/6
25 amp	30/-	35/-	47/6	60/-

SILICON RECTIFIERS

Tested and guaranteed				
750mA.	100v.	1/3	1 Amp.	100v. 3/-
	200v.	1/6		200v. 4/-
	400v.	3/6		400v. 6/-
3A.	100v.	3/6		
	200v.	5/-	10 Amp.	100v. 9/6
	400v.	7/6		200v. 12/6
	600v.	9/6		400v. 14/6
Sub-miniature glass encased—only approx. 2in. long, wire ended.				
400mA.	50v.	1/6	100v.	2/6 200v. 4/6

SEMI-CONDUCTOR BARGAINS

Type	Price	Type	Price	Type	Price
2N1727	15/-	MAT120	7/6	OC72	5/-
2N1728	10/-	MAT121	8/6	OC75	6/-
2N1742	25/-	OA5	5/-	OC76	5/-
2N1747	25/-	OA10	8/-	OC77	7/-
2N1748	10/-	OA47	3/-	OC78	5/-
AC107	9/-	OA70	2/-	OC79	5/-
AC127	9/-	OA79	2/6	OC81	5/-
ACV17	8/6	OA81	2/6	OC81D	5/-
ACV18	5/6	OA85	2/6	OC82	5/-
ACV19	8/6	OA90	2/6	OC83	5/-
ACV20	5/6	OA91	2/6	OC84	6/-
ACV21	8/-	OA200	3/6	OC139	8/6
ACV22	4/6	OA202	4/6	OC140	12/6
AF114	7/6	OC20	12/6	OC170	5/-
AF115	8/6	OC22	10/-	OC171	6/-
AF116	7/6	OC23	17/6	OC200	9/-
AF117	5/-	OC24	15/-	OC201	12/6
AF118	10/-	OC26	7/6	OC202	12/6
AF139	12/6	OC28	15/-	OC203	12/6
AF186	17/6	OC29	17/6	OC271	15/-
AF212	15/-	OC35	12/6	ORP12	8/6
AS221	15/-	OC42	15/-	ORP60	10/-
BC107	14/6	OC42	8/6	SB078	8/6
BY100	4/6	OC44	4/-	SB305	8/6
BY213	7/6	OC45	3/6	SB251	10/-
MAT100	7/6	OC70	4/-	ST140	4/-
MAT101	8/6	OC71	3/6	ST141	6/-

MINIATURE WAFER SWITCHES

4 pole, 2 way—3 pole, 3 way—4 pole, 3 way—2 pole, 4 way—3 pole, 4 pole—2 pole, 6 way—1 pole, 12 way. All at 3/6 each 36/- dozen, your assortment.

12v. INVERTER

Fully transistorised for operating a 20-watt fluorescent tube. Size 6 in. long by 1 1/2 in. £3.10.0. Post and insurance 3/-.

5 TRANSISTOR AMPLIFIER

Mounted on a printed board, size approx. 6in. x 2 1/2in. with volume control, input microphone socket and push-pull output using pair of OC81. An excellent amplifier rated at 1 watt for gram or tape recorder. Price £2.10.0.

Where postage is not definitely stated as an extra then order over £3 are post free. Below £3 add 2/6. Semi-conductors add 1/- post. Over £1 post free.



DRILL CONTROLLER

Electronically changes speed from approximately 10 revs. to max. Full power at all speeds by fingertip control. Kit includes all parts, case, everything and full instructions. 19/6 or ready made 32/6 plus 2/6 post and insurance.

THE VECTRONOME CAPSTAN DRIVEN TAPE RECORDER



GARRARD AUTO RECORD PLAYER Model 2000

This is one of the latest products of the World's most experienced maker of fine record reproducers. Its superior features include—automatic playing of up to 8 mixed size records—stopping and starting without rejecting manual playing—pick-up pivots to give include pick-up height—pick-up dropping position and stylus pressure. Size is 13 1/2 x 11 1/2 in. clearance 4 1/2 in. above, 2 1/2 in. below—fitted with latest hi-compliance cartridge for stereo—and mono. L.P. and 78. Supplied complete with mounting template and service sheet. Offered this month at the Special Snip price of £6.9.6. plus 7/6 carriage and insurance.

THIS MONTH'S SNIP

BECKASTAT

An Instant Thermostat. Simply push it into your wall socket and plug your fire or other appliance into it. Knob setting. Will save its cost in a season. Normally £3. We offer at 19/6 plus 2/- post. When ordering state whether for 13 amp or 15 amp socket.



F.M. TUNER

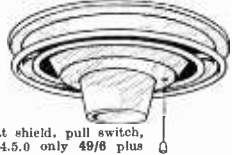
of exceptional quality, giving really fantastic results with virtually no noise. Suitable for mains or battery operation. 6 transistors—three IF stages—double-tuned discriminator. Complete, new, and built up all ready to work on chassis. Size 6 x 4 x 2 1/2 in. with tuning scale and slow motion drive. A £12.12.0 tuner for only £6.19.6 plus 3/6 post and ins.

HURSEAL AUTOMATIC TIME SWITCH

12 hour, 15A, to control heating, lighting, radio, immersion heaters, etc. Regular price £4.4.0. Limited quantity 3/6 p. & p. 3/-.

HEAT AND LIGHT UNIT

Bring luxury to your bathroom—have comforting heat where you now only have light—all the parts to build a full size (16in. diameter) model are now available—you will build it in an hour—12in. 750 watt circular silica glass encased element—opal bowl for up to 100 watt lamp—non-rust spun reflector—white enamelled base heat shield, pull switch, magnificent unit as sold normally at £4.5.0 only 49/6 plus 7/6 carr. and insurance.



BATTERY OPERATED TAPE DECK

With Capstan control. This unit is extremely well made and measures approx. 6 x 5 x 2 1/2 in. deep. Has three piano key type controls for Record, Playback and Rewind. Motor is a special heavy duty type intended for operation off 4 1/2 volts. Supplied complete with 2 spools ready to install. Record, Replay head is the sensitive M4 type intended for use with transistor amplifier. Price £4.15.0. Post and insurance 4/6.

Kit of parts for switched F.M. Tuner described August/September issues £4.15.0. P. & ins. 3/6.

EX-WD BARGAIN Easily rebuildable to short wave radio



This is the 46 Receiver/Transmitter. It has a range of approx. 5 miles. Operates from dry batteries. Complete with six valves and in metal case. Size approx. 12in. x 6in. x 3 1/2 in. Complete but less crystal, not tested nor guaranteed. 19/6 plus 7/6 post and insurance. Should not be operated as a transmitter in the U.K.

See in the Dark INFRA-RED BINOCULARS



These Infra-red binoculars when fed from a high voltage source will enable objects to be seen in the dark, providing the objects are in the rays of an infra-red beam. Each eye tube contains a complete optical lens system as well as the infra-red cell. These optical systems can be used as lenses for T.V. cameras—light cells, etc. (details supplied). The binoculars form part of the Army night driving (Tabby) equipment. They are unused and believed to be in good working order but sold without a guarantee. Price £3.17.6, plus 10/- carr. and ins. Handbook 2/6.

RECORD DECK

Heavy gauge pressed metal plyth, size 13in. x 11in. Fitted with Motor, Decca pick-up, on-off switch and 10in. turntable. Motor normally mains working but 78 r.p.m. only. Could no doubt be altered to 33 or 45 r.p.m. Limited quantity only. 29/6 each, plus post and insurance 6/6.

9 VOLT PRECISION MOTOR

Intended for driving battery operated tape recorders and record players. Laminated, 6 Pole armature with Brush gear and rapid start switch. Normally 25/- . Our price 7/6, plus post and insurance 1/6.



MAINS TRANSISTOR POWER PACK

Designed to operate transistor sets and amplifiers. Adjustable output 6v., 9v., 12 volts for up to 500mA (class B working). Takes the place of any of the following batteries: PP1, PP3, PP4, PP6, PP7, PP9 and others. Kit comprises: mains transformer rectifier, smoothing and load resistor, 5,000 and 500 mfd. condensers, Zener diode and instructions. Real snip at only 14/6, plus 3/6 postage.

SENSITIVE HAND MICROPHONE

Dynamic type. Low impedance, moving iron, fitted in unusually neat plastic head with anti-microphonic coupling to handle. Extra small size but very sensitive. 15/- each.

POLYESTER FILLED FLUORESCENT CHOKE

Extra silent operation, suitable for 230/240v. 40 watt tubes. Price only 13/6 or with two bi-pin push on ends, two spring tube clips, starter and starter holder 17/6 complete. Postage for kit or choke only is 4/6. 80 watt as above, price 17/6 for the choke or 21/- for the kit. Post 4/6.

STUPENDOUS OFFER—£11 for £2 The Princess Superhet



Only recently sold for £10.9.6. Note these features: Long & Medium Wave Long dial Push pull output A.V.C. and feed back Ferrite aerial Six transistors Cabinet size 4 1/2 in. x 3 1/2 in. with carrying strap. You get everything you need and instructions. 39/6 plus 3/6 p. & p. Battery 1/9 extra. Data separately 2/6.

ELECTRONICS (CROYDON) LIMITED

(Dept. P. W.) 102/3 TAMWORTH RD., CROYDON, SURREY (Opp. W. Croydon Stn.)

also at 266 LONDON ROAD, CROYDON, SURREY

Make Your Ability PAY

UNLIMITED OPPORTUNITIES exist today for "getting on" . . . but only for the fully trained man. Let ICS's tuition develop your talents and help you to success.

STUDY IS EASY with ICS guidance. The courses are thorough. Printed manuals, fully illustrated, make study simple and progress sure.

YOUR ROAD TO SUCCESS can start from here—today. Complete this coupon and post it to us, for full particulars of the course which interests you. MODERATE FEES INCLUDE ALL BOOKS.

Take the right course now . .

ADVERTISING & ART
Copywriting, Cartooning
Layout and Typography
Commercial Illustrating
Oil & Water Colour

BUILDING & CIVIL ENG'G
Architecture, Bricklaying
Building Construction
Builders Draughtsman
Builders Quantities
Interior Decoration
Quantity Surveying
Heating & Ventilation
Carpentry & Joinery

COMMERCE
Book-keeping
Accountancy & Costing
Business Training
Office Training
Purchasing, Storekeeping
Secretarialship
Shorthand & Typing
Computer Programming
Small Business Owners

DRAUGHTSMANSHIP
Architectural, Mechanical
Drawing Office Practice

ELECTRONICS
Computers
Electronic Technicians
Industrial Electronics

FARMING
Arable & Livestock
Pig & Poultry Keeping
Farm Management & Accounts

GENERAL EDUCATION
G.C.E. subjects at Ordinary &
Advanced Level
Good English
Foreign Languages

HORTICULTURE
Home Gardening
Park Gardening
Market Gardening

MANAGEMENT
Business Management
Hotel Management
Industrial Management
Office Management
Personnel Management
Public Relations (I.P.R.)
Transport Management
Works Management
Work Study
Foremanship

MECHANICAL & MOTOR ENG'G
Engineering Maths.
Diesel Engines, Welding
Industrial Instrumentation
Workshop Practice
Refrigeration
Motor Mechanics, etc.

POLICE
Entrance Examination
Promotion Examinations

PHOTOGRAPHY
Practical Photography
RADIO, TV & ELECTRICAL
Servicing & Engineering
Radio Construction (with Kits)
T.M.O. Certificates
Telecommunications
Electricians
Electrical Contractors

SELLING
Company Reps.
Sales Management
Marketing

WRITING FOR PROFIT
Television Scriptwriting
Short-story Writing
Free-lance Journalism
Technical Writing

INTENSIVE COACHING for all principal examinations—G.C.E.,
Secretariats, Accountancy, Engineering, Work Study, Manage-
ment, Radio, Transport and Surveying. Special courses for
G.C.E. French, German Oral Tests.

Member of the Association of British Correspondence Colleges

Start today the I.C.S. way!

INTERNATIONAL CORRESPONDENCE SCHOOLS
(Dept. 172)
Intertext House, Parkgate Rd., London, S.W.11

Send FREE book on.....

Name

Address

Occupation

9.67

INTERNATIONAL CORRESPONDENCE SCHOOLS

ELECTROLYTIC CONDENSERS

25µF	3 volt	3-2µF	64 µF	16µF	16 volt	64µF	9 volt
1µF	10 volt	4µF	4 volt	16µF	30 volt	64µF	10 volt
1µF	15 volt	4µF	12 volt	16µF	150 volt	64µF	40 volt
1µF	40 volt	4µF	25 volt	20µF	3 volt	100µF	3 volt
1µF	50 volt	4µF	100 volt	20µF	6 volt	100µF	6 volt
1µF	350 volt	5µF	6 volt	20µF	9 volt	100µF	10 volt
1-25µF	16 volt	5µF	25 volt	20µF	15 volt	100µF	12 volt
2µF	3 volt	5µF	50 volt	25µF	6 volt	100µF	15 volt
2µF	9 volt	5µF	70 volt	25µF	12 volt	150µF	12 volt
2µF	10 volt	6µF	12 volt	25µF	25 volt	150µF	25 volt
2µF	15 volt	6µF	15 volt	25µF	30 volt	200µF	3 volt
2µF	70 volt	6-4µF	40 volt	30µF	6 volt	200µF	4 volt
2µF	150 volt	8µF	3 volt	30µF	10 volt	200µF	16 volt
2-5µF	16 volt	8µF	6 volt	30µF	15 volt	250µF	2-5 volt
2-5µF	25 volt	8µF	50 volt	32µF	1-5 volt	250µF	9 volt
3µF	3 volt	10µF	6 volt	32µF	25 volt	250µF	15 volt
3µF	12 volt	10µF	10 volt	40µF	3 volt	320µF	2-5 volt
3µF	25 volt	10µF	12 volt	40µF	6-4 volt	500µF	4 volt
3-2µF	6 volt	10µF	25 volt	50µF	6 volt	640µF	2-5 volt
3-2µF	6-4 volt	12-5µF	4 volt	50µF	9 volt	750µF	18 volt
3-2µF	40 volt	12-5µF	40 volt	64µF	2-5 volt	1000µF	6 volt

All at 1/- each 9/- per dozen. Mixed packet (our selection) 20 for 10/-, 200/100µF 275 volt; 200/200µF 275 volt; 125/300/50µF 275 volt 5/- each or 3 for 10/-.

PAPER CONDENSERS

.001µF	500 volt	.02µF	600 A C	.25µF	350 volt
.001µF	1000 volt	.02µF	350 volt	.5µF	150 volt
.002µF	500 volt	.1µF	350 volt	.5µF	350 volt
.005µF	750 volt	.1µF	750 volt	.5µF	500 volt

All at 15/- per 100 or mixed packet (our selection) 50 for 10/-.

VERY SPECIAL VALUE! SILVER MICA, POLYSTYRENE, CERAMIC CONDENSERS. Very well assorted. Mixed types and values. 10/- per 100.

RESISTORS

Very small 1/2 watt, 5% long leads, ideal for transistor work .. 10/- for 50
1/2 watt assorted values including printed circuit types .. 10/- for 100
1/2 watt to 3 watt mixed values and types .. 55/- for 1000
1/2 watt to 3 watt mixed values and types .. 10/- for 1000
55/- for 1000

To clear 10 meg. 1/4 watt resistors. £1 per 1,000. **WIRE-WOUND** 3 watt, 5 watt, 6d. each, 7 watt, 10 watt, 9d. each. Most values, 1Ω to 47kΩ.

TRANSISTORS

AFZ12 screened V.H.F. oscillator transistors, 5/- each. OC44, OC45 R.F. Transistors, 2/6 each. OC8D, 2/6 each. OC71 equivalent 1/- each, £3 per 100. Switching Transistors ASY 22 (P.N.P.) or I.B.M. (N.P.N.) 6 for 10/- Car radio type Output Transistors type NKT405 10/- each. Unmarked, untested transistors, 50 for 10/- Light-sensitive transistors similar to OCPT71, 2/- each.

TELEVISION VALVES, BRAND NEW AND BOXED

PCF80	7/6	PCC84	6/6	PCL83	9/-
PCL84	7/6	EY86	6/-	PCL85	7/6
PL36	9/-	PC89	9/-	ECC82	6/6
ECL80	6/6	PCL82	7/6	PY33	9/-
PL81	7/6	PY81	6/-		

SILICON DIODES. Make excellent detectors, also suitable for keying electronic organs. 1/- each or 20 for 10/-.

BY100 TYPE TELEVISION H.T. RECTIFIERS. SPECIAL PRICE 5/- each, 30/- doz. ORP 12 light sensitive resistors 9/- each.

TRANSISTOR BATTERY ELIMINATORS—same size as PP930/-; PP620/-.

BATTERY CHARGERS. with meter and fuse. 4 amp. 6/12 volt 55/- each.

SOLON MODEL 615 Slim Pencil-bit Soldering Irons 25/- each.

WELLER DUAL-HEAT SOLDERING GUN. 57/6.

NUTS, SCREWS AND WASHERS. very useful assorted packs, 6/- each.

TRANSCEIVERS (not for use in U.K.) £7.10.0 pair.

SIGNAL INJECTOR. Parts and circuit to make 10/- only.

SIGNAL TRACER. Parts and circuit to make 10/- only.

MOTOR CAR REV. COUNTER (less 1mA meter). Parts and circuit to make 10/- only.

TRANSISTORS, COMPONENTS AND CIRCUIT. To convert 1mA meter to 0 to 10 Meg. ohm meter 10/-.

TRANSISTORISED RUMBLE AND SCRATCH FILTER (for improving reproduction of old records) all components and circuit 30/-.

SINCLAIR. All products in stock including latest version of MICRO-6. World's smallest radio, and only 59/6.

NEEDLES FOR RECORD PLAYERS. HALF PRICES. All types below at 3/6 ea. TC8LP; GC2LP; GC8LP; BF40LP; GP67LP; GP37; GP59; TC8 Stereo LP; Studio OLP. **CARTRIDGES.** Sonotone Mono 10/- Acos 15/- Acos Stereo Sapphire 12/6. Diamond 17/6. All complete with needles!

LAPEL MICROPHONES. Magnetic or Crystal 10/- each.

TAPE RECORDER MICROPHONES. Fantastic value at 12/- each.

ACOS MIC. 45 30/- Many other both crystal and dynamic in stock.

THIN CONNECTING WIRE. 10yds. 1/-; 100yds. 7/6; 500yds. 25/- post 4/6; 1,000yds. 40/- post 6/-.

LOUDSPEAKERS. 12in. Richard Allen 37/6. 12in. Bakers Guitars £5.5.0. 3in., 4in., 5in. and 5 x 3in. all at 10/- each. 8 x 2 1/2in. 12/6. 2in. 80 ohm 7/6. **EPIECES.** Magnetic or Crystal 5/- each.

VEROBOARD			
2 1/2 x 5in.	..	3/11	Terminal Pins. .. 50 for 3/-
2 1/2 x 3 1/2in.	..	3/3	Spot Face Cutter .. 7/3
3 1/2 x 5in.	..	5/6	Pin Insert Tool .. 9/6
3 1/2 x 3 1/2in.	..	3/11	Special Offer. Cutter & 5 boards 2 1/2 x 1in. 9/9

ORDERS BY POST TO

G. F. MILWARD, 17 Peel Close, Drayton Bassett, Staffs.

PLEASE INCLUDE APPROPRIATE POSTAGE COSTS

No enquiries without stamped addressed envelope

For customers in the Birmingham area, goods may be obtained from Rock Exchanges, 231 Alum Rock Road, Birmingham 8.

TWO METRE TRANSMITTER

F.G. RAYER G30GR

THE 144Mc/s amateur band covers a very wide frequency range compared with the low frequency bands, and crystal control is quite often used offering a simple means of obtaining good frequency stability. In addition to its obvious use on the 144Mc/s band, a transmitter of the kind described here may be adapted for use as a driver, with its output frequency multiplied into the 420Mc/s band. The new Class B licence permits operating on frequencies above 420Mc/s without any need to pass the Morse test, call-signs being allocated in the G8 (followed by three letters) series.

Figure 1 is the circuit, V1 using an 8Mc/s 3rd overtone type crystal so that output is obtained directly on 24Mc/s. If the tuned circuit L1/VC1 is tuned for maximum output, oscillation may not recommence after switching on and off, and VC1 is adjusted slightly as necessary to correct this.

V2 triples to 72Mc/s, while V3 doubles to 144Mc/s driving the power amplifier V4 at 144Mc/s ensuring reasonable efficiency. As grid current is very important, VC2 is panel operated, and a grid current meter is included. It is possible to omit this meter, fitting a jack for an external test-meter or similar instrument. If a grid dip oscillator is available this will be very useful to check the frequencies of the various circuits before applying power. Should a g.d.o. not be to hand, tuning up can be accomplished by means of the indicating wavemeter described. Initial adjustments should be made stage by

stage, and no h.t. must be applied to h.t.2 until the circuits are correctly tuned. If the coil details given are followed carefully, this should avoid any serious error such as working on the wrong harmonic. The coil details are given exactly as a guide, and this does not mean that somewhat dissimilar coils would not be satisfactory if a g.d.o. can be brought into use to adjust their frequency.

CONSTRUCTION

This is quite straightforward, with all circuits except the p.a. anode and output below the chassis. A piece of aluminium $4\frac{1}{2}$ in. x $9\frac{1}{2}$ in. has $\frac{1}{4}$ in. flanges bent on it, and is shaped to fit as in Fig. 2. The positions of valveholders and other items on the chassis can be judged from Figs. 2 and 3.

Figure 3 is the underside of the chassis. Heater and h.t. leads run close against the chassis. All bypass capacitors are connected with very short leads.

OVERTONE OSCILLATOR

The oscillator is intended for 3rd overtone type crystals, and other crystals may not be satisfactory. With the 8Mc/s overtone crystal, the lowest frequency present is the overtone, or 24Mc/s. The output frequency of the transmitter is approximately $\times 18$ the crystal frequency, and crystals can be chosen on this basis.

The position of the tapping T on L1 considerably influences results, and will probably have to be

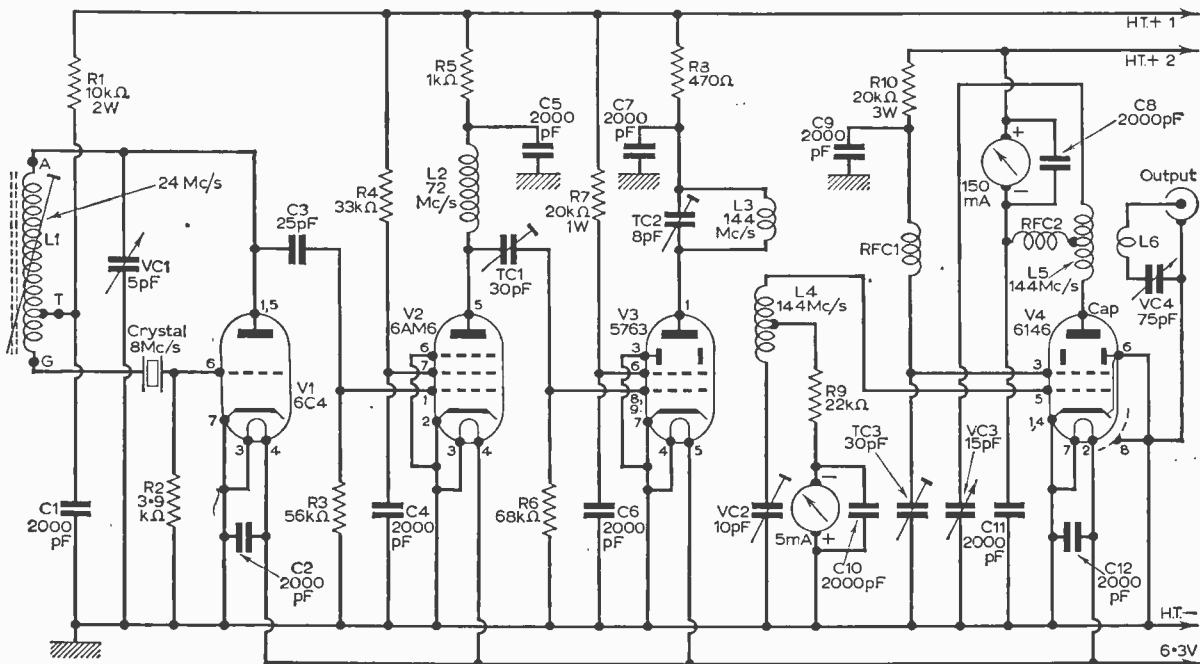


Fig. 1: Circuit diagram of the two metre transmitter.

L1 is wound with 24s.w.g. enamelled wire, on a 9/32in. diameter cored former. There are 18 turns in all, with the tapping 5 turns from the grid or crystal

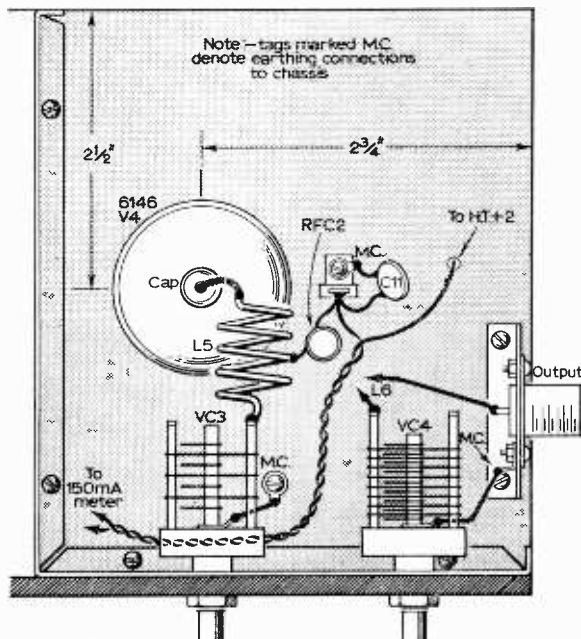


Fig. 2: Layout of the components in the p.a. compartment above chassis.

When adjustment is correct, adjusting L1 or VC1 will only slightly change the frequency, due to pulling the crystal, and if L1 is put very far off resonance, oscillation will cease, as shown by a rise in anode current.

Coil L2 has 6 turns of 16s.w.g. wire, spaced to occupy $\frac{3}{4}$ in., with an outside diameter of $\frac{5}{8}$ in. The

Insert V3. Temporarily insert a meter between R6 and chassis (positive to chassis). If a g.d.o. is available, adjust TC1 until L2 is resonant at 72Mc/s. If no g.d.o. is to hand, adjust TC1 for maximum grid current through R6, this should be over 0.5mA. Check with the wavemeter that L2 is tuned to 72Mc/s, and not some other multiple. Adjustments of TC1 may seem quite flat, because it is in series with V3 grid capacity. TC1 should be at least half closed. Should L2 not tune to 72Mc/s, it must be stretched or compressed slightly.

The driver coil L3 is adjusted to 144Mc/s with the parallel trimmer TC2. L3 is 2 turns of 16s.w.g. wire, with an outside diameter of $\frac{5}{8}$ in. and turns separated to occupy 5/16in. With grid current obtained through R6 as mentioned, rotate TC2 for maximum output, as shown by a wavemeter or lamp loop. The latter can be 1 turn of insulated wire, soldered directly to a 0.06 ampere bulb. The trimmer, L3, and C7 have the shortest possible leads. If L3 does not tune to 144Mc/s, it will have to be compressed or stretched slightly.

PA GRID COIL

As stray capacity is otherwise too great for efficient working, this is series tuned by VC2. It has $5\frac{1}{2}$ turns of 16s.w.g. wire, and is $\frac{1}{2}$ in. long, with an outside diameter of $\frac{1}{2}$ in. Wire V4 holder with stout conductors (16s.w.g.) and the shortest leads possible. Take by-pass capacitor and other connections to the tags adjacent to the sockets, not to the ends of the tags. A paxolin holder of the thin type, with little solid material, was found satisfactory, and the moulded type of holder with embedded sockets should not be used. A ceramic or other low-loss holder is preferable.

Connect L4 directly from tag 5 to VC2. Cut one lead of R9 very short, and solder this to the centre of L4. Put V4 in, but be sure no h.t. is applied to anode or screen grid. L3 and L4 are closely coupled as in Fig. 3. Adjustments in all stages can now be directed towards obtaining maximum grid current. With VC2 correctly adjusted, grid current should be 2mA to 3mA. If maximum grid current is with VC2 open, stretch L4 slightly. Should maximum grid current be obtained with VC2 closed, press the turns of L4 slightly together.

All the previous trimming adjustments can be checked now, to get maximum grid current on the meter. Although L3 and L4 need to be close together, on no account must they touch. The adjustments of TC2 and VC2 to some extent depend on each other, but after these are peaked VC2 should allow ample adjustment of grid current on the meter.

PA ANODE COIL

The p.a. anode coil L5 has $4\frac{1}{2}$ turns of 14s.w.g. wire wound to an outside diameter of $11\frac{1}{16}$ in. The coil is $\frac{3}{4}$ in. long and a $\frac{1}{2}$ in. flexible lead is soldered to the anode end. This can be a piece of co-axial cable outer braiding, or a number of pieces of bared flex twisted together. The other end goes directly to VC3. A 14s.w.g. wire runs from VC3 moving plates tag to chassis.

RFC2 is self-supporting and has 30 turns close wound of 22s.w.g. enamelled wire on a $\frac{1}{4}$ in. diameter rod. Straighten a piece of wire and fix one

BUILD YOURSELF A QUALITY TRANSISTOR RADIO-GUARANTEED RESULTS BACKED BY OUR SUPER AFTER SALES SERVICE!

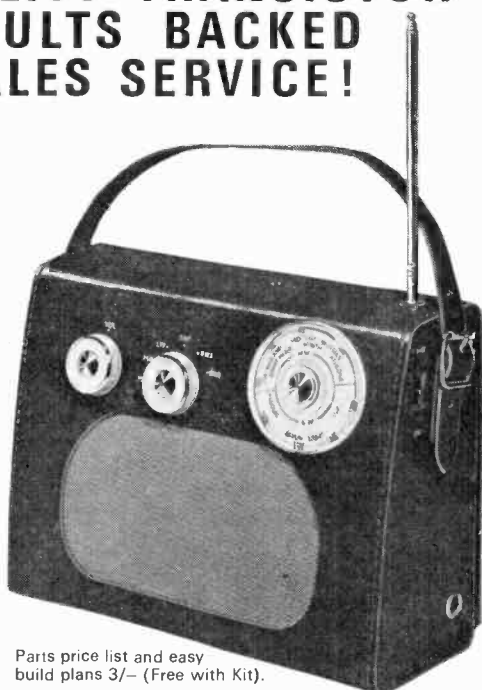
THE MAGNIFICENT ROAMER 7 MKII

SEVEN WAVEBAND PORTABLE AND CAR RADIO WITH A SUPER SPECIFICATION GIVING OUTSTANDING PERFORMANCE!

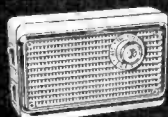
- 7 Fully tunable wavebands—MW1, MW2, LW, SW1, SW2, SW3 and Trawler Band.
- Extra Medium waveband provides easier tuning of "pop" stations.
- Built in ferrite rod aerial for Medium and Long Waves.
- 5 Section 22 inch chrome plated telescopic aerial for Short Waves—can be angled and rotated for peak S.W. listening.
- Socket for Car Aerial.
- Powerful push pull output.
- 7 transistors and two diodes including Philco Micro-Alloy R.F. Transistors.
- Famous make 7in. x 4in. P.M. speaker for rich-tone volume.
- Air spaced ganged tuning condenser.
- Separate on/off switch, volume control, wave change switches and tuning control.
- Attractive leather look case with hand and shoulder straps. Size 9in. x 7in. x 4in. approx.
- First grade components.
- Easy to follow instructions and diagrams make the Roamer 7 a pleasure to build with guaranteed results.

Total building costs

£5.19.6 P. & P. 5/6



Parts price list and easy build plans 3/- (Free with Kit).



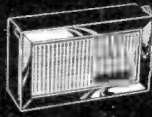
TRANSONA FIVE

MEDIUM WAVE, LONG WAVE AND TRAWLER BAND PORTABLE

Attractive case with red speaker grille. Size 6½ x 4½ x 1½in. Fully tunable. 7 stages—5 transistors and 2 diodes, ferrite rod aerial, tuning condenser, volume control, fine tone super dynamic 3in. speaker, all first grade components. Easy build plans and parts price list 1/6. (FREE with kit).

Medium, Short Wave, and Trawler Band version can be supplied if preferred.

Total building costs
42'6 P. & P. 3/6



POCKET FIVE

TWO WAVEBAND PORTABLE WITH 3in. SPEAKER

Attractive black and gold case. Size 5½ x 1½ x 3½in. Fully tunable over both Medium and Long Waves with extended M.W. band for easier tuning of "pop" stations. All first grade components—7 stages—5 transistors and 2 diodes, super sensitive ferrite rod aerial, fine tone 3in. moving coil speaker etc. Easy build plans and parts price list 1/6 (FREE with kit).

POCKET FIVE Medium and Long Wave version with miniature speaker ONLY 29/6. P. & P. 3/6.

Total building costs
42'6 P. & P. 3/6



MELODY SIX

TWO WAVEBAND PORTABLE WITH 3in. SPEAKER

Handsome leather-look case size 6½ x 3½ x 1½in. with gilt trim and hand and shoulder straps. Fully tunable over both Medium and Long waves. Incorporates pre-tagged circuit board, 8 stages—6 transistors and 2 diodes, ferrite rod aerial, push-pull output, wave change slide switch, tuning condenser, volume control, 3in. moving coil speaker etc. Easy build plans and parts price list 2/- (FREE with kit).

Total building costs
59'6 P. & P. 3/6



MELODY MAKER 6

THREE WAVEBAND PORTABLE WITH 3in. SPEAKER

Smart pocket size case, 6½ x 3½ x 1½in. with gilt fittings. Fully tunable over both Medium and Long Waves with extra M.W. band for easier tuning of "pop" stations. 8 stages—6 transistors and 2 diodes, top grade 3in speaker, 2 R.F. stages for extra boost, high 'Q' ferrite rod aerial. Easy build plans and parts price list 2/- (FREE with kit).

Total building costs
69'6 P. & P. 3/6

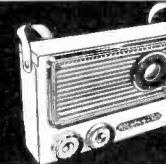


ROAMER SIX

SIX WAVEBAND PORTABLE WITH 3in. SPEAKER

Attractive case with gilt fittings, size 7½ x 5½ x 1½in. World wide reception. Tunable on Medium and Long waves, two short waves, Trawler Band plus an extra M.W. band for easier tuning of "pop" stations. Sensitive ferrite rod aerial and telescopic aerial for Short waves. All top grade components, 8 stages—6 transistors and 2 diodes including Philco Micro-Alloy R.F. Transistors etc. (Carrying strap 1/6 extra.) Easy build plans and parts price list 2/- (FREE with kit).

Total building costs
79'6 P. & P. 3/6



SUPER SEVEN

THREE WAVEBAND PORTABLE WITH 3in. SPEAKER

Attractive case size 7½ x 5½ x 1½in. with gilt fittings and carrying strap. The ideal radio for home, car or outdoors. Covers Medium and Long Waves and Trawler Band. Special circuit incorporating 2 R.F. Stages, push pull output, ferrite rod aerial, 7 transistors and 2 diodes, 3in. speaker (will drive larger speaker) and all first grade components. Easy build plans and parts. Price list 2/- (FREE with kit).

Total building costs
79'6 P. & P. 3/6

RADIO EXCHANGE CO.

Callers side entrance Barratts Shoe Shop • Open 9-5 p.m.
Saturday 9-12.30 p.m.

61 HIGH STREET, BEDFORD

Telephone: Bedford 52367

DE LUXE PLAYERS

4-Speed Mono Players 2-tone Cabinets 17 x 15 x 8 1/2 in. High. Luxe loudspeakers and Hi-Fi Quality Amplifiers ready built. Quality output. Volume and Bass controls. Special instructions enable assembly in 30 minutes, only 5 wires to join. 12 months guarantee.



TO BUILD YOURSELF

Post 2/6 per item

PORTABLE CABINET

As illustrated to fit standard player 69/6

3 WATT AMPLIFIER

Ready made and tested.

With UCL86 triode pentode valve and 59/6

SINGLE PLAY MONO

BSR GUT 24.19.6

Garrard SEP12 24.19.6

Garrard SP28 210.19.6

Philips AG1016 212.9.6

Garrard A70 219.19.6

Garrard LAB80 224.19.6

Garrard 401 229.19.6

Stereo/Mono Heads 12/6 extra.

Garrard Teak Wood Base WBI. Ready cut for

mountings. 1000, 2000, 3000, SP25, AT60

SUPERIOR AMPLIFIER

Ready made and tested.

Guaranteed better sound.

Fully isolated AC Mains

Transformer 4 watt out-

put. ECL86 triode pen-

tode valve. Volume and

tone controls with

knobs. Quality

Loudspeaker

89/6

AUTOCHANGE MONO

BSR Superslim 25.19.6

Garrard 1000 25.19.6

Garrard 2000 28.19.6

Garrard 3000 28.9.6

Garrard AT60 Mk. II

diecast turntable 212.19.6

27/6

FULL WAVE BRIDGE SELENIUM RECTIFIERS:

6 or 12v. outputs, 1 amp. 8/2; 2 a. 11/3; 4 a. 17/6.

CHARGER TRANSFORMERS 2 & P. 2/6 for 6 or 12 v., 1 1/2

amps., 17/6; 2 amps., 21/-; 4 amps., 25/- Circuit included.

WAVE-CHANGE SWITCHES WITH LONG SPINDLES.

2 p. 2-way, or 2 p. 6-way, or 3 p. 4-way, 3/6 each.

1 p. 12-way or 4 p. 2-way, or 4 p. 3-way, 3/6 each.

BARGAIN XTAL PICK-UP ARM Complete with

ACOS LP-78 Turnover Head and Stylus 20/-; Stereo 30/-.

SPEAKER FRET Tygan various colours, 52in. wide from

10/-; 11.28in. wide from 6/-; 11. Samples S.A.E.

EXPANDED METAL Gold or Silver 12 x 12in. 6/-.

NEW GARRARD GRAM MOTORS 100-130v. A.C. 15/-

pair for 200/250v. (in series) or 10/- each (Post 2/8).

STELLA RECORD PLAYER AMPLIFIER

4 watt. 2 stage. 3 to 7 ohm. Neg. feed back. UCL82, UY85. 200-250v. A.C. tapped input. Chassis size 8 x 2 1/2 x 4in. high. Gold/Walnut knobs. Volume and Tone controls on separate Polished Wood Panel 6 x 2in. Brand new with maker's guarantee. Bargain price. Post 2/6 78/6

NEW TUBULAR ELECTROLYTICS

2/350 v. 2/3 100/25 v. 2/-

4/350 v. 2/3 250/25 v. 2/8

8/450 v. 2/3 500/15 v. 3/-

16/450 v. 3/1 8-8/450 v. 3/8

32/450 v. 3/8 8-16/450 v. 3/8

50/25 v. 1/9 16-16/450 v. 4/3

50/50 v. 2/- 32-32/350 v. 4/9

CAN TYPES

8/600 v. 9/6

16/600 v. 12/6

16-16/500 v. 7/6

32-32/450 v. 6/-

50-50/350 v. 7/-

100-100/350 v. 11/6

100-200/275 v. 12/6

SUB-MIN. ELECTROLYTICS. 1, 2, 4, 5, 8, 16, 25, 30, 50, 100,

250mfd. 15v. 2/8; 500, 1000 mfd. 12v. 3/8; 2000mfd. 25v. 9/6.

CERAMIC 500v. 1 pF. to 0.01mfd., 9d. Discs 1/-.

PAPER TUBULARS

350v.-0.1 9d., 0.5 2/8; 1 mfd. 3/-; 2 mfd. 150v. 3/-.

500v.-0.001 to 0.05 9d.; 0.1 1/-; 0.25 1/8; 0.5 3/-.

1.000v.-0.001, 0.002, 0.0047, 0.01, 0.02, 1/8; 0.047, 0.01, 2/6.

E.H.T. CONDENSERS. 0.001mfd. 7kV, 9/6; 20kV, 10/6.

SILVER MICA. Close tolerance (plus or minus 1 pF.). 5 to

47pF., 1/-; ditto 1% 50 to 800 pF. 1/-; 1,000 to 5,000 pF. 2/-.

TWIN GANG. "40-0" 208 pF. + 176 pF. 1/6; 365 pF., minia-

ture, 10/-; 500 pF. standard with trimmers, 9/6; 500 pF

midset less trimmers, 7/8; 500 pF. slow motion, standard 9/-;

small 5-gang 500 pF. 15/8. Single "0" 365 pF. 7/8. twin 10/-.

SHORT WAVE. Single 10 pF., 25 pF., 50 pF., 75 pF.,

100 pF., 160 pF., 5/6 each. Can be ganged. Couplers 8d. each.

TUNING. Solid dielectric. 100 pF. 300 pF., 500 pF., 3/8 each.

TRIMMERS. Compression ceramic 30, 50, 70 pF., 9d.;

100 pF., 150 pF., 1/3; 250 pF., 1/6; 600 pF., 750 pF., 1/9.

250v. RECTIFIERS. Selenium 1 watt 100mA 5/-; BY10010/-;

CONTACT COOLED 1 watt 60mA 7/8; 85mA 9/6.

Full wave 75mA 10/-; 150mA 19/8; T.V. rectis. 10/-.

MAINS TRANSFORMERS

250-0-250, 80mA, 6.3v. 3.5a., 6.3v. 1a., or 5v. 2a. 25/-

350-0-350 80mA, 6.3v. 3.5a., 6.3v. 1a., or 5v. 2a. 29/6

MT.510 300-0-300v. 120mA, 6.3v. 1a. 29/6

MINIATURE 200v. 20mA, 6.3v. 1a. 29/6

MIDGET 220v. 45mA, 6.3v. 2a. 15/6

Small 250-0-250 50mA, 6.3v. 2a. 19/8

HEATER TRANS. 6.3v. 1a., 3/8; 6.3v. 4a. 10/6

Ditto tapped sec. 1.2, 2, 3, 4, 5, 6.3v. 1a. 10/6

GENERAL PURPOSE LOW VOLTAGE Outputs 9, 4, 5,

6, 8, 9, 10, 12, 15, 18, 24 and 30v. at 2a. 25/-

1a., 5, 10, 15, 20, 25, 30, 40, 45, 50, 55, 60 29/6; 1a. 47/8

AUTO TRANSFORMERS 0-115-230 volt Input/Output

60w. 18/8; 150w. 25/-; 500w. 92/8; 1,000w. 175/-.

BAKER 12 in. MAJOR

The ideal High Fidelity Loudspeaker for high output at home or public address, etc. Built in high efficiency tweeter cone. Voice Coil impedance 15 ohms. Max. Power 20 watts. Bass Res. 40/50 cps. Flux 14,000 gauss. Voice Coil diameter 1 1/2 in. Response 40-14,500 cps. Magnet material Alcomax. overall dia. 12in., overall depth 6in.



Price £8 Post Free

CATALOGUE S.A.E.

GROUP MODEL FOR VOCALS,

BASS, LEAD AND RHYTHM GUITARS

30-10,000 cps, Voice Coils 15 ohms. Heavy Duty.

'Group 25' 'Group 35' 'Group 50'

12in. 25w. 5gns. 12in. 35w. 8 1/2 gns. 15in. 50w. 18gns.

Quality Horn Tweeters 3-16kcs. 10w. 27/8. Crossover 14/6.

LOUDSPEAKERS P.M. 3 OHMS. 2in., 3in., 4in., 5in.,

7in. x 4in., 15/6 each; 8in. 22/8; 6in. 18/6; 10in. 30/-;

12in. 30/-; (15 ohms 35/-); 10in. x 6in. 30/-; 8in. x 5in. 21/-.

E.M.I. Double Cone 13 1/2 x 9in., 3 or 15 ohm models, 45/-.

SPECIAL OFFER! 8 ohm, 2 1/2in. 5in.; 15 ohm, 5in., 7 x 4in.

15/6 25 ohm, 5in., 6 x 4in., 35 ohm, 3in., 5in., 7 x 4in.

EACH-ANY TYPE. 80 ohm, 2 1/2in., 2 1/2in.

JACK SOCKETS Std. open-circuit 2/6, close circuit 4/6.

Chromed Socket 7/6 DIN 3-pin 1/3 5-pin 1/6; Lead 3/6.

Phono Plugs 1/-, Socket 1/-, JACK PLUGS Std. Chrome 3/-;

2.5mm., 3.5mm. 1/9; DIN 3-pin 3/6; 5-pin 5/-.

DE LUKE TAPE SPLICER. Cuts, trims, joins.

For editing and repairs. With 3 blades. 14/6

Trade Heads: Collaro 2 track 28/6 pair. B.S.R. 4 track 99/6

CHANNEL TRANSMITTER MICROPHONE MIXER

Add musical highlights and sound effects to recordings.

Will mix microphone, records, tape and tuner 52/6

with separate controls into single output.

PRIMO A.18 TRANSCRIPTION TONE ARM. 5gns.

With tracking template and two plus-in shells

Movink Coil Stereo Diamond Cartridge 20-18,000 cps. 5 gns.

end to some object. Wind by rotating the rod, keeping tension on the wire. Then when the rod is removed the turns will not spring out, but will remain as a solenoid. The actual tapping point is slightly off centre on the coil, as shown.

With no h.t. applied to V4 rotate VC2. A dip in grid current should be found indicating resonance for L5. If this is not found, compress or stretch L5, or check its frequency with a g.d.o. L6 is a single turn of 14s.w.g. wire, covered in stout sleeving. The co-axial socket is fixed to a bracket, and the ends of L6 go directly from this to VC4. A lead from VC4 moving plates tag runs to the socket outer member at a soldering tag.

NEUTRALISING

Series tuned screen neutralising is used, adjusted by TC3. The choke r.f.c.1 is 90 turns of 38s.w.g. wire on a 3/16in. diameter former. With TC3 fully closed, and no h.t. applied to V4, tune VC3 so that the dip in grid current mentioned is seen. Unscrew TC3 while VC3 is swung from side to side. A point should be found when the dip in grid current is much smaller, or absent and TC3 is left in this position.

PA TUNING

As a 6146 may readily draw a destructive anode current, a first test at reduced voltage is wise. Take h.t.2 to a 250V or similar supply, with a switch in circuit. A domestic lamp can be used as an artificial load. This is not ideal at 144Mc/s, and will present a much higher impedance than the usual load. A temporary loop having 2 or 3 turns of insulated wire should be made and connected by short leads to the lampholder terminals. Put this loop near L5, switch on the h.t.1 supply, and adjust VC2 for about 2mA grid current. Switch on h.t.2, and immediately rotate VC3 for a dip in anode current. If this is under about 100mA, bring the lamp loop nearer L5. With 25 watts input (100mA at 250V) a 15W lamp should light fairly brightly.

Efficiency is much higher with increased voltages. VC2 may need slight re-adjustment after

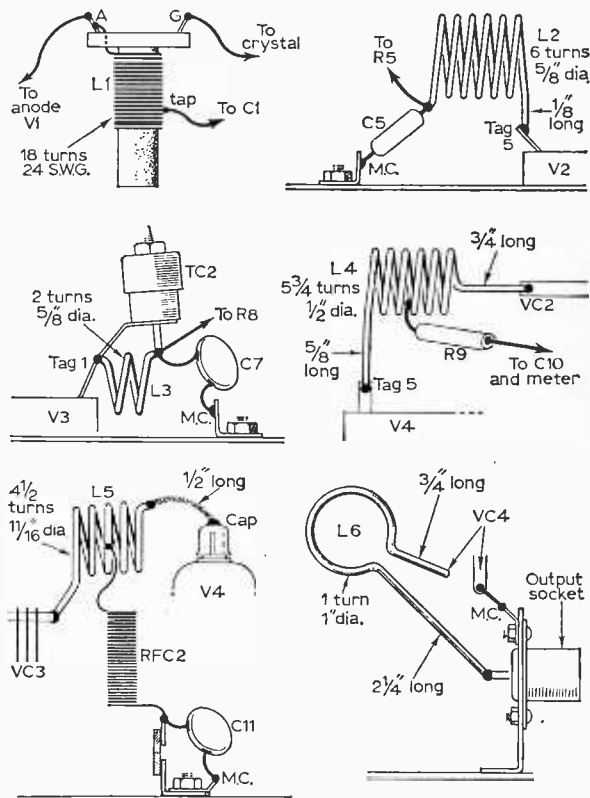


Fig. 4: Coil details. For winding instructions see text.

applying h.t. to V4. A 275V or 300V supply is recommended for h.t.1. When a lamp or other artificial load is connected to the output socket, closing VC4 from zero increases loading, but a 200/250V lamp is too high an impedance for this to be sufficient for full p.a. input.

C.W. ratings of the 6146 at 175Mc/s, are given as 140mA anode current at 320V. At 60Mc/s, ratings are 112mA at 600V. Telephony ratings are

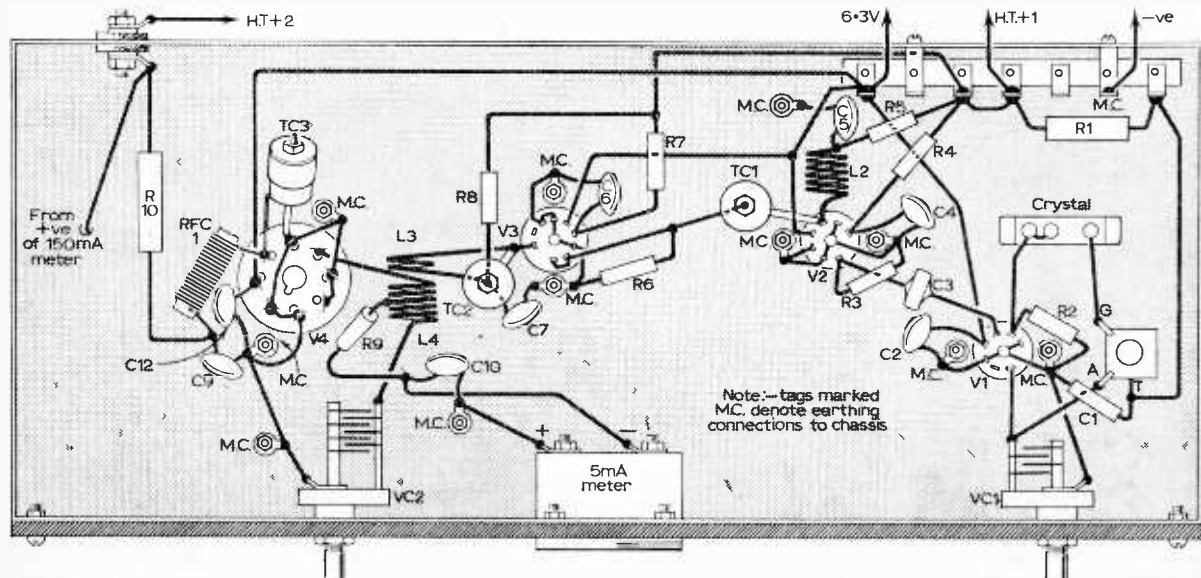


Fig. 3: Under chassis wiring diagram showing layout of components.

normally somewhat lower. In addition, the highest input ratings need ample grid drive, or full output is not obtained. In view of this, the amplifier has been operated at about 100mA anode current, from a 320V supply.

PA BIAS

The p.a. must not be operated without sufficient grid current (bias) or off resonance, or in conditions where the output obtained is so low that the anode dissipation is exceeded. With normal care, this should not be difficult. For increased output, R10 may be reduced to 16k Ω .

Point h.t.2 is supplied with modulated h.t. from the secondary of a modulation transformer. The modulator can be of normal type with a pair of 6L6 or 807 valves or similar stage delivering power about equal to half the p.a. input.

Note that the h.t. *must* be removed when changing crystals, if this is not done the valves could be permanently damaged.

WAVEMETER

If a g.d.o. or wavemeter is not available, a simple indicating wavemeter can be constructed as in Fig. 5. Provided the inductance and other details are exactly as shown, accuracy should be high enough for the various harmonic multiples to be identified. The output from the diode is taken to a test-meter or other instrument with a 1mA or similar range. The variable capacitor is fitted to a piece of

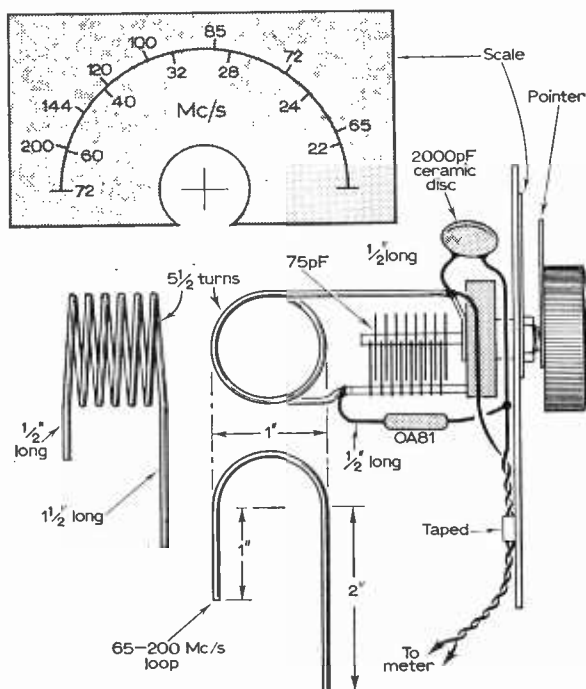


Fig. 5: Details and layout of suitable wavemeter.

insulating material, to serve as a handle and carry a card scale.

For the 22-72Mc/s band, take 17 1/2 in. of 16s.w.g. wire, and straighten it. Wind 5 1/2 turns so that the coil has an outside diameter of 9/10 in. and is 1/2 in. long, with the ends going directly to the tuning capacitor. For the 65-200Mc/s band, use 4 in. of 16 s.w.g. wire. Bend this round a suitable object to form the loop as shown, and solder it to the capacitor. To cover both bands, it is necessary either to make two wavemeters, or to unsolder the unwanted coil. The wavemeter coil is loosely coupled to the appropriate transmitter coil, and tuned for maximum reading on the milliammeter.

Fixed capacitors should be of high-frequency by-

—continued on page 360

★ components list

Capacitors:

All disc ceramic except C3
C1 2000pF
C2 2000pF
C3 25pF mica
C4 2000pF
C5 2000pF
C6 2000pF
C7 2000pF
C8 2000pF
C9 2000pF
C10 2000pF
C11 2000pF
C12 2000pF

Resistors:

R1 10k Ω 2W
R2 3.9k Ω
R3 56k Ω
R4 33k Ω
R5 1k Ω
R6 68k Ω
R7 20k Ω 1W
R8 470 Ω
R9 22k Ω
R10 20k Ω 3W

Miscellaneous:

Crystal (8Mc/s 3rd overtone); two B7G skirted valve holders with cans; one B9A skirted holder with can; one octal holder; 5mA meter; 150mA meter; chassis 12 x 5 x 3 in.; crystal holder; co-ax socket; four knobs; tagstrip; wire; solder etc.

Variable Capacitors:

TC1 30pF Beehive
TC2 8pF Beehive
TC3 30pF Beehive
VC1 5pF } air-
VC2 10pF } spaced
VC3 15pF } s.w.
VC4 75pF } variables

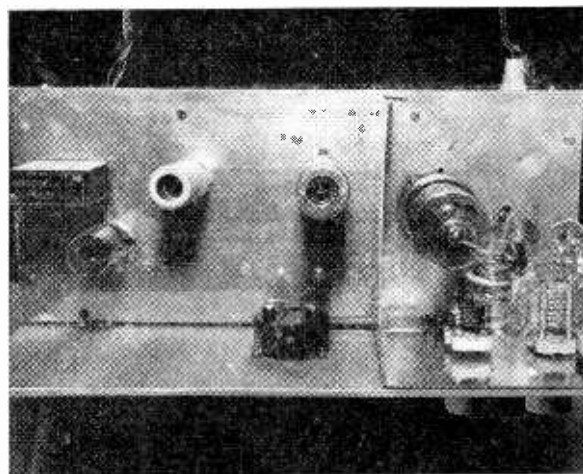
Inductors:

RFC1
RFC2
L1
L2
L3
L4
L5
L6

See text and Fig. 4

Valves:

V1 6C4
V2 6AM6
V3 5763
V4 6146



Top view of the chassis showing p.a. screening.

INCREASE YOUR KNOWLEDGE



RADIO TELEVISION ELECTRONIC ENGINEERING

MEMBER OF THE ASSOCIATION
OF BRITISH CORRESPONDENCE COLLEGES

CHOOSE THE RIGHT COURSE FROM
RADIO AND TELEVISION ENGINEERING,
INDUSTRIAL TELEVISION, RADIO AND
TELEVISION SERVICING, ELECTRONICS,
COMPUTERS AND PROGRAMMING,
ELECTRONIC TECHNICIANS, SERVOMECH-
ANISMS, TELEMETRY, CLOSED CIRCUIT TV,
INSTRUMENTATION, AND PRINCIPLES OF
AUTOMATION.

ALSO EXAMINATION COURSES FOR:

Inst. of Electronic and Radio Engineers
C. & G. Telecommunication Techns'. Cert.
C. & G. Supplementary Studies
R.T.E.B. Radio/TV Servicing Cert.
P.M.G. Certificates. Radio Amateurs' Exam.

LEARN AS YOU BUILD

Practical Radio Courses: Gain a sound knowledge of Radio as you build YOUR OWN 5-valve superhet Receiver and Transistor Portable, Signal Generator, Multitester and professional type valve voltmeter. At the end of the course you have valuable practical equipment and a fund of personal knowledge and skill. ICS Practical Radio and Electronic Courses open a new world to the keen amateur.

**YOUR
CAREER
IN**

ELECTRONIC ENGINEERING
RADIO AND TELEVISION
ENGINEERING
ELECTRICAL ENGINEERING

INTERNATIONAL CORRESPONDENCE SCHOOLS - LONDON

THERE IS AN **ICS** COURSE FOR YOU

Whether you need a basic grounding, tuition to complete your technical qualifications, or further specialized knowledge, ICS can help you with a course individually adapted to your requirements.

There is a place for you among the fully-trained men. They are the highly paid men—the men of the future. If you want to get to the top, or to succeed in your own business, put your technical training in our experienced hands.

ICS Courses are written in clear, simple and direct language, fully illustrated and specially edited to facilitate individual home study. You will learn in the comfort of your own home—at your own speed. The unique ICS teaching method embodies the teacher in the text; it combines expert practical experience with clearly explained theoretical training. Let ICS help you to develop your ambitions and ensure a successful future. Invest in your own capabilities.

FILL IN AND POST THIS COUPON TODAY

You will receive the **FREE ICS Prospectus** listing the examination, and ICS technical courses in radio television and electronics **PLUS** details of over 150 specialised subjects.

PLEASE SEND FREE BOOK ON.....

NAME

ADDRESS

OCCUPATION..... AGE.....

INTERNATIONAL CORRESPONDENCE SCHOOLS
Dept. 170, INTERTEXT HOUSE, PARKGATE ROAD, London, SW11

9/67

STARTLING NEWS ABOUT AERIALS!

"AS GOOD AS A 3 ELEMENT BEAM". So say the American "CQ" Magazine—the Radio Amateurs' Journal. The Aerial under review was the "JOYSTICK" Variable Frequency Antenna. But the JOYSTICK V.F.A. is NOT a beam. It receives signals equally well from ALL DIRECTIONS, so you do not have to rotate it as the 3 element beam must be rotated to point in the direction of the incoming signal. Add to this fact that it receives (and transmits where required) equally as well on ANY SPOT FREQUENCY on any amateur or broadcast band anywhere in the Short Wave and Medium Wave Spectrum and you must agree, as countless happy users agree—

THAT THE JOYSTICK V.F.A. IS TRULY AN AMAZING AERIAL!

YOUR "JOYSTICK" V.F.A. STOCKIST

BATH:	Ryland & Huntley, 15 Old Bond Street.
BIRMINGHAM:	Chas. H. Young Ltd., 170-172 Corporation Street.
BRIGHTON:	Technical Trading Co., Park Crescent Place.
BRISTOL:	R.S.C. Hi-Fi Ltd., 14 Lower Castle Street, Bristol 1.
CARDIFF:	Wesak Radio, 54 Daniel Street, Cathays.
CHELTENHAM:	S.P.A. Radio, 335-337 High Street.
COVENTRY:	Swanco Products Ltd., 247 Humber Avenue.
DARLINGTON:	R.S.C. Hi-Fi Centres Ltd., 13 Post House Wynd.
EDINBURGH:	R.S.C. Hi-Fi Centres Ltd., 133 Leith Street.
GLASGOW:	R.S.C. Hi-Fi Centres Ltd., 326 Argyle Street. R.S.C. Hi-Fi Centres Ltd., 403 Sauchiehall Street.
HARTLEPOOL:	The Radio Shop, 58 Park Road.
HARWICH:	C. H. Bernard & Sons Ltd., George Street.
HULL:	R.S.C. Hi-Fi Centres Ltd., 91 Paragon Street. Short Wave (Hull), 24a Newland Avenue.
LEICESTER:	S. May Ltd., 12-14 Church Gate.
LIVERPOOL:	Stephens-James Ltd., 70 Priory Road.
LONDON:	G. W. Smith & Co. Ltd., 3-34 Lisle Street, London, W.C.2. Lasky's Radio Ltd., 118 and 207 Edgware Road, London, W.2. Lasky's Radio Ltd., 33 and 42 Tottenham Court Road, London, W.1. Lasky's Radio Ltd., 152-153 Fleet Street, London, E.C.4. Alfred Imhof Ltd., 112-116 New Oxford Street, London, W.C.2. R. T. & I. Electronics Ltd., Ashville Old Hall, Ashville Road, London, E.11.
LUTON:	Coventry Radio Ltd., 189-191 Dunstable Road.
MANCHESTER:	R.S.C. Hi-Fi Centres Ltd., 60a Oldham Street.
MIDDLESBROUGH:	R.S.C. Hi-Fi Centres Ltd., 106 Newport Road.
NEWCASTLE UPON TYNE:	R.S.C. Hi-Fi Centres Ltd., 41 Blackett Street.
NEWPORT, MON:	K. F. Paull Ltd., 14 Dock Street.
PORTSMOUTH:	Technical Trading Co., 350-352 Fratton Road.
PURLEY:	G3HSC, 45 Green Lane, (Dem. by appt. phone 01 UPL 2896).
READING:	Lovering Bros., 76 Kings Road.
SHEFFIELD:	R.S.C. Hi-Fi Centres Ltd., 13 Exchange Street, Castle Market Buildings.
SOUTHAMPTON:	Technical Trading Co., 72 East Street.
WORCESTER:	Jack Porter Ltd., 30-31 College Street.
WORTHING:	G. W. M. Radio Ltd., 40-42 Portland Road. Technical Trading Co., Montague Street.

By the time this list appears in print it will be incomplete so
PLEASE ENQUIRE AT YOUR LOCAL DEALER
OR DIRECT TO

PARTRIDGE ELECTRONICS LTD.
(Dept. PW1)
Prospect Road, Broadstairs, Kent.

VALVES SAME DAY SERVICE NEW! TESTED! GUARANTEED!

SETS

1R5, 135, 1T4, 384, 3V4, DAF91, DF91, DK91, DL92, DL94.
Set of 4 for 16/8. DAF96, DF96, DK96, DL96, 4 for 24/8

1A7GT 7/6	10F1 9/8	DI81 12/6	EF183 6/6	FEN44 6/9	UCH42 8/9
1H8GT 7/8	10P13 8/6	DK32 7/9	EF184 6/3	PEN36C15/6	UCH81 6/6
1N8GT 7/9	12AT7 3/9	DE91 5/6	EL33 6/6	PFL20013/6	UCL82 7/9
1R5 5/6	12AU6 4/9	DK92 8/6	EL41 8/6	PL36 9/6	UCL83 8/9
184 4/9	12AU7 4/9	DK96 6/6	EL42 7/9	PL81 6/9	UF41 8/6
185 3/9	12AX7 4/9	DL33 6/9	EL84 4/9	PL82 6/6	UF80 7/6
1T4 2/9	12K8GT 7/9	DL35 5/6	EL90 5/6	PL83 6/6	UF99 8/9
3A5 7/6	20F1 10/6	DL92 4/9	EL95 5/6	PL84 6/3	UI41 8/9
3Q4 5/6	30L1 14/6	DL94 5/6	EM80 5/9	PL500 13/6	UI44 20/6
384 4/9	20P1 9/6	DL96 6/6	EM81 6/9	PX25 7/9	UL84 8/6
3V4 5/6	20P3 12/6	DY86 5/9	EM84 6/3	PY31 6/6	UY21 8/9
5U4G 4/9	20P4 13/6	DY87 5/9	EM87 6/6	PY32 8/6	UY41 5/6
5V4G 7/9	25U4GT11/6	EAB8C0 6/6	EY31 6/3	PY33 8/6	UY85 4/9
5Y3GT 5/6	30C15 10/6	EAF42 8/6	EY86 6/6	PY80 5/3	VP4B 11/6
5Z4G 7/9	30C17 11/6	EB91 2/3	EZ40 6/9	PY81 5/3	VP1321 21/6
6J30L2 9/9	30C18 10/3	EB93 2/3	EZ41 6/9	PY82 5/3	W77 3/8
6AL5 2/3	30F5 9/9	EB94 8/6	EZ80 4/6	PY83 5/9	Z77 3/6
6AM6 3/6	30PL1 10/9	EBF80 6/6	EZ81 4/6	PY88 7/3	Transistors
6AQ5 4/9	30PL14 11/3	EBF89 5/9	GZ32 9/6	PY800 6/6	AC107 10/6
6AT6 4/6	30PL15 11/6	ECC81 3/9	KT61 6/6	PY801 6/6	AC127 6/6
6BA6 4/6	30L17 12/6	ECC82 4/9	N18 5/6	R19 7/6	AD140 15/6
6BE6 4/3	30P4 11/6	ECC83 7/6	N78 14/9	R20 12/9	AF102 18/6
6BG6G 15/6	30P12 9/9	ECC84 6/6	PC26 9/6	PC28 9/6	AF118 9/6
6B76 6/9	30P13 11/6	ECC85 5/6	PC88 8/6	U26 9/6	AF116 6/6
6BW6 7/3	30PL1 12/9	ECC86 7/6	PC97 5/9	U47 9/6	AF117 5/6
6F1 7/9	30PL13 13/3	ECC87 6/9	PC900 8/6	U49 9/6	AF118 8/6
6F13 3/6	30PL14 13/9	ECC88 9/6	PC84 5/6	U52 4/6	AF124 7/6
6F14 9/6	35L8GT 6/3	ECH35 6/6	PC89 9/6	U78 3/6	AF125 7/6
6F23 9/9	35W4 4/6	ECH42 9/6	PC189 8/6	U101 10/6	AF126 7/6
6K7G 1/6	35Z4GT 4/6	ECH81 5/3	PCF80 6/6	U301 11/9	AF127 7/6
6K80 4/3	86A2 5/9	ECH84 5/9	PCF82 6/6	U801 16/3	OC22 9/9
6K8GT 7/6	6063 12/6	ECL80 6/6	PCF86 8/3	UAB8C0 5/9	OC25 9/6
6L18 6/6	AZ31 9/6	ECL82 6/6	PCF80010/6	UAF42 7/9	OC26 6/6
6V6G 3/6	B36 7/6	ECL86 7/6	PCF901 8/9	UB41 8/6	OC44 3/6
6V8GT 6/6	B729 10/6	EP39 3/9	PCF802 9/6	UBC41 6/9	OC45 3/6
6X4 3/6	DAC32 7/3	EP41 8/6	PCF805 9/9	UBF80 6/6	OC71 3/6
6X5GT 5/9	DAF91 3/9	EP80 4/9	PCF80611/3	UBF89 5/9	OC72 4/9
7B6 10/9	DAF96 8/6	EP85 5/6	PCF80811/3	UL21 9/6	OC75 5/9
7B7 7/6	DL290 7/6	EP86 6/6	PCL82 6/9	UC92 5/6	OC81 3/6
7C5 9/6	DF91 7/9	EP89 5/6	PCL83 8/6	UCC84 7/9	OC81D 3/6
7C6 6/9	DF91 2/9	EP91 3/6	PCL84 7/6	UCC85 6/6	OC82 3/6
7H7 5/6	DF96 6/6	EP92 3/3	PCL85 8/3	UCF80 8/3	OC82D 5/6
7Y4 6/6	DH77 4/6	EP97 7/6	PCL86 8/6	UCH21 9/3	OC170 5/6

READERS RADIO

85 TORQUAY GARDENS, REDBRIDGE, ILFORD, ESSEX. Tel. 01-550 7441

Postage on 1 valve 9d. extra. On 2 valves or more, postage 6d. per valve extra. Any Parcel Insured against Damage in Transit 6d. extra.

PUBLICATIONS FOR RADIO AMATEURS AND ENTHUSIASTS

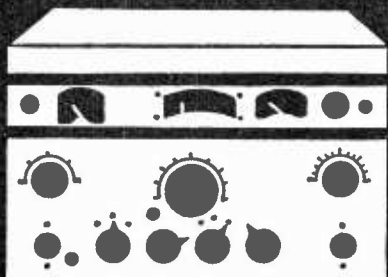
A Course in Radio Fundamentals	10/-
RSGB Amateur Radio Call Book	6/6
Understanding Amateur Radio	18/6
A Guide to Amateur Radio	5/9
Communications Receivers	3/-
Radio Amateurs' V.H.F. Manual	18/6
Antenna Handbook, Vol. 1	28/-
Test Equipment Handbook	4/6
Better Short Wave Reception	24/6
How to Listen to the World	26/-
Short Wave Listening	13/2
Dictionary of Radio and Television	38/-
Short Wave Receivers for the Beginner	6/6
Wireless World Radio Valve Data	10/6
Morse Code for Radio Amateurs	2/-
Beam Antenna Handbook	28/-
Mobile Manual for Radio Amateurs	23/6
Service Valve and Semiconductor Equivalents	5/6
Radio Amateurs' Handbook	44/-
Admiralty Great Circle Map	8/-

all prices include postage

We also keep a large selection of log books (see last month's advertisement).

Further details of other publications, information about membership, and a free sample copy of the RSGB Bulletin (the RSGB monthly journal), may be obtained by writing to:

RADIO SOCIETY OF GREAT BRITAIN, Dept. PW,
28 LITTLE RUSSELL STREET, LONDON, W.C.1



GUIDE TO SURPLUS COMMUNICATIONS RECEIVERS

K.ADKINS

PART 2

AR-8516L

This outstanding receiver, manufactured by R.C.A., is probably the last word in valve receivers. It was designed only a few years ago for marine communications, and a few of them have since become available on the amateur market. The receiver covers 80kc/s to 30Mc/s continuously, in 18 bands as follows:

1 80kc/s—200kc/s	10 12—14Mc/s
2 200kc/s—520kc/s	11 14—16Mc/s
3 520kc/s—1300kc/s	12 16—18Mc/s
4 1.09Mc/s—3.09Mc/s	13 18—20Mc/s
5 2—4Mc/s	14 20—22Mc/s
6 4—6Mc/s	15 22—24Mc/s
7 6—8Mc/s	16 24—26Mc/s
8 8—10Mc/s	17 26—28Mc/s
9 10—12Mc/s	18 28—30Mc/s

On bands 1 and 2, the receiver operates as a single superhet with an i.f. of 45kc/s. On bands 3, 4 and 5 operation is as a double superhet with i.f.'s of 455kc/s and 45kc/s. On bands 6 to 18 the receiver is a triple superhet with 2nd and 3rd i.f.'s of 455kc/s and 45kc/s respectively, and the first i.f. tunable from either 2.4Mc/s, or from 1.09-3.09Mc/s.

The valve line-up is as follows:

- 3BZ6 (Bands 6—18) R.F. Amplifier.
- 3CB6 (Bands 6—18) 1st Mixer to 2.4Mc/s or 1.09-3.09Mc/s.
- 3CB6 (Bands 6—18) Oscillator.
- 3BZ6 (Bands 6—18) I.F. Amplifier.
- or (Bands 1—5) R.F. Amplifier.
- 3CB6 (Bands 1—2) 1st Mixer to 45kc/s.
- or (Bands 3—5) 1st Mixer to 455kc/s.
- or (Bands 6—18) 2nd Mixer to 455kc/s.
- 7AU7 (Bands 1—3) V.F.O.
- 3CB6 (Bands 4—18) V.F.O.
- 3BZ6 455kc/s I.F. Amplifier.
- 3BZ6 455kc/s I.F. Amplifier.
- 3BZ6 455kc/s I.F. Amplifier.
- 3BE6 (Bands 3—5) 2nd Mixer to 45kc/s.
- or (Bands 6—18) 3rd Mixer to 45kc/s.
- 7AU7 Oscillator and crystal calibrator.
- 5U8 455kc/s B.F.O.
- 3AL5 455kc/s Detector and A.G.C.
- 5U8 45kc/s I.F. Amplifier.
- 7AU7 45kc/s B.F.O.
- 3AL5 45kc/s A.G.C.
- 1N34A 45kc/s crystal detector.
- 3AL5 Noise Limiter.
- 7AU7 A.F. Amplifier.
- 7AU7 Feedback Amplifier.
- 12CU5 A.F. Output.

Some of the valves serve more than one function.

Five positions of selectivity are available: 6kc/s, 3kc/s, 1.5kc/s, 0.8kc/s and 0.1kc/s. The 6kc/s and 3kc/s bandwidths are available only on the 455kc/s i.f. system. A mechanical filter is operative on bands 3—18. A noise limiter is included, and the a.g.c. has both fast and slow positions. An "S" meter is incorporated. C.W. receiver sensitivity for a 6dB signal plus noise-to-noise ratio is as follows:

Bands 1—2	3 microvolts
Bands 3—5	2 microvolts
Bands 6—18	1 microvolt.

Frequency drift due to changes in external environment or supply voltage is extremely low, and there is no long-term drift. The horizontal tuning scale has frequency markings at 50kc/s intervals, and a circular logging scale enables frequencies to be read to 1kc/s.

Output is arranged for high impedance phones, 3Ω speaker or 600Ω line. An output is also available at 455kc/s for FSK adaptors, etc. The receiver may be operated either from 115V a.c. or d.c., or from 230V a.c. The complete receiver weighs 91 lb, due mainly to the heavy gauge metalwork.

Modifications: It is unlikely that the performance could be improved.

Availability: As only a few of these receivers were ever released, a certain amount of difficulty may be encountered in obtaining one. Second-hand prices would probably run into three figures, although this is still a fraction of the original price. Manuals were available with the receivers.

BC453 BC454 BC455

These sets are popularly known as "Command Receivers", and were used in aircraft of the US Army. They are of totally shielded, all-aluminium, construction and are very light and compact. They were originally designed to operate from the 28 volt d.c. aircraft supply. The three receivers are identical except for their frequency coverage and i.f. frequencies, which are given below:

BC453	190-550kc/s.	I.F. 85kc/s.
BC454	3-6Mc/s.	I.F. 1415kc/s.
BC455	6-9.1Mc/s.	I.F. 2830kc/s.

Minor variations of these receivers are denoted by a suffix letter, e.g. BC453A.

These three receivers originate from a piece of equipment known as the SCR274. Another series, known as the ARC-5, contains an almost identical set of command receivers.

The command receiver has 6 valves, as follows:

Three 12SK7, one 12SR7, one 12A6, one 12K8. The circuitry includes one r.f. stage, two i.f. stages, mixer, detector, b.f.o. and audio. A 28 volt dynamotor power supply is incorporated. In its original form, the command receiver has output for 300 or 4,000Ω headphones. The circuitry does not usually incorporate a.g.c., but it is believed that a few command sets in the ARC-5 series do have this feature.

The size of the command receiver is 5in. x 8in. x 12in., and its weight is only about 6 lb.

Modifications. The command receiver has become very popular both in the USA and in this country, mainly because of its cheapness and small size. It is not normally used on its own as a communications receiver, but is used in conjunction with v.h.f. converters, or as a second i.f. channel for another communications receiver. It is admirably suited for both of these functions, after a certain amount of modification.

The first and obvious modification is to replace the 28 volt dynamotor with an a.c. power supply. It is possible to mount an a.c. power supply on the chassis in the position formerly occupied by the dynamotor, although reasonably small components must be used. The unit must supply 250V at 50mA. The valve heaters were originally wired for 25-2 volts, and must be rewired for operation from the more usual heater voltage supplies.

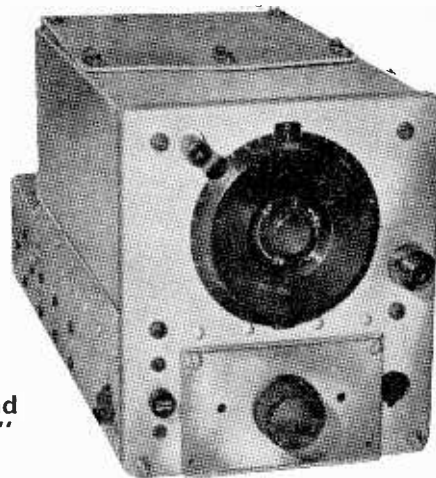
For loudspeaker operation, the output transformer must be changed, and it will probably be necessary to provide more audio power.

Few controls are provided and it will be necessary to modify the panel in order to allow for the mounting of the additional controls provided by the electrical modifications.

Other popular modifications include the addition of a noise limiter; and the replacement of the 12SK7 valves with 12SG7's in order to improve gain.

The BC453 version is normally employed as a second i.f. channel. It is set up to receive the i.f. signal from the main receiver, and then amplifies this signal at 85kc/s, at which frequency it is possible to obtain adequate selectivity for operation in the most crowded of bands.

The BC454 and BC455 versions are normally employed as single i.f. channels v.h.f. converters.



"Command Receiver"

Availability. Unlike the majority of the other receivers dealt with in this guide, the command receiver seems to come on to the surplus market in a steady trickle, rather than in batches. They are doubtless much more readily available in the United States. It is usually possible to hunt one down in the West End, as most retailers seem to hold a small supply of them at one time or another. The position is almost certain to become more difficult in the future.

Prices range up to a maximum of £4 or £5, depending on condition. The writer was lucky enough to obtain two of them, two or three years ago, for 2s. 6d. each! (In grade 3 condition, of course).

Command receivers can quite easily be obtained on the second-hand market, and here one has the advantage that the receiver has probably already been modified, although perhaps not to the purchaser's satisfaction.

Command receiver manuals are not widely available, and indeed are not generally considered necessary owing to the numerous modifications to this receiver published in the amateur radio press in the last ten years or so.

To be continued

TWO METRE TRANSMITTER

—continued from page 356

pass type, and sufficient voltage rating. When the p.a. is operated from a modulator, C11 should be rated at more than *twice* the h.t. voltage. A 1kV disc ceramic capacitor is ideal, but a mica capacitor can be used, and the value may be reduced to 1,000pF. The variable capacitors VC1, VC2 and VC3 can be modified somewhat, to use 7.5pF, 10pF, or similar components. Much larger values, such as 25pF or 50pF, are not suitable. The minimum capacity is too great, and adjustment too difficult. The capacity of some surplus miniature short wave tuning capacitors can easily be reduced by taking off plates. VC should be rated at twice the h.t. voltage or more, so needs double plate spacing.

Various combinations of inductance and capacity will reach the resonant frequency required in each stage. But with L3 in particular, output rises when

TC2 is at quite low capacity, so the coil may be compressed slightly if needed.

CW WORKING

Cathode keying of V4, suitable for lower frequencies, cannot be used. However, the screen grid supply to V3 can be keyed, and bias applied through L4 so that the input to V4 does not exceed 20 watts during key up intervals. In this case R9 should be reduced to 2.2kΩ, and the negative bias taken to positive on the 5mA meter. Bias from a small power pack delivering some 40V or so is most convenient, with a potentiometer to allow voltage adjustment. A check should then be made with no drive so that V4 d.c. input (voltage x current) is not over 20W for the anode and 3W for the screen grid.

During phone or c.w. working, the p.a. must be so coupled and loaded that the d.c. input does not exceed by more than 20W the r.f. output obtained. In the absence of bias from a power pack or battery, R9 must be 22kΩ.

BENTLEY ACUSTIC CORPORATION LTD.

Suppliers to H.M. Government

38 CHALCOT ROAD, LONDON, N.W.1

Telephone Primrose 9090

ALL GOODS LISTED BELOW, ACTUALLY IN STOCK. ALL GOODS ARE NEW. BEST QUALITY BRANDS ONLY, AND SUBJECT TO MAKERS' FULL GUARANTEE, PLEASE NOTE THAT WE DO NOT SELL ITEMS FROM USED EQUIPMENT NOR MANUFACTURERS' SECONDS & REJECTS, WHICH ARE OFTEN DESCRIBED AS "NEW AND TESTED" BUT HAVE A SHORT AND UNRELIABLE LIFE.

0A2	5/-	6CW4	12/-	10P13	12/-	50CD66	41/-	DK40	10/8	EF40	8/9	KT44	5/9	QQV03/10	U251	8/9	AF124	7/6	OA73	3/-	
0B2	6/9	6D3	7/6	10P14	13/-	50L6GT	6/-	DK91	4/9	EF41	9/9	KT61	12/-	30/-	U281	9/9	AF125	3/6	OA79	3/6	
0Z4	4/3	6D6	3/-	12A6	5/-	52KU	14/6	DK92	7/6	EF42	3/6	KT63	4/-	Q875/20	U282	12/8	AF126	7/-	OA81	2/-	
1A3	2/6	6E5	9/8	12A06	8/-	53AV	8/7	DK96	6/8	EF50	2/6	KT66	16/6	10/8	U301	12/8	AF127	3/6	OA85	3/-	
1A4	12/6	6F1	9/8	12A08	9/-	54	7/8	DL33	6/8	EF54	6/-	KT74	12/6	Q8150/15	U329	9/8	AF129	27/8	OA86	4/-	
1A5	3/6	6F6G	4/-	12A06	7/6	77	5/8	DL35	4/9	EF56	7/6	KT76	7/6	9/8	U403	6/8	AF178	13/6	OA90	3/6	
1A7GT	7/6	6F6GT/M	7/6	12A17	5/-	78	4/9	DL72	15/-	EF58	7/8	KT88	27/6	R10	5/6	U404	6/9	AF179	12/6	OA91	3/-
1C1	4/9	7/6	7/6	12A76	4/8	80	5/3	DL75	30/-	EF58	4/6	KTW61	4/3	R11	19/6	U801	18/-	AF180	18/6	OA95	2/-
1C2	7/6	6F7G	5/-	12A77	3/8	85A2	8/8	DL92	4/9	EF56	6/3	KTW62 12/6	R12	5/6	U4020	6/9	AF181	14/-	OA182	3/6	
1C3	6/6	6F8G	5/-	12A10 4/9	90AV	8/7	6/8	DL94	5/6	EF59	4/9	KTW63 4/-	R16	34/11	VMP4G	17/-	AF186	20/-	OA200	3/6	
1C5	4/9	6F12 3/8	12A17 4/8	90AV	8/7	6/8	6/8	DL96 6/8	EF51 3/8	KTZ41 6/-	R17 17/7	VM54B 12/6	R17	17/7	AF212 5/-	AF212	5/-	OA202	2/-		
1C6	10/6	6F13 3/8	12A16 5/6	90CG	3/4/-	12/6	6/8	DL810 10/6	EF52 2/6	LQ3 4/6	R18 9/8	VP2 3/6	R18	9/8	AF237 10/-	AF237	10/-	OA210	3/6		
1D5	6/-	6F14 15/-	12A17 4/8	90CV	33/6	6/8	6/8	DM70 6/-	EF97 8/-	LP2 9/6	R19 6/9	VP2B 9/6	R19	6/9	AF238 8/-	AF238	8/-	OA211 13/6	6/8		
1D6	9/6	6F15 10/6	12A17 9/9	90C1 18/-	DM71 9/9	EF98 9/-	6/8	DM71 9/9	EF98 9/-	R52 7/6	R52 7/6	VP4 14/6	R52	7/6	AF239 10/-	AF239	10/-	OA220 12/6	6/8		
1FD1	6/-	6F17 12/6	12B06 5/-	150B2 14/6	DW4/350	EF183 6/3	6/8	DW4/350	EF183 6/3	MHMD4	7/6	VP4A 14/6	R61/240A	7/6	AF240 28/-	AF240	28/-	OA220 10/6	6/8		
1FD9	3/3	6F18 7/6	12B06 5/3	150C2 5/-	8/8	EF184 5/3	6/8	8/8	EF184 5/3	MHLD6	6/8	VP4B 11/-	8/8	65/-	BA115 5/-	AF240 28/-	AF240	28/-	OA220 9/6	6/8	
1G6	6/-	6F23 8/6	12B17 7/6	161 15/-	DW4/500	EH90 7/6	6/8	161 15/-	EH90 7/6	ML6 6/-	8/8	VP13C 7/-	8/8	85/-	BA116 9/-	AF240 28/-	AF240	28/-	OA230 9/6	6/8	
1H5GT	7/6	6F24 10/-	12B1 17/6	185BT 35/-	8/8	EL32 3/-	3/-	185BT 35/-	EL32 3/-	MS4B 20/6	5/6	VP3 2/6	5/6	8130 24/6	BCY10 5/-	AF240 28/-	AF240	28/-	OA230 9/6	6/8	
1I4	2/6	6F32 3/-	12J5GT 2/6	301 20/-	DY86 8/6	EL33 12/-	6/8	301 20/-	DY86 8/6	MS4B 20/6	5/6	VP4 5/6	5/6	8130 24/6	BCY12 5/-	AF240 28/-	AF240	28/-	OA230 9/6	6/8	
1LD5	5/-	6G6G 2/6	12J7GT 6/8	302 16/8	DY87 5/6	EL34 9/6	6/8	302 16/8	DY87 5/6	MSR4 12/6	6/8	VR75 21/-	21/-	8130 24/6	BCY33 5/-	AF240 28/-	AF240	28/-	OA230 9/6	6/8	
1LN6	4/6	6H6GT 1/6	12K3 8/6	303 15/8	EB0F 24/-	EL35 10/6	6/8	303 15/8	EB0F 24/-	MX12/14 4/-	8/8	VR105 5/-	5/-	8130 24/6	BCY34 5/-	AF240 28/-	AF240	28/-	OA230 9/6	6/8	
1N5GT	7/6	6J5G 3/9	12K7GT 7/6	305 16/8	EC36 24/-	EL36 8/6	6/8	305 16/8	EC36 24/-	N37 23/3	8/8	VR150 5/-	5/-	8130 24/6	BCY35 5/-	AF240 28/-	AF240	28/-	OA230 9/6	6/8	
1P1	5/-	6J5GT 4/6	12K5GT 8/6	306 13/-	EC8CC 12/-	EL37 6/6	6/8	306 13/-	EC8CC 12/-	N78 28/3	8/8	VT61A 7/-	7/-	8130 24/6	BCY36 5/-	AF240 28/-	AF240	28/-	OA230 9/6	6/8	
1P10	4/6	6J8 3/-	12Q7GT 7/6	807 11/9	E180F 17/6	EL41 8/-	8/6	807 11/9	E180F 17/6	N108 26/7	8/8	VT501 3/-	3/-	8130 24/6	BC107 10/-	AF240 28/-	AF240	28/-	OC16W 35/-	6/8	
1P11	5/6	6J7G 4/9	12S4GT 7/6	956 2/-	E1148 1/9	EL42 7/6	6/8	956 2/-	E1148 1/9	N359 25/-	8/8	VU11 6/-	6/-	8130 24/6	BFY50 5/-	AF240 28/-	AF240	28/-	OC22 5/-	6/8	
1R5	4/9	6J7GT 8/6	12S4GT 7/6	1821 10/6	EA50 1/6	EL41 8/-	8/6	1821 10/6	EA50 1/6	P41 3/6	8/8	VU120 12/-	12/-	8130 24/6	BFY51 5/-	AF240 28/-	AF240	28/-	OC23 7/-	6/8	
1S4	4/9	6K5GT 5/-	12S4GT 7/6	5763 10/6	EA76 13/-	EL43 6/9	6/8	5763 10/6	EA76 13/-	P61 2/6	8/8	VT30C 14/6	14/6	8130 24/6	BFY52 5/-	AF240 28/-	AF240	28/-	OC25 7/-	6/8	
1S5	3/8	6K7G 1/8	12S4GT 7/6	7475 2/6	EABCB 6/9	EL44 4/6	6/8	7475 2/6	EABCB 6/9	PABCB 20/6	8/8	VT33 9/9	9/9	8130 24/6	BFY53 5/-	AF240 28/-	AF240	28/-	OC26 7/-	6/8	
1T2	34/11	6K7GT 4/6	12S4GT 7/6	1A834 20/-	EAC91 3/3	EL45 7/6	6/8	1A834 20/-	EAC91 3/3	PC86 8/6	8/8	VP25 5/-	5/-	8130 24/6	BFY54 5/-	AF240 28/-	AF240	28/-	OC28 5/-	6/8	
1T4	2/6	6K8G 3/-	12S4GT 7/6	AC044 14/-	EAF42 7/6	EL46 8/6	6/8	AC044 14/-	EAF42 7/6	PC88 8/6	8/8	VP26 20/6	20/6	8130 24/6	BFY55 5/-	AF240 28/-	AF240	28/-	OC29 16/6	6/8	
1U4	5/6	6K8GT 7/6	12S4GT 7/6	AC2PEN 19/6	EB41 4/9	EL47 8/6	6/8	AC2PEN 19/6	EB41 4/9	PC88 8/6	8/8	VP27 20/6	20/6	8130 24/6	BFY56 5/-	AF240 28/-	AF240	28/-	OC30 8/6	6/8	
1U5	5/6	6K26 24/-	12S4GT 7/6	AC2PEN 19/6	EB41 4/9	EL48 8/6	6/8	AC2PEN 19/6	EB41 4/9	PC89 8/6	8/8	VP28 20/6	20/6	8130 24/6	BFY57 5/-	AF240 28/-	AF240	28/-	OC31 10/6	6/8	
2D13C	7/6	6L1 10/-	12Y4 2/6	5/-	AC2PEN 19/6	EL49 8/6	6/8	5/-	AC2PEN 19/6	PC97 6/9	6/9	VP29 20/6	20/6	8130 24/6	BFY58 5/-	AF240 28/-	AF240	28/-	OC32 10/6	6/8	
2D21	5/6	6L6GT 7/6	13D1 5/-	5/-	DD 19/6	EL50 8/6	6/8	5/-	DD 19/6	PC90 8/6	8/6	VP30 20/6	20/6	8130 24/6	BFY59 5/-	AF240 28/-	AF240	28/-	OC33 10/6	6/8	
2X2	3/-	6L7GT/M	13D3 9/6	9/6	AC2PEN 19/6	EL51 8/6	6/8	9/6	AC2PEN 19/6	PC90 8/6	8/6	VP31 20/6	20/6	8130 24/6	BFY60 5/-	AF240 28/-	AF240	28/-	OC34 10/6	6/8	
3A4	3/6	6L8 5/6	14H7 9/6	9/6	AC2PEN 19/6	EL52 8/6	6/8	9/6	AC2PEN 19/6	PC94 8/6	8/6	VP32 20/6	20/6	8130 24/6	BFY61 5/-	AF240 28/-	AF240	28/-	OC35 10/6	6/8	
3A5	5/6	6L18 19/6	14H7 9/6	14/8	AC2PEN 19/6	EL53 8/6	6/8	14/8	AC2PEN 19/6	PC98 10/6	10/6	VP33 20/6	20/6	8130 24/6	BFY62 5/-	AF240 28/-	AF240	28/-	OC36 10/6	6/8	
3B7	5/-	6L19 19/6	14H7 9/6	18 12/6	AC2PEN 19/6	EL54 8/6	6/8	18 12/6	AC2PEN 19/6	PC98 8/6	8/6	VP34 20/6	20/6	8130 24/6	BFY63 5/-	AF240 28/-	AF240	28/-	OC37 10/6	6/8	
3D6	3/6	6L20 10/6	14H7 9/6	19 10/6	AC2PEN 19/6	EL55 8/6	6/8	19 10/6	AC2PEN 19/6	PC98 8/6	8/6	VP35 20/6	20/6	8130 24/6	BFY64 5/-	AF240 28/-	AF240	28/-	OC38 10/6	6/8	
3Q4	5/6	6N7GT 7/-	14H7 9/6	19 10/6	AC2PEN 19/6	EL56 8/6	6/8	19 10/6	AC2PEN 19/6	PC98 8/6	8/6	VP36 20/6	20/6	8130 24/6	BFY65 5/-	AF240 28/-	AF240	28/-	OC39 10/6	6/8	
3Q5GT	6/6	6P1 12/-	14H7 9/6	19 10/6	AC2PEN 19/6	EL57 8/6	6/8	19 10/6	AC2PEN 19/6	PC98 8/6	8/6	VP37 20/6	20/6	8130 24/6	BFY66 5/-	AF240 28/-	AF240	28/-	OC40 10/6	6/8	
3S4	4/9	6P25 12/-	20D1 10/-	20/5	AC2PEN 19/6	EL58 8/6	6/8	20/5	AC2PEN 19/6	PC98 8/6	8/6	VP38 20/6	20/6	8130 24/6	BFY67 5/-	AF240 28/-	AF240	28/-	OC41 10/6	6/8	
3V4	5/6	6P26 12/-	20D1 10/-	20/5	AC2PEN 19/6	EL59 8/6	6/8	20/5	AC2PEN 19/6	PC98 8/6	8/6	VP39 20/6	20/6	8130 24/6	BFY68 5/-	AF240 28/-	AF240	28/-	OC42 10/6	6/8	
4D1	3/9	6P28 25/-	20D1 10/-	20/5	AC2PEN 19/6	EL60 8/6	6/8	20/5	AC2PEN 19/6	PC98 8/6	8/6	VP40 20/6	20/6	8130 24/6	BFY69 5/-	AF240 28/-	AF240	28/-	OC43 10/6	6/8	
5R4GY	8/9	6Q7G 8/9	20P2 11/6	11/6	AC2PEN 19/6	EL61 8/6	6/8	11/6	AC2PEN 19/6	PC98 8/6	8/6	VP41 20/6	20/6	8130 24/6	BFY70 5/-	AF240 28/-	AF240	28/-	OC44 10/6	6/8	
5U4G	4/9	6Q7GT 8/9	20P2 11/6	11/6	AC2PEN 19/6	EL62 8/6	6/8	11/6	AC2PEN 19/6	PC98 8/6	8/6	VP42 20/6	20/6	8130 24/6	BFY71 5/-	AF240 28/-	AF240	28/-	OC45 10/6	6/8	
5V4G	8/9	6R7G 5/6	20P2 11/6	11/6	AC2PEN 19/6	EL63 8/6	6/8	11/6	AC2PEN 19/6	PC98 8/6	8/6	VP43 20/6	20/6	8130 24/6	BFY72 5/-	AF240 28/-	AF240	28/-	OC46 10/6	6/8	
5Y3GT	5/-	6R7GT 11/-	20P2 11/6	11/6	AC2PEN 19/6	EL64 8/6	6/8	11/6	AC2PEN 19/6	PC98 8/6	8/6	VP44 20/6	20/6	8130 24/6	BFY73 5/-	AF240 28/-	AF240	28/-	OC47 10/6	6/8	
5Z3	2/6	6R8GT 7/6	20P2 11/6	11/6	AC2PEN 19/6	EL65 8/6	6/8	11/6	AC2PEN 19/6	PC98 8/6	8/6	VP45 20/6	20/6	8130 24/6	BFY74 5/-	AF240 28/-	AF240	28/-	OC48 10/6	6/8	
6Z4G	7/6	6S4G 7/6	20P2 11/6	11/6	AC2PEN 19/6	EL66 8/6	6/8	11/6	AC2PEN 19/6	PC98 8/6	8/6	VP46 20/6	20/6	8130 24/6	BFY75 5/-	AF240 28/-	AF240	28/-	OC49 10/6	6/8	
6/3012	9/6	6S6GT 7/9	25A6G 7/6	16/6	AC2PEN 19/6	EL67 8/6	6/8	16/6	AC2PEN 19/6	PC98 8/6	8/6										

YOUR CAREER in RADIO & ELECTRONICS ?

Big opportunities and big money await the qualified man in every field of Electronics today—both in the U.K. and throughout the world. We offer the finest home study training for all subjects in radio, television, etc., especially for the CITY & GUILDS EXAMS (Technicians' Certificates); the Grad. Brit. I.E.R. Exam.; the RADIO AMATEUR'S LICENCE; P.M.G. Certificates; the R.T.E.B. Servicing Certificates; etc. Also courses in Television; Transistors; Radar; Computers; Servo-mechanisms; Mathematics and Practical Transistor Radio course with equipment. We have OVER 20 YEARS' experience in teaching radio subjects and an unbroken record of exam. successes. We are the only privately run British home study College specialising in electronic subjects only. Fullest details will be gladly sent without any obligation.

To: British National Radio School, Reading, Berks.

Please send FREE BROCHURE to:

NAME.....Block

ADDRESS.....Caps.

.....Please

9/67

BRITISH NATIONAL RADIO SCHOOL

PRE-PAK SEMICONDUCTORS

DAVIS & WHITWORTH LTD.

BY 222-224 WEST ROAD, WESTCLIFF-ON-SEA, ESSEX
PHONE: SOUTHELD (0502) 46344

FANTASTIC ! ★ OF THE YEAR ★

OC45	IF transistor	1/9
OC44	Qsc. transistor	1/11
OA9	Equal to OA5	2/-
OC36	Power transistor (better than OC35)	7/6

GENUINE TRANSISTORS NOT REMARKS

No.	DESCRIPTION	PRICE
A1.	6—Silicon rectifiers BY100 type	20/-
A2.	10—Relays mixed types and voltages	20/-
A3.	20—Mixed unmarked and tested trans.	20/-
A9.	1—2N 174 real power trans. 80V 150W	20/-
A15.	2—Power trans. Pair. 2N161 3	20/-
B1.	50—Unmarked, untested, trans., new	10/-
B2.	4—Solar cells, inc. Book of Instructions	10/-
B3.	4—OA5 gold bonded, diodes Mullard	10/-
B5.	7—Matched set, OC44, 45/811/81+diode	10/-
B6.	15—Red spot AF trans. or white spot RF	10/-
B8.	2—Power trans. OC28/35 type	10/-
B9.	1—Light sensitive cell, ORP12 type	9/-
B10.	10—50V trans. germ. P.N.P. latest type	10/-
B44.	1—Tunnel diode, AEY11, 1050 Mc/s	10/-
B21.	2—Sil. recs. 10 amp., 50-100V	10/-
B52.	30—Trans. new tested, but unmarked	10/-
B42.	5—Switching trans. TK22/STC	10/-
C2.	1—Uni junction, 2N2160 or 2N2646	15/-
C4.	2—RF power trans., OC22 and BY11	15/-
D18.	1—ORP60 type light sensitive cell	5/-

★ ALL OUR SEMICONDUCTORS HAVE A WRITTEN GUARANTEE ★

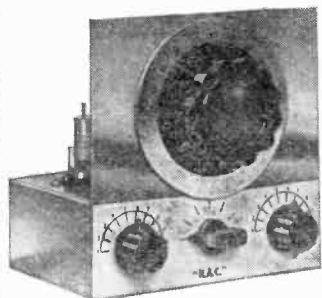
Send for our FREE lists and catalogue of all our products. Check your own equivalents with our free substitution chart.

FIRST EVER LOGIC KITS. Learn for yourself how computers work, even make one for yourself. Full instructions for a thoughts and crosses machine, binary counters, timers, etc. L1 5 km. L2 10 km. No need to purchase both kits, you can start with L2, which incorporates L1. DETAILS FREE.

NO CONNECTION WITH ANY OTHER FIRM. MINIMUM ORDER 10/- CASH WITH ORDER PLEASE. Add 1/- post and packing. OVERSEAS ADD EXTRA FOR AIRMAIL.

H.A.C. SHORT-WAVE KITS

NEW RELEASE: MODEL "DX"



Famous for over 30 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.

IMPROVED 1967 RANGE

One-valve model "DX", complete kit—price 56/6 (Postage and packing 3/6).

Customers say: "Definitely the best one-valve S.W. Kit available at any price." This kit contains all genuine short-wave components, drilled chassis, valve, accessories and full instructions. Ready to assemble, and of course, as all our products—fully guaranteed. Full range of other S.W. kits still available, including the famous model "K" (recommended by radio clubs). All orders despatched by return. (Mail order only.) Send now for a descriptive catalogue, order form, etc., to:—

"H.A.C." SHORT-WAVE PRODUCTS
29 Old Bond Street, London W.1

NEW RANGE U.H.F. AERIALS FOR BBC 2 (625) line transmissions

All U.H.F. aerials now fitted with tilting bracket and 4 element grid reflectors.
Loft Mounting Arrays, 7 element, 35/-; 11 element, 42/6; 14 element, 50/-; 18 element, 57/6. Wall Mounting with Cranked Arm, 7 element, 80/-; 11 element, 87/-; 14 element, 75/-; 18 element, 82/6. Mast Mounting with 2in. clamp, 7 element, 42/6; 11 element, 55/-; 14 element, 62/-; 18 element, 70/-; Chimney Mounting Arrays, Complete, 7 element, 72/6; 11 element, 80/-; 14 element, 87/6; 18 element, 95/-; Complete assembly instructions with every unit.
Low Loss Cable, 1/6 yd. U.H.F. Preamps. from 75/-; State clearly channel number required on all orders.

BBC · ITV · F.M. AERIALS



BBC (Band 1). Telescopic loft, 21/-; External S/D, 30/-; "H" £210.0.

ITV (Band 3). 3 element loft array, 25/-; 5 element, 35/-; Wall mounting, 3 element, 35/-; 5 element, 45/-.

Combined BBC/ITV. Loft 1+3, 41/3; 1+5, 48/9; Wall mounting 1+3, 56/3; 1+5, 63/9; Chimney 1+3, 63/9; 1+5, 71/3.

VHF transistor pre-amps, 75/-.

F.M. (Band 2). Loft S/D, 12/6; "H", 30/-; 3 element, 52/6. External units available. Co-ax cable, 8d. yd. Co-ax plugs, 1/3. Outlet boxes, 4/6. Diplexer Crossover Boxes, 12/6. C.W.O. or C.O.D. P. & P. 5/-; Send 8d. stamps for illustrated lists.

Quotations for special arrays available on request

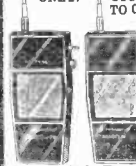
K.V.A. ELECTRONICS (Dept. P.W.)
27 Central Parade, New Addington
Surrey CRO OJB
LODGE HILL 2266

NO SOLDERING AMAZING CIGARETTE RADIO 25/-

Total Building Price

Yes a perfectly ordinary packet of cigarettes! Fetches in station after station loud and clear! Holds 10 cigarettes yet conceals sensitive, fully transistorised circuit (including battery). Even a young boy can assemble it in under 2 hours. No soldering, 16 connections to make. ALL PARTS including Semi-Conductors, ABC Plans, etc. ONLY 25/- plus 2/6 post. etc. Parts available separately.

500 ONLY.



FRUSTRATED IMPORTSHIPMENT. OFFERED BELOW HALF PRICE TO CLEAR. ALL TRANSISTOR

PERSONAL
TRANSCIVER SETS
OUR PRICE £6.19.6

You've heard about them—You've read about them. NOW YOU CAN OWN THEM. Highly sensitive two-way transistor transceiver sets have individual volume control and talk/listen switch. Telescopic aerial pulls in the other set over tremendous distances—no wires—a genuine transceiver as used by official bodies and forces. Only £6.19.6 plus 5/6 p. & p. (Batteries, leather cases, etc. 10/6 extra). Money back guarantee. These cannot be operated in U.K.

3500 Bought at "Rock Bottom" off Leading British Maker
REAL EPISCOP
PROJECTOR

No more to pay! Projects Full Size Magnified Picture on to your wall or screen in Black & White or Colour with Crystal Clarity any Photograph, Document, picture, drawing, stamp, etc. (Hundreds of uses in home, office, schoolroom, etc. A Full Size Real Glass Reflex Lens. Sturdy, reliable. So simple even a child can use it—standard mains. ONLY 45/- plus 5/- p. & p. Satisfaction or money back.

Only 45/-

CONCORD ELECTRONICS LTD. (P.W. 40)
77 New Bond Street, W1. (Mail orders only)



No. 17 *CRAY VALLEY* *RADIO SOCIETY*

**G
3
R
C
V**

THE Cray Valley Radio Society was founded in 1946 to provide a focal point for Radio Amateurs and Short Wave Listeners living in the vicinity of Cray Valley, a district covering Eltham, Sidcup, Bromley, Orpington and the Crays. Membership now consists of over 40 licensed operators and nearly 20 Short Wave Listeners drawn from a wide variety of trades, professions and students.

Early licences

The Society is proud to include among its members, four operators, G2HP, G2MI (who is President and a member of the RSGB Council), G2WI and G2ZI, all licensed in the earliest days of Amateur Radio.

There is no doubt that QUA, the Society's newsletter, does a great deal to keep members in touch. This is published regularly

each month, the present editor being G3DNC. Contributions from members are always welcome and usually make up a satisfactory proportion of the contents, varying from technical articles to miniature masterpieces of doggerel.

Meetings

The Society meets twice monthly. On the first Thursday in the month at the Congregational Church Hall, Court Road, Eltham, London S.E.9 the meeting is usually devoted to a technical lecture or feature. The second meeting, held a fortnight later at All Saints Church Hall, Bereta Road, New Eltham, London S.E.9 is usually a "natter-nite" because past experience has shown that members seldom have enough opportunity at the principal meeting to say all that they want to in the limited time avail-

able for conversation. It is hoped to alter the meeting night for this event in due course so that those members who find Thursdays inconvenient will at least be able to attend some of the meetings.

Until a few years ago there was little or no interest in contest operating but in the last three years, the Society has participated in both h.f. and v.h.f. contests with varying degrees of success. In an attempt to co-ordinate the efforts of individual members, G3VLT has taken on the job of Liaison Officer and hopes to produce improved results.

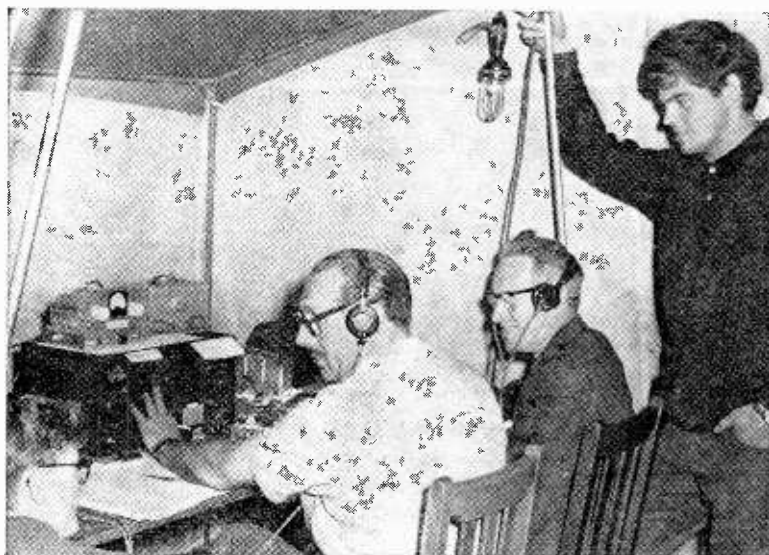
Balance of activities

One problem which must be common to many Societies is that of getting a reasonable balance of activities. This particular aspect has recently engaged the attention of the Cray Valley management committee to the extent of sending a questionnaire to all members and it is hoped that the future programmes based on suggestions received will be to their liking.

Society net

The Society runs a net on Top Band on Fridays at 21.00 hours and there is also a rival, though none the less popular, net on four metres at 20.00 hours on Tuesdays. The Top Band net has proved a valuable source of publicity for attracting new members who, by this means, often first learn of the club's existence.

Activity weekends are held at intervals, mainly with the object of giving other amateurs an opportunity of qualifying for the Cray Valley Award. Particulars of this are obtainable by sending a stamped addressed envelope to G3MCA.



Members at the 1966 NFD. From the left they are: Chris, G3VLT; Alan, G3ANK; Bill, G2AQB; and Dave, G3RGS.

No permanent QTH

One big handicap that has not yet been overcome is the lack of a permanent headquarters where gear can be installed and aerials erected. The Society looks forward to the day when this object can be achieved.

WVC award

The Society award a certificate to any licensed amateur who can give proof of two-way communi-

cation, any mode, any band. To gain the number of points pertaining to his locality, e.g., G stations require 15 points, European stations require 10 points and DX stations require 5 points.

One point is given for contacting each Society member and three points for contacting the Society Station, G3RCV. Net QSO's are void. Log extract, certified by two other licensed amateurs, or QSL's and 5 I.R.C. (or 2s. 6d.) to G3MCA.

To gain the required points, G3RCV need not be QSO'd. GM, GD, GC, GI and GW stations count as European.

The present committee includes G3JJC (Chairman) G3VLX (Secretary) and G3TCC (Treasurer). Anyone interested in joining will be welcome at any meeting; alternatively they can contact the secretary at 850-6945, evenings or weekends, or write to G3VLX, 234 Halfway Street, Sidcup, Kent.

LETTERS...

A book reviewed

The notice of Donald Smith's *ABC's of Electronic Test Equipment* by "HWH" in the June number conveys so little of interest that one wonders why the work was noticed at all; the space might well have been given to better use. What does "HWH" expect for 16/- — a tome covering the entire field of test instrumentation in such detail that low-grade technicians can make their own in their garden sheds, from parts bought at "junk shops"? Has "HWH" spent a whole day at, say, the recent RECMF show at Olympia. Has he examined the shelves of books on electronics in his local public library? Above all, has he himself written any books on electronics, and is he really familiar with the problems of publishers to-day? If "yes" to all queries, I am surprised and annoyed by his notice of this unimportant but harmless enough book, which may be best left for technicians to discover for themselves without his hostile remarks. For my part, I want information about more important practical books.—W. H. Cazaly.

[We, too, would love to see more useful books, but can only review those sent. To ignore those that dissatisfy makes a mockery of the task reviewers set themselves.

ABC's of Electronic Test Equipment falls awkwardly between two stools. It would have been more interesting (though even less useful) if it merely listed the available test gear seen at the recent RECMF Exhibition. It would have been more useful if it had continued as it began and developed its theme of basic design. But to omit so much fundamental

information that even we "low-grade technicians" could not use it to work in our garden sheds certainly merited some adverse comment.

There are indeed many books on the public library shelves—this reviewer has written a few himself, Mr. C., and is aware of the blood and sweat they entail. The few that deal with test instruments are either very expensive or narrowly specialised. I feel sure the Editor would be delighted to give space to a review of any work that deserved the attention of his faithful band of practical readers]—H.W.H.

Infinite baffle mods

I note with interest G. R. Fletcher's article "Idea for an Infinite Baffle" published in the April edition of P.W.

Whilst commending the scheme from the technical (and domestic) point of view, I should like to suggest certain slight modifications: (1) the chimney can resonate like a closed organ pipe. Although the fundamental will almost certainly be too low in pitch to be noticeable (18c.p.s. for a 30-foot chimney), the even harmonics emitted could produce devastating coloration.

(2) Front-to-back standing waves, reflected by hard materials such as firebrick, could present problems.

(3) The presence of a large lintel close to the rear face of the speaker cone causes "tunnel effect"—i.e. more coloration.

These effects can be remedied in the following ways:

(1) The chimney should be blocked above the speaker to make a rigid airtight seal. The height of the chamber so formed is not

critical, but should not be made a multiple of either major horizontal dimension. Mr. G. A. Briggs recommends ratios of—1 : 1.25 : 1.6 or 1 : 1.6 : 2.5—to minimise coloration.

The roof of the chamber should ideally be brick or concrete, but wood at least $\frac{1}{2}$ in. or preferably 1 in. thick could be substituted. Wood faced on the upper side with heavy unglazed ceramic tiles would be a good compromise.

(2) The whole cabinet should be lined on the inside with absorbent: a good thick layer of fluffy soot would help considerably.

(3) Bricks close to the speaker should be bevelled away:

The author's precaution of pushing newspaper wads up the chimney has probably saved him from the worst effects of column resonance—the pads will form an acoustic filter.

In conclusion—Good luck, Mr. Fletcher—an excellent idea.—W. S. Lymath, Engineer, Rank Wharfedale Ltd. (Bradford, Yorkshire).

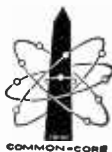
Veteran valve identity

I wonder if you or your Correspondent P. J. Plater, of Wallington, Surrey (June '66) can help me with the valve line up of a veteran Burndy 285.

As he says the valve identity marks do get lost, and this veteran was doing nicely, when it spluttered and stopped. I found that the ancient electrolytic was leaking and had evidently eaten through a lead to earth, but I cannot decide which of two tags it belongs to, till I know the identity of the output valve.—W. M. Mackenzie (Gosport, Hampshire).

NOW ADDED TO

The COMMON CORE Series



THE 'NUMBERS GAME'

Play it with **TRAINER-TESTER** Response Sheet No. E3 and the eleven
ADJUNCTIVE PROGRAMMING SUPPLEMENTS TO

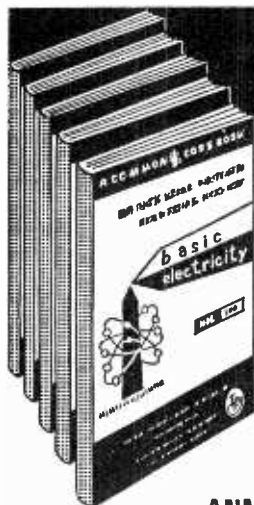
**basic electricity and
basic electronics**

Full details and prices will be sent on application to

THE TECHNICAL PRESS LTD

112 WESTBOURNE GROVE, LONDON, W.2

Incidentally **BASIC TELEVISION** part 1 is now ready (*see below*)



YOURS FREE FOR 7 DAYS

The New 'Picture - Book' way of learning

BASIC

**ELECTRICITY (5 Vols)
ELECTRONICS (6 Vols)
ELECTRONIC CIRCUITS (2 Vols)
INDUSTRIAL ELECTRICITY (2 Vols)
SYNCHROS & SERVOMECHANISMS (2 Vols)**

You'll find it easy to learn with this outstandingly successful new pictorial method—the essential facts are explained in the simplest language, one at a time; and each is illustrated by an accurate cartoon-type drawing.

The books are based on the latest research into simplified learning techniques. This has proved that the Pictorial Approach to learning is the quickest and soundest way of gaining mastery over these subjects.

**SPECIAL
ANNOUNCEMENT**

—NOW READY—
BASIC TELEVISION Pt. 1.

Price 22/- inc. postage.

Complete in two parts, publication date of Pt. 2 to be announced later. Available on 7 days free trial, see coupon.

POST NOW FOR THIS OFFER!

TO SELRAY BOOK CO.

60 HAYES HILL, HAYES, BROMLEY, KENT

Please send me Without Obligation to Purchase, one of the above sets on 7 Days Free Trial. I will either return set, carriage paid, in good condition within 7 days or send the following amounts. Basic Electricity 70/-. Cash Price or Down Payment of 15/- followed by 4 fortnightly payments of 15/- each. Basic Electronics 82/-. Cash Price or Down Payment of 15/- followed by 5 fortnightly payments of 15/- each. This offer applies to UNITED KINGDOM ONLY. Overseas customers cash with order.

Tick set required (*only ONE set allowed on free trial*).

BASIC ELECTRICITY 70/-	☐	BASIC ELECTRONICS 82/-	☐
BASIC ELECTRONIC CIRCUITS 40/-	☐		
BASIC INDUSTRIAL ELECTRICITY 40/-	☐		
BASIC SYNCHROS & SERVOMECHANISMS 38/-	☐		
BASIC TELEVISION PART 1 22/-	☐		

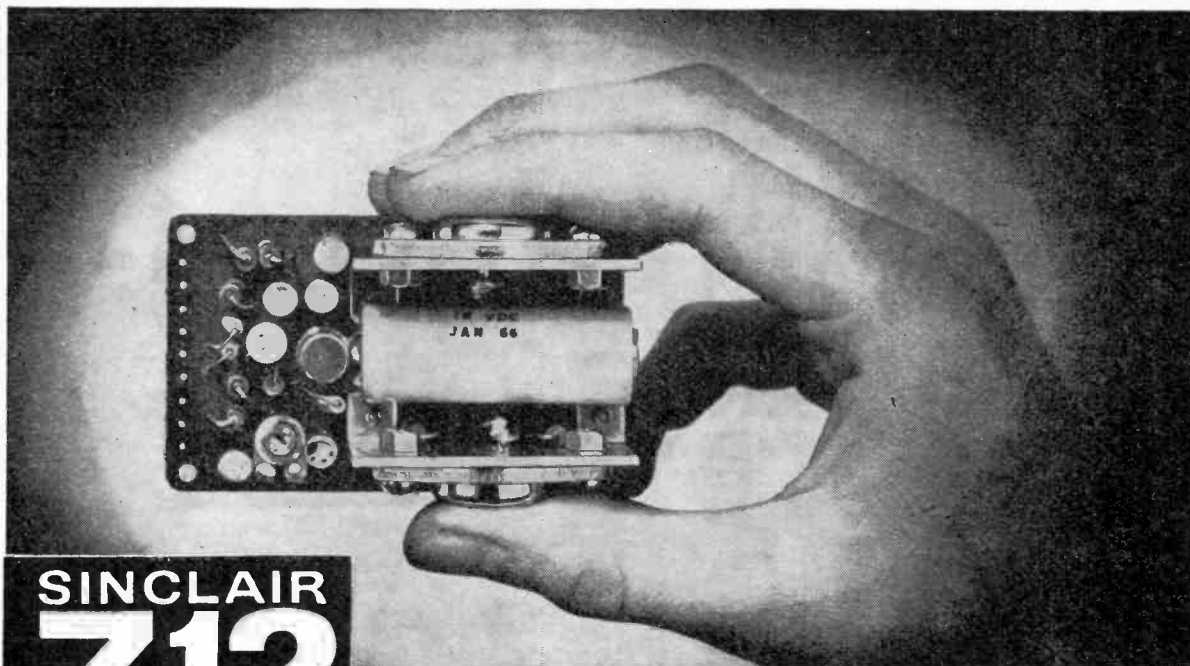
All prices
include
postage

Signature
(If under 21, signature of parent or guardian)

NAME

FULL POSTAL
ADDRESS

BLOCK LETTERS BELOW



SINCLAIR Z.12

COMBINED 12 WATT HI-FI AMP AND PRE-AMP

- ULTRALINEAR CLASS B OUTPUT
- 12 WATTS RMS CONTINUOUS SINE WAVE OUTPUT (24 W. Peak)
- 15 WATTS MUSIC POWER OUTPUT (30 W. Peak)
- INPUT—2mV into 2Kohms
- OUTPUT suitable for 15, 7.5 and 3 ohm speakers. Two 3 ohm speakers may be used in parallel

Eight special H.F. transistors are used in the Z.12 to achieve results to compare favourably in every way with the costliest equipment you can buy. But the Z.12 is smaller, is more versatile and certainly saves you money. It is preferred not only for mono and stereo hi-fi, but it also enjoys enormous popularity fitted in electric guitars, used for P.A. and intercoms and many other instances where power and dependability are imperative. This superb amplifier with integrated pre-amp is supplied ready-built, tested and guaranteed together with the Z.12 manual which details matching, volume and tone control and selector switching circuits using one Z.12 in mono or two in stereo.

- 3" x 1 $\frac{3}{4}$ " x 1 $\frac{1}{4}$ "
- 15-50,000 c/s ± 1 dB
- IDEAL FOR USE WITH BATTERIES

BUILT, TESTED AND GUARANTEED **89/6**

SINCLAIR MICRO FM

7 TRANSISTOR COMBINED FM TUNER AND RECEIVER



NEEDS NO ALIGNING

Less than 3in. x 1 $\frac{1}{2}$ in. x $\frac{1}{2}$ in. F.M. Superhet using pulse counting discriminator for superb audio quality. Low I.F. makes alignment unnecessary. Tunes 88-108 Mc/s. The telescopic aerial suffices for good reception in all but poorest areas. Signal to noise ratio —30dB at 30 microvolts. Takes standard 9v. battery. One outlet serves for feeding to amplifier or recorder, the other allows set to be used as a pocket portable. Brushed and polished aluminium front, spun aluminium dial. A fascinating set to build which gives excellent reception by any standards. Complete kit Inc. aerial, case, earpiece and Instructions.

£5.19.6



SINCLAIR STEREO

25

PRE-AMP AND CONTROL UNIT

For use with two Z.12's or any good hi-fi stereo system. The front panel is elegantly styled in solid brushed and polished aluminium with well styled solid aluminium knobs. Frequency response 25 c/s to 30 kc/s ± 1 dB connected to two Z.12's. Sensitivity Mic. 2mV into 50k Ω : P.U.—3mV into 50k Ω : Radio —20mV into 4.7 Ω . Equalisation correct to within ± 1 dB on RIAA curve from 50 to 20,000 c/s. Size 6 $\frac{1}{2}$ in. x 2 $\frac{1}{2}$ in. x 2 $\frac{1}{2}$ in. plus knobs.

BUILT, TESTED AND GUARANTEED

£9.19.6

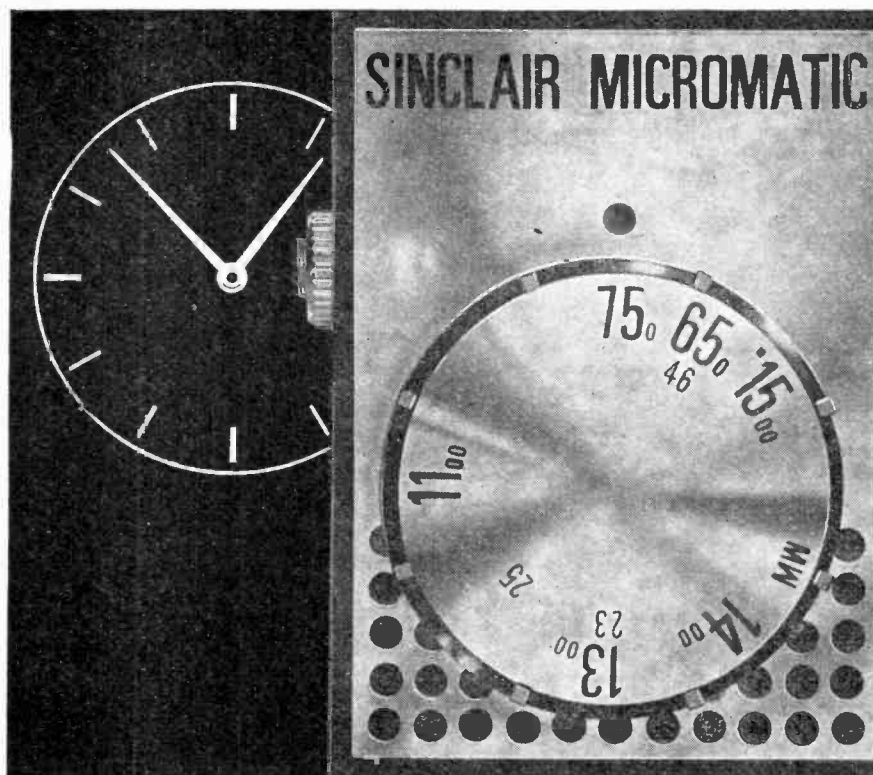
SINCLAIR PZ.3 Transistorised mains power supply unit with ample output for two Z.12's and Stereo 25 together.

79/6

SINCLAIR

SINCLAIR RADIONICS LTD., 22 Newmarket Rd., CAMBRIDGE

Telephone OCA3-52996



ALL ROUND THE DIAL...

*all
round
the
clock*

with the world's smallest radio



Actual Size

- CALIBRATED SLOW-MOTION DIAL
- BANDSPREAD AND A.G.C.
- TUNERS OVER M.W.
- FANTASTIC POWER, SELECTIVITY AND QUALITY
- GUARANTEED 5 YRS.

Guarantee

Should you not be completely satisfied with your purchase when you receive it from us, your money will be refunded in full at once and without question. **FULL SERVICE FACILITIES AVAILABLE TO ALL PURCHASERS.**

To the fantastically small size of the Sinclair Micromatic must be added its brilliant performance. This British made set assures you at all times of choice of B.B.C. and many other stations in the medium waveband. After dusk, even more stations come in all around the dial with amazing power and excellent quality. Vernier type tuning takes full advantage of the set's selectivity. This remarkable set provides good listening no matter where you are—indoors, in car, bus, train—everywhere. The Sinclair Micromatic brings a refreshingly new approach to personal listening and for its size, appearance, price and performance, there is nothing to equal it anywhere in the world.

TECHNICAL DESCRIPTION OF THE SINCLAIR MICROMATIC
6-stage receiver having two R.F. stages, a double diode detector and a powerful three stage A.F. amplifier, the output from which feeds into a specially matched high quality lightweight earpiece. The MICROMATIC has its own built-in ferrite rod aerial and uses vernier type tuning over the medium wave band. A.G.C. counteracts fading from distant stations. The beautifully styled case, size $1\frac{1}{8} \times 1\frac{3}{10} \times \frac{1}{2}$ in., is faced with an artist designed aluminium front panel of outstanding elegance, with aluminium tuning dial to match. Available as kit in "see-for-yourself" fitted pack, with earpiece, instructions and solder, or built and ready for use.

If you prefer not to cut this page, please quote PW9 when writing your order.

Kit as described

59/6

Built, tested and guaranteed with ear piece and batteries.

79/6

SINCLAIR RADIONICS LTD., 22 NEWMARKET ROAD, CAMBRIDGE

Please send

.....
.....
.....

for which I enclose cash/cheque/money
order value £.....s.....d.

NAME

ADDRESS

.....
.....
.....

PW.9

WEYRAD

COILS & TRANSFORMERS FOR CONSTRUCTORS

Special versions of our P50 Series are now available for AF117 or OC45 Transistors. They can be used in the standard superhet circuit with slight changes in component values, details of which are given in the latest edition of the Constructors' Booklet priced at 2/-.

Oscillator Coil	P50/1AC (For OC45)	P50/1AC (For AF117).....	5/4
1st I.F. Transformer	P50/2CC (For OC45)	P51/1 (For AF117).....	5/7
2nd I.F. Transformer	P50/2CC (For OC45)	P51/2 (For AF117).....	5/7
3rd I.F. Transformer	P50/3CC (For OC45)	P50/3V (For AF117).....	6/-
Rod Aerial	RA2W.....		12/6
Driver Transformer	LFDT4/1		9/6
Output Transformer.....	OPT1		10/6
Printed Circuit.....	PCA1		9/6

I.F. TRANSFORMERS & COILS FOR VALVE CIRCUITS

Production of Tuning Coils (Type "H") and I.F. Transformers is being continued and details of these and our other components are given in an illustrated folder which will be forwarded on request with 4d. postage please.

WEYRAD (ELECTRONICS) LIMITED

SCHOOL STREET, WEYMOUTH, DORSET

AERIAL WIRE: Coils of 25 yds. Single Strand 2/3 + 6d. P. & P.

RELAYS:

1. Miniature Plug-in Relays. 185 Coil 4-5/18v. 2 Change over Contacts 12/8 + 1/6 P. & P.
2. Miniature Plug-in Relays. 130 Coil 4, Light Duty Contacts. 9/15 volts, 18/9 + 1/6 P. & P.
3. Heavy duty Car Alarm Relay 6/12 volts. 3 c/o Contacts. 27/8 + 1/6 P. & P.
4. 6 volt octal base A/C Relays. 2 pairs heavy duty Contacts c/o. Complete with octal base. 23/- + 1/6 P. & P.
5. Single change over Relay. 875 Coil. 18 volts for printed circuit. 15/- + 1/6 P. & P.
6. Bases for Item 1 and 2. 3/9 + 6d. P. & P.

State whether wired or printed circuit.

TEST METER: Still available at reduced price of £3.19.6. 20 K per volt ITI-2, and 200 H. TAYLOR Jun. and Minor.

Small robust Test Meter suitable for Field Service. 38/6 + 2/- P. & P.

LOUDSPEAKERS: 8 2" to 5" from 7/8 to 13/6 + 1/6 P. & P.

Dual Cone Richard Allen, 3 and 15 s 29/6 + 3/- P. & P.

Car Speakers 7" x 4" 13/6 + 2/- P. & P. 8" and 10" Richard Allen.

TEST LEADS: Pairs of Strong Test Leads 4/6 per pr.

TRANSFORMERS: 250-0-250 sec. 60 M/A/6-3 volts. 15/9 + 3/6 P. & P.

250-0-250 sec. 100 M/A/6-3 volts. 39/6 + 3/6 P. & P.

TRANSFORMERS SUITABLE FOR SMALL POWER SUPPLIES: 5/11/17 volts at 4 amps. 27/6 + 3/6 P. & P.

3 to 30 volts tapped 2 amps. 30/- + 3/6 P. & P.

9-9-15 volts. 14 amps. 16/6 + 3/- P. & P. 75 watt auto transformers. 10/6 + 2/6 P. & P.

OUTPUT TRANSFORMERS: Suitable for DL96 Midget. 6/6 + 2/6 P. & P. Suitable for EL45/UL84 Singles. 6/6 + 2/6 P. & P. Midget Choke Output. 6/6 + 2/6 P. & P.

CARBON CONTROLS: 5 K to 2 M Lin. or Log. 3/6. 5 K to 2 M Lin. or Log. with s/W. 5/3 + 1/- P. & P.

WEYRAD RANGE of IFs, Coils, Driver & outputtrs.

EAR PIECES: 2-5 m/m or 3-5 m/m Magnetic 2/6. Crystal 2-5 m/m/3-5 m/m. 5/6.

SINGLAIR PRODUCTS: All units and Mat. Trans.

TRANSISTORS: POPULAR RANGE. OC44, OC45, OC71, OC72, OC81, OC82, all at 2/6.

POWER TRANSISTORS: OC26, 10/9, OC28 15/3, OC36, 13/6, ADT149, 15/-.

OSMOR RANGE of IFs, Coils, Driver & output trans.

Write or call for our free Components List.

BOTHWELL ELECTRIC SUPPLIES (Glasgow) LTD.
54 EGLINTON STREET,
GLASGOW, C.S. Tel. 041 SOUTH 2904.
Member of the Lander Group.

AMATEUR RADIO

G3NAP SPECIALISTS G3PQQ

STOCKISTS

Full range Lafayette Receivers, Partridge "Joystick" antennas and tuners. Eagle products. Electronics manual and products. R.S.G.B. publications. Sommerkamp transmitters and receivers. Tokai transceivers (Amateur's licence required), Kw transmitters, receivers, etc. Contactor switchgear mobile equipment. Swan transceivers (Amateur's licence required), etc., etc. SAE Lists.

SWANCO PRODUCTS LTD.

247 HUMBER AVENUE
COVENTRY

Open all day Sat. Tel: COV. 22714

Please mention

"Practical Wireless"

when replying to

Advertisements

4-STATION INTERCOM



£6/9/6

Solve your communication problems with this 4-Station Transistor Intercom system (1 Master and 3 Subs), in de-luxe plastic cabinets for desk or wall mounting. Call/Talk/Listen from Master to Subs and Subs to Master. Ideally suitable for Business, Surgery, Schools, Hospital, Office and Home. Operates on one 9V battery. On/Off switch. Volume control. Complete with 3 connecting wires each 66ft. and other accessories. P. & P. 6/6.

7-STATION INTERCOM

18 gns.

1 Master and 6 Subs in strong metal cabinets. Fully transistorised. 3 1/2" speakers. Call/Talk/Listen. Ideal for Office, Hotel, Hospital and Factory. Complete with 50 yds. cable and batteries. P. & P. 12/6.

INTERCOM/BABY ALARM



Originally 8 gns. Now only 57/6

Same as 4-Station Intercom for two-way instant communication. Ideal as Baby Alarm and Door Phone. Complete with 66ft. connecting wire. Battery 2/6. P. & P. 3/6.



55/-

Why not boost business efficiency with this incredible De-luxe Telephone Amplifier. Take down long telephone messages or converse without holding the handset. A useful office aid. On/Off switch. Volume Control. Battery 2/6 extra. P. & P. 2/6. Full price refunded if not satisfied in 7 days.

WEST LONDON DIRECT SUPPLIES (FW/9)
160 KENSINGTON HIGH STREET, LONDON W.8

Practical Wireless Classified Advertisements

The pre-paid rate for classified advertisements is 1/6d. per word (minimum order 18/-), box number 1/6d. extra. Semi-displayed setting £4. 12s. 6d. per single column inch. All cheques, postal orders, etc., to be made payable to PRACTICAL WIRELESS and crossed "Lloyds Bank Ltd." Treasury notes should always be sent *registered post*. Advertisements, together with remittance, should be sent to the Advertisement Manager, PRACTICAL WIRELESS, George Newnes Ltd., 15/17 Long Acre, London, WC2, for insertion in the next available issue.

METAL WORK

METAL WORK: All types cabinets, chassis racks, etc., to your specifications. PHILPOTTS METAL WORKS LTD., Chapman Street, Loughborough.

SERVICE SHEETS

SERVICE SHEETS. RADIO, TV, 5,000 Models. List 1/6. S.A.E. Enquiries. TELRAY, Mauding Bk., Preston.

SERVICE SHEETS (75,000) 4/- each: please add loose 4d. stamp: callers welcome: always open. THOMAS BOWER, 5 South Street, Oakenshaw, Bradford.

SERVICE SHEETS for all makes, Radio, TV, Tape Recorders, 1925-1967. Prices from 1/-, Catalogue 6,000 models 2/6d. Free fault-finding guide with all Sheets. Please send stamped addressed envelope with all orders/enquiries. HAMILTON RADIO, Western Road, St. Leonards, Sussex.

RADIO TELEVISION over 3,000 models. JOHN GILBERT TELEVISION, 1b Shepherds Bush Rd., London W.6. SHE 8441.

SERVICE SHEETS

4/- each, plus postage

We have the largest display of Service Sheets for all makes and types of Radios and Televisions, etc., in the country. Speedy service.

To obtain the Service Sheet you require please complete the attached coupon

Name:

Address:

To: S.P. DISTRIBUTORS

35/36 Great Marlborough Street,
London, W.1

Please supply Service Sheets for the following

Make:

Model No. Radio/TV

Make:

Model No. Radio/TV

Make:

Model No. Radio/TV

I require the new 1967 List of Service Sheets at 1/6 each plus postage.

(please delete items not applicable)

I enclose remittance of.
(which includes postage)

MAIL ORDERS ONLY (Sept.) PW

EDUCATIONAL

RADIO OFFICER training courses. Write: Principal, Newport and Monmouthshire College of Technology, Newport, Mon.

BECOME 'Technically qualified' in your spare time, guaranteed diploma and exam. home-study courses in radio, T.V. servicing and maintenance. T.T.E.B., City and Guilds, etc: highly informative 120-page Guide—free. CHAMBERS COLLEGE (Dept. 857K), 148 Holborn, London, E.C.1.

TRAIN TODAY FOR TOMORROW

Start training TODAY for one of the many first-class posts open to technically qualified men in the Radio and Electronics industry. ICS provide specialized training courses in all branches of Radio, Television and Electronics—one of these courses will help YOU to get a higher paid job. Why not fill in the coupon below and find out how?

Courses include:

- RADIO/TV ENG. & SERVICING
- AUDIO FREQUENCY
- CLOSED CIRCUIT TV
- ELECTRONICS—many new courses
- ELECTRONIC MAINTENANCE
- INSTRUMENTATION AND SERVOMECHANISMS
- COMPUTERS
- PRACTICAL RADIO (with kits)
- NEW PROGRAMMED COURSE ON ELECTRONIC FUNDAMENTALS

Guaranteed Coaching for:

- Inst. Electronic & Radio Engs.
- C. & G. Telecom. Techns' Certs.
- C. & G. Supplementary Studies
- R.T.E.B. Radio/T.V. Servicing Cert.
- Radio Amateurs' Examination
- P.M.G. Certs. in Radiotelegraphy

Start today—The ICS Way

INTERNATIONAL CORRESPONDENCE SCHOOLS

Dept. 173, Parkgate Rd., London, S.W.11.

Please send FREE book on

Name

Address

9.67

EDUCATIONAL

(continued)

CITY & GUILDS (electrical, etc.) on 'Satisfaction or Refund of Fee' terms. Thousands of passes. For details of modern courses in all branches of electrical engineering, electronics, radio, T.V., automation, etc., send for 132 page Handbook—FREE. B.I.E.T. (Dept. 168K) Aldermaston Court, Aldermaston, Berks.

RADIO OFFICERS see the world! Sea-going and shore appointments. Trainee vacancies during 1967. Grants available. Day and Boarding students. Stamp for prospectus. Wireless College, Colwyn Bay.

QUALIFY as a technician, to service COMPUTERS, COLOUR TELEVISION, AUTOMATIC CONTROL SYSTEMS.

Day or evening courses, include extensive practical work using modern equipment.

Also special course (2 days per week) enabling beginners to reach City and Guilds Intermediate level in six months. Full details from:—

Section 47/48,
Southall College of Technology,
Beaconsfield Road,
SOUTHALL, Middx.

TRANSISTOR COURSE: Professionally qualified tutors; free guidance. Material, components and illustrated instructions supplied. Also Basic Transistor Circuits Kit and Meter Kit. Write for FREE Booklet to Dept. WA, ELECTRONIC EXPERIMENTS, Brinklow, Rugby.

SITUATIONS VACANT

TV and Radio, City & Guilds, R.T.E.B., Certs., etc. on 'Satisfaction or Refund of Fee' terms. Thousands of passes. For full details of exams and home training Courses (including practical equipment) in all branches of Radio, TV, Electronics, etc. write for 132-page handbook—FREE. Please state subject. BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY, (Dept. 137K), Aldermaston Court, Aldermaston, Berks.

RADIO & TV Exam. and Courses by Britain's finest Home-study School. Coaching for Brit.I.R.E., City & Guilds Amateur's Licence, R.T.E.B., P.M.G. Cert., etc. FREE brochure from BRITISH NATIONAL RADIO SCHOOL, Russel Street, Reading.

ALDERMASTON COURT POSTAL TRAINING for B.Sc. (Eng) Part 1, A.M.I.E.R.E., A.M.S.E., City & Guilds, G.C.E., etc. prepares you privately for high pay and security as Technician or Technologist. Thousands of passes. For details of Exams & Courses in all branches of Engineering, Building, Electronics, etc. (including latest information on C.Eng.), write for 132-page handbook—FREE. Please state interest. BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY, (Dept. 169K), Aldermaston Court, Aldermaston, Berks.

SITUATIONS VACANT (continued)

RADIO TECHNICIANS

A number of suitably qualified candidates are required for permanent and pensionable employment (mostly in Cheltenham, but from time to time there are some vacancies in other parts of the UK, including London). There are also opportunities for service abroad.

Applicants must be 19 or over and be familiar with the use of Test Gear, and have had practical Radio/Electronic workshop experience. Preference will be given to candidates who can offer "O" level GCE passes in English Language, Maths and/or Physics, or hold the City and Guilds Telecommunications Technician Intermediate Certificate or equivalent technical qualifications.

Pay according to age, e.g. at 19—£812, at 25—£1,046 (highest age pay on entry) rising on 1.1.68 to; at 19—£828, at 25—£1,076.

Prospects of promotion to grades in salary range £1,159—£1,941. There are a few posts carrying higher salaries.

Annual Leave allowance of 3 weeks 3 days rising to 4 weeks 2 days. Normal Civil Service sick leave regulations apply.

Application forms available from:

Recruitment Officer (RT),
Government Communications
Headquarters
Oakley, Priors Road
CHELTENHAM, Glos.

BOOKS & PUBLICATIONS

AUDIO, America's foremost journal. Year's subscription £4.75, specimen copy 4/- All American radio journals supplied—list free, WILEN (Dept. 40), 61a Broadway, London, E.15.

SURPLUS HANDBOOKS

19 set Circuit and Notes ..	4/6 p/p 6d.
1155 set Circuit and Notes ..	4/6 p/p 6d.
H.R.O. Technical Instructions ..	3/6 p/p 6d.
38 set Technical Instructions ..	3/6 p/p 6d.
46 set Working Instructions ..	3/6 p/p 6d.
88 set Technical Instructions ..	5/- p/p 6d.
BC.221 Circuit and Notes ..	3/6 p/p 6d.
Wavemeter Class D Tech. Instr. ..	3/6 p/p 6d.
18 set Circuit and Notes ..	3/6 p/p 6d.
BC.1000 (31 set) Circuit and Notes ..	3/6 p/p 6d.
CR.100/B.28 Circuit and Notes ..	8/6 p/p 9d.
R.107 Circuit and Notes ..	5/- p/p 6d.
AR.88D Instruction Manual ..	15/- p/p 1/6
62 set Circuit and Notes ..	4/6 p/p 6d.
Circuit Diagram 3/- each post free, R.1116/A, R.1224/A, R.1355, R.F. 24, 25 and 26, A.1134, T.1154, CR.300, BC.312, BC.342, BC.348J, BC.348 (E.M.P.), BC.624, 22 set.	
52 set Sender and Receiver circuits 6/- post free	

Resistor colour code indicator, 1/6 p/p 6d.

S.A.E. with all enquiries please.
Postage rates apply to U.K. only.

Mail order only to:

INSTRUCTIONAL HANDBOOK SUPPLIES

DEPT. PW, TALBOT HOUSE,
28 TALBOT GARDENS, LEEDS 8

WANTED

WE BUY New Valves and Transistors. State price. A.D.A. MANUFACTURING CO., 116 Alfreton Road, Nottingham.

WANTED (continued)

WE BUY New Valves, Transistors and clean new components, large or small quantities, all details, quotation by return. WALTON'S WIRELESS STORES, 55 Worcester Street, Wolverhampton.

WANTED: Popular Brand New Valves. R.H.S. Stamford House, 538 Great Horton Road, Bradford 7.

DAMAGED AVO METERS wanted. Models 7 and 8. Any condition. Any quantity. Send for packing instructions. HUGGETTS LTD. 2-4 Pawson's Road, West Croydon.

WANTED NEW VALVES ONLY

Must be new and boxed
Payment by return

WILLIAM CARVIS LTD
103 North Street, Leeds 7

VALVES WANTED, brand new popular types boxed. DURHAM SUPPLIES (C), 175 Durham Road, Bradford 8, Yorkshire.

PRACTICAL WIRELESS Back copies required July, Aug., 1961; May, June, July, 1963; Oct., Nov., 1964; Feb., 1966. All letters answered. B. W. Hughes, 11 Henley Road, Ludlow, Shropshire.

FOR SALE

COMPUTER TRIAL 14

Now try it yourself!

Two-thousand DIGI-COMPS have been sold in the U.K., that means countless hours of fun and instruction, and programmed learning. This digital computer not only calculates, solves problems and plays games: it is accompanied by two large manuals which explain binary system, boolean algebra, elementary logic and computer principles to both the beginner and the more advanced.

DIGI-COMP is an education in itself—and now you can put it on 14-days' trial. That's how long you get to make up your mind! Simply send a cheque/P.O. for £3 10s. 6d. (includes both manuals); then experiment with Digicom for 14 days and if you are not satisfied we will refund payment in full.

Or, if you want more details write now for our trial-offer leaflet—

1-COR SYSTEMS (File PW5)
18 Stamford Hill, London N.16

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.

For details and course C.O.D. ring, s.d. 01-960 2896 or send 8d. stamp for explanatory booklet to:

68CHS/P. 45 GREEN LANE, PURLEY, SURREY

YUKAN SO PROFESSIONAL THE YUKAN SELF-SPRAY

Get these AIR DRYING GREY HAMMER OF BLACK WRINKLE (CRACKLE) finishes

Yukan Aerosol spraykit contains 16 oz. fine quality durable easy instant spray. No stove baking required. Hammers available in grey, blue, gold, bronze. Modern Eggshell Black Wrinkle (Crackle) all at 14/11 at our counter or 15/11 carriage paid, per push-button self-spray can. Also Durable, heat and water resistant Black Matte finish (12 oz. self-spray cans only) 13/11 carriage paid.

SPECIAL OFFER: 1 can plus optional transferable snap-on trigger handle (value 5/-) for 18/11, carriage paid. Choose at 3 self-spray atom colours and primer (Motor car quality) also available.

Please enclose cheque or P.O. for total amount to:

YUKAN, Dept.,
307a EDGWARE ROAD,
LONDON, W.2.
Open all day Saturday, Closed Thursday afternoons

Other Yukan Air Drying Aerosols include:
Zinc Chromate Primer
Clear Lacquer
Anti-Tarnish Gold
and Metallic Finishes

Dept. PW/9

FOR SALE (continued)

HAMMERITE HAMMER PATTERN BRUSH PAINT FOR PANELS, METALWORK

TRIAL TIN (covers 6 sq. ft.) 3/6d. + 9d. post.

● AIR DRYING ● JUST BRUSH ON ● WITHSTANDS 150°C. OIL, WATER, ETC.

2 1/2 oz. tin 3/6 Very special prices for larger sizes, fireproof thinners, tinters, transfers, list free.

1 pint 16/-

Carriage: Orders up to 5/-, 8d.; up to 10/-, 1/9; over 10/-, 3/-. Colours: blue, silver, black or bronze. Return of post service, Monday to Friday.

FINNIGAN SPECIALITY PAINTS (FW)
Mickley Square, Stocksfield, Northumberland.
Tel. Stocksfield 2280.

COMPONENTS AT GIVE-AWAY PRICES: 92 Assorted resistors, condensers, valve holders, diodes, electrolytics, droppers, coils, pre-sets and plugs etc., etc., all brand new stock 10/- lot. DIAMOND (MAIL ORDER) PRODUCTS, 204a FROGHALL LANE, HULL, EAST YORKSHIRE.

MINIFLUX 4-Track stereophonic/monophonic record/playback heads. List Price 6 gns.—Special Offer 55/- each. MINIFLUX 4-Track stereophonic/monophonic Ferrite Erase Heads. List Price £3.10.0.—Special Offer 32/6 each, or supplied together (one of each) at £3.17.6. SKN4 1-track stereophonic record/play heads for Transistor Circuits at 55/- each. Also available 1-track and full-track monophonic Ferrite Erase Heads. All heads complete with technical specifications. Send S.A.E. for details. LEE ELECTRONICS, 400 Edgware Rd., Paddington 5521.

TRANSISTORS SPECIAL OFFER

1 watt S.T.C. 300 mc/s N.P.N. Silicon Planar Transistors, limited stocks £1 for 6.

WITH DATA

3/- each. OC44, OC45, OC70, OC71, OC81, OC81D, OC200, GET16, GET20.

4/- each. AF114, AF115, AF116, AF117, OC170, OC171.

5/- each. OC139, OC140, GET7, GET8, GET9, XC141, BY100, OA211.

BSY27 7/6 each, OC20 10/- each

ZENER DIODES

All volts between 3.9v. and 26v.
1/2w 3/6 each, 1.5w 5/- each,
7w 6/- each.

Send 6d. for full lists:—
inc., S.C.R., Zeners.

CURSONS 78 BROAD STREET CANTERBURY, KENT

RECEIVERS & COMPONENTS

TRANSMITTING VALVES, 813 or 4B13. also 811-G.B., 3 Guildford Close, West Worthing, Sussex. Worthing 6151.

(continued on next page)

RECEIVERS & COMPONENTS (continued)

BARGAINS! BARGAINS!

Ex Government Equipment

HRO'S, AR88's, 19 Sets and equipment, 31 Sets, 844's, 88, 38 and 18 Sets and miscellaneous Surplus Equipment.

List 1/-

S.A.E. all enquiries

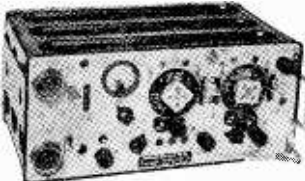
A. J. THOMPSON (Dept. P.W.)

Eiling Lodge, Codicote, Hitchin, Herts.

Tel.: Codicote 242

JOHN'S RADIO (Dept. B) OLD COPP, WHITEHALL ROAD, DRIFHLINGTON, BRADFORD

FAMOUS ARMY SHORT-WAVE TRANSRECEIVER MK. III



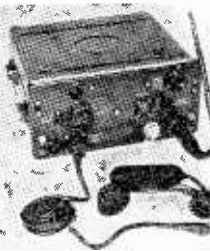
This set is made up of 3 separate units: (1) a two valve amplifier using a 6V6 output valve; (2) (some only, not built in the very latest models) a V.H.F. transreceiver covering 229-241 Mc/s using 4 valves; (3) the main short wave transmitter/receiver covering in two switched bands, just below 2 Mc/s-4 Mc/s, and 4 Mc/s-8 Mc/s (approx. 160-37.5 metres) using 9 valves. For R.T., C.W. and M.C.W. The receiver is superheterodyne having 1 R.F. stage, frequency changer, two I.F. (465 Kc/s) signal detector, A.V.C. and output stage. A B.F.O. included for C.W. or single side-band reception. T.X. output valve 807, other valves octal bases. Many extras, e.g. netting switch, quick flick dial settings, squelch etc. Power requirements LT 12 volts, HT receiver 275 volts D.C. HT transmitter 500 volts D.C., size approx. 17 1/2 x 7 1/2 x 11 1/2. Every set supplied in new or as new condition in carton with book including circuits, only £4.10.0d., or Grade 2 slightly used 50/- carriage both 15/-.

A FULL KIT of brand new attachments for this set including all connectors, control box, headphones and mike, aerial tuning unit, co-axial lead etc. at only 45/- carriage 5/-.

WE MAKE A MAINS 200/250 VOLT POWER UNIT in louvered metal case to plug direct into set power socket to run (1) receiver, 70/- post 5/- (2) TX and RX, £8.10.0 post 7/6d. (3) 12 Volt DC P.U. for receiver, 50/- carriage 5/-.

A charge of 10/- to unpack and test the receiver of these sets is made only if requested.

V.H.F. TRANSRECEIVER MK. I/1



This is a modern self contained tunable V.H.F. low powered frequency modulated transreceiver for R.T. communication up to 8-10 miles. Made for the Ministry of Supply at an extremely high cost by well known British makers, using 15 midget B.G. 7 valves, receiver incorporating R.F. amplifier, Double superhet and A.F.C. Slow motion tuning with the dial calibrated in 41 channels each 200 Kc/s apart. The frequency covered is 39 mc/s-40 mc/s. Also has built-in Crystal calibrator which gives pipe to coincide with marks on the tuning dial. Power required L.T. 4 1/2 volts, H.T. 160 volts, tapped at 90 volts for receiver. Every set supplied complete with valves and crystals. New in carton, complete with adjustable whip aerial, and circuit. Price £4.10.0 carriage 10/-. Headset or hand telephone 50/-.

Internal power unit stabilised for 200/250 volts A.C. input £6.10.0 extra.

RECEIVERS & COMPONENTS (continued)

TRANSISTORS, UNMARKED, UNTESTED, 40 for 10/-, p. and p. 1/-, 4 packets post free. Relays, thousands of types, special catalogue free. General catalogue of Mechanical and Electrical Gear, Tools, etc. (5,000 items), free. K. R. WHISTON (Dept. PRW), New Mills, Stockport.

PADED MOVING COIL HEADPHONES AND MIKE

NEW CONDITION HIGH QUALITY
HIGH IMPEDANCE

Bargain 13/-, Post Paid

S.A.E. for Lists of other Bargains

SALOP ELECTRONICS

9a GREYFRIARS ROAD, COLEHAM

SHREWSBURY, SHROPSHIRE

R & R RADIO

51 Burnley Road, Rawtenstall

Rossendale, Lancs.

Tel: Rossendale 3152

Salvage	Valves	Good	Emission	Guaranteed
EF80	1/6	30P4	7/-	30FL1 5/-
ECC82	3/6	EB91	1/-	PL82 4/6
ECL80	3/6	EF85	5/-	PL36 5/-
30F5	5/-	PCL84	5/-	PCC84 4/-
PCF80	4/-	EY86	4/-	PY81 3/6
PL81	5/-	U301	6/-	PY33 6/-

Speakers, Ex T.V. 5 inch rdn. 3/6. 6 x 4 3/8. Min. post 2/6.

BY100 and equiv. rect. with 10 watt res. 5/6.

Fireball tuners, less cover can 9/-.

Ekco line O/P Trans, U25 type 35/-, post paid.

Push Button tuners, using 30L15 and 30C15 valves, rectangular buttons 27/6, post paid.

Postage on valves 6d, over three, post paid.

S.A.E. with all enquiries.

150 NEW ASSORTED Capacitors, Resistors, Silvered Mica, Ceramic, etc. Carbon, Hystab, Vitreous, 1-20 watt, 12/6. Post Free. WHIT-SAM ELECTRICAL, 18 Woodrow Close, Perivale, Middlesex.

QUALITY NEW VALVES

Guaranteed six months. Postage 4d.

DCC90 4/8	EF91 2/8	EL91 2/-	PL81 6/9
DF91 2/-	EF92 2/-	EY86 6/-	PL83 6/-
DL92 4/-	EF93 4/-	PCC84 5/8	PY81 5/8
ECC81 3/-	EF95 3/8	PCC89 8/9	PY801 6/-
ECC82 4/-	EF98 7/-	PCC80 6/8	U25 11/-
ECC83 4/8	EF189 6/-	PCF82 6/8	6BH6 4/-
ECC81 2/8	EF184 6/-	PCL82 6/8	6CH6 4/8
ECF82 6/9	EL84 4/8	PCL85 8/3	85A2 5/-
ECH81 5/-	EL85 6/-	PL36 9/-	150B2 8/9

500ma rect.-800 PIV 3/-, 600 PIV 2/9, 400 PIV 2/3, 200 PIV 2/-, 100 PIV 1/3. St transistors, 200 Mhz, 300 mW 1/9. SCR's 5 & 10 Amp.-stocks limited-5 for £1. Mic 45 19/6, Mic 40 15/-, Mic 60 22/6. Replacement universal xtal cartridges.

Mono-high O/P 15/-, med O/P 12/-, Stereo-high O/P 30/-, med O/P 25/-, Above post paid. Large SAE for lists.

J. R. HARTLEY

2 Waterloo Terrace

Bridgnorth, Shropshire

BRAND NEW NORBIT UNITS

25/- post free

Consisting of 9 x 3in. chassis,

Con Strips, Resistances

2-OC29^s 2-OC35^s

M.A.C. LTD., Troy Road,
Morley, Nr. Leeds

Phone: Morley 2334

P.C.R. Rxs.

These are 8 valve plus rectifier Long, Med and S.W. Rx covering 8.W. 6 to 18 Mc/s 10 to 18 metres, fitted internal speaker, aks for phones, slow motion drive, supplied ready to work for 230v mains. Price: £8.10.0. plus 10/- carr.

Rect Unit Type 7

2 200/250v mains or 12v D.C. O/Pa 160v D.C. at 30 Ma C.T. 40v A.C. 30 Ma, 12v D.C. at 300 Ma fitted fuse, Ind lamp, terminal strips, spare vibrator, with circ new and boxed.

Price: 25/- plus 7/6 carr.

Indicator Unit Type 95

Contains C.R.T. type VCR97 green screen med persistence, 16 octal valves C.R.T. Fil trans, Focus, Brill and Gain controls fitted. Also 12 pots, Mu Metal shield, Slow motion dial 60.1, 2 x 500 Ft tuning cond, 100 Kc crystal unit, 2 x Slow motion drives, Yaxley and Key swts etc. In good condition with outer cover size 9 x 12 x 18in.

Price: £3.15.0. plus 10/- carr.

APQ-43 I.F. Strips

These are 30 Mc/s 10 Mc/s bandwidth I.F. strip using the following valves: 6AK5x7, 6AG7, 12AU7, 6AL5, in good condition.

Price: £2.2.6. plus 4/6 carr.

APQ-43 Prea Amps to match above 25/- plus 3/6 post. B.N.C. and Power plugs to fit above 2/6 each.

Test Sets 261 and 286

These are a portable test set intended to work off 6v D.C. The 261 covers 175 to 305 Mc/s and the 266, 95 to 180 Mc/s. These units are directly calibrated, no xtals are required. O/P is modulated with variable freq osc. A small Ae system is supplied. Overall size 7 x 8 x 16in. with circ, good condition.

Price: Either type £3.5.0. plus 10/- carr. Or £6.0.0. per pair carr. paid.

R.F. Amplifier No. 4

This is the V.F.O. and P.A. section of the Army No. 53 Tx, this unit covers the freq range 1.2 to 17.6 Mc/s in 4 bands and uses the following valves: Osce VT501, Buffer VT501, Driver 807, P.A. Two 818s, Bias rect 6X5, Voltage stab VS110x2. The following controls and meters are fitted: V.F.O. tuning by a large directly calibrated dial, Driver tuning, Grid drive P.A. tuning, Ae coupling, Ae loading, Meters P.A. grid current, P.A. An current, Ae current, Ae C/O relay is fitted. Heater and bias supplies are contained within unit. The following ext supplies are required: E.H.T. 1.5 Kv at 300 Ma, 400v at 100 Ma, 230v A.C., 12v D.C. The O/P of the unit is 250 watts with one 813 removed and the 1.5 Kv reduced. This will bring it down to 150 watts.

I/P. Unit is intended to work into dipole Ae. Supplied new and crated with circ.

Price £15.0.0. plus 20/- carr.

Rx. Unit Type ARR-2

These are a small airborne Rx tuning the band 234 to 258 Mc/s and are intended to receive A.M. modulated sub carrier transmissions and in their present form are unsuitable for normal use. These Rx can, however, be modified to work on 2 meters, i.e. they can be made to tune the unit 125 to 150 Mc/s, modification details and circ diagrams are supplied with Rx. The following valves are used: 6AK5x3, 9001x7, 12A6. The O/P is for low res headphones. The small size of these, i.e. 5 1/2 x 4 1/2 in. front, 1 1/2 in. deep, makes them well suited to mobile use. To carry out successfully the mods to these a Sig Gen or Test Osc is required. Supplied in new condition.

Price: £13.0.0. plus 6/- post.

Test Set Type 253

These are a test osc covering 20 to 83 Mc/s in 4 bands, and are for 230v mains supply. A large vernier dial is fitted; 2 Mc/s/10 is fitted for checking calibration. Noise diode with 60 Ma meter is also fitted for noise checks. R.F. signal is modulated with low freq xtals. Supplied with cal charts, used condition. These units were used for checking the R.F. 24/27 units.

Price: £3.5.0. plus 10/- carr.

Portable Giesler Counters

These are a 4 valve unit with CV2247 pick up tube, meter indication 1 to 10 Milli Ronktons, sockets for phones or counter, supplied in waterproof carrying case size 10 x 10 x 8in. These units are normal 200/250v dry batteries. These are not available but they can be operated off a 300v P.U. Supplied new and tested.

Price: 5.10.0. plus 8/6 carr. Kit of parts to build transfor P.U. to work off 9v battery 25/-.

Table Top Cabinet

Overall size 25 x 15 x 17in. All construction as lift up lid and removable back. New condition.

Price: £2.5.0. plus 12/6 carr.

Type 88 Walkie-Talkies

These are a 4-channel unit operating in the freq range 38 to 42 Mc/s. They req 90/1.5v carbon mike and low res phones. They use 14 miniature valves, weight 6lbs., size 5 1/2 x 3 1/2 x 9 1/2 in. Good condition with circ.

Price: £4.10.0. each plus 6/- post. Or 2 for £8.0.0. post paid.

Comparator Unit AN/GRD

I/P 115v contains valves: 6BN7x5, 6BA6, 6AU6, OB2x2, 5Y3. H.T. from unit is 350v at 100 Ma also 105/210v stabilised also contains U.H.F. coax relay, L.F. trans, 300c/s filter, block paper cond, panel neon, etc. These units are for 19in. rack mounting and have slide on top cover. Size 19 x 8in. front, 10in. deep. New condition with circ.

Price: £3.15.0. plus 12/6 carr.

Inverter Units

I/P 12.5v D.C. at 46 amps, O/P 115v 400c/s 345 watts one phase, well under-rated. New and crated.

Price: £12.10.0. plus 25/- carr.

Roller Inductors

For Ae tuning and loading, size of coil 2 1/2 in. dia, 7in. long, approx 48 turns with knob and counter dial. Ex equip.

Price: 17/6 plus 4/6 Post.

Blower Motors

115v 50c/s 3000 R.P.M. outlet 2 1/2 x 1 1/2 in., Inlet 1 1/2 in. dia. Overall length 5 1/2 in. Brand new, boxed.

Price: 25/- plus 4/6 post. 230/110 trans 11/6 post paid. B. Slater, 55 Handsworth Road, SHEFFIELD 9

RECEIVERS & COMPONENTS (continued)

BRAND NEW TELEVISION TUBES!

2 YEAR GUARANTEE. VAST RANGE
12" £3; 14" £4 (not CRM141)
17" £5.15.6; 19" £6.17.6 etc. etc.
Carriage 12/-

Also British valves lists free!

PHILIP H. BEARMAN, 6 Potters Road,
New Barnet, Herts. Bar 1934/7873.

WILSON ELECTRONICS

2/- ea. AC126, 127, 128, OC75, 819T (OC83).
2/6 ea. OC44, 45, 81D, 81, 82D, 82.
3/- ea. OC71, 72, 170, 84, AF118, 119.
3/6 ea. AF115, 116, 117, 125, 127.
4/- ea. AF114, OC171, 172.
7/- ea. OC29, 23, 20, 26, 28, 30, 200.
11/8 ea. AD140, 149, OC35, 36, 38.
R.F. FIELD METER MOD. 1300 (RF40) with aerial and ear piece 52/-
ACOS MIKE 45 18/6.
6d. per order. P. & P. Lists 6d.
20 Bradbourne Avenue, Wilford, Nottingham.

MICROMINIATURE MICROPHONES

Sensitive dynamic type. Will pick-up rustle of newspaper from 30 feet.
Size 9 mm. x 9 mm. x 3.5 mm.
Impedance 1 KΩ.



ONLY 28/6
Post free—C.W.O.

SHOWN
FULL
SIZE

MICRO DATA SYSTEMS
30 BAKER ST., LONDON, W.1

ELECTRICAL

INSTANT ★★ ELECTRICITY ANYWHERE!



AMAZING NEW
AMERICAN DYNA-
MOTOR UNIT which runs from any 12-v.
CAR BATTERY and produces a BIG
ELECTRICAL OUTPUT of 230/240 v. at
220 watts. Marvellous for TELEVISION,
ELECTRICAL DRILLS, MAINS LIGHT-
ING and all Universal AC/DC mains
equipment. ONLY £12.10.0 plus 30/- carr.
Send stamped addressed envelope for illus-
trated details. Open 7 days a week.

SCIENTIFIC PRODUCTS (Dept. N)

Onward Building (rear of Fleetwood Arms
Hotel), Mount Street, Fleetwood, Lancs.

240 VOLT ELECTRIC POWER FROM YOUR 12 volt or 6 volt CAR BATTERY

Run your mains AC/DC equipment direct from
your car battery
with this compact
low battery con-
sumption dyna-
motor. Size only
5in. x 3in. Sturdy
construction. Con-
verts a 12 volt input to a 240 volt output. Huge
purchase enables us to offer them at only 39/6
each, post and packing 5/-, 6 volt input model
only 35/-, p.p. 5/-. Thousands already sold. Dept.
PW2, S. & R. Supplies, 14 Clifton Grove, Leeds 9.



MISCELLANEOUS

ELECTRONIC MUSIC?

Then how about making yourself an electric
organ? Constructional data available—
full circuits, drawings and notes! It has
5 octaves, 2 manuals and pedals with 24
stops—uses 41 valves. With its variable
attack you can play Classics and Swings.

Write NOW for free leaflet and further
details to C. & S., 20 Maude Street,
Darlington, Durham. Send 3d. stamp.

MISCELLANEOUS (continued)

METERS!

All types, new condition, reasonable prices,
example. 100 μA 4 ins. dia. 32/6.
S.A.E. for lists.

SALOP ELECTRONICS

9a Greyfriars Road
Coleham
Shrewsbury, Shropshire



SEE THE WORLD-FAMOUS HEATHKIT Electronic Kits

at
233 Tottenham Court Road,
London, W.1 Tel. 01-636-7349
Send for FREE Catalogue
Dept. TC3

PADGETTS RADIO STORE OLD TOWN HALL, LIVERSEDE, YORKS.

Telephone: CLECKHEATON 2866

Special Offer. 19 Sets, Mark 3, in good clean
condition. Parts removed. B section. 807 valve,
and TX section made U.S. Receiver Bench
Tested, all you would need is a Power Pack.
Price 35/-. Carriage 10/-.
19 Sets in fair condition as above and also
removed is the meter and relay. 10/- Carriage
10/-. Not tested.
Breaking Up 19 Sets. Relays 100 ohm coil. 2/-.
Post and Packing 2/- Doz. 28/-. Post paid. Jack
Sockets. 7/6 doz. Post paid.
Metal Toggle Switches. 9d. Post and packing
7d. 7/6 doz. Post paid.
Pointer Knobs. 9d. Post and packing 6d. Doz.
7/6. Post paid.
46 Sets. New condition, less send receive switch,
coils and crystals. 12/6. Post paid.
Small Battery S.W. Chassis. complete with two
tuners. Condensers, and slow motion drives.
9/- Post paid.
88 Set Chassis. Valves, Send/Receive Switch,
and Crystals removed. 7/6. Post paid.
TV Chassis. Transformers removed. But com-
plete with condensers, resistors, and valve
holders. 10/22/-. Post paid.
Speakers Removed from TV Sets All 3 ohm PM
and perfect 5 x 4in. round. 3/- Post 2/9.
Six for 22/-. Post paid. 7 x 4in. 5/- Post 2/9. Six
for 34/-. Post paid. 8in. round. 6/6. Post 3/6.
New 12in. Speakers with Built-in Tweeter.
28/6. Post paid. 3 or 15 ohm Coil.

VALVE LIST

Ex Equipment. 3 months' guarantee.
10F1, EF80, EB91, ECL80, EF50, PY82, PZ30, 20P3.
All at 10/- per doz. Post paid.
Single valves post 7d.

ARP12	1/6	PL36	5/-	185BT	8/6
EB91	9d.	PL81	4/-	20D1	3/-
EBF80	3/-	PY33	5/-	20L1	5/-
ECC81	5/-	PY81	1/6	20P1	5/-
ECC82	3/-	PY82	1/6	20P3	2/6
ECC83	4/-	PZ30	5/-	20P4	8/6
ECL80	1/8	U25	5/-	5U4G	4/-
EF50	1/-	U28	5/-	6B8	1/8
EF80	1/8	U281	5/-	6K7	1/9
EF91	9d.	U282	5/-	6K25	5/-
EL38	5/-	U301	5/-	6P25	5/-
EY86	5/-	U329	5/-	6U4	5/-
KT36	5/-	U251	5/-	6V6	1/9
PCF84	2/5	U801	8/6	6P28	5/-
PCF80	2/-	10C2	5/-	EY51	2/6
PCL82	4/-	10P13	2/6		

NEW VALVES EX. UNITS

1T4, 2/-; 1L4, 2/-; 1A3, 2/6; IS5, 2/6; 12AT7, 3/-;
3A4, 2/6; EF91, 2/-; EB91, 1/3; EL81, 2/-; UU8, 4/-;
6SN7, 2/6; 10J13, 4/-; box of 50 ARP12 Valves.
22/- Post paid.
New Boxed TV Tubes. 14in. MW36/44.. 40/-
Carriage 10/-, 12 months' guarantee.
90 degree Tubes. Twelve months' guarantee.
Slight glass fault. 30/- and 50/- Carriage 10/-
Reclaimed Tubes. Six months' guarantee.
AW43/80, 30/-, MW43/80, 30/-, MW43/80, 30/-
CRM172, 30/-, CRM42, 17/-, 12in. Tubes. 10/-
17in. Tubes, perfect but without guarantee. 17/-
Carriage on any Tube in G.B., 10/-.

Resistors. 1W, 10%, High Stab. 3/- per doz. 18/6
per 100.
Capacitors. Min. Electrolytic. Pack of 12 9/-.
Polyester and foil. Pack of 12 6/-.
Transistors. (See Lists for large selection). Matched
Output Kit. OC81D + 2x OC81. 7/6 per set.
Type 1020 PNP Germ. AF50mV. 8/- per doz.
OC44, OC45, OC70, OC71, OC81, OC81D 2/3 each.
BC108, 5/6 each. OC25, 7/6. OC36, 10/-.
For complete list of Laboratory Components send
s.a.e. to
Laboratory Equipment (Elec.). 38 Crawford St.,
London W.1.

1/2 PRICE SPECIAL RADIO CHASSIS OFFERS

HI-FI KUBA ROYAL
STEREOPHONIC TUNER AMPLIFIER



High Fidelity stereo/tuner amplifier. A four
wave band tuner unit integrated with a
powerful 16 watt high fidelity push-pull
stereo amplifier. The most advanced com-
prehensive chassis yet designed.
8 Piano Key Selectors.
Separate bass and treble controls.
Full tape recording and play back facilities.
Complete with a 4 speaker system (2-in.
tweeters, 2-10in. bass speakers) plus BSR 4
speed record changer. Model UA70 with
ceramic cartridge and diamond stylus.
Fully guaranteed for one year
including all valves.

Special Package offer only £74.5.0. (Chassis
only 49/- Gns.)

Terms
£24.15.0 deposit followed by 24 Monthly Pay-
ments of £2.11.7 (total H.P. £86.13.0) + 17/6
P. & P. Send £25.12.6 NOW.
For other stereophonic equipment see page
374.

HI-FI EQUIPMENT CABINETS OF DISTINCTION

- Illustrated in this advertisement is just
one fine cabinet from the Lewis Radio
Range.
- Each Lewis Radio Cabinet is carefully
made by British Craftsmen and soundly
constructed from the best materials
available.
- Fill in coupon below to obtain FREE
catalogue showing this wonderful range
of cabinets.



Lowflex

FREE THE NEW LEWIS RADIO CATALOGUE

Designed to assist your choice of
Cabinet.

The New Lewis Radio Cabinet Cata-
logue—the most comprehensive ever
prepared. Sent absolutely FREE!

Also available comprehensive range of
stereophonic radiogram chassis and
matching equipment. See page 374

Please send your FREE cabinet catalogue
Stereophonic equipment leaflets

NAME

ADDRESS

..... (Dept. P97)

Capitals please

LEWIS radio

LEWIS RADIO, 100, CHASE SIDE, SOUTHGATE
LONDON, N.14. Telephone: PAL 3731/9666

BROADWAY ELECTRONICS

GARRARD 4 SPEED DECKS WITH CARTRIDGE:
Autochangers: AT6 Mk 11 £8.19.6. AT60 £10.19.6.
3000, £8.8.0. 2000, £6.19.6. 1000, £5.19.6.

AT5—Mono £6.10.0.
P. & P. all changes 7/6.

SINGLE PLAYERS:

SP25 with cartridge stereo or mono, £9.19.6. (SP25 with cast turntable £10.19.6.) BRP12, £4.5.0. P. & P. 7/6.

CARTRIDGES:

Stereo: EV26, 25/-, GP83, 15/-, Reuter, 8TD/2, 17/6. Mono Sonotone, 2T88, 15/-, Acos, GP67, 15/-, TCS less bracket 18/6. P. & P. 1/-.

MICROPHONES:

Xtal Hand Mikes.
BM3 and 200C 30/-, P. & P. 2/6. Stand for same 12/6. P. & P. 2/-, ACOS Mike 45, 21/-, ACOS Mike 40, 18/6. Dyn, Mike DM-391, 22/6. CM21 Xtal. 12/6. CM20 Xtal. 9/6. Magnetic Hm 63C with remote control switch, 15/-, Telephone Pick-up 10/6. P. & P. 1/-, Xtal Lapel Mike, 7/6. Guitar Mike, 12/6. P. & P. 1/-.

SPEAKER ENCLOSURES

Tony Corner Cabinet 20 x 10 x 7in. takes 10 x 6in speaker covered in Rexine and Vynair, 45/-, P. & P. 5/-.

Blake cabinet size 18 x 24 x 9 1/2 in., fabric covered £4.10.0. P. & P. 10/-.

Haydon, 10 1/2 x 15 x 7 1/2 in. fabric covered suitable for 12in. speaker, 45/-, P. & P. 7/6.

Haydon Enclosure fitted with 12in speaker and volume control £4.17.6. P. & P. 10/-.

Hi-Fi Bookshelf speaker enclosure foam lined, cabinet size 10 1/2 x 8 1/2 x 7 1/2 in. Teak finish, £3.0.0. P. & P. 3/6.

Wooler for above £3.0.0. P. & P. 2/6. Tweeter 12/6. P. & P. 1/6. Condenser for crossover 2/6. Terminals 2/6 pair. P. & P. 1/-.

PLINTE Teak finish to match above Hi-Fi speaker size 17 1/2 x 14 x 4 1/2 in. for Garrard 1000, 2000, 3000. AT60, SP25, £2.17.6. P. & P. 4/6.

SPEAKERS:

Elac Heavy duty Ceramic Magnets 11,000 line, 10in. round 10 x 6in. 3 ohm or 15 ohm, 43/6. P. & P. 3/6. 8in. round 15 or 3 ohm, 38/6. P. & P. 3/6. E.M.I. 13 1/2 x 8in. 15 or 3 ohm, 42/6. P. & P. 3/6. E.M.I. Tweeter, 12/6. P. & P. 1/6. R.T.C. 12in. 20 watt 15 ohm Ceramic magnet £5.5.0. P. & P. 3/6. 8 x 4in. Elliptical 30 ohm 30/-, P. & P. 3/6. All other speakers supplied—Goodmans, Bakers, W.B., Wharfedale, Eagle, Tripletone.

BARGAINS IN TRANSISTORS:

AC127, AF114, 115, 116, 117, 118, 119, OC189, 170, 171, 172, 200, 202, 203, 204, 5/6.
OC72, 75, 82, 83, AAZ12, BY38, BCZ11, 3/6. OC71, 81, 3/-, R.F. Packs 1 OC44, 2 OC45 8/6. AF Packs 1 OC81D, 2 OC81 (Mullard), 8/6. A.F. Pack 1 GET119, 5/6. GET113, Red Spot, 2/-, OC26, 28, 29, 9/6. ORP12 Light Cell, 8/6. Diodes OA81 2/3. OA91, OA95, 1/9. P. & P. 1/-.

TRANSISTOR ELECTROLYTICS:

1, 2, 4, 6, 8, 10, 16, 25, 32, 50, 100 mfd 15 volt working, 1/3. P. & P. 1/-.
250 mfd DC 3/-, 500 mfd 12v DC, 3/-, 500 mfd 25v DC, 3/6. P. & P. 1/-.
RESISTORS. 1/4 watt 10% from 3-3 ohm to 10 meg 5d. each, 4/- doz. P. & P. 1/- (minimum order 2/6).

EARPIECES WITH CORD AND 3.5 mm. plug. 8 ohm magnetic, 3/-, 250 ohm, 4/-, 180 ohm with clip, 6/6, Xtal 4/-, P. & P. 6d.

TRANSISTOR SPEAKERS 8 ohm 2in. 8/6; 3in. 10/6; 3 1/2 in. 12/6. P. & P. 1/-.

PANEL LIGHTS. 6v. Red, Blue, Green, Yellow, White (uses Lilliput bulbs) 3/- each. P. & P. 1/-.

NEON PANEL LIGHTS 200-250v. 3/- each. P. & P. 1/-.

PAPER CONDENSERS for Cross-Over Units 2 mfd. 2/6. P. & P. 1/-.

ROTARY SWITCHES

2 pole Mains Switch, 3/-, 1 pole 12 way, 2 pole 2 way, 3 pole 3 way, 3 pole 4 way, 4 pole 3 way, 3/6 each. P. & P. 1/-.

PIANOKEY PUSH BUTTON SWITCHES. 7 button, including mains on/off. 6 banks of 6 P.C.O. 8/6. P. & P. 1/-.

FERROX ROD AERIAL with coils, 8 x 1/2 in. 5/6. 4 x 1/2 in. 4/6. P. & P. 1/-.

INTERCOM BABY ALARMS

Complete with battery and connecting wire £2.15.0. P. & P. 2/6.

"SATELLITE" TRANSISTOR RADIOS

Complete with case, earphone and battery. All tested before despatch. 6 transistor 43/6. P. & P. 2/6.

9 transistor £4.19.6. P. & P. 3/6.

Stockists of ● Eagle Products ● Goodmans ● W.B. ● Wharfedale ● Bakers ● Tripletone ● Linear, all makes of amplifiers and speakers supplied. S.A.E. please. Trade terms to bona fide dealers.

**92 MITCHAM ROAD, Tooting
BROADWAY, LONDON, S.W.17**

Telephone BALham 3984

Closed all day Wednesday

(four minutes from Tooting Broadway Underground Station)

NEW VALVES!

Guaranteed Set Tested
24-HOUR SERVICE

1R5	5/-	DL94	5/6	EY51	5/11	PY81	5/-
185	3/9	DL96	5/11	EY86	5/6	PY82	4/9
1T4	2/8	DY86	5/6	EZ40	6/6	PY83	5/3
354	4/3	DY87	5/6	EZ80	4/3	PY800	5/11
3V4	5/6	EAB80	5/6	EZ81	4/6	PY801	5/11
5V4G	7/9	EB41	7/9	GZ82	8/9	R19	6/6
6F1	6/3	EBF80	5/9	KT61	6/3	U25	9/3
6L18	6/-	EBF89	5/9	N78	14/6	U26	8/9
10F1	9/6	ECC81	3/9	PC86	8/3	U191	10/-
10F13	9/3	ECC82	4/6	PC89	8/3	U301	11/6
20P2	10/3	ECC83	5/6	PC97	5/9	U801	16/-
20P1	8/9	ECC85	5/3	PC900	8/-	UABC80	5/-
20P4	12/6	ECH35	5/9	PCC84	5/3	UAF42	6/11
30P5	9/6	ECH42	8/9	PCC89	9/9	UBC41	6/6
30P14	11/6	ECH81	5/3	PCCB89	8/3	UBF89	5/9
30P19	11/6	ECH84	7/9	PCCB80	6/3	UCC84	7/9
DAC32	6/9	ECL80	5/9	PCF82	5/9	UCC85	6/-
DAP91	3/9	ECL82	6/-	PCL82	6/3	UCF80	8/-
DAP96	5/11	ECL86	7/6	PCL83	8/3	UCH42	8/6
DF33	7/6	EF39	3/6	PCL84	7/-	UCI81	5/9
DF91	2/9	EF41	8/6	PCL85	8/3	UCL82	6/9
DF96	5/11	EF80	4/9	PL36	9/-	UCL83	8/6
DK32	7/-	EF85	5/-	PL81	6/3	UF41	7/9
DK91	5/-	EF86	6/-	PL82	6/9	UF89	5/6
DK96	6/3	EF89	4/9	PL83	5/11	UL41	7/9
DL33	6/6	EL33	6/3	PL84	6/-	UL84	6/-
DL35	4/9	EL41	8/-	PY32	8/3	UY41	5/3
DL92	4/3	FL84	4/6	PY33	8/3	UY85	4/9

Postage on 1 valve 9d. extra. On 2 valves or more, postage 6d. per valve extra. Any parcel insured against damage in transit 6d. extra. Office address, no calls.

GERALD BERNARD

83 OSBALDESTON ROAD
STONE NEWINGTON
LONDON N.16

TV TUBES

REBUILT & RESCREENED

by Britain's largest

independent Tube

Rebuilder

MIDLAND TUBES LTD.

467/483 Oldham Road, Manchester, 10

Tel.: Collyhurst 4412

SUFFOLK TUBES LTD.

1/3 Upper Richmond Road, Putney,

London, S.W.15

Tel.: Vandyke 4304/5267

Football Pool Computer

- FORECASTS RESULTS
- CHEAP, EASY TO BUILD
- ANYONE CAN OPERATE IT
- SCIENTIFIC AID TO WINNING

Analogue Computer

- Very simple, cheap, easy-to-build circuit.
- Multiplies and divides.
- Fascinating demonstration of computer principles.

Circuits of the above, with two further circuits for the solution of Quadratic and Simultaneous equations, 4/6d post free.

PLANET INSTRUMENT CO.,
25(W) DOMINION AVE.,
LEEDS 7.

1/2 PRICE SPECIAL RADIO CHASSIS OFFERS

HI-FI CONTINENTAL
STEREOPHONIC RADIOGRAM CHASSIS



Magnificent 'Continental' Stereophonic Radiogram Chassis with piano key switches, built-in ferrite rod aerial. Comes complete with two 10" elliptical loudspeakers, plus a mono/stereo 4-speed automatic record changer. Complete 29 1/2 gns. (Units available separately if required. Chassis only, 21 gns.)

Special terms available of £10.6.6 deposit followed by 18 monthly payments of £1.7.3 (total H.P. of £34.17.0) + 17/6 P. & P. Send £11.4.0 now.

IMPERIAL HI-FI STEREOPHONIC RADIOGRAM CHASSIS



The Imperial Stereophonic 4 waveband chassis has the most advanced specifications yet offered in this country. There is a built-in ferrite rod aerial, seven piano key buttons, controlling mono/stereo selection. Gram Long-Medium-Short-FM-ON/OFF. The unit comes complete with two 10" elliptical loudspeakers plus a mono/stereo 4 speed automatic record changer. Complete £41.9.6.

Chassis only, 29 1/2 gns.

Special terms available of £13.16.6 deposit followed by 24 monthly payments of £1.8.10 (total H.P. £48.8.6) + 17/6 P. & P. Send £14.14.0 now.

EMPRESS HI-FI AM/FM STEREOPHONIC CHASSIS



This most advanced radiogram chassis with automatic push button selection covers short, medium and long wavebands plus V.H.F./F.M. Offered complete with 2 10 x 6 speakers 4 speed Stereo/Mono autochanger only £35.19.6. Chassis only, 25 1/2 gns. Special terms available of £12 deposit followed by 18 monthly payments of £1.11.7. (total H.P. £40.8.6) + 17/6 P. & P. Send £12.17.6 now.

All Lewis Radio equipment including valves are fully guaranteed for one year free of charge. For other Stereophonic Equipment and Cabinets, see page 373.

Send your cheque or P.O. today while stocks last to Dept. P.97.

LEWIS radio

LEWIS RADIO, 100, CHASE SIDE, SOUTHGATE
LONDON, N.14. Telephone: PAL 3733/9666

WE CAN SUPPLY FROM STOCK MOST OF THE PARTS SPECIFIED ON CIRCUITS IN THIS MAGAZINE. SEND LIST FOR QUOTATION.

OR BETTER STILL—BUY THE NEW 1967 CATALOGUE. EVERYTHING YOU NEED IS LISTED AND AVAILABLE FROM STOCK.



SCR'S (THYRISTORS)

1 AMP SERIES WIRE LEADS			
50 PIV	7/6	100 PIV	7/6
6 Matched Trans. OC44/45/81/81D	15/-	200 PIV	15/-
400 PIV (280V Rms) 1 Amp	17/6	400 PIV, 3 Amp Stud Type	9/6
400 PIV, 3 Amp (280V Rms) Stud	20/-	400 PIV 5/7 Amp (280V Rms)	25/-

TUNNEL DIODES

1mA 22/6; 5mA 15/-; 15mA 12/6.
Brn new at fraction of normal price.
Free Specs. supplied.



HENRY'S RADIO LTD.

333 EDGWARE ROAD, LONDON, W.2
PA (London) 1008/9 (STD: 01-723 1008)
Open Mon. to Sat. 9-6. Thurs. 1 p.m.
Open all day Saturday

GARRARD DECKS—BRAND NEW FULLY GUARANTEED

1000 mono	£5 19 6	SP25 stereo	£10 19 6	401 less cart./arm	£27 10 0
AT5 mono	£8 9 6	SP25 Deram	£13 19 6	AT6 mono Mk. II	£28 19 6
2000 mono	£8 9 6	*AT60 less cart.	£10 19 6	AT6 stereo Mk. II	£29 10 0
2000 stereo	£8 19 6	*AT60 mono	£11 10 0	AT6 Deram	£11 19 0
3000 1m stereo	£7 19 6	*AT60 stereo	£11 19 6	Decade Mk. II	£17 17 0
SP25 less cart.	£5 19 6	*AT60 Deram	£14 19 6	A70 less cart.	£17 17 0
SP25 mono	£10 10 0	LAB50 Mk. II	£25 0 0	(P. and P. 5/- any type)	

* Mk. II 30/- extra. All other makes of decks and cartridges in stock

RADIO CONTROL RECEIVER

"TINYTONE" 27 mc/s band receiver.
Printed circuit construction. Sensitive 4-transistor design. Size only 4" x 2" x 1". Complete with circuit and instructions. **TOTAL COST 55/- P.P. TO BUILD 1/6**
(Circuit, etc. 1/3 separately).

DEAC RECHARGEABLE BATTERY

● 9.6 volt 225mA/H 20/-, P.P. 1/6

DEAC CHARGER

To charge 3.6 volt and 9.6 volt packs. Fully mains isolated. In moulded case. **45/- P.P. 2/-**

MULTI-METERS-SCOPE

PT34 1kV 39/6 TP68 20kV £5.19.6
TF10 2kV 75/- EP30k 30kV £4.10.0
IT1-2 20kV 69/6 500 30kV £8.17.6
● CT52 Scope £22.10.0, p.p. 10/-
Complete range of test equipment in stock

NOMBEX TEST UNITS

★ 150 kc/s—350 mc/s RF Generator £10.10.0. All Transistor.

TRANSISTOR TESTER

Complete with large scale meter, test leads, battery etc. Tests NPN, PNP, all types. Also Diodes. Brand new aerial mast. **PRICE £7.7.0**

GARRARD BATTERY

Brand New with R/P head, erase/osc. head, tape cassette. Specifications and osc. circuits. 2 speed 2-track 9 volt operated. List Price 13 gns.

PRICE £8.19.6 P. & P. 3/6

COMPONENTS AND EQUIPMENT

The largest range in the country. 8/6 buys 1967 200-page catalogue with discount vouchers.

MW/LW QUALITY

TRANSISTOR RADIO TUNER
Fully tunable superhet with excellent sensitivity and selectivity. Output up to 1 volt peak. Complete with front panel, etc. 9 volt operated. For use with any amplifier or tape recorder. **TOTAL COST £3.19.6 P.P. TO BUILD 2/6**

VHF FM TUNER

Supplied as 2 Preassembled Panels, plus metal work Superhet design. 38-108 Mc/s, 9 volt operated, 6 Mullard Transistors. Total cost to assemble £12.17.6, p.p. 2/6

STABILISED POWER SUPPLY

Two outputs. 3.6 volt and 9.6 volt up to 250mA each. Transistorised and Zener stabilised. 110 to 250 volt mains input. In case with leads. **PRICE 67/6, p.p. 2/6.**

5 WATT AMPLIFIER

6-Transistor Push-pull, 3 ohms. 6mV into 1K. 12/18V supply, 2 1/2" x 2 x 1 1/2". **BUILT AND TESTED 69/6 P.P. (optional mains units 54/-) 2/-**

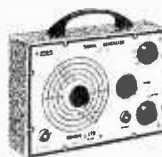
1 1/2 watt version 59/6
Matching Pre-amplifier, 6 inputs, treble/bass selector/volume controls. 6-10mV output. 9-18V supply. 79/6, p.p. 2/-.
For use with any Transistor Amplifier LEAFLET ON REQUEST.

FMT41 FM TUNER. 6-transistor, 3 diode design. Completely **£6.19.6 P.P. built and tested 2/-**

AMT31. Med. Wave Tuner. Built ready to use. 79/6, p.p. 2/-.

27 Mc/s BAND RADIO CONTROL

Sub-miniature crystals 17/6 each
Matched pairs for superhet 35/- pair
(State 455 kc/s or 470 kc/s I.F.)
Complete range of Receiver and Transmitter Kits in stock—see catalogue.



BI-PAK SEMICONDUCTORS

8 Radnor House
93/97 Regent St
London W1

NEW AND TESTED VALUE PAKS

One 10/- Pack of your own choice free with orders valued £4 or over.

2 Drift Trans. 2N1225 Germ. PNP 100 Mc/s	10/-
6 Matched Trans. OC44/45/81/81D	10/-
4 OA10 Diodes Mullard 30 PIV 1A	10/-
16 Red Spot AF Trans. PNP	10/-
15 White Spot RF Trans. PNP	10/-
4 Silicon Rects. 3A 100/400 PIV	10/-
2 10A Silicon Rects. 50 and 100 PIV	10/-
8 Germ. Diodes OA70 Mullard	10/-
2 OC139 Trans. NPN Switching	10/-
1 12A SCR 100 PIV	10/-
3 Sil. Trans. 2N3003 PNP	10/-
10 Assorted Computer Diodes	10/-
3 NPN Med. Speed Switching Trans.	10/-
4 Zener Diodes 250 mW 3-12V	10/-
2 20417 Trans. Evt. AF117	10/-
2 200 Mc/s Sil. Trans. NPN BSY26/27	10/-
2 Bi-directional Trans. ASY66 PNP	10/-
3 Zener Diodes 400 mW 33V 5% Tol.	10/-
4 High Current Trans. OC42 Evt.	10/-
2 Power Transistors 1 OC26 1 OC35	10/-
1 Silicon Rects. 100 PIV 250 mA	10/-
2 OC71 Transistors Mullard Type	10/-
3 NPN Silicon Trans. 70 Mc/s	10/-
1 Power Trans. OC20 100V	10/-
5 OA47 Gold Bonded Diodes	10/-
4 OA202 Sil. Diodes Sub-min	10/-
2 Low Noise Trans. NPN 2N2920	10/-
1 Sil. Trans. NPN VCB 100 ZT80	10/-
8 OA81 Diodes (CV448)	10/-
3 OC72 Transistors Mullard Type	10/-
3 OC72 Transistors Mullard Type	10/-
5 Metal Alloy Transistors Mat Type	10/-
4 Sil. Rects. 400 PIV 500 mA	10/-
5 GET884 Trans. Evt. OC44	10/-
5 GET883 Trans. Evt. OC45	10/-
2 GET30 (Germ. FNP Trans. with Heat-sink	10/-
3 VHF sil. Epoxy Trans. NPN 100 Mc/s	10/-
2 2N708 Sil. Trans. 300 Mc/s NPN	10/-
4 GT41/45 (Germ. Trans. PNP Evt. OC71	10/-
2 GT31 LF Low Noise (Germ. Trans. PNP	10/-
6 IN914 Sil. Diodes 75 PIV 75 mA	10/-
8 OA85 Germ. Diodes Sub-min IN69	10/-
3 NPN Germ. Trans. NKT773 Evt. AC190	10/-
2 OC22 Power Trans. Germ.	10/-
2 OC28 Power Trans. Germ.	10/-
2 OC73 Mullard Trans.	10/-
4 AC128 Trans. PNP High Gain	10/-

2 AC127/128 Comp. pair PNP/NPN	10/-
10 Assorted Gold Bonded Diodes	10/-
5 TK22C Germ. Switching Trans.	10/-
3 2N1307 PNP Switching Trans.	10/-
3 OC76 Mullard Trans.	10/-
20 Germ. Diodes General Purpose	10/-
7 CG62H Germ. Diodes Evt. OA7	10/-
3 OC170 Trans. Mullard Type	10/-
3 AF116 Mullard Type Trans.	10/-
12 Assorted Germ. Diodes Marked	10/-
1 30 Amp Power Rectifier 100 PIV	10/-
4 AC126 Germ. PNP Trans.	10/-
1 1 Amp Germ. Rect. 200 PIV	10/-
4 OA5 Gold Bonded Diodes	10/-
1 ORP61 Photo-conductive cell	10/-
3 Silicon Rects. 100 PIV 750 mA	10/-
3 AF117 Trans. Mullard Type	10/-
7 OC81 Type Trans.	10/-
3 OC171 Trans. Mullard Type	10/-
1 ORP12 Photo-conductive cell LDR03	8/6
2 10A 600 PIV Sil. Rects. 16425R	15/-
3 BC108 Sil. NPN High Gain Trans.	15/-
2 Zener Diodes 25W 18 and 22V	15/-
1 2N910 NPN Sil. Trans. VCB100 80 Mc/s	15/-
2 1000 PIV Sil. Rect. 1-5A RB310 AF	15/-
2 High Vol. AF Trans. PNP ACV17	15/-
3 BSY35A Sil. Trans. NPN 200 Mc/s	15/-
3 OC200 Sil. Trans. Mullard	15/-
2 Sil. Power Rects. BYZ13	15/-
1 AF139 VHF Germ. Trans. 1500 Mc/s	15/-
1 Sil. Power Trans. NPN100 Mc/s TK201A	15/-
6 Zener Diodes 3-15V Sub-min	15/-
1 2N1132 PNP Epitaxial Planar Sil. Trans.	15/-
2 2N697 Epitaxial Planar Trans. Sil.	15/-
4 Germ. Power Trans. Evt. OC16 Mullard	15/-
1 Unijunction Trans. 2N2646 Evt. DSE29	15/-
2 Sil. Trans. 200 Mc/s 60V cat ZT83/84	15/-
1 Sil. Planar Trans. NPN 100 Mc/s BSY25	15/-
1 Sil. Trans. IS104 150 Mc/s HFE 200 NPN	15/-
2 SCRS 50 PIV 1A TO-5 can	15/-
1 Tunnel Diode IN3720 (TD5) G.E.	15/-
1 Unijunction Trans. 2N2010 5-5 can G.E.	15/-
2 Sil. Rects. 5A 400 PIV Stud Type	15/-
2 Germ. Power Trans. OC28/29	15/-
1 10A Sil. Stud Rect. 800 PIV	15/-
1 Tunnel Diode AEY11 1050 Mc/s STC	15/-
2 2N712 Sil. Epoxy Planar HFE225 max.	15/-
1 2N1207 PNP P. Sil. Planar 20-5 cat	15/-
1 Sil. Power Trans. NPN 28721 85W	15/-
6 2N2826 NPN Sil. Planar Trans.	20/-
6 BY100 Type Sil. Rects.	20/-
25 Sil. and Germ. Trans. Mixed all Marked New.	30/-

Minimum Order 10/- CASH WITH ORDER PLEASE.
Add 1/- postage and packing per Order. GUARANTEED by return postal service. Overseas add extra for Airmail.

Our vast stocks change daily with hundreds of Semiconductor bargains becoming available. Just send 2/6 to cover 3 months mailing of our latest stock lists, e.v.t. charts, circuits, etc.

VALUE PACKS FOR '67

NEW	UNTESTED
120	GERM. SUB-MIN. DIODES 10/-
50	MIXED TRANSISTORS 10/-
16	SILICON 750 mA TOP-HAT RECTIFIERS 10/-
20	ALL TYPES MIXED VOLTS ZENERS 10/-
25	SIL. NPN 200 Mc/s TRANSISTORS 10/-
10	STUD. 2 AMP SILICON RECT. 10/-
75	GERM. DIODES GOLD-BONDED 10/-
30	PNP/NPN MIXED SILICON TRANSISTORS 10/-
60	SILICON 200 mA DIODES 10/-
40	ZENERS RECTIFIERS MIXED TOP HAT 10/-
20	1 AMP GERM. UP TO 300 PIV RECTIFIERS 10/-
40	LIKE OC81 AC128 TRANSISTORS 10/-
10	50-400 PIV 1 AMP SCR's 20/-

Head Office and Warehouse
44A WESTBOURNE GROVE
LONDON W2
Tel. PARK 5641/2/3

Z & I AERO SERVICES LTD.

Please send all correspondence and Mail-orders to the Head Office

When sending cash with order, please include 2/6 in £ for postage and handling

MINIMUM CHARGE 2/- No C.O.D. orders accepted

Retail Shop
85 TOTTENHAM COURT ROAD
LONDON W1
Tel. LANGHAM 8403
Open all day Saturday

First Quality Fully Guaranteed



ELECTRONIC VALVES

0A2 6/-	6AK6 7/6	6F11 6/-	10L1 7/6	EL81 9/-	KT45 15/-	PLL80 10/-	U193 7/-
0A3 10/-	6AL5 3/-	6F12 4/-	10L13 15/-	EL82 8/-	KT46 16/-	PT15 15/-	U281 6/-
0B2 6/-	6AM6 6/-	6F13 6/-	1103 7/-	EL83 7/-	KT47 45/-	PK4 20/-	U281 12/-
0C3 6/-	6AN6 10/-	6F14 15/-	1103 7/-	EL84 4/3	KT76 8/-	PK5 20/-	U282 12/-
0D3 6/-	6AN8 10/-	6F15 11/-	1103 7/-	EL85 7/6	KT88 23/-	PY31 5/-	U301 11/-
0Z4A 5/-	6AQ4 5/-	6F17 6/-	12AC6 8/-	EL86 8/-	LP2 7/-	PY32 8/6	U403 7/-
1A3 4/-	6AQ5 5/6	6F18 7/6	12AD6 8/-	EL87 5/6	ME1401 20/-	PY33 8/6	U404 8/-
1A5GT 5/-	6AR5 6/-	6F23 10/-	12AE6 7/6	EL88 10/-	ME1401 20/-	PY80 5/6	U801 17/-
1A7GT 8/-	6AR6 6/-	6F24 12/-	12AL5 7/-	EL89 10/-	ME1401 20/-	PY80 5/6	U801 17/-
1B3GT 8/-	6AR8 17/6	6F25 12/-	12AT5 5/-	EL90 5/-	ME1401 20/-	PY81 6/-	U801 17/-
1C5GT 5/-	6AS5 5/-	6F26 10/6	12AT6 5/-	EL91 2/6	ME1401 20/-	PY82 5/6	U801 17/-
1D6 8/-	6AS6 6/-	6H6 2/-	12AT7 4/-	EL92 10/-	ME1401 20/-	PY83 6/-	U801 17/-
1D8GT 8/-	6AS7G 15/-	6J4 9/-	12AUG 6/-	EL93 10/-	ME1401 20/-	PY84 6/-	U801 17/-
1G4GT 8/-	6AT6 4/6	6J5 9/-	12AV6 5/6	EL94 10/-	ME1401 20/-	PY85 6/-	U801 17/-
1G6GT 7/-	6AUG 5/6	6J6 3/6	12AV7 8/-	EL95 5/-	ME1401 20/-	PY86 6/-	U801 17/-
1H5GT 7/-	6AUG 5/6	6J7 9/-	12AV8 5/6	EL96 5/-	ME1401 20/-	PY87 6/-	U801 17/-
1L4 2/6	6AV5GT4 6/7G	6J8 5/-	12AV9 5/6	EL97 5/-	ME1401 20/-	PY88 6/-	U801 17/-
1N5GT 8/-	6AV6 11/-	6K6G 5/-	12AX7 6/-	EL98 5/-	ME1401 20/-	PY89 6/-	U801 17/-
1R4 8/-	6AW6 12/6	6K7GT 5/-	12AY7 10/-	EL99 5/-	ME1401 20/-	PY90 6/-	U801 17/-
1R5 8/-	6B4G 17/6	6K8G 4/-	12B4A 9/-	EL100 5/-	ME1401 20/-	PY91 6/-	U801 17/-
1R6 4/6	6B8 7/-	6L6G 7/6	12BA6 6/-	EL101 5/-	ME1401 20/-	PY92 6/-	U801 17/-
1T4 3/-	6B8G 2/6	6L7 5/-	12BE6 5/6	EL102 5/-	ME1401 20/-	PY93 6/-	U801 17/-
1T5GT 8/-	6BA6 4/6	6L8 5/-	12B7 5/6	EL103 5/-	ME1401 20/-	PY94 6/-	U801 17/-
1U4 5/-	6BA7 15/-	6L9 5/-	12BY7 10/-	EL104 5/-	ME1401 20/-	PY95 6/-	U801 17/-
1U5 6/-	6BA8 15/-	6L10 5/-	12C4 5/6	EL105 5/-	ME1401 20/-	PY96 6/-	U801 17/-
1V2 10/-	6BP6 6/-	6N7GT 12/-	12C5 5/6	EL106 5/-	ME1401 20/-	PY97 6/-	U801 17/-
1X2B 7/-	6BP7 15/-	6P25 12/-	12C6 5/6	EL107 5/-	ME1401 20/-	PY98 6/-	U801 17/-
2C24A 7/-	6RG6G 18/-	6P28 12/6	12C7 5/6	EL108 5/-	ME1401 20/-	PY99 6/-	U801 17/-
2C3A 7/6	6B4G 17/6	6P29 12/6	12C8 5/6	EL109 5/-	ME1401 20/-	PY100 6/-	U801 17/-
2C40 6/6	6B4G 17/6	6P30 12/6	12C9 5/6	EL110 5/-	ME1401 20/-	PY101 6/-	U801 17/-
2C51 10/-	6BK4 22/6	6Q7G 6/-	12CA 5/6	EL111 5/-	ME1401 20/-	PY102 6/-	U801 17/-
2C6 12/-	6BK7A 9/-	6P31 12/6	12CB 5/6	EL112 5/-	ME1401 20/-	PY103 6/-	U801 17/-
2D21 6/-	6BL7GT4 10/-	6P32 12/6	12CC 5/6	EL113 5/-	ME1401 20/-	PY104 6/-	U801 17/-
2E26 22/6	6B6 10/-	6P33 12/6	12CD 5/6	EL114 5/-	ME1401 20/-	PY105 6/-	U801 17/-
3A4 4/-	6B6 10/-	6P34 12/6	12CE 5/6	EL115 5/-	ME1401 20/-	PY106 6/-	U801 17/-
3A5 7/-	6B7A 7/6	6P35 12/6	12CF 5/6	EL116 5/-	ME1401 20/-	PY107 6/-	U801 17/-
3A6 6/6	6B7 11/-	6P36 12/6	12CG 5/6	EL117 5/-	ME1401 20/-	PY108 6/-	U801 17/-
3B7 5/-	6B8 5/6	6P37 12/6	12CH 5/6	EL118 5/-	ME1401 20/-	PY109 6/-	U801 17/-
3B8 40/-	6B8 17/-	6P38 12/6	12CI 5/6	EL119 5/-	ME1401 20/-	PY110 6/-	U801 17/-
3D6 4/-	6B9 17/-	6P39 12/6	12CJ 5/6	EL120 5/-	ME1401 20/-	PY111 6/-	U801 17/-
3Q4 7/-	6B9 17/-	6P40 12/6	12CK 5/6	EL121 5/-	ME1401 20/-	PY112 6/-	U801 17/-
3Q5GT 6/6	6B9 17/-	6P41 12/6	12CL 5/6	EL122 5/-	ME1401 20/-	PY113 6/-	U801 17/-
3V4 5/-	6B9 17/-	6P42 12/6	12CM 5/6	EL123 5/-	ME1401 20/-	PY114 6/-	U801 17/-
4B32 8/6	6C4 3/6	6P43 12/6	12CN 5/6	EL124 5/-	ME1401 20/-	PY115 6/-	U801 17/-
4E27 8/6	6C5GT 6/-	6P44 12/6	12CO 5/6	EL125 5/-	ME1401 20/-	PY116 6/-	U801 17/-
4T8P 8/-	6C6 4/-	6P45 12/6	12CP 5/6	EL126 5/-	ME1401 20/-	PY117 6/-	U801 17/-
4X150A 100/-	6C6 4/-	6P46 12/6	12CQ 5/6	EL127 5/-	ME1401 20/-	PY118 6/-	U801 17/-
5R4V 9/-	6C6 4/-	6P47 12/6	12CR 5/6	EL128 5/-	ME1401 20/-	PY119 6/-	U801 17/-
5U4AG 6/6	6C6 4/-	6P48 12/6	12CS 5/6	EL129 5/-	ME1401 20/-	PY120 6/-	U801 17/-
5U8 8/-	6C6 4/-	6P49 12/6	12CT 5/6	EL130 5/-	ME1401 20/-	PY121 6/-	U801 17/-
5V4G 8/6	6C6 4/-	6P50 12/6	12CU 5/6	EL131 5/-	ME1401 20/-	PY122 6/-	U801 17/-
5Y3GT 7/6	6C6 4/-	6P51 12/6	12CV 5/6	EL132 5/-	ME1401 20/-	PY123 6/-	U801 17/-
5Z3 7/6	6C6 4/-	6P52 12/6	12CW 5/6	EL133 5/-	ME1401 20/-	PY124 6/-	U801 17/-
5Z4G 7/6	6C6 4/-	6P53 12/6	12CX 5/6	EL134 5/-	ME1401 20/-	PY125 6/-	U801 17/-
6J30L2 8/6	6D4 15/-	6P54 12/6	12CY 5/6	EL135 5/-	ME1401 20/-	PY126 6/-	U801 17/-
6A8 8/-	6D6 3/6	6P55 12/6	12CZ 5/6	EL136 5/-	ME1401 20/-	PY127 6/-	U801 17/-
6AB4 6/6	6D6 3/6	6P56 12/6	12DA 5/6	EL137 5/-	ME1401 20/-	PY128 6/-	U801 17/-
6AB7 4/-	6D6 3/6	6P57 12/6	12DB 5/6	EL138 5/-	ME1401 20/-	PY129 6/-	U801 17/-
6AC5GT10/-	6EGT 10/-	6P58 12/6	12DC 5/6	EL139 5/-	ME1401 20/-	PY130 6/-	U801 17/-
6AC7 4/-	6EA8 11/-	6P59 12/6	12DD 5/6	EL140 5/-	ME1401 20/-	PY131 6/-	U801 17/-
6AF4 10/-	6F1 14/-	6P60 12/6	12DE 5/6	EL141 5/-	ME1401 20/-	PY132 6/-	U801 17/-
6AF8G 11/-	6F1 14/-	6P61 12/6	12DF 5/6	EL142 5/-	ME1401 20/-	PY133 6/-	U801 17/-
6AC5 2/6	6F6G 5/-	6P62 12/6	12DG 5/6	EL143 5/-	ME1401 20/-	PY134 6/-	U801 17/-
6AC7 6/-	6F6G 5/-	6P63 12/6	12DH 5/6	EL144 5/-	ME1401 20/-	PY135 6/-	U801 17/-
6AF6 10/-	6F7 5/-	6P64 12/6	12DI 5/6	EL145 5/-	ME1401 20/-	PY136 6/-	U801 17/-
6AK5 5/-	6F8G 5/-	6P65 12/6	12DJ 5/6	EL146 5/-	ME1401 20/-	PY137 6/-	U801 17/-

TRANSISTORS

OC16 25/-	OC141 22/6	AF117 6/-	GET11612/-
OC23 15/-	OC170 6/-	AF118 14/-	GET872 7/6
OC24 17/6	OC171 6/-	AF124 9/-	GET876 7/6
OC26 9/6	OC200 7/6	AF125 8/6	GET878 12/-
OC26 8/-	OC201 17/6	AF126 8/-	MAT101 7/6
OC28 12/6	OC202 13/6	AF127 8/-	MAT120 8/6
OC29 14/6	OC203 10/6	AF128 12/6	MAT121 8/6
OC35 12/6	OC204 15/-	AF129 15/-	V30/30P20/-
OC42 5/-	OC205 15/-	AF130 15/-	2G309 5/-
OC43 9/-	OC206 15/-	AF131 17/-	2G371A 5/-
OC44 5/-	OC207 15/-	AF132 12/6	2G381 5/-
OC45 4/6	OC208 15/-	AF133 12/6	2G403 5/-
OC70 5/-	OC209 15/-	AF134 12/6	2N410 3/6
OC71 5/-	OC210 15/-	AF135 12/6	2N412 3/6
OC72 5/-	OC211 15/-	AF136 12/6	2N413 3/6
OC73 9/-	OC212 15/-	AF137 12/6	2N414 3/6
OC75 8/-	OC213 15/-	AF138 12/6	2N415 3/6
OC76 6/-	OC214 15/-	AF139 12/6	2N416 3/6
OC77 8/-	OC215 15/-	AF140 12/6	2N417 3/6
OC78 5/-	OC216 15/-	AF141 12/6	2N418 3/6
OC79 5/-	OC217 15/-	AF142 12/6	2N419 3/6
OC80 5/-	OC218 15/-	AF143 12/6	2N420 3/6
OC81 5/-	OC219 15/-	AF144 12/6	2N421 3/6
OC82 5/-	OC220 15/-	AF145 12/6	2N422 3/6
OC83 5/-	OC221 15/-	AF146 12/6	2N423 3/6
OC84 5/-	OC222 15/-	AF147 12/6	2N424 3/6
OC85 5/-	OC223 15/-	AF148 12/6	2N425 3/6
OC86 5/-	OC224 15/-	AF149 12/6	2N426 3/6
OC87 5/-	OC225 15/-	AF150 12/6	2N427 3/6
OC88 5/-	OC226 15/-	AF151 12/6	2N428 3/6
OC89 5/-	OC227 15/-	AF152 12/6	2N429 3/6
OC90 5/-	OC228 15/-	AF153 12/6	2N430 3/6
OC91 5/-	OC229 15/-	AF154 12/6	2N431 3/6
OC92 5/-	OC230 15/-	AF155 12/6	2N432 3/6
OC93 5/-	OC231 15/-	AF156 12/6	2N433 3/6
OC94 5/-	OC232 15/-	AF157 12/6	2N434 3/6
OC95 5/-	OC233 15/-	AF158 12/6	2N435 3/6
OC96 5/-	OC234 15/-	AF159 12/6	2N436 3/6
OC97 5/-	OC235 15/-	AF160 12/6	2N437 3/6
OC98 5/-	OC236 15/-	AF161 12/6	2N438 3/6
OC99 5/-	OC237 15/-	AF162 12/6	2N439 3/6
OC100 5/-	OC238 15/-	AF163 12/6	2N440 3/6

THYRISTORS

3/40, 400 p.i.v. 3 amp, stud mounted. Gate voltage 3-10v. at 20mA max. 7/6
BLUE SPOT, 200 p.i.v. 5 amp, stud mounted. Gate voltage 3-25v. at 120mA max. 12/6
GREEN SPOT, 400 p.i.v. 5 amp, stud mounted. Gate voltage 3-25v. at 120mA max. 17/6

MULTIMETERS

TYPE MF 15
A.C. and D.C. voltage ranges:
0.1-10-50-250-500-1000V.
D.C. current ranges:
500µA-10-100mA.
Resistance range: 100MΩ-1MΩ-Ω.
The meter is also calibrated for Inductance (10-1000H), capacity (0.01µF) and output level measurements. Sensitivity 2000Ω/V. Accuracy ±2.5% for D.C. and ±4% for A.C. measurements.
Dimension: 5 1/2 x 3 1/2 x 1 1/2 in. Price £3.30.
Type 106-IT: 24 range precision portable meter. 5000 Ω.p.v. D.C. Volts; 2.5-10-50-250-500-2500V. A.C. Volts: 10-50-100-250-500-2500V; D.C. current 9.5-50-500mA. Resistance 2000-20,000 ohms; 2-20 megohms. Power output calibration in A.C. for 600 ohms line. Complete with prods and batteries, £5.50. P. & P. 5/-.

TEXAS SILICON FULL-WAVE BRIDGE RECTIFIERS
120K10100 p.i.v. 2 amps, dimensions 1.4 x 1.4 x .5in. 25/-
120K10100 p.i.v. 4 amps, dimensions 1.4 x 1.4 x .5in. 35/-
120K10100 p.i.v. 10 amps, dimensions 2 1/2 x 2 1/2 x 1in. 85/-
Postage 1/6 per rectifier.

WE REQUIRE KLYSTRONS
TYPE 723A/B and 2K25
ALSO VALVES TYPE 813, 845, 810, 4C35, 5C22.
30/- paid subject to test

25 WATT SOLDERING IRONS

200-250 watt exceptionally well made lightweight soldering irons with polished wooden handles and chromium plated body. Angle bit of sufficient length for long life. No breakable plastics used in construction. PRICE 16/- (P.P. 2/-). Spare bits 1/6. Spare elements 3/6.

ATTENTION — SALE

Sale of second-hand test equipment, Oscilloscopes, various Units, Chassis, Sub-assemblies, Relays, certain types of surplus Valves, etc., will take place at 44A Westbourne Grove, W.2, on Saturday, 30th September. Stocks must be cleared at any price.

ONE DAY ONLY

From 9 a.m. till 6 p.m.

The following blueprints are available from stock. Descriptive text is not available but the date of issue is shown for each blueprint. Send, preferably, a postal order to cover cost of the blueprint (stamps over 6d. unacceptable) to Blueprint Department, Practical Wireless, George Newnes Ltd., Tower House, Southampton Street, London, W.C.2.

The Strand Amplifier }	(Oct. 1962)	5/-	The Celeste 7-transistor Portable Radio }	(June 1963)	5/-
The PW Signal Generator }			The Spinette Record Player }		
The Berkeley Loudspeaker Enclosure }	(Dec. 1962)	5/-	Transistor Radio Mains Unit }	(June 1964)	5/-
The Luxembourg Tuner }			7 Mc/s Transceiver }		
The PW Troubadour }	(June 1962)	7/6	The Citizen (December 1961) }		5/-
The PW Everest Tuner }			The Mini-amp (November 1961) }		5/-
The PW Britannic Two }	(May 1962)	6/-	The Beginner's Short Wave Superhet (Dec. 1964) }		5/-
The PW Mercury Six }			The Empire 7 Three-band Receiver (May 1965) }		5/-
Beginner's Short Wave Two S.W. Listener's Guide }	(Nov. 1963)	5/-	Electronic Hawaiian Guitar (June 1965) }		5/-
PW "Sixteen" Multirange Meter }	(Jan. 1964)	5/-	Progressive SW Superhet (February 1966) }		5/-
Test Meter Applications Chart }			Beginner's 5-Band Receiver }	(Dec. 1966)	5/-
			Home Intercom Unit }		

PLEASE NOTE THAT WE CAN SUPPLY NO BLUEPRINTS OTHER THAN THOSE SHOWN IN
★ THE ABOVE LIST. NOR ARE WE ABLE TO SUPPLY SERVICE SHEETS FOR COMMERCIAL ★
RADIO, TV OR AUDIO EQUIPMENT.

Before using the query service it is important to read the following notes:

The PW Query Service is designed primarily to answer queries on articles published in the magazine and to deal with problems which cannot easily be solved by reference to standard text books. In order to prevent unnecessary disappointment, prospective users of the service should note that:

(a) We cannot undertake to design equipment or to supply wiring diagrams or circuits, to individual requirements.

(b) We cannot undertake to supply detailed information for converting war surplus equipment, or to supply circuitry.

(c) It is usually impossible to supply information on imported domestic equipment owing to the lack of details available.

(d) We regret we are unable to answer technical queries over the telephone.

(e) It helps us if queries are clear and concise.

(f) We cannot guarantee to answer any query not accompanied by the current query coupon and a stamped addressed envelope.

QUERY COUPON

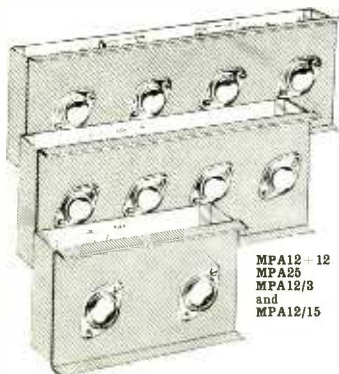
This coupon is available until 8th September, 1967 and must accompany all queries in accordance with the rules of our Query Service.

PRACTICAL WIRELESS, SEPTEMBER 1967

31 LEO

NEW SOLID STATE HIGH FIDELITY EQUIPMENT★★★

IMPROVED PERFORMANCE · NEW STYLING · NEW MODELS · MONO & STEREO



MPA12+12
MPA25
MPA12/3
and
MPA12/15



MP3



SP4

MP3. Mono preamplifier. All silicon low noise zener stabilized circuit. Full range of controls—fully equalised inputs for xtal p.m., dynastatic mks, radio tuners, tape head and preamp, replay. Supplied built and tested on metal chassis complete with grey silver front panel, alu. knobs and handbook. Output 250 mV. Supply 12 to 60 volts 3 mA. Overall size 9 1/2 x 1 1/2 x 1 1/2 in.

MP3 Price £6.19.6, P.P. 3/-

SP6-2. Mono-stereo preamplifier. Uses 8 silicon/germanium devices. Zener stabilised. Completely new low noise design. Full range of controls and filters. Inputs for magnetic/xtal/ceramic cartridges, radio tuners, tape preamp, microphone, tape head, etc. Record output socket. Supplied built and tested on metal chassis with grey/silver front panel and matching knobs. Complete with input sockets and handbook. Output 250 mV per channel. Supply 9 to 60 volts 4 mA. Overall size 12 x 3 1/2 x 3 1/2 in.

SP6-2 Price £14.19.6, P.P. 5/-

SP4. Mono/stereo preamplifier as previously advertised. Complete with front panel and knobs. Size 9 x 8 1/2 x 1 1/2 in.

SP4 Price £10.19.6, P.P. 3/6

MPA12/3 and MPA12/15. 12 watt power amplifiers for use with above preamplifiers. Improved response and performance with even lower distortion levels. MPA12/3 for 3 to 5 ohm speakers, 24/28 volt supply. MPA12/15 for 10 to 16 ohm speakers, 40/45 volt supply, uses 8 silicon and germanium devices. Inputs 100mV for 12 watts, response 1 dB, 30 c/s to 20 kc/s, THD 0.2% at 12 watts. High gain stable push-pull output designs. Built on to metal chassis as illustrated. Overall size 5 x 2 x 3 1/2 in. Complete with handbook.

MPA12/3 Price £4.10.0 P.P. 2/6

MPA12/15 Price £5.5.0, P.P. 2/6

MPA12-12. Twin amplifier for mono/stereo use with above preamplifiers. Consists of two matched MPA12/15 amplifiers (see above) on single chassis. Output for 10 to 16 ohm speakers, 40/45 volts supply. Overall size 10 x 2 x 3 1/2 in.

MPA12-12 Price £9.19.6, P.P. 4/-

MPA25. 25/30 watt power amplifier for use with above preamplifiers. New design and layout with improved response and overall performance. Output for 7 1/2 to 16 ohm speaker systems. Input 180 mV. for full output. Push-pull circuit. Uses 10 silicon and germanium devices. Supply 50/60 volts. Overall size 8 x 2 x 3 1/2 in.

MPA25 Price £7.10.0, P.P. 3/6

XP2. MAG/Pu., tape head, 50 k/mic silicon preamp moduli. 45/-, P.P. 1/6.

X84. Stereo version 70/-, P.P. 1/6

All models suitable for use with most other types of valve or transistor equipment—Alternately use one of the recommended systems.

**THE FINEST VALUE IN HIGH FIDELITY—FULLY GUARANTEED
CHOOSE A SYSTEM TO SUIT YOUR NEEDS AND SAVE POUNDS**

NEW SCOOP CAR RADIO OFFER

BRITISH MADE £7.19.6 P.P. 4/6



WE CAN SUPPLY FROM STOCK MOST OF THE PARTS SPECIFIED ON CIRCUITS IN THIS MAGAZINE. SEND LIST FOR QUOTATION.

OR BETTER STILL—BUY THE NEW 1967 CATALOGUE. EVERYTHING YOU NEED IS LISTED AND AVAILABLE FROM STOCK.

SEE PAGE 375 FOR FURTHER RANGE OF STOCK ITEMS

Globemaster as previously advertised to build £7.19.6 p.p. 4/-

TOURMASTER TRANSISTOR CAR RADIO British Made

7-Transistor MW/LW Car Radio. 12 volt operated, 3 watt output. Push-button wave change. RF stage. Supplied built boxed ready to use with Speaker and Baffle. Car fitting kit and manufacturers' current guarantee. Special Bargain Offer. Buy Now! LIST PRICE 15 GNS. **£7.19.6** 4/6

Push button version £11.19.6, P.P. 4/6.

REGENCY MW/LW POCKET RADIO TO BUILD

6-Transistor superhet. Geared tuning. Push-pull speaker output. Molded cabinet 5 x 3 x 1 1/2 in. Phone socket. **TOTAL COST TO BUILD 69/6**, P.P. 2/-. Circuit and details on request.

PW TRANSFILTER PORTABLE (July 67)

Transfilters—(both types) 9/6 each. Most other parts in stock.

PW AND PE DESIGNS to build yourself

Explorer (see chassis) 79/6; Explorer (with chassis) 99/6; Multi-band Superhet £10.10.0. Photo Flash valve (unit 42/6. Solid state version £5.19.6, P.P. 2/6 extra any model S.A.E. parts list on request.

VHF FM TUNER TO BUILD

87-103 Mc/s Transistor Superhet. Geared tuning. Terrific quality and sensitivity. For valve or transistor amplifiers. 4 x 3 1/2 x 2 1/2 in. Complete with dial plate, 5 Mullard Transistors. Plus 4 Diodes, 6/6p. Assembly 20/- extra! Lead on **£6.19.6** P.P. 2/6. **Total Cost to Build £6.19.6** 2/6

FM STEREO DECODER

7 Mullard Transistors. Printed Circuit Design with Stereo Indicator. For use with any valve or transistor FM. Uses pot cores to Mullard design and germanium and silicon transistors. Lead on request. As used by B.B.C. and G.P.O. **Complete Kit Price £5.19.6** 2/-

BUILD A QUALITY 2 OR 4 TRACK TAPE RECORDER

3-speed version using '383' decks
● TWO-TRACK. Deck £10.10.0. Martin Amplifier £14.19.6. Cabinet and speaker 7 gns. Complete kit with FREE 7m. 1200ft. tape spare spool. **27 gns.** P.P. 15/-
● FOUR-TRACK. Deck £13.10.0. Martin Amplifier £15.19.6. Cabinet with speaker 7 gns. Complete kit with FREE 7m. 1200ft. tape spare spool. **30 gns.** P.P. 15/-
Today's Value £50.

STABILISED POWER UNIT MODEL SP9/12

Mains input. Output switched 9 or 12 volts 100 mA. less than 1 volt variation. Fully protected. **PRICE 65/-**, p.p. 2/6.

MAYFAIR PORTABLE ELECTRONIC ORGAN

Now available as

- Complete kit of parts
- Built and tested
- Prebuilt assemblies

Reverberation units & recommended speakers and amplifiers in stock

Designed by L. W. Roche

Straightforward to build and tune—easy to play—fully guaranteed. All parts available separately—astounding value and performance. Start building for as little as £5.

- Plug-in printed circuits ● 170 transistors and devices ● 10 selected tone colours ● Fully sprung keyboard ● Vibrato ● 6 Octaves of generators ● Simple locked-in tuning ● 110/250 volt mains unit ● Cabinet size 30 1/2" x 15 1/2" x 9" ● Weight 35 lb. Cabinet with detachable legs, music stand and foot swell pedal ● Fully detailed building manual with photos, drawings and full circuits.

COMPLETE RANGE OF ORGAN PARTS IN STOCK.

H.P. FACILITIES AVAILABLE.

TRADE/EXPORT SUPPLIED.

FULLY DETAILED LEAFLET AND PRICE LIST ON REQUEST

Call for demonstration and play the Mayfair

RELAYS, MOTORS, SWITCHES, MINIATURE COMPONENTS, TRANSISTORS AND DEVICES

Complete range in stock all types for every purpose. Also panel and multimeters, precision components, radio control crystals and parts. Everything you need for amateur and professional applications—see 1967 catalogue. The largest range in the country. Suppliers of quality components and equipment for over 20 years.

LISTS AVAILABLE

- (incorporated in full catalogue)
● Transistors / Rectifiers / 80 R's / Valves
● Crystal-Zeners etc. 24 pages 1/-.
● 4-page high stock list with discounts.
● All popular makes. Free on request.
● Car radio and tape recorders. Free.
● Organs and components list. Free.

1967 CATALOGUE

Have you a copy? Fully detailed and illustrated. Over 200 pages of components equipment etc. Over 5,000 stock items. FULLY DETAILED AND ILLUSTRATED. PRICE 3/6, post paid. 5 Free discount vouchers value 10/- with every catalogue.



HENRY'S RADIO LTD.

303 EDGWARE RD., LONDON, W.2
PA 8Dington 1008/9 (8TD) 01-723 1008)
Open Mon. to Sat. 9-6. Thurs. 1 p.m.
Open all day Saturday

200 PAGES—PLUS!