PRACTICAL WIRELESS

1/6

DECEMBER 1960

EXTRA inside! SPECIAL 16-PAGE SUPPLEMENT

The P.W. Constructor's Guide

Mains-operated Model Control Transmitter

WIDE RANGE SIGNAL GENERATOR

MODEL SWO-300 150 kc/s, 300 Mc/s

The Model SWO-300 is an outstanding instrument specially designed to cover the wide frequency range from 150 kc/s–300 Mc/s, which covers all the requirements of equipment in general use.

Specification:
Frequency Range: 150 kc/s–150 Mc/s on fundamentals (6 bands), 150 Mc/s–300 Mc/s on harmonics. Calibration Accuracy: within ± 1 per cent. Modulation: Internal and external. Attenuation: To —40db. Output: Facilities for high and low. Power Supply: Internal 230 v. A.C. Size 7 x 10 x 5in.

FULLY GUARANTEED Only £14.19.6 P. & P. 5/6.

HI-FI HEADPHONES

These miniature Hi-Fi phones use high quality permanent magnetic speakers with regulated voice coil. The soft rubber ear moulds give correct spacing for optimum acoustic load. Each unit has a built-in miniature Hi-Fi transformer to ensure the finest music and voice reproduction. Supplied free is a small transformer unit which steps impedance up to 4000 ohms. Only 15/-. P. & P. 2/6.

MICROPHONES. BRAND NEW. Throat magnetic 4/6; Throat carbon 3/6; No. 8 carbon with switch 6/6; No. 7 moving coil 7/6. Tannoy power mikes only 5/-. Crystal mike 22/6.

HOOVER ROTARY TRANSFORMERS

12 v. input, 500 v. output at 65 mA. or 6 v. input, 250 output at 75 mA.

Only 10/6 EACH P. & P. 2/-.

POCKET MULTI-METER, BRAND NEW. 2,500 o.p.v. Multi range 6/30/120/300/1,200 v. A.C., ditto D.C. 0-1K., 0-1 megohm: 400 Micro-A., 12 mA. 300 mA —00 to +64 db 5 ranges; 3in. x 4¼in. x 1¼in. Large clear dial. Leads supplied. Our Price 70/-. p.&p. 2/6.

COMPLETE HEADPHONE & MICROPHONE ASSEMBLY. A must for every constructor and "Ham", consists of moving coil padded headphones and "press to talk" microphone. 10/-. P. & P. 3/6.

1 mA METER, 2in. round. 17/6. P. & P. 1/6.

POCKET VOLT TEST METER

Two D.C. ranges: 0-250 v. and 0-25 v. Complete with test prods, and leather case. Very limited quantity. Only 12/6. P. & P. 1/6.

NEW!

SUPER MINIATURE EARPHONE FOR TRANSISTOR CIRCUITS

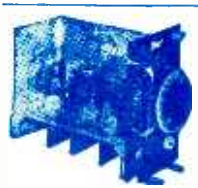
Here is a really sensitive dynamic earphone of exceptionally fine quality. This lightweight miniature earpiece is convenient and comfortable to wear. The practically invisible cord is connected to the earphone. Provides clear reproduction of music as well as speech. Fully Guaranteed and supplied complete with transparent ear insert, 3 feet cord, sub miniature plug and socket.

Model CR.5 Crystal Earpiece, high imp. .. 8/- P.&P.
Model MR-4 Magnetic Earpiece, low imp. .. 7/- 1/-

PORTABLE TRANS/RECEIVER SETS

Consisting of trans-receiver covering 7.4-9 Mc/s. range up to 10 miles. complete with 5 valves, headphones, microphone, junction box and 6ft. telescopic aerial. Only requires 120 v. and 3 v. dry battery.

ONLY 60/- Per Set P. & P. 4/-. Batteries 20/- per Set



TWO FOR £6 Post Free.

R.F. CONVERTORS

R.F.24. 20-30 Mc/s. switched tuning 22/6.
R.F.25. 40-50 Mc/s. switched tuning 8/6.
R.F.27. 65-85 Mc/s. variable tuning 29/6.
Circuits supplied. P.&P. 3/6 on ea.

TWO TRANSISTOR POCKET RADIO with Miniature Speaker

Anyone can build it!

This powerful pocket radio gives reception over the entire broadcast band. Complete with all parts, including 2 transistors, exclusive ferrite rod, miniature speaker tuning condenser, plastic case, wiring diagram, and step by step instructions. Size 4 x 3 x 1in. **ONLY 27/6.** P.&P. 1/6. Battery 1/- extra.

SPARE VALVE KIT. Here's a gift for all 38 and 18 Set owners! Case containing ARP12 & 1 ATP4 valves. Only 10/-. P. & P. 2/6.

U.S.A. WHIP AERIALS. 12ft. 12/6. P. & P. 2/6.

CRYSTAL DIODES 6/- per doz. P. & P. 1/-.

ACCUMULATORS. 2 volts 16 A.H. (unspillable). Ideal for 6 and 12 volts supply, etc. Brand new. Original cartons. Size 4in. x 7in. x 2in. 5/6 each. P. & P. 1/6, 3 for 15/-. P. & P. 3/6. 6 for 27/6. P. & P. 5/-.

PRECISION 1% RESISTORS Manufactured by Electrothermal, we offer the following values: 100K. 500K. all ±1% 1 watt. 1/6 each; 20/- per dozen.

CONTROL BOX-B.C.602.

Complete push-button control box. 4 position and on/off with dual coloured indicators for instant channel check. In black crackle case 5¼in. x 3¼in. x 1¼in. Bargain price 5/- each. P. & P. 1/6. Two for 8/-. P. & P. 2/6.

VARIABLE TRANSFORMERS

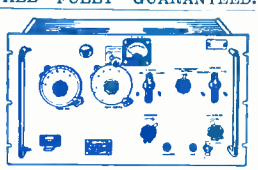
Input voltage 230 v. continuously variable output from 0-260 v. Supplied complete. Model B.5 Current rating 5 amps. £9.
Model B.10 Current rating 10 amps. £18.5.0
Model B.20 Current rating 20 amps. £32.10.0
ALL FULLY GUARANTEED.

POLICE - AIRCRAFT - HAM RECEIVER 1392

Frequency range 90–150 Mc/s. I.F. freq. 5 Mc/s. Complete with tuning meter, 14 valves: 2—R.F., 3—I.F., B.F.O., A.G.C., Audio, Crystal controlled with separate R.F. and oscillator tuning. R.F. and Audio controls, B.F.O. tone control. Oscillator and Audio signal fully metered. Power requirements 250 v. H.T., 6.3 v. L.T. Complete with circuit diagram.

PRICE COMPLETE ONLY **£6.5.0**

Carriage 15/-

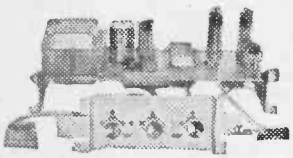


Relda Radio

Callers: 87 TOTTENHAM COURT ROAD, LONDON, W.1
Mail Orders: (DEPT. P), 32a COPTIC STREET, LONDON, W.C.1
Telephone: MUSeum 9607

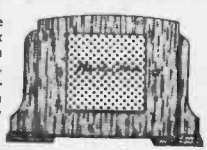
HARVERSON SURPLUS CO. LTD.

MONAURAL AMPLIFIER



This amplifier as illustrated, made by a leading manufacturer. Mullard valves—ECC83, EL84 x EL84. EZ80. Bass Treble and Volume on remote panel. Elegant Knobs. OUR PRICE one month only **£4.16.6** plus P. & P. 3/6.

EXTENSION SPEAKER



An attractive cabinet 8 x 6 x 2in. fitted with 3 ohm 5in. speaker complete with lead, a few only. **19/6** P. & P. 2/6.

STEREOPHONIC AMPLIFIER £5.10.0

Complete with 2 Loudspeakers

Plus 4/6 P. & P.

This is a compact amplifier embodying the latest features and giving a high standard of reproduction, with ample volume. Supplied complete with valves (ECL82, ECL82, EZ80), panel, knobs, etc., and two specially selected 3Ω matched loudspeakers. We only have a few, and we will never be able to repeat this offer at such a low price! Don't risk disappointment! Order now!

1/6 H.P. MOTOR

140 Watt (Approx. 1/6 H.P.). Series wound, 220/250 volt 50 cycle motor. Off load 14,000 rev/min. on load 8,500 rev/min. Ideal small saw, sewing machine, etc. P. & P. 3/-. **30/-**

CONDENSER/RESISTOR PARCEL

50 mixed P.F. Condensers and 50 mixed Resistors. An assortment of useful values. All popular sizes—all new—a must for the serviceman and constructor. **ONLY 10/-.** P. & P. 1/-.

RECTIFIERS FOR BATTERY CHARGERS

12 v. 1 amp.	4/3	12 v. 4 amp.	12/6
12 v. 2 amp.	7/-	12 v. 5 amp.	14/6
12 v. 3 amp.	10/-	P. & P. 6d.	

TRANSISTOR BARGAINS

ALL MULLARD FIRST GRADE

OC71	8/-
OC72	12/-
OC72 Matched Pair	25/-
OC45 Green Spot	15/-
OC45 Blue Spot	15/-
OC44	15/6
SB305 Semi Conductor	10/6
OA41 Diode	3/6

★ Postage on all the above 6d.

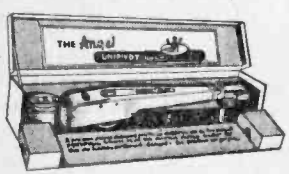
YOU ARE INVITED!

Spend a day browsing around our premises at **83 HIGH ST., MERTON, S.W. 19** (*one minute South Wimbledon Tube*).

We have a wealth of components, valves, chassis, tape decks, autochangers, amplifiers, F.M. tuners, record players, tape recorders, cabinets, and a whole host of other things we just don't have the space to describe. Please come and look for yourself. We will be pleased to see you, and there's no obligation to buy.

BARGAINS IN GRAM & TAPE EQUIPMENT

THE WORLD FAMOUS E.M.I. ANGEL TRANSCRIPTION P.U. (Model 17A)



A Pick-up for the connoisseur originally priced at £17.10.0. The last remaining few offered at **£4.10.0** Plus P. & P. 5/-.

PICK-UP CARTRIDGE BARGAINS

STUDIO P	17/6
ACOS HIGH G.	17/6
E.U. POWER POINT ...	12/6
RONETTE	18/6
G.C.Z.	16/6

P. & P. 1/-.

RECORD CHANGERS

GARRARD	RC 98 Mk. 4H.	4-speed autochanger	£16.10.0
	RC 120/D Mk.2	,, ,,	£9. 0. 0
	RC 120 Mk.4D	,, ,,	£9. 0. 0
	RC 120 Mk.4H	,, ,,	£9. 0. 0
	RC 121 Mk.1	,, ,,	£11.0. 6
	RC 121 Mk.4H	,, ,,	£11.0. 6
	RC 121/40 Mk.2	,, ,,	£11.0. 6
COLLARO	RC 54	4-speed autochanger ...	£6.19. 6
	RC 594	,, ,, ...	£7.19. 6
	Conquest	,, ,, ...	£6.12. 6
	Challenger	,, ,, ...	£7.19. 6
B.S.R.	Monarch UA8 4-speed autochanger		£6.19. 6
	TU8 4-speed single player less pick up		£2.10. 0

NOTE: Any of the above with Stereo Cartridge and Fittings, 16/- extra. Carriage and ins. on each of above 5/- extra.

TAPE DECKS

LATEST B.S.R. MONARDECK (single speed) 3¾in. per sec., simple control, uses 5¾in. spools.....**£9.19.6**
plus 5/6 carriage and insurance (tapes extra).

COLLARO STUDIO DECK piano key controls, pause control, space for additional head, uses 7in. spools, with counter.....**£14**
plus 6/- carriage and insurance (tapes extra).

WE HAVE A LARGE RANGE OF READY-BUILT RECORD PLAYERS AND TAPE RECORDERS (BOTH STEREO AND MONAURAL) AT BARGAIN PRICES

83 HIGH STREET, MERTON, S.W.19

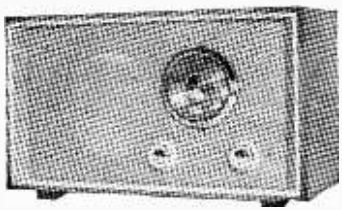
CHErrywood 3985/6/7

MIDGET GRAM AMPLIFIER READY-BUILT with Speaker

A 2½ watt gram amplifier, fitted with bass, treble, and vol./on-off controls. Supplied complete with 6 x 4in. 30 speaker, valves (UY85, UF89, UL84), knobs, etc., all mounted on an attractive baffle board, size 10½ x 7½ins.

OUR PRICE ONLY **49/-** P. & P. 3/-.

HARVERSON T.R.F. EASY FOUR KIT



All parts and theoretical wiring diagram only.
OUR PRICE **£4.0.0.** Plus P. & P. 3/6

HARVERSON SUPERHET 4 KIT

A medium and long wave superhet, incorporating two I.F. stages modern B9 valves (UCH81. UBF89. UCL83, U785). built-in ferrite rod aerial.All you need supplied, from theoretical wiring diagram to last nut and bolt (main components ready mounted), including an attractive contemporary styled cream plastic cabinet with gold trimmings. Size 11½ x 4½ x 6½in. PRICE **£6.12.6.** Post 3/6

AM/FM RADIOGRAM CHASSIS

★ By famous manufacturer. ★ 220/250 volts A.C. ★ Coverage 1000-1900 m, 200-500 m, 88-98 Mc/s. ★ Tuned by 5 "Piano Keys"—Off, LW, MW, FM and Gram. ★ Sockets for P.U., Ae, E, Extn. Spkr. and Dipole. ★ Tuning and tone controls fitted. ★ Valves, ECH81, EF89, EABC80, EL84, ECC85 and EZ80. **50 Only at ridiculous price of 12 gns.** plus 8/6 P. & P.

TAPE RECORDER

★ CONTEMPORARY Red and White Tygan Cabinet. Size 13½ x 14½ x 9½ inches.
★ B.S.R. DECK.
★ MAGIC EYE tuning.
★ INPUTS for RADIO and MIKE.
★ VOLUME and TONE Controls.
This instrument has to be seen and heard to be believed.
Complete with ACOS Xtal Mike. ONLY 18 gns.
P. & P. 8/6

GUARANTEED VALVES ★ NEW and BOXED ★ PROMPT DESPATCH ★ POST 6d. per valve extra

ACHLDD	9/3	EBC41	8/9	EF91	5/6	KLL32	8/-	PL81	11/9	U76	7/6	VU111	2/3	5Z4M	9/6
AC/P	7/-	EBF80	9/-	EF91(BVA)	8/6	KT2	4/6	PL82	8/-	U191	10/6	W21	11/9	6A7	10/6
AC/P4	7/-	EBF89	9/-		8/6	KT24	4/6	PL83	11/-	U339	11/9	W76	7/-	6A8G	8/6
AC5PEN		EBL21	22/-	EL32	4/3	KT32	9/3	PX25	11/9	U403	15/6	W77	8/-	6AC7	6/-
DD	25/9	EBL31	22/-	EL33	13/-	KT33C	8/-	PY80	7/-	U404	10/6	W729	9/9	6AG5	5/3
AC6PEN	6/-	ECC81	7/6	EL34	24/6	KT36	28/-	PY81	8/-	U801	23/-	X22	16/9	6AK5	6/-
ACVP1/3	9/3	ECC82	7/-	EL42	9/6	KT61	9/6	PY82	6/8	UABC80	9/6	X41C	16/9	6AL5	6/-
ATP4	3/3	ECC83	8/6	EL81	15/6	KT63	7/-	PY83	8/-	UAF42	8/9	X101M	11/6	6AM5	11/9
AZ1	9/3	ECC84	9/3	EL84	8/6	KT66	16/-	PZ30	18/6	UBC41	8/6	Y63	8/6	6AM6	4/6
AZ31	11/2	ECC85	9/-	EM84	8/9	KT88	21/-	PEN4DD		UBF80	8/9	Z21	9/9	6AQ5	7/-
B36	14/-	ECF80	11/3	EM80	9/3	KTW61	6/-		25/-	UCC84	10/-	Z309	7/-	6AT6	8/-
CBL31	22/9	ECF82	12/3	EM81	9/6	KTW63	7/-	PEN4VA		UCC85	10/6	Z359	7/-	6AU6	9/9
CCH35	22/9	ECH21	22/-	EY51	9/3	KTZ41	3/3		14/-	UCF80	15/6	1A3	3/-	6B8G	3/9
CL4	11/9	ECH42	9/-	EY86	9/3	MH41	6/6	PEN25	5/6	UCH42	9/9	1A5GT	5/6	6BA6	7/-
CL33	18/-	ECH81	8/6	EZ40	7/-	ML4	8/-	PEN46	6/6	UCH81	9/9	1A7GT	11/9	6BE6	7/6
CY31	15/9	ECL80	9/3	EZ41	7/-	MS4B	16/-	PEN383	22/-	UCL82	15/6	1C2	11/-	6BG6G	22/-
CY73	5/9	ECL82	9/9	EZ80	6/6	M8P4/5	7/-	PEN220A		UCL83	11/6	1C5GT	11/9	6BH6	8/6
C36A	6/-	EF22	8/-	EZ81	6/6	M8P4/7	7/-		3/9	UF41	8/6	1D5	11/9	6BJ6	9/6
DAF96	8/3	EF36	4/6	EZ90	7/-	MV8/PEN		PEN45DD		UF85	8/6	1D6	11/9	6BR7	11/9
DF96	8/6	EF37A	14/-	E1148	1/9		9/3		25/-	UF89	8/6	1H5GT	10/-	6BW6	8/6
DH63	11/6	EF39	5/3	FC13	6/-	MX40	16/-	PENA4	14/6	UL41	9/6	1L4	6/-	6BW7	8/-
DH101	11/6	EF40	13/6	FW4/300	9/3	N37	18/6	PM12M	7/6	UL44	25/-	1LD5	3/-	6C4	3/9
DK96	8/6	EF41	9/3	GTIC	25/6	N78	18/6	QP21	4/6	UL46	25/-	1N5	9/9	6C5GT	6/-
DL96	8/6	EF42	10/3	GZ32	11/-	N339	28/-	R16	25/-	UL84	8/6	1R5	7/-	6C6	4/6
DL145	9/3	EF50	3/9	H30	4/6	OZ4	5/-	SP41	2/9	UU6	18/6	1S4	9/9	6C31	7/-
DM70	7/-	EF50(8YL		H63	9/3	P61	3/3	SP61	2/9	UU8	25/-	1S5	6/-	6CD6G	28/-
DN41	16/6		6/6	HL23DD	8/-	PCC84	8/6	SP4/5	9/9	UY1N	11/9	1T4	5/6	6D6	4/6
EA50	1/3	EF54	5/6	HL22	6/-	PCF80	9/-	SP4/7	9/9	UY21	11/9	2C26	1/3	6CH6	9/9
EABC80	8/6	EF55	9/3	HL41	3/3	PCF82	11/9	T41	22/-	UY41	7/-	2P	25/-	6F6G	7/-
EAF42	9/6	EF80	7/-	HN309	23/-	PCL82	11/6	TDD13C	7/-	UY85	6/6	2X2	4/-	6F6M	7/-
EB34	1/9	EF85	7/-	K40N	8/6	PCL83	13/6	TH233	17/6	VP13C	3/3	3A4	6/8	6F1	13/-
EB41	8/-	EF86	11/6	KF35	8/-	PL38	16/8	TP22	7/6	VP23	6/-	3A8GT	5/6	6F13	13/-
EBC33	6/3	EF89	8/-	KK32	20/6	PL36	14/6	TP25	25/-	VP41	8/-	3D6	4/6	6F15	13/-
								U10	9/9	VP133	14/-	3Q4	7/6	6F17	11/9
								U14	8/-	VR22(PM	2A) 2/9	3Q5GT	9/-	6F33	16/6
								U16	8/-			3S4	7/-	6H6	2/3
								U16	11/9	VR105/30		3V4	8/-	6H6GT	2/3
								U17	11/9		7/8	4D1	2/9	6J5GT	4/6
								U22	7/6	VR116	3/9	5R4GY	9/-	6J5M	6/-
								U25	13/-	VR150/30		5U4G	6/3	6J6	5/6
								U26	11/9		7/-	5V4	10/9	6J7G	6/-
								U37	25/-	VU120A	3/3	5Y3G	7/6	6J7M	8/6
								U45	14/-	VU39(MU		5Y3GT	7/6	6K7G	3/9
								U50	7/6	12/14)	8/6	5Z4G	8/6	6K7M	6/3

6K8G	7/-	7B6	9/9	12K8GT	18/-	30PL1	11/9								
6K6GT	6/6	7B7	8/-	12Q7GT	7/-	35L6GT	9/3								
6K7GT	5/6	7B8	8/6	12SG7	7/-	25Y5	9/3								
6K8GT	9/9	7C5	7/6	12SH7	5/6	35W4	7/-								
6K25	18/6	7C6	7/6	12SJ7	5/6	35Z4GT	7/6								
6L1	14/6	7D6	12/6	12SK7	5/6	42	7/6								
6L6G	7/6	7H7	8/6	12SN7	7/6	35Z3	15/6								
6L6M	9/-	7Q7	8/6	12SL7GT		35Z5GT	8/6								
6L7G	7/-	787	9/-		14/-	50C5	10/9								
6L18	10/3	7Y4	8/-	12SQ7	8/-	50CD6G									
6L19	14/-	8D2	2/6	14S7	15/9		28/6								
6N7GT	7/-	9D2	3/3	15D2	7/3	50L6GT	8/-								
6P28	25/-	10C1	11/9	19AQ5	9/-	75	10/9								
6Q7G	7/-	10C2	16/9	19BG6G	3/-	77	7/-								
6Q7GT	9/-	10F1	14/8	20D1	5/-	80	8/-								
6SA7GT	7/6	10F9	14/6	20F2	25/-	142BT	3/3								
6SH7	7/-	10L1	9/-	20L1	25/-	185BT	30/-								
6SJ6	5/6	10LD11	9/6	20P1	25/-	210DDT	4/3								
6SJ7	8/-	10P13	16/6	20P3	22/-	210VPT	3/3								
6SK7	5/6	10P14	18/-	20P4	25/-	83	9/9								
6SL7GT	7/6	12A6	3/-	20P5	22/-	301	9/9								
6SN7GT	7/-	12AT6	10/-	25A6G	9/9	302	9/9								
6SQ7	8/9	12AT7	7/-	25L6GT	9/6	304	9/9								
6U4GT	11/3	12AU6	7/6	25Z4	9/-	305	9/9								
6U5/6G5	7/-	12AU7	7/6	25Z5	7/6	306	9/9								
	16/-	12AX7	7/6	25Z6	9/6	807	6/-								
6U5G	8/-	12BA6	8/6	27SU	18/6	954	1/9								
6U7G	8/-	12BE6	8/6	30C1	9/9	955	3/9								
6V6G	5/6	12C8	8/6	30F5	9/9	956	3/3								
6V6GT	7/3	12E1	32/6	30FL1	9/9	5763	10/9								
6X4	7/-	12H6	3/3	30L1	18/6	9002	5/-								
6X5G	6/6	12J5GT	2/9	30P4	19/-	9004	5/-								
6X5GT	6/6	12J7GT	10/-	30P12	11/9	9006	5/-								
6F15	13/-	6X5GT	6/6	12J7GT	7/-	30P16	9/-								
6F17	11/9	6/30L2	11/9	12K7GT	7/-										
6F33	16/6														

SPEAKER FRET

Super quality heavily woven fret, 54 inches wide. Usual price 50/- per yard. P. & P. 1/-
OUR PRICE **19/6** per yard.

MIDGET I.F. TRANS & COILS

A pair of midget 465 kc/s I.F. transformers, plus LW and MW coils. OUR PRICE 10/- per set. P. & P. 1/9. Set of I.F. transformers for transistor superhet. 9/-. P. & P. 1/9.

CYLDON 12 CHANNEL TURRET TUNERS

New purchase offered at still lower price. I.F. 33-38 Mc/s. Complete with PCC84 and PCF80 valves and 8 sets of Coils for 5 Band I channels and 8, 9, 10 Band III. New and unused. Value over £7.
OUR PRICE, Post paid **32/6**

MINIATURE AMPLIFIER

Miniature amplifier, size 3¾ x 2½ x 4½ins. Ideal for record player, etc. Controls, volume/on-off, bass and treble. Supplied ready built, less valves (UY85, UF89, UL84), and mains transformer, at the give away price of **14/-** P. & P. 2/6.

COSSOR C.R.T. SNIP

108K 10-inch. New and boxed, 15/-, plus 6/- P. & P.
75K 10-inch. New and boxed, 15/-, plus 6/- P. & P.

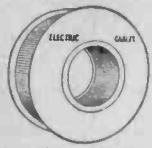
ION TRAP MAGNETS

To suit the above, 2/9 each.
P. & P. 3d.

A.C./D.C. Multimeter Kit

Ranges: D.C. volts 0-5, 0-50, 0-100, 0-500, 0-1,000 A.C. volts 0-5, 0-50, 0-100, 0-500, 0-1,000 D.C. milliamps 0-5, 0-100, 0-500. Ohms 0-50,000 with internal batteries. 0-500,000 with external batteries. Measures A.C./D.C. volts, D.C. current and ohms. All the essential parts including metal case, 2in. moving coil meter, selected resistors, wire for shunts, range selector, switches, calibrated scale and full instructions, price 19/6, plus 2/6 post and insurance.

Versatile Wire



Single-strand 18-gauge with P.V.C. covering which makes it rustproof. Extra strong, will stand tremendous strain. Ideal for gardening, clothes lines, indoor aerials, etc. etc. Also being steel alloy and having a resistance of approximately ¼ ohm per yard this can be used for electrical work, soil heating, wrapping round water pipes, etc. New on drum containing 3,000ft. Price 8/6, plus 3/6 carr.

Welding Transformer

Output 2/3 volts by highand low switch. Continuous rating 25 amps. Intermittent for spot welding exceeds 2,000 amps. Unused slightly soiled, but perfect working order. £3.10.0 plus 3/6 carriage.

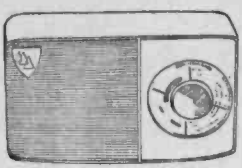
TV Workshop Aids

E.H.T. SEALER. Apply with soldering iron. Stops corona discharge, etc. 2/6 per stick.
POLYTHENE TAPE. 2in. x 10 thou. for E.H.T. insulation up to 25 kV. 5/- per 20ft. roll.
SPONGE STRIP. ½in. x ½in. For sealing or cushioning. 9d. per foot.
ANTI-STATIC SCREEN CLEANER For TV tubes and screens. Perspex or glass. Delays accumulation of dust. 3/- per tube.
CELLULOSE CEMENT. Specially prepared for radio gluing of metal, glass, cermaic, wood, fabrics. 4/6 per tin.

1960 ALL Mains Amplifier

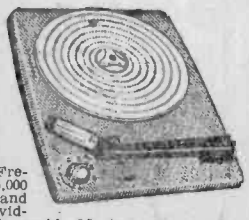
Undoubtedly finest value obtainable in amplifiers—powerful three valve circuit ideal for dances, parties, etc. Complete with valves, mains, transformers, volume and tone controls, but less chassis, speaker and cabinet. Price only 29/6, plus 2/6 post and ins. Data free with parts or available separately 1/6.

TRANSISTOR LOUDSPEAKER RADIOS



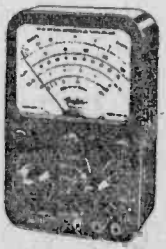
To build yourself—anyone can do it! **Pocket 4** uses three transistors and a diode, complete cost 42/6 plus postage and insurance.
Pocket 5, much louder, uses four transistors and diode, complete cost 55/-, plus 2/6 postage and ins.
Each complete to last nut and bolt with **proper cabinet, with proper tuning condenser** and **miniature loudspeaker.** Batteries available (10d. extra) and solder (1/-) are definitely only other items needed. Our circuits are completely portable and **do not need any aerial,** also SERVICE AT MODERATE CHARGES IS AVAILABLE SHOULD YOU GET INTO DIFFICULTIES. Demonstrations gladly. Money back guaranteed. S.A.E. for additional details.

PHILIPS TRANSCRIPTION UNIT

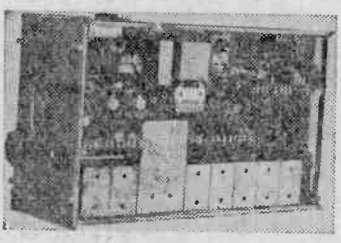


Philips AG 2009 Record Player, 4 speed. Ideal for the enthusiast. Pick-up arm wired for stereo, fine adjustment on all four speeds. Continuously variable pick-up weight (2.12gms.). Supplied with Philips Hi-Fi crystal type AG3019 for micro-groove and 78 r.p.m. Frequency response 30-15,000 c/s. Pick-up lifting and lowering device. Individually balanced heavy turntable. Muting switch. Can be used with any amplifier or radio set. Complete with monaural pick-up £10.10.0, or 2 gns. deposit and 20 fortnightly payments of 10/-. Available also with stereo head, diamond or sapphire stylus. Prices on request.

The Taylor Meter
Model 127A



A pocket size meter but with a big scale and a sensitivity of 20,000 Ohms per volt D.C., therefore an ideal unit for television servicing — robustly made and complete with leads and prods—20 ranges as follows:
D.C. current 50 micro-amps. to 1 Amp.
D.C. voltages—0-1,000 volt in seven ranges (25 KV.) with external probe, optional extra.
Volts A.C.—0.2,500 in six ranges.
Ohms—0-20 meg. Ohm in three ranges (self-controlled). Self-contained, 3½in. movement. Price £10 or 10/- deposit and 23 fortnightly payments of 10/-. Non-callers add 5/- carriage and insurance.



Breakdown Unit

Receiver Type 3085. Over 30 lbs. of useful spares including metal rectifiers, transformers, pot meters, switches, valve holders, resistors, coils, coil formers, knobs, pye plugs, sockets, slow-motion drives, trimmers, etc., etc. Must have cost £100 ea. Slightly soiled but most parts usable. 15/- plus 10/- carriage.

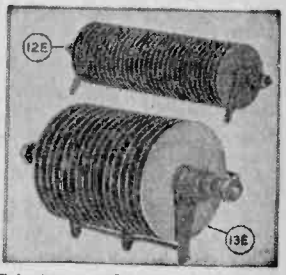
Connecting Wire

P.V.C. covered in 100ft. coils—2/9 a coil or four coils different colours, 10/-, post free.

Yaxley Switches

1 Pole 3 Way	1/6
1 Pole 5 Way	2/-
1 Pole 12 Way	3/-
2 Pole 2 Way	2/6
2 Pole 4 Way	2/-
2 Pole 6 Way	2/6
2 Pole 8 Way	3/6
2 Pole 12 Way	4/6
3 Pole 3 Way	1/6
3 Pole 6 Way	3/6
4 Pole 4 Way	3/-
6 Position Shorting	2/-
6 Pole 3 Way	2/6
6 Pole 3 Way	3/6
8 Pole 2 Way	2/-
9 Pole 3 Way	2/6
12 Pole 2 Way	2/-

Rectifier Bargains



Selenium rectifier type 12, 500 v. ½ A. half-wave easily rebuilt into full wave or multiple type, contains 30 35 mm. discs. Price 8/6, plus 1/6 post. Type 13, 36 volt 9 amp. easily rebuilt into six full wave charger rectifiers suitable for 6 or 12 volt batteries 3 amps, contains 24 84 mm. discs. Real bargain at 19/6, plus 1/6 post.

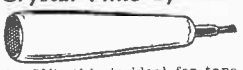
Morganite Potentiometers

Single and 2-gang types available, standard size with good length spindle, all newand boxed. **Single types.** 1/- each, values available: 5K, 10K, 25K, 50K, 100K, 250K, 1 meg., 2 meg. **Gang type** 3/- each—values available: 5K ± 5K, 100K ± 100K, ½ meg. ± ½ meg., 2 meg. ± 2 meg.

Hi-Fi Snip Infinite Wall Baffle

Nicely veneered and polished. Corner fitting (attaches to picture rail). Takes up no floor space. Gives really fantastic results with only low-price 8 in. speaker Fitting for tweeter. Only 45/- each, carriage and insurance 3/6.

Crystal Mike by Acos

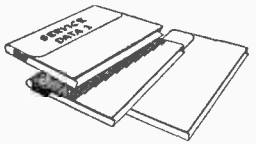


Model 39/1, this is ideal for tape or general amplifiers, complete with screened lead, 39/6, plus 1/- post.

Chassis Assembly

Superhet Chassis, 3-waveband, coloured scale, scale pan, etc. Scale size 14½in. x 3½in. Chassis size 15in. x 15in. x 2in. Price 9/6, plus 1/6 post.

TV Service Sheets



150 sheets covering the most popular post-war Televisors by leading makers—Cossor, Ekco, Ferguson, Pye, etc. Giving circuit diagram, component values, I.F. frequencies, etc. £1, post free.

Miniature Microphone

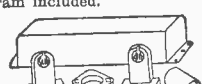
American made. Dynamic type, real bargain at 2/6, plus 6d. postage.

Speaker Bargain

12in. Hi-fidelity loudspeaker. High flux. Permanent magnet type with standard 3 ohm speech coil. Will handle up to 12 watts. Brand new by famous maker. Price 32/6, plus 3/6 post and insurance.

"Dim and Full" Switch

Particularly useful for controlling photoflood lamps which have only a short life at full brilliance. This toggle switch has three positions, the first position puts two lamps in series at half brilliance for setting up, the second position is off and the third position full brilliance for the operation shots. Also useful for controlling night lights, heaters, etc. etc. Price 3/9 each, post 9d. Circuit diagram included.



Fluorescent Light Bargain

Kit of parts comprising: choke, two lamp holders, starter holder and starter, 40 watt, 19/6, 80 watt, 23/6. Plus 2/- post and insurance.

Components for Transistor Sets

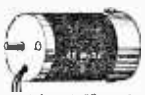
Parts for "Practical Wireless" Pocket Transistor Radios available. Send for lists.
Sub-miniature Electrolytics. 1 mfd 18v., 2.5 mfd 6v., 4 mfd 6v., 8 mfd 6v., 5 mfd 12½v., 10 mfd 6v., 25 mfd 6v., 30 mfd 3v., 50 mfd 3v., 200 mfd. All 1/9 each.
Transistor Ferrite Rod Aerial with medium and long wave coils with circuit. Price 7/6.
Oscillator Coil and set of 3 I.F. transformers for transistor set with circuit. Price 23/6.
Midget 3in. P.M. Loudspeaker for transistor set, 3 ohm or 80 ohm coil. Price 18/6.
Midget 208 pF + 476 pF two-gang Tuning Condenser with trimmers, ¼ spindle drilled and tapped. Price 9/-, plus 1/- post.
Push-pull Output Transformers, for transistors OC78, etc. Sub-miniature. Price 8/6, plus 1/- post.
Push-pull Input Transformer to match the above Output Transformer. 8/6.
0.0005 mfd Single Tuning Condenser. Solid dielectric ¼in. spindle for transistor or crystal set, 3/9; ditto with spindle tapped 6 BA, 4/-.
Transistors tested. Set of six for Superhet includes matched pair, Mullard £3.10.0, ditto unbranded, 45/-; suitable as mixers, 9/6 each. Suitable as I.F. amplifiers, 8/6; suitable for R.F. and Regen. circuits, 6/6; matched pairs for Push-pull Output, 16/- per pair. High gain for single ended output, 7/6. Ordinary white spot, 3/9; red spot, 3/6.
Resistors, miniature quarter watt type for transistor sets. All popular values, 5d. each.
Miniature ceramic condensers 6d. each.

Another Battery Charger Bargain

Components Would Cost More

Car Battery Charger—ready-made high output battery charger in stove enamelled sheet steel louvred case. New, complete and ready to work. Rated at 12 v. 5 amps, and variable rate selector for trickle charging, also a meter to show charging rate. Suitable for 230/250 A.C. mains. Special snip price of 65/-, plus 3/6 post and ins.

Motor Snip



Miniature motor 2½in. long x 1¼in. diameter, laminated poles and armature, separate winding for reversing. Operates off 20-30 v. D.C. or off A.C. mains through stepdown transformer. Original cost at least £3 each. Snip price for one month only 8/6, plus 1/6 postage and insurance.

Component Storage Drawers

Stout board construction these drawers are ideal for small parts. Supplied complete with simple erection instructions—1/6 each or 12 drawers each 6 x 2¼ x 6¼in., 13/6, post 2/-.

R1155 for Spares

These are less valves but otherwise reasonably complete—ideal for spares—prices £2 to £4 depending on condition—carriage 7/6.

INFRA-RED HEATERS

Make up one of these latest type heaters, ideal for bathroom, kitchen, bedroom, etc. They are simple to make from our easy to follow instructions—uses silica enclosed elements designed for the correct infra-red wavelength (3 microns). Price for 750 watt element and instructions 15/6, plus 2/6 post and insurance.

SPECIAL THIS MONTH

Twin Twisted Lighting Flex—equivalent 14/36, rubber insulated, cotton covered, 12/6 per 100 yard coil.

Moving Coil Meters
0-500 microamp .... 2in. flush ..17/8
250-0-250 microamp 2½in. surface 27/6
750 microamp ..... 2½in. surface 17/6
5-0-5 milliamp..... 2½in. flush ..17/8
0-30 milliamp ..... 2½in. flush ..17/8
0-100 milliamp ..... 2½in. flush ..15/-
0-300 milliamp..... 2½in. flush ..15/-
0-500 milliamp..... 2½in. flush ..15/-

Unbreakable Mains Lead type of lead fitted to electric razors makes fine lead for test meters and any other devices where subject to continuous bending. Twin figure eight construction, soft cream p.v.c. covered. Normally costs 2/- per yard. Three 6ft. leads for 2/-.

Filament Transformer, 6.3 v., 1½ amp. 6/6.

0.3 Amp Dropper—tappings marked 200/220/250. 3/6.

Auto-Transformer, totally enclosed primary 200-250, secondary 110-120v., 150 w., normally 27/6. Price 17/6.

Output Transformer—standard pentode—4/6, multi ratio. 6/6.

Bi-metal Strip with heavy duty contact—ideal for thermostat, fire, lamp, etc., 2/6.

Neon Lamp—midget wire ended, ideal mains tester, etc., 2/-, ex-Govt., 1/6.

5 amp. 12 v. full-wave Charger Rectifier, normal price 17/6. Price 10/-, plus 1/6 post and ins.

Install those extra points. 3,029 twin flat T.R.S. cable. Big purchase enables us to sell this at 45/- per 100 yds., carriage 8/6.

Head Phones. DLR5. Ideal crystal sets, etc., 8/6, plus 2/- post.

Goodmans Multi Ratio Output Transformer, 6 watt, 8 ratios, from 12-1 to 72-1. Centre tapped for push-pull, 7/6, plus 1/-.
Ditto, unbranded, 6/6, post 1/-.

Cold Cathode Valve CV413. Voltage regulator or trigger switch—unused but ex-equipment, 2/6 each.

Tag Panels. Ideal for constructors, experimental circuits, etc., 3 of each of 12 different types, 5/-, post 1/6.

Belling Lee 2BA fully insulated terminals for mounting through metal panels, 1/6 each.

Terminal Heads, insulated 4BA, 2/- doz. **0.1 mFd. 350 v.** Small tubular metal cased condensers made by Dubilier, 2/6 doz.

50 Assorted Resistors. Well mixed and useful values ½ and ¼ watt, 5/- for 50. Ditto, but 1 watt, 6/6 for 50.

Mains Transformer. Standard 230 v. input 250-0-250 at 80 mA., 6.3 v. at 5 A., 12/6, post 1/6.

Toggle Switch. Standard metal body type with round dolly fixing ring and on/off indicating plate, 1/3 or 12/- doz.

Metal Rectifier. 250 v. 60-80 milliamps., ideal for mains set or instrument or to replace that expensive valve, 4/6.

Screened Cable. Rubber covered flexible with metal braiding, ideal for microphone or gramophone extensions, 4d. per yd., 30/- per 100 yds.

ELECTRONIC PRECISION EQUIPMENT LTD.

★ Orders received by post are despatched from our warehouse, **Dept. 7, 66 Grove Road, Eastbourne,** and to save time, please post your order to this address. Please include enough for postage. Callers, however, should use one of the following addresses:

Electronics (M.P.) Ltd.,
520 High Street North,
Manor Park, E.12
Phone: Ilford 1011
Half day Thursday

Electronics (Ruislip) Ltd.,
42-46 Windmill Hill,
Ruislip, Mddx.
Phone: RUISLIP 5780
Half day Wednesday

Electronics (Croydon) Ltd.,
266 London Road,
Croydon.
Phone: CRO 6558
Half day Wednesday

Electronics (Finsbury Park) Ltd.,
29 Stroud Green Rd.,
Finsbury Park, N.4.
Phone: ARChway 1049
Half day Thursday

RETURN-OF-POST

We offer a really efficient Mail Order Service on all items stocked. All cash orders are dealt with on the day of receipt. Hire purchase orders are subject to slight delay but this is kept to the absolute minimum.

JASON FM TUNER KITS

Three Jason F.M. Tuner kits with variable tuning are now available to the home constructor. Brief details are given here and our Illustrated list is available free.

MOST IMPORTANT. We take great pains to see that every item needed is included in our kits and also that all items are entirely suitable in every way. This should be borne in mind when comparing prices.

Hire Purchase Terms are available on any kit.

INSTRUCTION MANUALS. All our kits include the instruction manual, but this can be supplied separately if required. Data Publications booklet describing FMT1, 2, and 3, 2/10: J.T.V.2, 3/10; Mercury 2, 3/10. All post free.

STANDARD TUNERS

FMT1. Supplied complete with a chassis-panel assembly fitted with a gold hammer finished panel and glass dial. Four EF91 valves are used and an external power supply is required. Complete kit £6.19.6. Power Pack Kit £2.12.6.

FMT2. This is a new version of the FMT1 and is supplied with a complete cabinet-chassis assembly which can be mounted in a cabinet or stood on a shelf. The circuit employs four EF80 valves and the power supply can be built into the cabinet if desired. Complete Kit less power supply £8.9.6. Kit with power supply £10.9.6.

FRINGE TUNER

FMT3. This is a fringe tuner using the same cabinet assembly as the FMT2 described above. The tuner is fitted with variable AFC and uses five EF80 and one ECC81 valves. Kit less power supply £10.9.6. Kit with power supply £12.7.6.

F.M./TV SWITCHED TUNERS

Kits for two new Jason F.M./ITV Sound switched tuners are now available. Both incorporate the latest "Fireball" Turret Tuner which gives switch positions for the three BBC Programmes as well as BBC and ITA TV Sound. A.F.C. is fitted to ensure freedom from drift.

4TV2. This tuner is complete with power supply in a cabinet which can be used either for shelf or cabinet mounting. Complete kit £15.17.6.

MERCURY 2. This is similar to the JTV2 but has no provision for a power supply. It is mounted on a small chassis with printed front panel and is intended for cabinet fixing. Complete kit £11.7.6.

IMPORTANT. When ordering JTV2 and Mercury 2 kits it is essential to give the TV channels and F.M. stations required on the tuner.

GRAMOPHONE EQUIPMENT

ALL LATEST MODELS
ALL POST FREE

	Cash Price	Hire Purchase Deposit	Mthly/Pmts.
RECORD CHANGERS			
COLLARO Conquest (Studio 0 PU)	£7.19. 6	£1.12. 0	12 of 12/3
GARRARD RC210 (GC8 PU)	£9.18. 6	£1.19. 6	12 of 15/-
B.S.R. UA14 Monarch (TC8 PU)	£7.15. 0	£1.10. 0	12 of 12/-
B.S.R. UA8 Monarch (TC8 PU)	£7. 5. 0	£1. 9. 0	12 of 11/4
B.S.R. UA14 Monarch (TC8S Stereo/LP/78) ..	£8.18. 0	£1.16. 0	12 of 13/6
SINGLE RECORD PLAYERS			
GARRARD TA (GC8 PU)	£8.10. 0	£1.14. 0	12 of 13/-
B.S.R. TU9 (TC8 PU) ..	£4.10. 0	£1. 5. 0	3 of £1.5.0
COLLARO RP594 (O, P or T PU)	£9.18. 9	£1.18. 9	12 of 15/-
E.M.I. (Acos Stereo/Mono PU) ..	£6.15. 0	£1. 7. 0	12 of 10/8
TRANSCRIPTION UNITS			
COLLARO 4T/200 (TX88 PU)	£18.13. 0	£3.15. 0	12 of £1.7.4
COLLARO 4TR/200 Motor only	£13.18. 3	£2.15. 3	12 of £1.0.5
GARRARD 4HF (GC8 PU)	£18. 9. 9	£3.15. 9	12 of £1.7.0

Many of the above can be supplied for stereo working. See our Gramophone Equipment List for details.

NEW ILLUSTRATED LISTS
Now Ready!

Illustrated lists are available on LOUDSPEAKERS, TAPE DECKS, TEST GEAR, RECORDING TAPES, GRAMOPHONE EQUIPMENT. Any will be sent free on request.

BLANK CHASSIS

The very latest blank chassis for the home constructor. Packed flat for easy and safe posting. These are made in bright tinplate and have the top plate and four side channels packed flat complete with nuts and bolts assembly. The top plate is completely flat for easy drilling before assembly. Earth connections can be made directly by soldering. Available in the following sizes: 7 x 5 x 2in., 4/9, post 1/3. 10 x 5 x 2in., 5/3, post 1/4. 10 x 7 x 2in., 6/-, post 1/6. 14 x 5 x 2in., 7/3, post 1/6. 14 x 10 x 2in., 8/9, post 1/9.

MULLARD CATHODE RAY TUBES

ALL AT NEW REDUCED PRICES

RADIANT SCREEN. The very finest picture tube available.

LUMENAR. Built to the same high standards as the Radiant Screen tube, but using reclaimed glass bulbs. Every other part is brand new.

FULL 12 MONTHS' GUARANTEE ON EITHER TYPE

	Radiant Screen	Deposit	Hire Purchase 12 mthly. pymts. of
12" MW31/74 ..	£9. 0.0	£1.16.0	13/6
14" MW36/24, MW36/44 ..	£9. 0.0	£1.16.0	13/8
14" AW36/20, AW36/80 ..	£9.10.0	£1.18.0	14/4
17" MW43/69, MW43/80 ..	£10. 0.0	£2. 0.0	15/-
17" AW43/80	£10.10.0	£2. 2.0	15/8
	Lumenar		
12" MW31/74 ..	£8. 2.6	£1.12.6	12/6
14" MW36/24, MW36/44 ..	£8. 2.6	£1.12.6	12/6
14" AW36/20, AW36/80 ..	£8.10.0	£1.14.0	13/-
17" MW43/69, MW43/80 ..	£9. 0.0	£1.16.0	13/8
17" AW43/80	£9.10.0	£1.18.0	14/4

ALL CARRIAGE AND INSURANCE FREE

STEREO COMPONENTS

Morganite ganged potentiometers as specified for the Mullard circuits. Lot/Anti-Log. 500k. 1 meg., 2 meg. Log/Log, 250k, 1 meg., 2 meg. Lin/Lin, 500k, 1 meg. All 10/6 each.

Denco Chassis for the Mullard circuits. All drilled with printed front panel. Three Valve Stereo Amplifier Chassis, 22/-. Seven watt Stereo Amplifier Chassis, 24/6. Stereo Pre-Amplifier Chassis, 24/6. Set of switches for Pre-Amp, 34/8. Pick-up cartridges, B.S.R. TC8S £2.4.11. Ronette DC284, £3.19.6. Both are turn-over types for Stereo, LP and 78 records.

LATEST TEST METERS

	Cash Price	Hire Purchase Deposit	Mthly/Pmts.
AVO Model 8	£23.10. 0	£4.14. 0	12 of £1.14. 6
AVO Model 8 with leather carrying case ..	£27. 8. 0	£5. 8. 0	12 of £2. 0. 4
AVO Model 7	£19.10. 0	£3.18. 0	12 of £1. 8. 8
AVO Model 7 with leather carrying case ..	£23. 8. 0	£4.12. 0	12 of £1.14. 6
AVO Multiminor ..	£9.10. 0	£1.13. 0	12 of 14/4
AVO Multiminor with leather carrying case ..	£11. 9. 0	£2. 5. 0	12 of 17/-
TAYLOR Model 127A ..	£10. 0. 0	£2. 0. 0	12 of 15/-
CABY A-10	£4.17. 6	£1. 7. 6	3 of £1. 6. 8
CABY B-20	£6.10. 0	£2. 0. 0	3 of £1.13. 4

Full details of any of the above supplied free on request.

TAPE DECKS

	Cash Price	Deposit	Hire Purchase Mthly/Pymts.
B.S.R. TD2	£8.19. 6	£1.16. 6	12 of 13/7
COLLARO STUDIO ..	£12.19. 6	£2.12. 6	12 of 19/5

All carriage free.

All components in stock for the Mullard Tape "C" Pre-Amplifier Kit. Fully detailed list available.

WATTS RADIO (MAIL ORDER) LTD

54 CHURCH STREET, WEYBRIDGE, SURREY. **Telephone: Weybridge 4546**

PLEASE NOTE: POSTAL BUSINESS ONLY FROM THIS ADDRESS

SERVICE

RECORDING TAPE

DOUBLE PLAY

B.A.S.F. 300ft (3"), 14/-; 600ft (4"), 25/-; 1200ft (5"), 45/-; 1800ft (5½"), 58/-; 2400ft (7"), 77/6.

BRAND FIVE. 1200ft (5"), 37/6; 2400ft (7"), 60/-.

EMITAPE 100. 400ft (3"), 17/-; 1200ft (5"), 45/-; 2400ft (7"), 80/-.

SCOTCH BOY 200. 400ft (3"), 17/-; 1200ft (5"), 45/-; 2400ft (7"), 80/-.

TELEFUNKEN. 1200ft (5") in plastic container, 40/-; 1800ft (5½") in plastic container, 50/-; 2400ft (7"), 75/-.

LONG PLAY

BASF. 210ft (3"), 9/-; 850ft (5"), 28/-; 1200ft (5½"), 35/-; 1800ft (7"), 50/-.

BRAND FIVE. 900ft (5"), 18/6; 1200ft (5½"), 23/6; 1800ft (7"), 35/-.

EMITAPE 99. 99/3 250ft (3"), 9/6; 99/3N 250ft (3½"), 9/6; 99/9 850ft (5"), 28/-; 99/12 1200ft (5½"), 35/-; 99/18 1800ft (7"), 50/-. 99/9, 99/12 and 99/18 available in **Emicase.** 2/6 extra.

SCOTCH BRAND 150. 300ft (3½"), 9/6; 900ft (5"), 28/-; 1275ft (5½"), 35/-; 1800ft (7"), 50/-.

ALL TAPE POST FREE!

TAPE ACCESSORIES

BIB Tape Splicer, 18/6. Post 9d.

WEARITE De-fluxer, 50/-. Post 1/3.

Full tape list including special offers of standard tapes available free.

LOUDSPEAKERS

	Cash Price	Hire Purchase Deposit	Hire Purchase Mthly/Pmts.
GOODMANS			
Axiom 110. 10"	£5. 0. 0	£1.10. 0	3 of £1. 6. 8
Axiom 112. 10"	£8.10. 0	£1.14. 0	6 of £1. 6. 0
Axiette. 8"	£6.12. 1	£1. 7. 1	6 of £1. 0.10
Axiom 300. 12"	£11. 5. 9	£2. 5. 9	12 of 16/8
Axiom 400. 12"	£16. 1. 0	£3. 4. 0	12 of £1. 3. 7
Audiom 60 Bass. 12" ..	£9.12. 9	£1.18. 9	12 of 14/6
Trebax Tweeter ..	£6. 4. 0	£1. 5. 0	6 of 19/10
CX5000 Cross-over unit	£1.19. 0	—	—
WHITELEY			
HF1016. 10"	£7.12. 3	£1.11. 3	6 of £1. 3. 6
HF1012. 10"	£4.15. 0	£1.10. 0	3 of £1. 5. 0
HF816 8"	£6.10. 6	£1. 8. 6	6 of £1. 0. 8
T816. 8"	£6. 3. 9	£1. 3. 9	6 of £1. 0. 0
T10 Tweeter	£4. 4. 0	£1. 4. 0	3 of £1. 3. 4
T359 Tweeter	£1.13. 3	—	—
CX3000 Cross-over unit	£1.10. 0	—	—
CX1500 Cross-over unit	£1.18. 3	—	—

OUTPUT TRANSFORMERS

GILSON
W0696A, W0696B. 50/6, post 2/-. W0710, W0710/8K. 55/6, post 2/-. W0892. 62/3, post free; W0767. 27/-, post 1/6.

PARTRIDGE
P3667. 52/6, post 2/-; P4014. 98/6, post free; P4131. 60/-, post free; P3591A. 99/-, post free; P5202. P5203. 95/-, post free.

PARMEKO. P2641. 27/-, post 1/6.

ELSTONE. OT3. 25/-, post 1/6; OT/ML. 45/-, post 2/-.

ELLISON. OPT64. 20 watt P-P Multi-ratio, 30/-, post 2/-.

AMPLIFIER KITS

We have full stocks of all components for the Mullard 510, Mullard 2 and 3 valve Pre-Amplifiers, GEC 912 Plus. Fully detailed list on any of these sent upon request. Instruction Manuals. Mullard. All Mullard Audio Circuits in "Circuits for Audio Amplifiers". 9/5. GEC 912. 4/6. All post free.

HIRE PURCHASE TERMS
are available on any item. Repayments may be spread over 3, 6 or 12 months. Details as follows: Three months: Deposit 6/- in the £. Service charge 5 per cent but minimum charge of 10/-. Six and Twelve months: Deposit 4/- in the £. Service charge 10 per cent. but minimum charge 20/-.

TERMS OF BUSINESS
Cash with order or C.O.D. We charge C.O.D. orders as follows. Up to £3, minimum 2/8. Over £3 and under £5, 1/6. Over £5 and under £10, 1/8. Over £10, no charge. **Postage extra on CASH orders under £3 except where stated.**

R.S.C. HI-FI TAPE RECORDER KIT

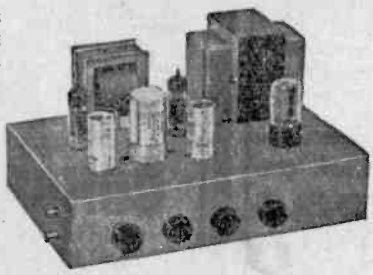
REALISM AT INCREDIBLY LOW COST. CAN BE ASSEMBLED IN HALF AN HOUR The Recorder incorporates the Latest Collaro Studio Tape Transcriptor. The Linear LT45X High Quality Tape Amplifier listed £12.12.0, High Flux P.M. Speaker listed 30/-, empty Tape Spool, a Reel of Best Quality Tape listed 22/6, and a Handsome Portable carrying Cabinet with latest attractive two-tone polychrome finish, size 18 x 13 x 9in. high, listed £4.10.0, and circuit. Total cost if purchased individually approximately £40. Performance equal to units in the £60-£80 class. S.A.E. for leaflet.

25½ GNS. Carr. 17/6

H.P. TERMS. Deposit £5.7.6 and 12 monthly payments of 2 gns. Cash price if settled in 3 months.

HIGH FIDELITY 12-14 WATT AMPLIFIER TYPE A11

PUSH-PULL ULTRA LINEAR OUTPUT "BUILT-IN" TONE CONTROL PRE-AMP STAGES



Two input sockets with associated controls allow mixing of "mike" and gram, as in A10. High sensitivity. Includes 5 valves, ECC83, ECC83, EL84, EL84, 5Y3. 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 "Lift" and "Cut." Frequency response ± 3 D.B. 30-30,000 c/cs. Six negative feedback loops. Hum level 60 D.B. down. ONLY 23 millivolts INPUT required for FULL OUTPUT. Suitable for use with all makes and types of pick-ups and microphones. Comparable with the very best designs. For **STANDARD or LONG PLAYING RECORDS** For **MUSICAL INSTRUMENTS** such as **STRING BASS, GUITARS,** etc., **OUTPUT SOCKET** with plug provides 300 v. 30 mA. and 6.3 v. 1.5 a. For supply of a **RADIO FEEDER UNIT.** Size approx. 12-9-7in. For A.C. mains 200-250 v. 50 c.p.s. Output for 3 and 15 ohms speakers. Kit is complete to last nut. Chassis if fully punched. Full instructions and point-to-point wiring diagrams supplied. Only **8 Gns.** Carr. 10/- (Or factory built 45/- extra).

If required louvred metal cover with 2 carrying handles can be supplied for 18/9. **TERMS ON ASSEMBLED UNITS. DEPOSIT 24/3. and 9 monthly payments of 24/3.** Send S.A.E. for illustrated leaflet detailing Ready-to-assemble Cabinets, Speakers, Microphones, etc., with cash and credit terms.

R.S.C. STEREO/TEN HIGH QUALITY AMPLIFIER

A complete set of parts for the construction of a stereophonic amplifier giving 5 watts high quality output on each channel (total 10 watts). Sensitivity is 50 millivolts, suitable for all crystal stereo heads. Ganged Bass and Treble Controls give equal variation of "left" and "cut". 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. **8 Gns.** Carr. 10/-

TELEVISION RECTIFIERS. 250 v. 200 mA. small size. Only **6/9** each.
RE-ENTRANT SPEAKERS. Tannoy, 8 watt, 7.5 ohms. Only **22/6** each.
Parmeko Horn Type, 10 watt, 15 and 200 ohm matching. **59/6.** R.C.A. 20 watt. 15 ohms or 200 ohms. **6 gns.**

PLESSEY 3-SPEED AUTO-CHANGERS

Brand new. Turnover sapphire stylI. Many exclusive features. For 200-250 v. A.C. mains. Very limited number. 8st only **£5.19.6.**

THE SKYFOUR T.R.F. RECEIVER. A design of a 3-valve Long and Medium wave 200-250 v. A.C. Mains receiver with selenium rectifier. **High gain H.F. stage** and low distortion detector. Power pentode output. Valve line-up 6K7, SP61, 6V6G. Selectivity and quality excellent. Simple to construct. Point-to-Point wiring diagrams, instructions and parts list. **1/9,** maximum building costs **£4.19.6,** inc. attractive Walnut veneered wood cabinet 12 x 6½ x 5in.

D.C. SUPPLY KIT. 12 v. 1 a. consisting of a partially drilled metal case, mains trans., F.W. Bridge Rectifier, 2 fuseholders and fuses. Change Direction switch, variable Speed regulator and circuit. For 200-250 v. A.C. mains. Suitable for Electric Trains. Limited number available at **33/9.**

R.S.C. BATTERY CHARGING EQUIPMENT

All for A.C. Mains 200-250 v., 50 ccs. Guaranteed 12 months.

ASSEMBLED CHARGERS

6 v. 1 amp. 19/9
6 v. or 12 v. 1 amp. 29/9
6 v. 2 amps. 29/9
6 v. or 12 v. 2 amps. 38/9
6 v. or 12 v. 3 amps. with ammeter 59/9
Above ready for use. With mains and output leads. Carr. 3/6.

HEAVY DUTY CHARGER KIT 6/12 v. 6 amps. variable output. Consisting of Mains Transformer 0-200-220-250 v.; F.W. (Bridge) Selenium Rectifier; Ammeter, Multi-Position Switch with Knob; Panels, Plugs, Fuses, Fuseholder and circuit, **59/9.** Carr. 4/6.

Assembled 6 v. or 12 v. 4 amps.

Fitted Ammeter and variable charge rate selector. Also selector plug for 6 v. or 12 v. charging. Louvred steel case with stoved blue hammer finish. Fused and ready for use with mains and output leads. Terms: Deposit 13/3 and 5 monthly payments 13/3. **69/9** Carr. 3/9.

ASSEMBLED CHARGER

6 v. or 12 v. 2 amps.

Fitted Ammeter and selector plug for 6 v. or 12 v. Louvred metal case finished attractive hammer blue. Ready for use With mains and output leads. Double Fused Only Carr. 3/9. **49/9**

BATTERY CHARGER KITS Consisting of Mains Transformer. F.W. Bridge, Metal Rectifier, well ventilated steel case. Fuses. Fuse-holders. Grommets, panels and circuit. Carr. 3/6 extra.

6 v. or 12 v. 1 amp. 24/9
As above, with Ammeter.. 32/9
6 v. 2 amps. 25/9
6 v. or 12 v. 2 amps. 31/6
6 v. or 12 v. 2 amps. inclusive of Ammeter 42/9
6 v. or 12 v. 4 amps. 53/9
6 v. or 12 v. 4 amps. with Ammeter and variable charge rate selector. **59/9.**

CHARGER AMMETERS. 0-1.5 a., 0-3 a., 0-4 a., 0-7 a., 0-25 a., 0-60 a. **8/9.**

R.S.C. MAINS TRANSFORMERS (FULLY GUARANTEED)

We can quote for special types singly or in any quantity.

Interleaved and impregnated. Primaries 200-230-250 v. 50 c/s. Screened

TOP SHROUDED DROP THROUGH

250-0-250 v. 70 mA, 6.3 v. 2 a, 5 v. 2 a.. 17/9
350-0-350 v. 80 mA, 6.3 v. 2 a, 5 v. 2 a.. 18/9
250-0-250 v. 100 mA, 6.3 v. 2 a, 3 v. 1 a.. 19/9
250-0-250 v. 100 mA, 6.3 v. 3.5 a, C.T. .. 19/9
250-0-250 v. 100 mA, 6.3 v. 4 a, 5 v. 3 a.. 25/9
300-0-300 v. 100 mA, 6.3 v. 4 a, 5 v. 3 a.. 25/9
350-0-350 v. 100 mA, 6.3 v. 4 a, 5 v. 3 a.. 25/9
350-0-350 v. 100 mA, 6.3 v. 4 v, 4 a, C.T. 0-4-5 v. 3 a. 25/9
350-0-350 v. 150 mA, 6.3 v. 4 a, 5 v. 3 a.. 29/9

FULLY SHROUDED UPRIGHT

250-250 v. 60 mA, 6.3 v. 2 a, 5 v. 2 a, Midget type 2½-3-3in. 17/11
250-0-250 v. 100 mA, 6.3 v. 4 a, 5 v. 3 a.. 26/9
300-0-300 v. 100 mA, 6.3 v. 4 a, 5 v. 3 a.. 26/9
350-0-350 v. 100 mA, 6.3 v. 4 a, 5 v. 3 a.. 26/9
300-0-300 v. 130 mA, 6.3 v. 4 a, 6.3 v. 1 a, for Mullard 510 Amplifier 35/9
350-0-350 v. 150 mA, 6.3 v. 4 a, 5 v. 3 a.. 35/9
425-0-425 v. 200 mA, 6.3 v. 4 a. C.T. 6.3 v. 4 a, C.T., 5 v. 3 a 49/9

FILAMENT TRANSFORMERS

All with 200-250 v. 50 c/s. primaries 6.3 v. 1.5 a. 5/9; 6.3 v. 2 a. 7/6; 0-4-6.3 v. 2 a. 7/9; 12 v. 1 a, 7/11; 6.3 v. 3 a, 8/11; 6.3 v. 6 a, 17/6; 12 v. 1.5 a twice. 17/6.

OUTPUT TRANSFORMERS

Midget Battery Pentode 66:1 for 3S4, etc. 3/9
Small Pentode, 5000 Ω to 3 Ω 3/9
Small Pentode 7/8,000 Ω to 3 Ω 3/9
Standard Pentode 5,000 Ω to 3 Ω .. 5/6
Standard Pentode 7/8,000 Ω to 3 Ω .. 5/6
10,000 Ω to 3 Ω 5/6
Push-Pull 10-12 watts 6V6 to 3 Ω or 15 Ω 18/9
Push-Pull 10-12 watts to match 6V6 to 3-5-8 or 15 Ω 19/9
Push-Pull EL84 to 3 or 15 Ω 18/9
Push-Pull 15-18 watts, 6L6, KT66 .. 22/9
Push-Pull for Mullard 510 Ultra Linear 29/9
Push-Pull 20 watts, sectionally wound 6L6, KT66, etc., to 3 to 15 Ω .. 47/9

ELIMINATOR TRANSFORMERS

Primaries 200-250 v. 50 c/s.
120 v. 40 mA. 5-0-5 v. 1 a. 15/9
90 v. 15 mA, 4-0-4 v. 600 mA. 9/9

SMOOTHING CHOKES

150 mA. 7-10 H 250 ohms.. .. .. 11/9
100 mA. 10 H 200 ohms 8/9
80 mA. 10 H 350 ohms 5/9
60 mA, 10 H 400 ohms 4/11

CHARGER TRANSFORMERS

All with 200-230-250 v. 50 c/s Primaries; 0-9-15 v. 1½ a. 11/9; 0-9-15 v. 2 a. 14/9; 0-9-15 v. 3 a, 16/9; 0-9-15 v. 5 a, 19/6; 0-9-15 v. 6 a, 23/9.

AUTO (Step up/Step down) TRANS.

0-110/120-230/250 v. 50-80 watts, 13/9; 0-110/120-200/230/250 v. 150 watts 27/9.

MICROPHONE TRANSFORMERS

120:1 high grade, clamped. 6/9; 120:1 Potted, Mu-metal screened. 9/9.

R.S.C. A12 STEREOPHONIC AMPLIFIER KIT

A complete set of parts to construct a Stereo amplifier with an undistorted output total 6 watts. For A.C. mains input of 200-250 v. Outputs for matched 2-3 ohm speakers. Sensitivity 130 m.v. Ganged Vol. and Tone Controls. Preset balance control. Full instructions and point-to-point wiring diagrams supplied. Only good quality components and latest high grade valves used. Exceptionally realistic reproduction can be obtained at ample volume for the home, as can be demonstrated in typical surroundings at our County Arcade premises. A really sensational offer.

4 Gns.

Carr. and pkg. 5/-

STEREO EQUIPMENT OFFER. Comprising A12 Kit, 2 matched 8in. L/Speakers, and Acos T/O Stereo head with sapphire stylus suitable most pick-ups. **£6.19.6** Carr. 7/7

PICK-UP ARMS complete with Hi-Fi turnover crystal head. Acos GP54. Limited number brand new, perfect, at approx. half price. Only **29/11.**

ACOS CRYSTAL MICROPHONES. Mic40 stand or desk. Listed 45/-. Only **27/9.** 39-1 Stick types, listed 5 gns. Only **39/6.**

R.S.C. 30 WATT ULTRA LINEAR HIGH FIDELITY AMPLIFIER A10

A highly sensitive Push-Pull high output unit with self-contained Pre-amp. Tone Control Stages. Certified performance figures compare equally with most expensive amplifiers available. Hum level 70 db. down. Frequency response —3 db. 30-30,000 c/s. A specially designed sectionally wound ultra linear output transformer is used with 807 output valves. All components are chosen for reliability. Six valves are used EF86. EF86. ECC83. 807. 807. GZ33. Separate Bass and Treble Controls are provided. Minimum input required for full output is only 12 millivolts so that **ANY KIND OF MICROPHONE OR PICK-UP IS SUITABLE.** The unit is designed for **CLUBS, SCHOOLS, THEATRES, DANCE HALLS or OUTDOOR FUNCTIONS,** etc. For use with Electronic **ORGAN, GUITAR, STRING BASS,** etc. For standard or long-playing records. **OUTPUT SOCKETS PROVIDES** L.T. and H.T. for a **RADIO FEEDER UNIT** An extra input with associated vol. control is provided so that two separate inputs such as Gram and 'Mike' can be mixed. Amplifier operates on 200-250 v. 50 c/cs. A.C. Mains and has output for 3 and 15 ohm speakers. Complete kit of parts with fully punched chassis and point-to-point wiring diagrams and instructions. If required cover as for A8 can be supplied for **18/9.** The amplifier can be supplied, factory built with 12 months' guarantee, for **£13.19.6.**

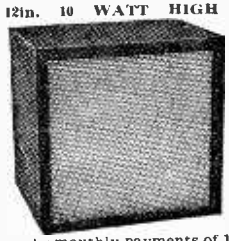
11 gns.

Carr. 10/-

TERMS: DEPOSIT 31/9 and 9 monthly payments of **31/9.**

FULL RANGE OF LINEAR AMPLIFIERS ALWAYS IN STOCK.

LINEAR L45 MINIATURE 4/5 WATT QUALITY AMPLIFIER. Suitable for use with any record playing unit, and most microphones. Negative feed-back 12 db. Separate Bass and Treble Controls. For A.C. mains input of 200-250 v. 50 c/cs. Output for 2-3 ohm speaker. Three miniature Mullard valves used. Size of unit only 7-5-5½in. high. Guaranteed for 12 months. Only **£5.19.6.** Send S.A.E. for illustrated leaflet. Terms, Deposit **22/6** and 5 monthly payments of **22/6.**

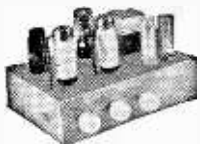


12in. 10 WATT HIGH QUALITY LOUDSPEAKER IN POLISHED WALNUT FINISHED CABINET

Gauss 12,000 lines. Speech coil 3 ohms or 15 ohms. Only **£4.19.6** Carr. 5/-. Terms: Deposit 11/3 and 9 monthly payments of 11/3.

12in. 20 WATT HI-FI LOUDSPEAKERS IN CABINETS. Size 18 x 18 x 18in. Finish as above. Terms: Deposit **17/9** and 9 monthly payments of **17/9.** Only **£7.19.6.** Carr. 8/6.

R.S.C. 4-5 WATT A5 HIGH-GAIN AMPLIFIER



A highly-sensitive 4-valve quality amplifier for the home, small club, etc. Only 50 millivolts input is required for full output so that it is suitable for use with the latest high fidelity pick-up heads, in addition to all other types of pick-ups and practically all 'mikes'. Separate Bass and Treble Controls are provided. These give full long-playing record equalisation. Hum level is negligible being 71db. down. 15db. of Negative feedback is used. H.T. of 300 v. 25 mA. and L.T. of 6.3 v. 1.5 a. is available for the supply of a Radio Feeder Unit, or Tape-Deck pre-amplifier. For A.C. mains input of 200-230-250 v. 50 c/s. Output for 2-3 ohm speaker. Chassis is not alive. Kit is complete in every detail and includes fully punched chassis (with baseplate) with Blue hammer finish and point-to-point wiring diagrams and instructions. Exceptional value at only £4.15.0, or assembled ready for use 25/- extra, plus 3/6 carr.; or Deposit 22/6 and 5 monthly payments of 22/6 for assembled unit.

R.S.C. PORTABLE GUITAR AMPLIFIERS

Junior 5 watts High Quality output. Separate Bass and Treble 'Cut' and 'Boost' controls. Sensitivity 15 m.v., Twin inputs, High Flux 8in. Loudspeaker 'built-in'. Handsome, strongly made Cabinet (size approx. 14 x 14 x 7in.) finished in satin walnut, and fitted carrying handle. H.P. Terms, Deposit £1 and 9 monthly payments of £1.

£8-19-6

Carr. 7/6

Senior 10 watts High Fidelity output. Separate Bass and Treble 'Cut' and 'Boost' controls. Twin separately controlled high gain inputs so that two instruments such as Guitar and String Bass can be used at the same time. Two loudspeakers are incorporated, a high Flux 12in. for Bass notes and a 7 x 4 m. elliptical for Treble. Cabinet is well made and finished satin walnut. Size approx. 18 x 18 x 18in. H.P. Terms. Deposit **34/9** and 9 monthly payments of **34/9.** Both models for 200-250 v. A.C. mains.

15 gns.

Carr. 10/-

SPECIAL TRANSISTOR OFFER. TS1 Brimar. Brand new. Perfect. 3 for **10/9**

AM FM RADIOGRAM CHASSIS for 200-250 v. A.C. mains only. 3 wavebands. V.H.F., Medium and Long. Built in Ferrite rod aerial. Attractive glass dial size 16in. long by 4in. high. Valve line up EF85. ECH81, ECC85. EABC80. EL84. EZ80. High quality output of up to 4 watts. Overall size 16½in. x 4½in. x 5¼in. Only **£12.9.6.** Carriage 10/-.

PLESSEY DUAL CONCENTRIC 12in. 15 ohms HIGH FIDELITY SPEAKER (12,000 lines) with built-in tweeter (completely separate elliptical speaker with choke, condensers, etc.) providing extraordinarily realistic reproduction when used with our A8 or similar amplifier. Rates 10 watts. Price only **£5.19.6.**

Hi-Fi CRYSTAL PICK-UP HEADS. (Turnover type with sapphire stylus). HGP59. Standard replacement for Garrard and B.S.R. B.S.R. Ful-fi. Garrard GC2. **19/9.** B.S.R. Stereo/Monaural **39/11**

P.M. SPEAKERS. 2-3 ohm. 2½in. Perdio **21/9.** 5in.. **17/9.** 6½in. **16/9.** 8in., **19/9.** 8 x 5in. **25/9.** 10in. **26/9.** 10 x 6in. **29/9,** 12in. **29/11.** 10in. W.B. "Stentorian" 3 or 15 ohms type HF1012 10 watts, hi-fidelity type. Recommended for use with our A8 Amplifier, **£4.10.9.** 12in. Plessey 3 ohms 10 watts (12,000 lines), **59/6.**

TWEETERS. Plessey 3Ω **19/9,** 15Ω **25/9.**

GLA MINIATURE 2-3 WATT GRAM AMPLIFIER. For use with any single or auto-change unit. Output for 2-3 ohm speaker. For 200-250 v. 50 c.p.s. A.C. mains. Over-all size 11¼ x 2½ x 2¼in. Controls: Vol. and Tone with switch. Guaranteed 12 months. Only **59/6.**

SUPERHET FEEDER UNIT. Design of a high quality Radio Tuner Unit (specially suitable for use with any of our Amplifiers). Delayed A.V.C. employed. The W.Ch. Sw. incorporates Gram position. Controls are Tuning, W.Ch. and Vol. only 250 v. 15 mA. H.T. and L.T. of 6.3 v. 1 amp. required from amplifier. Size of unit approx. 9-6-7in. high. Simple alignment procedure. Point-to-Point wiring diagrams, instructions and priced parts list with illustration, **2/6.** Total building cost **£4.15.0.** For descriptive leaflet send S.A.E.

R.S.C. BATTERY TO MAINS CONVERSION UNITS

Type BM1. An all-dry battery eliminator. Size 5½ x 4½ x 2in. approx. Completely replaces battery supplying 1.4 v. and 90 v. where A.C. mains 200-250 v. 50 c/s is available. **Suitable for all battery portable receivers requiring 1.4 v. and 90 v.** This includes latest low consumption types.

Complete kit with diagrams, **39/9,** or ready to use, **46/9.**

Type BM2. Size 8 x 5½ x 2½in. Supplies 120 v. 90 v. and 60 v., 40 mA. and 2 v. 0.4 a. to 1 amp. fully smoothed. **Thereby completely replacing both H.T. batteries and L.T. 2 v. accumulators** when connected to A.C. mains supply 200-250 v. 50 c/s. **SUITABLE FOR ALL BATTERY RECEIVERS** normally using 2 v. accumulator. Complete kit of parts with diagrams and instructions. **49/9,** or ready for use, **59/6.**

R.S.C. 3-4 WATT A7 HIGH-GAIN AMPLIFIER

For 200/250 v. 50 c/s. Mains input. Appearance and specification, with exception of output wattage, as A5 amplifier. Complete Kit with diagrams, £3.15.0. Carr. 3/6.

COLLARO JUNIOR 4-speed single player units and Hi-Fi crystal pick-up with turnover head. **£3.19.6.**

B.S.R. UA8 4-SPEED AUTO-CHANGERS with Stereo/Monaural pick-up head. **£7.19.6.** Carr. 5/-.

COLLARO CONQUEST 4-SPEED AUTO-CHANGER with high fidelity Studio pick-up. Latest model. For 200-250 v. 50 c.p.s. A.C. mains. Our price **£6.19.6.** Carr. 5/6.

TERMS: C.W.O. or C.O.D. No C.O.D. under £1. Post 1/9 extra under £2. 2/9 extra under £5
Open 9 to 6. Weds until 1 p.m. Trade supplied. S.A.E. with all enquiries.

R.S.C. (Leeds) Ltd.

BRADFORD, MANCHESTER and LEEDS

Mail Orders to 29-31 Moorfield Road, Leeds 12.
Callers to 5 and 7 County (Mecca) Arcade, Briggate, Leeds 1.
and 8-10 Brown Street (Market Street), Manchester 2,
or 56 Morley Street (next to Majestic Ballroom), Bradford.

EASY AS A.B.C. TO BUILD

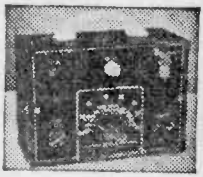
37/6

The new, exciting De Luxe "Gold Star" Pocket Radio in beautiful moulded plastic case—This model is a highly sensitive, self-contained set covering all medium waves. Uses modern miniature "button-base" valve and specially designed high efficiency coil. Exceptionally easy to build from our step-by-step plans—the case is supplied ready drilled! Size of radio only 4½in. x 2½in. x 1½in.!—and batteries fit inside. We can supply all parts including case, detachable aerial, instruction book, wire, screws, etc., for only 37/6, plus 2/6 Post and Packing. C.O.D. 2/- extra. (Parts sold separately. Priced parts list 1/6.)

29/6

Our engineers have designed a novel Wrist-Watch Radio using latest Transistor Techniques. Size only 1¼in. x 1in. x ½in. ! ! !—"Feather-weight"—yet gives clear, crisp, personal-phone reception over all medium waves. Tiny battery inside lasts months—costs 5d. No snags, anyone can build it in an hour or two using our pictorial step-by-step simple plans. All parts supplied (including case and strap) for only 29/6 (add 2/6 Post. etc.). C.O.D. 2/- extra. (All parts sold separately, priced parts list 1/6.) Send Now!

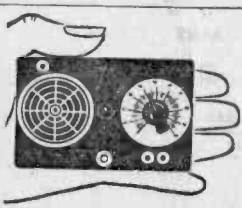
Can Be Built for 47/6. Build this exceptionally sensitive high efficiency personal phone radio. Uses unique assembly system and can be built by anyone without any radio knowledge whatever in 45 minutes. Handsome black-crackle steel case with specially made black and gold dial with stations printed. Size of radio only 6½in. x 5in. x 3in. Covers all medium and long waves. H.T. consumption only 1 to 1.5 mA. Ideal for Bedroom, Garden, Holiday, etc. BUILD THE "SKY-ROMA" NOW! Total building cost—everything down to the last nut and bolt, 47/6 (Postage, etc., 2/-)—with full set of clear, easy-to-follow plans. (Parts sold separately. Priced parts list and plans 1/6.) C.O.D. 2/- extra.



47/6

29/6

The sensational "Silvertone" model! A highly compact self-contained miniature "button-base" valve pocket radio at absolute "rockbottom" building cost! Covers all the medium waves with the very latest circuitry bringing in stations from all over Europe—without fuss. Easy as A.B.C. to assemble, using our step-by-step instruction manual. Size only 4¼in. x 2½in. x 1½in.—a fascinating little pocket radio. We can supply all the parts including beautiful two-tone case, detachable aerial, instruction book, screws, wire, etc., for only 29/6 (plus 2/- post and packing). C.O.D. 2/- extra. (Parts sold separately, priced parts list 1/9.)



THIS TRANSISTOR SET Can Be Built For Only 29/6. The "Sky-Scout" Pocket two-stage transistor set, size only 3in. x 3¼in. x 4in. Covers all medium waves and works entirely off tiny "penlight" battery which costs 6d. and fits inside case. All parts tested before despatch. Can be built for 29/6, plus 2/- Post and Packing. INCLUDING CASE, TRANSISTOR, STEP-BY-STEP PLANS FOR ABSOLUTE BEGINNERS, nuts, bolts, etc. (C.O.D. 2/- extra.) Parts sold separately, priced parts list and plans 1/6. VERY SIMPLE TO BUILD.

29/6

This amazing "Tiny-Tim" model—no larger than a match box—costs nothing to run—ever! No batteries! No Valves! No complete electricity! Will *never* run down or burn out. Uses the latest TRANSISTOR, TYPE GERMANIUM DIODE, receives local stations anywhere—without extra aerial. Clear, Crisp Tone. No snags, anyone can build it within an hour using our step-by-step instruction book, etc., for only 17/6, plus 2/- Post and Packing (C.O.D. 2/- extra). (Parts sold separately, priced parts list 1/9.)

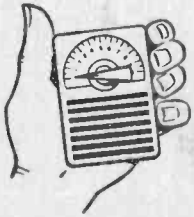
17/6

Anyone can build this beautiful precision Pocket Radio in an hour or two. No knowledge whatever needed. Our simple pictorial plans take you step-by-step! Remarkably sensitive—covers all medium waves, inc. Luxembourg. Home. Light. Size only 2in. x 3in. x 5¼in.—Not a Toy! But a Real, Personal-phone, Valve Radio with Detachable Aerial! IDEAL FOR BEDROOM, GARDEN, etc. We supply ALL parts necessary, together with plans, etc., for the special price of 39/6, plus 2/6 post and packing. (C.O.D. 2/- extra.) BUILD YOURS NOW! (All parts sold separately, priced parts list 1/9.) Send Today! Money refunded if parts returned intact within 7 days.

39/6

Choice of beautiful walnut veneered cabinet or ivory bakelite. This is the lowest possible price consistent with high quality. No radio knowledge whatever needed . . . can be built by anyone in 2-3 hours, using our very simple, easy-to-follow diagrams. The terrific new circuit of the "Ocean-Hopper" covers all medium and long waves, has razor-edge selectivity and exceptionally good tone. Price also includes ready drilled and punched chassis, set of simple-to-follow plans—in fact everything! Parts tested before despatch! Uses standard octal-base valves. (Low running costs—approximately 18 watts.) Size 12in. x 6in x 5in. Build this long-range powerful midget NOW. TOTAL BUILDING COST INCLUDING PLANS, ETC., £5/7/6. (Post and Packing 3/6). Parts sold separately. Priced parts list and plans 1/9. C.O.D. 2/- extra.

107/6



45/-

TWO-TRANSISTOR POCKET SET. Can Be Built for 45/-. BUILD THE "SKY-GNOME" VEST-POCKET TWO TRANSISTOR RADIO which gives a superb performance and is highly sensitive. Weight under 7 ozs.—yet it is a THREE-STAGE receiver covering all medium waves, working entirely off a "penlight" battery. Every part tested before despatch! SPECIAL STEP-BY-STEP PLANS FOR ABSOLUTE BEGINNERS. Total building cost including case, transistors, etc.—everything down to the last nut and bolt—ONLY 45/- with plans. Postage, etc., 2/-. (C.O.D. 2/- extra.) (Parts sold separately. Priced parts list and plans 1/6.) RUSH YOUR ORDER TODAY!

CONCORD ELECTRONICS

210, Church Road, Hove, Sussex

Dept. PW25

Orders receive prompt attention. Cheques accepted. Cash on delivery 2/- extra. Please print name and address in block letters. Suppliers to Schools, Universities, Government and Research Establishments. **Complete range of components and valves stocked.** *Regret no C.O.D. abroad. DEMONSTRATIONS DAILY AT WORKS.*

Stern's "fidelity" TAPE RECORDERS

There are no better value-for-money Tape Recorders on the market—if you can't call and hear them, send S.A.E. for fully descriptive leaflets.

BEFORE YOU BUY —YOU SHOULD HEAR THESE RECORDERS. THEY ARE COMPARABLE TO THE MUCH HIGHER-PRICED MODELS

MODEL CR/3S Incorporates the New COLLARO "STUDIO" TWIN TRACK 3-speed Deck H.P. Terms: Deposit £7.18.0 and 12 months of £2.17.11. **£39.10.0**

MODEL CR3/T Incorporates the very popular 3-speed COLLARO Mk. IV "TRANSCRIPTOR" Deck which has both upper and lower tape tracks. H.P. Terms: Deposit £9.10.0 and 12 months of £3.9.8. **£47.10.0**

MODEL TR3/Mk. VI Incorporates the New TRUVOX Mk. VI TWIN TRACK 2-speed Tape Deck H.P. Terms: Deposit £9.18.0 and 12 months of £3.12.7. **£49.10.0**

All prices quoted provide for the COMPLETE RECORDER including CRYSTAL MICROPHONE and 1,200 ft. Spool of Tape.

Each Model incorporates the highly successful HF/TR3 Amplifier (described opposite) thus ensuring truly "Hi-Fi" record and playback facilities.

TAPE AMPLIFIERS and PRE-AMPLIFIERS PRESENTED FROM MULLARD DESIGNS

MODEL HF/G2A-D

A complete self-contained Tape Recorder chassis incorporating Loudspeaker and comprising the Model HF/G2A Amplifier connected to the Garrard Tape Deck. Operates at 3¾in./sec. speed and supplied fully tested and ready for immediate operation, designed for easy fixing into a portable case or cabinet only four fixing screws being required.

PRICE **£25.0.0** (Including a 4in. spool of Long Play Tape.) Terms, Dep. £5.0.0, 12 months £1.16.8.

Alternatively we offer Complete Kit of Parts to build the HF/G2A Amplifier with the ASSEMBLED AND TESTED GARRARD TAPE DECK for **£22.0.0** Terms, Deposit £4.8.0, 12 months £1.12.3.

The model HF/G2A is available separately for

(a) COMPLETE KIT OF PARTS £11.0.0
(b) ASSEMBLED £12.15.0

MODEL HF/G2P-D

THE IDEAL "LINK" TO ADD FULL TAPE RECORDING FACILITIES TO HIGH QUALITY HOME INSTALLATIONS, RADIOGRAMS, etc. Comprises the HF/G2P Tape Pre-amplifier fitted to the Garrard Tape Deck, operates at 3¾in./sec. speed, connects into the tape input channel or pick-up sockets of existing Amplifier or Radio Chassis. COMPLETE WORKING UNIT, containing 4in. spool of Long Play Tape.

PRICE **£23.15.0**

Terms, Dep. £4.15.0, 12 months £1.14.10.

Alternatively we offer Complete Kit of Parts to build the HF/G2P Pre-amplifier with the ASSEMBLED AND TESTED GARRARD DECK for **£20.15.0**

Terms, Dep. £4.3.0, 12 months £1.10.5.

Model HF/GR2 Contains the Model HF G2A-D Unit (described opposite). A small robust recorder with outstanding performance. Truly portable, weighs only 22 lbs. Twin Track operates on 3¾in./sec. speed.

PRICE **£29.15.0**

H.P. Terms, Deposit £6.0.0, and 12 months at £2.3.7.

The Pre-amplifier Model HF/G2P is available separately for
(a) Complete Kit of Parts £9.10.0.
(b) Assembled £11.5.0.

MODEL HF/TR3 TAPE AMPLIFIER

(Mullard Type "A" design)

A very high quality Amplifier incorporating 3-speed treble equalisation, using the latest FEROXCUBE POT CORE INDUCTOR, FOR COLLARO-TRUVOX-BRENELL-WEARITE or MOTEK Tape Decks, has GILSEN Output Transformer. Includes separate Power Supply Unit.

KIT OF PARTS **£12.15.0** OR ASSEMBLED **£16.16.0**

H.P. Deposit £3.6.6 and 12 months at £1.4.2.

MULLARD TYPE "C" TAPE PRE-AMPLIFIER—ERASE UNIT

The "Hi-Fi" link to add full tape recording facilities to High Fidelity home installations. Incorporates FEROXCUBE POT CORE PUSH PULL OSCILLATOR and 3-speed treble equalisation by FEROXCUBE POT CORE INDUCTOR FOR WEARITE-COLLARO-TRUVOX-BRENELL or MOTEK TAPE DECKS Includes separate power Supply Unit.

KIT OF PARTS **£14.0.0** H.P. £3.8.0 Deposit and 12 months £1.4.11. OR ASSEMBLED **£17.0.0**

(Excluding power unit £11.15.0 and £14.10.0 respectively).

FOR THE HOME CONSTRUCTOR

SPECIAL 'COMBINED ORDER' PRICES

(a) The COLLARO "STUDIO" TAPE DECK and our Mullard Type "C" PRE-AMPLIFIER and Power Unit Assembled and Tested **£29.10.0**
H.P. Deposit £5.18.0 and 12 months £2.3.3.

(b) As above but TYPE "C" PRE-AMPLIFIER supplied as complete KIT OF PARTS **£26.10.0**

(c) The COLLARO Mk. IV TAPE DECK and the MULLARD TYPE "C" PRE-AMPLIFIER and Power Unit assembled, tested **£35.0.0**
H.P. Deposit £7, and 12 months £2.11.4.

(d) As (c) but Type "C" as COMPLETE KIT OF PARTS **£32.0.0**

(e) The TRUVOX Mk. VI DECK and the assembled Type "C" Pre-amplifier and Power Unit. **£40.0.0**
H.P. Deposit £8.0.0, and 12 months £2.18.8.

(f) As above but Type "C" as complete KIT OF PARTS **£36.10.0**

(g) The BRENELL Mk. V DECK and the assembled Type "C" PRE-AMPLIFIER and POWER UNIT **£46.0.0**
H.P. Deposit £9.4.0, and 12 months £3.7.6.

(h) As (g) but Type "C" as complete KIT OF PARTS **£43.0.0**

(i) THE WEARITE 4A DECK with TYPE "C" assembled and tested **£56.0.0**
H.P. Deposit £11.4.0, and 12 months £4.2.1.

(Carriage and Insurance on above quotes 10/- extra.)

EACH OF THE ABOVE CAN BE SUPPLIED IN A PORTABLE CASE THUS FORMING A COMPLETE PORTABLE PRE-AMPLIFIER. (FULL DETAILS ON REQUEST)

(a) COMPLETE KIT to build the HF/TR3 Amplifier together with the COLLARO "STUDIO" DECK. **£25.10.0**

(b) As above but with HF/TR3 supplied ASSEMBLED and TESTED **£29.0.0**
H.P. Deposit £5.16.0, and 12 months £2.2.6.

(c) COMPLETE KIT to build the HF/TR3, together with the Mk. IV COLLARO "TRANSCRIPTOR" TAPE DECK **£30.15.0**

(£1 extra if we are required to wire up Deck Switch Banks.)

(d) As above but HF/TR3 supplied ASSEMBLED and TESTED **£34.10.0**
H.P. Deposit £7.0.0, and 12 months £2.10.5.

(£1 extra if we are required to wire up Deck Switch Banks.)

(e) COMPLETE KIT to build the HF/TR3, together with the NEW TRUVOX Mk. VI TAPE DECK. **£36.0.0**

(f) As above but HF/TR3 supplied ASSEMBLED and TESTED **£39.10.0**
H.P. Deposit £7.18.0, and 12 months £2.17.11.

(g) COMPLETE KIT to build the HF/TR3 AMPLIFIER with the BRENELL Mk. V TAPE DECK. **£41.10.0**

(h) As above but HF/TR3 supplied ASSEMBLED and TESTED **£45.0.0**
H.P. Deposit £9.0.0, and 12 months £3.6.0.

(i) THE WEARITE 4A DECK with assembled and tested HF/TR3 Amplifier including WEARITE Head Lift Transformer **£55.0.0**
H.P. Deposit £11.0.0, and 12 months £4.0.8.

Carriage and Insurance on each above is 10/- extra.

Attractive PORTABLE CASE is available to accommodate the TRUVOX or COLLARO TAPE DECKS and we offer it, together with ROLA/CELESTION 10 x 6in. LOUDSPEAKER—ACOS CRYSTAL MICROPHONE—and 1,200ft. SPOOL E.M.I. TAPE—ALL FOR £8.10.0. Carriage and Insurance 5/- extra.

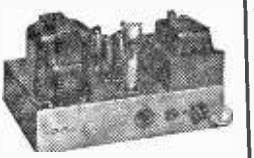
FULLY DESCRIPTIVE LEAFLETS ON ALL OF ABOVE ARE AVAILABLE—BUT PLEASE ENCLOSE S.A.E. AND STATE WHICH LEAFLET IS REQUIRED.

STERN RADIO LTD.

STERN'S MULLARD DESIGNS

Designed by MULLARD—presented by STERN'S strictly to specification

COMPLETE KIT OF PARTS— MULLARD "5-10" MAIN AMPLIFIER



For use with the MULLARD 2-valve pre-amplifier with which undistorted power output of up to 10 watts is obtained. We supply SPECIFIED COMPONENTS AND NEW MULLARD VALVES, including PARMEKO MAINS TRANSFORMER and choice of the latest Ultra-Linear PARMEKO or the PARTRIDGE Output Transformer. PRICE COMPLETE KIT (PARMEKO Output Trans.). **£10.0.0**

Alternatively we supply ASSEMBLED and TESTED. **£11.10.0**

ABOVE INCORPORATING PARTRIDGE OUTPUT TRANSFORMER, £1.6.0 EXTRA

MULLARD'S PRE-AMPLIFIER TONE CONTROL UNIT

Employing two EF86 valves, and designed to operate with the MULLARD MAIN AMPLIFIERS, but also perfectly suitable for other makes.

PRICE COMPLETE KITS OF PARTS **£6.6.0** ASSEMBLED AND TESTED **£8.0.0**

Supplied strictly to MULLARD'S SPECIFICATION and incorporating:

- Equalisation for the latest R.I.A.A. characteristics.
- Input for Crystal Pick-ups, and variable reluctance magnetic types.
- Input (a) Direct from High Imp. Tape Head. (b) From a Tape Amplifier or Pre-amplifier.
- Sensitive Microphone Channel. ● Wide range BASS and TREBLE Controls.

COMPLETE MULLARD "5-10" AMPLIFIER

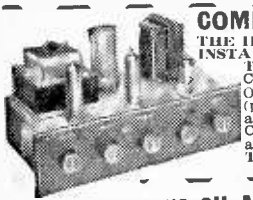
The popular and very successful complete "5-10" incorporating Control Unit providing up to 10 watts high quality reproduction. Only Specified Components and new MULLARD VALVES are supplied including PARMEKO MAINS TRANSFORMERS and choice of the latest PARMEKO or PARTRIDGE ULTRA-Linear Output Transformers.

KIT OF PARTS **£11.10.0** OR ASSEMBLED and TESTED **£13.10.0**

HIRE PURCHASE (Assembled Amp. only). DEPOSIT £2.14.0. 12 months at 19/10.

ABOVE incorporating PARTRIDGE OUTPUT TRANS. £1.6.0 extra

COMPLETE MULLARD "3-3"



THE IDEAL AMPLIFIER FOR A SMALL HIGH QUALITY INSTALLATION PROVIDING EXCELLENT REPRODUCTION OF UP TO 3 WATTS OUTPUT

COMPLETE KIT OF PARTS **£7.10.0** OR ASSEMBLED and TESTED **£8.19.6**

(plus 6/6 carriage and insurance) H.P. Terms: Deposit £2.0.0 and 8 Months at £1.0.0. Complete to MULLARD'S SPECIFICATION including Mullard valves and a PARMEKO OUTPUT TRANSFORMER.

STEREO "3-3" MAIN AMPLIFIER

Comprises two MULLARD 3-3 Main Amplifiers on one chassis. Operates with MULLARD STEREO PRE-AMPLIFIER. Output power 6 watts. Inputs for Crystal Pick-up and Radio Tuner.

KIT OF PARTS **£10.0.0** OR ASSEMBLED **£11.15.0**

COMPLETE STEREO AMPLIFIER

Meets the many requests for a low priced but good quality Stereophonic Amplifier. Output power is 4 watts and suitable for Crystal Pick-ups.

KIT OF PARTS **£8.10.0** OR ASSEMBLED **£10.10.0**

!! RECORD PLAYERS !!

THE LATEST MODELS ARE IN STOCK, MANY AT REDUCED PRICES

SEND S.A.E. FOR ILLUSTRATED LEAFLET

B.S.R. MONARCH UA8 4-speed mixer Autochanger with Crystal Pick-up. **£6.19.6**

The NEW COLLARO MODEL RP594 4-speed Single Record Player. Studio Cartridge. **£9.18.9**

The COLLARO "CONQUEST" 4-speed Autochanger Studio Pick-up. **£7.10.0**

The COLLARO 4-speed Single Record Player, Studio Pick-up. **£6.9.6**

THE NEW B.S.R. Model UA12 in Stock. A4 "SPEED" MIXER AUTOCHANGER. **£8.7.6**

UA12 also available incorporating the B.S.R. STEREO Pick-up, plays L.P. and 78 Records. **£10.10.0**

GARRARD MODEL TA/MK.II 4-speed Player fitted high output Crystal Pick-up. **£8.10.0**

GARRARD MODEL RC/210. Autochanger 4-speeds. High output. Crystal Pick-up. **£10.10.0**

Carriage and Insurance on each above. 5/- extra.

H.P. TERMS AVAILABLE ON EQUIPMENT OVER £9. DESCRIPTIVE LEAFLETS AVAILABLE FOR ALL EQUIPMENT. PLEASE SEND S.A.E.

Dept. P.W. **109 FLEET ST., LONDON, E.C.4**

Telephone: FLEET STREET 5812/3/4

PRICE REDUCTIONS

(a) The KIT OF PARTS to build both the "5-10" Main Amplifier and the 2-valve PRE-AMP CONTROL UNIT..... **£15.15.0**

(b) The "5-10" and the 2-stage PRE-AMP both ASSEMBLED and TESTED H.P. Dep. £3.16.0 and 12 months of £1.7.8..... **£18.18.0**

(c) The KIT OF PARTS to build the DUAL-CHANNEL "3-3" AMPLIFIER and the DUAL-CHANNEL PRE-AMPLIFIER CONTROL UNIT..... **£21.10.0**

(d) The DUAL-CHANNEL "3-3" AMPLIFIER and the DUAL-CHANNEL PRE-AMPLIFIER CONTROL UNIT BOTH ASSEMBLED and TESTED **£25.0.0**

H.P. Terms: Deposit £5 and 12 months of £1.16.8.

(e) THE KIT OF PARTS to build one "5-10" MAIN CHANNEL and the DUAL-CHANNEL PRE-AMP CONTROL UNIT.. **£21.10.0**

(f) ONE "5-10" AMPLIFIER and the DUAL-CHANNEL PRE-AMPLIFIER both ASSEMBLED and TESTED **£25.0.0**

H.P. Terms: Deposit £5, 12 months of £1.16.8.

(g) KIT OF PARTS to build Two "5-10" MAIN AMPLIFIERS (incorporating Parmeko Output Transformers) and the DUAL-CHANNEL PRE-AMPLIFIER CONTROL UNIT **£31.0.0**

(h) TWO "5-10" AMPLIFIERS and the DUAL-CHANNEL PRE-AMPLIFIER CONTROL UNIT BOTH ASSEMBLED & TESTED **£36.0.0**

H.P. Terms: Deposit £7.4.0, 12 months £2.12.0.

Carriage and Insurance 7/6 extra. Prices quoted are subject to £1.6.0 extra for Partridge Transformer.

STEREO PRE-AMPLIFIER

This model incorporates two Mullard 2-valve Pre-Amplifiers combined into a Single unit enabling it to be used for both STEREOPHONIC or MONAURAL operation. It is designed primarily to operate with our range of MULLARD MAIN AMPLIFIERS but will also operate equally well with any make of Amplifiers requiring an input of 250 m volts.

COMPLETE KIT OF PARTS **£12.10.0** ASSEMBLED AND TESTED **£15.0.0**

H.P. £3 Dep. and 12 mths. at £1.2.0

MODEL I.L. one microphone input matched for moving coil or Ribbon Mike. £1.17.0 extra.

MULLARD FOUR CHANNEL MIXER UNIT

Self powered with Cathode follower output. Incorporates Two inputs for MICROPHONES. One for CRYSTAL PICK UP and a fourth for RADIO or TAPE.

Complete Kit of Parts **£8.8.0**

Assembled and Tested **£10.0.0**

TERMS: Deposit £2 and 12 months at 15/-.

Mk.11 "Fidelity" FM TUNING UNIT

An attractively presented Unit incorporating MULLARD PERMEABILITY TUNING HEART and corresponding Mullard valve line up. FOR THE CONSTRUCTOR **£10.10.0** ASSEMBLED **£14.5.0**

A SPECIAL CASH OFFER!!

This very attractive PORTABLE AMPLIFIER CASE together with a good quality GRAM AMPLIFIER and a matched P.M. SPEAKER. For ONLY **£8.7.6** (Plus 7/6 Carr. & Ins.)

The Amplifier consists of a 2-stage design incorporating 3 modern B.V.A. valves and has separate BASS and TREBLE CONTROLS.

The Portable Case will also accommodate almost any make of Autochanger and is attractively finished in Mushroom Grey Rexine.

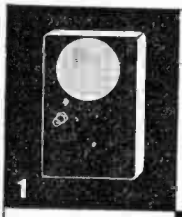
WE ALSO SUPPLY SEPARATELY— **£4.2.6**

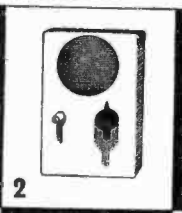
(a) The 2-stage (plus Rectifier) AMPLIFIER **£3.17.6**

(b) The PORTABLE CARRYING CASE

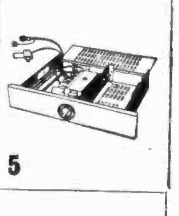
(c) 6in. P.M. SPEAKER **18/9** Carriage and Insurance 4/- extra.

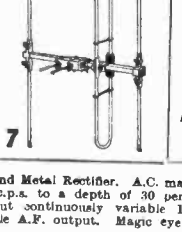
CHECK with these BARGAINS





ORDERS BY POST WILL RECEIVE OUR PROMPT ATTENTION





EASY TERMS AVAILABLE EXCEPTING AUTO-CHANGES

1. **3-TRANSISTOR POCKET RADIO with MINIATURE SPEAKER, FERRITE ROD, PRINTED CIRCUIT and GERMANIUM DIODE.** The only 3 transistor radio available at the price. Build it in 1 evening! Tuneable over M/L waves. Complete with easy-to-follow instructions and all components (less batteries obtainable anywhere 10d). 22/6, P. & P. 1/6. (All parts available separately).
2. **3-TRANSISTOR SUPER POCKET RADIO with MINIATURE SPEAKER.** Plus Germanium Diode and Printed Circuit. Size 3¼ x 4 x ⅞in. Ferrite Rod Aerial. Two Surface Barrier Transistors and one Audio. Tunable over medium and long waves. To build yourself 39/6, P. & P. 1/6. Circuit diagram 1/6, free with kit. All parts of items 1 and 2 sold separately.
3. **DOUBLE BEAM "SCOPE"** for D.C. and A.C. APPLICATIONS. A high gain, extremely stable differential Y-amplifier (30 mV C.M.). Provide ample sensitivity with A.C. or D.C. inputs. Especially suitable for measurements of transistor operating conditions where maintenance of D.C. levels is of para-mount importance. Push-pull X amplifier; Fly-back suppression; Internal Time-base Scan Waveform available for external use; pulse output available for checking TV line O/P Transformers, etc. Provision for external—I/P and CRT Brightness Modulation. A.C. mains 200/250 v. £19.19.0, P. & P. 7/6 or 50/- deposit plus P. & P. 7/6 and 12 monthly payments of 33/4. FULL 12 MONTHS' GUARANTEE INCLUDING VALVES and TUBE.
4. **A.C./D.C. POCKET MULTI-METER KIT.** 2in. moving coil meter, scale calibrated in A.C./D.C. volts, ohms and milliamps. Voltage range A.C./D.C. 0–50, 0–100, 0–250, 0–500. Milliamps 0–10, 0–100. Ohms range 0–10,000. Front panel, range switch, wirewound pot (for ohms zero setting), toggle switch, resistor and rectifier. 19/6, P. & P. 1/6. Wiring diagram 1/-, free with kit.
5. **CHANNEL TUNER.** Will tune to all Band I and Band III stations. Complete with P.C.C.84 and P.C.F.80 valves (in series) I.F. 16–19 or 33–38. Can be modified as an aerial converter (instructions supplied). 32/6, plus 3/6 P. & P. **HEATER TRANSFORMER** to suit above. 200–250 v., 6/-. plus 1/6 P. & P.
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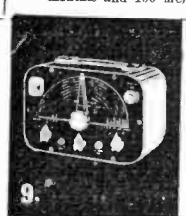
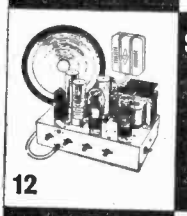
7. **WOLSEY 3-ELEMENT FOLDED DIPOLE.** I.T.V. Aerial less mounting bracket for external use, complete with 12 yds. of coaxial cable, 15/-; P. & P. 3/6.
8. **CYLDON TURRET TELETUNER 1 F 34/38 Mcs.** Brand new complete with biscuit for channels 2, 4, 8 and 9. Less valves, 10/-. P. & P. 2/6 Pair of knobs to suit, 3/6. (Valves required P.C.C. 84 & P.C.F. 80).
9. **SIGNAL GENERATORS.** Cash £6.19.6 or 25/- deposit and 6 monthly payments of 21/6, P. & P. 5/-. Coverage 100 kc/s to 100 Mc/s on funda-mentals and 100 Mc/s to 200 Mc/s on harmonics. Case 10 x 6¼ x 5¼in. Three miniature valves and Metal Rectifier. A.C. mains 200/250 v. Inter-nal modulation of 400 c.p.s. to a depth of 30 per cent; Modulated or unmodulated R.F. output continuously variable 100 millivolts. C.W. and mod. switch, variable A.F. output. Magic eye as output indicator. Accuracy ± 2 per cent.
10. **SIGNAL GENERATORS.** Cash £4.19.6 or 25/- deposit and 4 monthly payments of 21/6, P. & P. 5/-. Coverage 120 kc/s to 84 Mc/s. Case 10 x 6¼ x 4¼in. Size of scale 6¼ x 3¼in. 2 valves and rectifier. A.C. mains 230–250 v. Internal modulation of 400 c.p.s. to a depth of 30 per cent, modulated or unmodulated R.F. output continuously variable 100 millivolts. C.W. and mod. switch variable A.F. output and moving coil output meter. Accuracy ± 2 per cent.
11. **BATTERY RECORD PLAYER AND AMPLIFIER.** Comprising 45 r.p.m. "Starr" motor, "Acos" crystal pick-up, 3 transistor push-pull amplifier, complete with transistors. Output 500 milliwatts, 49/6, P. & P. 3/6.
12. **8-WATT PUSH-PULL AMPLIFIER COMPLETE WITH CRYSTAL MIKE AND 8in. LOUDSPEAKER.** A.C. mains 200–250 v. Size 10¼ x 6¼ x 2¼in. 6 valves. H.F. pen., 2 triodes, 2 output pens and rectifier. For use with all makes and type of pick-up and mike. Negative feed back. Two inputs, mike and gram. and controls for same. Separate controls for Bass and Treble lift. Response flat from 40 cycles to 15 kc/s, ± 2 db; 4 db down to 90 kc/s. Output 8 watts at 5 per cent total distortion. Noise level 40 db down all hum. Output transformer tapped for 3 and 15 ohms speech coils. For use with 8td. or L.P. records, musical instruments such as guitars, etc. £4.19.6, P. & P. 7/6 or 20/- deposit plus P. & P. 7/6 and 4 monthly payments of 23/-.
13. **B.S.R. MONARCH UA8 WITH FUL-FI HEAD.** 4-speed, plays 10 records, 12in., 10in., or 7in. at 16, 33, 45 or 78 r.p.m. Intermixes 7in., 10in. and 12in. records of the same speed. Has manual play position; colour, brown. Dimensions: 12¼ x 10⅝in. Space required above baseboard 4¼in., below baseboard 2⅜in. Fitted with Ful-Fi turnover crystal head. £6.19.6, P. & P. 5/- With Stereo Head, £7.19.6, P. & P. 5/-.
14. **TRANSISTOR TESTER.** For both P.N.P. and N.P.N. transistors incorporat-ing moving coil meter. In metal case, size 4¼ x 3¼ x 1½in. Scale marked in gain and leakage. 19/6, P. & P. 2/6.
15. **PUSH-PULL OUTPUT STAGE** inclusive of transistors with input and output transformers to match 3 ohms speech coil, suitable for use with the POCKET RADIO. Kit of parts, including transistors. 19/6, P. & P. 1/6. Wiring diagram 1/6, free with kit.
16. **PORTABLE AMPLIFIER.** On printed circuit for A.C. Mains 200/250 v Size 4 x 3in. with tone and volume control. Valves: ECL82 and EZ80. 39/6, P. & P. 2/6.





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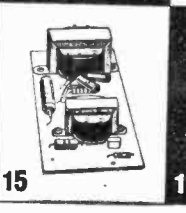

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Practical Wireless

VOL. XXXVI, No. 646, DECEMBER, 1960

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Contents

The Editor will be pleased to consider articles of a practical nature. Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor PRACTICAL WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Owing to the rapid progress in the designs of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

OUR CONSTRUCTOR'S GUIDE

WITH this issue, we present a free 16-page pull-out supplement entitled *The Practical Wireless Constructor's Guide.* This valuable booklet has been devised by members of our technical staff to provide a handy source of information which is required by the amateur radio constructor when designing and constructing receivers, amplifiers, tuners, etc.

Many useful tables are set out for easy reference in this supplement including details of the frequencies used by the BBC for sound broadcasts—both on medium and long-waves and on V.H.F. A wavelength-to-frequency conversion table is also given which will interest particularly the enthusiastic short-wave listener. We receive many enquiries about wire gauges and therefore a table comparing the different systems—both British and American—is incorporated. Several pages are devoted to a comprehensive guide to the colour code used for resistors and condensers and reference to this section should prevent the occurrence of many wiring errors.

Many amateurs find difficulty in understanding circuit diagrams and a whole section of the booklet is devoted to radio components and their symbols. Illustrations of various parts are given side by side with the circuit symbols, and the beginner would do well to study this section with particular care.

A FILM SHOW

THE films to be shown at the film show which we announced last month are "Conquest of the Atom", The Invisible Force" and "Particles Count". "Conquest of the Atom" deals with experiments which led to the achievement of nuclear fission. It begins with J. J. Thomson's work on electrons and positive particles, Rutherford's experiments that culminated in the splitting of the nitrogen nucleus, the splitting of the lithium atom by proton bombardment carried out by Sir John Cockroft and Dr. Walton, and continues with Sir James Chadwick's work and the eventual achievement of nuclear fission in 1938.

"The Invisible Force" is the story of magnetism and demonstrations are used to illustrate the ways in which early scientists found that magnetism existed and how, by fundamental research, industry has revealed more of the true nature of this force.

The third film—"Particles Count"—tells of the importance of counting and sizing of particles in many industrial processes. The development of electronic equipment that counts and sizes particles automatically is included and the film concludes with a comprehensive explanation of how the particle counting and sizing equipment operates.

The film show, which has been arranged in collaboration with Mullard Ltd., will be held at Caxton Hall, Westminster, on Friday, January 13th, 1961, at 7.30 p.m. Tickets are free and are now available from these offices. When applying for tickets, enclose a stamped addressed envelope (at least 3½in. x 6in.) and mark your envelope "Caxton Hall" in the top left-hand corner.

Our next issue, dated January, will be published on December 7th

Round the World of Wireless

POTENTIAL AND CURRENT NEWS

Broadcast Receiving Licences

THE following statement shows the approximate number of Broadcast Receiving Licences in force at the end of August, 1960, in respect of wireless receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland. The numbers include Licences issued to blind persons without payment.

Region	*Total*
London Postal	765,472
Home Counties	717,711
Midland	532,160
North Eastern	583,099
North Western	495,934
South Western	429,766
Wales and Border Counties	258,351
Total England and Wales	3,782,493
Scotland	439,117
Northern Ireland	129,725
Grand Total	4,351,335

Automatic Landing System for Air Freighter

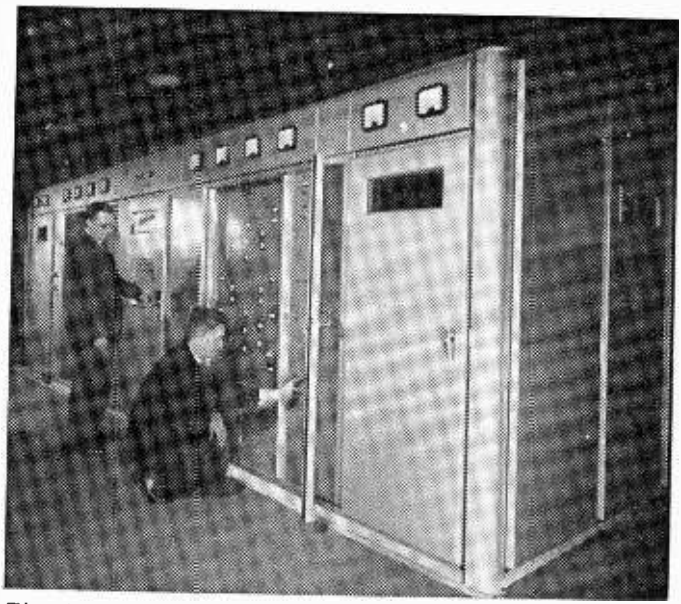
THE Short SC.5 Britannic, chosen as the R.A.F.'s strategic heavy freighter, will be the first transport aircraft in the world to be equipped with a fully automatic landing system suitable for passenger carrying aircraft. This equipment, which is based upon the system developed by the Ministry of Aviation Blind Landing Experiment Unit, will enable the 100 ton aircraft to land in all weathers, even in fog.

The system itself is being developed by Smiths Instruments, who have already prepared a comprehensive design study of every item of equipment. Also collaborating are Murphy, who are providing guidance equipment, and Standard Telephones, who are responsible for radio altimeter systems.

Electrical Engineers Exhibition Dinner

IN support of a recent call by the Prime Minister for increased efforts in the export field, the organisers of the National Electrical Engineers Exhibition held a dinner at Grosvenor House, London on October 13th. This event also marked the commencement of the campaign to attract buyers from home and overseas to the 1961 Exhibition at Earls Court. The dinner afforded an opportunity for exhibitors to meet diplomatic and commercial representatives of overseas countries, executives in the industry and its associations, and senior representatives of large purchasing organisations.

Among those present were the High Commissioners for Australia, Ceylon, Ghana and Pakistan; the Ambassadors for Afghanistan, Burma, Chile, Czechoslovakia, Haiti, Honduras, Iceland and many others. The speaker was the High Commissioner for Australia, His Excellency The Right Honourable Sir Eric Harrison, K.C.V.O.



The above illustration shows one of four 100kW high-frequency radio transmitters ordered by the Government of Ghana from Marconi's. This is for installation in a new station at Tema, near Accra. The new station will give Ghana the most modern high-power short wave broadcasting system on the African Continent.

Transmitter for Brookman's Park

A NEW 50kW medium frequency sound broadcasting transmitter has been ordered by the British Broadcasting Corporation from the Marconi Company for use at the Brookman's Park station. The original Brookman's Park transmitter, built and installed by Marconi's 31 years ago, is still radiating the Light Programme, but because of its great age the operating costs are now rather high compared with a modern equipment of equivalent output power. The new Marconi transmitter will be capable of being operated by remote control.

Type BD228 which is to be installed is a new design, with simplicity of operation, reliability, high efficiency and economy of floor-space. The radio frequency stages, three in number, use only three valves to obtain the final output of 50kW. A driving power of 2W is used for the input to the first stage which is a tetrode mounted in a single ended circuit. This valve drives a triode which is followed by a triode final amplifier.

Surveillance Radars for Switzerland

TWO new air traffic control radar systems now being installed to cover Switzerland's major air routes will mark the

first use of microwave relay links for remote control of all operating functions. Designed and produced by the Raytheon Company for Radio Suisse S.A., the radars will serve and be operated from control centres at the Geneva-Cointrin and Zurich-Kloten airports.

Radar transmitter-receivers for Geneva-Cointrin will be located atop 5,500ft Mont le Dole 16 miles away. The radar pedestal weighing several thousand pounds, the giant 40ft wide aerial, and the microwave relay equipment will be taken up the last 1,500ft of the mountain by cable car. For the Zurich-Kloten installation a concrete structure 60ft high will be erected on a hill about seven miles away.

Installation of the radar system and microwave relay equipment will be supervised by engineering teams of Raytheon Canada Ltd.

Lord Chandos visits Canada

LORD CHANDOS, Chairman of Associated Electrical Industries Ltd., left London recently on a visit to Canada. In Western Canada he will see the site of the main dam on the Peace River power development project. A.E.I. has been connected with this scheme since its inception and the first surveys by the Wenner-Gren organisation. This project has received the approval of the British Columbian Government. In Toronto, Lord Chandos will see representatives of Associated Electrical Industries (Canada) Ltd.

A.E.I is supplying generating equipment for a number of Canadian power projects. Included amongst these are a 220mW set for the Dominion's first big nuclear power station at Douglas Point.

Marconi Equipment for Indian Railways

AN order has been obtained by Marconi's Wireless Telegraph Co. Ltd. from Bharat Electronics of Bangalore, India, for the supply of a VHF multichannel communications system for South Eastern Railways in India.

The equipment consists of sixteen HM 100 terminals and eight HM 150 repeaters, with aerials and ancillary gear. It will be used to provide communication over the route connecting Adra, Tatanagar, Chakradharpur and Garden Reach (Calcutta).

This is the first order received after the signing of an agreement between the two companies for the right of manufacture of Marconi HM 100/150 multichannel equipment in India. The contract is for the supply and installation of the complete system including towers, diesel generators, telegraph equipment and teleprinters.

Ultra Anniversary Lecture

THE third Ultra Anniversary Lecture was given in the Recital Room of the Royal Festival Hall on October 12th. The speaker was Mr. G. W. A. Dummer, M.B.E., M.I.E.E., Superintendent, Technical Services Department, Royal Radar Establishment. Mr. Dummer's paper was entitled "The Changing Role of Electronic Components". The paper traced first the effect of constructional techniques on conventional componets, then the effect of potted and printed circuits, and also the influence of war conditions on component design and construction.

New Factory Extension

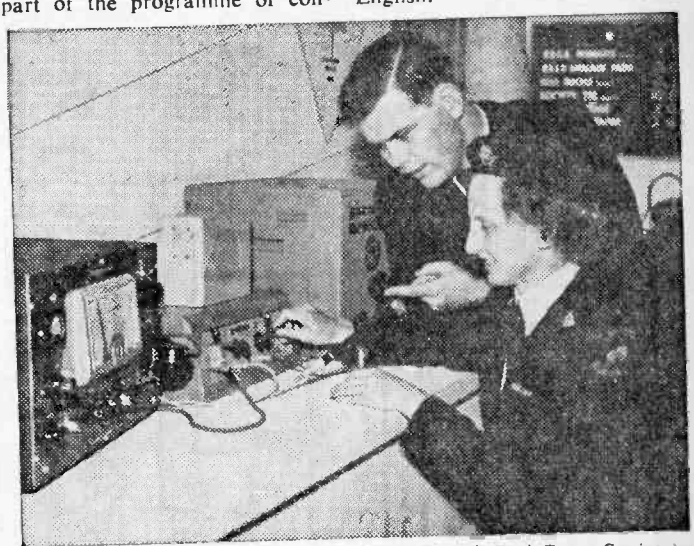
THE extension to the Hainault, Essex factory of Advance Components Ltd. has recently commenced. This extension is part of the programme of controlled expansion which brought the Company to Hainault from Walthamstow in 1956. The new buildings will increase the productive area by 50per cent and the office accommodation by about 25per cent. The work is in the hands of Architects, Ronald Ward and Partner, and the Building Contractors, K. Wager and Co. Ltd.

New British Journal

The world's first journal dealing specifically with cryogenics, the realm of low temperature engineering and research, has just been launched in Britain.

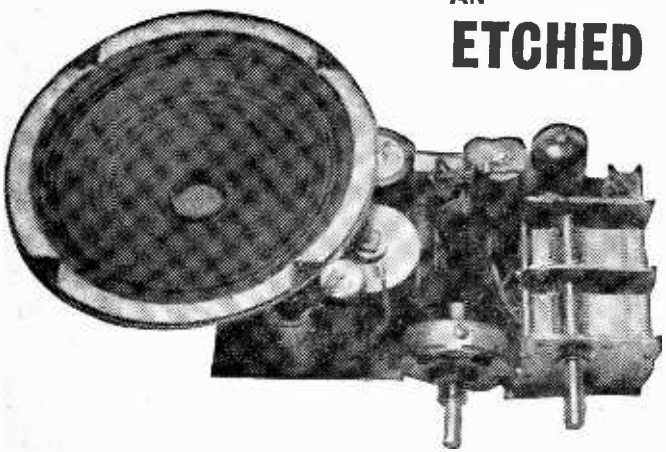
Called simply "Cryogenics", it will appear quarterly, publishing original papers on all aspects of cryogenic research and technology.

"Cryogenics" is edited jointly by three leading authorities: Dr. K. Mendelssohn, F.R.S., of the Clarendon Laboratory, Oxford; R. B. Scott, chief of the N.B.S. Cryogenic Engineering Laboratory, Colorado; and Professor L. Weil, of the Institut Fourier, Grenoble University. The first issue will contain nine original papers from Britain, America, France and the Netherlands, together with abstracts of each in French, German, Russian and English.



Miss Jane Blois is a staff officer in the British Red Cross Society's International Relations Department, and she has become the first woman member of the Society to volunteer for training as an amateur radio operator. Here, Mr. Alan Butcher, who represents the Radio Amateur Emergency Network, instructs Miss Blois in the use of the receiver/transmitter equipment installed at B.R.C.S. H.Q.

AN ETCHED CIRCUIT T.R.F.



A DUAL VALVE CIRCUIT GIVING HIGH PERFORMANCE WITH A HOME-MADE PRINTED CIRCUIT

By J. G. Ransome

THIS receiver, by the use of dual valves and circuitry, will give similar results to any 3-valve plus rectifier T.R.F. set and yet can be accommodated in a cabinet no more than 6in. x 10in. x 3½in. even though a large 5in. loudspeaker is used. A wide latitude in component values can be tolerated and this set makes an ideal "spares box special".

Circuit

The pentode section of the ECF80 is used as a conventional tuned R.F. amplifier. The screen grid resistor may be any value between 33k and 220k; the screen is at chassis potential to R.F. bypassed to chassis with a 0·01μF condenser. The 0·01μF cathode bypass condenser (C3) gives a small increase in gain, but may be omitted in places with high signal strength. Detection is effected by the crystal diode (X1) connected to L2. An alternative way of taking R.F. from the first stage is shown in Fig. 2. This will increase

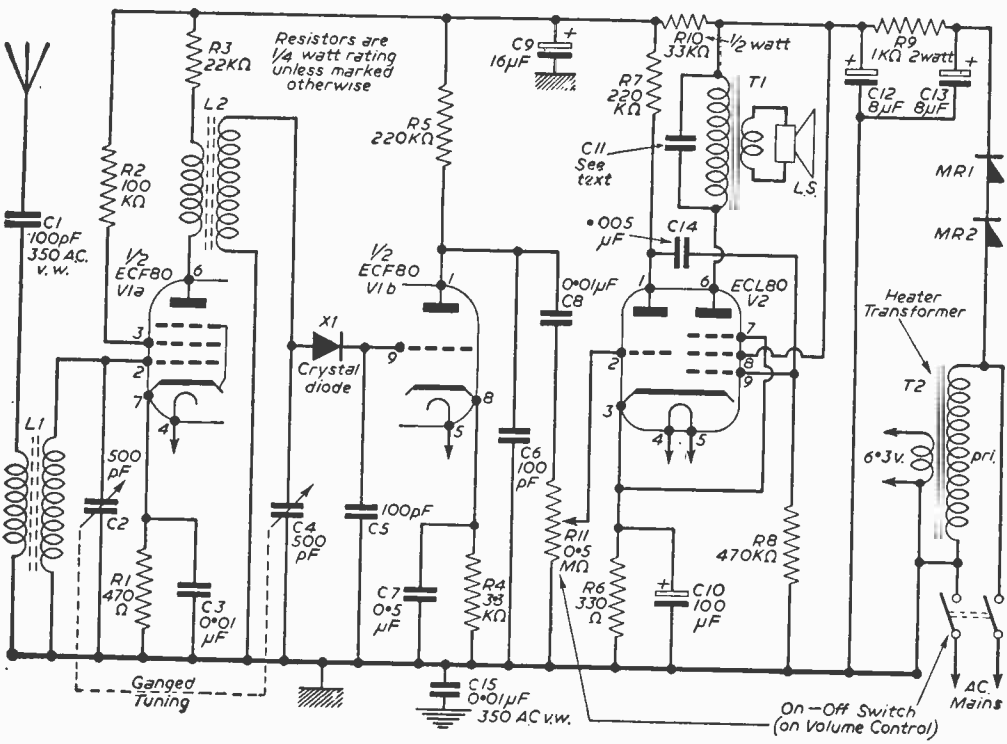


Fig. 1.—Theoretical circuit of the receiver.

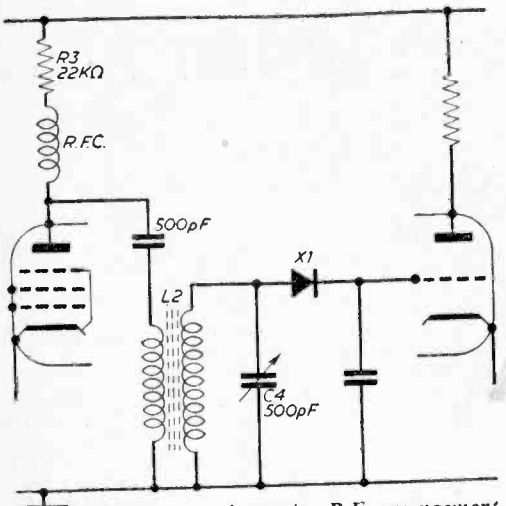


Fig. 2.—An alternative R.F. arrangement.

selectivity but involves two more components and the increase was not found to be worth the trouble in the original model. In any case, if the coils specified are used, then adequate selectivity will be obtained since they have a very good Q factor, giving a very remarkable performance in this circuit.

The detector output is taken to the grid of the triode section of the ECF80, which acts as a voltage amplifier. The crystal diode may be omitted if desired and the R.F. from L2 taken to the triode grid—the triode then acting as an anode bend detector. This reduces the output of the receiver, but this does not matter in high-signal areas. The cathode bypass condenser is essential and any value from 0·1μF may be used and R4 may be any value between 1·5k and 4·7k.

Output

The amplified signal from V2 is taken to the triode section of the ECL80. The anode supply for the triode is taken from the decoupled H.T. supply to avoid the effects of instability in the form of "motorboating." The very large value of the cathode bypass condenser is essential if the output stage is to remain stable under any condition. The output stage is of normal circuitry. The tone control condenser (C11) must be found by experiment to suit the constructor and a value of roughly 0·005μF should prove a good basis for experiment.

It must be emphasized that this receiver has all common metal points connected together which under certain circumstances may be connected to the "live" side of the mains. Therefore, the condensers C1 and C15 *must* be incorporated and they should be high-quality components and of the voltage rating specified. The set should be completely enclosed in a fully insulated cabinet and the projecting spindles should have fully enclosing knobs, the grub screws of which should be sealed with wax.

COMPONENTS LIST

R1—470Ω.
R2—100k (47-220k).
R3—22k (10-47k).
R4—3·3k (1·5-4·7k).
R5—220k (100-270k).
R6—330Ω (250-400Ω).
R7—220k (100-270k).
R8—470k (250k-1M).
R9—1k 2W.
R10—33k ½W (22-47k).
R11—0·5M potentiometer with switch.
C1—100pF 350V A.C. working (50-1000pF).
C2, 4—500pF variable twin gang condenser (small).
C3—0·01μF 150VW (0·01μF to 1μF).
C5, 6—100pF 250VW (50-500pF).
C7—0·5μF 100VW (0·1-1μF).
C8—0·01μF 250VW.
C9—16μF 350VW electrolytic (4μF or above).
C10—100μF 12VW electrolytic (or greater).
C11—tone control condenser (see text).
C12, 13—8+8μF 350VW electrolytic.
C14—0·005μF 350VW.
C15—0·01μF 350VW A.C.
MR1, 2—RM1 or equivalent.
T1—to match ECL80 to loudspeaker.
T2—6·3V heater transformer.
L1—QA.11 (Osmor).
L2—QHF.11 (Osmor).
Loudspeaker, copper bonded board 3½in. x 6in., solder, nuts, bolts, connecting wire, etc.

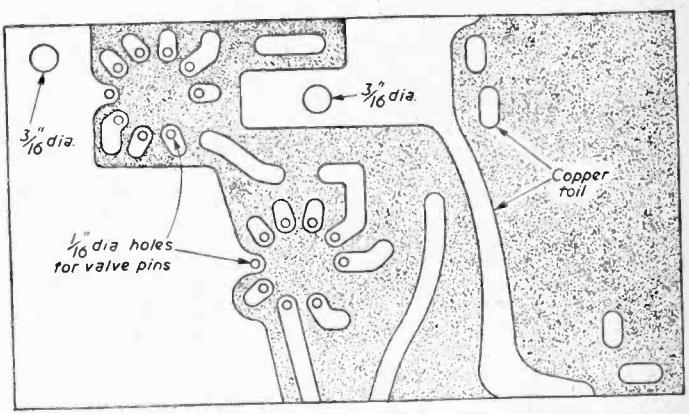
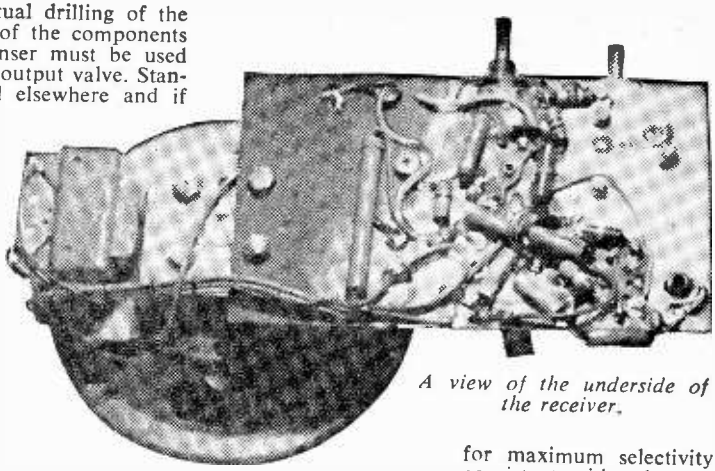


Fig. 3.—The circuit board template.

Preparing the Circuit

The diagram for the preparation of the etched circuit panel is given in Fig. 3. The light part indicates the copper that is to be left on the board. The etching is carried out as mentioned for the etched panel for the "Simpliamp" in a previous issue (page 313 August 1960). The panel size is 6in. x 3½in. The circuit should be highly polished before soldering to enable good connections to be made

on the circuit board. The actual drilling of the panel will depend on the size of the components used. A midget tuning condenser must be used if the vanes are not to foul the output valve. Standard-size components are used elsewhere and if miniature components are used a useful reduction in size may be obtained. The loudspeaker used in the original really governed the size of the set and if a smaller unit is employed then a much smaller set may be constructed. The component layout is unimportant, but it is always advisable to keep leads as short as possible and this will be found to be quite easy with this type of baseboard. The components may be mounted either above or below the board according to the space available.



A view of the underside of the receiver.

When all construction has been completed the receiver should be checked with the aid of the circuit diagram for shorts and proper connections; when this has been done the set should be connected to the mains and a good aerial connected to the aerial coil. When the set has warmed up the tuning condenser should be rotated and the local station tuned in. With the aid of a good *well-insulated* screwdriver, adjust the cores of the coils for maximum selectivity consistent with adequate volume. It is then advisable to line the set up with the aerial that is to be used finally. It will be found that a long aerial will give a good signal but poor selectivity (the capacitance of the lead damps the tuner circuit) and a short aerial gives good selectivity but with less volume. An aerial of about 3-4ft. should give good results.

The component wiring diagram is given in Fig. 4, and although the component layout is not critical, the actual connections must be as shown.

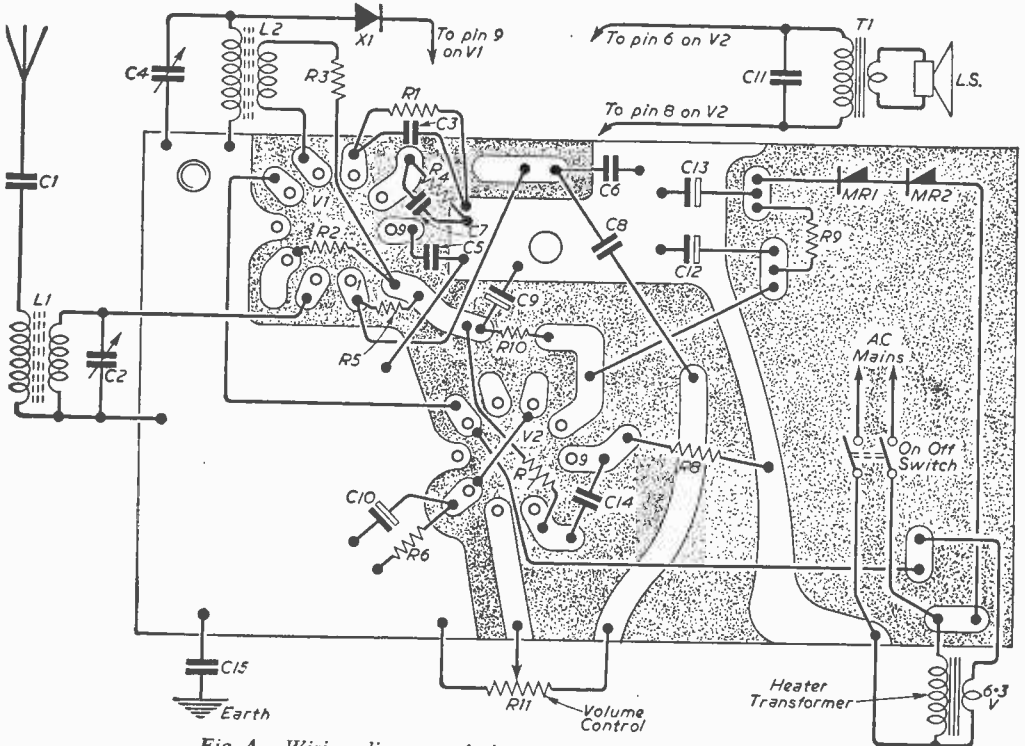


Fig. 4.—Wiring diagram of the receiver. (See note above.)

MAINS MODEL CONTROL TRANSMITTER

A SINGLE VALVE A.C. UNIT By F. G. Rayer

WITH any radio controlled model, much of the initial adjustment to the receiver, relay, and operating equipment can be done at home, where mains supplies are available. It is then convenient to have a small, self-contained mains trainsmitter, and such a unit can easily pay for itself by the saving in batteries which would be necessary if a portable, battery-operated transmitter were always used. The mains transmitter is, of course, also suitable for the ordinary control of a model which may be operated indoors, or in the garden, and for testing or using all sorts of radio-controlled devices in or near a house.

Transmitter Output

The transmitter described here has an output similar to that of a fairly powerful battery-run unit, and can easily give reliable control up to half a mile or so. At short distances, the powerful output is useful for insensitive diode or transistor receivers. It also allows short aerials to be used on transmitter and receiver.

The circuit is shown in Fig. 1, and uses a mains tetrode as a self-excited oscillator, with cathode keying. Bias is developed by grid rectification. Current is drawn from a small convertor or instrument type transformer. A 6·3V ¼A winding is needed for the valve heater. For high tension, a 220V 20mA winding is sufficient, but there is no need whatever to provide this exact voltage, 150V to 250V being satisfactory. A double-wound transformer is essential to isolate the equipment from the mains. No mains switch is provided, as the circuit is simply plugged in at a convenient point, when required, the valve cathode circuit being opened until the transmitter is keyed with the switch.

Component values are not very critical, but the H.F. choke should be a good short wave type. Though valveholder wiring is for a 6BW6, almost any triode, tetrode or pentode will operate successfully in this type of circuit.

Control Switch

This actually consists of a single on-off switch, but is made from a single-pole 4-way wavechange switch wafer, arranged as shown in Fig. 2. Four contacts are left, at 90 deg. intervals. Open-circuit positions are available between each pair of contacts. As a result, the circuit is completed, then broken, each time the control knob is turned through 90 deg. This is intended for use with a 4-position clockwork actuator. The rotation of the actuator then follows that of the control knob on the transmitter, in ¼-revolution steps. The knob thus has four positions, for "Stop," "Port," "Ahead," and "Starboard." Beginning from "Stop," with the model actuator also in this position, it is only necessary to turn the control knob to the required position for port, ahead, or starboard sailing. The actuator and control knob positions will continue to agree, provided the knob is always turned in the same direction. When passing through unrequired settings, the momentary contact of the switch rotor automatically energises the transmitter so that the model actuator can follow. This is a particularly simple means of guiding and controlling a model, and does well with small boats.

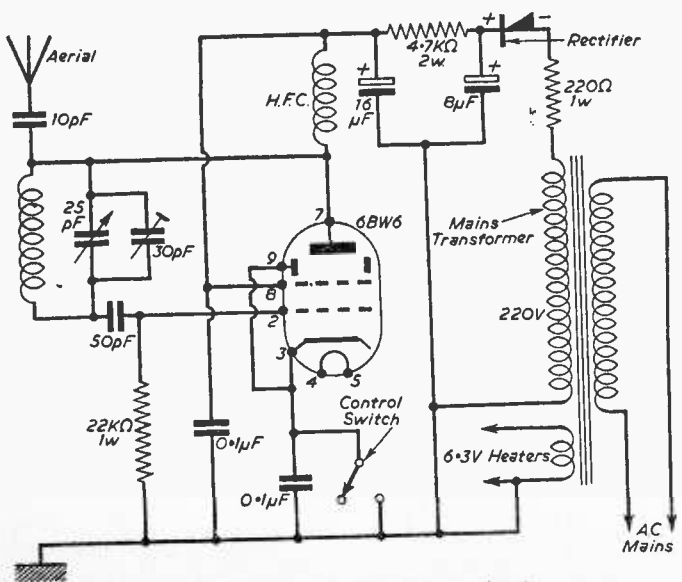


Fig. 1.—The transmitter circuit.

Chassis Layout

A small chassis, 3in. x 7½in., with ¼in. runners to clear nuts and bolts, will accommodate the parts, using the layout in Fig. 3. The panel, top and bottom, back and sides can be of hardboard or plywood, so that the unit is completely enclosed when finished. It can then stand vertically, or be held in the hand, with a short vertical aerial secured to one side by clips.

All connections are shown in Fig. 3. If the method of control described is not wanted, or is unsuitable for the model, the switch should be replaced by a push-button. To save space, the switch wafer is attached directly

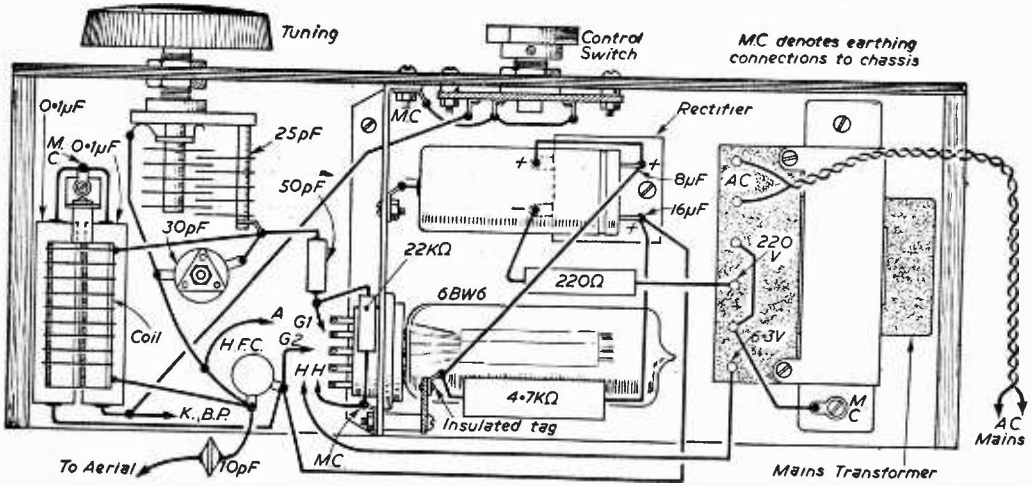


Fig. 3.—Layout and wiring plan.

to the panel with small bolts and spacing washers, an insulated rod being filed to match the rotor hole. A washer is placed under the knob. Inside, a small pin passes through a hole in the insulated rod to keep it in place.

H.T. Supply

A small vertical metal screen is bolted to the chassis and panel, to provide a mounting for the valveholder. All the mains power-supply components are to the right of this. The smoothing condenser capacity is not of much importance. The 220Ω and 4·7k resistors may be changed in value, if desired, to obtain an H.T. supply of around 175V to 200V when the valve is drawing current.

The radio-frequency part of the circuit lies to the left of the screen. Connections should be reasonably short and direct. The variable condenser can be about 15pF to 25pF. The 30pF trimmer is air-spaced and supported in the wiring.

It is essential that the coil should permit tuning to 27Mc/s, or approximately 11·1m. A suitable coil can be wound with 20s.w.g., or similar wire, on a ribbed former about ¾in. in diameter. For this, ten turns, occupying about ⅛in. winding space, will be satisfactory.

The size of the coil can be changed, if required, provided the number of turns is adjusted to allow the model control band to be reached with both condensers about half closed. The variable condenser spindle carries H.T., and it must not be fixed to a metal panel. In addition, the condenser should be set back with a spare nut or washers to reduce hand capacity, and a large knob should be fitted, for the same reason, and to cover the live mounting bush and nut.

Referring to Fig. 3, (G1) is control grid, (K) is cathode, (A) is anode, and (G2) is the screen grid. This will allow other valves to be used. With the 6BW6, the beam-plates (BP) have a separate pin, but with many valves they are internally connected to the cathode. (H) denotes the heater tags.

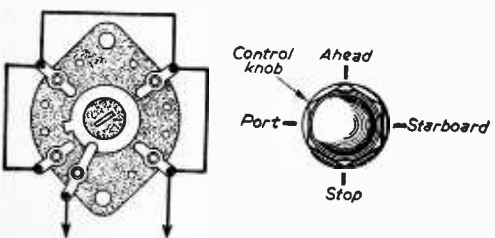


Fig. 2.—Control switch connections.

Aerial and Adjusting

For indoor testing of equipment, no aerial is required. For outdoor working, a short rod, some 18in. to 2ft or so long, is attached to the insulated side of the case. The 10pF condenser in series with the aerial must not be omitted as it isolates the rod from H.T. voltages. The capacity of this item is in no way critical, but should be quite small.

Initially, the variable condenser is half closed, and the 30pF trimmer is rotated with an insulated tool to bring the transmitter into the permitted band. Further adjustment, to compensate for changes to the aerial, etc., can then be made with the panel control knob.

The transmitter can be tuned on to frequency by any of the usual methods. One of the simplest is to use a model-control frequency meter, with a bulb or milliammeter to indicate resonance, and tune for maximum indication. Or calibration can be taken from an accurate signal-generator, a receiver, or another model control transmitter.

The 27Mc/s model control band extends from 26·96Mc/s to 27·28Mc/s. It is essential that the transmitter be confined to this band, or interference can be caused to TV reception over a wide area, due to harmonics. Normally, when only one set of equipment will be in use, it is best to locate the signal at about the centre of the band. With normal operation and care, there should then be little danger of shifting frequency so much as to bring the transmitter outside the permitted band.

CONVERSION OF THE P.W. A.C. "CORONET" 4 TO RADIOGRAM

ADDITION OF "MONAURAL" OR "STEREO" PLAYING FACILITIES

By J. B. Willmott (A.I.P.R.E.)

THE ever increasing popularity of gramophone records, and in particular of the modern L.P. and E.P. types, together with ready availability of reliable record playing units and a range of first class cabinet housings, has probably turned the thoughts of many home constructors towards the subject of record reproduction. Whilst there is much to be said for the popular type of portable record players, the traditional type of radiogram in a console cabinet is deservedly still popular, and not only is the standard of reproduction enhanced, but the addition to the furnishings of the room in which it is situated is generally viewed with approval. There have been numerous designs featured in *Practical Wireless* from time to time, both for simple gramophone amplifiers and complete radiograms. There will, however, be many readers not wishing to undertake the construction of a completely new receiver, and it is a fact that the addition of gram facilities to most modern radio receivers, especially if they are of the A.C. only type, is quite a simple matter.

The A.C. "Coronet" 4.

Doubtless a great many readers will have constructed the design which formed the subject of a blueprint issued with the October 1953 issue (see page iii of the cover), the A.C. "Coronet" 4. This receiver, whilst simple to construct, provides a very high standard of performance, and in view of its excellent form of presentation with modern, large, illuminated tuning dial, it is particularly suited to installation in a console type of radiogram cabinet. *The principles employed in the modifications may be employed with other receivers of a similar type.* In this article, two methods of modification, so as to include 'gram facilities, are described. The first method comprises the inclusion of "monaural" gramophone reproduction, whilst a more ambitious conversion provides for the reproduction of the latest type

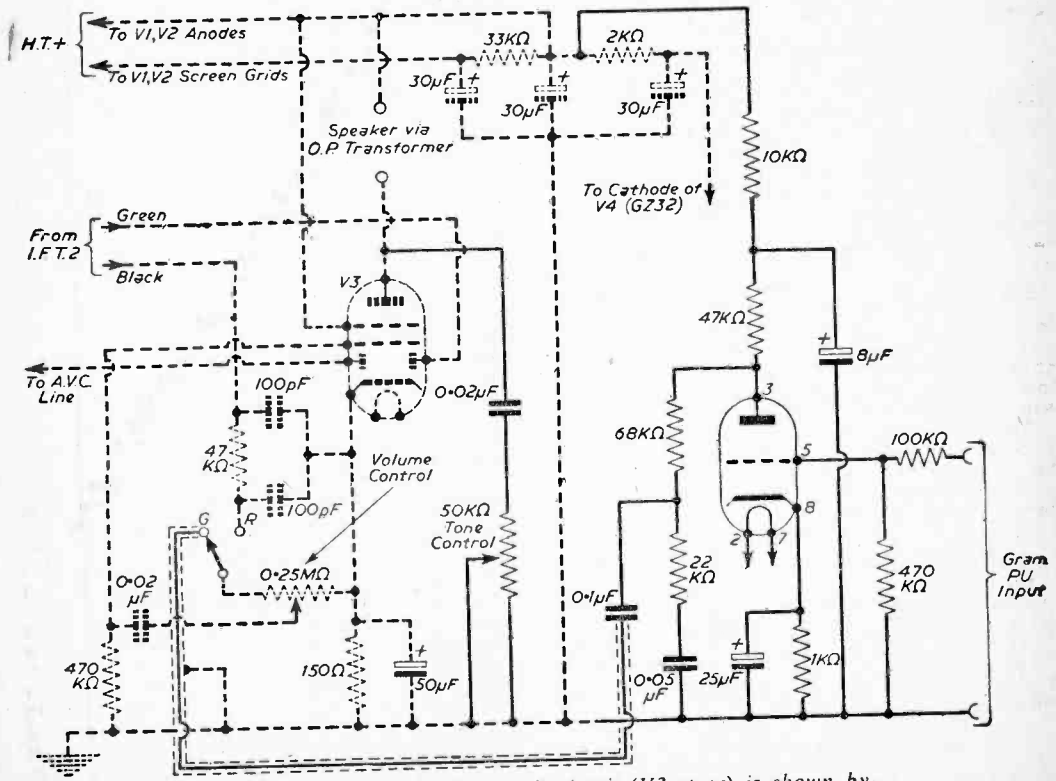


Fig. 1.—The original "Coronet" circuit (V3 stage) is shown by dotted lines and the additional wiring by continuous lines.

of "stereo" records; this of course calls for some major modifications to the existing "Coronet" chassis in view of the increased demands from the power supply section. Both modifications are, however, quite simple to carry out, and anyone who has successfully constructed the "Coronet" receiver, need have no fear of being unable to carry out the modifications and additions.

Addition of Monaural Gram Facilities

In the original "Coronet" design, the high-slope EBL31 double-diode-pentode valve, V3, provides the sole stage of audio amplification, and since the gain of the frequency changer and I.F. amplifier stages is sufficient to ensure that an adequate signal is presented to the control grid of this stage after demodulation, the arragement works very well. The output from a gramophone pick-up, even if of the sensitive crystal type, is insufficient to drive the stage satisfactorily, particularly when reproducing L.P. records, the output from which is lower than from the old type standard 78r.p.m. records. Therefore it is necessary to fit a stage of pre-amplification ahead of the EBL31 and, as the gain required is small, a single stage of triode amplification is ample. Also, as this stage is only to operate on gram, the opportunity can be taken to design the stage to provide the necessary bass boosting characteristic required to assist in faithful reproduction from records.

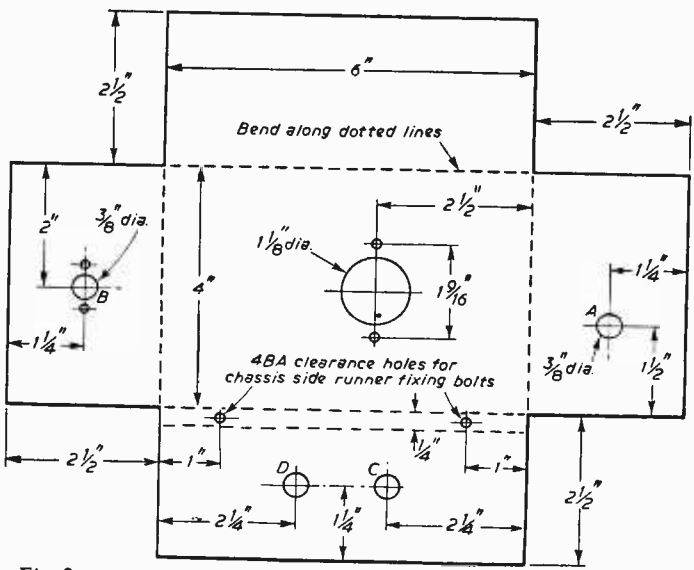


Fig. 2.—Additional chassis to be bolted to that of the "Coronet."

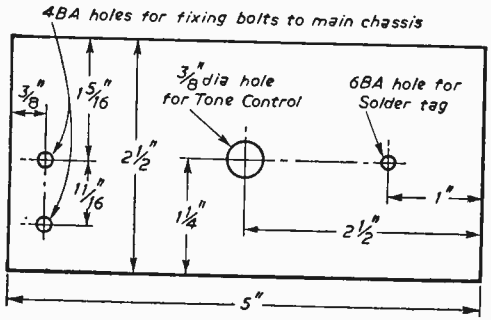


Fig. 3.—Tone control panel.

Additional Components

As the coil pack specified for the "Coronet" receiver does not provide for radio/gram change-over switching, a separate 2-pole 2-way switch is introduced for this purpose (actually only one pole is utilised in this modification, but a 2-pole 2-way is a standard component and more easily obtainable). It is also desirable to provide some form of simple "tone control" of the top-cut type, in order that background hiss on older records may be reduced, and this feature is also provided. Incidentally, this tone control also operates on radio, and will be found a useful addition, enabling much unwanted background noise to be minimised when listening to distant stations. Naturally, the provision of the radio/gram switch and tone control, calls for two additional control knobs, and in order to preserve the symmetry of the front panel layout, these are added to opposite sides of the existing chassis in such a manner that the control spindles are in line and equidistant from the existing ones.

The theoretical circuit of the original V3 stage is shown by the dotted lines on Fig. 1, whilst the additional pre-amp stage and interconnections is shown in continuous black lines. The valve used is a 6J5 (either metal or glass type can be used), and the entire pre-amp stage can conveniently be built on a small aluminium chassis measuring 6in. x 4in. x 2½in. (this being a standard size, obtainable ready made from several advertisers in this magazine), which is then bolted to the side runner of the original "Coronet" chassis, on the volume control side of the latter. The tone control is mounted on a small aluminium panel, measuring 5in. x 2½in., secured to the opposite (tuning control side) end of the "Coronet" chassis, utilising the existing bolts which fasten the dial assembly. All the necessary drilling dimensions are given in Figs. 2 and 3, and if these are followed exactly, there should be no difficulty.

The Pre-Amp Chassis

On the pre-amp chassis, the hole A houses the 2-pole 2-way radio/gram switch and hole B is for mounting a coaxial socket (this should be drilled to match the component obtained) which provides ingress for the signal from the gramophone pick-up. A solder tag should be provided

on one of the fixing bolts of this socket (inside the chassis) to allow for an earth point for a single screened wire subsequently conveying the audio signal to the 6J5 grid. Hole C should be fitted with a rubber grommet, thus obtaining the route for a length of single screened wire conveying the signal from the diode filter bottom junction of the 47k resistor and the 100pF capacitor in Fig. 1, to the radio/gram switch. This, together with a further length of single screened lead, conveys the signal from the radio/gram switch to the "top" of volume control on the main "Coronet" chassis. The international octal type valveholder, which accommodates the 6J5 valve, should preferably be mounted with the locating spigot in the direction which is indicated in Fig. 4 below; this will assist in obtaining short and direct wiring. It should be noted that a 3-way tagstrip is mounted on the fixing bolt nearest the locating spigot, and a 2-way tagstrip on the other valveholder fixing bolt, as in Fig. 4. The hole D in the pre-amp chassis allows for the passage of leads conveying the heater and H.T. positive supplies from the main "Coronet" chassis, and this hole should also be provided with an insulating rubber grommet. The power drawn by the pre-amp is very small, only 0.3A heater current, and some 3-5mA H.T. The original power supply in the "Coronet" receiver is well able to cater for this, and the additional voltage drop across the main 2k smoothing resistor is of no consequence.

Additional Smoothing Stage

In order to obviate any danger of unwanted feedback, decoupling of the 6J5 anode is provided by the 10k resistor and 8μF capacitor as shown on the diagram, and these components, in addition to providing decoupling, also act as an additional stage of smoothing for the H.T. supply; this results in an extremely low "hum" level, a very useful adjunct if full enjoyment is to be obtained from the completed instrument.

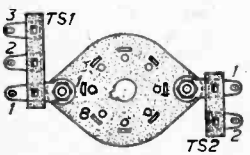


Fig. 4. — Tag strips mounted on the valveholder.

The reason for the inclusion of a 100k resistor between the "live" pick-up socket and the 6J5 control grid may not be immediately apparent; its purpose, in conjunction with the 470k grid-leak resistor, is to provide a fixed potentiometer network across the input circuit, and thereby obviate any possibility of the stage being overdriven, as might occur with a sensitive crystal pickup, particularly when operating on the older type of 78r.p.m. records.

The Tone Control

The tone control is of the simplest type, merely comprising a 0.02μF capacitor and 50k potentiometer, wired between the anode of the EBL31 output valve, and chassis. Wiring the pre-amp sub-chassis is straightforward, use is made of the tagstrips as shown in Fig. 5, and the wiring of the radio/gram changeover switch and tone control are clearly shown in Figs. 6 and 7; however, for the benefit of the less experienced constructor, the following wiring sequence is suggested.

Wiring the Pre-Amp Unit

The position of individual capacitors and resistors is by no means critical, and provided that short and direct wiring is adhered to, there should be no difficulties.

1. (Referring to the "Coronet" blueprint). Run a length of twisted twin flex from pins 2 and 7 of V2 (the EF39 valve), marked "X" and "Y" on the blueprint, through hole D to pins 2 and 7 of the 6J5 valveholder.
2. Connect pin 1 of 6J5 to the earthed tag No. 1 of tagstrip TS1.
3. Take an insulated lead from the 30μF red tag (junction of 2k and 33k wirewound resistors, as shown on blueprint) through the hole D to pin 6 of the 6J5 valveholder. This is a "spare" pin, and used as a convenient anchoring point.
4. Next connect a 10k, $\frac{1}{2}$W resistor between pin 6 and pin 4. The latter is again a "spare" pin, used for anchoring purposes.
5. Join a 47k, $\frac{1}{2}$W resistor between pin 4 and pin 3.
6. Solder the positive end of the 8μF, 350VW electrolytic capacitor to pin 4, and the negative end to tagstrip TS1, tag No. 1 (Earth).

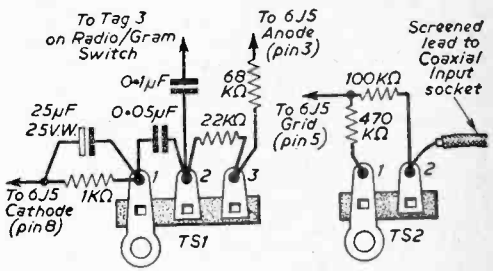


Fig. 5.—Wiring from the tag strips to the pre-amp sub-chassis.

7. Connect a 1k, $\frac{1}{2}$W resistor and a 25μF 25VW electrolytic capacitor in parallel, between pin 8 of 6J5 and the tagstrip, TS1 (tag No. 1); making sure that the positive end of capacitor goes to pin 8 of 6J5, and the negative end to Earth.
8. Join and solder a 68k $\frac{1}{2}$W resistor between pin 3 of the valveholder and tag No. 3 of TS1 (Fig. 5).
9. Connect 22k, $\frac{1}{2}$W resistor between tags 2 and 3 of TS1.
10. Next a 0.05μF capacitor is soldered between tags 1 and 2 of TS1, if a component with a black band at one end is used, this latter end should be wired to tag 1.
11. Now connect one end of 0.1μF, 450VW capacitor to tag 2 of TS1 and the other end to tag No. 3 on radio/gram switch (Fig. 6).
12. The inner wire of a length of single screened lead is taken from the centre ("live") connection of the coaxial input socket and soldered to tag 2 of TS2 (Fig. 5).
13. Earth the outer braiding of the above screened lead, at the solder tag provided, to

one of the mounting bolts of the coaxial socket.

14. Connect a 100k, ¼W resistor between tag 2 of TS2 and pin 5 of the valveholder.
15. A 470k, ¼W resistor is now connected between tag 1 of TS2 and pin 5 of the valveholder.
16. Disconnect the lead attached to right hand tag of the volume control on the "Coronet" chassis (this is the lead which comes from the diode filter comprising a 47k resistor and two 100pF capacitors), and divert the same through hole C—using a single screened lead; the outer covering of which can conveniently be earthed to the common earth busbar of the "Coronet" chassis—to connect to tag 2 on radio/gram switch.
17. Using a further length of single screened lead, connect from tag 1 of the radio/gram switch, again through hole C, to the right hand tag of the volume control on the "Coronet" (i.e., the tag from which the former connection was removed). The outer screening of this lead should be bonded to the screening of lead 16 at any convenient point.

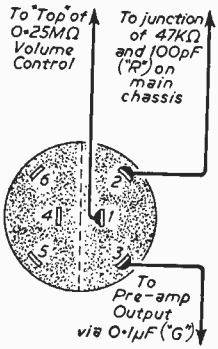


Fig 6. — Wiring details of the radio/gram switch.

The above completes the wiring of the pre-amp stage and the following two paragraphs describe the wiring in the tone control.

18. Connect one end of a 0.02μF, 450VW capacitor to pin 3 of the EBL31 valveholder (V3) on the "Coronet" chassis and extend the other wire from this capacitor, with a length of insulated wire, to reach tag 3 on the tone control potentiometer (Fig. 7). This wire should take the shortest route practicable, and be kept pressed down to the underside of the chassis.
19. Finally connect tag 2 on the tone control to a 6BA solder tag mounted in the position shown in Fig. 3.

Testing the Completed Units

Having completed the assembly and wiring as above, make a thorough check of all the connections to ensure that no errors have been made. Insert a 6J5 valve in the pre-amp valveholder. Set the tone control potentiometer fully anti-clockwise (minimum top-cut), the radio/gram switch clockwise (radio), and switch on by means of the combined volume control and on/off switch of the "Coronet" in the usual manner. The receiver should operate exactly as before the modifications were carried out, and the effect of varying the tone control can now be verified; advancing it in a clockwise direction should give the characteristic reduction in top-notes response and background noise. If, however, the receiver fails to operate, check that the radio/gram switch is correctly set, and that the wiring of this switch has been correctly carried out. Also ensure that there are no accidental shorts between the inner wire of any of the screened leads and the screening braiding.

Assuming that all is well, it should also be possible to observe that the heater of the 6J5 valve is lighting up (unless of course a valve of the all-metal type has been used). Now turn the changeover switch to its anti-clockwise position (gram). Place a screwdriver blade on the centre contact of the coaxial input socket, and on turning up the volume control on the "Coronet," a loud hum should be heard from the speaker. If not, re-check the wiring of the pre-amp throughout, and make sure that the 6J5 valve is properly seated in its valveholder.

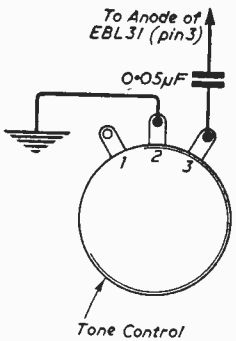


Fig. 7.—Tone control wiring.

Final Construction

All that now remains is to connect a suitable length of coaxial lead from the gram pick-up to terminate in a coaxial plug for insertion in the socket provided on the pre-amp chassis, the internal lead being connected to the centre spigot of the plug, and the external screening braid to the metal shielding.

(To be continued)

Component List for Monaural Modification

Chassis (6in. x 4in. x 2½in.).
Aluminium panel, about 16s.w.g. (5in. x 2½in.).
International octal valveholder.
Chassis mounting coaxial socket.
Coaxial plug.
2-pole 2-way switch.
50k potentiometer, tone control.
Control knobs (to match type already in use on "Coronet" chassis)—2.
3-way tagstrip (one end earth).
2-way tagstrip (one end earth).
6B.A. solder tags—2.
12in. Twin twisted PVC flex (heater wiring).
12in. Single PVC flex, red (H.T. lead from "Coronet" to pre-amp).
12in. Single screened wire.
⅜in. Rubber grommets—2.
8μF 350VW electrolytic capacitor.
25μF 25VW electrolytic capacitor.
·05μF 450VW tubular capacitor.
·02μF 450VW tubular capacitor.
0·1μF 450VW tubular capacitor.
6J5 Valve (glass or metal type).
Nuts and bolts, connecting wire and sleeving as required.
Resistors:
1k ¼W.
22k ¼W.
68k ¼W.
100k ¼W.
470k ¼W.
10k ¼W.
47k ¼W.

The No. 10 Crystal Calibrator

MODIFYING A USEFUL EX-GOVERNMENT UNIT

By G. F. Upton

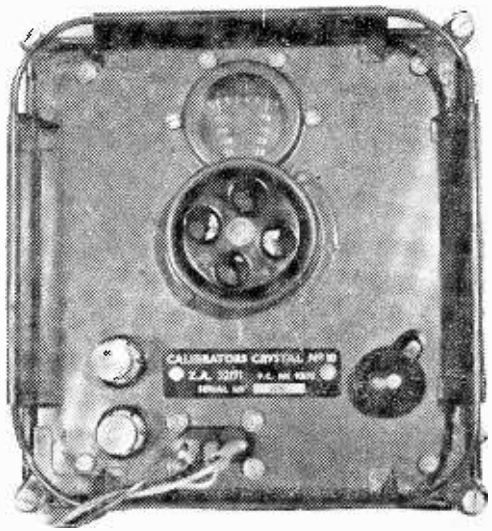
THE No. 10 type of crystal calibrator is available at very reasonable cost, and it provides crystal-controlled and tunable outputs over the band of approximately 500kc/s to 30Mc/s. This allows home-constructed receivers to be calibrated, or the dial markings of commercially-manufactured receivers to be checked and corrected. The calibrator output can also be used to check the frequency of an unknown station, or to tune an uncalibrated receiver to a station of known frequency.

The calibrator employs three small battery valves (two 1T4 and 1R5), but is normally intended for an H.T. supply of around 250V to 300V. This can be obtained from the receiver H.T. line, the drain being some 10mA to 15mA. For ease in connecting up, the receiver can be fitted with a socket from which H.T. can be drawn.

Fig. 1 shows the usual filament circuit, with dropper resistor and 6Ω potentiometer so adjusted that a 12V supply is required. As this is normally not very convenient, the circuit can be modified for 3V running. A 3V (2-cell) dry battery may then be used, and will have a long life.

As the 1T4 in the tunable oscillator stage must retain its filament choke, it is not feasible to convert for 1¼V running. However, the change to 3V can be made without disturbing any of the existing wiring or important parts, which would in any case be unwise, as the dial calibration might suffer. For 3V running, all filament chokes are left in circuit, but the dropper resistors are eliminated. The 6Ω and 30Ω resistors are by-passed by joining together the two points marked "X" in Fig. 1. The 22Ω resistor is then disconnected from the chassis at "Y" to avoid unnecessary current drain. The circuit is then effectively that in Fig. 2.

The calibrator should be carefully withdrawn from its case. The switch will then be seen in the position shown in Fig. 3. Very stout wire is employed for the L.T. circuit choke, so it can easily be identified. A new lead is taken from it to the filament line to which the three smaller filament chokes are wired. This point is easily reached by withdrawing the neon modulator and valve at the end of the chassis. The 22Ω resistor can also be disconnected from its tag behind the sub-panel. This item is shown in dotted lines in Fig 3.



The No. 10 crystal calibrator.

The sub-panel should not be removed, because of the tuning dial coupling. Care should also be exercised not to bend the tuning condenser plates, or to move the sealed trimmer or coil core. If this were done, the dial readings would be modified, though the crystal frequency marker points would not be changed.

As the 30Ω filament chokes drop 1¼V at 0·05A each, the unit is now ready for a 3V supply.

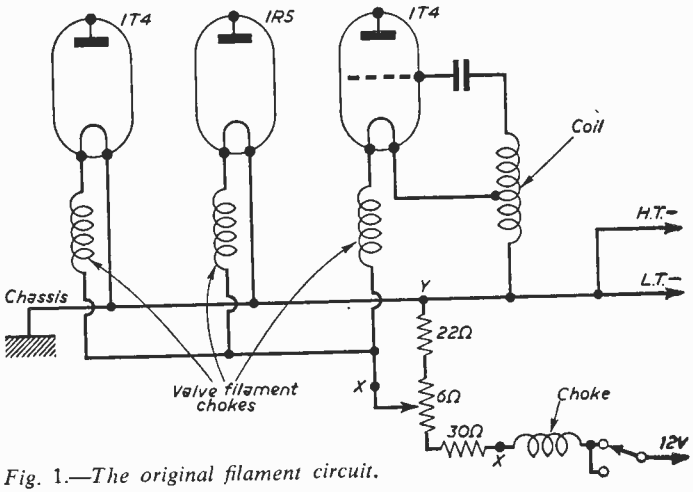
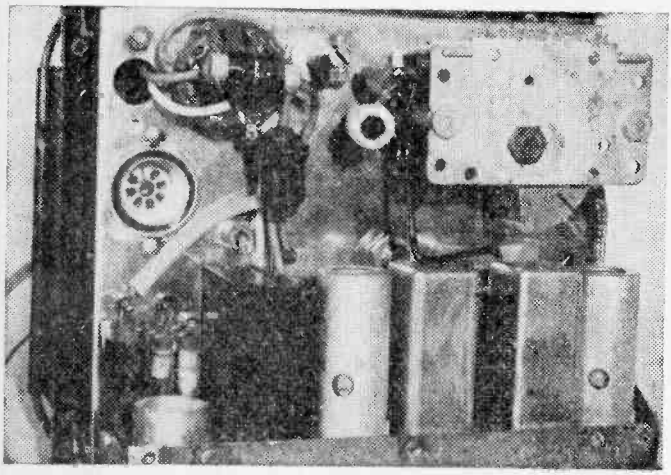


Fig. 1.—The original filament circuit.



View showing choke circuit wiring.

Fig. 2 shows the modified circuit and panel supply connector. The L.T. leads are taken to a 3V dry battery. The H.T. leads should be fitted with suitable plugs, so that current can be drawn from the receiver, as described.

Using the Calibrator

When the switch is set to 500kc/s the crystal-controlled oscillator and harmonic amplifier are in action. The signal is modulated at approximately one-second intervals by the neon, and will be heard at 500kc/s and multiples of 500kc/s, e.g., at 1Mc/s (1,000kc/s,) 1·5Mc/s, 2Mc/s, 2·5Mc/s, and so on. With a sensitive receiver the harmonics can be heard up to about 30Mc/s.

T.R.F. receivers should be adjusted so that the detector is just oscillating, reaction being used for this. With communications type superhets, the BFO should be switched on.

The calibrator is coupled to the receiver by joining the terminal marked "Aerial" on the calibrator to the receiver aerial terminal or socket. The receiver R.F. gain should be kept reasonably low, but will have to be advanced somewhat when using the higher harmonics.

If frequent use is to be made of the calibrator, a 2-way switch may be connected as shown in Fig. 4, so that the receiver can be operated from its aerial, or the calibrator output, at will.

When the calibrator switch is set to "dial" the tunable oscillator signal is mixed with the crystal controlled signal. The harmonics then differ in frequency from the crystal controlled signal by the extent of the dial readings, which are in Mc/s to two decimal places, reading being possible to three decimal places. The way in which tunable calibrations can be made will soon become clear when the unit is used with a receiver. Receiver and calibrator can be employed together in several ways, according to the purpose in view.

Receiver Calibration

With a home-constructed receiver, set the calibrator to 500kc/s. The fundamental is 600m, and may not be tunable on the receiver, but the second harmonic can easily be identified, as it falls on 1,000kc/s, or 300m. The receiver is slowly tuned down through each waveband. Each time the calibrator signal is heard the receiver tuning dial is marked. E.g., at 1Mc/s (1,000kc/s) (300m), 1·5Mc/s (200m), 2Mc/s (150m), 2·5Mc/s (120m), 3Mc/s (100m), and so on. This can be continued to about 30Mc/s if necessary.

The dial can now be turned to the reading giving 0·1Mc/s (100kc/s), 0·4Mc/s, 0·6Mc/s, and 0·9Mc/s. Signals will now be heard at these positions on the receiver, between the 500kc/s marks, and the dial can be calibrated accordingly. Other readings can then be chosen on the calibrator dial, so that the receiver tuning dial or scale can be marked in 0·1Mc/s divisions throughout the receiver tuning range. From about 2Mc/s, dial markings at this interval will be convenient. For lower frequencies, 10kc/s markings may be inserted, remembering that 10kc/s will be 0·01Mc/s. If the receiver is well made, and the dial well secured, a very high standard of accuracy can be expected.

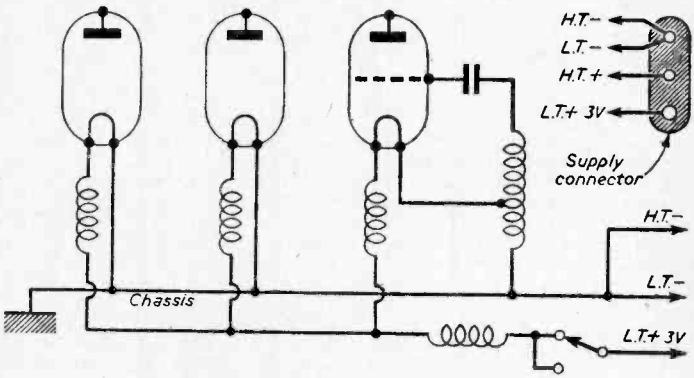


Fig. 2.—Circuit modified for 3V supply.

With a ready-calibrated receiver, the crystal calibrator will probably reveal some error in dial markings. If the error is uniform throughout, it may be corrected by moving the pointer. Should the error change towards one end of the tuning scale, this indicates incorrect trimming or padding.

Station Location

To find a station of known frequency, the calibrator is set to this frequency, and its signal

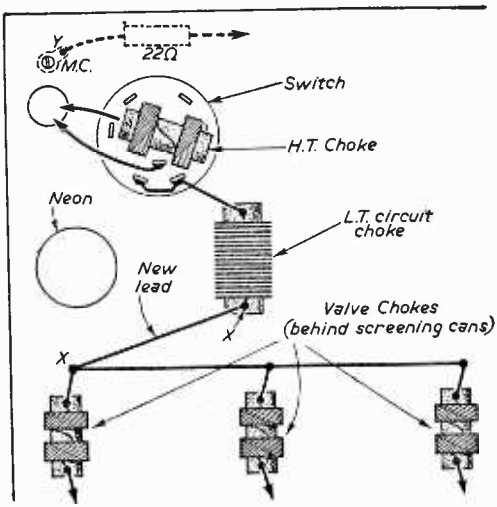


Fig. 3.—Internal connections.

tuned in on the receiver. The receiver is then switched from calibrator to aerial.

It is necessary that the receiver dial be marked with 500kc/s points, as described, since the calibrator tuning only locates the signal between these 500kc/s points. A direct-reading receiver dial is easiest to use, but with simple receivers a log of dial readings against frequencies can be made.

Frequency Determination

If a short wave or other station of unknown frequency is tuned in it will lie between known 500kc/s points, obtained as explained. The receiver is then switched to the calibrator, the latter is set for "dial" and the dial is turned until the calibrator tone is tuned in on the receiver. The station frequency can then be read off the calibrator dial.

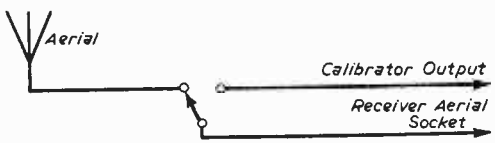


Fig. 4.—Receiver/frequency check switch.

Band Calibration

In many cases it is only desirable to calibrate a receiver over certain bands. If so, the crystal marker signal will furnish a known point, without bothering with other harmonics in the way described for complete all-wave calibration.

For example, the 80m amateur band extends from 3·5Mc/s to 3·8Mc/s. With the calibrator set for 500kc/s crystal controlled output, its signal will be heard at 3·5Mc/s and 4Mc/s. As amateurs will be heard, it will be at once obvious which mark is 3·5Mc/s and which is 4Mc/s. The calibrator can therefore be switched to "dial" and the 3·5Mc/s to 3·8Mc/s band marked up on the receiver with any desired degree of accuracy up to the limit provided by the equipment.

This method is convenient for those receivers having a single short wave band, or where there are gaps between wavebands. It is also suitable for calibrating bandspread dials, where a very small band may be tuned with great accuracy.

Battery Operation

In the original calibrator, three 47k resistors drop the H.T. to a suitable level. If these are eliminated the unit will function with a much reduced voltage, and it can then be used with a battery set, current being drawn from the receiver H.T. battery.

With this reduced supply there will, however, be insufficient voltage for the neon modulator to strike. The calibrator output will therefore be heard as a steady note, provided the receiver BFO is on, or reaction adjusted until the set oscillates when it is tuned through a station.

New East Anglian District Office

FOLLOWING the integration of the former district and branch office systems of Siemens Edison Swan Ltd. and W. T. Henley's Telegraph Works Co. Ltd. (both now part of A.E.I. Woolwich Group), a new District Office has been formed. Known as the East Anglian District Office, it represents the Woolwich Group in Norfolk, Suffolk, and the Northern half of Essex. It has been formed from the Colchester, Ipswich and Norwich Branch offices, which have been detached from the London District Office.

Mr. S. L. Crafford has been appointed manager of the East Anglian District Office. He joined W. T. Henley's Telegraph Works Co. in 1924 and in 1926 assisted in establishing Henley's sales promotion department, of which he subsequently took charge. Mr. Crafford was appointed to Henley's Colchester Branch Office in 1946. For the present he will continue to operate from the Colchester office in his capacity of East Anglian District Office Manager.

A past President of Colchester Engineering Society, Mr. Crafford is a member of Ipswich and District Electrical Association and sits on its management committee. He is also a member of Colchester Industries' Association.

Closing of Aeronautical Gallery

THE National Aeronautical Collection of the Science Museum has been closed to visitors from Monday, 3rd October, 1960.

The Collection is to be reorganised and installed in the new Centre Block of the Science Museum during 1961. Closing the collection a short period before the actual move to the Centre Block will enable preparations for the transfer to be carried out as far as possible within the general schedule of building operations for the expansion of Imperial College involving the area in which the Western Galleries stand.

Shortage of staff and preoccupation with the reorganisation will curtail the service available for answering queries and it is hoped that if queries are submitted they will be brief and of a specific nature.

Radio Construction for the Beginner

No. 3—A TRANSISTOR AMPLIFIER FOR THE CRYSTAL RECEIVER

By D. B. Kidd

SINCE many of the components will occupy different positions from those in the receiver built last month, it will be as well to remove all the components from the board with the exception of the aerial and earth screws, the two coil-core clips and the two headphone sockets. These six components may conveniently be left undisturbed.

Modification

The superfluous holes should be carefully filled as follows: a little plastic wood (or strong glue) is introduced into each screw-hole, using a scrap of wood or the finger tip. Next, a sharpened matchstick is driven deeply into each hole, using a light hammer. (If the matchstick breaks, no matter). After an hour or so, the adhesive should be dry and the matchsticks may then be sliced off level with the board by sliding a razor blade along the surface.

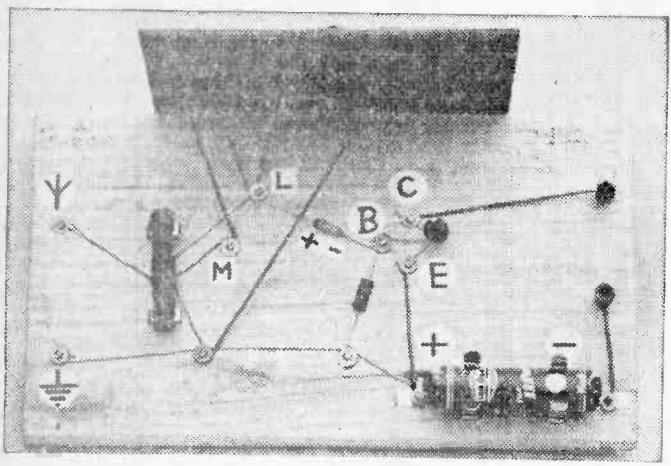


Fig. 1.—Plan view of the receiver.

A final rub with fine sandpaper should leave a surface hardly distinguishable from the rest (except in colour) and capable of accepting another screw in due course if required.

If this procedure is repeated every time a new circuit is attempted, the board will last indefinitely, without any fear of slipping screws and consequent bad contacts.

This receiver, employing one transistor, will require eleven brass washers, which should be visible in the plan view (Fig. 1).

The selected washers should be carefully burnished on both faces, using the "flour" grade glass-paper mentioned before. It is as well to re-burnish any which were used before in the previous circuit (the aerial and earth screws for instance). Copper tarnish, too thin to be visible, has a fair resistance and is strongly rectifying in nature. This latter fact, trivial under most circumstances, is quite important in receivers such as this, which detect the feeble signals from an aerial directly.

Layout

The screws and washers may now be fixed in position as shown in Fig. 1. It should be noted that the three labelled C, B and E in the illustration are not in a straight line, B being about half an inch to the left of the other two.

The materials required can now be listed:

One 0·0005μF, tuning condenser.
One crystal diode.
One 0·01μF fixed condenser.
One short length (at least 1½in.) of ferrite rod.
34-38 s.w.g. coil wire.
Pvc covered connecting wire.
Two spring tool-clips ¾in. high.
One "Audio" transistor.
One on/off switch.
One 3V (No. 8) battery.
Four spring tool-clips, 1¼in. high, with screws supplied.

Assembly

The first step in assembling is to fix the on/off switch to the panel. How this is done will depend upon the type used, but if it is of the toggle type, or of the table-lamp type illustrated, it will require a hole of ⅜in. diameter to be drilled in the panel, as for the tuning condenser.

The table-lamp type shown in the model was chosen for its cheapness and ease of fixing and connection, but it has the disadvantage of not indicating to the user its condition at any given moment, depression of the button giving "on" and "off" alternately. However, for its present purpose, this disadvantage is not very important.

The four large tool-clips are next mounted. Two of these are taken and screwed on to the board with their bases parallel and separated by about 1½in. These two clips hold the tubular battery firmly in just the same way that the two smaller ones hold the piece of ferrite rod.

The other two large clips are to provide the electrical contacts and for this purpose they should be modified

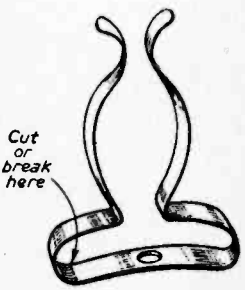
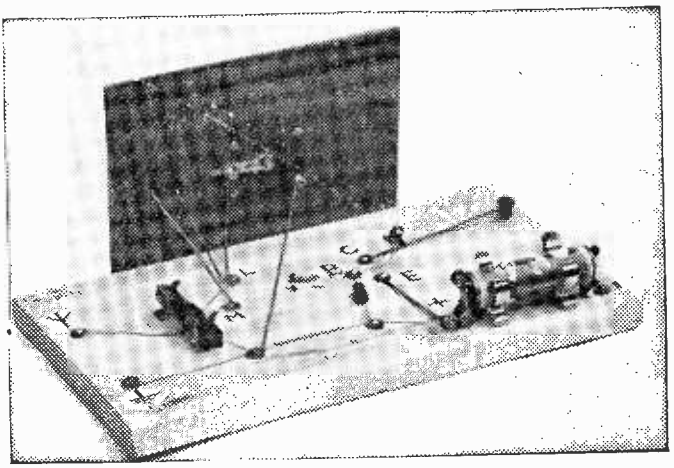


Fig. 2.—Preparing the spring clips.

slightly. Fig. 2 shows how this is carried out.

The clip is symmetrical and has a flat base with one central hole. The metal is to be severed at one end of the base portion at a point just before it starts to curve upwards.

This is best done with a sharp hacksaw blade, but as the spring is of tempered metal, it is quite simple to score it deeply with the edge of a file, then to bend it back and forth a few times until it breaks. The two smaller portions resulting are discarded; the larger parts—each with a base and fixing hole — are then smoothed with a file at the cut edge. They can now be secured to the board and Fig. 3 and the illustration show how they appear when fixed.



Rear view of the receiver.

Battery

The correct position of these two contact springs is best found as follows: the battery is inserted into the two spring clips with the brass "pip" (positive) pointing towards the earth screw (left) and the plain zinc end (negative) towards the lower headphone terminal (right). The battery is now moved within the clips until an equal length of case protrudes beyond them at each end.

The two contact springs are then brought up to the battery, convex sides towards it, until contact is just made centrally at each end.

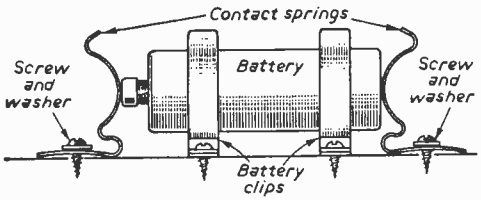


Fig. 3.—The method of clipping the battery.

With a pencil, a mark is now made on the baseboard through each fixing hole.

The clips are screwed down tightly at the marked points, with a brass washer under each screw-head. The battery is removed from its clips and the contact springs are strained inwards so as to deform them slightly, near to the base. (It may be necessary to hold the jaws of each battery clip apart while doing this).

The battery is now replaced as before and the contacts tested. A firm but gentle pressure is quite sufficient, so excessive straining of the springs is not needed. It is as well, however, to make sure that the pressure is effective by burnishing the brass tip and zinc bottom of the battery (in the same manner as the washers) to produce a clean metal-to-metal contact.

The Coil

The aerial coil is wound more or less as in the previous set. This receiver is to have a choice of two wavebands, in effect a nominal long and medium waveband.

If the reader has performed a few experiments as suggested in the last article, he will have formed his own ideas regarding the most interesting bands and should therefore be prepared to modify the following instructions accordingly.

Wind a sleeve of Sellotape, ½in. wide, round the middle of the piece of ferrite rod. If all windings are confined to this area, it will make for economy of turns, especially those of the long-wave coil.

Leaving six inches or so for connections, start winding coil-wire on to the sleeve, trapping the first turn under the succeeding ones as soon as possible. Twenty turns are now wound on, using an even tension, then a loop about 3in. long is twisted in the wire for the aerial "tapping", and winding is continued for another 40 turns (60 turns in all). Here, a second loop is twisted in the wire and winding recommenced until a further 140 turns have been laid (200 turns in all).

Wiring

Connections are made as follows: The start of the coil goes to the screw on the lower line, below the one marked "M". The first tapping goes, as already implied, to the aerial screw. The second tapping (at 60 turns) goes to the screw marked "M", and the finish of the coil to the screw marked "L".

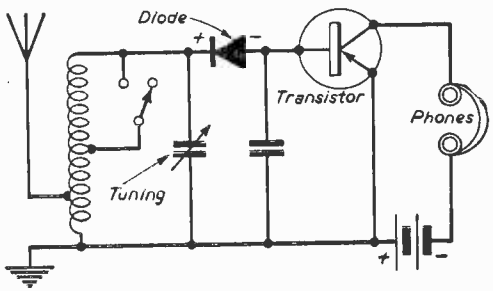
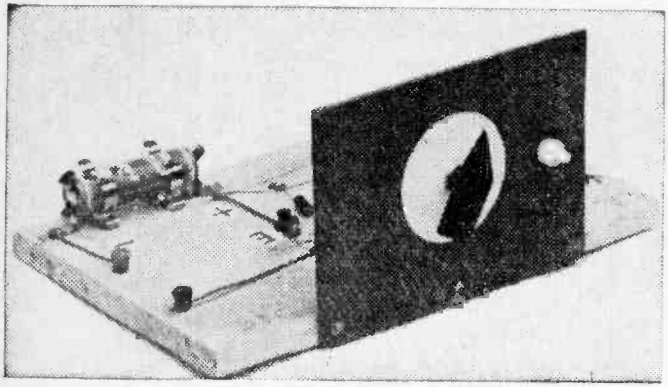


Fig. 4.—The circuit of the transistorised receiver.



A view showing the battery mounting.

The end of the coil can be anchored by a band of adhesive tape, bound very tightly round the core. It is as well to seat the core in its two clips before making the four connections and it is important to ensure that the ends of the wires (including the two "tapping" loops) are thoroughly free of enamel or other insulation where they pass under the washers.

The remainder of the wiring may now be completed. A length of wire just sufficient to reach from screw to screw should be used, with about ¼in. extra, bared of insulation, to twist under the washer at each end.

Notice that there is no connecting wire between "L" and "B", the "pigtails" of the crystal diode itself making the necessary contacts. Connections to the contact springs are made beneath the brass washers and not beneath the springs themselves.

Fixed Condenser

It now only remains to connect the fixed condenser by means of its own wires between "L" and the lower (earth) line and to clamp the three wires of the transistor into position. These three wires will have to be spread apart to fit under their respective washers, but must not be bent sharply near the point where they emerge from the transistor casing. There is no need to shorten the wires at all.

It is assumed that the reader has no previous experience of transistors, and the following brief remarks will therefore be helpful.

The transistor has three terminals (wires) called collector, base, and emitter. The collector is usually distinguished by a wider spacing or a spot of paint nearby, the base is invariably the middle wire, and the emitter the remaining one. This information should enable the reader to connect the transistor correctly on the board, using the initial letters "C", "B" and "E" as a guide.

Dangers

Transistors, although very robust and virtually everlasting, can be damaged by:

(a) High temperature (principal causes: soldering irons and excessive currents).
(b) Reversing the polarity of the battery.
(c) Connecting the collector directly to the base.

Using a 3V battery and no solder (a) can be ignored. The correct direction of fitting the battery has already been given; care should be taken whenever a fresh battery is inserted. The only real danger is (c) and provided the components and wires are kept neat, covered, and generously spaced as shown, this is fully taken care of.

The receiver is now ready to use. No power switch is provided; the insertion of the headphone wander-plugs automatically switches on the supply. One or both plugs should be pulled out when the receiver is not in use so as to spare the battery. With normal use a new battery should not be needed for several months.

Loudspeakers

This receiver is little more than an amplified crystal set. It is not very selective but should give reasonable local station reception. Under favourable circumstances, a high-impedance loudspeaker, connected in place of the headphones, can be driven directly from it, loud enough for a quiet room.

Readers with a little knowledge of transistors will have noticed that there is no "biasing". (This means a small steady current through the base to make it work more efficiently.)

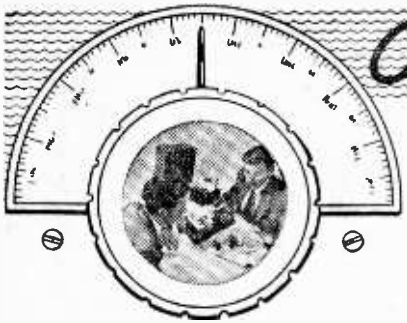
In fact, there is a small amount of current. This is produced by the crystal diode which rectifies the alternating current of the signal being received and passes it on to the base.

As an experiment, readers with a few resistors, the values of which they know, may safely try the experiment of connecting these one at a time between "C" and "B" to observe the effect of different biasing currents.

Bearing in mind danger (c), as described above, no resistor less than twenty thousand ohms (20kΩ) should be used. This figure allows a generous margin of safety.

The correct direction of the crystal diode has been indicated in Fig. 1 with the positive (+ red) end pointing leftwards towards the coil. Reversing the diode will do no harm, but will "switch off" the transistor so that little or nothing is heard.

The theoretical diagram of the receiver is given in Fig. 4.



On Your Wavelength

BY THERMION

Nothing New

ONE often hears the old saying that "there is nothing new under the sun". Radio is a comparatively new science, yet one is often coming up against ideas which were mooted many years ago. This was very forcibly brought home to me recently when I visited the home of a friend whom I had not seen for years, and he was one of the "older brigade" of constructors. During the evening we got round to talking about the modern developments of miniature radio, with special reference to the apparatus which is used in guided missiles. As you can guess the equipment used here is as compact as it is humanly possible to get it, and with the transistor as the "working" element, some remarkable units have been produced. I read some time ago in an American magazine that a new name has been coined for these miniature pieces of equipment, and various manufacturers in the States have their own adaptation of this group name. It would appear that a common term is a "module", indicating a complete stage, with its associated transistor(s), or in extreme cases, a complete powered unit.

I was talking about this arrangement to my friend, when he said "Of course, it's been done before", and I asked for more details. He went to one of his "radio cupboards" and brought out two boxes with a sly smile on his face, and from them he withdrew two valves. Holding them out to me he said "Here is a complete five-valve set, all in two glass envelopes". It transpired that these valves were manufactured in Germany in the 1920's, and in addition to the valve electrodes the glass envelope contained all the resistors and capacitors for a two H.F. or a three L.F. amplifier. Of course, in those days R.-C. coupling was used for H.F. amplification, and the resistors and the capacitors were chemically deposited on short lengths of glass tubing. The completed assembly was slightly larger than the valves of the day, but they were mounted on an ebonite or bakelite base and had only 4 or 5 pins. Thus, by using just those two valves, and plugging them into a valveholder, one automatically built a 5 valve set. To my mind these valves were perfect "modules". Perhaps some of my older readers will remember them, or have details of some other special development of this type.

Loudspeaker Design

Whilst on the subject of the old days, I would like to tell you about some loudspeakers which my friend showed me on this particular visit. The one which fascinated me most was a Marconi design built into a wooden framework, and having a cone manufactured from ordinary stiff paper. As most readers know, the cone has to be held centred in a gap in the magnet assembly, and the apex of the cone, carries a small ring on which the speech coil is wound. This part of the cone has to be held rigidly centred, but at the same time capable of being moved backwards and forwards whilst remaining central in the gap. This is usually accomplished by what is known as a spider, acting in conjunction with the wrinkles round the periphery of the diaphragm. In the Marconi speaker referred to above, a long rod extended from the centre of the pole piece in the centre of the part carrying the gap, and attached to the top of the rod (that is, farthest from the apex of the cone) was a paper spider. The edge of the cone was free, and the spider was attached a short way down the cone. It was thus held by a single spider and not as in the modern speaker by more rigid means.

Gramophone Records

I am still receiving correspondence on the subject of records, and whilst there are many who agree with the remarks which I have made there are, of course, hundreds who disagree, many of them most violently. Why is it that when anyone agrees they are polite and write reasonable letters, whilst when anyone disagrees they sit down and write the most abusive letters. After all, one is entitled to one's own point of view, and whilst I do not suppose everyone is pleased with everything I write, there is no justification for writing abusive letters. One of the faults which I have recently come across in gramophone records has been pointed out to me by a musician friend. It appears that he has an electric organ in his home and in addition to playing with the radio he likes also to play with gramophone records, when they are to his liking. He tells me that he has found that many records which are of American origin and apparently taken from old 78 discs (I am referring now, of course, to L.P.'s), and that many of these are recorded or re-recorded at the wrong speed. When a disc is played, if it is not rotated at the same speed at which it was recorded, the frequency at which the reproduction takes place will be different and therefore the note will be sharp or flat (depending upon whether the disc is slower or faster). My friend finds that whilst he can play with, or accompany, most English discs, when he tries to play with those of American origin, he is unable to do so, and he asks me why motor manufacturers do not produce motors with a small adjustment for speed. In the old days, he says, he could adjust the speed of the motor until the piano or organ was in tune with the disc, but although he has a four-speed motor there is no adjustment and he is then unable to obtain the maximum enjoyment from his discs.

SIMPLE GUITAR MICROPHONE

"ELECTRIFYING" A GUITAR

By M. Dunn

A THROAT microphone, one of which is used in this construction, may be purchased very cheaply from any electrical supply firm and single units can be obtained for as little as one shilling. When one of these microphones is gently pressed against the soundboard of a stringed instrument, the sounds picked up may be fed into an amplifier. The simple device to be described will hold the microphone in position, and all that is required is a clothes-peg, a small quantity of hardboard, of ¼in. x ¼in. cross section, some felt or foam plastic about ⅛in.-¼in. thick, and some screws and glue. The form the device takes may be clearly seen in the diagram and the only critical measurement is the height. In the model made by the writer it was found that the thickness of the guitar belly was not consistent, and so this measurement should be made at the site where it is ultimately to be fixed if the reader's instrument is likewise uneven.

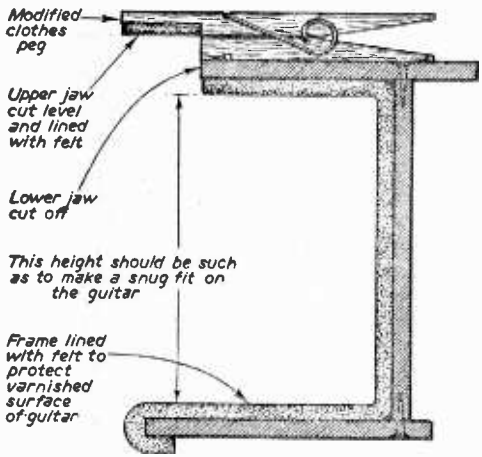


Fig. 1.—This simple framework is used to hold the throat microphone against the soundboard of the guitar.

The apparatus consists of a simple framework which slides friction-tight on to the belly of the guitar. On to the top member is mounted an ordinary wooden spring-type clothes-peg which has undergone a few simple modifications to suit its new job. The lower jaw is cut off completely and the gripping surface of the upper one is made flat and has a small rectangle of felt glued on to it.

The Framework

The writer made his frame from three short lengths of mahogany, ½in. x ¼in. in section, glueing and screwing the butt joints at the top and bottom as these must he strong and rigid. The whole of the inner surface is lined with a strip of felt or foam plastic to protect the instrument from scratches. When making the measurement for the height, the distance between the upper and lower felts should be made to be just less than the height of the guitar belly so that the finished article will push on neatly.

The clothes-peg is glued to the top of the upper limb so that the free upper jaw projects well forward. When fixed in position, the throat microphone is then slipped under and held down with firm but gentle pressure. It will be found that too much pressure will stop the microphone working and too little will give no sound pick-up. The clothes-peg spring was found to exert just the right degree of pressure.

Connecting the Amplifier

Most throat microphones are of low impedance and work best with a high ratio step-up input transformer which should be situated close to the amplifier. (These may be purchased very cheaply from advertisers in this magazine, if not already possessed.) With this arrangement it was found that the lead can consist of several yards of twisted flex with no evident hum pick-up.

The tonal quality is remarkably similar to that which issues from the very much more expensive instruments sold commercially. In view of the fact that this device can be made for five shillings or less, it is well worth while and not the least bit difficult. The output may he fed straight into a simple amplifier with quite pleasing results, but better still experiment with the variable controls of a tone correcting filter to produce a variety of different tone colours by emphasising or attenuating different frequencies present in the waveform.

Servicing Examinations - 1960

The Radio Trades Examination Board has recently announced the result of the TV Servicing Certificate Examination. Of the 642 candidates who sat, 298 qualified for the award of the Certificate, 96 were referred in the practical test, and 248 failed.

The interest in this examination is being maintained, and the total number of candidates who sat for this year's examination showed an increase of 179 compared with the corresponding figure for 1959.

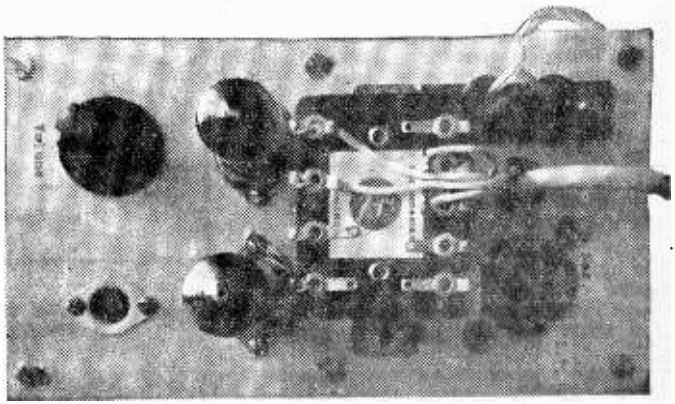
As regards the Radio Servicing Examination, only the written paper in this test has so far been completed, and of the 1,715 candidates who sat, 1,253 were successful and thus qualified to take the practical test, which was conducted at various Centres on 22nd and 29th October, 1960. A further 330 candidates who were referred in the practical test in the 1959 examination will also be taking this year's practical examination, giving a total of 1,583 candidates.

A Two Valve General Purpose Amplifier

BUILD THIS UNIT FROM YOUR SPARES BOX

By R. Murray-Shelley

THE amplifier to be described will be found to be very useful for all purposes where a medium power, low distortion unit is required.



Above chassis view of the amplifier.

The Circuit

The circuit of the amplifier is shown in Fig. 1. Two modern high efficiency valves are used. The first stage employs an EF86 pentode valve working as a voltage amplifier at high gain. This valve is very suitable, giving high gain at a low noise level.

The EF86 is resistance/capacity coupled to the output stage, a single EL84. This valve was chosen in view of its high gain and excellent power handling ability. Use is made of negative feedback, and thus the amplifier is able to deliver some 3½W of power at a very low level of distortion.

Noise

The hum level of the amplifier is low. This is mainly due to the use of large smoothing condensers in the power unit, and to decoupling of the first stage and of the screen grid of the output valve. Decoupling the screen of the EL84 not only lowers the hum level of that stage, but also, by lowering the voltage on the screen of the valve, lengthens valve life and stabilises the output stage.

Hum, and in particular, harmonic distortion, are also reduced by the use of negative feedback from the secondary of the output transformer to the cathode of the EF86. Negative feedback also, unfortunately, reduces the effective gain of the amplifier, though this tends to make the unit more stable.

No variable tone controls are included in the amplifier, since in the prototype a variable control of tone was not found to be necessary. In any case, the addition of negative feedback would to some extent cancel out any variation in frequency response which might be introduced by the tone control.

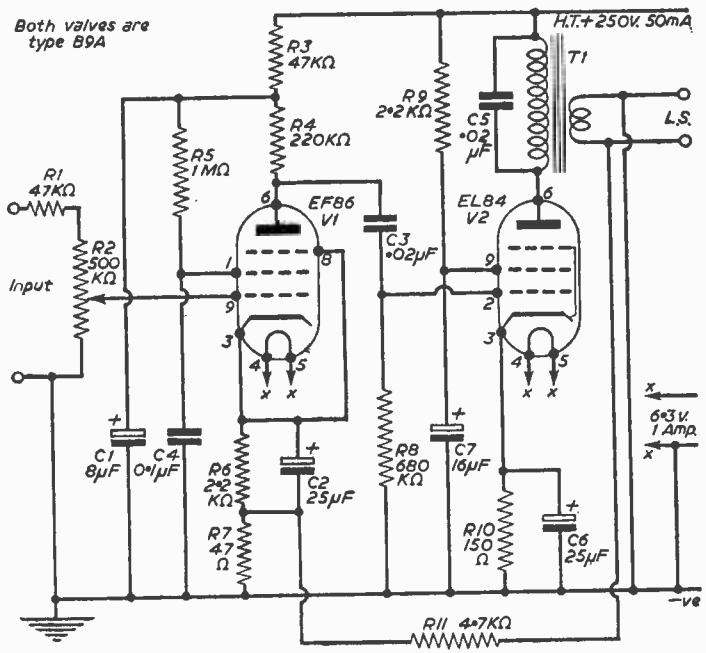


Fig. 1.—Theoretical circuit.

Power Supplies

The amplifier requires a power supply of 250V at 50mA and 6·3V at 1A. A power pack is not included in the basic circuit of Fig. 1, since many constructors already possess a suitable power unit. For those who do not possess such

a unit, a suitable circuit is given in Fig. 2.

An EZ80 rectifier is used, although there is no reason why an octal based rectifier such as a 5Z4, or a B7G based 6X4 could not be used instead. Most octal based rectifiers, however, require a heater voltage of 5, and this should be remembered when obtaining the mains transformer. If any valve other than an EZ80 is used, then the reservoir condenser, C1, should be reduced to 16μF capacity, as this is the maximum recommended value for most rectifier valves.

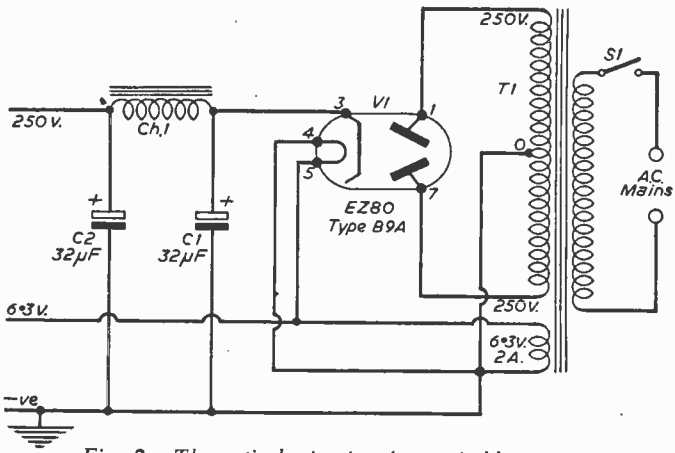
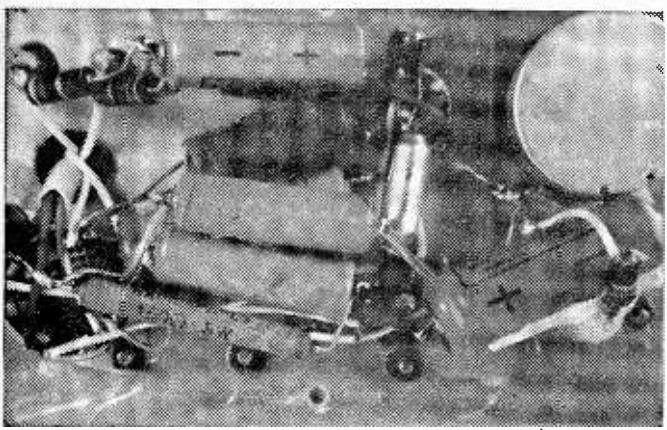


Fig. 2.—Theoretical circuit of a suitable mains unit for the amplifier.

The Output Transformer

In the writer's case this was a comparatively inexpensive multi-ratio type which gives good results. A "high fidelity" component could no doubt be used to good effect and the best transformer available to the constructor should be used. For a 3Ω speaker, the transformer ratio should be as near to 40:1 as possible. For a speaker of 15Ω impedance, the ratio should be about 15·5:1. The primary of the transformer should be rated at at least 40mA to avoid saturation of the core and subsequent distortion.



Underside view.

Construction

The prototype was built on a sheet of aluminium (16s.w.g.), size 7in.×4in. This flat sheet was, in the writer's case. used to form one side of a wooden box. There is no reason. however, why a normal type of chassis should not be used. The size of the chassis is really dependent on the size of the output transformer used. The wiring of the prototype tended to be a little cramped, and a larger chassis could be used with advantage.

Input connections are made via coaxial cable and a coaxial plug and socket. The output is taken via a socket strip and wander plugs. The power pack is built on a separate chassis to the amplifier, and power is fed into the amplifier by a flexible cable. A feature of the construction is a power output socket from which power can be taken to operate a feeder unit, etc. This socket can be of any type and its inclusion is, of course, entirely optional.

No particular precautions are necessary in building the amplifier. The grid and anode leads should be kept short, and the grid leads

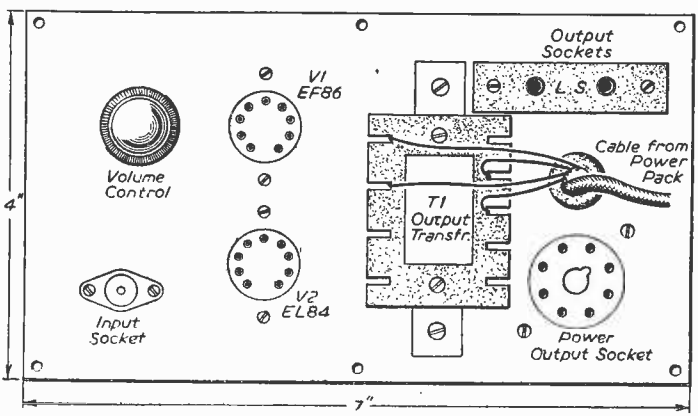


Fig. 3.—Chassis layout plan.

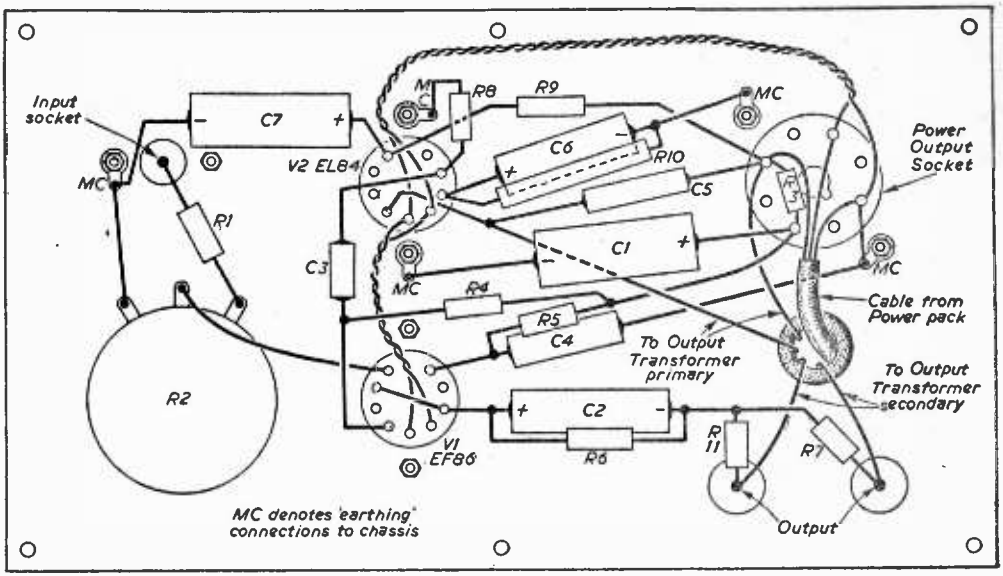


Fig. 4.—Wiring diagram of the amplifier.

should preferably be screened, particularly in the case of the EF86. Moulded or nylon loaded valve-holders should be used in preference to paxolin types, as the latter tend to break down easily.

Oscillation

Owing to the types of valves used, no trouble should arise due to microphony or instability. If, on first switching on, the amplifier oscillates violently, switch off immediately, and reverse the connections to the secondary of the output transformer. This oscillation is caused by the application of positive instead of negative feedback.

The amplifier should never be operated without a speaker being connected, as this will damage the output transformer, and possibly the output valve.

Component values are not particularly critical, though for preference, 10 per cent tolerance resistors should be used. All resistors are of ½W rating unless otherwise stated. The coupling condenser, C3, should be beyond question as regards leakage.

The input impedance of the amplifier is high, and therefore it should not be used with low impedance microphones, etc., unless a suitable matching transformer is also used.

In conclusion, this amplifier will be found to be very pleasing in its performance, and economical both to build and in its power requirements.

New Microscope Technique

THE basic technique for achieving the remote observation of images lies in the use of the image tube, but such tubes cannot work in the dynamic vacuum system of the electron microscope because the sensitive elements would be damaged by the residual vapour present.

Amorphous Selenium

In 1955, Dr. M. E. Haine, of A.E.I. Research Laboratories, proposed a system using amorphous selenium as the sensitive material. Amorphous selenium can be exposed to air without deleterious effects. Later Haine and his colleague P. A. Einstein built an experimental apparatus and showed that not only could an image converter tube be made to work within an electron microscope but, in addition, that a substantial degree of intensification could be obtained.

The operation of the intensifier relies on the increase in the conductivity of selenium with electrons. The primary electron beam in the microscope falls on a layer of selenium supported on a thin plastic membrane, backed by a layer of evaporated aluminium held at positive potential. When the free surface of the selenium is scanned in a standard television raster from a low voltage electron gun, a signal appears on the backing layer which is proportional to the primary beam intensity at the position of the scanning spot. This signal is amplified and applied to a cathode ray tube scanning in synchronism. By this means the electron intensity image in the microscope is converted into a voltage signal which can be transmitted through a television system. The intensification of the image results from the fact that several thousand electrons are released inside the selenium film for every single high energy incident electron. Efficient collection of these electrons produces a signal of reasonable amplitude for further amplification.

Practical Wireless

POCKET SUPERHET

MOUNTING THE SPEAKER AND COMPLETE ALIGNMENT DETAILS OF OUR LATEST BLUEPRINT RECEIVER

(Continued from page 611 of the November issue.)

FOUR ¼in. 6B.A. countersunk headed bolts, with three nuts each, secure the speaker to the chassis. The heads of the bolts should lie nearly flush with the front of the speaker, or the back of the case will not fit. If the heads are very large, they should be filed down before inserting them. The holes in the speaker can also be countersunk slightly with a ¼in. or similar metal drill. A washer will be required between speaker and the first nuts, or the nuts may not tighten completely.

A second nut is placed on each bolt, and adjusted so that the speaker will be 9mm above the level of the chassis. The four bolts are then threaded through the holes in the chassis, the output transformer, on its strip, is added, and the nuts are tightened.

A check should be made to see that no connections or bare joints touch the speaker. The speech coil is then wired to the output transformer secondary. This is most readily achieved by soldering short lengths of thin flex to the speech coil tags before mounting the speaker. These may then be soldered to brown and purple tags of the transformer.

Testing the Receiver

If a meter is available, this can be included in one battery lead, when first connecting the battery. This will show if there are any short circuits, and the circuit should be disconnected at once if the meter shows more than about 10mA.

The volume control must be rotated fully anti-clockwise to switch the set off, and a coloured dot may be painted to show this position. If the control is merely turned to minimum, the battery will still be on.

A current reading of approximately the value mentioned, and moderate volume from the local station, may be anticipated, and will show that wiring, etc., is correct. Full sensitivity and volume may then be expected when aerial, oscillator and I.F. circuits have been aligned. All these adjustments can be carried out with the set in its case, but a provisional check to see that the set is working properly is best made before fitting the chassis in place.

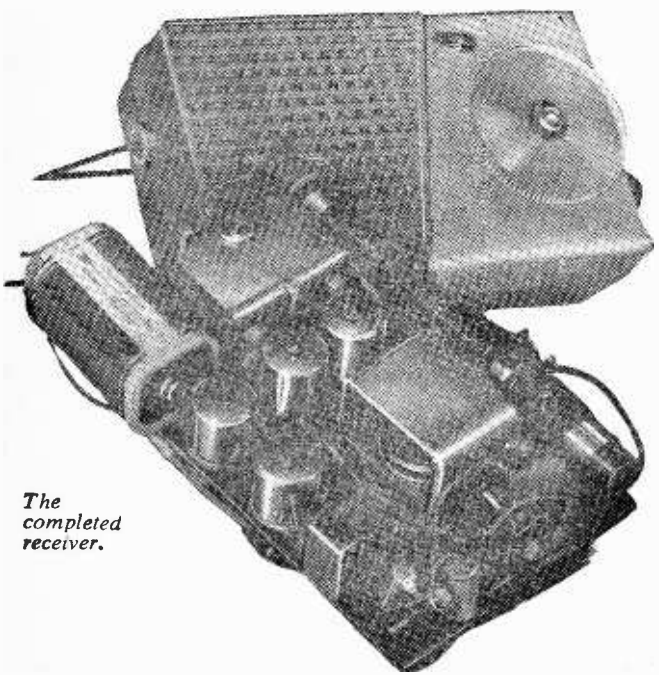
Alignment With Signal Generator

If a signal generator is available, adjust it to give a 465kc/s modulated output. The output lead of the generator is now coupled to the base lead of the OC44 transistor. A direct connection is not normally required—it should suffice to hook an insulated lead from the generator round the insulated sleeving of the wire going from the 0·04μF condenser to transistor.

An insulated trimming tool which will engage with the slots in the adjustable cores should be made from a strip of paxolin at least 1½in. long. Wood is not suffi-

PRINCIPAL FEATURES

- *Six transistors and 1 diode in a superhet circuit*
- *Long and medium Wavebands covered*
- *Efficient AGC system*
- *Long life battery*
- *Professionally produced case available*
- *Simple to align and operate*



The completed receiver.

WAVELENGTH-FREQUENCY CONVERSION TABLE

m.	*kc/s.*	*m.*	*kc/s.*
1	300,000	350	857·1
2	150,000	360	833·3
3	100,000	370	810·8
4	75,000	380	789·5
5	60,000	390	769·2
6	50,000	400	750
7	42,857	410	731·7
8	37,500	420	714·3
9	33,333	430	697·7
10	30,000	440	681·8
25	12,000	450	666·7
50	6,000	460	652·2
100	3,000	470	638·3
150	2,000	480	625
200	1,500	490	612·2
205	1,463	500	600
210	1,429	510	588·2
215	1,395	520	576·9
220	1,364	530	566
225	1,333	540	555·6
230	1,304	550	545·4
235	1,277	560	535·7
240	1,250	570	526·3
245	1,225	580	517·2
250	1,200	590	508·5
255	1,177	600	500
260	1,154	650	461·5
265	1,132	700	428·6
270	1,111	750	400
275	1,091	800	375
280	1,071	850	352·9
290	1,034	900	333·3
295	1,017	950	315·9
300	1,000	1,000	300
310	976·7	1,250	240
320	937·5	1,500	200
330	909·1	1,750	171·4
340	882·3	2,000	150

To convert kilocycles per second (kc/s.) to wavelengths in metres, divide 300,000 by the number of kc/s.

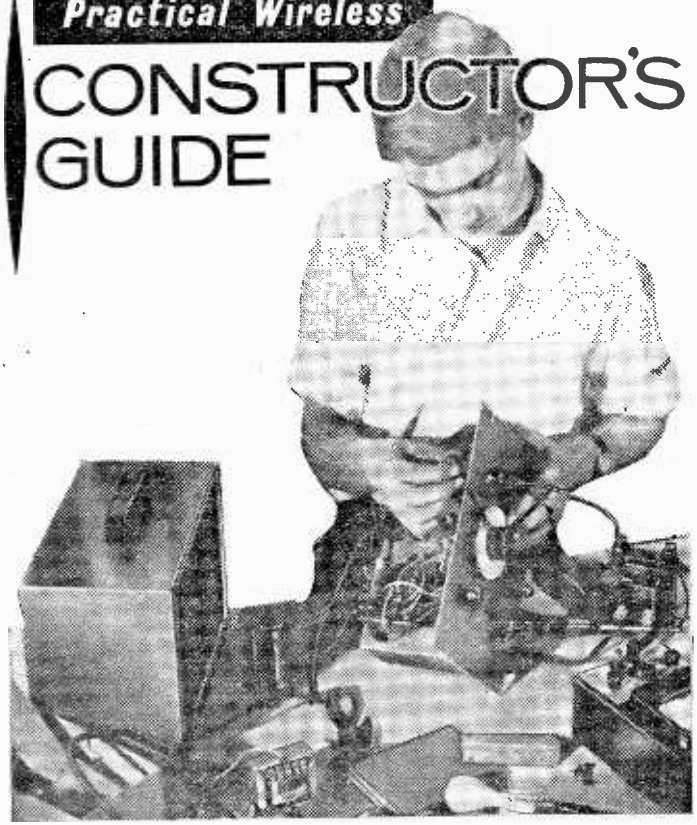
To convert wavelengths in metres to kc/s., divide 300,000 by the number of metres. One megacycle per second (Mc/s.)—1,000,000 cycles per second. Thus 30,000 kc/s.=30 Mc/s.

To make up the Constructor's Guide, detach the 8 extra pages and fold them along the line to the right of this page. Then, cut along the top of the book so formed to make up your 16 page Guide. If possible, you should staple the pages together at the fold.

PLEASE FOLD ALONG THE DOTTED LINE

Practical Wireless

CONSTRUCTOR'S GUIDE



–How to understand circuit diagrams

–Essential formulae and data including the colour code, Ohm's Law, etc.

–Hints on layout and construction

(Presented free with Practical Wireless, December 1960)

BBC M.W. AND L.W. WAVELENGTHS

Home Service

Wavelength	*Frequency*	*Main Areas Served*
434m	692kc/s	Lancashire, Yorkshire, Cheshire, Flint, Nottinghamshire, Derbyshire, Lincolnshire (*Moorside Edge*).
371m	809kc/s	Scotland (*Westerglen, Burghead, Redmoss*).
341m	881kc/s	Wales (*Washford, Penmon, Wrexham*).
330m	908kc/s	London, S.E. England, Home Counties (*Brookmans Park*).
285m	1052kc/s	Cornwall, S. Devon, Dorset, Isle of Wight, S. Coast (*Start Point*).
276m	1088kc/s	Midland Counties and Norwich Area (*Droitwich, Norwich*).
261m	1151kc/s	(i) Northern Ireland (*Lisnagarvey, Londonderry*). (ii) N.E. England, Scottish Border (*Stagshaw*).
206m	1457kc/s	(i) Somerset, S. Gloucestershire (*Clevedon*). (ii) S. Hampshire, S. Wiltshire (*Bartley*).

Low-power transmitters have been brought into operation to provide a local service in certain areas not covered by the main stations. These are at Brighton, Bexhill, Redruth, and Folkestone (206m), Ramsgate and Barrow (202m), Cromer and Whitehaven (434m), Scarborough (261m), Barnstaple/Bideford (285m), Towyn (341m), and Dumfries (371m).

Light Programme

The main transmission comes from a high-power transmitter at Droitwich on 1500 m. (200kc/s) *and is audible throughout the British Isles.*

In addition, there is an auxiliary service on 247m (1214kc/s) having a restricted range, and serving: Moray Firth area of Scotland; Aberdeen; Edinburgh and Glasgow; parts of Northern Ireland; Tyneside; S. Lancashire and S.W. Yorkshire; London; Plymouth; Redruth, Cornwall.

Third Programme

464m	(647kc/s)	(i) serving places up to about 100 miles from Daventry, Northamptonshire; (ii) local services in Aberdeen, Glasgow, Edinburgh, and Newcastle-on-Tyne.
194m	(1546kc/s)	serving Belfast, Bournemouth, Brighton, Dundee, Exeter, Leeds, Liverpool, Portsmouth, Preston (Lancs.), Plymouth, Redruth, Southampton, Stockton, and Swansea.

AMERICAN CONDENSER COLOUR CODE

All Values in pF ($\mu\mu$F)

Using the same colour code as on the previous page "C1" (below) will read:

Yellow, Mauve, Orange (4, 7, 000) } = 47,000 pF—or—0·0047 μF

with an assumed rating of 500V and a tolerance of 20%.

"C2" will read as follows:

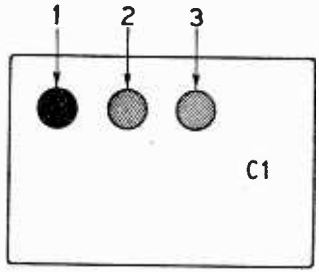
First Row of Dots = First Three Figures.

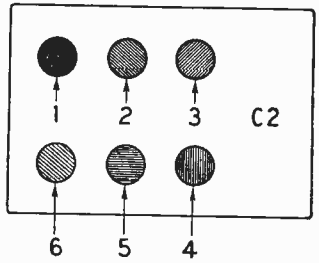
Second Row of Dots = Number of Noughts, Tolerance, Voltage Rating (in order shown)

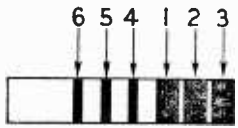
Value: Red, Red, Green, Yellow (2, 2, 5, 0000) } = { 2,250,000 pF—or—2·25 μF.

Green 5 } = ±5%

Blue 6 } = 600V







CIRCULAR TYPE

USEFUL FORMULAE

Ohm's Law:

$$V = IR \text{ or } I = \frac{V}{R} \text{ or } R = \frac{V}{I}$$

Power Dissipation:

$$W = IV = I^2R = \frac{V^2}{R}$$

Resistors in Series:

$$Rt = R1 + R2 + R3 \text{ - - - } + Rn$$

Resistors in Parallel:

$$\frac{1}{Rt} = \frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3} \text{ - - - } + \frac{1}{Rn}$$

Condensers in Parallel:

$$Ct = C1 + C2 + C3 \text{ - - - } + Cn$$

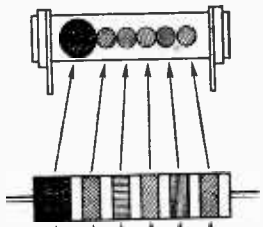
Condensers in Series:

$$\frac{1}{Ct} = \frac{1}{C1} + \frac{1}{C2} + \frac{1}{C3} \text{ - - - } + Cn$$

SIX BAND OR DOT CONDENSER COLOUR CODE

Colour	Temperature coeff.		Capacitance value							
	significant figure	value tol. *	multiplier	first figure	second figure	multiplier	tolerance	
	1st band or dot		2nd band or dot	3rd band or dot	4th band or dot	5th band	rated cap. exceeding 10 pF	6th band or dot rated cap. up to 10 pF incl.
Black	—	—	—	1	0	—	±20%	±0·1 pF
Brown	—	—	—	2	1	10^1	±1%	±0·25 pF
Red	1·0	±0·15	10^2	3	2	10^2	±2%	
Orange	1·5	±0·25	10^3	4	3	10^3		
Yellow	2·2	±0·35	10^4	5	4	10^4	±5%	
Green	3·3	±0·6	—	6	5	—		
Blue	4·7	±0·9	10^0	7	6	—		
Violet	7·5	±1·2	10^8	8	7	—		
Grey	—	—	10^9	9	8	10^{-2}	±10%	±1 pF
White	—	—	10^1		9	10^{-1}		

* or ± 40 parts per million per °C., whichever is the greater.



EXAMPLE OF APPLICATION OF SIX BAND OR DOT COLOUR CODE

Capacitor with Temperature Coefficient of — 100 Parts per Million/°C., rated Capacitance 56 pF and Tolerance ±5%.

RED	(SIGNIFICANT FIGURE OF TEMP. COEFF.)
RED	(MULTIPLIER)
GREEN	(1ST FIGURE OF CAP)
BLUE	(2ND FIGURE OF CAP)
BLACK	(MULTIPLIER)
GREEN	(TOLERANCE)

BBC V.H.F. STATIONS

Stations	*Frequencies (Mc/s)* Third/ Network *Light*	*Three*	*Home*	*Power (e.r.p.) kW (each programme)*
Wrotham	89·1	91·3	93·5	120
Pontop Pike	88·5	90·7	92·9	60
Wenvoe	89·95	96·8	94·3 (Welsh) 92·125 (West)	120
Divis	90·1	92·3	94·5	60
Meldrum	88·7	90·9	93·1	60
North Hessary Tor	88·1	90·3	92·5	60
Sutton Coldfield	88·3	90·5	92·7	120
Norwich	89·7	91·9	94·1	120
Blaen-plwyf	88·7	90·9	93·1	60
Holme Moss	89·3	91·5	93·7	120
Rowridge	88·5	90·7	92·9	60
Kirk o'Shotts	89·9	92·1	94·3	120
Sandale	88·1	90·3	92·5 (Scottish) 94·7 (North)	120
Llanddona (Anglesey)	89·6	91·8	94·0	3-9*
Llangollen (N. Wales)	88·9	91·1	93·3	6
Rosemarkie	89·6	91·8	94·0	6
Isle of Man (Douglas)	88·4	90·6	92·8	6
Orkney (1)	89·3	91·5	93·7	6
Thrumster (2)	90·1	92·3	94·5	6
Peterborough (2)	90·1	92·3	94·5	1-20*
Dover (3)				

(1) Temporarily. Home only.
(2) Under construction.
(3) Projected.
* Directional aerial system.

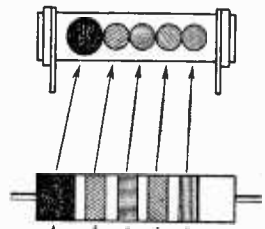
COMPARATIVE WIRE GAUGES AND RESISTANCE VALUES

(Diameters in inches)

No.	British S.W.G.	Birmingham B.W.G.	American B. & S.	Ohms/yard at 60deg.F.	
				Copper	Constantan (Eureka)
0	·324	·340	·3249		
1	·300	·300	·2893		
2	·276	·284	·2576		
3	·252	·259	·2294		
4	·232	·238	·2043		
5	·212	·220	·1819		
6	·192	·203	·1620		
7	·176	·180	·1443		
8	·160	·165	·1285		
9	·144	·148	·1144		
10	·128	·134	·1019	·00186	·054
11	·116	·120	·0907	·00227	·0658
12	·104	·109	·0808	·00282	·0818
13	·092	·095	·0720	·00361	·104
14	·080	·083	·0641	·00478	·138
15	·072	·072	·0571	·00589	·171
16	·064	·065	·0508	·00746	·216
17	·056	·058	·0453	·00975	·282
18	·048	·049	·0403	·01336	·384
19	·040	·042	·0359	·01911	·553
20	·036	·035	·0320	·02359	·682
21	·032	·032	·0285	·02985	·863
22	·028	·028	·0253	·03899	1·13
23	·024	·025	·0226	·0531	1·53
24	·022	·022	·0201	·06316	1·83
25	·020	·020	·0179	·07642	2·21
26	·018	·018	·0159	·09435	2·73
27	·0164	·016	·0142	·11365	3·29
28	·0148	·014	·0126	·13955	4·04
29	·0136	·013	·0113	·16527	4·78
30	·0124	·012	·0100	·1988	5·75
31	·0116	·010	·0089	·2272	6·57
32	·0108	·009	·0080	·2621	7·58
33	·0100	·008	·0071	·3057	8·84
34	·0092	·007	·0063	·3612	10·4
35	·0084	·005	·0056	·4332	12·5
36	·0076	·004	·0050	·5292	15·3
37	·0068		·0045	·6611	19·1
38	·0060		·0040	·8491	24·6
39	·0052		·0035	1·13	32·7
40	·0048		·0031	1·327	38·4
41	·0044		·0028	1·579	45·7
42	·0040		·0025	1·910	55·3
43	·0036		·0022	2·359	68·2
44	·0032		·0020	2·985	86·3
45	·0028		·0018	3·899	113
46	·0024			5·307	154
47	·0020			7·642	221
48	·0016			11·941	345
49	·0012			21·23	614
50	·0010			30·57	884

FIVE BAND OR DOT CONDENSER COLOUR CODE

Colour	Temperature coeff.	Capacitance value: first figure	Capacitance value: second figure	Capacitance value: multiplier	tolerance: rated cap. exceeding 10 pF	tolerance: rated cap. up to 10 pF incl.
	1st band or dot	2nd band or dot	3rd band or dot	4th band or dot	5th band or dot	5th band or dot
Black	0	—	0	1	±20%	±0·1 pF
Brown	−33	1	1	10	±1%	±0·25 pF
Red	−75	2	2	10²	±2%	
Orange	−150	3	3	10³		
Yellow	−220	4	4	10⁴	±5%	
Green	−330	5	5	—		
Blue	−470	6	6	—		
Violet	−750	7	7	10⁷		
Grey	—	8	8	10⁸	±10%	
White	−330	9	9	10⁹		±1 pF

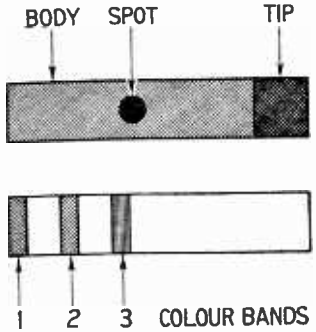


ORANGE (TEMPERATURE COEFFICIENT)
YELLOW (1ST FIGURE OF CAP)
VIOLET (2ND FIGURE OF CAP)
WHITE (MULTIPLIER)
BROWN (TOLERANCE)

EXAMPLE OF APPLICATION OF FIVE BAND OR DOT COLOUR CODE

Capacitor with, Temperature Coefficient of −150 Parts per Million/°C., rated Capacitance 4·7 pF and Tolerance ±0·1 pF.

RESISTOR COLOUR CODE



0. Black	5. Green
1. Brown	6. Blue
2. Red	7. Mauve
3. Orange	8. Grey
4. Yellow	9. White

First Number—Body or Band 1 } Yellow = 4

Second Number—Tip or Band 2 } Mauve = 7 } 47,000Ω (47k)

Number of Noughts—Spot or Band 3 } Orange = 3

A Gold Band at the extreme end indicates ±5% tolerance
A Silver Band at the extreme end indicates ±10% tolerance
No Band at the extreme end indicates ±20% tolerance
A Salmon Pink Band indicates high stability

LAYOUT AND CONSTRUCTION

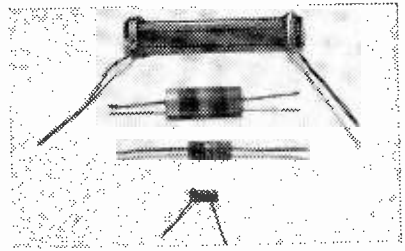
The material most often used for chassis is sheet aluminium or sometimes paxolin. Before securing components, fit them on to the drilled chassis to ensure that holds, connecting tags, etc., match one another. All components should be mounted close to the chassis and positioned so that any wiring is as short and direct as possible. The valves must always be placed into their holders only after all other construction is completed. Whenever possible, transistors should be mounted in sockets, but, where soldering is essential, a thermal shunt should be employed to prevent damage to the component.

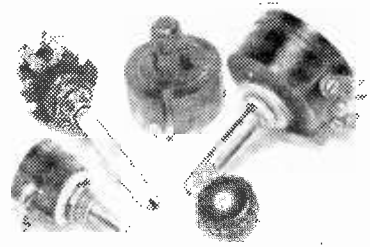
Always use cored solder (such as "Ersin Multicore") containing a non-corrosive flux for making joints, and tin the soldering iron before commencing work. Where necessary, clean wires and tags, etc., otherwise "dry" joints will result. When soldering try to heat the surfaces to be joined and allow the solder to flow over them rather than carry it to the join with the iron and thus lose the benefit of the flux.

PICTORIAL CIRCUIT GUIDE

THIS booklet has been designed to provide a useful source of information for amateur radio constructors. So that it may be of use to the beginner as well as the more advanced experimenter, this section has been especially compiled by members of our technical staff. The following pages contain illustrations of many radio components side-by-side with their circuit symbols thus making the interpretation of circuit diagrams easier.

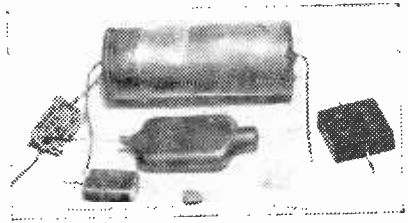
Fixed resistors.

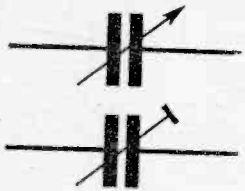


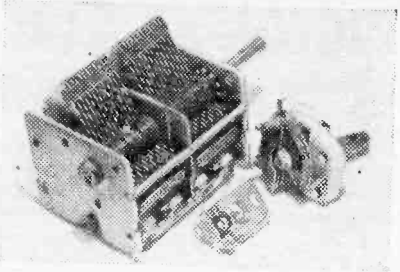


Variable resistors (potentiometers).

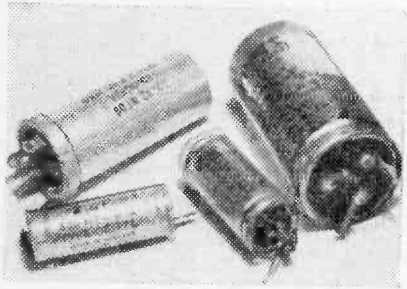
Capacitors (condensers).

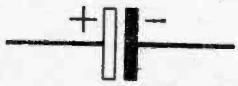




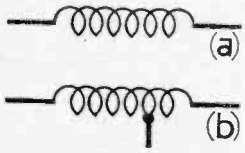


Variable capacitors—Trimmers and other pre-set capacitors are shown by a "hammer-head" instead of an "arrow-head".

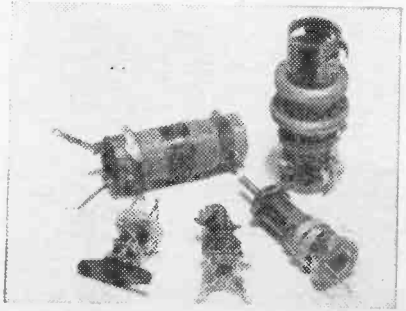


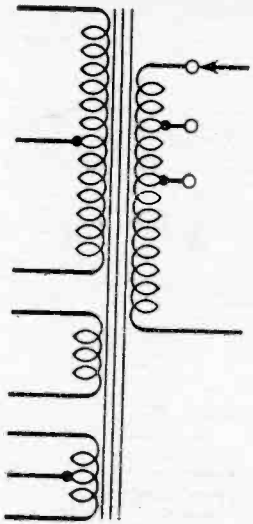


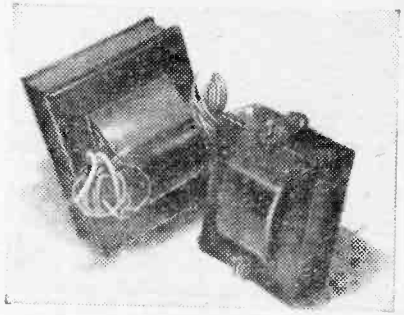
Electrolytic capacitors—note the markings indicating polarity.



Air-cored coils or chokes—
(a) a single coil and
(b) a tapped coil.

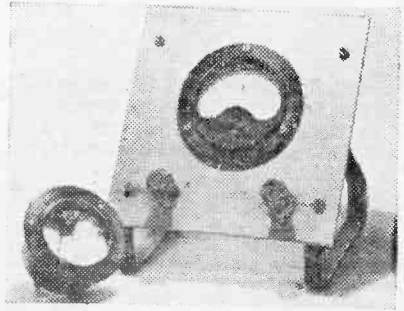




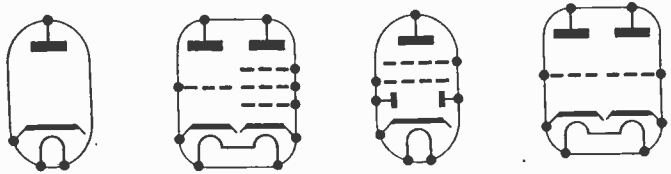


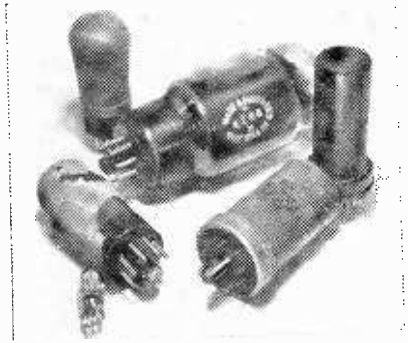
Typical mains transformers—used in the power supply sections of receivers and amplifiers.

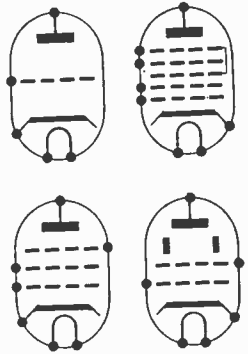
Simple meters—those used for servicing may have many refinements.



Do not forget that in Practical Wireless each month there are valuable articles on constructing receivers, amplifiers, etc.— all the information needed for you to build your own circuits is given. We are prepared to help you by post in your problems but you must comply with the rules of our query service and send a stamped addressed envelope and a query coupon from the current issue.

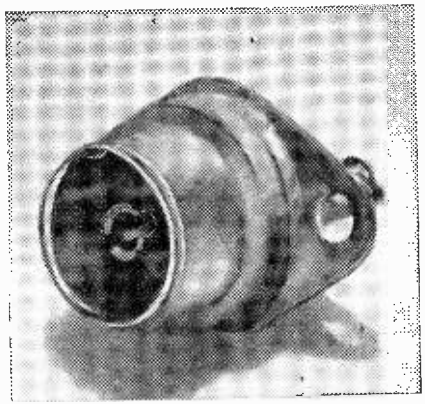


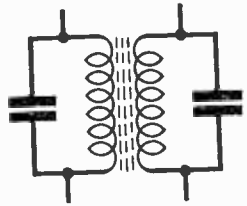




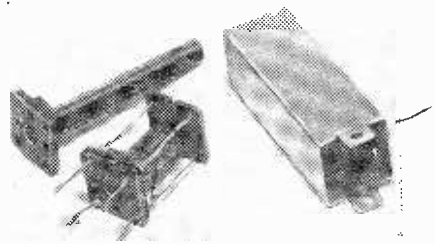
Valves commonly used in radio — ranging from diodes to pentodes and dual valves.

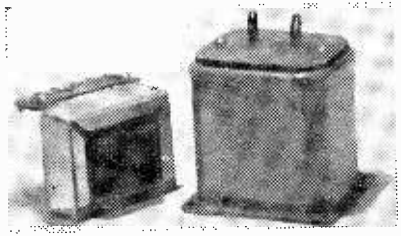
Coaxial socket—used in audio circuits where screened wiring is essential.

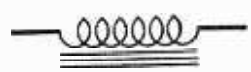




An I.F. transformer. Where trimmers are used they replace the fixed capacitors shown.



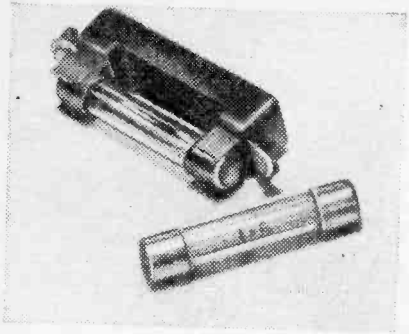




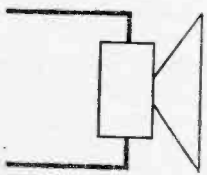
Iron-cored chokes—often for power circuits.

Ferrite aerials or iron-dust-cored coils.

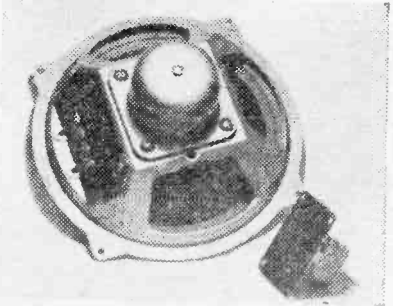
Headphones.

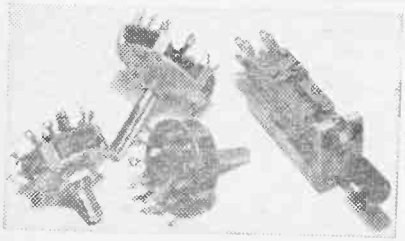


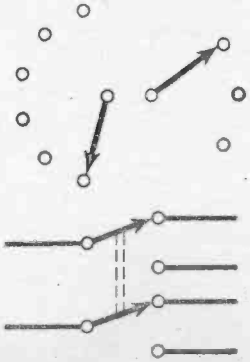
Fuse—used in power supply circuits.



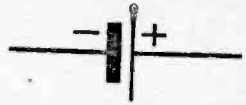
Loudspeakers.





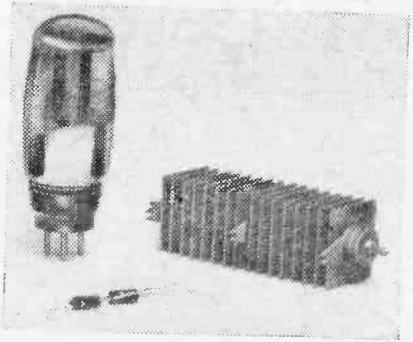


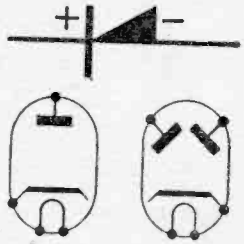
Switches—single- and multi-pole.



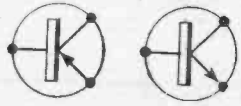
Cell.

Battery.

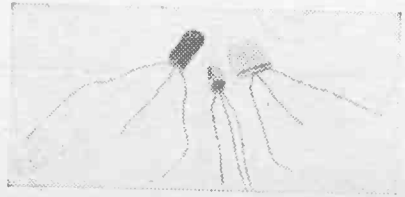




Valve and metal rectifiers.



p-n-p n-p-n
Transistors.



ciently strong. The paxolin is carefully filed until it fits the core slots properly.

Transformer Adjustment

The three I.F. transformers should now be adjusted for maximum volume. If this is done by ear keep volume down by reducing the coupling between generator and transistor base circuit. The audio volume control should be left at maximum, the aim being to avoid a large output from the diode, which would provide a large AVC voltage, and make critical adjustment difficult. If, however, a meter has been included in the battery circuit, as mentioned, core adjustments should be directed towards obtaining the maximum current reading, which indicates maximum signal strength. Once the I.F. cores have been peaked for maximum gain, they are not altered.

The lead from the generator should then be placed a little distance from the rod aerial, this being adjusted, according to generator output, etc., for convenient signal strength.

The switch is set to short out the L.W. portion of the aerial, and the oscillator coil core, oscillator trimmer, and aerial coil position are adjusted for optimum results. As there is no aerial coil trimmer, it is necessary to balance the oscillator coil trimmer against stray capacity and the aerial inductance. The latter is modified by the position of the winding on the rod, this effect being most obvious at higher wavelengths.

With a signal of about 225m adjust the oscillator trimmer and tuning dial simultaneously for best volume. Then use a signal of about 500m and adjust the oscillator coil core, and position of the M.W. winding on the rod, for best results. When this has been repeated, good reception should be obtained over the M.W. band. If it is found that the M.W. winding needs to be slipped far off the rod, for best volume at a high wave length, unscrew the oscillator trimmer and core a turn or two, and repeat the procedure.

To align the L.W. band, screw down the L.W. trimmer for maximum sensitivity near the low wavelength end of the band, and adjust the position of the winding on the rod at a high wavelength. Or merely adjust for optimum reception of the 1500m Light Programme.

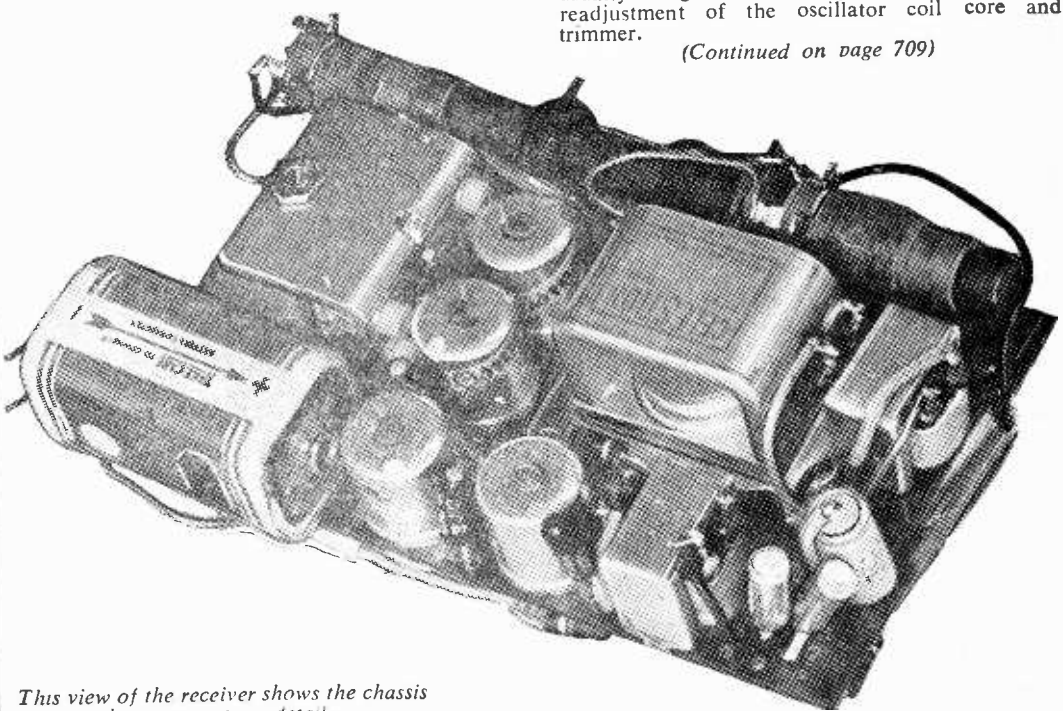
Without a Generator

If no generator is available, tune in a local station and peak the I.F. cores for maximum volume, as already explained. Care is necessary—half a turn of a core either way can easily reduce volume to a small part of that obtainable with correct adjustment.

The aerial and oscillator circuits should then be dealt with as explained, but actual stations are tuned in instead of the signal generator output. As alignment approaches that which gives best reception, sensitivity will increase, and weak stations should then be chosen.

When adjustment is finished, a spot of adhesive should be used to hold the windings in position on the aerial rod. Slight changes, such as caused by inserting or removing the receiver from its case, or moving the aerial and other internal connections, will have some effect on sensitivity, but can usually be ignored, or compensated for by *slight* readjustment of the oscillator coil core and trimmer.

(Continued on page 709)



This view of the receiver shows the chassis layout in some detail.

A Reliable Radiogram

AN ECONOMICAL AND EFFICIENT ARRANGEMENT

By A. Sydenham

NOWADAYS, when many new and attractive blank cabinets are available at reasonable cost it becomes possible to construct elegantly housed equipment of a kind only available commercially to those in a high income bracket. Much home construction equipment is of a superior variety but because it often does not have an attractive cabinet, it is not presentable when completed. This radiogram will be considered presentable by most people and, furthermore, is efficient in every way. It also remains comparatively cheap to construct.

Variations in Design

The whole equipment comprises an amplifier, a power pack, a 4-speed auto-changer gram unit and a superhet A.M. radio tuner, all of which are built into one of the Nordyck equipment cabinets, these being easily obtainable The loudspeaker—a 10in. unit—is separately housed, though if desired, a speaker could be built in with the items detailed above—one of the elliptical types operating through an aperture cut in the side of the cabinet. Alternatively, two such speakers could be used, one at each side. The possibilities are varied and interesting although the use of a separately housed speaker is preferable. The makers of the cabinet do supply, where required, a speaker cabinet that matches the equipment cabinet and as the size of both is identical, two mounting positions are thus made possible, viz, one above the other or side by side. In this case, however, an inexpensive cabinet was home-constructed to contain an existing unit and brief details of this will be given later.

When the equipment cabinet is purchased it will be undrilled, containing only a motor board that can be placed at two different heights depending upon the type of gram unit used. In the radiogram illustrated the auto-changer is fitted, not centrally on the motor board, but to the right and owing to the height of the record control arm the motor board is placed on the lower

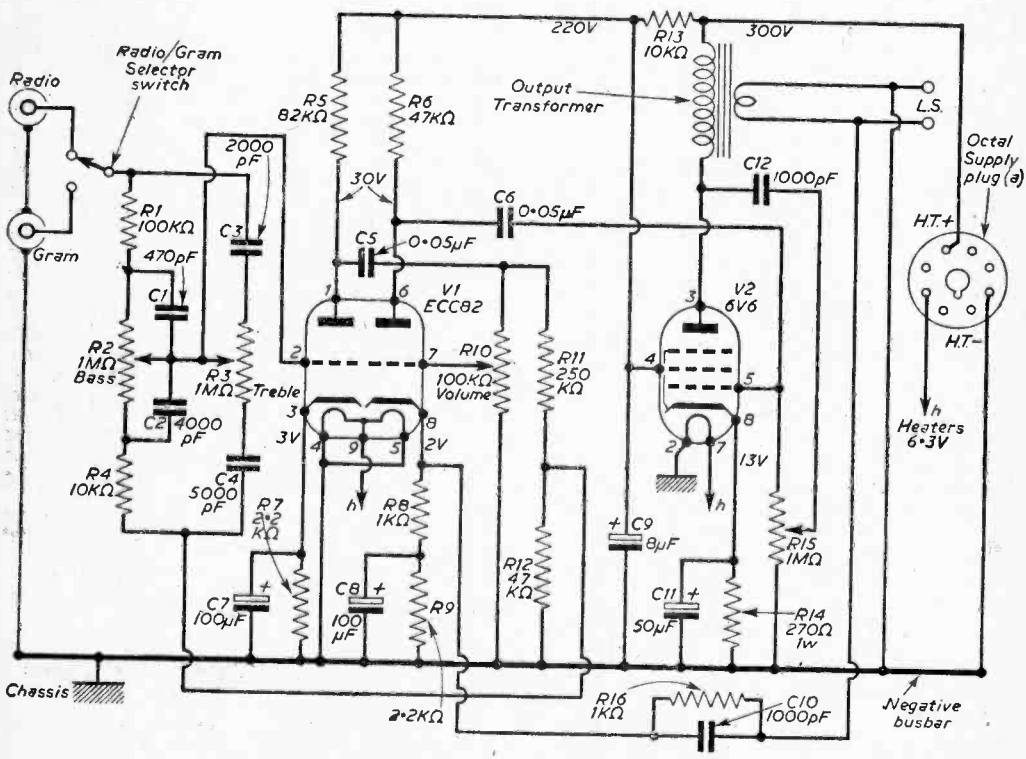


Fig. 1.—Circuit diagram of the amplifier.

of the two slots so that the lid can close properly. Mounting the gram unit in this way makes available enough space for the radio tuner unit which is positioned *above* the motor board instead of in the compartment housing the remainder of the equipment. The radio panel is thus some 4¼in. higher than the turntable and permits the fixture of a pigmy bulb (of the type suitable for mains voltage) for illuminating the player deck.

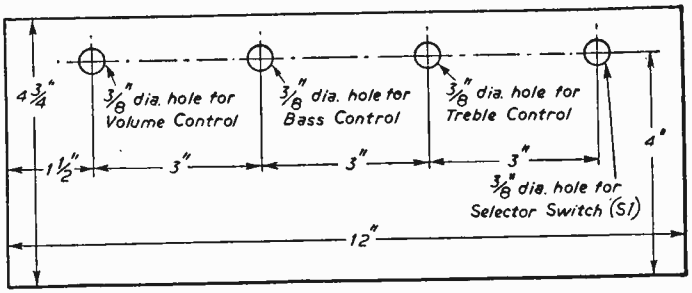


Fig. 3.—Details of the amplifier front panel.

The Amplifier Section

The circuit diagram of this section is illustrated in Fig. 1. In the average size room, the need for full rotation of the volume control never arises with this amplifier owing to the large output it affords. Distortion is low until the volume control reaches approximately three-quarters travel, but by then more than enough volume is experienced.

Owing to the wide range tone controls network V1(a) provides very little gain, but this is not important as V1(b) and V2 are sufficient. Note that part of the output from V1(a) is fed back to improve the response. Feedback is also taken from the secondary winding of the output transformer—which should be a good quality component—via R16, C10, etc., these values being used in conjunction with a 3Ω speech coil. The potentiometer, R15 (which is a pre-set type in the original amplifier) is not really essential and may be omitted together with C12 if desired, but if this is done, a 500k resistor should be connected from pin 5 of V2 to the negative bus-bar.

Smoothing

No hum is audible in the prototype owing to adequate smoothing of the H.T. supply and the fact that only a single connection is made to the chassis at the input sockets. The power supply leads are plaited together and terminated in a plug that fits one of the international octal valve sockets on the power pack. This plug, together with the one required for the radio tuner, were made from the bases of discarded octal valves.

The layout above chassis is illustrated in Fig. 2, while in Fig. 3 the front panel that is bolted to this chassis is shown. This panel was made from a piece of ebonite, but plywood would do since it is not visible when the amplifier is in position. The purpose of it is merely to raise the four controls sufficiently to give the front of the cabinet a pleasing appearance. The decoupling capacitor, C9, is mounted under the chassis and is a wire-ended component.

The Tuner Section

Although this section is comparatively simple (see Fig. 4) one or two unusual features are included. For high sensitivity and good selectivity a superhet is used, designed in such a way that the output is comparable with that provided by the gram unit. Switched tuning is used, and as the Light programme is not satisfactorily received on the medium waveband at this location, long waveband coils have had to be incorporated, viz. L2 and L4. On the medium waveband the following arrangement is employed: the tuner is adjusted to receive the local Home Service transmission by means of L1, L3 and associated trimmers, C3 (which is a panel control) being set to approximately half capacity. Then, by rotating C3 slightly at the appropriate time during the evening it is possible to correct tuning or receive other stations.

Several advantages result from using a tuner that

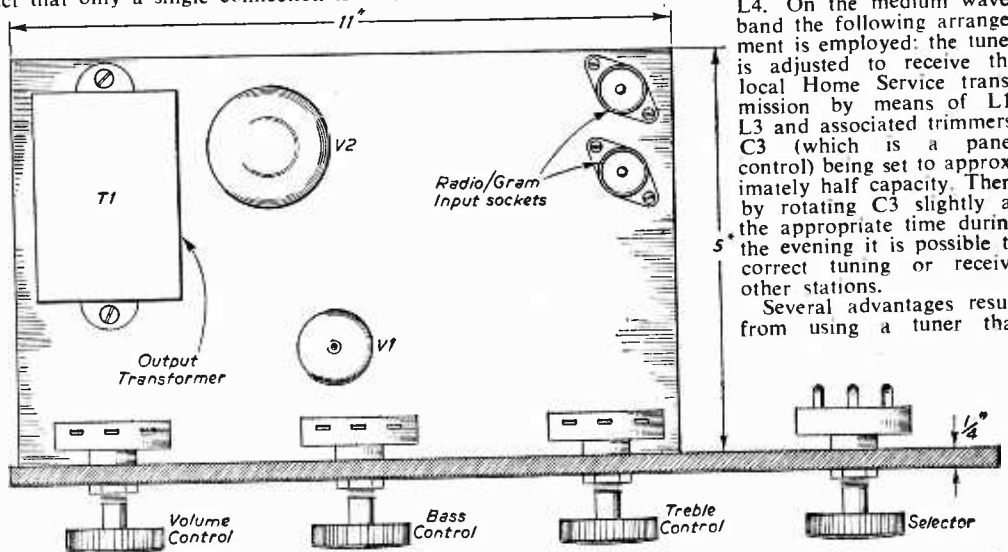


Fig. 2.—Above-chassis layout of the amplifier.

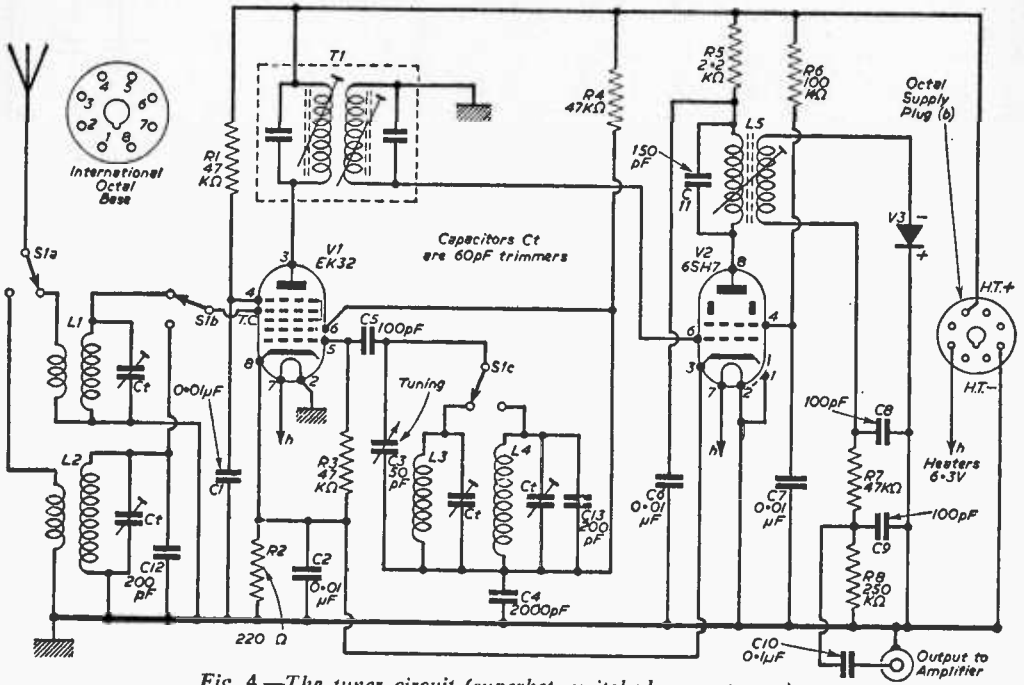


Fig. 4.—The tuner circuit (superhet, switched, pre-set type).

is switch-tuned, one of which is that no twin gang tuning capacitor is needed, thus making station selection easy. Secondly, padding problems do not arise, and, thirdly, the use of coils of differing makes and design can be utilized if desired since they do not need to be matched.

Automatic volume control is not really essential and has been omitted here, which means that a short grid based valve can be used as the intermediate frequency amplifier. All this simplifies matters and keeps down the cost considerably.

A disadvantage of switched tuning, however, is that full output might not result should the local oscillator drift off frequency after a period of running, but, owing to the inclusion of C3 no such trouble is encountered in this arrangement. A further disadvantage is that the choice of programme is limited, but in the prototype S1 is a 6-way switch so that at a later date other transmissions can be received.

The I.F. is 470kc/s, and only a single I.F. transformer is employed, V2 feeding into a long

LIST OF COMPONENTS FOR THE TUNER

Chassis—8¼in. x 4¼in. x 1½in. Panel—14½in. x 4¾in. x ⅛in.
Two I.O. valve bases. One I.O. plug. One coaxial plug.
V1—EK32. V2—6SH7. V3—Germanium Crystal Diode. Two control knobs.
One tag strip (4 plus earth). Aerial/earth socket strip.
Wavechange switch—two-bank type (see text). T1—465kc/s I.F.T.
Capacitors: C1, 2, 6, 7—0·01μF 350VW, C3—50pF trimmer (see text), C4—2,000pF, C5, 8, 9—100pF, mica C10—0·1μF 350VW, C11—150pF, C12, 13—200pF (only required when long waveband coils are used for 12, 14), Ct—60pF trimmers.
Resistors: R1, 3, 4, 7—47k, R2—220Ω, R5—2·2k, R6—100k, R8—250k.
Coils: L1, PA2. L2, PA1. L3, PO2, L4, PO1. L5—QA12. (All "Osmor.")

LIST OF COMPONENTS FOR THE AMPLIFIER

Chassis 8in. x 5in. x 2in. Panel 12in. x 4¾in. I.O. valve base.
One B9A valve base. Four engraved control knobs. Output transformer.
Two surface-mounting coaxial sockets. One I.O. plug.
V1—ECC82. V2—6V6. S1—1-pole, 2-way selector switch.
Capacitors: C1—470pF, C2—4,000pF, C3—2,000pF, C4—5,000pF, C5, 6—0·05μF, C7, 8—100μF, 6 VW (electrolytic), C9—8μF 350VW (electrolytic), C10, 12—1,000pF, C11—50μF 25VW (electrolytic).
Resistors: R1—100k, R2, 3—1M potentiometers, R4—10k, R5—82k, R6, 12—47k, R7, 9—2·2k, R8, 16—1k, R10—100k potentiometer and switch, R11—250k, R13—10k, R14—270Ω, 1W, R15—1M potentiometer (see text).

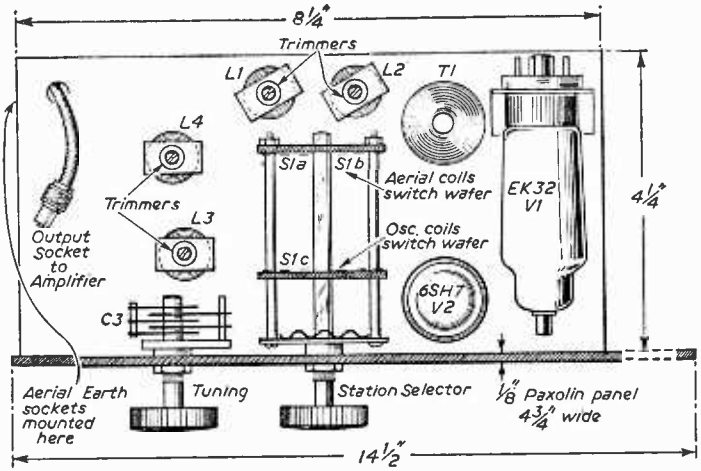


Fig. 5(a).—Layout of the main components on the tuner chassis.

waveband coil, the main winding of which feeds V3. The normal primary winding is tuned to the I.F. and connects to the anode of V2. No experience with coils other than the one specified for L5 is to hand and results might not be satisfactory if an alternative make is used.

In order that the tuner will fit into the space available, V1 is laid on its side on the chassis, but it will be observed that when in position in the cabinet, this valve is upright since the rear flange of the tuner chassis rests on the motor board. The layout and positioning of the main components is shown in Fig. 5 together with all necessary dimensions.

The Power Pack

This section is quite conventional and requires little comment. Only a single heater winding exists on the mains transformer used in the prototype, thus confining the choice of valve for V1 since a type with a separate cathode is essential. If a transformer with a separate rectifier heater winding is available so much the better. Owing to the height of T1, the power pack was built on a flat piece of plywood and, as there are no items that need to be mounted under the chassis, this is quite satisfactory. Two "L"-shaped brackets need to be made from 16s.w.g. aluminium for retaining the power output sockets, which are, in fact, octal valve bases.

Setting Up

Except for the tuner section, setting up consists merely of sliding the chassis into the main cabinet after routine tests have been made for H.T. shorts, etc., and inserting the various power and signal supply plugs into their respective sockets. Coaxial cable is suitable for the signal leads,

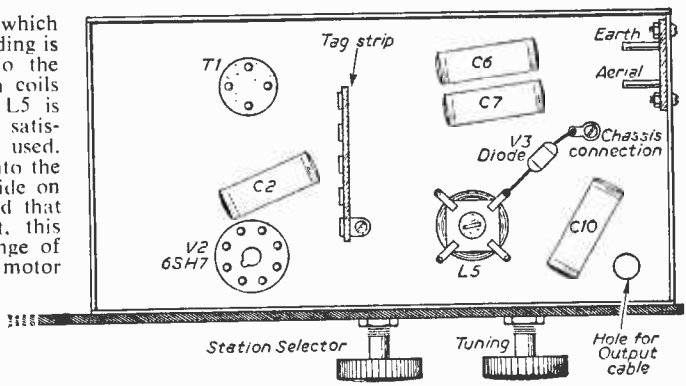


Fig. 5(b).—Under-chassis layout.

one length being required for the gram to the amplifier and another from the tuner to the amplifier.

(To be continued)

POCKET SUPERHET

(Continued from page 705)

Fitting in the Case

A piece of thin card or similar material is cut to fit over the speaker grating, and has a round hole to match the speaker cone. Three 6B.A. bolts hold the set in the case. The mouldings in the case can be tapped to receive these. Alternatively, a 6B.A. bolt with a notch filed in it may be used for tapping, if this is done carefully.

A 6B.A. bolt, with washer under its head, secures the tuning dial to the condenser spindle, which is tapped to receive the bolt. A spacing bush about ⅛in. long is placed between dial and condenser.

The cheapest and most economical battery supply will be obtained by wiring four U16 cells in series to make a 6V battery. This will be approximately ¼in. x ¼in. x 1¾in overall. It is not essential to use this voltage, though the circuit is intended for 6V and a larger battery will not necessarily improve reception. In no circumstance must more than 9V be used.

To prevent contact between the end of the battery and the can of the second I.F. transformer insulating tape should be applied to the transformer can. The lower tags of the tuning condenser are bent up to clear the battery. The largest battery which can be accommodated is the PP4. Smaller 9V batteries may also be fitted. **Transistors may be permanently damaged by connecting a battery in the wrong polarity.**

Coloured spots of enamel may be used to identify switch positions. If electrolytic condensers with bare metal cases are used, these should be covered with thin insulation, such as adhesive tape, before wiring them in.

PRE-SET TUNING FOR FIVE SHILLINGS

A SIMPLE MODIFICATION WHICH ANYONE CAN CARRY OUT

By E. L. Higgs

TWO pre-set stations can be added to an AM radio simply by fitting three inexpensive parts, giving instant selection of any two medium wave stations. No alteration of the original circuit is necessary and it takes a very short time to complete.

Set the tuning control to the required medium wave station that is highest in frequency and switch

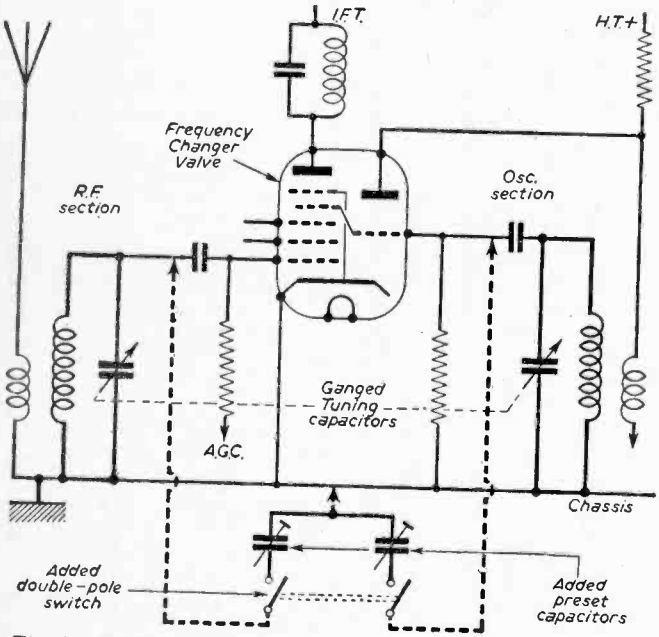


Fig. 1.—Circuit arrangement.

across each section of the variable tuning condenser, a pre-set capacitor which tunes the R.F. and oscillator to the new lower frequency (Fig. 1).

Components

Only three connections to the variable tuning condenser are made, and the parts needed are a double pole toggle switch, pre-set compression capacitors of 500pF, and a few inches of stiff wire.

The simple assembly shown in Fig. 2 should now be connected. Use the stiff connecting wire as short as possible making a rigid, compact unit. If the body of the reader's switch is metal then it is advisable to cover it with adhesive PVC tape.

Assembly

Decide where the switch is to be located. Cut the leads just long enough to reach the terminals on the tuning gang. These leads should be sleeved 16s.w.g. wire. Solder the leads from the switch tags to those of the "live" tuning gang, and the earth lead from the common pair of pre-set connections to an earth point on the radio chassis; near or on the gang frame is best.

Use of the Switch

Switch on the radio and tune to the station you require as a highest frequency of the preset pair, on the medium wave. Turn the new station switch "On," when the tuning of the first station will go. At this point adjust the new pre-set trimmer that has been connected across the local oscillator section of the gang until the second of the required stations comes in. Once tuned the other R.F. pre-set capacitor can be adjusted for a maximum sensitivity or volume. Now switching the new switch up or off will tune immediately to the first station.

There may be some hand capacity and de-tuning effects when the switch unit is moved to its fixing position, and these can be finally trimmed up with a filed knitting needle afterwards. When using the radio to receive other stations put the switch into the "off" position and tune manually as before. The effect of the modification on the radio is to shift slightly the stations down the scale of the medium wave. This effect is negligible on the long wave, but the short wave is thrown out a lot.

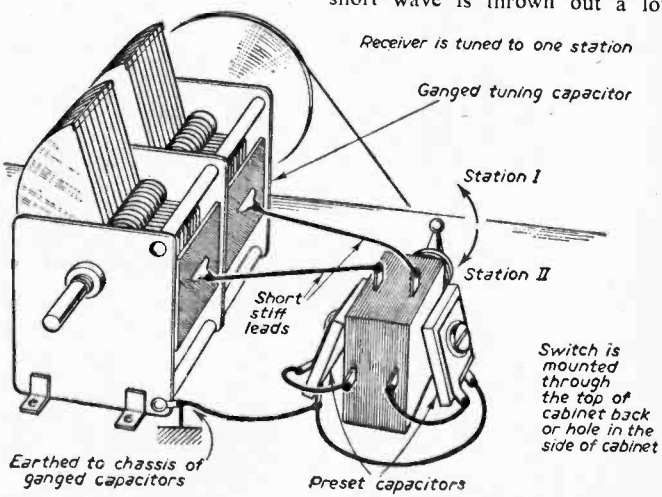


Fig. 2.—Practical interpretation.

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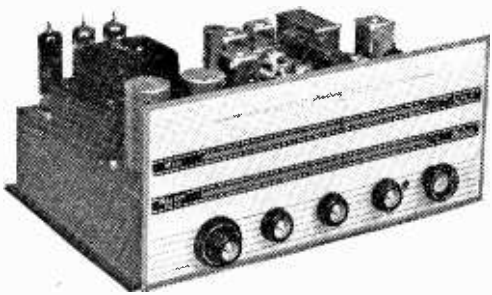

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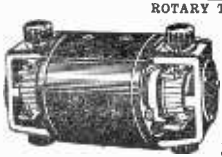

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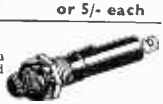

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Current and Voltage Feeds

SOME CURRENT DIFFICULTIES EXPLAINED

By B. Sexton

THE terms "current fed" and "voltage fed" occur frequently in circuit descriptions. A thermionic valve is normally considered as voltage operated whereas a transistor is current operated.

Whether the feed is voltage or current depends upon the output impedance of the source supplying the device and the input impedance of the device.

Fig. 1 shows a constant voltage circuit. Assume the source voltage is 3V. If RS the source or output impedance, is 10k and RL 50k then the current is 3/60mA=0·05mA and the voltage across RL=2·5.

Now suppose RL is increased by 50 per cent to 75k. The current is now 3/85mA=0·0353mA and the voltage across RL becomes 2·65 which is an increase of (0·15/2·5) x 100=6 per cent.

If the original value of RL is decreased by 50 per cent to 25k then the current becomes 3/35mA=0·0857mA and the voltage across RL is 2·14. This represents a percentage decrease on the original value of (0·36/2·5) x 100=14·4 per cent.

Thus the (±50) per cent variation of the load resistor has only varied the voltage across the load from (+6) per cent to (−14·4) per cent. Compared with the resistance variation the voltage variation is small. The voltage can be regarded as constant and the load is voltage fed.

Now consider how the current through the load has varied. The current was originally 0·05mA.

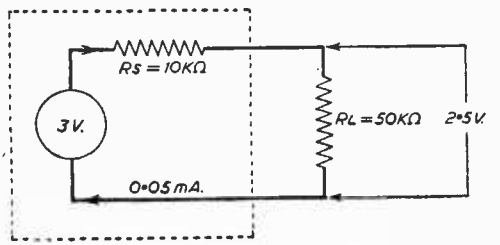

Fig. 1.—Circuit of a constant voltage source.

When RL was increased by 50 per cent the current decreased to 0·0352mA which represents on the original value a percentage decrease of (0·148/0·05) x 100=29·6 per cent

When RL was decreased by 50 per cent the current increased to 0·0857mA or a percentage increase of (0·0357/0·05) x 100=71·5 per cent. Thus the current is by no means constant.

If a constant current through the load is required a different arrangement must be used as in Fig. 2. This can be considered, as far as RL is concerned, as a constant current source.

Some readers may be more familiar with "constant current generator" circuit as shown in Fig. 3. In this case a constant current of 0·06mA is assumed to flow to RS and RL in parallel. A current of 0·05mA will flow through RL and 0·01mA through RS.

To make a more direct comparison with Fig. 1, the circuit of Fig. 2, although unconventional, will be used. The current through RL can be calculated as 0·05mA. If RL is increased by 50 per cent to 75k the current becomes (15/325mA)=0·046mA.

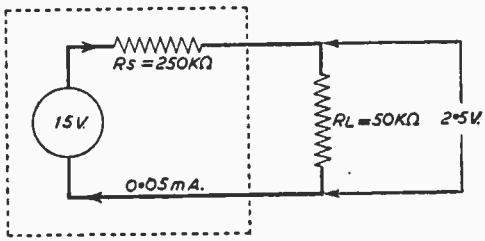

Fig. 2.—Circuit of a constant current source.

This is a percentage decrease of (0·004/0·05) x 100=8 per cent. Now if RL is decreased by 50 per cent to 25k the current becomes (15/275mA) =0·0545mA, a percentage increase of (0·0045/0·05) x 100=9 per cent.

Thus a variation of (±50) per cent of RL has only varied the current by (+9) per cent and (−8) per cent. The current can be regarded as constant and the load is current fed.

It should be noted that the voltage, across the load, has varied considerably. Increasing RL by 50 per cent gives a voltage of 3·45, a percentage increase of (0·095/2·5) x 100=38 per cent. Decreasing RL by 50 per cent gives a voltage drop of 1·36 or a percentage decrease of (1·14/2·5) x 100=45.5 per cent.

Thus comparing Fig. 1 and Fig. 2 it can be seen that the effect of the variation of RL depends upon the ratio of RS/RL.

To obtain a constant voltage across the load the ratio of RS/RL must be low, as in Fig. 1. To obtain a constant current the ratio RS/RL must be high as in Fig. 2.

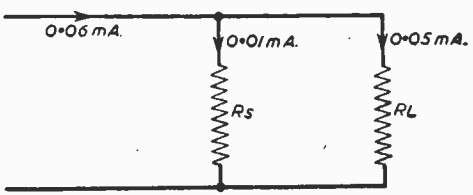

Fig. 3.—Compare this circuit with Figs. 1 and 2.

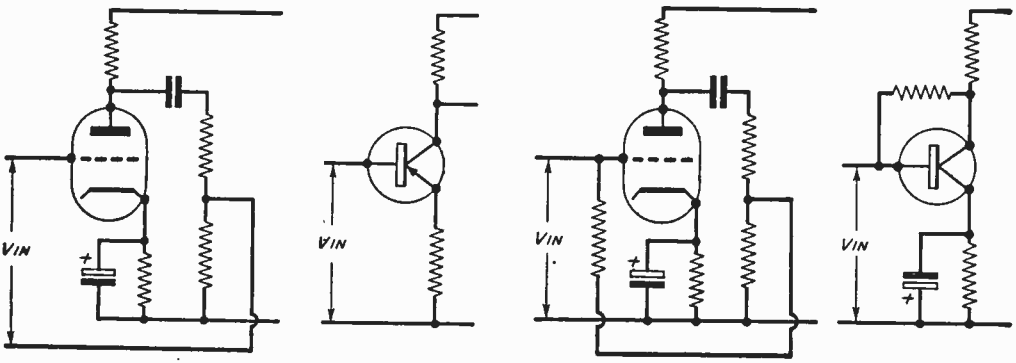

Fig. 4.—(left) Series feeds, and (right) parallel feeds.

Negative Feedback

With valves and transistors RS and RL can be modified by the use of negative feedback. RS is the output impedance and RL will depend upon the input impedance of the following stage.

The feedback voltage can be proportional to the output current (current feedback) or proportional to the output voltage (voltage feedback). The effect on the output resistance depends upon the type of feedback. Current feedback will increase the output impedance, i.e., tend to keep the output current constant. Voltage feedback will decrease the output impedance, i.e., tend to keep the output voltage constant.

The effect on the input impedance does not depend on whether the feedback is current or voltage but whether it is connected in series or parallel with the signal input voltage. If connected in series it will increase the input impedance, i.e., the required condition for voltage feeding. If connected in parallel it reduces the input impedance which is the required condition for current feeding.

Examples of various types of feedback applied to transistors and valves are illustrated in Fig. 4.

Measurement of Input and Output Impedance

Assuming the measurement is made at low frequencies and the impedance is resistive the simplest method is shown in Fig. 5. A voltmeter (V) is placed across the output terminals with the source off load. V should be of such high resistance that it can be considered to read the true off-load voltage, i.e., it must draw a negligible current from the source. A resistor is then placed across the output terminals, the resultant current will then cause the voltmeter reading to decrease owing to the internal voltage drop across RS.

R is then varied until the voltmeter reading has dropped to half the original value. This then means that the load resistor is equal to RS and thus RS is known.

If the output impedance of a voltage source is being measured it will be remembered that the load resistor is large with respect to RS. If the load resistor is made equal to RS it will mean that a relatively heavy current is drawn from the source. This is to be avoided. The best method in this case is to cause the off-load voltage to fall by a fraction, say 1/10 or 10 per cent. Then:—

$RL/(RS+RL)=0{\cdot}9$.

Therefore, $RL=0{\cdot}9\ (RS+RL)$,

$0{\cdot}1RL=0{\cdot}9RS$,

Therefore, $RS=RL/9$, i.e., RS would then be a ninth of the resistor value found to decrease the off-load voltage by 10 per cent.

If the source impedance is known, the preceding method can be used to measure input impedance. The off-load voltage of the source must be measured and the percentage drop calculated as it is placed on load across the input terminals of the device being measured. Assume that the voltage drops by 1/20 or 5 per cent. This means that the input impedance is high compared with the source impedance. We can calculate as below (letting RL=input impedance); $RL/(RS+RL)=19/20$.

Therefore, $RL=19(RS+RL)/20$,

$RL/20=19RS/20$,

Therefore $RL=19RS$.

Thus the input impedance is 19 times the source impedance.

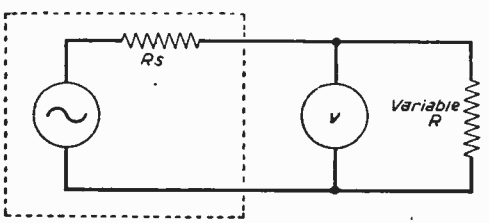

Fig. 5.—Measuring input and output impedances.

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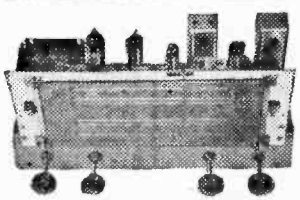

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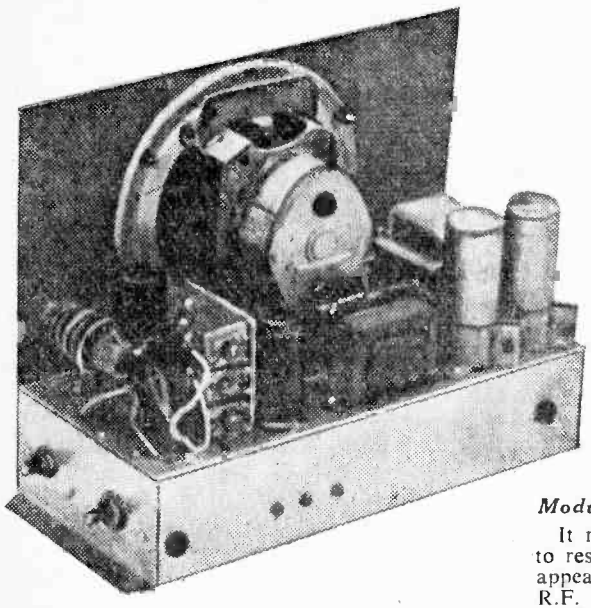


A Midget T.R.F. Receiver

By J. Smith

(Continued from page 607, November issue)

Tuning

WHEN all is well, advance C15 to a point just short of oscillation and connect a reasonably good aerial. It should now be possible with the switch in the first medium wave position, to tune with the appopriate trimmers (C1 and C9) stations between 200m and 210m. If one of these is required, nothing more need be done; otherwise, capacity must be added to the circuits (C4 and C12) until they may be tuned with the trimmers to the desired frequency. This must be carried out by trial and error as the capacity required varies somewhat with different coils, but as a guide it can be said that with a typical coil tuned on the trimmers to 1500kc/s, the addition of 100pF will shift the resonant frequency to about 1000kc/s, while another 100pF will take it to 850kc/s. The operation must then be repeated for the second medium wave position. For the light programme with the switch in the third (long wave) position, 250pF will usually be correct for C6 and C14.

Modulation Hum

It may be found that as the circuits are tuned to resonance on a transmission, a prominent hum appears. This is modulation hum and is due to R.F. currents circulating in the A.C. mains. The usual remedy is to use a mains transformer with a screened primary winding but transformers of the type specified for this receiver are often not so fitted. If modulation hum is found, it may be eliminated by connecting two 0·01μF capacitors across the transformer primary and earthing the centre tap as shown in Fig. 1. The capacitors should be high voltage ceramics as used for the suppression of interference from domestic electrical apparatus.

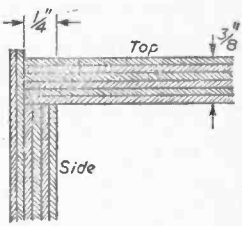


Fig. 6. — The rebated corner joint for the cabinet. Note the slight projection to allow for sanding-off.

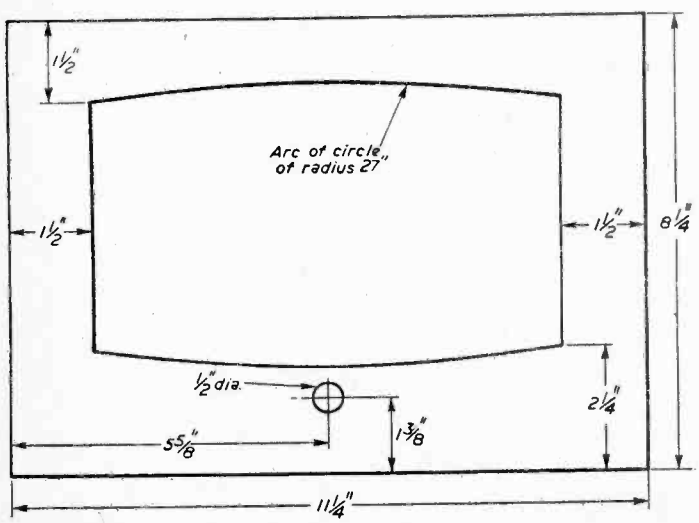


Fig. 7.—Cutting and drilling dimensions for the front of the cabinet.

Cabinet

The best home-built receiver will be viewed with disfavour about the house if insufficient attention has been paid to its appearance and a proper cabinet which at least does not offend the eye, must be regarded as an essential part of the construction. This is neither expensive nor difficult to build and no special tools are needed. For this receiver, plywood ⅛in. thick with a facing of oak, walnut, etc., is suitable for the top, bottom and sides, and ¼in. ply, similarly faced, is required for the front of the cabinet. First

cut the top and bottom, each 11in. x 5in. and the two sides, each 8¼in. x 5in. At the top and bottom of each side on the unfaced surface form a rebate very slightly more than ⅛in. wide and ¼in. deep, so that when assembled, the corners of the cabinet will come together as shown in Fig. 6. These rebates must be fairly accurate and may be made by cutting across the wood with a tenon saw and removing the unwanted material with a chisel or penknife. Finish off with glass paper. The more fortunate constructor will probably tackle the job with a rebating plane.

When this has been carried out, assemble the top, bottom and sides securing them temporarily with two or three 1in. panel pins driven half way home at each corner. Square up the assembly, lay it on a sheet of ⅛in. ply

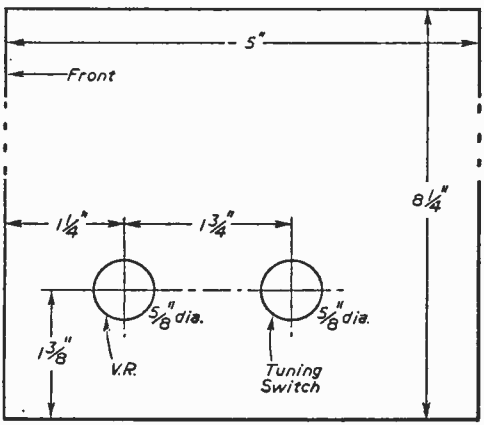


Fig. 8.—The right-hand-side of the cabinet drilling data.

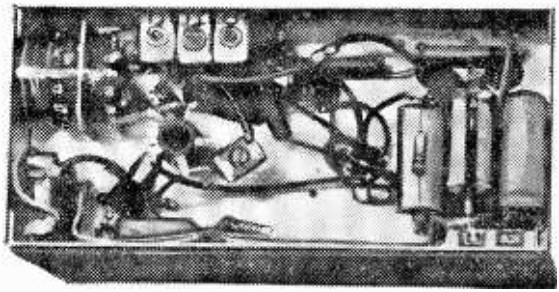
and mark out the front. Cut the front about 1/32in. oversize to allow for sanding off, and make apertures for the speaker and pilot light as in Fig. 7. The curves at the top and bottom of the speaker apertures are arcs of a circle of which the radius is 27in. and can be marked out accurately with the aid of a pencil and a length of string.

Assembly

Dismantle the assembly and make two ⅜in. holes in the right hand side for the controls in the positions shown in Fig. 8. Coat all mating surfaces with casein glue and re-assemble, driving the panel pins right home. Square up, and fit the front similarly with glue and panel pins.

Finishing

Punch the heads of the panel pins below the surface and fill in the holes and any other blemishes with plastic wood of the colour in which the cabinet is to be finished. When the filler is hard, give a good rub down with No. 2 glass-paper, squaring off the corners and removing any old polish from the wood. Finish off with No. 0 paper and rub in wood dye of the desired colour. The best final finish is French polish and a very good result can be obtained with any of the several kinds sold for amateur use. Alternatively, a satisfactory finish can be obtained by rubbing in two or three coats of a colourless floor sealer



View of the underside of the chassis.

marketed by a well known polish manufacturer. Rub down lightly with No. 0 paper between each coat.

Fitting the Receiver

Glue a piece of coloured Perspex over the pilot light position and fit a piece of speaker cloth over the speaker aperture. The latter is best secured with an impact adhesive if a good tight fit is to be obtained. Cut off the control spindles to a length of ½in. and slide the receiver into position. Now drill two holes through the bottom of the cabinet into the chassis flanges, one at each end and enlarge the holes in the wood only and countersink them. If two ½in. wood screws of suitable gauge are now inserted, they will have a self-tapping action as they enter the chassis flanges.

Brass couplers should be fitted to the controls and the cut off portions of the spindles can then be used to extend the controls to the outside of the cabinet so that knobs can be fitted. A piece of felt should be glued to the bottom of the cabinet so that it will not mark polished surfaces on which it may stand, remembering to make holes in the felt for access to the screws which secure the chassis.

COMPONENTS LIST.

Resistors (¼W): R1 220Ω, R2 1·2M, R3 470k, R4 47k, R5 100k, R6 33k, R7 22Ω, R8 470k, R9 150Ω, R10 220Ω.
Resistors (1W): R11 2·2k.
Variable Resistor: VR 10k with switch.
Capacitors: C1, 2, 3, 9, 10, 11 and 15. 50pF (max.) trimmers.
C4, 5, 6, 12, 13, 14—values as required. C7 0·1μF, C8 0·1μF, C16 16μF, 350VW electrolytic, C17 47pF, C18 0·1μF, C19 0·01μF, C20 330pF, C21 50μF, 25VW electrolytic, C22 0·002μF, C23 16μF, 350VW electrolytic, C24 16μF, 350VW electrolytic.
Coils: Any T.R.F. dual range pair.
Valves: V1 EF92, B7G base and can, V2 EF91, B7G base and can, V3 EF91, B7G base.
Switch: Yaxley type, 2-bank, 3-pole, 3-way.

Buying Radio Components by Post

NEW AND SURPLUS EQUIPMENT

By E. V. King

THE author, in dealing with readers' queries, has noted the difficulty many enthusiasts have in obtaining supplies to build the apparatus described in this and other journals. The author purchases entirely through the post hundreds of pounds' worth of new and surplus radio components each year and feels justified in saying that he is an expert in this matter.

Types of Dealer

Postal dealers are divided, by the author, into two classes:—

(a) Those supplying new standard (non-surplus) components.

(b) Those supplying ex-Government and other surplus equipment.

Of course, some dealers' stock will fluctuate between the two types. Others offer a counter service as well as postal. It should be noted that sometimes a dealer has two addresses, and to avoid delay the correct mail order one must be used.

Catalogues

As many catalogues and lists as possible should be obtained and filed. The date each is received should be entered on one main sheet by the dealer's name, and the correct mail order postal address should be shown on the sheet. The dates are then amended as new lists are received.

In this way the addresses are always at hand and those catalogues which might be out of date can be seen at a glance.

The catalogues will cost a few shillings, but are full of useful data. Each should be read carefully and compared with one another.

Readers should remember that most radio dealers do not stock, or cannot be bothered with, the single small items required by the amateur; and in the exceptions to this rule the purchaser is limited in choice, and therefore, when looking for a specific item, several catalogues should be consulted.

Return of Post Service

Many advertisers give a trustworthy guarantee of a return of post service (especially in dealing with valves). Other firms keep the customer waiting for any length of time—from a few days to even a few weeks.

Ordering the Components

Many people do not like writing letters, but a letter is not required to order radio parts. As long as the dealer has his money, your correct address and knows *exactly* what you want, that is enough.

A typical order to a dealer is given as a suitable guide.

SPECIMEN LETTER USING CATALOGUE CODING

Messrs. Radio Parts, Ltd.
London, W.C.2.
October 4th, 1960.

Deliver to:
Mr. K. N. Brown,
29 Forest Lane,
Tiny Village,
Sorting Office Town,
Sussex.

Dear Sirs,

Please supply the following goods (as advertised in the October issue of "Practical Wireless") by return of post:

No. Required	Catalogue No.	Maker and No.	Description	Cost
1	MRC6	Electrix No. unknown	250V 50mA Rectifier	18s. 0d.
2	ECC5	T.C.C. CEL28L	Electrolytic Condenser	10d.
1	WR3	Bulgin R.33	Resistor, 100 ohms, 5 watts	3s. 0d.
1	TS2	Arcolectric a610	Toggle Switch	3s. 8d.
1	QT12	Ardente D147/3	P/P output transformer	30s. 0d.
			Total ...	£2 15s. 6d.
			Postage	3s. 6d.
			P.O enclosed for	£2 19s. 0d.

Yours faithfully,
R. N. BROWN (signed).

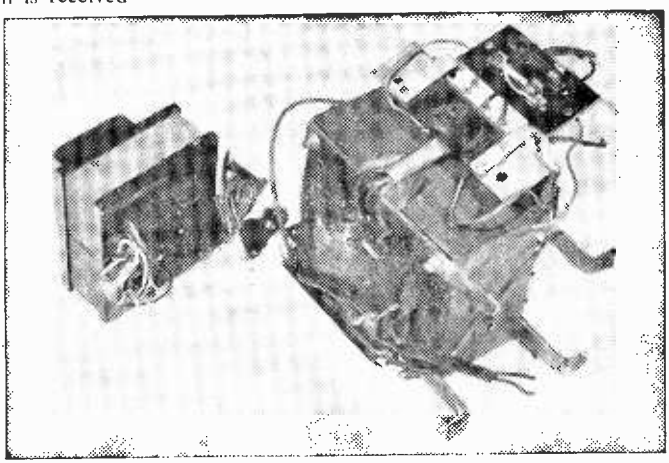


Fig. 1.—A "surplus" mains transformer compared with a standard component.

Readers will note how helpful catalogue coding is. When ordering from dealers who do not have their own code, or give the maker's name and code, the description of the goods must be clear enough to give perfect selection. If possible the maker's name and the dealer's number should be given. The type of the article required must be made clear in words, and the range or working capacity of some equipment is often important

and sometimes essential. The dimensions of components are usually important for the customer and so the required size should be stated (where there is a choice).

All other features of the equipment which help to make it specific must, of course, be stated.

Paying the Money

Never send money through the post, always use postal orders, money orders or a cheque and make them payable to the dealer and cross them. Most dealers will return your money or give credit if the goods are unsuitable or damaged and are returned *immediately*. The author has never experienced trouble in this respect with any advertiser. Remember to comply with the dealer's advertised postal charge; some have a round figure of 1/- on all orders, others have a sliding scale, while some charge the full fee. Where the latter is charged the dealer will return any excess cash which you may have sent.

Correct Addressing

Correct addressing both ways is important to avoid delay. Names of towns with similar spelling (especially when in the same county) often lead to confusion, and so the address should include the actual town and the postal district (where applicable).

Insurance of Parcels

Where possible you should take up an option to insure goods, usually at a charge of about 6d. When this is done there is a minimum of delay in dealing with damage or non-delivery.

Purchasing from Surplus Dealers

To help some readers the author gives some hints which he has gained from experience.

Readers should look at a bargain and ask themselves why it is being sold so cheaply? Sometimes size does not matter, but weight often does.

Physical Aspects of Govt. Surplus Equipment

Until recently, when some lightweight material came on the market, most surplus equipment was somewhat bulky and heavy. At the same time it was robust and could be thrown about without harm, One dealer advertises transformers for 240V 50c/s mains at under 10s. and they are good ones, but they are about four times as large and heavy as standard types (Fig. 1).

Often the method of fixing is not standard and adaptation is necessary. This applies in particular to electrolytic condensers of the box type, plugs and sockets, variable condensers and control knobs.

The metal of which the components are made is often better than used elsewhere, or is plated to resist corrosion, but in some cases, where the part was made for a special purpose, it is inferior.

Difficult Packing

Many dealers pack their goods very thoroughly, and the customer must be careful and patient when unpacking them.

Corrosion

Surplus soldering tags, valve bases (especially the EF50 type), plugs and sockets, valve pins, and the sliding contacts of condensers may become either oxidised or corroded with salt water. Generally, this means scraping at the offending parts with a penknife before soldering or plugging in a valve, etc. (Fig. 2).

Fig. 2.—The contacts of "surplus" valveholders and valves often need cleaning before use.

Age of the Components

The durability of Government surplus equipment is such that age will not matter much except in the case of electrolytic capacitors which may have to be brought slowly to their working voltage to avoid breakdowns.

Removal of Fixed Components

Sometimes goods advertised are in one unit, the implication being that the parts can be removed for use This is not always an easy task for the following reasons:—

1—The nuts and bolts may be varnished to lock them (Fig. 3), but a hot iron on them may loosen them.
2—The wired joints may be so short as to make resistors and other components useless when removed.
3—It may be extremely difficult to get to the parts concerned.
4—Rivets may have been used in difficult places.

Electrical Aspects of Government Surplus Gear

Often the electrical conditions used by the armed Forces bear no relation to those in our homes. For instance, many units sold as complete with transformers are indeed as stated, but they are designed for use on a mains frequency well above the usual 50c, and with a few exceptions are useless on normal mains.

The impedance of headphones and speakers is often unusual, and in some cases has a marked effect on the use to which the gear can be put. Some small one-valve shortwave radios advertised will not give reaction when used with low impedance phones. On the other hand, the reed-type high impedance phones, available quite cheaply, are as good as any on the market.

The frequency for which coils and I.F. transformers, etc., were designed may make them quite useless for the home unless they are rewound or otherwise adapted.

Measuring instruments, on the whole, are very good and quite suitable for home use without any adaptation. The cheaper meters will be found to have unconventional calibrations, but it is not difficult to replace them with new scales.

Buying Government Surplus Gear by Post

Readers should try to obtain a clear picture of the meaning of the dealers' advertisements which use few words and many abbreviations.

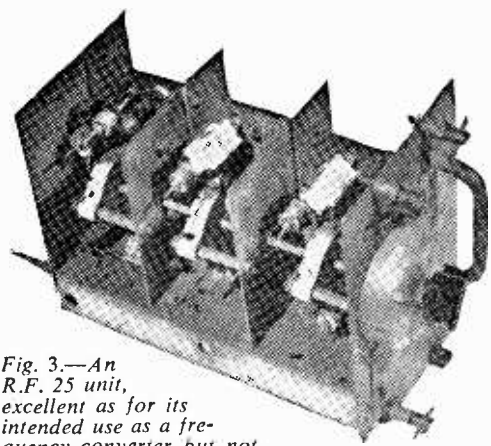


Fig. 3.—An R.F. 25 unit, excellent as for its intended use as a frequency converter but not as a source of spare parts; it is difficult to remove components without damaging them.

It should be remembered that the postal charge for heavy equipment is very great and road carriage may be required in some cases. Damage in transit is unlikely as the equipment is strongly made.

These points should be noted about Government supplies:—

They are usually robust and reliable, but some may be difficult to use as the calibrations used by the Forces do not always coincide with the normal ones experienced by the radio enthusiast (e.g., L.F. chokes and coupling transformers).

Other components will be found to be almost useless because of being too large, or corroded (e.g., valve bases, tag strips, etc.), or tend to leak (paper condensers). The author also advises careful ordering of plugs, sockets and metal rectifiers.

For surplus equipment other than ex-Government one would not expect it to be so conservatively rated, so well packed, or so strong.

Express Postal Service

A small fee is charged for express delivery from certain main post offices. The local postmaster will give you full details about the service. Valves ordered by express can sometimes be received the same day by a later post.

Registration and Postal Receipts

When returning unsuitable or faulty goods either register the parcel (all loose string ends must be fixed with sealing wax) or ask for a postal receipt (free of charge). If a small parcel is sent by letter post, ask for a receipt and expect a charge of 1d. for it.

Postal Regulations

Parcels are limited in size, dimensions, weight, etc., and sometimes they will have to be sent by rail or road.

The passenger train parcel service is very useful and quick.

Credit Notes

Where goods are returned as unsuitable, the supplier will either return the money or send a credit note. The credit note must be sent with the next order as part of the payment.

Faulty Goods

Goods should be inspected and tested immediately on arrival, and returned at once if faulty. If the parcel is damaged keep the wrapping and goods, inform the supplier and the local postmaster, who will send round a representative to look at it. The post office will give compensation quickly and efficiently in most cases.

Club News

REPORTS OF CURRENT ACTIVITIES

AMATEUR RADIO MOBILE SOCIETY

Hon. Sec.: N. Fitch, 79 Murchison Road, Leyton, London E.10.

At the Lincoln Hamfest and Rally about half the mobiles present were ARMS members. (Two travelled from London for the occasion.) The ARMS committee members met personally several members of the Radio Amateurs' Invalid and Bedfast Association.

A representative of ARMS who went by chance to the Science Museum in London was made most welcome at a meeting of the Civil Service Radio Society, where Mr. J. Haywood, of the British Astronomical Society gave a lecture on radio astronomy.

Several members in the North of England have suggested that the ARMS form a North of England Section. The committee has discussed and agreed with this idea and invites volunteers to contact the hon. sec. to work out the details.

BRADFORD AMATEUR RADIO SOCIETY

Hon. Sec.: M. T. Powell, G3NNO, 28 Gledhow Avenue, Roundhay, Leeds 8.

The first meeting of the new session was held on September 6th when G3LZW gave an interesting talk on "Transistors for the Amateur". A recorded talk was given by W1PFA on September 13th and this was illustrated by colour slides. The talk was on the DXpedition to St. Pierre and Miquelon Islands and was presented by G3LB. "TV Circuitry" was the subject of the talk given on September 26th by G3EKE. A Mullard film show was held at St. George's Hall, Bradford on October 11th. All meetings are held at Cambridge House, 66 Little Horton Lane, Bradford 5 at 7.30 p.m.

Future Events:
November 8th—Visit to Tinshill Television Radio Link Station.
November 22nd—Modulation.
December 6th—Junk Sale.
December 20th—Social Evening at Mechanics' Institute Cafe.
January 10th—Talk on Transistors.
January 24th—Amateur Receiver Alignment.
February 14th—Transistors, Pirates, and Direction Finding.
February 28th—Informal Meeting.

BRITISH INSTITUTION OF RADIO ENGINEERS

Hon. Sec.: F. W. Sharp, 9 Bedford Square, London W.C.1.

The British I.R.E. held its annual convention recently at the Bristol College of Science and Technology. The subject of this year's convention was "Aviation Electronics and its Industrial Applications". It took place on October 7th and 8th, and the two days were taken up by lectures given by members of various electrical and aeronautical firms.

THE CHESTER AND DISTRICT RADIO SOCIETY

Hon. Sec.: A. Bagley, Oak Lea, Long Lane, Saughall, near Chester.

Future Events:
November 8th—Bring and Buy Sale.
November 15th—Discussion on R.E.A.N. led by Mr. C. Riche.
November 22nd—The Moni-Match by G3EWZ.
November 26th—Visit to the R.S.G.B. Radio Hobbies Exhibition.
December 6th—Club Net Night in which other amateurs are invited to take part.
December 13th—Open Night.
All meetings are held at the Y.M.C.A., The Old Bishop's Palace, Chester.

DERBY AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec.: F. C. Ward, 5 Uplands Avenue, Littleover, Derby.

A demonstration of standing waves was given for members on October 19th.

Future Events:
November 16th—Stereo demonstration.
November 23rd—Direction finding theory and practice.
November 26th—Annual Trip to London and Hobbies Exhibition.

HALIFAX AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec.: A. Robinson, G3MDW, Candy Cabin, Ogden, Halifax.

On October 4th, G3LB presented a recorded talk on St. Pierre and Miquelon Islands DXpedition by W1PFA. Projected slides accompanied the talk.

Future Events:
December 6th—"Where, When and What to Look For" by G3IGW.
December 20th—An informal evening.

MITCHAM AND DISTRICT RADIO SOCIETY

Hon. Sec.: M. Pharaoh, G3LCH, 1 Madeira Road, Mitcham.

On October 7th, F. G. Parker gave a lecture on colour television, and on October 21st R. Sykes described the DX100 transmitter.

Future Events:
December 2nd—Round and About with a Camera, by K. Frankcom.
December 16th—Constructional Contest.

PETERBOROUGH AMATEUR RADIO SOCIETY

Hon. Sec.: D. Byrne, G3KPO, Jersey House, Eye, Peterborough.

Meetings are held at Peterborough Technical College on the first Friday in each month at 7.15 p.m. At the first meeting of the winter session, a lecture on ultra-high frequency communication was given by Mr. D. Gordon, G3FJK, and a new type all-band transmitter was demonstrated by Mr. W. Miles, G3GGK, whilst the chairman, Mr. D. Byrne, had a RTTY teleprinter on view.

A course of instruction for the Radio Amateurs' Examination and the G.P.O. Morse Test will be held at Peterborough Technical College during the autumn and winter months.

Future events:
December 2nd—Teleprinters.
January 6th—A film show.

THE READING AMATEUR RADIO CLUB

Hon. Sec.: R. G. Nash, G3EJA, "Peacehaven", 9 Holybrook Road, Reading.

Recent meetings have been very well attended and several "hams" have given interesting descriptions on the early days of radio. On October 29th Morse Instruction was given and this was followed by a talk on Mobile Operation by a former member of the Club who, at one time, lived in Reading. All meetings are held at Palmers Hall, West Street, Reading.

SOUTHPORT RADIO SOCIETY

Hon. Sec.: J. E. Ford, 278 Portland Street, Southport.

The Southport Radio Society meets every Thursday at the Club House, The Esplanade at 8.30 p.m. and on Sunday afternoons at about 4 p.m. There is also morse code practice at 8 p.m. on Thursdays.

SOUTH SHIELDS AND DISTRICT AMATEUR RADIO CLUB

Hon. Sec.: K. Sketheway, 51 Baret Road, Walkergate, Newcastle-on-Tyne 6.

The Annual General Meeting was held in September when several new officials were elected. The Treasurer remains as previous. G3ELP, with G3KZZ elected Chairman and G3NCL as Secretary. Arrangements were made for the coming session and the following monthly meetings which are held every last Wednesday of the month will consist of film shows, lectures and demonstrations.

The weekly club meeting is held on Fridays from 6.30 p.m. onwards. Meetings are held at Trinity House, Laygate Lane, South Shields.

WELLINGBOROUGH RADIO CLUB

Hon. Sec.: P. E. B. Butler, 88 Wellingborough Road, Rushden, Northamptonshire.

S. Harris gave a lecture for members on October 6th. He called his lecture "The Upper Atmosphere".

Future Events:
December 1st—"Cumberland Expedition 1960".
December 15th—Annual Christmas Dinner.

WEST MIDDLESEX TAPE RECORDING CLUB

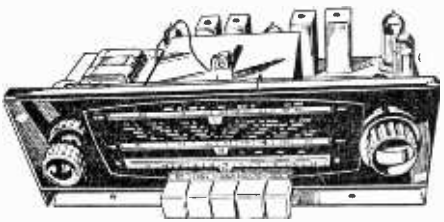
Hon. Sec.: H. E. Saunders, 20 Nightingale Road, Hampton, Middlesex.

At the meeting in the Railway Hotel on October 13th, Hampton members made recordings of Bruce Bargavel singing.

The promised playlets and sketches, written by a local author for members to record, may have to be cancelled owing to some extra work that has befallen Ken Phipps who is arranging this item.

Freddie Westcott has been able to obtain some of the prize-winning tapes from the recent National Contest, and these are to be played at a forthcoming meeting.

BRAND NEW AM/FM (V.H.F.) RADIOGRAM CHASSIS AT £13.6.8 (P. & P. 10/-)



Tapped input 220-225 v. and 226-250 v. A.C. ONLY.
Chassis size 15 x 6¼ x 5¼in. high. New manufacture. 12 mths. guarantee.
Dial 14¼ x 4in. in black and yellow.
Pick-up. Extension Speaker. Ae., E., hd Dipole sockets. Five "piano" push buttons—OFF L.W., M.W., F.M. and Gram. Aligned and tested.
With all valves and O.P. Transformer. Tone Control Fitted.
Covers 1,000—1,900 M.; 200-500 M.; 88-98 Mc/s.
Valves EZ80 rect., ECH81, EF89, EABC80, EL84, ECC85.
Speaker and Cabinet to fit chassis (table model). 47/6.
10 x 6in. ELLIPTICAL SPEAKER. 20/-, to purchasers of this chassis.
TERMS:—(Chassis) £4.16.8 down + 10/- carr. and 6 Monthly Payments of 30/-, or with Cabinet and Speaker £5.9.2 down and 7 Monthly Payments £1.12.2.
Some dusty (but working) chassis at £10 (carr. 10/-).

BATTERY ELIMINATOR. Converts your Battery Set to Mains. For 4 Low Consumption Valves (96 range). 90 v. 15 mA. and 1.4 v. 125 mA, 42/6 (2/6 post). 200-250 v. A.C. Size 5¼ x 3¼ x 2¼in. Also for 250 mA, 1.4 v. and 90 v. 15 mA at same price. Specify which, or give Valve line-up.

THE "CABY" TEST METERS

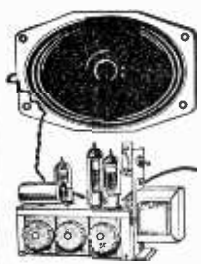
In moulded case. Prices include Test Prods., Batteries, Instruction Book. FULLY GUARANTEED. Also measure db. Accuracy: A.C., 3 per cent. D.C., 2 per cent.

A-10 **£4.17.6**

B-20 **£6.10.0**

A.10—2K ohms/v. on A.C. and D.C. volts (10, 50, 250, 500 and 1000 v.); 10K and 1M ohms; ½ mA, 25 mA and 250 mA. D.C. Size: 5¼ x 3¼ x 1¼in. Weight 17 ozs.

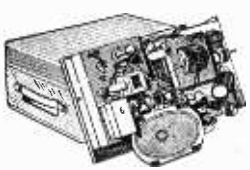
B-20—10K ohms/v. on 0.5 v. and 2.5 v.; 4K ohms/v. on 10, 50, 250, 500 and 1000 v., A.C. and D.C. Resistance, 2K, 200K, 2M and 20M-ohms.; D.C. current, 100 microA, 2.5 mA, 25 mA, 250 mA. Size: 5¼ x 3¼ x 2¼in. Weight, 24 ozs.



3-VALVE AMPLIFIER (INC. RECT.). Capable of giving 6 watts. Mains and output transformers. Valves ECC83, EL84, and EZ80. 3 Controls, volume, bass and treble. On/Off switch. Fully guaranteed. Chassis size 6¼ x 3 x 2¼in. 6¼in. round or 7 x 4in. elliptical speaker, state which. Not suitable for microphone input.

67/- (3/- p. & p.)

TAPE RECORDER ASSEMBLED TO B.S.R. MONARDECK



A QUALITY ARTICLE. Valves EZ80, ECC83, ECL82, DM70. Acos Crystal "mike", 850ft. Tape and extra spools. 3¾in./sec. Mike and Radio inputs; Vol. on/off tone, Ext. L.S. and Monitor. Fast forward and reverse. Cannot be accidentally erased. Magic Eye Indicator. 7 x 4in. Speaker. Four separate chassis assembled to base of the Monardeck to fit into cabinet of 14 x 11¼ x 7in.

PRICE for Recorder and Deck Assembly, as above (without Cabinet). £16.10.0 (10/- p. & p.). Cabinet £3 (5/- carriage).

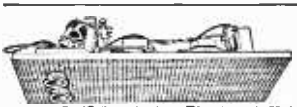
Enquiries invited for any of the parts.

"READY TO USE" ITA CONVERTER

Separate gain controls. Valves PCF80 and PCC84. Switch position ITA (1)—ITA (2)—BBC. Bakelite moulded cabinet 8¼ x 4 x 6in. £5.5.0. P. & P. 3/-.

LISTEN WITHOUT INTERFERENCE

Fully built V.H.F./F.M. Set for £8.8.0 (3/- post). Covers 88-98 Mc/sec. Wired, aligned and tested. Mullard permeability tuner and 4 valves (ECC85, ECL82 and two EF91), with mains transformer. Cheap room dipole, 10/-. 300 ohm twin feeder, 6d. yd. All with 12 months' guarantee.



GRAMOPHONE AMPLIFIER with 5in. SPEAKER. On Fabric-covered Baffle 12¼ x 5in. Mains and Output Transformers. EZ40 and EL41. Tone and Volume Controls. On/Off switch. Plenty of Volume. Fully Guaranteed. Two Knobs supplied. Ready to play. Useful for Stereo.

ONLY 57/-, post 3/-

BEREC BATTERY RADIO IN MAKER'S CARTON. Valves DK96, DF96, DAF96, DL96. Requires Ever Ready battery B103 (or battery elim. for converting to mains operation)—see adjacent item. Two Short Wavebands 2.5 to 7 Mc/s and 6.5 to 17 Mc/s. Cabinet 12 x 7½ x 6in. **ONLY £5** (2/6 p. & p.); MW and SW £5.4.0 (plus 2/6 p. & p.); LW and MW £6 (plus 2/6 p. & p.). Available as kits at 10/- less each.

AUTOMATIC RECORD CHANGERS COLLARO CONQUEST with manual play also. 4-speed. A.C. mains 200-250 v., see illus.

£7.10.0 (5/- P. & P.)

B.S.R. UA8 4-speed auto-changer. £6.10.0 (5/- carr.) or with Stereo Head. £6.12.6 (5/- carr.).

All with Crystal Turnover Head.

ALL ITEMS GUARANTEED 12 MONTHS—B.V.A. VALVES 3 MONTHS

Send 6d. (stamps will do) for our illustrated catalogue of the above items and others. All New Goods. Delivered by return. Terms:—One-third down and balance plus 7/6 in four equal monthly payments. Postage with down payment (C.O.D. 2/- extra).

SEE SPECIAL TERMS FOR A.M./F.M. CHASSIS.

Posted Orders to Camberley Please.

See additional advertisement on page 743

GLADSTONE RADIO 58A HIGH STREET, CAMBERLEY, SURREY. Tel. 22791
Also at 247 New Road, Portsmouth, Hants. and 3 Church Road, Redfield, Bristol 5.
Camberley closed Saturdays. Portsmouth and Bristol closed Wednesdays.

Trade News

NEW PRODUCTS AND DEVELOPMENTS

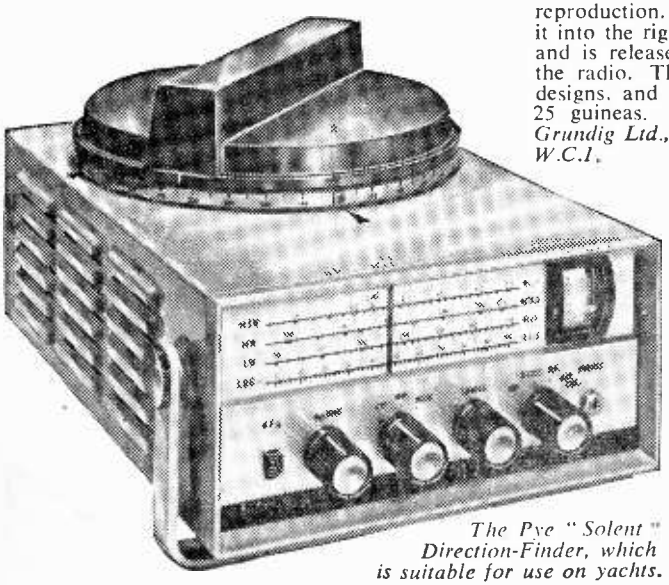
DIRECTION-FINDER FOR SMALL CRAFT

FOR the first time yachtsmen can obtain a fully portable direction-finding receiver offering in one case all the facilities of a large ship's installation. With the Pye "Solent" accurate direction finding bearings can be taken from radio beacons on the Long Wave Beacon Band. Sensitivity and selectivity compare favourably with that of fixed installations and bearings can be taken to an accuracy of plus or minus one degree. The aerial is of a new design using a ferrite rod which is mounted, together with a compass rose, on top of the receiver case. A beat frequency oscillator is incorporated so that the "Consol" method may be used for long-range navigation. Marketed at 45 guineas, the direction-finder will be available in early December and is made by *Pye Limited, Cambridge.*

RECORD PLAYER FOR THE MOTORIST

FEATURED on the Philips stand at this year's Motor Show was a record player made for easy installation in any make of car. This record player, the Philips Auto-Mignon, has been designed to operate in conjunction with a car radio, which acts as the amplifier, and is fully automatic.

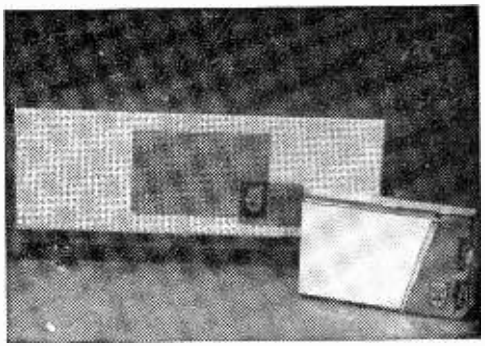
It is the only record player available in Britain which has been specially constructed for permanent installation in a car and gives good reproduction of seven-inch 45r.p.m. records. It can be adjusted for either 12 or 6V supply and sells at 23 guineas. *Philips Electrical Ltd., Century House, Shaftesbury Avenue, London, W.C.2.*



The Pye "Solent" Direction-Finder, which is suitable for use on yachts.

NEW MINIATURE RADIO

A NEW pocket radio recently introduced by Grundig Ltd. measures only 4in. x 2½in. x 1in. and weighs 8¾oz. The "Mini-Boy" can be stowed into the smallest pocket or handbag. Controlled by two thumb wheels, one the on/off switch and volume control, the other the tuning control, the Mini-Boy gives up to 80 hours' use on one battery. Fully transistorised, it has its own built-in directional ferrite rod aerial, a high flux



This illustration shows the Grundig "Mini-Boy" together with the speaker enclosure.

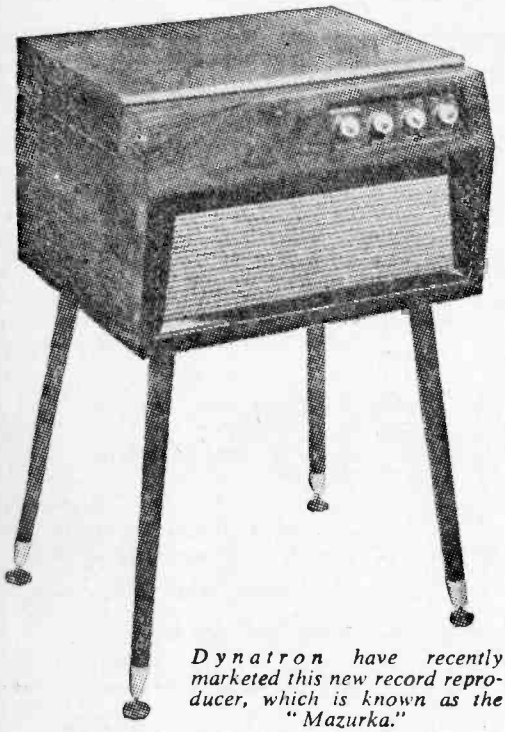
permanent magnet dynamic loudspeaker and gives full medium wave coverage.

For home use, a speaker enclosure is supplied. This contains a larger speaker providing excellent reproduction. The radio is fitted simply by sliding it into the right hand end of the speaker enclosure and is released by pressing the left hand side of the radio. There is a choice of three two-colour designs, and the price, including purchase tax, is 25 guineas. *The Mini-Boy is manufactured by Grundig Ltd., 39/41, New Oxford Street, London, W.C.1.*

NEW VALVE TESTER

THE new Model 45C valve tester is capable of testing over 5,000 different types of valves, British, American and Continental. Two ranges of Mutual Conductance are provided, 0-3mA/V and 0-15mA/V, and tests are also incorporated for element shorts, cathode leakage and emission. This instrument is also able to check the latest 12V car radio valves.

The 45C incorporates 21 valve holders and test facilities are provided for earlier type valves as well as the very latest TV types, etc. This valve tester is made by *Taylor Electrical Instruments Ltd., Montrose Avenue, Slough.*



Dynatron have recently marketed this new record reproducer, which is known as the "Mazurka."

STEREO RECORD REPRODUCER

THE "Mazurka" is a new record reproducer introduced by Dynatron Radio Ltd., and is available in four versions, designed to meet every requirement. There are two stereo models, one fitted with automatic record changer and the other with a single record player. Both versions incorporate six valves and provide 6W power output on each channel. It has a dual channel tone control unit incorporating ganged volume, bass and treble controls. A two-position selector switch can be set to "Gram" for record reproduction or "Radio" for monophonic reproduction from an external radio or tape input. The mains on/off and balance control is located inside the reproducer for ease of operation. Models GR3ST (autochanger) and GR4ST (single player) are made by *Dynatron Radio Ltd., Maidenhead, Berks.*

A ROTARY POSITION SELECTOR UNIT

A REMOTELY controlled device with applications in many fields where it is required to rotate a shaft with a high degree of accuracy has been developed by the Plessey Company Ltd. in conjunction with the Ministry of Supply for use with multi-channel transmitters and receivers.

This unit, which is designed to rotate a shaft to any one of the twelve positions, each position being set up independently, with an accuracy of within six minutes of a degree, is available for 12-48V D.C. operation in two panel sizes (4in. x 4in. or 3¼in. x 4⅜in.) and with a torque of either 35oz-in. or 60oz-in.

Visible indication from the front of the unit shows the selected position and a built-in switch can be used for confirming the position to the remote control site. Further information may be obtained from *The Plessey Co Ltd., Ilford, Essex.*

TRANSISTOR PORTABLE RADIO

LEATHERCLOTH has been chosen for the exterior finish of the "Decca Debonaire" transistor portable. The leathercloth (PVC) is in mushroom-grey which can be sponged clean quite easily should the surface become spoiled. The durable handle is also in Everflex PVC. The "Decca Debonaire" can be tuned to both medium and long wavebands and retails at 17 guineas. It it available from most Decca dealers.

Model D900 is a new transistor test set made by Beulah Electronics Ltd. This model was recently seen at the Radio Show at Earls Court.

TRANSISTOR TEST SET

THIS new Beulah test set (the D900) enables quick and easy tests to be made of transistors and transistor receivers. The instrument has a novel feature in that it has a self-contained power supply, continuously variable from 0-25V centre tapped, supplying a current of up to 25mA. A continuously variable base current is available from 10μA to 1mA.

When a transistor is tested in the audio stage of a radio receiver an audible note is heard in the receiver's loudspeaker. The D900 costs £10 and is made by *Beulah Electronics, 138, Lewisham Way, New Cross, London, S.E.14.*

"POST HASTE" — "POST FREE"

JASON F.M. TUNER KITS

We are the Authorised Jason Dealer and the whole kit is as supplied by them. You can therefore safely return to Jason for alignment without them rejecting it for non-standard components.
We can also align for the standard charge.

FMT1 is the standard variable tuner for cabinet mounting, unpowered. Supplied complete with four EF91 valves £6.16 0
Hire purchase Deposit £1.8.6 and 6 monthly £1. 1. 4
Instruction book, 2/6 extra.

FMT1 Power pack with ready drilled chassis kit ... £2. 1. 9

FMT2 is a new tuner in a green modern case, which can be used for shelf or cabinet mounting, and has space for power supplies if required. Supplied complete with four EF80 valves ... £7. 6. 6
Hire purchase Deposit £1.10.6 and 6 monthly £1. 2. 8

FMT2 With power. Complete kit £9. 2. 0
Hire purchase Deposit £1.18.0 and 6 monthly £1. 7. 4
Instruction book, 2/6 extra.

FMT3 is the Fringe version and should be used when further than 70 miles from transmitter. Supplied complete with 6 valves £9. 3. 6
Hire purchase Deposit £1.17.6 and 6 monthly £1. 7. 8

FMT3 With power. Complete kit £10.19. 0
Hire purchase Deposit £2.5.0 and 8 monthly £1. 4. 3
Instruction book, 2/6 extra.

NEW JASON SWITCHED TUNERS

The **JTV/2** and **Mercury 2** are both of the pre-set station type with the addition of BBC and ITA sound. They use the latest "Fireball" turret and the A.F.C. ensures freedom from drift. The Mercury 2 is for cabinet mounting with external power supplies. The JTV/2 has the same tuning heart, with power supplies mounted in a case. This again can be used for shelf or cabinet mounting. The JTV/2 cannot be supplied less power.

JTV/2 Complete with valves and book £14.14. 9
Hire purchase Deposit £3.4.9 and 12 monthly £1. 1. 1

Mercury 2 Complete with valves and book... ... £10.16. 6
Hire purchase Deposit £2.4.6 and 8 monthly £1. 4. 0
Power pack for Mercury 2 in kit form ... £2. 1. 9
Instruction books for switched tuners, 3/6.

IMPORTANT
Required channels must be specified.
All Jason kits can be supplied less valves. To find the cash price, less valves, deduct 7/6 per valve.

A more detailed price list can be sent upon request.

ALL JASON TUNERS ARE ON DEMONSTRATION

GRAMOPHONE EQUIPMENT

B.S.R. Monarch TC8H, cartridge £6.15. 0
Hire purchase Deposit £1.7.0 and 6 monthly £1. 1. 4
Collaro Conquest "O", cartridge £7.15. 0
Hire purchase Deposit £1.11.0 and 6 monthly £1. 4. 0
Garrard TA Mk.2 GC8, cartridge £8.10. 0
Hire purchase Deposit £1.14.0 and 6 monthly £1. 6. 0
Garrard 4HF, GC8, cartridge £18. 9. 9
Hire purchase Deposit £3.19.9 and 12 monthly £1. 6. 7
Philips AG2009, AG3016, cartridge £10.10. 0
Hire purchase Deposit £2.2.0 and 8 monthly £1. 3. 6
Connoisseur 2-speed Transcription unit £16.13. 1
Hire purchase Deposit £3.13.1 and 12 monthly £1. 3.10
Garrard TPA12, Pick-up arm, less cartridge £4. 9. 6
Garrard GCS10, Stereo cartridge £1.12.10
Garrard GC8, Mono cartridge 19/7
Collaro "R", Stereo turn over cartridge £3.19. 6
Acos 71/S, Stereo cartridge with diamond £2.12.10
B.S.R. Mono turn over cartridge £1. 9. 9
Garrard SPG3, new stylus gauge, 0–12 grammes ... 19/6

For further information please write for manufacturers' list.

TAPE EQUIPMENT

Collaro Studio Deck. 3 speed, 3 motors, 7in. spools. Pause control space for third head, piano keys, counter.
List price £17.10.0 OUR PRICE £14. 0. 0
Hire purchase Deposit £3.0.0 and 12 monthly £1. 0. 2

Tape Amplifier for Studio Deck. Completely assembled by famous maker. NOT A KIT. Full wiring plans to connect to deck. Magic Eye, Radio and Mic inputs, Mixing and Superimposing ex L/S socket. Low level input tone control. Can be used as amplifier. EF86, ECC83, 2—EL84, EM84, EZ80, OA81. 3 watts output. CASH PRICE £11.10. 0
Hire purchase Deposit £2.2.0 and 8 monthly £1. 3. 6

Tape Recorder Case to house the above Deck and Amplifier. Two tone colour £5. 5. 0
EMI speaker, 10 x 5in., to fit case £1. 5. 0
1200ft. Brand Five Tape. 25/-; Crystal Mic, 40 mic, £1. 7. 0
Screened input plugs, 4/6 each.

The above Recorder complete to PERSONAL SHOPPERS ONLY for £35. 0. 0
Hire purchase Deposit £7.0.0 and 12 monthly £2. 11. 4

This machine is a first-class job and normally sells at £41. 0. 0

SEND FOR MAKER'S ILLUSTRATED LEAFLET

B.S.R. Monardeck TD1 3¾ i/s. One motor, 5¾in. spools.
List price £12.12.0. OUR PRICE £7. 9. 6
Collaro Tape Heads, Record/Playback and Erase ... 37/6 pair

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Magnetic Recording Tape Made in U.S.A. Fully guaranteed High grade Acetate base and boxed.

5in. 600ft. ... 16/- 5in. 900ft. ... ... 18/6d.
5¾in. 1200ft. ... 23/6d. 7in. 1200ft. 25/-
7in. 1800ft. ... 35/-

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OC45	I.F. ...	... 23/	12/-	+	A.F. 5/-
OC71	Audio ...	... 14/	8/6	+	
OC72	Audio ...	... 17/	8/6	+	
OC78D	Driver	... 17/	10/-	+	White spot
OC78	Audio ...	... 17/	10/-	+	R.F. 6/-

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Letters to the Editor

The Editor does not necessarily agree with the opinions expressed by his correspondents

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying commercial or surplus equipment. We cannot supply alternative details for receivers described in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. If a postal reply is required a stamped and addressed envelope must be enclosed with the coupon from page iii of cover.

SHORT WAVE LISTENERS' LOG

SIR,—I was very pleased to see the "Short Wave Listeners' Log—1" on page 442 of the September 1960 issue. To a short wave enthusiast, a log such as this is most interesting and helpful, as much of this useful information is hard to come by. Together with many more of your readers, I hope this will now be a regular feature. — H. CHAMBERLAIN (Newark-on-Trent).

RADIO MOSCOW

SIR,—I wonder if any readers could help me. I have just been listening to Radio Moscow on about 217m, the signal quality was so good that my father and I argued about the origin of the signal. My father's argument was that it was relayed by a trawler outside of the three mile limit; mine was that it was direct from Moscow. We have also had the same argument about Radio Luxembourg.—R. W. L. LIMEBEAR (London N.21).

CRYSTAL SET RECEPTION

SIR,—With reference to D. J. Connoly's letter (October issue) about reception of Radio Moscow on a crystal set, I have often noted the same occurrence. I believe that it is due to Radio Moscow's programmes being beamed to the British Isles at certain times of the day—mainly in the evening.—J. A. ROHAM (Dublin).

THREE TRANSISTOR RECEIVER

SIR,—I built a three transistor receiver using a crystal detector. After various experiments I found the crystal not very sensitive so I removed it and connected the aerial to the base and the earth to the emitter of the first transistor. It has improved reception in the way of cutting out BBC television interference but has decreased sensitivity. Perhaps I should put a capacitor between the aerial and base of the first transistor, but I do not know of what capacity it should be. Has anybody else had this difficulty and found a suitable solution to the problem? — N. MILLER (Sutton Coldfield).

TRANSISTORS v VALVES

SIR,—Is it not about time the dispute between transistors and valves was forgotten? Everyone who has used them will realise that each has its limitations. Whereas valves are slightly bigger and need larger transformers and so on, transistors do not, but their reproduction is slightly inferior, etc. We all realise that each has its own uses and disadvantages and I believe that everyone has now heard enough on the subject. — D. RASBERRY (St. John's Wood, N.W.8.).

PRINTED CIRCUITS

SIR,—I was interested in the experience of D. M. Payne (September issue) but when I tried to remove a similar coil I was not as lucky. The very frail base of the coil broke and when eventually I managed to remove it the printed circuit at that point was ruined. The coil in question can be put in according to the instructions and be wrong if one does not follow the circuit, as the instructions merely state, "the red spot to point to the transistor". This could be any of three positions as all pins are spaced the same. — E. CLARK (Leeds 12).

SHORT WAVE LISTENING

SIR,—How fascinating short wave listening is! For days conditions are so poor that one almost gives up, then suddenly, as on August 17th, stations under a thousand miles away disappear and those over this distance suddenly re-appear. This revealed that Lima, Peru, broadcasts in English every Wednesday and Friday from 10.30 p.m. to 11 p.m., with South American music, in the 19·8m vicinity. Beunos Aires, Argentine, nightly broadcast in English both in 19m and 25m bands with Argentine tangos and traditional Latin music.

On the night in question, on an 8ft upright aerial, no less than a dozen Brazilian broadcasters were heard on 16, 19 and 25m bands. In addition Monte Video, only heard rarely from Uruguay on 19·5m came over at good strength between 10 p.m. and 11 p.m.—F. N. H. (London W.2.).

INTERFERENCE

SIR,—Can anyone explain the reason for the following fault on my radiogram? When tuned to the Light Programme, medium waveband, the Home Service is often heard in the background. Sometimes, this is so loud that the Light Programme is badly distorted and it is just a jumble of words. However, the Home Service is received quite free from interference.—C. E. C. (Boreham-wood).

STEREO PHASE DIFFICULTIES

SIR,—I have recently been experimenting with stereo and after reading an advertisement, decided to employ a multi-speaker system. I bought

some "tweeters" and assembled them with the necessary woofers in the two cabinets and was very pleased with the results. A friend came round and after listening to one or two records criticised the reproduction, and after a lot of trouble we came to the conclusion that the phasing of the speakers was not correct. We made several changes and finally found an arrangement which satisfied my friend. When he had gone I carried out a few tests and found that the speakers were not phased in the way one usually associates with two speakers. Is there, in fact, a difference when using this multi-speakers scheme for stereo? Perhaps some keen reader has experimented in this connection and can lay down some rule, such as all tweeters in phase, all woofers out of phase, or some similar rule which could be followed. I quite see that all in phase, may not apply when the speakers are separated by the space one usually devotes for stereo reproduction.—W. S. YSMUDU (W.1).

CORRESPONDENTS WANTED

SIR,—I am 17 years of age and would like to correspond with other amateurs of my age who hope to become licensed operators. I have been interested in short wave radio for about a year now.—F. SHURAN (6, St. Mary's Terrace, Daingean, Offally, Ireland).

SIR,—I have been interested in amateur radio for three years and would like to correspond with other amateurs of my age, 14.—G. CHERINGTON (42, Severn Drive, Pemberton, Wigan, Lancs).

SIR,—Amateur radio has been my hobby for some years and I would like to hear from other readers of my age, 13, with similar interests. —G. CALLISTER ("Silverburn", Ballanard Road, Douglas, Isle of Man).

SIR,—I should like to correspond with anyone who has performed a successful conversion on the Bendix R.A. 10DB. — M. CLEAR (140a, Oxford Road, Calne, Wilts).

VALVE BASE TROUBLE

SIR.—I recently experienced serious trouble in a set which, in servicing, I found to be due to the material between two of the valve pin sockets having carbonised. Thinking it might have been a manufacturing fault I threw it away and bought a new one. Shortly after the set had been put into use again, the same trouble occurred and on looking at the valvebase I found the same carbonising. I put a new holder in and again tried out the set, this time, with the chassis upside down, and I found that after working for an hour or so, a small arc began between the two pins, which eventually made a very good carbon path and finally short-circuited the two pins. I know this often happened with old paxolin or ebonite type valveholders, but I thought the new nylon loaded types were free from this trouble. It appears, therefore that the makers have still not found a solution to this kind of fault and it would be interesting if we could be given details of the maximum current and voltage ratings which must be employed.—G. RICH (Teddington).

LOUDSPEAKER EXPERIMENTS

SIR,—I have at last found what I feel to be the best circuit for my particular requirements and have finalised the design and cabinet. As a result I am at a loss most evenings and weekends for something to experiment with. I am not interested in television and think perhaps that there would be an interesting field for me in loudspeaker experiments. I visualise obtaining two or three different types and then trying out cabinets and labyrinths, etc. I wonder if any reader could give me some suggestions for tests which I could carry out or interesting lines upon which my experiments could be based.— F. R. ENTWHISTLE (Rotherham).

COIL CORES

SIR,—I wonder if I could seek some aid in repairing some I.F. coils which I have damaged. In setting up a receiver some time ago I tried to fix the cores by putting in some adhesive. Recently I found it necessary to retrim one of the coils but couldn't turn the core. After a lot of work I unfortunately pushed the trimmer screwdriver through the side of the coil former. Happily the wire was not damaged, but I cannot remove the old pieces of core. If these could be taken away I have sufficient thread for a new core. Can anyone suggest a way of cleaning out the coil former, which is a standard bakelite component with about $\frac{1}{2}$in. clean thread at the top and $\frac{1}{4}$in. or so at the other end.—J. BRADLY (Portsmouth).

CROSS-OVER NETWORKS

SIR,—I would endorse Mr. Baker's remarks that cross-over units need not be expensive. From the information in various books the coils can be wound and absolute accuracy is not essential. Suitable 4μF 100V condensers could be bought from many of your advertisers.

Mr. Baker appears to be confused however, in the relation of loudspeakers to cross-over units by his remark that an 8in. speaker will make a unit sound better. A cross-over does not add anything, in fact there is a slight power loss when it is inserted in a speaker system. The extra bass he obtained by using a larger speaker could have been obtained by connecting it in parallel with the smaller speaker.

One of the reasons for using a cross-over unit is to feed each speaker with the frequency range it is best equipped to handle. From personal experience there appears to be little advantage in using a cross-over unit with two or three speakers of the same size, whether they be 12in. or 5in. in fact it is not worth while using them under these conditions. My personal preference is 12in. bass, 8in. for middle range and 3in. for treble.

This question of phase does not seem to be appreciated by many stereo enthusiasts. I have found it advisable to wire a double pole switch in the leads to one speaker so that phasing can be easily corrected, as in some installations the stereo effect can be considerably improved by ensuring the speakers are in phase. A quick check can be made by placing the speakers side by side when a loss in bass will indicate that they are out of phase.—J. W. DAVISON (Durham).

RECEIVERS & COMPONENTS

RESISTORS.—100 new, wire ended, assorted, all types, **7/6** box, post free. COOK'S OF BEDFORD, 29, St. Mary's Street, Bedford.

SPEAKER REPAIRS. Cones/Fields fitted. Clock Coils Wound. L. S. REPAIRS, Pluckley, Ashford, Kent.

LOUDSPEAKERS 7in. x 4in. and 6½in. **7/6** post 1/6. 8in. **10/-**, post 2/-. Valves, Transistor Components and Kits. List available. S.A.E.: H.R. MAIL ORDER, 16, Regent Parade, Harrogate.

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AM FEEDER UNIT, SUPERHET AVAILABLE, DEC. Size 4½ x 3 x 1¼in. TOTAL COST OF COMPONENTS £5.10.0. CONSTRUCTOR'S BOOKLET, 1/9.

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VALVES 1/- each (tested O.K.) Radio and TV. List, stamp. 85, Charminster Avenue, Bournemouth.

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(continued)

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CHEAP Valves, Components, Books. Constructors' Kit, Crystal Set **8/6.** Transistor Set **19/6.** Short Wave Radio 22/6. List 3d. HAMILTON RADIO (W), 13, Western Road, St. Leonards, Sussex.

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Carr. 2/6.

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New, ½ w-3 w, 50—4/-; 100—**7/6,** post 1/-. Welwyn 10 w w/w 5 K precision on ceramic formers. 1/3 each, post 6d.

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Standard matching for 3-5 ohms speaker. Only 2/9, post 1/-. S.A.E. with enquiries.

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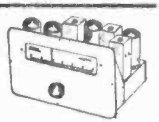

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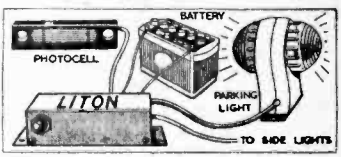

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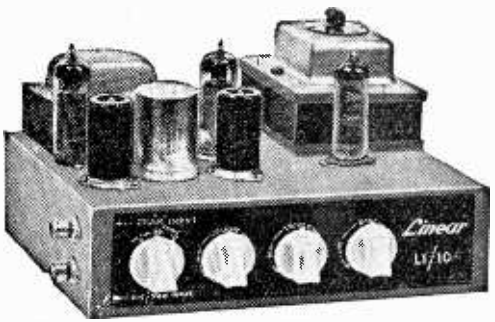

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Varleys small size 4 x 3¼ x 1¼in., 2 v. 14 A.H., brand new. **6/9** ea., 3 for **15/6.**

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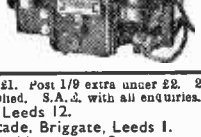

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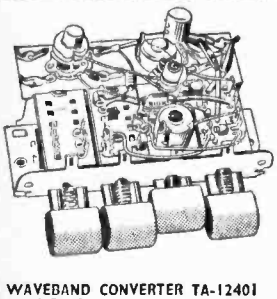
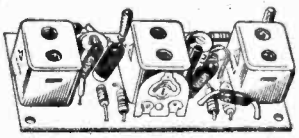
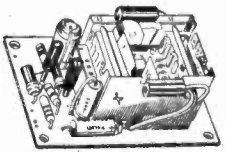
R.F., I.F., AUDIO AND F.M. UNITS







using the very latest transistors

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3 WAVEBAND CONVERTER TA-12401
With OC170 transistor in emitter injected autodyne converter circuit. S.W., 5.9-13 Mc/s; M.W., 510-1,620 kc/s; L.W., 150-275 kc/s. Wavechange and on-off by four pushbuttons. Overall size 3.4 x 2.1 x 1.8in. **67/6** *plus* 22/9 *purchase tax.*
Set of aerial coils **9/-**; 8 x $\frac{3}{8}$in. ferrite rod **5/-**

460 kc/s I.F. AMPLIFIER 322-0001
2 x OC169 transistors are used as very high gain common emitter amplifiers. High cut-off frequency makes neutralisation unnecessary; high gain provides for greatly increased degree of A.G.C. High "Q" double-tuned I.F. transformers give 5 kc/s square wave response. A signal separated from 460 kc/s by 9 kcs will be 57 dB down. Size 3.5 x 1.5 x 1in. **92/6**

1 WATT A.F. AMPLIFIER GS-12005
2 x OC71's direct coupled cascade drive to 2 precision matched OC74's in Class B push-pull provide up to 1W. undistorted output from 5 mV. in at 1.5 K-ohm. Frequency response, 60-16,000 c/s ± 3dB. Overall size 3 x 2.2 x 1.2in. **92/6.**

Requirements for this and other 2 units—6 volt battery.

ALSO AVAILABLE
Transistorised FM Front Ends; 10.7 Mc/s I.F. transformers, OC169 transistors; Constructors' Manual No. 167, **2/6.** Leaflets on request.

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DISC CERAMIC CONDENSERS 500 v. Wkg.
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MINIATURE POLYSTYRENE CONDENSERS
10 pF., 50 pF., 59 pF., 60 pF., 75pF., 82pF., 100 pF., all 125 v. working, 6d. each. 300 pF., 350 pF., 470 pF., 560 pF., 1,000 pF., 1,200 pF., 4,000 pF., all 9d. each.

SUB MINIATURE TRANSISTOR COILS
Set of 3 I.F. Transformers 470 Kc/s plus Oscillator coil.
As specified for Mazda Circuits 23/6 complete.
As specified for Mullard Circuits 23/6 complete.
WTC oscillator Coils for Jackson or Plessey Gang 4/6 each. WTC 470 kc/s I.F. Transformers 4/- each, 7/6 pair.

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5K, 50K, 220K, 330K, 1M, 2/- each. 5M with switch, 4/6. 5K, 1/6, 500K preset 1/-. 1M Transistor Pots. 2/-. 5K Transformer Pots, 1/6.

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The "MIRACLE" Super Six (transistor components), as advertised in the November issue, Page 649, and the electrolytic condensers as advertised in the September issue, page 457, are still available

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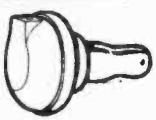

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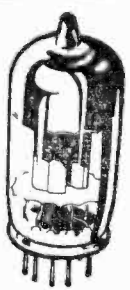

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SEE BACK PAGE

Practical Wireless

BLUEPRINT SERVICE

ALL OF these blueprints are drawn full-size and although the issues containing descriptions of these sets are now out of print, an asterisk in the list below denotes that constructional details are available free with the blueprint.

The index letters which precede the Blueprint Number indicate the periodical in which the description appeared. Thus PW refers to PRACTICAL WIRELESS; AW to *Amateur Wireless* and WM to *Wireless Magazine*.

Send (preferably) a postal order to cover the cost of the Blueprint (stamps over 6d. unacceptable) to PRACTICAL WIRELESS, Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2.

SPECIAL NOTE

THE following blueprints include some pre-war designs and are kept in circulation for those constructors who wish to make use of old components which they may have in their spares box. *The majority of the components for these receivers are no longer stocked by retailers.*

Title	*Number*	*Price*
CRYSTAL SETS		
Junior Crystal Set	PW94*	2/-
Dual-wave Crystal Diode ...	PW95*	2/6
STRAIGHT SETS		
Battery Operated		
Modern One-valver	PW96*	2/6
All-dry Three	PW97*	3/6
Modern Two-valver	PW98*	3/6
SUPERHETS		
Mains Operated		
A.C. Band-pass Three	PW99*	4/-
A.C. Coronet-4	PW100*	4/-
A.C./D.C. Coronet	PW101*	4/-
MISCELLANEOUS		
The PW 3-speed Autogram ...	—*	8/-
The PW Monophonic Electronic Organ	—	8/-
TELEVISION		
The PT Band III converter ...	—*	1/6

Title	*Number*	*Price*
A.C. Fury Four	PW20*	2/6
Experimenter's Short Wave ...	PW30a*	2/6
Midget Short Wave Two ...	PW38a*	2/6
Band-Spread Three (Battery) ...	PW68*	2/6
Crystal Receiver	PW71*	2/-
Signet Two (Battery)	PW76*	2/6
Simple S.W. One-valver	PW88*	2/6
Pyramid One-valver	PW93*	2/6
BBC Special One-valver	AW387*	2/6
Short-Wave Two	AW429*	2/6
Short-Wave World Beater ...	AW436*	3/6
Standard Four Valve S.W. ...	WM383*	3/6
Enthusiast's Power Amplifier ...	WM387*	3/6
Standard Four Valve	WM391*	3/6
Listener's 5-Watt Amplifier ...	WM392*	3/6

QUERY COUPON

This coupon is available until 7th December, 1960, and must accompany all queries in accordance with the notice on our "Open to Discussion" page.

PRACTICAL WIRELESS, DECEMBER, 1960.

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