

PRACTICAL

ELECTRONICS

JUNE 1972

20p

**VERSATILE
LIGHT EFFECTS UNIT.....**

- **STROBE**
- **SOUND SYNC+STROBE**
- **SOUND SYNC**

for DISCOTHEQUES and PARTIES



CN.240/2 Miniature soldering iron 15 watt 240 volts, fitted with nickel plated 3/32" bit and packed in transparent display box. Also available for 220 volts. **Price £1.70**

CN.240 Miniature soldering iron 15 watt 240 volts, fitted with iron coated 3/32" bit. Up to 18 interchangeable spare bits obtainable. This iron can also be supplied for 220, 110, 50 or 24 volts. **Price £1.70**

G.240 Miniature soldering iron 18 watt 240 volts extensively used by H.M. Forces. Suitable for high speed soldering and fitted with iron coated 3/32" bit. Also available for 220 volts. Spare bits 1/8", 3/16" and 1/4" are obtainable. **Price £1.83.**



CCN.240 New model 15 watt 240 volts miniature soldering iron with ceramic shaft to ensure perfect insulation (4,000 v A.C.). Will solder live transistors in perfect safety: fitted with 3/32" iron coated bit. Spare bits 1/8", 3/16" and 1/4" available. Can also be supplied for 220 volts. **Price £1.80**

CCN.240/7 The same soldering iron fitted with our new 7-star high efficiency bit for very high speed soldering. The triple-coated bits are iron, nickel and chromium plated. **Price £1.95**



E.240 20 watt 240 volts soldering iron fitted with 1/4" iron coated bit. Spare bits 3/32", 1/8" and 3/16" available. Can also be supplied for 220 and 110 volts. **Price £1.80.**

ES.240 25 watt 240 volts soldering iron fitted with 1/8" iron coated bit. Spare bits 3/32", 3/16" and 1/4" available. Can also be supplied for 220 and 110 volts. **Price £1.83**



**SK.1
SOLDERING
KIT**

The kit contains a 15 watt 240 volts soldering iron fitted with a 3/16" bit, nickel plated spare bits of 5/32" and 3/32", a reel of solder, heat sink, cleaning pad, stand and booklet "How to Solder". Also available for 220 volts.

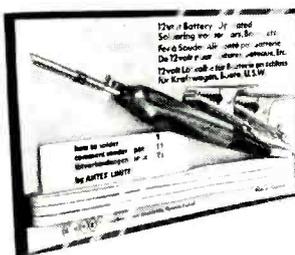
Price £2.75



**SK.2
SOLDERING KIT**

This kit contains a 15 watt 240 volts soldering iron fitted with a 3/16" bit, nickel plated spare bits of 5/32" and 3/32", a reel of solder, Heat Sink, 1 amp fuse and booklet "How to Solder"

**Price
£2.40.**

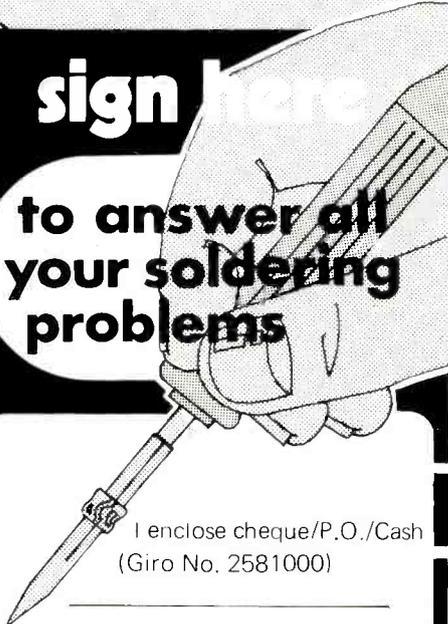


MES. 12

A battery operated 12 volts 25 watt soldering iron complete with 15' lead, two crocodile clips for connection to car battery and a booklet "How to Solder" packed in a strong plastic wallet. **Price £1.95.**

sign here

to answer all
your soldering
problems



I enclose cheque/P.O./Cash
(Giro No. 2581000)

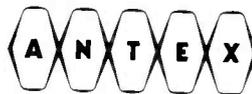
Name _____

Address _____

PE6

Please send the Antex
colour catalogue.

Please send the following:

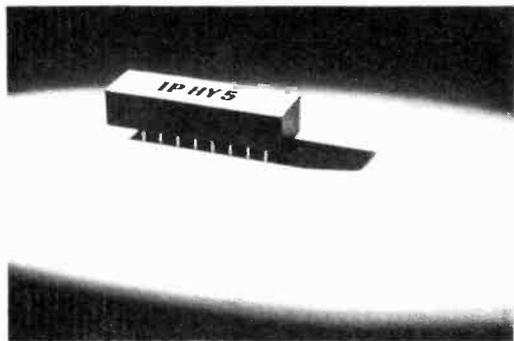


from electrical, radio or car accessory
shops or from **Antex Ltd., Freepost**
(no stamp required) **Plymouth**

PL1 1BR Telephone 0752 67377/8



ILP (Electronics) Ltd



HY40 IS POWER AMP PERFECTION

Lets face it — an immediate success, the HY40 is here to stay.

HY40 means Hybrid Power, power neatly locked away inside an Integrated Circuit. Power the modern way, simply mount only five additional components on a printed circuit board (all of which are supplied with the HY40). Power not only for Hi-Fi, power for Groups, for public address, for industry, power for all.

HY40 is HI-FI POWER ILP are POWER PROUD

In addition to the P.C. board and manual supplied with the HY40 we now include the five remaining components, at minimal cost, needed to complete the assembly of a High Performance Power Amplifier.

By merely combining two HY40s with a Stereo Preamplifier (2 x HY5) and simple Power Supply (PSU45), premium quality stereo may be obtained for a very modest outlay.

The free manual supplied with the HY40 gives clear, easy build instructions for Power Supply; volume, bass, treble and balance controls, together with inputs for Ceramic and Magnetic Pick-ups, Tape, Tuner and Auxiliary functions.

Internally the HY40 is based on conventional and proven circuit techniques developed over recent years.



OUTPUT POWER British Rating 40 WATTS PEAK, 20 watts RMS continuous.

LOAD IMPEDANCE 4–16 ohms

INPUT IMPEDANCE 22Kohms at 1KHz.

INPUT SENSITIVITY 300 mV for maximum output.

VOLTAGE GAIN 30db at 1KHz.

FREQUENCY RESPONSE 5Hz-60KHz \pm 1db.

TOTAL DISTORTION less than 1% (typical 0.1%) at all output powers.

SUPPLY VOLTAGE \pm 22.5 volts D.C.

SUPPLY CURRENT 0.8 amps maximum.

PRICE: including comprehensive manual, P.C. Board and FIVE EXTRA COMPONENTS:

MONO £4-40 STEREO £8-80 all post free.

A WORLDS FIRST TO JOIN THE WORLDS BEST

The HY5 is a unique and revolutionary concept in High-Fidelity pre-amplifiers. Thanks to the latest techniques, all feedback and equalization networks are, for the first time, combined into an integrated pre-amplifier circuit.

Simply by adding volume, treble, bass potentiometers and only three stabilizing capacitors, which are supplied, your HY5 is complete and ready for use.

The HY5 provides equalization for almost every conceivable input. This years developments in equalization technique enables precise correction for both output voltage and frequency response for any crystal or ceramic cartridge. Yet another feature of the HY5 is its inbuilt stabilization circuit, allowing it to be run off any unregulated power amplifier supply.

The HY5 contains a balance circuit which, when linked by a balance control to a second HY5, forms a complete stereo preamplifier.

Specifically and critically designed to meet exacting Hi-Fi standards, the HY5 combines extremely low noise with a high overload capability. When used in conjunction with the HY40 and PSU45 forms a completely integrated system.

INPUTS

Magnetic Pick-up (within \pm 1db RIAA curve) 2mV.

Tape Replay (external components to suit head). 4mV.

Microphone (flat) 10mV.

Ceramic Pick-up (equalized and compensatable) 20 – 2000mV variable.

Tuner (flat) 250mV.

Auxiliary 1 250mV.

Auxiliary 2 2–20mV.

OUTPUTS

Main Pre-amp output 500mV.

Direct tape output 120mV.

ACTIVE TONE CONTROLS

Treble \pm 12db.

Bass \pm 12db.

INTERNAL STABILIZATION

Enables the HY5 to share an unregulated supply with the Power Amplifier.

SUPPLY VOLTAGE

15–25 volt.

SUPPLY CURRENT

5mA approx.

OVERLOAD CAPABILITY

better than 28db on most sensitive input infinite on tuner and auxl.

OUTPUT NOISE VOLTAGE

0.5mV.

PRICE

Mono £3-60

Stereo £7-20

POWER SUPPLY PSU45



The PSU45 is specifically designed to supply, simultaneously, your HY40 (in mono or stereo format) and one or two HY5s.

Spec.

PSU45 \pm 22.5 volts, 2 amps simultaneously.

PRICE: £4-50 including Postage and Packing

CROSSLAND HOUSE · NACKINGTON · CANTERBURY · KENT
TELEPHONE: CANTERBURY 63218

A fascinating foundation for your child's future...

In Radio & Electronics with



Radionic Construction Kits



**NO SOLDERING
BATTERY OPERATED**

A teenager will enjoy many exciting hours constructing experiments with his Radionic Kit.

Not only is it entertaining and absorbing but the knowledge gained of the principles of electronics is invaluable in helping with general studies for higher education. So simple and practical to use—and there is no soldering whatsoever.

You couldn't choose a better gift for any occasion—or why not just buy one anyway?

Radionic Products Limited

St. Lawrence House, Broad Street,
Bristol BS1 2HF. Tel: 0272 25351
A member of the ESL BRISTOL Group of Companies

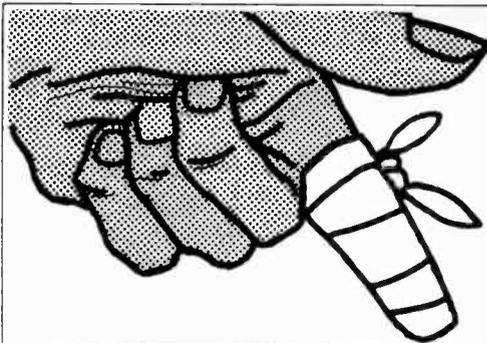
PHILIPS

Please send me literature on Radionic radio and electronics construction kits.

NAME _____

ADDRESS _____

PE



Burns and scalds can rob your fingers of the dexterity essential to your hobby. So keep Burneze close to hand for minor burns. This unique scientific aerosol cools the heat out in just 8 seconds, anaesthetizes pain, reduces swelling. Be well-equipped—buy Burneze, from chemists.



Potter & Clarke Ltd Croydon CR9 3LP



AMAZING MINI-DRILL



**FOR PRECISION
MODEL
WORK**



Indispensable for precision drilling, grinding, polishing, etching, gouging, shaping. Precision power for the enthusiast. Shockproof. Completely portable power from 4½ volt external battery. So much more scope with MINI-DRILL. Super Kit (extra power, interchangeable chuck) £4.95 p.p. 13p. De Luxe Professional Kit with 17 tools £7.65 p.p. 23p. Money Ref. Guarantee.

ONLY
£2
P & P. 10p

+ 6 TOOLS

MERLIN SUPPLY CO

Dept. PE6D, Nailsea, Bristol BS19 2LP

LOW COST BRIDGE RECTIFIERS

DC output		Type Nos.
Amps	Volts	
10 when mounted	60	PM7A1
	125	PM7A2
	250	PM7A4
	375	PM7A6
15 when mounted	60	PM7A1Q
	125	PM7A2Q
	250	PM7A4Q
	375	PM7A6Q



AVAILABLE EX STOCK

AEI
SEMICONDUCTORS

AMP tags electrically isolated from mounting bracket. Mount them on a chassis, the equipment box, transformer housing etc.

AEI Semiconductors Limited
Carholme Road Lincoln

Great new OFFER from DIOTRAN

TRANSISTORS

BRAND NEW FULLY GUARANTEED DEVICES

AC107	15p	AF115	17p	BC140	35p	BCY31	22p	BF272	80p	EC403	15p	ORP60	40p	2N918	30p	2N2714	25p	2N3704	15p
AC113	20p	AF116	17p	BC141	35p	BCY32	25p	BF273	30p	GE780	27p	ORP61	40p	2N929	22p	2N2904	25p	2N3705	12p
AC115	23p	AF117	17p	BC142	45p	BCY33	17p	BF274	30p	MAT100	15p	ST140	12p	2N930	25p	2N2904A	30p	2N3706	12p
AC125	17p	AF118	30p	BC143	40p	BCY34	20p	BF308	35p	MAT101	17p	ST141	17p	2N1131	20p	2N2905	25p	2N3707	13p
AC126	17p	AF124	21p	BC145	45p	BCY70	17p	BF309	37p	MAT120	15p	TIS43	40p	2N1132	22p	2N2905A	30p	2N3708	8p
AC127	17p	AF125	20p	BC147	17p	BCY71	30p	BF316	75p	MAT121	17p	UT46	27p	2N1302	17p	2N2906	25p	2N3709	8p
AC128	17p	AF126	20p	BC148	12p	BCY72	15p	BFV10	55p	MPF102	43p	V405A	25p	2N1303	17p	2N2906A	27p	2N3710	10p
AC141K	17p	AF127	20p	BC149	17p	BCZ11	20p	BFX29	27p	MPF105	43p	V410A	45p	2N1304	20p	2N2907	25p	2N3711	10p
AC142K	17p	AF139	33p	BC150	17p	BD121	85p	BFX84	20p	OC44	15p	2G301	19p	2N1305	20p	2N2907A	30p	2N3819	40p
AC151	15p	AF178	50p	BC151	20p	BD123	85p	BFX85	27p	OC20	50p	2G302	19p	2N1306	22p	2N2923	13p	2N3820	£1
AC154	15p	AF179	50p	BC152	17p	BD124	75p	BFX86	22p	OC22	30p	2G303	19p	2N1307	22p	2N2924	13p	2N3903	25p
AC155	17p	AF180	50p	BC153	27p	BD131	80p	BFX87	25p	OC23	33p	2G304	20p	2N1308	27p	2N2925	13p	2N3904	27p
AC156	17p	AF191	50p	BC154	30p	BD132	80p	BFX88	22p	OC24	45p	2G306	35p	2N1309	27p	2N2926	12p	2N3905	25p
AC157	17p	AF186	45p	BC157	20p	BDY20	£1	BFY50	25p	OC25	25p	2G308	35p	2N1613	17p	(G)	12p	2N3906	27p
AC165	17p	AF239	37p	BC158	17p	BF115	22p	BFY51	20p	OC26	25p	2G309	35p	2N1711	20p	2N2926(Y)	11p	2N4058	15p
AC166	17p	AF211	37p	BC159	20p	BF117	45p	BFY52	20p	OC28	40p	2G339	17p	2N1889	35p	2N1889	35p	2N4059	10p
AC167	20p	AFZ12	45p	BC167	13p	BF118	60p	BFY53	17p	OC29	40p	2G339A	15p	2N1893	37p	2N3010	80p	2N4060	12p
AC168	20p	AL102	85p	BC168	13p	BF119	70p	BSX19	15p	OC35	33p	2G344	15p	2N2160	60p	2N3011	20p	2N4061	12p
AC169	14p	AL103	85p	BC169	13p	BF152	35p	BSX20	15p	OC36	40p	2G345	15p	2N2147	75p	2N3053	20p	2N4062	12p
AC176	23p	ASV26	25p	BC170	12p	BF153	35p	BSY25	15p	OC41	20p	2G371	13p	2N2148	60p	2N3054	50p	2N5172	42p
AC177	20p	ASV27	30p	BC171	13p	BF154	35p	BSY26	15p	OC42	22p	2G371B	10p	2N2149	60p	2N3055	63p	2N5459	13p
AC187	30p	ASV28	25p	BC172	13p	BF157	35p	BSY27	15p	OC44	15p	2G374	15p	2N2192	30p	2N3056	63p	2N5460	13p
AC188	30p	ASV29	30p	BC173	13p	BF158	35p	BSY28	15p	OC45	15p	2G377	27p	2N2193	30p	2N3057	17p	2N5461	13p
AC178	25p	ASV50	25p	BC174	13p	BF159	30p	BSY29	15p	OC70	15p	2G378	15p	2N2194	27p	2N3058	20p	2N5462	13p
AC188	20p	ASV51	25p	BC175	22p	BF160	30p	BSY30	15p	OC71	9p	2G382	15p	2N2217	20p	2N3059	17p	2N5463	13p
AC189	22p	ASV52	25p	BC177	17p	BF162	30p	BSY31	15p	OC72	12p	2G401	30p	2N2218	25p	2N3060	15p	2N5464	13p
AC190	20p	ASV54	25p	BC178	17p	BF163	35p	BSY40	30p	OC74	12p	2G414	30p	2N2219	27p	2N3061	15p	2N5465	13p
AC191	20p	ASV55	25p	BC179	17p	BF164	35p	BSY41	30p	OC75	15p	2G417	25p	2N2220	22p	2N3062	22p	2N5466	13p
AC192	19p	ASV56	25p	BC180	20p	BF165	35p	BSY45	12p	OC76	15p	2N388	30p	2N2221	27p	2N3063	22p	2N5467	13p
AC193	18p	ASV57	25p	BC181	22p	BF167	22p	BSY95A	£1.90	OC77	25p	2N388A	50p	2N2222	27p	2N3064	22p	2N5468	13p
AC194	19p	ASV58	25p	BC182	10p	BF173	22p	BU105	£3.90	OC81	15p	2N404	22p	2N2223	27p	2N3065	22p	2N5469	13p
AC195	20p	ASV59	25p	BC183	10p	BF174	35p	CI11E	60p	OC81D	15p	2N404A	50p	2N2224	27p	2N3066	22p	2N5470	13p
AC196	20p	ASV60	25p	BC184	10p	BF175	35p	C400	30p	OC82	15p	2N524	55p	2N2225	27p	2N3067	22p	2N5471	13p
AC197	20p	ASV61	25p	BC185	10p	BF176	45p	C407	25p	OC82D	15p	2N527	60p	2N2226	27p	2N3068	22p	2N5472	13p
AC198	20p	ASV62	25p	BC186	10p	BF177	50p	C424	40p	OC83	20p	2N696	12p	2N2227	27p	2N3069	22p	2N5473	13p
AC199	20p	ASV63	25p	BC187	10p	BF178	50p	C425	40p	OC84	20p	2N697	15p	2N2228	27p	2N3070	22p	2N5474	13p
AC200	20p	ASV64	25p	BC188	10p	BF179	50p	C426	30p	OC139	15p	2N698	24p	2N2229	27p	2N3071	22p	2N5475	13p
AC201	20p	ASV65	25p	BC189	10p	BF180	50p	C427	30p	OC140	17p	2N699	55p	2N2230	27p	2N3072	22p	2N5476	13p
AC202	20p	ASV66	25p	BC190	10p	BF181	50p	C428	30p	OC170	15p	2N706	7p	2N2231	27p	2N3073	22p	2N5477	13p
AC203	20p	ASV67	25p	BC191	10p	BF182	50p	C441	27p	OC171	15p	2N706A	7p	2N2232	27p	2N3074	22p	2N5478	13p
AC204	20p	ASV68	25p	BC192	10p	BF183	50p	C442	25p	OC172	15p	2N707	12p	2N2233	27p	2N3075	22p	2N5479	13p
AC205	20p	ASV69	25p	BC193	10p	BF184	50p	C444	37p	OC200	25p	2N708	12p	2N2234	27p	2N3076	22p	2N5480	13p
AC206	20p	ASV70	25p	BC194	10p	BF185	50p	C450	30p	OC201	27p	2N709	45p	2N2235	27p	2N3077	22p	2N5481	13p
AC207	20p	ASV71	25p	BC195	10p	BF186	50p	C451	30p	OC202	27p	2N711	40p	2N2236	27p	2N3078	22p	2N5482	13p
AC208	20p	ASV72	25p	BC196	10p	BF187	50p	C452	30p	OC203	25p	2N712	42p	2N2237	27p	2N3079	22p	2N5483	13p
AC209	20p	ASV73	25p	BC197	10p	BF188	50p	C453	30p	OC204	25p	2N718	24p	2N2238	27p	2N3080	22p	2N5484	13p
AC210	20p	ASV74	25p	BC198	10p	BF189	50p	C454	30p	OC205	35p	2N718A	50p	2N2239	27p	2N3081	22p	2N5485	13p
AC211	20p	ASV75	25p	BC199	10p	BF190	50p	C455	30p	OC309	35p	2N726	27p	2N2240	27p	2N3082	22p	2N5486	13p
AC212	20p	ASV76	25p	BC200	10p	BF191	50p	C456	30p	P346A	17p	2N727	27p	2N2241	27p	2N3083	22p	2N5487	13p
AC213	20p	ASV77	25p	BC201	10p	BF192	50p	C457	30p	P397	45p	2N743	17p	2N2242	27p	2N3084	22p	2N5488	13p
AC214	20p	ASV78	25p	BC202	10p	BF193	50p	C458	30p	OCP71	43p	2N744	17p	2N2243	27p	2N3085	22p	2N5489	13p
AC215	20p	ASV79	25p	BC203	10p	BF194	50p	C459	30p	ORP12	43p	2N914	17p	2N2244	27p	2N3086	22p	2N5490	13p
AC216	20p	ASV80	25p	BC204	10p	BF195	50p	C460	30p					2N2245	27p	2N3087	22p	2N5491	13p
AC217	20p	ASV81	25p	BC205	10p	BF196	50p	C461	30p					2N2246	27p	2N3088	22p	2N5492	13p
AC218	20p	ASV82	25p	BC206	10p	BF197	50p	C462	30p					2N2247	27p	2N3089	22p	2N5493	13p
AC219	20p	ASV83	25p	BC207	10p	BF198	50p	C463	30p					2N2248	27p	2N3090	22p	2N5494	13p
AC220	20p	ASV84	25p	BC208	10p	BF199	50p	C464	30p					2N2249	27p	2N3091	22p	2N5495	13p
AC221	20p	ASV85	25p	BC209	10p	BF200	50p	C465	30p					2N2250	27p	2N3092	22p	2N5496	13p
AC222	20p	ASV86	25p	BC210	10p	BF201	50p	C466	30p					2N2251	27p	2N3093	22p	2N5497	13p
AC223	20p	ASV87	25p	BC211	10p	BF202	50p	C467	30p					2N2252	27p	2N3094	22p	2N5498	13p
AC224	20p	ASV88	25p	BC212	10p	BF203	50p	C468	30p					2N2253	27p	2N3095	22p	2N5499	13p
AC225	20p	ASV89	25p	BC213	10p	BF204	50p	C469	30p					2N2254	27p	2N3096	22p	2N5500	13p
AC226	20p	ASV90	25p	BC214	10p	BF205	50p	C470	30p					2N2255	27p	2N3097	22p	2N5501	13p
AC227	20p	ASV91	25p	BC215	10p	BF206	50p	C471	30p					2N2256	27p	2N3098	22p	2N5502	13p
AC228	20p	ASV92	25p	BC216	10p	BF207	50p	C472	30p					2N2257	27p	2N3099	22p	2N5503	13p
AC229	20p	ASV93	25p	BC217	10p	BF208	50p	C473	30p					2N2258	27p	2N3100	22p	2N5504	13p
AC230	20p	ASV94	25p	BC218	10p	BF209	50p	C474	30p					2N2259	27p	2N3101	22p	2N5505	13p
AC231	20p	ASV95	25p	BC219	10p	BF210	50p	C475	30p					2N2260	27p	2N3102	22p	2N5506	13p

Eavesdrop on the exciting world of Aircraft Communications—
V.H.F. AIRCRAFT BAND

CONVERTER ONLY £2.85
Listen in to AIRLINES, PRIVATE, FLIGHT, JET, PLANE. Eavesdrop on exciting cross talk between pilots, ground approach control, airport tower. Hear for yourself the disciplined voices hiding tenseness on talk downs. Be with them when they have to take nerve-racking decisions in emergencies—Tune into the international distress frequency. Covers the aircraft frequency band including **HEATHROW, GATWICK, LUTON, RINGWAY, PRESTON, ETC. ETC. CLEAR AS A BELL.** This fantastic fully transistorised instrument can be built by anyone over nine in under two hours. No soldering necessary. Fully illustrated simple instructions take you step-by-step. Uses standard PP3 battery. All you do is extend rod aerial, place close to any ordinary medium wave radio (even tiny portables) **NO CONNECTIONS WHAT-EVER NEEDED. SEND ONLY £2.85 + 20p p & p for kit including case, nuts, screws, wire, etc. etc.** (Parts available separately.)

SLEEP INDUCER
ONLY £3.25

Do you wake up in the night and can't get off to sleep again? Would you like to be gently soothed off to satisfying sleep every night? Then build this ingenious electronic sleep inducer. It even stops by itself so you don't have to worry about it being on all night! The loudspeaker produces soothing audio-frequency sounds, continuously repeated—but as time goes on the sound gradually becomes less and less—until they eventually cease altogether, the effect it has on people is amazingly very similar to hypnosis. All transistorised, simple to build, electronics or radio needed. Step-by-step instructions. No soldering necessary. Kit includes case, nuts, wire, screws, etc. **SEND £3.25 + 20p p & p.** (Parts available separately.)

FIND BURIED TREASURE!

Transistorised Treasure Locator

This fully portable transistorised metal locator detects and tracks down buried metal objects—it signals exact location with loud audible sound (no phones used)—uses any transistor radio which fits inside—no connections needed. **FINDS GOLD, SILVER, COINS, JEWELLERY, ARCHAEOLOGICAL PIECES, ETC. ETC.**
Extremely sensitive, will signal presence of certain objects buried several feet below ground!
No knowledge of radio or electronics required. Can be built with ease in one short evening by anybody from nine years of age onwards, with the clear, easy-to-follow, step-by-step, fully illustrated instructions—uses standard PP3 battery. No soldering necessary. Kit includes nuts, screws, wire, etc. **ONLY £2.85 + 25p p & p.** (Sectional handle as illustrated 95p extra.) Parts available separately. Made up looks worth £15!

SHORTWAVE TRANSISTOR RADIO
ONLY £2.75

Anyone from 9 years up can follow the step-by-step, easy as ABC, fully illustrated instructions. No soldering necessary. 76 stations logged on rod aerial in 30 mins—Russia, Africa, USA, Switzerland, etc. Experience thrills of world wide news, sport, music, etc. Eavesdrop on unusual broadcasts. Uses PP3 battery. Size only 3in x 4 1/2in x 1 1/2in. **Only £2.75 + 20p p & p.** Kit includes cabinet, screws, instructions, etc. (Parts available separately.)

BUILD 5 RADIO AND ELECTRONIC PROJECTS

ONLY £2.45
Amazing Radio Construction set! Become a radio expert for **£2.45.** A complete Home Radio Course. No experience needed. Parts including simple instructions for each design. Illustrated step-by-step plans, all transistors, loudspeaker, personal phone, knobs, screws, etc., all you need. Presentation box 45p extra as illus. (if required) (parts available separately) no soldering necessary. **Send £2.45 + 20p p & p.**

SOOTHE YOUR NERVES RELAX WITH THIS AMAZING RELAXATRON

CUTS OUT NOISE POLLUTION SOOTHS YOUR NERVES! The RELAXATRON is basically a pink noise generator. Besides being able to mask out extraneous unwanted sounds, it has other very interesting properties. **IF YOU WORK IN NOISY OR DISTRACTING SURROUNDINGS, IF YOU HAVE TROUBLE CONCENTRATING, IF YOU FEEL TENSED, UNABLE TO RELAX**—then build this fantastic Relaxatron. Once used you will never want to be without it—**TAKE IT ANYWHERE.** Uses standard PP3 batteries (current used so small that battery life is almost shelf-life). **CAN BE EASILY BUILT BY ANYONE OVER 12 YEARS OF AGE** using our unique step-by-step, fully illustrated plans. No soldering necessary. All parts including case, a pair of crystal phones, Components nuts, Screws, Wire, etc., no soldering. **Send only £2.75 + 25p p & p.** (Parts available separately.)

ELECTRONIC ORGAN

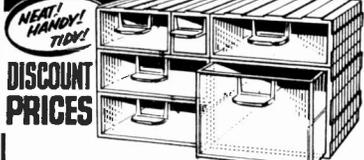
ONLY £3.25
Don't confuse with ordinary electronic organs that simply blow air over mouth-organ type reeds, etc. Fully transistorised. **SELF-CONTAINED LOUD-SPEAKER.** Fifteen separate keys span two full octaves—play the "Yellow Rose of Texas", play "Silent Night", play "Auld Lang Syne", etc. etc. You have the thrill and excitement of building it together with the pleasure of playing a real live, portable electronic organ. **NO PREVIOUS KNOWLEDGE OF ELECTRONICS NEEDED.** No soldering necessary, simple as ABC to make. Anyone over nine years can build it easily in one short evening following the fully illustrated, step-by-step, simple instructions. **ONLY £3.25 + 25p p & p for kit,** including case, nuts, screws, simple instructions, etc. Use standard battery (parts available separately). Have all the pleasure of making it yourself, finish with an exciting gift for someone.

READY BUILT AND TESTED TREASURE LOCATOR MODULE

ONLY £4.95
FULLY TRANSISTORISED PRINTED CIRCUIT METAL DETECTOR MODULE. Ready built and tested—just plug in a PP3 battery and 'phones and it's working. Put it in a case, screw a handle on and **YOU HAVE A PORTABLE TREASURE LOCATOR EASILY WORTH ABOUT £20!** EXTREMELY SENSITIVE—PENETRATES EARTH, SAND, ROCK, WATER, ETC. EASILY LOCATES COINS, GOLD, SILVER, JEWELLERY, HISTORICAL RELICS, BURIED PIPES, ETC. So sensitive it will detect certain objects buried **SEVERAL FEET BELOW GROUND!** **GIVES CLEAR SIGNAL ON ONE COIN! £4.95 + 30p carr. etc.**

CONCORD ELECTRONICS LTD. (PE6U), 8 Westbourne Grove, London, W.2. Callers Welcome 9 a.m.-5.30 p.m. inc. Sat.

INTER-LOCKING PLASTIC STORAGE DRAWERS



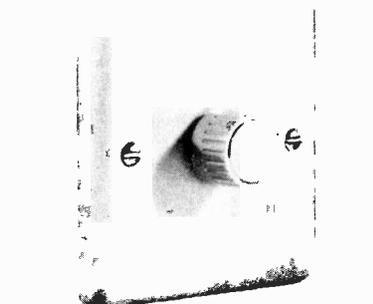
Neatest, neatest system ever devised for storing small parts and components: resistors, capacitors, diodes, transistors, etc. Rigid plastic units interlock together in vertical and horizontal combinations. Transparent plastic drawers have label slots/removable space dividers. Build up any size cabinet for wall, bench or table top.

BUY AT TRADE PRICES!
SINGLE UNITS (1D) (5ins x 2 1/2ins x 2 1/2ins) £1.35 DOZEN.
DOUBLE UNITS (2D) (5ins x 4 1/2ins x 2 1/2ins) £2.25 DOZEN.
TREBLE (3D) £2.35 for 8.
DOUBLE TREBLE 2 draws, in one outer case (6D2), £3.65 for 8, **EXTRA LARGE SIZE (6D1)** £3.30 for 8.

PLUS QUANTITY DISCOUNTS!
Orders £5 and over DEDUCT 5% in the £
Orders £10 and over DEDUCT 7 1/2% in the £
Orders £20 and over DEDUCT 10% in the £
PACKING/POSTAGE/CARRIAGE: Add 35p to all orders under £5. Orders £5 and over, packing/postage/carriage free.

QUOTATIONS FOR LARGER QUANTITIES ALL PRICES TAX PAID
IVORYET LIMITED (Dept. PE6) 124 Cricklewood Broadway, London, N.W.2 Tel. 01-450 4844

Vary the strength of your lighting with a DIMMASWITCH



The DIMMASWITCH is an attractive and efficient dimmer unit which fits in place of the normal light switch and is connected up in exactly the same way. The ivory mounting plate of the DIMMASWITCH matches modern electric fittings. Two models are available, with the bright chrome knob controlling up to 300 w or 600 w of all lights except fluorescents at mains voltages from 200-250 v, 50Hz. The DIMMASWITCH has built-in radio interference suppression:
600 Watt — £3.20. Kit Form £2.70
300 Watt — £2.70. Kit Form £2.20
All plus 10p post and packing.
Please send C.W.O. to:—

DEXTER & COMPANY
1 ULVER HOUSE, 19 KING STREET
CHESTER CH1 2AH Tel. 0244-25883
As supplied to H.M. Government Departments

4-STATION INTERCOM



£7.25
Solve your communication problems with this 4-Station Transistor Intercom system (1 master and 3 Subs), in de-luxe plastic cabinets for desk or wall mounting. Call/talk/listen from Master to Subs and Subs to Master. Ideally suitable for Business, Surgery, Schools, Hospital, Office and Home. Operates on one 9V battery. On/off switch. Volume control. Complete with 3 connecting wires each 66ft. and other accessories. P. & P. 40p.
MAINS INTERCOM
No batteries—no wires. Just plug in the mains for instant two-way, loud and clear communication. On/off switch and volume control with lock system. Price £12.40. P. & P. 55p extra.

INTERCOM/BABY ALARM



£3.35
Same as 4-Station Intercom for two-way instant communication. Ideal as Baby Alarm and Door Phone. Complete with 66ft. connecting wire. Battery 14p. P. & P. 25p.

Transistor TELEPHONE AMPLIFIER
£2.99
Why not boost business efficiency with this incredible De-Luxe Telephone Amplifier. Take down long telephone messages or converse without holding the handset. A useful office aid. On/off switch. Volume control. Battery 14p extra. P. & P. 25p. Full price refunded if not satisfied in 7 days.
WEST LONDON DIRECT SUPPLIES (PE11)
169 KENSINGTON HIGH STREET, LONDON, W.8

LEAK BARGAINS STEREO 30 PLUS amplifier (cased)

Power output (both channels sinewave driven): 15 watts r.m.s. each channel into 8 ohm loudspeakers. Music power output 20 watts r.m.s. each channel into 8 ohm loudspeakers. Total harmonic distortion 0.1% for all power levels up to 10 watts r.m.s. each channel at 1KHz into 8 ohm loudspeakers. Crosstalk: Between left and right channels -50dB up to 1KHz and -30dB at 10KHz. Dimensions: 13in (W) x 4½in (H) x 9½in (D).

LIST PRICE £62.50
LASKY'S PRICE **£45.00** C & P £1.00

STEREO 70 amplifier (cased)

Power output (both channels sinewave driven): 35 watts r.m.s. each channel into 8 ohm loudspeakers. Total harmonic distortion: 0.1% for all power levels up to 25 watts r.m.s. each channel at 1KHz into 8 ohm loudspeakers. Crosstalk: Between left and right channels -50dB up to 1KHz and -30dB at 10KHz. Dimensions: 13in (W) x 4½in (H) x 9½in (D).

LIST PRICE £75.00
LASKY'S PRICE **£55.00** C & P £1.00

LEAK TEAK CASES

Teak case for Stereo 30 or Stereo 70, please state which is required.

LIST PRICE £7.37
LASKY'S PRICE **£2.75** C & P 25p

Teak case for Stereofetic tuner only.

LIST PRICE £7.37
LASKY'S PRICE **£2.50** C & P 25p

Double case to hold Stereo 30 or Stereo 70 and Stereofetic tuner.

LIST PRICE £10.37
LASKY'S PRICE **£4.95** C & P 35p



LEAK TRUSPEED

Superb belt drive turntable system complete with arm, plinth and cover and Shure cartridge.

LIST PRICE £69.50
LASKY'S PRICE **£47.50** C & P £1.50

SINCLAIR PHASE LOCK LOOP STEREO TUNER



Incorporates varicap diodes, printed circuit, coils, squelch circuit I.C. Decoder, etc., supplied completely built and tested and ready to be mounted into any cabinet you choose. It may be used with any High Fidelity Amplifier.

LIST PRICE £25.00
LASKY'S PRICE **£16.95** C & P 25p

NIVICO MCA-V7E 4-CHANNEL AMPLIFIER



The MCA-V7E can be used as a true 4-channel integrated amplifier from discreet 4-channel source using four speakers or have synthesised 4-channel sound using only two speakers. The MCA-V7E can also be used as a conventional stereo amplifier with two speakers only. Output 4 x 12.5W or 2 x 25W.

LIST PRICE £115.00
LASKY'S PRICE **£69.50** C & P £1.00

BELTEK C5700 8 TRACK

Stereo car

Player

Accepts all standard pre-recorded 8 track stereo cartridges. Features include automatic head cleaner, channel select and channel repeat push buttons, slider type volume and tone controls, channel balance. Output 5 watts per channel, frequency response 50Hz-10KHz. Output imp. 4 ohms, size 4½(W) x 1½(H) x 6½(D) in. Operates on 12V DC negative earth. Beautifully styled with black ivory and chrome trim.

BELTEK C5700 complete with mounting brackets and 8 track pre-recorded demonstration cartridge **£19.75**

Beltek SP24 speakers match the C5700 and other Beltek car units in performance and finish. Size: 7½in(W) x 6in(D) x 4½in rear, 2½in front (H). Complete with leads. **£5.95** Pair

BELTEK FM TUNING ADAPTOR

Matches the C5700, the ideal car stereo system.

LASKY'S PRICE **£18.95** C & P 25p

BELTEK CM88 MINI MODEL

Ultra mini model with repeat mechanism.

LASKY'S PRICE **£23.95** C & P 25p

BELTEK CF03F CAR STEREO

Cartridge player and FM car radio combined.

LASKY'S PRICE **£47.50** C & P 25p

BELTEK C1600 De-Luxe 8 TRACK RECORDER

De-Luxe 8 track stereo recorder deck styled to suit any home surroundings.

LASKY'S PRICE **£55.00** C & P 25p

AKAI SCOOP! (C & P 75p on all Tape Decks.)

AKAI 4000D List Price £96.38 Lasky's Price **£61.50**

AKAI 1720L List Price £89.91 Lasky's Price **£58.95**

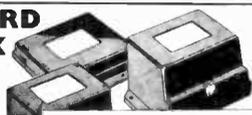
AKAI X1800SD List Price £167.50 Lasky's Price **£111.50**

AKAI X200D List Price £162.53 Lasky's Price **£106.50**

2 CSS-8 Speakers List Price £25.00 Lasky's Price **£15.00** C & P 50p

2 ADM 10/8 mics. Suitable for use on all Akai tape recorders. List Price £11.90 Lasky's Price **£7.50**. C & P 15p.

MULLARD UNILEX KITS



C & P 15p each

CONTROL Fitted with bass, treble, vol. and balance controls. All wires fitted for connecting. Size 9in x 1½in x 1in. **£2.25**.

EP-9001 PRE-AMP. Input imp. PU 2.2M, tuner 1M. Sensitivity PU 320mV, tuner 140mV. Treble and bass control range -14dB to +14dB. Treble at 16KHz, bass at 60Hz. Size 4in x 5in x 1in. **£2.40**.

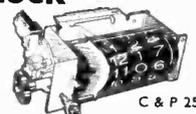
EP 9000 AMP. Output 4W per channel into 12 ohms. Output imp. 12-15 ohms or 8 ohms with series resistors. Freq. resp. 50Hz-16KHz. Size 3½in x 4in x 1½in. **£2.25**.

EP 9002 POWER SUPPLY. Use with control, EP9001 and 2 x EP9000 For 220/250V mains. **£3.50**.

DIGITAL CLOCK SCOOP

EXCLUSIVELY FROM LASKY'S

The clock measures 4½ W x 1½ H x 3½ D (overall from front of drum to back of switch). SPEC.: 210/240V a.c. 50Hz operation; switch rating 250V, 3A. Complete with instructions. HUNDREDS OF APPLICATIONS COMPLETE WITH KNOBS. FEATURES: ● MAINS OPERATION ● 12-HOUR ALARM ● AUTO "SLEEP" SWITCH ● HOURS, MINUTES AND SECONDS READ-OFF ● FORWARD AND BACKWARD TIME ADJUSTMENT ● SILENT OPERATION ● SHOCK AND VIBRATION PROOF ● BUILT IN ALARM BUZZER. SPECIAL QUOTES FOR QUANTITIES. LASKY'S PRICE **£6.50**



C & P 25p

BSR TD8S

8 TRACK STEREO CARTRIDGE PLAYER

The unit is switched on and off by the insertion of the cartridge; The TD8S is suitable for use with most modern stereo amplifiers and delivers a pre-amp output of 125mV. Power requirements: 210/250V AC, 50Hz. Frequency response: 50Hz-10KHz. A plot dynamically balanced synchronous motor maintains unwavering speed accuracy - independent of mains fluctuations. Compact in size the TD8S is housed in black and woodgrain plastic cabinet. Size: 8½(W) x 3½(H) x 10½(D) in.

List Price £24.20

LASKY'S PRICE **£17.95**



C & P 35p



BARGAIN SCOOP

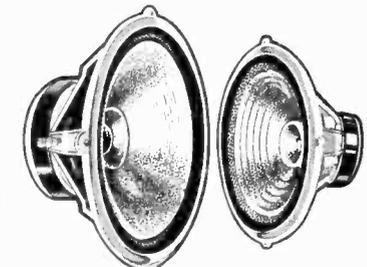
PYE S.W. CAR RADIO CONVERTER

High quality transistorised and ultra compact Shortwave Converter for use with any suitable MW(AM) Car Radio. Self powered for use on 12V positive or negative earth systems. The model 2649 is simply connected to the radio via the aerial socket and provides shortwave covering in 6 push button selected band spread ranges (13, 16, 19, 25, 31, 41, 49, 60 & 90 MHz) combined with the normal radio tuning to give full cover from 3.2MHz-21.75 MHz. On/off switch and by-pass switch for normal MW radio use. Complete with mounting bracket fitting and alignment instructions. Black hammer crackle finished case—size: 6(W) x 1½(H) x 3½(D) in. C & P 20p.

Made to sell at Approx. £20.00

LASKY'S PRICE **£8.75** C & P 20p

FANTASTIC VALUE WHARFEDALE SCOOP!



BRONZE 8RS/DD 8in, 15 ohms

LIST PRICE £4.75
LASKY'S PRICE **£2.95** C & P

TWO FOR **£5.75**

SUPER 10RS/DD 10in, 15 ohms

LIST PRICE £13.50
LASKY'S PRICE **£6.50** C & P

TWO FOR **£12.50**

Lasky's Radio Limited

Branches

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

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

Open all day 9 a.m.-6 p.m. Monday to Saturday

152/3 FLEET STREET, LONDON, E.C.4 Tel: 01-353 2833

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

The Home of High Fidelity

42-45 TOTTENHAM CT. RD., LONDON, W.1 Tel: 01-580 2573

Open all day 9 a.m.-6 p.m. Monday to Saturday

NEW CITY BRANCH NOW OPEN

109 FLEET STREET, LONDON, E.C.4 Tel: 01-353 5812

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

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





"Where can I get exclusive ROC ELECTRONICS!"

ACADEMY STEREO CASSETTE TAPE DECK, MODEL CS-2000D

No hi-fi system is complete without one hook it up to any ROC or other good quality amplifier, and the results are fantastic! The CS-2000D records and plays back. A big feature is its easy-to-use piano-key controls. Easy-to-get-at mic inputs are on top, line inputs and outputs at the rear.

ROC PRICE £42.00
Including two pencil microphones and all connecting leads
Normal Price £65.00

Dual channel recording level meter. Pop-up cassette ejection. Stereo (Mono button). Tape counter. Pause control. Tape speed 1½ ips (4.75 cms). Frequency response 100-10,000 Hz. Wow and flutter better than 0.3%. Rewind time better than 60 sec with C60 cassette. Engineered throughout to the highest electrical and mechanical standards. Size 16" wide, 4½" high and 8" deep. Walnut cabinet with satin aluminium trims.

REALISTIC 30 WATT STEREO AMPLIFIER MODEL SA-500

A superb hi-fi amplifier with all the features you've ever wanted for under £46.00. Saving over £10.00 on the normal retail value. Up to the minute slider controls for bass and treble. Separate volume and balance controls. Headphone socket on front panel. Push-button input controls - magnetic phono (high/low) tuner, aux, mono, monitor. Loudness push-button control for perfect sound at low output levels. Left and right push-button on/off switches for speakers. Noise filtering and tape monitoring facilities. Two auxiliary AC outlets. Frequency response 20-20,000 Hz. 1 db at full power. 15 watts rms per channel. Walnut cabinet with satin aluminium trims. Inputs: phono 2.5mV and 5mV RIAA, tuner/aux 250mV. Hum and noise: phono - 60db, tuner/aux - 65db. How's that for a specification! Size 14½" wide, 3½" high, 10½" deep.

ROC PRICE £35.20
Normal Price £95.00

8-TRACK STEREO CARTRIDGE TAPE DECK, MODEL RP-1000ST

The popular Lear-Jet type recording unit is the heart of the fantastic RP-1000ST, which has full record and playback facilities. Automatic track change with manual override. Press to start button. Stereo headphone and Left and Right Mic sockets on front panel. Dual recording level meter, and Left and Right volume controls. Built-in pre-amp. Tape speed 32 ips (9.5 cms). Frequency response: playback 30-10,000 Hz; recording/playback 30-8,000 Hz. Line output: fully variable 0-500mV. The RP-1000ST incorporates all the features you'd expect in a top quality Cartridge Tape Deck. Size 16" wide, 4" high, 9" deep. Cabinet in walnut. Including connecting leads.

ROC PRICE £59.55
Normal Price £95.00

REALISTIC HI-FI 36-WATT STEREO CONCERTMASTER FM-AM RECEIVER SYSTEM, MODEL 12-694

Brilliantly designed tuner/amplifier with two matching speakers. All three units in beautifully finished walnut cabinets with smart aluminium vertical trims. The tuning dial is fronted by unique black glass. Figures light up behind it in green when the unit is on. Separate easy-to-operate Left and Right volume controls. Microswitch for on/off. Programme selector. Separate bass and treble controls. Headphone socket on front panel for easy access. Single tuning knob for FM and AM. Built-in aerials, facilities for external FM aerial. Illuminated dial. Stereo broadcast indicator light. Each speaker has 6½" bass and 3" treble units. Output: 9 watts r.m.s. per channel into 8 ohms. Frequency response: 30 to 20,000 Hz. FM: frequency range 80-108 MHz, sensitivity 2.5µV, stereo separation 30dB, image rejection 40db. AM: frequency range 530-1605 kHz, sensitivity 100µV. Sizes: speakers 8" wide, 12" high and 9½" deep; receiver 8" wide, 12" high and 9½" deep. And their sophisticated appearance matches the excellence of the specification.

ROC PRICE £70.99
Including connecting leads
Normal Price £115.00

OLSON RA-310 AM/FM/MPX STEREO TUNER

This ROC Tuner is especially designed to match the Olson AM-395 Stereo Amplifier. In price and value, as well as it's good looking design! But of course it's also ideal for use with any other amplifier. The RA-310 costs £10.00 less than the normal retail value, and yet it is a highly sophisticated unit, incorporating the latest solid state techniques. Operation is drift free for supreme station-holding capability. You can connect this Tuner to a stereo amplifier, to a tape deck or a tape recorder. And of course it covers all the stations in the AM and FM bands. FM: 87-108 MHz, AM: 525-1605 kHz. FM Sensitivity: FM 3µV, AM 250µV. Stereo separation 30dB at 1kHz, image rejection 60dB. Size: 11½" wide, 4" high, 7½" deep.

ROC PRICE £31.20
Normal Price £50.00

REALISTIC SA-100B 6-WATT STEREO AMPLIFIER

Here's fabulous, exciting value in miniature! This high quality stereo amplifier measures only 9" wide, 3" high, 5½" deep. And yet it has separate ganged volume, balance and tone controls. Plus speaker in/out, mono/stereo, phono and tuner and power on/off slide switches. The ends are oiled walnut, with matching enamelled metal top. The front panel is satin aluminium and walnut brown enamel. Frequency response is 50 to 10,000 Hz. 3dB. Output 3 watts r.m.s. per channel into 8 ohms. Inputs are 100mV for both phono and tuner.

ROC PRICE £12.45
Normal Price £21.00

8-TRACK HOME STEREO CARTRIDGE PLAYER MODEL E1

With this unit, you can play any standard 8-track cartridge on the market - at a fraction of the normal retail value! It gives you a total of 5 watts of power, to feed into two 8-ohm speakers. The frequency response is 50 to 10,000 Hz, giving you a fine tonal quality that can't be bettered at anything near this price. The E1 has separate tone, balance and volume controls, giving you complete freedom to select the sound you want to hear. Tape speed is 32 ips, and wow and flutter are both less than 0.3%. Size 11½" wide, 5" high, 11" deep.

ROC PRICE £31.20
Normal Price £49.00

25-WATT 3-WAY CRYSLER, 'LIVING AUDIO' SPEAKER CE-5b

This high quality speaker has its own built-in 3-way sound response switch giving you the ideal frequency response for hi-fi, natural or mood music listening. Its beautiful, heavy, oiled walnut cabinet incorporates two separate speaker units an 8" woofer, and a 5" mid-range with 2" concentric tweeter. Power handling capacity: 25 watts r.m.s. into 8 ohms. Overall frequency response: 35-20,000 Hz. Cabinet size: 10½" x 7½" x 8½". Exactly right for matching the most modern decor.

ROC PRICE £27.25
Normal Price £39.95 each

REALISTIC TM-100 AM/FM/MPX STEREO TUNER

Here's another unit that gives you fabulous value in miniature! Designed specifically to match the Realistic SA-100B in both appearance, size and performance, the TM-100 is superb value-for-money. It gives you the full FM and AM ranges - FM: 88-108 MHz, AM: 535-1605 kHz. Sensitivity: FM 5µV, AM 250µV. Image rejection 50dB.

ROC PRICE £31.20
Normal Price £50.00

OLSON AM-395 40-WATT STEREO AMPLIFIER

An ideal unit for your new stereo separate system. It is more than £10.00 below the normal retail price! Making the AM-395 one of Britain's best hi-fi buys. It takes in signals from magnetic or ceramic pick-ups, tuners (see Olson RA-310) and tape decks. And it's got outputs for taping and for headphones. There are separate bass and treble controls, separate Left and Right channel volume controls. And a loudness switch for boosting the bass and treble notes when listening at low output levels. Frequency response: 20-20,000 Hz. 3dB. Output: 20 watts r.m.s. per channel into 8 ohms. Inputs: magnetic phono 3.0mV RIAA, crystal phono 100mV; tape 160mV, tuner 160mV. Size 11½" wide, 4" high, 7½" deep. The specification reads well - sounds even better!

ROC PRICE £31.20
Normal Price £49.00

OLSON AM-372 16-WATT STEREO AMPLIFIER

Here's a really good amplifier at a really down-to-earth price - nearly £7 less than the normal retail value! Just look at what the AM-372 will do for you - reproduce signals from ceramic or crystal cartridges, AM and FM tuners, and tape recorders. And it gives you outputs for two sets of speakers, headphones and tape recorders. Frequency response is 30 to 20,000 Hz. 3dB. Output 8 watts r.m.s. per channel music power into 8 ohm speakers. Phono input 200mV. Tuner input 200mV. Size: 12" wide, 3½" high, 7½" deep.

ROC PRICE £27.55
Normal Price £42.00

PALACE AM/FM/MPX STEREO TUNER AMPLIFIER SSA-16

This is one of the lowest priced stereo tuner amplifiers on the market. It covers the full range of both AM and FM broadcast frequencies. And when you're switched to FM, an indicator lights up when a stereo signal is received - that's the time to switch to 'Stereo'! The SSA-16 has all the facilities you'd expect to find on tuners costing twice as much - separate volume, bass, treble, balance and tuning controls. Selector switch for tape, phono, AM, FM, stereo. Jack socket on front panel for stereo headphones. Frequency range: FM 88-108 MHz, AM 535-1605 kHz. Frequency response: 50-10,000 Hz. 3dB. Power output: 4 watts total music power into two 8 ohm speakers. Size: 16" wide, 4½" high, 8" deep.

ROC PRICE £27.55
Normal Price £42.00

OLSON AM-357 4-WATT STEREO AMPLIFIER

Here's marvellous value for someone just starting to set themselves up in audio! At only £9.00 you get a fine amplifier in a scratch resistant metal cabinet, with a smart brushed aluminium front panel. It incorporates separate tone and volume controls for each channel. Inputs are provided for turntable (ceramic cartridge), tuner and tape deck or recorder. Frequency response: 70-20,000 Hz. 3dB. Output: 2 watts r.m.s. per channel into 8 ohms. Inputs: phono 80mV, tuner/aux 80mV. Size 8" wide, 2½" high, 4½" wide.

ROC PRICE £24.10
Normal Price £39.00

REALISTIC SA-100B 6-WATT STEREO AMPLIFIER

Here's fabulous, exciting value in miniature! This high quality stereo amplifier measures only 9" wide, 3" high, 5½" deep. And yet it has separate ganged volume, balance and tone controls. Plus speaker in/out, mono/stereo, phono and tuner and power on/off slide switches. The ends are oiled walnut, with matching enamelled metal top. The front panel is satin aluminium and walnut brown enamel. Frequency response is 50 to 10,000 Hz. 3dB. Output 3 watts r.m.s. per channel into 8 ohms. Inputs are 100mV for both phono and tuner.

ROC PRICE £17.80
Normal Price £28.00

R 446 3-WAY MATCHED SPEAKERS

These will do justice to your amplifier - and to your pocket. At only £17.80 a pair, they are real value-for-money. Each cabinet is heavily lagged and oak finished. They handle 16 watts rms (8 watts rms each). Each loudspeaker contains a large dual cone base unit, plus a separate tweeter. Frequency range: 40 to 19,000 Hz. Size 14" high, 9" wide, 6½" deep.

ROC PRICE £17.80
Normal Price £25.00 per pair

ROC 7-WATT STEREO AMPLIFIER CHASSIS SK-317

This exclusive R.O.C. Stereo Chassis is completely self-contained, and it costs £2.25 less than the normal retail value! The SK-317 is a really compact unit measuring only 5½" wide, 1½" high and 6½" deep. It contains its own mains power supply, and has a ganged tone control and separate volume controls for each channel. Specification: frequency response 40-17,000 Hz. 3dB; output 3.5 watts music power per channel into 8 ohms; input, phono 600mV; signal-to-noise ratio better than 45dB.

ROC PRICE £5.50
Normal Price £7.75

OLSON AM-372 16-WATT STEREO AMPLIFIER

Here's a really good amplifier at a really down-to-earth price - nearly £7 less than the normal retail value! Just look at what the AM-372 will do for you - reproduce signals from ceramic or crystal cartridges, AM and FM tuners, and tape recorders. And it gives you outputs for two sets of speakers, headphones and tape recorders. Frequency response is 30 to 20,000 Hz. 3dB. Output 8 watts r.m.s. per channel music power into 8 ohm speakers. Phono input 200mV. Tuner input 200mV. Size: 12" wide, 3½" high, 7½" deep.

ROC PRICE £17.80
Normal Price £28.00

REALISTIC TM-100 AM/FM/MPX STEREO TUNER

Here's another unit that gives you fabulous value in miniature! Designed specifically to match the Realistic SA-100B in both appearance, size and performance, the TM-100 is superb value-for-money. It gives you the full FM and AM ranges - FM: 88-108 MHz, AM: 535-1605 kHz. Sensitivity: FM 5µV, AM 250µV. Image rejection 50dB.

ROC PRICE £15.10
Normal Price £25.00

OLSON AM-395 40-WATT STEREO AMPLIFIER

An ideal unit for your new stereo separate system. It is more than £10.00 below the normal retail price! Making the AM-395 one of Britain's best hi-fi buys. It takes in signals from magnetic or ceramic pick-ups, tuners (see Olson RA-310) and tape decks. And it's got outputs for taping and for headphones. There are separate bass and treble controls, separate Left and Right channel volume controls. And a loudness switch for boosting the bass and treble notes when listening at low output levels. Frequency response: 20-20,000 Hz. 3dB. Output: 20 watts r.m.s. per channel into 8 ohms. Inputs: magnetic phono 3.0mV RIAA, crystal phono 100mV; tape 160mV, tuner 160mV. Size 11½" wide, 4" high, 7½" deep. The specification reads well - sounds even better!

ROC PRICE £15.10
Normal Price £25.00

OLSON AM-357 4-WATT STEREO AMPLIFIER

Here's marvellous value for someone just starting to set themselves up in audio! At only £9.00 you get a fine amplifier in a scratch resistant metal cabinet, with a smart brushed aluminium front panel. It incorporates separate tone and volume controls for each channel. Inputs are provided for turntable (ceramic cartridge), tuner and tape deck or recorder. Frequency response: 70-20,000 Hz. 3dB. Output: 2 watts r.m.s. per channel into 8 ohms. Inputs: phono 80mV, tuner/aux 80mV. Size 8" wide, 2½" high, 4½" wide.

ROC PRICE £9.00
Normal Price £14.70

OLSON AM-395 40-WATT STEREO AMPLIFIER

An ideal unit for your new stereo separate system. It is more than £10.00 below the normal retail price! Making the AM-395 one of Britain's best hi-fi buys. It takes in signals from magnetic or ceramic pick-ups, tuners (see Olson RA-310) and tape decks. And it's got outputs for taping and for headphones. There are separate bass and treble controls, separate Left and Right channel volume controls. And a loudness switch for boosting the bass and treble notes when listening at low output levels. Frequency response: 20-20,000 Hz. 3dB. Output: 20 watts r.m.s. per channel into 8 ohms. Inputs: magnetic phono 3.0mV RIAA, crystal phono 100mV; tape 160mV, tuner 160mV. Size 11½" wide, 4" high, 7½" deep. The specification reads well - sounds even better!

ROC PRICE £24.10
Normal Price £39.00

OLSON AM-372 16-WATT STEREO AMPLIFIER

Here's a really good amplifier at a really down-to-earth price - nearly £7 less than the normal retail value! Just look at what the AM-372 will do for you - reproduce signals from ceramic or crystal cartridges, AM and FM tuners, and tape recorders. And it gives you outputs for two sets of speakers, headphones and tape recorders. Frequency response is 30 to 20,000 Hz. 3dB. Output 8 watts r.m.s. per channel music power into 8 ohm speakers. Phono input 200mV. Tuner input 200mV. Size: 12" wide, 3½" high, 7½" deep.

ROC PRICE £15.10
Normal Price £25.00

OLSON AM-357 4-WATT STEREO AMPLIFIER

Here's marvellous value for someone just starting to set themselves up in audio! At only £9.00 you get a fine amplifier in a scratch resistant metal cabinet, with a smart brushed aluminium front panel. It incorporates separate tone and volume controls for each channel. Inputs are provided for turntable (ceramic cartridge), tuner and tape deck or recorder. Frequency response: 70-20,000 Hz. 3dB. Output: 2 watts r.m.s. per channel into 8 ohms. Inputs: phono 80mV, tuner/aux 80mV. Size 8" wide, 2½" high, 4½" wide.

ROC PRICE £9.00
Normal Price £14.70

OLSON AM-372 16-WATT STEREO AMPLIFIER

Here's a really good amplifier at a really down-to-earth price - nearly £7 less than the normal retail value! Just look at what the AM-372 will do for you - reproduce signals from ceramic or crystal cartridges, AM and FM tuners, and tape recorders. And it gives you outputs for two sets of speakers, headphones and tape recorders. Frequency response is 30 to 20,000 Hz. 3dB. Output 8 watts r.m.s. per channel music power into 8 ohm speakers. Phono input 200mV. Tuner input 200mV. Size: 12" wide, 3½" high, 7½" deep.

ROC PRICE £15.10
Normal Price £25.00

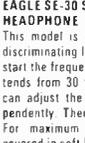
units at lowest prices?..

TOP VALUE · TOP QUALITY ACCESSORIES THAT EVERY HI-FI ENTHUSIAST NEEDS TO COMPLETE HIS SYSTEM

R.328 STEREO HEADPHONE
If you're starting in hi-fi, and you discover the need for a pair of really good stereo headphones. The R.328 is ideal, at a price you can afford. They have padded ear cushions, a 6-foot cord and jack plug. Frequency range 30-15,000 Hz. Impedance 8 ohms per channel.
ROC PRICE £2.95



EAGLE SE-30 STEREO HEADPHONE
This model is for the more discriminating listener. For a start the frequency range extends from 30 to 16,000 Hz. And you can adjust the volume of each earpiece independently. There's also a mono/stereo switch. For maximum comfort, the ear cushions are covered in soft leathers.
ROC PRICE £7.05



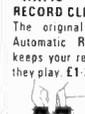
TEC HR-007 HEADPHONE RADIO
When you want to listen to the radio all by yourself. Then this will solve the problem. Separate volume and tuning controls with easy-to-use knobs. Frequency range is 535 to 1605 kHz medium wave band. Maximum output is 300 mW.
Normal Price £9.45 **ROC PRICE £8.50**



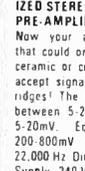
EAGLE 8-TRACK CAR STEREO PLAYER, CS.8
Drive to the sound of music - with this fabulous 8-Track Cartridge Player. It gives you superb tone and power to fill the car with stereo sound. Ideal for use with R.151 or R.152 speakers. Complete with all mounting accessories. For negative earth electrical systems only. Output: 2.5 watts per channel. Frequency range: 70-10,000 Hz. Wow and flutter: less than 0.3%. Tape speed: 3.5 cm/sec. Channel selector: automatic with manual over-ride. Mounting dimensions: 5 1/4" x 5 1/2" x 2 1/4".
ROC PRICE £27.20



"WATTS" RECORD CLEANERS
The original "Dust Bug" Automatic Record Cleaner keeps your records clean as they play. £1.20 Watts Disc Preener. Keeps new records like new - for perfect record reproduction. 35p



R.307 TRANSISTORIZED STEREO PRE-AMPLIFIER
Now your amplifier that could only reproduce ceramic or crystal pick-up cartridges, can accept signals from moving-magnet cartridges! The R.307 steps up signals from between 5-20mV to 200-800 mV. Input: 5-20mV. Equalisation: RIAA. Output: 200-800mV flat. Frequency range: 20-22,000 Hz. Dimensions: 3 1/2" x 1 1/2" x 2 1/4". Supply: 240 VAC. **ROC PRICE £4.92**



15-FOOT STEREO HEADPHONE EXTENSION CORD R.362
Fitted with heavy duty 3-circuit stereo plug at one end and a matching stereo socket at the other. **ROC PRICE £1.30**

STEREO HEADPHONE "Y" ADAPTOR R.361
Enables you to use two sets of stereo headphones from a single socket. Fitted with male plug and two female sockets. **ROC PRICE £1.30**



Every item shown here is the best of its kind within its price range. Buy them separately or at the same time as the other top-value audio products listed.

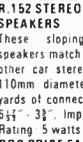
R.186 STEREO HEADPHONE JUNCTION BOX
If you want easy, fingertip control of headphones and loudspeakers, here's the ideal solution to the problem. All you do is connect it to your speakers and amplifier, plug in your headphones - and you're ready to take over! At the flick of a slide switch, you can have headphones alone, or speakers alone, or both together in parallel: suitable for use with amplifiers rated up to 20 watts. Size: 2 1/4" x 3 1/2" x 1 1/4".
ROC PRICE £1.50



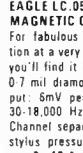
R.151 STEREO CAR SPEAKERS
Smart black tough, plastic cases, each containing a high flux 110mm diameter speaker unit. Just what you need to go with the CS.8 Cartridge Player or any other car stereo system. Fitted with over three yards of connecting cable. Dimensions: 6 1/4" x 5 1/4" x 3 1/2". Impedance: 8 ohms per speaker. Rating: 5 watts max per speaker. **ROC PRICE £3.72**



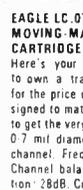
R.152 STEREO CAR SPEAKERS
These sloping front speakers match the CS.8 Cartridge Player or any other car stereo system. Fitted with high flux 110mm diameter speaker unit, and over three yards of connecting cable. Dimensions: 6 1/4" x 6 1/4" x 3 1/2". Impedance: 8 ohms per speaker. Rating: 5 watts max. per speaker.
ROC PRICE £4.96



EAGLE LC.05 STEREO MAGNETIC CARTRIDGE
For fabulous reproduction at a very low price, you'll find it hard to beat. 0.7 mil diamond stylus. Output: 6mV per channel. Frequency range: 30-18,000 Hz. Channel balance: -1.5dB. Channel separation: 20dB. Recommended stylus pressure: 2-4 grams. Compliance: 9 x 10.5 cm/dyne. **ROC PRICE £4.75**



EAGLE LC.07 STEREO MOVING-MAGNET CARTRIDGE
Here's your opportunity to own a transcription cartridge for the price of a ceramic! Is specially designed to match top quality tone arms, and to get the very best from your hi-fi amplifier. 0.7 mil diamond stylus. Output: 7mV per channel. Frequency range: 20-21,000 Hz. Channel balance: -1dB. Channel separation: 28dB. Compliance: 12, 10.5 cm/dyne. **ROC PRICE £6.37**



R.088 MATCHED STEREO LOUD-SPEAKERS
Here's real value in stereo speakers! Each unit comes complete with 10-foot lead and phono plug, and look really smart. Power handling per speaker: 4 watts rms, 8 watts peak. Frequency range: 40-16,000 Hz. Flux density: 8,500 gauss. Impedance: 8 ohms. Dimensions: 9" high, 5 1/2" wide, 4 1/2" deep. Finish: oiled walnut.
ROC PRICE £9.50 pair



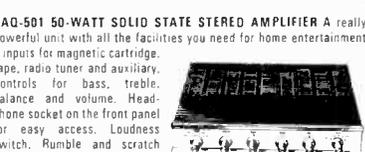
SPECIAL PURCHASES! OFFERED AT EVEN LOWER PRICES! EXCLUSIVE TO ROC

A-3000 36-WATT SOLID STATE STEREO AMPLIFIER
The A-3000 looks as good as it sounds! Giving you a big performance this superb audio amplifier has a full range of facilities on the front and rear panels. On the front - all the controls you're ever likely to need plus a headphone socket. On the rear - signal inputs, speaker outputs and a line fuse for circuit protection.



Specifications: 18 watts rms per channel into 8 ohms. Frequency response: 20-35,000 Hz (-2db) Inputs: Magnetic, Ceramic, Tuner, Tape, Aux. Tape Play. Size: 345mm x 300mm x 130mm. Normal Price £30.70. **ROC PRICE £28.00**

SAQ-501 50-WATT SOLID STATE STEREO AMPLIFIER
A really powerful unit with all the facilities you need for home entertainment - inputs for magnetic cartridge, tape, radio tuner and auxiliary. Controls for bass, treble, balance and volume. Headphone socket on the front panel for easy access. Loudness switch. Rumble and scratch filters.



Specifications: 25 watts rms per channel into 8 ohms. Inputs: Magnetic, Tuner, Tape/Aux. Tape play. Frequency response 20-20,000 Hz (-1db). Size: 333mm x 102mm x 285mm. Normal Price £33.60. **ROC PRICE £26.40**

A-5000 60-WATT SOLID STATE STEREO AMPLIFIER
With the A-5000, you're in the big-sound class - 30 watts rms per channel into 8 ohms! The circuit is all-silicon-transistor, giving you top quality sound and a mere 0.2% distortion at 25 watts output. And optimum stereo input balance is derived from the use of an IC (integrated circuit). There's no need to worry about overload or short-circuiting the output - the A-5000 has built-in protection. Specifications: 30 watts rms per channel into 8 ohms. Frequency response 15-40,000 Hz (-2db) Inputs: Magnetic, Tuner, Tape/Aux, Tape Play. Normal Price £43.40. **ROC PRICE £34.00**



R-200 20-WATT AM/FM/MPX STEREO TUNER AMPLIFIER
What more could a hi-fi enthusiast want! The R-200 gives you top quality reproduction of both AM and FM programmes, including all the stereo broadcasts now available on FM. And you have built-in facilities for recording your favourite programmes on an external tape recorder. The front panel is carefully designed, with the latest slider controls for bass, treble, volume and balance. Alongside the dial are a meter for accurate tuning and a stereo indicator lamp that automatically lights up when you're tuned in to a stereo signal. Dozens of other brilliant facilities including main and remote speaker terminals.



Specifications: 10 watts rms per channel into 8 ohms. Frequency response: 25-40,000 Hz (-2db) Inputs: Magnetic, Ceramic, Tape, Aux. Tape Play. Size: 398mm x 267mm x 106mm. Normal Price, £50.00. **ROC PRICE £42.00**

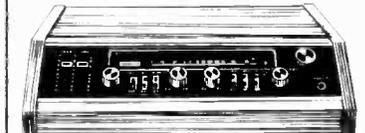
R-150 12-WATT AM/FM/MPX STEREO TUNER AMPLIFIER
You couldn't get better value-for-money in Stereo Tuner Amplifiers anywhere! Just look at all the facilities the R-150 gives you - bass, treble, balance, volume, switchable AFC for driftless reception on FM, socket for headphones on the front panel. A tuning meter, Stereo indicator. Tape output, so that you can record your favourite programmes. To name but a few. AM section covers the medium waveband - 535-1605 kHz, and the FM band 88-108 MHz. Specifications: 6 watts rms per channel into 8 ohms. Frequency response: 40-20,000 Hz (-2db) Inputs: Magnetic, Ceramic, Aux. Size: 107mm x 385mm x 263mm. Normal Price £38.30. **ROC PRICE £29.90**



D-4008 STEREO CASSETTE DECK
Precision engineered for trouble-free performance, this Stereo Cassette Deck has a fantastic range of facilities, making it a real value-for-money unit. Left and right level meters for recording, the latest slider controls for record level, switchable playback noise filter, aux/mic switch, nine input sockets, piano-key controls for record, rewind, play, fast forward, and stop/eject. Index counter with reset button. Specifications: Frequency response: 35-12,000 Hz. Wow and flutter less than 0.25%. Inputs: Mike, Aux. Din Socket. Size: 345mm x 300mm x 100mm. Normal Price £39.50. **ROC PRICE £34.00**



MR-15 AM/FM/MPX STEREO TUNER AMPLIFIER
Here's a beautifully styled AM/FM Stereo Tuner Amplifier. Featuring FET (Field Effect Transistor) front end FM tuner, and dual-channel IC equalizer for perfect balance, the MR-15 incorporates professional style vertical sliding controls for bass and treble. All the input/output facilities you need. Covers FM 88-108 MHz. AM 535-1605 kHz. Output 16 watts rms per channel into 8 ohms. Inputs: Magnetic, Tape, Aux. Tape Play. Size: 467mm x 458mm x 130mm. Normal Price £67.60. **ROC PRICE £54.00**



ROC ELECTRONICS LTD

N. JORY Esq. 193 EDGWARE RD, LONDON, W2 1ET. 01-723 6211

CALLERS WELCOME 9-6 MON TO SAT.

LATE NIGHT THURSDAY 7 PM



Return-of-post mail order service. Orders over £10 post free (UK only). Add 25p for p & p to orders under £10. HP terms available for callers

Compare our prices with any other unit on the hi-fi market, and you'll find you won't beat ROC unit prices. No matter where you live. London or Land's End!
Take a good look at all these super audio equipment bargains. They're all on demonstration at our Shop from 9 to 6 p.m. Monday to Saturday, late night Thursday until 7 p.m. But don't worry if you can't get there yourself. Our Mail Order service is at your disposal. With the same exclusive ROC equipment and at the same super value-for-money prices!

When you invest in ROC equipment you're getting much more than an exclusive product. You're getting value for money that is literally unbeatable. ROC units are bought direct from the manufacturer, and ALL the savings ROC derive from this are passed on to you!
At ROC Electronics, we take extra care to select only the best buys. We check everything before you do and it's fully guaranteed whether you buy at the shop or by Mail Order.



gspk (sales)

quite simply — the best

RESISTORS

FULL RANGE OF ISKRA CARBON FILM RESISTORS

1W (range 4.7 ohms to 470K) 1p each
 1W and 1/2W (range 4.7 ohms to 10 Megs) 1p each
 1W (range 4.7 ohms to 10 Meg) 2p each
 2W (range 4.7 ohms to 10 Meg) 3p each

Iskra Miniature High Stability carbon Film Resistors with negligible noise factor.

All Resistors ± 5 per cent (except values over 4.7 Megs). These Resistors are even lower in price than most 10 per cent and older carbon composition types.

PRE-SET POTENTIOMETERS

Standard values of pre-sets from 100 ohms to 5 Meg—
 Standard/miniature 7p each Sub-miniature 5p each

SIEMENS PROFESSIONAL CAPACITORS

POLYCARBONATE AND POLYESTER

Voltage	Capacitance	Price
100V	0.1 μ F	6p
100V	0.15 μ F	6p
100V	0.22 μ F	6p
100V	0.33 μ F	9p
100V	0.47 μ F	10p
100V	0.68 μ F	15p
250V	0.01 μ F	5p
250V	0.015 μ F	5p
250V	0.022 μ F	5p
250V	0.033 μ F	6p
250V	0.047 μ F	6p
250V	0.068 μ F	6p
250V	0.1 μ F	6p

ELECTROLYTIC

Voltage	Capacitance	Price
10V	22 μ F	7p
10V	47 μ F	11p
16V	47 μ F	7p
25V	10 μ F	7p
25V	100 μ F	9p
25V	220 μ F	11p
25V	170 μ F	14p
25V	1,000 μ F	23p
25V	2,200 μ F	42p
35V	4.7 μ F	7p
35V	220 μ F	14p
100V	10 μ F	8p
100V	22 μ F	9p
100V	47 μ F	14p

SPECIAL INTRODUCTORY OFFER

FREE

with all orders value £5 or over we will give absolutely free one GSPK P.C. Kit for making your own printed circuits (normal retail price £1.95).



Hurry! Offer valid for limited period only.

SEMICONDUCTORS

Here are just a few examples of our LOW Semiconductor prices... Many more semiconductors available all at equally sensational prices... NOW

	1+	25+		1+	25+		1+	25+
AC127	24p	22p	BZY88C Series	10p	9p	OC76	22p	21p
AC128	19p	16p	E12 (2.7V-30.0V)	10p	9p	OC170	24p	21p
AC176	15p	13p				IN4001	6p	5p
AC178	18p	15p	NKT210	24p	19p	IN4002	6p	5p
AD161	27p	25p	NKT211	24p	19p	IN4003	7p	6p
AD162	27p	25p	NKT212	24p	19p	IN4004	8p	7p
AF139	28p	26p	NKT213	24p	19p	IN4005	10p	9p
BC107	9p	8p	NKT214	19p	17p	IN4006	12p	11p
BC108	8p	7p	NKT218	24p	19p	IN4007	18p	16p
BC109	9p	8p	NKT219	24p	19p	IN4148	4p	3p
BC147	8p	7p	NKT223	26p	20p	2N1302	16p	15p
BC148	8p	7p	NKT224	21p	19p	2N1304	21p	20p
BC149	8p	7p	NKT242	14p	12p	2N1613	14p	13p
BCY70	14p	13p	NKT243	51p	44p	2N1711	15p	14p
BCY71	20p	19p	NKT401	70p	56p	2N2904	29p	28p
BCY72	14p	12p	NKT402	75p	59p	2N2905	24p	22p
BDY20	91p	73p	NKT403	64p	50p	2N2906	19p	18p
BFX29	24p	23p	NKT453	41p	33p	2N2907	22p	21p
BFY30	24p	23p	OA47	3p	6p	2N3053	17p	16p
BFY50	19p	18p	OA79	6p	5p	2N3054	49p	47p
BFY51	18p	17p	OA90	5p	4p	2N3055	57p	52p
BFY52	19p	18p	OC70	12p	12p			

NUMEROUS OTHER ITEMS AVAILABLE INCLUDE:

Switches. Comprehensive range of N.S.F. Toggle switches and Rotary Wafer switch kits (to enable you to make your own switch to your own specification).

Copper laminate and all materials available to make your own printed circuit boards.

Lamps and lampholders for every requirement. Ready Built Circuits and Modules.

Freezer and Cleaner aerosol sprays.

Jack plugs and sockets.

Variety of speciality products.

All orders value £2 or over post free. Other orders please add 10p P. & P. We only sell new products—do not confuse with "seconds" or surplus stock. Because of our keen prices we regret the prices apply to U.K. and B.F.P.O. addresses only.

To GSPK (Sales) Limited

Dept. P.E., Head Office, Hookstone Park, Harrogate, Yorkshire HG2 7BU

ALL CALLERS WELCOME

MON. TO FRI. 9-5.00

Please fill in the coupon and send with 10p (refundable on ordering) for catalogue

Name

Address

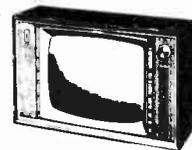
P.E.

TV'S 19" NOW £11.95

TWO YEARS' GUARANTEE ALL MODELS

405/625: 19" £25.95; 23" £35.95

Carr. £1.95 FREE CATALOGUE



DAILY DEMONSTRATIONS FOR PERSONAL SHOPPERS

COLOUR TV 19" £145 OR 25" £185
 LIMITED SUPPLY. REGRET PERSONAL CALLERS ONLY

TV TUBES REBUILT GUARANTEED 2 YEARS



17" & 19" £5.95; 21" & 23" £6.95.
 Exchange Bowls carr. 55p.

RECORD PLAYER CABINETS

£3-75. Designed for the modern autochanger. Size 17" x 15" x 7 1/2". p.p. 55p.

PRESS BUTTON SWITCHING UNITS
 4 Banks 25p, 6 Banks 35p.
 p.p. 5p.

COMPONENTS MUST BE CLEARED

Transistor Radio Cases: 25p each. Size 9 1/2" x 6 1/2" x 3 1/2". Post 15p.
 Speakers: 2 1/2" 8 Ω . Brand new. Post 15p.

Precision Tape Motors: £1.95 200/250V. Famous German manufacturer. Post 20p.

Transistor Gang Condensers: 20p. Miniature AM. Post free.

Modern Gang Condensers: 30p. AM/FM or AM only 20p. Post 10p.

Radio £3-95. 8 Transistors LW/MW. Free case, ear piece, battery. Post 20p.

Volva ELL80 50p.
 Pots: 25p each. Post 5p. D/SW 500/500 K Ω . D/SW 500/100 K Ω . D/SW 1 meg./100 K Ω . S/SW 500/500 K Ω . S/SW 500/1 meg.

DUKE & CO. (LONDON) LTD.

621/3 ROMFORD ROAD, MANOR PARK, E.12 Phone 01-478 6001-2-3

SOUND BARGAINS

BEST OF ALL WORLDS

VHF, FM, AM, AFC, AIR BAND, PUBLIC SERVICE AND WEATHER BANDS

BATTERY CHECK INDICATOR

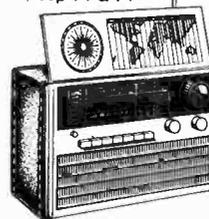
GIANT POWER MULTI-WAVEBAND COMMUNICATIONS RECEIVER

WITH 3 IN 1 AC/DC POWER SUPPLY SYSTEM
 MAINS/BATTERY plus BUILT-IN BATTERY BOOSTER

OUR PRICE £10.50
 +40p P. & P.

THIS NEW 1972 RADIO. No less than 8 VHF BANDS. Picks up Aircraft Transmissions, Pop Pirates, Taxis, Ambulances, Local Radio, Continental and all BBC VHF Stations plus Fascinating Public Service Transmissions. We are not allowed to mention! Even TV sound in certain areas. PLUS A SPECIAL WEATHERBAND. Frequency ranges: MW 440-1600kHz, FM 88-108MHz, Airband 108-145 MHz, VHF 145-175 MHz, 23 semiconductors—12 transistors, 11 diodes and thermistors. Automatic frequency control 3.1in telescopic aerial. Runs off mains a.c. 230/250V or off 4 C2 batteries, or use re-chargable nickel alkaline cell. Finished in strong leather grained case with carrying handle. Approx. size 10 1/2in x 6 1/2in x 3 1/2in. Written guarantee. Special magnetic ear-piece for personal listening, dry batteries free. HURRY! Limited quantity only from Marktyme. Money back guarantee.

OUR PRICE £28.95
 +50p P. & P.



Tune into the world with this amazing communications receiver. A truly exceptional unit in performance and looks—leatherette with stainless steel trim. Looks good anywhere. Use either as a portable with standard batteries or plug it directly into 220-240V domestic mains supply. 14 transistors; 9 diodes; 1 thermistor. Internal ferrite rod antenna plus telescopic aerial. Separate tone, volume and tuning controls with push-button selectors for the 8 WAVEBANDS. Complete with Hi-Fi earphone for personal listening. Frequency ranges: Long wave 150-350 kHz. Medium 333-1605 kHz. Marine 1.6-4.3 MHz. Short Wave 12-24 MHz. FM/VHF 88-108 MHz. Aircraft 108-135 MHz. PUBLIC SERVICE BANDS 135-174 MHz. Fully guaranteed.

8 WAVEBANDS AND WORLD MAP & TIME ZONE DIAL

N.B. The Ministry of Post & Telecommunications has pointed out that a licence (not generally available to the public) is required for reception of transmissions by Pirate Brigade, Aircraft, Shipping, etc.

MARKTYME

(Dept. PE1), 372 EDGWARE ROAD LONDON, W.2. Tel. 01-723 0094
 Callers welcome Mon. to Sat. 9 a.m.-6 p.m.

ADCOLA Soldering Instruments add to your efficiency

THE NEW 'INVADER'

ADCOLA L646

PRICE **£1.85**

for Factory Bench Line Assembly

A precision instrument—supplied with standard 3/16" (4.75 mm) diameter, detachable copper chisel-face bit* Standard temp. 360°C at 23 watts. Special temps. from 250°C-410°C.

*Additional Stock Bits (illustrated) available

COPPER



B 38 $\frac{3}{8}$ " — 3.2 mm CHISEL FACE



B 14 $\frac{3}{32}$ " — 2.4 mm CHISEL FACE



B 24 $\frac{3}{16}$ " — 4.75 mm SCREWDRIVER FACE



B 12 $\frac{3}{16}$ " — 4.75 mm EYELET BIT



B 58 $\frac{1}{4}$ " — 6.34 mm CHISEL FACE

LONG LIFE



B 42 LL $\frac{3}{16}$ " — 4.75 mm CHISEL FACE



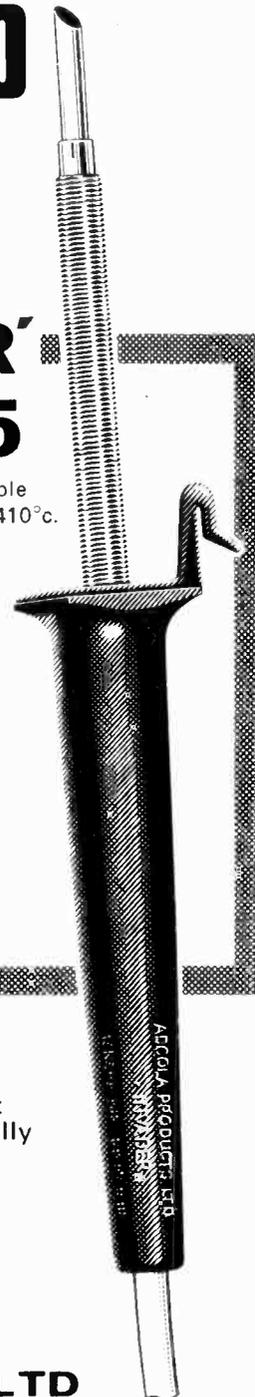
B 38 LL $\frac{1}{8}$ " — 3.2 mm CHISEL FACE



B 14 LL $\frac{3}{32}$ " — 2.4 mm CHISEL FACE



B 44 LL $\frac{3}{16}$ " — 4.75 mm SCREWDRIVER FACE



Don't take chances. We don't. All our ADCOLA Soldering Instruments are of impeccable quality. You can depend on ADCOLA day after day. That's why they're so popular. You get consistent good service . . . reliability . . . from our famous thermally controlled ADCOLA Element and the tough steel construction of this ideal production tool.



* Write for price list and catalogue

ADCOLA PRODUCTS LTD

(Dept. L.), ADCOLA HOUSE, GAUDEN RD., LONDON, S.W.4. Telephone 01 622 0291/3. Telegrams: Soljoint London Telex • Telex: Adcola London 21851

READY-BUILT? — OR D.I.Y? SAXON ENTERTAINMENTS HAVE IT!!

STANDARD & CUSTOM BUILT SOUND EQUIPMENT

100 WATT FULL RANGE AMPLIFIER £48.50 carr. free



100 Watt RMS for all musical and P.A. applications
 * FOUR individually mixed high impedance inputs
 * 20Hz-20,000Hz response
 * FULLY short and open circuit proof
 * Bohm load for full output
 * Four 1.5 amp output transistors—all silicon
 IDEAL FOR GROUPS—DISCOTHEQUES—CLUBS, ETC.
 FULL 12 MONTHS GUARANTEE.

50 WATT VERSION Identical to above but 50 Watt output £37.75

GOODMANS 12P 50W 8 or 15ohm
 £12.37 (rec. R.P.). **Our Price £10.90**
HUGE DISCOUNTS ON CRESCENDO'S

**SUPER HIGH EFFICIENCY 20,000 GAUSS
 MAGNET (state impedance required)**



(rec. R.P.) **Our Price**
 12in 100 Watt RMS £28.75 £21.50
 15in 100 Watt RMS £35.90 £26.80
 18in 150 Watt RMS £45.90 £36.75
 Larger discounts for quantities

MUSICAL INSTRUMENTS NEW & SECONDHAND

100 WATT MODULE



- * Fibre-glass p.c. board
- * All silicon transistors
- * Short/open circuit proof
- * Bohm's load for 100 Watt

Needs only power supply components—input sensitivity 200mV 10k.

£13.50 + 20p carr.

IDEAL FOR YOUR CUSTOM BUILT SYSTEM.

Or complete with power supply and transformer. **£18.75 + 40p carr.**

20 WATT INTEGRATED MODULE

- * Two mixed inputs
- * Fibre-glass p.c. board
- * Baxandall treble and bass controls
- * All power supply components mounted less transformer



Excellent Value and Reliability for only **£8.60 + 20p carr.**

D.J.'s Fader unit with built-in Pre-fade listen and tone controls. This unit plus two decks makes an economical Disco-control panel **£6.50 + 20p carr.**

SAXON ENTERTAINMENTS
327-331 WHITEHORSE ROAD
WEST CROYDON CR0 2HS 01-684 6385



for fast, easy reliable soldering

Ersin Multicore Solder contains 5 cores of non-corrosive flux, instantly cleaning heavily oxidised surfaces. No extra flux is required.

IDEAL FOR HOME CONSTRUCTORS



Size 1 cartons all at 25p each in 40/60, 60/40, or Savbit alloys in 7 gauges.

EASY-TO-USE DISPENSERS



Size 5 (Savbit) 18swg, 18p (illustrated)

Size 19A (60/40 alloy) 18swg, 18p

Size 15 (60/40 alloy) 22swg, 22p

BIB WIRE STRIPPER AND CUTTER



Model 3A. Strips insulation from cable or flex without nicking wire. 4 different settings. 4 & 6 BA spanner ends, ground cutting edges Price 32p. Also available, de luxe Model 8. Price 58p.

NEW!

From Electrical and Hardware Shops. If unobtainable, write to: **Multicore Solders Ltd., Hemel Hempstead, Herts.**

DIGITAL DISPLAY MODULES

from **£3.20 per Decade**

- * Fibreglass Printed Circuit Board (5.25in x 2.75in) for up to 6 decades
- * 7-Segment Indicators (Type 3015F) with I.C. drivers (Type 7447)
- * Single supply of SV required at typically 120mA per decade
- * B.C.D. Inputs—T.T.L. compatible
- * Inputs for selection of decimal point position
- * Zero suppression, blanking and lamp test facilities
- * Available assembled and tested, or as a kit
- * Data Sheet sent free on request

Number of Decades	1	2	3	4	5	6
Kit	£4.15	£7.25	£10.35	£13.30	£16.30	£19.20
Assembled and Tested	£4.85	£8.05	£11.25	£14.30	£17.40	£20.40

All parts available separately if required. Send for Price List.
 Terms: Cash with Order. Postage and Packing Free for Kits and Assembled Modules.

CAVERN ELECTRONICS (Dept. 101)
 29 Clarefield Road, Leicester LE3 6FB

FERRANTI

SEMICONDUCTORS AT LOWEST PRICES

All semiconductors brand new and fully guaranteed.

ZTX107 10p	ZTX320 28p	BFS61 19p	ZS176 21p	KS043A 17p
ZTX108 9p	ZTX330 13p	BFS96 16p	ZS178 34p	KS047A 17p
ZTX109 10p	ZTX331 14p	BFS97 21p	ZS270 10p	KS056A 17p
ZTX114 20p	ZTX500 10p	BFS98 21p	ZS271 14p	KS062A 17p
ZTX300 10p	ZTX501 11p	2N3055 65p	ZS272 16p	KS068A 17p
ZTX301 11p	ZTX502 15p		ZS274 17p	KS075A 17p
ZTX302 15p	ZTX503 12p	Diodes	ZS276 23p	KS082A 17p
ZTX303 12p	ZTX504 39p	ZS140 23p	ZS278 33p	KS091A 17p
ZTX304 19p	ZTX510 15p	ZS141 39p		KS100A 17p
ZTX310 7p	ZTX530 19p	ZS142 30p	Zeners	KS110A 17p
ZTX311 9p	ZTX531 20p	ZS170 9p	KS030A 17p	KS120A 17p
ZTX312 9p	ZTX550 15p	ZS171 11p	KS033A 17p	KS130A 17p
ZTX313 10p	BFS59 15p	ZS172 14p	KS036A 17p	KS150A 17p
ZTX314 11p	BFS60 19p	ZS174 15p	KS039A 17p	KS180A 17p

MOTOROLA: MJE2955 £1.06, MJE3055 65p, 2N4444 £2.25
 R.C.A.: CA3075 £1.13, CA3090Q £3.46

Postage & packing 10p. Free above £2. Send SAE for Ferranti data.

DAVIAN ELECTRONICS, P.O. BOX 38, OLDHAM, LANCs

BUDGET HIGH-FIDELITY STEREO SYSTEMS



ONLY
£40-95
carr. £1.75

FREE
leads and plugs
supplied with all
systems

PREMIER STEREO SYSTEM "ONE" consists of the new Premier 800 all transistor stereo amplifier, Garrard 2025 T/C auto manual record player unit fitted stereo/mono ceramic cartridge with diamond stylus and mounted in teak finish plinth with perspex cover and two matching teak finish loudspeaker systems. Absolutely complete and supplied ready to plug in and play. 800 amplifier has an output of 5 watts per channel with inputs for ceramic and magnetic pick-up, tape and tuner also tape output socket and headphone socket. Controls: Bass, Treble, Volume, Balance, Selector. Mono/Stereo switch. Headphone socket. Power on/off. Black leatherette cabinet with aluminium front panel. Size: 12 1/2 in x 6 1/2 in x 2 1/2 in. (Amplifier available separately if required £15. Carr. 50p.)
PREMIER STEREO SYSTEM "TWO", as above but with Garrard SP25 Mk. III and magnetic cartridge—ONLY £46. Carr. £1.75.

METER BARGAINS



MODEL GT300 MULTIMETER
A precision made pocket sized test meter, ideally suited for testing electronic circuits or electronic appliances. Supplied complete with test lead and batteries.
Ranges—D.C. voltages: 10, 50, 250, 1,000V (1,000 O.P.V.). A.C. voltages: 10, 50, 250, 1,000V (1,000 O.P.V.). D.C. current: 1mA, 100mA. Resistance: 0-150 kohms. Decibels: -10 to +22dB (at A.C. 10V range). £2.47. P. & P. 25p.



MULTIMETER 20,000 O.P.V. MULTIMETER
Features large easy-to-read meter, wide choice of ranges. With test leads, batteries and manual. Size: 4 1/2 in x 3 1/2 in.
Ranges: D.C. voltages: 0.5-250-500-500-2,500V. A.C. voltages: 0-10-50-100-500-1,000V. D.C. current: 0-50µA-2.5mA-250mA. Resistance: 0-6,000 ohms, 0-6 meg ohms (300 ohms and 30 kohms at centre scale). Capacity: 10µf to 0.01µf, 0.01µf to 1µf. Decibels: -20 to +22dB. £4.90. P. & P. 25p.



MODEL CT820 MULTITESTER
Ranges: D.C. voltages: 0.5, 25, 100, 500/1,000V (20,000 ohms/V). A.C. voltages: 0.5, 25, 100, 500, 1,000V (10,000 ohms/V). D.C. current: 0, 50µA, 0mA, 5mA, 50mA, 500mA. Resistance: 0, 6kΩ, 600kΩ, 6MΩ, 60MΩ. Decibels: -20 to +62dB in 5 ranges. £5.82. P. & P. 25p.



"WELLER EXPERT" SOLDER GUN
Saves time and simplifies soldering in the home and service dept. Two position trigger gives instant dual heat 100/140 watt. 240 volt A.C. £3.95 P. & P. 50p.



"Weller Marksman" Soldering Iron
Lightweight, 3/4 in pencil bit, 25 watt. 240 volt A.C. £1.50 P. & P. 15p.



VERITAS V-313 TAPE HEAD DEFLUXER
A must for all tape users! Tape heads become permanently magnetized with constant use; this leads to background noise that prevents perfect recordings. Simply applied to recording head the V313 leaves head free of magnetism. Cleans any tape head in seconds. £1.72. P. & P. 15p.

PREMIER HI-FI OFFERS!

- Rogers Ravensbrook 11 Stereo Amplifier in teak case **£38.50**
- Rogers Ravensbourne Stereo Amplifier in teak case **£49.00**
- Metrosound ST20E Stereo Amplifier in teak case **£25.50**
- Thorens TD150A/11 Transcription unit with arm **£31.00**
- Garrard SP25 111 with Goldring G800 cartridge **£15.00**

SP25 Mk III SPECIAL!

Garrard SP25 Mk. III Single Record Player. Fitted Goldring G800 Magnetic Stereo Cartridge. Complete in Teak Plinth with Cover.
Total list Price over £34.
PREMIER PRICE £18.50
P. & P. 50p

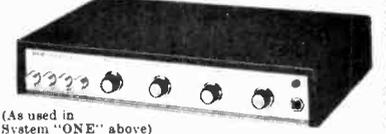
GARRARD AP76 WITH G800, READY WIRED TO 5-PIN DIN IN PLINTH WITH COVER £29.50

Garrard AP76 less cartridge **£18.80**

GARRARD 401 TRANSCRIPTION UNIT £27.40

Garrard 2025 T/C with Stereo Ceramic Cartridge **£8.50**
Garrard 2025 T/C with Stereo Ceramic Cartridge ready wired in teak plinth with cover **£12.45**
Carriage and Insurance 60p extra any item.

PREMIER 800 STEREO AMPLIFIER



(As used in System "ONE" above)
A truly high quality stereo amplifier—compare the specification, compare the price. Output: 5 watts per channel. Frequency response: 30-20,000Hz ± 2db. Distortion: 1%. Output Impedance 8 ohms non. Inputs equalised to R.I.A.A. Magnetic 4mV. Ceramic 100mV. Tuner 100mV. Tape 100mV. Tape out 150mV. Din sockets for inputs and outputs. Controls: Bass, Treble, Volume, Balance, Selector. Mono/Stereo switch. Stereo Headphone socket. Attractive slim line design black leatherette cabinet with aluminium front panel. Size 12 1/2 in x 6 1/2 in x 2 1/2 in **ONLY £15.00** Carr. 50p
Mk. II Version available with Teak Finish Cabinet. £16.25. Carr. 50p.



HI-FI STEREO HEADPHONES
Designed to the highest possible standard. Fitted 2 1/2 in speaker units with soft padded ear muffs. Adjustable headband. 8 ohm impedance. Complete with 6ft lead and stereo jack plug. **£2.47** P. & P. 25p

STEREO STETHOSCOPE SET Low imp. £1.25. P. & P. 10p
MONO STETHOSCOPE SET Low imp. 52p. P. & P. 10p

E.M.I. 13x8in. HI-FI SPEAKERS



Fitted two 2 1/2 in tweeters and crossover network. Available with 8 or 16 ohm impedance. Handling capacity 10W. Brand new. **£3.47** P. & P. 50p

VERITAS V-49 MIXER

Battery operated 4-channel audio mixer providing four separate inputs. Size 6in x 3in 2 1/2 in suitable for crystal microphone, low impedance microphone with transformer, radio, tape, etc. Max. input 1.5V, max. output 2.5V, gain 61B. Standard jack plug socket inputs, phono plugs output. Attractive teak wood grain finish case. **Model £3 Stereo Model £3.47** P. & P. 15p



"VERITONE" RECORDING TAPE

SPECIALLY MANUFACTURED IN U.S.A. FROM EXTRA STRONG PRE-STRETCHED MATERIAL. THE QUALITY IS UNEQUALLED.
TENSILISED to ensure the most permanent base. Highly resistant to breakage, moisture, heat, cold or humidity. High polished splice free finish. Smooth output throughout the entire audio range. Double wrapped—attractively boxed.

LP3 3' 260' P.V.C.	28p	LP6 5 1/2' 1200' ACETATE	75p
TT3 3' 450' POLYESTER	37p	DT6 5 1/2' 1800' POLYESTER	£1.12
DT3 3 1/2' 600' POLYESTER	57p	TT8 5 1/2' 2400' POLYESTER	£1.87
SP5 5' 600' P.V.C.	42p	SP7 7' 1200' P.V.C.	62p
LP6 5' 900' ACETATE	50p	LP7 7' 1800' ACETATE	75p
DT6 5' 1200' POLYESTER	75p	DT7 7' 2400' POLYESTER	£1.25
		TT7 7' 3800' POLYESTER	£2.50

TAPE SPOOLS 3" 5p, 5", 5 1/2", 7" 9p.
Post and Packing 3" 5p, 5", 5 1/2" 8p, 7" 10p. (3 reels and over Post Free.)



TAPE CASSETTES

C60 (60 min.)	37p	3 for £1.05
C90 (90 min.)	62p	3 for £1.80
C120 (120 min.)	87p	3 for £2.55

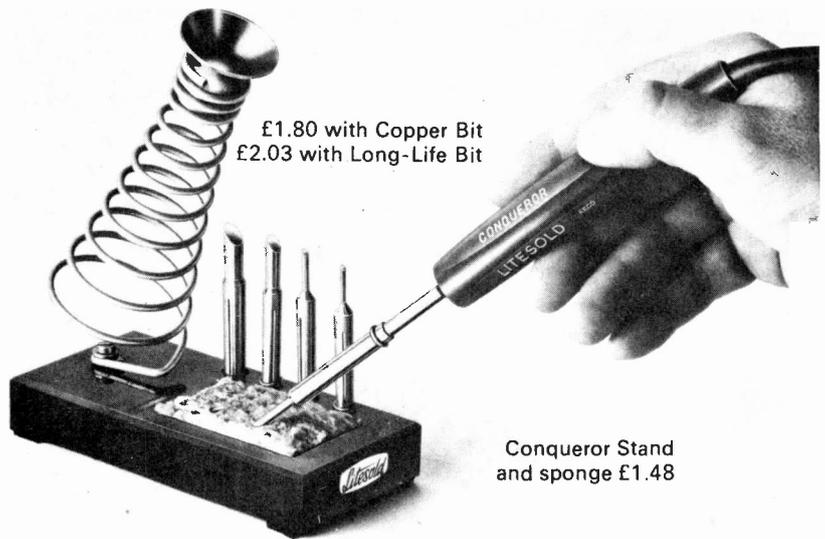
P. & P. 5p
FREE Cassette Head Cleaner with every 10 cassettes

PREMIER RADIO — OXFORD ST — 23
TOTTENHAM COURT RD
DOMINION

23, TOTTENHAM COURT ROAD, LONDON, W.1 Tel: 01-636 3451

The *Litesold* CONQUEROR

An outstandingly simple and efficient new soldering tool, featuring a fully enclosed element and slip-on bits which can't seize. Five tip sizes available, $\frac{1}{16}$ in to $\frac{1}{4}$ in, covering most work with one iron only. Lighter and slimmer than comparable irons, and with better performance. A pleasure to use and excellent value. Mains or low voltages. Conqueror spring stand gives complete safety and convenience, and holds spare bits.



£1.80 with Copper Bit
£2.03 with Long-Life Bit

Conqueror Stand
and sponge £1.48

Please ask for leaflet
37/1016.

LIGHT SOLDERING DEVELOPMENTS LTD.

28 Sydenham Road · Croydon CR9 2LL

01-688 8589/4559

250 skilled technician apprenticeships.

Within the next few months the Navy needs 250 young men to train to be its top technicians.

You could be one of them.

Imagine what this would mean. You'd be chosen for just about the finest technician training – with the opportunity to take your O.N.C.

Within a few years you'd be maintaining and operating some of our most important equipment: radar, missiles, electronic systems, gas turbines, aircraft.

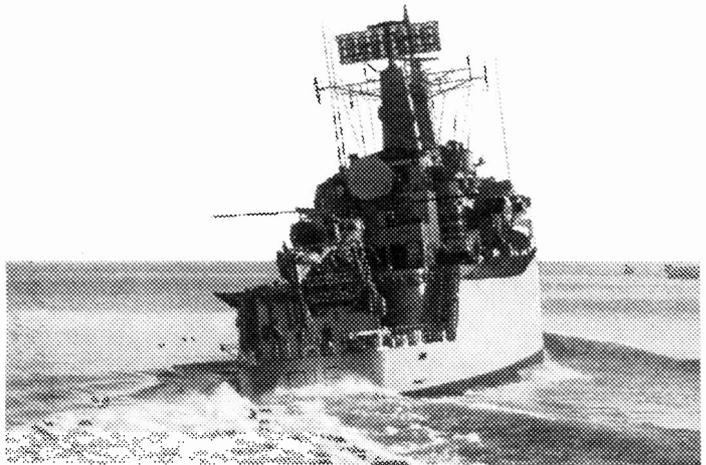
We'd pay you well (After training, over £2,000 a year, with plenty more to come.)

It's a great life too. Plenty of sport, travel and good company. And, with your training, you'd be sure to get a good job when you return to civilian life.

So if you're 15½ to 21 (bright at Science or Maths) here's your great opportunity.

Send the coupon for full details.

Our next Apprentice entry is in Sept.





SEND FOR FREE BOOK

Name _____

Address _____

Date of birth _____

Royal Naval Careers Service (Apprenticeships)
 (877 FMI), Old Admiralty Bldg.,
 Whitehall, London, SW1A 2BE.
 Please send me, without obligation,
 my free "Navy Technician
 Apprenticeships" Booklet.



SEW PANEL METERS

USED EXTENSIVELY BY INDUSTRY, GOVERNMENT DEPARTMENTS, EDUCATIONAL AUTHORITIES, ETC.
 ● LOW COST ● QUICK DELIVERY ● OVER 200 RANGES IN STOCK ● OTHER RANGES TO ORDER

NEW "SEW" DESIGNS! CLEAR PLASTIC METERS BAKELITE PANEL METERS

TYPE SW. 100
 100 x 80 mm

500μA	...	\$3-20
1mA	...	\$3-10
50-0-50μA	...	\$3-10
20V d.c.	...	\$3-10
50V d.c.	...	\$3-10
300V d.c.	...	\$3-10
1A d.c.	...	\$3-20
5A d.c.	...	\$3-10
300V a.c.	...	\$3-10
100-0-100μA	...	\$3-35
VU Meter	...	\$3-75

TYPE S-80
 80 mm square fronts

50μA	...	\$3-20
50-0-50μA	...	\$3-10
100μA	...	\$3-10
100-0-100μA	...	\$3-00
500μA	...	\$2-75
1mA	...	\$2-60
1mA d.c.	...	\$2-60
20V d.c.	...	\$2-60
5A d.c.	...	\$2-60
300V a.c.	...	\$2-60
300V d.c.	...	\$2-60
VU Meter	...	\$3-37

"SEW" CLEAR PLASTIC METERS

Type MR. 35P. 4 1/2in. 4 1/2in. fronts.

50mA	...	\$2-80
100mA	...	\$2-80
500mA	...	\$2-80
1A	...	\$2-80
5A	...	\$2-80
15A	...	\$2-80
30A	...	\$2-80
20V d.c.	...	\$2-80
50V d.c.	...	\$2-80
150V d.c.	...	\$2-80
300V d.c.	...	\$2-80
300V a.c.	...	\$2-80
1mA	...	\$2-87
VU Meter	...	\$2-87
500-0-500μA	...	\$2-80
2A	...	\$2-80
1-0-1mA	...	\$2-80
5mA	...	\$2-80
10mA	...	\$2-80
30A a.c.*	...	\$2-80

Type MR. 35P. 1 21/32in. square fronts.

150mA	...	\$1-60
200mA	...	\$1-60
300mA	...	\$1-60
500mA	...	\$1-60
750mA	...	\$1-60
1A	...	\$1-60
2A	...	\$1-60
5A	...	\$1-60
10A	...	\$1-60
3V d.c.	...	\$1-60
10V d.c.	...	\$1-60
15V d.c.	...	\$1-60
20V d.c.	...	\$1-60
20V d.c.	...	\$1-60
100V d.c.	...	\$1-60
150V d.c.	...	\$1-60
300V d.c.	...	\$1-60
500V d.c.	...	\$1-60
750V d.c.	...	\$1-60
15V a.c.	...	\$1-70
50V a.c.	...	\$1-70
160V a.c.	...	\$1-70
300V a.c.	...	\$1-70
500V a.c.	...	\$1-70
8 Meter	...	\$1-70
10mA	...	\$1-60
20mA	...	\$1-60
50mA	...	\$1-60
100mA	...	\$1-60
VU meter	...	\$2-10

Type MR. 52P. 2 1/2in. square fronts.

50μA	...	\$2-10
50-0-50μA	...	\$2-10
100μA	...	\$2-10
100-0-100μA	...	\$2-10
500μA	...	\$2-10
1mA	...	\$2-10
5mA	...	\$2-10
10mA	...	\$2-10
50mA	...	\$2-10
100mA	...	\$2-10
500mA	...	\$2-10
1A	...	\$2-10
5A	...	\$2-10
10V d.c.	...	\$2-10
20V d.c.	...	\$2-10
50V d.c.	...	\$2-10
300V d.c.	...	\$2-10
1mA	...	\$2-10
5mA	...	\$2-10
10mA	...	\$2-10
50mA	...	\$2-10
100mA	...	\$2-10
500mA	...	\$2-10
1A a.c.*	...	\$2-10
5A a.c.*	...	\$2-10
10A a.c.*	...	\$2-10
20A a.c.*	...	\$2-10
30A a.c.*	...	\$2-10

Type MR. 45P. 2in. square fronts.

50μA	...	\$2-25
50-0-50μA	...	\$2-10
100μA	...	\$2-10
100-0-100μA	...	\$1-87
200μA	...	\$1-87
500μA	...	\$1-75
500-0-500μA	...	\$1-70
1mA	...	\$1-70
5mA	...	\$1-70
10mA	...	\$1-70
50mA	...	\$1-70
100mA	...	\$1-70
500mA	...	\$1-70
1A	...	\$1-70
5A	...	\$1-70
10V d.c.	...	\$1-70
20V d.c.	...	\$1-50
50V d.c.	...	\$1-50
300V d.c.	...	\$1-50
15V a.c.	...	\$1-80
300V a.c.	...	\$1-80
8 Meter	...	\$1-80
1mA	...	\$1-85
VU Meter	...	\$2-25
1A a.c.*	...	\$1-70
5A a.c.*	...	\$1-70
10A a.c.*	...	\$1-70
20A a.c.*	...	\$1-70
30A a.c.*	...	\$1-70

Type MR. 65P. 3 1/2in. 3 1/2in. fronts.

50μA	...	\$2-47
50-0-50μA	...	\$2-75
100μA	...	\$2-75
100-0-100μA	...	\$2-65
200μA	...	\$2-65
500μA	...	\$2-40
500-0-500μA	...	\$2-20
1mA	...	\$2-20
5mA	...	\$2-20
10mA	...	\$2-20
50mA	...	\$2-20
100mA	...	\$2-20
500mA	...	\$2-20
1A	...	\$2-20
5A	...	\$2-20
10A	...	\$2-20
20A	...	\$2-20
50A	...	\$2-20
5V d.c.	...	\$2-20
10V d.c.	...	\$2-20
20V d.c.	...	\$2-20
50V d.c.	...	\$2-20
150V d.c.	...	\$2-20
300V d.c.	...	\$2-20
1mA	...	\$2-37
VU meter	...	\$3-37
500mA a.c.*	...	\$2-80
100mA a.c.*	...	\$2-20
200mA a.c.*	...	\$2-20
500mA a.c.*	...	\$2-20
1A a.c.*	...	\$2-20
5A a.c.*	...	\$2-20
10A a.c.*	...	\$2-20
20A a.c.*	...	\$2-20
30A a.c.*	...	\$2-20

"SEW" BAKELITE PANEL METERS
 Type MR. 65 3 1/2in. square fronts.

500mA	...	\$1-95
1A	...	\$1-95
5A	...	\$1-95
15A	...	\$1-95
30A	...	\$1-95
50A	...	\$1-95
5V d.c.	...	\$1-95
10V d.c.	...	\$1-95
20V d.c.	...	\$1-95
50V d.c.	...	\$1-95
150V d.c.	...	\$1-95
300V d.c.	...	\$1-95
30V a.c.*	...	\$1-95
50V a.c.*	...	\$1-95
150V a.c.*	...	\$1-95
300V a.c.*	...	\$1-95
500mA a.c.*	...	\$1-95
1A a.c.*	...	\$1-95
5A a.c.*	...	\$1-95
10A a.c.*	...	\$1-95
20A a.c.*	...	\$1-95
30A a.c.*	...	\$1-95
50A a.c.*	...	\$1-95
VU meter	...	\$3-10

*** MOVING IRON — ALL OTHERS MOVING COIL**
 Please add postage

"SEW" EDUCATIONAL METERS

Type ED.107. Size overall 100mm x 90mm x 108mm.
 A new range of high quality moving coil instruments ideal for school experiments and other bench applications. 3" mirror scale. The meter movement is demountable internal in the following ranges:

50μA	...	\$4-00
100μA	...	\$4-65
1mA	...	\$4-40
50-0-50μA	...	\$4-65
1-0-1mA	...	\$4-40
1A d.c.	...	\$4-40
5A d.c.	...	\$4-40
10V d.c.	...	\$4-40
20V d.c.	...	\$4-40
50V d.c.	...	\$4-40
300V d.c.	...	\$4-40
Dual range	...	
500mA/5A d.c.	...	\$4-65
5V/50V d.c.	...	\$4-65

EDGEWISE METERS

PE.70 3 1/2in. 1 15/32in. 2 1/2in. deep.

50μA	...	\$3-10
50-0-50μA	...	\$2-00
100μA	...	\$2-00
100-0-100μA	...	\$2-80
200μA	...	\$2-80
500μA	...	\$2-75
1mA	...	\$2-65
300V a.c.	...	\$2-45
VU meter	...	\$2-40

MULTIMETERS for EVERY purpose!

MODEL LT.101 1000 O.P.V. 0/10/50/250/1000 V. D.C. 0/10/50/250/1000 V. A.C. 0/100 M.A. 0/150 K ohms. \$1-97. P. & P. 15p.

HIOKI MODEL 780X 30,000 O.P.V. Overload protection. 5/25/100/500/1000V D.C. 10/50/250/1000V A.C. 50μA/250mA. 20K/2 Meg ohm. -5 to + 62db. \$4-97. P. & P. 15p.

TMK MODEL MD.120. Mirror scale. 20kΩ/volt d.c. 10kΩ/volt a.c. 30/60/300/600/3,000V d.c. 6/120/1,200V a.c. Current 0-60μA/0-12/0-300mA. 0-60kΩ/0-6MΩ. -20 to +63dB. \$4-62 1/2. P. & P. 15p

MODEL FL436. 20kΩ/Volt d.c. 8kΩ/Volt a.c. Mirror scale. 0-6/3/12/30/120/600V d.c. 3/30/120/600V a.c. 50/600μA/60/600mA. 10/100k/1 Meg/10 meg Ω. -20 to + 46dB. \$6-97 1/2. P. & P. 12 1/2p.

MODEL 500. 30,000 O.P.V. with overload protection, mirror scale 0/5/2.5/10/2.5/10/250/500/1,000 V. d.c. 0/2.5/10/2.5/10/250/500/1,000 V. a.c. 0/50 μA/5/50/500 mA. 12 amp. d.c. 0/60K/6 Meg./60 Meg Ω. \$3-97 1/2. Post paid.

MODEL 5025. 57 ranges, giant 5 1/2in. polarity reverse switch. Sensitivity: 50K/Volt d.c. 5K/Volt a.c. D.C. 250, 500, 1,000V. A.C. Volts: 1.5, 2.5, 5, 10, 25, 50, 125, 250, 500, 1,000V. D.C. current: 25, 50mA, 2.5, 5, 25, 50, 500mA, 5, 10A. Resistance: 2K, 10K, 100K, 1 meg, 10 meg. Decibels: -20 to +85dB. \$12-50. P. & P. 17 1/2p.

TMK LAB TESTER. 100,000 O.P.V. 6 1/2in scale buzzer short circuit check. Sensitivity: 100,000 Ω/V d.c. 5/Volt a.c. D.C. volts: 0-5, 2.5, 10, 50, 250, 1,000V. A.C. volts: 3, 10, 50, 250, 500, 1,000V. D.C. current: 10, 100μA, 10, 100, 500mA, 2.5, 10A. Resistance: 1K, 10K, 100K, 10 meg, 100 meg. Decibels: -10 to +49dB. Plastic case with carrying handle, size 7 1/2in x 6 1/2in x 3 1/2in. \$18-90. P. & P. 25p.

HIOKI MODEL 700X 100,000 O.P.V. Overload protection. Mirror scale. 3/1-6/1-21/3/6/12/30/60/120/300/600/1,200VDC 1-5/3/6/12/30/60/150/300/600/1,200 VAC 6/12 AMP DC 2K/200K/2 Meg/20 meg ohm -20 to + 63 db \$13-50 P. & P. 20p

ROUND SCALE TYPE PENCIL TESTER MODEL TS.68

Completely portable, simple to use pocket sized tester. Ranges 0/3/30/300V a.c. and d.c. at 2,000 o.p.v. Resistance 0-20K Ω. ONLY \$1-97. P. & P. 13p.

TMK MODEL 117 F.E.T. ELECTRONIC VOLTMETER

Battery operated, 11 meg input. 26 ranges. Large 4 1/2in mirror scale. Size 3 1/2in x 4 1/2in x 2 1/2in. D.C. volts 0-3-1,200V. A.C. volts 3-8-8,000V. P.P. D.C. current 0-12-12MA. Resistance up to 2,000Ω. Decibels -20 to +51dB. Complete with leads/instructions. \$17-50. P. & P. 20p.

RUSSIAN 22 RANGE MULTIMETER Model U 437 10,000 o.p.v. A first class versatile instrument manufactured in U.S.S.R. to the highest standards. Ranges: 2.5/10/50/250/500/1000V d.c., 2.5/10/50/250/500/1000V a.c. D.C. current 100 mA / 1 / 10 / 100mA/A.I.A. Resistance 300 ohms / 3 / 30 / 300K / 3M Ω. Complete with batteries, test leads, instructions and sturdy steel carrying case. **OUR PRICE \$25-97.** P. & P. 25p.

TE-20D RF SIGNAL GENERATOR

Accurate wide range signal generator covering 120kc/s-50Mc/s on 6 bands. Directly calibrated Variable R.F. attenuator, audio output. Xtal socket for calibration. 220/240V. A.C. Brand new with instructions. \$15. Carr. 37 1/2p. Size 1 1/2 x 2 1/2 x 1 1/2 in.

TO-3 PORTABLE OSCILLOSCOPE

3in tube. Y amp. Bandwidth 0-1V p-p/CM. Sensitivity 1.5 cps/1.5M Hz. Input imp. 2 megΩ 25pF X amp. sensitivity 0.9V/megΩ. Input imp. 2 megΩ 20pF. Time base, 5 ranges, 10cps-300KHz. Synchronisation. Internal/external. Illuminated scale 140 x 215 x 330 mm. Weight 15 1/2lb 220/240V a.c. Supplied brand new with handbook. \$40. Carr. 50p.

TE22 SINE SQUARE WAVE AUDIO GENERATORS

Size: 20cs to 200 kc/s on 4 bands. Square waves. 20cs to 30 kc/s. Output impedance 5,000 ohms. 200/250V a.c. Supplied brand new and guaranteed with instruction manual and leads. \$17-50. Carr. 37 1/2p.

HONEYWELL DIGITAL VOLTMETER VT.100

Can be panel or bench mounted. Basic meter measures 1 volt d.c. but can be used to measure a wide range of a.c. and d.c. volt, current and ohms with optional plug-in cards. Specification:—Accuracy: ± 0.2, ± 1 digit. Resolution: 1mV. No. of digits: 3 plus fourth overrange digit. Overrange: 100% (up to 1.999). Input impedance: 1000 Meg ohm. Measuring cycle: 1 per second. Adjustment: Automatic zeroing, full scale adjustment against an internal reference voltage. Overload: to 100V d.c. Input: Fully floating (3 poles). Input power: 110-230V a.c. 50/60 cycles. Overall size: 5 1/2in. x 2 1/2in. x 8 5/16in. AVAILABLE BRAND NEW AND FULLY GUARANTEED AT APPROX. HALF PRICE. \$49-97 1/2 Carr. 50p

TE-20RF SIGNAL GENERATOR

Accurate wide range signal generator covering 120 kc/s-260 Mc/s on 6 bands. Directly calibrated variable R.F. attenuator. Operation 200/240V a.c. Brand new with instructions. \$18. P. & P. 37 1/2p. S.A.E. for details.

240° WIDE ANGLE 1mA METERS

MW1-6 60mm square \$3-97 1/2. MW1-8 80mm square \$4-97 1/2. P. & P. extra.

G. W. SMITH & CO (RADIO) LTD.
 Also see next two pages

SEMI-CONDUCTORS/VALVES

ALL DEVICES BRAND NEW AND FULLY GUARANTEED

Transistors		2N3415		2N3416		2N3417		2N3418		2N3419		2N3420		2N3421		2N3422		2N3423		2N3424		2N3425		2N3426		2N3427		2N3428		2N3429		2N3430		2N3431		2N3432		2N3433		2N3434		2N3435		2N3436		2N3437		2N3438		2N3439		2N3440		2N3441		2N3442		2N3443		2N3444		2N3445		2N3446		2N3447		2N3448		2N3449		2N3450		2N3451		2N3452		2N3453		2N3454		2N3455		2N3456		2N3457		2N3458		2N3459		2N3460		2N3461		2N3462		2N3463		2N3464		2N3465		2N3466		2N3467		2N3468		2N3469		2N3470		2N3471		2N3472		2N3473		2N3474		2N3475		2N3476		2N3477		2N3478		2N3479		2N3480		2N3481		2N3482		2N3483		2N3484		2N3485		2N3486		2N3487		2N3488		2N3489		2N3490		2N3491		2N3492		2N3493		2N3494		2N3495		2N3496		2N3497		2N3498		2N3499		2N3500		2N3501		2N3502		2N3503		2N3504		2N3505		2N3506		2N3507		2N3508		2N3509		2N3510		2N3511		2N3512		2N3513		2N3514		2N3515		2N3516		2N3517		2N3518		2N3519		2N3520		2N3521		2N3522		2N3523		2N3524		2N3525		2N3526		2N3527		2N3528		2N3529		2N3530		2N3531		2N3532		2N3533		2N3534		2N3535		2N3536		2N3537		2N3538		2N3539		2N3540		2N3541		2N3542		2N3543		2N3544		2N3545		2N3546		2N3547		2N3548		2N3549		2N3550		2N3551		2N3552		2N3553		2N3554		2N3555		2N3556		2N3557		2N3558		2N3559		2N3560		2N3561		2N3562		2N3563		2N3564		2N3565		2N3566		2N3567		2N3568		2N3569		2N3570		2N3571		2N3572		2N3573		2N3574		2N3575		2N3576		2N3577		2N3578		2N3579		2N3580		2N3581		2N3582		2N3583		2N3584		2N3585		2N3586		2N3587		2N3588		2N3589		2N3590		2N3591		2N3592		2N3593		2N3594		2N3595		2N3596		2N3597		2N3598		2N3599		2N3600		2N3601		2N3602		2N3603		2N3604		2N3605		2N3606		2N3607		2N3608		2N3609		2N3610		2N3611		2N3612		2N3613		2N3614		2N3615		2N3616		2N3617		2N3618		2N3619		2N3620		2N3621		2N3622		2N3623		2N3624		2N3625		2N3626		2N3627		2N3628		2N3629		2N3630		2N3631		2N3632		2N3633		2N3634		2N3635		2N3636		2N3637		2N3638		2N3639		2N3640		2N3641		2N3642		2N3643		2N3644		2N3645		2N3646		2N3647		2N3648		2N3649		2N3650		2N3651		2N3652		2N3653		2N3654		2N3655		2N3656		2N3657		2N3658		2N3659		2N3660		2N3661		2N3662		2N3663		2N3664		2N3665		2N3666		2N3667		2N3668		2N3669		2N3670		2N3671		2N3672		2N3673		2N3674		2N3675		2N3676		2N3677		2N3678		2N3679		2N3680		2N3681		2N3682		2N3683		2N3684		2N3685		2N3686		2N3687		2N3688		2N3689		2N3690		2N3691		2N3692		2N3693		2N3694		2N3695		2N3696		2N3697		2N3698		2N3699		2N3700		2N3701		2N3702		2N3703		2N3704		2N3705		2N3706		2N3707		2N3708		2N3709		2N3710		2N3711		2N3712		2N3713		2N3714		2N3715		2N3716		2N3717		2N3718		2N3719		2N3720		2N3721		2N3722		2N3723		2N3724		2N3725		2N3726		2N3727		2N3728		2N3729		2N3730		2N3731		2N3732		2N3733		2N3734		2N3735		2N3736		2N3737		2N3738		2N3739		2N3740		2N3741		2N3742		2N3743		2N3744		2N3745		2N3746		2N3747		2N3748		2N3749		2N3750		2N3751		2N3752		2N3753		2N3754		2N3755		2N3756		2N3757		2N3758		2N3759		2N3760		2N3761		2N3762		2N3763		2N3764		2N3765		2N3766		2N3767		2N3768		2N3769		2N3770		2N3771		2N3772		2N3773		2N3774		2N3775		2N3776		2N3777		2N3778		2N3779		2N3780		2N3781		2N3782		2N3783		2N3784		2N3785		2N3786		2N3787		2N3788		2N3789		2N3790		2N3791		2N3792		2N3793		2N3794		2N3795		2N3796		2N3797		2N3798		2N3799		2N3800		2N3801		2N3802		2N3803		2N3804		2N3805		2N3806		2N3807		2N3808		2N3809		2N3810		2N3811		2N3812		2N3813		2N3814		2N3815		2N3816		2N3817		2N3818		2N3819		2N3820		2N3821		2N3822		2N3823		2N3824		2N3825		2N3826		2N3827		2N3828		2N3829		2N3830		2N3831		2N3832		2N3833		2N3834		2N3835		2N3836		2N3837		2N3838		2N3839		2N3840		2N3841		2N3842		2N3843		2N3844		2N3845		2N3846		2N3847		2N3848		2N3849		2N3850		2N3851		2N3852		2N3853		2N3854		2N3855		2N3856		2N3857		2N3858		2N3859		2N3860		2N3861		2N3862		2N3863		2N3864		2N3865		2N3866		2N3867		2N3868		2N3869		2N3870		2N3871		2N3872		2N3873		2N3874		2N3875		2N3876		2N3877		2N3878		2N3879		2N3880		2N3881		2N3882		2N3883		2N3884		2N3885		2N3886		2N3887		2N3888		2N3889		2N3890		2N3891		2N3892		2N3893		2N3894		2N3895		2N3896		2N3897		2N3898		2N3899		2N3900		2N3901		2N3902		2N3903		2N3904		2N3905		2N3906		2N3907		2N3908		2N3909		2N3910		2N3911		2N3912		2N3913		2N3914		2N3915		2N3916		2N3917		2N3918		2N3919		2N3920		2N3921		2N3922		2N3923		2N3924		2N3925		2N3926		2N3927		2N3928		2N3929		2N3930		2N3931		2N3932		2N3933		2N3934		2N3935		2N3936		2N3937		2N3938		2N3939		2N3940		2N3941		2N3942		2N3943		2N3944		2N3945		2N3946		2N3947		2N3948		2N3949		2N3950		2N3951		2N3952		2N3953		2N3954		2N3955		2N3956		2N3957		2N3958		2N3959		2N3960		2N3961		2N3962		2N3963		2N3964		2N3965		2N3966		2N3967		2N3968		2N3969		2N3970		2N3971		2N3972		2N3973		2N3974		2N3975		2N3976		2N3977		2N3978		2N3979		2N3980		2N3981		2N3982		2N3983		2N3984		2N3985		2N3986		2N3987		2N3988		2N3989		2N3990		2N3991		2N3992		2N3993		2N3994		2N3995		2N3996		2N3997		2N3998		2N3999		2N4000	
-------------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--

Integrated Circuits		FJH101		FJH111		FJH121		FJH131		FJH141		FJH151		FJH161		FJH171		FJH181		FJH191		FJH201		FJH211		FJH221		FJH231		FJH241		FJH251		FJH261		FJH271		FJH281		FJH291		FJH301		FJH311		FJH321		FJH331		FJH341		FJH351		FJH361		FJH371		FJH381		FJH391		FJH401		FJH411		FJH421		FJH431		FJH441		FJH451		FJH461		FJH471		FJH481		FJH491		FJH501		FJH511		FJH521		FJH531		FJH541		FJH551		FJH561		FJH571		FJH581		FJH591		FJH601		FJH611		FJH621		FJH631		FJH641		FJH651		FJH661		FJH671		FJH681		FJH691		FJH701		FJH711		FJH721		FJH731		FJH741		FJH751		FJH761		FJH771		FJH781		FJH791		FJH801		FJH811		FJH821		FJH831		FJH841		FJH851		FJH861		FJH871		FJH881		FJH891		FJH901		FJH911		FJH921		FJH931		FJH941		FJH951		FJH961		FJH971		FJH981		FJH991		FJH1001	
---------------------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	--------	--	---------	--

VALVES		0A2		0B2		0B4		0B6		0B8		0C1		0C2		0C3		0C4		0C5		0C6		0C7		0C8		0C9		0D1		0D2		0D3		0D4		0D5		0D6		0D7		0D8		0D9		0E1		0E2		0E3		0E4		0E5		0E6		0E7		0E8		0E9		0F1		0F2		0F3		0F4		0F5		0F6		0F7		0F8		0F9		0G1		0G2		0G3		0G4		0G5		0G6		0G7		0G8		0G9		0H1		0H2		0H3		0H4		0H5		0H6		0H7		0H8		0H9		0I1		0I2		0I3		0I4		0I5		0I6		0I7		0I8		0I9		0J1		0J2		0J3		0J4		0J5		0J6		0J7		0J8		0J9		0K1		0K2		0K3		0K4		0K5		0K6		0K7		0K8		0K9		0L1		0L2		0L3		0L4		0L5		0L6		0L7		0L8		0L9		0M1		0M2		0M3		0M4		0M5		0M6		0M7		0M8		0M9		0N1		0N2		0N3		0N4		0N5		0N6		0N7		0N8		0N9		0O1		0O2		0O3		0O4		0O5		0O6		0O7		0O8		0O9		0P1		0P2		0P3		0P4		0P5		0P6		0P7		0P8		0P9		0Q1		0Q2		0Q3		0Q4		0Q5		0Q6		0Q7		0Q8		0Q9		0R1		0R2		0R3		0R4		0R5		0R6		0R7		0R8		0R9		0S1		0S2		0S3		0S4		0S5		0S6		0S7		0S8		0S9		0T1		0T2		0T3		0T4		0	
--------	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	---	--

HI-FI EQUIPMENT

SAVE UP TO 33 1/3% OR MORE

SEND S.A.E. FOR DISCOUNT PRICE LISTS AND PACKAGE OFFERS!



RECORD DECKS

B.S.R.			
UA90 Mono	£4-97		
C1291	£6-80		
MP60	£6-50		
610	£14-07	GOLDRING	
510	£11-50	GL69/2	£18-97
310	£9-40	GL69/2/P	£24-20
810	£23-45	GL72	£22-25
M560 TPD1	£12-95	GL72/P	£29-05
MP60 TPD2	£16-40	GL75	£29-05
610 TPD1	£20-35	GL75/P	£34-95
510 TPD1	£18-20	LID75	£3-83
210 Package*	£9-55	LID72	£3-65
HT70	£14-99	G99	£19-30
HT70 Package	£21-60	GL85	£46-50
GARRARD		GL85P	£54-30
2025TC*	£3-50	LID85	£4-80
40B*	£9-25	G101	£21-95
5-300*	£3-50	PIONEER	
SP25 111	£10-50	PL12AC	£35-15
SP25 111/G800*		PL13C	£50-25
		PLA25	£62-85
SL65B	£13-45	THORENS	
AP76	£18-35	TD125	£57-65
AP76/G800*	£22-50	TD125AB	£91-15
SL72B	£22-25	TX25	£6-40
SL75B	£22-00	TD150	£27-90
SL95B	£22-50	TD150A II	£33-20
401	£22-60	TD150AB II	£37-90
ZERO 100A	£41-95	TD150 Plinth	£3-47
ZERO 100S	£37-50	TX11	£3-65

RECORD DECK PACKAGES

Decks supplied with cartridge ready wired in teak veneered plinth with cover.

Garrard 2025TC/9TAHCD	£12-95
Garrard SP25 111/9TAHCD	£15-95
Garrard SP25 111/G800	£19-50
Garrard SP25 111/M75-6	£19-50
Garrard SP25 111/M44-7	£20-85
Garrard SP25 111/M35-E	£22-30
Garrard SP25 111/G800 (Play on Plinth and Cover)	£19-75
Garrard AP76/G800	£22-50
Garrard AP76/M75-6	£22-25
Garrard AP76/M35E	£23-95
Garrard AP76/M75EJ	£24-90
B.S.R. McDonald MP60/AT55	£19-25
Golding GL72/G800	£24-50
Golding GL75/G800	£29-70
Golding GL75/G800E	£44-15

*Carriage 30p any item

SINCLAIR EQUIPMENT



Project 60. Package offers, 2 x Z30 amplifier, stereo 60 pre-amp, P25 power supply, £15-95. Carr. 37p. Or with P26 power supply, £18-00. Carr. 37p. 2 x Z50 amplifier, stereo 60 pre-amp, P28 power supply, £20-25 Carr. 37p. Transformer for P28, £2-97 extra. Add to any of the above £4-45 for active filter unit, and £13-90 for pair of Q16 speakers. Project 60 FM Tuner £16-95. Carr. 37p. New Project 60S £20-97. Carr. 37p. All Sinclair products in stock. IC12 £1-80. P. & P. 10p. 2,000 amplifier, £23-50. Carr. 37p. 3000 Amplifier, £30-95. Carr. 37p. Neoteric amplifier, £43-95. Carr. 37p.

LATEST CATALOGUE



SEND NOW— STILL ONLY 37 1/2p P. & P. 10p

Our new 6th edition gives full details of a comprehensive range of HI-FI EQUIPMENT COMPONENTS, TEST EQUIPMENT AND COMMUNICATIONS EQUIPMENT. FREE DISCOUNT COUPONS VALUE 50p. 272 pages, fully illustrated and detailing thousands of items at bargain prices.

TELETON F.2000 AM/FM STEREO TUNER AMPLIFIER

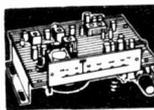


Probably the most popular budget Tuner/ Amp. and now offered at a ridiculous low price. 5 watts r.m.s. per channel. Tape/ Car phono inputs. AFC/Built-in MPX. OUR PRICE £28-25. Carr. 50p.

SUGGESTED SYSTEM

F.2000, Garrard 2025TC Changer fitted stereo cartridge, with plinth and cover and pair of G.W.S. Speakers. OUR PRICE £52-95. Carr. £1.

★ TRANSISTORISED FM TUNER ★



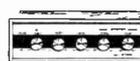
6 TRANSISTOR HIGH QUALITY TUNER. SIZE ONLY 6x4x2 1/2in. 3 I.F. stages. Double tuned discriminator. Ample output to feed most amplifiers. Operates on 9V battery. Coverage 88-108 MHz. Ready built ready for use. Fantastic value for money. £6-37 1/2. P. & P. 12 1/2p. Stereo multiplex adaptors £4-97 1/2.

HA-10 STEREO HEADPHONE AMPLIFIER



All silicon 10 transistor amplifier operates from magnetic, ceramic or tuner inputs with twin stereo headphone outputs and separate volume controls for each channel. Operates on 9V battery. Inputs 3MU/100MU. Output 50mW. £5-97. P. & P. 15p.

NS-1,600W STEREO AMPLIFIER



Exceptional budget price amplifier. All silicon transistor. Handsome walnut case. Switched input selector, separate balance, volume, treble, bass controls. Output 2 x 6W R.M.S. Inputs Mag. Tape, Xtal, Tuner, Tape Out. £14-75. Carr. 37p.

BH.001 HEADSET AND BOOM MICROPHONE

Moving coil. Ideal for language teaching, communications. Headphones, imm. 16 ohms. Microphone 200 ohms. £4-32. P. & P. 15p.



SKYWOOD CX203 COMMUNICATION RECEIVER



Solid state. Coverage on 5 bands 200-420 KHz and 0-55 to 30 MHz. Illuminated slide rule dial. Bandspread. Aerial tuning. BFO. AVC. A.N.L. 43 meter. AM/CW/SSB. Integrated speaker and phono socket. Operation 220/240V AC or 12V DC. Size 325 x 266 x 150mm. Complete with instructions and circuit. £28-50. Carr. 50p.

Model S-100TR MULTIMETER/ TRANSISTOR TESTER

100,000 o.p.v. MIRROR SCALE/ OVERLOAD PROTECTION

0/12/16/31/12/30/120/600 VDC. 0/30/120/600 VAC. 0/12/600uA/12/300mA/12 AMP DC. 0/10K/1 MEG/100 MEG. -20 to +60 db. 0-01 - 2 MFD. Transistor tester measures Alpha, Beta and Ico. Complete with batteries, instructions and leads. £13-50. P. & P. 25p.



MCA. 220 AUTOMATIC VOLTAGE STABILISER

Input 220-240V a.c. or 176-250V a.c. Output 120V a.c. or 240V a.c. 200VA rating. £11-97. Carr. 50p.



BELCO AF-5A SOLID STATE SINE SQUARE WAVE C.R. OSCILLATOR

Sine 18-200,000Hz; Square 18-50,000Hz. Output max +10dB (10k Ohm). Operation internal batteries. Attractive two-tone case 7 1/2in x 5in x 2in. Price £17-50. Carr. 17 1/2p.

TRANSISTORISED L.C.R. A.C. MEASURING BRIDGE

A new portable bridge offering excellent range and accuracy at low cost. Ranges: R 1n-111 meg Ohm; G Ranges ±1%; L 1 uH - 111 HENRYS; C Ranges -2%. C. 10pF ±1110 in F.d. 6 L:11100. G Ranges ±1%. Bridge voltage at 1,000 cps. Operated from 9 volts. 100uA. Meter indication. Attractive 2 tone metal case. Size 7 1/2 x 5 x 2in. £20. P. & P. 25p.

230/240V SMITHS SYNCHRONOUS MOTORS

Built in gearbox. All brand new and boxed. 60RPM CW; 30RPH CW; 2R/HR ACW; 2R/HR CW; 8R/DAY CW; 10RPM CW; 20R/HR ACW; 50p each. Post 12p



E.H.T. TESTER E-30KCV

Completely self-contained with built-in voltmeter. Easy to read, very accurate, robust construction. An essential for colour television servicing, etc. Size 360mm long. 50mm dia. £6-95. P. & P. 25p.

HELICAL POTENTIOMETERS

ITT MCPM15 10 turn 2 1/2W Available 500ohm, 1K, 5K ohm. £1-25 ea. P/P 15p.

POWER RHEOSTATS

High quality ceramic construction. Windings embedded in vitreous enamel. Heavy duty brush wiper. Continuous rating. Wide range ex-stock. Single hole fixing. 1in. dia. shafts. Bulk quantities available.

25 WATT	10/25/50/100/250/500/1,000/2,500 or 5,000 ohms.	£1-05.	P. & P. 7 1/2p.
50 WATT	10/25/50/100/250/500/1,000/2,500 or 5,000 ohms.	£1-37 1/2.	P. & P. 7 1/2p.
100 WATT	15/10/25/50/100/250/500/1,000 or 2,500 ohms.	£1-37 1/2.	P. & P. 7 1/2p.

"YAMABISHI" VARIABLE VOLTAGE TRANSFORMERS

S-260 General Purpose Bench Mounting		S-260B Panel Mounting	
1A	£7-00	1A	£7-90
2.5A	£8-05	2.5A	£8-95
5A	£11-75	Please add postage	
8A	£15-90	ALL MODELS	
10A	£22-50	INPUT 230 VOLTS, 50/60 CYCLES.	
12A	£23-60	OUTPUT VARIABLE 0-280 VOLTS	
20A	£49-00	Special discounts for quantity	

SPECIAL OFFER! SINCLAIR PROJECT STEREO FM TUNER



The first tuner in the world to use the phase lock loop principle—as used for receiving signals from space craft because of its vastly improved signal to noise ratio. Provides fantastic results even in difficult areas. Tuning range 87.5 to 108MHz. Automatic stereo indicator. Sensitivity: 2uV. AFC range ±200KHz. Signal to noise ratio: 65dB. Output voltage 2x150mV. Operating voltage 25-30V D.C. Size: 93 x 40 x 207mm. REC. LIST PRICE £28.

OUR PRICE **£16-95** P. & P. 25p

Unrepeatable offer—buy now and save over £8.

RP14 REGULATED POWER SUPPLY

Solid state. Variable output 0-24V DC up to 1 amp. Dual scale meter to monitor volt-amp. Range 0-24V. Range 0-100mA. Size 185 x 85 x 105mm. £28-97. P. & P. 25p.

PS1000B REGULATED POWER SUPPLY

Solid state. Output 6, 9 or 12 volt DC up to 3 amps. Meter to monitor current. Input 220/240V AC. Size 4in x 3 1/2in x 6 1/2in. £11-97. P. & P. 25p.



UNR-30 RECEIVER

4 Bands covering 350KHz-30MHz. B.F.O. Built in Speaker 220/240V a.c. Brand new with instructions. £15-75. Carr. 37 1/2p.



LAFAYETTE HA-600 RECEIVER

General coverage 150-400KHz, 550KHz-30MHz. PET front end, 2 mech. filter, product detector, variable B.F.O., noise limiter, S Meter, Bandspread, RF Gain. 15in x 9 1/2in x 8 1/2in. 220/240V a.c. or 12V d.c. Brand new with instructions £50. Carr. 50p.

AUTO TRANSFORMERS

0/115/230v. Step up or step down. Fully shrouded.

80W	£2-10.	P. & P. 18p
150W	£2-70.	P. & P. 18p
300W	£3-60.	P. & P. 23p
500W	£5-25.	P. & P. 33p
1,000W	£7-50.	P. & P. 38p
1,500W	£10-20.	P. & P. 43p
2,250W	£17-25.	P. & P. 50p
5,000W	£36-00.	P. & P. £1.

SDR-8V HI-FI PHONES

Input 8-16 Ohm. Frequency 20-18,000Hz stereo or mono switch, separate volume controls each ear-piece, padded headband. £28-97. P. & P. 20p.



G.W.SMITH & CO. (RADIO) LTD

10 TOTTENHAM CT. RD. LONDON, W.1 Tel: 01-637 2232 CALLERS WELCOME MONDAY TO SATURDAY 9AM-6PM

27 TOTTENHAM CT. RD. LONDON, W.1 Tel: 01-636 3715

3 LISLE STREET, LONDON, W.C.2 Tel: 01-437 8204

34 LISLE STREET, LONDON, W.C.2 Tel: 01-437 9155

311 EDGWARE ROAD, LONDON, W.2 Tel: 01-262 0387

All Mail Orders to— 11-12, Paddington Green, London, W.2 Tel: 01-262 6562

CRESCENT RADIO LTD

11 & 40 MAYES ROAD, LONDON N22 6TL 888 3206

MAIL ORDER
DEPT.
No. 11
MAYES RD.
LONDON
N22
6TL

**COMPONENTS AND HI FI
FOR THE HOME CONSTRUCTOR**
OUR SHOPS ARE OPEN ALL DAY
FROM 9 A.M. TO 6 P.M. 6.30 P.M. ON FRIDAY
(WE CLOSE ALL DAY THURSDAY)
13 SOUTH MALL, EDMONTON, N.9 803 1685

EA1000 3 WATT AUDIO AMPLIFIER

An Audio Amplifier designed around the TAA821 Linear I.C. Supply Voltage 9-24V Speaker Imp. 8-16 ohm Frequency 50Hz-25kHz Overall Size 2in x 3in x 2in Ideal Amplifier for radios, record players, stereo units, etc. Full technical data and diagrams with each module. All guaranteed and a bargain at



£2.63
+ 5p P. & P.

MINI STROBE

Another Bargain from Crescent. 1 joule output, speed variable from 2-10 flashes per sec. and powered from a.c. mains 230V-250V. Housed in its small attractive fibreglass case (size approx 6in x 4in x 4in high). Makes an ideal Strobe Unit for Discos, Experimental Work, Photography and many other uses.



£16.50
plus 38p P. & P.

74 Series I.C.s.	Price
7400	15p
7401	15p
7402	15p
7410	15p
7430	15p
7441	67p
7473	37p
7474	37p
7490	87p

Please include 5p P.&P. per 3 I.C.s.

DIGITAL CLOCK KIT

24-hr. Nixie dig. clock kit. We supply: a complete set of components; a complete set of easy to follow instructions; printed circuits made to make construction as simple as possible; a cabinet and front panel to give a professional finish. All for the price of the components: **£22.50 + 50p P. & P.** Please send S.A.E. if you require more information.



CRESCENT CASSETTES

Best quality **LOW NOISE** Cassettes, complete in standard storage case. Please note our new low price.

C60	28p
C90	38p
C120	48p

Please include 5p P. & P.



EMI LOUDSPEAKER 450 10W 13in 8m ± (two 2-2in tweeters and cross-over. All wired and ready for use. This ever-popular 450 in 3-8-15 ohm imp. **£3.25** plus 38p P. & P. each.

PRINTED CIRCUIT KIT Everything for producing your own Printed Circuits. **£1.40**, plus 10p P. & P.

MKS CALIBRATED KNOB 0-10 calibrated plastic knob with metal insert and skirt. Fixing size 6.35mm. Skirt dia. 36mm. Our price **20p** each plus 2p P. & P.

HIGH QUALITY IMPORTED HEADPHONES

1,000 Ω per phone **95p** TTC
2,000 Ω per phone **£1.05** G1105
Plus 10p P. & P. per pair.



BRIGHTNESS CONTROL

Full control over 300 watts of incandescent lighting. Thyristor light dimmer mounted on a standard switch block ready to fit into a MK, Box. Enjoy the pleasure of having the precise amount of light you require at any time. Our Price **£2.75** plus 8p P. & P. each



TRI-VOLT BATTERY ELIMINATOR

Enables you to work your Transistor Radio, Amplifier or Cassette, etc., from the a.c. mains through this compact Eliminator. Just by moving a plug you can select the voltage you require. 6, 7½ or 9 volt. This means all your transistor power pack applications can be handled by this one unit. Approx. size 2½in x 2½in x 3½in. Our Price **£2.75** plus 10p P. & P. Same model suitably wired for the Philips Cassette **£3** plus 10p P. & P.



INTEGRATED CIRCUIT SOCKETS

A must for the experimenter interested in I.C.s. 14 pin, 20p each. 16 pin, 20p each. Please include 5p P. & P. per 3 sockets.



CRESCENT 100W STEREO

A new style 100 watt per channel stereo amplifier. All loudspeaker systems, 8-15 ohm are suitable. This amplifier is designed for the D.J. and group who must have good looking and reliable equipment. A bargain at **£42**. We also have a mono 100 watt at **£42**. If you require more information please send S.A.E.

MINI LOUDSPEAKERS

2½in 8 ohm **50p**
2½in 40 ohm **50p**
Please include 5p P. & P. on each L.S.

2N3055

Popular power transistor now at our low price = **50p** each. Please include 5p P. & P.



IB40K05 Bridge Rectifier (Texas). Plastic encapsulated 50V at 4A. Approx. size 1½in x 1½in ½in. Our Price **60p** each.



ADD LUXURY TO YOUR CAR

WITH A MOTOR DRIVEN **CAR AERIAL**
Spec.: 5 Section
Extended Length 100cm
Length under Fender 40cm
Cable Length 120cm
Supplied complete with Fixing Bracket and **£5.50** plus 25p Control Switch. P. & P.



BARGAIN S.C.R. Tested Thyristor. 400V, 3amp. **45p** each. 5 for **£2**. 5p P. & P.

PSYCHEDELIC LIGHT CONTROL UNIT

Three Channel: Bass—Middle—Trebble. Each channel has its own sensitivity control. Just connect the input of this unit to the loudspeaker terminals of an amplifier, and connect three 250V up to 500W lamps to the output terminals of the unit, and you produce a fascinating sound-light display. (All guaranteed) **£18.50** plus 38p P. & P.
If you require more information please send S.A.E.



SAFEBLOC

of robust construction

Safe, quick and secure it connects 2-core and 3-core bare-ended flexible leads to the mains (A.C. only).

The concept was pioneered by Rendar, and introduced to the market 13 years ago.

Safebloc saves time. No need to fit a plug for tests. No danger, as no current can pass with the lid open.

Invaluable for testing and demonstrations in industry and shops, the work bench and the home.

Ask for Safebloc at your local stockist — or you can order it direct from the manufacturer.

If ordering by post, send cash with order.

PRICE **£2.60+10p P.&P. EACH**

Special bulk order wholesale and industrial rates on application



RENDAR®

Rendar Instruments Ltd., Victoria Road, Burgess Hill, Sussex. Tel. Burgess Hill 2642



**Brunel
Technical College, Bristol**

Ashley Down, Bristol BS7 9BU

Department of Marine and Aero-Electronics

Marine Radio and Electronic Officers

The Department offers the following Courses:

- For prospective Radio Officers in the Merchant Navy a Course of two years and one term leading to the MPT General Certificate in Radiocommunications and the DoTI Radar Maintenance Certificate. Commences September and January.
- For qualified Marine Radio or Electronic Officers the MNTB Additional Certificate in Marine Electronics, in two modules of three months each.
- Short advanced technique Courses for serving Radio Officers.
- MPT R/T Licences

Licensed Aircraft Radio Engineers

The Department provides a 2-year Full-time Course leading to a career in Civil Aviation. The Course is fully approved by the ARB so that successful students may obtain a full Category R Licence at the end of the Course. The Department's aircraft, workshops and laboratories cover:
12-1 Airborne Communication Systems
12-2 Airborne Navigation Systems
12-3 Airborne Pulse and FM Systems
Courses are also provided for Aeronautical R/T Licences and Category X Compass Licences.
Courses commence each September.

For further information apply to Head of Department of Marine and Aero-Electronics, Brunel Technical College, Ashley Down, Bristol BS7 9BU. Tel. 41241

BI-PRE-PAK



TELEPHONE DIALS

Standard Post Office type. Guaranteed in working order.

ONLY 50p

COMPLETE TELEPHONES



EX. G.P.O. NORMAL HOUSEHOLD TYPE

ONLY 95p

POST & PACKING 35p EACH

TESTED AND GUARANTEED PAKS

B2	4	Photo Cells, Sun Batteries. 0.3 to 0.5V, 0.5 to 2mA	50p
B79	4	IN4007 Sil. Rec. diodes, 1,000 PIV 1 amp. plastic	50p
B81	10	Reed Switches, mixed types large and small	50p
B99	200	Mixed Capacitors. Approx. quantity, counted by weight	50p
H4	250	Mixed Resistors. Approx. quantity counted by weight	50p
H7	40	Wirewound Resistors. Mixed types and values	50p
H8	4	BY127 Sil. Recs. 1000 PIV 1 amp. plastic	50p
H9	2	OC71 Light Sensitive Photo Transistor	50p
H12	50	NKT155/259 Germ. diodes, brand new stock clearance	50p
H28	20	OC200/1, 2/3 PNP Silicon uncodod TO-5 can	50p
H30	20	1 Watt Zener Diodes, Mixed Voltages 6-8-43V	50p
H35	100	Mixed Diodes, Germ. Gold bonded, etc. Marked and Unmarked	50p
H38	30	Short lead Transistors, NPN Silicon Planar types	50p

UNMARKED UNTESTED PAKS

B1	50	Germanium Transistors PNP, AF and RF	50p
B66	150	Germanium Diodes Min. glass type	50p
B83	200	Trans. manufacturers' rejects all types NPN, PNP, Sil. and Germ.	50p
B84	100	Silicon Diodes DO-7 glass equiv. to OA200, OA202	50p
B86	50	Sil. Diodes sub. min. IN914 and IN916 types	50p
B88	50	Sil. Trans. NPN, PNP equiv. to OC200/1, 2N706A, BSY95A, etc.	50p
H6	40	250mW. Zener Diodes DO-7 Min. Glass Type	50p
H15	30	Top Hat Silicon Rectifiers, 750mA. Mixed volts	50p
H16	8	Experimenters' Pak of Integrated Circuits. Data supplied.	50p
H17	20	3 amp. Silicon Stud Rectifiers, mixed volts	50p
H20	20	BY126/7 Type Silicon Rectifiers 1 amp. plastic. Mixed volts	50p
H34	15	Power Transistors, PNP, Germ. NPN Silicon TO-3 Can	50p

MAKE A REV COUNTER FOR YOUR CAR

The 'TACHO BLOCK'. This encapsulated block will turn any 0-1mA meter into a linear and accurate rev. counter for any car with normal coil ignition system.

£1 each



OUR VERY POPULAR 3p TRANSISTORS

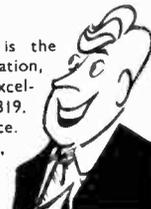
TYPE "A" PNP Silicon alloy, TO-5 can.
TYPE "B" PNP Silicon, plastic encapsulation,
TYPE "E" PNP Germanium AF or RF.
TYPE "F" NPN Silicon plastic encapsulation.

FULLY TESTED AND MARKED SEMICONDUCTORS

4p		5p	
AC107	0-15	OC170	0-23
AC126	0-15	OC171	0-23
AC127	0-17	OC200	0-25
AC128	0-15	OC201	0-25
AC176	0-20	2G301	0-13
AC177	0-20	2G303	0-13
AF239	0-30	2N715	0-50
AF186	0-20	2N1302-3	0-15
AF139	0-30	2N1304-5	0-17
BC154	0-20	2N1306-7	0-20
BC107	0-10	2N1308-9	0-22
BC108	0-10	2N3819FET	0-45
BC109	0-10		
BF194	0-15	Power Transistors	0-50
BF274	0-20		0-30
BFY50	0-15	OC20	0-25
BSY25	0-13	OC23	0-25
BSY26	0-13	OC25	0-25
BSY27	0-13	OC26	0-25
BSY28	0-13	OC28	0-30
BSY29	0-30	OC35	0-25
BSY95A	0-10	OC36	0-37
OC41	0-15	AD149	0-30
OC44	0-13	AUY10	1-25
OC45	0-10	25034	0-25
OC71	0-10	2N3055	0-50
OC72	0-10		
OC81	0-13	Diodes	0-10
OC81D	0-13	AAY42	0-09
OC83	0-18	OA95	0-09
OC139	0-13	OA79	0-09
OC140	0-15	OA81	0-09
		IN9114	0-07

F.E.T. PRICE BREAKTHROUGH!!

This field effect transistor is the 2N3823 in a plastic encapsulation, coded as 3823E. It is also an excellent replacement for the 2N3819. Data sheet supplied with device. 1-10 30p each, 10-50 25p each, 50+ 20p each.



BULK BUYING CORNER

NPN/PNP Silicon Planar Transistors, mixed, untested, similar to 2N706/6A/B, BSY26-29, BSY95A, BCY70, etc. £4-25 per 500; £8 per 1,000.

Silicon Planar NPN Plastic Transistors, untested, similar to 2N3707-11, etc., £4-25 per 500; £8 per 1,000.

Silicon Planar Diodes, DO-7 Glass, similar to OA200/202, BAY31-36, £4-50 per 1,000.

NPN/PNP Silicon Planar Transistors, Plastic TO-18, similar to BC113/4, BC153/4, BF153/160, etc., £4-25 per 500; £8 per 1,000.

OC44, OC55 Transistors fully marked and tested, 500+ at 8p each; 1,000+ at 6p each.

OC71 Transistors, fully marked and tested, 500+ at 6p each; 1,000+ at 5p each.

3823E Field effect Transistors. This is the 2N3823 in Plastic Case, 500+ 13p each; 1,000+ 10p each.

1 amp Miniature Plastic Diodes:

IN4001, 500+ at 4p each; 1,000+ at 3p each.
IN4004, 500+ at 3p each; 1,000+ at 4p each.
IN4006, 500+ at 6p each; 1,000+ at 5p each.
IN4007, 500+ at 8p each; 1,000+ at 7p each.

FREE CATALOGUE

FOR TRANSISTORS, RECTIFIERS, DIODES, INTEGRATED CIRCUITS, FULL PRE-PAK LISTS



8 RELAYS FOR 8 VARIOUS TYPES £1 P. & P. 25p

COLOUR T.V. LINE OUTPUT TRANSFORMERS

Designed to give 25kV when used with PL509 and PY500 valves. As removed from colour receivers at the factory.

NOW ONLY 50p each post and packing 23p.

Quantity	1-10	10-50	50+
BB105 Varicap Diodes	10p	8p	6p
OC71 or 72 Fully Tested Unmarked	5p	5p	4p
Matched Sets 1-OC44 and 2-OC45's. Per Set	25p	20p	15p
Matched Sets of OC45's 1st and 2nd IF	15p	12p	10p
OA47 Gold-Bonded Diodes. Marked and Tested	3p	3p	2p
1-watt Zener Diodes 7-5, 24, 27, 30, 36, 43 Volts	5p	4p	3p
10-watt Zener Diodes 5-1, 8-2, 11, 13, 16, 24, 30, 100 Volts	20p	17p	15p
Micro Switches, S/P, C/O	25p	20p	15p
1-amp Bridge Rec's 25-volt	25p	23p	20p

INTEGRATED CIRCUITS

Quantity	1-10	10-50	50+
SL403D Audio Amp., 3-Watts	2-00	1-95	1-80
709C Linear Opp. Amp	25p	20p	15p
Gates, Factory Marked and Tested by A.E.I.	25p	22p	20p
J. K. Flip-Flops Factory. Marked and Tested by A.E.I.	40p	35p	30p
SN7490 Decade Counter	50p	45p	40p
UL914 Dual 2 1/P Gate	40p	35p	30p

LOW COST DUAL INLINE I.C. SOCKETS

14 pin type at 15p each
16 pin type at 16p each.

BOOKS

We have a large selection of Reference and Technical Books in stock. These are just two of our popular lines:

B.P.I. Transistor Equivalents and Substitutes: This includes many thousands of British U.S.A., European and C.V. equivalents. **40p**

The Hi-Fi Radio Valve & Transistor Data Book 9th Edition: Characteristics of 3,000 valves and tubes, 4,500 Transistors, Diodes, Rectifiers and Integrated Circuits. **75p**

Send for lists of these English publications.

Please send me the FREE Bi-Pre-Pak Catalogue.

NAME.....
ADDRESS.....

MINIMUM ORDER 50p. CASH WITH ORDER PLEASE. Add 10p post and packing per order. OVERSEAS ADD EXTRA FOR POSTAGE

BI-PRE-PAK LTD

DEPT. A. 222-224 WEST ROAD, WESTCLIFF-ON-SEA, ESSEX
TELEPHONE: SOUTHEND (0702) 46344

DISCOUNTS UP TO

60% ON BRANDED GOODS

* ALL BRAND NEW in manufacturer's sealed cartons. GUARANTEED 12 MONTHS.

SPECIAL OFFER
Garrard SP25 Mk. III £17.95
Goldingr G800
Teak plinth and tinted cover.
All leads supplied
Please add £1.25 for P. & P.

TURNTABLES

Please add 75p post & packing

Garrard SP25 Mk. III £9.45
Garrard AP75 £18.75
Garrard SL65B £12.75
Garrard 1025T + cart. £5.97
Garrard 401 £26.50
Garrard Zero 100 (Auto) £38.25
Garrard Zero 100 (Single) £36.25
BSR MP60 £9.50
Goldingr GL72 £21.95
Goldingr GL72/P £29.00
Goldingr GL75 £26.95
Goldingr GL75/P £34.25
Leak Delta £53.95
Wharfedale Linton + cart. £26.95
Thorens TD 125 £97.25
Thorens TD125AB £88.00
Thorens TD150 Mk. II £27.25
Thorens TD150A Mk. II £33.00

AMPLIFIERS

Please add 75p post & packing

Amstrad 8000 Mk. II £16.25
Amstrad IC2000 £26.95
Armstrong 521 (Teak cased) £43.75
Alpha Highgate 212 £25.00
Alpha Highgate FA300 £27.95
Alpha Highgate FA400 £31.95
Ferroglyph F307 Mk. II (Wood cased) £47.50
(Metal cased) £45.00
Leak Delta 30 £47.50
Leak Delta 70 £55.50
Metrosound ST20E £24.45
Metrosound ST60 £46.25
Pioneer SA900 £92.00
Pioneer SA1000 £94.00
Rogers R/brook (Chassis) £35.00
Rogers R/brook (Cased) £37.00
Rogers R/bourne (Chassis) £41.50
Rogers R/bourne (Cased) £46.50
Scaneltra HT58 £29.75
Sinclair PR060 2 Z30/PZ5 £17.35
Sinclair PR060 2 Z30/PZ6 £17.35
Sinclair PR060 2 Z50/PZ8/Trans £21.50
Sinclair AFU (Filter Unit) £4.40
Sinclair 605 £18.50
Sinclair 2000 Mk. II £21.50
Sinclair 3000 Mk. II £29.50
Wharfedale Linton £39.50
Goodmans Max Amp £37.95
Teleton SAQ 206B £20.50
Teleton SAQ 306 £22.50
Europhon 10 + 10 £16.95

TUNERS
Please add 75p post & packing

Armstrong 523 £39.00
Armstrong 524 £30.50
Rogers R/brook FET4 (Chassis) £31.00
Rogers R/brook FET4 (Cased) £35.00
Rogers R/bourne FET4 (Chassis) £43.00
Rogers R/bourne FET4 (Cased) £48.00
Sinclair PR060 (Module) £18.25
Sinclair 2000/3000 Tuner £32.50
Philips RH690 £33.00
Leak Delta FM (Cased) £54.25
Leak Delta AM/FM (Cased) £65.25

TUNER/AMPLIFIERS
Please add 75p post & packing

Armstrong 525 (Teak cased) £67.95
Armstrong 526 AM/FM £77.95
Leak Delta 75 £127.25
Philips RH781 £50.00
Philips RH882 (+cass. head) £72.00
Philips RH702 £82.50
Teleton 2100 £29.95
Goodmans One Ten Rogers Ravensbrook £103.25
(Teak cased) £79.50
Rogers R/brook (Chassis) £73.95
Scaneltra 1515 AM/FM £102.50
Scaneltra 3030 FMG £110.50
Scaneltra 1515 FM £74.50

SPEAKERS
Please add £1.25 for post & packing Price per pair

Amstrad 138 £19.95
Wharfedale Denton 2 £27.95
Wharfedale Linton 2 £36.25
Wharfedale Melton 2 £47.25
Wharfedale Dovedale 3 £60.50
Celestion Ditton 120 £38.00
Celestion Ditton 15 £53.95
Celestion Ditton 25 £89.00
Goodmans Double Maxim £47.50
Goodmans Mezzo 3 £44.00
Goodmans Magister £74.00
Sinclair Q16 £12.50

CARTRIDGES
Please add 10p post & packing

Goldingr G850 £3.45
Goldingr G800 £5.95
Goldingr G800E £10.00
Goldingr G800 Super E £15.15
Shure M3D £37.75
Shure MA9E £55.00
Shure MS5E £6.50
Shure M75E Type 2 £10.50
Sonotone 9T4HC £1.55

£3.20*
Plus 35p P. & P.
Finished in teak veneer with tinted dust cover. (Fully assembled). For Garrard SP25, 2025TC, 3000; AT60; 2000; 2500; 3500; 5100; 1025; SL65B; Also for BSR, McDonald MP60 and others.
For AP75; AP75; SL72B; SL75; SL95B; £4.20 plus 35p P. & P.
Also finished in walnut to match Japanese equipment—at no extra.



GLOBAL AUDIO DISCOUNT WAREHOUSES

Dept. PE 10 174 Pentonville Road, London, N1. Telephone 01-278 1769
Or: 4 High View Parade, Redbridge Lane East, Woodford Avenue, Ilford, Essex. Tel: 01-550 1086.

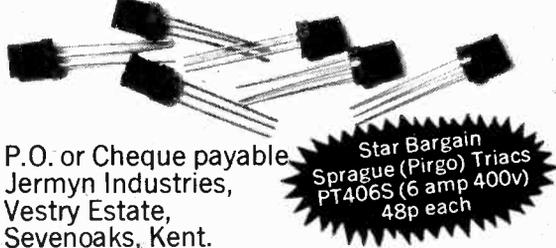
Open Monday to Saturday 9.30 a.m. to 6 p.m. LATE NIGHT FRIDAY 7 p.m.
MAIL ORDERS: Order with confidence. Send Postal Order, Cheque, Money Order, Bank Draft, Giro or Cash by Registered Mail. CALLERS: Please note that cheques can only be accepted together with cheque cards (not Barclay Card).

JERMYN 50p BARGAIN PACKS

All fully coded, all from well-known manufacturers and now available, while stocks last, at better than bulk-buyer's prices! Cash with order only.

1N4148 Signal Diode 18 for 50p (= 1N914)
1N5060 1 Amp Rectifier 400V avalanche protected 7 for 50p (=A14D)
2N2923 NPN Silicon Transistor hfe 90 - 180 (25v) 7 for 50p
2N2926 NPN Silicon Transistor hfe 55 - 110 8 for 50p (Red)
2N391A Si NPN Hi Gain (250 - 500) low noise transistor 3 for 50p
2N3402 Medium power (driver) 900mw 25v Hfe 75 - 225 6 for 50p
C6U 1.6 amp general purpose 25v SCR in T05 case 3 for 50p

Post and packing 10p for 1 or 2 packs; 3 packs or more post free.
Order any quantity, till sold (but we regret packs cannot be subdivided).



P.O. or Cheque payable Jermyn Industries, Vestry Estate, Sevenoaks, Kent.

VALVES SAME DAY SERVICE NEW! TESTED! GUARANTEED!

SETS		1R5, 1R5, 1T4, 384, 3V4, DAF91, DF91, DL92, DL94.		Set of 4 for £1.12. DAF96, DF96, DK96, DL96. 4 for £1.55.						
1R5	28	30C1	28	EABC80	32 EM80	38	PCL83	57	UAF42	50
1R5	22	30C15	58	EAF42	50 EM81	38	PCL84	84	UBC41	52
1T4	18	30C17	70	EB41	40 EM84	32	PCL85	38	UBF80	34
384	28	30C18	81	EB91	10 EM87	34	PCL86	38	UBF89	32
3V4	47	30F5	84	EBC33	40 EY1	38	PCL88	65	UCB4	32
J14G	31	30FL1	72	EB41	54 EY36	29	PCL80	75	UCB9	35
5V4G	35	30FL12	69	EBF90	22 EZ40	43	PENA4	77	UCF80	32
5Y3GT	84	30FL14	68	EBF90	32 EZ41	43	PEN36C	70	UCF82	58
5Z4G	35	30L1	29	EBF89	29 EZ80	22	PFL200	52	UCH81	32
6/30L2	54	30L15	57	ECC81	17 EZ31	23	PL36	49	UCL82	32
6AL5	11	30L17	67	ECC82	20 G20	34	PL81	44	UCL83	55
6AM6	13	30P4	57	ECC83	35 G22	40	PL81A	47	UF41	56
6AQ5	22	30P12	72	ECC85	24 GZ34	48	PL82	31	UF89	30
6AT6	20	30P19	57	ECC804	54 KT41	77	PL83	33	UL41	57
6AU6	20	30PL1	60	ECC80	31 KT61	55	PL84	30	UL44	£1.00
6BA6	20	30PL13	89	ECC82	26 KT66	78	PL500	63	UL84	30
6BE6	21	30PL14	65	ECC85	55 LN319	63	PL504	63	UM84	28
6BJ6	41	35L6GT	46	ECH42	59 LN329	72	PM84	33	UY41	39
6BW7	58	35W4	26	ECH81	29 LN339	69	PM85	95	UY85	28
6F14	40	35Z4G	25	ECH83	40 N78	87	PY32	55	VF43	77
6F23	68	807	45	ECH84	38 P61	40	PY83	55	W77	43
6F25	58	AC/VP2	77	ECL80	35 PABC90	34	PY81	25	Z77	22
6G7G	84	B349	65	ECL82	31 PC86	47	PY82	25	Transistors	
6K7G	12	B729	62	ECL86	35 PC88	47	PY83	28	AC107	17
6M8U	17	CC135	67	EF39	38 PC96	42	Y88	33	AC127	18
6Q7G	30	EF41	69	EF41	39 PC97	39	Y89	34	AC140	37
6N87GT	30	DAF91	22	EF80	23 PC90	31	Y801	34	AF115	20
6V6G	28	DAF96	38	EF85	28 PC84	29	R19	30	AF116	20
6V6GT	28	DF33	38	EF86	30 PC85	25	R20	58	AF117	20
6X4	23	DF91	16	EF89	26 PC88	40	U25	64	AF118	48
6X5GT	28	DF96	38	EF91	13 PC89	45	U26	56	AF125	17
10F13	58	DH77	20	EF92	30 PC89	48	U47	64	AF127	17
12AU6	95	DK92	38	EF94	65 PC805	51	U49	58	OC81	25
12AT7	17	DK91	28	EF183	28 PCF80	28	U50	28	OC44	18
12AU6	20	DK92	50	EF184	31 PCF82	33	U52	31	OC45	18
12AU7	20	DK96	45	EH90	35 PCF86	48	U78	24	OC71	12
12AX7	22	DL35	40	EL33	55 PCF800	58	U191	59	OC72	12
19B6G6	80	DL92	28	EL34	45 PCF801	28	U193	42	OC75	12
20P2	67	DL94	47	EL41	54 PCF802	40	U251	68	OC81	18
20P3	77	DL96	38	EL84	65 PCF805	61	U301	58	OC81	12
20P4	92	DY86	24	EL90	26 PCF806	56	U329	68	OC82	18
25L6GT	18	DY87	24	EL95	33 PCF808	68	U801	80	OC82D	12
26U4GT	37	DY802	33	EL900	62 PCL82	32	UABC80	32	OC170	23

READERS RADIO 85 TORQUAY GARDENS, REDBRIDGE, ILFORD, ESSEX. Tel. 01-550 7441

Post/Packing on 1 valve 7p, on 2 or more valves 3p per valve extra.
Any parcel insured against damage in transit 3p extra.

VARIABLE VOLTAGE TRANSFORMERS

INPUT 230/240V a.c. 50/60 OUTPUT VARIABLE 0.260V

All Types from ½ to 50 amp from stock.

SHROUDED TYPE

1 amp, £7.00	20 amp, £49.00
2.5 amp, £8.05	25 amp, £58.00
5 amp, £11.75	37.5 amp, £82.00
10 amp, £22.50	50 amp, £98.00
15 amp, £25.00	

(Panel Mounting) ½ amp, £4.75.
1 amp, £7.00. 2½ amp, £8.05. All carriage paid.



2.5 amp OPEN TYPE

L.T. TRANSFORMERS

All primaries 220-240V	Type No.	Sec. Taps	Price	Carr.
1	30, 32, 34, 36V at 5A		£4.68	45p
2	30, 40, 50V at 5A		£6.88	45p
3	10, 17, 18V at 10A		£4.95	45p
4	6, 12V at 20A		£6.43	45p
5	17, 18, 20V at 20A		£7.28	55p
6	6, 12, 20V at 20A		£6.88	55p
7	24V at 10A		£5.23	45p
8	4, 6, 24, 32V at 12A		£7.15	45p
9	6 and 12V at 10A		£3.75	45p

220/240 VOLT A.C. CENTRIFUGAL FAN/BLOWER

Smooth, balanced running unit. Two pole shaded pole Mycalex motor gives approximately 90 cubic ft./min. but draws only 240mA on run. Weight 2½lb. Case dia. 3 1/8 in. depth (case only) 3 1/2 in. width overall (inc. motor) 5.25 in. aperture 3 1/2 in. 1.85 in. Price only £2.95. P. & P. 25p.



12 VOLT D.C. MOTOR

Powerful 1 amp. REVERSIBLE motor. Speed 3,750 r.p.m. complete with external gear train (removable) giving approx. final speed of either 125 r.p.m. or 240 r.p.m. Size: 4 1/2 in x 2 1/2 in dia. Either type price 95p inc. post.



230V/240V COMPACT SYNCHRONOUS GEARED MOTORS

Manufactured by either Sangamo, Hayden or Smith. Built-in gearbox.

1 r.p.m. cw.	1 r.p.h. a/cw.	10 r.p.h. a/cw.
60 r.p.m. cw.	2 r.p.h. cw.	15 r.p.h. a/cw.
	3 r.p.h. a/cw.	20 r.p.h. cw.
	6 r.p.h. cw.	30 r.p.h. cw.

cw. = clockwise rotation; a/cw. = Anticlockwise. Fraction of makers' price. All at 75p incl. P. & P.



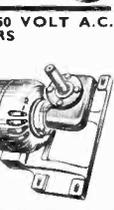
CONSTANT SPEED, PRECISION MADE 6 VOLT D.C. GOVERNED MOTOR

Seven pole armature, ballrace bearing. 2,750 r.p.m. Length 2 1/8 in. Dia. 1 1/2 in. Shaft length 3/8 in. Shaft dia. 5/64 in. No load 40 mA. Normal load 350 mA. Ideal for portable recorders, etc. Price £1.25 P. & P. 10p.



PARVALUX TYPES D19 230/250 VOLT A.C. REVERSIBLE GEARED MOTORS

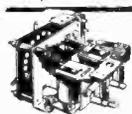
30 r.p.m. 40 lb. ins. Position of drive spindle adjustable to 3 different angles. Mounted on substantial cast aluminium base. Ex-equipment. Tested and in first-class running order. A really powerful motor offered at a really low price. maker's price. £6.30. P. & P. 50p.



17 WAY SELECTOR SWITCH with RESET COIL

This fascinating electro mechanical device can be switched through 17 positions, and can be reset from any position by energising the reset coil.

110 volt operation, or 230/240V a.c. with 500 ohm, 10W resistor, or 50V d.c. Two for £1. P. & P. 10p.



600 WATT DIMMER SWITCH.

Easily fitted. Fully guaranteed by makers. Will control up to 600W of all lights except fluorescent at mains voltage. Complete with simple instructions. £3 incl. P. & P.



UNISELECTOR SWITCHES

NEW 4 Bank 25 Way
24V d.c. operation. £5.88. P. & P. 25p. **6 Bank 25 Way**
24V d.c. £6.50. P. & P. 25p. **8 Bank 25 Way, 24V d.c.**
operation. £7.62 plus 25p. P. & P.



230V A.C. SOLENOID

Extremely powerful with approx. 14lb pull, 1in travel. Fitted with mounting feet. Size: 4in long, 2 1/2 in wide, 3in high. £2.00 incl. P. & P.



230-250 VOLT A.C. SOLENOID
Manufactured by Westcoy Ltd. (similar in appearance to above illustration). Approx. 1 1/2 lb pull. Feet size 1 1/2 in x 1 1/2 in. Price 85p incl. P. & P.

18-24 VOLT D.C. SOLENOID
Size: O.A.L. 3 1/2 in x 1 1/2 in. Max. push 1 1/2 lb. approx. PRICE: 75p incl. P. & P.

STROBE! STROBE! STROBE!

Build a Strobe Unit, using the latest type Xenon white light flash tube. Solid state timing and triggering circuit. 230/250V operation.

EXPERIMENTERS' ECONOMY KIT
Speed adjustable 1 to 36 Flash per sec. All electronic components including Veroboard S.C.R. Unijunction Xenon Tube and instructions £6.30, plus 25p P. & P.

NEW INDUSTRIAL KIT
Ideally suitable for schools, laboratories, etc. Roller tin printed circuit. New trigger coil, plastic thyristor. Speed adjustable 1-80 f.p.s. Price £10.50. P. & P. 50p.

HY-LYGT STROBE MK III
This strobe has been designed and produced for use in large rooms, halls and the photographic field and utilises a silica plug-in tube for longer life expectancy, printed circuit for easy assembly, also a special trigger coil and output capacitor. Speed adjustable 0-30 f.p.s. Light output approx. 4 joules. £12.00. P. & P. 50p. **SPECIALY DESIGNED. FULLY VENTILATED METAL CASE.** For industrial or Hy-Lygt. Including reflector. £4.00 P. & P. 45p. Post paid with kit.

THE 'SUPER' HY-LYGT KIT

Approx. four times the light output of our well proven Hy-Lyght strobe. Incorporating:

- Heavy duty power supply.
- Variable speed from 1-23 flash per sec.
- Reactor control circuit producing an intense white light.

Never before a Strobe Kit with so HIGH an output at so LOW a price. ONLY £20 plus 75p P. & P.

ATTRACTIVE, ROBUST, FULLY VENTILATED METAL CASE specially designed for the Super Hy-Lyght Kit including reflector £7.00 P. & P. 45p. **7-inch POLISHED REFLECTOR** Ideally suited for above Strobe kits. Price 53p. P. & P. 13p or post paid with kits.

6 INCH COLOUR WHEEL

As used for disco lighting effects, etc. £5.75 incl. P. & P. can be operated from our one r.p.m. synchronous motor price 75p incl. P. & P.

INSULATION TESTERS NEW!

Test to I.E.E. Spec. Rugged metal construction, suitable for bench or field work, constant speed clutch. Size L.8in, W.4in, H.6in, weight 6lb. 1,000V, 1,000 megohms. £34.00 carriage paid. 500V, 500 megohms, £28 incl. P. & P.



36V 30 AMP. A.C. or D.C. VARIABLE L.T. SUPPLY UNIT

INPUT 220/240V a.c.
OUTPUT CONTINUOUSLY VARIABLE 0-36V Fully isolated. Fitted in robust metal case with Voltmeter, Ammeter Panel Indicator and handles. Input and output fully fused. Ideally suited for Lab. or Industrial use. £68 plus £2 P. & P.



240V A.C. SOLENOID FLUID VALVE

Will handle liquids or gases up to 7 p.s.i. Forged brass body, stainless steel core and spring. 3/8 in b.s.p. inlet/outlet. Precision made, British mfg. PRICE: £1.75. P. & P. 20p. Special quotation for quantity. (New in makers' carton)



PROGRAMME TIMERS

(Mfg. by Magnetic Devices Ltd.). 240V a.c. 5 r.p.m. Crouzet motor. Drives 15 cams, each operating variable, allowing innumerable combinations. Ideally suited for machinery control, automation, etc. Also in the field of entertainment, for chaser lights, animated displays, etc. PRICE £5.75. P. & P. 25p.



MOTOROLA MAC II/6 PLASTIC TRIAC 400 11V 10 AMP

Now available **EX STOCK**, Supplied with full data and applications sheet. Price £1.05. P. & P. 7p. Suitable DIAC (RCA 40583) 30p each.

Superior Quality Precision Made NEW POWER RHEOSTATS



100 WATT. 1 ohm, 10A; 5 ohm, 4.7A; 10 ohm, 3A; 25 ohm, 2A; 50 ohm, 1.4A; 100 ohm, 1A; 250 ohm, 0.7A; 500 ohm, 0.45A; 1 kΩ, 280 mA; 1.5 kΩ, 230mA; 2.5 kΩ, 2A; 5 kΩ, 140mA. Diameter 3/8 in Shaft length 1/2 in, dia. 1/8 in. All at £1.65 each. P. & P. 7p.

50 WATT. 1/5/10/25/50/100/250/500/1/1/1/5/2/5/5kΩ. All at £1.15 each. P. & P. 7p.

25 WATT. 10/25/50/100/250/500/1/1/1/5/2/5/5/5kΩ. All at 90p each. P. & P. 7p.

Black Silver Skirted knob calibrated in Nos. 1-9. 1 1/2 in. dia. brass bush. Ideal for above Rheostats, 18p ea.

RELAYS SIEMENS, PLESSEY, Etc. MINIATURE RELAYS

Col. (1)	1	2	3	4
Col. (1) coil ohms	52	3-6	2 c/o	63p
Col. (2)	410	10-18	4 c/o	73p
Working d.c. volts	600	12-24	4 c/o	78p
	700	16-24	4M 2B	63p
	700	16-24	4 c/o	78p
Col. 3	700	12-24	2 c/o	63p
Contracts	700	15-35	2 c/o HD	73p
	700	16-24	6M	65p
Col. (4)	700	6-12	1 c/o HD	50p
Price	700	20-30	6 c/o	75p
	1,250	24-36	4 c/o	63p
HD =	2,500	36-45	6M	63p
Heavy duty	2,400	30-48	4 c/o	50p
*Incl. Base	9,000	40-70	2 c/o	50p
Post paid.	15k	85-110	6M	50p

12 VOLT D.C. RELAY 140 ohm coil

Three sets c/o contacts rated at 5 amps. 78p including P. & P. (Similar to illustration below.)



'DIAMOND H' 230 VOLT A.C. RELAYS (Unused)

Three sets c/o contacts rated at 5 amps. PRICE: 50p. P. & P. 10p. (100 lots £40 including P. & P.)

230 VOLT A.C. RELAYS MFG. KEY SWITCH

One set c/o contacts rated at 7.5 amps. Boxed. PRICE: 40p. P. & P. 5p. (100 lots £32 inc. P. & P.)

MINIATURE RELAYS

9-12V d.c. operation. Two c/o 500 mA. contacts. Size only 1in x 1/2 in. Price 58p post paid. 230V a.c. operation. Two c/o 500 mA. contacts. 3,200 ohm coil. Size only 1in x 1/2 in x 1/2 in. 43p post paid.

VENNER Electric Time Switch

200/250V Ex. G.P.O. Tested. Manually set 2 on, 2 off every 24h. Override switch: 15A £3.25, 20A £3.75. P. & P. 20p. Also available with solar dial ON dusk, OFF dawn. Price as above.



G.E.C. 12 WAY 15 AMP CONNECTORS

NEW in makers carton. BAKELITE £1.25 per doz. FLEXIBLE £1.50 per doz. Post paid (Minimum 1 doz).



LIGHT SOURCE AND PHOTO CELL MOUNTING

Precision engineered light source with adjustable lens assembly and ventilated lamp housing, to take MBC bulb. Separate photo cell mounting assembly for ORP12 or similar cell. Both units are single hole fixing. Price per pair £2.75. P. & P. 18p.



LIGHT SENSITIVE SWITCHES

Kit includes ORP.12 Photocell, Relay Transistor Circuit. For 6 or 12V D.C. operation. Price £1.50 plus 12p P. & P. **ORP. 12 and Circuit 63p post paid.** **220/240V A.C. MAINS MODEL** Mains transformer, rectifier, relay, 1 make 1 break H.D. contacts. price incl. circuit £2.65. P. & P. 20p.



50 IN I ELECTRONIC PROJECT KIT

50 easy to build Projects. No soldering, no special tools required. The kit includes Speaker, Meter, Relay, Transformer, plus a host of other components and a 56-page instruction leaflet. Some examples of the 50 possible Projects are: Sound Level Meter, 2 Transistor Radio, Amplifier, etc. Price £7.75. P. & P. 30p.

'HONEYWELL' LEVER OPERATED MICRO SWITCH

15 amps 250 volt a.c. c/o contacts. NEW in maker's carton. PRICE: 10 for £1.90 incl. P. & P.



D.C. AMMETERS NEW!

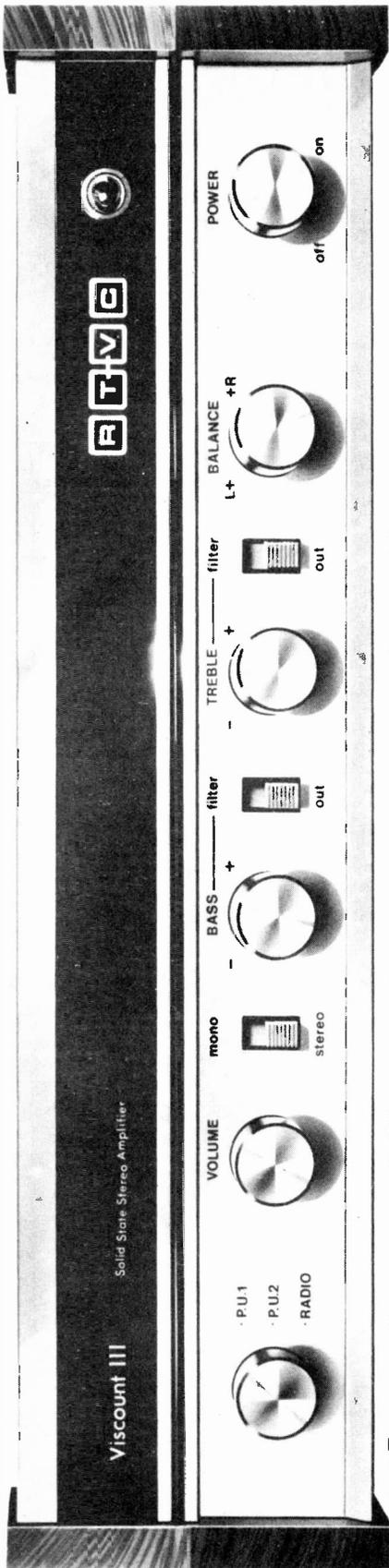
1A, 5A, 15A, 20A, £1.75, incl. P. & P. 0-300V a.c., £1.90, incl. P. & P.



All Mail Orders—Callers—Ample Parking
Dept. PE6, 57 BRIDGMAN ROAD
LONDON W4 5BB
Phone 01-995 1560
Showroom open Mon.-Fri.

SERVICE TRADING CO.

Personal callers only. Open Sat.
9 LITTLE NEWPORT STREET
LONDON WC2H 7JJ
Phone 01-437 0576



Viscount III
Solid State Stereo Amplifier

The Specification sounds fine the System sounds great

Viscount III Audio Suite complete £49

14 + 14 watts r.m.s. 40 Hz to 40kHz ± 3dB. Total distortion at 10 watts at 1 kHz — 0.1%

This is real value for money! We have designed 3 systems and the heart of them all is the Viscount III amplifier. A unit of great eye appeal with teak finished cabinet. It is available in 2 versions—R100 for ceramic cartridges and R101 for magnetic and ceramic. FET's (Field effect transistors) are incorporated on the input stages, just like top priced units. FET's give you more of the signal you want and almost none of the hiss you don't. Both units have output sockets for headphones and tape recorder. Filters and tone controls give a wide range of bass and treble adjustment.

For all systems we have chosen the famous Garrard SP25 Mk. III deck which comes complete with simulated teak plinth and dust cover.

The exclusive Duo loudspeaker systems are incomparable for quality within their price range. Large speakers in extremely substantial cabinets. There's a choice of the Duo II's for the smaller room or the big Duo III's for real bass response.

PRICES SYSTEM 1

Viscount III R101 amplifier £22.00+90p p&p
2 x Duo Type II speakers £14.00+£2 p&p
Garrard SP25 Mk. III with MAG. cartridge plinth and cover £23.00+£1.50 p&p
Total £59.00

Available complete for only £52 + £3.50 p&p

SYSTEM 2

Viscount R101 amplifier £22.00+90p p&p
2 x Duo Type III speakers £32.00+£3 p&p
Garrard SP25 Mk. III with MAG. cartridge, plinth and cover £23.00+£1.50 p&p
Total £77.00

Available complete for £69 + £4 p&p

SYSTEM 3

Viscount III Amplifier R100 £17.00+90p p&p
2 x Duo Type II speakers, pair £14.00+£2 p&p
Garrard SP25 Mk. III with CER, diamond cartridge, plinth and cover £21.00+£1.50 p&p
Total £52.00

Available complete for only £49 + £3.50 p&p

SPEAKERS

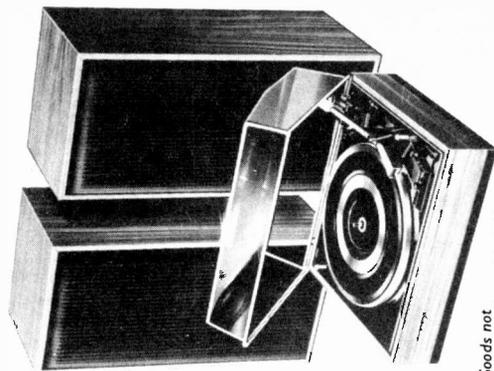
Duo Type II
Size approx. 17in x 10½in x 6½in. Drive unit 13in x 8in with parasitic tweeter. Max. power 10 watts, 8 ohms. Simulated Teak cabinet. £14 pair + £2 p&p.

Duo Type III

Size approx. 23in x 11½in x 9½in. Drive unit 13½in x 8½in with H.F. speaker. Max. power 20 watts at 3 ohms. Freq. range 20Hz to 20kHz. Teak veneer cabinet. £32 pair + £3 p&p.

SPECIFICATION R101

14 watts per channel into 3 to 4 ohms (suitable 3-15 ohms). Total distortion @ 10W @ 1kHz 0.1%. P.U.1. (for ceramic cartridges) 150mV into 3 Meg. P.U.2. (for magnetic cartridges) 4mV @ 1kHz into 47K equalised within ±1dB R.I.A.A. Radio 150mV into 220K. (Sensitivities given at full power). Tape out facilities: headphone socket, power out 250mW per channel. Tone controls and filter characteristics: Bass: +12dB to -17dB @ 60Hz. Bass filter: 6dB per octave cut. Treble control: treble +12dB to -12dB @ 15kHz. Treble filter: 12dB per octave. Signal to noise ratio: (all controls at max) R101—P.U.1 and radio—65dB. P.U.2 —58dB. R100 same as R101 but P.U.2 (for crystal cartridges) 450mV into 3 Meg. Cross talk better than -35dB on all inputs. Overload characteristics better than 26dB on all inputs. Size approx. 13½in x 9in x 3½in.



Goods not despatched outside U.K.

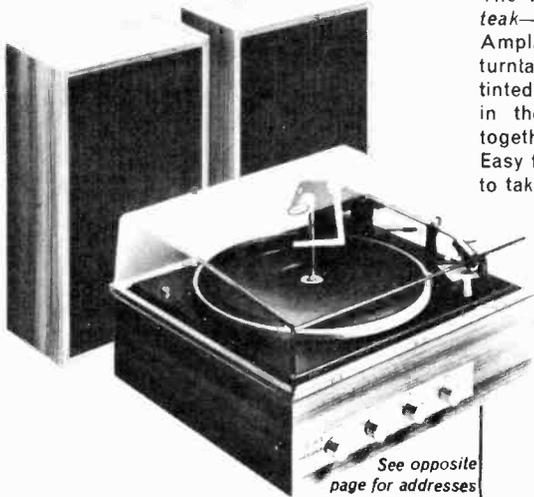


S.A.E. for fully illustrated leaflet.

Radio and TV Components (Acton) Ltd.
21d High Street, Acton, London W3 6NG
323 Edgware Road, London, W2. Mail orders to Acton. Terms C.W.O. All enquiries S.A.E.

£25

takes the wraps off
UNISOUND
 a new concept in stereo



See opposite page for addresses

The whole system is complete including superb cabinets in simulated teak—just simply screw together the components and you save pounds! Amplifier is based on the famous Mullard Unilex system. Garrard 2025TC turntable complete with stereo ceramic cartridge, teak simulated plinth and tinted acrylic cover. Plus the big 13" x 8" EMI speakers ready for mounting in their elegant cabinets which simply need screwing and gluing together. All glue and screws supplied.

Easy to follow step-by-step instructions guide you quickly and effortlessly to taking the wraps off truly realistic stereo sound.

£25 complete plus £2'80 P. & P.

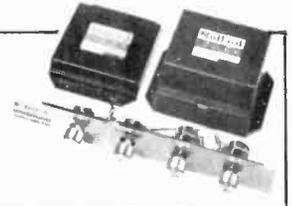
Power output: 4 watts per channel into 8 ohms.

Inputs: 120 mV (for ceramic cartridges)



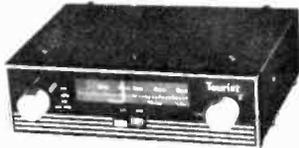
UNISOUND MODULES ONLY £6-95

If you prefer, you can buy the three modules—pre-amplifier, power supply dual power amplifier, and control panel—by themselves for only £6-95. P. & P. 50p extra. No soldering, just simply screw together with screw-driver supplied. Their overall specification is the same as shown for the complete Unisound console.



TOURIST

**MARK 3
 CAR RADIO
 ALL TRANSISTOR**



Beautifully designed to blend with the interiors of all cars. Permeability tuning and long wave loading coils ensure excellent tracking, sensitivity and selectivity on both wave bands. R.F. sensitivity at 1MHz is better than 8 micro volts. Power output into 3 ohm speaker is 3 watts. Pre-aligned I.F. module and tuner together with comprehensive instructions guarantees success first time. 12 volts negative or positive earth. Size 7in 2in 4 1/2in deep.

Circuit diagram 13p. free with parts Speaker, baffle and fixing kit £1'25 extra plus P. & P. 25p

**SET OF PARTS
 £6-30** Plus P. & P. 50p

Speaker postage free when ordered with parts



**DUETTO MK. II I.C.
 STEREO AMPLIFIER**

Sophisticated styling combined with up-to-date electronics means Hi-Fi. This is what the Duetto Mk. II offers at a realistic price. Mullard built stereo pre-amplifier tone control module and the highly efficient I.C. monolithic power chips ensure reliability, very low distortion at all power levels, correct operation in all ambient temperatures, full power over the audio spectrum, etc.

Inputs: P.U. 150mV @ 2.2 Meg. (for cer. cartridge). Auxiliary 100mV @ 1 Meg. (for radio, tape, etc.).
Outputs: 5 watts rms per channel into 8 15Ω speakers. Switched stereo headphone socket with power correction.
Controls: Mono/stereo switch, selector switch, treble, bass, volume, balance and on/off switch. Neon indicator.
Tone Controls: Treble ± 14dB @ 15kHz. Bass ± 14dB @ 60 Hz.
Power Bandwidth: ± 2db 20Hz - 25kHz.

£10-50 plus P. & P. 60p



RELIANT MK. IV

The Reliant Mk. IV provides a high standard of sound reproduction, with full mixing facilities. Its versatility makes it suitable for: Discotheque, P.A., Home Entertainment Applications, etc.

- ★ Five Electronically Mixed Inputs
- ★ Three Individual Mixing Controls
- ★ Separate bass and treble controls common to all five inputs
- ★ Mixer employing F.E.T. (Field Effect Transistor)
- ★ Solid State Circuitry
- ★ Attractive Styling

1. Crystal Mic. or Guitar 9mV. 2. Moving coil Mic. or Guitar 8mV. Inputs 3, 4 and 5 are suitable for a wide range of medium output equipment (Gram, Tuner, Monitor, Organ, etc.). All 250mV sensitivity.

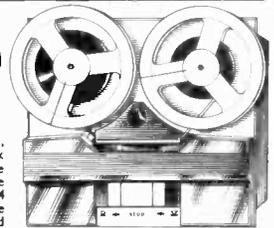
CONTROLS: 3 Volume controls. Bass control range -13dB @ 60 Hz. Treble control range -12dB @ 15kHz. Separate ON/OFF Switch. Neon Indicator.
POWER OUTPUT: 12 Watts R.M.S. into 3 to 4 16Ω speaker.

SIGNAL/NOISE: Better than -60dB on inputs 3, 4 and 5 and -50dB on 1 and 2.
SUPPLY: 220 to 250V A.C. Mains.
SIZE: 12 1/2in 6in 3 1/2in.

**PRICE
 £9-50**

Plus P. & P. 60p

**CONTINENTAL
 4-TRACK, 3-SPEED
 TAPE DECK**



with high impedance heads

R.C. 74 tape deck. Three speeds—7 1/2, 3 1/2 and 1 1/2 i.p.s. 4-track record/playback head. Plus 4-track erase head. Positive pressure pad system. Takes any tape spool up to and including 7in. The R.C. 74 is driven by a powerful 200/250V 50-cycle a.c. motor. A heavy, accurately balanced flywheel brings wow and flutter levels down to approx. 0.3% total at 3 1/2 and 7 1/2 i.p.s. Fast rewind in both directions. Controls couldn't be simpler! Just five push buttons that interlock to cut out accidental tape damage. Efficient servo-action type braking. Easy drop-in tape loading.

The R.C. 74 comes with an attractive moulded deck cover, which has positions for tone and volume controls. The unit is built into a rigid die-cast frame, and overall size of the whole unit is 12 1/2 x 11 1/2 x 6in. Every single deck fully tested before dispatch. Spools not supplied. £15. Plus 75p P. & P.

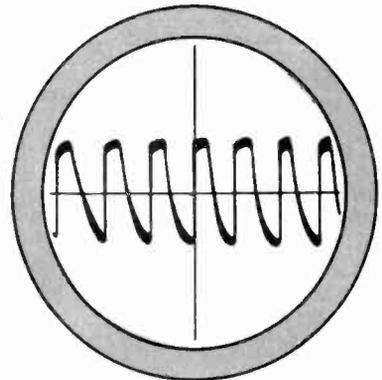


See opposite page for addresses

look! electronics really mastered

**... practical
... visual
... exciting!**

no previous knowledge
no unnecessary theory
no "maths"



RAPY

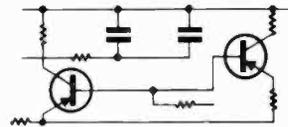
BUILD, SEE AND LEARN

step by step, we take you through all the fundamentals of electronics and show how easily the subject can be mastered. Write for the free brochure now which explains our system.

1/ BUILD AN OSCILLOSCOPE

You learn how to build an oscilloscope which remains your property. With it, you will become familiar with all the components used in electronics.

2/ READ, DRAW AND UNDERSTAND CIRCUIT DIAGRAMS



as used currently in the various fields of electronics.

3/ CARRY OUT OVER 40 EXPERIMENTS ON BASIC ELECTRONIC CIRCUITS & SEE HOW THEY WORK, including :

valve experiments, transistor experiments amplifiers, oscillators, signal tracer, photo electric circuit, computer circuit, basic radio receiver, electronic switch, simple transmitter, a.c. experiments, d.c. experiments, simple counter, time delay circuit, servicing procedures

This new style course will enable anyone to really understand electronics by a modern, practical and visual method—no maths, and a minimum of theory—no previous knowledge required. It will also enable anyone to understand how to test, service and maintain all types of electronic equipment, radio and TV receivers, etc.

FREE POST NOW for BROCHURE

or write if you prefer not to cut page

To **BRITISH NATIONAL RADIO & ELECTRONICS SCHOOL, P.O. BOX 156, JERSEY.** Please send your free brochure, without obligation, to: we do not employ representatives

NAME

BLOCK CAPS

ADDRESS

PLEASE EL62

special free gift also to all our students

VOL. 8
June

No. 6
1972

PRACTICAL ELECTRONICS

Editor F. E. BENNETT Assistant Editor M. A. COLWELL Editorial D. BARRINGTON G. GODBOLD S. R. LEWIS B.Sc. (Eng.)
Art Editor J. D. POUNTNEY Technical Illustrators J. A. HADLEY R. J. GOODMAN
Advertisement Manager D. W. B. TILLEARD

BACK TO SCHOOL

It will seem remarkable to many that an industry closely identified with advanced communications and precision control of changing conditions should be unable to organise its own input of technical manpower efficiently. And yet there really does exist a serious mis-match between the educational policies pursued in the schools and technical colleges, and the electronics industry's present and future manpower needs. This unhappy fact is acknowledged in a report entitled *The Electronics Industry and the Schools* issued by the National Economic Development Office last March.

The Report states that greater opportunities than ever before will arise in the future for graduates, technician engineers, and technicians, especially in industries that have not previously employed electronics personnel on any large scale. However, the Report warns against too much emphasis upon graduate entry into industry while there is a real danger of deficiency in the supply of technician engineers and technicians. It is recruitment of the latter categories that should receive special attention. This point was endorsed at the IEEETE Conference held at Sheffield last March, where the view was expressed that an ordinary degree for technician engineer status should be introduced.

Coming back to the NEDO Report, we read: "The proper progression of a potential technician's education and training requires a greater degree of vocational awareness and flexibility on the part of both pupils and teachers than is commonly present in schools now." The Report stresses the need for more people with a scientific and engineering background to remedy the shortage in the teaching profession. Perhaps the remedy is to be found in courses such as that planned by Edge Hill College of Education, Ormskirk, Lancs, and recently brought to our attention. Entitled *Science and People* this new course aims to provide "an alternative route into teaching, not only for sixth formers, but also for suitably qualified men and women who may find their present industrial occupations unsuitable or insecure."

We think this kind of feedback is much to be desired. An infusion into the schools of persons with practical industrial experience of electronics will help remove those barriers that apparently still separate some academics from practising technicians and engineers.

continued on page 497

THIS MONTH

CONSTRUCTIONAL PROJECTS

VERSATILE LIGHT EFFECTS UNIT	464
P.E. GEMINI STEREO TUNER	483
TWO-TWENTY MINUTE TIMER	494
CHARGER POWER UNIT	510

SPECIAL SERIES

ALPHA-NUMERIC DISPLAYS — 4	471
----------------------------	-----

GENERAL FEATURES

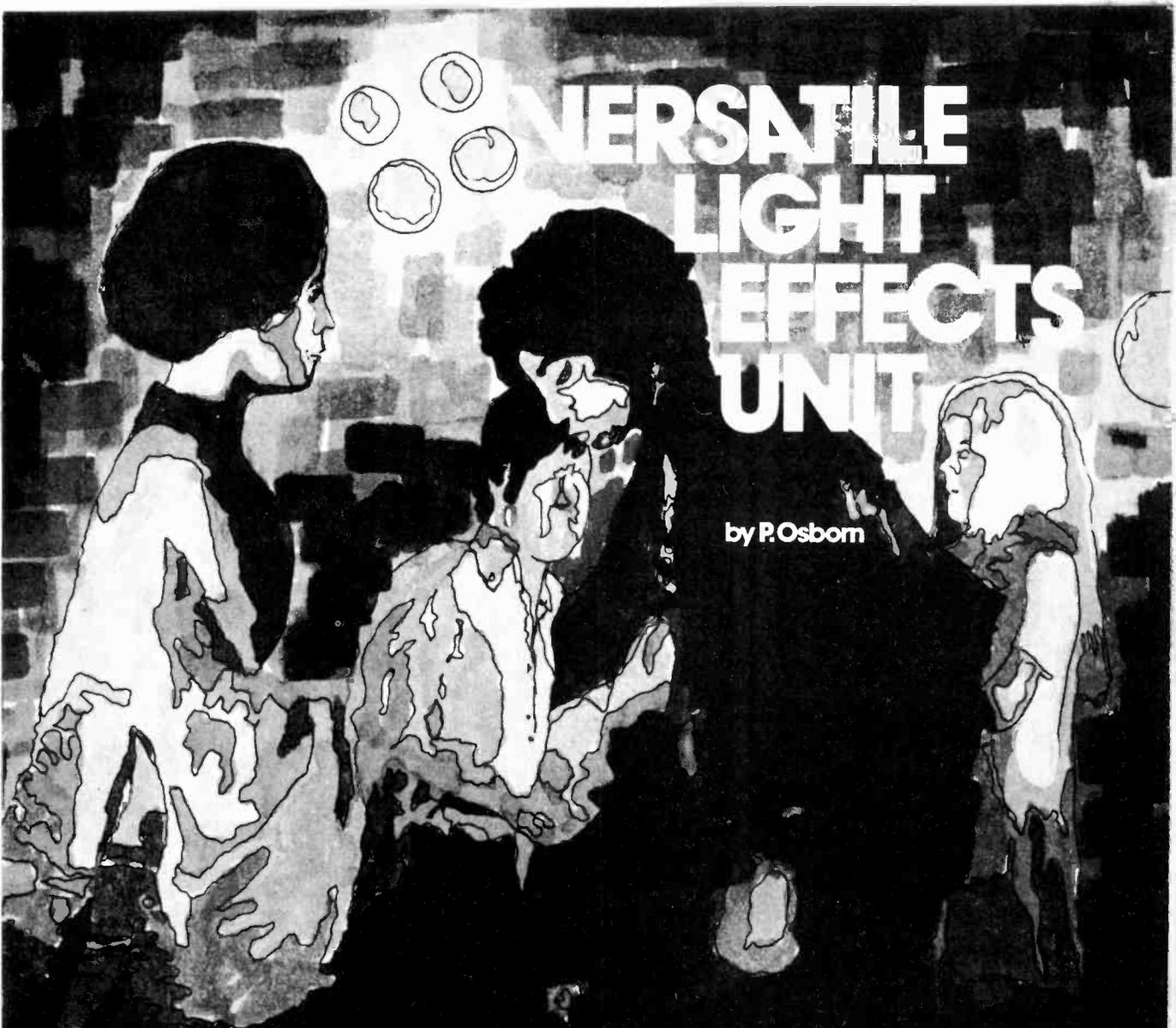
STEREO RECEPTION	477
INGENUITY UNLIMITED	501

NEWS AND COMMENT

EDITORIAL	463
SPACEWATCH	470
INDUSTRY NOTEBOOK	474
ELECTRONORAMA	489
SONEX '72	490
PATENTS REVIEW	498
POINTS ARISING	502
MARKET PLACE	505
REPORT FROM AUSTRALIA	506
NEWS BRIEFS	509
PHYSICS EXHIBITION	511
READOUT	512

*Our July issue will be published on
Friday, June 9*

© IPC Magazines Limited 1972. Copyright in all drawings, photographs and articles published in PRACTICAL ELECTRONICS is fully protected, and reproduction or imitations in whole or part are expressly forbidden. All reasonable precautions are taken by PRACTICAL ELECTRONICS to ensure that the advice and data given to readers are reliable. We cannot, however, guarantee it, and we cannot accept legal responsibility for it. Prices quoted are those current as we go to press. Subscription Rates including postage for one year, to any part of the world, £2-65 (£2 13s. 0d).
Practical Electronics, Fleetway House, Farringdon St., London. E.C.4. Phone: Editorial 01-634 4452; Advertisements 01-634 4202



VERSATILE LIGHT EFFECTS UNIT

by P. Osborn

LIGHTING effects units previously described in PRACTICAL ELECTRONICS have been primarily designed to be driven from a sound source. The audio signal has been divided, by filtering into a number of frequency bands, each of which is converted to provide an amplitude sensitive switching current to fire a thyristor or triac.

In this article the author has devised a means for frequency modulating the single channel sound source with a square wave, so that the louder the signal, the faster the flashing rate, or strobing effect.

THREE MODES

The unit described here is capable of driving filament lamps, of total power not exceeding 750 watts in three modes; these are strobe, sound-strobe and sound only. The last two modes are synchronised with sound by a feed

from a record player or similar sound source. The unit is suitable for use at parties and as a light show with discotheques or groups.

The author has built several thyristor light units and with them has often had difficulties with the thyristor driver stage "locking on" and it is understood that this is a moderately common fault. Several methods for curing this condition have been tried but were not considered by the author to be good long term solutions.

It was considered necessary at the outset, therefore, to design a reliable and effective driver and pivot the rest of the design around this. The resultant design (showed in the block diagram Fig. 1) has worked well in practice and on occasion has operated continuously for as long as ten hours without mishap. Indeed it has not yet been possible for the author to coax the prototype driver transistors into being more than luke-warm.

SOUND MODE

In the sound mode, the brightness of the lights connected to the output is controlled by the volume of the sound fed to the unit from a record player or similar system, at loudspeaker level via the input jack on the front panel.

STROBE MODE

When operating in the strobe mode the connected lights flash on and off at a rate which may be set by the panel SPEED control. The range of adjustment is not great but sufficient for some interesting effects to be produced.

SOUND-STROBE

When set to operate on sound-strobe, the unit combines the two above functions to provide a stroboscopic effect whose flashing speed is controlled by the volume of the sound arriving at the input socket, i.e. the louder the sound the faster the flash rate. The switching is carried out by a key switch; only the basic functions being shown in Fig. 1.

CIRCUIT DESCRIPTION

In all modes the thyristor is connected to mains neutral input as is shown in Fig. 2. It is at all times driven by the driver TR13 and TR14 on board 2. This driver fulfils the basic switch-on requirements of a thyristor, which is that the gate should be fed with a small positive potential, relative to the cathode, from a current limited source. The brightness control adjusts the limiting and so adjusts the brightness.

To effect sound control of the lights, the sound connected to the input jack is amplified and isolated on board one, then fed via the function switch (contacts B, C, F, E) and the light level control VR5 to TR12.

To produce a stroboscopic effect from the lights it is necessary to feed the thyristor driver with an audio signal pulsed at the flash rate required. This audio signal (of the order of 1.5kHz) is provided from the multivibrator TR8 and TR9. This signal is then gated by TR10 and its impedance at the output of the gate (C12) is lowered by the emitter follower TR11.

The signal at C13 is then routed via the function switch (contacts G, H) to VR4 on board 2. In the sound function the output at pin 2-5 is switched to signal earth, via switch contact I to stop leakage. The required amount of drive, set by VR4, is fed to the driver selector contacts (D, E, F) on the function switch. The gate TR10 is driven from TR7, the strobe multivibrator, via switch contacts J and K.

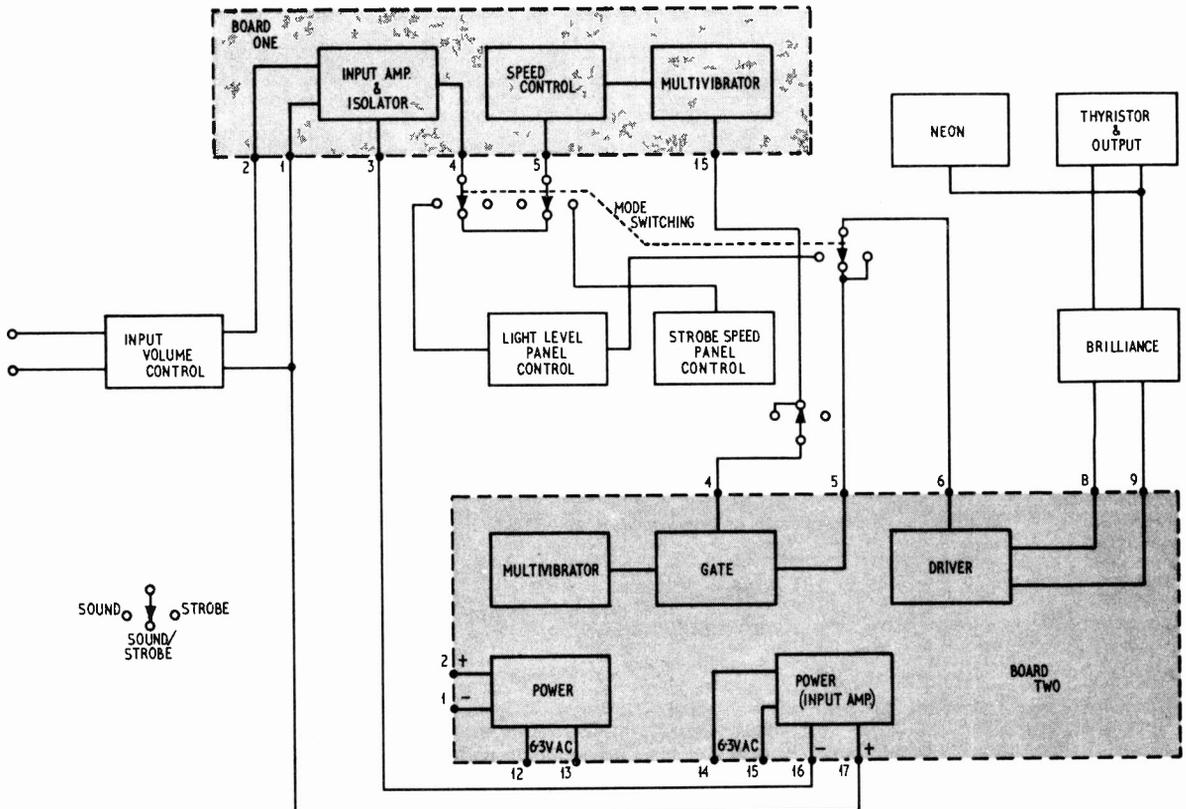


Fig. 1. Block diagram of the main functions of the sound-strobe lighting effects unit. Numbers correspond to terminations shown in Fig. 2

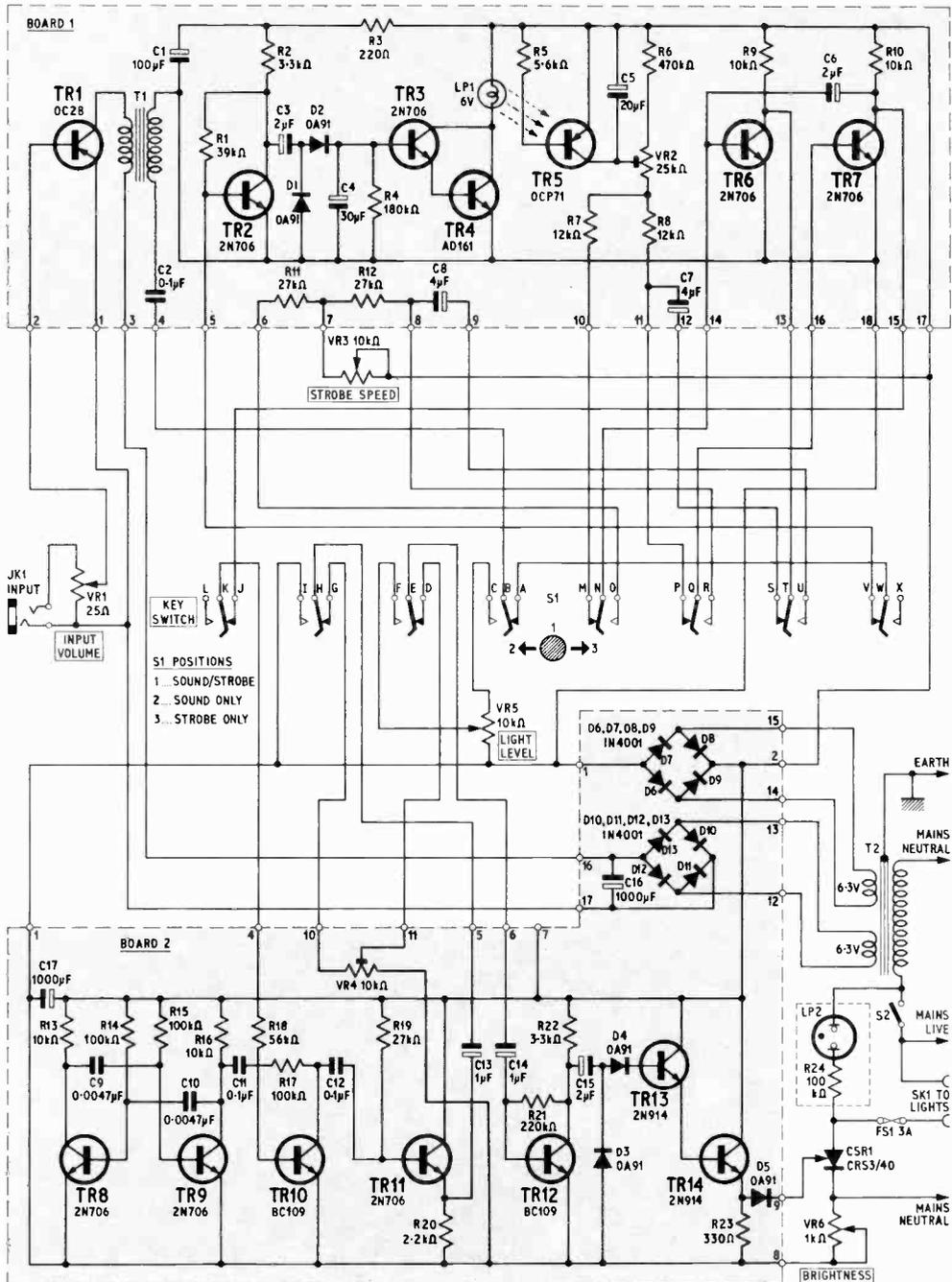


Fig. 2. Complete circuit of the effects control unit as built on two assembly boards, with the switch contacts in the centre. Movement of the keyswitch dolly in one direction (2) operates only contacts A to L. Movement in the opposite direction (3) operates only contacts M to X. The contacts are drawn as with the dolly in the centre position

The function switch selects with contacts M, N, O; P, Q, R; S, T, U, the relevant time-constant networks. The timing capacitor C6 is common to both strobe and sound-strobe function. The network for the strobe function is completed by R11, R12, C8 and the front panel "speed" control, VR3.

PHOTOTRANSISTOR

When in the sound-strobe position the function switch selects R7, R8 and C7. This network is completed as a d.c. path to the positive supply line by the phototransistor TR5 assisted by VR2 and R6. Because of this configuration, the speed of the multi-vibrator in the sound-strobe function may be controlled by the light emitted by the bulb LPI, which in turn is controlled through TR2, TR3, TR4, and the input amplifier by the sound supplied through the input jack.

The preset potentiometer VR2 enables adjustment to be made of the amount of speed change the lamp/phototransistor gives. This configuration looks perhaps a little complicated but was considered after a trial of other methods to give the best compromise between ease of operation and economy.

The wiring for the mains input, fuse, neon, thyristor, and transformer is shown bottom right of Fig. 2, and particular attention should be paid to the neon connections which give the neon two functions. When the on/off switch is closed, the neon functions as an output monitor and follows the output to facilitate easy setting up of the controls when the controlled lights are at a distance.

With the mains switch "off" the neon will only light when a continuous path exists from the neon resistor through the fuse and connected lights to the live mains connection. This is because the neon takes very little current and so there is little voltage drop across either the transformer or the resistor R24.

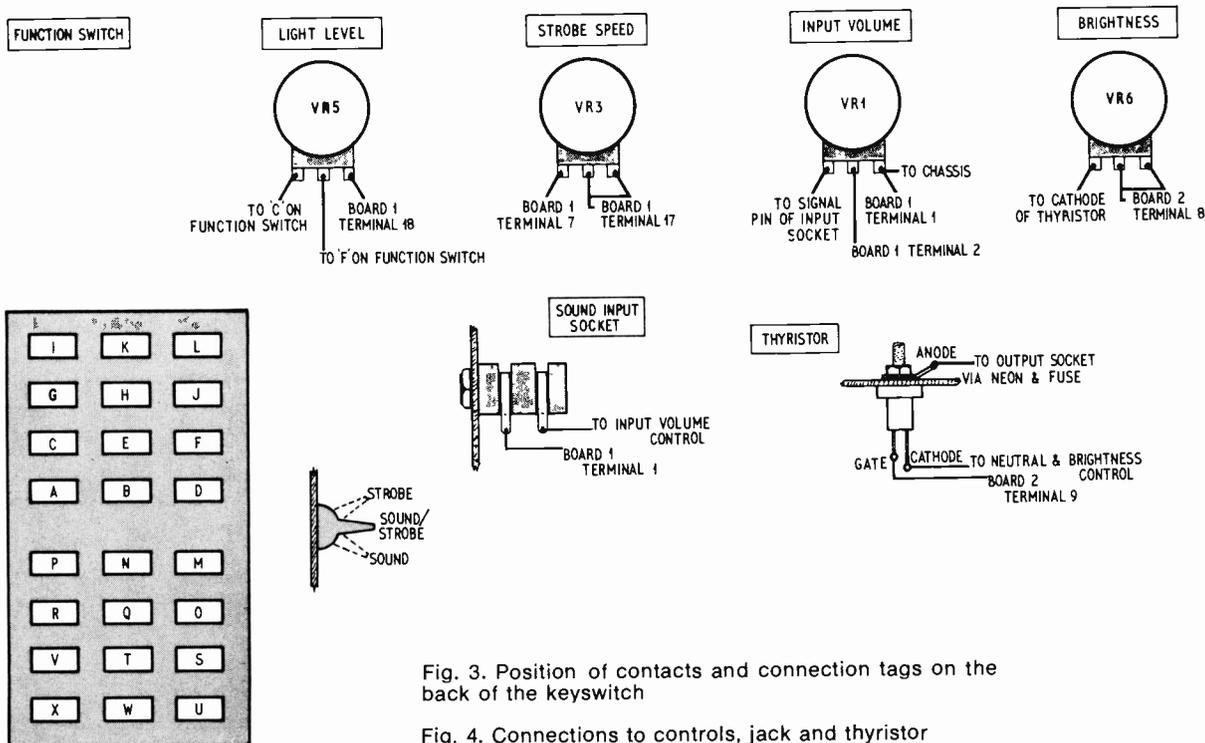
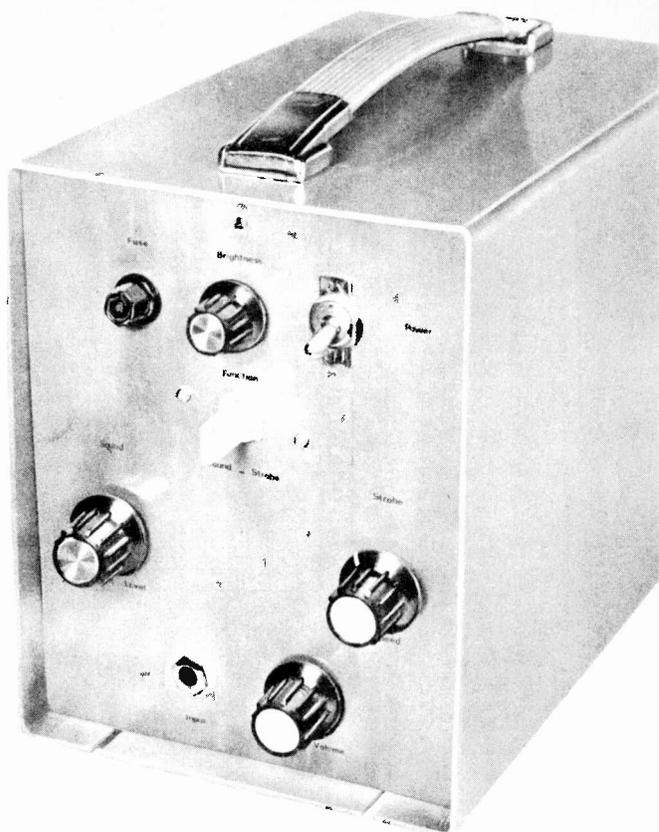


Fig. 3. Position of contacts and connection tags on the back of the keyswitch

Fig. 4. Connections to controls, jack and thyristor

COMPONENTS . . .

BOARD ONE

Resistors

R1 39k Ω	R5 5.6k Ω	R9 10k Ω
R2 3.3k Ω	R6 470k Ω	R10 10k Ω
R3 220 Ω	R7 12k Ω	R11 27k Ω
R4 180k Ω	R8 12k Ω	R12 27k Ω

All $\pm 10\%$, $\frac{1}{4}$ W carbon

Potentiometer

VR2 25k Ω linear preset (skeleton type)

Capacitors

C1 100 μ F elect. 12V	C5 20 μ F elect. 10V
C2 0.1 μ F polyester	C6 2 μ F elect. 6V
C3 2 μ F elect. 12V	C7 4 μ F elect. 12V
C4 30 μ F elect. 12V	C8 4 μ F elect. 12V

Transformer

T1 Miniature push pull output transformer (e.g. type T/T7 or similar)

Transistors

TR1 OC28	TR3 2N706	TR6 2N706
TR2 2N706	TR4 AD161	TR7 2N706
TR5 OCP71 (phototransistor)		

Diodes

D1, D2 OA91 (2 off)

Lamp

LP1 6V 40mA

Miscellaneous

S.r.b.p. wiring board 0.1in matrix or printed wiring board

BOARD TWO

Resistors

R13 10k Ω	R17 100k Ω	R21 220k Ω
R14 100k Ω	R18 56k Ω	R22 3.3k Ω
R15 100k Ω	R19 27k Ω	R23 330 Ω
R16 10k Ω	R20 2.2k Ω	

All $\pm 10\%$, $\frac{1}{4}$ W carbon

Potentiometer

VR4 10k Ω linear preset (skeleton type)

Capacitors

C9 0.0047 μ F	C14 1 μ F elect. 12V
C10 0.0047 μ F	C15 2 μ F elect. 12V
C11 0.1 μ F	C16 1,000 μ F elect. 12V
C12 0.1 μ F	C17 1,000 μ F elect. 12V
C13 1 μ F elect. 12V	

Transistors

TR8 2N706	TR11 2N706	TR13 2N914
TR9 2N706	TR12 BC109	TR14 2N914
TR10 BC109		

Diodes

D3, D4, D5 OA91 (3 off)
D6 to D9 1N4001 (4 off)
D10 to D13 1N4001 (4 off)

Miscellaneous

S.r.b.p. wiring board 0.1in matrix or printed wiring board

OTHER COMPONENTS

Potentiometers

VR1 25 Ω (input volume)	VR5 10k Ω (light level)
VR3 10k Ω (strobe speed)	VR6 1k Ω (brightness)

Transformer

T2 Mains transformer. Two secondary windings, each 6.3V 0.1A or more

Thyristor

CSR1 400V 3A or higher. Type CRS3/40

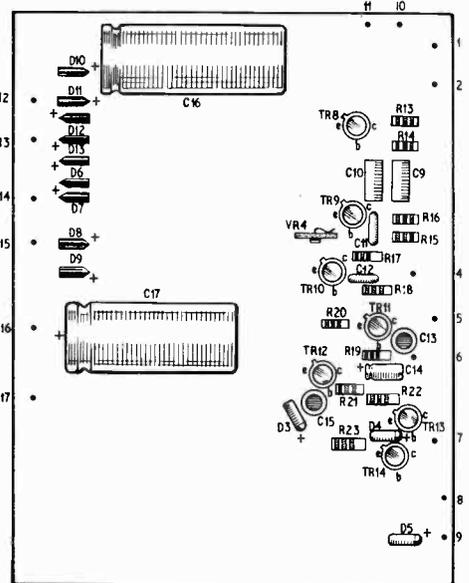
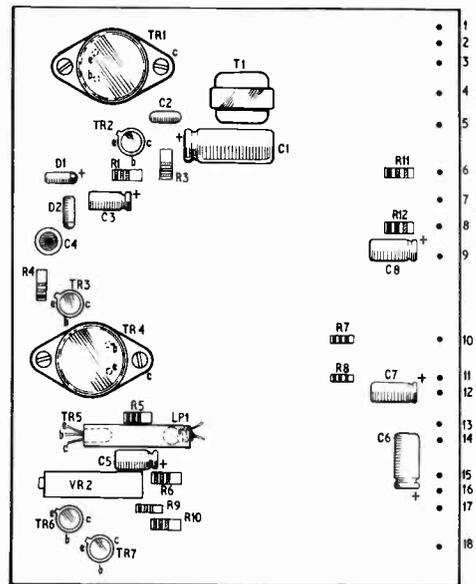


Fig. 5. Suggested positions only of components on two separate boards as on the author's unit

Switch

- S1 Keyswitch, P.O. type, three-position locking, 2x4 poles
- S2 Single-pole on-off toggle switch

Sockets

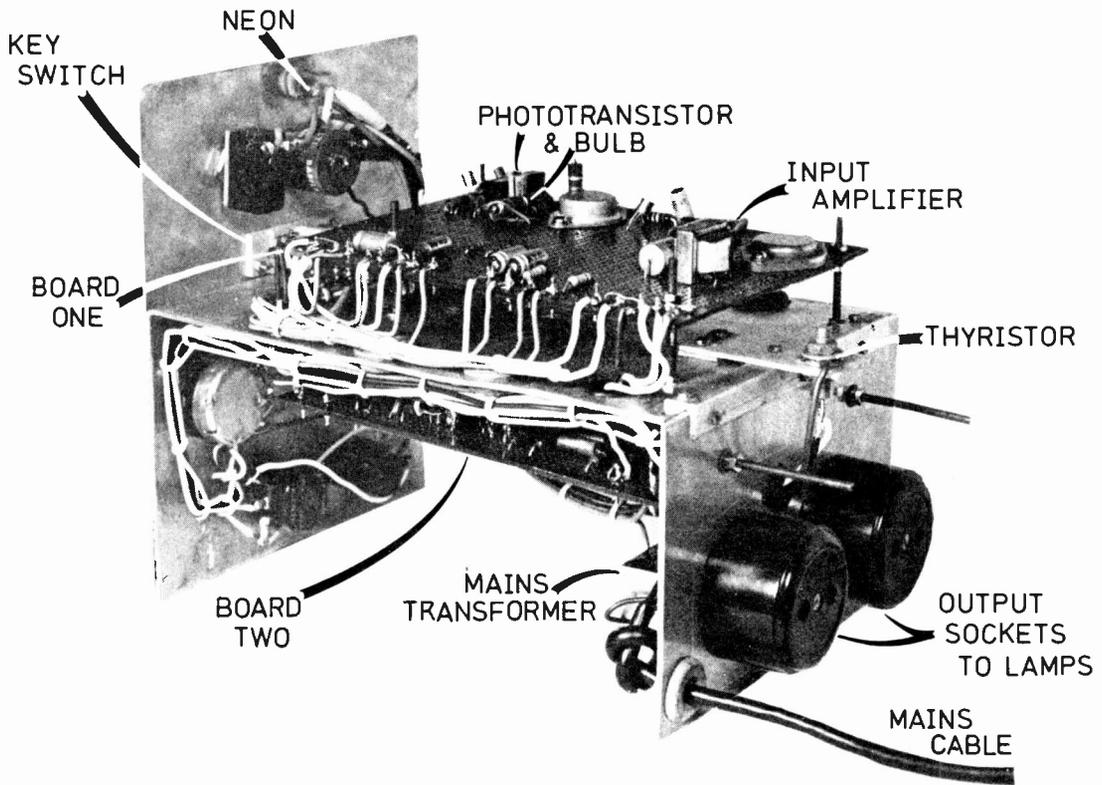
- JK1 Input jack
- SK1 Two pin, 5A socket for lights, or two 2A sockets

Miscellaneous

Case and chassis to choice to suit board assembly
LP2 Lamp assembly, mains neon with 100k Ω ballast resistor (R24)

FS1 Fuse 3A

Mains cable and light fittings to choice



This property of the circuit gives an easy check on the lights and the wiring to them and also on the fuse, for if any of them are defective the neon will remain unlit.

CONSTRUCTION

Mechanical construction, it is felt, is rather at the discretion of the constructor. The author used a spare instrument case as shown in the photographs and the chassis and the front panel were made from sheet aluminium. The case was approximately 7in by 5½in by 9½in and the unit fitted into it well. The circuitry was built up on two perforated s.r.b.p. matrix boards which were approximately 4½in by 5½in, but any suitable printed wiring board can be adopted. It is possible to build the circuitry for both board one and board two on one s.r.b.p. or fibreglass board as small as 3½in by 9in using a printed circuit or ready made printed wiring board.

The main concern in the layout and positioning of components is that none of the more sensitive circuits on the boards should be mounted or wired in close proximity to any large signal components or wiring. Care should be taken, for example, when mounting the power transformer and thyristor circuit and wiring them to the rest of the circuit. It is advisable to tie all wires into cable forms and then route these out of the way of the boards.

The function switch specified is a G.P.O. type keyswitch and has 24 contacts, 22 of which are used. Care should be taken with this component because any mistakes made are difficult to rectify because of the close proximity of the contacts.

In the author's unit the thyristor was mounted on a piece of glass fibre board. This was then rigidly mounted on the chassis. It should be remembered

when siting this component that the anode is at the mains line potential and is therefore somewhat dangerous. Do not allow contact between the thyristor and any other metallic conductor other than the intended connecting wires.

CONCLUSION

Since its completion this unit has worked quite satisfactorily. It was found, however, that one or two minutes are needed after switch on, for the auto speed circuit to settle down. When switched on the idle speed tends to race slightly but this effect disappears after about one minute. This was not found to be too objectionable.

One thing the described design does lack is a large dynamic range. The unit has to be readjusted after a quiet record for use with a loud one. This was not felt to be too objectionable but a compressor or a.v.c. would help to overcome this. ★

This month's cover picture was photographed in the "Bird's Nest" pub in the Kings Road, Chelsea, London.

INDEX

An Index for Volume Seven (January 1971 to December 1971) is now available price 10p inclusive of postage.

BINDERS

Binders for P.E., with a special pocket for storing booklets and data sheets, are available price £1, including postage and packing. State Volume Number required.

Orders for Indexes and Binders should be addressed to Binding Dept., IPC Magazines Ltd., 68, Great Queen Street, London, W.C.2.



FOURTH UK SATELLITE

The fourth U.K. satellite *Ariel 4* weighing 222lbs carried five experiments relating to an integrated experiment. There is on board an experiment contributed from America and was the first to go into orbit aboard a U.K. satellite. The satellite orbit is inclined at 83 degrees at a height of approximately 340 miles.

The main purpose of the mission is the exploration of the Earth's upper ionosphere and the relationship and interaction of this area with charged particles, plasma and electromagnetic waves. There is also equipment for studying the special noise which appears in the radio spectrum in these regions.

The American experiment relates to study of the spectrum of electrons and protons from 5.0eV and 50,000eV. This experiment is under the direction of Prof. L. A. Frank of the University of Iowa.

The other experiments are co-operative between Jodrell Bank under Prof. F. G. Smith and the space research station at Slough under R. Dalziel. These experiments use two 20ft extending aerials whose length can be controlled from Earth. The object is to study radio waves set up by the Cerenkov radiations from particle streams impinging on plasma in the magnetosphere and the ionosphere. These radiations are detected by a swept frequency receiver which operates from 0.75 to 4.0MHz and a receiver with a fixed frequency of 2.0MHz.

The VLF (very low frequency) and ELF (extra low frequency) radiations in the ionosphere caused by the instability of energetic particles, are detected by very sensitive receivers, each covering a very

wide band, and fed from an aerial system slung between the satellite paddles which carry the solar power cells. Correlation of the satellite data is between Sheffield University under Prof. T. R. Kaiser with an earth based station and another installation at Halley Bay.

Finally, their is an experiment for the study of electron density and temperature which is vital to an understanding of the structure of the magnetosphere and the electrical conductivity. This is gauged by grids at the end of booms which are fixed to opposing power cell paddles.

Due to mutual interference of experiments, arrangements are available for switching off individual units to remove this hazard.

In addition to the main experiments there is a small package receiver which will count thunderstorms and their distribution.

UHURU SATELLITE

The Uhuru satellite is providing a great deal of important data. This is particularly the case with the X-ray experiments. There is an extended region of such activity in the Coma cluster of galaxies. It contains some 800 galaxies, with a powerful radio source over a wide area and central X-ray source.

There is a weak magnetic field extending through the cluster with a strength of about 100 nanogauss. The high energy electrons that traverse the field generate electromagnetic waves in the radio range. At the same time collisions between photon and electrons give rise to X-rays.

To the question: How did this weak magnetic field appear, the researchers who have measured it, G. Perola and M. Reinhardt, suggest that it may be a relic of the primeval field that once filled the Universe. A requirement of such a suggestion is that a hot gas permeates the cluster and holds these field lines. Cosmologists have always required a certain minimum amount of matter to hold a field and in this case the amount stated is enough to satisfy them.

There is, however, an alternative possibility. If very old radio sources have decayed and left a skeleton field, an appreciable amount of gas will be needed to support it. There are other clusters, Hercules and Proteus for example, which possess X-ray and radio sources and, if it is a fact that clusters all have this type of field, its origin is of the utmost importance to cosmologists.

THE VELA PULSAR

For some time the X-ray counterpart of the Vela pulsar has been sought by theoretical astronomers.

They have made a number of abortive attempts to detect X-rays and astronomers will be relieved that this pulsar does, as it should with the short period of 89 milliseconds, emit X-rays. There are some puzzling difficulties still and it may be that there are more than one family of pulsars.

JUPITER HAS DEUTERIUM

Infra-red spectrometer measurements have revealed that deuterium in the form of deuterated methane (CH_3D) is present on the planet Jupiter. It is probably the first time that this isotope has been found outside the earth and there is evidence that this spectroscopic line appears in the spectrum of Jupiter as a whole.

The low density of the planet suggests it must consist for the most part of a mixture of hydrogen and methane. What the proportion of the deuterium is to the hydrogen is difficult to determine at this stage.

EARTH RESOURCES SATELLITE

The satellite to be launched to study the earth's resources will add enormously to the survey abilities available to investigators of the environment and ecology. The ability of the return beam vidicon camera and the multispectral scanner owes much to the successful *Nimbus* operations.

Multispectral techniques, with a coverage beyond that of the unaided human eye, can show detail which cannot be achieved in any other way. It is possible to distinguish between fields of oats, sorgham, wheat and maize. It can be shown that diseased crops and healthy crops have a different appearance not easily detectable at close hand.

Using the scanner each type of crop has a different spectral "signature". It will also be possible to chart the movement of fish and monitor pollution worldwide. To list the benefits would occupy a good deal of space if dealt with in detail.

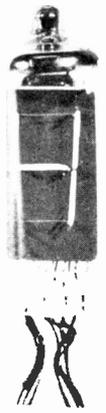
However, the importance of this activity is so great that it is justifiable to recount some specific items. Direct benefits are the detection of forest fires and the advent of locust storms; observations of ice movements, winter and monsoon conditions in India and Japan. The study of the hydrologic cycle in the Santa River basin in Peru, snow surveys in Norway to assess spring flooding; soil erosion in Guatemala.

More than 50 scientists from all over the world will be cooperating in this venture.

The data from this satellite will be freely available to all nations.

ALPHA NUMERIC DISPLAYS

Part
By R.W. Coles



Decoding & Driving circuits for filament displays

IN LAST month's article some of the various incandescent filament displays were described. The discrete character and bar matrix type displays require different circuits for decoding the binary coded decimal (B.C.D.) into a form suitable to drive the display devices. This month some of these circuits are discussed, in particular those using the now widely available TTL integrated circuits.

DISCRETE CHARACTER DISPLAYS

The first type of display described in Part 3 last month was the discrete character type, where a separate circuit, i.e. an individual bulb, is used for each character.

A suitable decoding and driving circuit for this type of display is shown in Fig. 4.1. The input to the decoder is in the form of binary coded decimal and in order to drive the display this must be decoded into a one out of ten output.

This can be achieved using the SN74145N integrated circuit. This has ten outputs, only one of which will be conducting at a time. Thus only the bulb corresponding to the decimal equivalent of the B.C.D. input will be illuminated.

If the display device has a decimal point then a separate circuit of discrete components will be necessary. Any transistor which will withstand the current and voltage rating of the lamp is suitable.

DECODING/DRIVING CIRCUITS FOR MATRIX DISPLAYS

There is one fundamental difference between matrix and discrete character displays: the former requires a switching system which encodes the basic number or letter information into a series of on/off responses for each part of the matrix, whereas the latter uses the number or letter information directly to energise the correct character.

If the original information is in some other coded form (specifically Binary Coded Decimal, B.C.D.) then this information must first be decoded to decimal before being re-encoded in the form to drive the matrix. Only the decoder is required for the discrete type.

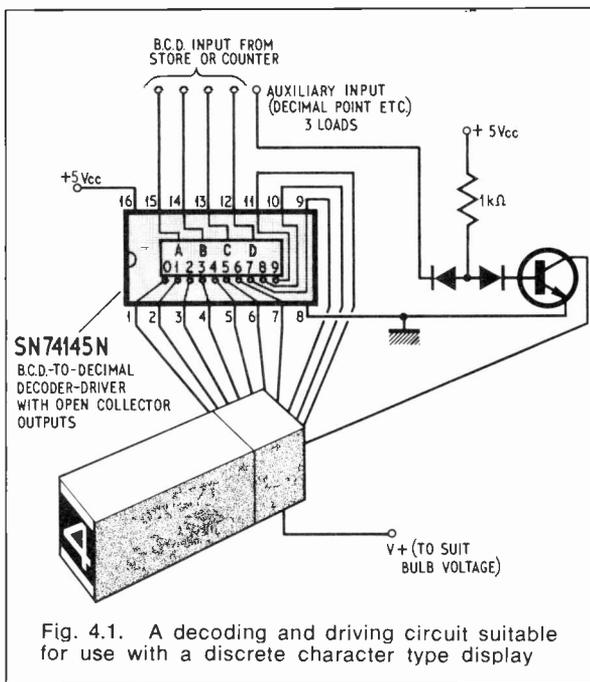
This decoding/encoding makes the logic of a seven segment "decoder/driver" i.e. quite complex, as can be seen from the gate diagram of the SN7447 device, which is part of the TTL Medium Scale Integration (M.S.I.) family, and which is shown in Fig. 4.2.

This complexity need be of no concern however, since the widespread use of seven segment indicators has brought the price of the 7447 down to a very low value in recent months, making it very competitive on a "decoder plus indicator" cost comparison with cold cathode tubes.

THE SN7447 INTEGRATED CIRCUIT

This decoder is typical of a variety of types available, and is suitable for directly driving the "Atron" and similar indicators, its outputs sinking 20mA at up to 15 volts (the 7446 is selected for use up to 30 volts).

The inputs to this decoder must be in B.C.D. form, and thus only the numerals 0 to 9 are catered for; the "invalid" binary codes of 10 to 14 do produce a display, but it is meaningless. In addition to the four



B.C.D. inputs and the seven segment drive outputs, a number of other useful facilities have been provided.

The "lamp test" input can be grounded through a gate or switch to force all the segments to "on", thus showing up any open circuit filaments, a handy, and simply arranged facility.

The other input and output are the "Ripple Blanking Input" (R.B.I.) and the "Ripple Blanking Output, or Blanking Input" (R.B.O.). These two lines

are used to achieve the leading or trailing edge ripple suppression of insignificant zeros in multi-digit displays, giving a much easier to read number.

In addition the R.B.O. can be used as an input to blank the display, a feature which is often employed to vary the brightness by switching the indicator on and off at high speed, the mark-space ratio of this on/off waveform altering the effective intensity.

ZERO SUPPRESSION

Ripple blanking itself was introduced when dealing with the 74141 decoder/Nixie tube combination in Part 2, and it is a neat little trick to prevent the display of meaningless zeros in long numbers, e.g. a six digit display system with a central decimal point would display 2.8 like this without ripple blanking:

002.800

but with ripple blanking the display would appear like this:

2.8

an obvious improvement!

The 74141 system required some quite complex gating external to the decoder to achieve ripple blanking, but with the 7447 seven segment decoder this gating is inside the device, only wire being required to make it work in a large display.

Just how easily a sophisticated six digit display can be made is demonstrated in Fig. 4.3. Here six Atrons are driven by six 7447s, and the display incorporates lamp-test, intensity control, and leading and trailing edge ripple blanking. Only one 5V supply is required, and the whole thing can be made very small, an excellent choice for a counter or voltmeter.

The ripple blanking is not connected for the two digits on either side of the decimal point; this improves readability and ensures that all numbers are displayed as we would write them, e.g. 0.005 will be displayed as:

0.005

rather than as:

.005

as it would be with all decades connected for blanking.

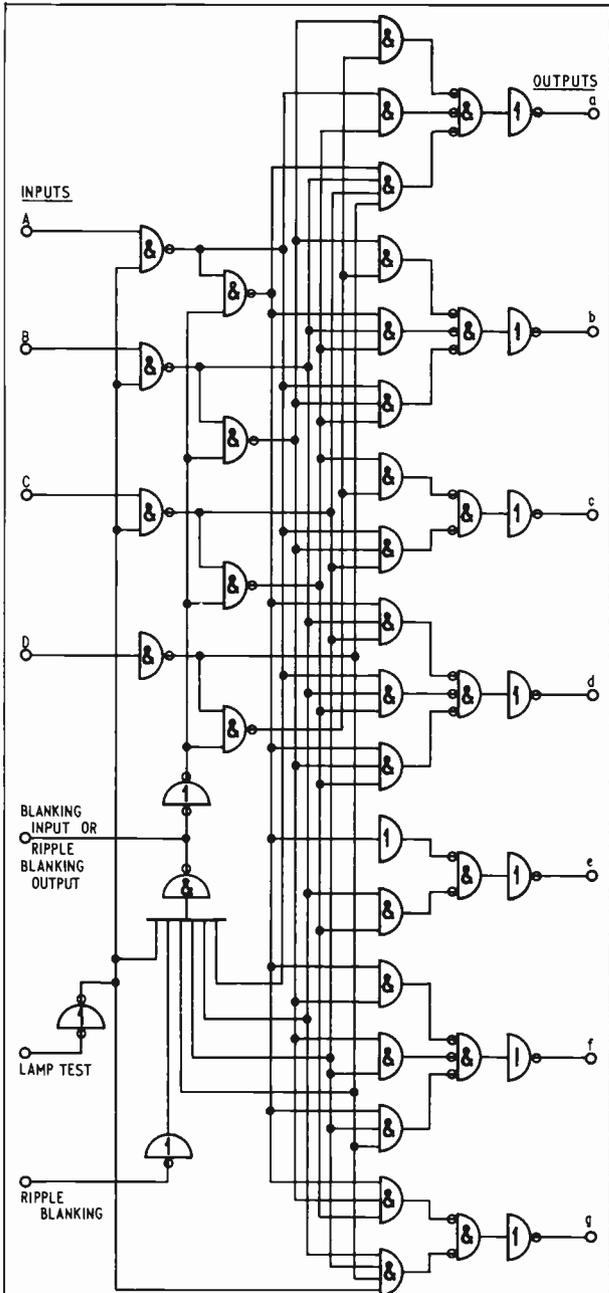
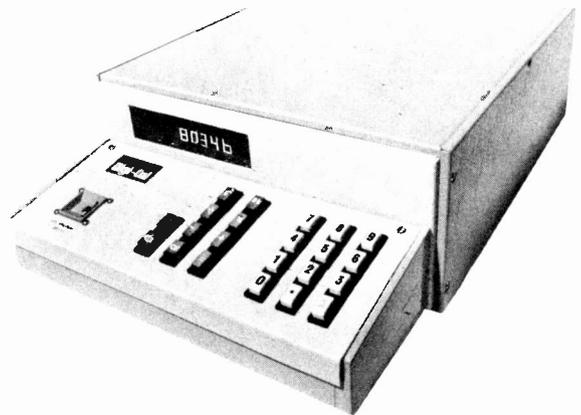
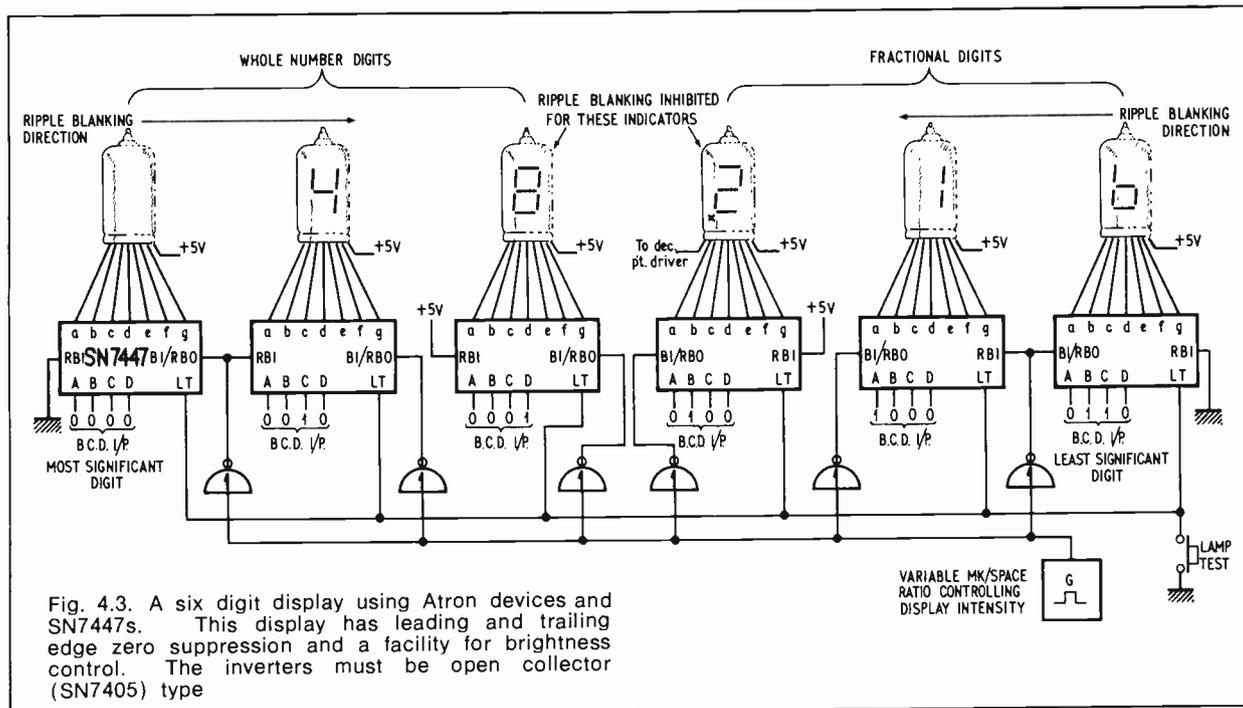


Fig. 4.2. The internal logic of the SN7447 integrated circuit. The SN7446 has the same internal logic but the output drivers can handle higher voltage



Eight seven-segment filament indicators are used in the P.E. Digital electronic calculator to be seen next month



The intensity control scheme uses an open collector inverter package (SN7405) as the driver to each decoder. This is necessary (rather than a common wire to all decoders) because the R.B.O. is "wired-or" connected with the intensity modulation. "Wired-or" logic was described in *Making the Most of Logic IC's*, but those who have not come across this article, just remember that an open collector buffer is necessary to use this facility.

OTHER DECODERS

When discussing formats in Part I it was stated that a variety of letters and symbols, as well as the numerals, could be displayed on the seven segment design, but the 7447 does not help at all, being intended only to give 0 to 9, so what can be done to include these other character options? The answer is a "do-it-yourself" custom decoder, which is not as complicated as may be expected, and gives a high degree of flexibility.

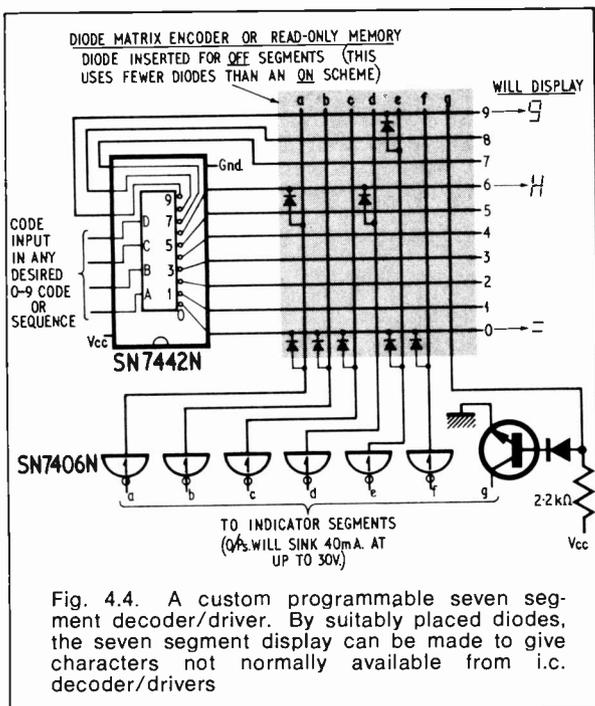
A scheme to achieve this is shown in Fig. 4.4, where two i.c.s and a number of diodes are arranged in the form of a "Read Only Memory" (R.O.M.) which is programmed by the constructor to give any desired character out for any particular input, simply by wiring in diodes.

The R.O.M. is really a decoder/encoder combination, but it is easier to visualise when described as a R.O.M.

In this circuit a 7442 is used to generate the ten separate outputs for any of the possible B.C.D. inputs, and the particular output which is "addressed" by the input code then "reads" the particular set of diodes to produce the required on/off output arrangement. This is inverted and buffered by a hex power-driver i.c. (with one extra transistor to make the number up to the required seven) which drives the indicator directly.

Only three examples of possible coding are shown, diodes being inserted in the matrix wherever an "off" segment is required. If a 74154 (four to 16 line) decoder is used instead of the 7442, then the complete number set can be programmed along with up to six letters or symbols, handy for those special applications encountered occasionally.

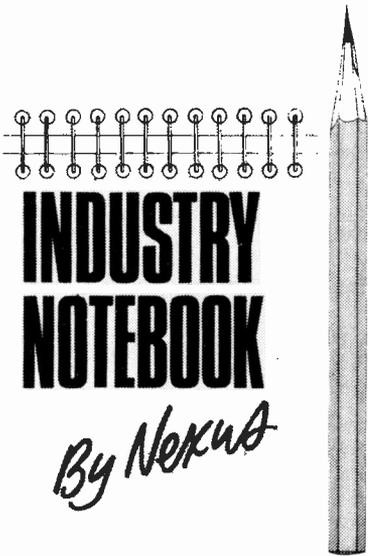
Next month: Light Emitting Diode (L.E.D.) Displays



OUTLOOK FAIR

The first of the great trade barometers, the annual Paris Electronic Components Exhibition, while not exactly forecasting sunshine ahead was nonetheless far less gloomy than last year's event. The tone was set by the French themselves who reported a fortnight before the opening that the professional equipment sector of the French industry showed a 25 per cent growth in 1971 and an order book indicating that exports would be up by no less than 50 per cent.

Prior to the show I had been to Toulouse to visit the Motorola semiconductor plant and my personal impression was that the worst was over and while nobody was foolish enough to start counting their chickens there was a feeling of renewed buoyancy.



INDUSTRY NOTEBOOK

By Nexus

The impression was reinforced when I arrived at the Porte de Versailles exhibition centre in Paris where 1,000 exhibitors from 25 countries had set up shop. At the turn of the year it was feared that only a handful of British companies would be exhibiting following last year's depressing show. In the event the turnout was creditable, a number of companies having come in at the last moment.

Factors influencing the late-comers included Britain's imminent entry to the Common Market, hopes (which were later justified) of a businessman's Budget in March, and the realisation that there was a perceptible but quite genuine upturn of trade in the UK and therefore they could afford, perhaps, to appear in Paris after all.

Any exhibitor will tell you that the Paris Salon is about the costliest exercise in the year's publicity

and promotional budget—even with the financial support of the Department of Trade and Industry. But many companies still say, whatever the expense, that Paris is a "must". Plessey, in fact, used Paris as the key show of the year and balanced the books by ignoring the IEA at Olympia. I am told, however, that Plessey will be back at Olympia for the 1973 London Components show.

British instrument manufacturers made a brave show either on their own stands or those of their agents. New instruments using LED's for readout were shown by Marconi Instruments and Solartron. New counters were shown by Advance Electronics, and SE Laboratories exhibited a 150MHz counter-timer with eight-decade readout. Other British companies in the instrument field were G. and E. Bradley (low cost counters), Farnell Instruments (RF signal generators), and Wayne Kerr (automatic test equipment).

Although Paris attracted about 100 fewer exhibitors this year it remains a brilliant, if tiring, exhibition. Now, having counted the cost, the salesmen are sweating it out hoping that the optimism engendered by a brisk enquiry rate will be justified in terms of orders.

YOU KNOW IT MAKES SENSE

I have long held the view that the advance of technology during the past decade has outpaced applications. That before a new development had been fully exploited there was always something to take its place and that development engineers almost automatically specified the newer—and generally more expensive as well as less proven—device to its predecessor.

In Britain we discovered the virtue of using the devil-you-know some little while back, a good example being the electronics in the Nimrod maritime reconnaissance aircraft which, while recognised as being among the most (if not the most) advanced in the world from the operational viewpoint, was put together largely from off-the-shelf equipment. Clever systems engineering gave us a quick and cost-effective solution to anti-submarine warfare. Even the Nimrod airframe is a modified Comet.

Now, I note that our cousins in the U.S. are feeling the financial pinch and following our lead. New contracts are specifying that current state-of-the-art components will be used as far as possible rather than exotic third or fourth generation devices still on the drawing board. This, of course, is a sad let-down for the back-room boys who have made a rich living out of

inventing better and better devices which not only cost a lot more but don't always live up to expectations.

So worried are the Americans about escalating R and D costs in the defence field that an even worse fate is in store and one that would have been unthinkable in the U.S. five years ago. It is actually suggested that Uncle Sam should purchase ready-made defence systems from Europe. In fact the proposal is more than a suggestion and the British Rapier surface-to-air missile system is just one of the items now being evaluated and, one hopes, that is high on the U.S. Department of Defence shopping list.

This raises new hopes for the future of the British Clansman military communication system for which Racal Electronics recently announced the first production orders worth £11 million, divided £6 million for the British Army and £5 million for the Iranian Army. When I asked Racal Chairman and Managing Director, Ernie Harrison, if he thought there was much chance of it being specified for the U.S. Army he was not too optimistic. Nonetheless, Clansman is a production reality and is recognised as the best in the world after many years of development, while the Americans are only now putting out tenders for a Clansman-like equipment.

The Americans are clearly coming round to the idea that there is no profit in re-inventing the wheel or, for that matter, Clansman. They should think again before spending millions on duplication of other people's efforts.

HUMBLE PIE

Those who thought GEC were out of the semiconductor business for good, following last year's losses in the low-cost volume market and the subsequent closing of the Witham and Glenrothes plants, may yet have to eat humble pie. The custom-built business, based at Wembley, is gearing up towards a throughput of 2 million devices a year and products will include bipolars, MOS and thick-film hybrids. Full use will be made of the expertise of the famous Hirst Research Centre plus computer-aided design (CAD) and advanced production processes including ion implantation.

Technical Director and General Manager of GEC Semiconductors, Clive Foxell, has a closely-knit team, a fully integrated facility with everything he needs on hand, some captive clients within the giant GEC organisation as well as plenty outside and, above all, freedom from the commercial pressures and atrocious price structure of the TTL rat race. We wish him well.

Build yourself a TRANSISTOR RADIO

NEW! ROAMER 10 WITH VHF INCLUDING AIRCRAFT

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

Built-in ferrite rod aerial for MW/LW. Retractable, chrome plated telescopic aerial, for peak short wave and VHF listening. Push-pull output using 600mW transistors. Car Aerial and tape record sockets. Switched earpiece socket complete with earpiece. 10 transistors plus 3 diodes. 8" x 21" speaker. Air spaced gauged tuning condenser with VHF section. Volume/on/off, wave change and tone controls. Attractive case in black with silver blocking. Size 9in x 7in x 4in.

Easy to follow instructions and diagrams. Parts price list and easy build plans 30p (FREE with parts).

TOTAL BUILDING COSTS

£8.50

P. P. & INS. 50p
(OVERSEAS P. & P. £1)

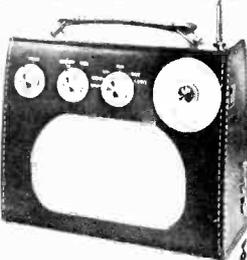


ROAMER EIGHT Mk. I

NOW WITH VARIABLE TONE CONTROL

7 TUNABLE WAVEBANDS: MW1, MW2, LW, SW1, SW2, SW3 AND TRAWLER BAND. Built-in ferrite rod aerial for MW and LW. Retractable chrome plated telescopic aerial for short waves. Push-pull output using 600mW transistors. Car aerial and tape record sockets. Selectivity switch. Switched earpiece socket complete with earpiece. 8 transistors plus 3 diodes. 8" x 21" speaker. Air spaced gauged tuning condenser. Volume on/off, tuning, wave change and tone controls. Attractive case in rich chestnut shade with gold blocking. Size 9in x 7in x 4in approx. Easy to follow instructions and diagrams. Parts price list and easy build plans 25p (FREE with parts).

TOTAL BUILDING COSTS **£6.98** P. P. & INS. 41p (OVERSEAS P. & P. £1)

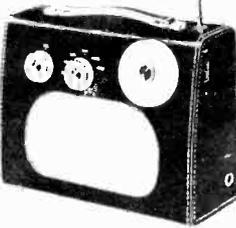


ROAMER SEVEN Mk. IV

7 TUNABLE WAVEBANDS: MW1, MW2, LW, SW1, SW2, SW3 AND TRAWLER BAND. Extra

medium waveband provides easier tuning of Radio Luxembourg, etc. Built-in ferrite rod aerial for MW and LW. Retractable 4 section 24in chrome plated telescopic aerial for SW. Socket for var aerial. Power full push-pull output. 7 transistors and 2 diodes, including micro-alloy R.F. transistors. 8" x 21" speaker. Air spaced gauged tuning condenser. Volume/on/off, tuning and wave change controls. Attractive case with carrying handle. Size 9in x 7in x 4in approx. Easy to follow instructions and diagrams. Parts price list and easy build plans 15p (FREE with parts). Earpiece with plug and switched socket for private listening. 30p extra.

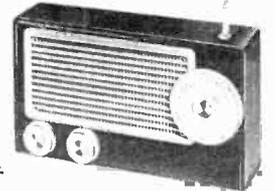
TOTAL BUILDING COSTS **£5.98** P. P. & INS. 41p (OVERSEAS P. & P. £1)



ROAMER SIX

6 TUNABLE WAVEBANDS: MW, LW, SW1, SW2. TRAWLER BAND PLUS AN EXTRA MW BAND FOR EASIER TUNING OF LUXEMBOURG, ETC. Sensitive ferrite rod aerial and telescopic aerial for short waves. 3in speaker. 8 stages 6 transistors and 2 diodes including micro-alloy R.F. transistors, etc. Attractive black case with red grille, dial and black knobs with polished metal inserts. Size 9in x 5 1/2in x 2 1/2in approx. Easy build plans and parts price list 15p (FREE with parts). Earpiece with plug and switched socket for private listening 30p extra.

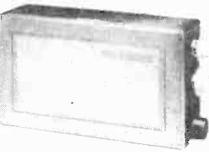
TOTAL BUILDING COSTS **£3.98** P. P. & INS. 26p (OVERSEAS P. & P. £1)



POCKET FIVE

3 TUNABLE WAVEBANDS: MW, LW, TRAWLER BAND WITH EXTENDED MW BAND FOR EASIER TUNING OF LUXEMBOURG, ETC. 7 stages 5 transistors and 2 diodes, supersensitive ferrite rod aerial, fine tone moving coil speaker. Attractive black and gold case. Size 5 1/2in x 1 1/2in x 3 1/2in. Easy build plans and parts price list 10p (FREE with parts). Earpiece with plug and switched socket for private listening 30p extra.

TOTAL BUILDING COSTS **£2.23** P. P. & INS. 21p (OVERSEAS P. & P. 63p)

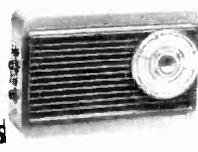


TRANSONA FIVE

5 TRANSISTORS AND 2 DIODES

3 TUNABLE WAVEBANDS: MW, LW AND TRAWLER BAND. 7 stage 5 transistors and 2 diodes, ferrite rod aerial, tuning condenser, volume control, fine tone moving coil speaker. Attractive case with red speaker grille. Size 6 1/2in x 4 1/2in x 1 1/2in. Easy build plans and parts price list 10p (FREE with parts). Earpiece with plug and switched socket for private listening 30p extra.

TOTAL BUILDING COSTS **£2.50** P. P. & INS. 22p (OVERSEAS P. & P. 63p)

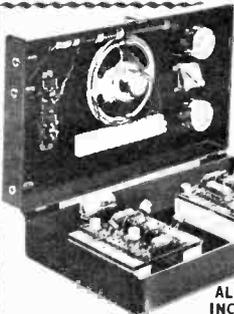
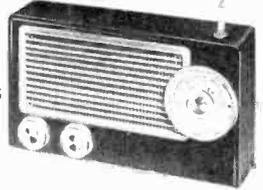


TRANS EIGHT

8 TRANSISTORS AND 3 DIODES

6 TUNABLE WAVEBANDS: MW, LW, SW2, SW3 AND TRAWLER BAND. Sensitive ferrite rod aerial for MW and LW. Telescopic aerial for short waves. 3in speaker. 8 improved type transistors plus 3 diodes. Attractive case in black with red grille, dial and black knobs with polished metal inserts. Size 9in x 5 1/2in x 2 1/2in approx. Push-pull output. Battery economiser switch for extended battery life. Ample power to drive a larger speaker. Parts price list and easy build plans 25p (FREE with parts). Earpiece with plug and switched socket for private listening 30p extra.

TOTAL BUILDING COSTS **£4.48** P. P. & INS. 31p (OVERSEAS P. & P. £1)



NEW! "EDU-KIT"

BUILD RADIOS, AMPLIFIERS, ETC., FROM EASY STAGE DIAGRAMS. FIVE UNITS INCLUDING MASTER UNIT TO CONSTRUCT. Components include: Tuning Condenser: 2 Volume Controls: 2 Slider Switches: 4" x 21" Speaker: Terminal Strip: Ferrite Rod Aerial: 3 Plugs and Sockets: Battery Clips: 4 Tag Boards Balanced Armature Unit: 10 Transistors: 4 Diodes: Resistors: Capacitors: Three 3in Knobs. Units once constructed are detachable from Master Unit, enabling them to be stored for future use. Ideal for Schools, Educational Authorities and all those interested in radio construction.

ALL PARTS INCLUDING CASE AND PLANS **£5.50** P. P. & INS. 31p (OVERSEAS P. & P. £1)

RADIO EXCHANGE LTD

61 HIGH STREET, BEDFORD. Tel. 0234 52367

I enclose £ please send items marked

- | | | | |
|---------------|--------------------------|--------------|--------------------------|
| ROAMER TEN | <input type="checkbox"/> | ROAMER SEVEN | <input type="checkbox"/> |
| ROAMER EIGHT | <input type="checkbox"/> | TRANS EIGHT | <input type="checkbox"/> |
| TRANSONA FIVE | <input type="checkbox"/> | ROAMER SIX | <input type="checkbox"/> |
| POCKET FIVE | <input type="checkbox"/> | EDU-KIT | <input type="checkbox"/> |

Parts price list and plans for

Name

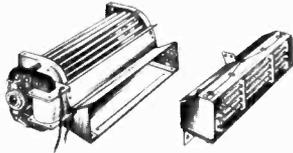
Address

P.E. 42

FULL AFTER SALES SERVICE

- ★ Callers side entrance Barratts Shoe Shop
- ★ Open 10-1, 2.30-4.30 Monday-Friday, 9-12 Saturday

LINDAIR (ELECTRO-TECH) LTD



TANGENTIAL HEATER

Silently driven by a shaded pole Mycalex motor. Compact, powerful and quiet running with aluminium impeller (outlet 51 x 11). Mains voltage. PLUS matching heater unit with spiral element. May be switched for 500 or 1,000 watts. **PRICE ONLY £1.60** P. & P. 40p

SYNCHRONOUS AUTO-RESET PROCESS TIMER

By LONDEX LIMITED

Type IMP Mk. 2. Brand New and Boxed. These well known timers are already in world-wide use and are perfect for Industrial Electronic Timing, Research and for all machine control timing problems. Repetitive accuracy better than 0.5% of full scale setting. Two or more can be interconnected to give control of a series of processes. 230/250v. 50Hz, also available 50Hz. 15 minutes full scale, 15 secs. per division. Driven by self-starting sync. motor. Contact rating 5 amp at 250v. a.c. Incorporates solenoid operated clutch. Also, lever actuated micro switches. Normal price probably in excess of £16. Complete with multi-pin connector as illustrated.



OUR PRICE ONLY £6.50

SEEN THIS ?

This is the only way we could illustrate this fabulous item.

NORPLEX

the famous American fibre-glass copper-clad laminate. Finest quality with Woven Glass base of Epoxy-resin. Excellent mech. and elec. conductive properties. Heat Resistant. Ideal for P.C.s., etc. **THIS IS A SPECIAL PURCHASE AND ONLY AVAILABLE WHILE STOCKS LAST.** Sizes: 12" x 12", 24" x 12", 24" x 24". FULL SHEET 43" x 37" (11 sq. ft.). Single sided copper with thicknesses of 1/32", 3/64", 1/16", 3/32", also Double sided 1/32", 1/16", 3/32".

PRICE ONLY £1 per sq. ft. £8 per full sheet. P. & P. 25p up to 4 sq. ft. Over 4 sq. ft. (cut sizes only) Post FREE. Full sheets post by rail G.B. only £1 one or more sheets.

MICRO-LITES

Wonderful engineering—micro miniature incandescent lamps small enough to pass through the eye of a needle! 1,000's of uses. Will operate from the output of a transistor. Rating: 1.5v. 10-15ma. Size 4.4 x 1.4mm. dia. Leads 22mm. These fantastic lamps have a life expectancy of 1,000 hrs.

OUR PRICE

£3.25

per doz. Free p. & p.



NEW AND UNUSED

Postal or carriage charges are for Great Britain only. We welcome orders from established companies, educational depts., etc. All orders under £2.50, cash with order please.

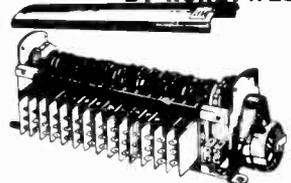
FURTHER BULK PURCHASE

SILVANA MAGNETIC SWITCH

NOW COMPLETE WITH REFERENCE MAGNET. A magnificently activated switch. Vacuum sealed in a glass envelope. Silver contacts normally closed, rated 3 amp at 120v. 13 amp at 240v. Size (approx.) 17/16" long 1/2" dia. Ideal for Burglar Alarms, Security systems, etc., and wherever non-mechanical switching is required. **New Lower Price. Only £2.10 for 12. £3 for 50 or £15 for 100 complete with magnet.**

£2.10

PROGRAMMER TIMER BY HONEYWELL



A bank of 15 micro-switches are each independently operated by 15 pairs of cams which in turn are individually adjustable to give switching periods of zero to 12 seconds with infinitely variable combinations. A mains synchronous motor drives the cam shaft at 1 rev. per 12 seconds (5 R.P.M.). Designed originally for vending machines at a cost of £15.00 plus. Many applications where continuous sequence programmes are required, such as lighting effects etc. New in original makers cartons. First class value at £5.75 plus 25p P. & P.

£5.75

301 EDGWARE ROAD, LONDON W2. Tel: 01-262 2251. Open 9 a.m.-6 p.m. MON to SAT

RADIO AMATEUR'S HANDBOOK 1972

by THE A.R.R.L.

£2.70 Postage 25p.

GUIDE TO PRINTED CIRCUITS by Gordon J. King. £2.50. Postage 10p.

FOUNDATIONS OF WIRELESS AND ELECTRONICS by M. G. Scroggie. £1.80. Postage 20p.

BASIC DATA PROCESSING. Prepared by the Bureau of Naval Personnel. £1.50. Postage 12p.

RADIO, TELEVISION AND AUDIO TEST INSTRUMENTS by Gordon J. King. £3.80. Postage 12p.

20 SOLID STATE PROJECTS FOR THE CAR AND GARAGE by R. M. Marston. £1.20. Postage 8p.

SERVICING WITH THE OSCILLOSCOPE by Gordon J. King. £1.80. Postage 10p.

AUDIO TECHNICIAN'S BENCH MANUAL by John Earl. £3. Postage 10p.

RADIO VALVE AND TRANSISTOR DATA by A. M. Ball. 75p. Postage 12p.

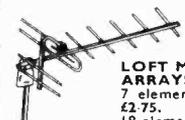
THE MODERN BOOK CO.

BRITAIN'S LARGEST STOCKIST of British and American Technical Books
19-21 PRAED STREET LONDON W2 1NP

Phone 01-723 4185
Closed Saturday 1 p.m.

U.H.F. TV AERIALS

SUITABLE FOR COLOUR & MONO-CHROME RECEPTION



All U.H.F. aerials now fitted with tilting bracket and 4 element reflector.

LOFT MOUNTING ARRAYS

7 element £2.25. 11 element £2.75. 14 element £3.25. 18 element £3.75.

WALL MOUNTING c/w WALL ARM AND BRACKET. 7 element £3.25. 11 element £3.75. 14 element £4.25. 18 element £4.75.

CHIMNEY MOUNTING ARRAYS c/w MAST AND LASHING KIT. 7 element £4. 11 element £4.50. 14 element £4.75. 18 element £5.25.

MAST MOUNTING arrays only 7 element £2.25. 11 element £2.75. 14 element £3.25. 18 element £3.75. Complete assembly instructions with every aerial. **LOW LOSS** coaxial cable 9p yd.

KING TELEBOOSTERS from £3.75. **LABGEAR** all band V.H.F.—U.H.F.—F.M. radio mains operated pre-amplifiers £7.50. State clearly channel number required on all orders. P. & P. on all aerials 50p accs. 15p. C.W.O. min. C.O.D. charge 25p.

BBC-ITV-FM AERIALS

BBC (band 1) Wall S/D £2. **LOFT inverted 'T'** £1.25. **EXTERNAL 'H'** array only £3. **ITV (band 3) 5 element** loft array £2.50. 7 element £3. **COMBINED BBC-ITV** loft 1+5 £2.75. 1+7 £3.50. **WALL AND CHIMNEY UNITS ALSO AVAILABLE.** Pre-amplifiers from £3.75.

COMBINED U.H.F.-V.H.F. aerials 1+5+9 £4. 1+5+14 £4.50. 1+7+14 £5. **F.M. RADIO** loft S/D £1. 3 element £3.25. 4 element £3.50. Standard coaxial plugs 9p. Coaxial cable 5p yd. Outlet box 30p. P. & P. all aerials 50p. accs. 30p. C.W.O. min. C.O.D. charge 25p. Send 5p for fully illustrated lists.

CALLERS WELCOMED OPEN ALL DAY SATURDAY

K.V.A. ELECTRONICS

40-41 Monarch Parade, London Rd.
Mitcham, Surrey
Telephone 01-648 4884

6 WATT STEREO AMPLIFIERS



High quality amplifiers giving 3W/channel RMS. With low distortion (0.2%). The circuit is designed around the Plessey Integrated Circuit Type SL403D.

There is a single and a two-tone control model each designed to accept a crystal pick-up. Giving a frequency response from 50 to 15kHz with a load of 8 ohm impedance 3W/channel.

Transformers for above amplifiers £1.25 each
Single Tone Controls £5.95 each
Dual Tone Controls £7.49 each

LOUDSPEAKER ENCLOSURE

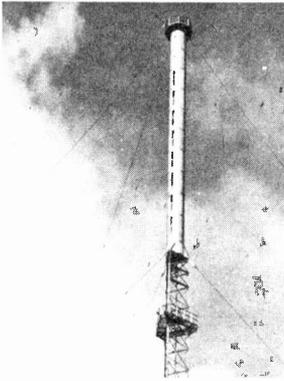


Incorporating 6 x 4in Fane speaker 10,000 Gauss. Voice coil impedance 8 ohm. With 6ft of lead. Teak Vinyl covered enclosure with slotted Scandinavian type front. Size 12 1/2 x 7 1/2 x 3 1/2 in. Ideal for extension speakers. Price, £3.60 each.

Plessey I.C.'s Type SL403D complete with circuit diagram, £1.25 each

Trade enquiries invited. Post and packing 20p for speakers and amplifiers.

CIRTEC PRINTED CIRCUITS LTD
HIXON INDUSTRIAL ESTATE, HIXON
STAFFORD



Stereo Reception

By M. G. Foster, C.Eng., M.I.E.E.

THE FIRST BBC experimental stereophonic transmissions were broadcast from the Old Vic, in London, in 1926 using two medium-wave transmitters. In those days the medium wave band was not so congested, the power of transmitters was less and radio reception was possible using comparatively simple equipment.

By the late 1930s the position had radically altered and consideration was being given to ways of providing interference-free domestic radio services. In the event, however, it was not until after the war that any real progress became possible.

MEDIUM WAVE LIMITATIONS

By this time the number of medium wave channels available to the BBC had become insufficient, and their quality inadequate, for the satisfactory national distribution of three programmes.

Fading, increasing interference from powerful foreign stations and the necessity for synchronized working were severely limiting the range of existing stations, mainly as a consequence of the unsatisfactory working of the Copenhagen Wavelength Plan in Europe.

To overcome these difficulties the BBC put forward a plan to establish a v.h.f. broadcasting service within the band allocated for sound broadcasting in the European Region. The BBC plan was subjected to a long series of practical tests both as regards its feasibility and in respect of the system of modulation to be used.

As nothing in this world is perfect it was only to be expected that snags existed, and among these the most noticeable from the listener's viewpoint were likely to be receiver hiss and impulsive interference such as that produced by motor car ignition systems.

ADVANTAGES OF F.M.

One result of the tests was that frequency modulation was adopted for the v.h.f. service because its use resulted in a considerable reduction in both these forms of noise and interference. It was also decided to use horizontal polarization throughout.

Propagation conditions in the v.h.f. band differ considerably from those in the medium and low frequency bands. Signal strength decreases rapidly with distance from the transmitter and terrain contours exert a greater influence on signals between transmitter and receiver; hills cast partial "shadows", similar to optical shadows.

Fading may occur at times owing to changes in weather conditions, reflections from aircraft, and similar causes depending on the distance from the transmitter.

It is not possible to give as precise an estimate of the service area of a v.h.f. station as it is for one operating on medium waves. Listeners living in particularly unfavourable positions within a nominally "first class" service area may obtain only second class results, whereas those in geographically favourable locations outside such an area may still get a first class service.

Two other matters which could cause deterioration in reception are interference from stations operating on the same frequency, and interference from those on closely adjacent frequencies.

The first can be reduced to negligible proportions by carefully siting transmitters using the same frequencies so as to provide the greatest possible geographical separation between them. The second can be mitigated by similar action but is also to some extent dependent on receiver design.

F.M. RECEIVERS

Two essential requirements for a good v.h.f. f.m. broadcast receiver are (a) that it should be provided with a limiter able to operate efficiently at the minimum field strength for which the receiver is designed, and (b) that oscillator drift should be reduced to reasonable limits. This latter point is inherent in the design of any v.h.f. receiver, but, with modern circuitry and sometimes the application of automatic frequency control it can be achieved without undue difficulty.

The first requirement is of the greatest importance because, unless the limiter does become fully operative the principal advantage of f.m., that of noise suppression, is partially or wholly lost.

EXPERIMENTAL STEREO BROADCASTS

The v.h.f. broadcasts by the BBC passed out of the experimental stage and became a service, from the Wrotham station in Kent, in 1955. Within a year or two, however, stereophony was reaching, and interesting, a much wider audience through the medium of stereo recordings and reproducing equipment and a demand for stereophonic radio programmes began to assert itself.

A series of experimental transmissions using the pilot tone system was inaugurated by the BBC from Wrotham in 1962. These continued at intervals until,

on 30 July 1966, the then Postmaster General authorised the BBC to introduce a limited stereo service using this system, which had been agreed as the stereo broadcasting system for the U.S.A. and certain other European countries.

This system permits the stereo signal to be broadcast on a single v.h.f. channel without any significant increase in bandwidth and provides a satisfactory mono signal for listeners using existing v.h.f. receivers. It also offers a stereo service comparable with if not better than that obtainable from good stereo gramophone records.

ENCODING OF STEREO SIGNALS

Fig. 1 shows diagrammatically the distribution of the signals in the transmitted spectrum, including the 19kHz pilot tone.

The left plus right (L + R) section provides for mono reception by any f.m. receiver and, suitably combined with the left minus right (L - R) sidebands and the pilot tone in a multiplex decoder, the three signals provide a stereo output.

To achieve this modulation the left and right signals from the microphones—or the appropriate outputs from a stereo microphone—are connected to a matrixing network from which two new outputs, the L + R and the L - R, are derived. The whole chain is shown in diagrammatic form in Fig. 2. The L + R is the equivalent of the mono signal but, as only a single transmitter is to be used, the L - R signal has also to be conveyed without its causing any interference to the reception of the mono signal.

The L + R signal normally has a frequency range of about 30Hz to 15kHz and, although the audio frequency spectrum may be considered to extend outside this range, receiver design precludes the reproduction of other frequencies. The L + R signal is therefore used to modulate the transmitter in a conventional manner.

To handle the remaining information which must be sent simultaneously, a very stable 19kHz oscillator is used to generate the pilot tone which is used as additional modulation for the transmitter for ultimate recovery and processing in the receiver.

A second output from the oscillator is frequency-doubled to produce a 38kHz r.f. carrier. This, together with the L - R signal, is fed to a suppressed-carrier modulator in which sidebands are generated whilst the actual carrier is suppressed. The two sidebands obtained by this method provide the third source of modulation for the transmitter.

THE STEREO RECEIVER

At the receiver these well spaced signals will permit a mono set to reproduce only the L + R, or audio signal, shown on the left in Fig. 1, thus providing the mono programme. In a stereo receiver, however, one of two alternative types of decoder is present.

In the sum and difference type, shown in the diagram Fig. 3, the received f.m. signal is fed to three filters. The first, being tuned to pass only audio frequencies, rejects all but the L + R signal. The second accepts only frequencies above 23kHz and thus rejects the L + R signal and the 19kHz pilot tone, but passes the L - R sidebands.

The final filter, being sharply tuned to 19kHz,

rejects all but the pilot tone. The pilot tone is passed through a frequency doubler whose output is fed, together with the L - R sideband signals into a demodulator at the output of which the L - R signal is recovered.

The L - R and L + R signals then pass into a matrix network from which the original L and R signals are reproduced. This decoding system is, in essence, a reversal of the transmitting arrangements but it suffers from the disadvantage that each of the filters delays the signal by a different amount thus necessitating the inclusion of phase-correcting networks to re-establish the correct phase relationship between them prior to reproduction. This entails added complication and cost.

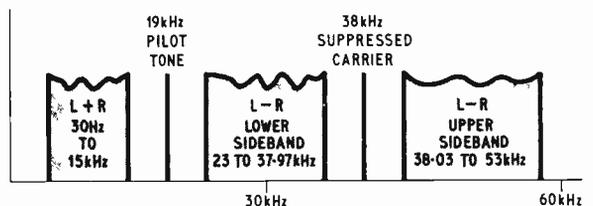


Fig. 1. Diagram showing the various components of the modulation of an f.m. stereo transmission. The signal bands are spaced for clarity; their positions on the frequency scale are only approximate

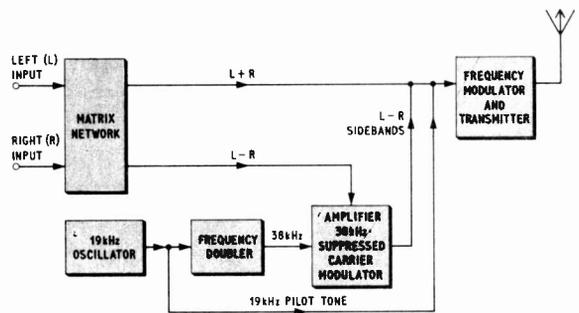


Fig. 2. Block diagram showing the method of modulating an f.m. transmitter with a multiplex stereo signal

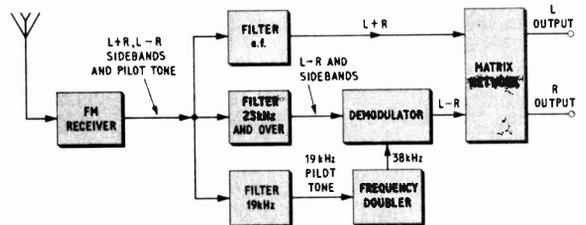


Fig. 3. Block diagram of a sum and difference type stereo decoder

SWITCHING DECODER

The second type of decoder, the switching decoder, was developed to overcome the disadvantage inherent in the sum and difference type. It is shown in schematic form in Fig. 4.

The 19kHz pilot tone is again extracted using a suitable filter and is frequency doubled as before to produce the 38kHz sub-carrier. This is fed to two demodulator units in which it is used as a switching signal to direct the entire output alternately to the left- or right-hand channel.

The v.h.f. transmissions certainly provide the best quality reception of sound radio available in the U.K. Interference from foreign stations is virtually eliminated and the f.m. system provides a much wider frequency range than is possible on the a.m. services on medium wave. Radio 3 also offers the stereo service over a wide area of the country as shown in Fig. 5.

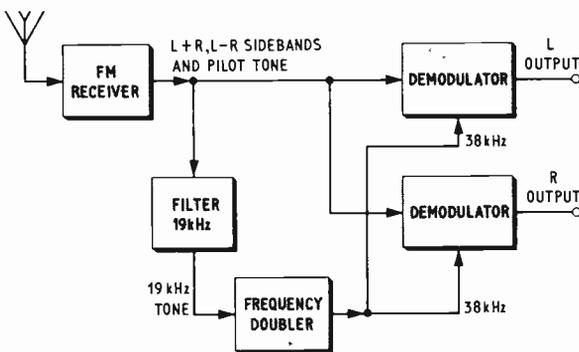


Fig. 4. Block diagram of a switching type stereo decoder

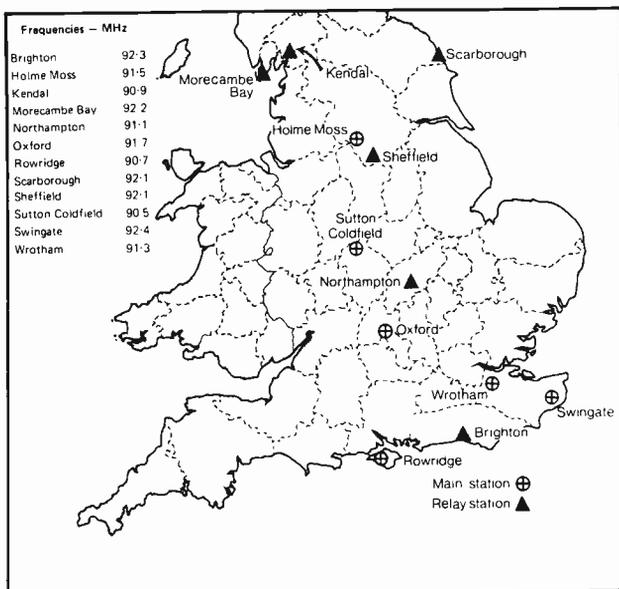


Fig. 5. The present area served by Radio 3 stereophonic transmissions. Good stereo reception should be obtainable over most of the area indicated by the unshaded part of the map, but the receiving aerial requirements are far more critical than those for monophonic reception

V.H.F. AERIALS

If, however, full advantage is to be taken of the improved reception which the service offers it is essential that a suitable aerial be used.

V.h.f. aerials are directional and thus the signal strength received depends upon the position of the aerial in relation to the direction of the transmitter. Freedom from interference and noise in a v.h.f. receiver depends partly on the strength of signal delivered to the receiver which, in turn, is dependent on the aerial.

The better the aerial the better the reception and the greater the freedom from noise.

This is particularly important when stereo programmes are being broadcast, as the slight reduction in the mono service area due to the fact that a small proportion—9 per cent to be exact—of the permissible deviation available for the f.m. transmitter is used to carry the 19kHz pilot tone; also some of the programme is carried in the supersonic part of the spectrum around 38kHz.

The only effect this is likely to have on a mono receiver is to make it slightly more susceptible to background noise, particularly motor car ignition noise if the receiver is located near a busy road. Tests have shown, however, that in nearly every case where such degradation was perceptible, it could be cured by the use of a more efficient aerial.

STEREO SIGNAL TO NOISE RATIO

A situation similar to that described above also exists when a stereo receiver is used, but there is an additional, inherent, reason for some worsening of the signal to noise ratio. The mono receiver is concerned purely with noise occurring within the frequency range 30Hz to 15kHz, whereas the stereo receiver must receive frequencies up to 53kHz, and thus any additional noise in this part of the spectrum, together with any intermodulation products falling within the audible range, will cause some degradation of the reproduced sound.

Some amelioration of these undesirable features can be achieved by suitable decoder design but, once again, practical experience has shown that very considerable improvement in the stereo reception at a given location is almost always possible by using a more efficient aerial to provide a higher input to the receiver.

From the foregoing it will be seen that, given a satisfactory receiver and a reasonable signal strength probably the most important single factor affecting v.h.f. reception in either mono or stereo is the use of a really efficient aerial to deliver the signal to the set. So important does the BBC consider the question of aerials that it has produced a leaflet entitled V.H.F. Receiving Aerials which can be obtained on request.

ADJACENT CHANNEL INTERFERENCE

In certain areas there is also the question of adjacent channel interference to be considered when receiving a stereo broadcast. Such interference can be caused by stations separated in some cases by only 200kHz. Under these circumstances the fifth harmonic of the 38kHz sub-carrier—190kHz—produces a difference frequency of 10kHz which is carrying both amplitude and frequency modulation.

This in turn gives rise to whistles or warbles, often referred to as "birdies". The insertion of a low pass

filter between the discriminator and decoder to remove the 190kHz component prevents this undesirable effect. The filter should be designed to pass only those frequencies below about 70kHz.

23KHZ PILOT TONE

On page 311 of the April 1972 issue it is stated that the BBC "have the unfortunate habit of putting a 23kHz pilot tone on top of mono programmes" and it may be of some interest to outline the reason for this tone.

Continuity monitoring of frequency-modulated transmissions over radio paths is the purpose of this low-level pilot tone. Originally the frequency used was 20kHz but, with the introduction of the stereo service, it was changed to 23kHz to prevent any mis-switching of stereo receivers.

The tone is injected into the audio system at a transmitting station at a level of -30 dB with reference to zero level and produces approximately 4.5kHz deviation at the transmitter output.

At the receiving station it is detected by a receiver, filtered out and used to start up or close down transmitters, or to change from one programme source to another.

If the tone is to be used on the next radio path it is removed from the programme by a low-pass filter and tone from a local oscillator substituted prior to re-transmission. Some systems rely on detecting the main station carrier to start or close down relay transmitters. These, however, suffer from the disadvantage that it is possible for noise to produce sufficient output from the receiver after the main station has shut down for the relay to remain switched on.

LISTENING TO STEREO

For best stereophonic listening the two loudspeakers should ideally be spaced 6 to 12 feet apart and the listener should sit at a point which is equidistant from them and preferably not closer to them than their distance apart.

The programme announcements will usually be made from a central position and the receiver should be adjusted using the balance control, if fitted, so that the speaker's voice appears to come from a point midway between the loudspeakers.

The acoustics of the listening room will affect the results and different listening and loudspeaker positions should be tried to obtain the best result.

SERVICE AREA

At present the stereophonic transmissions are available to listeners within the service areas of the BBC's v.h.f. transmitting stations at Wrotham, Rowridge, Sutton Coldfield, Holme Moss and Swingate and of the following relay stations: Brighton, Oxford, Northampton, Sheffield, Scarborough, Morecambe Bay and Kendal, and the approximate area of the U.K. in which they can be received is shown in Fig. 5.

Stereophonic programmes are available in these areas on v.h.f. Radio 3 and are marked in *Radio Times* by a special "S" symbol. The emphasis is mainly on music, because this type of programme derives the greatest benefit from stereophonic reproduction.

Equipment is being installed to enable the number of stereophonic programmes in Radio 3 to be

increased. The BBC would like to extend stereophony throughout the country and to more than one of the radio services and it is hoped that the necessary finance can soon be found to bring this worthwhile improvement to the listener. In the meantime it is planning to expand its stereo service considerably during the next few years. The extension beyond the present Radio 3 service will take place in three phases.

EXTENSION OF STEREO SERVICE

First the installation of stereo origination facilities for Radio 2 (with Radio 1) and Radio 4. This has called for a major re-equipment programme involving modifications to the continuity suites and central control equipment in London as well as a considerable increase throughout the United Kingdom in the number of tape machines, gramophone desks, studios and outside broadcast units equipped for stereo.

This phase is already in progress, and it is expected that it will be possible to originate a major proportion of stereo programmes on Radio 2 by the end of 1972, and also to make possible the transmission of some stereo programmes on Radio 4. Further increases in stereo capability will continue during the succeeding years.

PULSE CODE MODULATION

The second phase concerns the extension of Radio 2 and Radio 4 stereo to those transmitters already radiating Radio 3 in stereo. For this a new system of super high frequency (s.h.f.) radio links is planned, using pulse code modulation (PCM).

The PCM system to be used on the s.h.f. radio links has been developed by the BBC. It will carry ten audio circuits. Each stereo programme will use two circuits, for the L and R channels, and the stereo coding will be carried out at each main transmitting station.

The PCM system will provide improved quality in respect of both audio bandwidth and signal-to-noise ratio, from which mono as well as stereo listeners will benefit. It thus forms part of the BBC's plan to improve still further the quality of its v.h.f. transmissions throughout the country.

It is expected that the three-network service, which involves the construction of several new radio link sites on the main route, will be available in the London area and the Midlands by the end of 1972 and in the North of England during 1973. Rowridge, serving central southern England, will be included in this phase and a full stereo service from Belmont, serving Lincolnshire, will follow the extension to the North of England.

THIRD PHASE

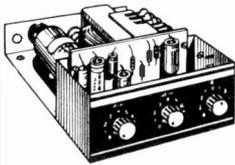
The third phase of the plan is the extension of the three network stereo service northwards to Central Scotland and westwards to the Bristol Channel area. The Post Office Corporation and the BBC are working towards this phase which it is expected will start in 1974.

ACKNOWLEDGEMENT

The author wishes to thank the Director of Engineering BBC for permission to publish this article.



SUPERSOUND 13 HI-FI MONO AMPLIFIER

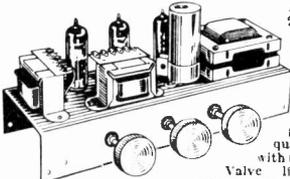


A superb solid state audio amplifier. Brand new components throughout. 5 silicon transistors plus 2 power output transistors in push-pull. Full wave rectification. Output approx. 13W r.m.s. into 8 ohm. Frequency response 12Hz-30KHz ±3dB. Fully integrated pre-amplifier stage with

separate Volume, Bass boost and Treble cut controls. Suitable for 8-15 ohm speakers. Input for ceramic or crystal cartridge. Sensitivity approx. 40mV for full output. Supplied ready built and tested, with knobs, escutcheon panel, input and output plugs. Overall size 3in high x 6in wide x 7in deep. A.C. 200/250V.

PRICE £10.50 P. & P. 25p.

DE LUXE STEREO AMPLIFIER



A.C. mains 200-240 volts. Using heavy duty fully integrated E.C.L.86 triode Pentodes. Complete with output transformer matched for 3 ohm speaker. Size 7in. w. x 3d. x 6h. Ready built and tested. PRICE £23.75. P. & P. 40p. ALSO AVAILABLE mounted on board with output transformer and speaker wire to fit cabinet below. PRICE £24.88. P. & P. 50p.

QUALITY RECORD PLAYER AMPLIFIER MK II
A top-quality record player amplifier employing heavy duty double wound mains transformer, E.C.83, EL84, and rectifier. Separate Bass, Treble and Volume controls. Complete with output transformer matched for 3 ohm speaker. Size 7in. w. x 3d. x 6h. Ready built and tested. PRICE £23.75. P. & P. 40p. ALSO AVAILABLE mounted on board with output transformer and speaker wire to fit cabinet below. PRICE £24.88. P. & P. 50p.

DE LUXE QUALITY PORTABLE R/P CABINET MK II
Circuit motor board size 14 1/2" x 12in., clearance 2in. below. 5in. above. Will take above amplifier and any B.S.R. or GARRARD changer or Single Player (except AT60 and S.R.23). Size 18 x 15 x 8in. PRICE £24.75. P. & P. 50p.

SPECIAL PURCHASE OF MANUFACTURER'S SURPLUS: All Transistor F.M. tuner head with twin A.M. Gang incorporated. Beautifully engineered with precision geared reduction drive. F.M. R.F. Transistor, oscillator/Mixer and first I.F. stage (10.7 Mc/s output) with optional AFC connection. Built on printed circuit panel and fully screened. Extremely stable over range 88-108 Mc/s. Brand new and pre-aligned. Size 2 1/2in H. x 4 1/2in D. For 6V D.C. @ 2.8mA. A.M. Gang fitted with trimmers which can be connected to standard A.M. aerial and oscillator circuits if required. LIMITED NUMBER. Only £2.25 post free. Connection details supplied.

BLACK ANODISED 16g. ALUMINIUM HEAT SINKS. For TO3, complete with mica's and bushes. Size 2 1/2in x 3in approx. 25p pair. P. & P. 5p.

HIGH GRADE COPPER LAMINATE BOARDS 8in x 6in x 1/4in. FIVE for 50p. P. & P. 13p.

TELESCOPIC AERIALS WITH SWIVEL JOINT. Can be angled and rotated in any direction. 6 section Lacquered Brass. Extends from 6in. to approx. 22in. Maximum diameter 1/4in. 25p each. P. & P. 5p.

BRAND NEW MULTI-RATIO MAINS TRANSFORMERS. Giving 13 alternatives. Primary: 0-210-240V. Secondary combinations: 0-5-10-15-20-25-30-35-40-60V half wave at 1 amp or 10-0-10, 20-0-20, 30-0-30V, at 2 amps full wave. Size 3inL 3 1/2inW x 3inD. Price £1.75. P. & P. 30p.

MAINS TRANSFORMER. For transistor power supplies. Pri. 200/240V. Sec. 9-0-9 at 500mA. 70p. P. & P. 15p. Pri. 200/240V. Sec. 12-0-12 at 1 amp. 85p. P. & P. 15p. Pri. 200/240V. Sec. 10-0-10 at 2 amp. £1.25. P. & P. 30p.

4 AMP BATTERY CHARGER TRANSFORMER
Brand new. For 6 or 12V. 24V Primary. Secondary volts r.m.s. off load 10 and 16.5V. Overall size approx. 2 1/2in x 2 1/2in x 3in. Weight 3lb. Limited number at £1.35. P. & P. 30p.

HANDBOOK OF TRANSISTOR EQUIVALENTS AND SUBSTITUTES

A must for servicemen and home constructors. Including many 1000's of British, U.S.A., European and Japanese transistors. ONLY 40p. Post 5p.

4-SPEED RECORD PLAYER BARGAINS
Mains models. All brand new in maker's packing. **LATEST B.S.R. C109/C129 4-SPEED AUTOCHANGER.** With latest mono compatible cartridge £26.97. Carr. 50p. With stereo cartridge £27.97. Carr. 50p. **LATEST GARRARD MODELS. S.A.E. for Latest Prices!**

PRECISION ENGINEERED PLINTHS
Beautifully constructed in heavy gauge "Colorcoat" plastic coated steel. Resonance free. Designed to take Garrard 1025, 2000, 3023TC, 2500, 3000, 3500, 5100, SP23 11 and 111, SL65B, AT60, etc., or B.S.R. C109, C129, A21, etc. Choice of black leatherette or teak grain finish. Size 12 1/2in x 14 1/2in x 3 1/2in high (approx. 7 1/2in high, including rigid smoked acrylic cover). Price £5.50 P. & P. 60p.

LATEST ACOS GP91/18C Mono Compatible Cartridge with 1/6 stylus for L.P./EP/78. Universal mounting bracket. £1.50. P. & P. 80p.

SONOTONE STAKO COMPATIBLE STEREO CARTRIDGE T/O stylus. Diamond Stereo LP and Sapphire 78. ONLY £2.50. P. & P. 10p. Also available fitted with twin Diamond T/O stylus for Stereo LP. £3. P. & P. 10p.

LATEST RONETTE T/O Stereo Compatible Cartridge for EP/LP/Stereo/78. £1.65. P. & P. 10p.

LATEST RONETTE T/O Mono Compatible Cartridge for EP/LP/78 mono or stereo records on mono equipment. £1.50. P. & P. 10p.

QUALITY RECORD PLAYER AMPLIFIER MK II
A top-quality record player amplifier employing heavy duty double wound mains transformer, E.C.83, EL84, and rectifier. Separate Bass, Treble and Volume controls. Complete with output transformer matched for 3 ohm speaker. Size 7in. w. x 3d. x 6h. Ready built and tested. PRICE £23.75. P. & P. 40p. ALSO AVAILABLE mounted on board with output transformer and speaker wire to fit cabinet below. PRICE £24.88. P. & P. 50p.

DE LUXE QUALITY PORTABLE R/P CABINET MK II
Circuit motor board size 14 1/2" x 12in., clearance 2in. below. 5in. above. Will take above amplifier and any B.S.R. or GARRARD changer or Single Player (except AT60 and S.R.23). Size 18 x 15 x 8in. PRICE £24.75. P. & P. 50p.

SPECIAL OFFER!! HI-FI LOUSPEAKER SYSTEM

Beautifully made teak finish enclosure with most attractive Tygan-Vynair front. Size 16 1/2in high x 10 1/2in wide x 5 1/2" deep. Fitted with E.M.I. Ceramic Magnet 13in x 8in bass unit, two H.F. tweeter units and crossover. Power handling 10W. Available 3, 8 or 15 ohm impedance.

Our Price £8.40 Carr. 65p.
CABINET AVAILABLE SEPARATELY £4.60. Carr. 60p.

Also available in 8 ohm with EM1 13in x 8in. bass speaker with parasitic tweeter. £9.50. Carr. 65p.

LOUDSPEAKER BARGAINS
5in 3 ohm £1.05. P. & P. 15p. 7 x 4in 3 ohm £1.15. P. & P. 20p. 10 x 6in 3 or 15 ohm £1.90. P. & P. 30p. E.M.I. 8 x 6in 3 ohm with high flux magnet £1.62. P. & P. 20p. E.M.I. 13" x 8in 3 ohm with high flux ceramic magnet £2.10 (15 ohm £2.25). P. & P. 20p. E.M.I. 12 x 8in, 3 or 8 ohm with two built-in tweeters and crossover network £4.20. P. & P. 30p. E.M.I. 13" x 8" twin cone (parasitic tweeter) 8 ohm £2.25. P. & P. 30p.

BRAND NEW. 12in 15W H/D Speakers, 3 or 15 ohm. Current production by well-known British maker. Now with HiLux ceramic ferrobar magnet assembly £6.25. Guitar models: 25w £8.50, 35w £3.50. P. & P. 38p each.

E.M.I. 3in HEAVY DUTY TWEETERS. Powerful ceramic magnet. Available in 3, 8 or 15 ohm 88p each. P. & P. 13p.

12in "RA" TWIN CONE LOUSPEAKER
10 watts peak handling, 3, 8 or 15 ohm £2.90. P. & P. 30p. 35 ohm SPEAKERS 3". ONLY 63p. P. & P. 13p.

"POLY PLANAR" WAFER-TYPE, WIDE RANGE ELECTRO-DYNAMIC SPEAKER

Size 11 1/2in x 14 1/2in x 1 1/2in deep. Weight 19oz. Power handling 20W r.m.s. (40W peak). Impedance 8 ohm only. Response 40Hz-20KHz. Can be mounted on ceilings, walls, doors, under tables, etc., and used with or without baffle. Send S.A.E. for full details. Only £5.75 each. P. & P. 20p.

YVNAIR & BEXINE SPEAKERS & CABINET FABRICS
YVNAIR 54in. wide. Usually £1.75 yd., our price 75p yd. P. & P. 15p (min. 1 yd.). S.A.E. for samples.

HI-FI STEREO HEADPHONES

Adjustable headband with comfortable flexifoam ear-muffs. Wired and fitted with standard stereo in jack plug. Frequency response 30-15,000Hz. Matching impedance 8-16 ohms. Easily converted for mono. PRICE £2.95. P. & P. 15p.

HIGH IMPEDANCE CRYSTAL STICK MIKES. OTR PRICE £1.05. P. & P. 8p.

GENERAL PURPOSE HIGH STABILITY TRANSISTOR PRE-AMPLIFIER. For P.U. Tape, Mike, Guitar, etc., and suitable for use with valve or transistor equipment. 9-18V. Battery or from H.T. line 200/300V. Frequency response 15Hz-25KHz. Gain 24dB. Solid encapsulation size 1 1/2 x 1 1/2 in. Brand new - complete with instructions. Price 88p. P. & P. 13p.

CENTRE ZERO MINIATURE MOVING COIL METER. 100µA for balance or tuning. Approx. size 1in 1in 1/2in. Limited number 75p. P. & P. 10p.

HARVERSONIC SUPER SOUND 10 + 10 STEREO AMPLIFIER KIT



NEW FURTHER IMPROVED MODEL WITH HIGHER OUTPUT AND INCORPORATING HIGH QUALITY READY DRILLED FIBRE GLASS PRINTED CIRCUIT BOARD WITH COMPONENT IDENTIFICATION CLEARLY MARKED FOR EVEN EASIER CONSTRUCTION

A really first-class Hi-Fi Stereo Amplifier Kit. Uses 14 transistors including Silicon Transistors in the first five stages on each channel resulting in even lower noise level with improved sensitivity. Integrated pre-amp with Bass, Treble and two Volume Controls. Suitable for use with Ceramic or Crystal cartridges. (Very simple to modify to suit magnetic cartridge—instructions included). Output stage for any speakers from 5 to 15 ohms. Compact design, all parts supplied including drilled metal work, high quality ready drilled fibre glass printed circuit board, smart brushed anodised aluminium front panel with matching knobs, wire, solder, nuts, bolts—no extras to buy. Simple step by step instructions enable any constructor to build an amplifier to be proud of. Brief specification: Power output 14W r.m.s. per channel into 5 ohms. Frequency response ±10dB 12-30,000Hz. Sensitivity better than 80mV into 1MΩ. Full power bandwidth 3-30Hz 12-15,000Hz. Bass boost approx. to +12dB. Treble cut approx. to -16dB. Negative feedback 18dB over main amp. Power requirements 35V at 1.0 amp. Overall size—12" wide 8" deep 2 1/2" high.

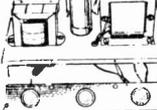
Fully detailed 7-page construction manual and parts list free with kit or send 18p plus large S.A.E.

PRICES AMPLIFIER KIT £10.60 P. & P. 15p. (Magnetic input components 30p extra)

POWER PACK KIT, £3 P. & P. 30p.
CABINET, £3 P. & P. 30p.

(Post Free if all units purchased at same time). Full after sales service. Also available ready built and tested, £20.50. Post Free.

Note: The above amplifier is suitable for feeding two mono sources into input (e.g. mike, radio, twin record decker etc.) and will then provide mixing and fading facilities for medium powered Hi-Fi Discotheque use, etc.



3-VALVE AUDIO AMPLIFIER HA34 MK II

Designed for Hi-Fi reproduction of records. A.C. Mains operation. Ready built on plated heavy gauge metal chassis, size 7in w. x 4in d. x 4 1/2in h. Incorporates EC83, EL84, E280 valves. Heavy duty, double wound mains transformer and output transformer matched for 3 ohm speaker. Separate volume control and now with improved wide range tone controls giving bass and treble lift and cut. Negative feedback line. Output 41 watts. Front panel can be detached and leads extended for remote mounting of controls. Complete with knobs, valves, etc., wired and tested for only £24.75. P. & P. 35p.

HSL "FOUR" AMPLIFIER KIT. Similar in appearance to HA34 above but employs entirely different and advanced circuitry. Complete set of parts, etc. £3.98. P. & P. 40p.

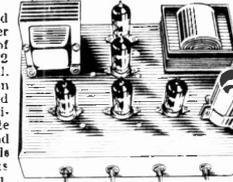
HARVERSON'S SUPER MONO AMPLIFIER

A super quality gram amplifier using a double wound fully isolated mains transformer, rectifier and ECL82 triode pentode valve as audio amplifier and power output stage. Impedance 3 ohms. Output approx. 3.5 watts. Volume and tone controls. Chassis size 7in wide x 3in deep x 6in high overall. AC Mains 200/240V. Supplied absolutely Brand New, completely wired and tested with good quality output transformer.

OUR ROCK BOTTOM BARGAIN PRICE £2.75 P. & P. 35p

10/14 WATT HI-FI AMPLIFIER KIT

A stylishly finished monaural amplifier with an output of 14 watts from 2 ECL82 in push-pull. Super reproduction of both music and speech, with negligible hum. Separate inputs for mike and gram allow records and other instruments to follow each other. Fully shrouded section wound output transformer to match 3-10Ω speaker and 2 independent volume controls, and separate bass and treble controls are provided giving good lift and cut. Valve line-up 2 EL84s, EC83, E86 and E280 rectifier. Simple instruction booklet 13p. (Free with parts). All parts sold separately. ONLY £7.97. P. & P. 55p.



Open 9-5.30 Monday to Saturday
Early closing Wed. 1 p.m.
A few minutes from South Wimbledon Tube Station

HARVERSON SURPLUS CO. LTD.

170 HIGH ST., MERTON, LONDON, S.W.19 Tel. 01-540 3985

SEND STAMPED ADDRESSED ENVELOPE WITH ALL ENQUIRIES

(Please write clearly)
PLEASE NOTE: P. & P. CHARGES QUOTED APPLY TO U.K. ONLY. P. & P. ON OVERSEAS ORDERS CHARGED EXTRA.

YATES ELECTRONICS (FLITWICK) LTD.

RESISTORS

½W Iskra high stability carbon film—very low noise—capless construction.
¼W Mullard CR25 carbon film—very small body size 7.5 × 2.5mm. 4W
Erie wire wound. ½W 2% ELECTROSIL TRS

Power watts	Tolerance	Range	Values available	Price
½	5%	4.7Ω-2.2MΩ	E24	1-99 100+
½	10%	3.3MΩ-10MΩ	E12	0-8p
½	2%	10Ω-1MΩ	E12	3-5p
½	10%	1Ω-3.9Ω	E12	1-0p
½	5%	4.7Ω-1MΩ	E12	1-0p
4	10%	1Ω-10Ω	E12	6p

Quantity price applies for any selection. Ignore fractions on total order.

DEVELOPMENT PACK

0.5 watt 5% Iskra resistors 5 off each value 4.7Ω to 1MΩ.
E12 pack 325 resistors £2.40. E24 pack 650 resistors £4.70.

POTENTIOMETERS

Carbon track 5kΩ to 2MΩ, log or linear (log ½W, lin ¼W).
Single, 12p. Dual gang (stereo), 40p. Single D.P. switch 24p.

SKELETON PRESET POTENTIOMETERS

Linear: 100, 250, 500Ω and decades to 5MΩ. Horizontal or vertical P.C.
mounting (0-1 matrix).
Sub-miniature 0-1W, 5p each. Miniature 0.25W, 6p each.

SEMICONDUCTORS

AC107 15p	BC108 10p	BFY52 22p	OC71 12p	1N4006 12p
AC126 12p	BC109 10p	BY127 12p	OC72 12p	1N4007 12p
AC127 12p	BC147 13p	BZY10 20p	OC81 12p	2N2926R 9p
AC128 12p	BC148 13p	BZY13 20p	OC82 12p	2N2926O 9p
AC131 12p	BC149 13p	OA85 7p	OC82D 12p	2N2926Y 9p
AD140 50p	BC157 14p	OA90 5p	ORP12 50p	2N2926G 10p
AF114 20p	BC158 14p	OA91 5p	1N4001 6p	2N3055 60p
AF115 20p	BC159 14p	OA202 7p	1N4002 10p	2N3702 13p
AF116 20p	BC179 32p	OC26 45p	1N4003 10p	2N3703 11p
AF117 20p	BFY50 22p	OC44 12p	1N4004 10p	2N3707 13p
BC107 10p	BFY51 22p	OC45 12p	1N4005 12p	2N3711 10p

ZENER DIODES

400mW 5% 3-3V to 30V, 15p.

LINEAR I.C.'s (D.I.L.)

709 50p 741, 50p

710 50p 748, 50p

DIL Socket 14

and 16 pin, 16p

BRUSHED ALUMINIUM PANELS

12in × 6in = 25p; 12in × 2½in = 10p; 9in × 2in = 7p.

ELSTOW STORAGE DEPOT,
KEMPSTON HARDWICK,
BEDFORD

C.W.O. PLEASE. POST AND PACKING
PLEASE ADD 10p TO ORDERS UNDER £2.

Catalogue which contains data sheets for most of the
components listed will be sent free on request.
5p stamp appreciated.

10% DISCOUNT TO ALL CALLERS ON SATURDAYS

MULLARD POLYESTER CAPACITORS C296 SERIES

400V: 0.001μF, 0.0015μF, 0.0022μF, 0.0033μF, 0.0047μF, 2½p. 0.0068μF, 0.01μF,
0.015μF, 0.022μF, 0.033μF, 3p. 0.047μF, 0.068μF, 0.1μF, 4p. 0.15μF, 6p. 0.22μF, 7½p.
0.33μF, 11p. 0.47μF, 13p.
160V: 0.01μF, 0.015μF, 0.022μF, 0.033μF, 0.047μF, 0.068μF, 3p. 0.1μF 3½p. 0.15μF 4½p.
0.22μF, 5p. 0.33μF, 6p. 0.47μF, 7½p. 0.68μF, 11p. 1.0μF, 13p.

MULLARD POLYESTER CAPACITORS C280 SERIES

250V P.C. mounting: 0.01μF, 0.015μF, 0.022μF, 3p. 0.033μF, 0.047μF, 0.068μF,
3½p. 0.1μF, 4p. 0.15μF, 5p. 0.22μF, 6½p. 0.33μF, 8½p. 0.47μF, 11p. 1.0μF, 13p.
1.5μF, 20p. 2.2μF, 24p.

MYLAR FILM CAPACITORS 100V

0.001μF, 0.002μF, 0.005μF, 0.01μF, 0.02μF,
2½p. 0.04μF, 0.05μF, 0.068μF, 0.1μF, 3½p.

CERAMIC DISC CAPACITORS

100pF to 10,000pF, 2p each.

ELECTROLYTIC CAPACITORS—MULLARD C426 SERIES

6p each.
(μF/V) 10/2.5, 40/2.5, 80/2.5, 160/2.5, 320/2.5, 500/2.5, 8/4, 32/4, 64/4, 125/4, 250/4,
400/4, 6.4/6.4, 25/6.4, 50/6.4, 100/6.4, 320/6.4, 4/10, 16/10, 32/10, 64/10, 125/10,
200/10, 2.5/16, 10/16, 20/16, 40/16, 80/16, 125/16, 1.6/25, 6.4/25, 12.5/25, 25/25, 50/25,
80/25, 1/40, 4/40, 8/40, 16/40, 32/40, 50/40, 0.64/64, 2.5/64, 5/64, 10/64, 20/64, 32/64.

ELECTROLYTIC CAPACITORS—MULLARD C437

100/40, 160/25, 250/16, 400/10, 640/6.4, 800/4, 1000/2.5, 9p. 100/64, 160/40, 250/25,
400/16, 640/10, 1000/4, 1250/4, 1600/2.5, 12p. 160/64, 250/40, 400/25, 640/16, 1000/10,
1600/6.4, 2000/4, 2500/2.5, 15p. 250/64, 400/40, 640/25, 1000/16, 1600/10, 2500/6.4,
3200/4, 4000/2.5, 18p.

ELECTROLYTIC CAPACITORS Miniature P.C. mounting

(μF/V): 10/12, 50/12, 100/12, 200/12, 5/25, 10/25, 25/25, 100/25. 5p each.

VEROBOARD

2½ × 3½	0-1	0-15
2½ × 5	22p	16p
3½ × 3½	24p	24p
3½ × 5	24p	24p
17 × 2½	27p	27p
17 × 3½	75p	57½p
17 × 5 (plain)	100p	78p
17 × 3½ (plain)	—	60p
17 × 2½ (plain)	—	42p
2½ × 5 (plain)	—	12p
2½ × 3½ (plain)	—	11p
Pin insertion tool	52p	52p
Spot face cutter	42p	42p
Pkt. 50 pins	20p	20p

JACK PLUGS AND SOCKETS

Standard screened	18p	2.5mm insulated	8p
Standard insulated	12p	3.5mm insulated	8p
Stereo screened	35p	3.5mm screened	13p
Standard socket	15p	2.5mm socket	8p
Stereo socket	18p	3.5mm socket	8p

D.I.N. PLUGS AND SOCKETS

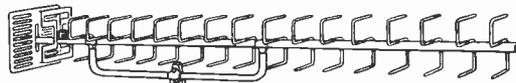
2 pin, 3 pin, 5 pin 180°, 5 pin 240°, 6 pin
Plug 12p. Socket 8p.
4 way screened cable, 15p/metre.
6 way screened cable 22p/metre.

BATTERY ELIMINATOR

£1-50
9V mains power supply. Same size as PP9 battery.

UHF-AERIALS

Suitable for colour and monochrome reception.
PLANAR folded dipoles + MESH reflectors



ILLUSTRATED UHF.50

Aerial Arrays designed for fringe area reception UHF.50 £3-90

UHF.18 £2-60

Without alochrome process for

loft/window sill mounting UHF.10 £1-95

chm Bkt & 5' angled mast C,5 £1-50

wall Bkt & 5' angled mast W,5 £1-00

(Available by mail order only when ordering UHF.50-UHF.18 or FM Aerials)

VHF/FM AERIALS

Aerial Array single-dipole B,21 £1-30

Aerial Array dipole-reflector B,22 £1-65

CAR-AERIALS

Wing mounting spring Aerial 3-section extends to 48½" A,6 £1-60

Motorised electric Aerial complete with details &

switch. 12V pos or neg. 5-section extends to 40" A,7 £6-00

PRE-AMPLIFIERS

Suitable for colour and monochrome, freq coverage 40-860 MHz-14dB Gain

Weather proof Pre-Amplifier T1 £5-25

240V.A.C. Power Unit T1/PU £4-25

Low-Loss co-axial cable sold in multiples of 5 meters at 40p, nylon cable clips

per 100 at 30p. Aerial switches at 90p Co-axial plugs at 8p.

P & P. UHF & VHF/FM Aerials 50p, Car Aerials-Amps & cable etc., 25p.

When ordering UHF Aerials, please state channel combination

or transmitter location. S.A.E. with enquiries please.

Terms P.O./Cheque with order. U.K. Mainland only.

AVEE (COMMUNICATIONS) LTD

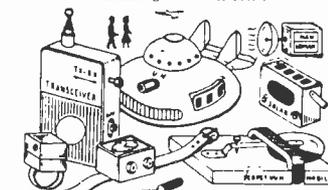
Dept P.E.1. 96a Plains Avenue, Maidstone, Kent

Telephone Maidstone 56962

PRINTED CIRCUIT KIT

BUILD 60 INTERESTING PROJECTS on a PRINTED CIRCUIT CHASSIS with
PARTS and TRANSISTORS from your SPARES BOX

CONTENTS: (1) 2 Copper Laminated Boards 4½in × 2½in. (2) 1 Board for Match-
box Radio. (3) 1 Board for Wristwatch Radio, etc. (4) Resist. (5) Resist Solvent.
(6) Etchant. (7) Cleanser/Degreaser. (8) 16-page Booklet *Printed Circuits for Amateurs*.
(9) 2 Miniature Radio Dials 8W/MW/LW. Also free with each kit: (10) Essential
Design Data, Circuits, Chassis Plans, etc. for 50 TRANSISTORISED PROJECTS.
A very comprehensive selection of circuits to suit everyone's requirements and
constructional ability. Many recently developed very efficient designs published for
the first time, including 10 new circuits.



EXPERIMENTER'S

PRINTED CIRCUIT KIT

60p

Postage & Pack. 10p (UK)

Commonwealth:

SURFACE MAIL 15p

AIR MAIL 60p

Australia, New Zealand,

South Africa, Canada

(1) Crystal Set with biased Detector. (2) Crystal Set with voltage-quadrupler detector.
(3) Crystal Set with Dynamic Loudspeaker. (4) Crystal Tuner with Audio Amplifier.
(5) Carrier Power Conversion Receiver. (6) Split-Load Neutralised Double Reflex.
(7) Matchbox or Photocell Radio. (8) "TRIFLEXON" Triple Reflex with self-
adjusting regeneration (Patent Pending). (9) Solar Battery Loudspeaker Radio.
The smallest 3 designs yet offered to the Home Constructor anywhere in the World.
3 Subminiature Radio Receivers based on the "Triflexon" circuit. Let us know
if you know of a smaller design published anywhere. (10) Postage Stamp Radio.
Size only 1.62in × 0.95in × 0.25in. (11) Wristwatch Radio 1.15in × 0.80in × 0.50in. (12)
Ring Radio 0.9in × 0.70in × 0.50in. (13) Bacteria-powered Radio. Runs on sugar or
bread. (14) Radio Control Tone Receiver. (15) Transistor P/P Amplifier. (16) Inter-
com. (17) 1-valve Amplifier. (18) Reliable Burglar Alarm. (19) Light-Seeking Animal,
Guided Missile. (20) Perpetual Motion Machine. (21) Metal Detector. (22) Transistor
Tester. (23) Human Body Radiation Detector. (24) Man/Woman Discriminator.
(25) Signal Injector. (26) Pocket Transceiver (Licence required). (27) Constant
Volume Intercom. (28) Remote Control of Models by Induction. (29) Inductive-Loop
Transmitter. (30) Pocket Triple Reflex Radio. (31) Wristwatch Transmitter/Wireless
Microphone. (32) Rain Alarm Receiver. (33) Ultrasonic Switch/Alarm. (34) Stereo Pre-
amplifier. (35) Quality Stereo Push-Pull Amplifier. (36) Light-Beam Telephone
"Photophone". (37) Light-Beam Transmitter. (38) Silent TV Sound Adaptor. (39)
Ultrasonic Transmitter. (40) Thyristor Drill Speed Controller. Plus 10 Photoelectric
Circuits, Simple Alarms, Long Range Alarms, Projector Modulators, etc.

YORK ELECTRICS, Mail Order Dept.

335 BATTERSEA PARK ROAD, LONDON, S.W.11

Send a S.A.E. for full details and a brief description of all kits and Projects.

P.E. GEMINI

STEREO TUNER

PART THREE

BY D.S.GIBBS & I.M.SHAW

THIS is the final article describing the printed circuit board assembly, cord drive, and setting up procedure.

COILS

Coil L2 is available as a ready made unit, but L1 has to be specially wound by the constructor on a Neosid NS/E3 former. Wind 17 turns of 30 s.w.g. enamelled wire neatly on to this former and solder the ends to the pins shown in Fig. 21. The winding should be secured with a smear of polystyrene model cement or a single layer of coloured adhesive tape, to ensure that the tuning of the coil remains stable.

Now apply a little polystyrene cement to the bottom of the coil former and slip the ferrite sleeve over the coil. Then apply a dab of polystyrene cement to the top of the coil former and push on the polythene clamp ring. Leave for 30 minutes to dry and then screw in the ferrite core until the top of the core just protrudes from the top of the coil former. Finally, carefully solder the 47pF tuning capacitor (C16) in place.

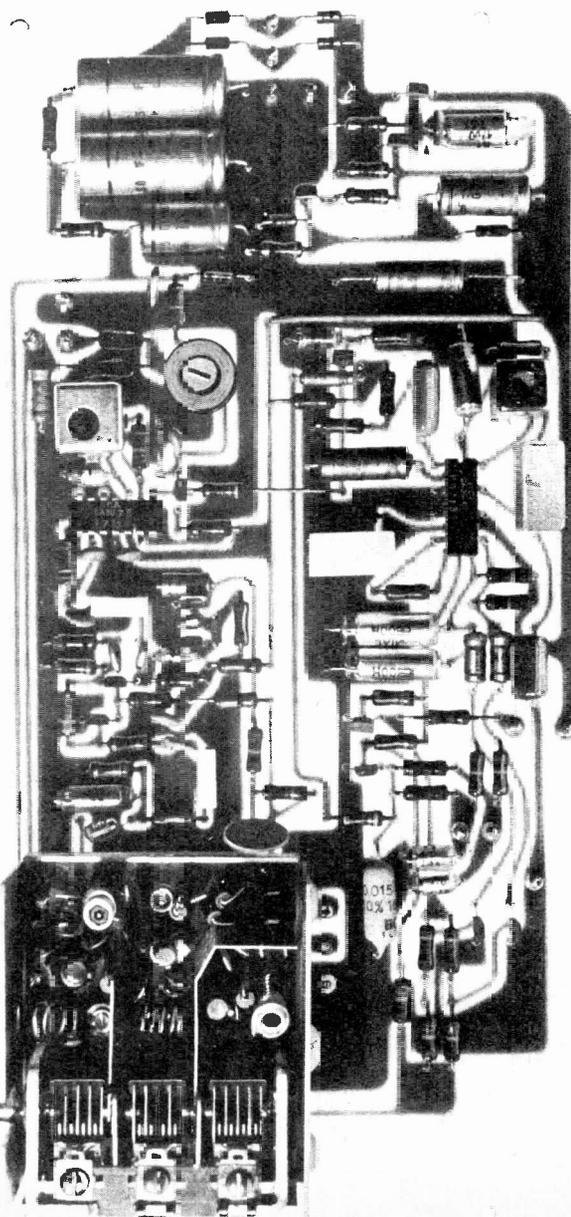
It is very important to handle the ferrite coil former for L1 with great care, as it is very fragile, and any damage could alter the properties of the complete assembly.

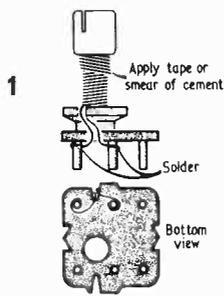
PRINTED CIRCUIT BOARD

Most of the components are mounted on a single glass fibre printed circuit board. The conductor pattern of this is shown in Fig. 22 and the component layout in Fig. 23. If you do not purchase a ready drilled p.c.b. you will need a No. 60 drill for component and i.c. leads; a No. 46 drill for the turret tags. Solder the tags to the copper before any of the components are inserted.

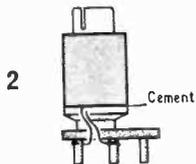
The wiring of the board is self-explanatory but the following sequence is preferable, and will minimise the risk of damage to the integrated circuits and the tuner head.

Insert and solder all the resistors except R14, and then all the capacitors. Mount the two coils. The semiconductor devices can now be inserted, but before doing so *make sure that the soldering iron is earthed* and that the circuit board is completely "floating" above earth (for example, placed on an insulated table top).



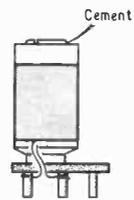


1. Carefully wind on 17 turns of 30 s.w.g. enamelled wire and solder to the pins shown. Secure the winding with a smear of polystyrene cement or a single layer of adhesive tape. Handle the former very carefully or it will break



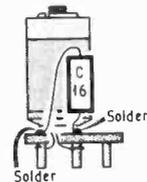
2. Apply a little polystyrene cement to the bottom of the coil former and slip the ferrite sleeve over the coil

3. Apply a dab of polystyrene cement to the top of the coil former and push on the polythene clamp ring. Leave for 30 minutes to dry



3

4. Screw in the ferrite core until it just protrudes from the top of the coil former. Use a trimming tool, a screwdriver may break the core. Carefully solder the tuning capacitor in place as shown



4

5. Insert in the printed circuit board, together with the screening can

Fig. 21. Construction of L1

Fig. 22. The printed circuit board, copper side (full size)

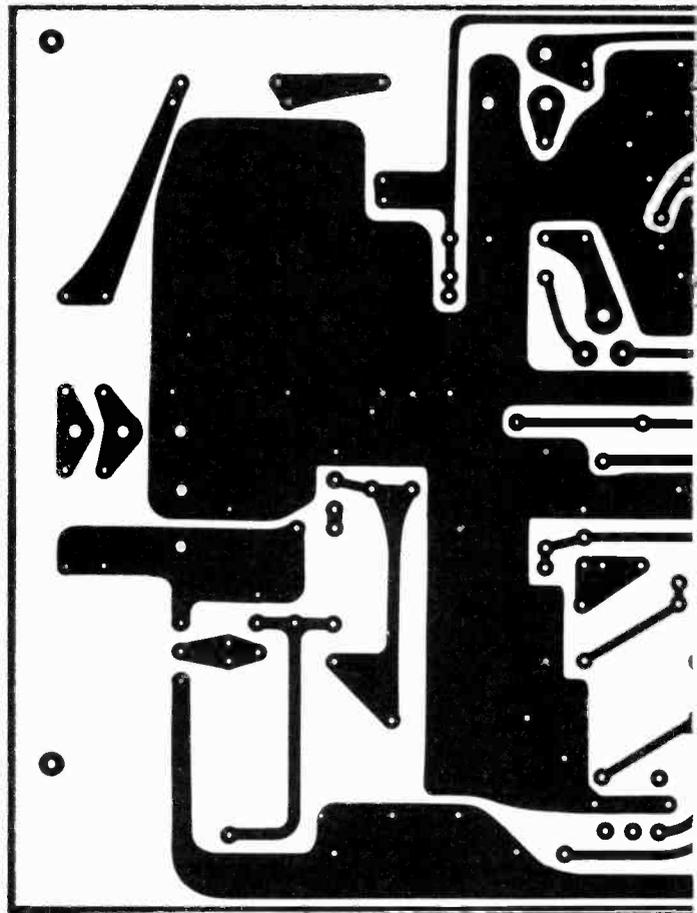
Fig. 23 (top right). The components assembled on the printed circuit board

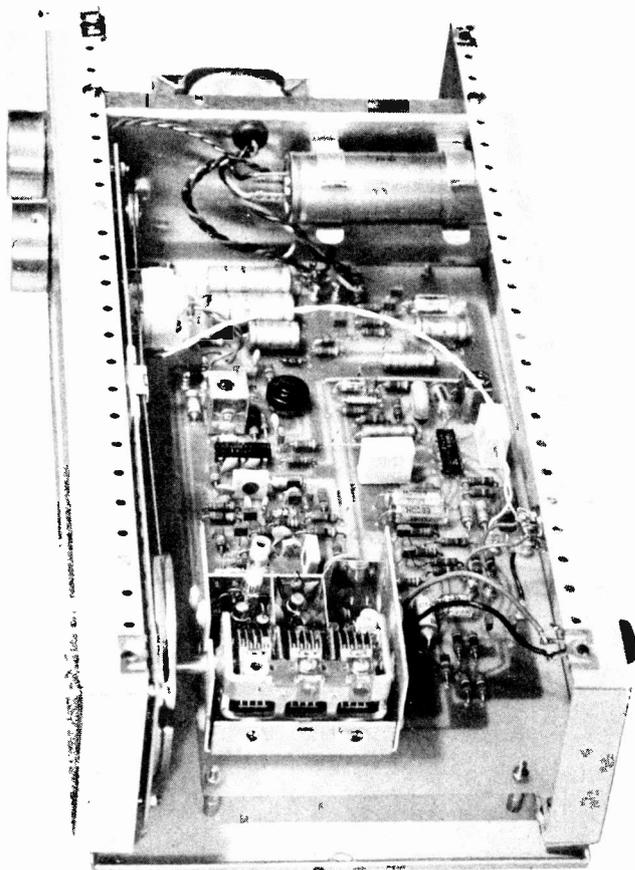
FURTHER NOTES

Some readers have informed us that they have had cases of the ZTX550 (TR12) blowing up.

The authors have investigated this and have been unable to duplicate the fault, even when operating the power supply at a considerable overload. As the ZTX550 is worked within its ratings they can only assume that these cases were due to "rogue" devices, but TR12 does run hot and constructors who would like an additional safeguard can fit a heat dissipating clip if they wish. Suitable types are the I.E.R.C. type RUR67B1U or the Redpoint type 92DC.

In Fig. 14, the dimension from the left-hand end of the panel to hole A for the pilot lamp should be $2\frac{3}{4}$ in.





Semiconductor devices can easily be damaged by high voltage transients from unearthed soldering irons, and a damaged CA3090Q will cost you over three pounds to replace. Heat shunts are not necessary with silicon semiconductors provided the joint is made quickly with a clean hot iron.

An iron of 15 or 25 watts with a small bit (less than $\frac{1}{8}$ in diameter) is preferable, and 22 s.w.g. cored solder should be used. Take great care not to allow solder "bridges" between adjacent tracks on the printed circuit board.

Finally, mount the tuner head and solder the pins that protrude from the underside and pass through holes in the board.

WIRING UP

The mains transformer and C40 are mounted on the small chassis plate shown in Fig. 20 last month. The mains switch is mounted on the front panel and the transient suppressor capacitor C41 should be wired directly on the switch terminals that are connected to the transformer. Sleeve the leads of this capacitor to prevent the possibility of a short circuit to the case. Mount the fuse holder, mains socket, aerial socket, and audio output socket on the back panel.

The printed circuit board is supported on five $\frac{1}{4}$ in spacers, and it is advisable to place a thin insulated washer over the top of the centre spacer because of the closeness of one of the copper tracks. In some cases it may be necessary to increase or decrease the height of the p.c.b. slightly to ensure that the tuning

drum fits inside the front panel without touching the top or the bottom. The top of the tuning drum should be approximately level with the top of the inner front panel.

There is very little wiring to do; this is shown in Fig. 24. If you are using a 75 ohm aerial the braid of the coax feeder should be connected to tag 16 and the inner to either tag 14 or tag 15 (it doesn't matter which). For a 300 ohm balanced feeder connect to tags 14 and 15; tag 16 is not used. The wiring shown in Fig. 24 is for the usual 75 ohm arrangement.

CORD DRIVE

Make a loop of nylon or similar drive cord approximately 25 inches total length and thread it around the drum, pulleys, and tuning drive as shown in Fig. 16 last month. Wrap two turns around the small drive shaft. It will probably be necessary to experiment with the length of the drive cord to obtain a satisfactory tension. If the cord is too slack remove it and shorten it slightly, or if it is too tight try a slightly longer loop.

Now turn the tuning knob so that the vanes of the tuning capacitor are fully interleaved. Slip the pointer over the front panel, slide it up to the 88MHz mark on the scale, and fasten to the cord. Make sure that the drive works smoothly over the whole length of the scale. If it slips the cord may be too slack, or there may be oil on the drive shaft. If everything is satisfactory the pointer can be secured with a blob of adhesive.

SETTING UP THE R.F. CIRCUITS

Before switching on check the board and the wiring carefully for errors, particularly the power supply. It is a good idea to complete the power supplies and test these before the integrated circuits or the tuner head are wired into circuit. Both power supplies should give between 11.2 and 12.5 volts.

Initially, resistor R14 should be left out or one end disconnected, so that the tuner head and the i.f. amplifier do not operate. Set VR1 to its mid-position, and if necessary adjust the mechanical zero of the tuning meter. Now switch on and adjust VR1 to bring the tuning meter back to zero. Switch off, disconnect the tuner from the mains, and solder R14 in place.

Temporarily short out the a.f.c. by connecting a link between tags 7 and 8, or if you have fitted an a.f.c. switch put it in the "out" position. Connect the tuner to an audio amplifier and the aerial socket to a suitable dipole aerial. Now switch on and tune the receiver through the f.m. band. It should be possible to find a station, although it will probably be badly distorted at this stage. As you tune through the station the background noise will fall and then will start rising again. Tune for minimum noise (pay no attention to the signal at this point as minimum noise may well coincide with minimum signal), or alternatively try to set the tuning midway between the two points where the noise becomes perceptible, as shown in Fig. 25. Now insert a trimming tool into the core of L1 and adjust it to bring the tuning meter back to zero. The reproduction should now be virtually noiseless and undistorted. Check that the tuning meter swings approximately equal amounts either side of zero as you tune through the station, and if not make a slight

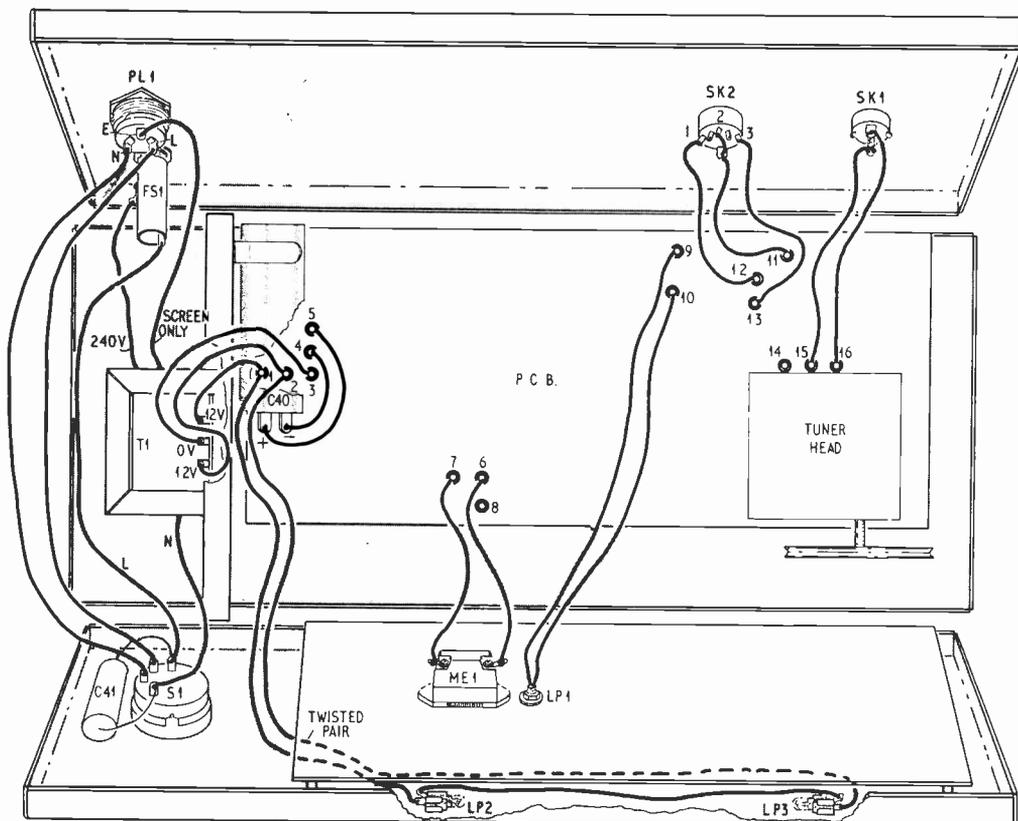
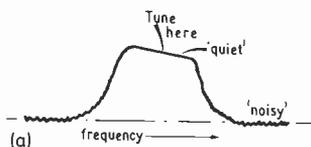


Fig. 24. Connections from the printed circuit board turret tags to components mounted on the case

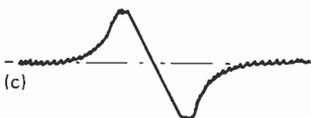


1. When you first switch on, the response of the discriminator as you tune through a station will probably be like this. Try to tune to the centre of the quiet band. This may well coincide with minimum signal



2. Adjust the core of L1 to bring the tuning meter back to zero. Use a trimming tool, a screwdriver will break the core.

If your tuning was not quite accurate to start with the response may look like this



3. Tune through the station and check that the tuning meter swings approximately equal amounts either side of zero. If not, make a slight readjustment to L1

Fig. 25. Adjustment of L1

readjustment to L1. Finally, adjust the output coil of the tuner head for minimum background noise. This is best done on a stereo transmission. This adjustment is only required to take up the tolerance of the external tuning capacitors (C2 and C3) and it should not be necessary to tune the core more than about one turn either way. Use a hexagonal nylon trimming tool of the correct size as a screwdriver will break the core and may damage the coil as well. **ON NO ACCOUNT MUST ANY OTHER ADJUSTMENTS BE MADE TO THE TUNER HEAD.**

Disconnect from the mains and remove the short on the a.f.c.

ALTERNATIVE METHOD

If you live in a strong signal area and have a test meter of 10,000 ohm/volt or more there is a more simple and accurate method of adjustment as follows:

After adjusting VR1 as described earlier, short out the a.f.c. and solder R14 back in place. Connect an audio amplifier and an aerial. Connect the test meter, on the 10V range, to the collector of TR5 and tune in to a station.

Normally the collector voltage of TR5 will be about 0.2V, but when a strong signal is being received it rises. Adjust the tuning for maximum reading on the voltmeter, and adjust the output coil of the tuner head for maximum. Then, without altering the tuning, adjust the core of L1 to bring the tuning meter back to zero.

BBC STEREO TEST TRANSMISSION

Test No.	Time (approx.)	Left Channel (A)	Right Channel (B)
1	23.42	250Hz at zero level	440Hz at zero level
2	23.44	900Hz at +7dB	900Hz at +7dB antiphase to left channel
3	23.48	900Hz at +7dB	900Hz at +7dB in phase with left channel
4	23.49	900Hz at +7dB	No modulation
5	23.50	No modulation	900Hz at +7dB
6	23.51.20	Tone sequence at -4dB, 60Hz, 900Hz, 5kHz, 10kHz. Repeated	No modulation
7	23.52.20	No modulation	Tone sequence as at 23.51.20
8	23.53.30	No modulation	No modulation
	23.55	Monophonic transmission	

Note: If programme material extends beyond 23.42, test transmission begins two minutes after close. To facilitate channel identification and adjustment of channel crosstalk, 250Hz is transmitted in the left channel only from about four minutes after the end of Radio 3 until 23.55.

Zero reference level corresponds to 40 per cent of maximum modulation applied to either stereo channel before pre-emphasis.

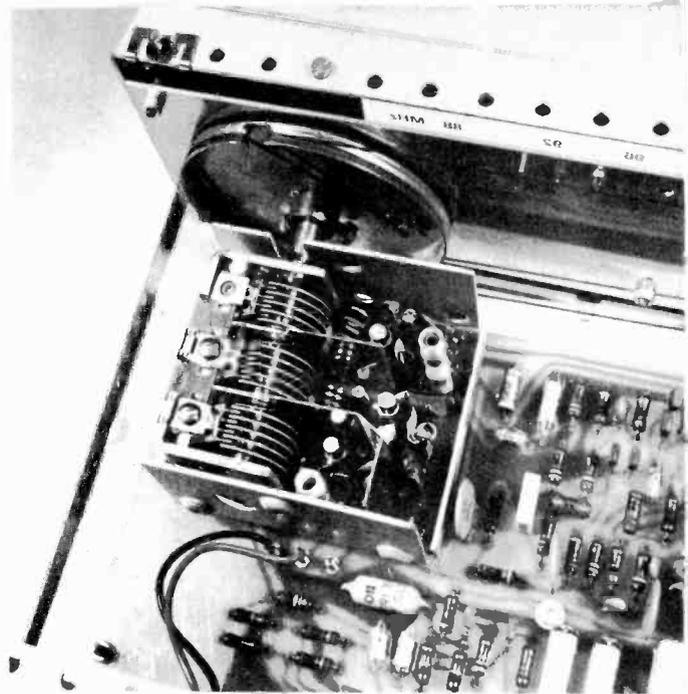
The prime purpose of the above test transmissions is described on the BBC leaflet mentioned in the text of this article.

STEREO DECODER

Screw the core of L2 fully down and tune in to a stereo transmission. The pilot indicator lamp should light; if it does not screw the core of L2 up slightly until the lamp comes on. Make sure that the lamp does not light on a mono programme, due to the stereo decoder locking on to the 23kHz signal which the BBC sometimes transmit.

The exact tuning of L2 is not critical since once the phase lock loop locks, the coil is pulled into tune by the reactance circuit. However, best results can be obtained by adjusting the coil on the test tones which are transmitted by the BBC every Wednesday and Saturday night after 11.30 p.m. Details of these tones are given on information sheet 1605 issued by the BBC Engineering Information Department, Broadcasting House, London W1A 1AA.

The core in L2 should be adjusted to give maximum separation, i.e. minimum signal in the right-hand channel when only the left-hand channel is being transmitted, and vice versa. You might have to make more than one attempt at doing this as no announcements are made between the various test tones transmitted and it is very easy to get lost. This completes the setting up of the tuner.



MONO TUNERS

Constructors who do not require stereo operation can build a mono version of the tuner as follows:

1. Omit all the parts associated with the stereo decoder, including R21 to R42, C21 to C34 and TR7 to TR11. Leave C20 in circuit.

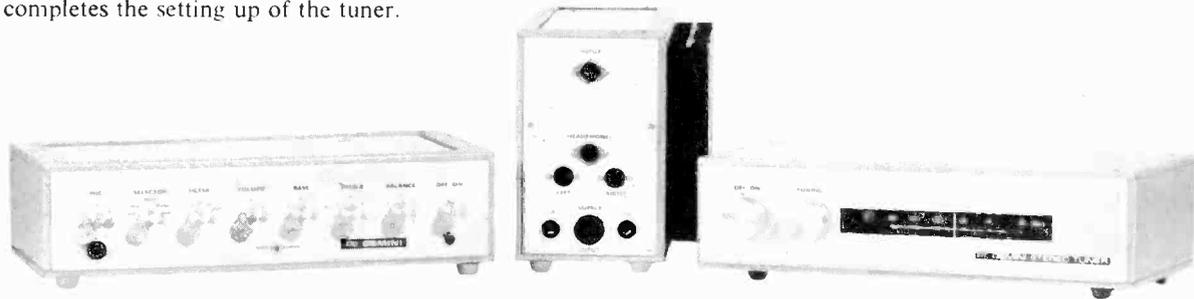
2. Increase C19 to 0.01 μ F and take the output from point X to the output socket via a capacitor of 0.22 μ F. The load resistance presented by the amplifier should be 47 kilohms or greater.

AERIAL

In strong signal areas the tuner will probably perform adequately from a short piece of wire connected to the aerial socket, but for best results, particularly from stereo transmissions, a dipole aerial of correct dimensions for the area of reception should be mounted as high up as possible. The signal-to-noise ratio of stereo programmes is always worse than mono programmes because of the increase in bandwidth from 15kHz for mono to 53kHz for stereo. Also there is a slight drop in signal level on stereo. In order to achieve the best possible stereo results, the need for a good aerial system cannot be over-emphasised.

ACKNOWLEDGEMENT

We are grateful to Ferranti Limited for permission to publish this article. ★





The central apparatus room at the Churches Television Centre



The latest Ampex Video Tape Recorder, type AVR-1



Churches TV Centre goes Colour

IN AN AGE when congregations are slowly dwindling away, even the Church has to look to the mass media as a fast and efficient method of spreading the message.

The Churches Television Centre has been established since 1959 and has three main aims: to train people on both sides of the camera; to produce material for religious education; and to carry out research into the problems of communication. The centre is financed by a Trust Fund created by the late Lord Rank.

The Centre has a fully equipped closed circuit studio at Bushey, near Watford, and with its latest planned changeover to colour, at an estimated cost of nearly a quarter of a million pounds, it is expected to become the most up to date closed circuit system in the world.

The new colour equipment includes the advanced Marconi Mark VIII Automatic colour cameras (seen undergoing tests, bottom left). With automatic line-up and colour balance achieved within three minutes of switch on, as compared with the normal half hour, they are claimed to attain new standards in both performance and operational simplicity.

This system together with the latest Ampex Video Tape Recorder (upper left) will enable the Churches TV Centre to produce programmes of a quality suitable for any of the major broadcasting authorities.

Marconi Mark VIII colour cameras under test

A review of the techniques used in some high fidelity audio equipment seen at . . .

By M. A. COLWELL

How valuable are technical specifications to the buyer of hi fi equipment. "Vital!" you might say, and we would be inclined to agree with you. But does this mean that all other considerations go by the board in the potential buyers' assessment.

If one stops to think about this, one will then realise that perhaps these other considerations (for example, aesthetic appearance, personal auditory opinion, suitability for the intended auditorium) have a very important place in equipment choice.

Listening to recorded music over a period of time often spurs the listener to make auditory comparisons due, no less, to a wide variety of recording qualities. Is there something wrong with the recording, or is it the equipment? Such a perplexing problem is very real to the chap who has, by this time, joined the bands of hyper-sensitive critics looking for ways to cure that undesirable feature of his musical pleasures.

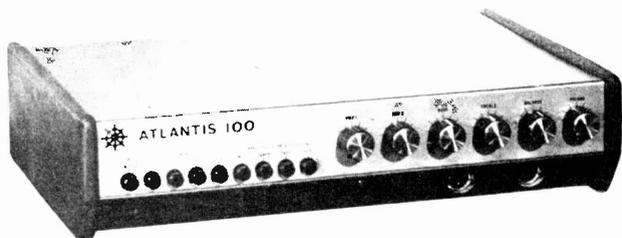
TRIP TO SONEX

Picture this chap for a moment embarking on his first trip to Sonex (such as held recently at the Skyway Hotel, London Airport); rows of small rooms, on four floors—most of which are emitting recorded sound in two or perhaps four channel stereo. Where does our perplexed friend start—with a catalogue? 'Fraid not! This is one exhibition that does not seem to believe in such necessities.

We could not even find the programme of seminar titles and times, until someone in the Press office made enquiries for us. We could not find many photos; we really had to hunt the whole four floors for the latest in audio equipment techniques.

But where was all that four-channel stuff we were promised would sweep the market (that was a couple of years ago). Still in the hands of the Japanese? like Sansui and JVC. Where is that British sense of innovation; still riding the stiff upper lip perhaps! Oh well! perhaps next year, or the year after?

Helme Atlantis 100 55 watt amplifier



CYBERNETIC HI FI

Going back to our friend with a desire to find out what he is missing, the best start is, believe it or not, the end of the chain, the loudspeaker, or sometimes referred to as "the weakest link".

However, some of the modern loudspeaker systems offer improvements over several five-year-old predecessors and if you are anxious to cut on size without loss of quality, we suggest you try to arrange a listen-in to "Servo-Sound Cybernetic Hi Fi". Don't be fooled by the fancy title; you should be truly surprised by the results.

These are small speakers (approximately 11in × 10½in × 7in) that reproduce church organ music, bass guitars, full orchestras, as good as several others six or more times the size. The secret is in the feedback technique that the makers use in conjunction with the built-in power amplifiers.

The "cybernetic circuit" senses the motion of the speaker diaphragm, compares this with the original signal, and corrects the drive signal to balance the speaker output. The significant feature is the suppression of undesirable cabinet resonances, typical of such a size.

The price quoted for the unit, which includes the 15 watt (r.m.s.) amplifier is £55. A more robust version with ceiling or wall mounting cradle, for public address or discotheque work is offered for £64. Further details of these and stereo mixers, attenuators, and pre-amplifier control units are available from Sono-Sound, 5 Queen Street, London, EC4N 1SU.

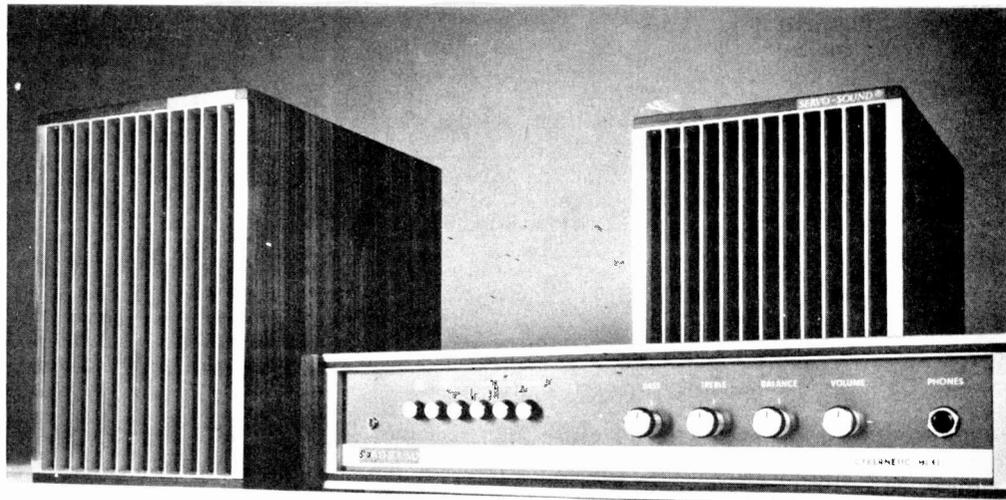
SPEAKERS

BBC monitors are the currently accepted standard by which to assess speaker performance, following the extensive trials carried out over the past few years. Incorporated in these are, among others, the rolled p.v.c. cone suspension pioneered by that fast growing firm KEF.

Now that KEF have successfully established themselves as quality manufacturers, they have breathed new life into the smaller bookshelf styles with the Coda (£18.75 each plus purchase tax) and the Cantor (£22.25 each plus purchase tax), both of which are available as matched pairs.

The Coda is intended to handle up to 15 watts r.m.s. (plenty for a domestic room) with a B110 15cm bass/mid-range unit and a T27 tweeter. System resonance is quoted as 60Hz. The Cantor, rated at 20W r.m.s. uses a B200 20cm bass unit and T27 tweeter; system resonance 70Hz. Both units will sit on a shelf 6in deep.

Servo-Sound Cybernetic Hi Fi speaker system and pre-amplifier



The company responsible for the original BBC monitor, IMF Products, of High Wycombe, exhibited at Sonex and created considerable interest with an add-on system of speaker units. For those whose speakers lack the clean resonance-tamed low frequency response, IMF are offering a £50 bass only speaker which comprises a transmission line system folded to take on the appearance of a 33in × 22in × 20in coffee table. Omni-directional radiation is achieved by the downward facing drive unit, and it is claimed that 17Hz can be reproduced. (Wonder what size organ pipe this would be.)

Also recommended are the "Studio" range of speakers from £61.95 to £73 plus purchase tax. Although somewhat expensive they are an excellent range and come from Spendor Audio Systems Ltd, of Redhill, Surrey. Main constituents are an 8in woofer of their own make, coupled with tweeters from Rola Celestion and ITT.

If you see the name Yamaha in connection with speakers, don't associate them with the noise of motor cycles. The Japanese certainly do come up with some unusual ideas, not the least being the Yamaha NS (for Natural Sound—what else?) range coded JA-6001, JA-5002, and many more.

The slim-line cone is of unusual shape, perhaps best described as a combination of semi-elliptical and small round (or those for guitars, more trapezoidal). Presumably this is a combination of woofer and tweeter on one chassis and one cone. For the added manufacturing complication and perhaps non-linear cone excursions, I personally fail to see any advantage over separate units. These types vary considerably in price and are imported by Jonathon Fallowfield Ltd, 60 St John Street, London, E.C.1.

TV SOUND THROUGH HI FI

It is worth noting that for addicts who crave to feed television sound signals through their hi fi systems, Rola Celestion are offering the Telefi ED10. This is one of those precious boxes claimed to get round the problems of live television chassis. This unit picks up the radiated 6MHz f.m. sound field from u.h.f. 625-line receivers only and converts in the normal way to an audio signal ready to feed into the "tuner", "aux", or "phono" input of the amplifier.

No electrical connection is made to the television receiver; only a pick-up transducer is mounted on the cabinet close to the i.f. strip. Rola Celestion are acting as distributors for the manufacturers Dinosaur Electronics Ltd of Windsor.

SUPER AMPLIFICATION

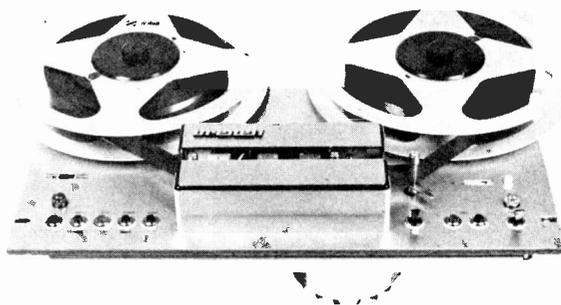
Since some of the foregoing indicate continuing improvements in loudspeaker design, the same cannot always be said for amplifiers. The standard of reproduction from a few is now approaching the ultimate possible with currently available components. It is all the more surprising therefore that several manufacturers do not seem to have the resources to improve their amplifiers measurably.

One well-known quality brand was in evidence in most of the non-amplifier demonstrations and in one room alone three were being used side by side. Have the rest accepted defeat?

There is very little to report on this subject but if you have the chance, listen-in to the Helme Atlantis 100 from P. F. & A. R. Helme Ltd of Harrogate. If you can detect -70dB noise at something like 55 watts r.m.s. into 8 ohms or 0.1 per cent distortion at 50 watts r.m.s., then you may not like this amplifier, but you would probably go a long way to find better figures than these quoted from the specification for such power output.

This brings us back to earlier comments; this amplifier has what is termed "Dynamic Matching Control". There are l.f. and h.f. controls which are set up during listening tests to an optimum to suit the listener's interpretation of how the loudspeakers are performing.

We gather that this is a kind of manual version of the Servo-Sound idea already described, in that speaker cabinet resonances can be damped by judicious settings of the controls. The idea is primarily to make up for deficiencies inherent in small bookshelf systems. The suggested retail price is quoted as £119.



Brenell Type 19 professional 1in tape deck

FRONT END

Now for the front end, and it is a pity that f.m. tuners were not as evident as they should be. Would this be due to difficult f.m. reception conditions so close to the moving aircraft at Heathrow, or lack of interest in a market that should grow after expansion of stereo broadcasting later this year.

So we are left with tape and disc, the former showing the boom in cassette cartridge systems with Dolby B incorporated. The success of chromium dioxide tapes added to Dolby makes tape recording and reproductions at 1½ in per second an excellent proposition for acceptable quality music reproduction.

BASF introduced a combined radio/cassette recorder, the CC9300 priced at £67.97. With such a small size the cassette will undoubtedly be widely considered for incorporating with other equipment in one package, providing a very versatile system for domestic sales.

TAPE RECORDERS

Mention the words tape recorder and Philips are bound to be somewhere nearby. The interesting point about this organisation is diversity. Their products range from good value low price cassette machine that will go in a coat pocket, to professionally engineered studio transcriptors for broadcasting. Their latest is a three-motor, three-speed stereo machine and built-in 10 watt stereo amplifier, with illuminated tip-touch buttons allowing remote control boxes to be used.

The electronics has mixing, monitoring, multiplay and echo facilities, all demanded these days by the progressive musician who records at home or in a studio. This recorder, coded N4418, is offered at £189.75 including purchase tax, but if you want quality it is worth paying the price.

Brenell Engineering Co. seem to be on their own in supplying tape transport systems (to the general public) that can be applied to tailor-made self-constructed tape amplifiers. Brenell make a wide variety of decks and complete recorders.

They now produce a rugged tape deck Type 19 for industry that uses a Papst hysteresis synchronous motor and two spool motor. Two speeds are available, 3¼ and 7½ in per second, and the solenoid



Goldring G101 record deck with G850 pick-up

operated mechanics confirms the principles of older transcription machines, that use these for reliability.

However, for domestic applications, Brenell cater for less expensive tastes without neglecting quality, for example, the Mk 6 Deck at £62.04 and the Mk 610 at £79.60 including purchase tax. Bogen heads are available as optional extras for the Type 19, while the Mk 6 and 610 will accept a wide variety of heads at extra cost.

FOUR CHANNEL DISC

Turning for a moment to four-channel matters, it was a welcome sight to see the new RCA compatible discrete CD-4 disc record which will become available in May. RCA have been working with JVC and National Panasonic to produce this disc specially for four-channel equipment, and at the same sort of price as a top grade two-channel stereo disc. They are also willing to offer their expertise to other disc manufacturers to produce these recordings. Is this the kind of boost that the British want after Japan has already a choice of 65 CD-4 recordings?

LOW PRICE RECORD DECK

On the two-channel front, Goldring now produce the GL85, which was described in our Audio Fair report, and a newcomer, the G101, which is also belt driven and uses a magnetic cartridge—the G850. The aim of this new model is to offer Goldring quality at an economic price. At £24 plus purchase tax, including plinth and cover, this model is certainly good value.

PURCHASE TAX

Finally a note concerning prices; those quoted here were correct to the best of our knowledge at the time of going to press. Where purchase tax is not quoted, a reasonable estimate only would be to add about 17 per cent of the recommended retail prices.

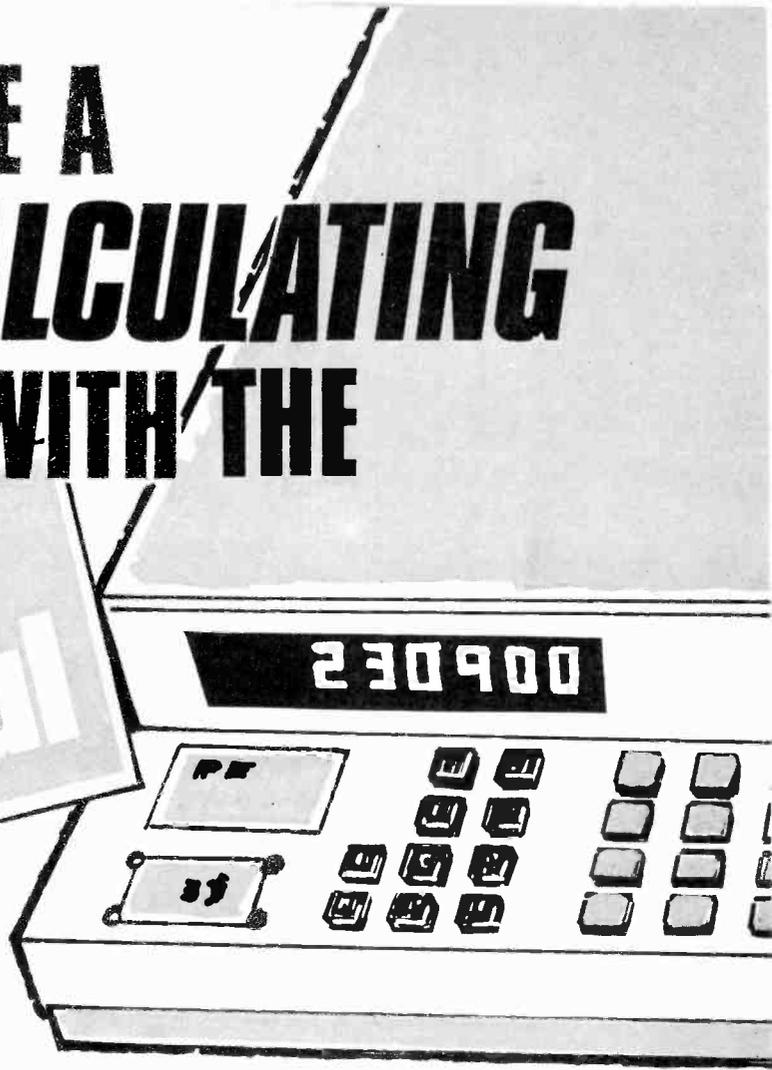
As purchase tax is based on manufacturers' trade prices, it is always wise to confirm the correct figures from them. Recent budget changes in purchase tax rates could in some cases mean "no change" where it is not applicable, or about 25 per cent of trade prices where reductions become effective.

The next date for your diary is October 23 to 28, the Audio Fair in the large Grand Hall, Olympia, London. ★



Philips N4418 professional tape recorder

.... BECOME A CALCULATING PERSON WITH THE



**DIVIDES...
MULTIPLIES
SUBTRACTS
ADDS....
PLUS
AUTOMATIC
SQUARING**

Get the answers at your fingertips with the P.E. Digi-Cal, the first digital calculator designed specifically for the amateur constructor.

P.E. Digi-Cal is a high-speed electronic calculator which can add and subtract, multiply and divide—all at the touch of a switch. It can store any constant for repeated use and perform squaring simply by pressing a single key.

Entries of up to six digits may be made, and the answers are given in up to eight digits. Calculations are carried out just as they are written.

Construction employs readily available TTL logic i.c.s in easily accessible plug-in boards. The display consists of eight miniature seven-segment indicators to display keyboard entries and answers.

ALSO— THE CALLERCORD

There are times when it is impossible to answer a call at the door. The "Callercord" will answer callers and record messages on magnetic tape.

DIGITAL ELECTRONIC ORGAN SYSTEMS

A look at the more up-to-date methods of organ design

in the JULY issue of

**PRACTICAL
ELECTRONICS**

ON SALE JUNE 9



2-20 minute **TIMER**

By R. Verrill B.Sc.

This simple electronic timer can be used for any operation where it is required to switch on an apparatus for a length of time and then automatically switch off. Alternatively, it can be used to switch on the apparatus automatically after the pre-set time, and remain on until switched off manually.

CIRCUIT DESCRIPTION

The circuit diagram of the timer is shown in Fig. 1. Here, when the mains switch S2 is turned on, the bridge rectifier (D1-D4) supplies the circuit with about 35V d.c. smoothed by the capacitor C1. The 250 μ F capacitor C2 is charged up to this voltage via the resistors R1 and R2. Some of the charging current flows through the base of the *pnp* transistor TR1 so that this remains on for a few seconds after closing S2 until C2 has become charged.

During the time that TR1 is on, capacitor C3 is charged up to the line voltage via TR1, R4 and the diode D5. As soon as TR1 goes off, the voltage on C3 starts to fall slowly because of the small current being leaked away by TR2. This transistor acts as a constant current source because its base is at a fixed potential and there is resistance in the emitter lead whose value is determined by the position of S1. The value of the emitter current is approximately equal to the emitter voltage divided by the emitter resistance. A fine control over the discharge current is obtained by adjustment of VR1 which alters the base voltage of TR2.

The Schmitt trigger circuit, comprising TR3, TR4, operates when the voltage on C3 has fallen to about 2 volts. TR3 then starts to turn off and TR4 starts to turn on. Current through the resistor R20 biases the emitter of TR3 positive thus turning TR3 further

COMPONENTS . . .

Resistors

R1	22k Ω	R18	4.7M Ω
R2	10k Ω	R19	100k Ω
R3	4.7k Ω	R20	6.8k Ω
R4	1k Ω	R21	56k Ω
R5	390k Ω	R22	56k Ω
R6	15k Ω	R23	10k Ω
R7-R17	5.6k Ω (11 off)	R24	390 Ω
All 10%, $\frac{1}{2}$ W carbon			

Potentiometer

VR1 22k Ω carbon linear

Transistors

TR1 ZTX503 (Ferranti)
TR2-TR5 ZTX107 (Ferranti) (4 off)

Diodes

D1-D4 ZS170 (Ferranti) (4 off)
D5-D7 ZS120 (Ferranti) (3 off)

Switches

S1 Double-pole, mains toggle switch
S2 Single-pole 11-way wafer switch

Relay

RLA 2-pole 2-way 26V 700 Ω , STC4189 GD
(Henry's Radio)

Transformer

T1 Mains transformer, secondary 25V 0.5A
Douglas MT102AT (Henry's Radio)

Miscellaneous

Diecast box $8\frac{1}{2}$ in \times $5\frac{1}{2}$ in \times $3\frac{5}{32}$ in, Veroboard
3.4in \times 5 $\frac{1}{2}$ in 0.1in matrix, FS1-100mA fuse and
holder, SK1-six pin plug and socket (Bulgin).

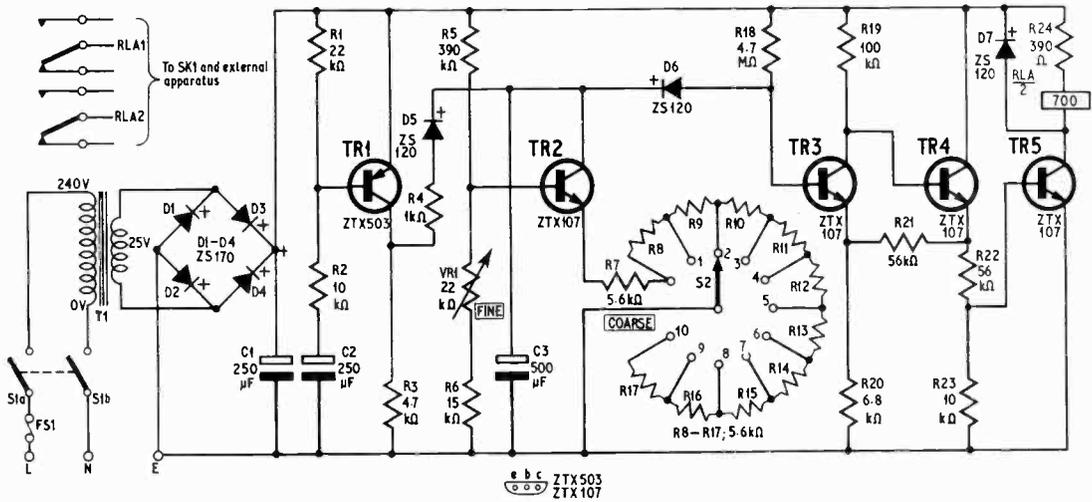


Fig. 1. Circuit diagram of process timer

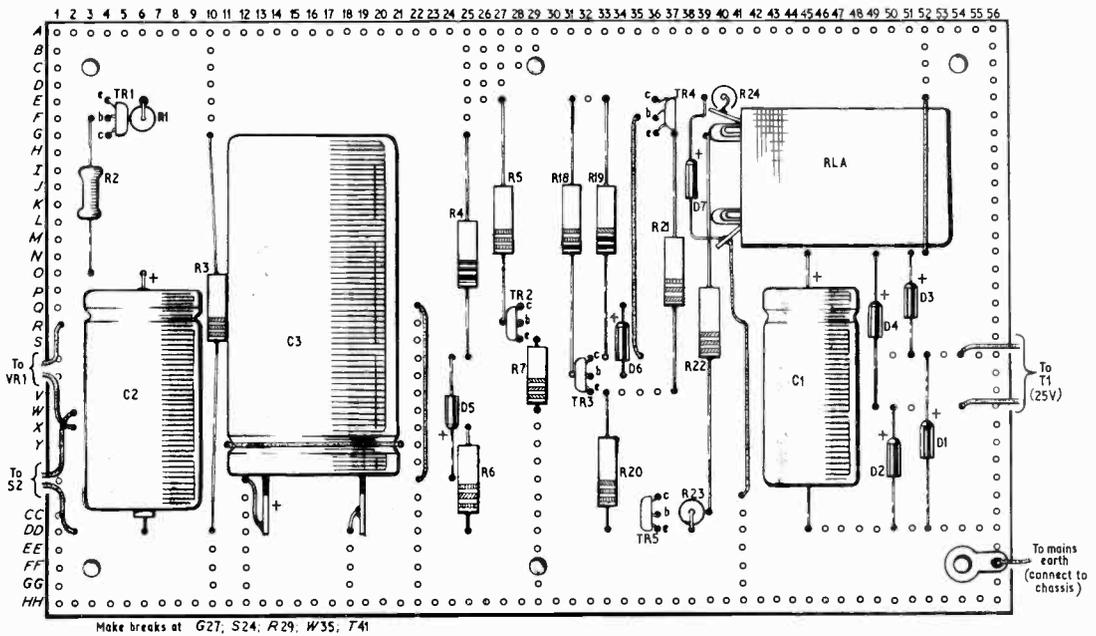
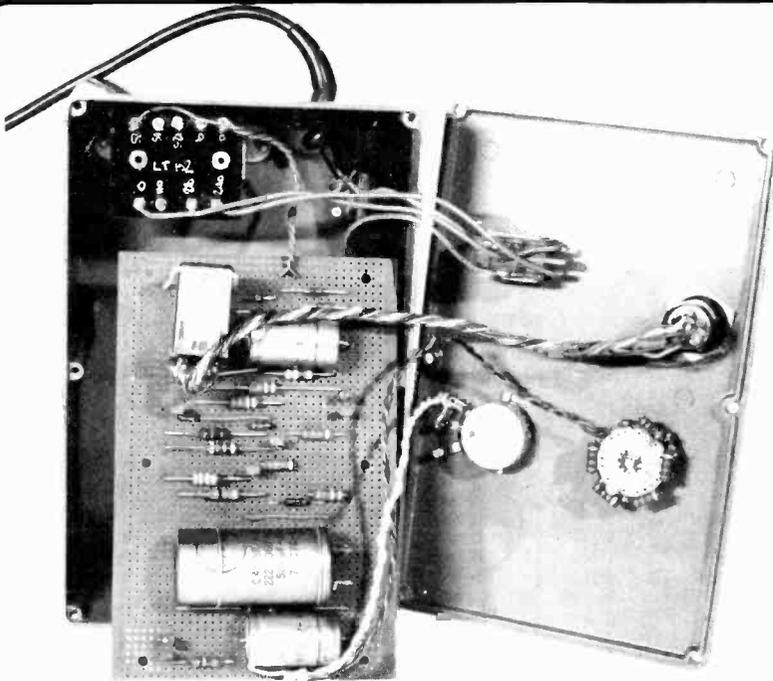


Fig. 2. Component mounting and wiring details of Vero-board sub-assembly



Interior photograph of the timer. Here, the relay strap also serves as a link wire

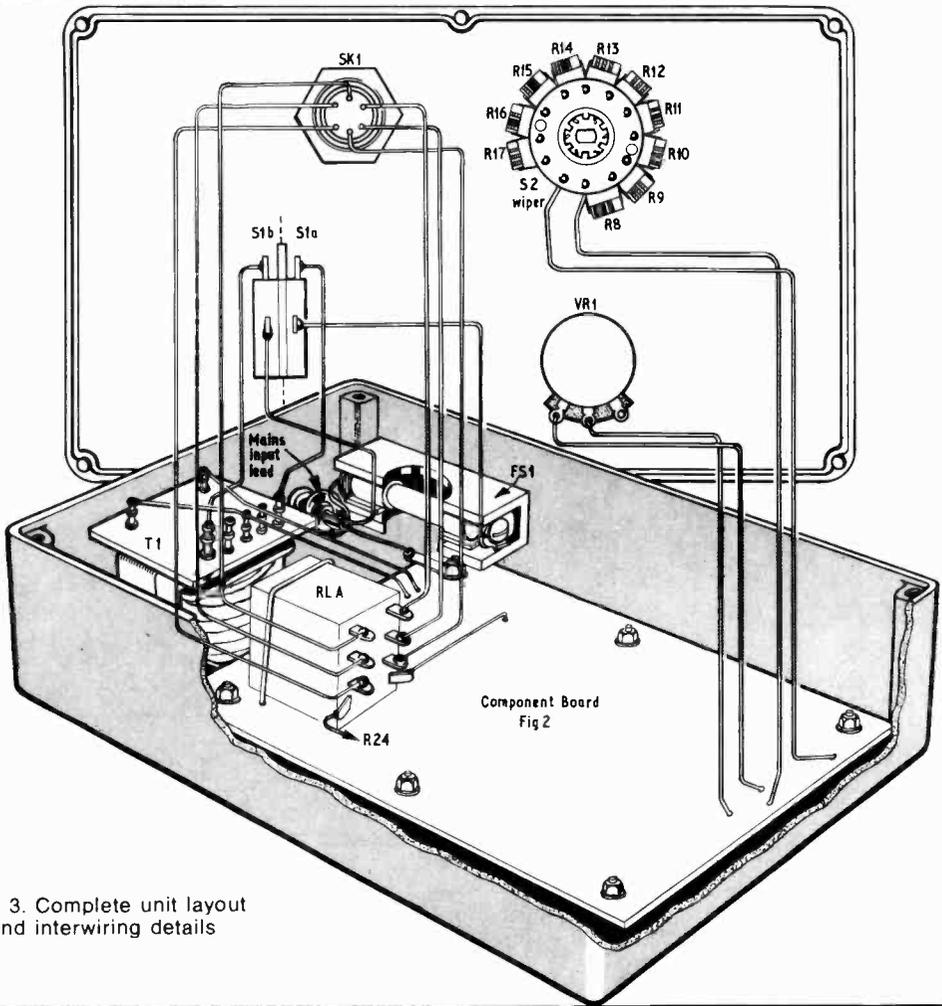


Fig. 3. Complete unit layout and interwiring details

off. Regenerative feedback occurs so that TR3 is turned completely off and TR4 is turned on supplying current through R22 to the base of TR5 which operates the relay. The appropriate relay contacts are used to turn on or off the external apparatus as required.

CALCULATING THE PERIOD

The actual length of the timed period can be calculated as follows. The time taken for the voltage on a capacitor of C farads to fall by a voltage V volts when a constant current of I amperes is drawn from the capacitor is CV/I seconds.

The voltage at the base of TR2 is

$$\frac{35(VR1 + R6)}{VR1 + R5 + R6}$$

which works out at about 2.2V with VR1 wiper in the mid-position. Since the case/emitter drop is 0.7V the voltage at TR2 emitter is (2.2-0.7) which is 1.5V. If S2 is set for maximum resistance (61.6k Ω) the emitter current

$$I_e = \frac{1.5}{61.6 \times 10^3} = 24\mu A$$

In the expression CV/I we can now substitute:—

$$C = 500\mu F$$

$$V = 33 \text{ volts (the voltage dropped from 35V to 2V)}$$

$$I = 27\mu A$$

Therefore

$$\text{period (CV/I)} = \frac{33 \times 500 \times 10^{-6}}{24 \times 10^{-6}} = 690 \text{ s}$$

If VR1 had been set to zero resistance, the period would work out as 25 minutes, 40 seconds.

CHOICE OF CAPACITOR

Some readers may be of the opinion that the use of electrolytic capacitors in timing circuits should be avoided. This is true in some circuits especially where very accurately timed periods are required. The objection to using electrolytics arises mainly from their high internal leakage currents. For example, the type of capacitor used in this timer has a leakage of up to 1mA when used at its maximum working voltage of 64V. Since the discharge current in the circuit can be as low as 10 μ A we would require the leakage current to be less than 1 μ A and to change by less than 0.1 μ A to give any degree of stability to the timed period. In practice the degree of stability obtained is at least as good as this when a capacitor of the type specified is used.

LOW LEAKAGE

When a voltage is supplied to an electrolytic capacitor, besides the current required to give the capacitive charge, a forming current flows through the electrolyte until an insulating layer is formed of sufficient strength to withstand the voltage. If the voltage is then reduced, the insulating layer is more than sufficient to withstand the voltage now present so the forming current is no longer required and the leakage current is extremely small.

In the timer circuit, after the initial charge, the voltage on the capacitor is reduced at a constant rate, so the above conditions for low leakage are ideally satisfied.

CONSTRUCTION

All of the small circuit components are mounted on a 5 $\frac{1}{2}$ in \times 3 $\frac{1}{2}$ in 0.1in matrix Veroboard as in Fig. 2. Since, with this type of circuit, layout is not particularly critical, other forms of assembly can be made.

In Fig. 3 the timer is shown completely assembled. When wiring up SK1 to the relay use different coloured sleeving, so that the switches of the relay can be identified.

SETTING UP

Before any setting up is done the circuit wiring should be thoroughly checked. If this checks out with Fig. 3 set the "Coarse" switch to position "1" and the "Fine" control (VR1) to a minimum. Switch on and you should find the relay changes over after a period of about two minutes.

Exact time multiples can be set up on S1 if VR1 is set for a 130 second delay. This has the effect of multiplying each of the "Coarse" range switch positions by a factor of 2. This means that position "1" will produce a delay of two minutes, position "2" four minutes and so on, up to 20 minutes at position "10". The error on each range will be about 10 seconds which is the time taken for C2 to be charged initially.

Repeated checks of timing periods produced an error of 10 seconds on the 20 minute range and proportionately less for shorter times.

RELAY CONTACT RATING

The relay specified has a contact rating of 2A but the actual load can be doubled if the switch contact pairs are used in parallel. ★

BACK TO SCHOOL

continued from page 463

Finally, a domestic note which is not entirely out of place here. A magazine such as PRACTICAL ELECTRONICS finds itself in a unique position in that while catering for the interests of private individuals it becomes to some extent a bridge between the educational establishments and the industry. This is because we are in regular contact with both sides and receive contributions from members of both the teaching and the engineering professions. We do not claim to be an educational journal in the formal sense, and are flattered and delighted that so many of the teaching profession do turn to PRACTICAL ELECTRONICS for instruction in applied modern electronics. We feel confident that they will be able to rely on this service equally in the future.

As to some recent critical comment aired in these pages, we wonder what teacher would like to be judged and outrightly condemned simply on one single lecture, delivered when Sir was perhaps somewhat under par?

F.E.B.

PATENTS REVIEW...

THUNDERSTORM WARNING

BY a quaint coincidence the waterproofing patent mentioned last month was published only one week later than British Patent 1 248 300 from Nitro Nobel AB of Sweden. The Nobel specification is concerned with a thunderstorm warning system.

Not surprisingly Nitro Nobel are concerned mostly with predicting thunderstorms for the benefit of those working with explosives, but the invention will probably find much wider interest.

It is customary in thunderstorm warning systems to detect both the quasistatic electric field, which occurs between the electric charge of a thundercloud and earth, and the pulses of longwave electromagnetic radiations that are transmitted from lightning discharges. The signals are usually detected in two threshold steps; alert and alarm, which can be audible and/or visual warning.

The radiation pulses are detected by an aerial wire, often of considerable length and the obvious problem is that this aerial is likely to be struck by lightning. Another problem is that the device may mistake local machine spark discharges for lightning flashes.

The Nobel invention relies on an electronic logic system which ensures that the alarm is triggered by radio frequency radiation pulses only if these pulses are repeated within a predetermined time interval, or combined with simultaneous pulses in another (for example, spectral) range. The alarm can be triggered by a quasistatic electric field of above a threshold intensity. The alarm will also be triggered if the electric field alone rises to a predetermined high level.

Nobel suggest a field detector formed from a capacitor and a rotatable diaphragm positioned in front of the capacitor and operating in accordance with the so-called field mill principle. The detector can be of relatively small size and the diaphragm actually housed inside an antenna for longwave radio pulses. It is claimed that this arrangement is unlikely to attract a lightning strike.

In Fig. 1 Nobel show how a detector system is connected to a logic unit by shielded cable. The detector system is earthed and

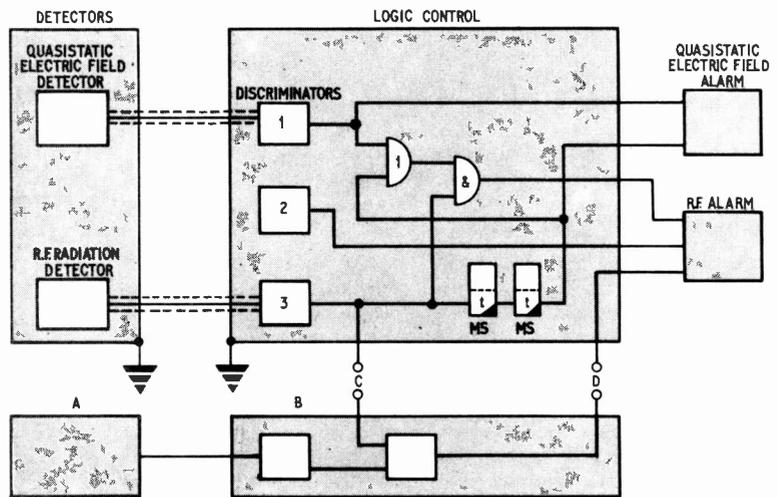
includes the two component detectors for electric field and electromagnetic radiation emission. The former provides a signal proportional to the intensity of the quasistatic electric field, for example, a sinusoidal voltage of 200Hz. This signal is fed to two amplitude discriminators 1 and 2 having different threshold values. Discriminator 1 output is connected to the electric field warning circuit so as to activate it all the time that the quasielectric field is higher than a selected base threshold. This discriminator also feeds one input of an OR circuit.

is set by the trailing edge of the output of the first monostable.

An output signal from the second monostable is connected to the electric field warning circuit and to the second input of the OR circuit. The output of the OR circuit is connected to the second input of the AND circuit. The output from the latter AND circuit triggers the r.f. alarm, so that it is sounded if a signal pulse is transmitted from discriminator 3 during the time period in which D1 discriminator is producing a signal, and also if two consecutive signal pulses from discriminator 3 occur

BP 1 248 300

Fig. 1



An output signal from discriminator 2 triggers the alarm circuit which holds "on" when activated.

When a lightning strike occurs, the r.f. radiation detector sends pulses to discriminator 3 which has a discriminating level corresponding to a normal flash of lightning at a distance of 10 to 15 kilometres. A radiation pulse exceeding this provides a signal pulse from discriminator 3 which is connected to the first input of an AND circuit, and to a timing circuit composed of two monostable multivibrators in series. One monostable is set by the pulse from discriminator 3 and the other

within a predetermined time interval. This distinguishes between one single pulse and a pulse train.

Pulses having a large spacing in time, in all probability, do not emanate from a thunderstorm. The actual time period gating must be suited to the geographical location in which the device is to be used.

The system described in this patent may be supplemented by other detectors. Supplementary optical detectors, discriminators, and AND gates can be linked into the system at A, B, C and D. More details are given in the patent specification.

So many of the components you need for PE designs are in the Electrovalue catalogue. Bigger, better than ever. Post free 10p.

ELECTROVALUE

Electronic Component Specialists

TRANSISTORS

Wide range. Up to date. Brand new —no 'seconds' or surplus. Highest quality and reliability.

No.	Type	Purpose	Price
2N697	Sil. NPN	General	18p
2N1304	Ger. NPN	"	26p
2N1305	PNP	"	26p
2N2646	Sil. UJT	Oscillator, SCR driver	47p
2N296A	NPN	Small sig. amp	11p
2N3055	NPN	High power	50p
2N3702	PNP	Low power	10p
2N3704	NPN	Low power	10p
AC126	Ger. PNP	Small sig. driver	23p
AC128	PNP	Low power	20p
AD149	NPN	High power	55p
AC176	NPN	Low power	16p
*AD161	NPN	Med. power	33p
*AD162	PNP	Med. power	30p
BC108	Sil. NPN	Small Signal	11p
BC109	NPN	Low noise	12p
BC168	NPN	Small signal	10p
BC169	NPN	Low noise	11p
BF194	NPN	HP amp.	14p
BFY51	NPN	Med. current	20p
OA90	Ger. diode	RF detector	8p
OA91	"	General	5p
8D1	"	Silicon Rectifier 1 amp	10p
W02	"	Silicon bridge 1 amp	30p

*Matched pair AD161/AD162

(Sil. = Silicon, Ger. = Germanium)

RESISTORS 10%—5%—2%

Code	Power	Tolerance	Range in ohms	Values 1 to 9	10 to 99	100 up
C	1/20W	5%	82-220K	E12 9	8	7
C	1/8W	5%	4.7-470K	E24 1	0.8	0.7
C	1/4W	10%	4.7-10M	E12 1	0.8	0.7
C	1/2W	5%	4.7-10M	E24 1	1	0.9
C	1W	5%	4.7-10M	E12 2.5	2	1.8
MO	1/2W	2%	10-1M	E24 4	3-5	3
WW	1W	10%	0.22-3.9	E12 7	7	6
WW	3W	5%	±1/20Ω	12-10K	E12 7	6
WW	7W	5%	12-10K	E12 9	9	8

Codes: C = carbon film high stability low noise
MO = metal oxide Electrofil TR5 ultra low noise
WW = wire wound Plesey

Values: E12 denotes series 10, 12, 15, 18, 22, 27, 33, 39, 47, 56, 68, 82 and their decades; E24 as E12 plus 11, 13, 16, 20, 24, 30, 36, 43, 51, 62, 72, 91 and their decades. Prices are in pence each for same ohmic value and power rating. NOT mixed values. (Ignore fractions of 1p on total value of resistor order.)

BAXANDALL SPEAKER

As designed by P. J. Baxandall and originally described in "Wireless World". Complete kit inc. spkr., equaliser and special cabinet kit (18in x 12in x 10in) cut to size. 10 watt RMS/15Ω loading. Carr. free in U.K.

Net £13-81

Speaker unit and equaliser kit, net £4-81.
Pack flat cabinet assembly (all cut to shape), natural teak finish, £9.

MISCELLANEOUS

CARBON SKELETON PRE-SETS
Small high quality, type PR linear only: 100Ω, 200Ω, 470Ω, 1K, 2K, 4K, 10K, 20K, 47K, 100K, 200K, 470K, 1M, 2M, 5M, 10MΩ. Vertical or horizontal mounting, 5p each.

ZENER DIODES 5% full range, E24 values: 400mW: 2.7V to 36V, 14p each; 1W: 6.3V to 82V, 27p each; 1.5W: 4.7V to 75V, 48p each.
Clip to increase 1.5W rating to 3 watts (type 266F) 4p.

MINIATURE TOGGLE SWITCHES
2A/250V. DP/DT, 46p.

MAIN LINE AMPLIFIER KITS
70 watt power amp module kit, £12-80 net. Power supply kit, £6-50 net. Matching pre-amp kit, £3-30 net. (Above prices for mono.) Stereo Kit, 2 power amps pre-amp kit, power supply kit and matched controls for building into your own cabinet, £38-90 net.

Minitron DIGITAL INDICATOR



TYPE 3015F Seven segment indicator, compatible with standard logic modules and power supplies. Figs. 0-9 from well illuminated filament segments to give character of 3mm height plus decimal point. Power requirement 8mA from 3V d.c. per segment. A limited number of alphabetical symbols also available. In 16 lead dill case £2

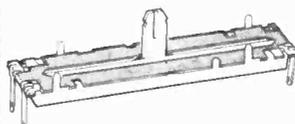
Suitable BCD decoder driver type FLL21T £1-36

Dil Socket, 16 lead 30p. No. 3015G showing + or - and fig. 1 and decimal point £2.

RIVLIN PRECISION RESISTORS

0.1% to 0.01% tolerance. Prices and delivery details on request. Example: values up to 100kΩ, between £1 and £2.

SLIDE POTENTIOMETERS



Robust construction, smooth silent action. In values from 4k7Ω to 1MΩ, linear or log. 28p each. Escutcheon.

Knobs, flat, grip type, in black/red/green, yellow/blue/lt. grey/dark grey or white. 5p each.

SIEMENS CAPACITORS

POLYCARBONATE—5% TOLERANCE
250V up to 0.1μF: 100V/0.1μF and above.
0.01, 0.012, 0.015, 0.018, 0.022, 0.027, 0.033, 0.047, 0.056, 3p each.
0.068, 0.082, 0.1, 0.12, 0.15, 4p each.
0.18, 0.22, 5p each.
0.27, 0.33, 6p; 0.39, 7p; 0.47, 8p; 0.56, 10p; 0.68, 11p; 1μF, 13p.

ELECTROLYTIC CAPACITORS
(Values in μF/V)
0.47/100, 1/100, 2/263, 4.7/35, 10/25, 22/16, 47/10, 47/25, 100/10, 220/35, 5p each.
10/63, 22/35, 47/35, 100/16, 100/25, 220/6, 220/10, 220/16, 470/3, 6p each.
47/50, 47/63, 100/35, 470/10, 7p each; 100/30, 220/35, 9p each; 100/63, 470/25, 100/10, 10p each; 220/63, 470/35, 100/16, 14p each; 1000/25, 18p each; 470/63, 1000/35, 18p each; 2000/200, 28p each; 1000/63, 2200/35, 4700/16, 33p each.
Tantalum and other capacitors, etc., see latest 1972 catalogue—issue No. 6.

1972 ELECTROVALUE CATALOGUE (No. 6)

Now enlarged to 96 pages plus cover. More items, more information, more diagrams than ever. Post free—10p.

We are official distributors for SOLDERSTAT SOLDER IRONS

As appointed distributors for well-known Hemesco-Wolf "Solderstat" irons, we offer this model HMS in 16 or 24 watt, a.c. mains, net £1-87

INFINITELY VARIABLE TEMPERATURE CONTROLLED SOLDER IRON

Designed essentially for micro-miniature and printed circuit board assemblies. Temperature is adjusted as required by control on base and remains constant whether idling or on load. Although for working to very delicate standards, the iron is of rugged construction and is exceptionally reliable. Price, complete with base, net £4-20.

DE-SOLDER BRAID

The efficient money-saving way to de-solder soldered joints, per 6ft length, net 50p.

SIEMENS TTL INTEGRATED CIRCUITS

FLH101 (7400)	20p	FLJ121 (7473)	45p
FLH201 (7401)	20p	FLJ141 (7474)	45p
FLH191 (7402)	20p	FLJ151 (7475)	45p
FLH291 (7403)	20p	FLJ131 (7476)	45p
FLH211 (7404)	25p	FLH221 (7480)	60p
FLH231 (7405)	23p	FLH231 (7482)	67p
FLH381 (7408)	25p	FLH241 (7483)	1.32
FLH391 (7409)	25p	FLH341 (7485)	33p
FLH111 (7410)	20p	FLJ161 (7490)	80p
FLH361 (7413)	35p	FLJ221 (7491A)	1.28
FLH121 (7420)	20p	FLJ171 (7492)	85p
FLH181 (7430)	20p	FLJ181 (7493)	80p
FLH141 (7430)	24p	FLJ231 (7494)	1.18
FLH101 (7414)	1.22	FLJ261 (7495)	87p
FLH281 (7442)	1.16	FLJ261 (7496)	1.40
FLH361 (7443)	1.45	FLJ301 (74100)	1.66
FLH371 (7444)	1.45	FLJ281 (74104)	40p
FLH151 (7450)	20p	FLJ271 (74107)	52p
FLH161 (7451)	20p	FLK101 (74121)	48p
FLH171 (7453)	20p	FLJ201 (74190)	1.80
FLH181 (7454)	20p	FLJ211 (74191)	1.80
FLJ101 (7466)	20p	FLJ241 (74192)	1.74
FLJ101 (7470)	45p	FLJ251 (74193)	1.74
FLJ111 (7472)	32p		

NEWMARKET LINEAR I.C.s

LIC 709C/14 dual in line, 34p.
LIC 741C/14 dual in line, 40p.
T05 version also available.

CARBON TRACK POTENTIOMETERS

CARBON TRACK POTENTIOMETERS, long spindles. Double wipers.
SINGLE GANG linear 100Ω to 2.2MΩ, 12p; Single gang log, 4.7kΩ to 2.2MΩ, 12p; Dual gang linear 4.7kΩ to 2.2MΩ, 42p; Dual gang log, 4.7kΩ to 2.2MΩ, 42p; Log/antilog, 10kΩ, 22kΩ, 47kΩ, 1MΩ only 42p; Dual antilog, 10kΩ only, 42p. Any type with 2A D.P. mains switch, 12p extra.
Only decades of 10, 22 and 47 available in range quoted.
DUAL CONCENTRIC in any combination of P:20 values, 60p; with switch, 72p.

DISCOUNTS

10% on orders £5 to £15.
15% on orders over £15. No discount on items marked Net. Prices subject to alteration without notice.

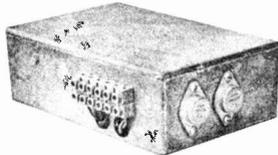
POSTAGE AND PACKING

Free on orders over £2. Please add 10p if order under £2. Overseas orders: carr. and insurance charged at cost. U.S.A. CUSTOMERS are invited to contact ELECTROVALUE AMERICA, P.O. Box 27, Swarthmore, PA 19081.

ELECTROVALUE

(Dept. PE 672) 28 ST. JUDES ROAD, ENGLEFIELD GREEN, EGHAM, SURREY TW20 0HB
Hours: 9—5.30. Sat. 1 p.m. Tel.: Egham 5533 & 4757 (STD 0784-3). Telex 264475
ELECTROVALUE—AN INDEPENDENT COMPANY SINCE ITS ESTABLISHMENT IN 1965

PRACTICAL ELECTRONICS
"SCORPIO"
ELECTRONIC IGNITION
SYSTEM



This Capacitor-Discharge Electronic Ignition system was described in the November and December issues of Practical Electronics. It is suitable for incorporating in any 12V ignition system in cars, boats, go-karts, etc., of either pos. or neg. earth and up to six cylinders. The original coil, plugs, points and contact-breaker capacitor fitted in the vehicle are used. No extra or special components are required.

Helps to promote easier starting (even under sub-zero conditions), improved acceleration, better high-speed performance, quicker engine warm-up and improved fuel economy. Eliminates excessive contact-breaker point burning and the need to adjust point and spark-plug gaps with precision.

Construction of the unit can easily be completed in an evening and installation should take no longer than half an hour.

A complete complement of components is supplied with each kit together with ready-drilled roller-tinned, professional quality fibre-glass printed-circuit board, custom-wound transformer and fully-machined die-cast case. All components are available separately. Case size 7½ in × 4½ in × 2 in approx.

Complete assembly and wiring manual 25p, refundable on purchase of kit. Price: £10.50 plus 50p P. & P. S.A.E. with all enquiries.

PSYCHEDELIC LIGHTING
UNIT Mk. 3



This unit represents a natural progression from our phenomenally successful Mk. 1 and 2 Units. As before the drive voltage is derived directly from the amplifier output or across the speakers. The unit converts the audio frequency signals into a three-coloured light display; the colour depending on the frequency of the signal and the intensity on the loudness of the audio source.

The unit is constructed on professional fibre-glass printed-circuit board material and uses latest full-wave triac circuitry. There is a master-level control, together with independent sensitivity controls for each channel. The original minimum ambient light level controls have been redesigned permitting their use as faders; allowing dimming from max. to zero at the turn of a knob. R.F.I. suppression is now incorporated as standard as well as provision for D.J. "Pulse-Flash" controls. The choice of two inputs enables operation from both high and low power amplifiers. Max. power 1.5kW per channel at 240V a.c.

Complete assembly built and tested. Size 9 in × 7 in × 3 in.

Price £25 carr. paid. S.A.E. with all inquiries.

DABAR ELECTRONIC
PRODUCTS
 98a LICHFIELD STREET, WALSALL
 STAFFS WS1 1UZ
 WALSALL 34365
MAIL ORDER ONLY

NEW, AT LAST

HEATSINKS, a new range, never before available (see "Market Place" May 1972 issue), gives decreased leakage current, longer transistor life and greater circuit reliability, lower costs.

FAN TOP T05 LB T066 UP T03 T08



Only 10p Only 20p Only 35p

AUDIO CABLE,

graphite loaded thermoplastic screen gives flexibility, less noise than orthodox types, designed for all audio applications, ideal for loudspeaker leads, DIN plug use, etc. Price: 1 core, 5p; 2 core, 10p; 3 core, 15p; 4 core, 20p per yd.

COMPONENTS, NEW LOW PRICE

1N4148	100V	75m/A Gen. purpose, fast	per 10pk.	25p
SD05	50V	1A Rectifier	per 10pk.	35p
3A05	50V	3A Rectifier	per 5pk.	45p
SD4	400V	1A Rectifier	per 10pk.	45p
3A4	400V	3A Rectifier	per 5pk.	55p
FET "N"	Channel 2N4302	Gen. purpose	each	35p

LINEAR ICs: 709: DIL Op Amp each 35p
 741C DIL Op Amp each 45p

ALL BRAND NEW AND GUARANTEED
 Please include 5p P. & P. on any order

J. W. SALES, 6 Russet Road
Cox Green, Maidenhead

NEW

15 Watt Hi-Fi
AMPLIFIERS
 £3.75 plus 25p postage packing

7 TRANSISTORS - GUARANTEED
PRINTED CIRCUIT - TESTED
DESIGN BUILT - INSTRUCTIONS

A great new 15 watt Hi-Fi amplifier is now available at the low cost of £3.75. Just look at the specification—Power 15 Watts R.M.S. Frequency response 15 cs-19000 cs, ±1dB at all powers. Signal to noise ratio better than -70 dB. Harmonic distortion 0.1%. Input sensitivity 750 mv into 2k. These factors make the H. Electronics Hi-Fi amplifier the best at its price—order now

H-ELECTRONICS.
 105, Grange Road, London, S.E. 25

BATTERY ELIMINATORS

The ideal way of running your TRANSISTOR RADIO, RECORD PLAYER, TAPE RECORDER, AMPLIFIER, etc. Types available: 6v, 9v, 12v, 18v (single output) £1 each. P. & P. 15p. 9v + 9v; 6v + 6v; or 4½v + 4½v (two separate outputs) £2.50 each. P. & P. 15p. Please state output required. All the above units are completely isolated from mains by double wound transformer ensuring 100% safety.

R.C.S. PRODUCTS (RADIO) LTD.
 (Dept. P.E.), 31 Oliver Road, London, E.17

The Open University

Post-Experience Course

Electromagnetics
and Electronics

This course aims to provide a good understanding of the scientific bases of electronics and of electronic circuit design. Students are introduced to the latest methods of electronic design, and are provided with their own oscilloscope, electronic components and other equipment for use at home. Specially written correspondence material is supplemented by television and radio programmes, tutorials and a one-week summer school. Apart from the summer school, no time need be taken off work to study.

The course runs from January to November 1973, and leads to either a Course Certificate or Letter of Course Completion. Applications open on 1 June and close on 30 September 1972. To obtain a prospectus and application form, please complete and return the coupon below without delay.

To: The Post-Experience Student Office
 The Open University, PO Box 76, Bletchley, Bucks
 Please send me a prospectus and application form for 1973
 Post-Experience Courses

Name _____
 Address _____

EB 1

INGENUITY UNLIMITED

A selection of readers' suggested circuits. It should be emphasised that these designs have not been proven by us. They will at any rate stimulate further thought. This is YOUR page and any idea published will be awarded payment according to its merits.

RADIO ALARM

HAVING constructed the *Digital Clock* described in the December 1970 issue, I required an additional circuit to enable a transistor radio to be switched on at the same time as the alarm.

A thyristor was tried initially, but the holding current was greater than that drawn by the radio, so that after the ten-minute period that the alarm circuit input is active (i.e. pin 3, IC18 is high), the circuit would turn off (assuming the alarm had been turned off).

The circuit eventually devised is based on an emitter-coupled bistable and is given in Fig. 1.

With the alarm inactive, TR4 is on and TR5 is off. The voltage at the collector of TR4 is just above zero, and hence insufficient to cause the Darlington pair TR1, TR2 to switch on. When the alarm circuit is active, pin 3 of IC18 goes high (point B on the diagram) and TR3 is switched on, grounding the base of TR4. The bistable switches states (TR4 off and TR5 on) and the voltage at TR4 collector rises and the Darlington pair switch on (TR1 hard on).

So far as the radio is concerned, the circuit (Fig. 1) may be considered as a switch and should be connected into one of the battery leads. However, since transistors are used, the "switch" is voltage sensitive, and point "A" must be positive with respect to the circuit earth rail (the other pole of the switch), see Fig. 2a. Alternatively, the circuit may be inserted into the negative lead, if more convenient, but again, care must be taken to ensure that point "A" remains positive, Fig. 2b.

With a 6V battery in the radio, the leakage current through the circuit when "off" is less than $10\mu\text{A}$. It should be noted, however, that there is 0.6V dropped across the power transistor so a slight drop in radio volume will be noted.

This circuit may only be used with a battery powered radio and under no circumstances should a mains operated radio be used.

To retain the portability of a battery operated radio a jack plug socket mounted in the case of the radio and wire as shown in Fig. 3 can be used. The socket should be the type used for an earphone accessory.

R. C. Stone,
Hampton,
Middx.

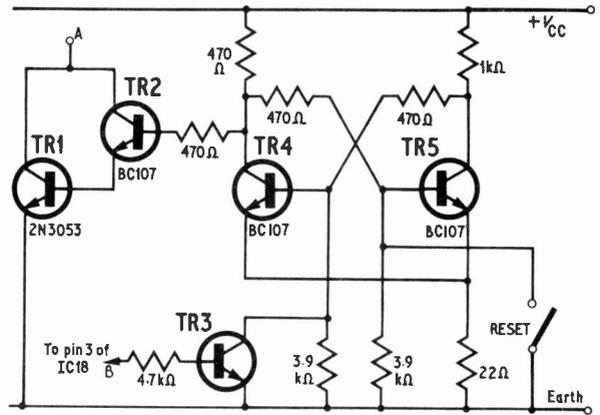
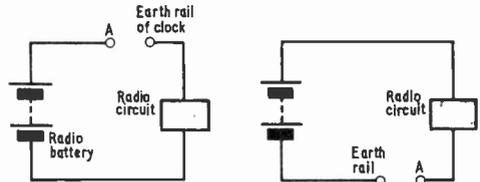


Fig. 1. Circuit of the radio time switch



Figs. 2. Method of connecting different polarity radios to the clock, for point A positive (left); point A negative (right)

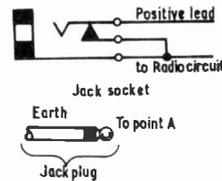


Fig. 3. Wiring of the break jack and plug

PHOTOMETER FOR ECOLOGICAL STUDIES

THE details in Fig. 1, show a simple photometer which was built in order to investigate variations in light intensity beneath various types of vegetation. It is simple to construct and use, and robust enough for field study work.

The basic element of the instrument is two photo-voltaic Selenium cells. They consist of circular plates about 6cm in diameter and 2mm in thickness. They are capable of giving a considerable deflection on a millimeter when under full daylight illumination.

The cells are set in a piece of plywood, which has one surface chiselled out to hold them firmly. Below the cells a similarly shaped piece of aluminium foil is inserted so as to give a good electrical contact in the circuit.

A thicker though smaller sheet of foil is applied to the upper surface of the photosensitive plates, big enough to make electrical contact but not covering any appreciable part of the photo-electric surface. It is important that the two sheets of foil do not make contact with each other. To prevent this happening, a small piece of plastics is inserted between them. The entire assembly is then sandwiched by a plate of Perspex, with terminals to the upper and lower aluminium sheets.

Using a standard light source the instrument could be calibrated absolutely. Without such a source, however, a relative calibration is still possible, i.e. the non-linear response of the cell can be determined.

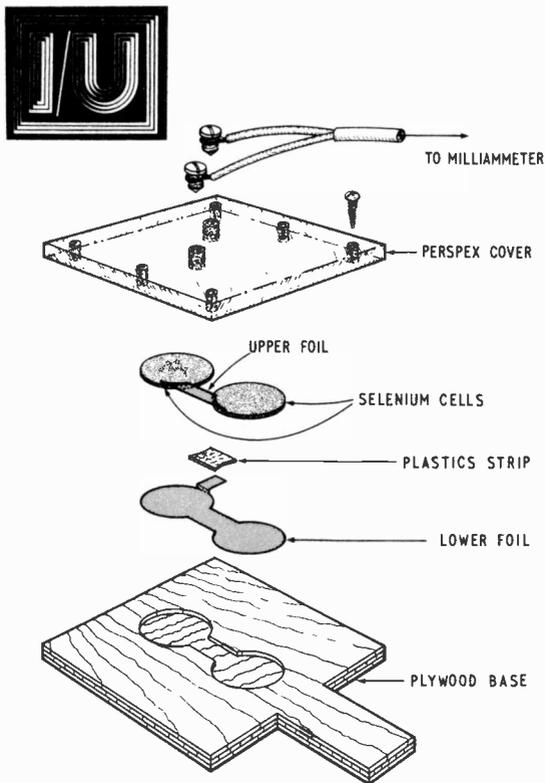


Fig. 1. Constructional details of a simple photometer

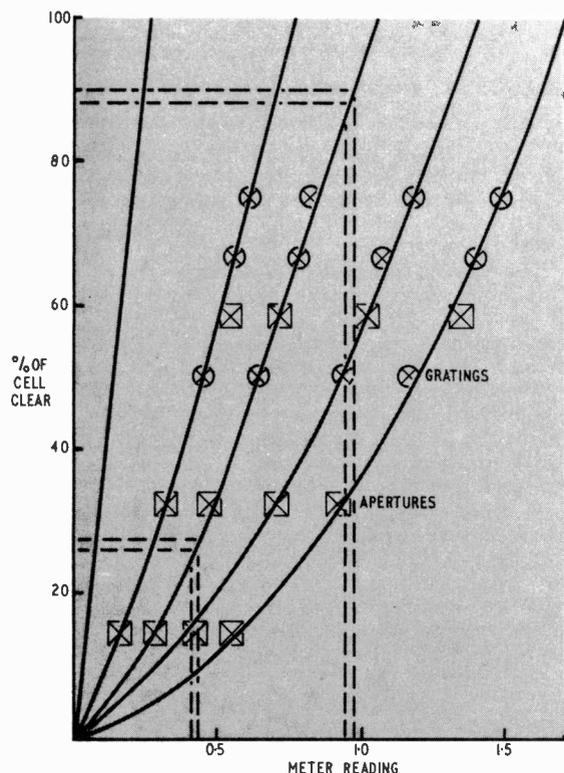


Fig. 2. Calibration graph for the photometer

Two methods were tried. The first utilised the inverse square law (placing the cell at different distances from a light source). In practice, this did not prove very successful, and instead the following method was devised.

A set of apertures and gratings were constructed out of black paper, transmitting 75%, 66.6%, 50%, of the total light. These apertures were fixed, in turn, with adhesive to the Perspex cover. Starting with the full cell area, a light source is moved to a position which gave a realistic reading on the millimeter. Then, without changing this distance, one of the apertures or gratings is placed over the Perspex cover and the current recorded.

Recalibration, with the apertures moved slightly so as to cover different parts of the cell surface, will give more accurate results. These are in Fig. 2.

Using the latter, relative transmissions of the different types of foliage can be determined. For example, the following results were obtained on an overcast October day (instrument held horizontally for all readings).

Open sky reading	Under foliage
0.96	0.44
0.98	0.42

Taking the 1.06 calibration curve, a 0.96 meter reading is equivalent to 88 per cent transmission, and 0.44 reading to 27 per cent transmission.

We therefore, obtain a relative transmission of:

$$27/88 \times 100 = 30.7 \text{ per cent.}$$

Similarly, the second pair of results give about 27.5 per cent relative transmission.

E. D. Dale,
Worsley, Lancs.

POINTS ARISING

SEMICONDUCTOR LEADOUT IDENTICHART *May*
The outline diagram for the 2N3702 to 2N3711 types should be diagram number 59a not 35a. On diagram 22a, reverse the b and e connections.

TAPE SPEED CONTROL (*Ingenuity Unlimited April 1972*)
Page 299, Fig. 3. Transistors TR7 and TR8 should be OC81 and OC35 types respectively.

P.E. SCORPIO IGNITION SYSTEM (*November and December 1971*)

Some constructors have had difficulty with using certain makes of 2N3055 in the "Scorpio" ignition system. What happens is that the circuit oscillates normally (at about 2kHz) until the output of the inverter is shorted, when the inverter goes into a high frequency mode at around 200kHz and remains in this mode when the short is removed.

This arises because 2N3055 transistors are made by a very large number of manufacturers and there are large variations in characteristics such as f_t between different makes. Only minimum or average values are normally quoted on the data sheet.

This trouble does not occur with the specified Ferranti 2N3055, or with RCA devices. It has occurred with Fairchild 2N3055's and may also occur with Motorola devices due to their high f_t .

RUSSIAN WORLD BEATER!

JUST ARRIVED! THE FABULOUS BRAND NEW **VEF 204**

WORLD WIDE RECEPTION
THOUSANDS OF TRANSMISSIONS AND STATIONS THE WORLD OVER!

8 WAVEBAND 10 TRANSISTOR PLUS 2 DIODES PORTABLE RADIO

AND NOW WITH **SHIP-TO-SHORE MARINE BAND**

BATTERY MODEL £13.97P

BOX ROSE ETC 50p

MAINS/BATTERY ELIMINATOR £1.48 extra

WE COULDN'T EVEN MAKE THEM FOR OUR FANTASTIC PRICE!

*COMPARE IT'S PERFORMANCE WITH £42 RADIOS!

IMPORTANT: THIS VERY LATEST MODEL INCORPORATES ALL THE LATEST TECHNOLOGICAL IMPROVEMENTS AND SUPERSEDES ALL EARLIER MODELS! DESIGNED FOR WORLD-WIDE RECEPTION—it'll probably make your present radio seem like a "crystal set"! It even incorporates a special MARINE WAVEBAND to receive spoken communications from ship-to-shore! We're almost giving them away at only £13.97—a fraction of today's Russian miracle price! Compare performance with 242 radios! *Refund if not astounded. Purer and sweeter tone than ever! Wider band spread for "pin-point" station selection. The Russians have really surpassed themselves this time, proving again their ability in the field of space communications. Yes, 8 separate wavebands, including standard Long, Medium and Short Waves to cover the world. PLUS special "ship-to-shore" MARINE BAND! Thousands of different transmissions and stations, including ships at sea, etc., and messages from all over the world. You must hear it to believe it! Superb sweet tone—from a whisper to a roar! Push-pull output! Separate ON/OFF volume & Treble/Bass tone controls! Press button dial illumination! Take it anywhere—runs on standard batteries or through battery eliminator from 220/240V a.c. mains. Internal ferrite rod plus telescopic aerial. It's also a fabulous CAR RADIO! Black & Chrome case, 11in x 9in x 3 3/4in overall approx. Made to give years of service. WRITTEN GTEC, manual with instructions & circuit diagram. ONLY £13.97 (with mains/battery eliminator £1.48 extra) POST 50p. Standard batteries 38p extra. Can also be used through extension amplifier, tape recorder or public address system. (SORRY—we cannot exchange these radios for any earlier model) already purchased!)

NOTE.—The Ministry of Posts and Telecommunications has pointed out that a Licence (not generally available to the public) is required for the reception of transmissions by Fire Brigade, Aircraft, Shipping, etc.

THIS FANTASTIC OFFER ONLY FROM US!

SAVE £20.25 NOW!

fabulous BRAND NEW **SOLID STATE**

This equipment's got EVERYTHING!

BATTERY/MAINS AC

Combined **V.H.F. AM/FM RADIO and CASSETTE TAPE RECORDER & PLAYER**

RECOMMENDED RETAIL PRICE £44

OUR PRICE £23.75 CARR. ETC. 35p

WITH REMOTE CONTROL MICROPHONE



FANTASTIC (even by our standards!) Brand new—the latest sensation in the world of sound! First class makers! Not only a fabulous VHF AM/FM Radio AND Cassette Tape Recorder and Player combined, but it also runs off standard batteries or mains (simply plug in 220/240V a.c. line cord). Now you can record and play back anything, anywhere! You can even tape direct from the Radio as you listen! **RECOMMENDED RETAIL PRICE GENUINELY £44 YET WE OFFER AT ALMOST HALF PRICE!** Just look at these wonderful features:—*Press-button Keyboard Control panel or latest MASTER SWITCH CONTROL! *"MAGIC EYE" Visual Battery check/recording level indicator or built-in automatic leveller! *Separate ON/OFF, and HI-LO volume controls! Heavy duty built-in speaker! *Earphone (for personal listening or "monitoring") and extension speaker sockets! *Remote control microphone! *Built-in swivel telescopic extension aerial (24in approx)! Magnetically made case, with carry handle (DESIGNS VARY SLIGHTLY). Takes standard 30, 60, 90 or 120 minute Philips Cassette Tapes obtainable everywhere. But wait, the amazing built-in full circuit VHF AM/FM Radio gives you superb clarity of tone and incredible station selection—Unique rotating Station Selector Dial—get all local city and regional stations in every part of the country plus BBC National VHF. Picks up dozens of foreign stations. Also fabulous in your car! You could pay ££££ more for a Car Radio or Car Cassette Player ALONE! ONLY £23.75, carr. etc. 35p. Complete with simple instructions, remote control microphone with on/off switch and microphone stand. **WRITTEN GUARANTEE. BONUS OFFER—Standard Batteries and Cassette Tape 25p extra.**

MOTORSING SENSATION!

SAVE £24 NOW!

Complete **8-TRACK CAR STEREO SYSTEM**

Yes! **superb CARTRIDGE CASSETTE PLAYER!** Plus **TWO MATCHED SPEAKERS!** Plus **ALL CONNECTIONS and FITTINGS!**

LIST PRICE £39.97! **ONLY £15.97** CARR. ETC 35p



ASTRONOMICAL REDUCTION! Frustrated import order must be turned into cash! Brand New, from first class makers—we must not mention name! Absolutely the ultimate in luxury car equipment! The sort of offer that you only dream about, but THIS is true! Yes, for the incredible price of £15.97 carr., etc., 35p, you can have this magnificent complete 8-track stereo system. Superb Cartridge cassette player beautifully made—so compact, overall size 6 1/2in x 6 1/2in x 2 1/2in approx. for easy mounting in any car, boat or truck—or even in the home. (Runs off 12V battery.) Just "slap-in" a Cartridge cassette (takes standard 8-track Cartridge cassettes—gives you hours of continuous playing) and experience rich true-fidelity stereo sound! Autoplay, automatic track changer, plus manual programme selector. Separate thumb-wheel volume and treble/bass tone controls, sliding balance control. Outstanding 80-10,000 c/s frequency response! Circuit—10Tr. OTL system! Playback system—8-track 4 channels! Speaker impedance—4-8 ohms each channel! Output power—5W (2.5W per channel). Plus 2 compact matched stereo speakers, each 4 1/2in dia. approx. plus all leads, connections, fittings, etc. Designed for fast, easy mounting. With simple instructions. **WRITTEN GUARANTEE. Yes, everything for £15.97 carr., etc. 35p but please hurry—limited stock only! Refund if not delighted.** Many fantastic bargains on display at both our stores.

Order to Uxbridge Road or call at either store.

COMMERCIAL TRAVELLERS PLEASE NOTE:

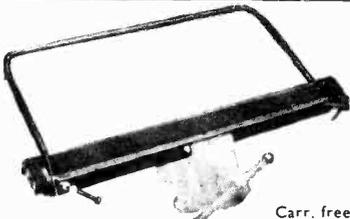
Merchandising Office at Holborn.

Dept. PE/17, 164 UXBRIDGE ROAD (facing Shepherds Bush Green), LONDON W12 8AQ. (Thurs. 1, Fri. 7). Also at 37/39 HIGH HOLBORN (opposite Chancery Lane), LONDON, W.C.1. (Thurs. 7 p.m.).

BOTH STORES OPEN FROM MONDAY TO SATURDAY 9 a.m.—6 p.m.

SHOPERTUNITIES LTD. SL

PARKERS SHEET METAL FOLDING MACHINES HEAVY VICE MODELS



With Bevelled Former Bars Carr. free

No. 1. Capacity 18 gauge mild steel x 36in. wide £15

No. 2. Capacity 18 gauge mild steel x 24in. wide £12

No. 3. Capacity 16 gauge mild steel x 18in. wide £12

Also new bench models. Capacities 36in. x 18 gauge £35. 24in. x 16 gauge £32. Carriage free.

End folding attachments for radio chassis Tray and Box making for 36in. model, 27 1/2p per ft. Other models 17 1/2p. The two smaller models will form flanges. As supplied to Government Departments, Universities, Hospitals.

One year's guarantee. Money refunded if not satisfied. Send for details.

A. B. PARKER, Folding Machine Works, Upper George St., Heckmondwike, Yorks. Heckmondwike 3997

REED COILS

3, 6, 9, 12, 24V Miniature 27p

Small 27p

Standard 34p

REED SWITCHES

Large range of many sizes, types and manufacture

Popular types:

E Small n/o 10 for 50p

A Miniature n/o 24p each

B Standard c/o 40p each

REED PUSH BUTTON SWITCHES

Momentary Action

1 contact £1.00

2 contacts £1.25

Illuminated 1 contact £1.30

Illuminated 2 contacts £1.55

REED RELAYS

Many versions available, popular types: 3, 6, 9, 12, 24V

Miniature 1/A normally open 56p

Small 2/E 1 contact 36p

2/EE 2 contacts 44p

2/EEE 3 contacts 52p

STD 3/B change over 87p

REELS OF ENAMELLED COPPER WIRE

20 s.w.g. to 47 s.w.g. 50, 100 & 200 grams, Send for prices

C.B.M. ELECTRONIC COMPONENTS LTD.

26 Avon Trading Estate, Avonmore Road, London, W.14

TRANSFORMERS

MAINS ISOLATING SERIES
Primary 200-250 Volts Secondary 240 Volts Centre Tapped (120V) and Earth Shielded
ALSO AVAILABLE WITH 115/120V SEC. WINDING

Ref. No.	VA (Watts)	Weight lb	Size cm.	P & P
07	20	1 11	7.0 × 6.0 × 6.5	£ 1.61 30
100	60	3 8	8.9 × 8.0 × 7.7	2.39 36
61	100	5 12	10.2 × 8.9 × 8.3	2.62 52
30	200	9 8	12.0 × 10.3 × 10.0	4.39 52
62	250	12 4	9.5 × 12.7 × 11.4	5.80 67
55	350	15 0	14.0 × 10.8 × 12.4	7.77 82 *
63	500	27 0	17.1 × 11.4 × 15.9	11.20 *
92	1000	40 0	17.8 × 17.1 × 21.6	20.63 *
128	2000	63 0	24.1 × 21.6 × 15.2	34.10 *

AUTO SERIES (NOT ISOLATED)

Ref. No.	VA (Watts)	Weight lb oz	Size cm.	Auto Taps	P & P
113	20	1 11	7.3 × 4.3	4.4 0-115-210-240	£ 0.85 22
64	75	1 14	7.0 × 6.4	6.0 0-115-210-240	1.66 30
4	150	3 0	8.9 × 6.4	7.6 0-115-200-220-240	2.00 36
66	300	6 0	10.2 × 10.2	9.5	3.89 52
67	500	12 8	14.0 × 10.2	11.4	5.78 67
84	1000	16 0	11.4 × 14.0	14.0	10.49 82 *
93	1500	28 9	13.5 × 14.9	16.5	15.20 *
95	2000	40 0	17.8 × 16.5	21.6	19.84 *
73	3000	45 8	17.4 × 18.1 × 21.3	26.99 *

TOTALLY ENCLOSED 115V AUTO TRANSFORMERS
115V 500 Watt totally enclosed auto transformer, complete with mains lead and two 115V outlet sockets, £7.87, P & P 67p.
Also available a 20 Watt version, £1.67, P & P 22p.

LOW VOLTAGE SERIES (ISOLATED)

Ref. No.	Amplitude	Weight lb oz	Size cm.	Secondary Windings	P & P			
111	0.5	0.25	12	7.6 × 5.7	4.4 0-12V at 0.25A × 2	£ 0.85 22		
213	1	0	8.3	5.1	5.1 0-12V at 0.5A × 2	1.01 22		
71	2	1	0	7.0	6.4	5.7 0-12V at 1A × 2	1.33 22	
18	4	2	8.3	7.0	7.0 0-12V at 2A × 2	1.86 36		
70	8	3	12	10.2	7.6	8.6 0-12V at 3A × 2	2.24 42	
108	8	4	5	4	10.0	8.3	8.2 0-12V at 4A × 2	2.48 52
72	10	5	6	3	7.9	10.8	10.2 0-12V at 5A × 2	2.94 52
17	16	8	7	8	12.1	9.5	10.2 0-12V at 8A × 2	4.54 52
115	20	10	11	13	12.1	11.4	10.2 0-12V at 10A × 2	5.78 67
187	30	15	16	12	13.3	12.1	12.1 0-12V at 15A × 2	10.67 82 *
226	60	30	34	0	17.0	14.5	12.5 0-12V at 30A × 2	19.61 *

30 VOLT RANGE

Ref. No.	Amplitude	Weight lb oz	Size cm.	Secondary Taps	P & P	
112	0.5	1	4	8.3 × 3.7	4.9 0-12-15-20-24-30V	£ 1.01 22
79	1	2	0	7.0 × 6.4	6.0	1.35 36
3	2	3	2	8.9 × 7.0	7.6	2.01 36
20	3	4	6	10.2 × 8.9	8.6	2.48 42
21	4	6	0	10.2 × 10.0	8.6	2.94 52
51	5	6	0	12.1 × 10.0	8.6	3.66 52
117	6	7	8	12.1 × 10.0	10.2	4.36 52
88	8	10	0	14.0 × 11.7	10.0	5.64 67
89	10	12	2	14.0 × 10.2	11.4	7.14 67

50 VOLT RANGE

Ref. No.	Amplitude	Weight lb oz	Size cm.	Secondary Taps	P & P	
102	0.5	1	11	7.0 × 7.0	5.7 0-19-25-33-40-50V	£ 1.33 30
103	1	2	10	8.3 × 7.3	7.0	1.94 36
104	2	5	0	10.2 × 8.9	8.6	2.69 42
105	3	6	0	10.2 × 10.2	8.3	3.65 52
106	4	9	4	12.1 × 11.4	10.2	4.83 52
107	6	12	4	12.1 × 11.1	13.3	7.14 67
118	8	18	9	13.3 × 13.3	12.1	9.32 97
119	10	19	12	16.5 × 11.4	15.9	11.68 97

60 VOLT RANGE

Ref. No.	Amplitude	Weight lb oz	Size cm.	Secondary Taps	P & P	
124	0.5	2	4	8.3 × 9.5	6.7 0-24-30-40-48-60V	£ 1.35 36
126	1	3	0	8.9 × 7.6	7.6	1.88 36
127	2	5	6	10.2 × 8.9	8.6	2.94 42
125	3	8	8	11.9 × 9.5	10.0	4.48 52
123	4	10	6	11.4 × 9.5	11.4	5.78 67
120	6	16	12	13.3 × 12.1	12.1	8.37 82 *
122	10	23	2	16.5 × 12.7	16.5	13.85 *

LEAD ACID BATTERY CHARGER TYPES

Ref. No.	Amplitude	Weight lb oz	Size cm.	P & P	
45	1.5	1	9	7.0 × 6.0 × 6.0	£ 1.34 30
5	4	3	11	10.2 × 7.0 × 8.3	2.03 42
86	6	5	12	10.2 × 8.9 × 8.3	3.07 52
146	8	6	4	8.9 × 10.2 × 10.2	3.49 52
50	12.5	11	14	13.3 × 10.8 × 12.1	5.20 67

All ratings are continuous. Standard construction: open with solder tags and wax impregnation. Enclosed styles to order.

FULL SPEC. TRANSISTORS

BC107/108/109 9-p each	2N 3055 6p each	AD 161/162 6p pair
25 + 7p	+ mica and bushes	+ mica and bushes
100 + 6.5p	25 + 55p	25 + 55p
500 + 6p	100 + 45p	100 + 50p
Minimum order 10 pieces this range.	500 + 40p	500 + 45p
	1000 + 40p	

**AVOMETERS · MAINS KEYNECTOR
ELECTROSIL RESISTORS**

*CARRIAGE VIA BR5

BARRIE electronics

11 MOSCOW ROAD, QUEENSWAY
LONDON W2 4AH Tel: 01-229 6681/2
NEAREST TUBE STATIONS: BAYSWATER, QUEENSWAY

A.M.C. ELECTRONICS LTD.

SCORPIO ELECTRONIC IGNITION

Complete kit of parts and comprehensive constructional data giving answers to most of the questions concerning operation, installation and fault finding.

KIT AS ABOVE—£11.25 post paid.

CONSTRUCTION DATA—10p.

COMPONENT PRICE LIST—S.A.E. Please.

GEMINI TUNER

Please ask to be put on our mailing list (U.K. only). Components available to date include Tuner Head, Drive Components, Dial, Front Panel, P.C.B., L1, L2, F1, F2, T1, sets of Resistors, Capacitors and Semiconductors.

**AMCEL, MAIL ORDER, 160 DRAKE ST.,
ROCHDALE Tel. 0706-46234**

LATEST RELEASES

from R.S. Components Ltd. include these Printed Circuit type CAPACITORS. Electrolytic, low voltage, small size. Available in the following: 0.47/63, 1/63, 2.2/63, 4.7/40, 10/63, 22/40, 100/10, 7p each; 47/40, 10p each; 100/63, 220/40, 470/16, 13p each; 1,000/16, 16p each.



Miniature Moulded Bridge Rectifiers for printed circuit mounting. REC 60, 800 volt, 0.9 amp, 38p each; REC 65, 800 volt, 1.3 amp, 45p each.

Fixed Voltage Regulators, TO-3 case. MVR 5 volt, MVR 12 volt, MVR 15 volt, all at £1.50 each.

Low Voltage Transformers for the above Regulators. 9 volt for MVR 5 volt; 15.5 volt for MVR 12 volt; 17.5 volt for MVR 15 volt, all at £1.60 each.

All of the above and many, many other high grade components, are shown in our CATALOGUE, Price 25p by return of post.

All prices POST FREE in U.K. Minimum order 50p.

MAIL ORDER ONLY FROM

CELESTRON-E

Dept. P.E., P.O. Box No. 1, Llantwit Major, Glamorgan CF6 9YN

**FOR THE AMATEUR AND CRAFTSMAN ALIKE
PRACTICAL**

WOODWORKING

the magazine for detailed how-to-do-it features covering every aspect of working with wood

MAKING NEW FURNITURE TO MODERNISING OLD · BUILDING A SUMMERHOUSE TO PANELLING A ROOM · TURNING A CHAIRLEG TO BUILDING A BOAT · STREAMLINING A KITCHEN TO CONSTRUCTING A BABY'S PLAYPEN · OUT EVERY MONTH ONLY 25p

PLACE A REGULAR ORDER NOW

PLUGS AND SOCKETS

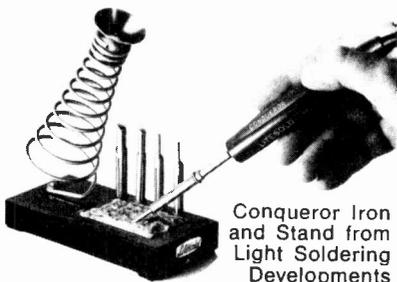
To help rationalize the profusion of plug and socket connecting configurations in the continental Din range, **Parry Electronic Developments** have introduced a PD Din connector that can be easily assembled in either 2-pin, 3-pin or 5-pin stereo configurations.

These connectors do not require soldering but use small terminal tags which are crimped, at one end, to the required wire and then have a pin inserted in a sprung triangular section at the other end. The pins are placed in any required arrangement on a centre bush, placed in one half of the outer casing and then the two halves are snapped together to form the complete connector.

Details of other connectors in the series and addresses of nearest stockists can be obtained from Parry Electronic Developments Ltd., 28 Greville Street, London EC1.

A miniature 2-pin plug and socket, useful for extension leads, is now being marketed by **Senate Engineering**.

A feature of the plug and socket



Conqueror Iron and Stand from Light Soldering Developments

is that it is rated at 25A and has a claimed contact resistance of less than 1.4 milliohms. Again, leads are connected without the use of solder or screws.

Typical applications could be for automobile, caravan and boat electrics and emergency supplies. There are also many low current low voltage applications, such as control circuits and loudspeaker extensions where advantage can be taken of the low contact resistance.

The recommended retail price is 25p and further information is available from Senate Engineering Ltd., 77 Cotes Road, Barrow-in-Soar, Loughborough, Leicestershire.

SOLDERING IRON AND STAND

Available as a set or individual items **Light Soldering Developments** recently announced a new soldering iron and stand.

Called the Conqueror, the iron is available with five different slip-on tip sizes from $\frac{1}{16}$ in to $\frac{1}{4}$ in. Ideal for transistor and i.c. work the iron is available for operating voltages of 12, 24, 115, 220 and 240V.

A feature of the stand is the arrangement for mounting four spare bits on the base. The iron stand base is made from heatproof Bakelite and contains a wiping sponge for keeping iron tips clean.

The spring guard is claimed to give complete protection from burns and prevent damage to the iron if knocked. A flared steel ferrule at the narrow end of the spring gives easy location of the iron.

The price of the Conqueror is £1.80 with standard copper bits, or £2.03 with a long-life bit. The cost of the stand is £1.48. Further details and stockists can be obtained from Light Soldering Developments, 28 Sydenham Road, Croydon CR9 2LL.

SOUND SYSTEMS

For people who prefer to purchase and choose their own turntable, cartridges, speakers, and design enclosures we can recommend the System 12 from **Bi-Kits**.

The kit consists of a pre-wired pre-amplifier, two integrated circuit power amplifiers, power supply

module and two 8in diameter twin cone speakers. The kit also contains all the necessary connecting wire, silver anodised front panel and control knobs.

The power amplifier modules use an SGS integrated circuit which they claim gives an output of 6 watts r.m.s. per channel. The frequency response of the system is claimed to be 20Hz to 50kHz.

Kits are available, price £13.95 plus 35p postage and packing, from Bi-Kits, 63a High Street, Ware, Herts.

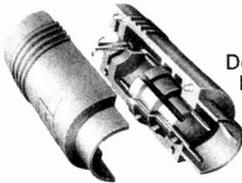
The System 12 can be heard at the new **Bi-Pak's** Components Supermarket at 18 Baldock Street, Ware, Herts.

A new stereo system is now available from **Servicon Dynamics Ltd.** The amplifier moves away from conventional amplifier techniques and incorporates integrated operational amplifiers as the pre-amplifier tone control and driver stages. The output stages, which are transformerless and d.c. coupled, use complementary silicon transistors connected in a common emitter mode.

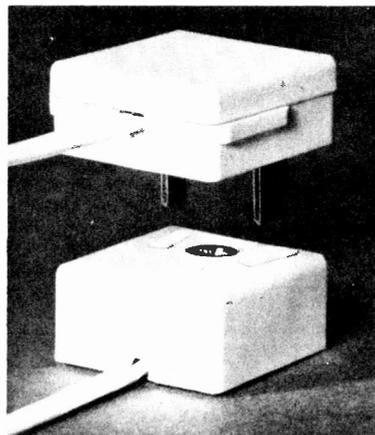
Total distortion is claimed to be 0.09 per cent at 15W per channel at

MARKET PLACE

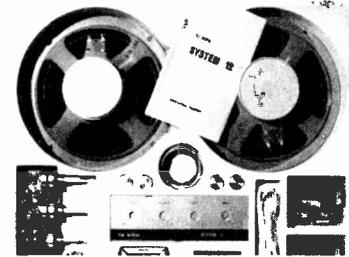
Items mentioned in this feature are usually available from electronic equipment and component retailers advertising in this magazine. However, where a full address is given, enquiries and orders should then be made direct to the firm concerned.



Parry Electronic Developments PD Din Plug



Miniature 25A Plug and Socket made by Senate Engineering



System 12 Kit marketed by Bi-Kits

1kHz and the cross talk -60dB at 1kHz with tone control flat and 15 watts/zero watts per channel loading.

The amplifier is mounted in a teak finish cabinet with a Perspex/teak lid which can be kept in place with records playing. The deck is the latest Garrard SP25 Mk. III with a ceramic cartridge KS41C-CDS as standard; a magnetic cartridge can be supplied as an extra.

The output is 30 watts r.m.s. per channel into 7.5 ohms with a frequency response of 30Hz to 29kHz (\pm dB).

The system is sold as a package with two teak finish speaker cabinets each containing an 8in l.f. speaker and 4in tweeter with crossover capacitor. Power output 15 watts r.m.s. at 15 ohms per channel. Frequency 30Hz to 20kHz. A 50 watt system can be supplied as an alternative.

The system is offered at £89.00 for the 30 watt system; the amplifier and deck complete, without speakers, is £70.35. Further details available from Servicon Dynamics Ltd., 186/190 Cirencester Road, Charlton Kings, Cheltenham, Glos.

report from AUSTRALIA

BY J.M.WALDIE

In this new series of "Reports from down-under", the aim will be to cover three broad aspects of Australian electronics: home construction, industrial development, and the local hi-fi scene. It is felt that readers of P.E. intending to migrate to this side of the world would naturally be interested to know if their hobby is perpetuated here, and what form it takes; at the same time it is possible to make useful comparisons between here and the U.K. On the industrial front, items will be selected of interest to both hemispheres, since P.E. enjoys a relatively large readership in Australia.

MAGAZINES

Considering the population here, which may be considered to consist of approximately one and a half times that of Greater London spread over an area the size of America, and also in view of the fact that it is essentially an "outdoor" society, the interest in electronics as a hobby is remarkably widespread. Naturally this is concentrated in the five major cities of Australia, and particularly in Sydney and Melbourne.

This industry is served by two local magazines; all the English magazines, of which P.E. is the most popular, are also available at most newsagents.

Both local magazines, however, do not restrict themselves to home constructional projects. They both examine, in some detail, new commercial products in the hi-fi field and both conduct record reviews.

HOME CONSTRUCTION

A major difference is the fact that published projects are designed in the magazines' own laboratories. As a consequence, commercial units built here are frequently based on designs available to the public which contrasts sharply with the situation in the U.K. and in America where d.i.y. hi-fi projects appear to follow industrial trends. This rather unusual situation offers two important advantages to the home constructor. Firstly, he can build units equal in performance to some local commercial systems and, secondly, the designs presented follow in logical

sequence in terms of facilities and improved performance.

What service is offered to the constructor in terms of components, tools and so on? Visitors and migrants should not expect Australian equivalents to the Edgware and Tottenham Court Roads, although small pockets of suppliers do exist. A glance through the local magazines indicate that Sydney possesses twelve kit/component shops; Melbourne has half that number. Only two or three of these advertise themselves as being strictly mail-order. Constructors should note, however, that, unlike the U.K., the great majority of importers and manufacturers will sell direct to individuals. The writer has not bought components in four years from a kit-shop, but rather from "trade-sales" counters in wholesale outlets.

PROJECTS

Readers and intending visitors should not delude themselves into thinking that Australia is simply a place where kangaroos leap down the main streets, and where the bath-water goes down in the opposite direction. Industrially and technically it is well advanced; although f.m. radio and colour television are not yet with us, plans are well advanced for their introduction. The sophistication is amply reflected in the standard and selection of home construction projects. There exists a greater penetration of components of American origin than in the U.K., which has led to a relatively early introduction of such devices as field-effect transistors, triacs and i.c.s into d.i.y. projects; circuits based on triacs, for example, appeared in 1968.

The projects themselves are basically similar to those in P.E. with possibly a greater emphasis on "outdoor" systems such as water-level alarms for home pools and protective and ancillary circuits for cars. Mercifully, an all-electronic barbecue has yet to emerge. It seems, too, that there does not appear to be much interest in sophisticated toys and war-games.

This summarises the situation here regarding d.i.y. electronics in

Australia and those contemplating a temporary or permanent move need not have any fears regarding the ability to continue their hobby.

COMPUTERISED BETTING SHOPS

One interesting excursion of electronics into traditional areas has been the introduction in Sydney of computerised betting shops. These, in all states, are Government run; they are known as the TAB (Totaliser Agency Board), and provided £1million profit last year in N.S.W. Bets can be placed not only on horse and greyhound racing, but also on trotting, a form of equine harassment not known in the U.K. The volume of punting is such that an expected 10,000 bets per minute will be placed by 1978.

It was decided to use an IBM 360/44 computer to handle this volume and was installed some 12 months ago. It is supported by AWA (Amalgamated Wireless Australia) branch selling terminals, STC branch printers and PMG telex in country areas. Cut-over of telephone betting from manual to computer has now been completed; the system of transmitting full collation figures to headquarters from the branches is more than half-way complete and 15 of the 380 existing branches converted to machine vending. These are now being converted at the rate of four per week.

UP TO THE "OFF"

The computer checks the validity of each bet, runners and "scratchings" until the "off", the credit standing of the telephone punter and the validity of a winning claim and the amount. The timing is such that a bet placed two seconds after the race is due to close will be rejected.

Tradition dies hard. The cold impersonality of the new system, according to veteran punters, is no substitute for the excitement which occurred in 1964, for example, when crowds queueing outside two TAB branches had to be controlled by police because the windows had closed before all the punters had laid their wagers.

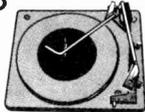
HENRY'S FOR **FIRST GRADE BRAND** **GERMANIUM and SILICON TRANSISTORS, DIODES, RECTIFIERS,**
LOW COST NEW BRANDED TRIACS, FETS, ZENERS, BRIDGES and INTEGRATED CIRCUITS
 BY **ATES · EMIHUS · FAIRCHILD · FERRANTI · I.T.T. · MULLARD · NEWMARKET · PHILIPS · R.C.A. · TEXAS**

TRANSISTORS
 A SELECTION FROM OUR LIST

AAV30 10p	BD115 75p	OC14 50p	2N1303 15p
AAV42 15p	BD123 85p	OC20 25p	2N1304 25p
AAZ13 10p	RD124 80p	OC22 50p	2N1305 25p
AAZ15 10p	BD131 75p	OC23 80p	2N1306 25p
AAZ17 10p	BD132 80p	OC24 60p	2N1307 25p
AC107 35p	BDY11 10p	OC25 40p	2N1307 25p
AC126 30p		OC26 25p	2N1308 25p
AC127 25p	BDY17 15p	OC28 80p	2N1309 25p
AC127Z 50p		OC29 40p	2N1813 75p
AC128 20p	BDY38 85p	OC35 50p	2N1247 75p
AC176 20p	BDY60 10p	OC36 60p	2N2140 60p
AC187 25p		OC42 40p	2N2217 25p
AC188 25p		OC43 50p	2N2218 10p
AC191 25p	BF115 35p	OC44 15p	2N2219 25p
AC192 25p	BF154 30p	OC45 15p	2N2220 25p
AC193 25p	BF158 30p	OC70 15p	2N2221 25p
AC194 25p	BF159 35p	OC71 15p	2N2222 25p
AC195 25p	BF180 35p	OC72 80p	2N2223 25p
AC196 25p	BF181 35p	OC73 25p	2N2224 25p
AC197 25p	BF182 35p	OC74 25p	2N2225 25p
AC198 25p	BF183 35p	OC75 25p	2N2226 25p
AC199 25p	BF184 35p	OC76 25p	2N2227 25p
AC200 25p	BF185 35p	OC77 40p	2N2228 25p
AC201 25p	BF186 35p	OC78 40p	2N2229 25p
AC202 25p	BF187 35p	OC79 40p	2N2230 25p
AC203 25p	BF188 35p	OC80 40p	2N2231 25p
AC204 25p	BF189 35p	OC81 40p	2N2232 25p
AC205 25p	BF190 35p	OC82 40p	2N2233 25p
AC206 25p	BF191 35p	OC83 25p	2N2234 25p
AC207 25p	BF192 35p	OC84 25p	2N2235 25p
AC208 25p	BF193 35p	OC85 25p	2N2236 15p
AC209 25p	BF194 35p	OC86 25p	2N2237 15p
AC210 25p	BF195 35p	OC87 25p	2N2238 15p
AC211 25p	BF196 35p	OC88 25p	2N2239 15p
AC212 25p	BF197 35p	OC89 25p	2N2240 15p
AC213 25p	BF198 35p	OC90 25p	2N2241 15p
AC214 25p	BF199 35p	OC91 25p	2N2242 15p
AC215 25p	BF200 35p	OC92 25p	2N2243 15p
AC216 25p	BF201 35p	OC93 25p	2N2244 15p
AC217 25p	BF202 35p	OC94 25p	2N2245 15p
AC218 25p	BF203 35p	OC95 25p	2N2246 15p
AC219 25p	BF204 35p	OC96 25p	2N2247 15p
AC220 25p	BF205 35p	OC97 25p	2N2248 15p
AC221 25p	BF206 35p	OC98 25p	2N2249 15p
AC222 25p	BF207 35p	OC99 25p	2N2250 15p
AC223 25p	BF208 35p	OC100 25p	2N2251 15p
AC224 25p	BF209 35p	OC101 25p	2N2252 15p
AC225 25p	BF210 35p	OC102 25p	2N2253 15p
AC226 25p	BF211 35p	OC103 25p	2N2254 15p
AC227 25p	BF212 35p	OC104 25p	2N2255 15p
AC228 25p	BF213 35p	OC105 25p	2N2256 15p
AC229 25p	BF214 35p	OC106 25p	2N2257 15p
AC230 25p	BF215 35p	OC107 25p	2N2258 15p
AC231 25p	BF216 35p	OC108 25p	2N2259 15p
AC232 25p	BF217 35p	OC109 25p	2N2260 15p
AC233 25p	BF218 35p	OC110 25p	2N2261 15p
AC234 25p	BF219 35p	OC111 25p	2N2262 15p
AC235 25p	BF220 35p	OC112 25p	2N2263 15p
AC236 25p	BF221 35p	OC113 25p	2N2264 15p
AC237 25p	BF222 35p	OC114 25p	2N2265 15p
AC238 25p	BF223 35p	OC115 25p	2N2266 15p
AC239 25p	BF224 35p	OC116 25p	2N2267 15p
AC240 25p	BF225 35p	OC117 25p	2N2268 15p
AC241 25p	BF226 35p	OC118 25p	2N2269 15p
AC242 25p	BF227 35p	OC119 25p	2N2270 15p
AC243 25p	BF228 35p	OC120 25p	2N2271 15p
AC244 25p	BF229 35p	OC121 25p	2N2272 15p
AC245 25p	BF230 35p	OC122 25p	2N2273 15p
AC246 25p	BF231 35p	OC123 25p	2N2274 15p
AC247 25p	BF232 35p	OC124 25p	2N2275 15p
AC248 25p	BF233 35p	OC125 25p	2N2276 15p
AC249 25p	BF234 35p	OC126 25p	2N2277 15p
AC250 25p	BF235 35p	OC127 25p	2N2278 15p
AC251 25p	BF236 35p	OC128 25p	2N2279 15p
AC252 25p	BF237 35p	OC129 25p	2N2280 15p
AC253 25p	BF238 35p	OC130 25p	2N2281 15p
AC254 25p	BF239 35p	OC131 25p	2N2282 15p
AC255 25p	BF240 35p	OC132 25p	2N2283 15p
AC256 25p	BF241 35p	OC133 25p	2N2284 15p
AC257 25p	BF242 35p	OC134 25p	2N2285 15p
AC258 25p	BF243 35p	OC135 25p	2N2286 15p
AC259 25p	BF244 35p	OC136 25p	2N2287 15p
AC260 25p	BF245 35p	OC137 25p	2N2288 15p
AC261 25p	BF246 35p	OC138 25p	2N2289 15p
AC262 25p	BF247 35p	OC139 25p	2N2290 15p
AC263 25p	BF248 35p	OC140 25p	2N2291 15p
AC264 25p	BF249 35p	OC141 25p	2N2292 15p
AC265 25p	BF250 35p	OC142 25p	2N2293 15p
AC266 25p	BF251 35p	OC143 25p	2N2294 15p
AC267 25p	BF252 35p	OC144 25p	2N2295 15p
AC268 25p	BF253 35p	OC145 25p	2N2296 15p
AC269 25p	BF254 35p	OC146 25p	2N2297 15p
AC270 25p	BF255 35p	OC147 25p	2N2298 15p
AC271 25p	BF256 35p	OC148 25p	2N2299 15p
AC272 25p	BF257 35p	OC149 25p	2N2300 15p
AC273 25p	BF258 35p	OC150 25p	2N2301 15p
AC274 25p	BF259 35p	OC151 25p	2N2302 15p
AC275 25p	BF260 35p	OC152 25p	2N2303 15p
AC276 25p	BF261 35p	OC153 25p	2N2304 15p
AC277 25p	BF262 35p	OC154 25p	2N2305 15p
AC278 25p	BF263 35p	OC155 25p	2N2306 15p
AC279 25p	BF264 35p	OC156 25p	2N2307 15p
AC280 25p	BF265 35p	OC157 25p	2N2308 15p
AC281 25p	BF266 35p	OC158 25p	2N2309 15p
AC282 25p	BF267 35p	OC159 25p	2N2310 15p
AC283 25p	BF268 35p	OC160 25p	2N2311 15p
AC284 25p	BF269 35p	OC161 25p	2N2312 15p
AC285 25p	BF270 35p	OC162 25p	2N2313 15p
AC286 25p	BF271 35p	OC163 25p	2N2314 15p
AC287 25p	BF272 35p	OC164 25p	2N2315 15p
AC288 25p	BF273 35p	OC165 25p	2N2316 15p
AC289 25p	BF274 35p	OC166 25p	2N2317 15p
AC290 25p	BF275 35p	OC167 25p	2N2318 15p
AC291 25p	BF276 35p	OC168 25p	2N2319 15p
AC292 25p	BF277 35p	OC169 25p	2N2320 15p
AC293 25p	BF278 35p	OC170 25p	2N2321 15p
AC294 25p	BF279 35p	OC171 25p	2N2322 15p
AC295 25p	BF280 35p	OC172 25p	2N2323 15p
AC296 25p	BF281 35p	OC173 25p	2N2324 15p
AC297 25p	BF282 35p	OC174 25p	2N2325 15p
AC298 25p	BF283 35p	OC175 25p	2N2326 15p
AC299 25p	BF284 35p	OC176 25p	2N2327 15p
AC300 25p	BF285 35p	OC177 25p	2N2328 15p
AC301 25p	BF286 35p	OC178 25p	2N2329 15p
AC302 25p	BF287 35p	OC179 25p	2N2330 15p
AC303 25p	BF288 35p	OC180 25p	2N2331 15p
AC304 25p	BF289 35p	OC181 25p	2N2332 15p
AC305 25p	BF290 35p	OC182 25p	2N2333 15p
AC306 25p	BF291 35p	OC183 25p	2N2334 15p
AC307 25p	BF292 35p	OC184 25p	2N2335 15p
AC308 25p	BF293 35p	OC185 25p	2N2336 15p
AC309 25p	BF294 35p	OC186 25p	2N2337 15p
AC310 25p	BF295 35p	OC187 25p	2N2338 15p
AC311 25p	BF296 35p	OC188 25p	2N2339 15p
AC312 25p	BF297 35p	OC189 25p	2N2340 15p
AC313 25p	BF298 35p	OC190 25p	2N2341 15p
AC314 25p	BF299 35p	OC191 25p	2N2342 15p
AC315 25p	BF300 35p	OC192 25p	2N2343 15p
AC316 25p	BF301 35p	OC193 25p	2N2344 15p
AC317 25p	BF302 35p	OC194 25p	2N2345 15p
AC318 25p	BF303 35p	OC195 25p	2N2346 15p
AC319 25p	BF304 35p	OC196 25p	2N2347 15p
AC320 25p	BF305 35p	OC197 25p	2N2348 15p
AC321 25p	BF306 35p	OC198 25p	2N2349 15p
AC322 25p	BF307 35p	OC199 25p	2N2350 15p
AC323 25p	BF308 35p	OC200 25p	2N2351 15p
AC324 25p	BF309 35p	OC201 25p	2N2352 15p
AC325 25p	BF310 35p	OC202 25p	2N2353 15p
AC326 25p	BF311 35p	OC203 25p	2N2354 15p
AC327 25p	BF312 35p	OC204 25p	2N2355 15p
AC328 25p	BF313 35p	OC205 25p	2N2356 15p
AC329 25p	BF314 35p	OC206 25p	2N2357 15p
AC330 25p	BF315 35p	OC207 25p	2N2358 15p
AC331 25p	BF316 35p	OC208 25p	2N2359 15p
AC332 25p	BF317 35p	OC209 25p	2N2360 15p
AC333 25p	BF318 35p	OC210 25p	2N2361 15p
AC334 25p	BF319 35p	OC211 25p	2N2362 15p
AC335 25p	BF320 35p	OC212 25p	2N2363 15p
AC336 25p	BF321 35p	OC213 25p	2N2364 15p
AC337 25p	BF322 35p	OC214 25p	2N2365 15p
AC338 25p	BF323 35p	OC215 25p	2N2366 15p
AC339 25p	BF324 35p	OC216 25p	2N2367 15p
AC340 25p	BF325 35p	OC217 25p	2N2368 15p
AC341 25p	BF326 35p	OC218 25p	2N2369 15p
AC342 25p	BF327 35p	OC219 25p	2N2370 15p
AC343 25p	BF328 35p	OC220 25p	2N2371 15p
AC344 25p	BF329 35p	OC221 25p	2N2372 15p
AC345 25p	BF330 35p	OC222 25p	2N2373 15p
AC346 25p	BF331 35p	OC223 25p	2N2374 15p
AC347 25p	BF332 35p	OC224 25p	2N2375 15p
AC348 25p	BF333 35p	OC225 25p	2N2376 15p
AC349 25p	BF334 35p	OC226 25p	2N2377 15p
AC350 25p	BF335 35p	OC227 25p	2N2378 15p
AC351 25p	BF336 35p	OC228 25p	2N2379 15p
AC352 25p	BF337 35p	OC229 25p	2N2380 15p
AC353 25p	BF338 35p	OC230 25p	2N2381 15p
AC354 25p	BF339 35p	OC231 25p	2N2382 15p
AC355 25p	BF340 35p	OC232 25p	2N2383 15p
AC356 25p	BF341 35p	OC233 25p	2N2384 15p
AC357 25p	BF342 35p	OC234 25p	2N2385 15p
AC358 25p	BF343 35p	OC235 25p	2N2386 15p
AC359 25p	BF344 35p	OC236 25p	2N2387 15p
AC360 25p	BF345 35p	OC237 25p	2N2388 15p
AC361 25p	BF346 35p	OC238 25p	2N2389 15p
AC362 25p	BF347 35p	OC239 25p	2N2390 15p
AC363 25p	BF348 35p	OC240 25p	2N2391 15p
AC364 25p	BF349 35p	OC241 25p	2N2392 15p
AC365 25p	BF350 35p	OC242 25p	2N2393 15p

BSR LATEST SUPERSLIM STEREO & MONO

Plays 12", 10" or 7" records. Auto or Manual. A high quality unit built by BSR reliability with 12 months' guarantee. AC 200/250V. Size 13 1/2" x 11 1/2". Above motor board 3 1/2". below motor board 2 1/2".



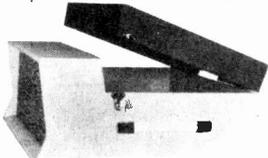
with STEREO and MONO XTAL £8.75 Post 25p.
MONO-COMPATIBLE £7.75 Post 25p.
Plays all records

RCS DE-LUXE 3 WATT AMPLIFIER. Ready made tested. 2-stage triode pentode valve UCL82, 3 watts output, Tone and volume controls. Rectifier valve UF85. Knobs, with high performance loudspeaker. Response 50-18,000 cps. Sensitivity 200mV. £4 25p.

R.C.S. PORTABLE PLAYER CABINET

£4

Post 25p



Really smart appearance with space for R.C.S. Amplifiers and most modern autochangers. Size 18 x 15 x 8in Metal fittings. Carrying handle. Popular Colours. Two-tone reline covering. £4 25p.

GARRARD SINGLE PLAY TA Mk II. Ideal Discoboth or Hi-Fi. Complete with stereo/mono plug-in head. £10

GARRARD AUTOCHANGERS with Souatone Cartridges. Stereo Diamond and Mono Sapphire. Model 1025 £10. Model 2500 Stereo and Mono Autochanger £14. Post 25p.

BSR JUNIOR SINGLE PLAYER. Turntable. 4-speed motor and separate pick-up. £4.50

EMI PICK-UP ARM. With mono stial and stylus £1.25. HI-FI PICK UP CARTRIDGES. Diamond LP/Stereo, Stereo/Mono 9TA £2.50; GP94 £2.50; GP93 £2. Sapphire Mono GP91 £1.50; Powerpoint LP/78 60p.

E.M.I. WOOFER AND TWEETER KIT

£5.75 Post 25p

Comprising a fine example of a Woofer 10 1/2" dia. with a massive Ceramic Magnet, 4ozs, Gauss 13,000 lines. Aluminium Cone centre to improve middle and top response. Also the E.M.I. Tweeter 3 1/2" square has a special lightweight paper cone and magnet flux 10,000 lines.

Impedance Standard 8 ohms
Maximum power 12 watt
Useful Response 35 to 18,000 cps
Bass Resonance 45 cps
SUITABLE ENCLOSURE 20 x 13 x 9 1/2". £9. Post 25p.



WEYRAD P50 - TRANSISTOR COILS

RA2W Ferrite Aerial... 72p
Oac. P50/1AC... 33p
1.F. P50/2C 47k/c... 36p
3rd L.F. P50/3C... 38p
P51/1 or P51/2... 38p
P50/3V... 38p
Mullard Ferrite Rod 8 x 1/2". 20p. 6 x 1/2". 20p.

VOLUME CONTROLS

Long spindles. Midget Size 6 K. ohms to 2 Meg. LOG or LIN. L/S 15p. D.P. 25p. STEREO L/S 55p. D.P. 75p. Edge 5K. S.P. Transistor 25p.

80ohm Coax 4p. yd.
BRITISH AERIALITE
AERAXIAL-AIR SPACED
40 yd. £1.40; 60 yd. £2.
FRINGE LOW LOSS 10p.
Ideal 625 and colour yd

8in. ELAC HI-FI SPEAKER

Dual cone plasticised roll surround. Large ceramic magnet. 50-18,000 cps. Bass resonance 55 cps. 8 ohm impedance. 10 watts music power. £4.80



BLANK ALUMINIUM CHASSIS. 18 s.w.g. 2 1/2in. sides 6 x 4in. 90p; 8 x 6in. 55p; 10 x 7in. 85p; 12 x 8in. 85p; 14 x 9in. 90p; 16 x 6in. 90p; 12 x 3in. 50p; 4 x 10in. £1.
ALUMINIUM PANELS 18 s.w.g. 6 x 4in. 9p; 8 x 6in. 15p; 14 x 3in. 16p; 10 x 7in. 19p; 12 x 5in. 20p; 12 x 8in. 28p; 16 x 6in. 28p; 14 x 9in. 34p; 12 x 12in. 40p; 16 x 10in. 60p.

1 1/2inch DIAMETER WAVECHANG SWITCHES. 25p.
2 p. 2-way, or 2 p. 6-way, or 3 p. 4-way 25p each.
1 p. 1 2-way, or 4 p. 2-way, or 4 p. 3-way 25p.
TOGGLE SWITCHES, 4p. 14p; dp. dt. 25p.

"THE INSTANT" BULK TAPE ERASER & HEAD DEMAGNETISER 200/250 v. A.C. £2.35 Post 15p
Leathel S.A.E.

HI-FI STOCKISTS. RETURN OF POST DESPATCH.

RADIO COMPONENT SPECIALISTS

Radio Books & Component Lists 5p. Written guarantee. (Export: Remit cash and extra postage.)

R.C.S. STABILISED POWER PACK KITS

All parts and instructions with Zener Diode, Printed Circuit, Bridge Rectifiers and Double Wound Main Transformer input 200/240V a.c. Output voltages available 6 or 9 or 12 or 15 or 18 or 20V d.c. at 100mA or less PLEASE STATE VOLTAGE REQUIRED. £2 Post Free
Details S.A.E. Size 3 1/2" x 1 1/2" x 1 1/2".

R.C.S. GENERAL PURPOSE TRANSISTOR PRE-AMPLIFIER BRITISH MADE

Ideal for Mike, Tape, P.U., Guitar, etc. Can be used with Battery 9-12v. or H.T. line 200-300v. D.C. operation. Size 1 1/2" x 1 1/2" x 1 1/2". Response 25 cps to 25 Kc/s, 26 db gain. For use with valve or transistor equipment. 90p Post Full instructions supplied. Details S.A.E.

NEW TUBULAR ELECTROLYTICS	CAN TYPES	
2/350V 14p	250/25V 14p	50+50/350V 35p
4/350V 14p	500/25V 20p	80+100/350V 58p
8/450V 14p	1000/25V 35p	32+32/250V 18p
16/450V 18p	1000/50V 47p	32+32/450V 33p
32/450V 20p	8+8/450V 18p	350+50/325V 50p
25/25V 10p	8+16/450V 20p	32+32+32/350V 48p
50/50V 10p	16+16/450V 25p	
100/25V 10p	32+32/350V 25p	100+50+50/350V 48p

LOW VOLTAGE ELECTROLYTICS.
1. 500mF 15V 15p; 25V 20p; 50V 30p; 100V 200mF 15V 10p.
2. 500mF 12V 17p; 25V 38p; 50V 47p; 100V 70p.
3. 2000mF 6V 25p; 25V 42p; 50V 57p.
4. 2500mF 50V 62p; 3000mF 25V 47p; 50V 65p.
5. 5000mF 6V 25p; 12V 42p; 25V 75p; 35V 82p; 50V 95p.

CERAMIC 1pF to 0.01mF, 4p. Silver Mica 2 to 5000pF, 4p. PAPER 350V 0.1 4p. 0.5 15p. 1m 15p; 2m 150V 15p. 500V-0.01 to 0.05 4p. 0.1 5p. 0.25 8p. 0.47 25p. SILVER MICA. Close tolerance 1%. 2.2-500pF 8p; 500-2.200pF 10p; 2.700-5.600pF 20p; 6.800pF-0.01, mtd 30p each. TWIN GANG. "0-0" 208pF+178pF, 65p; slow motion drive 385pF+385pF with 25pF+25pF, 60p; 500pF slow motion, standard 5p; 5mfd 8-gang 500pF £1.60. SEPTOR WAVE SINGLE. Opt. 30p. 25pF. 55p. 50pF. 55p. NEON PANEL INDICATORS 250V AC/DC Red or Amber 20p. RESISTORS. 1 w. 1 w. 1 w. 2 w. 10 to 10M. HIGH STABILITY. 1 w. 2% 10 ohms to 1 meg. 10p. Ditto 5%. Preferred values 10 ohms to 10 meg., 4p. WIRE-WOUND RESISTORS 5 watt, 10 watt, 15 watt, 10 ohms to 100K 10p each; 2 1/2 watt, 1 ohm to 8.2 ohms 10p.

DECCA DECADED GARRARD MOTOR UNIT Mk. II

Single play Stereo; Mono Deram transcription head and arm. Four speeds. 10 1/2in. turntable. Anti-rumble filter. Bias compensation. Laboratory motor.



SPECIAL PRICE £18.50 Post 25p

METAL PLINTH AND PLASTIC COVER

Cut out ready for Garrard or B.S.R. Will play with cover in position. Latest Design. Covered in black leatherette. Antimagnetic. 12 1/2" 14 1/2" 7 1/2in. high. £5.50 Post 25p

ALSO AVAILABLE IN SOLID NATURAL MAHOGANY WAX POLISHED FINISH AT SAME PRICE

MAINS TRANSFORMERS

All post 25p each
250-0-250 80 mA. 6.3 v. 4 amp. £1.50
250-0-250 80 mA. 6.3 v. 3.5 a. 6.3 v. 1 a. or 5 v. 2 a. £2.50
350-0-350 80 mA. 6.3 v. 3.5 a. 6.3 v. 1 a. or 5 v. 2 a. £3
300-0-300 v. 120 mA. 6.3 v. 4 a. C.T. 6.3 v. 2 a. £3.25
MINIATURE 200 v. 20 mA. 6.3 v. 1 a. 2 1/2 x 2 1/2 in. 75p
MIDGET 220 v. 45 mA. 6.3 v. 1 a. 2 1/2 x 2 1/2 in. 90p
MINI-MAINS 200 v. 100 mA. 1 1/2 x 1 1/2 in. 50p
HEATER TRANS. 6.3 v. 3a. 60p
Ditto tapped sec. 1.4 v. 2.3 a. 4.5. 6.3 v. 1 1/2 amp. 80p
GENERAL PURPOSE LOW VOLTAGE. Tapped outputs at 2 amp. 3, 4, 5, 8, 9, 10, 12, 15, 18, 24 and 30 v. £2.25
1 amp., 6, 8, 10, 12, 16, 18, 20, 24, 30, 36, 40, 48, 60. £2.25
2 amp., 6, 8, 10, 12, 16, 18, 20, 24, 30, 36, 40, 48, 60. £2.25
5 amp., 6, 8, 10, 12, 16, 18, 20, 24, 30, 36, 40, 48, 60. £2.75
AUTO TRANSFORMERS. 115v to 230v or 230v to 115v. 150w. £2.25; 500w. 26.25; 750w. £10; 1000w. £14.
CHARGER TRANSFORMERS. Input 200/250v. for 6 or 12v. 1 1/2 amp. £1.50; 2 amp. £1.60; 4 amp. £2.50
FULL WAVE BRIDGE CHARGER RECTIFIERS: 6 or 12v. outputs. 1 1/2 amp. 55p; 4 amp. 85p.
LUCAS 2DS500 Bridge 70r. 5 amp £1.



E.M.I. 13 1/2 x 8in. LOUDSPEAKERS

With twin tweeters. And crossover. 10 watt. Size 3 or 8 or 15 ohm. As illustrated. Post 15p

With flared tweeter cone and ceramic magnet. 10 watt. Bass res. 45-60 cps. £2.75 Post 15p

Flux 10,000 gauss. State 3 or 8 or 15 ohm. Post 15p

Teak Cabinet. Size 16 x 10 x 9in. Post 25p. £5

MINIMUM POST AND PACKING 15p.

ALL MODELS "BAKER SPEAKERS" IN STOCK

BAKER 12in MAJOR £9



30-14,800 c.p.s., 12in. double cone, woofer and tweeter, cast together with a BAKER ceramic magnet assembly having a flux density of 14,000 gauss and a total flux of 145,000 Maxwell. Bass resonance 40 c.p.s. Rated 20 watts. Size 3 or 8 or 15 ohm. Post Free.

Module kit, 30-17,000 c.p.s. with tweeter, crossover, baffle and instructions. £11.50

BAKER "BIG-SOUND" SPEAKERS		
'Group 25'	'Group 35'	'Group 50'
12 inch 25 watt	12 inch 35 watt	15 inch 50 watt
3 or 8 or 15 ohm	3 or 8 or 15 ohm	8 or 15 ohm

TEAK HI-FI SPEAKER CABINETS. Fluted wood front. For 12in. dia. or 10in. speaker 20 x 13 x 9in. £9 Post 25p. For 13 x 8in. or 8in. speaker 16 x 10 x 9in. £6 Post 25p. For 10 x 6in. or 6in. speaker 16 x 8 x 6in. £4 Post 25p. LOUDSPEAKER CABINET WADDING 18in. wide, 15p ft

GOODMANS 6 1/2in. HI-FI WOOFER

8 ohms, 10 watt. Large ceramic magnet. Special Cambric cone surround. Frequency response 30-12,000 cps. Ideal P.A. Columns. Hi-Fi Enclosure Systems, etc. £4



ELAC CONE TWEETER

The moving coil diaphragm gives a good radiation pattern to the higher frequencies and a smooth extension of total response from 1,000 cps to 18,000 cps. Size 3 1/2 x 3 1/2 in. dia. deep. Rating 10 watt. 3 ohm or 15 ohm models. £1.90 Post 10p

SPEAKER COVERING MATERIALS. Samples Large S.A.E. Horn Tweeters 2-16Kc/s, 10W 8 ohm to 15 ohm £1.50. De Luxe Horn Tweeters 2-18 Kc/s, 15W 15 ohm £2. TWO-WAY 3,000 c.p.s. CROSSOVERS 3 or 8 or 15 ohm 95p. SPECIAL OFFER: 30 ohm 2 1/2 in. 35 ohm 2in.; 3 in. 15 ohm, 3 1/2 in. dia.; 6 1/2 in.; 8 1/2 in. £1 EACH

3 ohm, 2 1/2 in. 3in. 5in. 5 1/2 in. LOUDSPEAKERS P.M. 3 OHMS 7. 4in. £1.25; 6in. £1.50; 8 x 6in. £1.60; 8 x 2 1/2 in. £1.50; 8in. £1.75; 10 x 6in. £1.90. RICHARD ALLAN TWIN CONE LOUDSPEAKERS 8in. dia. 4 watt; 10in. dia. 5 watt; 12 in. dia. 6 watt, 3 or 8 or 15 ohm model; £2 each Post 15p. VALVE OUTPUT TRANS. 25p. MIKE TRANS. 50:1 25p. 5 WATT MULTI RATIO. 3, 8 and 15 ohms 80p.

BAKER 100 WATT ALL PURPOSE TRANSISTOR AMPLIFIER

4 inputs speech and music. Mixing facilities. Response 10-30,000 cps. Matches all loudspeakers. A.C. 200/250V. Separate Treble and Bass Controls. Guaranteed. Details S.A.E. £39 Post Free



BARGAIN AM TUNER. Medium Wave. £4.50

Transistor Superhet. Ferrite aerial. 9 volt.

BARGAIN 4 CHANNEL TRANSISTOR MONO MIXER. Add musical highlights and sound effects to recordings. With mix Microphone, records, tape and tuner with separate controls into single output. 9 volt. Stereo version of above £4.50. £3.50

BARGAIN FM TUNER 88-108 Mc/s Six Transistor. 9 volt. Printed Circuit. Calibrated slide dial tuner. £12.50

Walnut Cabinet. Size 7 x 5 x 4 inch BARGAIN FM TUNER as above. £8.85 Chassis only, less cabinet.

BARGAIN 3 WATT AMPLIFIER. 4 Transistor £3.50

Push-Pull Ready built, with volume control. 9v.

COAXIAL PLUG 6p, PANEL SOCKETS 6p. LINE 15p. OUTLET BOXES. SURFACE OR FLUSH 25p. BALANCED TWIN FEEDERS 5p yd, 80 ohms or 300 ohms. JACK SOCKET 84d. open-circuit 14p, closed circuit 23p. Chrome Lead Socket 45p. Phone Plug 5p. Phone Socket 5p. JACK PLUGS Std. Chrome 15p; 3.5mm Chrome 14p. DIN SOCKETS Chassis 3-pin 10p; 5-pin 10p. DIN SOCKETS Lead 3-pin 18p; 5-pin 15p. DIM PLUGS 3-pin 18p; 5-pin 25p. VALVE HOLDERS, 6p; CERAMIC 8p; CANS 5p.

E.M.I. TAPE MOTORS. 120v. or 240v. AC. £1.80 r.p.m. 4 pole 185mA. Spindle 0-187 x 0-75 in. Size 3 1/2 x 2 1/2 x 2 1/2 in. (Illustrated). Post 15p. £1.25

BALFOUR GRAM. MOTORS. 120v. or 240v. AC. 1,200 r.p.m. 4 pole 50mA. Spindle 1/8 x 3/20. Size. 85p 2 1/2 x 2 1/2 x 1 1/2 in. Post 15p

CUSTOMERS FREE CAR PARK. CALLERS WELCOME

337 WHITEHORSE ROAD, CROYDON

Open 9-6 p.m. (Wednesdays 9-1 p.m., Saturdays 9-5 p.m.) Buses 50, 48, 159. Rail Selhurst. Tel. 01-684-1666

NEWS BRIEFS

SOLID-STATE EYE

A SMALL research model of a black-and-white camera employing a solid-state "eye" that could make possible future TV cameras as small as a wristwatch was demonstrated recently by RCA.

The camera's imaging sensor is a silicon integrated circuit in contrast to the vacuum tubes of conventional TV systems.

The camera's integrated circuit "eye" consists of 32 rows of photo-sensitive elements, with 44 elements in each row. When an image strikes the array, an electrical charge proportional to the light intensity is produced in each element. The rows are read out very rapidly in sequence to produce a black-and-white television-type picture.

A model of the camera, developed at RCA Laboratories in Princeton, America, has been delivered for evaluation to the Air Force Avionics Laboratory in Ohio, which sponsored research on the system.

LASAR DRILLS FOR DIAMONDS

MINUTE flaws and other imperfections in diamond gemstones can now be removed by use of a laser developed by the Raytheon Company of America.

In a series of experiments on natural diamonds, light energy from the laser was focused to extremely small areas and tiny holes "drilled" to the imperfections. The imperfections are then removed by a variety of methods and the small-diameter holes cleaned.

The holes pierced by the laser are about two-thousandths of an inch in diameter—about the diameter of a human hair. These holes are not generally visible without magnification, and because of their small diameters, they do not change the stone's natural reflections.

SPACEWATCH

THE International Telecommunication Union has made a proposal that a satellite communications system should be set up to provide aid following natural disasters such as earthquakes and floods.

The ITU proposes the setting up of an organization in Geneva from where the coverage using two geostationary satellites over the Equator would be worldwide. Communications links required with this scheme include walkie-talkie radios, medium distance multi-channel voice links and a mobile earth station. All this equipment would be air transportable with self-contained power sources.

DOLBY SOUND IN THE CINEMA

RANK Audio Visual Ltd., in agreement with Dolby Laboratories, are now making Dolby noise reduction units available to cinemas on a rental basis. The new unit (Model 364) is a modification of the now well known Dolby "A" system. This reduces noise levels by boosting low level signals at all stages of recording until playback when they are reduced to their original level.

Cinema film sound is usually read from an optical track which is characteristically noisy, grain and dirt being the main offenders. The h.f. range of cinema sound is thus severely limited. By reducing noise the h.f. response can be greatly improved, for instance by using a better quality speaker system.

The full potential of the playback unit will not be realised until Dolbied films are available, but Rank demonstrations have shown that in use with existing films the 364 unit gives a healthy though not dramatic improvement. At only £2.74 per week, many cinema owners should soon be taking advantage of this chance to improve the weak link in the film projection system.

Would YOU pay 50 pence for a components catalogue?



You'll be glad you did when you get THIS one!

A components catalogue is so vital to any keen constructor that it simply does not pay to make do with less than the best. True, the best may cost a little more... but it's the cheapest in the end. So invest in a Home Radio Components Catalogue, listing over 8,000 items, more than 1,500 of them illustrated. If you call at our shop the catalogue is yours for just 50 pence. If you order by post—70 pence, including postage and packing. You also get 10 Vouchers, each worth 5 pence when used as instructed—so you can get the cost of the catalogue back in any case!

Send the coupon today with your cheque or P.O. for 70p.

Please write your Name and Address in block capitals

NAME

ADDRESS



HOME RADIO (Components) LTD., Dept. PE, 01-648 8422
234-240 London Road, Mitcham, Surrey CR4 3HD

charger-

Unit

BY C.MARSHALL

An inexpensive 9V supply and Deac battery charger combined

If you use your transistor portable at home, this power supply unit will be a worthwhile investment. It will replace a 9V battery, the most common of supply voltages, by simply connecting the radio battery terminals to the output of the unit. Although this is a constant current device the power available is more than adequate for the majority of good quality transistor radios.

A built in bonus is the facility for charging nickel cadmium or Deac batteries. As any user of secondary cells knows, regular charging is the only way to get the best out of these.

DROPPING THE VOLTAGE

The circuit of Fig. 1 is unusual in that the normal mains voltage dropping transformer is missing, in this a capacitor (C1 or C2) is used to fulfil this function. One of the great advantages of using a reactance whether it be capacitive or inductive, is the fact that very little power is consumed although a voltage is dropped and a current passed.

For the capacitors used the reactance presented to the mains input is $1/(2\pi fC)$ ohms. This is, of course, an idealised figure since the capacitor diode bridge and load have resistance so the formula should be modified to $Z = \sqrt{(X_c^2 + R^2)}$ where X_c is the reactance and R the total circuit resistance. If comparative measurements were made it would be found that the reactance figure would be far in excess of the resistance figure so that we can say that the circuit is constant current device, the value being dependent on the series capacitance as the load presented plays little part in modifying the total impedance.

CROSSING THE BRIDGE

With the mains voltage applied and dropped it only remains for it to be rectified and smoothed. In this circuit the diodes D1-D4 afford rectification and the capacitor C3, smoothing. By rectification is meant the conversion of a.c. to d.c. However, when there is conversion there is normally some ripple present, so the capacitor C3 attempts to smooth this before it is passed on to the load.

ZENER PROTECTION

The diode D5 has the unique function of deciding the output voltage. In the condition of no load, the

COMPONENTS . . .

Resistors

R1 680k Ω $\frac{1}{2}$ watt carbon

Capacitors

C1 0.68 μ F 400V

C2 0.33 μ F 400V

C3 5,000 μ F elect. 25V

Diodes

D1-D4 1S100 or any silicon diodes of 50 p.i.v. and current capacity greater than 100mA

D5 ZS9-1 Zener (see text)

Switches

S1 Double-pole mains on/off toggle

S2 Single-pole, double throw

Miscellaneous

LP1 Mains neon, FS1-500mA fuse, 2in \times 1 $\frac{1}{2}$ in Veroboard 0.15in matrix

voltage at the output would approach that of mains potential which could be dangerous. With the Zener diode D5 in circuit the voltage will drop to 9.1V. Obviously any low voltage diodes would be destroyed without this protective influence, so the diode serves as protection to the bridge and to supplying an output voltage on load of about 9V.

BATTERY CHARGING

Up to now we have only dealt with the unit in its power supply role at 9V. As a flexible secondary cell

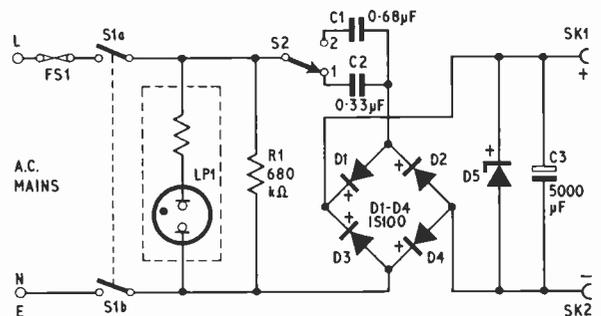
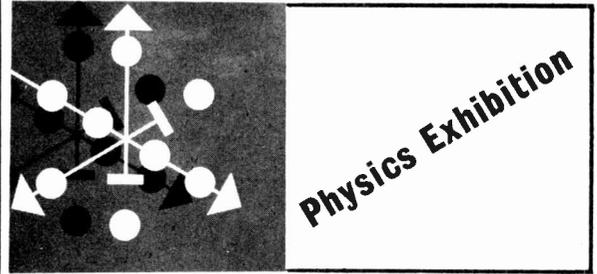


Fig. 1. Circuit diagram of power unit



THE poor level of participation at this year's, the fifty-sixth, Physics Exhibition, was particularly evident by the large area of unused floor space in the Great Hall of Alexandra Palace. Earlier this year (March 13-16) this showcase of scientific instruments and apparatus seems to have been a sufferer of the same economic exigencies that have been denuding commercial exhibitions, particularly on the electronic scene.

With a reduction of nearly fifty per cent of last year's exhibitor count, the translation of the venue and amalgamation with another exhibition would seem inevitable. This, in fact, is what will happen next year when this will combine under the joint title of Labex and Physics Exhibition and be held at Earls Court. This Mecca will no doubt assure the future viability of this high quality scientific exhibition, but for me its "Ally-Pally" situation seemed in tune with its not too commercial, academic tenor.

This year the special features included exhibits arranged by the Electronics, Optical and Spectroscopy Group, to mark the occasion of the 1971 Nobel Prizes for both physics and chemistry to Professor Gabor for his developments of holography and Dr Herzberg for his work on the electronic structure and geometries of molecules.

With man's desire for faster travel comes an awareness of the limitations of the existing systems. Conventional steel wheel-on-rail suspensions are limited to about 200 m.p.h. In overcoming this barrier two avenues have been explored; air suspension (hovercraft) and magnetic levitation (linear motors). While the former is commercially viable and a 250 m.p.h. tracked hovercraft will soon be starting test trials in this country, the linear motor has not yet enjoyed the same emergence.

The Department of Engineering at the University of Warwick demonstrated a linear motor model using superconducting magnets for the suspension and guidance of high speed vehicles with a conducting track.

In the same vein, a fascinating exhibit on the Decca Radar stand was a piezo-electric transducer in disc form made to act as a linear motor when subjected to ultrasonic vibrations at its resonant frequency. When excited this disc propelled itself silently along an inclined surface at speeds which were infinitely controllable up to 100 m/s. Possible research applications for this are tape and chart recorder drives and conveyor belts.

Ultrasonics also have applications in medicine as was shown by the Medical Research Council. The exhibit demonstrated that instantaneous blood velocity in the human aorta could be measured by Doppler analysis without involving the patient in chest surgery so enabling a quick assessment of heart pumping action.

A recent development from Mullard is a channel image intensifier which is fitted to the front of a television camera and can provide a gain of up to a hundred thousand so enabling the camera to produce bright clear pictures even in starlight.

Other Mullard exhibits included a fruit machine and a digital clock both specially devised for their educational service.

It is this sort of diversity that makes the Physics Exhibition so appealing and we can only hope that in its move to Central London that it manages to retain its particular identity. ★

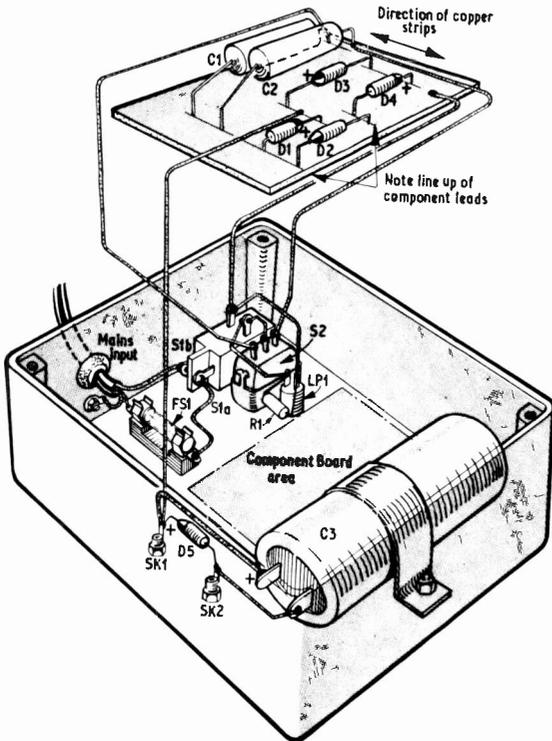


Fig. 2. Veroboard layout and interwiring details of power unit

charger there are a number of other points to be considered.

When charging a nickel cadmium cell it should be remembered that the charging current should not exceed the 10 hour rate. By this is meant that for a 200mAH cell, the charge current should be $200/10 = 20\text{mA}$ and at 225mAH, the current is $225/10 = 22.5\text{mA}$.

To recharge a totally discharged battery the total charge time should be the charging rate times 1.4. For example, if current is being replaced at the 10 hour rate the total time for recharge would be $10 \times 1.4 = 14$ hours.

With the circuit shown, in position 1 of the function switch S2, the unit will provide 25mA with Zener protection, for up to five Deac cells. This follows since the maximum charging voltage per cell is 1.5V, so that in the circuit given the output voltage will be around 9V with the cells disconnected. With a battery connected this will start to charge and the Zener diode will be cut off.

While the Zener diode will prove adequate for charging up to five cells, two ZS9-1 diodes connected in series should be used for six to ten cells, that is, for charging a 9 to 15V battery.

UNIT ASSEMBLY

The small components are assembled on a 2in \times 1½in piece of 0.15in matrix Veroboard, as in Fig. 2. Also given here are the complete interwiring details for the unit. The actual box dimensions for the prototype was 6in \times 4in \times 1½in but since any rearrangement of the components will not adversely affect performance, other housings can be tried. ★

Readout —

A SELECTION FROM OUR POSTBAG

Correspondents wishing to have a reply must enclose a stamped addressed envelope. We regret we are unable to guarantee a reply on matters not relating to articles published in the magazine. Technical queries cannot be dealt with on the telephone.

Wrong formula

Sir—I have been teaching Physics, not pure Nuffield but with a slant that way, for only 10 years, but I share Mr. Cozens' concern, see "Paradoxical Stage" April *Readout*.

Perhaps he will be glad to know that the Association for Science Education, the Institute of Physics, and the numerous "new Maths" authorities are also aware and worried. The incompetence of pupils trained by some of the experimental methods is very obvious, and Mr. Cozens is quite right in saying that Physics teachers have to do their own traditional Maths teaching.

At an earlier stage, a colleague of mine who teaches both trad and modern Maths finds he has to teach 14 year olds that, say, 4.18 on a scale lies between 4.10 and 4.20. And at a higher level, some University entrance authorities are less than happy about the mathematical incompetence of many applicants who hold Maths and Physics Highers and A levels.

Incidentally, it's probably a traditional printer's error, but Mr. Cozens has the Wheatstone Bridge formula wrong. And very few pupils with a modern Physics Higher would know what a Wheatstone Bridge is, although they would know what to do with a collection of gates and a 5V supply.

It's sad that the same blind concern with change and trendiness affects the attitudes of some modern teachers to things like not hurting other people's feelings unless you really want to (manners), and sometimes getting on with something when you want to do something else (discipline). Luckily, most of these educational experiments are rethought before too much harm has been done.

W. H. Jarvis, M.A., A.Inst.P.,
Perthshire,
Scotland.

I hope Mr. Jarvis is right in saying that educational experiments are usually put right before too much harm is done, but I am afraid I do not share his optimism, I think that this particular experiment with the "New Maths" should be left until the student has safely passed C.S.E. or G.C.E. in traditional maths.

About my error in the Wheatstone Bridge formula Mr. Jarvis is right. I will try to make it clear.

When the bridge is balanced

$$R_1 R_3 \\ R_2 = R_4$$

If R_1 is unknown resistance and R_2 is the standard known resistance then

$$R_1 = \frac{R_3}{R_4} \times$$

G. A. Cozens.

Better performance

Sir—As your Ferranti boys' *Scorpio* ignition looked the most sophisticated circuit yet published I purchased a set of components and assembled it for my Rover 2000 SC. The result is a distinctly brighter performance.

From the photograph enclosed you will notice that I have transposed the transformer and circuit connector block to suit the Rover. I have also clamped down the two large discharge capacitors by means of a hard Dural bridge-piece and a stainless steel rod screwed 6B.A. This rod passes through a clearance hole in the circuit board and is secured to the case by a couple of nuts. This is a more secure fixing than anchoring to the board which could distort in time and allow the clamp to loosen.

Recently I went with a stop-watch to my favourite testing stretch of level road (there are six miles of it) and got the following results.

Top gear: 30-50m.p.h. 11.4 secs.
Scorpio 10.0 secs.

Top gear: 50-70m.p.h. 14.8 secs.
Scorpio 11.2 secs.

3rd gear: 30-50m.p.h. 7.5 secs.
Scorpio 7.0 secs.

3rd gear: 50-70m.p.h. 9.7 secs.
Scorpio 8.6 secs.

The above results with brand new contact points, once they were burnt down a bit the discrepancy would be greater as I had previously found that after about 4,000 miles the engine got rough over 5,000 revs due to erratic ignition timing with the points pitted.

Please convey my congratulations to Messrs. Gibbs and Shaw.

G. A. Turner,
Airdrie, Lanarkshire.

Mumbo-jumbo

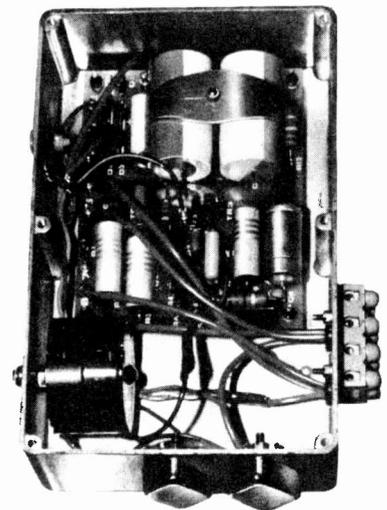
Sir—I resumed buying P.E. last December especially for the articles on "Logical Radio Control" and like Mr. W. G. Jones, (Letters, March issue), I found the whole thing almost unintelligible. I should like to make it clear that I have worked as a technician for a number of years in various types of laboratories and am used to unravelling the intricacies of strange systems.

This is England, I am English and your magazine prints articles in English for me to understand. Of course Electronics has its own slice of language to be understood, but surely all the bits of electronic language have to be joined by clear, simple English. If you like, try printing your magazine using only an Electronic Dictionary and see how far you get!

Needless to say, I have not built any of the radio control circuits described (?) in the articles and feel disappointed about them. No doubt if I built them up just as shown and connected them all together it would all work, but I wouldn't know why and would have learnt nothing—and what if something went wrong? I was going to complain before now but let it slide until I read your Editorial in the April issue in which you seem to be defending the type of bad technical writing under discussion; your attitude being that it is our fault if we don't understand the mumbo-jumbo.

If your motives are good I can only assume that you don't realise how difficult it is to be a teacher and pass on information in a clear manner. If on the other hand, your intentions are less honourable I suppose it is in order to maintain some sort of superior position by withholding information.

C. F. Hughes,
Bedford.



**FOR
RAPID
SERVICE**

GARLAND BROS. LTD.

DEPTFORD BROADWAY, LONDON, SE8 4QN

TRANSISTORS

AC127	17p	BFX29	38p
AC128	18p	BFX84	25p
AC176	22p	BFX88	30p
AC187	28p	BFY50	21p
AC188	23p	BFY51	21p
ACY19	23p	BFY52	22p
AD149	47p	MAT100	25p
AD161/162	72p	MAT101	29p
ADT140	62p	MAT120	25p
AF118	45p	MAT121	29p
AF124	22p	OC28	58p
AF125	19p	OC35	48p
AF126	20p	OC44	13p
AF127	19p	OC45	13p
AF178	67p	OC71	11p
AF179	66p	OC72	12p
AF180	45p	OC75	20p
AF239	32p	OC200	27p
BC107	11p	OC201	38p
BC108	11p	OC211	60p
BC109	11p	ST140	15p
BC147	12p	ST141	23p
BC148	12p	UT46	35p
BC149	12p	2N696	15p
BC157	15p	2N706A	12p
BC158	14p	2N2926G	14p
BC159	14p	2N2926Y	13p
BD131	75p	2N2926O	12p
BD132	75p	2N3053	25p
BF115	25p	2N3054	60p
BF178	32p	2N3055	72p
BF179	56p	2N3702	15p
BF180	30p	2N3703	14p
BF181	30p	2N3704	14p
BF184	30p	2N3705	15p
BF185	32p	2N3706	14p
BF194	14p	2N3711	14p
BF195	14p	2N3819	35p
BF196	28p	2N4058	17p
BF197	15p	2N4058	17p
BFW10	70p	2N5459	60p

DIODES

AA119	11p	OA202	10p
OA47	71p	BY100	15p
OA90	71p	BY127	221p
OA91	6p	BYZ12	221p

ZENER DIODES

From 2 to 33 volts,
400mW, 15p; 1.5W, 221p

SILICON BRIDGE RECTIFIERS

40 P.I.V., 1.5A **50p**
200 P.I.V., 2.0A

MISCELLANEOUS ITEMS

Mercury switch, 2 amp., 25p
B9A valve bases, 2p
5kΩ edge control, fits most small, imported radios. 7p
20Ω volume control for 3Ω speakers, 20p
Antex CN240, 15W miniature soldering iron, £1.70
Valve and Transistor Data book, 9th edition, 75p
Transistor equivalent book, BP1, 40p

PANEL FUSEHOLDERS

For 1½in fuses 18p
For 20mm fuses 15p

CONTROLS, Log. or Lin.

Single, less switch, 15p
Single, D.P. switch, 24p
Tandem, less switch, 40p
5kΩ, 10kΩ, 25kΩ, 50kΩ, 100kΩ, 250kΩ, 500kΩ, 1MΩ, 2MΩ

RESISTORS

Carbon
All 5%, high-stability, E12 values.
½W, 1p; ¼W, 11p; 1W, 4p; 2W, 6p
Wire-wound
5W, 10p; 10W, 12p

ELECTROLYTICS

1µF	450V	19p	1,000µF	25V	27p
2µF	500V	20p	1,000µF	50V	39p
4µF	350V	14p	2,000µF	25V	36p
8µF	450V	16p	2,000µF	50V	53p
16µF	450V	17p	2,500µF	25V	45p
25µF	50V	8p	2,500µF	50V	60p
32µF	450V	24p	3,000µF	25V	48p
50µF	50V	10p	5,000µF	25V	55p
100µF	25V	10p	5,000µF	50V	98p
100µF	50V	10p	8-8µF	450V	18p
250µF	25V	12p	8-16µF	450V	20p
250µF	50V	17p	16-16µF	450V	27p
500µF	25V	18p	16-32µF	450V	63p
500µF	50V	23p	32-32µF	450V	49p
			50-50µF	350V	38p

MINIATURE ELECTROLYTICS

1µF	25V	10µF	64V	7p
2.5µF	64V	16µF	40V	
4µF	40V	25µF	25V	
5µF	64V	30µF	15V	
8µF	15V	50µF	15V	
8µF	40V	100µF	15V	

VARIABLE POWER SUPPLY

Input: 240V, a.c.
Output: Switched 3, 4.5, 6, 7.5, 9, 12 volts d.c. at 500mA **£4.20**

NEW ILLUSTRATED 1972-73 CATALOGUE

Post Free **15p**

VEROBOARD

Size	0.1 matrix	0.15 matrix
2½in × 3½in	22p	16p
2½in × 5in	24p	15p
3½in × 3½in	24p	25p
3½in × 5in	27p	29p
17in × 2½in	75p	57p
17in × 3½in	£1	75p

Pins—both sizes; packet of 36, 18p

ALUMINIUM BOXES with lids and screws

Type	Length	Width	Depth	Price
GB7*	2½in	5½in	1½in	38p
GB8*	4in	4in	1½in	38p
GB9*	4in	2½in	1½in	38p
GB10*	4in	5½in	1½in	44p
GB11	4in	2½in	2in	38p
GB12	3in	2in	1in	33p
GB13	6in	4in	2in	52p
GB14	7in	5in	2½in	63p
GB15	8in	6in	3in	81p
GB16	10in	7in	3in	92p

* These sizes fit standard Veroboards

CASSETTE OWNERS!

For Philips and similar cassette recorders.
PU12 Power unit for connection to 12V + or - E car electrical systems giving 7½V, stabilised output. **£3.25**

PP75 Mains power supply, output 7½V d.c.
Both units are complete with cable and 5 pin D.I.N. plug **£1.95**

BONDED ACRYLIC FIBRE

B.A.F. wadding, 18in wide, 1in thick. The ideal lining for speaker enclosures. 25p per yard

LOW-OHM RESISTORS

2½ watt wire-wound, 1Ω, 1.8Ω, 2.7Ω, 3.3Ω, 3.9Ω, 4.7Ω, 5.6Ω, 6.8Ω, 8.2Ω **10p**

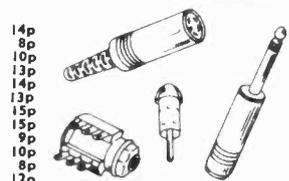
CAPACITORS

2.2pF	500V	S/M	71p	0.0027µF	500V	S/M	15p
3.3pF	500V	S/M	71p	0.0033µF	500V	P.S.	5p
5pF	500V	S/M	71p	0.0033µF	1,000V	Poly.	6p
10pF	500V	P.S.	5p	0.0036µF	500V	S/M	15p
10pF	500V	S/M	71p	0.0047µF	125V	P.S.	9p
15pF	125V	P.S.	5p	0.0047µF	500V	Poly.	6p
15pF	500V	Cer.	4p	0.0047µF	500V	S/M	20p
18pF	500V	S/M	71p	0.0047µF	1,000V	MDC	6p
22pF	125V	P.S.	5p	0.005µF	100V	Mylar	3p
22pF	500V	S/M	71p	0.005µF	500V	Cer.	5p
25pF	500V	S/M	71p	0.0068µF	125V	P.S.	101p
27pF	500V	Cer.	4p	0.0068µF	500V	S/M	30p
33pF	125V	P.S.	5p	0.0068µF	500V	Poly.	6p
33pF	500V	S/M	71p	0.0082µF	125V	P.S.	101p
39pF	500V	S/M	71p	0.0082µF	500V	S/M	30p
47pF	125V	P.S.	5p	0.01µF	18V	Disc	4p
47pF	500V	Cer.	4p	0.01µF	125V	P.S.	101p
50pF	500V	S/M	71p	0.01µF	400V	Poly.	3p
56pF	500V	S/M	71p	0.01µF	250V	M.F.	3p
68pF	125V	P.S.	5p	0.01µF	400V	Poly.	3p
68pF	500V	S/M	71p	0.01µF	500V	Cer.	5p
75pF	500V	S/M	71p	0.01µF	500V	S/M	30p
82pF	500V	S/M	71p	0.01µF	600V	MDC	7p
100pF	500V	S/M	71p	0.01µF	1,000V	MDC	9p
100pF	500V	S/M	71p	0.015µF	160V	Poly.	3p
100pF	500V	Cer.	5p	0.015µF	400V	Poly.	3p
120pF	500V	S/M	71p	0.02µF	100V	Mylar	3p
150pF	125V	P.S.	5p	0.022µF	18V	Disc	5p
150pF	500V	S/M	71p	0.022µF	250V	M.F.	3p
150pF	500V	Cer.	5p	0.022µF	400V	Poly.	3p
180pF	500V	S/M	71p	0.022µF	600V	MDC	7p
200pF	500V	S/M	71p	0.022µF	1,000V	MDC	7p
220pF	125V	P.S.	5p	0.033µF	250V	M.F.	4p
220pF	500V	Cer.	5p	0.033µF	400V	Poly.	4p
250pF	500V	S/M	8p	0.047µF	12V	Disc	6p
270pF	500V	Cer.	5p	0.047µF	160V	Poly.	3p
300pF	500V	S/M	8p	0.047µF	250V	M.F.	3p
330pF	125V	P.S.	5p	0.047µF	400V	Poly.	4p
330pF	500V	S/M	8p	0.047µF	500V	Poly.	4p
390pF	500V	S/M	8p	0.047µF	1,000V	MDC	10p
470pF	125V	P.S.	5p	0.1µF	30V	Disc	6p
470pF	750V	Disc	5p	0.1µF	250V	M.F.	4p
500pF	500V	S/M	8p	0.1µF	400V	Poly.	5p
560pF	500V	S/M	8p	0.1µF	600V	MDC	10p
680pF	125V	P.S.	6p	0.1µF	1,000V	MDC	13p
680pF	500V	S/M	8p	0.15µF	250V	M.F.	3p
820pF	500V	S/M	8p	0.22µF	160V	Poly.	6p
0.001µF	100V	Mylar	3p	0.22µF	150V	M.F.	5p
0.001µF	125V	P.S.	6p	0.22µF	400V	Foil	10p
0.001µF	400V	Poly.	3p	0.22µF	1,000V	MDC	15p
0.001µF	500V	S/M	10p	0.33µF	250V	M.F.	8p
0.001µF	500V	Cer.	5p	0.47µF	250V	Foil	8p
0.001µF	1,000V	MDC	6p	0.47µF	400V	Foil	10p
0.0015µF	400V	Poly.	3p	0.47µF	1,000V	MDC	20p
0.0015µF	500V	S/M	10p	1.0µF	250V	M.F.	15p
0.0018µF	500V	S/M	10p				
0.002µF	100V	Mylar	3p				
0.002µF	500V	Cer.	5p				
0.002µF	125V	P.S.	5p				
0.0022µF	500V	S/M	10p				
0.0022µF	1,000V	MDC	6p				

Note:
S/M=silver mica 1% tol.
P.S.=polystyrene 2½% tol.
MDC—casing=300V.
M.F.=Mullard min. foil.
Cer.=ceramic.

PLUGS

Car aerial
Co-axial
D.I.N. 2 pin (speaker)
D.I.N. 3 pin
D.I.N. 4 pin
D.I.N. 5 pin, 180°
D.I.N. 5 pin, 240°
D.I.N. 6 pin
Jack, 2½mm unscreened
Jack, 2½mm screened
Jack, 3½mm unscreened
Jack, 3½mm screened
Jack, ½in unscreened
Jack, ½in screened
Jack, stereo, unscreened
Jack, stereo, screened
Phono, plastic top
Phono, plated metal
Phono, fitted 4 ft lead
Wander, red or black
Banana 4mm, red or black



SOCKETS

Car aerial
Co-axial, surface
Co-axial, flush
D.I.N. 2 pin (speaker)
D.I.N. 3 pin
D.I.N. 5 pin, 180°
D.I.N. 5 pin, 240°
Jack, 2½mm
Jack, 3½mm
Jack, ½in unscreened
Jack, ½in screened
Jack, stereo, switched
Phono, single
Phono, 2 on a strip
Phono, 3 on a strip
Phono, 4 on a strip
Wander, single, red or black
Wander, stereo, strip
Banana 4mm red, or black

MAIL ORDERS: C.W.O. only. Please include 10p P. & P. (Air mail extra). S.A.E. with all enquiries please. Telephone 01-692 4412

Sinclair Project 60



Project 605

The easy way to buy and build Project 60



Project 605 is one pack containing: one PZ.5, two Z30's, one Stereo 60 and one Masterlink. This new module contains all the input sockets and output components needed together with all necessary leads cut to length and fitted with neat little clips to plug straight on to the modules. Thus all soldering and hunting for the odd part is eliminated. You will be able to add further Project 60 modules as they become available adapted to the Project 605 method of connecting.

Complete Project 605 pack with comprehensive manual, post free **£29.95**

All you need for a superb 30 watt high fidelity stereo amplifier.

Sinclair Radionics Ltd, London Road, St. Ives, Huntingdonshire PE17 4HJ. Tel: St. Ives 64311

sinclair

Project 60 offers more advantage to the constructor and user of high fidelity equipment than any other system in the world. Performance characteristics are so good they hold their own with any other available system irrespective of price or size.

Project 60 modules are more versatile – using them you can have anything from a simple record player or car radio amplifier to a sophisticated and powerful stereo tuner-amplifier. Either power amplifier can be used in a wide variety of applications as well as high fidelity. The Stereo 60 pre-amplifier control unit may also be used with any other power amplifier system as can the AFU filter unit. The stereo FM tuner operates on the unique phase lock loop principle to provide the best ever standards of audio quality. Project 60 modules are very easily connected together by following the 48 page manual supplied free with Project 60 equipment. The modules are great space savers too and are sold individually boxed in distinctive white and black cartons. With all these wonderful advantages, there remains the most attractive of all – price. When you choose Project 60 you know you are going to get the best high fidelity in the world, yet thanks to Sinclair's vast manufacturing resources (the largest in Europe) prices are fantastically low and everything you buy is covered by the famous Sinclair guarantee of reliability and satisfaction.

Typical Project 60 applications

System	The Units to use	together with	Units cost
Simple battery record player	Z.30	Crystal P.U., 12V battery volume control, etc	£4.48
Mains powered record player	Z.30, PZ.5	Crystal or ceramic P.U. volume control etc.	£9.45
12 W. RMS continuous sine wave stereo amp for average needs	2 x Z.30s, Stereo 60, PZ.5	Crystal, ceramic or mag P.U., F.M. Tuner, etc	£23.90
25 W. RMS continuous sine wave stereo amp using low efficiency (high performance) speakers	2 x Z.30s, Stereo 60, PZ.6	High quality ceramic or magnetic P.U., F.M. Tuner, Tape Deck, etc.	£26.90
80 W (3 ohms) RMS continuous sine wave de luxe stereo amplifier. (60 W. RMS into 8 ohms)	2 x Z.50s, Stereo 60 PZ.8, mains transformer	As above	£34.88
Indoor P.A.	Z.50, PZ.8, mains transformer	Mic., guitar, speakers, etc., controls	£19.43

F.M. Stereo Tuner (£25) & A.F.U. Filter Unit (£5.98) may be added as required.

Project 60 Stereo F.M. Tuner

Built and tested. Post free. **£25**

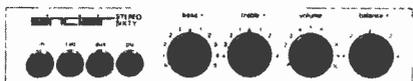


The phase lock loop principle was used for receiving signals from space craft because of its vastly improved signal to noise ratio. Now, Sinclair have applied the principle to an F.M. tuner with fantastically good results. Other original features include varicap diode tuning, printed circuit coils, an I.C. in the specially designed stereo decoder and squelch circuit for silent tuning between stations. In terms of a high fidelity this tuner has a lower level of distortion than any other tuner we know. Stereo broadcasts are received automatically as the tuning control is rotated, a panel indicator lighting up as the stereo signal is tuned in. This tuner can also be used to advantage with most other high fidelity systems.

SPECIFICATIONS—Number of transistors: 16 plus 20 in I.C. Tuning range: 87.5 to 108 MHz. Capture ratio: 1.5dB. Sensitivity: $7\mu\text{V}$ for lock-in over full deviation. Squelch level: $20\mu\text{V}$. Signal to noise ratio: $>65\text{dB}$. Audio frequency response: 10 Hz – 15 KHz ($\pm 1\text{dB}$). Total harmonic distortion: 0.15% for 30% modulation. Stereo decoder operating level: $2\mu\text{V}$. Cross talk: 40dB. Output voltage: 2 x 150mV R.M.S. Operating voltage: 25-30 VDC. Indicators: Stereo on; tuning. Size: 93 x 40 x 207mm.

Stereo 60 Pre-amp/control unit

Built, tested and guaranteed. **£9.98**



Designed for Project 60 range but suitable for use with any high quality power amplifier. Again silicon epitaxial planar transistors are used throughout, achieving a really high signal-to-noise ratio and excellent tracking between channels. Input selection is by means of push buttons and accurate equalisation is provided for all the usual inputs.

SPECIFICATIONS—Input sensitivities: Radio – up to 3mV. Mag. p.u. 3mV; correct to R.I.A.A curve $\pm 1\text{dB}$: 20 to 25,000 Hz. Ceramic p.u. – up to 3mV; Aux – up to 3mV. Output: 250mV. Signal to noise ratio: better than 70dB. Channel matching: within 1dB. Tone controls: TREBLE +12 to -12dB at 10 KHz; BASS +12 to -12dB at 100Hz. Front panel: brushed aluminium with black knobs and controls. Size: 66 x 40 x 207mm.

A.F.U. High & Low Pass Filter Unit

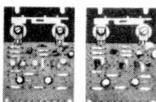
Built tested and guaranteed. **£5.98**



For use between Stereo 60 unit and two Z.30s or Z.50s, and is easily mounted. It is unique in that the cut-off frequencies are continuously variable, and as attenuation in the rejected band is rapid (12dB/octave), there is less loss of the wanted signal than has previously been possible. Amplitude and phase distortion are negligible. The A.F.U. is suitable for use with any other amplifier system. Two filter stages – rumble (high pass) and scratch (low pass). Supply voltage – 15 to 35V. Current – 3mA. H.F. cut-off (-3dB) variable from 28KHz to 5KHz. L.F. cut-off (-3dB) variable from 25Hz to 100Hz. Distortion at 1KHz (35V. supply) 0.02% at rated output. Size: 66 x 40 x 90 mm.

Z.30 & Z.50 power amplifiers

Built, tested and guaranteed with circuits and instructions manual. **Z.30 £4.48** **Z.50 £5.48**



The Z.30 and Z.50 are of advanced design using silicon epitaxial planar transistors to achieve unsurpassed standards of performance. Total harmonic distortion is an incredibly low 0.02% at 15w (8 Ω) and all lower outputs. Whether you

use Z.30 or Z.50 amplifiers in your Project 60 system will depend on personal preference, but they are the same size and may be used with other units in the Project 60 range equally well.

SPECIFICATIONS (Z.50 units are interchangeable with Z.30s in all applications).

Power Outputs

Z.30 15 watts R.M.S. into 8 ohms using 35 volts.
20 watts R.M.S. into 3 ohms using 30 volts.

Z.50 40 watts R.M.S. into 3 ohms using 40 volts:
30 watts R.M.S. into 8 ohms using 50 volts.

Frequency response: 30 to 300,000Hz $\pm 1\text{dB}$.

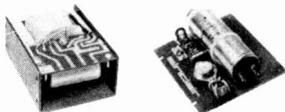
Distortion: 0.02% into 8 ohms.

Signal to noise ratio: better than 70dB unweighted.
Input sensitivity: 250mV into 100 Kohms (for 15w into 8 Ω)

For speakers from 3 to 15 ohms impedance.

Size: 14 x 80 x 57 mm.

Power Supply Units



Designed special for use with the Project 60 system of your choice. Use PZ.5 for normal Z.30 assemblies and PZ.6 where a stabilised supply is essential.

PZ.5 30 volts un stabilised £4.98

PZ.6 35 volts stabilised £7.98

PZ.8 45 volts stabilised

(less mains transformer) £7.98

PZ.8 mains transformer £5.98

Guarantee

If within 3 months of purchasing Project 60 modules directly from us, you are dissatisfied with them, we will refund your money at once. Each module is guaranteed to work perfectly and should any defect arise in normal use we will service it at once and without any cost to you whatsoever provided that it is returned to us within 2 years of the purchase date. There will be a small charge for service thereafter. No charge for postage by surface mail. Air-mail charged at cost.

sinclair

To: SINCLAIR RADIONICS LTD LONDON ROAD ST. IVES HUNTINGDONSHIRE PE17 4HJ

Please send _____

Name _____

Address _____

I enclose cash/cheque/money order.

PE6

RST

VALVE MAIL ORDER CO.
BLACKWOOD HALL
16a WELLFIELD ROAD, LONDON SW16 2BS
SPECIAL EXPRESS MAIL ORDER SERVICE
 Express postage 1p per transistor, over ten post free

	5p	5p	5p	5p	5p	5p	5p
1N91	0-17	AC126	0-80	BF173	0-85	GJ4M	0-88
1N93	0-20	AC127	0-85	BF181	0-85	GJ5M	0-85
1N85	0-88	AC128	0-80	BF184	0-80	GJ7M	0-87
1N923	0-50	AC187	0-25	BF185	0-80	HG1005	0-60
1N256	0-50	AC188	0-25	BF194	0-17	H9100A	0-20
1N645	0-25	ACY17	0-80	BF195	0-15	MT100	0-25
1N725A	0-20	ACY18	0-25	BF196	0-15	MT101	0-20
1N914	0-27	ACY19	0-25	BF197	0-15	MT120	0-25
1N4007	0-20	ACY20	0-20	BF861	0-28	MT121	0-20
18021	0-20	ACY21	0-20	BF898	0-28	MJE20	0-87
18113	0-15	ACY22	0-10	BFX12	0-20	MJE2955	1-37
18130	0-18	ACY27	0-25	BFX13	0-25	MJE3055	0-87
18131	0-18	ACY28	0-17	BFX29	0-25	NKT128	0-85
18202	0-23	ACY39	0-60	BFX30	0-25	NKT129	0-85
2G340	1-97	ACY40	0-50	BFX35	0-98	NKT211	0-25
2G301	0-20	ACY41	0-15	BFX63	0-60	NKT213	0-25
2G302	0-22	ACY44	0-25	BFX84	0-25	NKT214	0-15
2G306	0-30	AD140	0-50	BFX85	0-30	NKT216	0-37
2G371	0-22	AD149	0-50	BFX86	0-25	NKT217	0-35
2G381	0-25	AD181	0-37	BFX87	0-25	NKT218	1-13
2G414	0-20	AD182	0-27	BFX88	0-20	NKT219	0-33
2G417	0-22	AF106	0-30	BFY10	1-00	NKT222	0-20
2N214	0-43	AF114	0-25	BFY11	0-25	NKT224	0-22
2N247	0-25	AF115	0-25	BFY17	0-25	NKT251	0-24
2N250	0-50	AF116	0-25	BYF18	0-25	NKT271	0-25
2N404	0-20	AF117	0-25	BFY19	0-25	NKT272	0-25
2N697	0-15	AF118	0-62	BFY24	0-45	NKT273	0-15
2N698	0-40	AF119	0-20	BFY44	1-00	NKT274	0-20
2N706	0-10	AF124	0-25	BFY50	0-22	NKT275	0-25
2N706A	0-12	AF125	0-20	BFY51	0-20	NKT277	0-20
2N708	0-15	AF126	0-17	BFY52	0-22	NKT278	0-25
2N709	0-63	AF127	0-17	BFY53	0-17	NKT301	0-40
2N711	0-37	AF139	0-80	BFY64	0-42	NKT304	0-75
2N987	0-50	AF139	0-55	BSX50	0-25	NKT403	0-75
2N1090	0-30	AF179	0-80	BSX27	0-60	NKT404	0-55
2N1091	0-33	AF180	0-52	BSX60	0-93	NKT678	0-30
2N1131	0-25	AF181	0-42	BSX76	0-18	NKT713	0-25
2N1132	0-25	AF186	0-40	BSY26	0-18	NKT773	0-25
2N1302	0-18	AFY19	1-13	BSY27	0-17	NKT777	0-38
2N1303	0-18	AFZ11	0-60	BSY31	0-50	07B3	0-38
2N1304	0-22	AFZ12	0-60	BSY5A	1-12	0A5	0-20
2N1305	0-22	ASY26	0-25	BSY95	0-12	0A6	0-12
2N1306	0-25	ASY27	0-32	BT102/500R		0A47	0-10
2N1307	0-25	ASY28	0-25		0-75	0A70	0-10
2N1308	0-25	ASY29	0-30	BTY42	0-92	0A71	0-10
2N1309	0-25	ASY36	0-25	BTY79/100R		0A73	0-10
2N1420	0-93	ASY39	0-17		0-75	0A74	0-10
2N1507	0-38	ASY51	0-40	BTY79/400R		0A79	0-10
2N1526	0-88	ASY53	0-20		1-25	0A81	0-08
2N1909	0-25	ASY55	0-20	BY100	0-15	0A85	0-12
2N2147	0-75	ASY62	0-25	BY126	0-15	0A86	0-15
2N2148	0-60	ASY86	0-33	BY127	0-17	0A90	0-08
2N2190	0-80	ASZ21	0-42	BY182	0-85	0A91	0-07
2N2218	0-20	ASZ30	0-75	BY183	0-85	0A95	0-07
2N2219	0-20	AUY10	0-93	BY213	0-25	0A200	0-07
2N2287	1-03	AU101	1-50	BY210	0-35	0A202	0-10
2N2287	0-20	BC107	0-10	BY211	0-32	0A210	0-25
2N2369A	0-15	BC108	0-10	BY212	0-30	0A211	0-30
2N2444	1-99	BC109	0-10	BY213	0-25	0A220	0-55
2N2613	0-25	BC113	0-15	BY215	0-95	0A2201	0-50
2N2646	0-48	BC115	0-20	BY215	0-20	0A2202	0-42
2N2712	0-25	BC116	0-25	BY216	0-62	0A2203	0-42
2N2764	0-50	BC116A	0-30	BYZ88C3V3		0A2204	0-30
2N2846	0-75	BC118	0-25		0-15	0A2205	0-42
2N2848	0-42	BC121	0-20	C111	0-65	0A2206	0-42
2N2904	0-20	BC122	0-20	CR81/05	0-25	0A2207	0-47
2N2904A	0-25	BC125	0-25	CR81/40	0-47	0A2208	0-32
2N2906	0-20	BC126	0-65	CS4B	2-50	0A2209	0-32
2N2907	0-23	BC140	0-55	CS10B	3-13	0A2210	0-32
2N2924	0-23	BC147	0-15	DD000	0-15	0A2211	0-32
2N2925	0-16	BC148	0-13	DD003	0-15	0A2222	0-45
2N2926	0-10	BC149	0-15	DD006	0-18	0A2223	0-45
2N3054	0-60	BC157	0-15	DD007	0-40	0A2224	0-45
2N3055	0-75	BC158	0-13	DD008	0-38	0A2241	0-22
2N3702	0-10	BC160	0-63	GD3	0-33	0A2242	0-23
2N3705	0-10	BC169	0-13	GD4	0-05	0A2244	0-22
2N3706	0-23	BCY31	0-35	GD5	0-38	0A2246	0-23
2N3707	0-12	BCY32	0-55	GD8	0-25	0A2290	0-38
2N3709	0-10	BCY33	0-25	GD12	0-30	0A2291	0-50
2N3710	0-10	BCY34	0-30	GET102	0-30	0A2292	0-38
2N3711	0-10	BCY34	0-30	GET103	0-22	0A2293	0-37
2N3819	0-35	BCY38	0-40	GET113	0-20	0A2294	0-37
2N3820	0-60	BCY39	1-00	GET114	0-15	0A2295	0-37
2N3823	0-75	BCY40	0-50	GET115	0-45	0A2296	0-37
2N6027	0-53	BCY42	0-23	GET116	0-60	0A2297	0-37
2N6098	0-33	BCY70	0-15	GET117	0-15	0A2298	0-37
2N8006	1-00	BCY71	0-20	GET872	0-30	0A2299	0-37
28178	0-40	BCZ10	0-35	GET875	0-25	0A2299	0-37
28301	0-50	BCZ11	0-50	GET880	0-37	0A2299	0-37
28304	0-75	BD121	0-65	GET881	0-25	0A2299	0-37
28501	0-37	BD123	0-80	GET892	0-25	0A2299	0-37
28705	0-62	BD124	0-75	GET895	0-25	0A2299	0-37
AA129	0-20	BF111	1-32	GET844	0-38	0A2299	0-37
AAZ12	0-30	BF115	0-25	GEX45/1	0-10	0A2299	0-37
AAZ13	0-12	BF117	0-50	GEX941	0-15	0A2299	0-37
AC107	0-37	BF167	0-25	GJ3M	0-25	0A2299	0-37

SEMI-CONDUCTOR SET FOR P. E. GEMINI AMPLIFIER £13.95

SEND S.A.E. FOR LIST OF 8,000 TYPES VALVES, TUBES AND TRANSISTORS

Open daily to callers: Mon.-Sat. 9 a.m.-5 p.m.
 Closed Sat. 1.30 p.m.-2.30 p.m.

Terms C.W.O. only | Tel. 01-769 0199/1649

EDGWARE ELECTRONICS CENTRE

194 EDGWARE ROAD, LONDON, W.2

Phone 01-723 1465

EEC Product AC/DC Converter

Input 240 volts. Output 3V, 4.5V, 6V, 7.5V, 9V, 12V d.c. Current 500mA.
 Price £4.47 postage paid

EEC Car Adaptor

Input 12 volts. Output 6V, 7.5V, 9V.
 Price £5-10 postage paid

MD 800 Sound Headphones with volume control £3-90
 Garrard 2025 with plinth cover and cartridge £12-30
 Shira Car Radio MW/LW—

Manual £8-50

Twin Speaker £8-95

Push Button £10-45

Plinth and Cover suitable for Garrard SP25, £3-25
 Headphones DHO25, £2-25

Siran Battery Chargers 6V and 12V, £2-85

Please send 25p for postage and packing

Quality Cassettes at cheapest prices

C60 35p plus 5p P. & P.

C90 47p plus 5p P. & P.

C120 60p plus 5p P. & P.

Surplus

Thousands of varieties in Electronic Components at throwaway prices.

Save ££££££££££ here

Mixed packet of resistors 25p postage paid

MULTIMETER IT1-2, 20,000 ohm/V, £4.20. 10W TRANSISTOR AMPLIFIER, £3.75. 1 VALVE (EL84) AMPLIFIER CHASSIS, £3. STEREO HEADPHONES, 8 ohm, £1.95. HIGH IMPEDANCE (2,000 ohm), 80p. TELESCOPIC AERIALS, 47in, 45p. RECORDING TAPE: 5in L.P. 900ft, 45p; 5½in L.P. 1,200ft, 60p; 7in L.P. 1,800ft, 80p; C60, 39p; C90, 60p. MICROPHONES: Lapel, 28p; ACOS Mic. 45, 90p; Dual Impedance, 600 ohm and 50kΩ, £4.50. 5kΩ Potentiometers with Switch, 16p. Bridge Rectifiers, 40V, 1.5A, 36p. Rotary Switches, 250V, 2A, 9p. 4P 3 Way Wave Change Switches, 15p. PLUGS: Jack Standard, 10p; SCREENED, 13p; 2.5mm and 3.5mm, 6p; SCREENED, 8p. BALANCE AND TUNING METER, 500µA, 38p. 100 MIXED RESISTORS, 45p. MINIATURE INDICATOR LAMPS (5 colours), 11p; 6V or 12V BULBS for above, 4p. CARTRIDGES: COMPATIBLE ACOS GP91-3SC, 90p; STEREO GP93-1, £1.15. MAINS NEONS panel mounting (red, green, clear), 13p. TELEPHONE AMPLIFIER, £2.62. MINIATURE SKELETON PRESETS, 6p. CAPACITORS: 400-200-50-16mF, 300V, 30p. A range of miniature CERAMICS 50V and Miniature ELECTROLYTICS. FERRITE ROD 6in x ¾in with M & L Coil, 15p.
 Special prices for quantity. S.A.E. for list. Add 10p for P. & P. on orders under £5.

M. DZIUBAS

158 Bradshawgate, BOLTON, Lancs

DISTRIBUTION PANELS

Just what you need for work bench or lab.

4 x 13A sockets in metal box to take standard 13A fused plugs and on/off switch with neon warning light. Supplied complete with 7 feet of heavy cable. Wired up ready to work. £2-25 plus 23p Post and Insurance.

MULTI-SPEED MOTOR

Six speeds are available 500, 850 and 1,100 r.p.m. and 8,000; 12,000 and 15,500 r.p.m. shaft is 3/16 dia. 230/240V. Its speed is to be further controlled with the use of our Thyristor controller. Very powerful and useful motor, size approx. 2 1/2 in dia. x 5 1/2 in long. Price 85p plus 23p postage and insurance.

MAINS MOTOR

Precision made — as used in record decks and tape recorders—ideal also for extractor fan, blower heaters, etc. New and perfect. Snip at 50p. Postage 10p for first one, then 5p for each one ordered.

TELEPHONE HAND SET

Ex-G.P.O. Perfect order. 60p each + 20p p. & p.

12 VOLT 11 AMP POWER PACK

This comprises double-wound 230/240V mains transformer with full wave rectifier and 2000 mfd/50V smoothing. Price £1-50, plus 20p post and packing.

New Light Dimmer. This uses the latest technique from America, a self-triggering device known as the thermo tab and has enabled us to produce a really reliable dimmer at a remarkably low price—namely £2-50 each or 10 for £22-50.

ROCKER SWITCHES

3 new types to offer this month, all snip in fixing into oblong holes.

Type 1 8 P. on/off 10 amp 250V. Size approx. 1 1/2 in x 3/4 in. Made by Arrow electric (93 series). Price 12p each. 10 for £1-08.

Type 2 D.P. on/off 10 amp 250V with neon indicator in the lever. Again Arrow 93 series. Price 25p each or 10 for £2-25.

Type 3 Double pole change over spring return, made by the French Russenberg Company. Size approx. 1 in x 3/4 in. Price 15p each. 10 for £1-35.

Amplifier Case. Teak veneer on 3/4 in ply, modern appearance and design. Size—front 13 1/2 in x 4 1/2 in deep x 8 1/2 in. Limited quantities £1-25 each plus 25p post and insurance.

Music on Tape. A further buy enables us to offer these at an even lower price—namely 65p each or 5 for £2-50. Send for list of titles. We can't repeat when sold out.

Pressure Switch. Made by Bailey and Mackey Ltd., Type 108R. Adjustable up to 15lb per sq. in. (instructions included). Set to trip at 8lb per sq. in. Changeover switch rated at 5 amp 250V a.c. with re-set button. Electrical connections in box with conduit entry. Price £1-50 each plus 20p post and insurance.

20 Watt Inverter. Smart and Brown—For van lighting or camping, etc. Will light a 2ft 20 watt standard fluorescent tube from a 12V car battery, current approx. 2A. Very well made unit using die cast chassis. Size 1 1/2 in x 2 in x 1 1/2 in. Price £2-50 complete with lamp holders and tube clips.

Flex Cable Snip. 3 core heavy circular T.R.S. waterproof flex, ideal for running down the garden to pool or shed. 1.5mm cores (5 amp) 100 yard coils £4-25 plus carriage 75p up to 200 miles. £1—300 miles. £1-50—500 miles.

DOOR INTERCOM

Know who is calling and speak to them without leaving bed, or chair. Outfit comprises microphone with call push button, connectors and master inter-com. Simply plugs together. Originally sold at £10. Special snip price £3-95, plus 20p postage.

AUTO-ELECTRIC CAR AERIAL

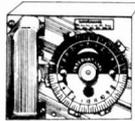
with dashboard control switch—fully extendable to 40in or fully retractable. Suitable for 12V positive or negative earth. Supplied complete with fitting instructions and ready wired dashboard switch. £5-75 plus 25p post and ins.

NEED A SPECIAL SWITCH?

Double Leaf Contact. Very slight pressure closes both contacts. 6p each, 60p doz. Plastic push-rod suitable for operating. 5p each, 45p doz.

NUMERICATOR TUBES

For digital instruments, counters, timers, clocks, etc. Hi-vac X.N.3. Price 99p each. 10 for £9.



24-HOUR TIME SWITCH

Made by Smiths, these are AC mains operated. NOT CLOCKWORK. Ideal for mounting on rack or shelf or can be built into box with 13A socket. Two completely adjustable time periods per 24 hours. 2A changeover contacts will switch circuit on or off during these periods. £2-50 post and ins. 23p. Additional time contacts 50p pair.

MULLARD I.F. MODULE

This is a fully screened intermediate frequency module for amplification and detection of f.m. signals at 10.7MHz and a.m. signals at 470KHz. The first stage is used as an i.f. amplifier for f.m. and a self-oscillating mixer for a.m. operation, in conjunction with an external oscillator coil. 75p each; 10 for £6-75; 100 for £62-50. With connection dig.

COMPUTER TAPE

2,400ft of the Best Magnetic Tape may claim good results with Video and sound. 1in wide £1-00 plus 33p post and insurance with cassette. 3/4 in wide £85p plus 30p post and insurance with cassette. 3/4 in wide 85p plus 25p post and insurance with cassette. Spare reels and cassettes—1in 75p, 3/4 in 75p each plus 20p post and insurance.

ERGOTROL UNITS

These units made by the Mullard Group are for operating and controlling d.c. Motors and equipment from A.C. mains. Thyristors are used and these supply a variable d.c. resulting in motor speed control and operating efficiency far superior to most other methods.

The units are contained in wall mounting cabinets with front control panel on which are fuses—push buttons for on/off and the variable thyristor firing control.

4 models are available—all are brand new in makers cases:

Model 2410 for up to 5 amps £17-50

Model 2411 for up to 10 amps £27-50

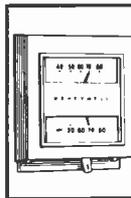
Model 2415 for up to 80 amps £95-00

Note: 2415 is a floor mounting 3 phase unit.

THIS MONTH'S SNIP

THERMOSTAT WITH THERMOMETER

Made by Honeywell for normal air temperatures 40-80°F (3-25°C). This is a precision instrument with a differential which can be adjusted to better than 1.5°F. A mercury switch breaks on temp. rise—the switch is operated by a coiled bi-metal element and an adjustable heater is incorporated for heat anticipation. Elegantly styled and encased in an ivory plastic case with clear plastic windows, thermometer above and switch setting scale below—size approx. 3.8 in x 3.2 in x 1.4 in deep—can be mounted on conduit box or directly on wall. Price £1-95 each or ten for £11-25.



CENTRIFUGAL FAN

Mains operated, turbo-blower type. Pressed steel Housing contains motor and aluminum impeller. Motor is 1/4 hp giving considerable air flow but virtually no noise. Approx. dimensions 10 1/2 in wide by 12 in dia. Outlet into trunking 10 1/2 in x 4 1/2 in. £4-95 + 21.



THE FULL-FI STEREO SIX

THE AMPLIFIER SENSATION OF THE YEAR

You will be amazed at the fullness of reproduction and at the added qualities your records or tuner will reproduce. Built into metal chassis ready for mounting on plinth this amplifier uses an integrated solid state amplifier is ideal for use with normal pick-ups and tuners, it has a double wound mains transformer and gauged volume and tone controls—also switching for Mono to Stereo, tuner or pick-up. UNREPEATABLE PRICE is £6-50 plus 20p post and insurance. Simulated Teak cabinet ready for mounting amplifier £1-50 (postage free when ordered with chassis).



P.E. GEMINI

Dual purpose twin 30W stereo amplifier for exceptional performance. Complete kit of parts £45 or reprint of data and parts list 25p.



MULLARD AUDIO AMPLIFIER MODULE

Uses 4 transistors, and has an output of 500mW into 8 ohms speakers. Input suitable for crystal mic. or pick-up. 9V battery operated. Size 2in long 1 1/2 in wide 1 1/2 in high. SPECIAL SNIP PRICE 60p each. 10 for £5.

CAPACITOR DISCHARGE CAR IGNITION

This system has proved to be amazingly efficient. We offer a Kit of Parts as PW circuit. £5-95 plus 20p postage. De-luxe model with prepared circuit board £8-95. When ordering please state whether for positive or negative systems.

ELECTRONIC IGNITION

RADIO STETHOSCOPE

Easiest way to fault find—traces signal from aerial to speaker—when signal stops you've found the fault. Use on Radio, TV amplifier, anything—complete kit comprises two special transistors and all parts including probe tube and crystal earpiece. £2—twin stethoscopes instead of ear-piece 75p extra—post and ins. 20p.



QUICK CUPPA

Mini Immersion Heater, 350w. 200/240V. Boils full cup in about two minutes. Two any socket or lamp holder. Have at bedside for tea, baby's foot, etc. £1-25, post and insurance 14p. 12v. car model also available same price. Jug heater £1-50 plus p. & p. 14p.



MAINS OPERATED SOLENOIDS

Model 772—small but powerful 1in pull—approx. size 1 1/2 x 1 1/2 x 1 1/2 in. Model 4001 1in pull. Size 2 1/2 x 1 1/2 in. Model TT10 1 1/2 in pull. Size 2 1/2 x 2 1/2 in. £1-80 plus 20p post and ins.

MAINS RELAY BARGAIN

Special this month are some single, double and treble pole changeover relays. Contacts rated at 15 amps. Operating coil wound for 240V. A.C. Good British Make. Unused. Size approx. 1 1/2 in x 1 in. Open construction. Single pole 25p each 10 for £2-25 Treble pole 35p each 10 for £3-15

DRILL CONTROLLER NEW 1KW MODEL

Electronically changes speed from approximately 10 revs. to maximum. Full power at all speeds by finger-tip control. Kit includes all parts, case, everything and full instructions. £1-50 plus 13p post and insurance. Made up model also available. £2-25 plus 13p post and p.



SLIDE SWITCHES

Slide Switch. 2-pole changeover panel mounting by two 6B.A. screws. Size approx. 1in x 2in rated 250V lamp, 6p each. 10 for £4p, 100 for £5-10, 500 for £24. Ditto as above but for printed circuit 5p each. 10 for 45p, 100 for £4-25. Sub Miniature Slide Switch. DPDT 18mm (3/4 in approx.) between fixing centres. 12p each or 10 for £1-08.



MINIATURE WAFER SWITCHES

2 pole, 2 way—4 pole, 2 way—3 pole, 3 way—4 pole, 3 way—2 pole, 4 way—3 pole, 4 way—2 pole 6 way—1 pole, 12 way. All at 30p each. £1-80 for ten, your assortment.



LIGHT CELL

Almost zero resistance in sunlight increases to 10 K Ohms in dark or dull light, epoxy resin sealed. Size approx. 1in dia. by 3/4 in thick. Rated at 500 mW. wire ended. 48p with circuit. Also ORP12 light cell 45p.



TELESCOPIC AERIAL

for portable, car radio or transmitter. Chrome plated—six sections, extends from 7 1/2 to 47in. Hook in bottom for 6B.A. screw, 38p. KNUCKLED MODEL FOR P.M. 50p.

O-8 AMMETER

2 1/2 in square full vision for flush mounting. Moving iron instrument. Ideal for charger. Price 43p each. 10 for £3-90.



EXTRACTOR FAN

Cleans the air at the rate of 10,000 cubic ft. per hour. Suitable for kitchens, bathrooms, factories, changing rooms, etc., it's so quiet it can hardly be heard. Compact, 5 1/2" casing with 3 1/2" fan blades. Kit comprises motor, fan blades, sheet steel casing, pull switch, mains connector, and fixing brackets, £2 plus 36p post and ins.

MICRO SWITCH

5A changeover contacts, 9p each. 21 doz. 13 amp Model 10p each or £1-05 doz.

Dry Film Lubricant. In aerosol can for easy application and for putting lubricant into places where the normal oil can cannot reach. Home and everyday uses. We have purchased a large quantity of these from the Liquidator and are able to offer them to you at about half of the original list price. 30p per (8oz.) can or 12 cans for £3 post paid. The lubricant is I.C.I. fluon L169.



Where postage is not stated then orders over £5 are post free. Below £5 add 20p. Semi-conductors add 5p post. Over £1 post free. S.A.E. with enquiries please.

J. BULL (ELECTRICAL) LTD.

(Dept. P.E.) 7 Park Street, Croydon CRO 1YD
Callers to 102/3 Tamworth Road, Croydon.

LARGEST STOCKS WIDEST RANGE SEMICONDUCTORS & COMPONENTS BRAND NEW GUARANTEED

TRANSISTORS

2N301	20p	2N3405	45p	40311	85p	BC175	15p	BSW70	27p	NKT238	25p
2N302	20p	2N3414	22p	40312	47p	BC175	15p	BSW70	27p	NKT239	27p
2N303	20p	2N3415	22p	40313	47p	BC182	20p	BSX19	17p	NKT241	27p
2N306	42p	2N3416	37p	40320	47p	BC183	9p	BSX21	37p	NKT242	30p
2N307	30p	2N3417	37p	40323	32p	BC184	11p	BSX26	45p	NKT243	30p
2N308	30p	2N3570	21p	40324	47p	BC212L	13p	BSX27	47p	NKT244	30p
2N309	30p	2N3572	27p	40326	37p	BCY30	30p	BSX28	32p	NKT245	30p
2G371	15p	2N3605	27p	40329	30p	BCY32	30p	BSX29	30p	NKT246	30p
2G381	22p	2N3606	27p	40344	57p	BCY33	30p	BSX60	82p	NKT247	30p
2N404	22p	2N3607	27p	40347	57p	BCY33	30p	BSX61	82p	NKT248	30p
2N696	20p	2N3702	11p	40348	52p	BCY34	30p	BSX76	22p	NKT249	30p
2N697	20p	2N3703	10p	40360	40p	BCY38	40p	BSX77	22p	NKT250	30p
2N698	20p	2N3704	11p	40361	47p	BCY39	60p	BSX78	27p	NKT251	30p
2N706	12p	2N3705	10p	40362	57p	BCY40	50p	BSX78	27p	NKT252	30p
2N708	16p	2N3707	11p	40370	32p	BCY43	15p	BSV11	27p	NKT253	30p
2N709	62p	2N3708	7p	40408	57p	BCY54	32p	BSY24	15p	NKT254	30p
2N718	25p	2N3709	9p	40407	40p	BCY58	22p	BSY25	15p	NKT255	30p
2N720	30p	2N3710	9p	40410	52p	BCY59	22p	BSY26	17p	NKT256	30p
2N727	30p	2N3711	12p	40410	52p	BCY60	87p	BSY27	17p	NKT257	30p
2N914	17p	2N3716	11p	40467A	57p	BCY70	20p	BSY28	17p	NKT258	30p
2N916	17p	2N3716	11p	40468A	35p	BCY71	17p	BSY29	25p	NKT259	30p
2N918	30p	2N3791	22p	40600	57p	BCY72	27p	BSY30	22p	NKT260	30p
2N929	22p	2N3819	30p	40673	85p	BCY10	27p	BSY36	25p	NKT261	30p
2N930	27p	2N3823	97p	AC107	30p	BCZ11	30p	BSY37	25p	NKT262	30p
2N1090	22p	2N3854	27p	AC126	20p	BD116	11p	BSY38	25p	NKT263	30p
2N1091	22p	2N3854	27p	AC126	20p	BD121	65p	BSY39	22p	NKT264	30p
2N1131	25p	2N3855	27p	AC127	20p	BD123	65p	BSY40	22p	NKT265	30p
2N1132	25p	2N3855A	27p	AC154	22p	BD124	65p	BSY51	32p	NKT266	30p
2N1302	17p	2N3856	30p	AC176	25p	BD131	85p	BSY52	32p	NKT267	30p
2N1303	17p	2N3856A	35p	AC187	62p	BD132	85p	BSY53	32p	NKT268	30p
2N1304	22p	2N3858	25p	AC188	37p	BDY10	11p	BSY54	40p	NKT10419	30p
2N1305	22p	2N3858A	25p	AC188	37p	BDY11	11p	BSY55	40p	NKT10439	37p
2N1306	20p	2N3859	27p	AC128	20p	BDY12	11p	BSY56	47p	BSX47	30p
2N1307	25p	2N3860	27p	AC128	20p	BDY13	11p	BSY57	45p	NKT20329	42p
2N1308	30p	2N3860A	27p	AC128	20p	BDY19	11p	BSY82	52p	NKT20339	37p
2N1309	30p	2N3866	11p	ACY21	22p	BDY20	11p	BSY89	52p	NKT80111	77p
2N1507	17p	2N3877	40p	ACY22	20p	BDY38	97p	BSY93A	181p	NKT80111	77p
2N1613	25p	2N3877A	40p	ACY28	20p	BDY60	11p	C111	75p	NKT80113	77p
2N1631	85p	2N3900	37p	ACY40	20p	BDV61	21p	C225	55p	NKT80113	77p
2N1632	85p	2N3900	37p	ACY40	20p	BDV62	21p	C426	40p	NKT80113	77p
2N1637	30p	2N3901	97p	ACY41	25p	BF117	47p	C428	37p	NKT80215	82p
2N1638	27p	2N3903	35p	ACY44	40p	BF117	47p	C428	37p	NKT80215	82p
2N1671B	11p	2N3904	35p	AD140	52p	BF163	37p	C744	30p	NKT80215	82p
2N1869	32p	2N3906	37p	AD149	57p	BF167	17p	D13T1	82p	NKT80216	82p
2N1893	37p	2N3906	37p	AD160	62p	BF173	19p	D1P1P	37p	OC20	75p
2N2147	30p	2N4039	10p	AD162	62p	BF177	19p	D1P2P	40p	OC22	50p
2N2148	57p	2N4060	12p	AP106	42p	BF178	30p	D1P3P	37p	OC23	50p
2N2160	57p	2N4061	12p	AP114	25p	BF180	30p	D1P4P	40p	OC26	60p
2N2193	40p	2N4062	12p	AP115	25p	BF181	32p	DA0N1	75p	OC28	60p
2N2193A	42p	2N4244	12p	AP116	25p	BF184	32p	GET102	30p	OC28	60p
2N2194	40p	2N4285	17p	AP117	25p	BF185	42p	GET113	20p	OC29	62p
2N2217	27p	2N4286	17p	AP118	62p	BF194	15p	GET119	42p	OC35	50p
2N2218	22p	2N4287	17p	AP119	62p	BF196	15p	GET119	42p	OC36	62p
2N2219	23p	2N4288	17p	AP124	22p	BF197	15p	GET120	52p	OC37	62p
2N2220	25p	2N4289	17p	AP125	20p	BF198	15p	GET120	52p	OC42	25p
2N2221	25p	2N4290	17p	AP126	20p	BF198	15p	GET783	12p	OC42	25p
2N2222	30p	2N4291	17p	AP127	17p	BF200	52p	GET870	30p	OC44	20p
2N2287	11-07p	2N4292	12p	AP139	37p	BF224	14p	GET887	20p	OC45	15p
2N2297	30p	2N4303	47p	AP178	42p	BF225	15p	GET889	22p	OC46	15p
2N2368	17p	2N5027	47p	AP179	72p	BF237	23p	GET890	22p	OC70	15p
2N2369	17p	2N5028	47p	AP180	52p	BF244	23p	GET896	22p	OC71	15p
2N2369A	17p	2N5029	47p	AP180	52p	BF244	23p	GET897	22p	OC72	15p
2N2410	42p	2N5030	42p	AP181	42p	BFW58	27p	GET898	22p	OC73	15p
2N2483	27p	2N5172	12p	AP229	47p	BFW59	25p	MJ400	1-07p	OC75	25p
2N2484	32p	2N5174	52p	AP230	47p	BFW60	25p	MJ420	1-12p	OC76	25p
2N2539	22p	2N5175	52p	AP280	62p	BFX12	22p	MJ430	1-12p	OC77	25p
2N2540	22p	2N5176	45p	AFZ11	32p	BFX13	22p	MJ440	95p	OC81	20p
2N2613	35p	2N5232A	30p	ASV26	27p	BFX29	30p	MJ480	97p	OC83	25p
2N2646	55p	2N5245	45p	ASV27	27p	BFX30	30p	MJ481	1-26p	OC84	25p
2N2696	62p	2N5249	67p	ASV28	27p	BFX33	37p	MJ481	1-26p	OC139	32p
2N2711	25p	2N5255	35p	ASV36	25p	BFX44	37p	MJ490	1-37p	OC140	30p
2N2712	25p	2N5266	22-62p	ASV36	25p	BFX48	67p	MJ500	1-37p	OC170	30p
2N2713	27p	2N5267	22-62p	ASV51	32p	BFX84	25p	MJ580	1-27p	OC201	40p
2N2714	30p	2N5305	37p	ASV54	32p	BFX85	32p	MJ530	60p	OC210	40p
2N2865	62p	2N5306	40p	ASV54	32p	BFX86	25p	MJ520	60p	OC211	40p
2N2904	30p	2N5307	37p	ASV86	32p	BFX87	27p	MJE250	60p	OC201	40p
2N2905A	37p	2N5308	67p	ASZ21	42p	BFX88	25p	MJE251	75p	OC202	40p
2N2905B	37p	2N5309	62p	AU103	1-25p	BFX89	62p	MJE255	75p	OC203	40p
2N2906A	25p	2N5310	42p	BC107	10p	BFX93A	70p	MJE3055	1-37p	OC204	42p
2N2906B	25p	2N5354	27p	BC107	10p	BFY11	42p	MJE3055	1-37p	OC205	90p
2N2906A	27p	2N5355	27p	BC108	10p	BFY12	42p	MFP102	42p	OC207	75p
2N2907	30p	2N5356	32p	BC109	10p	BFY17	22p	MFP103	37p	OCPT1	42p
2N2923	30p	2N5365	47p	BC113	15p	BFY18	32p	MFP104	37p	ORP12	50p
2N2924	15p	2N5365	47p	BC115	15p	BFY19	32p	MFP105	37p	P346A	50p
2N2925	15p	2N5367	57p	BC116A	15p	BFY20	42p	MPS3638	32p	TIP29A	50p
2N2926	2N5457	37p	BC118	10p	BFY21	42p	NKT0013	47p	TIP30A	60p	
.. Green	14p	28005	75p	BC121	20p	BFY24	45p	NKT124	42p	TIP30A	60p
.. Yellow	12p	28020	22p	BC122	20p	BFY25	25p	NKT125	27p	TIP31A	62p
.. Orange	12p	28102	50p	BC125	20p	BFY26	20p	NKT126	27p	TIP32A	62p
2N3011	30p	28103	50p	BC126	20p	BFY29	20p	NKT128	27p	TIP33A	62p
2N3014	32p	28104	25p	BC140	37p	BFY30	50p	NKT135	27p	TIP34A	62p
2N3053	16p	28501	32p	BC147	50p	BFY41	50p	NKT187	32p	TIS84	40p
2N3054	46p	28502	35p	BC148	10p	BFY43	62p	NKT211	30p	TIS43	40p
2N3055	62p	28503	27p	BC149	12p	BFY50	23p	NKT212	30p	TIS44	10p
2N3133	30p	3N128	70p	BC152	17p	BFY51	20p	NKT213	30p	TIS45	27p
2N3134	30p	3N136	11-27p	BC153	17p	BFY52	23p	NKT214	22p	TIS46	11p
2N3135	25p	3N140	70p	BC157	20p	BFY53	17p	NKT215	22p	TIS47	12p
2N3136	25p	3N141	72p	BC158	11p	BFY53A	57p	NKT216	37p	TIS48	12p
2N3390	25p	3N142	65p	BC159	12p	BFY55	57p	NKT217	42p	TIS49	12p
2N3391	20p	3N143	67p	BC160	62p	BFY77	42p	NKT218	42p	TIS49	12p
2N3391A	30p	3N152	87p	BC167	11p	BFY90	67p	NKT223	27p	TIS82	12p
2N3392	17p	R.C.A.	—	BC168	11p	BFY90	67p	NKT224	27p	TIS83	12p
2N3393	15p	40244	55p	BC169B	11p	BFY90	67p	NKT225	22p	TIS86	25p
2N3394	15p	R.C.A.	—	BC169B	11p	BFY90	67p	NKT225	22p	TIS86	25p
2N3402	22p	40261	87p	BC169C	18p	BFY10	41p	NKT229	22p	TIS60	25p
2N3403	22p	40309	82p	BC170	12p	BRV39	47p	NKT235	35p	TIS62	27p
2N3404	32p	40310	45p	BC171	15p	BSW41	42p	NKT237	35p	TIS62	27p

D.C. PANEL METERS

VOICE OPERATED AUTO FADE UNIT

FULLY ELECTRONIC
VARIABLE MUSIC CLAMP LEVEL
VARIABLE DELAY TIME
VARIABLE SWITCHING LEVEL
VARIABLE NON CLAMP LEVEL
REQUIRES ONLY 24V+ TO USE

MONO £4 STEREO £5.75
KIT KIT
plus 35p postage and packing

FOR DETAILS S.A.E. TO DEPT. P.E.6
PARTRIDGE ELECTRONICS
21-25 HART ROAD, BENFLEET, ESSEX

Arbour Electronics Limited

Manufacturing Contractors
10-14 HALL ROAD
MALDON, ESSEX CM9 7LA
Telephone: Maldon 4775

EX COMPUTER PRINTED CIRCUITS
4 1/4" x 4 1/4" pack of 5, 50p.
Approx. 100 Semiconductors plus Resistors and various other components. P. & P. 12p.
Colvern W/W Potentiometers, 100 ohm 1W, 15p each. P. & P. 5p.
Aluminium cases with lid, 9in x 7 1/2in x 4 1/2in deep, 50p each. P. & P. 20p.
Mini Pack surplus components, Resistors, Capacitors, etc., 50p each. P. & P. 10p.
LIMITED SUPPLY
Unused Leak=50W R.M.S. KT88 valve amplifiers 50 or 100V line. Suitable for P.A. work. £26 P. & P. inclusive U.K. only.

TRANSFORMERS

DOUGLAS GUARANTEED

12 or 24 Volts

Output V. & Amps.	Ref. No.	Price P. & P.
12V x 2 250 mA x 2	MT111 CS**	£0.91 9p
12V x 2 500 mA x 2	MT213 CT**	£0.97 13p
12V x 2 1A x 2	MT 71 AT**	£1.48 24p
12V x 2 2A x 2	MT 15 AT**	£2.04 30p
12V x 2 3A x 2	MT 70 AT**	£2.59 32p
12V x 2 4A x 2	MT 108 AT**	£2.92 33p
12V x 2 5A x 2	MT 72 AT**	£3.38 34p

30 Volts. All tapped at 0-12-15-20-24-30V
Out-Ref. No. Price P.P. Out-Ref. No. Price P.P.

put Amps.	put Amps.	£	put	£
500 mA MT 112 CT**	1 1/2 15p	3A	MT 20 AT**	£2.64 32p
1A MT 79 AT**	1 5/8 29p	4A	MT 21 AT**	£1.0 40p
2A MT 3 AT**	2 2/3 30p	5A	MT 51 AT**	£3.1 42p

50 Volts. All tapped at 0-19-25-33-40-50V

put Amps.	put Amps.	£	put	£
500 mA MT 102 AT**	1 4/5 24p	3A	MT 105 AT**	£9.1 41p
1A MT 103 AT**	1 30 32p	4A	MT 106 AT**	£6.06 41p
2A MT 104 AT**	2 10 32p	6A	MT 107 AT**	£7.47 50p

60 Volts. All tapped at 0-24-30-40-48-60V

put Amps.	put Amps.	£	put	£
500 mA MT 124 AT**	1 4/6 21p	2A	MT 127 AT**	£1.16 41p
1A MT 126 AT**	2 2/4 28p	3A	MT 125 AT**	£6.99 41p

AN AUTO-WOUND RANGE

Power output	Windl tapped at	Ref. No.	Price P. & P.
20 VA	0-11.5-21.0-24.0	MT 113 CT**	£0.89 15p
75 VA	"	MT 64 AT**	£2.17 30p
150 VA	0-11.5-20.0-22.0-24.0	MT 4 AT**	£2.16 31p
200 VA	"	MT 65 AT**	£3.00 32p

400 V. Output at 50 Hz. Ref. IT3 AT**
C-D Ignition system by R. M. Marston
£2.25 29p

EQUIPMENT RANGE

Sec. Output (r.m.s.)	Ref. No.	Price P. & P.
3-0-3 V	200 mA MT 209 CS**	£0.89 8p
9-0-9 V	100 mA MT 13 CS**	£0.91 8p
12-0-12 V	50 mA MT 210 CS**	£0.91 8p
20-0-20 V	30 mA MT 211 CS**	£0.91 8p
0-20-0 x 2	MT 214 CT**	£1.1 14p
0-8-9 x 2	500 mA x 2 MT 207 CT**	£1.48 20p
0-15-20 x 2	500 mA x 2 MT 205 AT**	£2.12 29p
0-15-27 x 2	500 mA x 2 MT 203 AT**	£2.45 29p
0-15-27 x 2	1A x 2 MT 204 AT**	£3.42 30p
10-12-0-12-20	700 mA (d.c.) MT 221 AT**	£1.11 25p

AT indicates open universal fixing with tags; CT is open U-clamp fixing with tags; CS is open U-clamp fixing with P.C. spalls; * with interwinding screen; † tapped 240V Primary; ‡ Primary tapped at 210-240V; other Primaries tapped at 200-220-240V.
Over 200 types in stock through agents or direct. Send for list.

DOUGLAS ELECTRONICS INDUSTRIES LTD.
(Dept. MO. 55), Thames Street, LOUTH, Lincs.

Please mention
PRACTICAL ELECTRONICS
when replying to
Advertisements

D. H. COMPONENT FACTORS Ltd. Dept. P.E.
For Eagle, Sinclair, Data Books and Components. 1W 5% resistors 1p or 60p/100. Electrolytic C426 4/40, 8/40, 10/16, 32/10, 25/25, 100/6-4, all 4p. IN914 6p. 100V 1A Bridge 40p. Panel neon 15p. Mains Transformers 32-0-32 at 150mA 50p; Electrolytic 1000/50 10p; 500/50 12p; 100 12p; 1000/25 25p; 1000/50 35p. UL914 30p; 7/40 0/1/10/30 15p. Free list, C.W.O. pp. U.K. 10p. Bargain Electrolytic packs. Send for list. Discount £10-10%. Money back guarantee. Brand new to spec. P.O. BOX 18, LUTON, BEDS, LU1 1SU.

MOTORISTS!

A Workshop Manual
will FREE you
from car repair bills

Save £££ on garage bills with your own Workshop Manual. It helps you do your own repairs and servicing easily, quickly, correctly. Simple step-by-step instructions, easy-to-follow diagrams, photos, charts. So easy to follow even a near-beginner can do a perfect job. Post your Free Trial Voucher below for your manual on 7 days Free Approval.
 DETAILED REPAIR AND SERVICING DATA.
 DURABLE STIFF COVER IN OIL-PROOF, LEATHER-EMBOSSED PVC.
 AVERAGE CONTENTS 175 LARGE, CLEAR PAGES.
 SPECIALLY WRITTEN FOR THE DIY MOTORIST.
 EASY-TO-CHECK FAULT-DIAGNOSIS TABLES WITH EVERY SECTION.

IS YOUR CAR HERE?

ALFA ROMEO	PORSCHE
Cadila 1900 1967 71	266A 266B 266C 1957 65
ALFA 101	911 912 964 82
Mini with Chassis 1958 71	914 917
Mini Cooper - 19 1967 72	Model M 3 1/2 6 1951 82
AMC 400 1967 71	8 22 16 816 818 820 82 71
AMC 1 2 3 1964 71	1291 1271 1369 71
AMC 118 1955 58	VAN DIE 1021 1041 1045 72
1100 1300 1500 1 2 1963 71	WOLSKEL
1800 161 2 5 1964 71	1100 1101 2 1960 70
Mini 1000 1700 1961 71	1400 1401 2 1961 70
ALFA 101 1961 71	1600 1601 2 1961 70
ALFA 101 1961 71	1800 1801 2 1961 70
Alfa 101 1961 71	2000 2001 2 1961 70
Alfa 101 1961 71	2200 2201 2 1961 70
Alfa 101 1961 71	2400 2401 2 1961 70
Alfa 101 1961 71	2600 2601 2 1961 70
Alfa 101 1961 71	2800 2801 2 1961 70
Alfa 101 1961 71	3000 3001 2 1961 70
Alfa 101 1961 71	3200 3201 2 1961 70
Alfa 101 1961 71	3400 3401 2 1961 70
Alfa 101 1961 71	3600 3601 2 1961 70
Alfa 101 1961 71	3800 3801 2 1961 70
Alfa 101 1961 71	4000 4001 2 1961 70
Alfa 101 1961 71	4200 4201 2 1961 70
Alfa 101 1961 71	4400 4401 2 1961 70
Alfa 101 1961 71	4600 4601 2 1961 70
Alfa 101 1961 71	4800 4801 2 1961 70
Alfa 101 1961 71	5000 5001 2 1961 70
Alfa 101 1961 71	5200 5201 2 1961 70
Alfa 101 1961 71	5400 5401 2 1961 70
Alfa 101 1961 71	5600 5601 2 1961 70
Alfa 101 1961 71	5800 5801 2 1961 70
Alfa 101 1961 71	6000 6001 2 1961 70
Alfa 101 1961 71	6200 6201 2 1961 70
Alfa 101 1961 71	6400 6401 2 1961 70
Alfa 101 1961 71	6600 6601 2 1961 70
Alfa 101 1961 71	6800 6801 2 1961 70
Alfa 101 1961 71	7000 7001 2 1961 70
Alfa 101 1961 71	7200 7201 2 1961 70
Alfa 101 1961 71	7400 7401 2 1961 70
Alfa 101 1961 71	7600 7601 2 1961 70
Alfa 101 1961 71	7800 7801 2 1961 70
Alfa 101 1961 71	8000 8001 2 1961 70
Alfa 101 1961 71	8200 8201 2 1961 70
Alfa 101 1961 71	8400 8401 2 1961 70
Alfa 101 1961 71	8600 8601 2 1961 70
Alfa 101 1961 71	8800 8801 2 1961 70
Alfa 101 1961 71	9000 9001 2 1961 70
Alfa 101 1961 71	9200 9201 2 1961 70
Alfa 101 1961 71	9400 9401 2 1961 70
Alfa 101 1961 71	9600 9601 2 1961 70
Alfa 101 1961 71	9800 9801 2 1961 70
Alfa 101 1961 71	10000 10001 2 1961 70

Manuals for these cars and others in our series
ONLY £2.10
(42.-) POST FREE

MANY OTHER MANUALS IN STOCK!
If your car is not listed, send coupon and if the manual is in stock we will send it 7 days free approval.
Phone orders/enquiries dealt with at once. Phone Brighton (0273) 66161, and ask for Dept. PEL 1.

YOUR FREE TRIAL VOUCHER
Send no money!
To: AUTOBOOKS LTD.
Golden Lane, Brighton BN1 2QJ
Please send me a Workshop Manual on 7 days Free Approval. I promise to send you £2.10 if I decide to keep the book. Otherwise, I will return it within 7 days and pay you nothing.

Year Make
Model
Name
Address
PEL 1
AUTOBOOKS
Offer applies to U.K. residents only.

OSMABET LTD.

We make transformers amongst other things

MAINS TRANSFORMERS
Prim. 200/240V a.c. TX6, 425-0-425V. 500 Ma. 6-3V 6A CT, 6-3V 6A CT, 0-5-6-3V 3A, £12.75; TX1, 425-0-425V, 250Ma, 6-3V 4A CT, 6-3V 4A CT 0-5-6-3V, 3A, £7.50; TX2, 250-0-250V, 150mA, 6-3V 4A CT, 0-5-6-3V, 3A, £4.05; TX5, 300-0-300V, 120mA, 6-3V 2A CT, 6-3V, 2A, 6-3V, 1A, £4.05; TX8, 250-0-250V, 65mA, 6-3V, 1A, £2.10; MT1, 200V, 30mA, 6-3V, 1A, £1.20; MT2, 230V, 45mA, 6-3V, 1.5A, £1.60; MT2A, 250V, 60mA, 6-3V, 2A, £1.95; MT3 Prim. 110/240V, Sec. 250V, 100mA, 6-3V, 2A, £2.25.

AUTO TRANSFORMERS
0-110-200-220-240V a.c. up or down fully shrouded fitted insulated terminal blocks. 30W £1.35; 50W £1.80; 75W £2.10; 100W £2.55; 150W £3.15; 200W £3.90; 300W £5.25; 400W £6.30; 500W £7.50; 600W £8.25; 750W £9.75; 1000W £12.75; 1500W £18; 2000W £24.75; 3000W £33; 4000W £45.

MULTIVOLT TRANSFORMERS
Prim. 200/240V a.c. OMT4/1 tapped sec. 0-60V 1A, £2.25; OMT4/2, ditto 2A, £3.45; OMT5/1 tapped sec. 0-110V 1A, £3.45; Duo sec. 12V 4A-12V 4A, £3.60; Duo sec. tapped, 0-10-20-25V 2A-0-10-20-25V 2A, £3.60.

LOW VOLTAGE TRANSFORMERS
Prim. 200/240V a.c. 6-3V, 1.5A, 85p; 3A, £1.13; 6A CT, £1.80; 12V, 1.5A, £1.13; 3A CT, £1.80; 6A CT, £2.70; 11-0-11V CT, £1.80; 24V, 1.5A CT, £1.80; 3A CT, £2.70; 6A, £2.75; 8A, £3; 12A, 9p; 40V, 3A CT, £3.45.

FIDWEE RECTIFIER TRANSFORMERS
For FW rect., size 1 1/2 x 2 x 1 1/2in. Prim. 200/240V a.c. output, PPT1, 9-0-9V, 0-3A, PPT2, 12-0-12V, 0-25A, PPT3, 20-0-20V, 0-15A, £1.20 each; ditto, size 2 x 2 1/2 x 1 1/2in. MTV1, 9-0-9V, 1A, 98p; MTV2, 12-0-12V, 1A, MTV3, 20-0-20V, 0-7.5A, £1.20 each.

O/P TRANSFORMERS FOR POWER AMPLIFIERS
P.P. sec. tapped 3-7.5-15 ohms, A-A-6-6kΩ, 30W (KT86), £2.05; 50W, 3kΩ, A-A, £6.75; 100W, 3kΩ, A-A, £L34 (KT88), etc. £11.40 and to 400W.
LOUDSPEAKERS FOR POWER AMPLIFIERS
New, famous makes, 15W with tweeter, £4.99; 25W, 45-60; 35W, 47-20; 50W, £10.60; 100W, £22.50; E.M.I. 134 x 8in 10W, 3 or 8 or 15 ohms, £2.00. Ditto with two tweeters and Xover, £4.00; Horn Tweeters 2-16kHZ 10W 8 or 16 ohms, £1.50; HI-FI, 8 x 6in 8Ω, £1.85; 10 x 6in 3 or 8 or 15Ω, £2.10.

G.E.C. MANUAL OF POWER AMPLIFIERS
Covering valve amplifiers of 30 to 400 watts, with price list of transformers and chokes specified, 25p.
LOUDSPEAKERS
2 1/2in 16Ω, 2 1/2in 25Ω, 3in 8 or 30Ω, 60p each; 3 1/2in 3 or 15Ω, 4in 8 or 15Ω, 5in 3, 15 or 25Ω, 5 x 3in 3, 8, 15 or 25Ω, 90p each; 6 x 4in 8 or 25Ω, 7 x 4in 3Ω, 8in 3Ω, £1.08; 8 x 5in 3, 8, 15 or 25Ω, £1.60; 8in 3Ω, £1.85.

SPEAKER AUTO MATCHING TRANSFORMER 12W
3 to 8 or 15 ohms, up or down, 75p. P. & P. 15p.
MINIATURE RELAYS FOR MODELS, ETC.
1 x 1 x 1 1/2in 10z, with transparent cover, 2 C.O. in 9; 15; 20 or 30V d.c. 50p each.
BULK TAPE ERASERS
Instant erasure, tape spools and cassettes, demagnetizes tape heads, a.c. 200/250V, £2.40 plus 24p P. & P.
PRINTED CIRCUIT ETCHING KITS
Complete outfit; solutions and equipment to make your own P.C. boards instructions, £1.40, P. & P. 21p.
Extra p.c. Boards 8 x 6in, 15p each.
TAPE RECORDER LISTS
A variety of uses, Blowers, Fans, etc., new. 230/250V a.c. 50p each.
CONDENSERS
Paper: 0-01/2KV 12p; 0-1/1KV 12p; 0-22/1KV 20p; 0-22/800V a.c. 25p; 0-47/700V 15p; 0-47/1KV 25p; 4/500V 25p. Electrolytics: 100 + 200/270V 40p; 100 + 200/350V 50p; 100 + 450/450V 30p; 450 + 200/225V 15p; 100 + 400/275V 20p; 24/450V 10p; 2500/64V 50p

BATTERY ELIMINATORS/POWER UNITS
To operate battery equipment from mains 200/240V a.c. Outputs, 6V, £1.55; 9V, £1.50; 7.5V (for cassettes), £2.00; 12V 1A, £3.90; 40V 1A, £4.50.
Carriage extra on all orders, etc.
MAIL ORDER ONLY
S.A.E. INQUIRIES TO: DEPT. P.E.6
45 Kenilworth Road, Edgware, Middx. HA8 8YG
Tel. 01-968 9314

The largest selection

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

PIV	1A	3A	7A	10A	16A	30A
50	0.22	0.25	0.47	0.50	0.53	1.15
100	0.25	0.33	0.53	0.58	0.63	1.40
200	0.35	0.37	0.57	0.61	0.75	1.60
400	0.43	0.47	0.67	0.75	0.93	1.75
600	0.53	0.57	0.77	0.87	1.25	—
800	0.83	0.70	0.90	1.20	1.50	4.00

SIL. RECTS. TESTED

PIV	300mA	750mA	1A	1.5A	3A	10A	30A
50	0.04	0.05	0.05	0.07	0.14	0.21	0.47
100	0.04	0.06	0.05	0.13	0.18	0.23	0.75
200	0.05	0.09	0.08	0.14	0.20	0.24	1.00
400	0.06	0.13	0.07	0.20	0.27	0.37	1.25
600	0.07	0.16	0.10	0.23	0.34	0.46	1.85
800	0.10	0.17	0.13	0.25	0.37	0.55	2.00
1000	0.11	0.25	0.15	0.30	0.46	0.63	2.50
1200	—	0.33	—	0.33	0.57	0.75	—

TRIACS

VDMO	2A	6A	10A
TO-1	TO-66	TO-88	
\$p	\$p	\$p	
100	30	50	78
200	50	60	90
400	70	75	1-10

DIACS

FOR USE WITH TRIACS
BR100 D32 . . . 37p each

UNIUNION

UT46, Evt. 2N2646, Eqt. T1843, BEN3000
87p each, 25-99 25p
100 up 20p.

NPN SILICON PLANAR

BC107/108, 10p each;
60-99, 9p; 100 up,
8p each; 1,000 oil,
7p each. Fully tested
and coded TO-18 case.

FREE

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

SPECIAL OFFER

2N2926 (Y) (O). 10 for
60p, 25 for \$1. 20,000
TO CLEAR.

CADMIUM CELLS

ORP12 43p
ORP60, ORP61 40p each

GENERAL PURPOSE

NPN SILICON SWITCHING
TRANS. TO-18
SIM. TO 2N706/9,
BSY27 98.95A. Available
devices no open or short
circuits. ALSO AVAIL-
ABLE IN PNP Sim. to
2N2906, BCY70. When
ordering please state
preference NPN or PNP.
\$p

20 For	0.50
50 For	1.00
100 For	1.75
300 For	7.50
1000 For	13.00

PHOTO TRANS.

OC71 Type. 43p

SIL. G.P. DIODES

300Mv. 30 . . . 0.50
40PIV (Min.) 100 . . . 1.50
Sub-Min. 300 . . . 5.00
Full Tested 1,000 . . . 9.00
Ideal for Organ Builders.

D13D1 Silicon Unilateral

switch 50p each.
A Silicon Planar, mono-
lithic integrated circuit
having thyristor electri-
cal characteristics, but
with an anode gate and a
built-in "Zener" diode
between gate and
cathode. Full data and
application circuits avail-
able on request.

FULL RANGE OF ZENER DIODES

VOLTAGE RANGE
2-33V, 400mV (DO-7
Case) 15p ea. 14W (Top-
Hat) 18p ea. 10W (SO-10
Stud) 25p ea. All fully
tested 5% tol. and
marked. State voltage
required.

10amp POTTED BRIDGE

RECTIFIERS on heat
sink. 100 PIV. 90p each.

JUMBO COMPONENT

PAKS
MIXED
ELECTRONIC
COMPONENTS
Exceptionally
good value

Resistors, capacitors,

pot. electrolytics and
coils plus many other
useful items. Approx-
imately 3lbs in weight.
Price incl. P. & P.
\$1.50 only
Plus your satisfaction or
money back guarantee.

BRAND NEW TEXAS

GERM. TRANSISTORS
Coded and Guaranteed

Pak No. EQ1 T

T1	8 2G371B	OC71
T2	8 1D1374	OC75
T3	8 1D1216	OC81D
T4	8 2G381T	OC81
T5	8 2G382T	OC82
T6	8 2G341B	OC44
T7	8 2G343B	OC45
T8	8 2G378	OC78
T9	8 2G399A	2N1302
T10	8 2G417	AF117

All 50p each pak

2N2060 NPN SIL. DUAL

TRANS. CODE D1699
TEXAS. Our price 25p
each.

120 VCB NIXIE DRIVER

TRANSISTOR. Sim.
BSX21 & C407, 2N1803
FULLY TESTED AND
CODED ND120. 1-24
17p each. TO-5 N.P.N.
25 up 16p each.

Sil. trans. suitable for

P.E. Organo. Metal TO-18
Eqt. ZTX300 5p each.
Any Qty.

NEW LINE

PLASTIC ENCAPSULATED 2 AMP BRIDGE RECTS.

Each	Price
50V RMS 32p	
100V RMS 37p	
400V RMS 46p	

Size 15mm x 6mm

KING OF THE PAKS Unequaled Value and Quality

SUPER PAKS NEW BI-PAK UNTESTED SEMICONDUCTORS

Satisfaction GUARANTEED In Every Pak, or money back.

Pak No.	Description	\$p
U1	120 Glass sub-min. general purpose germanium diodes	0.50
U2	60 Mixed germanium transistors AF/RF	0.50
U3	75 Germanium gold bonded diodes sim. OA5, OA47	0.50
U4	40 Germanium transistors like OC81, AC128	0.50
U5	60 200mA sub-min. Sil. diodes	0.50
U6	30 Silicon planar transistors NPN sim. BSY95A, 2N706	0.50
U7	16 Sil. rectifiers Top-Hat 750mA up to 1,000V	0.50
U8	50 Sil. planar diodes 250mA, OA/200/202	0.50
U9	20 Mixed volts 1 watt Zener diodes	0.50
U11	25 PNP silicon planar transistors TO-5 sim. 2N1132	0.50
U13	30 PNP-NPN sil. transistors OC200 & 28104	0.50
U14	150 Mixed silicon and germanium diodes	0.50
U15	25 NPN Silicon planar transistors TO-5 sim. 2N697	0.50
U16	10 3-Amp silicon rectifiers stud type up to 1000 PIV	0.50
U17	30 Germanium PNP AF transistors TO-5 like ACY 17-22	0.50
U18	8 6-Amp silicon rectifiers BYZ13 type up to 600 PIV	0.50
U19	25 Silicon NPN transistors like BC108	0.50
U20	12 1.5-Amp silicon rectifiers Top-Hat up to 1,000 PIV	0.50
U21	30 A.F. germanium alloy transistors 2G300 series & OC71	0.50
U23	30 Mads' like MAT series PNP transistors	0.50
U24	20 Germanium 1-Amp rectifiers 4JM up to 300 PIV	0.50
U25	25 300Mc/s NPN silicon transistors 2N708, BSY27	0.50
U26	30 Fast switching silicon diodes like IN914 micro-min	0.50
U29	10 1-Amp SCR's TO-5 can up to 600 PIV CR81/25-600	1.00
U31	20 Sil. Planar NPN trans. low noise amp 2N3707	0.50
U32	25 Zener diodes 400mV D07 case mixed volts, 3-18	0.50
U33	15 Plastic case 1 amp silicon rectifiers IN4000 series	0.50
U34	30 Sil. PNP alloy trans. TO-5 BCY26, 28302/4	0.50
U35	25 Sil. planar trans. PNP TO-18 2N2906	0.50
U36	25 Sil. planar NPN trans. TO-5 BFY50/51/52	0.50
U37	30 Sil. alloy trans. 80-2 PNP, OC200 28322	0.50
U38	20 Fast switching sil. trans. NPN, 400Mc/s 2N3011	0.50
U39	30 RF germ. PNP trans. 2N1303/5 TO-5	0.50
U40	10 Dual trans. 6 lead TO-5 2N2060	0.50
U41	25 RF germ. trans. TO-1 OC45 NKT72	0.50
U42	10 VHF germ. PNP trans. TO-1 NKT667 AF117	0.50
U43	25 Sil. trans. plastic TO-18 A.P. BC113/114	0.50
U44	20 Sil. trans. plastic TO-5 BC115/116	0.50
U45	7.3A SCR's TO-66 up to 600 Piv.	1.00

Code Nos. mentioned above are given as a guide to the type of device in the Pak. The devices themselves are normally unmarked.

NEW QUALITY TESTED PAKS

Pak	Description	Price \$p
Q1	20 Red spot trans. PNP AF	0.50
Q2	16 White spot R.F. trans. PNP	0.50
Q3	4 OC77 type trans.	0.50
Q4	6 Matched trans. OC44/45/81/81D	0.50
Q5	4 OC75 transistors	0.50
Q6	4 OC72 transistors	0.50
Q7	4 AC128 trans. PNP high gain	0.50
Q8	4 AC126 trans. PNP	0.50
Q9	7 OC71 type trans.	0.50
Q10	7 OC71 type trans.	0.50
Q11	2 AC127/128 comp. pairs PNP/NPN	0.50
Q12	3 AF116 type trans.	0.50
Q13	3 AF117 type trans.	0.50
Q14	3 OC171 H.F. type trans.	0.50
Q15	5 2N2926 sil. epoxy trans.	0.50
Q16	2 GET880 low noise germ. trans.	0.50
Q17	3 NPN 1 ST141 & 2 ST140	0.50
Q18	4 Mads' 2 MAT 100 & 2 MAT 120	0.50
Q19	3 Mads' 2 MAT 101 & 1 MAT 121	0.50
Q20	4 OC44 germ. trans. A.F.	0.50
Q21	3 AC127 NPN germ. trans.	0.50
Q22	20 NKT trans. A.F. R.F. coded	0.50
Q23	10 OA202 sil. diodes sub-min.	0.50
Q24	8 OA81 diodes	0.50
Q25	6 IN914 sil. diodes 75PIV 75mA	0.50
Q26	8 OA95 germ. diodes sub-min. IN69	0.50
Q27	2 10A 600PIV sil. rect. 1B40R	0.50
Q28	2 Sil. power rect. BYZ13	0.50
Q29	4 Sil. trans. 1 x 2N2906, 1 x 2N697, 1 x 2N698	0.50
Q30	7 Sil. switch trans. 2N706 NPN	0.50
Q31	6 Sil. switch trans. 2N708 NPN	0.50
Q32	3 PNP sil. trans. 2 x 2N1131, 1 x 2N1132	0.50
Q33	3 Sil. NPN trans. 2N1711	0.50
Q34	7 Sil. NPN trans. 2N2369, 500MHZ.	0.50
Q35	3 Sil. PNP TO-5 2 x 2N2904 & 1 x 2N2905	0.50
Q36	7 2N3646 TO-18 plastic 300MHZ NPN	0.50
Q37	3 2N3035 NPN sil. trans.	0.50
Q38	7 PNP trans. 4 x 2N3703, 3 x 2N3702	0.50
Q39	7 NPN trans. 4 x 2N3704, 3 x 2N3705	0.50
Q40	7 NPN amp. 4 x 2N3707, 3 x 2N3708	0.50
Q41	3 Silicon PNP TO-18 2N3904	0.50
Q42	6 NPN trans. 2N6172	0.50
Q43	7 BC107 NPN trans.	0.50
Q44	7 NPN trans. 4 x BC108, 3 x BC109	0.50
Q45	3 BC113 NPN TO-18 trans.	0.50
Q46	3 BC115 NPN TO-5 trans.	0.50
Q47	6 NPN high gain 3 x BC167, 3 x BC168	0.50
Q48	4 BCY70 NPN trans. TO-18	0.50
Q49	4 NPN trans. 2 x BFY61, 2 x BFY62	0.50
Q50	7 BSY28 NPN switch TO-18	0.50
Q51	7 BSY92A NPN trans. 300MHZ.	0.50
Q52	8 BY100 type sil. rect.	1.00
Q53	25 Sil. & germ. trans. mixed all marked new	1.60

PRINTED CIRCUITS—EX-COMPUTER

Packed with semiconductors and components, 10 boards give a guaranteed 30 trans and 30 diodes. Our price 10 boards, 50p. Plus 10p P. & P. 100 Boards \$3. P. & P. 30p.

SILICON PHOTO TRANSISTOR.

TO-18 Lens end. NPN Sim. to BFX 25 and P21. BRAND NEW. Full data available. Fully guaranteed.

Qty.	1-24	25-99	100 up
Price each	45p	40p	35p

FET's

2N3819 . . . 35p	2N5458 . . . 50p
2N3820 . . . 50p	2N5459 . . . 40p
2N3821 . . . 35p	BFW10 . . . 40p
2N3823 . . . 30p	MPF105 . . . 40p

NEW EDITION

TRANSISTOR EQUIVALENTS

BOOK. A complete cross reference and equivalents book for European, American and Japanese Transistors. Exclusive to BI-PAK 90p each. Red Cover Edition.

A LARGE RANGE OF TECHNICAL AND DATA BOOKS

ARE NOW AVAILABLE EX-STOCK. SEND FOR FREE LIST.

OUR STOCKS of individual devices are now too numerous to mention in this Advertisement. Send S.A.E. for our listing of over 1,000 Semiconductors. All available Ex-Stock at very competitive prices.

POWER TRANSISTOR BONANZA!

GENERAL PURPOSE GERM. PNP

Coded REPLACEMENT. BRAND NEW TO-3 CASE. POSS. REPLACEMENT: OC25-28-29-30-35-36. NKT 401-403-404-405-406-430-451-432-453. T1102-3028, 2N250A, 2N456A-457A-458A, 2N511 & B. 2G220-222, ETC. VCEO 80V VCEO 50V IC 10A PT. 30 WATTS Hfe 30-170. PRICE: 1-24 45p each 25-99 40p each 100 up 36p each

SILICON High Voltage 250V NPN

TO-3 case. G.P. Switching & Amplifier Applications. Brand new Coded R 2400 VCEO 250V VCEO 100IC 6A/30 Watts. HFE type 20/HT 5MHZ. OUR PRICE EACH: 1-24 60p 25-99 45p 100 up 40p

EX-STOCK TYPE EACH AS PRICED

OC20 50p	OC28 40p	AD149 45p	BD131 70p	BD139 75p
OC22 30p	OC29 40p	AL102 85p	BD132 80p	BD140 85p
OC23 33p	OC35 33p	AL103 85p	BD135 70p	BD150 75p
OC24 45p	OC36 40p	BD121 60p	BD136 80p	BU165 43
OC25 25p	AD14040p	BD123 75p	BD137 70p	2N3054 45p
OC26 25p	AD1240p	BD124 70p	BD138 80p	

2N3055

115 WATT SIL POWER NPN 50p EACH

AD161 NPN

M/P COMP GERM TRANS. OUR LOWEST PRICE OF 55p PER PAIR

- the lowest prices!

74 Series T.T.L. I.C.'s DOWN AGAIN IN PRICE

Check our 74 Series List before you buy any I.C.'s. Our prices are the lowest possible. All devices ex-stock. Full spec. guaranteed.

BI-PAK Order No.	Price and qty. prices			BI-PAK Order No.	Price and qty. prices		
	1-24	25-99	100 up		1-24	25-99	100 up
BP00=SN7400	0.15	0.14	0.12	BP86=SN7486	0.32	0.30	0.28
BP01=SN7401	0.15	0.14	0.12	BP90=SN7490	0.87	0.84	0.58
BP02=SN7402	0.16	0.14	0.12	BP91=SN7491AN	0.87	0.84	0.78
BP03=SN7403	0.16	0.14	0.12	BP92=SN7492	0.67	0.64	0.58
BP04=SN7404	0.15	0.14	0.12	BP93=SN7493	0.67	0.64	0.58
BP05=SN7405	0.15	0.14	0.12	BP94=SN7494	0.77	0.74	0.68
BP07=SN7407	0.18	0.17	0.16	BP95=SN7495	0.77	0.74	0.68
BP08=SN7408	0.18	0.17	0.16	BP96=SN7496	0.77	0.74	0.68
BP09=SN7409	0.18	0.17	0.16	BP100=SN74100	1.75	1.65	1.55
BP10=SN7410	0.15	0.14	0.12	BP104=SN74104	0.97	0.94	0.88
BP13=SN7413	0.29	0.26	0.24	BP105=SN74105	0.97	0.94	0.88
BP16=SN7416	0.43	0.40	0.38	BP107=SN74107	0.40	0.38	0.38
BP17=SN7417	0.43	0.40	0.38	BP110=SN74110	0.55	0.53	0.50
BP20=SN7420	0.18	0.14	0.12	BP111=SN74111	1.25	1.15	1.00
BP30=SN7430	0.15	0.14	0.12	BP118=SN74118	1.00	0.95	0.90
BP40=SN7440	0.15	0.14	0.12	BP119=SN74119	1.35	1.25	1.10
BP41=SN7441	0.67	0.64	0.58	BP121=SN74121	0.67	0.64	0.58
BP42=SN7442	0.67	0.64	0.58	BP141=SN74141	0.67	0.64	0.58
BP43=SN7443	1.85	1.85	1.75	BP145=SN74145	1.50	1.40	1.30
BP45=SN7445	1.85	1.85	1.75	BP150=SN74150	1.80	1.70	1.60
BP46=SN7446	0.87	0.84	0.88	BP151=SN74151	1.00	0.95	0.90
BP47=SN7447	0.87	0.84	0.88	BP152=SN74152	1.00	1.00	1.00
BP48=SN7448	0.87	0.84	0.88	BP154=SN74154	1.80	1.70	1.60
BP50=SN7450	0.15	0.14	0.12	BP155=SN74155	1.40	1.30	1.20
BP51=SN7451	0.15	0.14	0.12	BP156=SN74156	1.40	1.30	1.20
BP52=SN7452	0.15	0.14	0.12	BP160=SN74160	1.80	1.70	1.60
BP54=SN7454	0.15	0.14	0.12	BP161=SN74161	1.80	1.70	1.60
BP60=SN7460	0.15	0.14	0.12	BP162=SN74162	2.00	1.80	1.80
BP70=SN7470	0.29	0.26	0.24	BP163=SN74163	2.00	1.80	1.80
BP72=SN7472	0.29	0.26	0.24	BP181=SN74181	2.75	2.60	2.40
BP73=SN7473	0.37	0.35	0.32	BP182=SN74182	0.97	0.94	0.88
BP74=SN7474	0.37	0.35	0.32	BP190=SN74190	3.50	3.25	3.00
BP75=SN7475	0.47	0.45	0.42	BP191=SN74191	3.50	3.25	3.00
BP76=SN7476	0.43	0.40	0.38	BP192=SN74192	2.10	1.95	1.75
BP80=SN7480	0.67	0.64	0.58	BP193=SN74193	2.10	1.95	1.75
BP81=SN7481	0.67	0.64	0.58	BP235=SN74195	1.10	1.05	0.95
BP82=SN7482	0.67	0.64	0.58	BP196=SN74196	1.80	1.70	1.60
BP83=SN7483	1.10	1.05	0.95	BP197=SN74197	1.80	1.70	1.60
				BP198=SN74198	5.50	5.00	4.00
				BP199=SN74199	5.50	5.00	4.00

PRICE-MIX. Devices may be mixed to qualify for quantity prices.

PRICES for quantities in excess of 500 pieces mixed, on application.

Owing to the ever increasing range of TTL 74 Series, please check with us for supplies of any devices not listed above, as it is probably now in stock. WARE 3442.

LINEAR I.C.'s FULL SPEC.

Type No.	Price		
	1-24	25-99	100 up
BP 201C - SL201C	63p	58p	45p
BP 701C - SL701C	63p	50p	45p
BP 702C - SL702C	63p	50p	45p
BP 702 - 72702	53p	45p	40p
BP 709 - 72709	53p	45p	40p
BP 709P - μ A709C	53p	45p	40p
BP 710 - 72710	53p	45p	40p
BP 711 - μ A711	58p	50p	45p
BP 741 - 72741	78p	60p	50p
μ A 703C - μ A703C	43p	35p	27p
TAA 263 -	70p	60p	55p
TAA 293 -	90p	75p	70p
TAA 350 -	170p	158p	150p

S.G.S. EA 1000 £2.63.

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

Type No.	Price		
	1-24	25-99	100 up
BP930	12p	11p	10p
BP932	13p	12p	11p
BP933	13p	12p	11p
BP935	13p	12p	11p
BP936	13p	12p	11p
BP944	25p	24p	22p
BP946	12p	11p	10p
BP948	25p	24p	22p
BP951	65p	60p	55p
BP962	12p	11p	10p
BP9093	40p	38p	35p
BP9094	40p	38p	35p
BP9097	40p	38p	35p
BP9099	40p	38p	35p

Devices may be mixed to qualify for quantity price. Larger quantity prices on application. (DTL 930 Series only)

NUMERICAL INDICATOR TUBES

MODEL	CD66	GR116	3015F
Anode voltage (Vdc)	170 mm	175 mm	5 mm
Cathode current (mA)	2.3	14	8
Numerical height (mm)	16	13	9
Tube height (mm)	47	32	22
Tube diameter (mm)	19	13	12 wide
I.C. driver rec.	BP41 or 141	BP41 or 141	BP47
Price each	£1 70	£1 55	£1 90

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

STOP PRESS! NOW OPEN BI-PAK'S NEW COMPONENT SHOP

A wide range of all types of electronic components and equipment available at competitive prices.

18 BALDOCK ST. (A10) WARE, HERTS. Tel. 61593
OPEN 9.15-6 TUES. to SATS. FRIDAYS UNTIL 8 p.m.

BI-PAK DO IT AGAIN!

50W pk 25W (RMS)

0.1% DISTORTION!

HI-FI AUDIO AMPLIFIER

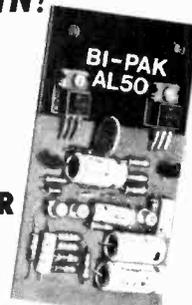
THE AL50

- ★ Frequency Response—15Hz to 100,000 Hz.
- ★ Load—3, 4, 8 or 16 ohms.
- ★ Distortion—better than 0.1% at 1kHz.
- ★ Signal to noise ratio 80dB.

ONLY

£3.25p each

- ★ Supply voltage 10-35 volts.
- ★ Overall size 63mm x 105mm x 30mm



Tailor made to the most stringent specifications using top quality components and incorporating the latest solid state circuitry and AL50 was conceived to fill the need for all your A.F. amplification needs. FULLY BUILT—TESTED—GUARANTEED.

STABILISED POWER MODULE

AP80 is especially designed to power 2 of the AL50 Amplifiers, up to 15 watt (r.m.s.) per channel, simultaneously. This module embodies the latest components and circuit techniques incorporating complete short circuit protection. With the addition of the Mains Transformer MT80, the unit will provide outputs of up to 1.5 amps at 35 volts. Size: 63mm x 105mm x 30mm.

These units enable you to build Audio Systems of the highest quality at a hitherto unobtainable price. Also ideal for many other applications including:—Disc Systems, Public Address, Intercom Units, etc. Handbook available, 10p.

STABILISED POWER MODULE SPM80 £2.95

TRANSFORMER BMT80 £1.95 p. & p. 25p

SPECIAL COMPLETE SET COMPRISING

2 AL50's, 1 SPM80 & 1 BMT80. ONLY £11 FREE P. & P.

DTL AND TTL INTEGRATED CIRCUITS

Manufacturers "Fall outs"—out of spec. devices including functional units and part functions, but classed as out of spec. from the manufacturers' very rigid specifications. Ideal for learning about I.C.'s and experimental work.

PAK No.	Price	PAK No.	Price
UIC930 = 12 x μ A 930	50p	UIC948 = 8 x μ A 948	50p
UIC932 = 12 x μ A 932	50p	UIC951 = 5 x μ A 951	50p
UIC933 = 12 x μ A 933	50p	UIC961 = 12 x μ A 961	50p
UIC935 = 12 x μ A 935	50p	UIC9093 = 5 x μ A 9093	50p
UIC936 = 12 x μ A 936	50p	UIC9094 = 5 x μ A 9094	50p
UIC944 = 12 x μ A 944	50p	UIC9097 = 5 x μ A 9097	50p
UIC945 = 8 x μ A 945	50p	UIC9099 = 5 x μ A 9099	50p
UIC946 = 12 x μ A 946	50p	UICX9 29 Assorted 930 Series	£1 50

PAKs cannot be split but 25 Assorted Pieces (our mix) is available as PAK UICX9. Data Booklet available for the BP930 Series. PRICE 13p.

UIC00 = 12 x 7400N	50p	UIC46 = 5 x 7446N	50p	UIC81 = 5 x 7481N	50p
UIC01 = 12 x 7401N	50p	UIC47 = 5 x 7447N	50p	UIC82 = 5 x 7482N	50p
UIC02 = 12 x 7402N	50p	UIC48 = 5 x 7448N	50p	UIC83 = 5 x 7483N	50p
UIC03 = 12 x 7403N	50p	UIC50 = 12 x 7450N	50p	UIC86 = 5 x 7486N	50p
UIC04 = 12 x 7404N	50p	UIC51 = 12 x 7451N	50p	UIC90 = 5 x 7490N	50p
UIC05 = 12 x 7405N	50p	UIC53 = 12 x 7453N	50p	UIC91 = 5 x 7491N	50p
UIC10 = 12 x 7410N	50p	UIC54 = 12 x 7454N	50p	UIC92 = 5 x 7492N	50p
UIC13 = 8 x 7413N	50p	UIC60 = 12 x 7460N	50p	UIC93 = 5 x 7493N	50p
UIC20 = 12 x 7420N	50p	UIC70 = 8 x 7470N	50p	UIC94 = 5 x 7494N	50p
UIC40 = 12 x 7440N	50p	UIC72 = 8 x 7472N	50p	UIC95 = 5 x 7495N	50p
UIC41 = 5 x 7441AN	50p	UIC73 = 8 x 7473N	50p	UIC96 = 5 x 7496N	50p
UIC42 = 5 x 7442N	50p	UIC74 = 8 x 7474N	50p	UIC121 = 5 x 74121N	50p
UIC43 = 5 x 7443N	50p	UIC75 = 8 x 7475N	50p	UICX1 = 25 x Ass'd	74's £1 50
UIC44 = 5 x 7444N	50p	UIC76 = 8 x 7476N	50p		
UIC45 = 5 x 7445N	50p	UIC80 = 5 x 7480N	50p		

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

BI-PAK

P.O. BOX 6, WARE · HERTS

Postage and packing add 7p. Overseas add extra for airmail.
Minimum order 50p. Cash with order please.

Guaranteed Satisfaction or Money Back

Practical Electronics Classified Advertisements

RATES: 8p per word (minimum 12 words). Box No. 10p extra. Advertisements must be prepaid and addressed to Classified Advertisement Manager, "Practical Electronics" IPC MAGAZINES LTD., Fleetway House, Farringdon Street, London EC4A 4AD

MISCELLANEOUS

YOUNG SCIENTISTS

and not-so-young, whether beginner or advanced — we offer a range of over 35 SUPER projects.

Have you ever wanted to build A MACHINE THAT LEARNS? Or perhaps make a TEACHING DEVICE? Maybe you fancy the idea of an ELECTRONIC FANTASY MACHINE? How about a "Thing" capable of REPRODUCING ITSELF? Whatever your electronic turn-of-mind, there's just GOT TO BE LEADS TO INTEREST YOU in the science-fiction-world of BOFFIN.

GET YOUR CATALOGUE — SEND JUST 15p NOW! (S.A.E. for details).

TO: BOFFIN PROJECTS

4 CUNLIFF ROAD
STONELEIGH, EWELL
SURREY

Designs by GERRY BROWN and JOHN SALMON and presented on TV.

ELECTRONIC MUSIC

Build your own units or even a complete sound machine from our circuit assemblies. These include L-C Ring Modulator, Phasing amps, White Sound effects, auto Waa-Waa, an amazing V-C oscillator, and many others. Send 10p for catalogue; mail order only.

TAYLOR ELECTRONIC MUSIC DEVICES
GREYFRIARS HOUSE • CHESTER

GLASS FIBRE OPTIC

FLEXIBLE LIGHT PIPE, now available in any length. 150 + glass fibres with three times lower loss than plastic fibre. P.V.C. sheath 0.080 in. dia.

Used like wire but to convey light to remote or inaccessible positions for inspection, panel indicators, photo-electric and other applications. Prices per ft. (post free): 1-9, 25p; 10-49, 20p; 50-249, 15p. Enquiries S.A.E.

FIBRE OPTIC SUPPLIERS

P.O. BOX 702, LONDON W10 6SL

PROFESSIONAL CONTROL PANELS

with **FASCIA KIT**

MAKE YOUR OWN PANELS IN PERMANENT, ANODISED, SELF-ADHESIVE ALUMINIUM. NO SPECIAL EQUIPMENT NEEDED. EASY TO FOLLOW INSTRUCTIONS. CHOICE OF SILVER ON BLACK, RED, BLUE, GREEN.

TRIAL KIT £1.28 Carr. Paid
No. 1 KIT £1.88 Carr. Paid
No. 2 KIT £2.39 Carr. Paid

M.P.E. Ltd., BRIDGE ST., CLAY CROSS, DERBYS.

CLEARING LABORATORY, scopes, V.T.V.M's, V.O.M's, H.S. recorders, transcription turntables, electronic testmeters, calibration units, P.S.U.'s, pulse generators, D.C. null-potentiometers, bridges, spectrum analysers, voltage regulators, sig-gens, M/C relays, components, etc. Lower Beeding 236.

CHEAP FAST LOGIC EX-IGT. 2, 4, 6 DTL gates per board, suit 100ns clock (1MHz rate) Circuits, write-ups 50p. Free with order. 10 Boards £1.50. CHAPLIN, 14 Warminster Road, London, S.E.25.

DAILY UFO flight pattern, 38p. UFO wave pattern and prediction, 45p. TV notes on UFO detection, 2 optical circuits, 50p. UFO map (S. England), 38p. R. & E. PUBLICATIONS, Highlands, Needham Market, Suffolk.

CHROMASONIC ELECTRONICS is well and living at 56 Fortis Green Road, London, N10 3HN. 40-page illustrated catalogue 20p post free.

12 VOLT FLUORESCENT LIGHTS

(as illustrated)



Beat power cuts. Be independent. Ideal for caravans, tents, emergency lighting, etc. Works anywhere where 12v is available. Guaranteed for six months. Ready to use at:

12ins. 8 watt £3.60 post paid
21ins. 13 watt £4.60 post paid

**SALOP ELECTRONICS, 23 WYLE COP
SHREWSBURY, SHROPSHIRE.** Callers welcome. For lists or enquiries, large.s.a.e.

CONSTRUCTION AIDS. Fascia panels, dials, nameplates in etched aluminium to individual specification. Sheet aluminium, printed circuits—drafting tapes, negatives supplied, boards manufactured, singles or small runs. Copper clad laminate supplied. Hardware for constructors. S.A.E. details. **RAMAR CONSTRUCTOR SERVICES, 29 Shelbourne Road, Stratford-on-Avon, Warwicks.**

RECORD T.V. SOUND using our loudspeaker isolating transformer. Provides safe connection to recorder. Instructions included, £1 post free. **CROWBOROUGH ELECTRONICS (P.L.),** Eridge Road, Crowborough, Sussex.

BUILD IT in a DEWBOX quality cabinet 2in x 2½in x any length. **DEW LTD.,** Ringwood Road, Ferndown, Dorset. S.A.E. for leaflet. Write now—right now.

CIRCUIT BOARD ETCHING KITS, full instructions, £1.25, c.w.o. **ARVIN SERVICE COMPANY, 12 Cambridge Road, St. Albans, Herts.**

NO NEED TO WORRY ABOUT A TRANSMITTING LICENCE

because this GPO approved transmitter/receiver kit does not use R.F. and you can get one easily. Your transmissions will be virtually SECRET since they won't be heard by conventional means. Actually it's TWO KITS IN ONE because you get all the printed-circuit boards and components for both the transmitter AND receiver. You're going to find this project REALLY FUN-TO-BUILD with the EASY-TO-FOLLOW instructions. An extremely flexible design with quite an AMAZING RANGE—has obvious applications for SCHOOL PROJECTS, LANGUAGE LABORATORIES, SCOUT CAMPS, etc.

GET YOURS! SEND £5.50 NOW (S.A.E. for details)
TO: **BOFFIN PROJECTS**
DEPT. KE2010
4 CUNLIFF ROAD
STONELEIGH, EWELL, SURREY

SONY VIDEO-TAPE RECORDER OUTFIT. Brand new with makers' guarantee. System comprising: "V.T.R.", camera and lens; tripod; microphone; 9in TV monitor (video/broadcast); cables and carrying case. 1 hour record/playback. Superb picture. Absolute bargain for complete outfit. £395. **HORNTON'S ELECTRONICS LTD.,** 15 Navigation Street, Birmingham, 2. Tel. 021-643 0972.

AUTOMATIC CHORDS. Add them to your organ using our unit. S.A.E. details. **MOLLOY,** Elm Road, Tokers Green, Reading, Berks.

13 DISTRIBUTION AMP PANEL

£6.75



A quality job!
FOUR 13 amp 3-pin shuttered Socket Outlets PLUS On/Off switch PLUS Magnetic Circuit breaker. A red neon warning indicator operates when in use. 30ft (9 metres) approx. lead. Size: 17in x 6¼in x 2¼in approx. with rubber feet. Attractive grey housing. Saves trouble replacing fuses. If you draw too much current, it switches off automatically. Safe and quick! Only £6.75 +40p P. & P. Send £7.15.

MICROJET WELDER

A TINY FLAME UP TO 5000°F!
WELDS METALS
SOLDERS

£10.99

FLAME TUBE
A precision tool using a combination of butane and compressed oxygen. U.S.A. manufactured. Gives two sizes of flame of pencil lead thickness. Adjustable temperatures up to 5,000°F. Lights instantly, no priming. Cuts metals, welds, brazes and solders, etc., gold and silver. Ideal for electronics and electrical engineering, jewellers, clockmakers, silversmiths. Up to 40 minutes' operation using fuel supplied. Replacement set of 2 oxygen and 1 butane cylinders £1.60 inc. post. Complete with instructions. Our price £10.99 + 31p P. & P. Send £11.30. **TWIN-BEAM SPEC-LAMP**—Worn just like a pair of spectacles. Two powerful spot lamps illuminate working area. See close up work with less eye strain and fatigue. Battery operated. Only £1.90 +10p P. & P. Send £2.

JOHN DUDLEY & CO. LTD., Dept. PE4
301 Cricklewood Lane, Child's Hill, London, N.W.2
Tel. 01-468 5917. Callers welcome.

ANALOGUE COMPUTERS

Shorts General Purpose Analogue Computers, complete with stabilised power supplies and double beam oscilloscope for display of results. 18 Function Units (integrators/summers), etc. £200. Details on request. Demonstration by appointment. Instruction Manual and some spares available.

The Oakhill Press, Oakhill, Bath BA3 5HU
Oakhill 255 (day and evening)

P.E. GEMINI. Etched aluminium fascia panels as detailed in latest publication. Printed circuit boards and other items. S.A.E. details. **RAMAR CONSTRUCTOR SERVICES, 29 Shelbourne Road, Stratford-on-Avon, Warwick.**

SERVICE SHEETS

SERVICE SHEETS (1925-1972) for Televisions, Radios, Transistors, Tape Recorders, Record Players, etc., by return post, with free Fault-Finding Guide. Prices from 5p. Over 8,000 models available. Catalogue 13p. Please send S.A.E. with all orders/enquiries. **HAMILTON RADIO, 54 London Road, Bexhill, Sussex.** Telephone, Bexhill 7097.

SERVICE SHEETS. Radio, TV, etc., 8,000 models. List 10p. S.A.E. enquiries. **TELRAY, 11 Maudland Bank, Preston.**

RADIO, TELEVISION AND TAPE RECORDERS. 50 mixed odd sheets 50p. Also large stock of obsolete and current valves. **JOHN GILBERT TELEVISION, 1b Shepherds Bush Road, London, W.6 (01-743 8441).** S.A.E. enquiries.

Department of

ELECTRICAL and ELECTRONIC ENGINEERING

4-year sandwich courses leading to C.N.A.A. Degrees in

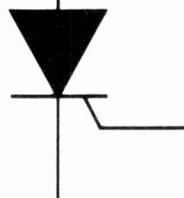
ELECTRONIC ENGINEERING
ELECTRICAL ENGINEERING
ELECTRO MECHANICAL ENGINEERING

Designed to cover all aspects of Electrical and Electronic Engineering. Both men and women are welcome on these courses.

H.N.D. in **ELECTRICAL and ELECTRONIC ENGINEERING**

Further details may be obtained from the Head of Department of Electrical and Electronic Engineering North Staffordshire Polytechnic, Beaconside, Stafford or telephone him at Stafford 52331.

Please quote reference 526 P.E. on both envelope and letter



GET INTO Electronics—opportunities for trained men. Learn at home. Postal courses in RTEB, City & Guilds, Radio, TV, Telecoms, etc. FREE informative guide: CHAMBERS COLLEGE (Dept. R.103), Aldermaston Court, Reading, RG7 4PF.

FOR SALE

SEEN MY CAT? 5,000 items. Mechanical and Electrical Gear, and materials. S.A.E. K. R. WHISTON, Dept. PE, New Mills, Stockport.

CATALOGUE NO. 18, Electronic and Mechanical Components, new and manufacturers' surplus. Credit vouchers value 50p. Price 23p, including post. ARTHUR SALLIS RADIO CONTROL LTD., 28 Gardner Street, Brighton, Sussex.

ELECTRONIC COMPONENTS, unused, cheap, clearing laboratory, for details write: G. SMITH, 3 Hart Road, Old Harlow, Essex.

MORSE MADE EASY!!
FACT NOT FICTION. If you start **RIGHT** you will be reading amateur and commercial Morse within a month (normal progress to be expected).

Using scientifically prepared 3-speed records you automatically learn to recognise the code **RHYTHM** without translating. You can't help it, it's as easy as earning a tune. 18 W.P.M. in 4 weeks guaranteed.

Complete Course **£4.50** (Overseas £1.00 extra) details only, 4p stamp. 01-660 2896.

G5HSC (Box 19), 45 GREEN LANE, PURLEY, SURREY

PERFECT SPEAKERS EX TV

P.M. 3 OHM (Minimum order 2)
8" x 2 1/2" 15p each, add 10p per speaker P. & Pkg.
100 SPEAKERS for £15 delivered
200 SPEAKERS for £25 delivered

UHF TUNERS EX TV (Complete with Valves)
£1.50 each + 50p p. & pkg.
or 10 for £23 post free

TRADE DISPOSALS (Dept. PE)

Thornbury Roundabout, Leeds Road, Bradford
Telephone 665670

YUKAN SELF-SPRAY SO PROFESSIONAL THE YUKAN AEROSOL WAY -
Get these air drying GREY HAMMER BLACK WRINKLE OR (CRACKLE) finishes NOW!

Yukan Aerosol sprays contain 453g fine quality durable latex instant spray. No stove baking required. Hammer available in grey and blue. 800 can per Modern Eggshell Black Wrinkle (Crackle) producing a 30 textured finish. 900 can per Jet at 800 psi pump-action self spray can all over counter. Also durable nail and metal resistant Black Matt Finish (130g self-seal cans only). 750 can per SPECIAL OFFER One can glass operator transferable snap on trigger handle (value 25p) for 900 can per. Choice of 11 self-spray plain colours and primer (colour can quote) 1.80 per litre.

Other Yukan Air Drying Resepri: 453g at 900 can per includes 100 Christmas Tree Colour, Metallic Grey, Blue.

Please enclose cheque or crossed P.O. for total amount direct to:
DEPT. PE & YUKAN, 307a EDGWARE ROAD, LONDON W2 1BN
We supply many Government Departments, Municipal Authorities, Institutes and Leading Industrial Organizations—this can supply you too.
Close of day Saturday. Closed Thursday afternoons. New Britain even better.

OPTICS. "How to use Lenses and Mirrors". 112p. 100 ills. Hardback. Best book on the market for the newcomer to optics. £1 each on 14 days, approval against cash. New and ex-Gov. optical equipment of all types. 48 page illustrated catalogue free for 3p stamp. H. W. ENGLISH, 469 Rayleigh Road, Hutton, Brentwood, Essex. Dept. P.E.

AMBE (Elec), City & Guilds, RTEB Certs Radio Amateurs Cert. Study at home course in all branches of Electrical Engineering, etc. Details and illustrated book—FREE—BIET (Dept. H.5), Aldermaston Court, Reading RG7 4PF. Accredited by C.A.C.C.

ENGINEERS—get a technical certificate. Postal courses in Engineering, Electronics, Radio, TV, Computers, Draughtsmanship, Building, etc. FREE book from: BIET (Dept. H.4), Aldermaston Court, Reading, RG7 4PF. Accredited by C.A.C.C.

SITUATIONS VACANT

HIGH SALARY AND A SECURE FUTURE

Get into the Computer Industry the fast, easy way. In only 4 weeks we can train you for a career as a **COMPUTER OPERATOR**. With pay prospects of £2,500+ p.a. **JOBS GALORE!** Train with LCOTC and our exclusive appointments bureau—one of the leaders of its kind in the world—introduces you to eager computer users. Find out more FREE and without obligation. Write or telephone **TODAY!**

London Computer Operators Training Centre
E81, Oxford House
9-15, Oxford Street, W.1.
Telephone: 01-734 2874

127, The Piazza, Dept. E81,
Piccadilly Plaza, Manchester 1.
Telephone: 061-236 2935



Established 1891

TECHNICAL TRAINING IN RADIO, TELEVISION AND ELECTRONIC ENGINEERING

First-class opportunities in Radio and Electronics await the **ICS** trained man. Let **ICS** train YOU for a well-paid post in this expanding field.

ICS courses offer the keen, ambitious man the opportunity to acquire, quickly and easily, the specialized training so essential to success. Diploma courses in Radio/TV Engineering and Servicing, Colour TV Servicing, also Electronics, Computers, etc. Expert coaching for:

- * **C. & G. TELECOMMUNICATION TECHNICIANS' CERTIFICATES.**
- * **RADIO AMATEURS' EXAMINATION.**
- * **GENERAL RADIOCOMMUNICATIONS CERTIFICATE.**
- * **C. & G. RADIO SERVICING THEORY.**

Now available, Colour T.V. Servicing.

Examination Students coached until successful.

NEW SELF-BUILD RADIO AND ELECTRONIC COURSES

Build your own 5-valve receiver, transistor portable, signal generator and multi-meter. **All under expert guidance.**

POST THIS COUPON TODAY and find out how **ICS** can help YOU in your career. Full details of **ICS** courses in Radio, Television and Electronics will be sent to you by return mail.

MEMBER OF THE ABCC

ACCREDITED BY THE CACC

INTERNATIONAL CORRESPONDENCE SCHOOLS

International Correspondence Schools
(Dept. LA25), Intertext House, Stewarts Road,
London SW8 4UJ

NAME
Block Capitals Please

ADDRESS

AGE OCCUPATION

BOOKS AND PUBLICATIONS

PICTURE BOOK WAY OF LEARNING

BASIC ELECTRICITY 5 Vols. £4.50 post paid
 BASIC ELECTRONICS 6 Vols. £5.40 post paid
SELRAY BOOK COMPANY, 60 Hayes Hill, Bromley BR2 7HP

OVER 1,000,000 PARTS ALREADY SOLD

Available on our 100% Guarantee Money back if not completely satisfied

Illustrated Prospectus Free on Request

WANTED

CASH PAID for New Valves. Payment by return. **WILLOW VALE ELECTRONICS**, 4 The Broadway, Hanwell, London, W.7. 01-567 5400/2971.

HIGHEST POSSIBLE CASH prices for Akai, B. & O., Brenell, Ferragham, Revox, Sanyo, Sony, Tandberg, Uher, Vortexion, etc. 9.30-5.00. 01-242 7401.

TOP PRICES PAID

for new valves and components
 Popular T.V. and Radio types
KENSINGTON SUPPLIES
 (B) 367 Kensington Street
 Bradford 8, Yorks.

SMALL SECONDHAND AUTOMATIC private branch exchange required. **F. D. STAPLEY & SONS**, High House Farm, Kenardington, Ashford, Kent.

LADDERS

LADDERS. 20ft. £7.80. Callers Welcome. Carr. 80p. Leaflet. (Dept. PEE), HOME SALES, Baldwin Road, Stourport, Worcs. Phone 02-993 2574/5222. Ansaphone installed 5222. Open Sunday 8-12 noon.

RECEIVERS AND COMPONENTS

WITWORTH TRANSFORMERS

TV Line out-put transformers
 Manufacturers of the largest range in the country. All makes supplied.
 Free catalogue.

Modern
BAIRD, BUSH, GEC, PHILIPS
 Replacement types ex-stock.
 For "By-return" service, contact London 01-948 3702.

Tidman Mail Order Ltd., Dept. PE,
 236 Sandycombe Road,
 Richmond, Surrey TW9 2EQ

Valves, Tubes, Condensers, Resistors, Rectifiers and Frame out-put Transformers also stocked.
 Callers welcome.

SOUND SUPPLIES (LOUGHTON) CO. LTD.

for Eagle International and International Rectifier Products.
TOA P.A. Equipment and Mikes.
 Capacitors, Resistors, Plugs, Sockets, Cables, Audio Leads, Semiconductors, Valves, Vero Board, etc., for the constructor.

Electronics Dept. Tel. 01-508 2715
 12 Smart's Lane, Loughton, Essex
 Hours: 9.30 a.m.-1 p.m. 2-6 p.m., Mon., Tues., Wed. and Fri. 9.30 a.m.-1 p.m., 2-5.30 p.m. Sat. Closed All Day Thurs.

MINI MAINS TRANSFORMER MT7, 30mm x 30mm x 37mm, 7-0-7V r.m.s., 120mA, for 9V rectified d.c. Top quality component with really comprehensive data, 70p, U.K. post 5p. Mail order only. **AMATRONIX LTD.**, 396 Selsdon Road, South Croydon, Surrey, CR2 0DE.

RECEIVERS AND COMPONENTS

EX COMPUTER PRINTED CIRCUIT PANELS
 2in x 4in packed with semi-conductors and top quality resistors, capacitors, diodes, etc. Our price 10 boards 80p, P. & P. 7p. With a guaranteed minimum of 35 transistors. Data on transistors included.

SPECIAL BARGAIN PACK. 25 boards for £1. P. & P. 18p. With a guaranteed minimum of 85 transistors. Data on transistors included.

250 MIXED CAPACITORS 62p
 Plus 9p P. & P.

709C OPERATIONAL AMPLIFIER T05
 8 lead I.C. 1 off 50p. 50 off 35p.
 100 off 20p.

250 MIXED RESISTORS 62p
 1/2 & 1/4 watt.

150 MIXED HI STABS 62p
 1/2, 1/4 & 1 watt 5% & better.

QUARTZ HALOGEN BULBS
 12V 55W for car spot lights, projectors, etc. 50p each. P. & P. 5p.

GPO EXTENSION TELEPHONES
 with dial but without bell. 95p each. P. & P. 30p. £1.75 for 2. P. & P. 50p.

BARGAIN RELAY OFFER
 Single pole change over silver contacts 25V to 50V. 2.5kΩ coil. 8 for 50p. P. & P. 5p.

KEYTRONICS mail order only
44 EARLS COURT ROAD
LONDON, W.8 01-478 8499

PRECISION POLYCARBONATE CAPACITORS

Close tolerance capacitors by well-known manufacturer. Good stability and very low leakage. All 63V d.c.

0.47µF:	±5% 30p:	±2% 40p:	±1% 50p
1.0µF:	±5% 40p:	±2% 50p:	±1% 60p
2.2µF:	±5% 50p:	±2% 60p:	±1% 75p
4.7µF:	±5% 70p:	±2% 80p:	±1% £1.15
10µF:	±5% £1.10:	±2% £1.40:	±1% £1.80
15µF:	±5% £1.60:	±2% £2.10:	±1% £2.70

P.E. SCORPIO IGNITION SYSTEM

Special 1µF 440 V a.c. capacitor for use in place of two existing 0.47µF 1,000V d.c. units (C6 and C7). Does the job of both. Size 2in x 3/4in. Price - 45p each
Also available - 0.47µF 440 V a.c. capacitor. Size 1 1/2in x 3/4in. Price - 35p each.
 Post and packing 5p on all orders
V. ATTWOOD, P.O. BOX 8, ALRESFORD, HANTS

PRINTED CIRCUIT BOARDS for P.E. PROJECTS

All boards drilled and roller tinned complete with layout drawing.

EXAMPLES
 Waa-Waa pedal Vol. 4 No. 7 14p ea. Audio Sig. Gen. (Sine and Square on one board) Vol. 5 No. 10 43p ea.
NEW
 Scorpio Ignition Nov./Dec. '71. Fibreglass 60p. Logical R/C Coder Dec. '71. Fibreglass 44p. S.A.E. for List.
P.H. ELECTRONICS LTD., Industrial Estate, Sandwich, Kent. Tel. 2517

LOUDSPEAKER BARGAINS

EMI 13in x 8in 10W 15 or 8 ohms ..	2-15
EMI 13in x 8in 10W with tweeter 15 or 8 ohms ..	2-85
EMI 13in x 8in 10W twin tweeter with crossover 15 or 8 ohms ..	3-45
EMI 7in x 3 1/2in 4W 3 or 8 ohms ..	1-20
Goodmans 6 1/2in dual cone 8 ohms ..	2-35
Goodmans 8in 8P 15W 8 or 15 ohms	4-05
Celestion PS8 15 ohms for Uniflex ..	2-45
Celestion PS12 15 ohms for Uniflex ..	7-90
Fane 12in 25W 15 ohms ..	5-75
Fane 15in 60W 15 ohms ..	10-90
Fane 18in 100W 15 ohms ..	19-50
Goodmans 12in 50W 8 or 15 ohms ..	10-50
Goodmans 18in 100W 8 or 15 ohms ..	26-00
Celestion 12in G12M 25W 8 or 15 ohms ..	10-50

STEREO HEADPHONES

Eagle FF8 60-12kHz 8 to 16 ohms ..	2-20
Eagle SE5 30-15kHz 8 to 16 ohms ..	2-90
Eagle SE40 20-18kHz 8 to 16 ohms ..	6-20
Koss Red Devil 20-20kHz 4 to 16 ohms ..	9-50
Koss K/711 20-20kHz ..	9-50
Koss K6 10-15kHz ..	12-00

All units new and guaranteed. P. & P. 25p per item. Disco amplifiers, etc., by F.A.I., WEM, Sound City, Park. All at discount prices. Send S.A.E. for lists.

PETER LANGDON

AMPS, STACKS DISCO, LIGHTS, GUITARS, Etc.

81 WORCESTER STREET
WOLVERHAMPTON
 Tel. 27251

Trampos electronics

All Brand New, to spec. Money Back Guaranteed.
DIL SOCKETS for 74N, etc. 14 & 16 Pin 12p.
ULTRASONIC transducer (transmit/receive) £2.
3015F Numerical Indicator 0-5DP 5 volt £2.
 2 & £1.85 ea. SAE free data. 7447 Driver £1.23.
LIGHT EMIT DIODES: Visible Red panel 67p.
 Infrared £1.49. IC Photo Detector and amp 44p.
2N3065 40p. BC107, 8p. BC108, 8p. BC109, 8p.
 2N3702/3/4/5/6/7 11p. 2N3708/9/10/11 8p.
 2N4004-2 17p. ME411/2 18p. ME4001 12p.
 ME4102 11p. BC177/8/9 15p. FET2N3819 29p.
ZENERS 400mW 12p. IN914/6 6p. SCR 4A400V 59p.
INTEGRATED CIRCUITS with free data. 703 rf amp 59p. 709 24p. 710 45p. 741 33p.
AUDIO AMP 3.5 watt. Hi-Fi, etc. £1.49. TAA263 68p. Dual Preamp £1.48. FM/MPX Stereo decoder £1.49. TAD100/110 Receiver £1.75. Data Booklet 15p. 74N: data booklet 12p. Gates 7400 etc. 18p. 7490/92 67p. 7441 87p. 7470/72 29p. 7473 39p. **RESISTORS** 1/2 5% 1p. CAPS 1050/100µF 6p. 0.1µF 6p. **STEREO AMPLIFIERS** 4 + 4V in case £18.67.
FREE CATALIST SAE. Data Sheets 7p ea. C.W.O. P. & P. 7p. Overseas 30p. Discount 10 + 10%. P.O. BOX 28, BRACKNELL, BERKS.

100 WATT AMPLIFIER

Fully protected, transformerless, 9 transistor circuit. Input 500 mV. Output into 8 ohms. 0.1% distortion.
 Printed circuit board and full instructions. £1.45p + 10p P. & P. S.a.e. for further information and list of component bargains.
EDMUNDS COMPONENTS, 134 NORTH END ROAD, LONDON, W14. (No callers please)

RECEIVERS AND COMPONENTS

P.E. transistor circuits look better

BUILD THESE ON NIPPBOARD
S.R.P. or FIBREGLASS

1A 15p	1B 18p	GENERAL PURPOSE AMPLIFIER	3A or 3B
2A 26p	2B 34p	TREMOLO	1A or 1B
3A 36p	3B 43p	TREBLE BOOSTER	1A or 1B
2A5 29p	2B5 34p	PHOTOCELL THYRISTOR SWITCH	1A or 1B
4A5 44p	4B5 52p	RHYTHMETRON	2A or 2B
6A5 60p	6B5 72p		

C.W.O. to DEPT NEW
NIP ELECTRONICS P.O. Box 11, St. Albans, Herts.

TRANSISTORS 2p EACH
SPECIAL BULK PURCHASE

New unmarked, assorted gain transistors.
NPN-PNP similar to: BFY 50-53, BCY 30-33, BFX88, 2N3702-3, 2N3704-11, 2N706.

In packs of 50 (units of 10) state type required.
PRICE £1 PER PACK
C.W.O. add 10p P. & P.

Special offer while stocks last
DIODE IN1914 (IN4148) at 3p each
BACON ELECTRONICS
133 High St., HURSTPIERPPOINT, Sussex
TEL. 2554-5

DRY REED INSERTS



Overall length 1.85" (Body length 1.1").
Diameter 0.14" to switch up to 500 mA at up to 250V D.C. Gold clad contacts. 621p per doz.; £3.75 per 100; £27.50 per 1,000; £250 per 10,000. All carriage paid.

G.W.M. RADIO LTD.
40/42 Portland Road, Worthing, Sussex 0903 34897

AARVAK ELECTRONICS. Soundlight. (Convertors 3 channel 1-2kW £17, 3kW £25, Strobes, 1 Joule £16, 4 Joule £25. Mail or call, 74 Bedford Avenue, Barnet, Herts. Tel. 01-449 1268.

BRAND NEW copperclad fiberglass laminate printed circuit board, 2-2" x 8in, 19p. Add 10p for double sided. C.W.O. plus P. & P. 10p. H.R. CIRCUITS, 44 Wattyhall Road, Wibsey, Bradford, Yorks.

COMPUTER PANELS. 5-BC108 diodes, 16p, post 5p; 4 for 50p, post, 10p. **AMERICAN PANELS.** 4 for 55p, post 12p. **ASSORTED PANELS.** silicon and germanium transistors, 6 for 70p, post 20p. Send large S.A.E. for list of panels, etc. **LAD POT CORES** ex equipt., 20p (C.P.); new, boxed, 30p (C.P.). **COPPER CLAD PAXOLIN**, single sided 8 x 5, 10p, post 5p each; 13 x 11, 30p, post 10p each. **ORP12 ON PANEL**, ex equipt., 35p, C.P. **22 POSITION STEPPING SWITCH**, a.c. mains operated, with reset, 80p, post 15p. **RESETTABLE 5 FIGURE COUNTER**, 18/22v, will work on 12v, £1.75, post 15p. **UNIT WITH 25V D.C. MOTOR**, 2 relays, 2 motorised switches, mass of gears, etc., £1.75 (C.P.). **NEW COIL PACK**, L.M.S.W. 8 piano key, no dope, 60p, post 20p. **PIANO KEY SWITCH**, 3 interlock and reset, 25p, post, 10p. **POLYESTER CAPACITORS**, 125V, 150, 180, 220, 330, 390, 500, 680, 820, 1,000, 1,500, 2,200, 2,700, 3,300, 3,900, 5,600, 6,800, 0.01, 0.012, 15p dozen, post 10p; 0.015, 0.018, 0.022, 0.027, 0.033, 24p dozen, post 10p. **ASSORTED COMPONENTS**, 7lb, £1.30, C.P. **ASSORTED COMPUTER PANELS**, 2lb, £1.80, C.P. **J.W.B. RADIO**, 75 Hayfield Road, Salford 6, Lancs. MAIL ORDER ONLY

RAPID SERVICE — GOOD VALUE
MONEY BACK GUARANTEE

709 30p; 723 71p; 741 32p; PA230 90p; PA234 84p; PA237 £1.45; SN76013 £1.24; SL702C 40p; 7400 16p; 7474 33p; 7475 44p; 7490 72p; RECTIFIERS 1A 50V 33p; 2N2926 Red 6p; Orange 7p; Green 8p; 2N3054 40p; 2N3055 45p; BFY 50/1/2 10p; ME0402 19p; ME0412 19p; ME4102 12p; DALO ETCH RESIST MARKER PEN only 80p.
IC PIN SOCKETS IN STRIPS AT 0.7p per pin. One FREE set with orders for I.C.'s in MAY.

JEF ELECTRONICS (P.E.6)
York House, 12 York Drive, Grappenhall, Warrington WAP2 2EJ. Mail Order Only.
C.W.O. P. & P. 9p per order. Overseas 65p. Discounts start at 10% for 10+.

P.D. DIN TYPE 180° PLUGS—interchangeable 5-pin or 3-pin, solder optional, 31p. Includes P. & P. **PARRY ELECTRONIC DEVELOPMENTS (PE)**, 28 Greville St., London, E.C.1

DIMIT

range of light dimmers
standard wall mounting models
Kit-Form prices: orders add 10p P. & P.

Rotary: 400W £2.50 1KW £3.10
module only: 400W £2.20 1KW £2.80
Slider: 400W £3.30 1KW £4.10
module only: 400W £2.50 1KW £3.10

All models available built and tested
Send 10p for complete catalogue
Trade enquiries invited. Discount for quantities
YOUNG ELECTRONICS
54 Lawford Rd., London NWS 2LN 01-267 0201

Hornby controller, manufactured by Meccano. This is a step-resistance, rectifier-controller for use with a 15V a.c. input, output 0/12V d.c. Eight speed control in either "normal" or "reverse" positions (limited quantity) £1. P. & P. 20p. Mullard ferrite core LA2100, 50p post free. P.V.C. connecting wire, 10 different colours, 30 x 1 yard lengths, 30p, post free. Assorted brand new wire-wound resistors, 1-10W, 100 for £1 post free. Miniature magnets ideal for experimenters, etc., etc. 100 for £1.25. P. & P. 10p. Edge volume controls 5K switched, for transistor radios, 10 for £1 post free. Assorted capacitors (no rubbish) includes silver mica, Ceramic and Polystyrene types, 100 for 50p. P. & P. 10p.

MAIL ORDER ONLY
XEROZA RADIO
1 EAST STREET
BISHOP'S TAWTON, DEVON

COMPONENTS & KITS

CANNY SCOTS BUY FROM
FORTRONIC (FIFE) LTD.—
WHY?

7400 series 1/CS Gates from 11p;
7472 from 22p; 7474 from 30p
BC109 and BC177 from 7p at 25+
Power Trans in general to 2N3055
from 25p at 25+
Firebug Transistorised Ignition Kit,
£6

Send S.A.E. for full component lists
FORTRONIC (FIFE) LTD.
13 KNOWEHEAD ROAD, CROSSFORD, FIFE

HARROGATE

ELECTRONICS CENTRE

Electronics components, test meters
Hi Fi · SW receivers · Books
DIY items · Kits

BRAND NEW COMPONENTS BY RETURN.
Electrolytics 15 or 25V 1, 2, 5, 10 mfd—31p, 25, 50—4p. 100—5p. Mylar Film 100V, 0.001, 0.002, 0.005, 0.01, 0.02—2p; 0.04, 0.05—2 1/2p; 0.068, 0.1—3p. Mullard miniature carbon film resistors third watt E.12 series 1Q-10MΩ, 8 for 5p, insured postage 8p. The C.R. SUPPLY CO., 127 Chesterfield Rd., Sheffield, S8 0RN.

ELECTRONIC COMPONENTS, send S.A.E. for list. **RADNOR SUPPLIES**, 23 Arbury Road, Nuneaton, Warwicks.

GY-NORMOUS

RADIO BARGAINS!

*3 types, all superhets with push-pull output to internal loudspeaker. Supplied complete with carrying case, earphone and batteries.

Type A—Very neat little set, still only £1.50 + p & p 20p.

Type B—Large battery operated model, full LW and MW coverage. Ideal for kitchen or car. Complete with swivelling telescopic aerial. £5.80 + p & p 45p.

Type C—Large portable radio as sold nationally, A.M. and F.M. coverage (Yes F.M.—88-108MHz). Horizontal pointer tuning scale. Operates from own dry batteries or a.c. mains from internal transformer isolated power pack, with provision for rechargeable cells (not supplied). £8 + p & p 50p.

All these sets are BRAND NEW and complete in manufacturers original cartons, but may require slight attention—hence bargain prices—cheaper than kits!

***CASSETTE PLAYERS**—last few only—uses standard musicassettes—possible conversion to full recorder. Deck alone worth our price of £8.99 + p & p 55p.

***C120 Cassettes**. Top quality. 75p + p & p 74p.

***SAVE £££'s ON BATTERIES**, run your transistor, etc., from the mains with our 9V eliminator. £1.50 + p & p 15p.

***LABGEAR "Magic Circle"** indoor UHF aerial only £1.25 + p & p 15p.

T.V.'s T.V.'s T.V.'s T.V.'s T.V.'s T.V.'s
*4 Channel 19in UHF T.V.'s Despatched tested, and in full working order. £20.

*19in Slimline, only requires UHF tuner for BBC2, untested, complete, £8.

*As above but with UHF tuner, £12.

*2 Channel (with 405/625 Timebase) 19in 110" tube, untested, £5.
(Carriage £1.50 extra all models.)

SUMIKS
7 High Street
Langley, Warley, Worcs.
Callers Welcome

If you have difficulty in obtaining
PRACTICAL ELECTRONICS
Please place a regular order with your newsagent or send 1 year's subscription (2.65) to Subscription Department, Practical Electronics, Fleetway House, Farringdon Street, London, E.C.4.

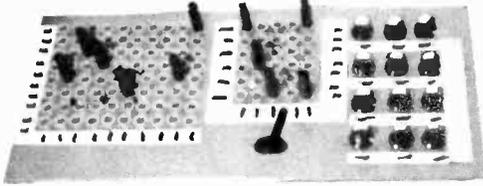
BRAND NEW SEMICONDUCTORS MONEY BACK GUARANTEE. INDIVIDUALLY LABORATORY TESTED PRIOR TO SAME DAY DESPATCH

2G304	20p	AC127	25p	BC210	20p	BY100	15p
2N823	80p	AC128	18p	BF115	25p	BY126	12p
2N744	17p	AC176	20p	BF167	25p	BY127	12p
2N1303	15p	AS129	20p	BF179	30p	GET335	15p
2N1305	22p	AS732	20p	BF184	20p	GET892	15p
2N1309	25p	AS776	20p	BF185	20p	NKT221	25p
2N1711	24p	BC107	10p	BF194	15p	OC45	10p
2N2270	82p	BC108	10p	BF195	15p	OC70	10p
2N3053	20p	BC109	10p	BFY18	25p	OC71	10p
2N313	30p	BC148	10p	BFY51	15p	OC74	20p
2N3702	10p	BC187	27p	BFY52	20p	OC81	18p
2N3707	12p	BCY30	35p	BFY56	57p	OC83	20p
2N4036	55p	BCY32	45p	BFX87	25p	OC139	25p
AC107	35p	BCY34	35p	BPX88	20p	OC140	40p
AC126	30p	BCY43	15p	BPX25	30p	OC201	60p

BULK BUYS
BC210 100+ 17p 500+ 13p
BY127 100+ 9p 500+ 7p
AS729 100+ 17p 500+ 13p
GET335 100+ 12p 500+ 9p
AS776 100+ 17p 500+ 13p
OC71 100+ 7p 500+ 5p
BCY30 100+ 30p 500+ 25p
OC74 100+ 17p 500+ 13p

JOHN D. ADAMS, INDUSTRIAL ELECTRONICS.
Dept. E, 219 Gloucester Rd., Croydon, CR0 2DW.
C.W.O. 01-884 2833 P. & P. 5p

BUILD A PROJECT 'X' SYNTHESISER



MAN-SIZED ROBUST PATCHBOARD
MAKE A "PATCH" AS IF YOU MEAN IT.
"K-L-O-N-K" and it's MADE!

No fiddling with fragile patch pins. No cables.
Countless possible combinations giving **FULL RANGE EFFECTS**. Keyboards available for versatile "live" use.

NEW BREAKTHROUGH

VCO-2 gives SINE, TRIANGULAR and SQUARE outputs, and is stable! 1 volt/octave control. Single £20 each. Matched and tracked £23 each.

SHE-1 SAMPLE, HOLD and ENVELOPE module gives sustain and variable env. to VCO signal. £11.50.

With over 7 years' unblemished reputation in these pages, Dewtron continues to lead in new technical developments in electronic sound effects! Ask any of our customers. See our products in the music stores, too. Suppliers of special equipment to a leading group. Our modules are used in professional equipment!
Send s.a.e. for synthesiser details or send 15p for full catalogue of our famous musical effects.

D.E.W. LTD.

254 Ringwood Road, FERNDOWN, Dorset BH22 9AR

THE ULTIMATE IN COMMUNICATIONS RECEIVERS

WORLD MASTER 8 WAVE BANDS

+ WORLD MAP & TIME ZONE DIAL

Brings **INSTANT WORLD-WIDE RECEPTION** at the press of a button. Sensational scoop purchase of this just-released model enables us to offer a truly advanced communications receiver at a previously unheard-of price! (Similar models can cost £120 or more!) The 8 WAVEBANDS enable you to cover the world at the press of a button. You might even pick up a world scoop on your world-wide receiver! As well as all the usual BBC Programmes you can pick up Local Radio Stations (including new stations yet to be introduced). *Pop Pirates. *Aircraft (control to pilot—pilot to control). *Shipping. *Taxis. *RAC. *AA. *Fire and Ambulances; *Continental and 100s more too numerous to list, from Australia, Africa, America, India, Europe. You'll get hour after hour of enjoyable listening on this superb receiver 24 hours a day—7 days a week. A complete hobby in itself. Enjoy the exciting cross-talk between control towers and airline pilots—listen to the progress of an ambulance on its way to an accident—hear the deep-sea trawler captain's ship-to-ship and ship-to-shore conversations. **PLUS** many more exciting and absorbing Public Service Band transmissions we are not allowed to mention. This set has been manufactured by one of the most advanced companies in radio and electronic communications and carries their **FULL WRITTEN GUARANTEE**. Attractively finished in Leatherette and stainless steel to add quality and distinction to any living-room. Completely portable using standard batteries (obtainable anywhere)—or can be plugged directly into mains. 14 Transistors, 9 diodes, 1 thermistor, internal ferrite rod antenna and external Telescopic Antenna. Tone, volume and tuning controls. Very latest keyboard push-button waveband selector. Dial light (enabling use in darkness). Special **WORLD-WIDE DIAL** and **WORLD MAP** enables you to tell the correct time in any country of the world (essential for world listening). Hi-fidelity earphone automatically cuts out main speaker when in use. Freqs.: Long Wave 150-350Kcs. Medium 535-1605Kcs. Marine 1.6-4.5Mcs. Short Wave 4-12Mcs. Short Wave 12-24Mcs. FM/VHF 88-108Mcs. AIRCRAFT 108-135Mcs. **PUBLIC SERVICE BANDS** 135-174Mcs.



CASH PRICE

£29.50 +50p p. & p. or send £7.60 deposit + 50p p. & p. and 6 monthly payments of 24.40 (Total £38.90).

Note: Ministry of Posts and Telecommunications state that a licence not generally available to the public is required for the reception of Aircraft, Fire-brigade, Shipping, etc. **BUT THERE'S NO LICENCE NEEDED TO BUY!**

SCIENTIFIC AND TECHNICAL (PE6)

507-511 LONDON ROAD, WESTCLIFF, ESSEX

using **Dewtron** (Regd. Trademark)

PROFESSIONAL MODULES

CASH SAVINGS

by buying modules and parts in bulk!
All modules are available separately:
Ring Modulator RM2, £7. Voltage-controlled Oscillator VC01, £9.50, giving sawtooth and square-wave outputs. Envelope shapers, ES1, self-triggered or ES2 keyboard-triggered, either type £12.50. White noise type WN1, £6. Voltage-controlled amplifier VCA1, £10. Voltage-controlled selective amplifier (filter for waa-waa, etc.) SA1, £12. Voltage-controlled Phase PH1, £17. Automatic Announcement Fader module for fading of music by microphone announcement, AF1, £9. etc., etc. **ALL MODULES ARE BUILT, TESTED AND SEALED FOR LONG LIFE.** Simply connect coloured wire connections as per easy instructions, build cabinet and wire in controls and patchboard connections! Joystick controls £4.50.

GUNTON ELECTRONIC IGNITION KIT £7.95 35p P. & P.

★ ALL HIGH QUALITY COMPONENTS ★
Capacitive discharge ignition is recognised as being the most efficient system and will give you:

- Continual Peak Performance
- Up to 20% reduced fuel consumption
- Easier All-weather Starting
- Increased Acceleration and Top Speed
- Longer Spark Plug Life
- Increased Battery Life
- Elimination of Contact Breaker Burn
- Purer Exhaust Gas Emission



12 volt only—state pos. or neg. earth. Supplied with illustrated assembly and fitting instructions, with details for fitting all types of tachometers. Can be built in an evening and fitted in 15 minutes. Spare snap-on connectors for coil, etc. Call in for a demonstration. S.A.E. all enquiries please.

INVERTER TRANSFORMERS: Scorpio, £1.85 + 25p P. & P.; Flight 20 watt £1.85 + 25p P. & P.; Choke 85p + 15p P. & P.; 8 watt £1.45 + 25p P. & P. Silver Hammer Case/alum. base + H/sink 75p + 20p P. & P.

ELECTRONICS DESIGN ASSOCIATES
82 BATH STREET, WALSALL WSI 3DE

BAKER 15in. AUDITORIUM

A high wattage loudspeaker of exceptional quality with a level response to above 8,000 cps. Ideal for Public Address, Discotheques, Electronic instruments and the home.

Maximum Power 35 watts
Bass Resonance 35 c.p.s.
Flux Density 15,000 gauss
Voice coil impedance 8 or 15 ohms models
Useful response 20-14,000 c.p.s.
GUITAR MODEL "GROUP 50"
50 watt £19

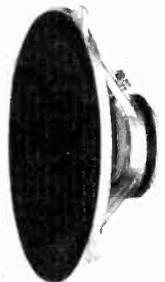
£19

POST FREE

20 PLANS, CUBIC TABLES, CROSSOVER DATA AND CATALOGUE 42p POST FREE CATALOGUE ONLY 5p

Baker Reproducers Ltd

Bensham Manor Road Passage, Thornton Heath, Surrey. 01-684-1665



In just 2 minutes, find out how you can qualify for promotion or a better job in Engineering...

That's how long it will take you to fill in the coupon below. Mail it to B.I.E.T. and we'll send you full details and a free book. B.I.E.T. has successfully trained *thousands* of men at home - equipped them for higher pay and better, more interesting jobs. We can do as much for YOU. A low-cost B.I.E.T. Home Study Course gets results fast - makes learning easier and something you look forward to. There are no books to buy and you can pay-as-you-learn.

If you'd like to know how just a few hours a week of your spare time, doing something constructive and enjoyable, could put you out in front, post the coupon today. No obligation.

WHICH SUBJECT WOULD INTEREST YOU?

Mechanical

A.M.S.E. (Mech)
Inst. of Engineers
Mechanical Eng.
Maintenance Eng.
Welding
General Diesel Eng.
Sheet Metal Work
Eng. Inspection
Eng. Metallurgy
C. & G. Eng. Crafts
C. & G. Fabrication

Draughtsmanship

A.M.I.E.D.
Gen. Draughtsmanship
Die & Press Tools
Elec. Draughtsmanship
Jig & Tool Design
Design of Elec. Machines
Technical Drawing
Building

Electrical & Electronic

A.M.S.E. (Elec.)
C. & G. Elec. Eng.
General Elec. Eng.
Installations & Wiring
Electrical Maths.
Electrical Science
Computer Electronics
Electronic Eng.

Radio & Telecomms.

C. & G. Telecomms.
C. & G. Radio Servicing
Radio Amateurs' Exam
Radio Operators' Cert.
Radio & TV Engineering
Radio Servicing
Practical Television
TV Servicing
Colour TV
Practical Radio & Electronics (with kit)

Auto & Aero

A.A.I.M.I.
MVA IMI Diploma
C. & G. Auto Eng.
General Auto Eng.
Motor Mechanics
A.R.B. Certs.
Gen. Aero Eng.

Management & Production

Computer Programming
Inst. of Marketing
A.C.W.A.
Works Management
Work Study
Production Eng.
Storekeeping
Estimating
Personnel Management
Quality Control
Electronic Data Processing
Numerical Control
Planning Engineering
Materials Handling
Operational Research
Automation
Sales Management

Constructional

A.M.S.E. (Civ.)
C. & G. Structural
Road Engineering
Civil Engineering
Building
Air Conditioning
Heating & Ventilating
Carpentry & Joinery
Clerk of Works
Building Drawing
Surveying
Painting and Decorating.
Architecture
Builders' Quantities

General

C.E.I.
Petroleum Tech.
Practical Maths.
Refrigerator Servicing
Rubber Technology
Sales Engineer
Timber Trade
Farm Science
Agricultural Eng.
General Plastics

General Certificate of Education

Choose from 42 'O' and 'A' Level subjects including:
English
Chemistry
General Science
Geology
Physics
Mathematics
Technical Drawing
French
German
Russian
Spanish
Biology

B.I.E.T. and its associated schools have recorded well over 10,000 G.C.E. successes at 'O' and 'A' level.

WE COVER A WIDE RANGE OF TECHNICAL AND PROFESSIONAL EXAMINATIONS.

Over 3,000 of our Students have obtained City & Guilds Certificates. Thousands of other exam successes.

THEY DID IT— SO COULD YOU

"My income has almost trebled... my life is fuller and happier." - Case History G/321.

"In addition to having my salary doubled, my future is assured." - Case History H/493.

"Completing your Course meant going from a job I detested to a job I love." - Case History B/461.

FIND OUT FOR YOURSELF

These letters and there are many more on file at Aldermaston Court - speak of the rewards that come to the man who has given himself the specialised know-how employers seek. There's no surer way of getting ahead or of opening up new opportunities for yourself. It will cost you a stamp to find out how we can help you.

Free!

Why not do the thing that really interests you? Without losing a day's pay, you could quietly turn yourself into something of an expert. Complete the coupon (or write if you prefer not to cut the page). We'll send you full details and a FREE illustrated book. No obligation and nobody will call on you... but it could be the best thing you ever did.

BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY

Dept B4, Aldermaston Court, Reading RG7 4PF.

POST THIS COUPON TODAY

To: B.I.E.T., Dept B4, Aldermaston Court, Reading RG7 4PF
Please send me book and details of your Courses in

Name.....
BLOCK CAPITALS PLEASE
Address.....

Age.....

Subject of Interest.....



BIET

(Write if you prefer not to cut this page)

B.I.E.T. - IN ASSOCIATION WITH THE SCHOOL OF CAREERS - ALDERMASTON COURT, BERKSHIRE

Published approximately on the 15th of each month by IPC Magazines Ltd., Fleetway House, Farringdon Street, London, E.C.4. Printed in England by Chapel River Press, Andover, Hants. Sole Agents for Australia and New Zealand - Gordon & Gotch (Asia) Ltd.; South Africa - Central News Agency Ltd.; Rhodesia and Zambia - Kingstons Ltd.; East Africa - Stationery and Office Supplies Ltd. Subscription Rate (including postage): For one year to any part of the world £2.65 (£2.13.0.). Practical Electronics is sold subject to the following conditions, namely, that it shall not, without the written consent of the Publishers first given, be lent, resold, hired out or otherwise disposed of by way of Trade at more than the recommended selling price shown on the cover, and that it shall not be lent, resold or hired out or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of Trade, or affixed to or as part of any publication or advertising, literary or pictorial matter whatsoever.

HENRY'S RADIO LIMITED

ENGLAND'S LEADING ELECTRONIC CENTRES



HI-FI · ELECTRONIC COMPONENTS · TEST · P.A. · DISCOTHEQUE · LIGHTING · MAIL ORDER

TEXAN



20 WATT I.C. STEREO AMPLIFIER

(As featured by Practical Wireless May/June 1972)

DEVELOPED BY "TEXAS" ENGINEERS FOR PERFORMANCE, RELIABILITY AND POWER

FEATURES INCLUDE: Low profile with specially designed Gardners Transformer. 6 I.C.'s, 10 Transistors, 4 Diodes, 2 Zeners, Fibreglass P.C. panel. Multi protection. Stabilised supply. DIN input/output. Complete chassis work.

FUNCTIONS: Separate Treble/Bass/Volume/Balance controls. Input selector, Mag. pu. Radio, Tape in and out. Headphone socket. Scratch and rumble filters. Mono/Stereo switch.

SLIM DESIGN WITH SILVER TRIM—Chassis size overall 14 1/2 in. x 6 in. x 2 in. max.

Total component cost £32. (Parts list on request Ref. No. 20.)
SPECIAL KIT PRICE £28.50, Post 45p. (Optional Teak sleeve available July/August.)

TEXAS — HENRY'S VALUE AND PERFORMANCE

Henry's are sole U.K. trade and retail suppliers of the TEXAN.
ENQUIRIES INVITED

LATEST EDITION CATALOGUE

Fully detailed and illustrated covering every aspect of Electronics — plus data, circuits and information

PRICE 55p
POST PAID (40p FOR CALLERS)

10,000 Stock lines at Special Low Prices and Fully Guaranteed

PLUS! FIVE 10p VOUCHERS

Send to this address Henry's Radio Ltd. (Dept. PE), 3 Albemarle Way, London, E.C.1 — for catalogue by post only. All other mail and callers to "303", see below.

PUBLIC ADDRESS, LIGHTING AND DISCOTHEQUE EQUIPMENT

DJ1055 30 watt rms Amplifier, 4 inputs, master tone and volume controls, etc. 8 ohm output. Cased portable. £33.50, Post 40p. **DJ705** 70 watt rms version. Cased portable. £49.75, Post 40p.

DISCOAMP 100 watt rms to 8 ohms, 4 inputs, separate bass and treble controls, PFL, etc. Cased for cabinet or rack mounting. £67.50, Post 40p.

MCDONALD MP60 fitted to plinth with cover, SC5MD cartridge to match above amplifiers. £17.25, Post 70p.

DJ30L13 3 Channel light control unit for above amplifiers. 3 x 1kW. Treble, Bass and Mid range. £28.50, Post 35p. **DJ40L** as 30L plus microphone £37.50.

EFFECTS PROJECTORS—Coloured rotating light patterns.

DISCO COLT 150W Tungsten £22.50.

L1Q1 50-50 watt Q.I. £32.50.

L1Q1 150-150 watt Q.I. £50.

Complete range of Disco/PA and Lighting on display at "309"

SPECIAL!! Anti-Feedback Microphone designed and made for Henry's for all PA/Disco Equipment. £11.50.

LIGHT GUIDE 64 fibres sheathed £1 per yd. Mono (0.01in) £1.50 per 25 metre reel.

Call, write or phone for details and lists.

HI-FI—LARGEST RANGE IN STOCK—BIGGEST DISCOUNTS—FREE 12-PAGE STOCK LIST—Ref. 16.17.

MORE OF EVERYTHING AT LOW PRICES ALWAYS AT HENRY'S

Send large S.A.E. with list for parts quote for your circuit or get a Catalogue—its all in there

Electronic Components, Audio and Test Gear Centre
356 EDGWARE ROAD, LONDON, W.2.
Tel: 01-402 4736

High Fidelity Sales & Demonstrations Centre
354 EDGWARE ROAD, LONDON, W.2.
Tel: 01-402 5854

P.A., Disco & Lighting Centre
309 EDGWARE ROAD, LONDON, W.2.
Tel: 01-723 6963

Mail Orders, Special Bargain Shop, Industrial Sales
303 EDGWARE ROAD, LONDON, W.2.
Tel: 01-723 1008/9

"309", "354" & "356" OPEN SIX FULL DAYS A WEEK 9 am to 6 pm MONDAY TO SATURDAY

TEST EQUIPMENT

Huge range in stock—too much to list here. It's all in the latest catalogue—prices, specifications, etc. Also Panel Meters and Edge Meters.



GARRARD McDONALD GOLDRING

CHASSIS (Post 50p)
SP25/3 £10.50 HT70 £15.00
MP60 £10.40 MP610 £14.15
AP76 £18.85 Zero 1005 £40.75

WITH PLINTH/COVER

(Post 70p)
MP60 PC £17.20.
HT70 PC £21.60.
HL75 PC £35.25.
GL72P £29.26.
TD150AB/TXII £40.75.
PR2A PC £35.25.
BD2 £32.25.

CART PLINTH/COVER

(Post 70p)
GL72PC/G800 £34.50.
(HL) AP76/G800 £29.95.
HT 70PC/G800 £27.00.
MP60 PC/G800 £17.25.
(HL) SP25/3/G800H £18.95.
(HL) 2025 TC/9TAHCD £13.50.

ULTRASONIC TRANSDUCERS

Operate at 40kc/s up to 100 yds. Ideal remote switching and signalling. Complete with data and circuits.
PRICE PER PAIR £5.90, Post 10p.

POWER INTEGRATED CIRCUITS

SL403D—3 watt with 8-page data, layouts and circuits £1.50.
P.C. Board 60p; Heat Sink 14p.
IC12—6 watt with data and circuits £2.50.
TOSHIBA—20 watt Power Amp Module £4.57.
TOSHIBA—IC Preamplifier £1.50
TOSHIBA Data/Circuits Book No. 42 10p.

TEXAS PUBLICATIONS

1-100 watt Amplifiers and Preamplifier. Layouts and data £1.25. (Free list No. 48A).
700-page IC Data Book (No. 2) all TTL IC's. 60p. 420-page Transistor Data (No. 3) 60p. 340-page Transistor Data (No. 4) 60p. (Post, etc., 20p each.)

7 SEG & NIXIE TUBES

(Post 15p per 1 to 6)
XN3, XN13, GN6 0-9 side view with data, 85p.
GNP-7, GNP-8 0-9 side view with decimal points and data, 95p.
3015F 7 seg. £7 per 4 with data. New Digital clock circuits NIXIE & 7 SEG. Ref. No. 31 15p. (Post, etc., 20p each.)

TRANSISTORS, I.C.'s etc. Free list No. 36 on request.



LOW COST HI-FI SPEAKERS



E.M.I. Size 13 1/2 in. 8 in. and Ceramic Magnet
TYPE 150 6 watt, 3, 8 or 15 ohms £2.20, Post 22p.
TYPE 150TC Twin cone version £2.75, Post 22p.
TYPE 450 10 watt with twin tweeters and crossover, 3, 8 or 15 ohms. £3.85, Post 25p.
TYPE 350 20 watt with tweeter and crossover, 8 and 15 ohms. £7.70, Post 28p.



POLISHED CABINETS For 150, 150TC and 450 £4.60, Post 30p.

HIGH POWER AMPLIFIER MODULES

MPA12



Quality transformerless low noise amplifiers suitable for all Audio, PA and Hi-Fi use. Modern compact designs. PA25 and PA50 supplied with plug harness for use with MU442 Power Supply.



PA25

MPA12/3 18V 0.8A 12W 3-4 ohm £4.50.
MPA12/15 30V 0.5A 12W 12-16 ohm £5.25.
MU24/40 Mains unit for 1 or 2
MPA12/15 or 15 £4.50
PA25 22-0.22V 1A 25W 8 ohm £7.50.
PA50 22-0.22V 2A 50W 3-4 ohm £9.50.
MU442 Mains unit for 1 or 2 PA25 or 1 only PA50 £6.
Post 20p per unit.

ALL SILICON-FET PREAMPLIFIER AND MIXER SELF POWERED



PRICE £10.50 Post 30p

All inputs. Adjustable input and output. DIN sockets. Tape in and out. Microphone mixing. Suitable up to 4-PA25 or 2-PA50.

300mW TRANSISTOR AMPLIFIER MODEL 4-300

Fully assembled 5TR Amplifier. Size 5 1/2 in. x 1-10mV adjustable sensitivity. Output 3-8 ohms. Fitted Vol. control. 9 volt operated. Thousands of uses plus low cost. £1.75 p.p. 15p (or 2 for £3.25 p.p. 15p).



BUILD THIS VHF FM TUNER

5 TRANSISTORS 300kc/s BANDWIDTH PRINTED CIRCUIT. HIGH FIDELITY REPRODUCTION. MONO AND STEREO. A popular VHF FM Tuner for quality and reception of mono and stereo. There is no doubt about it—VHF FM gives the REAL sound. All parts sold separately. Free Leaflet No. 3 & 7. TOTAL £6.97, p.p. 20p. Decoder Kit £5.97. Tuning meter unit £1.75. Mains unit (optional) Model P5900 £2.47, Post 20p. Mains unit for Tuner and Decoder P51200 £2.62, Post 20p.



SINCLAIR PROJECT 60 MODULES —SAVE POUNDS!

Z30 £3.60 Z50 £4.38
STEREO 60 £7.98 PZ5 £3.98
PZ6 £6.38 PZ8 £5.97
Transformer for PZ8 £2.95.
Active Filter Unit £4.45.
Stereo FM Tuner £16.95.
IC12 £1.80 Q16's £15 pair.
Post, etc. 20p per item.

ALSO IN STOCK
2000 £23.50 3000 £30.95
Post 50p each.



PACKAGE DEALS

2 x Z30, Stereo 60. PZ5 £15.95, Post 25p.
2 x Z30, Stereo 60. PZ6 £18.00, Post 25p.
2 x Z50, Stereo 60. PZ8 £20.25, Post 25p.
Transformer for PZ8 £2.95, Post 20p.
NEW PROJECT 605 KIT £19.95, Post 25p.

"BANDSPREAD" PORTABLE TO BUILD



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

TOTAL COST TO BUILD £7.98, p.p. 32p (Batt. 22p). All parts sold separately—Leaflet No. 2. "77" MEDIUM AND LONG WAVE PORTABLE (as previously advertised) £6.98, p.p. 35p from stock—Leaflet No. 1.

SLIDER CONTROLS—Top quality. 60mm/singles and ganged. Complete with knobs. 5K, 10K, 25K, 100K, 500K 1 meg. Log and Lin. 45p each, 10K, 25K, 50K, 100K, Log and Lin ganged. 75p each. Post 1-5, 15p; 6 or more 20p.