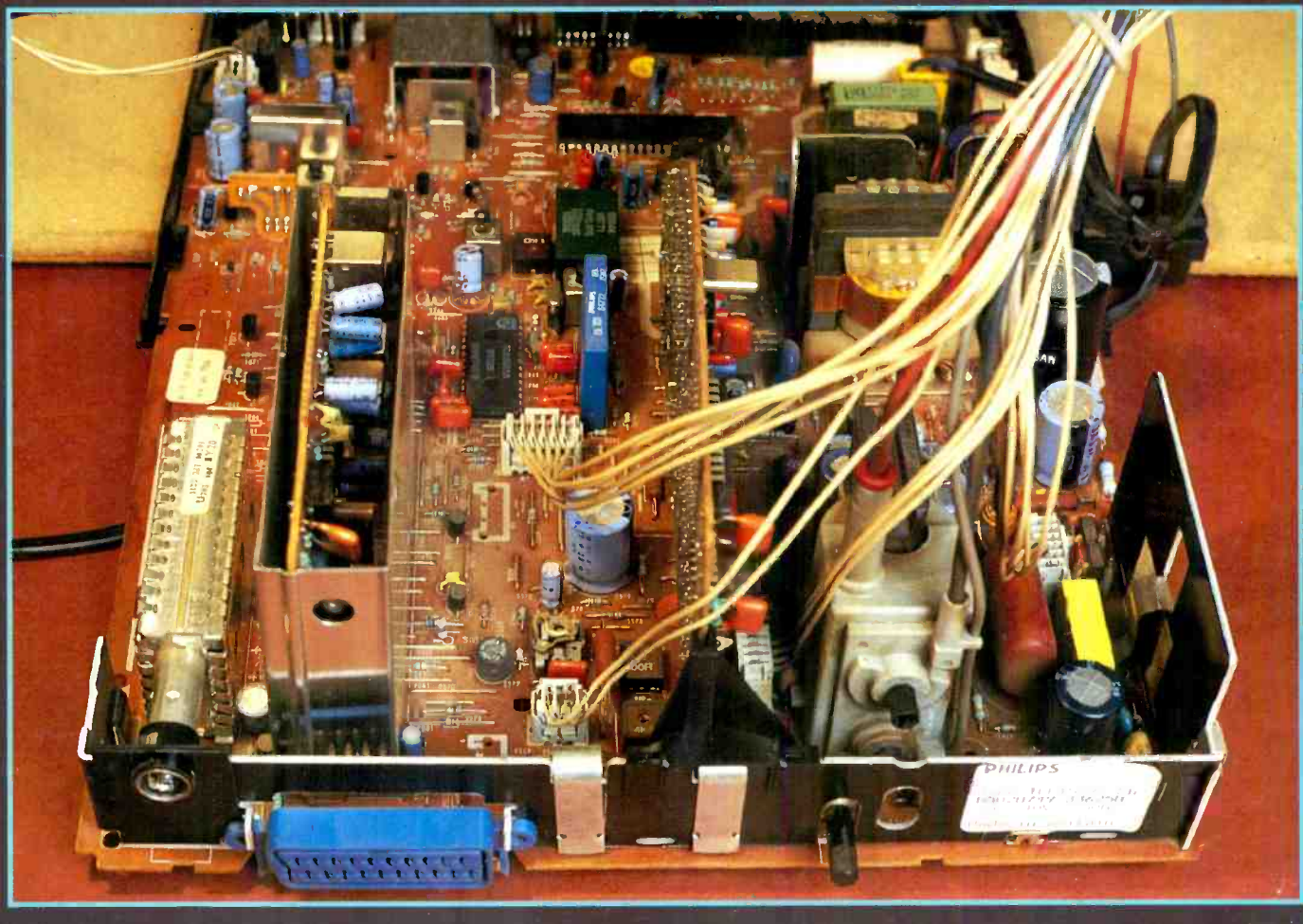
MARCH 1993

TELEVISION

SERVICING·VIDEO·SATELLITE·DEVELOPMENTS

FREE 32-PAGE CATALOGUE



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TELEVISION

MARCH 1993

Vol. 43 No.5 Issue 509

On sale FEBRUARY 17th

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All correspondence regarding advertisements should be addressed to the Advertisement Manager, "Television", Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.Editorial correspondence should be addressed to "Television" Editorial Department, Reed Business Publishing, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

INDEXES AND BINDERS

Indexes to Vols. 39 and 40 are available at £2.00 from the Editorial office (address above) Indexes to Vols. 37 and 38 are available at £1.50 each. Photostats of the indexes to Vols. 31 – 36 can be supplied at £1.00 each. Make cheques etc. payable to Reed Business Publishing Ltd.

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BC107	8p
BC108	8p
BC109	8p
BC109C	10p
BC140	20p
BC141	20p
BC142	20p
BC143	20p
BC147	8p
BC148	8p
BC149	8p
BC157	8p
BC159	8p
BC160	30p
BC171	10p
BC172	10p
BC177	14p
BC178	14p
BC179	14p
BC182	7p
BC182L	7p
BC183	7p
BC183L	7p
BC184	7p
BC184L	7p
BC212	7p
BC212L	7p
BC213	7p
BC213L	7p
BC214	7p
BC214L	7p
BC237	7p
BC238	7p
BC239	7p
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BC301	20p
BC302	20p
BC303	20p
BC304	25p
BC327	7p
BC328	7p
BC337	7p
BC338	7p
BC441	28p
BC446	8p
BC449	15p
BC461	28p
BC477	18p
BC478	18p
BC516	22p
BC537	25p
BC546	8p
BC547	8p
BC548	8p
BC549	8p
BC550	8p
BC556	8p
BC557	7p
BC558	8p
BC559	8p
BC560	8p
BC637	20p
BC638	20p
BC639	20p
BC640	20p
BCY70	16p
BCY71	16p
BCY72	16p
BD115	30p
BD124P	50p
BD131	25p
BD132	25p
BD133	50p
BD135	20p
BD136	20p
BD137	20p
BD138	20p
BD139	20p
BD140	20p
BD144	90p
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BD204	42p
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BD244	50p
BD245	50p
BD246A	50p
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BD267	45p
BD269	45p
BD278	50p
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BD315	150p
BD317	150p
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BD332	40p
BD361	60p
BD362	60p
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BD371	30p
BD410	50p
BD433	28p
BD434	30p
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BD437	28p
BD438	36p
BD439	40p
BD440	40p
BD441	40p
BD533	50p
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BD538	40p
BD643	50p
BD645	50p
BD647	50p
BD649	50p
BD675	40p
BD676	40p
BD677	38p
BD678	40p
BD679	40p
BD680	40p
BD681	45p
BD682	45p
BD705	50p
BD707	50p
BD709	50p
BD711	50p
BD736	50p
BD826	50p

BD828	50p
BD897	50p
BD899	50p
BD901	50p
BD977	50p
BDX32	100p
BDX33	60p
BDX65	80p
BDW23	55p
BDW24	55p
BDW93	50p
BDW94	50p
BDY92	100p
BF137	35p
BF167	30p
BF180	16p
BF181	18p
BF183	20p
BF195	7p
BF199	8p
BF200	16p
BF225	30p
BF240	16p
BF245	25p
BF254	15p
BF255	12p
BF256	18p
BF257	18p
BF258	18p
BF259	18p
BF262	25p
BF263	25p
BF270	18p
BF273	15p
BF311	21p
BF336	20p
BF337	20p
BF338	20p
BF362	30p
BF367	13p
BF371	17p
BFR40	25p
BFR90	52p
BFR91	99p
BFT43	30p
BFX29	20p
BFX84	20p
BFX85	20p
BFX87	15p
BFX88	15p
BFX89	60p
BFY17	30p
BFY18	40p
BFY50	14p
BFY51	14p
BFY52	14p
BFY56	25p
BFY64	25p
BFY90	45p
BLY48	85p
BR100	14p
BR103	37p
BR303	85p
BRY49	38p
BSS74	33p
BSX20	15p
BSX26	18p
BT100A	70p
BT106	180p
BT109	90p
BT119	100p
BT146	99p
BT151	58p
BTY79	140p
BU100A	110p
BU104	80p
BU105	80p
BU108	100p
BU109	80p
BU110	110p
BU111	140p
BU124	60p
BU126	65p
BU180	150p
BU184	100p
BU204	75p
BU205	70p
BU206	100p
BU208	70p
BU208A	60p
BU208AT	90p
BU208D	80p
BU209	140p
BU225	190p
BU226	190p
BU312	120p
BU325	55p
BU326	75p
BU406	70p
BU406D	85p
BU407	55p
BU407D	80p
BU408	75p
BU408D	85p
BU409	95p
BU426A	70p
BU500	100p
BU508A	75p
BU508AF	95p
BU508D	80p
BU508DF	115p
BU526	75p
BU536	100p
BU546	140p
BU608	150p
BU626	150p
BU636	150p
BU801	80p
BU806	75p
BU807	70p
BU902	130p
BU903	130p
BU920	130p
BU922	130p
BU930	130p
BUT11AF	70p
BUT12	80p
BUT56A	150p
BUX80	180p
BUX84	50p
BUX85	50p
BU69A	200p
BUY71	300p
BUZ71	75p
C106D	28p
MJ1000	200p
MJ1001	200p
MJ10012	300p
MJ15001	325p
MJ15002	300p
MJ15003	325p
MJ15004	370p
MJ2501	110p
MJ2955	55p
MJ3000	115p
MJ3001	115p
MJE29A	30p
MJE30A	30p
MJE340	25p
MJE350	80p
MJE520	30p
OC28	350p
OC29	250p
OC35	350p
OC36	250p
OC45	50p
OC72	50p
OC200	180p

R2008B	100p
R2010B	100p
S2800D	52p
S2800M	72p
T2800D	52p
T2800M	72p
TIP29	15p
TIP29A	22p
TIP29C	25p
TIP30	25p
TIP30C	30p
TIP31A	22p
TIP31C	30p
TIP32	24p
TIP32A	21p
TIP32C	28p
TIP33	50p
TIP33C	60p
TIP34	50p
TIP34C	60p
TIP35C	65p
TIP36C	65p
TIP41A	20p
TIP41C	22p
TIP42A	20p
TIP42C	22p
TIP47	40p
TIP48	40p
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TIP51	120p
TIP52	120p
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TIP106	65p
TIP107	65p
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TIP111	50p
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TIP121	46p
TIP122	47p
TIP125	47p
TIP126	56p
TIP127	56p
TIP130	30p
TIP131	30p
TIP141	90p
TIP142	90p
TIP145	65p
TIP146	90p
TIP147	100p
TIP150	90p
TIP151	90p
TIP2955	42p
TIP3054	45p
TIP3055	42p
TIS44	40p
TIS61	15p
TIS90	15p
TIS91	18p
TIS93	20p
VK1010	88p
VN10KM	60p
VN66AF	100p
VN88AF	115p
ZTX107	11p
ZTX108	11p
ZTX109	12p
ZTX212	27p
ZTX300	13p
ZTX301	16p
ZTX302	16p
ZTX303	24p
ZTX304	17p
ZTX320	29p
ZTX500	13p
ZTX501	13p
ZTX502	18p
ZTX503	18p
ZTX504	25p
ZTX550	24p
2N696	26p
2N697	22p
2N698	40p
2N706	22p
2N708	22p
2N914	28p
2N930	18p
2N1131	28p
2N1132	28p
2N1613	24p
2N1711	24p
2N1893	30p
2N2102	50p
2N2218A	24p
2N2219	24p
2N2221	23p
2N2222	23p
2N2369	15p
2N2484	20p
2N2646	40p
2N2904	20p
2N2905	20p
2N2906	18p
2N2907	18p
2N2926	8p
2N3019	28p
2N3053	18p
2N3054	40p
2N3055	38p
2N3055H	50p
2N3440	58p
2N3442	85p
2N3585	120p
2N3702	9p
2N3703	9p
2N3704	9p
2N3705	9p
2N3706	9p
2N3707	9p
2N3708	9p
2N3710	12p
2N3711	12p
2N3771	85p
2N3772	90p
2N3773	100p
2N3799	18p
2N3819	29p
2N3866	68p
2N3903	11p
2N3904	11p
2N3905	11p
2N3906	11p
2N4031	25p
2N4036	25p
2N4062	12p
2N4064	100p
2N4401	12p
2N4403	12p
2N4443	76p
2N5061	20p
2N5088	20p
2N5192	50p
2N5241	500p
2N5245	45p
2N5294	30p
2N5296	30p
2N5366	25p
2N5401	12p
2N5448	12p
2N5496	80p
2N6107	40p
2N6292	40p

2N6385	120p
2N6403	160p
3N143	65p

DIODES

Rectifier Diodes

BY127	8p
BY133	8p
BY164	40p
BY179	35p
BY184	32p
BY196	20p
BY206	11p
BY207	11p
BY210	22p
BY225	120p
BY227	19p
BY228	28p
BY296	20p
BY298	23p
BY299	22p
BYX10	15p
BYX55/350	30p
BYX55/600	25p
BYX70/500	32p
OA47	10p
OA90	10p
OA91	10p
OA200	10p
OA202	10p
IN.914	2p
IN.4001	3p
IN.4002	3p
IN.4003	3p
IN.4004	3p
IN 4005	3p
IN.4006	3p
IN.4007	4p
IN.4148	2p
IN.5400	9p
IN.5401	8p
IN.5402	8p
IN.5403	8p
IN 5404	8p
IN 5405	11p
IN 5406	12p
IN.5407	12p
IN 5408	12p
RGP15	15p
RGP30	16p
SKE4F2/06	60p
SKE4F2/08	80p
SKE4F2/10	100p
SR2M	60p

I.C. SOCKETS

8PIN	5p
14PIN	6p
16PIN	7p
18PIN	10p
20PIN	12p
22PIN	13p
24PIN	14p
28PIN	16p
40PIN	18p

ZENERS

400 MW
BZY88 RANGE
2V7 to 39V 5p
1.3W
BZX61 RANGE
2V7 to 39V 9p

CRYSTALS

Freq in MHz

1.0	260p
2.4576	180p
3.276	115p
4.0	110p
4.194	130p
4.43	95p
5.0	130p
6.0	115p
10.0	140p
11.0	250p
12.0	120p
14.756	200p
15.0	160p
18.0	130p
18.432	130p
24.0	250p
48.0	160p

VOLTAGE REGULATORS

7805	25p
7806	25p
7808	25p
7812	25p
7815	25p
7818	25p
7824	25p
7905	25p
7906	30p
7908	30p
7912	30p
7915	30p
7918	30p
7924	30p
78L05	24p
78L08	24p
78L12	24p
78L15	24p
78L18	24p
78L24	24p
79L05	35p
79L08	35p
79L12	35p
79L15	35p
7818KC	100p
7824KC	100p
LM309K	100p
LM317K	200p
LM317T	100p
LM323K	350p
LM723	35p
78H08KC	800p
78H12KC	700p
79HGKC	800p

VALVES

DAF96	100p
DY87	80p
EB91	50p
EBF80	60p
EBF89	60p
ECC84	80p
ECH83	100p
ECH84	90p
ECL80	65p
ECL82	80p
ECL84	100p
ECL85	80p
EF85	80p
EF183	75p
EF184	85p
EL34	300p
EL95	85p
EL500	100p

EY86	70p
EY87	70p
EY88	80p
PC97	100p
PCC85	60p
PCF80	100p
PCF801	110p
PCF802	80p
PCF806	115p
PCH200	100p
PCL81	65p
PCL82	80p
PCL84	60p
PCL85	80p
PCL805	80p
PFL200	110p
PL36	120p
PL83	60p
PL84	80p
PL95	180p
PL504	120p
PL508	200p
PL519	430p
PY81	100p
PY88	100p
PY500A	190p

LED's

3mm	
RED	5p
YELLOW	8p
GREEN	8p
5mm	
RED	5p
YELLOW	8p
GREEN	8p

RECTANG. LED's

5mm · 2.5mm	
RED	5p
YELLOW	8p
GREEN	8p

LINEAR IC's

AN203	210p
AN210	165p
AN214Q	170p
AN228	280p
AN240P	130p
AN252	150p
AN259	250p
AN262	140p
AN271	230p
AN274	250p
AN301	330p
AN303	250p
AN304	360p
AN315	210p
AN316	350p
AN360	100p
AN362	140p
AN366	150p
AN610	160p
AN612	160p
AN3312	350p
AN3320K	800p
AN3331K	900p
AN3792	400p
AN3794	450p
AN3795	500p
AN3821	800p
AN3821K	600p
AN3822K	700p
AN3830K	800p
AN3990K	300p
AN3991K	400p
AN5010	450p
AN5011	400p
AN5015	350p
AN5020	200p
AN5025	250p
AN5030	550p
AN5033	400p
AN5034	500p
AN5111	550p
AN5132	250p
AN5135	600p
AN5138	450p
AN5150	600p
AN5151	600p
AN5215	100p
AN5250	150p
AN5256	150p
AN5260	350p
AN5262	175p
AN5265	150p
AN5352	600p
AN5355	450p
AN5410	375p
AN5411	450p
AN5421	150p
AN5429	420p
AN5431	300p
AN5440	400p
AN5510	400p
AN5512	250p
AN5515	200p
AN5520	550p
AN5521	250p
AN5612	400p
AN5613	200p
AN5615	300p
AN5620	330p
AN5622	350p
AN5625	400p
AN5712	350p
AN5722	140p
AN5730	160p
AN5732	160p
AN5753	170p
AN5763	450p
AN5790	300p
AN5791	350p
AN5836	450p
AN5862	300p
AN6135	150p
AN6238	400p
AN6247	200p
AN6270	400p
AN6300	600p
AN6306	550p
AN6307	250p
AN6320	300p
AN6328	400p
AN6332	390p
AN6337	420p
AN6341	550p
AN6344	440p
AN6350	610p
AN6359	500p
AN6360	320p
AN6362	480p
AN6371	470p
AN6387	560p
AN6811	130p
AN6884	240p
AN7105	210p
AN7110	130p
AN7114	150p
AN7115	150p
AN7116	90p
AN7120	130p
AN7130	110p
AN7140	450p

AN7145	195p
AN7146	210p
AN7154	180p
AN7156	240p
AN7168	260p
AN7178	270p
AN7222	180p
AN7254	150p
AN7256	250p
AN7310	90p
AN7311	90p
AN7410	250p
AY3-1015	290p
AY3-1270	800p
AY3-1350	450p
AY3-8910	360p
AY3-8912	400p
BA301	65p
BA311	80p
BA313	60p
BA333	100p
BA340	150p
BA401	60p
BA402	60p
BA511	160p
BA514	160p
BA516	150p
BA521	160p
BA524	240p
BA526	180p
BA527	95p
BA532	140p
BA534	290p
BA536	180p
BA546	180p
BA612	160p
BA656	150p
BA658	380p
BA684	400p
BA685	400p
BA1310	160p
BA1320	110p
BA1330	160p
BA1360	160p
BA4403	220p
BA5101	400p
BA5102	220p
BA5204	200p
BA5402	180p
BA5406	180p
BA5408	180p
BA6104	250p
BA6208	250p
BA6209	260p
BA6304	120p
BA6305	140p
BA6410	220p
BA6411	250p
BA6993	150p
BA7001	150p
BA7004	200p
BA7007	200p
BA7021	180p
BA7022	350p
BA7751LS	150p
BA7752	250p
BA7755	150p
BA7767AS	200p
CX108	950p
CX134A	950p
CX136	600p
CX139	1450p
CX139A	750p
CX141	750p
CX143	800p
CX143A	1250p
CX145	725p
CX150B	325p
CX158	825p
CX175	325p
CX186	750p
CX187	825p
CX804A	775p
CX832	825p
CX867	575p
CX868	525p
CX877	300p
HA1125	150p
HA1137W	135p
HA1197	150p
HA1199	145p
HA1319	240p
HA1338	300p
HA1339A	350p
HA1377	160p
HA1388	320p
HA1389	210p
HA1392	200p
HA1394	280p
HA1397	250p
HA1398	240p
HA11219	280p
HA11221	180p
HA11225	150p
HA11235	145p
HA11251	240p
HA11423	210p
HA11724	800p
HA12002	300p
HA12003	250p
HA12005	320p
HA12017	130p
HA13001	170p
HA13002	250p
HA13006	400p
HA13007	400p
HA13108	350p
HA13412	600p
HA13432	400p
HA17524	250p
HA17805	100p
ICL7106	650p
ICL7611	90p
ICL7660	240p
ICM7555	60p
ICM75556	80p
KA2101	100p
KA2102	150p
KA2130	150p
KA2206	150p
KA2209	125p
KA2210	230p
KA2212	80p
KA2213	130p
KA2214	150p
KA2261	100p
KA2263	100p
KA2264	100p
KA2284	100p
KA2401	150p
KA2412	350p
KA2912	125p
KA2914A	300p
LA1130	240p
LA1150	150p
LA1185	150p
LA1201	75p
LA1210	140p
LA1222	80p
LA1230	130p
LA1231	210p
LA1364	200p
LA1365	120p
LA1368	220p
LA1385	170p
LA1460	220p

LA2000	150p
LA2101	270p
LA2200	190p
LA3160	120p
LA3201	80p
LA3210	65p
LA3220	100p
LA3300	140p
LA3301	110p
LA3350	110p
LA3361	100p
LA3375	300p
LA4030	180p
LA4031	140p
LA4032	140p
LA4051	160p
LA4100	85p
LA4101	80p
LA4102	100p
LA4110	120p
LA4112	120p
LA4120	270p
LA4125	200p
LA4126	240p
LA4137	180p
LA4140	60p
LA4160	100p
LA4180	300p
LA4182	180p
LA4190	300p
LA4192	140p
LA4200	130p
LA4201	120p
LA4220	120p
LA4260	230p
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LINEAR ICs — Cont.

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JAPANESE TRANSISTORS

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2SC3680	380p
2SC3685	450p
2SC3687	650p
2SC3688	750p
2SC3691	150p
2SC3692	150p
2SC3705	120p
2SC3715	480p
2SC3717	120p
2SC3719	150p
2SC3729	450p
2SC3743	270p
2SC3746	120p
2SC3747	120p
2SC3752	250p
2SC3769	700p
2SC3781	150p
2SC3783	600p
2SC3787	100p
2SC3789	75p
2SC3790	120p
2SC3795	200p
2SC3798	220p
2SC3807	120p
2SC3811	80p
2SC3832	200p
2SC3833	250p
2SC3853	220p
2SC3854	250p
2SC3855	280p
2SC3857	500p
2SC3858	550p
2SC3870	200p
2SC3883	280p
2SC3890	150p
2SC3895	400p
2SC3897	650p
2SC3907	420p
2SC3909	450p
2SC3927	550p
2SC3946	120p
2SC3950	120p
2SC3953	120p
2SC3954	150p
2SC3973	275p
2SC3975	275p
2SC3987	100p
2SC3996	1200p
2SC4006	100p
2SC4020	280p
2SC4023	325p
2SC4056	350p
2SC4106	200p
2SC4123	450p
2SC4124	250p
2SC4169	60p
2SC4236	550p
2SC4237	750p
2SC4242	200p
2SC4262	50p
2SC4301	550p
2SD198	180p
2SD199	280p
2SD200	210p
2SD201	260p
2SD257	195p
2SD313	40p
2SD315	75p
2SD325	45p
2SD330	110p
2SD348	460p
2SD357	40p
2SD358	40p
2SD371	240p
2SD380	650p
2SD381	80p
2SD388	170p
2SD389	90p
2SD400	20p
2SD401	50p
2SD402	120p
2SD415	120p
2SD424	400p
2SD426	150p
2SD427	350p
2SD438	45p
2SD467	60p
2SD468	25p
2SD471	75p
2SD525	70p
2SD526	70p
2SD545	60p
2SD549	120p
2SD551	400p
2SD555	500p
2SD560	150p
2SD571	80p
2SD575	530p
2SD600	80p
2SD601	40p
2SD602	60p
2SD612	100p
2SD613	70p
2SD636	30p
2SD637	40p
2SD638	60p
2SD639	60p
2SD640	350p
2SD642	50p
2SD655	60p
2SD661	60p
2SD666	70p
2SD667	70p
2SD668	120p
2SD669	40p
2SD673	350p
2SD676	250p
2SD716	115p
2SD717	180p
2SD718	100p
2SD722	240p
2SD725	350p
2SD734	60p
2SD741	120p
2SD743	130p
2SD756	100p
2SD757	120p
2SD758	140p
2SD762	140p
2SD763	140p
2SD768	180p
2SD772	200p
2SD773	40p
2SD774	60p
2SD777	400p
2SD784	650p

2SD786	100p
2SD787	80p
2SD788	100p
2SD789	80p
2SD792	400p
2SD794	100p
2SD795A	140p
2SD811	450p
2SD819	400p
2SD820	450p
2SD821	550p
2SD82[illegible]	400p
2SD82[illegible]	100p
2SD836	150p
2SD836A	200p
2SD837	80p
2SD838	400p
2SD841	160p
2SD844	200p
2SD845	250p
2SD850	260p
2SD856	80p
2SD858	250p
2SD863	60p
2SD864	200p
2SD866	120p
2SD866A	140p
2SD868	450p
2SD870	400p
2SD871	450p
2SD879	60p
2SD880	40p
2SD882	80p
2SD892A	100p
2SD89[illegible]	120p
2SD895	200p
2SD896	200p
2SD900	400p
2SD905	450p
2SD916	130p
2SD917	300p
2SD921	320p
2SD92[illegible]	360p
2SD946	120p
2SD947	100p
2SD950	300p
2SD951	350p
2SD957A	520p
2SD958	60p
2SD965	100p
2SD970	170p
2SD973	60p
2SD973A	70p
2SD985	120p
2SD986	120p
2SD1012	60p
2SD10[illegible]	40p
2SD10[illegible]	120p
2SD10[illegible]	400p
2SD1024	130p
2SD1030	75p
2SD1031	130p
2SD1037	750p
2SD1046	200p
2SD1047	225p
2SD10[illegible]	130p
2SD10[illegible]	130p
2SD10[illegible]	150p
2SD10[illegible]	200p
2SD1064	250p
2SD10[illegible]	200p
2SD106[illegible]	150p
2SD1071	450p
2SD1073	350p
2SD1088	150p
2SD1094	520p
2SD11[illegible]	225p
2SD1111	60p
2SD11[illegible]	225p
2SD11[illegible]	200p
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2SD1135	150p
2SD1138	80p
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2SD1142	350p
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2SD1151	50p
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2SD1164	120p
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2SD1263	90p
2SD1264	120p
2SD1265	75p
2SD1266	180p
2SD1267	100p
2SD1267A	125p
2SD1[illegible]	200p
2SD1[illegible]A	225p
2SD1[illegible]	200p
2SD1[illegible]	100p
2SD1[illegible]	160p
2SD1[illegible]	200p
2SD1[illegible]	190p
2SD127[illegible]	600p
2SD1288	175p
2SD128[illegible]	300p
2SD1291	400p
2SD1292	60p
2SD1297	425p
2SD1302	40p
2SD1308	140p
2SD1309	140p
2SD1310	140p
2SD1313	1000p
2SD1326	200p
2SD1328	60p
2SD1347	70p
2SD1348	85p
2SD1350	150p
2SD1376	125p
2SD1379	100p
2SD1380	100p
2SD1383	100p
2SD1384	50p
2SD1389	200p
2SD1390	350p
2SD1391	450p
2SD1392	150p
2SD1395	150p
2SD1396	240p
2SD1397	175p
2SD1398	130p
2SD1399	300p

2SD1400	280p
2SD1402	280p
2SD1404	125p
2SD1406	80p
2SD1407	160p
2SD1408	125p
2SD1409	170p
2SD1412	100p
2SD1413	175p
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2SD1663	450p
2SD1664	40p
2SD1666	120p
2SD1667	120p
2SD1668	120p
2SD1677	300p
2SD1730	350p
2SD173[illegible]	400p
2SD173[illegible]	350p
2SD174[illegible]	125p
2SD1748	90p
2SD1760	80p
2SD1762	70p
2SD1773	160p
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2SD1796	180p
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2SD1911	400p
2SD1913	50p
2SD1929	60p
2SD1939	75p
2SD1941	500p
2SD1959	280p
2SD1961	50p
2SD1978	50p
2SD1984	150p
2SD2012	50p
2SD2046	50p
2SJ48	425p
2SJ49	425p
2SJ50	425p
2SJ56	700p
2SJ74	60p
2SJ75	280p
2SJ76	220p
2SJ77	350p
2SJ79	225p
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2SJ106	40p
2SJ108	60p
2SJ115	525p
2SJ116	1000p
2SJ117	550p
2SJ118	600p
2SJ119	700p
2SJ122	800p
2SJ161	650p
2SJ162	680p
2SK19	45p
2SK40	50p
2SK49	50p
2SK55	100p
2SK68	100p
2SK73	75p
2SK106	40p
2SK107	40p
2SK109	120p
2SK118	50p
2SK125	100p
2SK133	650p
2SK134	415p
2SK135	415p
2SK147	160p
2SK150	150p
2SK162	115p
2SK163	40p
2SK168	40p
2SK176	800p
2SK192	45p
2SK195	150p
2SK197	140p

2SK214	170p
2SK216	200p
2SK217	35p
2SK218	400p
2SK240	140p
2SK270	50p
2SK294	350p
2SK310	200p
2SK312	750p
2SK315	70p
2SK320	120p
2SK322	140p
2SK323	130p
3SK358	300p
2SK370	40p
2SK371	40p
2SK386	600p
2SK388	850p
2SK405	450p
2SK413	500p
2SK414	500p
2SK415	500p
2SK429	180p
2SK511	450p
2SK513	325p
2SK517	200p
2SK531	350p
2SK534	700p
2SK537	900p
2SK538	450p
2SK539	1100p
2SK555	400p
2SK556	500p
2SK557	400p
2SK566	475p
2SK695	550p
2SK719	300p
2SK724	600p
2SK725	600p
2SK727	1200p
2SK735	600p
2SK758	300p
2SK787	1100p
2SK794	500p
2SK872	950p
2SK903	500p
2SK1057	600p
2SK1058	800p
2SK45	100p
2SK51	100p
2SK59	100p
2SK73	60p
2SK74	50p
2SK77	50p
2SK81	50p
2SK85	160p
2SK87	45p
2SK88	70p
2SK121	150p
2SK129	175p
2SK165	225p
2SK166	300p

COMPUTER ICs

2114	150p
2532	200p
2716	100p
2732	200p
2732A	220p
2764	150p
27C64	200p
27128	150p
27256-25	150p
27512	300p
4116	40p
4164-15	80p
4164-12	90p
4164-10	100p
41256-15	80p
41256-12	100p
41256-10	110p
41464-12	150p
41464-10	200p
6116	80p
6264-15	160p
6264-12	200p
6264-10	210p
62256-12	300p
6502	300p
6502A	360p
65C02	930p
6522	280p
6551	380p
6800	210p
6802	220p
6803	500p
6808	500p
6809	500p
6810	150p
6818	380p
6840	290p
6845	200p
6850	90p
8080A	380p
8085A	300p
8086	500p
8088	480p
8156	300p
81LS96	130p
81LS97	130p
81LS98	130p
8224	240p
8226	240p
8243	250p
8250	750p
8251	200p
8253	160p
8255	160p
8256	700p
8257	220p
8271	3400p
8279	270p
8283	400p
8284	440p
8287	260p
8288	650p

8748	700p
8755	800p
Z80ACPU	100p
Z80BCPU	160p
Z80ADMA	200p
Z80APIO	150p
Z80BPIO	150p
Z80ACTC	140p
Z80BCTC	200p
Z80ASIO	210p
Z80ASIO-1	210p
Z80ASIO-2	210p
Z80ADART	260p
74S289	180p
74S387	200p
75107	65p
75110	75p
75113	100p
75122	110p
75150	95p
75154	100p
75162	700p
75182	95p
75183	95p
75188	55p
75189	55p
75195	185p
75451	40p
75454	65p
75492	55p
8T26	95p
8T28	110p

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256K×9-80	1000p
256K×9-70	1100p
1MB×9-80	3000p
1MB×9-70	3200p

SIPS

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256K×9-70	1200p
1MB×9-80	3100p
1MB×9-70	3200p

OPTO COUPLERS

4N25	50p
4N26	50p
4N27	50p
4N28	50p
4N29	90p
4N30	90p
4N31	90p
4N32	100p
4N33	100p
4N36	58p
4N37	58p
4N38	68p

BRIDGE RECTIFIERS

W005 1A 50V	16p
W01 1A 100V	18p
W02 1A 200V	19p
W04 1A 400V	21p
W06 1A 600V	23p
W08 1A 800V	28p
BR81D 2A 100V	33p
BR82D 2A 200V	33p
BR84D 2A 400V	37p
BR86D 2A 600V	43p
BR88D 2A 800V	43p
BR32 3A 200V	43p
BR34 3A 400V	43p
BR36 3A 600V	44p
BR62 6A 200V	80p
BR64 6A 400V	72p
BR251 25A 100V	150p
BR252 25A 200V	165p
BR254 25A 400V	185p
BR256 25A 600V	200p
BR258 25A 800V	240p
BR351 35A 100V	185p
BR352 35A 200V	200p
BR354 35A 400V	220p
BR356 35A 600V	230p
BR358 35A 800V	260p
BY164 1.5A 100V	40p
BY179 1.5A 800V	40p

TRIACS

TIC2[illegible]D 4A 400V	60p
TIC225D 6A 400V	69p
TIC226D 8A 400V	68p
TIC236D 12A 400V	85p
TIC246D 16A 400V	105p
TIC253D 20A 400V	190p
TIC2[illegible] 25A 400V	205p
T2800D 8A 400V	52p

THYRISTORS

[illegible]	20p
[illegible]	28p
TIC116C 8A 300V	59p
TIC116D 8A 400V	70p
TIC116M 8A 600V	79p
TIC126D 12A 400V	75p
TIC126M 12A 600V	90p
BR103	37p
BR303	85p
BT106	180p
BT116	80p
BT119	100p
TIC44	22p
17088	200p
17089	200p
17127	200p
15 80H	230p
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TR4994 **£23.00**
TR4995 **£33.00**

GRUNDIG
VS410.440.450.460.500/505/510/520.521/530 **£17.00**
BARCELONA.MVS400.340.500.600
SE5100/6100/TVR4500/VS400/440/500/505/510/518/600/610 **£18.00**
MADRID/SE5140/VS540/VS5480 **£35.00**
MVS550/620/630/640 **£38.00**
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VXL7 **£22.00**
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VT3000 **£10.00**
VT4000/4200/5000/5500 **£15.00**
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VT8/VT9/VT56/VT57 **£34.00**
VT65 **£35.00**
VT130/VT135/VT138/VT145/VT250/VT255/VT258/VT420/425/426/428/430/431/435/438/535/536/VTL301/VTM630/635/636 **£29.50**
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VR3833/VR3913/VR3914/VR3963/VR3975/VR3912 **£6.50**
VR3986 **£20.00**
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VR3927 **£17.00**
VR3976 **£24.50**
VR3977 **£31.00**
VR3994 **£23.50**
VR3995.3997 **£31.50**
VR3917 **£16.00**

JVC 3HSS
HR2200.HR3300.HR3320.HR3330.HR3350/HR3360/HR3660/HR3750.HR3860.HR4100 **£6.50**
3292.8903.8900.8901/8902.8903/8906.8922.8928.3VO1.3V06.3V22/HR3660.HR7600.HR7610.HR7650/HR7700.HRD110.HRD111.HRD120/HRD121.HRD220.HRD225.HRS100 **£6.50**

FERGUSON 3HSSL PIN
8904.8924.8941.8943/8944/3V16.3V23/3V24.3V31.3V35.3V36.3V38.3V39.3V49 **£6.50**
HRD140.HRD141.HRD143/HRD150.HRD157/HRD158.HRD160.HRD5101.HRS10 **£15.50**

FERGUSON
8947/8948/3V42.3V44.3V45.3V46/3V47.3V52.3V54.3V55.3V56.3V57/8950.8951/3V64.FV10.FV11.3V65.FV20/FV21.FV22.FV26 **£15.50**
3V48 **£17.00**
3V43.3V53 **£24.50**
8930.8940.3V29/3V30 **£31.50**
8945 **£7.50**
3V00 **£24.00**
FV31 **£10.00**
FV37 **£22.00**
£38.00

JVC
HRD170.171.210.211 **£17.00**
HRD565.566 **£24.50**
HRD725.HRD755 **£31.50**
BR7000E.BR7000S **£30.00**
HR7200.7300.7350.2650 **£7.20**
HRD455 **£20.00**
HRD520 **£22.00**
HRD300/HRD400.HRD600 **£29.00**
HRD140 **£10.00**
HRD750 **£33.00**
HRD250.257 **£27.00**

JVC & FERGUSON
3V32.8942.HR7655/HRD180.230.3V59/FV12L.FV20B/FV22.26.30.32.33/HRD370.3V58.FV13H.HRD430/HRD470/HRD530.700.FV14T/GRC1.GRG2.3V41 **£23.00**
£30.50
£27.00
£33.50
£30.00

LOGIK
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VR950 **£16.00**

LOEWE
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OC50.OC55.OC60.OC65 **£15.00**

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HS330 **£32.00**
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NVH70 **£50.00**
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N.E.C.
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£20.00
£33.50
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£37.00

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£14.00

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£7.00

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£14.00
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VR2000/VR3300/VR3600 **£15.00**

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SV7400/8400 **£23.00**
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VC793 **£36.00**
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SLV201.202 **£29.50**
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V5470/V5480 **£18.00**

TRIUMPH
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£2.50

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FERGUSON
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£2.50

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VHSBY3/VHSCC1 **£2.50**
VHSDS2 **£2.50**
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GRUNDIG
BARCELONA.MADRID.MVS500.MVS550.MVS600.MVS620.660.SE5110.SE5140.SE6100.SE6160/TVR4500/VS500/VS505/VS510/VS520.VS521/VS530/VS540/VS550/VS600.VS610/VS620/VS630/VS640/VS660.VS680/VS5180/VS5480 **£2.50**
MVS400/MVS440/VS400/VS410.VS440/VS460 **£2.50**
VS120 **£2.50**
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HINARI
V20H/VXL10/VXL11/VXL19/VXL5/VXL6/VXL7/VXL8/VXL9/VXL90 **£2.50**
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HITACHI
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VT3000/5000/VT8000/VT9300/VT9500 **£2.50**

ITT
VR3605/VR3905/VR3935/VR3985/VR3986/VR3993/VR3994/VP3826/VR3906/VR3916/VR3926/VR3946/VR3948/VR3976/VR3995/VR3997/VR6948 **£2.50**
VR3913/VR3914/VR3943/VR3954/VR3963/VR3984 **£2.50**
VR3907 **£2.50**
VR3912 **£2.50**
VR3917/VR3833 **£2.50**
VR3929/VR3968 (PRESSURE ROLLER ASSEMBLY) **£6.25**

JVC
HR2000.HR3300.HR3330.HR3360/HR3660.HR4100.HR7200.HR7300.HR7350.HR7600.HR7610/HR7650.HR7655 **£2.50**
HRD110.HRD111.HRD120.HRD121/HRD140.HRD150.HRD160.HRD225/HRD455.HRD565.HRD725.HRD157/HRD158.HRD170.HRD180.HRD210/HRD230.HRD250.HRD257.HRD300/HRD320.HRD370.HRD400.HRD430/HRD470.HRD530.HRD566.HRD700/HRD750.HRD755.HRD950.HRP50/HRS5000.HRS5500 **£2.50**

MATSUI
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MITSUBISHI
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NATIONAL
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VR6460/VR8920 **£2.50**
VR2020/VR2021/VR2022/VR2023/VR2024 **£3.20**
VR6711 **£2.50**
VR6540 **£2.50**
DV856/VR6485/VR6585/VR6589/VR6880/VR6948 **£2.50**
VR445/VR6442/VR6542/VR6843/VR6943 **£2.50**
DV464/VR2324/VR2300/VR2334/VR2340/VR2350/VR2414/VR2480/VR2486/VR2489/VR2490/VR2498/VR6462/VR6463/VR6464/VR6560/VR6660/VR6861/VR6862/VR6863 **£2.50**

Pressure Roller Assembly
DV186/DV190/DV286/DV486/DV471/DV582/DV571/DV761/VR6180/VR6182/VR6185/VR6285/VR6290/VR6291/VR6293/VR6362/VR6367/VR6390/VR6391/VR6393/VR6467/VR6468/VR6470/VR6561/VR6570/VR6581/VR6670/VR6676/VR6760/VR6761/VR6762/VR6870/VR6970/VR6975/VR6981.63587.68587.68SB4.71SB4.72SB8.92SB31 **£6.25**

SANYO
VHR1100/VHR1300/VHR1500/VHR2300/VHR1150/VHR1200/VHR2100/VHR2500/VHR2700 **£2.50**
VTC5000/VTC5150/VTC5500/VTC9300/VTCM10/VTCM20/VTC5150/VTC5350/VTC5400/VTC6000/VTC6500/VTC9100/VPR5800/VTCM11/VTCM21/VTCM31/VTCM50 **£2.50**
VHR3100/VHR3300/VHR3310/VHR3700/VHRD500/VHRD700 **£2.50**
VTC3000 **£2.50**

SHARP
VC381/VC386/VC2300/VC3300/VC7300/VC7700/VC8300/VC9100/VC9300/VC9500/VC9700/VC200/VC2300/VC3300/VC384/VC385/VC388/VC390/VC393/VC6000/VC6200/VC7750/VC800 **£2.50**

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VCR PINCHROLLERS Cont.

SHARP Cont.
VC387, VC481, VC483, VC486, VC496, VC581, VC582, VC583, VC585, VC402, VC471, VC473, VC477, VC500, VC571, VC573, VC584, VC5W20E, VCA1031 **£2.50**
VC651, VC681, VC685, VC750, VC780, VC781, VC785, VC787, VC793, VC772, VC600, VC682, VC684, VC693, VC699, VC700, VC772, VC7810, VC782, VC7822, VC7282MK2, VC783, VC786, VC800, VCF3, VCA100, VCA102, VCA104, VCA202, VCA303, VCA211, VCA234, VCA501, VCA602, VCD801, VCD802, VCH852, VCH881 **£2.50**
VC220 **£2.50**

SAISHO
VR2000, VR3800 **£2.50**

SOLARA
SV6500, SV6600 **£2.50**
SV7300, SV8200, SV8300, SV9200, SV9300 **£2.50**
SV7400, SV8400, SV8420, SV8500, SV8520, SV8550, SV8600, SV8620, SV8700, SV8710, SV8720, SV8800, SV8830, SV9500, SV9600, SV9810 **£2.50**
SV8000, SV8100 **£2.50**

SAMSUNG
SV711, SV717, VB510, VB520, VB610, VB616, VB617, VB619, VB620, VB626, VB627, VB629, VB900, VB910, VI510, VI520, VI611, VI616, VI621, VI626, VI900, VI910, VX510, VX520, VX616, VX617, VX619, VX626, VX627, VX629 **£2.50**
SVX301, SVX303, SVX305, SVX307, SVX319, SVX322, VB710, VB770, VB8220, VB971, VB8225, VI730, VI770, VI790, VI8220, VI8225, VX8220, VX710, VX712, VX720, VX730, VX750, VX770, VX790, VX8220, VX825, VX970, VX971, VX972 **£2.50**

SIEMEN
FM350, FM352, FM355 **£2.50**
FM361, FM362, FM363, FM364 **£2.50**
FM391, FM392, FM394, FM461, FM462, FM464, FM468, FM561 **£2.50**

SONY
SLC5, SLC6, SLC7, SL3000, SL8000, SL8080, SL8200, SL8600, SL36, SL37, SLJ10, SLT6ME, SLT7ME **£2.50**
SLC9, SLC20, SLC24, SLC30, SLC33, SLC44, SLHF100, SLF1, SLF11, SLF25, SLF30, SLF60, SLF100, SL200, SLF60PS, SLF90E, SLHF150, SLHF850, SLK88, SLK95, SLT20ME, SLT30ME, SLT50ME, BMC100, BMC200, BMC500 **£2.50**
SLV201, SLV202, SLV301, SLV302, SLV401, SLV402, SLV801, SLV802 **£2.50**

TOSHIBA
DV80, DV90, DV96, DV97, V200, V200, V202, V205, V207, V300, V309, V500, V509, V55, V57, V61, V63, V65, V66, V67, V700, V71, V73, V74, V75, V77, V81, V83, V85, V86, V93, V94 **£2.50**
V5470, V5480 **£2.50**
V91, V951 (Pressure Roller Assembly) **£6.25**

VCR BELT KITS

AKAI
VP7100, VS9300, VS9500, VS9700, VS9800 **£1.30**
VS1, VS2, VS4, VS5, VS12, VS15, VS53, VP88, V56, V58, V59 **£1.00**
VS10 **£0.65**

AIWA
AV66 **£1.25**
AV77 **£1.40**
G700 **£1.60**
G900 **£1.80**

ALBA
VCR3000X, VCR4000 **£1.30**

AMSTRAD
TVR123, VCR4600, VCR4700, VCR5200, VCR6000, VCR7000 **£1.60**
VCR6000, VCR6100 **£0.80**
VCR6000, VCR6100 **£1.80**

AUTHENTIC
N850 **£1.20**

DECCA
VR8300 **£1.20**
VRH8945DK **£0.80**

FERGUSON
3292, 3V00, 3V01, 3V16, 3V22, 8900, 8901, 8902, 8903, 8904, 8906, 8909, 8912, 8922 **£1.35**
3V23, 8923, 8924, 8929 **£0.65**
3V29, 3V30, 8930, 8931, 8940 **£0.90**
3V31, 3V32, 8941, 8942 **£0.85**
3V35, 3V36, 3V38, 3V39, 3V49, 8943, 8944 **£0.70**
3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 57, 8945, 8947, 8948, 3V58, 3V59, 3V64, 3V65, 8950, 8951, FV10, FV11, FV12, FV13, FV14, FV20, FV21, FV22, FV26, FV30, FV32, FV33 **£1.05**

FIDELITY
HQS200, VCR600, VCR6100 **£1.80**
VCR100 **£1.60**
VTR1000 **£1.00**

FISHER
VBS7000 **£2.45**
VBS9000 **£1.20**
FVHP520, FVHP530, FVHP420, FVHP615, FVHP618, FVHP620, FVHP622, FVHP710, FVHP721, FVHP715, FVHP716, FVHP720, FVHP721, FVHP722, FVHP725, FVHP730, FVHP830, FVHP840 **£0.60**
FVHP905, FVHP906, FVHP907, FVHP908, FVHP910, FVHP911, FVHP915, FVHP916, FVHP918, FVHP5000, FVHP5005, FVHP5050, FVHP5075, FVHP5100 **£1.00**
VBF330, VBS7500, VBS7600, VBS9900, VBS3500 **£1.00**
£0.75

FUJITSU
HS760, VX715, VX720D **£1.60**

FUNAI
V1, V25, VCR4600, VCR4800, VCR5200, VCR5400, VCR5600, VCR6600 **£2.10**
VCR4530, VCR5840, VCR5843, VCR6800, VCR680 **£1.80**
VIP3000, VIP5000 **£1.60**

GEC
4005 **£1.50**
V4004 **£1.00**

GOLDSTAR
GHV1221, GHV1232, GHV1241, GHV1242, GHV1243, GHV1244, GHV1245, GHV1246, GHV1248, GHV51, GHV8000, GHV8210, GHV8215, VCP4100, VCP4130 **£0.80**
GHV1290, GHV1291, GHV1295, GHV1296, VCP4200, VCP4300, VCP4301, VCP4305, VCP4306, VCP4310, VCP4311, VCP4315, VCP4320, VCP4321, VCP4325, VCP4328, VCP4000 **£1.20**
GHV1247, GHV8200 **£1.50**

GRUNDIG
MVS400, MVS440, VS400, VS410, VS440, VS450, VS460 **£0.55**

HINARI
VXL2 **£0.80**
VXL7, VXL8, VXL9 **£1.80**
VXL4, VXL35 **£0.70**
VXL5, VXL6 **£1.80**
VXL3, VXL20 **£0.90**

HITACHI
VT11, VT14, VT17, V119, VT33, VT34, VT35, VT38, VT39, VT88, VT165, VT330, VT5000, VT5500 **£1.00**
VT7000, VT8000, VT8500 **£1.20**
VT680, VT6500, VT6800, VT9300, VT9500, VT9700, VT9900 **£0.60**
VT52, VT61, T62, T63, VT64, VT65, VT85, VT86, VT640 **£0.50**
VT3000 **£1.50**
VT100, VT110, VT111, VT113, VT115, VT118, V120, VT125, VT128, VT130, VT138, VT145, VT150, VT175, VT220, VT225, VT250, VT255, VT258, VT260, VTL30 **£1.50**

ITT
VR3605, VR3905, VR3935, VR3954, VR3985, VR3913, VR3914 **£0.90**
VR3826, VR3906, VR3916, VR3926, VR3946, VR3948, VR3976, VR3986, VR3995, VR3997, VR6948, VR3927, VR3928, VR3977, VR3993, VR3994, VR3912, VR3917, VR3929, VR3968, VR3907 **£1.00**

JVC
HR3300, HR3330, HR3360, HR3660, HR4100, HR7200, HR7300, HR7350, HR7600, HR7610, HR7650, HR7655, HR7700, HRD110, HRD111, HRD120, HRD121, HRD225 **£0.90**
HRD140, HRD150, HRD157, HRD158, HRD160, HRD250, HRD257, HRD455, HRD565, HRD566, HRD725, HRD755, HRP50, HRD170, HRD180, HRD210, HRD230, HRD300, HRD320, HRD370, HRD400, HRD430, HRD530, HRD700, HRD750, HRD950, FV14T **£1.10**

MATSUI
VX850 **£0.75**

MITSUBISHI
HS200, HS318, HS319, HS410 **£2.00**
HS300, HS301, HS302, HS307, HS310, HS303, HS304, HS306, HS320, HS330, HS400, HS700 **£1.50**

NEC
N830, N831, N832, N833 **£1.00**
N895 **£1.30**
PVC2300, PVC2400

NATIONAL
NV300, NV332, NV333, NV340, NV366, NV600, NV688, NV777, NV788, AG6010, AG6015 **£1.35**
NV2000, NV2010, NV3000 **£1.00**
NV7000, NV7200, NV7500, NV7800, NV8600, NV8610, NV8620 **£1.50**
NV230, NV250, NV260, NV280, NV370, NV380, NV430, NV450, NV460, NV465, NV630, NV730, NV770, NV780, NV810, NV830, NV850, NV870, NV890, AG1000, AG1200, AG1500 **£0.95**
£1.60
£1.25

PHILIPS
VR6460, VR6920 **£1.70**
VR6540 **£1.00**
DV186, DV190, DV286, DV468, DV471, DV562, DV571, DV761, VR6180, VR6182, VR6185, VR6285, VR6290, VR6291, VR6293, VR6362, VR6367, VR6390, VR6391, VR6393, VR6467, VR6468, VR6470, VR6561, VR6570, VR6581, VR6670, VR6676, VR6760, VR6761, VR6762, VR6870, VR6970, VR6975, VR72S88, VR68SB4, VR86SB1, VR92SB3 **£0.85**
VR6442, VR6542, VR6843, VR6943, VR44SB9 **£0.70**

SAISHO
VR2000 **£0.90**
VR3800 **£0.75**

SALORA
SV6500 **£1.00**
SV6600 **£1.50**
SV8000 **£1.20**
SV8100 **£0.60**
SV8500, SV8520, SV9500 **£1.50**
SV7300, SV7400, SV8400, SV8420, SV9200, SV9300 **£1.20**

SAMSUNG
SV18, SV717, V1616, V1621, V1626, VX616, VX626, VX627, VB520, VB610, VB616, VB617, VB619, VB620, VB626, VB627, VB629, V1510, V1520, V1611, VX510, VX520, VX617, VX619, VX629 **£0.85**
VB900, VB910, V1900, V1910 **£1.00**
£1.10

SANYO
VTC5000, VTC5150, VTC6000, VTC6500, VTCM10, VTCM11, VTCM20, VTCM21, VTCM30, VTCM31, VTCM50 **£0.75**
VTC5300, VTC5350, VTC5400, VPR5800 **£1.00**
VTC5500 **£0.95**
VTC9100, VTC9300 **£2.20**
VTC1100, VTC1300, VTC1500, VHR1100, VHR1150, VHR1200, VHR1300, VHR1500 **£0.90**
VHR2100, VHR2300, VHR2500, VHR2700 **£1.50**

SHARP
VC200, VC381, VC383, VC384, VC386, VC388, VC390, VC393, VC2300, VC8381, VC9100, VC9300, VC9500, VC9700 **£1.25**
VC6300 **£1.50**
VC7300, VC7500, VC7700 **£1.50**
VC8300 **£1.50**
VC300, VC387, VC471, VC473, VC477, VC481, VC483, VC486, VC488, VC496, VC8481 **£1.00**
VC402, VC500, VC571, VC573, VC581, VC582, VC583, VC584, VC585, VCSF3 **£0.90**
VC600, VC651, VC681, VC682, VC684, VC685, VC693, VC699, VC700, VC772, VC781, VC782, VC783, VC785, VC786, VC793, VC800, VC7810, VC7822, VC6F3, VC6V3, VCA100, VCA102, VCA103, VCA104, VCA202, VC7750, VC8000 **£0.70**
£1.50

SONY
SLC6, SL36ES, SLJ10, SLT6ME, SLC5, SLC7, SL37E, SLT7ME, SLC9, SL8000, SL8080, SL8200, SL8600 **£1.40**
£1.40
£1.65
£2.00

TOSHIBA
V55, V57, V5250, V5280, V33, V53, V96, V9600, V9680, V61, V63, V65, V66, V67 **£0.85**
£2.30
£0.85
£1.50

TRIPLERS

UNIVERSAL **£4.50**
THORN 9000 SERIES **£8.00**
PHILIPS G9 **£7.50**
G8 520 550 **£7.50**
KT3 **£4.50**
DECCA 100 SERIES **£7.50**
120 130 **£6.50**
ITT CVC 20 30 **£7.00**
CVC 825 **£8.00**
RANK T20A **£7.00**
UNIVERSAL TO FIT
20AX TUBE **£8.00**
30AX TUBE **£8.00**

DIODE SPLIT TRANSFORMER

LEADS TO FIT CHASSIS CODE
CTX TYPE **£2.50**
G11 TYPE **£2.50**
KT4 TYPE **£2.50**

VIDEO MOTORS

AMSTRAD
VCR7000 REEL MOTOR **£17.00**

AIWA
AV77 CAPSTON MOTOR **£25.00**

AKAI
VP7100, VS 9300, VS9500, VS9800 CAPSTON MOTOR **£21.00**
VP7100, VS9300, VS9500, VS9800 DRUM MOTOR **£19.50**

AUTHENTIC
N850 REEL MOTOR **£19.00**

BLAUNPUNKT
RTV211, RTV214 REEL MOTOR **£13.00**
RTV325 LOADING MOTOR **£8.00**

DECCA
VR8300 REEL MOTOR **£19.00**

FISHER
BVR330, VBS3500, VBS7500, VBS7600, VBS9900 REEL MOTOR **£6.30**

FERGUSON
PU 45979 CAPSTON MOTOR **£21.00**
HR3300, HR3660, HR4100, 3V00, 3V01, 3V16, 3V22, 3292, 8900, 8901, 8902, 8903, 8904, 8906, 8909, 8912, 8922 **£19.50**
PU 55371V CAPSTON MOTOR 3V35, 3V36, 3V38, 3V39, 8943, 8944, HRD110, HRD111, HRD120, HRD121, HRD225 **£19.50**
PU 46414 DRUM MOTOR HR3300, HR3320, HR3330, HR3360, HR3600, HR3660, HR4100, 3V00, 3V01, 3V16, 3V22, 3292, 8900, 8901, 8902, 8903, 8904, 8906, 8909, 8912, 8922 **£19.00**
PU 51381V REEL MOTOR 3V29, 3V30, 3V31, 3V32, 3V39, 8930, 8931, 8941, 8942, HR7200, HR7300, HR7600, HR7610, HR7650, HR7655 **£17.00**

FERGUSON & JVC
PU 58635V CAPSTON MOTOR 3V58, 3V59, 3V64, 3V65, 8950, 8951, FV10B, FV11R, FV12L, FV13H, FV20B, FV21R, FV22L, HRD170, HRD180, HRD230, HRD370, HRD430 **£29.00**
PU 58636W REEL MOTOR 3V58, 3V59, 3V64, 3V65, 8950, 8951, FV10B, FV11R, FV12L, FV13H, FV14T, FV20B, FV21R, FV22L, HRD170, HRD180, HRD230, HRD370, HRD430, HRD530 LOADING MOTOR **£8.00**
3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8945, 8947, 8948, HRD140, HRD150, HRD157, HRD158, HRD160, HRD250, HRD257, HRD455, HRD565, HRD566, HRD725, HRD755, HRP50, R73AF PU60201V CAPSTON MOTOR HRD300, HRD330, HRD337, HRD400, HRD520, HRD530, HRD700, HRD750, HRD950, FV14T **£34.00**
HRD 140, HRD150 CAPSTON MOTOR **£30.00**
HRD250, HRD565, HRD566 3V29, 3V30 CAPSTON MOTOR 8930, 8931 **£30.00**

HINARI
VXL2, VXL4, VXL20, VXL35 LOADING MOTOR **£8.00**
XL20 REEL MOTOR **£13.50**

HITACHI
5578154 CAPSTON MOTOR VT52, 61, 62, 63, 64, 65, 640 **£20.00**
VT3000 CAPSTON MOTOR **£21.00**
VT3000 DRUM MOTOR **£19.50**

ITT
VP3826, VR3906 LOADING MOTOR VR3916, VR3926, VR3846, VR3948, VR3976, VR3997, VR6948 **£8.00**
VR3912 CAPSTON MOTOR **£21.00**
VR3912 DRUM MOTOR **£19.50**
VR3605, VR3905 CAPSTON MOTOR VR3935, VR3954, VR3985, VR3913, VR3914 REEL MOTOR VR3993, VR3994 **£19.00**

MITSUBISHI
288P02801 MOTOR REEL SPOOLING HS300, 301, 302, 310 **£33.50**
288P02806 MOTOR REEL SPOOLING HS303, 304, 320, 330, 700 **£31.50**
288P03401 MOTOR REEL TAKE UP GEN HS303, HS320, HS700 **£21.00**

NEC
N830EG, N831EG CAPSTON MOTOR N832, N833EG, N895 LOADING MOTOR **£19.50**
£8.00

NATIONAL
MYN 135V5L REEL MOTOR NV300, NV332, NV333, NV340, NV366 **£13.00**
VEM0212 MOTOR REEL GEN NV730, NV770 **£30.00**
VEM0217 REEL MOTOR NV7000 **£19.00**
MAX13V9LP CAPSTON MOTOR NV300, NV332, NV333, NV340, NV366, NV600 **£30.00**

ORION
NEVHL VC150, VC180 REEL MOTOR VH201, VH205, VH212, VH250, VH254, VH288, VH3, VH300, VH303, VH312, VH700, VH704, VH708, VH712, VH770, VH774, VH780, VH820, VH844, VH900, VH974, VH1000, VH1204, VH2000, VH2004, VH2204, VH3030, VH3050, VH3060, VH4008, VHF2A, VP200, VR2948, VR2949, VR2956, VR2957 **£13.50**

ORION Cont.
NVHL, NVHM LOADING MOTOR VH250, VH254, VH288, VH300, VH404, VH412, VH512, VH530, VH535, VH600, VH630, VH635, VH640, VH666, VH704, VH730, VH735, VH744, VH770, VH774, VH820, VH844, VH850, VH888, VH893, VH900, VH974, VH1012, VH1204, VH1440, VH1500, VH1660, VH1800, VH2004, VH3030, VH3050, VH3060, VH4010, VH4015, VH4020, VH5410, VH5015, VHF2A, VP220, VR294, VR2949, VR2956, VR2957, VR2996, VR2980, VXL20, VXL25, VXL30 **£8.00**

PHILIPS
VR6540 REEL MOTOR **£16.00**

SAISHO
VR705, VR805 REEL MOTOR VR905, VR2000 **£13.50**

SAMSUNG
VB510 REEL MOTOR **£11.00**

SANYO
4 529V 10800 (RM11) REEL MOTOR VTC5000, VTC5150, VTC5300, VTC5400, VTC6000, VTC6500 **£6.30**
VTC3000 CAPSTON MOTOR **£25.00**

SHARP
RMOTV 1008GEZZ REEL MOTOR VC200, VC381, VC384, VC385, VC386, VC483, VC3300, VC8381, VC9100, VC9300, VC9500, VC9700 **£13.50**
RMOTV 1007GEZZ REEL MOTOR VC300, VC402, VC471, VC477, VC481, VC482, VC488, VC496, VC500, VC571, VC573, VC581, VC582, VC583, VC584, VC5F3, VC8481, VC8581 **£16.00**
VC7822, VCA102 CAPSTON MOTOR VCA202, VCA234, VCA602 **£32.00**

SONY
BHF 1100D CAPSTON MOTOR SLC5, SLC7, SLC37, SL3000 **£25.00**

THOMSON
VK300, VK301 CAPSTON MOTOR VK302, VK303, VK305, VK3301 **£21.00**
VK300, VK302 DRUM MOTOR VK303, VK305, VK308, VK3301 **£19.50**

TOSHIBA
V55, V57 CAPSTON MOTOR **£19.50**
V61, V63 LOADING MOTOR **£8.00**
V71, V73, V74 REEL MOTOR **£10.50**
V75, V81, V83, V85, V86, V93, V94, V300, V500, V700, DV90 **£9.50**
V71, V73, V74 CAPSTON MOTOR V75, V81, V83, V85, V700, V86, V93, V94 CAPSTON MOTOR **£15.00**

CASSETTE HOUSING

GRANADA
VHSDP1 CASSETTE LIFT ASSEMBLY **£15.00**
VHSYJ2 **£24.00**

FERGUSON & JVC
3V38, 3V39, 8943, 8944, 895 , 3V35, 3V36, 3V49, HRD110, HRD111, HRD120, HRD121, HRD225 **£24.00**
3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948, HRD140, HRD141, HRD150, HRD157, HRD158, HRD160, HRD250, HRD257, HRD455, HRD565, HRD566, HRD725, HRD755 **£24.00**
8948, 8950, FV10B, FV12L, FV13H, FV14T, FV20B, FV21R, FV22L, FV26, FV395, HRD230, HRD430, HRD530 **£24.00**
3V58, 3V59, 3V64, 3V65, FV11R, 8950, 8951, HRD170, HRD180, HRD370 **£24.00**

ITT
VR3605, VR3905 **£24.00**
VR3916, VR3926, VR2946, VR3948, VR3976, VR3986, VR3995, VR3997, VR6948 **£24.00**

NATIONAL
NV730 **£31.00**

NEC
N830EG, N831EG, N832, N833EG **£24.00**
N895 **£24.00**

PHILIPS
CASSETTE LIFT ASSEMBLY 69120366 **£15.00**
DV186, 190, 286, 471, 562, 761, VR6180, 6182, 6185, VR6285, 6290, VR6291, 6293, 6362, 6367, 6393, VR6467, 6468, 6470, 6561, 6670, VR6760, 6761, 6870, 6970 **£15.00**

TELEFUNKEN
VR2970 **£24.00**

THOMSON
V320, V321, V323, V326, V4200, V4300 **£24.00**
V342, V343, V352, V353, V360, V364, V368, V4210, V4230, V4260, V5400, V6000, V8540 **£24.00**

TOSHIBA
V55, V57 **£24.00**
V65, V66 **£24.00**

PANASONIC MODE SWITCHES

NV2000, 2010, 7000, 7200, 7800 (VSS0048) **£4.00**
NV230, 260, 430, 810, 870, 2300, 4300 (VSS0110) **£2.50**
NV830 (VSS0091) **£3.00**
NV300, 333, 340, 366, 688, 777, 778 (VSS0060) **£4.00**
NVG21, 25, NVH65, NVD80 (VSS0175A) **£2.50**

ON/OFF MAIN SWITCHES

GRUNDIG
PART NO 29703 29102
USED ON C2500, C2500TT, C8500, C8502, C8712, C8714, C8898, M66-190, M66 190 99, M70-155, P40-345, ST66 1602, T55-340, V7722
PRICE **£3.25**

ITT
PART NO 13 1074
USED ON CP0200, 0211F, 0323, 0323/1, 0341 15, 0345F, 0351, 0351 1, 0361, 0361 1, 9350, CT0500, 0500 1T, 0500T
PRICE **£3.50**
PART NO LFC 005
USED ON CVC40
PRICE **£3.25**

MATSUI/SAISHO
USED ON MATSUI 2190, SAISHO FST2130TX
PRICE **£3.50**

PHILIPS
USED ON K30, K35, K40, KT3, KT4
PRICE **£1.50**

SONY
PART NO 155466611 (POWER SWITCH 26mm - REMOTE SWITCH)
USED ON KV1612 MK1, KV1612 MK2, KV1614, KV2052, KV2056, KV2062, KV2066, KV2212, KV2216, KV2252, KV2256, KV2704, KV2705, KV2706, KV2752PE3, KV2756PE3, KX20PS1, KX20PS2, KX27PS1
PRICE **£3.50**
PART NO 155496511 (POWER SWITCH 21mm - REMOTE SWITCH)
USED ON KV2022, KV2024
PRICE **£3.50**
PART NO 155482011 (POWER SWITCH)
USED ON KV1810 MK1, KV1810 MK2, KV1820, KV1822, KV2000 MK1
PRICE **£7.50**
PART NO 155496711 (POWER SWITCH 26mm)
USED ON KV1400, KV1440, KV2040, KV2060
PRICE **£2.00**

SONY
PART NO 155258800 (POWER SWITCH 21mm - REMOTE SWITCH)
USED ON KV2020
PRICE **£2.50**
PART NO 155277400-21 (FUNCTION SWITCH)
USED ON KV1612 MK1, KV1612 MK2, KV2052, KV2056, KV2212, KV2215, KV2216, KV2252, KV2256, KV2704, KV2705, KV2706, KV2752PE3, KV2756PE3
PRICE £0.60
PART NO 155336300 (FUNCTION SWITCH)
USED ON VARIOUS
PRICE **£1.00**

VIDEO LAMPS

UNIVERSAL VIDEO LAMPS 9V 80mA (310mm WIRES) **£0.30**
PANASONIC VIDEO LAMPS **£0.50**
SHARP VIDEO LAMPS **£0.50**
HITACHI 5381682 (VT63-64) VIDEO LAMPS **£1.35**

VIDEO SENSOR LAMPS

AIWA, AKAI, ALBA, AMSTRAD, BLAUPUNKT, FIDELITY, FISHER, FUJITSU, FUNAI, GEC, GOLDSTAR, GRANADA, GRUNDIG, HINARI, HITACHI, ITT, JVC (HRD SERIES), MATSUI, MITSUBISHI, NEC, ORION, NATIONAL, PHILIPS, SAISHO, SALORA, SAMSUNG, SANYO, SHARP, SIEMEN, SONY, TELEFUNKEN, THOMSON, FERGUSON, TOSHIBA
(SENSOR LAMP CODE NO. VLO5) **£1.60**
AKAI: GRANADA (VHSTJ2); HITACHI (VT3000); ITT (VR3912, VRP3833); JVC (HR2200, 3300, 3330, HR3660); MITSUBISHI (HS200); TELEFUNKEN (VR510, VR519, 610); THOMSON (VK300, 305, 306, 3301); FERGUSON (3V00, 3V16, 3V22, 3V24, 3292, 8900, 8901, 8902, 8903, 8909, 8912, 8922, 8925) **£0.30**
(CASSETTE LAMP 9V 80mA 310mm WIRES CODE NO. VL01)
BLAUPUNKT: ORION, VH1 2A); NATIONAL (NV2000, NV2010, NV3000, NV8150, NV8200, NV8400, NV8600, NV8610, NV8620); SHARP (VC2300, VC6000, VC6200, VC6300, VC7300, VC7700, VC8000, VC8300) **£0.50**
(CASSETTE LAMP 6V 150mA CODE NO. VLO2)
AKAI (VS10); GRANADA (VHSXJ3); ITT (VR3993, VR3994); JVC (HR2650, HR7600, 7610, HR7650, HR7655); TELEFUNKEN (VR530, VR535, VR539, VR550, VR630, VR650); THOMSON (V309, V316, V357, VK309, VK411, VX8000); FERGUSON (3V31, 8941, 8942) **£0.50**
(CASSETTE LAMP 9V 80mA 310mm SKEO CODE NO. VLO6)
AUTHENTIC (N850); DECCA (VR8300); GRANADA (VHSTJ3, VHSWJ1, VHSWJ3); ITT (VR3913, 3914, 3963); JVC (HR7200, 7300, 7350, 7700); TELEFUNKEN (VR450, 520, 529, 540, 549, 620, 640, 920, 1920); THOMSON (V4100, VK308, 309, 312, 410); FERGUSON (3V23, 3V29, 3V30, 8923, 8924, 8929, 8930, 8931, 8940) **£0.50**
(CASSETTE LAMP 9V 80mA 210mm SKEO CODE NO. VLO7)
GRANADA (VHSAY3); SHARP (VC200, 381, 384, 385, 386, 388, 390, 393, 9300, 9500, 9700) **£0.70**
(CASSETTE LAMP 5V 115mA CODE NO. VLO8)

NATIONAL LINE OUTPUT TRANSFORMER

TLF 14611B **£19.00**
TLF 15542F **£25.00**
TLF 14568F **£26.00**
TLF 14567F **£26.00**
TLF 14715F **£27.00**
TLF 14749B **£20.00**
TLF 6609B **£23.00**

CASSETTE DC MOTORS

6V MOTOR **£2.00**
9V MOTOR **£2.00**
12V CW MOTOR **£2.00**
12V CCW MOTOR **£2.00**
13.2V CCW MOTOR **£2.90**

CASSETTE TAPE HEADS

MONO HEAD **£0.90**
STEREO HEAD **£1.10**
MINI HEAD **£2.30**
AUTO REVERSE HEAD **£2.60**

SONY FLYBACK TRANSFORMERS

Part No.	Models	Price
1-439-216-00	KV-2002E 2010E 2200E 2015 1820E 2010SE	
	KV-2012ME 2016ME 2015ME 2010ME	£14.00
1-439-256-11	KV-2704EC 2704UB 2704ET 2704E(A) 2704E	£40.00
1-439-286-21	KV-2215UB 2217UB 2215EI 2215FE 2212EX 2215ET	£30.50
1-439-289-21	KV-2705F 2705FE 2705UB 2705E 2706UB 2720EC	£40.00
1-439-303-00	KV-2064EC 20PS1 2082ME7 2056EC 2060SA	
	KV-2062E(ESPI)	£22.75
1-439-311-00	KV-1440AEC 1440AS MK2 CPS-14CD3 CPV-14CD2 KTX-1350NF, KTX-1430UB	£22.00
1-439-332-21	KV-2756 2730EC 2730FE 2764EC 2752UB 2752F	£30.00
1-439-333-00	KV-1882EC 1882UB 1882F 1882CH 1882AEB 1882AM, KV-1882ME3 1882HK 1882AS 16TR1 882EC(PS) 1770R	£21.50
1-439-363-21	KV-19HT1A 19FX1M1 18G2 1602M7 1602GE ADM-16B KV-2092UB 2096UB	£22.00

FLYBACK TRANSFORMERS

FERGUSON		
000-4208-001	TX9	£14.00
000-4-208-002	TX9	£14.00
000-4-235-002-01G	TX90	£14.00
000-4-247-001	TX90	£14.00
000-4-247-001 HT1	TX90	£14.00
060-3-093-001	TX100	£14.00
(110) 060-3-087-001	TX100	£14.00
(110) 060-3-064-001	TX100	£14.00
060-3-088-001	TX100	£14.00
GRUNDIG		
29201-019-05		£8.00
29201-024-11		£14.00
29201-024-04		£14.00
PHILIPS		
PS 140-17112	G11	£14.00
PS 140-10306	G90AE	£11.50
PS 140-10353	G90B	£15.50
PS 140-10151	K12	£15.00
PS 140-10283	K30, K30111	£15.00
PS 140-10246	K40	£13.00
PS 140-10247	KT4	£14.00
PS 140-10149	KT2	£9.00
PS 140-10161	KT3	£9.00
PS 140-17033	G8	£10.00
PS 140-17089	G9	£10.00
PS 140-10328	NC3	£14.00
ITT		
	CVC20	£11.50
	CVC25	£11.50
	CVC30	£11.50
HITACHI		
2432981	CPT 1444	£15.00
2434274	CPT 2174 CPT2176 CPT 2178	£18.00
OUTPUT TV MODULE	HM6251 (REF 2370551) HM6232	£5.50 £5.50

IDLERS & PULLEYS REPLACEMENTS

AKAI

VS1-2 VS4-5 VS15 VS3 6 12 56 58 59	FF-REW IDLER	M1327773	£4.50
VS1-2 VS4-5 VS15 VS3 6 12 58 59	T-UP IDLER	BV327815	£6.00
V9700	IDLER	BV321979	£6.00
VS125 126 155 VS165 240 244 245 247 248 250 512 515 516 VS22 38 105 112 115 116 205 220	IDLER ASSY	MZ366960J2	£11.00
VP7100 VS9300 VS9500 VS9800	T-UP IDLER	PU47752	£4.50
VP7100 VS9300 VS9500 VS9800	UNLOADING IDLER	PU46381	£4.00
VP7100 VS9300 VS9500 VS9800	REW IDLER	PU46380	£6.00
VP77 VS10	REEL IDLER	BV327815	£3.00
VP88	IDLER	BV336067	£5.00
VS1 3 4 9 12 VS15 58	REEL TABLE	BR347731	£5.50
VS23 35 37 53 55 VS66 75 VSA77	CLUTCH	ML373043	£13.00
VS9700	FF IDLER	BV321761	£3.20
VS9700	REW IDLER	VV321762	£4.25

AMSTRAD

VCR7000	IDLER	150280	£1.50
TVR1 VCR4500	CLUTCH	150873	£3.75
VCR4600 VC5200 VCR9000 TVR1 VCR4500 VCR5200	GEAR HOLDER	151284	£3.50
VCR4600 VCR5200 VCR9000 TVR1 VCR4600 VCR5200	REF CLUTCH		£3.50
VCR6000 VCR6100	CLUTCH	153202	£3.80
VCR4500 VCR9000	CLUTCH		£4.00
VCR4500 VCR4600 VCR4700	MOD KIT	(TAPE CREASING)	£4.50
MOD KIT TAPE CREASING FOR AMSTRAD VCR4500 4600 4700			£4.50

FERGUSON

3V00 3V01 3V16 3V22 3292 8900 8901 8904 8906	T-UP IDLER	PU47752	£4.50
3V16 3V22 8902 8903 8909 8912 8922	T-UP IDLER	PU49280	£5.50
3V23 3V29 3V30 3V31 3V32 3V35 8923 8924 8929 8930 8931 8940 8941 8942	REEL IDLER	PU48967	£2.50
3V23 3V31 3V29 3V30 3V31	ROLLER ASSY	PU49042A	£4.00
3V32 3V35 3V36 3V38 3V39 3V49 8930 8931 8940 8941 8942 3V29 3V30 3V31	T-UP IDLER T-UP CLUTCH	51402 PU51380	£1.25 £2.25
3V32 8930 8931 8940 8941 8942 3V35 3V36 3V38 3V39 8943 8944	REEL IDLER	PU55374	£2.85
3V35 3V36 3V38 3V39 3V49 8943 8944	T-UP CLUTCH	PU55373	£2.00
3V58 3V59 3V64 3V65 FV10 FV11 FV12 FV13 FV14 FV20 FV21 FV22 FV26 FV30 FV32 FV33 8950 VC141L	IDLER ARM	PU58645	£2.25
3V42 3V43 3V42 3V44 3V45 3V48 3V53 3V54 3V55 3V57 8947 8948	CLUTCH ASSY CLUTCH ASSY	PU55822 PU57658	£13.50 £11.50
3V42 3V43 3V44 3V45 3V48 3V53 3V54 3V55 3V56 3V57 8947 8948	T-UP CLUTCH	PU56043-1-4	£2.80
3V42 3V43 3V44 3V45 3V48 3V53 3V54 3V55 3V56 3V57 8947 8948	SUPPORT CLUTCH	PU56044-1-5	£2.80
3V00 3V01 3V16 3292 8900 8901 8902 8903 8904 8906 8909 8912 8922	LOADING IDLER	PU43681	£4.00
3V00 3V01 3V16 3292 8900 8901 8904 8906	REW IDLER	PU46308	£6.00
3V16 3V22 8902 8909 8912 8922	IDLER	PU49281	£1.70
3V16 3V22 8902 8909 8912 8922	IDLER	PU49283	£1.00

FISHER

FVHP420 520 530	FF-REW PULLEY	HI638531	£1.00
FVHP615 618 620 FVHP622 710 711 FVHP720 721 722 FVHP725 730 830 FVHP840 905 906 FVHP908 910 911 FVHP915 916 918	COMP IDLER ASSY	FI1430420400300	£3.30
FVHP615 618 620 FVHP622 710 711 FVHP720 721 722 FVHP725 730 830 FVHP840	GEAR IDLER ASSY	FI1430490400900	£4.50
FVHP615 618 620 FVHP622 710 711 FVHP720 721 722 FVHP725 730 830 FVHP840	REEL T-UP ASSY	FI1430410400900	£5.50
FVHP905 906 908 FVHP910 911 915 FVHP916 918	GEAR IDLER ASSY	FI1430490402400	£4.00
FVHP975 980 990 FVHP999 5000 5005 FVHP5050 5075 5100	IDLER	FI1430420400700	£4.50
FVHD40 55 140 FVHP1 10 20	REEL DRIVE ROLLER		£6.00
FVHP975 980 990	GEAR		£3.00
FVHP975 980 990	CLUTCH	FI1430510404200	£9.50
FVHP420 520 530	IDLER		£2.80
FVHP420 520 530	TAKE UP IDLER		£3.60
FVHP990	LOADING GEAR		£2.00
VBS3500	REEL DRIVE PULLEY		£5.20
VBS3500	IDLER		£3.00
VBS7000	REW IDLER		£1.20

GOLDSTAR

GHV1221 1232 1240 GHV1241 1242 1243 GHV1244 1245 1246 GHV1247 1248 8000 GHV8200 8210 8215 GHVP51 VCP4100 4130	CLUTCH GEAR	435038A	£2.50
GHV1221 1232 1240 GHV1241 1242 1243 GHV1244 1245 1246 GHV1247 1248 8000 GHV8200 8210 8215 GHVP51 VCP4100 4130	IDLER		£1.70

HINARI

VXL3 VXL20	REEL IDLER	40000009	£1.50
VXL2	IDLER		£1.50
VXL4 VXL35	IDLER		£2.75
VXL4 VXL35	CLUTCH		£6.50
VXL4 VXL12 VXL25 VXL30 VXL35 VTV300	LIMITER POST		£1.30
VXL5 VXL6	CLUTCH		£3.75
VXL5 VXL6	GEAR HOLDER		£3.50
VXL7 VXL8 VXL9	CLUTCH		£3.80

HITACHI

VT11-33 VT63-64 VT14 17 19 38 57 86 88 34 35 39 52 61 62 65 85 330 640 VT16S	CLUTCH ASSY	6879515	£7.50
VT120-220 100 110 111 113 115 118 120 125 128 130 135 138 145 150 175 225 250 255 258 260 VTL30	CLUTCH ASSY	6886824 6886972	£7.50
VT8000-8300 7000 VT8500-8700	FF-REW IDLER	6413663	£2.80
VT8000-8300 7000 VT8500-8700	PLAY IDLER	6414221	£3.60
VT8000-8300 7000 VT8500-8700	FF-REW PULLEY	6383531	£0.80
VT9300-9500 6500 VT680 6800 9700 9900	FF-REW IDLER	8681471	£3.30
VT9300-9500 6500 VT680 6800 9700 VT9900	PLAY IDLER	6861482 6861481	£3.20
VT9300-9500 9700 VT9900 6500 680 6800	IDLER	681505	£3.00
VT11-33 VT63-64 VT14 16S 17 19 34 VT35 38 39 52 61 62 VT65 85 86 88 330 640 VT100 110 111 113 VT115 118 118 120 125 128 130 135 138 145 150 VT175 220 225 250 255 258 260 VTL30 VT400 405 410 413 VT414 415 418 420 425 426 428 430 431 435 VT438 450 498 510 518 520 525 526 530 535 VT536 540 545 546 548 570 575 576 580 585 VT588 VTM625 626 630 635 636 640 645 646 VTS80 85	FF-REW ARM	6886792 6897094	£2.75 £1.30
VT400 405 410 413 VT414 415 418 420 425 426 428 430 431 435 VT438 450 498 510 518 520 525 526 530 535 VT536 540 545 546 548 570 575 576 580 585 VT588 VTM625 626 630 635 636 640 645 646 VTS80 85	CLUTCH BASE	6896951	£3.25
VT3000 VT3000 VT680 6500 6800 VT9700 9900	T-UP IDLER (LARGE) REW IDLER FS-BRAKE	6861505	£4.50 £6.00 £3.00

HITACHI TV

OUTPUT MODULE HM 6251 OUTPUT MODULE HM 6232		£5.50 £5.50

JVC

HR330 3660 4100	T-UP IDLER SML	PU49280	£5.50
HR7200 7600 7650	T-UP CLUTCH	PU53462A	£2.25
HR7655 7300 7350 7610 HR7200 7300 7350	REEL IDLER	PU48967	£2.50
HR7600 7610 7650 7655 7700 HR7655 7700	ROLLER ASSY	PU49042A	£4.00
HR3300 3660 4100	T-UP IDLER LRG	PU47752	£4.50
HR7200 7600 7650 HR7655 HRD110 HRD111 HR7300 7350 7610 HRD120-121 225	T-UP IDLER	PU51402A	£1.25
HRD110 HRD120-121 HRD225 HRD111	T-UP CLUTCH	PU55373	£2.00
HRD110 HRD120-121 HRD225 HRD111	IDLER ARM	PU55374-3-8	£2.85
HRD170 180 210 230 HR0320 370 400 430 470 530 700 750 950 3000 HR55000 HR55500	IDLER ARM	PU58465	£2.25
HRD455 HRD725	CLUTCH MECH	PU558822	£13.50
HRD140 150 157 158	CLUTCH MECH	PU57658	£11.50
HRD160 250 257 565 566 755 HRP50 HR3300 HR3330 HR3660 HR4100	REW IDLER	PU46380	£6.00
HRD140 150 157 158 HRD160 250 257 455 565 566 725 755 HRP50	TAKE UP CLUTCH	PU56043-1-4	£2.80
HRD140 150 157 158 HRD160 250 257 455 565 566 725 755 HRP50	TAKE UP CLUTCH	PU56044-1-5	£2.80

MATSUI

VX730 735 750 755 VX810 820 850 880 990	CLUTCH	850A00005	£6.50
VX730 735 750 755 VX770 800 810 880 VX990	LIMITER POST LEVER ASSY		£1.30
VX800A VX900 VX800A VX820 VX850 VX900	IDLER REEL REEL UNIT CLUTCH ASSY IDLER		£1.50 £3.50

MITSUBISHI

HS306 307 318 319 HS400 410 710	GEAR ASSY	522P00201	£6.25
HS337 338 347 349 HS411 412 421 HSB10 HSB20 HSB30 HSE10 HSE20 HSE30 HSE70	IDLER	552B01701	£6.50
HS306 307 318 319 HS400 410 710	IDLER	641C34301	£2.00
HS347 349 412 HSB10 HSB20 HSB30 HSE10 HSE20 HSE30 HSE70	IDLER	522B02002	£3.00

MITSUBISHI Cont.

HS337 338 411 421	IDLER	552B01801	£3.50
HS200	TAKE UP IDLER (LARGE)		£4.50
HS200	UNLOADING IDLER		£4.00
HS200	REWIND IDLER		£6.00
HS306 307 318 319 HS400 410 710	SUPPLY REEL DISK	522A00101	£3.20
HS306 307 318 319 HS400 410 710	TAKE UP REEL DISK	522A00102	£3.20
HS320	REEL DISK	522C06301	£3.00
HS337 338 411 421	REEL DISK	522P00601	£5.00
HS300 301 302 310	PULLEY	522CD5201	£2.25
HS306 307 318 319 HS400 410 710	GEAR WHEEL	641D71101	£1.50
HS306 307 318 319 HS400 410 710	GEAR WHEEL	641D71001	£1.50

NEC

N830 N831 N832 N833	TAKE UP CLUTCH		£2.25
N830 N831 N832 N833	TAKE UP IDLER		£1.45
N830 N831 N832 N833	REEL IDLER		£2.85
N895	TAKE UP IDLER SMALL		£6.00
N911 N915 N916 N917 N9112 9013 9014 9016 9033 9034 9054 9055 9066 9110 N9510 9520 9530 9610	REEL DRIVE PULLEY		£5.50

NATIONAL

NV322 NV600 NV688 NV777 NV788 NV332 AG6100 6200 6800 6810	IDLER UNIT	VXP0463	£2.75
NV300 NV333 NV340 NV366	IDLER ARM	VXL0997	£3.60
NV300 NV330 NV333 NV340 NV366	IDLER UNIT	VXP0401	£0.75
NV300 NV330 NV333 NV340 NV366 NV8620	PLAY IDLER	VXP0433	£2.75
NV300 NV332 NV333 NV340 NV366 NV600 NV777 NV788 NV2000 NV2010 3000 7000 AG6010 AG6015	ACTION GEAR	VDG0016	£0.60
NV333 NV688 NV2000 NV3000 NV7800	LOADING GEAR	VXP0325	£2.00
NV300 NV332 NV333 NV340 NV366 NV600 NV777 NV788 NV2000 NV2010 3000 7000 AG6010 AG6015	INTERMEDIATE GEAR	VXG0017	£0.65
NV330 NV333 NV340 NV366 NV777 NV788	CAM GEAR	VXG0158	£1.00
NV230 NV250 NV260 NV280 NV370 NV380 NV430 NV450 NV460 NV465 NV470 NV480 NV630 NV650 NV730 NV780 NV810 NV830 NV850 NV870 NV97 NV99 NVG10 NVG11 NVG12 NVG14 NVG15 NVG16 VG18 NVG30 NVG400 AG1000 AG1200 1500 1810 2100 AG2200 NVH65 NVH70	IDLER ARM	VXP0521	£1.70
NV370 NV430 NV870 NV730 NV830 NV850 NV770 NV890 AG1000	CAM GEAR	VDG0200	£1.20
NV730 NV770 NV2000 2010 3000 NV2000 2010 3000 NV2000 NV3000 NV7000 7200 7800 NV7000 7200 7800 NV8150 8200 8300 NV8400 8600 8610 8620 NV8200 8400 8600 NV8610 8620 NV8620 NV332 NV600 NV688 NVG20 NVG21 NVG25 NVG40 NVG45	IDLER UNIT CLUTCH IDLER UNIT PULLEY UNIT	VXP0581 VXP0331 VXP0329 VDG0068 VXP0344 VXP0343 VXP0488 VXP0767	£2.50 £1.00 £1.00 £1.00 £1.00 £4.00 £0.90 £0.90 £4.00 £3.50 £5.00
NV230 NV250 NV280 NV430 NV450 NV460 NV465 NV650 NV730 NV770 NV810 NV830 NV890 NV99 NVG10 NVG12 NVG15 NVG30 NVG120 NVG130 NVG400 NVH70 AG1000 NV230 NV250 NV260 NV280 NV430 NV450 NV730 NV770 NV780 NV810 NV870 NV890 NV97 NVG10 NVG11 NVG12 NVG14 NVG15 NVG16 NVG30 NVG120 NVG130 NVG400 NVH70 AG1000	WORM WHEEL CLUTCH GEAR WORM WHEEL LOADING GEAR	VXP0604 VXP0595 VXP0691 VDG0035	£2.00 £1.00 £1.50 £0.60
NV7000 7200 7800 8050 NV230 NV250 NV370 NV430 NV450 NV460 NV630 NV730 NV770 NV780 NV810 NV830 NV890 NV97 NVG10 NVG12 NVG15 NVG30 NVG120 NVG130 NVG400 NVH70 AG1000	LOADING GEAR	VXP0520	£1.50
NV230 NV250 NV260 NV280 NV430 NV450 NV730 NV770 NV780 NV810 NV870 NV890 NV97 NVG10 NVG11 NVG12 NVG14 NVG15 NVG16 NVG30 NVG120 NVG130 NVG400 NVH70 AG1000	CLUTCH GEAR		£2.50
NV230 NV250 NV260 NV280 NV300 NV333 NV340 NV366 NV370 NV430 NV450 NV460 NV465 NV630 NV650 NV777 NV780 NV788 NV810 NV830 NV850 NV870 NV890 NV2000 NV2010 7200 7800 NVG7 NVG10 NVG12 NVG14 NVG15 NVG18 NVG30 NVG120 NVG130 NVG400 NVH70 AG1000	LIMITER ROLLER		£1.50

ORION

MULTIPLE MODELS	IDLER	850A200004	£3.50
MULTIPLE MODELS	IDLER	850A200005	£6.50
VH1 VH2A	IDLER		£1.20
VH1 VH2A	IDLER		£1.20
VH1 VH2A	DRIVING GEAR		£0.60
VH1 VH2A	INTERMEDIATE GEAR		£0.65
VC150 VC180 VH200	IDLER		£1.50
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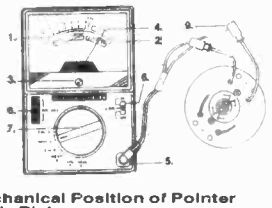

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J SIZE 6V 2.95
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PP3 1.10

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63v

1uf at 63v .12
4.7uf at 63v .12
47uf at 63v .18
100uf at 63v .22
220uf at 63v .35

250v

1uf at 250v .20
4.7uf at 250v .25
10uf at 250v .35
22uf at 250v .40
33uf at 250v .55
47uf at 250v .65
100uf at 250v 1.25

400v

1uf at 400v .23
4.7uf at 400v .35
10uf at 400v .70
22uf at 400v .85

(All PCB Mounting)

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BY227 .20
BY229/800 .95
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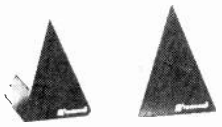

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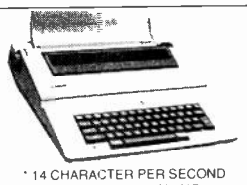

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TDA-2505	7.50
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TDA-2543	2.63
TDA-2545A	1.65
TDA 2546A	2.70
TDA-2548	2.32
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TDA-2556	2.63
TDA-2557	2.10
TDA-2560	2.55
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TDA-2579	5.63
TDA-2579A	3.75
TDA-2582	2.37
TDA-2590	1.98
TDA-2591	1.72
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TDA-3566	4.14
TDA 3569	4.50
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TEA-2018A	1.95
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TMS 3450NL	1.88
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UPD 8255AC	21.72
UPD-8355C	4.50
UPD-8749HD	10.19
X-0031	4.50
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16014	0.75
16029	0.75
16083	0.75
16090	0.60
16514	0.75
16802	0.75
16905	0.60
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2SA 1490	1.86
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2SC 1890	0.15
2SC 1904	0.66
2SC-1906	0.17
2SC-1907	0.27

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COVER PHOTO

This month's cover photograph shows the Philips CP90 chassis – see servicing article on page 336

REED BUSINESS PUBLISHING

Japanese Gloom

We have for so long watched with awe the development of the Japanese consumer electronics industry that the idea of it being in considerable difficulty takes a while to sink in. But the fact is that in both its domestic and export markets the industry is in trouble. There are signs of this everywhere now. NEC for example has just withdrawn from VCR manufacture. It will continue to supply VCRs, but these will be made by Sanyo on an original equipment manufacturer (OEM) basis. Distribution will be limited to NEC's 6,000 affiliated distributors in Japan. This might offer some minor relief for Sanyo, which recently announced its first dividend cut in twenty two years. Last July Sanyo forecast a 36 per cent fall in pre-tax profits: by mid-December the forecast decline had been increased to 73 per cent. Matsushita, Sony and just about every other Japanese consumer electronics manufacturer have been reporting similar results. The situation of smaller manufacturers is probably that much worse. Shintom, a medium-sized electronics manufacturer whose main business is the production of VCRs on an OEM basis – for others to apply their brand names – recently closed one of its VCR assembly plants (outright closure of a factory is rare with listed Japanese companies). In the case of Shintom, some 90 per cent of production is exported. But the drop in the Japanese domestic VCR market is alarming: from a peak of 7·15 million units to an estimated 4·3m in 1992, with a further decline expected this year. With VCR market penetration rates of over 80 per cent in Japan and the USA, sales prospects are poor and production capacity is grossly excessive. In the third quarter of last year alone Japanese VCR production fell by over 20 per cent.

You don't have to be a genius to understand what has gone wrong. With any market, saturation is eventually achieved. Couple this with the fact that economic downturns are a fact of life and sooner or later trouble arises. But it looks as if the Japanese consumer electronics industry became mesmerised by its own success, generating the same sort of false optimism that drove the property market in the UK in the late Eighties. There was of course always hope that new products would come along to keep things going. But there are few products that have the potential of hi-fi, the personal stereo, the TV receiver and the video. The Las Vegas Consumer Electronics Show reported on in a later page revealed many interesting new systems and products, but somehow they don't seem to have the same universal appeal as those just mentioned.

The extraordinary thing really was the VCR boom. In the history of consumer products there can have been few that took off so rapidly. It undoubtedly led to unrealistic sales projections and the installation of the excessive production capacity that was to have met this demand.

There were other factors that fuelled the growth of Japanese production capacity in the Eighties. This column has always felt that relatively low interest rates in Japan was one such factor. Most commentators dismissed this view. Not so they said, the Japanese success was due to the development of new manufacturing techniques. These must have played a part, but it's interesting that a special paper just released by the Bank of Japan, *Corporate Business under Economic Adjustment*, states that "much of the apparent improvement in Japanese companies' financial performance in the last decade was a reflection of cheap finance rather than improved efficiency". The report casts doubt on the theory that Japanese industrial competitiveness was mainly a result of the flexibility and efficiency of Japanese factories.

It comes to something when that giant amongst Japanese consumer electronics manufacturers Matsushita decides to send about five hundred members of its staff to work with local retailers, visiting their customers at home to find out what would encourage them to spend more. One wonders what they discovered. The step was taken last November, after Matsushita had reported a 65·6 per cent drop in pre-tax profits for the half year to September.

Teletopics

NEW VHS FORMAT

JVC has announced a new VHS format, W-VHS. The W stands for wide, which according to JVC signifies (a) the worldwide penetration of VHS, (b) the ability to handle wide-screen (16:9) high-definition pictures and (c) the development of a wide range of applications for VHS! According to JVC over 400 million VHS units have been produced since the system was launched in Japan in 1976: now various developments such as wide-screen pictures and improved-definition TV systems call for an enhanced video format.

W-VHS has the following features: (1) Compatibility with Japanese Hi-Vision broadcasts, including 16:9 recording and playback. (2) Compatibility with future broadcasting systems such as EDTV-II (Japan), ATV (USA) and HD-MAC (Europe). (3) The ability to record simultaneously, and playback likewise, two high-quality conventional TV programmes or accept inputs from two cameras simultaneously to produce 3-D images. (4) Compatibility with the existing VHS and S-VHS formats. Technical details are scarce at present, but W-VHS uses baseband, two-track parallel recording, the colour signal being time compressed. HD-TV signals are split into two separate components for recording on the twin tracks. This two-track system, using metal tape, also gives the system the ability to record two separate conventional video signals simultaneously. A picture quality improvement circuit uses a noise-reduction system called temporal emphasis, and there's a cross-jitter compensation circuit. The standard audio system is f.m. stereo, though PCM digital sound is an option. Drum diameter is 62mm, speed 1,800 r.p.m. Tape speed is 33·4mm/sec.

JVC plans to launch the first W-VHS machines in Japan in the autumn, at a price equivalent to slightly over £3,000. They will be able to play VHS and S-VHS recordings.

JVC's announcement of the W-VHS format is part of an effort to push HDTV, which has had very limited success in Japan to date. As a second contribution to encouraging HDTV JVC has announced a lower-priced MUSE receiver, again to be launched in the autumn. It uses a newly developed decoder with fewer i.c.s. The selling price is expected to be around the equivalent of £6,750.

NEURAL CAMCORDER

The main feature of Sharp's new 8mm camcorder, Model VLN1H, is its Neuro auto-exposure system. Sharp says that the system has been taught how to identify and adjust to thirty different lighting conditions, selecting the optimum exposure. Other features include a x12 zoom, four fast shutter speeds with a top speed of 1/10,000th sec, a 16:9 mode, 3lux low-light capability, viewfinder menuing, a fader, a digital signal processor and remote control. Suggested price is £550.

SATELLITE TV

December seems to have been a good month for satellite TV installations, with BSkyB and the *Financial Times* Satellite Monitor putting the figure at 120,000. According to manufacturers the equipment shortage is now over. Both Amstrad and Pace claim significant sales increases. There continues to be disagreement over the total number of installations, with Continental Research which runs the *FT* Monitor and BARB which produces the official TV ratings issuing figures that vary by around 300,000. This is not too surprising: there is no exact count of sales or of disconnections, while the end of the old BSB transmissions has further complicated the situation.

The EBU has moved its entire programme exchange network from Eutelsat I-F5 to Eutelsat II-F4, at the same time increasing the number of transponders leased from two to four. Eutelsat has also announced that Deutsche Bundespost Telekom, France Telecom and the Swiss PTT have agreed to go ahead with the Europesat 1 project, which will transmit fourteen DBS TV channels.

Supervision Ltd., Tower Works, 2 Globe Road, Holbeck, Leeds LS11 5QG (0532 444 195) has launched a complete range of satellite receiving equipment and accessories under the brand name Apollo. The first two products, both non-IRD receivers, are the 120-channel stereo model SR1800 and the SR1900 which has 199-channel capacity and provision for dual LNB inputs. Initially aimed at the export market, deliveries of the UK manufacturerd receivers started in February.

The Swedish Microwave XL800 triple-band LNB, which has the exceptionally low noise figure of 0·8dB maximum, is available from exclusive supplier Satellite Solutions (UK) Ltd., 35 Quarry Park Close, Moulton Park, Northampton NN3 1QB (0604 670 900). It covers the FSS, DBS and Telecom bands over the range 10·95-12·75GHz, the gain being typically 55dB (maximum variation over the bandwidth ±2dB). As industry-standard connectors are fitted the LNB can be used for system upgrading.

Satellite Solutions is also distributing the new Philips STU909 multi-standard satellite receiver which has a 2GHz tuner, 120 preselections divided between 32 satellites and automatic 16:9 widescreen switching. It can receive D2-MAC, PAL and SECAM, with ten selectable mono sound channels and three selectable stereo channels. D2-MAC processing includes digital hi-fi sound with the option of picture blanking during radio reception. There's an on-board Eurocrypt decoder/reader and a decoder scart that can be used with virtually all PAL/SECAM descramblers. Frequency range is 950-2,000MHz and the threshold carrier-to-noise ratio 7dB. Three scart sockets, audio phono and S-VHS connectors and inputs for two LNB inputs are provided. All three types of polariser can be used with the STU909.

IN BRIEF

The Independent Television Commission will be moving to 33 Foley Street, London W1 this summer. The ITC's staff, including its twelve national and regional offices, has been reduced to 190. . . AT&T in the USA has developed a system that enables subscribers to receive interactive video signals via standard telephone lines for services such as placing orders and responding to advertisments. It's regarded as a transitional technology to provide such services before installing fibre-optic cables. . . Amstrad's technical director Bob Watkins, who joined the company in 1976 and oversaw many of its major products during the Eighties, has left to become group managing director of Binatone, heading the company's UK and Hong Kong operations. . . Dixons and Currys have announced that a potential danger due to overheating can occur with Matsui Model 2580 25in. receivers supplied between May 1989 and May 1991. A modification will be carried out free of charge by Mastercare Ltd. who can be contacted by owners on freephone 0500 234 558.

MICROWAVE CONTROL PANEL. Mains operated, with touch switches. Complete with 4 digit display, digital clock, and 2 relay outputs one for power and one for pulsed power (programmable). Ideal for all sorts of precision timer applications etc. **Now only £4.00 ref 4P151.** Good expenmenters board.

FIBRE OPTIC CABLE. Stranded optical fibres sheathed in black PVC. Five metre length £7.00 ref 7P29R or £2 a metre.

12V SOLAR CELL. 200mA output ideal for trickle charging etc. 300 mm square. Our price £15.00 ref 15P42R. Gives up to 15v.

PASSIVE INFRA-RED MOTION SENSOR. Complete with daylight sensor, adjustable lights on timer (8 secs -15 mins), 50' range with a 90 deg coverage. Manual overide facility. Complete with wall brackets, bulb holders etc. Brand new and guaranteed. **Now only £19.00 ref 19P29**

Pack of two PAR38 bulbs for above unit £12.00 ref 12P43R

VIDEO SENDER UNIT Transmit both audio and video signals from either a video camera, video recorder or computer to any standard TV set within a 100' range! (tune TV to a spare channel) 12v DC op. £15.00 ref 15P39R Suitable mains adaptor £5.00 ref 5P191R. Turn your camcorder into a cordless camera!

FM TRANSMITTER Housed in a standard working 13A adapter (bug is mains driven). £26.00 ref 26P2R. Good range device.

MINATURE RADIO TRANSCEIVERS A pair of walkie talkies with a range of up to 2 kilometres. Units measure 22x52x155mm. Complete with cases and earpieces. £30.00 ref 30P12R

FM CORDLESS MICROPHONE. Small hand held unit with a 500' range! 2 transmit power levels. Reqs PP3 battery. Tuneable to any FM receiver. Our price £15 ref 15P42AR

12 BAND COMMUNICATIONS RECEIVER. 9 short bands, FM, AM and LW DX/local switch, tuning 'eye' mains or battery. Complete with shoulder strap and mains lead. £19 ref 19P14R. Ideal for listening all over the world.

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FM BUG Built and tested superior 9v operation. £14.00 ref 14P3R

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SINCLAIR C5 MOTORS 12v 29A (full load) 3300 rpm 6"x4" 1/4" O/P shaft. New. £20.00 ref 20P22R. Limited stocks.

As above but with fitted 4 to 1 inline reduction box (800rpm) and toothed nylon belt drive cog £40.00 ref 40P8R. 800 rpm.

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12 TO 220V INVERTER KITA s supplied it will handle up to about 15w at 220v but with a larger transformer it will handle 80 watts. Basic kit £12.00 ref 12P17R. Larger transformer £12.00 ref 12P41R

VERO EASI WIRE PROTOTYPING SYSTEM Ideal for designing projects on etc. Complete with tools, wire and reusable board. **New low bargain price only £2.00 ref B2P1**

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BARGAIN NICADS AAA SIZE 200MAH 1.2V PACK OF 10 £4.00 REF 4P92R, PACK OF 100 £30.00 REF 30P16R

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ULTRASONIC ALARM SYSTEM. Once again in stock these units consist of a detector that plugs into a 13A socket in the area to protect. The receiver plugs into a 13A socket anywhere else on the same supply. Ideal for protecting garages, sheds etc. Complete system **now only £19 !!!**

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Brand new complete with shrimp hatchery, shrimps, prepared slides, light etc. £29.00 ref J29P4.

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CUSTOMER RETURNED SPECTRUM +3

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TWO BUILT IN 5 1/4" DRIVES

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KEYBOARD, MOUSE & MANUAL

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AMSTRAD DMP4000 PRINTER ASSEMBLIES Entire printer assemblies including print head, platen, cables, stepper motors etc. Everything bar the electronics and case. Our price just £20 ref Q20P2

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VCR RABBIT SYSTEM Lets you control your VCR from a second set using the VCR remote control. Retail £99 ours £39!!!

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FAX 0273 323077

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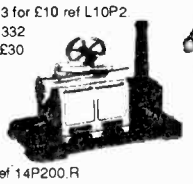

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Small units that are designed to hold over the mouth piece of a telephone to send MF dialling tones. Ideal for the remote control of answer machines. £5.00 ref 5P209R

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Fully programmable talking, lockable coinbox BT approved, retail price is £79 ours is just £29! ref J29P2.

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Complete cased brand new drives with cartndge and software 10 times faster than tape machines works with any Commodore 64 setup. The orginal price for these was £49.00 but we can offer them to you at only £25.00! Ref 25P1R

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Made for installation in hotels etc as the main sat receiver no data but fully cased quality unit. £20 ref K20P1. Suitable psu £8 ref K8P3.

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Tower case 52cmx40cmx20cm. 2 fans, speaker, 275w psu, IEC I/L and O/L, 386 m/board with onboard disc controller, ethernet, display driver, parallel and serial ports. **There are several IC's missing from the m/board plus no data! £79 ref K79P1.**

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transmits between 88-108MHZ FM. 5 2cm x 2cm, uses LR44 watch battery. Complete with wire aerial & battery. £16 ref K16P1

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BUMPER PACK NO 1 10 of our popular £1 packs for just £5 our choice of contents.

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LCD 1 X 32 DISPLAY Bargain price of just £3 complete with loads of data for a similar display. £3 ref L3P1.

USEFUL POWER SUPPLIES. 18v 900mA dc output (regulated) fully cased with mains cable and DC out cable. £6 ref K6P1.

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RADAR DETECTORS. Detects X and K bands (ie speed traps). Not legal in the UK so only available if you intend to 'export' it. £59 ref J59P1.

100 WATT MOSFET PAIR. Same spec as 2Sk343 and 2SJ413 (8A,140v, 100w) 1 N channel and 1 P channel. £3 a pair ref J3P9.

LOW COST CAPS. 1,000 capacitors £3 (33uf,25v) ref J3P10.

VELCRO. 1 metre length 20mm wide, blue. £2 ref J2P16.

JUG KETTLE ELEMENTS. Good general purpose heating element just £3 ea ref £3P8 or 5 for £10 ref J10P3.

VERY BIG MOTOR. 200v induction 1.1kw 1410 rpm 10"x7" GEC 1" keyed shaft. Brand new. £95 ref J95P1.

BIG MOTOR. 220-240v 1425rpm 2 8A 5/8th" keyed shaft GEC 6.5" x 8" complete with mounting plate. £38 ref J38P1

SMALL MOTOR. Electrolux 160 watt 3,000 rpm, 220-240v 5/8" shaft precision built £18 ref J18P1.

EPROMS 27C64 PACK OF 10 £7 REF M7P1.

EPROMS 27C256 PACK OF 10 £9 REF M9P1.

EPROMS 27C512 PACK OF 10 £10 REF M10P1.

MODEMS FOR £1.25? These modems are suitable for stripping only hence they are only 4 for £5 ref J5P3.

SOLAR POWERED WOODEN MODELS. Complete with solar panel, motor and full instructions. £9 ref J9P2. 3 diff £20 ref J20P3.

SOUND OPERATED LIGHT. Clap your hands and light comes on. Turns after preset delay. (4 AA's req'd). £2 ref J2P3.

FERGUSON SRB1 REMOTE CONTROLS. Brand new units ideal fer a spare or have two remotes! £4 each.

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VCR Clinic

Reports from Philip Blundell, AMIEIE, Stephen Leatherbarrow, Eugene Trundle, Brian Storm, Nick Beer, Michael Dranfield, Roger Burchett, John Edwards, Chris Avis, Jeff Herbert and Graham Richards.

GEC V4007

This Philips clone had the classic one broken/clogged head symptom. A scope check at the f.m. out test point (pin 3 of plug L6) confirmed that there was no f.m. output from video head one. Cleaning the heads a few times produced no improvement so, as a rough check on the head preamplifier, I injected a signal at pins VK1 and 2 and was surprised that there was again no head 1 output. So the heads were blameless this time! A check through the signal path then brought me to C2001 (22nF) which was open-circuit. Ninety nine times out of a hundred it's the heads that are at fault, but beware of the one in a hundred! **P.B.**

Toshiba DV90

This machine would play a tape but there was no display and no signals were tuned in during E-E operation. The d.c.-d.c. converter was inoperative because ZL62 (ICP-N10) was open-circuit. **P.B.**

Sharp VC651H

This machine didn't record. I decided to follow the signal path through the AN3215K video signal processor chip IC201 – the signal enters and leaves at several points. All was well up to pin 19, but there was no output at pin 21 (TP203). The chip itself proved to be faulty, but fitting a replacement revealed another problem – the video heads were badly worn. Some days you just can't win.

It's quite common with this and related machines to find that the sound is being recorded only intermittently. The cause is usually dry-joints on the audio board. You have to unsolder this from the main panel in order to work on it. To complete the job we also solder the wires directly to the erase head. **S.L.**

Akai VS22

We've had our fair share of these nice machines in recently because of no results. The cause is invariably failure of one of the transistors on the power supply panel. I strongly recommend fitting only exact replacements, otherwise problems can arise. The numerous small electrolytics on this panel regularly fail, producing various symptoms such as dead with localised transistor overheating or display o.k. but no power up. We've had C6 causing interference/patterning and C20 (100µF, 16V) causing no power up. Our policy is to remove and test all the electrolytics on this board. It saves time in the long run as you avoid bounces.

After doing this recently with two of these machines and successfully repairing the power supplies we found that they would both load tapes normally but neither the drum nor the capstan motor operated. There was no rewind or fast forward drive either. In both cases the BU2735AS chip IC503 was the cause. **S.L.**

Hitachi Capstan Bearings

We've had a lot of trouble recently with gunged-up capstan bearings in Hitachi VCRs. A VTM720 would squeal on rewind and would intermittently unlace at odd intervals: the upper capstan bearing was dirty and tight. The same thing with the same effects occurred with a VTM622E. It's not difficult to dismantle the motor to clean and lubricate the upper bearing. Use very thin oil – as much as a gnat might put in his chamber pot. **E.T.**

Sanyo VHR4350

A couple of these machines developed intermittent loss of drum servo phase lock – the effect is similar to that of dirty heads, but it drifts in and out of the picture. Check the internal jointing and plug/socket connections to the drum motor's PG coil. You have to dismantle the upper and lower drum assemblies to get at the stator PCB. **E.T.**

Philips VR502

After running for about fifteen minutes this machine lost all TV programmes – it was as if the aerial lead had been pulled out. We found that the voltage at pin 11 of the tuner was being pulled down from within the tuner. A suitable voltage fed to pin 11 from a bench power supply showed that 22mA was being sunk inside the tuner. A new tuner restored normal operation. **E.T.**

Sanyo VHR3300

The audio/control head stack used in this and similar models wears at a relatively fast rate – we've replaced many of them. Signs of failure are: sound level fluctuation; tape fussiness with respect to servo lock with a machine's own recordings; and intermittent miscounting by the tape counter. The only cure is a replacement ACE head assembly. **E.T.**

Pioneer VR727/Philips VR6870

Failure of C2011 in the chopper power supply has been mentioned on a number of occasions. Another, nastier failure in the same area occurs when the 6·8V reservoir capacitors C2032 and C2033 dry up. They are both 680µF, 16V. The symptoms are several: the machine may take minutes or hours to come to life after being switched on; all segments in the fluorescent display may light up; or there may be intermittent or no sound in the E-E and playback modes. **E.T.**

Sharp VC681

When this machine finds a blank portion of tape it switches into the video search mode and quickly skips through until it comes to the next recording. It then reverts to the play mode. We had one of these machines that would remain in the search mode however: the only way to stop it was to press the play button.

The blank detector circuit is centred around the µPC393C chip IC701. It works by detecting the off-tape line sync pulses. All was well at Q701's collector, but although the signal at pin 3 of IC701 changed when a recording was found the signal at pin 1 didn't change. As replacing IC701

made no difference it seemed that R7106 and R7107 at pin 2, the operational amplifier's non-inverting input, were faulty. But their values were spot on. With no faulty component present we could only conclude that the circuit had gone out of tolerance, perhaps due to age. So a modification was called for. After some consideration we decided that the fault could be cured by reducing the voltage at pin 2 by 0·2V. The modification consisted of adding a 470kΩ resistor in parallel with R7107. A good soak test showed that this had cured the fault. **M.Dr.**

Amstrad VCR9000

This machine had no E-E or playback sound. A check at pin 6 of IC701 showed that its 8V supply was missing, though there was voltage at the other end of R735. This resistor was o.k., the cause of the problem being that C721 (100µF, 10V) was short-circuit. We fitted a replacement rated at 16V. **M.Dr.**

Samsung VI730

As the 1·2Ω, 0·5W protection resistor (FR101) for the STK5333 voltage regulator was open-circuit the machine was dead. The cause of the failure was a loose fuse clip in the mains plug. The machine had stopped in the partially laced condition. **R.B.**

Philips VR6542

This machine has a Panasonic deck and suffers from the same mode-switch problems as Panasonic models. **R.B.**

Panasonic NVF65

This Nicam stereo hi-fi deck wouldn't stop when search tuning, though if you tried tuning in the opposite direction the machine would usually (but not always) lock on a station. So checks were made for sync low and a.f.c. defeat switching at the pins of the demodulator pack. Normally when tuning the a.f.c. defeat voltage changes from 4·5V to 0V. In this case it remained at 2·5V all the time. The MN12C261D front panel memory chip IC7502 is directly responsible for this and proved to be the culprit, a replacement curing the fault. **B.S.**

Panasonic NVJ47

The mechanism was erratic to say the least: a lot of movement but rarely reaching the play position without sighing to a halt and shutting down. The cause of the problem seemed to be the capstan stator. It had very little torque and emitted strange whistling noises intermittently. When the capstan rotor was removed to gain access to the stator we found that the soldering to the stator coils could have been better. In fact resoldering the stator coils and the Hall i.c.s cured the trouble. **B.S.**

Panasonic NVJ42

The search tuning fault with this machine was no lock in either direction. Sync low and a.f.c. defeat were normal but because there was no a.f.c. feed from pin 6 of the plug-in demodulator pack the front panel microcontroller chip had no information to work on. Pin 6 of the demodulator pack proved to be the cause of the problem: it was open-circuit to the demodulator pack plug itself. Fitting a new socket cured the problem. **B.S.**

JVC HRD110/Ferguson 3V38/9

This machine would shut down after attempting to lace up. A new loading belt was fitted but made no difference. The cause of the fault was traced to the after-load leaf switch unit which is mounted close to the loading motor – one of the contacts had broken off. **J.E.**

Ferguson 3V35/JVC HRD120

As the thermal fuse in the mains transformer's primary winding was open-circuit this machine was dead. Fortunately the pin-outs on the PCB are accessible. So to avoid the cost of a new transformer we added a 250mA fuse externally, soldering it across the pins in place of the internal fuse. The machine then worked well. **J.E.**

Hitachi VT17

Motorboating on sound during playback was caused by relay RL401 on the audio PCB. Removing the plastic cover and cleaning the contacts provided a cure. **J.E.**

Sharp VCA113HM

When play was selected the picture appeared for a few seconds in the pause mode then the machine went into the stop mode. The pinch wheel had fallen down its shaft because its internal grip had broken. A new pinch wheel assembly (part no. MLEVF0281GEZZ) cured the problem. **J.E.**

GEC V4005

This Hitachi clone (VT63/4) suffered from an intermittent very loud knocking noise when playing or recording. Not the capstan bearing this time – too loud anyway – but a worn reel pulley on its pinion. A new clutch base assembly provided a complete cure. **N.B.**

Fisher FVHP520

The cause of low reel torque can be difficult to find on these machines. We've found that it's usually due to reel spool tyre wear. Cleaning with alcohol and drying will prove the point. **N.B.**

Susumu XR1

The cause of tape chewing in this Clydesdale supplied machine was a faulty reel idler. It's Panasonic part no. VXP0521. Willow Vale list it and a number of other spares for this model – the mechanism is similar to that used in the Panasonic Model NV370.

There was a second fault however – very poor playback picture quality because of poor screening around the head amplifier. The cause was that some idiot hadn't secured the upper PCB behind the mechanism – the screws were nowhere to be seen and the board was being held down by the lid! It has a spring contact to earth the plate. **N.B.**

Logic VR950/Samsung VI611

This machine wouldn't play or record – the arms didn't lace up because the pin had dropped out of the sector gear. As a result it didn't move when the main cam did. A new sector gear was installed and the pin, found loose in the mechanism, was fitted into it. The old gear was faulty – the hole for the pin had become enlarged. **N.B.**

JVC HR7200/Ferguson 3V29

This oldie had no colour playback with known good recordings and no drum lock or chroma with its own recordings – no prizes for spotting the connection. The fault could be instigated and cleared by touching anywhere on the bottom PCB. We eventually found the dry-joint on one leg of C347, which is connected to one leg of IC402. The leg had a very fine ring around it. **N.B.**

Osaki VCR33

It didn't take long to find the cause of the fault in this machine – tape chewing due to a faulty reel idler. But the fact that the Panasonic mechanism it uses is similar to that in the NV370 may be of interest since the appropriate VUD kit or individual components are easy to obtain. Don't use the Panasonic pinch roller though – a Sharp unit from Willow Vale will do. The rest of the machine is not of Panasonic origin. The whole lot looks very similar to the Susumu XR1 which was marketed by Clydesdale. **N.B.**

JVC HRD565

There was intermittent loss of r.f. vision, the symptom being a black raster with weak vision floating through. Wiggling either r.f. lead would instigate the fault or cure it. When I'd dismantled the r.f. modulator/amplifier I found that there was a break in the print between the input plug's vision pin (screened lead) and its first connection about 1·5in. away inside the modulator. **N.B.**

Panasonic NV870

The only sign of life was an occasional flicker from the display. There was less than 1V on the Reg 5V rail due to a 10Ω short to chassis. Several plugs, sockets and links later I reached the operation display board and found that the earthed leg of C6512, which decouples the supply to IC6503, was pushed against the positive leg of the Reg 5V decoupler C6502, behind the digitron. With the leads apart life was restored to the machine. But no channels could be tuned or memorised for several minutes, after which this fault would suddenly clear. The AN5033 tuning chip was temperature-sensitive. **C.A.**

Panasonic NV370

The E-E picture was marred by fine horizontal lines that varied with the tuning. A.G.C. decoupler C702 on the tuner/i.f. panel was open-circuit. **C.A.**

Baird 8940/JVC HR7350

No erase or recorded sound prompted a gleeful leap on to the erase head connector, only to find that it had already been bypassed and removed. The cause of the problem was that the bias oscillator was receiving no supply voltage in the record mode because switching transistor Q10 was not being turned on. Its base bias resistor had risen in value from 5·6kΩ to 53kΩ. **CA.**

Panasonic NVG40

The playback and E-E pictures were intermittent, but the owner said that the machine worked fine on its side! Tapping anywhere on the top main board affected the fault, so I scoped the video signal at input pin 3 of the luma/chroma subpanel. It was constant here, but at output pin 1 it fluctuated as the panel was flexed. When the subpanel was removed I saw that there were cracks around pins 1 and 2. Resoldering them provided a more permanent remedy that gravity! **C.A.**

Panasonic NVL25

Very intermittent servo lock caused us a few problems with this machine. It would play all right for hours then, suddenly, the capstan motor would rapidly speed up, causing sound distortion. At the same time the drum speed would go way off lock, the result on the picture being like loss of line hold. The fault would last for about ten seconds after which everything returned to normal as suddenly as the fault had appeared. After much head scratching and component changing we found that the cause of the fault was the STK5392 regulator chip in the power supply. When the fault condition was present the regulated 5V rail rose to 6·2V and became unsmoothed with h.f. pulses on it. Because of the very intermittent nature of the fault it took several days of testing and probing to find the cause. **J.H.**

Panasonic NVJ35

Playback was perfect, but when record was selected the machine would run for a few seconds then return to the stop mode. L4002, the choke in the l.t. feed to the audio bias oscillator, had gone open-circuit because a solder blob inside the oscillator transformer T001 had provided a short to chassis. When L4002 had been replaced and the solder blob had been removed the record function worked normally. A microcontroller chip pin monitors the bias oscillator: if no oscillation is detected the deck is returned to the stop mode. **J.H.**

Panasonic NVJ40

No full tape width erase was the trouble with this machine. The symptom was blue and red patterns with new recordings because the chroma from the previous recording wasn't being erased. The cause of the fault was simple. The full width erase head plugs in. During manufacture one pin had bent over when the plug was inserted and thus failed to make contact. With these later type G decks the erase voltage is fed via a ribbon cable across the top of the cassette housing, along with the end sensor supply. **J.H.**

Sentra VX8400HQ/Alba VCR5000X

Tuning drift is a common problem with these machines. Change D101, preferably to a TAA550 i.c. If you still have problems, remove the glue/gunge from around C133/4/5, also around R158/9/60. The glue becomes slightly conductive, causing erratic drifting – sometimes on one or two channels only! **G.R.**

Hitachi VT430

The mains input PCB had to be repaired because of damage caused by mains-borne lightning. This got the machine working, but in the play and E-E modes there was a blank raster. Replacing Q3301 – we used a BC640 – restored the playback luminance but we now had weak E-E. Scope checks proved that the i.f./demodulator and p-in-p modules were o.k. The video was traced to pin 7 of the LA7016 chip IC1501, but there was very little output at pin 4. Replacing this chip cleared the final fault. **G.R.**

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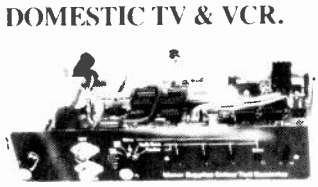

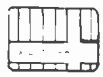

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CAMCORNER

Reports from David C. Woodnott and Nick Beer

Panasonic NVM3B

This one was o.k. until you switched it off! All the normal functions worked: play, record etc. were fine. But at switch off things went seriously wrong. It would eventually switch off, but after several attempts R20 (2·2Ω, 1W) would burn out. This resistor is in the 12V supply to the loading motor drive chip IC6004. By connecting an ammeter in series with the supply we found that at switch off the current drawn by the loading motor was greatly in excess of the normal value. Hence the burn out of R20.

The clue was the fact that the excess current was the cause of the unit shutting down: it triggered the excess-current circuit in the power supply. The cause of the problem was an open-circuit link-through from one side of the PCB to the other. As a result the syscon micro was robbed of its supply when switch off was attempted. It reacted by driving the loading motor hard in the unload direction. The moral is that when extraordinary symptoms are present, look for all possible clues. In this particular case the clue was provided by monitoring the micro's 5V supply. **D.C.W.**

Sharp VCC10P

The colour was erratic in the camera mode, with bent verticals and intermittent picture roll. Playback was o.k. The customer said that if you hit the camera the fault cleared. And it did! The cause of the trouble was a dry-joint on the camera video board, where the sync subpanel is connected. It took rather longer than it should have done to find the dry-joint, because a touch almost anywhere produced the fault. **D.C.W.**

Philips VKR6830/JVC GRC7E

The customer complained of no functions, and indeed absolutely nothing worked. An internal inspection showed that the cause of the problem was a common one – water! Why don't they tell us they got it wet? Carefully cleaning the operation PCB restored most of the functions, but after a short period they ceased. There was a further contaminated area on the MDA PCB. Except for these two areas everything else had been spared the flood effect.

I always give equipment that has suffered in this way an extended test run. This hopefully avoids the possibility of a further failure. As a general rule, if the fault produces various unexplained symptoms look for an ingress of liquid. When asked, the customer invariably "remembers" the circumstances of the accident! **D.C.W.**

Canon VME70E

This camcorder had been dropped. There was only slight cabinet damage, the complaint being of tape chewing. The cassette housing had suffered slightly, but this responded to some metal work. The mechanism seemed to work all right, at least without a tape. When a tape was inserted and the play button was pressed pictures were obtained. No incorrect tape path effects were apparent. The record mode also worked correctly.

I left the machine running in the LP play mode and got on with some other work. Shortly afterwards a scrunching sound from the direction of the VME70E drew my attention. The tape had ridden up the capstan shaft and was about to jam against the guides – I managed to get to the stop button just in time. After some observation it became clear that the fault occurred only at the start of transport when a rewound cassette was laced up and moving. I subsequently found that the cause was the fact that both helical-wrap guide pole securing screws were loose. Tightening them and checking the tape path for correct operation cured the fault. Both screws loosened by a fall? Well I never! **D.C.W.**

Ferguson 3C03/JVC GRC7E

The reported fault was no record or playback colour. E-E colour was o.k. The customer said that it happened after "winter storage". Unfortunately the fault is quite common with this model: it's unfortunate because of the high cost of IC10, which is almost always the cause of the problem. Check carefully around IC10 on the YC PCB for other possible causes, but be prepared to replace IC10. After replacing it a complete chroma set-up is advisable. **D.C.W.**

Sony ACP88

This worldwide camcorder charger/power supply unit is quite expensive to replace but is eminently serviceable. This one was dead, with fuse F101 (1·25A) black. Not surprisingly the 2SC3457 chopper transistor Q101 was short-circuit all ways round, but the cause was a dry-joint on the reservoir capacitor C105 – the big black one. Its positive connection had obviously been arcing. **N.B.**

Sanyo VMD3P

You may recall that I wrote about failure of the silver-can, surface-mounted electrolytic capacitor in position C4011 in the system control circuit in this model. More recently this type of capacitor has been failing everywhere. With this particular machine there was loss of vision in the pause/cue and review modes because C1095 (10μF) had fallen in value. When all the other capacitors of the same type were checked I found that the vast majority of them were physically leaking. I ended up replacing the lot in the VCR section. Imagine the problems that this will cause if the trouble is widespread, with electrolyte leaking all over the densely packed PCBs. And they smell awful when you heat the area with an iron! **N.B.**

Sanyo VMD6P

This camcorder came to me from Australia (some reputation, eh?). The problem was that a cassette was jammed inside and the loading motor could be heard running. When I dismantled the unit (watch the plugs and sockets which connect the assemblies to the cases) I found that two out of the four loading gears mounted on the loading motor bracket had damaged or missing teeth. A new set of four gears was fitted. I've since had several others in with the same problem. **N.B.**

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Part 3

Eugene Trundle

Last month we saw how the transmitted signal is converted by the tuner to a constant, lower intermediate frequency. The next step is to demodulate this signal in order to recover the original "baseband" sound and vision signals.

The purpose of the filtering and selectivity incorporated in the tuner is mainly to avoid interference and spurious effects arising from the use of the superhet technique – there would be no need for image and n ± 4 rejectors if there were no local oscillator signal for these transmissions to beat with. The receiver's main selectivity and bandpass characteristics are provided after the tuner, in the form of an i.f. filter that has a well-defined and closely-specified response curve. The response curve is especially critical with terrestrial transmissions because one of the sidebands is severely curtailed to save precious spectrum space in the broadcast bands. Vestigial sideband (v.s.b.) transmission is universal with a.m. broadcast TV.

The IF Filter

The required i.f. filter bandpass characteristics can be provided by using a fairly complex combination of L, C and R elements, either in the form of a "lumped" circuit block or by spreading the necessary acceptors, rejectors and traps throughout an i.f. amplifier that consists of several discrete component stages. These were the techniques used prior to the advent of the SAW (surface acoustic wave) filter. Aligning such an i.f. amplifier is now largely a lost art, like setting up the convergence with a delta-gun tube. Modern sets all use a SAW filter: it provides the required band shaping without any need for adjustment, setting up or operating power, can be mass produced, and comes in a tiny, cheap package.

The construction and operating principle of a SAW filter is shown in Fig. 1. The substrate consists of a slice of piezoelectric material similar to that used in a ceramic filter. A transducer printed on one end converts the incoming electrical signal into an acoustic one. This mechanical vibration is propagated across the surface of the substrate like the ripples in a pond. Some of this mechanical energy is intercepted by a second transducer at the output end, being recoverted in the process to an electrical signal. Maximum output is obtained when the pitch of the comb-like transducer electrodes matches the half wavelength of the acoustic surface wave. As the input frequency varies so the efficiency of the SAW couling varies, giving peaks and troughs in the response – a bandpass characteristic. Dampers prevent reflection of the acoustic waves at each end.

Response Curve

The most important characteristic of a SAW filter is its response curve. Fig. 2 shows a typical one for system I. The main passband is about 6MHz wide, centred on 36MHz and providing at least 40dB of rejection to signals outside the passband – in practice these consist of adjacent channel transmissions that pass easily through the relatively broadband tuner.

The crucial points in the response curve are noted in Fig. 2, the main one being the placement of the vision carrier (39·5MHz) 6dB below the peak of the response. With a v.s.b. transmission the lower sideband of the vision r.f. signal is largely suppressed at the transmitter, causing an imbalance in the modulation energy received: with video signals up to 1·25MHz there are two sidebands while for the higher transmitted video frequencies, corresponding with the fine picture detail, there is only one sideband. If this "lop-sided" spectrum was presented to the vision demodulator the low-frequency luminance components would be emphasised in its output to the detriment of the picture. The falling response of the i.f. filter at frequencies above the 39·5MHz carrier (remember the sideband mirroring effect introduced by the superhet system) balances the signal energy fed to the demodulator and equalises the frequency response of the system as a whole.

Another critical frequency is that of the sound carrier, 33·5MHz with system I. As Fig. 2 shows, the response at this frequency is about 20dB down from the peak level. This ensures that the sound carrier is too weak to cause mischief by beating with the chroma subcarrier at 35·1MHz – otherwise there would be coarse patterning on the picture at 1·6MHz – and that the sound carrier is always below the level of the vision signal, whose negative-going amplitude modulation takes it to a very low point on picture highlights. So long as this condition is fulfilled there is no significant amplitude (i.e. vision) modulation of the intercarrier sound signal (see later), which is extracted as a beat product of the vision demodulator. Frequency modulation is used for the audio signal, and to prevent it being amplitude modulated by the vision it sits on a little "shelf" at one side of the SAWF's response curve.

The other two frequency markers on the curve shown in Fig. 2 are at the rejection notches for the main out-of-band carriers anticipated: adjacent channel vision at 31·5MHz and adjacent channel sound at 41·5MHz. These are both attenuated by about 55dB. Don't be mislead by the logarithmic

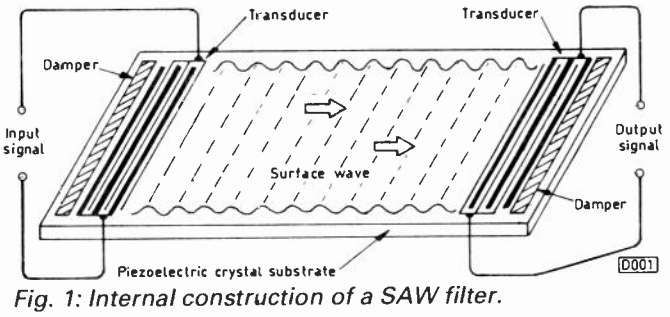

Fig. 1: Internal construction of a SAW filter.

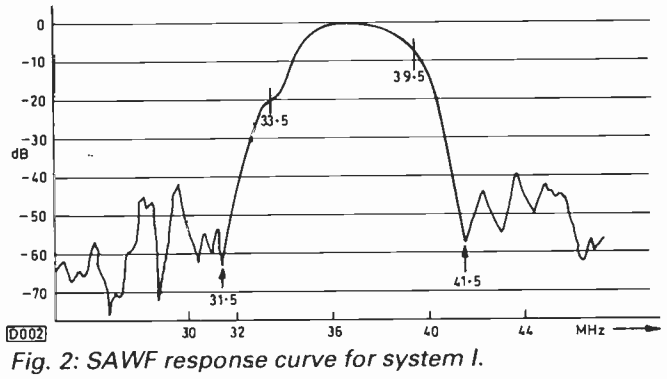

Fig. 2: SAWF response curve for system I.

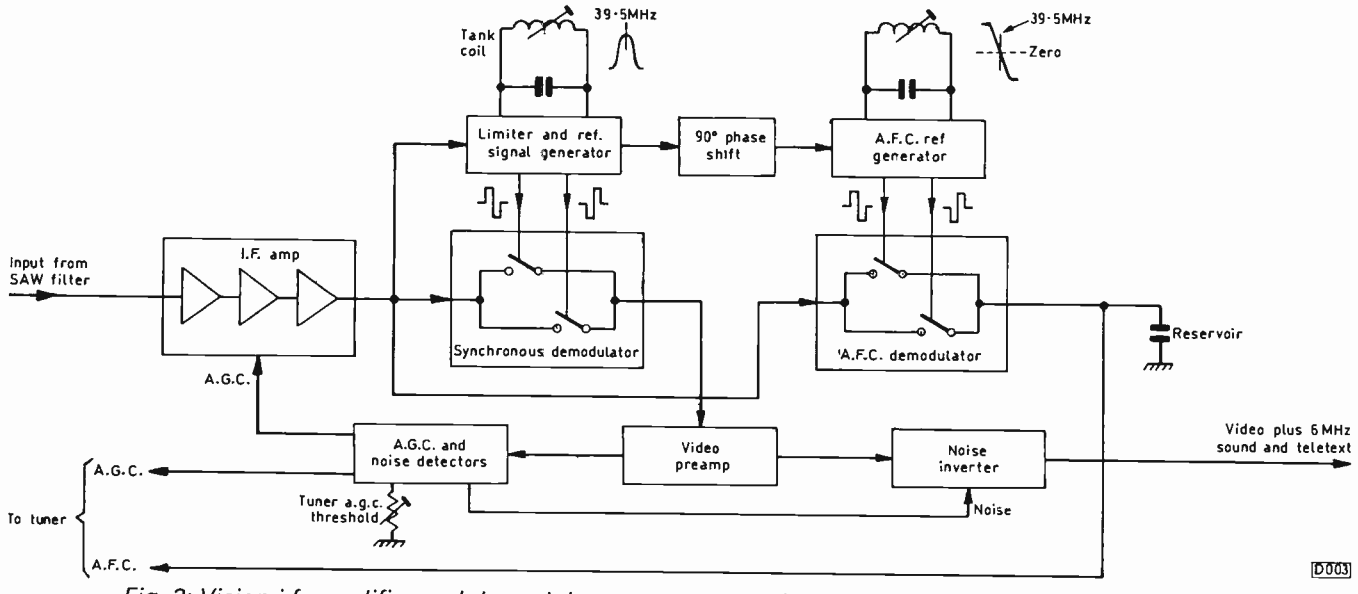

Fig. 3: Vision i.f. amplifier and demodulator arrangement for terrestrial TV reception (a.m. vision).

scale (dB): 55dB represents about 500:1 and the 20dB sound carrier point about 10:1. The insertion loss of the SAWF is about 20dB, so that 0dB in Fig. 2 can be taken as −20dB in the overall scheme of things. This loss is made up by the i.f. amplifier's gain.

Group Delay

Any circuit through which a modulated vision carrier passes, especially one that provides selectivity, must have a reasonably linear phase response: any phase change that occurs with the signal sidebands should be proportional to the frequency deviation from the carrier, so that all signal components, regardless of frequency, arrive at the demodulator simultaneously. Time errors greater than 100nsec cause visible preshoots or overshoots on the picture. Errors much smaller than this upset teletext decoding.

Group delay characteristics are specified by the broadcasting authorities for each transmission system and are built into the SAWF.

Dual SAWFs

In sets that incorporate a Nicam decoder special attention is given to the phase-modulated Nicam sound carrier, which with system I is spaced at 6·552MHz from the vision carrier, representing an i.f. of 32·948MHz. For this purpose a special "quasi-parallel" SAWF is available: it has one input transducer and separate output transducers for the vision and sound carriers. The vision channel response curve differs from the standard type in that it falls steeply in the region of the sound carriers. In the sound channel there are two quite narrow response curves: one embraces both sound carriers and is centred on 33·2MHz, the other one being sharply tuned to 33·95MHz. We'll return to this when we come to the sound circuits.

IF Amplifier

The vision i.f. amplifier itself is a very straightforward wideband amplifier that generally works with a balanced (push-pull) input from the SAWF. It has high gain, typically 60dB over three or four stages, the gain being controllable over a wide range by automatic gain control (a.g.c.). The latter is based on detection of the amplitude of the demodulated sync pulse tips since these represent maximum carrier power (with negative-going vision modulation peak white represents minimum carrier amplitude and the sync tips maximum carrier amplitude). The a.g.c. loop ensures that changes in the r.f. signal level affect only the noise content of the picture, not the contrast.

The i.f. amplifier's output is balanced. It goes three separate ways, as shown in Fig. 3: to a synchronous demodulator, to a carrier reference signal generator and to an a.f.c. demodulator.

The Synchronous Vision Demodulator

Synchronous demodulators work on the principle of closing a switch once per carrier cycle and storing the signal sample thus obtained in a reservoir. This is the sample-and-hold principle much used in analogue electronics. In practice because a balanced input is applied to the detector there are two switches which are closed on alternate half cycles of the carrier, giving full-wave signal demodulation.

We need a reference pulse train to control the switches. It's derived from a "tank" coil that's tuned to the 39·5MHz carrier frequency and is driven by an amplitude-limited sample of the signal: the limiting ensures that the phase and amplitude of the reference signal thus generated are unaffected by the modulation itself. Squaring the 39·5MHz sinewave produced by the tank coil produces the required switch control pulses.

The smoothed outputs from the switches represent the recovered baseband video signal complete with the chroma information and, where applicable, the 6MHz intercarrier sound signal.

AFC

For automatic frequency control (a.f.c.) a d.c. voltage that's proportional to any tuning drift is required. It can then be added to the varicap bias voltage applied to the tuner to produce the necessary correction. Tuning is exactly right when the vision carrier is spot on at 39·5MHz. The a.f.c. voltage is obtained from a second synchronous demodulator whose reference signal input is in quadrature with that applied to the vision synchronous demodulator, i.e. there's a 90° phase difference, equal to a quarter cycle of the carrier.

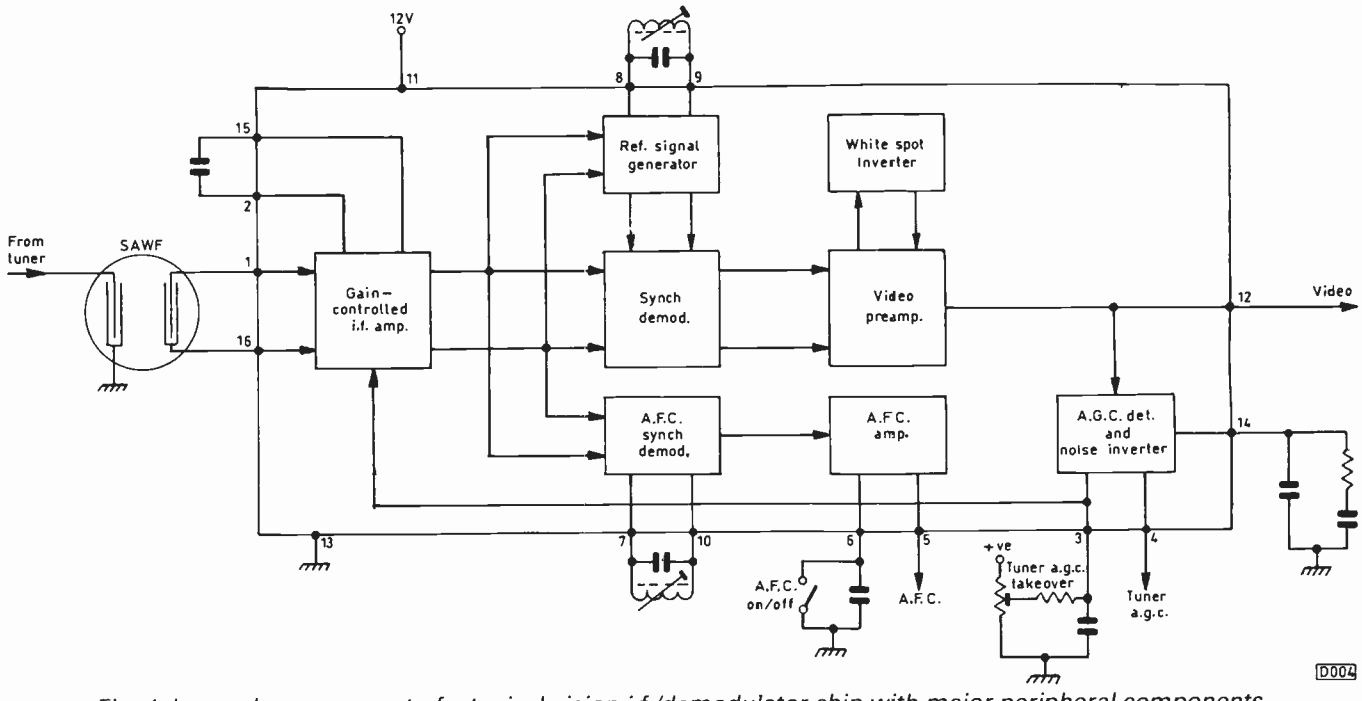

Fig. 4: Internal arrangement of a typical vision i.f./demodulator chip with major peripheral components.

between the two reference signals. It's generated by a second LC tuned circuit.

Because of this 90° phase shift the a.f.c. demodulator's switches should close when the vision carrier is passing through zero. Any difference from zero represents a tuning drift. As the carrier frequency departs from 39·5MHz because of tuning drift, the a.f.c. demodulator produces an output that indicates by its polarity the direction of drift and by its amplitude the degree of drift. This output is fed back to the tuner's varicap control system to provide the required correction.

Because of the very stable broadcast carriers a.f.c. is not required with frequency-synthesis tuning. It's used with satellite TV systems to compensate for slight LNB local oscillator drift. A.F.C. is particularly helpful where the r.f. signal comes from the modulator in a VCR, computer or a video games system: in such cases drift is a real possibility.

RF AGC

As the TV set's input signal steadily increases the i.f. gain is reduced to compensate. Initially the gain of the r.f. amplifier in the tuner is held at maximum, minimising the receiver's noise level. When the i.f. a.g.c. voltage exceeds a preset level, corresponding to an r.f. input signal level of 2-3mV, a control voltage is produced for the tuner and is converted to a reducing current for the pin diode attenuator inside the tuner (see last month). This is done to prevent the risk of cross-modulation in the tuner's r.f. amplifier, something that can occur when the stage is overloaded. The receiver's noise level is irrelevant when such a high signal input is present.

Typical IF Chip

Let's tie up this section by taking a look at the operation of a typical commercial i.f. amplifier/demodulator chip, see Fig. 4. The balanced output from the SAWF is applied to pins 1 and 16, where it's fed to a three-stage amplifier with over 60dB of a.g.c. To maintain the best signal-to-noise ratio the a.g.c. is applied sequentially, starting with the final (pre-demodulator) stage where the signal amplitude is largest. The capacitor between pins 2 and 15 decouples the d.c. feedback loop within the chip.

The LC circuit connected to pins 8 and 9 forms a tuned load for the reference signal amplifier, which feeds switching signals to the synchronous demodulator. The a.f.c. synchronous demodulator is tuned to the carrier frequency by the LC circuit between pins 7 and 10. Its output at pin 5 forms a high-impedance current source that's converted to a control voltage by an external resistor.

The differential outputs from the vision demodulator are converted by the video preamplifier to a positive-going composite video output at about 2·5V peak-to-peak. This buffered output appears at pin 12. A white-spot inverter operates with the video preamplifier: it takes over-modulation (noise) spikes and clamps them at mid-grey level: because of the high selectivity of the carrier reference circuit this type of synchronous vision demodulator is particularly sensitive to pulse and spike interference.

Further feeds from the video preamplifier go to the a.g.c. detector. An important item here is the noise inverter/protection circuit which limits the video signal amplitude in the presence of noise, preventing false a.g.c. action when impulsive interference is present. The capacitor connected to pin 14 is the a.g.c. reservoir capacitor: the parallel RC network provides critical damping of the a.g.c. loop. The tuner a.g.c. output is produced at pin 4, the onset of its action being governed by the voltage applied to pin 3.

FM Vision Demodulator

Frequency modulation is used for the vision signal with satellite TV transmissions. The i.f. and demodulator circuits are broadly similar to those we've been considering with the following main differences: first the SAWF has a broad response, about 27MHz, with a centre i.f. of typically 480MHz (see Fig. 5); secondly the vision demodulator is an f.m. type that's immune to amplitude and pulse modulation once the input signal level exceeds a certain threshold. Most vision f.m. demodulators use the phase-locked loop (PLL) principle – see block diagram shown in Fig. 6.

The principle of the PLL demodulator is simple. A linear voltage-controlled oscillator (VCO) free-runs at the second

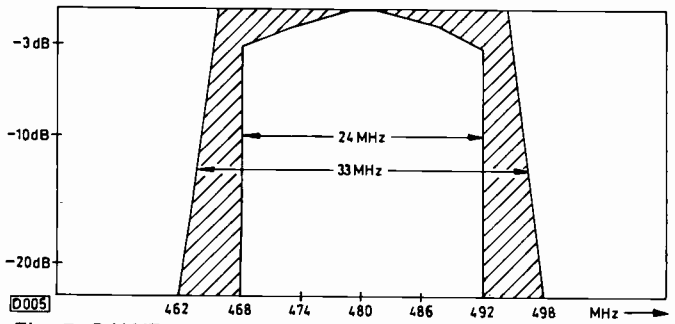

Fig. 5: SAWF response curve tolerance for satellite TV reception, based on a second i.f. of 480MHz: the actual response must fall within the shaded area.

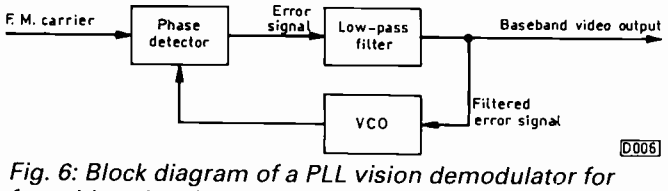

Fig. 6: Block diagram of a PLL vision demodulator for f.m. video signals: the performance, especially with low-level signals, depends largely on the time-constant of the loop filter.

i.f., say 480MHz. Its output forms one input to a phase detector. The other input is the frequency-modulated vision carrier. The phase detector's output, which is an error signal (the difference between the two inputs), is used to steer the VCO which thus faithfully tracks the vision carrier deviations. As a result the error voltage, after suitable low-pass filtering, is a facsimile of the modulating signal, i.e. the video waveform complete with the sound carriers and, where applicable, the teletext data.

Any fixed-level intervals in the video signal (porches, sync pulses, peak-white captions etc.) produce spot frequencies in the f.m. vision channel. These could cause interference to other services. To prevent this the carrier is kept on the move, frequency wise, by adding an energy-dispersal waveform to the video signal before modulation. It takes the form of a triangular wave that's locked to the field scanning rate. Thus the whole video waveform sits on a ramp. So the first post-demodulator process required is to clamp the video signal to a fixed voltage once per TV line to prevent shading effects from the top to the bottom of the picture.

Integration

The i.f./demodulator arrangement shown in Fig. 4 is nowadays often incorporated in a large "jungle" chip along with the sound i.f. demodulator, the line and field timebase generators and/or the colour decoder. Similarly in a satellite TV receiver the i.f. and vision f.m. demodulator chip is incorporated in a complete screened module that contains the tuner: the downlead from the LNB is connected to one end, the baseband video signal emerging at the other. Tuning instructions are fed to pins somewhere around the middle! Manufacturers treat it as a black box, the internal details of which are seldom given in service literature.

Servicing the Philips CP90 Chassis

Richard Newman

The Philips CP90 chassis first appeared in 1987. There were versions to drive small and larger-screen tubes, with and without remote control and also with or without teletext. Most of the circuitry is on one main panel, the exceptions being the plug-in teletext board and the soldered-in i.f./sync module. Tuning, volume, brightness, colour and remote control are handled by a single microcomputer chip whose type varies with the features incorporated in the particular model.

The following servicing notes are intended to be used in conjunction with the official Philips circuit diagrams (code numbers 4822 727 15737 and 4822 727 15968). Particular attention is paid to the SOPS (chopper) type power supply and the control section: the rest of the circuitry follows conventional lines.

Power Supply

The power supply is the heart of any receiver and is where most of the breakdowns usually occur. On the primary side the SOPS circuit is similar to that used in the 2A chassis (see December 1992 issue of *Television*) – the same fault-finding procedure can be adopted. The component reference numbers are different however, and the modifications don't apply (they are already incorporated). The circuit is shown in Fig. 1.

If the BUT11AF chopper transistor Tr7677 has failed Philips recommend that D6674 in its base circuit should be changed to type BYD33J. I also change D6675, fitting a BYD33J here as well. Also check transistors Tr7673 and Tr7674 and the associated diodes.

C2679 can go short-circuit and in this event usually takes D6679 with it. Use a good-quality 1nF capacitor rated at 2kV as a replacement. If a set comes in with many faulty components in the power supply pay attention to the chopper transformer T5763 which suffers from dry-joints. These should be dealt with as a matter of course. Occasionally the transformer itself can fail.

Once all suspect components have been replaced, disconnect the line output stage from the power supply by unplugging connector M6, which is by the line output transformer. Connect a dummy load (60W bulb) across the h.t. reservoir capacitor C2696 with a meter set to read 100V in parallel. Connect the mains input to the set via a variac, switch on and slowly increase the voltage fed to the set. At around 70V the lamp should start to glow. Slowly advance the input to about 100V while watching the meter. With this input the meter should read 95V and the reading should not change when the input from the variac is increased further.

If the power supply doesn't start up at around 70V, switch off and recheck components on the primary side of the circuit, also the zener diodes connected to the gate of thyristor Ty6696. If the h.t. voltage doesn't stabilise, or the supply shuts down at around 100V, check the circuit around the CNX62 optocoupler. The power supply will also shut down if the set h.t. control R3700 is advanced too far, so try adjusting it.

Once the h.t. line is correct at 95V the dummy load and meter can be disconnected and plug M6 refitted. If the power supply then shuts down, suspect a fault in the line

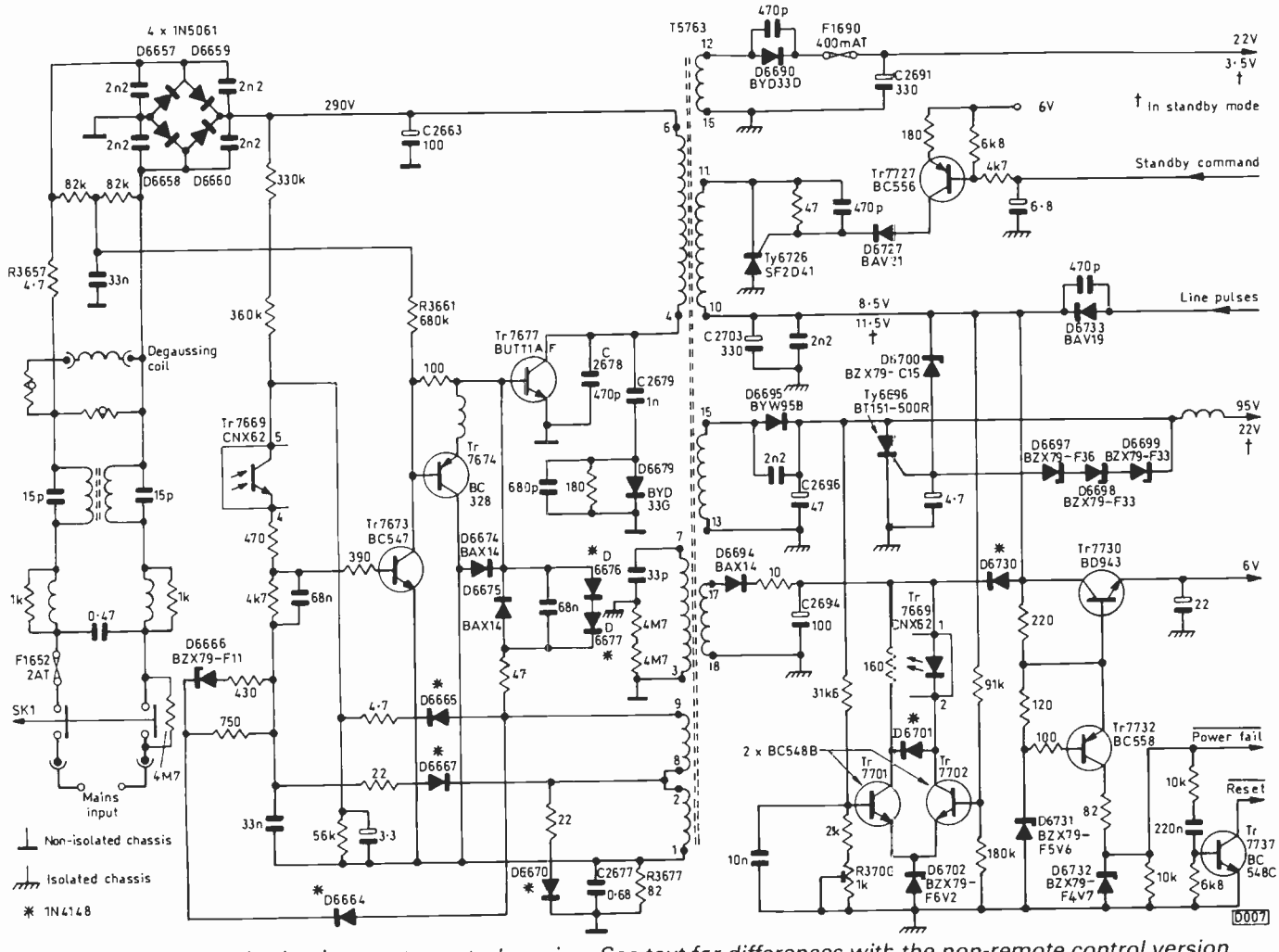

Fig. 1: Power supply circuit, remote control version. See text for differences with the non-remote control version.

output stage.

There's some interesting circuitry concerned with the standby function on the secondary side of the SOPS transformer. Overvoltage protection is provided by thyristor Ty6696 in conjunction with the four zener diodes that are connected to its gate. These diodes will conduct should an overvoltage condition occur, firing the thyristor and shutting down the power supply. It follows that if any of these diodes should fail the power supply will shut down. It's thus worth checking them if the set won't start up.

When the standby command is given the microcomputer chip switches on Tr7727 and D6727. Thyristor Ty6726 will then conduct, acting as a rectifier. As a result the voltage at pin 10 of the SOPS transformer rises from 8·5V to around 11·5V. This voltage is fed to Tr7730 to maintain the 6V supply to the microcomputer chip and to D6730 to supply the optocoupler and the error detector transistors Tr7701/2. The 11·5V also increases the base bias applied to Tr7702. Thus the light output within the optocoupler is increased and the feedback to Tr7673/4 cuts off the chopper transistor Tr7677 for a longer period. All other outputs from the SOPS transformer then fall to well below their normal level.

In normal operation a pulse from pin 3 of the line output transformer is fed to D6733 which produces the 8·5V supply across C2703. This is fed to Tr7730 to provide the 6V rail. In this condition D6730 is reverse biased and the optocoupler and Tr7701/2 receive their supply from the rectifier circuit D6694/C2694.

A problem that sometimes occurred with early remote control sets consisted of a buzz in the standby mode. Its cause was the fact that the 22V supply to the audio output stage didn't fall sufficiently because of incorrect switching of thyristor Ty6726 which, in this event, should be replaced.

Line Output Stage and EW Correction

These sections of the receiver are conventional. The only components that may cause problems are C2619 (1·5nF) and C2610 (8·2nF). Failure of either of these may result in the demise of the BUT11AF line output transistor Tr7619. Fit a good-quality 2kV capacitor as a replacement.

C2495 (33nF) going open-circuit will affect the beam limiter, the result being low contrast.

It's good practice to resolder the connections to the line output and driver transformers which both seem to suffer quite badly from dry-joints.

Sync/IF Module

This module provides line and field drive outputs, also transmission identification and sandcastle pulse outputs. It's not considered to be serviceable, a complete unit being available from Philips. If the can is opened however you'll find that standard components are used, so some repairs can be carried out. In practice because of the awkwardness of repairing the module in situ and the labour involved it's probably cheaper to replace the complete unit.

When checking for loss of line drive first make sure that the 22V start-up voltage from the power supply is present at pin 12. If not, check F1690 (400mAT). If this has blown the

CP90 CHASSIS MODEL LIST

Philips

14CE1200/05B
14CE1201/05B
14CE1201/05W
14CE1500/05B
15CE1010/05B
15CE1210/05B
15CE1210/05L
15CE1210/05W
15CE1518/05B
17CE1230/05B
17CE1530/05B
17CE1538/05B
17CE1630/45B
21CE1051/05B
21CE1059/05B
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21CE1557/05B
21CE1557/05Z
21CE1558/05B
21CE1559/05B

Pye

27KE1112/05L
27KE1115/05L
37KE1022/05B
37KE1025/05B
38KE1102/05B
38KE1185/05B
43KE1312/05M
43KE1315/05M
43KE1385/05M
52KE1510/05M
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52KE1585/05M

audio output chip could be faulty – this is also supplied by the 22V rail. During normal running the module receives a 13V supply at pin 8. This is derived from the line output transformer.

The Control Circuit

The microcomputer chip used in remote control sets is a Toshiba type TMP47C432. It's fairly well known that this suffered from static problems – replacements are now supplied with a metal shield. It's very important when replacing this chip to check the programme code stamped on the device. With a non-text or standard text set the programme code is 8188. With a Fastext set the programme code is 8189. Either type can be fitted to a non-text set, but with text sets the correct type must be fitted – failure to do this will result in no text at all. The Philips part number for the 8188 version is 4822 209 72038, for the 8189 version it's 4822 209 87305.

Loss of tuning memory and the personal preference settings is usually caused by a faulty back-up battery.

Tuning drift on the higher channels only with early models was cured by the following production change. Wire link 9636 replaced with a BYD33D diode, anode to D6638. Wire link 9868 replaced with a 1N4148 diode, anode to the 12V line. D6106 replaced with a wire link. R3833 changed to 1·8MΩ. R3912 changed to 1·2kΩ. R3106 replaced by a 10kΩ resistor fitted between the cathode of D6106 and the base of Tr7106. An extra 1N4148 diode added between pins 36 and 38 of IC7840, with its cathode to pin 36.

No remote control functions can be caused by photodiode D6960 being dry-jointed. The following TDA3047 chip IC7960 is basically a limiter and pulse squarer. Its output pin 9 is connected directly to the microcomputer chip. When the remote control unit is operated a pulse train should be clearly visible on a scope connected to this point.

As with most Philips TV sets, the microcomputer chip is able to give simple error codes should a fault develop within the control system. A list of these codes is given at the back of the service manual.

Other Circuits

The other main items on the PCB are the TDA3561A colour decoder chip, the TDA8190 intercarrier sound/audio output chip and the BD939F field output transistors Tr7571/Tr7573. These circuits are conventional. A problem with early receivers was buzz on sound. It was cured by fitting 6MHz ceramic filter modification kit part number 4822 310 27563. Intermittent loss of sound can be caused by a faulty headphone socket.

The RGB output stages and blanking are on the c.r.t. base. If the problem is intermittent colours, check for dry-joints here.

Non-remote Control Versions

With non-remote control versions the power supply is much simplified. The standby circuitry and the 6V supply rail are deleted and only one transistor, TR7701, acts as error detector and optocoupler driver. The microcomputer control chip is type HA11484. It performs only the tuning operation, volume, brightness, colour and contrast being set by ordinary controls. Some models are not equipped with a scart socket, so the circuitry around the chroma and audio chips is further simplified. The rest of the circuitry is the same as that in remote control sets.

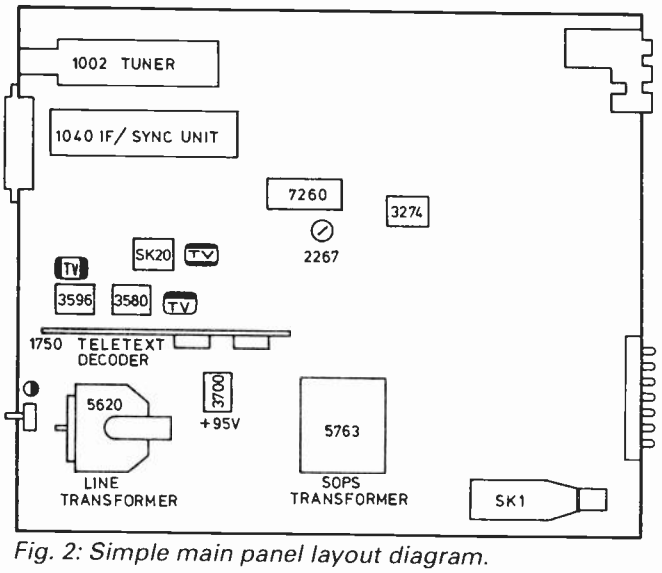


Fig. 2: Simple main panel layout diagram.

625-405 LINE CONVERTER

Those who still run 405-line equipment will be delighted to know that Pineapple Video, 39 Brownlea Gardens, Ilford, Essex IG3 9NL (081 599 1476) has introduced a 625/405-line converter. It uses the latest frame store technology to provide a high-quality 405-line picture while occupying only a small board area and requiring little power. There are up to eight selectable interpolation methods – the interpolation can be switched off to show its effect. A frame freeze facility is included. VHS replays are stable, and a circuit and EPROM programming information are available. The converter is available in two forms. As a PCB with BNC input and output connectors and DIL switches for freeze frame and interpolation selection at £249. A regulated 8V supply at 300mA is required. Alternatively the boxed version with power supply and thumbwheel control of interpolation is available at £299.

The Las Vegas Consumer Electronics Show

George Cole

This year's January Consumer Electronics Show (CES) at Las Vegas was the largest ever, reflecting the efforts by the international consumer electronics industry to come up with new products that will revive the market. While some of the products on display, such as Panasonic's electronic budget and cheque writer, were of mainly novelty interest, there was much of significance to see in such fields as multimedia and video systems. Over 1,700 exhibitors took part and the displays in the various hotels and exhibition halls covered around 905,000 square feet.

Interactive Multimedia

Many computer, video and games companies believe that the days of the TV couch potato are numbered. They claim that people want to be more actively engaged when watching the television screen. As a result a plethora of multimedia systems that allow users to interact with the TV display were on show.

Existing home multimedia systems are CD based – the discs store photographs, video, graphics, text and animation as well as sound. Users can decide what information on the disc they want to see and hear. The Philips' Compact Disc Interactive (CD-I), Kodak Photo CD and Commodore CDTV are examples. Several more interactive systems were revealed at the CES, including one developed by 3DO, a consortium of companies that includes Matsushita (Panasonic), Time Warner, AT&T and Electronic Arts.

3DO aims to establish an international standard for home multimedia – its strategy is based on JVC's success in making VHS the world standard for home video. 3DO itself will not be producing either hardware or software, though some of the member companies will. Instead it will license the technology. Hardware companies won't have to pay for the licence to produce 3DO equipment (though 3DO will presumably ensure that all products are up to standard). In some cases 3DO will pay towards engineering and marketing costs. An $8,000 developer's kit contains various production tools. Software companies will be charged around $3 for every disc distributed.

3DO Hardware

3DO showed an interactive multiplayer (IM) produced by Panasonic. It uses a 32-bit ARM60 RISC (reduced instruction set – computer) processor which was developed by a consortium that includes Acorn Computers, Apple and VLSI Technology. This provides far more processing power than the 16-bit processors used in the current generation of CD-I and CDTV players. The IM also has two custom built graphics animation processors that are claimed to be fifty times faster than existing PC and video games machines. There are chips for video processing, digital sound and data flow, twenty four direct memory access (DMA) channels and a memory management unit to allow fast data interchange. The machine uses a multi-task operating system known as Opera, and has a double-speed CD-ROM drive for faster access time and data transfer, doubling the transfer rate from the standard CD 150kbytes/sec to 300kbytes/sec.

The IM provides full-screen, full-motion video at 30 frames/sec (the US standard), though the first players will use a software-based compression system called Compact Video – this is another name for Apple's QuickTime 1·5, which enables Apple computers to play digital video clips and sound. Later machines will have an MPEG-based full-motion video plug-in cartridge.

It's also possible to feed in an analogue video signal, digitise and manipulate it, then convert it back to analogue form for copying on to tape. No details of how this is done have been released. The IM plays audio, Photo and Interactive CDs.

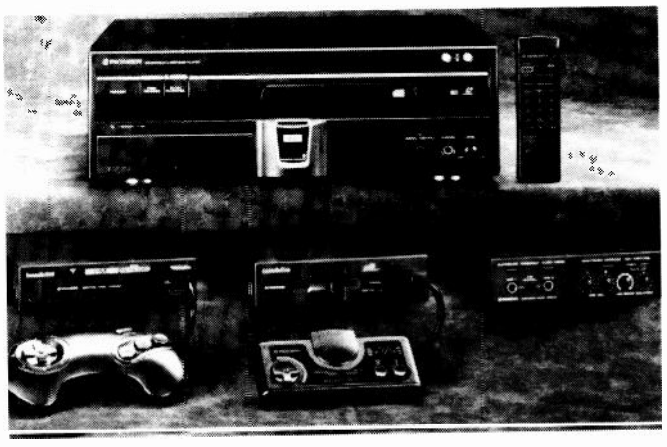
The IM demonstrations were very impressive, with plenty of fast graphics and clever animation, but most of these were from a hard disc that ran on a powerful Apple computer. There were also problems when running Photo CDs.

Launch Plans

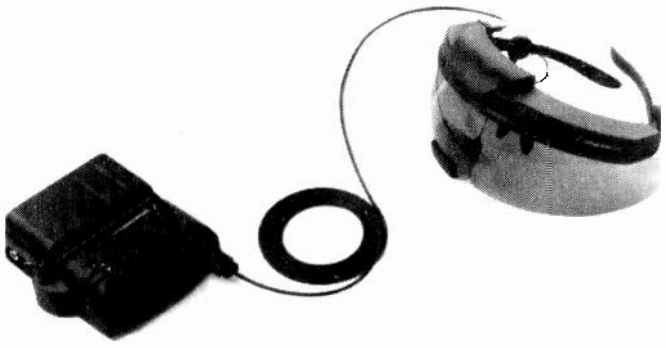
Around eighty software developers now support 3DO. The company says that the first IM will go on sale in the USA this autumn, priced at the equivalent of around £470. This seems to be a rather optimistic time scale however in view of the development work that still has to be done. The system certainly won't reach Europe until well into next year at the earliest. Even so the arrival of 3DO must concern Philips, which is still trying to establish CD-I as the world standard home multimedia system. The next eighteen months or so should be very interesting.

LaserActive

Pioneer, Sega and NEC showed a hybrid system called LaserActive. It's a cross between CD-ROM, CD-I and the LaserDisc. Up to 540Mbytes of data plus an hour of full-motion analogue videc with f.m. stereo sound are stored on a 12in. disc. Pioneer says that the system has several advantages over CD-based systems, including better quality video. While systems like CD-I divide their 540Mbytes of



Pioneer's LaserActive hybrid disc system.



Virtual Vision's Sport personal projection TV system.

data between an interactive program and the sound, pictures, text and graphics, the LaserActive disc can use its 540Mbytes of data storage for interactive purposes alone, the picture and sound storage being separate.

A CD-I disc can store around 7,000 photographic images without sound while a LaserActive disc can hold 108,000 images plus an hour of sound – in addition to the interactive data program. The digital data is stored at the l.f. end of the recorded bandwidth, followed by the two stereo sound channels and the analogue video as the frequency rises (the bandwidth is 0-14MHz).

In many ways the LaserActive disc is an extension of the LaserDisc digital audio system used in the NTSC areas of the world. This adds pulse-code modulated digital sound to analogue sound and pictures.

The LaserActive player is a massive machine weighing 19·8lb. It plays a wide range of optical discs. The basic player handles 3in. and 5in. audio CD and CDV discs and 8 and 12in. LaserDiscs. There are three optional packs:

(1) The Mega LD pack plays LaserActive Mega-LD discs, CLV and CAV discs, and enables the user to play Sega's 16-bit games cartridges and CD-ROMs.

(2) The LD-ROM pack plays 8in. and 12in. LaserActive LD-ROM discs, CD plus graphics discs, also NEC's Turbo graphics games CD-ROM discs etc.

(3) The karaoke pack plays karaoke laser discs.

LaserActive is due to be launched in Japan this summer. The first player will cost the Japanese equivalent of £470 while the packs and LaserActive discs will be priced at around £30 and £52 respectively. No UK release data has been suggested.

VIS

Tandy's video information system (VIS) was launched in the USA last November. The first VIS player, the Memorex MD2500, plugs into a domestic TV set and stereo system and is operated via a remote control handset. VIS discs store a mixture of text, sound and pictures, but there's no full-motion video. The operating system is called Modular Windows – it's a variant on the Microsoft Windows 3·1 system. VIS machines won't play Windows software however.

The advantage of using Modular Windows is that it's cheaper and easier for software companies to develop material for VIS as well as Windows. Tandy says that some of the first VIS titles were created using a low-end 286 PC!

The VIS deck plays audio CDs and VIS discs and includes an EEPROM cartridge for saving games points and information. The MD2500 has r.f., phono composite video and S terminals, a headphone jack, phono audio output sockets and a DIN connector for a wired remote control handset. Video resolution ranges from 320 x 200 to 640 x 400 pixels. There are at present around fifty VIS titles, mostly children's programmes, electronic encyclopaedias and how-to discs. The VIS player costs the equivalent of around £467 in the USA – again no decision has been taken on a possible UK launch.

CD-I FMV

Motorola showed its full-motion video (FMV) cartridge for the CD-I system. It was a pre-production type that stuck out from the back of the CD-I player – the production version will be flush mounted. The chip set used in the cartridge is known as the MCD250 MPEG full-motion video decoder. It decodes at up to 5Mbits/sec, with 10Mbits/sec transfer rates, and provides refresh for 4Mbytes of video DRAM. It can also convert video sequences between PAL and NTSC. There are five display modes – play, still frame, frame advance, slow motion and scan, the output being in digital RGB form with 24-bit colour.

Motorola has also developed the MCD210 video decoder and system controller which can decode and display two channels of video graphics simultaneously, and the MV44200 triple eight-bit video DA converter.

Video

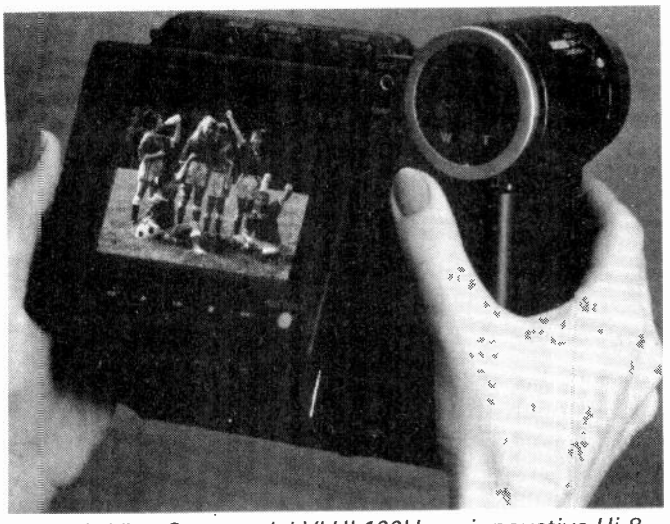
Virtual Vision's Sport, a personal projection TV system, attracted the crowds. It lets users watch large-screen TV images through a pair of lightweight eyeglasses. The system is based on the "head-up" technology used by fighter pilots. Sport consists of a pair of glasses with built-in stereo earphones: weight is just 140g. There's a wire link between the glasses and a beltpack that weighs 1kg. This pack includes a TV tuner with a 15in. retractable aerial and a Nicad battery that provides a playing time of around three hours. Video and stereo sound input sockets are provided so that signals can be fed in from a VCR, camcorder or other video source. There's also an optional radio link.

The system works in the following way. The user watches the image through his/her dominant eye. Virtual Vision says that the other eye can be closed, because the brain gives priority to the image viewed by one's dominant eye, though the image will seem to appear in front of both eyes. The display device inside the glasses is a thumbnail-sized active-matrix colour LCD. A reflective lens which bounces the image from the video display so that it appears to be focused 8-15ft away – the company refers to this as a virtual image – is mounted just below the dominant eye's normal field of vision.

I tried the eyeglasses and watched images from a camcorder. The results were rather disappointing, with low-resolution images and poorly-focused pictures. The idea is a good one but more work needs to be done to improve the system. Sport goes on sale in the USA later this year at the equivalent of around £600.

Mitsubishi showed a more conventional TV receiver, though the CS40FX1 at the equivalent of around £3,333 is no ordinary set. It is the world's first mass-produced 40in. model, whose features include twin speakers, a remote control operated graphic equaliser, PIP and on-screen programming. The CS40FX1 has a specially designed scandium-oxide tube and weighs 265lb.

Sharp's VLHL100U is a Hi-8 camcorder with a 4in.



Sharp's ViewCam model VLHL100U, an innovative Hi-8 camcorder design, incorporates a 4in. colour LCD monitor and a variable-angle rotation system to get away from the limitations imposed by a simple single-eye viewfinder.

colour LCD screen whose variable-angle rotation system enables the monitor and lens to be rotated for shooting at various angles. The monitor can even be swivelled through 180°, allowing the user to record himself using an infra-red controller. Other features include a x8 zoom, hi-fi stereo sound, digital picture effects including snapshot and strobe, a digital image stabiliser system and "neuro" auto-exposure. The latter is claimed to work better than conventional auto-exposure systems. Size of the VLHL100U is 7·8 x 3 x 5·8in., weight 1·9lb. Price is the equivalent of around £1,466.

Gemstar, maker of the VideoPlus timer system, announced that 44 companies representing 90 per cent of the world's VCR manufacturers have now licensed Video-Plus technology. The companies include Amstrad, Ferguson, Hitachi, JVC, Mitsubishi, Panasonic, Sanyo, Sharp, Sony and Toshiba. Over seven hundred newspapers and magazines around the world print the PlusCodes. According to Gemstar more than fifty per cent of the VCRs designated for the UK market in 1993 will have VideoPlus built in.

TV Allowance

One of the most popular video accessories was TV Allowance, a unit that enables parents to control how much TV their children watch. The unit, which looks like a large calculator, is wired to the TV set's mains cable. A master code controls the system: it's used by the parents to allocate each child's viewing time (the unit can be used for up to four children). Each child is given its own personal code. Whenever the child keys in his/her code to watch, the subsequent time is deducted from the allowance – this is shown on an LCD screen. When the allowance has been used the mains power is switched off. A child can also be "in credit" and have this time carried over to the next week. The inventor claims that the code is virtually unbreakable and that the unit can withstand rough treatment. In fact during tests the only unit which broke down was one that was hit with a baseball bat by a frustrated child!

Test Case 363

Now is the winter of our discontent in the Test Case workshop. We are surrounded, dominated and bunged up solid with TV sets that won't go wrong: a Ferguson with a blue picture once in a green moon; a B and O with a sound crackle that no one's ever heard; a triple-bounced Tatung that, legend has it, cuts out at eight o'clock every evening; and so on. The hunt was on for a set with a real fault: Dylan won the fight for a Sony TV receiver on whose label it said "no picture".

This KV2252UB (PE3 chassis) had, after eight years of sterling service, developed its first fault. When it was put on the bench and switched on it really did produce the symptom described. The sound appeared to be o.k., and the rustle of e.h.t. was heard. Dylan wiped the dust from the neck of the picture tube, switched out the workshop lights and peered at the rear end of the tube. The three heaters were alight. Good! The stage was set for a straightforward, text-book diagnosis and repair session, wasn't it?

A good start was made by checking the tube's electrode voltages. The e.h.t. was certainly present, and the first anode (or G2 as Sony call it) supply was correct at 500V. Dylan thought he'd found the cause of the trouble when he discovered that the focus voltage was also around 500V, but this is normal with tubes of this type. It was the cathode voltages that were wrong. All three were way above the normal 140V operating level. So Dylan retreated into the RGB amplifiers on the C (tube base) panel. He found that the 200V supply was present: but there were low voltages, and no signals, at the RGB inputs to the panel. Another step backwards then with the scope and the meter, to board D where the TDA3562A colour decoder chip IC301 lives.

A luminance input was present at pin 8 and a chroma input at pin 4, but there were no RGB outputs at pins 13, 15 and 17 respectively. So the signals were getting snagged up within the colour decoder chip. Resisting the temptation to fit a replacement, and all the while keeping a beady eye on the soak-testing sets around him, Dylan settled down to check the conditions at the chip's pins. He started at brightness control pin 11, where he found that the voltage could be varied over the range quoted in the manual by adjusting the user control. The same situation was present at contrast control pin 6. Then our man remembered this particular chip's fussiness about the correct shape of the sandcastle pulses at pin 7.

These pulses originate at pin 17 of the TDA2578A timebase generator chip IC551. When checked – at pin 7 of IC301 – they were seen to be correct with respect to shape and timing. Nor were they lacking in in amplitude. Dylan moved to data blanking pin 9, where the condition was correct at 0V. There were no discrepancies at the text/data input pins 12, 14 and 16. Dylan's gloom deepened. This was supposed to have been an easy repair, wasn't it?

Dylan consulted two other technicians who suggested that a further check be made on the sandcastle pulses, also to check that the field timebase was running. These checks were carried out to no avail: the sandcastle pulses were correct, and the field timebase was throbbing away happily. Dylan came to the conclusion that the only thing left was to change IC301. Was this the right course of action? Was the chip faulty? Answer on page 350.

Satellite Notebook

Nick Beer

There's an oddity about the signal from the transponder used by UK Gold. I wouldn't like to say whether it's just plain weak or whether it has an odd offset, but ever since the clamour to get customers tuned in to this very popular channel I've had no end of complaints about poor signals in relation to those from other Astra 1B transponders. All the installations concerned have had problems – low-gain or high-noise LNBs, or dishes slightly off beam – but nonetheless UK Gold has looked much worse than the other channels. I've seen cases where Tele 5, the next channel down with the same polarisation, has been slightly sparkly but UK Gold has been CCIR grade 2 or worse! Has anyone else noticed this?

Sparkly Signals

I've had a number of installations in the last few weeks where the higher Astra 1B channels have been very sparkly – all the 1A channels have looked fine and the lower 1B channels have been passable. The fact is that the problem has always been present, but with the launch of UK Gold it's now one of which the customer is aware.

Noisy LNBs

In most cases the complaints have been with older systems where the receiver threshold is not good – the B and O SAT LX and RX for example (not the current, superb SAT LM). Despite the use of a Fuba 85cm dish with electromagnetic polarisation and a 1·3dB maximum noise figure LNB there are problems. Is it perhaps that the Fuba LNBs were chosen on the basis of their l.f. noise performance, or is it that they've all become noisy? Installing an 0·8dB noise figure LNB has in every case cleared the trouble. I've made a point of measuring the output level, which in each case was o.k. – 86dBu, as specified on the case of the LNB. These have been the main systems that have given us this trouble, but I've also had problems with a couple of Salora installations. With these the problem has been cleared by using a 1·1dB LNB as rebuilt by MCES.

Manhattan LNBs

I've recently been introduced to the Manhattan LNB by the local (Exeter) branch of Eurosat. This device was suggested when I was specifying a fixed system for use with the Eutelsat II F2 satellite. I selected the 0·8dB version and the installer was, to say the least, enthusiastic about the results – I was too when I checked them. The LNB has better performance than the 0·8dB Sharp unit I've been using with the same kit for motorised installations.

I took advantage of this experience when dealing with the previously mentioned problem of LNBs with noisy h.f. performance. The results obtained are excellent, and the price of the unit isn't bad either – £59 plus VAT trade for the 0·8dB version, £69 for the 0·7dB version. On the specification sheets so far, the 0·8dB types have had a figure of 0·7dB at the top of the band, with 0·8dB only at 10·95GHz.

Progress

LNB technology really is amazing. I remember only a few years ago being impressed by the first LNB I came across with a noise figure of less than 2dB!

Teleclub

I note that the encryption used by the Swiss/German pay TV film channel Teleclub (der kino kanal) has been changed to Nagravision, as used by Premiere. We get quite a few enquiries about decoders for this service, possibly because of the pornography content. It's interesting that with the previous encryption system you could get a pretty good idea of what was going on when certain Sony TV sets were used with the colour turned up. So I'm told, anyway!!

Customer Difficulties

Whilst on the subject of scrambling, a recent incident comes to mind. A call came in that a customer, known to be troublesome, had lost tuning on a number of channels. His receiver is a Ferguson SRV1. There were several possibilities – loss of one polarisation due to a receiver or LNB failure, loss of Videocrypt channels due to the connector, trouble from the capacitor in the tuner, etc. There was a suspicious note at the bottom of the card however – the customer complained that he'd never had an instruction book. As he'd had the system for over two years this seemed odd to say the least, especially as we make sure that all customers have an instruction book – which they invariably lose. He'd not said anything the previous week when I'd called because of a complaint that his system was "dead", only to find that he'd dropped the handset and put the batteries back the wrong way round!

Having created a scene in the shop when he booked the call he repeated the performance when I called at the house. On checking through the channels I found that they were all tuned in, and told him so. He then started reading channel numbers from a list, saying that they weren't tuned in. No. 3 for instance. We went there and found scrambled Sky Movies. He didn't have a subscription to any channel, so I explained the situation – that the channel was tuned in but as he'd not paid a subscription he couldn't get a picture. "Well I'm not paying you any money until you tune it up!"

I then went through the 32 channels, one by one, explaining what was what and why. He insisted that what his neighbour had told him was true, that we were conning him by not tuning in channels.

Later that afternoon his neighbour appeared in the shop, wanting to know why his poor, elderly neighbour had been fobbed off and was being treated so badly by us conmen. I had to go over everything with a display receiver and answer his questions. In the end he thanked me and even asked about a problem with his own set.

The Sadelta TC90 SSM

We've recently purchased another signal-strength meter for satellite TV service work. It seemed sensible to have one that included the TV/f.m. and CATV bands, and the Sadelta TC90 appeared to fit the bill well. After enquiries with several suppliers we eventually obtained one from BK Elec-

tronics, Southend.

The meter is well presented, in a black carrying case, though the poorly written or translated instruction book is a bit of a let down. It has built-in rechargeable lead-acid batteries, so you can top them up. The ranges are standard, from v.h.f. radio 45-110MHz to satellite TV at 950-1,750MHz (first i.f.). Satellite signals can be measured in the range –70dBm to –10dBm, v.h.f. and u.h.f. signals from 20µV to 3V. The monitor loudspeaker can be used on the latter bands for station identification etc.

The unit can power an LNB. There's an audible finder tone that can be very helpful in avoiding the need to look at the meter when searching. Also ideal for searching is a sweep that scans the band at high speed within a given selected i.f. range. A digital LCD provides the i.f. readout, an analogue meter being used for strength measurements.

The meter scale is easy to read. A correction chart is provided to compensate for tuner nonlinearity – its use should not be overlooked. During the few weeks that I have been using the unit I've been well impressed with it and would recommend it without hesitation. It has been a hit in the workshop and a local installer/engineer is keen to get one. BK Electronics, Units 1 and 5, Comet Way, Southend-on-Sea, Essex SS2 6TR can supply it at £499·80 plus VAT.

Correction

There was an error in the last Satellite Notebook (January). Under the heading Ferguson SRV1/Pace SS9000 the RS part number for the 2·2µF electrolytic should have been quoted as 108-081, not 116-830. The latter will do but the former, being a higher thermal stability device (>105°), is preferable.

CD Player

Reports from Mike Leach, Nick Beer and Philip Blundell, AMIEIE

Crown CD80R

There were several faults listed on the job ticket. First, that the machine would only intermittently read the TOC. Then, that when it finally did read the disc the left and right channels would go off independently. And finally that the machine would sometimes switch off and go back to the stop mode. We didn't have the circuit diagram for this particular model but noticed that relay RL101 could be heard clicking during some of the fault conditions. The machine's performance improved when this relay was changed, but the TOC readout was still intermittent. The cause of this fault was traced to dry-joints around the h.f. amplifier and decoder sections. When these had been attended to the machine worked quite well. After inspecting the main panel I'd advise anyone undertaking the repair of one of these machines to have a good solder up around the regulators as well. **M.L.**

Marantz CD54

The customer's complaint about this rather smart player was of intermittent no functions. I ran the machine for several minutes and found that it would eventually stop, after which none of the controls on the front panel had any effect on its operation. Several boards are mounted on the front panel. One of these has several beefy transistors on it. All were dry-jointed. They were QY05, QY06, QY07 and QY08. A good solder up restored normal operation. **M.L.**

Akai ACM370L

A new laser assembly had been fitted to this midi system. It worked all right for several months and then started to play its old tricks again – reading discs intermittently and playing only some tracks. The customer reported that track four of some discs couldn't be played while with some other discs the machine wouldn't play beyond track two. It all depended on the length of the disc. The laser whistled constantly while the player tried to find a particular track. Basically there was a mechanical fault: the sled mechanism would travel only so far after which it came to a halt.

The cause of the fault was traced to a faulty rack that drives the laser assembly via a series of cogs from the loading/sled motor. It screws on to the laser assembly at two points and after some time can crack at the screw holes. As a result is becomes slightly warped and is unable to travel it's full distance when driven slowly, i.e. in the play mode. A replacement rack cured the fault.

I don't think that this item is listed as a spare part. The service manual shows it as item number 22 on the exploded view but I couldn't find a part number. Presumably a whole CD mechanism assembly has to be ordered. Check with Akai. My spare part came from a scrap machine in the workshop. **M.L.**

Philips 70CD555

For CD problems such as failure to read the TOC etc., before dismantling the set to get at the CDM2 try pressing the CD decoder board in the centre, then try again. If you are lucky the CD player will now work. Remove the decoder board and check for dry-joints on the wire links soldered to the component side – the dry-joints will be on the print side. It's worth a try: removing the CDM2 is almost a morning's work! **P.B.**

Toshiba Computer CD Unit

This unit, from a local college, had no make or model markings on it though their engineer assured me that it was of Toshiba manufacture. It was a CD player, with audio outputs, and a parallel interface for use with computers.

The unit was dead and the 2AT, 20mm input fuse on the board and the one in the fuseholder accessed from the back were both black. The cause was a short-circuit bridge rectifier, which was replaced, but a hole had been blown in the side of the inrush current suppressor that's in series with the live input to the bridge. This was found to be a 10Ω, 3A device that I was able to obtain from RS Components.

Interesting to see the far superior mechanical build quality of this unit in comparison with domestic ones – and the use of a switch-mode power supply. **N.B.**

Long-distance Television

Roger Bunney

Prolonged high-pressure systems, with associated fog, produced several lengthy periods of enhanced tropospheric propagation during December and cheer to DXers. Reception included Band III and u.h.f. signals from central Europe. Sporadic E reception was less than wonderful, but there was early morning F2 layer reception from the Middle East on the 20th! The collated SpE log for December is as follows:

8/12/92	DR (Denmark) ch. E3.
12/12/92	TVE (Spain) E2, 3; DR E3.
13/12/92	RAI (Italy) IA; TVE E3.
14/12/92	NRK (Norway) E2, 3; DR E3; TVE E2, 3.
15/12/92	SVT (Sweden) E2, 3; NRK E2, 3; CIS R1.
19/12/92	TVE E2, 3.
31/12/92	TVE E3.

Luckily Roger Fussel (Torpoint) tuned across ch. E2 at 0845GMT on the 20th and logged Arabic signals. Initially there were script and appropriate dress. At 0850 there was a "shaded card" with captions, the signal fading at 0900. This was almost certainly Dubai.

Tropospheric Openings

But it was tropospheric reception that brought cheer to December. There were several openings. A minor lift on the 10th produced TVE ch. E7 in the south west. Conditions were much better on the 14/15th, when many Band III and u.h.f. signals were received from Germany, Denmark and the Benelux countries. Highlights were CST (Czechoslovakia) ch. R10 and the ch. E48 UK forces SSVC outlet in Germany. After a lull there was more dramatic reception over the 21/22nd. Simon Hamer logged YLE-1 (Finland) ch. E6, a suspected Faroe Islands ch. E6 signal, TVP (Poland) ch. R8, Norwegian NRK/TV2 and Swedish SVT1/TV2 signals. The best tropospheric opening occurred on the 26th through to the 29th. This produced very intense signals from across Europe. Apart from the more usual signals from France, Germany and the Benelux countries, ORF (Austria) chs. E8 and 32, TVP (Poland) and CST (Czechoslovakia) chs. 29, 30 and 35 were noted, along with signals from Sweden and Norway. There was a weak opening on the 30th, bringing us to 1993 when signals from the nearer Continental countries were received on the 2nd and 3rd.

Our thanks to Simon Hamer (Powys), Brian Williams (Penarth), Roger Fussel (Torpoint), Cyril Willis (King's Lynn), Frank Lumen (Ayr), David Oliver (Birmingham) and Dave Glenday (Arbroath) for sending in logs and reception reports.

Finally congratulations to Simon Hamer who was recently heard over the air from Radio New Zealand discussing, via a phone-in, various aspects of DXing, Radio St. Helena and the UK Christmas!

News Items

Sri Lanka: According to a press release sent to us by Bandula Gunasekera the Telshan service should by now have begun, with ch. E3 and E4 transmitters operating in parallel with ch. E21 and E26 transmitters.

Portugal: Because the Angolan government allows transmission of only state-provided film the Portuguese SIC network has developed with IBM a digital compression system that enables telephone lines to be used for sending back dramatic footage from the crisis-ridden former Portugese colony.

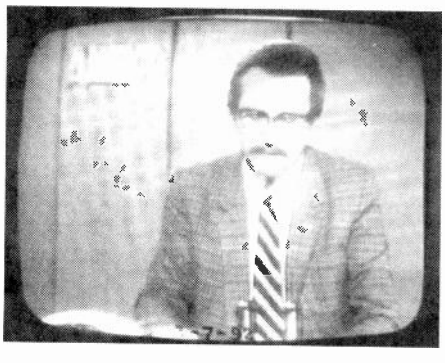
Poland: TV services are on the increase, with several private stations now in operation. Nowa Telewizja Warzsawa is running a commercial entertainment channel that serves four million people in a forty mile radius of Warsaw.

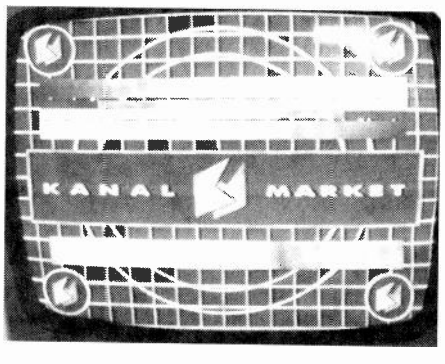
Swaziland: There are plans for a second channel. The present service operates from 1800-2230 hours weekdays and 1600-2330 at the weekends, spilling over into South Africa and Mozambique. Fifteen per cent of the programmes are locally produced, the others being imported.

Radio Amateurs: There are now 82 50MHz band operators throughout Spain. Israel now allows Class A operators to use 50-52MHz and Class B operators to have part use of the band.

Satellite TV

UK Gold is seeking partners to start a pay-TV channel that would begin operations some time after 1994. Intelsat has realigned the main platform on the 502 satellite at 21·5° to give improved Ku band links with SNG units in Somalia.





Left: Can anyone identify this ch. R1 signal received by Ryn Muntjewerff? Centre: An unusual test pattern received via Intelsat 601 at 27·5°W. Right: An example of satellite TV reception by Andrew Sykes, Halifax, using an 80cm dish and an LNB with a 1dB noise figure.

The uplink is cross-strapped into a global C band downlink for reception by broadcasters throughout the world. Intelsat is negotiating for the launch of the first two of its new series 8 craft by Ariane during 1996.

A new Earth station to look out for is the North Miami International Teleport, which should become operational at any time. Six dishes with sizes up to 13m will be used, operating between the Americas and Europe and the Middle East plus Africa.

China has purchased a used US Spacenet-1 C band (4GHz) satellite which is to be moved from 120°W to 115°E for communications and TV purposes. It can carry twenty four C band and twelve Ku band TV channels, though there's doubt about whether all the transponders are still functional.

The new RTL-2 test pattern can now be received from Eutelsat II F2 at 13°E. Programme transmissions are awaited – delay has been caused by investigations being carried out by German media authorities into the operators CLT Luxembourg and the Kirch Group.

The frequencies to be used by Astra 1C will run from transponder 33 at 10·964GHz horizontal to transponder 48 at 11·185GHz vertical. Astra 1D will have transponders 49 at 10·714GHz horizontal to 64 at 10·835GHz vertical.

Finally a cheap 95cm mesh dish fitted with a 1·2dB noise figure Ku band LNB is available from Amstrad trade outlets. Single packs cost £80 plus VAT – there are quantity discounts.

Interference

European standards are being laid down for minimising radiation, particularly from computer equipment. Increasingly in radio and communications publications one sees reference to EMC (Electro-Magnetic Compatibility), which in general refers to living with and using electronic equipment whilst minimising interference problems.

The Choke Current Balun

Over the years I've mentioned information provided by Pat Hawker in his Technical Topics column in *Radio Communication* since it often has relevance to TV-DXing. In his January 1993 column Pat provides practical information on choke current baluns. Many of us make our own Band I aerials, with a dipole (balanced) to which we connect coaxial cable (unbalanced). Use of coaxial cable with a balanced aerial element can result in interference pick up, the most critical point being the section of coaxial cable nearest to the dipole connection since this is where interference can be induced in the cable screen. The problem can be greatly aggravated if the installation is close to a radio amateur or CB operator, particularly where a wideband aerial amplifier with bipolar transistor(s) is used. If the coaxial downlead runs close to a TV cable system trunk it's possible for this to lead to pick up on the coaxial cable screen.

Choke current baluns can be used to reduce or eliminate signal currents flowing via the screen. Try one at the dipole end initially, then if necessary add one at the receiver input. Previously a large ferrite ring has been used, with the thinner coaxial cable wound round it, seven to eight turns being typical. This is difficult to arrange with an external installation since the toroid will need to be weatherproofed and plugs/sockets will introduce a loss. One answer is a weatherproof box from Fringe Electronics: it's a preamplifier case with ample room for a toroid.

The choke current balun described in the previously mentioned Technical Topics column consists of a series of ferrite beads whose internal diameter is sufficient for them to be slid over the coaxial cable. Beads with a quarter or half inch internal diameter are available. There are also two types of ferrite material, type 77 (manganese-bronze) for below 10MHz and type 43 (nickel-zinc) for use above 10MHz. Select six or seven beads of the appropriate type and slide them over the cable. Use heat-shrink sleeving to hold them in place – they have to be in contact with each other. It's preferable to cover the sleeving since the Sun's UV radiation will dry it out, causing it to crack. The beads should be available from shops that stock amateur radio equipment. Alternatively write for details of ferrite selection and prices to Ferromagnetics, PO Box 577, Mold, Clywd CH7 1AH, including an s.a.e. with stamp.

RSGB Guide to EMC

The RSGB has recently published *The Radio Amateur's Guide to EMC* by Robin Page-Jones, G3JWI. This excellent book deals in a completely non-mathematical way with interference causes, effects, tracing and elimination. It includes detailed information on a vast range of filters available commercially or for making oneself, also typical measurement data, aerials, cables, measuring equipment and so on. Though the book is primarily intended for those who run an amateur transmitter, the advice throughout also relates to domestic and DX receiving equipment. The book has 120 pages and is very good value at £6·50 plus £2 postage in the UK, £3·50 overseas. It's available from RSGB Sales, Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE.

Test Report: Beckman AM12 Multimeter

David Botto

The Beckman Industrial AM12 is an analogue-type multimeter housed in an attractive high-impact shock-resistant case with a handy tilt stand. It weighs 500g including the batteries and measures 175 x 125 x 50mm. The mechanical and electrical design comply fully with the American UL1244 and VDE 0411 standards, which are tough. No design can provide complete protection against misuse of course, but Beckman state that the AM12 was designed with safety in mind.

The AM12 is not powered from the circuitry under test and incorporates recently patented developments in solid-state technology.

In my view, expressed in these columns on many occasions, the best type of multimeter for TV/video servicing is a digital one. Why then this review of an analogue meter? Because I still meet many engineers who say that they prefer to use an analogue meter. They like the positive swing of the needle. For such engineers the AM12 could well be their choice.

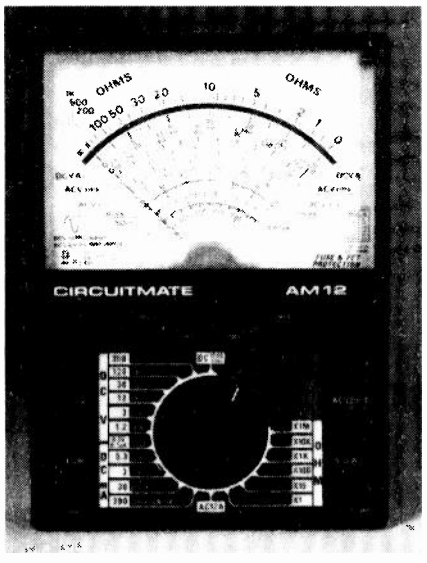
Basic Features

The heart of the meter is a balanced bridge circuit that uses field-effect transistors to drive the movement. An imbalance in the circuit caused by the applied test voltage unbalances the bridge, the result being that the meter movement produces a reading.

This circuitry along with the switching and other components gives the AM12 the advantage of being able to make a wide range of measurements with an extremely high input impedance – 10MΩ on all the d.c. voltage ranges except the 300mV range where it's 3MΩ.

Dual-f.e.t. circuitry and a 2A/250V fuse provide further protection against overloads. The meter is powered by three batteries, a PP3 and two pencil-type 1·5V AA batteries.

The internal construction is of a high standard, with the main components mounted on a top-quality phenolic PCB. Four recessed input test sockets on the panel provide insulation, protecting the user from shock due to accidental contact. The test leads have shrouded jacks and finger guard rings at the business end. It's easy to overlook this sort of detail when choosing a multimeter. Bear in mind though that under certain circumstances voltages over 25V or even less can be dangerous.



The Beckman Circuitmate AM12 analogue multimeter.

A gently flashing green LED warns you that the meter is on, and a little picture shows the position of the electronic bridge zero adjustment knob. At first I thought that the LED might be distracting, but it isn't. The advantage of the flashing light is that it catches your eye when the meter is not in use, prompting you to switch off to conserve the batteries.

The required range is selected by a positive-click, 24-position rotary switch. Although the switch contacts form part of the PCB they look as if they will stand up to repeated use. Clearly labelled d.c./ohms switch positions make range selection simple. Reading the a.c. settings is a little difficult however because of the red lettering used.

The AM12's jewelled-pivot 44μA meter has 4·5in. 90° arc scales. Being nicely damped, the needle is rock-steady in use. Multi-coloured range scales, an antiparallax mirror and the knife-edge pointer make it easy to read off the measured values. Large black figures on the ohms scale help to reduce eye strain when carrying out resistance measurements. The six ohms ranges give the AM12 an exceptionally wide coverage of resistances, from 0·1Ω to 1,000MΩ. I found that the open-circuit voltage across the test prods was 0·871V on the x1MΩ range: it measured between 1·567V and 1·554V on the other five resistance ranges.

Table 1 provides a brief electrical specification for the Circuitmate AM12. Table 2 lists test measurement readings made with precision standards. The readings were identical with negative d.c. voltages.

Beckman Industrial state that the rated accuracy is ±2·5 per cent on the d.c. voltage ranges and ±3·5 per cent on the a.c. voltage ranges. My tests confirmed these claims. A

Table 1: Electrical specification.

D.C. voltage ranges: 0·3V, 1·2V, 12V, 30V, 120V, 300V, 1·2kV. At centre zero ±0·15V, 0·6V, 15V, 60V, 150V, 600V. Accuracy ±2·5%. Input impedance approximately 10MΩ, 3MΩ in the 0·3V range.

A.C. voltage ranges: 3V, 12V, 30V, 120V, 300V, 1·2kV r.m.s.; 8·4V, 33V, 84V, 330V, 840V, 3·3kV peak-to-peak. Accuracy ±3·5% at 50Hz, ±5% at 3MHz. Input impedance 1MΩ, 2·5MΩ in the 3V range.

Decibels: –10dB to +63dB at a.c. ranges.

Current: 0-12A a.c.; 0·1μA, 0·3mA, 3mA, 30mA, 300mA, 12A d.c.

Resistance: 0-1kΩ, 0-10kΩ, 0-100kΩ, 0-1MΩ, 0-10MΩ, 0-1,000MΩ. Accuracy ±2·5%.

Scales: Nine including one for a.c. r.m.s., two for a.c. peak-to-peak, one for ± d.c. V/A (centre null) and one for 12A a.c.

Operating temperature range: 25°C (75°F). Less than 4% additional error over the range 4°C (25°F) to 50° (130°F).

tolerance of ±2·5 per cent represents a reading of between 19·5V and 20·5V when measuring 20V d.c. The AM12 read 19·995V, which is good for an analogue meter.

The accuracy on the resistance ranges – this is extremely important for servicing work – is well within the specification of ±2·5 per cent, i.e. almost spot on. This is one of the many advantages of using an electronic multimeter instead of a mechanical type.

The peak-to-peak a.c. voltage ranges are ideal for service work. A special d.c. voltage scale allows you to set the pointer to a central null position, while the special dB scale enables you carry out dB measurements (0dB = 1mW at 600Ω).

When making d.c. voltage or current measurements a switch selects either positive or negative d.c. polarity. For a.c. or resistance measurements this switch has to be in the positive position. An auto-polarity circuit to eliminate the need for this switch would have been better – it's not particularly difficult to include this circuitry in an electronic meter – but this would have increased the cost of the AM12.

On the Bench

The AM12 proved to be surprisingly easy to use. Its pointer didn't drift off zero, which is a problem I've had with some electronic multimeters. The 30V d.c. range is excellent for checking voltages in the signal path circuits of TV sets and VCRs, its 10MΩ input impedance minimising circuit loading. The large, clear scales are a joy to read – this will be much appreciated by service engineers whose sight is not quite what it once was.

The x1 resistance range is effective for diode checks, but the ohms test voltage applied does not always allow in-circuit resistor checks.

Conclusion

Personally I'd always recommend a digital rather than an analogue meter. But if an engineer prefers to purchase an analogue meter I'd say that the Circuitmate AM12 is an excellent choice. The price is very reasonable at £41 plus VAT. The meter is available from Wavetek Ltd., Astec Building, High Street, Wollaston, Stourbridge, West Midlands DY8 4PG (0384 442 394).

My thanks to Wavetek for loan of the review instrument.

Table 2: Test measurements.

Precision standard	AM12
+2V d.c.	+1·99V
+3V d.c.	+3V
+5V d.c.	+4·99V
+8·5V d.c.	+8·5V
+12V d.c.	+12V
+20V d.c.	+19·95V
+24V d.c.	+23·8V
18V a.c.	17·7V a.c.
34V a.c.	33·8V a.c.
240V a.c.	240V a.c.
47Ω	47Ω
100Ω	100Ω
1kΩ	1kΩ
330kΩ	330kΩ
1MΩ	1MΩ
10MΩ	9·99MΩ

Repairing LED Clock Radios

Part 1

Ian Rees

Millions of clock radios have been bought. Many of them, built down to a price, have not been reliable and find their way to the workshop soon after the guarantee expires. Because of their low retail price most shops and service departments turn them away as uneconomical to repair. Provided fault diagnosis is rapid however they can be turned around profitably. I find them a welcome break from hi-tech TV sets and VCRs.

As most of them are based on i.c. manufacturers' recommended circuits they follow similar lines. A few extra bells and whistles are added as sales gimmicks – lights, autodimmers or musical alarms for example.

Before getting too deeply involved take a careful look at the connections and component dressing. Pay particular attention to vertically mounted resistors or diodes with bare leadouts: they can get pushed over, shorting out other components.

Power Supplies

LED clock radios that use a common-cathode display have a power supply circuit similar to that shown in Fig. 1. The mains transformer has a thermal (F) that's embedded deep in its windings. Thus in the event of a blown fuse a complete transformer is required. The fuse can fail for no apparent reason – possible causes in such cases are shorted turns in the transformer or a faulty fuse.

Diodes and reservoir/smoothing capacitors fail with monotonous regularity. The diodes in particular are often of poor quality. They are likely to be substandard, with no maker's marking being visible. The set may still work with a leaky or shorted diode in its power supply. A nasty situation can arise if the diode in the battery back-up circuit is faulty. The PP3 battery, if fitted, can heat up and burst with a loud bang, spewing out its contents. The thermal fuse will sometimes fail before this happens. Check for this condition by seeing whether a voltage is present at the battery connector with no battery in place. Note the 1MΩ resistor in parallel with the diode – its presence may result in erroneous readings with a high-impedance meter. No back-up is generally caused by a snapped wire at the PP3 connector.

If you fit a new transformer, run the set and note the temperature rise with your hand. As a guide, a transformer connected to the mains off load for fifteen minutes will not feel warmer than one fitted to a set on load. Any rapid temperature rise should lead to an investigation. The transformer is a safety component, so a genuine manufacturer's spare should be used – they are seldom expensive items.

In the design shown in Fig. 1, with a two-diode full-wave rectifier circuit used to produce a negative supply, the centre-tap of the transformer provides a positive supply. Sets that incorporate a cassette deck use the more familiar bride rectifier arrangement.

The series regulator transistor is switched on by supplying base bias from the clock chip's snooze or alarm output via an isolating diode. The manual override comes from the function switch. A.M. only radios may not incorporate stabilisation. A very common cause of not being able to turn the radio off is the ceramic capacitor between the regulator transistor's base and collector being leaky – use a Mylar type as a replacement. Alternatively the transistor may be short-circuit. This same capacitor can be responsible for (wait for it!) the clock ticking intermittently, waking sleepers in the early hours. Occasionally the zener diode or its decoupling capacitor will be found to have gone short-circuit, the result being no radio or alarm output – the same symptoms will be caused by the transistor being open-circuit. Tuning drift, especially on v.h.f., can be traced to failure of this circuit to stabilise.

The 1,000μF reservoir and smoothing capacitors tend to dry out. This gives hum problems etc. Failure of the 220μF capacitor in the clock supply will result in no or a dim, flickering display. Make sure that the voltage rating is high enough when fitting replacements. As a result of cost cutting by manufacturers, or lack of quality control, you often find 10V working components for example fitted where a 16V type would be appropriate.

If time stands still don't blame Dr. Who. Check the small

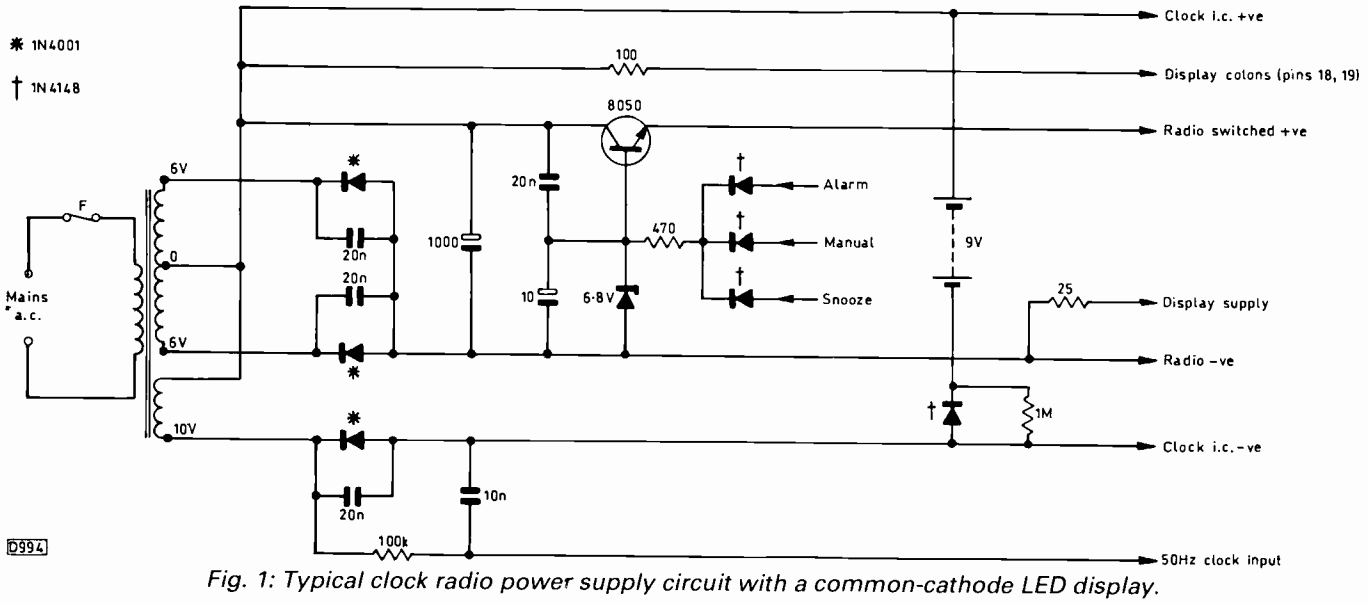


Fig. 1: Typical clock radio power supply circuit with a common-cathode LED display.

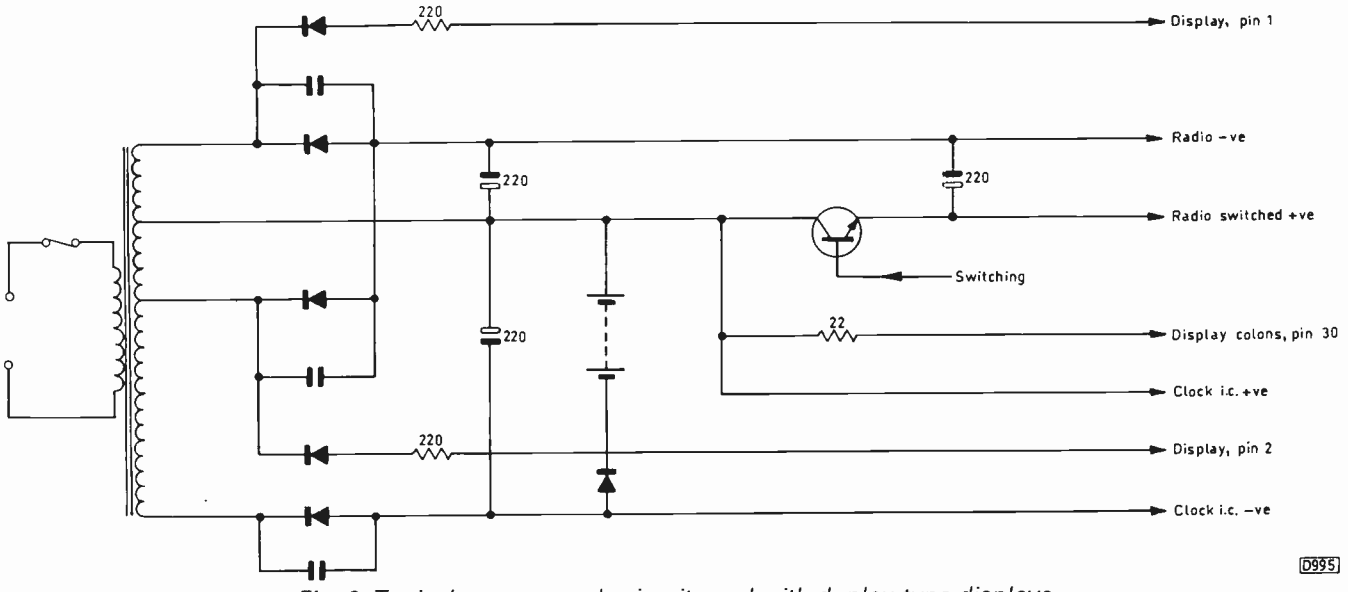


Fig. 2: Typical power supply circuit used with duplex-type displays.

10nF ceramic capacitor across the 50Hz clock feed: a scope connected across this supply should display a sinewave with the tops cut off.

The common-cathode display has been superseded by a duplexed arrangement. This runs cooler and seems to be more reliable. The power supply circuit used is similar – see Fig. 2 – but with extra diodes to feed a half cycle alternately to the display through the 220Ω series resistors. You can quickly identify the type of display used by looking at the edge connections. With a common-cathode display nearly all the thirty plus pins will be connected to the LEDS: with the duplexed arrangement there are far fewer connections with plenty of blank pins.

Clock Circuits

Fig. 3 shows a typical common-cathode clock circuit. The dedicated i.c. incorporates functions that are selected by links during manufacture. Several problems can arise because links are omitted or dry-jointed. If, in the UK, the 50/60Hz link is not connected the clock will lose about a minute in every hour.

When time problems are reported I soak test the unit over several days. Locked to the 50Hz mains supply a clock is not as accurate as a crystal circuit and may suffer from transient interference. An i.c. that gains time is rare – I have never been able to confirm a fault where this was reported. Careful questioning of a customer to discover whether the unit may have been disconnected because of a mains interruption etc. can clear up a few problems. Without mains synchronisation the on-board oscillator can gain or lose several minutes in an hour. One customer who read on the bottom of the set that it had to be disconnected when not in use pulled the plug on going to work and reconnected it on his return.

Early clock chips (LM8361, MM5387 etc.) required an external RC phase-shift oscillator running at 50Hz to maintain operation during mains supply interruptions. A small preset potentiometer was used to set the oscillator to 50Hz on battery back-up with the mains supply disconnected. Poor timekeeping with mains operation could often be traced to a faulty oscillator or a sync feed resistor that had gone high in value. Newer chips need no setting up and incorporate the oscillator. Without battery back-up the i.c. will produce flashes to indicate an interruption.

Clock chips that require more than one link for 12/24-hour operation give some odd displays when the links are missing or dry-jointed.

A small 0·0068μF Mylar capacitor connected to pin 32 of the LM8363 chip can cause faulty timing or display faults if

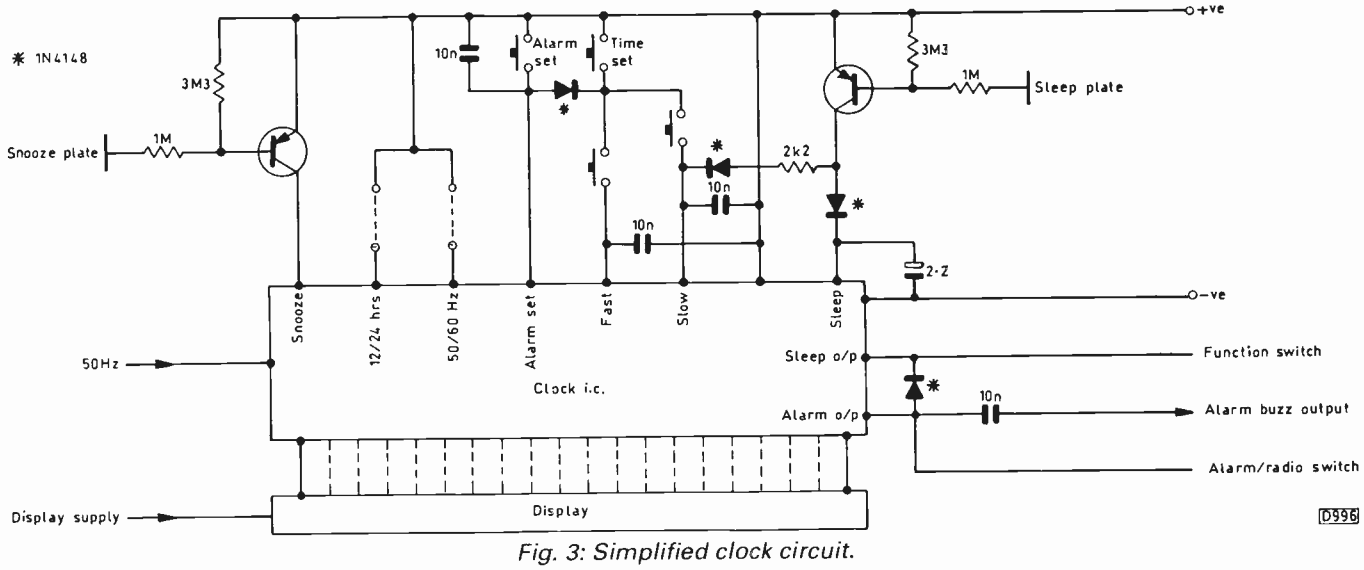


Fig. 3: Simplified clock circuit.

it or its feed resistor is faulty.

With some older clocks the life of a PP3 battery is as short as an hour. With later ones the battery will last a day or two. An interesting fault that causes short battery life occurs when a supply diode on the clock side becomes leaky, allowing the battery to light the display dimly.

Function Faults

Function faults occur for several reasons. Apart from the chip, which is fairly reliable, any problem relating to incorrect display functions should direct attention to the switch setting circuits. To operate any i.c. function one or more connections have to be made at the same moment.

Consider for example the alarm set mode in Fig. 3. When the alarm set push-button is pressed the associated diode is forward biased and is thus connected to the fast and slow push-buttons. A leaky diode in this position will result in the alarm set mode being selected when the time set push-button is pressed. It's a simple problem that is common with this type of set. The small ceramic capacitors connected across the set switches often leak. As a result the time runs at the wrong speed. This is one of the most common faults.

Fig. 4 shows a variation on this arrangement. Pull-down diodes are used in this circuit to prevent the set buttons applying a voltage to the relevant i.c. input pins otherwise than when required. Those inputs we want to select have their associated pull-down diodes switched out by the function switch, which is often incorporated with the wavechange switch.

Several different types of set switches will be found depending on the price of the unit. Many use a PCB with the complete switchbank etched on it. Each switch has a convex, sprung metal contact that's arched over the print. The contact assembly is held in place by Sellotape, which stretches during the assembly process. After a time the tape relaxes and moves back. As a result the contacts are pulled out of registration. The buttons will then be either permanently on or will not work when pressed. When you dismantle the PCB you'll see the problem. Clean up with contact cleaner, dry off then apply some new tape deftly, i.e. without stretching. Some of the convex contacts lose their springiness and remain down.

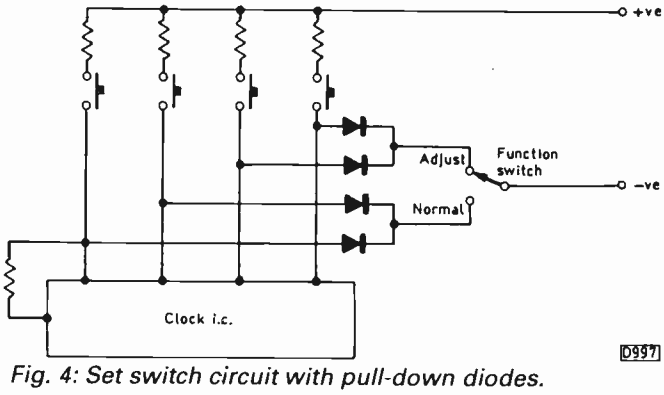


Fig. 4: Set switch circuit with pull-down diodes.

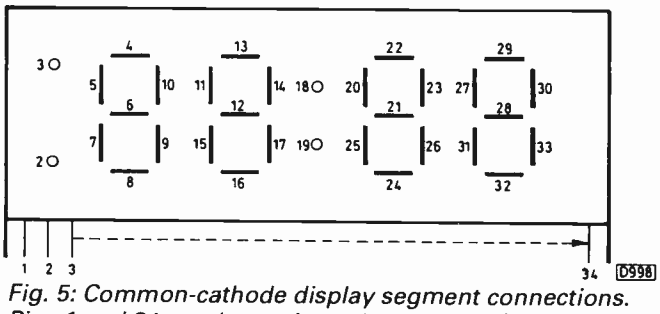


Fig. 5: Common-cathode display segment connections. Pins 1 and 34 are the -ve input (an extra indicator LED dot on the right-hand side may be connected to pin 34 in some displays).

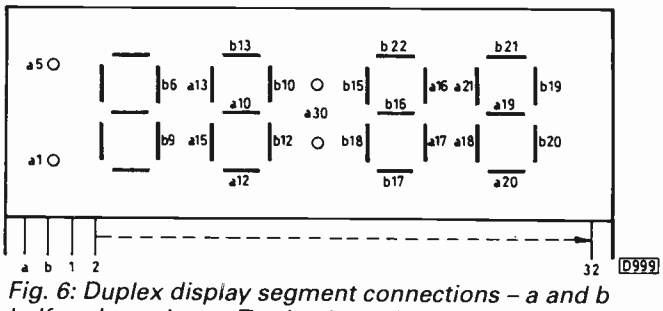


Fig. 6: Duplex display segment connections – a and b half-cycle -ve input. Twelve-hour display.

Switches of the rubber type can become intermittent in operation. You may find that they are either coffee impregnated or have lost their carbon faces. In the former case I clean with contact cleaner. Some ingenuity is required with the latter condition. Provided there's no sideways movement of the button, graphite from a soft pencil rubbed on the face of the contact works. A more satisfactory repair in the event of a new part not being available is to glue a circle of kitchen foil on to the carbon face. Convenient round sections can be made by using the type of hole-punch used for ring-binding paper. It's possible to transplant contacts from scrapped remote control units.

Leaky transistors can be a problem with functions selected by touch-sensitive plates, e.g. snooze and sleep in Fig. 3.

If you use an isolation transformer you may find that the touch sensors won't work: the hum induced when the plate is touched is insufficient to turn the transistor on. Touch plates that have been linked together by the use of wet wipe across the surface of the casing will malfunction. It will take a considerable time for the film to evaporate. The action of

ANSWER TO TEST CASE 363

– SEE PAGE 341 –

Loss of the picture in a set fitted with the TDA3562A colour decoder chip can be a very difficult fault to diagnose. It's a fine chip but it's amongst the fussiest, demanding exactly correct conditions at the sandcastle pulse input and in the RGB amplifiers, which form part of an automatic grey-scale correction feedback loop. As Television Ted said, it would shut down at the drop of a hat.

Dylan had done a good job with his tests up to the point where he ran out of ideas. Though he'd not gone deeply into the RGB amplifiers, where this sort of fault often originates (with the chip in disagreement with what it sees coming back at sampling pin 18), in this case the trouble didn't lie here either. Nor was the chip itself guilty, except perhaps of pernicketiness. For the problem lay with its supply at pin 1. There should have been 12V at this point. In fact the voltage was 13·2V, with rather more hash and ripple present than there should be on a supply line.

The supply comes from the 2SD795A series regulator transistor Q655, which receives about 14·5V from a rectifier fed from a winding on the chopper transformer. This transistor was faulty, probably leaky, a replacement restoring correct operation.

Meanwhile the soak-testing TV sets continued to behave impeccably.

insensitive touch plates can be improved by connecting the frame of the mains transformer to the negative side of the radio supply.

Alarm Problems

The cause of no alarm operation can be easily traced by triggering the alarm and tracing the output from the i.c. A misleading fault is where the alarm isn't triggered or triggers for only a brief moment. Before pulling the i.c., make sure that the alarm-off mode isn't being selected by a faulty ceramic capacitor, switch or transistor.

Some sets will trigger when time and alarm or alarm and time are brought together; others will go off only when time is brought up from behind the alarm setting. Most LCD clocks will trigger only when time is brought up from behind and is released about a minute before the alarm setting, allowing it to move on to the alarm setting by itself. Few sets will trigger unless at least an hour separates the time and alarm positions before they are brought together.

The alarm tone can be generated within the chip or externally. The rasping buzz tone comes from the alarm output. All types can be modulated with the one-second pulses used to flash the colons. Musical tunes are generated by a separate i.c. of the type often found in greetings cards.

LED Displays

Failure of one or more segments in a LED display calls for careful tests if lengthy removal of the i.c. or display is to be avoided. The pins are likely to be hand soldered to a ribbon cable. This gives plenty of scope for dry-joints and solder shorts to be present. PCB tracks are often of poor quality. Careful examination of the print between the ribbon and the i.c. may save a lot of time. Handle the ribbon cable with care: it's likely to be brittle and easily broken at its joints if flexed several times.

Most displays have similar pin connections. Fig. 5 shows a common-cathode display as seen from the front with the connections facing forwards. The individual segments are numbered to correspond with the pin numbering from left to right. Where a segment fails to come on it's useful to be able to light it in order to check whether the display or its drive is at fault. A flylead connected via a 470Ω series resistor to the Vdd supply can be used to light individual segments by touching the relevant pin.

Fig. 6 shows the connections to a duplexed type display. The first two pins a and b are common to the segments shown prefixed a and b respectively. The remaining pins are numbered 1-32 as before. As a quick check for missing segments with a display of this type short pins a and b. This should light the complete display. Thus any faulty segments will be obvious. Unlike the common-cathode type of display, combinations of segments will remain unlit if a pin is disconnected. Should one of the supply diodes fail all the associated a or b prefixed segments will remain unlit.

Phantom segments can be seen if the display mask isn't tight against its PCB. Otherwise suspect a leaky latch in the i.c. Extra segments alight may be caused by short-circuited pins. Display dimming may be provided by either a switched resistor in series with the supply or a transistor and LDR (light dependent resistor). If the series resistor burns out there will be total loss of the display. A dry-jointed LDR etc. will have the same effect or alternatively the display may be dim and not vary with the ambient light.

When fitting a new display make sure that you get it the right way up: it's very easy to wire one in back to front, especially when it's mounted upside down.

The Nikkai Baby 10 – A Problem Solved

It's a safe bet that many frustrated service engineers have one or more of these widely sold colour receivers gathering dust on the awaiting spares shelf while the 12V regulator (IC402) becomes extinct. After three months on Willow Vale's waiting list (the situation is the same with other suppliers) I decided to look for an alternative device.

As the input voltage to IC402 is less than 14V an ordinary regulator can't be used – because of the higher voltage drop across it (yes, you've discovered that too!). RS Components stocks a range of regulators with a very low voltage drop however, less than 1V. The best one for the Baby 10 is type LT1084CP-12, RS stock no. 657-943, which has a similar case to the BU508A and is rated at 5A. In theory you could use the cheaper 3A version, but with a typical current of 2·6A it runs very hot. I believe that the cooler 5A version is worth the extra cost. I also decided to abandon the PCB-mounted heatsink in favour of the larger area provided by the rear of the metal chassis frame.

If a suitable hole is drilled to the left of the line output transformer, viewed from the rear, the replacement regulator can be mounted on the inside of the frame – with the usual insulation and heatsink compound of course – then wired to the original connection points on the board. The original Nikkai replacement regulator kit included a hefty diode that has to be wired in series with the regulator's output and mounted beneath the PCB "because the set won't work properly without it". The purpose of this diode is not clear to me, but I fit one anyway. Without the original heatsink there's plenty of room to mount it above the PCB. It also has to be generously rated (a 1N5401 will fry!) – the 200V, 6A RS type 261-823 is suitable.

This modification has proved to be efficient, reliable, readily available and cheaper than the original Nikkai kit. It also runs cooler – and has reduced the temperature of a few customers.

Chris Avis

ECONOMIC DEVICES 32 TEMPLE STREET, WOLVERHAMPTON, WV2 4AN

15/80H	3.83	2SC1573Q	0.26	2SD716	1.11	BC148	0.12	BD232	0.28	BFR90A	0.61	CD4069	0.17	M54532	1.28	SL1432	1.97	TA7205P	0.00	TDA1200	0.91	TDA8140	2.38
15/85R	3.84	2SC1675	0.09	2SD718	1.45	BC148A	0.06	BD234	0.25	BFR91	0.43	CD4070	0.14	M54543L	1.32	SL471	1.70	TA7207P	1.68	TDA1270	1.79	TDA8153	5.10
17052	3.20	2SC1685	0.14	2SD734	0.24	BC148B	0.04	BD237	0.30	BFR96	0.53	CNX62A	0.88	M54544L	1.51	SL490	2.31	TA7210P	1.50	TDA1412	0.77	TDA8170	2.58
17053	2.38	2SC1740	0.12	2SD762	1.27	BC149	0.04	BD238	0.11	BFW92A	0.48	CR3CM	2.62	M54548L	2.53	SN29764AN		TA7214P	3.74	TDA1470	0.00	TDA8180	5.35
17088	2.38	2SC1741	0.17	2SD774	0.24	BC149C	0.04	BD239	0.29	BFX85	0.33	CR02AM	1.75	M54644BL	3.31		1.47	TA7217AP	1.45	TDA1470P	0.00	TDA8190	3.57
17089	3.39	2SC1815	0.14	2SD787E	0.26	BC157	0.13	BD241	0.41	BFY50	0.34	CV12E	2.70	M54648L	5.51	SN7474N	0.38	TA7222	1.24	TDA1506	4.59	TDA9503	2.13
17127	1.77	2SC1826	0.72	2SD837	0.90	BC159	0.06	BD243	0.39	BFY51	0.34	CX109	7.05	M54898AP	17.01	SN76013ND	7.99	TA7222AP	1.27	TDA1510	3.23	TEA1002	5.30
1N4001	0.04	2SC1827	0.77	2SD841	1.61	BC160	0.42	BD243A	0.43	BR100	0.17	DTA124EF	0.13	M58485P	5.95	SN76227N	1.07	TA7227P	2.02	TDA1512	2.36	TEA1009	1.24
1N4002	0.07	2SC1845	0.20	2SD856	0.87	BC161	0.27	BD243C	0.37	BR101	0.98	DTA144EF	0.17	MB3730	2.38	SN76666N	1.26	TA7230P	1.35	TDA1515A	1.99	TEA1014	1.87
1N4003	0.05	2SC1846	0.29	2SD869	2.55	BC167	0.42	BD244A	0.34	BR103	0.39	ER1400	2.15	MB3731	2.04	SN76705AN		TA7233P	1.77	TDA1516Q	3.33	TEA1039	2.02
1N4004	0.07	2SC1923	0.14	2SD870	3.07	BC171B	0.14	BD244C	0.42	BR303	1.22	HA11235	1.68	MB3732	2.47		1.70	TA7240AP	0.00	TDA1518Q	3.15	TEA2018A	
1N4005	0.06	2SC1942	3.33	2SD871	6.61	BC177	0.14	BD245C	0.72	BRX44	1.02	HA11244	3.83	MC13002	0.00	SR2M	0.00	TA7240P	2.21	TDA1670A	2.81		1.40
1N4006	0.06	2SC1959	0.11	2SD880	0.34	BC178	0.11	BD246C	0.71	BRY56	0.43	HA1124A	0.73	MC13002P	4.79	STA341M	2.38	TA7241	2.30	TDA1701	4.86	TEA2164	2.48
1N4007	0.06	2SC1969	2.29	2SD882	0.30	BC182	0.06	BD278A	0.56	BSS38	0.23	HA11423	2.02	MC1310P	0.85	STA401	2.30	TA7243P	0.00	TDA1770	2.57	TEA2165	0.00
1N4148	0.04	2SC1983	0.87	2SD898B	2.97	BC182A	0.13	BD317	0.87	BT120	1.28	HA11440	2.92	MC1327AP	1.62	STA441C	3.62	TA7250	3.38	TDA1870	0.00	TIC106D	0.55
1N4448	0.06	2SC2001	0.14	2SD904	5.95	BC182L	0.06	BD318	1.10	BT129	3.26	HA1166X	3.38	MC1330AIP	1.26	STK0029	5.88	TA7267P	2.02	TDA1904	1.21	TIC106M	0.60
1N5061	0.23	2SC2029	0.34	2SD973	0.38	BC182LB	0.06	BD380	0.34	BT139600	0.95	HA11713	1.24	MC1350P	1.82	STK0039	5.69	TA7270	1.55	TDA1905	0.93	TIC45	0.59
1N5402	0.09	2SC2073	0.51	74LS00	0.21	BC183	0.06	BR433	0.27	BT151/500R	0.97	HA11741	6.80	MC1352P	1.45	STK0040	7.40	TA7270P	1.68	TDA1908A	1.14	TIL100	0.52
1N5404	0.12	2SC2078	0.59	7805	0.24	BC184	0.09	BR434	0.34	BT151800	1.15	HA11745	5.10	MC1358P	1.59	STK0059	9.75	TA7271P	1.95	TDA1940	2.77	TIP110	0.36
1N5406	0.12	2SC2141	1.48	7805T022	0.00	BC184L	0.04	BD435	0.38	BU205	1.07	HA13001	1.34	MC14493P	4.80	STK025	9.66	TA7273	3.21	TDA1950	1.86	TIP112	0.00
1N5408	0.12	2SC2166	0.96	7808	0.30	BC184LC	0.10	BD436	0.32	BU208A	1.16	HA13108	2.76	MC1452BCP		STK043	0.00	TA7274P	2.72	TDA2002	0.85	TIP112H	0.39
1N914	0.04	2SC2168	1.27	7812	0.30	BC204	0.37	BD437	0.32	BU208D	1.87	HA13118	1.91		2.22	STK3042	5.08	TA7280	2.11	TDA2003V	0.65	TIP120	0.57
1S1555	0.22	2SC2236	0.25	7815	0.30	BC207B	0.23	BD438	0.17	BU326A	0.88	HA13119	1.87	MDA2062	2.21	STK3062	8.88	TA7281	0.00	TDA2004	1.27	TIP121	0.42
1S2076	0.29	2SC2271	0.22	7818	0.41	BC212	0.06	BD441	0.41	BU406	0.65	HA13403	4.42	MJ2955	0.97	STK4131	7.79	TA7299	2.34	TDA2005	1.27	TIP126	0.53
2N2219A	0.27	2SC2274	0.22	7905	0.34	BC212B	0.06	BD442	0.29	BU406D	1.02	HA1374A	5.10	MJ802	2.04	STK4141	8.25	TA7313AP	0.62	TDA2006	1.06	TIP132	0.46
2N2222	0.17	2SC2274K	0.22	7912	0.43	BC212L	0.06	BD510	1.34	BU407	0.53	HA1377	1.60	MJE13005	0.82	STK4142	8.21	TA7317P	0.93	TDA2009	2.29	TIP137	0.48
2N2905	0.21	2SC2314	0.29	AA119	0.36	BC213	0.11	BD529	0.97	BU407D	0.97	HA1388	2.63	MJE2955	0.68	STK4162M		TA7325P	0.45	TDA2020	3.72	TIP2955	0.83
2N2926G	0.37	2SC2335	1.11	AA143	0.13	BC214	0.06	BD530	1.11	BU426A	0.96	HA1389	2.52	MJE3055	0.51		9.51	TA7343AP	0.72	TDA2030	0.00	TIP29C	0.30
2N3053	0.36	2SC2458	0.09	AC127	0.11	BC214L	0.09	BD535	0.43	BU426E	2.13	HA1392	1.61	MJE340	0.40	STK4171	10.50	TA7358P	0.78	TDA2030H	0.61	TIP29E	0.41
2N3054	0.98	2SC2482	0.34	AC141K	0.46	BC237	0.05	BD536	0.48	BU500	1.09	HA1397	2.63	ML237B	0.00	STK4181 II		TA7535BP	0.68	TDA2030V	0.73	TIP3055	0.77
2N3055	0.59	2SC2547E	0.24	AC176K	0.30	BC237A	0.08	BD675	0.30	BU508A	0.95	HA1398	2.33	ML923	5.10		12.85	TA7607AP	2.11	TDA2040	0.00	TIP30C	0.17
2N3442	0.75	2SC2565	6.40	AC187	0.16	BC237B	0.05	BD677	0.32	BU508AF	1.27	HA1452	3.36	MN1405VKF		STK4181A		TA7609P	1.95	TDA2170	2.55	TIP31	0.00
2N3702	0.11	2SC2570A	0.29	AC187K	0.33	BC238	0.11	BD707	0.51	BU508D	1.27	HM6232	11.82		11.08		12.46	TA7630	0.00	TDA2270	1.68	TIP31A	0.32
2N3704	0.14	2SC2577	2.13	AC188	0.30	BC238B	0.05	BD839	0.51	BU508DF	0.95	HM6251	9.52	MN1435VX		STK4332	5.54	TA7630P	1.87	TDA2525	0.00	TIP31B	0.30
2N3773	1.02	2SC2581	2.45	AC188K	0.67	BC239	0.04	BD901	0.46	BU508V	1.17	HM7103	14.07		13.60	STK4352	1.70	TA7640AP	0.98	TDA2530	4.76	TIP31C	0.39
2N3819	0.34	2SC2632	0.29	AD149	0.52	BC252B	0.07	BD902	0.51	BU526	1.41	ICH28I	1.24	MN1435VXB		STK437	8.30	TA7676P	4.25	TDA2540	0.38	TIP32A	0.37
2N3904	0.11	2SC2655	0.25	AD161	1.02	BC300	0.48	BD911	0.65	BU536	1.68	KA2101	0.60		10.66	STK4392	6.31	TA7680AP	4.52	TDA2541	0.72	TIP32C	0.38
2N4444	2.68	2SC2671	0.68	AD162	0.96	BC301	0.24	BD912	0.63	BU608	1.59	KBL08	0.47	MN650	2.50	STK441	10.28	TA7698AP	5.93	TDA2560	2.55	TIP33	0.85
2N6292	0.62	2SC2688	0.30	AF124	0.77	BC302	0.36	BDV65B	1.16	BU705	1.61	KSR1004	0.09	MPSA42	0.23	STK459	10.18	TA7705P	1.68	TDA2576A	5.95	TIP33A	0.92
2SA1015	0.10	2SC2785	0.17	AF127	0.59	BC303	0.28	BDW84C	1.28	BU806	0.82	L200CV	1.13	MPSA56	0.12	STK461	9.27	TA7769P	1.43	TDA2577	4.86	TIP33C	0.98
2SA1016	0.17	2SC2791	5.44	AF139	0.29	BC307	0.06	BDW93C	0.59	BU806A	0.80	LA1201	0.56	MPSA93	0.09	STK4843	11.10	TA8205	3.65	TDA2577A	4.25	TIP34	0.00
2SA1020	0.31	2SC3150	1.44	AF239	0.43	BC307A	0.06	BDW94C	0.46	BU807	0.51	LA1230	0.00	MPSU10	0.00	STK5211	13.79	TA8210H	4.25	TDA2578A	2.55	TIP34C	0.89
2SA1020Y	0.30	2SC3153	2.28	AF279	0.34	BC307B	0.06	BDX32	1.70	BU826A	1.59	LA1385	1.45	MR854	0.14	STK5322	5.59	TA8215	3.57	TDA2579	0.00	TIP41A	0.38
2SA1095	7.44	2SC3156	6.31	AL102	2.55	BC308	0.06	BDY20	2.13	BU908	1.17	LA3161	0.40	MSM5840H		STK5325	4.25	TA8691N	5.92	TDA2581	4.61	TIP41B	0.31
2SA1102	1.79	2SC3182	3.25	AN245	0.00	BC308A	0.09	BF115	0.41	BUK444	2.38	LA4140	0.37		15.36	STK5326	5.08	TAA550	0.00	TDA2581Q	2.06	TIP41C	0.37
2SA1143	0.17	2SC3225	0.38	AN3821K	7.23	BC308C	0.06	BF179	0.31	BUT11	0.68	LA4182	0.78	MVS240	0.53	STK5331	4.35	TAG626	1.05	TDA2582	1.66	TIP42A	0.34
2SA1175	0.51	2SC3795	1.79	AN5265	1.34	BC327	0.10	BF184	0.41	BUT11A	0.85	LA4192	1.14	NE545B	3.20	STK5332	2.81	TBA120	0.53	TDA2591	1.15	TIP42C	0.37
2SA1186	3.52	2SC380	0.12	AN5435	1.45	BC327B	0.17	BF185	0.29	BUT11AF	0.85	LA4220	1.29	NE555	0.21	STK5333	4.28	TBA120AS	0.90	TDA2593	0.75	TIP47	0.51

SPECIAL OFFERS – ENDS 31/03/93 OR WHILE STOCKS LAST

TDA 2600 x 2	3.95	TDA 3654 x 2	2.20
TDA 4601D x 2	2.95	TBA 120S x 5	1.55
BUT 11AF x 5	3.25	TDA 4601 x 2	2.50
BU 208A x 5	3.60	STK 5481 x 2	9.00
BU 508A x 5	3.50	VIDEO FAULT FINDING GUIDE	10.29
CO AXIAL AERIAL PLUG x 25	3.75	TV FAULT FINDING GUIDE	9.26
'F' CONNECTOR (SCREW TYPE) x 25	3.00	KBL08 800V 2A BRIDGE/R X 5	1.00

2SA1208	0.26	2SC388A	0.59	AN5512	1.65	BC328	0.07	BF194	0.22	BUT12A	0.85	LA4261	1.65	NE555N	0.37	STK5372	5.28	TBA120S	0.89	TDA2594	2.21	TIPL791A	1.17
2SA1265	1.95	2SC458	0.10	AN5515	2.13	BC337	0.06	BF196	0.15	BUT56A	0.57	LA4270	2.11	NE592	1.85	STK5421	2.60	TBA120T	0.59	TDA2595	2.16	TIS43	0.66
2SA1286	0.34	2SC536	0.09	AN5521	1.65	BC337L	0.22	BF197	0.25	BUW11	1.03	LA4282	2.29	NE646N	2.47	STK5422	5.74	TBA120U	0.39	TDA2600	3.08	TL011CP	1.36
2SA473	0.71	2SC710	0.12	AN5612	2.97	BC338	0.06	BF198	0.17	BUW11A	0.90	LA4422	1.27	NP1106	11.86	STK5451	5.27	TBA2800	0.68	TDA2611A		TL071CP	0.38
2SA562	0.17	2SC867A	5.27	AN5900	1.27	BC368	0.09	BF199	0.04	BUW41B	1.02	LA4440	1.68	OA47	0.25	STK5466	5.08	TBA395	0.68		0.64	TL494	1.16
2SA634	0.54	2SC945	0.10	AN6310	4.69	BC369	0.17	BF200	0.39	BUW81A	2.18	LA4445	1.29	OA90	0.10	STK5471	6.12	TBA520	0.85	TDA2611AQ		TMP47C432AP	
2SA639S	0.64	2SD1051	0.48	AN6326	3.61	BC372	0.47	BF240	0.11	BUW84	1.11	LA4460	1.34	DA91	0.15	STK5476	5.00	TBA540	1.97		1.74		11.24
2SA673	0.09	2SD1128	1.02	AN6341	2.29	BC546	0.00	BF244	0.30	BUX84	0.34	LA4461	1.29	R2540	2.77	STK5481	5.61	TBA540Q	0.77	TDA2640	3.98	TMP47C434N–	
2SA684	0.21	2SD1138	0.82	AN6610	0.93	BC546A	0.06	BF245A	0.19	BUX85	0.60	LA4475	2.11	R2540X	1.92	STK5482	4.37	TBA560C	0.68	TDA2652	13.56	3555	16.58
2SA733	0.17	2SD1207	0.23	AN6671K	5.35	BC547	0.11	BF245B	0.41	BUZ71	0.52	LA4476	2.29	R2M	0.72	STK6962	2.65	TBA570A	1.77	TDA2653A	3.26	UC3844	1.78
2SA769	1.02	2SD1265	0.77	AN7158	2.73	BC547A	0.04	BF255	0.11	BY127	0.15	LA4500	1.68	R3297	0.00	STK7216	5.53	TBA651	1.01	TDA2680	5.10	UPA81C	0.72
2SA798	0.38	2SD1273	0.82	AN7161	3.23	BC547B	0.11	BF256	0.24	BY133	0.06	LA4505	1.79	R4050	2.38	STK7226	8.17	TBA750Q	5.10	TDA3190	1.27	UPC1181H	6.80
2SA872	0.14	2SD1275	0.68	AN7171K	3.98	BC547C	0.00	BF256LC	1.40	BY164	0.67	LA4507	0.00	R4051	2.95	STK7308	4.91	TBA800	0.51	TDA3190P	1.36	UPC1182H	5.95
2SA872A	0.20	2SD1276	0.85	BA145	0.11	BC548	0.00	BF257	0.36	BY179	0.80	LA4508	2.38	RB156	1.80	STK7348	4.67	TBA810P	1.66	TDA3300B	0.00	UPC1185H	10.20
2SA940	0.66	2SD1279	4.88	BA156	0.06	BC548A	0.29	BF258	0.04	BY184	0.32	LA4520	1.11	RGP10	0.00	STK7356	5.59	TBA810S	0.66	TDA3330	7.94	UPC1188	3.83
2SA952	0.14	2SD1292	0.41	BA157	0.07	BC548B	0.18	BF259	0.31	BY20320	0.00	LA4700	3.52	RGP15	0.41	STK7358	5.46	TBA820	0.55	TDA3541	0.95	UPC1212C	0.83
2SA958	0.44	2SD1308	0.77	BA158	0.07	BC548C	0.12	BF324	0.12	BY206	0.13	LA5112	2.37	RGP15J	0.34	STR1096	4.67	TBA820L	0.55	TDA3560	4.64	UPC1225H	0.00
2SA966Y	0.29	2SD1397	1.89	BA159	0.30	BC549	0.06	BF337	0.33	BY207	0.18	LA5512	0.48	RGP30M	0.30	STR40090	6.83	TBA820M	0.34	TDA3561A	3.31	UPC1228HA	
2SA970	0.14	2SD1398	2.13	BA317	0.06	BC556	0.00	BF338	0.40	BY210400	0.19	LA7223	2.54	RM11C	0.38	STR4090	0.00	TBA920	0.51	TDA3562A	3.31		0.56
2SA984	0.20	2SD1426	2.38	BA318	0.04	BC556B	0.06	BF355	0.55	BY224600	5.10	LA7520	2.13	S2000AF	1.19	STR4211	5.95	TBA950	1.68	TDA3565	2.29	UPC1230	2.21
2SB1010	0.34	2SD1427	2.89	BA5102A	1.27	BC557	0.07	BF392	0.16	BY226	0.13	LA7800	1.27	S2055AF	1.81	STR440	6.38	TBA970	4.08	TDA3566	3.40	UPC1230H	2.53
2SB546	0.53	2SD1432	4.88	BA536	1.14	BC557B	0.06	BF393	0.17	BY227	0.14	LA7801	1.27	S2530A	2.27	STR441	5.95	TCA270S	1.03	TDA3571B	3.08	UPC1278H	2.13
2SB633	0.93	2SD1439	5.51	BA5406	1.61	BC557C	0.11	BF419	0.65	BY228	0.38	LA7820	1.57	SAA1004	1.14	STR451	7.05	TCA440	1.95	TDA3576	11.90	UPC1318	2.97
2SB643	0.00	2SD1453	2.23	BA6109	1.43	BC558	0.00	BF422	0.15	BY229	1.64	LA7830	1.02	SAA1121	11.22	STR50020	8.07	TCA660B	0.43	TDA3640	6.12	UPC1335V	2.81
2SB643S	0.20	2SD1497–02	7.05	BA6209	1.31	BC558A	0.06	BF423	0.10	BY229600	1.27	LM1303N	0.88	SAA1174	5.10	STR50103	6.63	TCA800Q	1.65	TDA3650	9.45	UPC1351C	1.70
2SB644	0.68	2SD1497–06	7.06	BA6219	1.45	BC558B	0.06	BF435	2.64	BY229800	0.97	LM1877	1.45	SAA1250	2.92	STR54041	6.15	TCA910	1.21	TDA3651A	0.00	UPC1353	1.34
2SB688	1.28	2SD1541	3.40	BA6222	1.19	BC559	0.11	BF450	0.19	BY238	0.31	LM317T	0.48	SAA1251	3.30	STR5412	5.95	TCA940	3.40	TDA3653AQ		UPC1363C	1.06
2SB772	0.34	2SD1555	2.47	BA656N	0.84	BC560C	0.21	BF458	0.30	BY255	0.14	LM324N	0.25	SAA1293	0.00	STR58041	6.37	TD3F900H	6.57		1.92	UPC1363CA	
2SB772Q	0.43	2SD1577	3.35	BA718	0.77	BC635	0.23	BF459	0.29	BY298	0.15	LM339N	0.15	SAA1351	8.23	STR6020	5.46	TDA1004A	3.40	TDA3653B	1.86		2.13
2SB793	0.31	2SD1649	1.80	BAS11	0.32	BC637	0.15	BF469	0.34	BY299	0.12	LM358	0.23	SAA3027P	6.37	STR6020MT		TDA1010	1.30	TDA3654	1.61	UPC1365C	1.70
2SB819	0.48	2SD1650	2.47	BAV18	0.07	BC639	0.13	BF470	0.29	BY476A	0.68	LM358N	0.22	SAA5010	3.12		5.95	TDA1011	0.99	TDA3810	2.55	UPC1378H	1.19
2SB861	0.82	2SD1876	4.88	BAV20	0.26	BC640	0.06	BF480	0.67	BYD14J	0.31	LM380N	0.82	SAA5012	3.31	T6064Y	2.63	TDA1011A	1.32	TDA4420	1.27	UPC1391H	0.52
2SB891	0.38	2SD1877	2.13	BAV21	0.49	BC879	0.39	BF493S	0.34	BYD33G	0.68	LM386	0.00	SAA5030	6.42	T6076V	3.35	TDA1013A	1.45	TDA4427	2.05	UPC1394	1.23
2SC1008	0.17	2SD1911	4.45	BAW62	0.07	BC880	0.38	BF597	0.16	BYD33J	0.16	LM393N	0.27	SAA5050	4.68	T9013V	5.23	TDA1015	0.99	TDA4442	3.49	UPC1420CA	
2SC1061	0.59	2SD234	0.94	BAX14	0.28	BCY70	0.07	BF757	0.43	BYV10–40	1.80	M192B1	1.86	SAB3013	5.44	T9034V	1.45	TDA1020	1.27	TDA4500	3.79		5.29
2SC1096	0.50	2SD313	0.43	BB105B	0.24	BD131	0.28	BF758	0.32	BYV95C	0.36	M21C	1.40	SAB3021	6.15	T9035V	1.50	TDA1035SB		TDA4501	5.08	UPC1488H	1.22
2SC1114	1.16	2SD350A	1.23	BC107	0.14	BD132	0.21	BF759	0.34	BYV96D	1.14	M293	14.63	SAB3035	6.35	T9038V	6.09		4.15	TDA4503	3.38	UPC2002	1.13
2SC1162	0.31	2SD401	3.46	BC107B	0.20	BD135	0.22	BF760	0.24	BYW56	0.17	M490	15.37	SAF1032P	5.17	T9053V	0.92	TDA1035T	2.35	TDA4505E	4.64	UPC324C	1.74
2SC1213	0.14	2SD438	0.25	BC108	0.15	BD136	0.20	BF762	0.29	BYX55600	0.20	M491	7.94	SAF1039	2.36	T9054V	0.88	TDA1037	8.50	TDA4600	1.70	UPC4558C	
2SC124	0.44	2SD468C	0.00	BC109	0.12	BD137	0.45	BF869	0.25	CA1310E	0.78	M494	9.61	SDA2112	13.35	T9064	1.20	TDA1044	1.43	TDA4600-2	2.14		0.43
2SC1306	1.16	2SD476	0.97	BC109A	0.12	BD139	0.29	BF870	0.23	CA3094	3.06	M50115AP	2.50	SG264A	10.62	T9065V	5.14	TDA1060	2.47	TDA4600D		UPC574	1.07
2SC1318	0.10	2SD525	0.77	BC109B	0.15	BD140	0.24	BF959	0.18	CD4001	0.14	M51102L	1.77	SG613	18.79	TA7063P	1.14	TDA1082	4.25		2.97	UPC580C	2.55
2SC1364	0.29	2SD551	5.81	BC109C	0.20	BD168	0.76	BF960	0.27	CD4011	0.21	M51231P	2.55	SGSIF344	5.51	TA7228P	0.63	TDA1083	1.19	TDA4600F	1.70	UPD1937C	
2SC1384	0.50	2SD613	0.63	BC117	0.14	BD175	0.29	BF966	0.61	CD4013	0.34	M51393AP	4.64	SKE2G202	0.00	TA7146P	5.61	TDA1151	0.51	TDA4601	1.70		3.15
2SC1398	0.80	2SD636	0.14	BC119	0.38	BD179	0.34	BF970	0.30	CD4016	0.14	M51515L	2.01	SKE4F104	0.97	TA7176P	1.30	TDA1170	0.99	TDA4601D	2.42	X0065CE	1.70
2SC1413A	1.36	2SD637	0.12	BC139	0.33	BD189	0.41	BFR39	0.00	CD4021	0.43	M51521L	0.54	SKE4F210	0.87	TA7193AP	3.36	TDA1170N	1.23	TDA4605	3.01	X2402	5.08
2SC1509	0.39	2SD667	0.26	BC140	0.21	BD190	0.31	BFR41	0.44	CD4052	0.22	M5218L	0.38	SKE5F310	1.68	TA7193P	4.09	TDA1170S	1.16	TDA4950	1.39	ZPY120	10.62
2SC1520	0.54	2SD669	0.55	BC141	0.25	BD201	0.40	BFR79	0.00	CD4053	0.20	M5231L	0.55	SL1430	1.41	TA7205	0.00	TDA1180	1.28	TDA7240A	1.53	ZTX650	0.51
2SC1573	0.26	2SD669A	0.81	BC147A	0.06	BD203	0.46	BFR90	0.61	CD4066	0.30	M53216P	1.48	SL1431	1.70	TA7205AP	1.31	TDA1190Z	4.08	TDA7270S	8.20	ZTX753	1.09

IF YOU DON'T SEE IT LISTED ASK FOR QUOTE. GIVE MAKE, MODEL, LOCATION. REMEMBER TO ADD £1.00 POST & HANDLING U.K. MAINLAND ONLY. HANDLING CHARGE TO ALL EXPORT ORDERS AT COST. ADD 17½% VAT TO TOTAL

THE GREENWELD

1993 Spring Supplement

Boing! Leap inside for a few Spring Surprises!

FREE! GIFT!

EASIWIRE Prototype Wiring Tool

Full details in main Cat

ABSOLUTELY FREE!!

With first 2,000 orders!!

RRP £15!!

Only 2 conditions: One per household. Coupon must be stuck to Order Form

FREE! GIFT! COUPON Cut off and STICK to ORDER FORM

AMPLIFIED SPEAKER SYSTEM

Order Code A179P

Output Power 2x2W
Freq. Res. 50-12kHz
Speakers 2x2¼"
Size (folded) 107x51x70mm

SUPER VALUE!

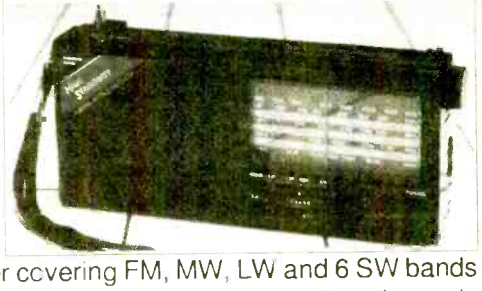
Foldable, designed to give portable radios, cassettes or CD players a high quality boosted sound output. Amp can be switched in or out. Powered by 4xAA cells or external supply (neither included)

OUR PRICE £5.95

9 BAND RADIO RECEIVER

Order Code B118C

Frequency Coverage:
FM 87.5-108.5MHz
MW 522-1620kHz
LW 150-281kHz
SW1 4.5-5.1MHz
SW2 5.82-6.2MHz
SW3 7.1-7.5MHz
SW4 9.45-9.9MHz
SW5 11.45-11.95MHz
SW6 17.45-18.06MHz
Uses 2xAA batts
Size 170x60x30mm

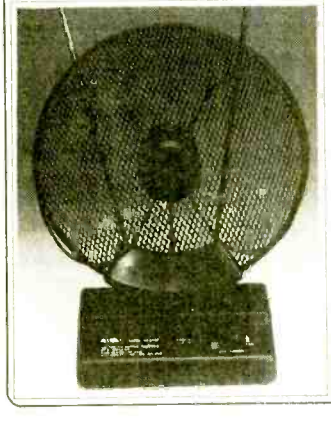


Compact receiver covering FM, MW, LW and 6 SW bands (19, 25, 31, 41, 49 & 60m). Built in ferrite rod + telescopic aerial. Tuning LED, earphone skt. Great spec. at a low, low price!

£12.95

AMPLIFIED UHF/VHF/FM AERIAL

Order Code T143A



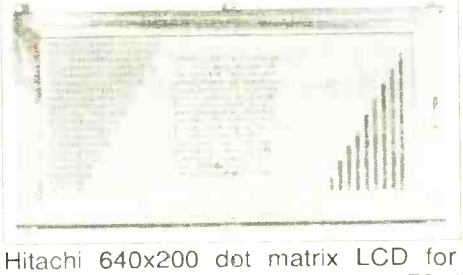
Dish can be rotated to pick up best signal, then boosted using built in amp with gain control - can also be used with external aerial.

Gain..... 20dB VHF; 30dB UHF
Gain Control 0-30dB
Max Ouput level..... 100dBµV
Power..... 12V DC
Size..... 340x220x110mm

£9.95

JUMBO DOT MATRIX DISPLAY

Order Code LM225



NOW ONLY £25

Hitachi 640x200 dot matrix LCD for PC's, WP's, and industrial equipment. Module size 270x150x13mm. Display area 239x104mm. Dot size 0.32x0.46; pitch 0.35x0.49. Has on board 16 x HD61100 & 4 x HD61103 chips. With comprehensive data. Reduced from £39.50

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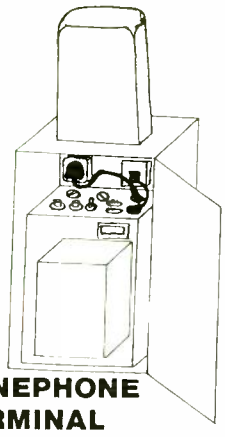
Welcome to our 1993 Spring Supplement, presented FREE with your favourite monthly magazine. In it's 32 pages you'll find a mix of regular lines and surplus goods - a Super Selection of Spring Special Offers! So browse through the Bargains - but please remember some items are only available in limited quantities, so don't delay - Order today by phone, fax, post or in person - see page 30 for full information. We look forward to serving you soon.

★ This brochure contains only a fraction of our stock - see page 30 for details of our other publications!

ZONEPHONE ZAPPED!!!

You've probably seen in the press the much hailed personal phone has been a dismal flop - with 3 different systems and the restraints imposed on its use meant it had little practical value. Failure seemed inevitable - but there's a silver lining to every cloud and its an ill wind that blows nobody any good, etc, etc ... we've purchased some of the goods with more to follow.



ZONEPHONE TERMINAL

Z8956 These were the units screwed to various buildings throughout the UK which you stood next to whilst making a phone call with your incredibly useful handset! Too bad if you weren't in range (99.9% of the UK wasn't!) but it was a nice toy while it lasted. There was a lot of clever technology involved, and we're selling these at probably about 1% or 2% of their real cost! So what do you get for your money?

Well, a lot of case for a start - in the outer steel case (a) 480 × 300 × 150mm with fibreglass aerial case on top (b) 250 × 160 × 75mm, there's another steel case (c) 325 × 245 × 130mm and inside this there's a plastic box (d) 200 × 15 × 75mm.

(a) contains a metal surface mounting 13A socket and a BT line socket

(b) has 2 whip aerials 200mm long terminated in PL259 plugs

(c) contains 8V 3.8Ah sealed lead acid battery, mains transformer (10V 2A Sec), mains filter and a plethora of plugs and sockets mounted on top - 3 BNC and 2 × 9 pin 'D' type, also 2 fuseholders, a lead with 13Aplug and another lead with BT plug, and a power on/ off toggle. Screwed to the inside of the lid is a PCB 250 × 160 with lots of nice bits - 64180 CPU, 27C256 EPROM, 5256-15 256k RAM × 3, LM2940, LM317T, BD680 × 2, 3.6V AA size lithium cell in holder, about 30 various linear/ logic chips, 3 xtals etc, etc. (You're getting great value for money here!)

(d) contains the Tx/Rx panel 170 × 135mm. Lovely bit of kit, this, all surface mount - about 20 chips. Inputs and outputs are taken to 2 min PCB sockets.

There's another panel the same size in this box, with lots of hi-tech devices - 2 × TMS77C82 programmable 8 bit microcontroller, 77C01, TMS320MC10FNL 16/ 32 bit signal processor, LM2984 triple 5V output regulator and another 10 chips, 4 'D' plugs/ sockets and lots of other bits

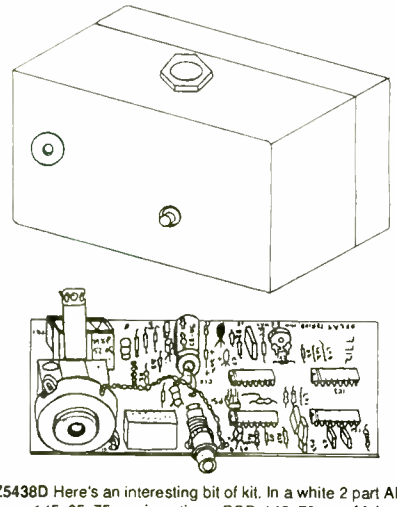
And that's about it!

PRICES

COMPLETE Z8956 £17.95

LESS AERIALS & FIBREGLASS CASE Z8985 £12.95

VERSATILE TIMER UNIT



Z5438D Here's an interesting bit of kit. In a white 2 part ABS case 145x85x75mm is a timer PCB 142x70mm. Mains is applied directly to the board and the seemingly unnecessarily complicated timer (4 chips where one would do) enable times from 1min to 2 hrs (can be extended). There are 2 heavy duty relays with 10A contacts, a piezo sounder and MBC indicator. The unit, made by Energy Conservation Systems was designed to switch off lights. Supplied with original instructions + some useful data and ccts from our technical dept.

£4.95 100+ 2.40

Add VAT to quantity prices

LOGIC PROBE

Suitable for displaying the logic state of each gate of TTL, CMOS etc. Logic state displayed in light and sound. Pulse enlargement capability allows pulse detection down to 25ns. Supplied with comprehensive instruction manual

Order Code Y132

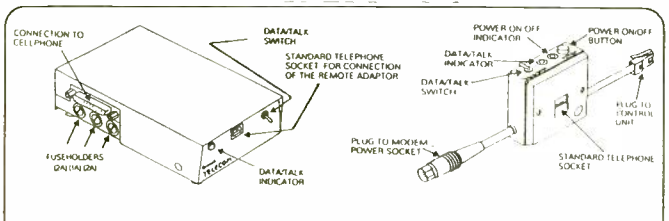
SPECIAL PRICE

£8.88

Working voltage: 4-16V
Threshholds: Hi 70% Vcc; Lo 30% Vcc
Input Z: 1M. Max input freq: 20MHz

CLOCK MODULE

Z2741D 4 digit 13mm LED display and clock on PCB 78x35mm, made by National, type MA1002-1 Supplied with a data sheet. **£2.00**



DATA INTERFACE

Z8976D DS1000 data interface for using cellular phones for fax transmission. Comes in 2 parts: a) Control Unit in a steel case 170x102x45mm with connections to cellphone and remote adaptor and b) Remote Adaptor, which is a BT socket that has plugs to the control unit and modem, a standard telephone skt, data/talk switch and indicator, and on/off button and indicator. Must have cost a fortune. Brand new and boxed, we're selling these for the useful parts -relays, pot cores chips, plugs, sockets etc. The whole lot, with data for just **£5.95** 100+ 3.50

DISK DRIVE DEAL

Knockout price on 5.25" double sided 360k PC compatible drives, brand new by Copal, model F5022. Standard 42mm high. Full info supplied

£12.95 Order Code Z5510

100+ £7.00 +VAT

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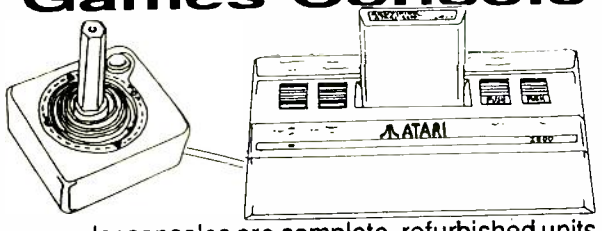
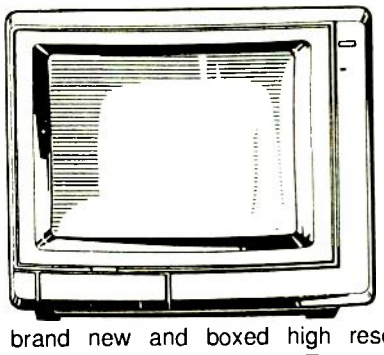
3

Atari 2600
Games Console



These popular consoles are complete, refurbished units with joystick, power supply, TV lead and games cartridge (Centipede). **£29.95**

SCOOP PURCHASE OF HIGH QUALITY MONITORS!!



Z9128 These brand new and boxed high resolution video composite monochrome monitors made by Thompson model no VM3102VA have a 12" amber non-glare CRT and 35MHz video bandwidth. Resolution is an incredible 1000 lines at centre. Scanning frequency 15.725kHz horizontal, 50-60Hz vertical. Composite video input, -ve sync (0.6-2.5V p-p) (not RGB). There is also an audio input and internal amplifier and speaker. 220-240V ac operation. Smart two tone grey case. Overall size 336 wide x 290 high x 300mm deep. Video and audio inputs on phono sockets. Supplied with full circuit diagram and instruction manual.

OUR PRICE **£34.95**

Y136C INSULATION TEST UNIT

Intended for use with the M260 and M266 clamp ammeters, but now they are no longer available - however instructions are included to use with almost any digital meter

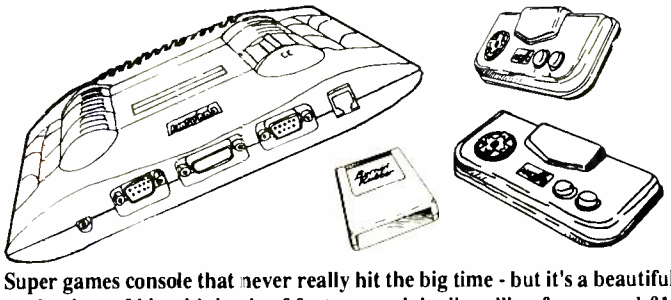
Original Selling Price £45+ **£12.95**

500Vdc insulation test unit designed for use with the M260 (Y136B) and M266 (Y136A) digital clamp ammeters. Unit plugs directly into the meter sockets. Insulation resistance readings directly on clamp meter display. Complete with leads, instruction manual, battery and carrying case.

Measuring voltage	500Vdc
Measuring ranges	100k-20MΩ ±2% 10MΩ-1999MΩ ±4%
Batteries 4 x AA (supplied) Dims	90 x 70 x 50mm

AMSTRAD GX4000
HOME ENTERTAINMENT SYSTEM

- *Games Console
- *2 Control Paddles
- *TV lead
- *Burnin' Rubber Cartridge
- *Power Supply
- *Instruction Books



Super games console that never really hit the big time - but it's a beautifully made piece of kit with loads of features, originally selling for around £100 - and the cartridges were £25!

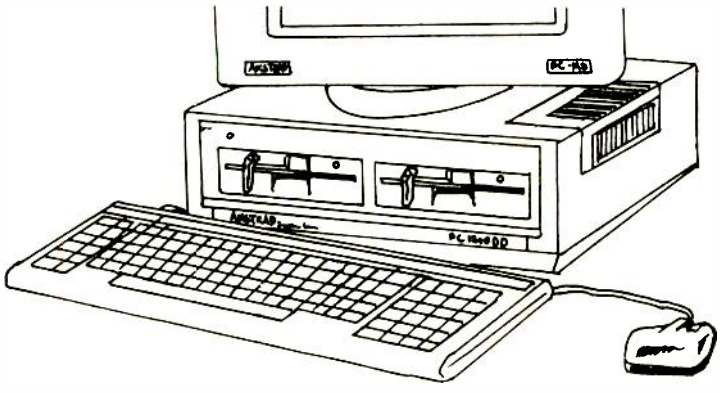
The console itself measures 250x160x40mm and has a myriad of inputs and outputs to cater for most devices. Inputs: 2 paddles with 9 pin D sockets (supplied), also 15 way D skt for analogue joysticks and 6 way aux modular socket for light pen/gun etc. Outputs are 8 pin RGB monitor skt; SCART skt, UHF output to phono skt; and a stereo sound 3.5mm jack socket. It can be powered by the AC adaptor supplied (11V @ 500mA) or 5V from MM12/CM14 monitors.

Inside the plastic case, the PCB 205x147mm contains a wealth of goodies: Z80A CPU in socket, AY-3-8912 sound chip, 168 pin dedicated chip, UM1234 UHF modulator, games cartridge socket, 7805 on a heatsink + a dozen transistors.

EXCEPTIONAL VALUE AT £29.95
NOW REDUCED TO JUST £19.95

AMSTRAD PC1640 COMPUTER

See pages 8 & 9 for details of Software for use with this machine



Brand new full spec base unit, keyboard, mouse and manual (no monitor) Standard PC1640 with 640k RAM and 2 x 5.25" disk drives, only being sold so cheaply because we have no monitors to go with them. Actually worth more as spares (work it out - keyboard £25, 2 disk drives £50, case £20, motherboard £25, mouse £5) but as they're taking up lots of room and we haven't the time or space to take them all apart, you gain an absolute bargain! **£99.95**

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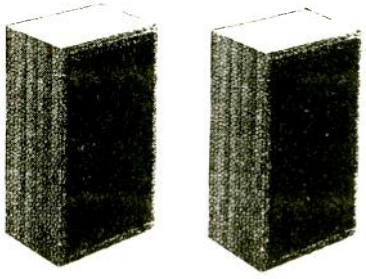
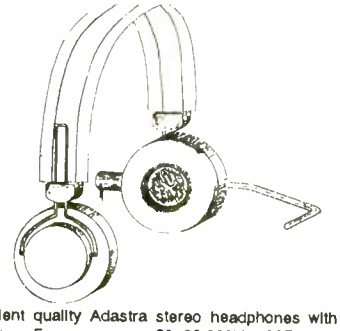
CABINET SPEAKERS



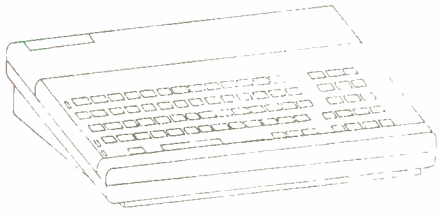
Z9121 Dark veneered wood finish, size 330x217x116mm. Single wide range 4R speaker. Max total output 20 watts music power. Ideal as extension speakers for kitchen, workshop, etc. **Only £12.95 per pair.**

HEADPHONES

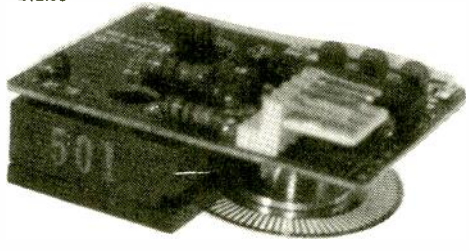


H8 Excellent quality Adastra stereo headphones with boom microphone. Freq. response 20-20,000Hz, 32R impedance. Microphone 600R . 2m leads fitted with 3.5mm plug for mic, and 3.5 mm plug +adaptor for headphones. Padded earpieces and leatherette headband.
ONLY £9.95

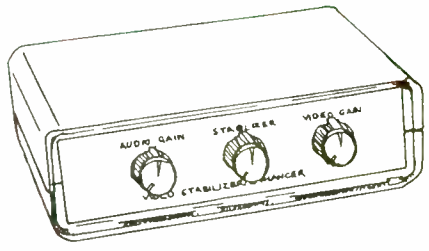
Viewdata Terminal/Modem



Tandata TD1100 alphanumeric Viewdata/Prestel Adaptor. These units were used with a home banking system. The console was hooked up to your TV and telephone line, and by using the standard qwerty keyboard with seperate numeric keypad, you could access your account. The well styled black and grey case 300x180x75/40 has a 75 key keyboard connected inside by a DIL plug to the main PCB. This has mounted on it the modem sub-panel + 3 relays, UM1286 Astec colour modulator with sound, + SAA5020, 5050, 5070, SY6504, 68B10, MCM51101P45, 2x2114 & 2732 EPROM all in sockets, as well as over 20 other LS and linear chips, transistors etc. There's a back up nicad battery and a regulated power supply. On the rear panel is an on/off rocker switch, UHF output socket, printer skt(15 way D), and cassette DIN socket for recording data.
There are 3 leads attached; 4m long mains lead with 13A plug, 4m long BT lead with old-style plug, and a 3m long TV co-ax lead.
All in all, a versatile, useful compact unit either to use as it is or for the parts within. The component value alone is over £60, so you can see what a bargain this is - it even comes with a photocopied handbook!!
Order Code Z8963. The whole unit as described for just **£12.95**



Z345 Optical Shaft Encoder. Made by sharp. Ideal wherever the position or speed of a rotating shaft needs to be know - ie machine tool control, robotics etc. Supplied with comprehensive data sheet. Size of module 46 x 33.5 x 20mm; size of disc 28mm dia. Bush with grub screw will take a 4mm dia shaft. Disc has 96 slots. DP £48 18.
Our Price **£8.50**
Data sheet available separately **30p**



T128C VIDEO ENHANCER JAB86

A stereo sound and picture enhancer designed to improve picture and sound quality when recording from tape to tape or from camera to tape. Audio and video gain controls and picture stabilizer. Input and outputs via phono sockets. Requires an external 12Vdc 100mA power supply.

Audio frequency range	100Hz - 1kHz
Video frequency range	0.5MHz - 5MHz
Audio gain	15dB min.
Video gain	4dB min. 8dB nor.
Audio gain adjust	20dB min.
Video gain adjust	20dB min.

Scoop purchase of all remaining stocks! Selling just for the parts value - although they are brand new and boxed, there is a design fault - a black bar across the screen when in use. Normal cat price £23.95

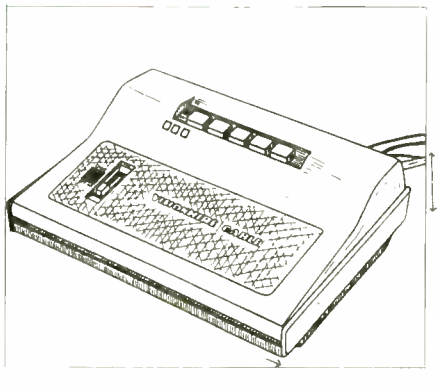
CLEARANCE PRICE £8.95

INSTRUMENT CASE

Z8969 Superb heavy duty steel instrument case finished in light grey 426x290x78mm with 4 plastic screw on feet. This was an Isolan repeater for use on a data network, and although the contents have been removed (before being used), the front and back panel remain, the former having 4 oblong red LED's and the latter a fused, suppressed IEC mains inlet, on/off DP rocker switch and 2 x 15 way D sockets joined to 16 way IDC skts with a short length of ribbon cable. There's a 60mm circular cut-out for a speaker on one side and mounting pillars in the base. Just look around and see the price this type of high quality case normally costs! - somewhere around the £30-£40 mark - then compare it to our low, low price - **just £9.95**

CABLEVISION CALAMITY !!!

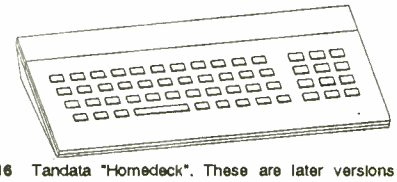
Seems like Visionhire became a bit over-stocked on their cablevision consoles - we've just purchased a quantity of these superb brand new units which contain some great electronics and as ever can offer them at an absolute BargainPrice!!



Two tone brown case (dimensions as shown) contains PCB 192x195mm with easily removed UHF modulator made by Labgear (Sound and Vision); video pre-amp; stabilized power supply and all the decoding circuitry (9 transistors and TBA673 chip).

On the front of the case is a cable/off air switch and 5 push buttons (4 channels and on/off mains switch). There are 4 cables coming from the rear (these alone are worth what we are asking for the whole thing!) - 2m mains lead, 1.5m 8 core screened cable with 9 pin plug, 2m video in lead with coax plug and 2m video out lead with coax socket. As you would expect from a company like Visionhire, everything is top quality. The case can easily be utilised for other purposes - the dark brown inserts on the front are both easily removable, if required. Please note the low price we are asking in no way reflects their true worth - they're taking up a lot of space, so we need to shift them quickly!!

Z8939 £6.95 100+ 3.50 1k+ 2.50. **Add VAT to quantity prices**



Z5216 Tandata "Homedeck". These are later versions of Z8963 and are (a) smaller and (b) remote controlled. The two tone grey case is 270x110x28mm and has a full qwerty keyboard and seperate numeric keypad. Inside, on the PCB are a few components to transmit the data via 2 IR LED's to the receiver. The unit is powered by a PP3 battery. Super value at just **£3.00**

MEMORY

16k static RAM's by Motorola

MCM2016-35
MCM2018-35

Either type:

4 for £2.00

100+ 0.35; 1k+ 0.30

GREENWELD 27 Park Road Southampton SO1 3TB
Spring Supplement '93
Tel (0703) 236363 Fax (0703) 236307

5

Z5286D Metal detector panel 185x115mm. This is the complete PCB from an expensive (£80+) "treasure detector" - just add wire coil and meter to make a working unit. Circuit uses 15 transistors and 3 IC's. There are 5 pots and a rotary switch. Detailed info supplied. **£12.95**

STEREO CASSETTE PLAYER

Z5405 High quality heavy duty all metal construction stereo cassette player mechanism, probably intended for continuous background music. This is a lovely bit of kit – starts playing as soon as a cassette is inserted. Has fast forward, rewind and eject keys. It's bi-directional, and the sensing circuit automatically reverses the tape at the end. Has a Canon motor and works off 12V DC. **Great value at £4.95.**

FLASH UNITS

Z4100 Flash Unit. Found a few more of these compact but powerful units. Complete and new, they were intended for installation in a camera body, so have no case. Size 57x30x17mm overall inc flash tube and reflector. Min 3V relay on board. **Only £2.75**

ZZZZAPPPP

Z2819 The 'Revenger' key chain. 24 sounds to zap all your enemies! Supplied complete with batteries. **Only £1.50**

VISTEL UNITS - Can't sell these at any price, so are breaking them down and selling the parts as shown:

Z9120 Keyboard. 105 keys on PCB 385x192mm. 18 6x4mm cased LED's - 16 red, 1 each yellow and green. Also 7 LS chips and 8279C-2. Output to 26 way IDC socket. **Great value at £10.00**

Z5465 Modem PCB 197x127mm. Contains input socket for phone and output lead and plug to BT skt. 2 Omron G4D relays - 1 @ 3.6V, 1 @ 5V, both with DPCO contacts; 2 G4K 5V SPCO types. Other parts include TIP126, 3x2.2µF poly caps, ULN2003, LS04, 2x2N2222 etc. **£4.00**

Z5466 Display - 40 character single line fluorescent type M40SD02CA by Futaba. Mounted on PCB with driver chips **£3.00**

Z5467 Power Supply panel - torroidal transformer with 2 outputs feeding regulator circuitry - 2x78T05 regs on heatsinks. Also mains DP rocker switch and IEC chassis plug and socket. **Great value at £4.00**

Z5468 Main PCB 320x200mm with many great parts - 3x27128 EPROMS, 8085A µprocessor, 8251, 3x8255, EF7190, 4364, 6264, 6818 + 16 linear/logic chips. There's also a 4.8V 100mA Memopac Ni-cad, xtals, plugs, sockets etc. **Only £8.00**

Or buy the complete case unit with handbook for just £35.00!!

Z5499 UM1233 Astec UHF modulator, brand new, full spec. Currently being sold for around £6.00

OUR PRICE £2.00

Z5427 Tachometer. Here's a nice little unit at a fraction of its true worth - made by Transicon Inc, this will give an accurate voltage for any given speed. Gradient 1.55V/1000RPM. **Only £8.00**

Z5500 Telephone handset in pale grey with black 4 core lead. No plug **£2.00**

Z5488 9V stereo cassette deck mech. Record/replay and erase heads, 6 push buttons - fwd, rev, play, rec, pause and stop. **Only £2.95**

Z5487 Mabuchi hi-torque 9V cassette motor 35mm dia x 25mm. **Only £1.00; Box of 200 £65**

Z2852 TEK8202 5 tap active delay line. 14DIL package, pins are labelled Vcc, G, 1, 2, 3, 4, IN & OUT (like Bourns DL6300 series - their price 3.94) **Our Price 2 for £1.00;** 100+ 0.25

Z2724 Printer mechanism by Epson (M262?), 40 col on 75mm wide paper. Believed new, but no further data. **£4.00**

Over 100 different component packs are listed in our "Yellow Pages" Bargain List! Here are two new ones:

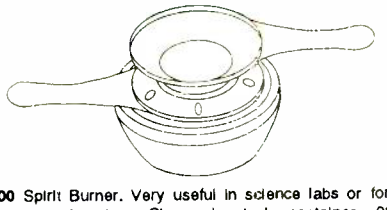
MYLAR CAPACITOR PACKS

K901 A good variety of the small 50 and 100V types - nearly all values in the E12 series from 0.001 to 0.082µF. **Pack of 200 £3.50**

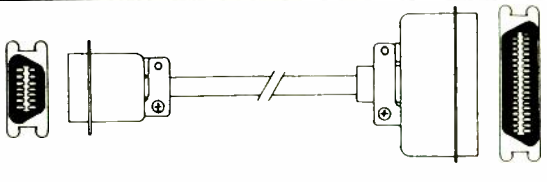
K902 A selection of larger values, all 50V from 0.1 to 0.47µF. **Pack of 50 £2.00**

GAMES PADDLE

Z5435 New boxed games controller paddles type PD1 for use with the Amstrad GX4000, 464+ and 6128+. **Our price £3.95**



Z5200 Spirit Burner. Very useful in science labs or for the home experimenter. Chromed steel container 93mm dia x 48mm high has absorbent material covered in wire mesh. Adjusting lever allows variations in temperature. Complete with 70mm dia dish for heating substances in. **Only £2.50**

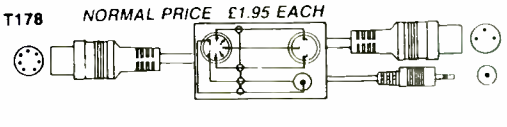


NORMAL PRICE £5.95

T190B **£2.00**

14-way Centronics plug to 36-way Centronics plug. MSX printer lead.
Length 2m

T178 *NORMAL PRICE £1.95 EACH*



7-pin DIN plug to 3-pin DIN plug and 2.5mm jack plug. Colour grey.
Length 1m

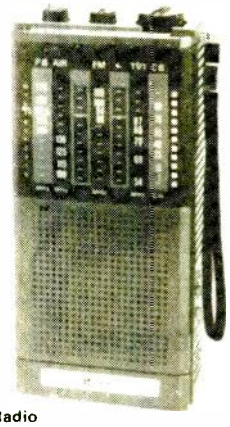
5 FOR £1.00

CAT PRICE £2.58

T108 **BUC12**

BNC plug to PL259 (UHF) plug.
Length 1.2m

CLEARANCE PRICE £1.00; 100 FOR £50.00



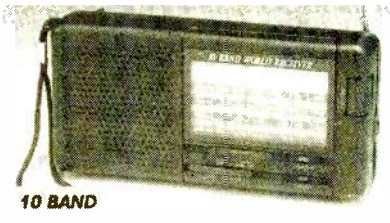
Multiband Radio

This compact piece of equipment 200 × 95 × 50mm comes in an attractive metallic grey case with controls on top - tuning, on/off and volume, squelch. The telescopic aerial extends to 500mm and can be rotated in any direction. The 3 wavebands are

1) CB, channels 1-80
2) TV1 54-87 MHz & FM 88-108 MHz
3) AIR 108-145 MHz & PB 145-176 MHz

The large 3" full range speaker delivers 280mW of undistorted power. There is an earphone jack and DC adaptor jack. The unit is powered by 4 × AA cells. All this technology for just ..... **£17.95** 10+ 11.90

Order Code **MB100**



10-BAND RECEIVER **B118CA**

A compact 10-band radio receiver covering FM, LW, MW and seven short wave bands. A built-in ferrite bar antenna receives the MW and LW transmissions and the telescopic rod antenna receives FM and SW transmissions. The tuning LED lights when a strong signal is present.

Frequency coverage:	
FM	88 – 108MHz
MW	530 – 1600kHz
LW	150 – 270kHz
SW1	4.75 – 5.10MHz (60m)
SW2	5.85 – 6.20MHz (49m)
SW3	7.10 – 7.50MHz (41m)
SW4	9.45 – 9.90MHz (31m)
SW5	11.50 – 11.95MHz (19m)
SW6	15.10 – 15.55MHz (19m)
SW7	17.45 – 18.00MHz (16m)
Power	3Vdc 150mA (2 x AA batteries)
Dims	160 x 78 x 35mm

Price ..... **£23.95** 6+14.27

MULTI-BAND RECEIVER **B118E**

A compact 4-band radio receiver with PLL synthesised tuning, auto frequency scan, LCD frequency display, clock, alarm and 20 programmable frequency memories. AM/FM/LW and SW receiving. The tuning LED lights when a strong signal is present.

Frequency coverage:	
AM	531 – 1602kHz
FM	87 – 108MHz
LW	146 – 281kHz
SW	5.95 – 15.60MHz
Power	4 x AA batteries (not supplied)
Dims	195 x 40 x 120mm

Price ..... **£34.95** 3+ 22.72

GREENWELD Spring Supplement '93

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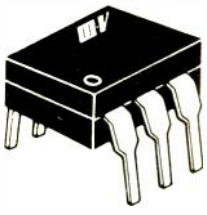
Tel (0703) 236363 Fax (0703) 236307

All the goods on this page are from IIIV Systems - a major US manufacturer of opto product. All new, full spec devices at our usual low, low prices!



(A) OPTOCOUPLERS

(i) Transistor

CODE	PART NO	VOLTS (RMS)	CTR% MIN	NOTE	£2 PK QTY	100+
Z2773	4N35	2500	100		10	.12
Z2775	CNY1711	3000	63		10	.12
Z2777	CNY33	1770	20		10	.12
Z2779	CNY47	2000	20		10	.12
Z2780	CNY47A	2000	40		10	.12
Z2782	CNY51	4000	100		10	.12
Z2783	H11A2	1060	20		10	.12
Z2788	H11A3	1770	20		10	.12
Z2790	H11A520	4000	20		10	.12
Z2791	H11A550	4000	50		10	.12
Z2792	H11AA2	1770	10	D	6	.20
Z2793	H11AGI	4000	300	A	6	.20
Z2794	H11AVI	4000	100		10	.12
Z2795	H11AVIA	4000	100	B	10	.12
Z2796	H11AV3	4000	20		10	.12
Z2797	H11AV3A	4000	20	B	10	.12
Z2800	H11D4	1770	10		10	.12
Z2822	H11F2	1770		C	10	.12
Z2826	H11J3	NO INFO			20	.06
Z2835	MCT2	1060	20		10	.12

Notes: A: CMOS CTR @ 1mA
B: GULLWING
C: FET - NO OTHER DATA
D: AC INPUT

K845 Mixed pack containing many of the above, plus others in quantities too small to list. **25 for £2.95**

(ii) Darlington

CODE	PART NO	VOLTS (RMS)	CTR% MIN	£2 PK QTY	100+
Z2771	4N30	1060	100	8	.13
Z2772	4N31	1060	50	10	.10
Z2778	CNY35	1060	10	10	.10
Z2781	CNY48	1500	600	6	.16
Z2798	H11B2	1770	200	8	.13
Z2799	H11B3	1700	100	8	.13
Z2823	H11G1	2500	1000	4	.25
Z2824	H11G3	1500	200	8	.13
Z2825	H11G46	4000	500	6	.16
Z2831	MCA230	2500	100	8	.13
Z2832	MCA231	2500	100	8	.13
Z2835	MCA255	2500	200	6	.16

K846 Mixed pack containing many of the above, plus others in quantities too small to list. **25 for £3.95**

(iii) Triac/SCR

CODE	PART NO	VOLTS (RMS)	Itr mA MAX	Vb	NOTE	£2PACK QTY	100+
Z2774	4N39	1060	14	200	S	6	.16
Z2776	CNY30	1770	11	200	S	6	.16
Z2783	GE3009	7500	30		T	6	.16
Z2784	GE3010	7500	15		T	6	.16
Z2785	GE3012	7500	5		T	6	.16
Z2786	GE3021	7500	15		T	6	.16
Z2836	MOC3009	7500	30		T	6	.16
Z2837	MOC3011	7500	10		T	6	.16
Z2838	MOC3012	7500	5		T	6	.16
Z2840	MOC3021LP	7500	15		TP	6	.16

Note: S = SCR T = Triac P = Surface mount pins

K847 Mixed pack containing many of the above, plus others in quantities too small to list. **20 for £3.95**

(iv) Schmitt

CODE	PART NO	VOLTS (RMS)	Itr mA (MAX)	£2PACK QTY	100+
Z2827	H11L2	2500	10	3	.35
Z2828	H11L3	2500	5	3	.35
Z2830	H11N1	3750	3	3	.35

(B) (i) PHOTOTRANSISTORS, INFRA RED

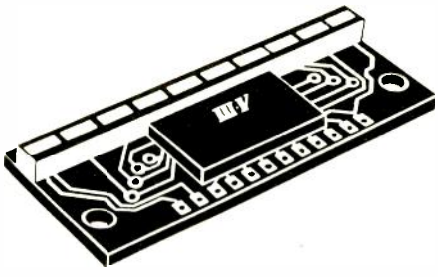
All are in TO18 hermetically sealed cases.

CODE	PART NO	ImA	mW/²cm	£2 PK QTY	100+
Z2766	TDET800W	0.3	5	10	.10
Z2767	TDET801W	0.5	5	10	.10
Z2768	TDET802W	2.5	5	10	.10
Z2769	TDET803	4	5	10	.10
Z2770	TDET804	7	5	10	.10

(ii) LED's

Hermetically sealed, TO46 case

CODE	PART	COL	RATING	£2 PK	100+
Z2764	TLMP9210	GRN	3.0 mcd@20ma	15	.07
Z2765	TLMP9310	YELL	3.0 mcd@20ma	15	.07

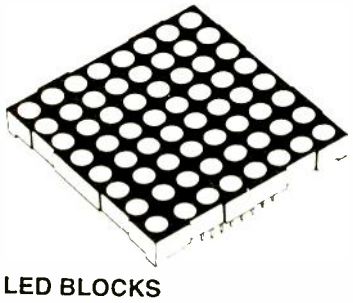


(iii) Bargraph Displays with Driver

Replacements for conventional meters. A combined 10 element LED array and chip. Supplied with data and application sheet.

CODE	PART NO	PRICE
Z2762	TSM39147 8 green, 2 red linear driver	£3.00
Z2763	TSM3916 10 red, VU driver	£3.00

A more comprehensive A4 size12 page booklet is available priced **£2**. Order code **Z2841**



(C) LED BLOCKS

CODE	PART NO	SIZE (MM)	MATRIX	COLOUR	PRICE
Z2759	TFB3358C	35	5X8	YELLOW	1.60
Z5469	TFB3458C	35	5X8	GREEN	1.60
Z2760	TFB3758A	35	5X8	HE RED	1.60
Z5470	TFB3758C	35	5X8	HE RED	1.60
Z2761	TFB5357A	51	5X7	YELLOW	1.80
Z5471	TFB5357C	51	5X7	YELLOW	1.80
Z5474	TFB5457A	51	5X7	GREEN	1.80
Z5475	TFB5457C	51	5X7	GREEN	1.80
Z5478	TFB5757A	51	5X7	HE RED	1.80
Z5479	TFB5757C	51	5X7	HE RED	1.80
Z5472	TFB5388A	58	8X8	YELLOW	3.50
Z5473	TFB5388C	58	8X8	YELLOW	3.50
Z5476	TFB5488A	58	8X8	GREEN	3.50
Z5477	TFB5488C	58	8X8	GREEN	3.50
Z5480	TFB5788C	58	8X8	HE RED	3.50

The suffix A or C to the part number indicates common anode and common cathode respectiveley.

1 off and pack prices in **bold** type include VAT; qty prices in light type don't - please add at the current rate. Thank you.

(D) LCD DOT MATRIX MODULES

All with HD44780 controller (and HD44100 on larger displays)

CODE	PART No.	SIZE	CHAR	HT	PRICE
Z5481D	TLCM1610	16X1	5X7	5.73	4.00
Z5482D	TLCM1620	16X2	5X7	4.27	6.00
Z5483D	TLCM1621	16X2	5X7	4.27	6.00
Z5484D	TLCM2011	20X1	5X7	5.20	4.60
Z5485D	TLCM2021	20X2	5X7	4.85	7.00
Z5486D	TLCM4021	40X2	5X7	5.20	9.50

A data sheet is included in the price.
Application notes: A 16 page booklet is available, price £2.00 order code **Z2842**

LED's

Z2091 Red 5mm square, Liton type LTL9223A. **Pack of 12 £1.00;** 100+ 0.038; 1k+ 0.03

Z2098 Red 7x2.55mm rectangular by Senior type SE6511D. **Pack of 12 £1.00;** 100+ 0.038; 1k+ 0.03

Z2095 Red 5mm square with rounded corners by Phillips type HR44DL. **Pack of 12 £1.00;** 100+ 0.038; 1k+ 0.03

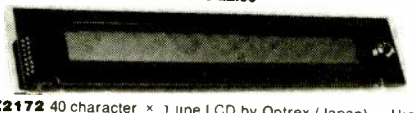
Z2096 Clear infra red 4.5x1.5mm rectangular, Honeywell type 8406. **Pack of 8 £1.00;** 100+ 0.06; 1k+ 0.04

Z2097 Red 5x2mm rectangular by GI, type MV57123. **Pack of 12 £1.00;** 100+ 0.038; 1k+ 0.03

Traffic Light LED modules. Plastic moulding 15x10x7.5mm that have 2 x 3mm LED's mounted in them. Ideal for railway modellers etc.

Z2855 Red and Orange
Z2856 Red and Green
Z2857 Green and Yellow
All the same price - any mix, **10 for £2.00**

Z5501 Panel 71x27mm with dual 7 seg LED + red and green rect LED's. **Pack of 10 £2.00**
Z5502 Another, this time with a dual and single 7 seg LED + red and green rect LED's. **Pack of 8 £2.00**



Z2172 40 character × 1 line LCD by Optrex (Japan). High quality double height display with 192 character ROM; other characters can be displayed by generation in RAM. Other features include cursor with control, blink character, scroll display, read and write display data, single +5V supply, data and power inputs by one 16 pin 0.05" SIL socket, pin outs standard and compatible with other Optrex displays, contrast control, easily interfaced with either 4 or 8 bit uP's. Supplied complete with data Dimensions: Characters are 5 × 12 dot arrays measuring 3.2 × 10mm Display size 170 × 17.5mm Module size 220 × 40mm DP over £50.00 **Our Price £15.00**

PRICE REDUCED TO £7.50!!

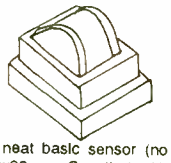
Z5489 20x2 dot matrix display by Toshiba, type TLC501 with 2xHD44100 & HD44780A00 chips on board. Fitted with 14 pin IDC type plug. PCB 115x37mm. **£7.00**

Z5460 Epson dot matrix display type EG2401A. Display area 139x39mm. Overall size 178x69mm. **No data at present £15.00**

Z5458 Epson 20 character x 8 line LCD, model EA-Y-20080AT, with backlight. This is the same spec (apart from the size) of our Z4372. Overall size 140x95mm. Dispaly area 83x63mm. Supplied with comprehensive data. **£25.00**

Z5459 Futaba 16 character x 2 line vacuum fluorescent display, type 162-BY-01Z. Supplied with pin out. Next month's 'Guardian' will have some driver circuits shown. **Only £2.50**

PIR SENSOR



Z2700 **PIR sensor.** Extremely neat basic sensor (no electronics) in plastic moulding 33x28x30mm. Supplied with circuits and lots of information. Has 10m range, 164° angle of view, <1mW power consumption. **£9.95**

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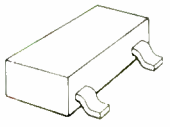
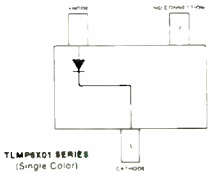
SURFACE MOUNT LED's





These LED's are in a SOT23 package (2.9x1.1x1.4mm)

CODE	PART NO	COLOUR	SPEC	£2 PACK	100+	1k+
Z2671	TFS056	Red	1.6mcd @ 10mA	12	.08	.06
Z2672	TFS059	Green	1.6mcd @ 10mA	12	.08	.06
Z2673	TLMP6301	Orange	0.5mcd @ 10mA	15	.06	.045
Z2674	TLMP6311	Red	1.6mcd @ 10mA	12	.08	.06
Z2675	TLMP6401	Yellow	0.5mcd @ 10mA	15	.06	.045
Z2676	TLMP6411	Yellow	1.6mcd @ 10mA	12	.08	.06
Z2677	TLMP6501	Green	0.5mcd @ 10mA	15	.06	.045
Z2678	TFS021	Red/Green	0.5mcd @ 10mA	8	.12	.09
Z2679	TLMP6802	Red/Yellow	1.6mcd @ 10mA	6	.16	.12
Z2680	TLMP6803	Red/Orange	1.6mcd @ 10mA	6	.16	.12
Z2681	TLMP6811	Red/Green	1.6mcd @ 10mA	6	.16	.12

KS106 A mixed pack of 100, containing most of the above types for just **£8.95**

MINIATURE LED's

These LED's have axial leads

CODE	PART NO	COLOUR	SPEC	£2 PACK	100+	1k+
Z2691	TFS065	Red 1.8mm	2.8mcd @ 10mA	10	.10	.07
Z2692	TFS066	Red 1.8mm	2.8mcd @ 10mA	10	.10	.07
Z2693	TFS068	Green 1.8mm	4.5mcd @ 10mA	10	.10	.07

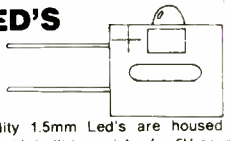
STANDARD LED's

These LED's have radial leads

CODE	PART NO	COLOUR	SPEC	£2 PACK	100+	1k+
Z2682	MV6052	Red 5mm	0.7mcd @ 20mA tint/undiffused	25	.045	.03
Z2683	SL35091G	Orange 3mm	16mcd @ 10mA	16	.06	.04
Z2684	HLMP3850	Yellow 5mm	150mcd @ 20mA untint/undiffused	12	.075	.05
Z2685	HLMP3950	Green 5mm	150mcd @ 20mA untint/undiffused	12	.075	.05
Z2686	TLMP7413	Yellow 5mm	150mcd @ 20mA untint/undiffused	12	.075	.05
Z2687	TLMP7513	Green 5mm	150mcd @ 20mA untint/undiffused	12	.075	.05
Z2688	TLMP7313	HE Red 5mm	150mcd @ 20mA untint/undiffused	12	.075	.05
Z2689	LST712L	Orange/Green 5mm	4mcd @ 20mA milky/diffused	10	.09	.06
Z2690	XC5549R	Red 5mm	4mcd @ 10mA tinted/undiffused	30	.04	.025
Z2694	TLMP5401*	Yellow 5x2mm	4mcd @ 20mA tinted/undiffused	15	.055	.035

*These have an interlocking moulding incorporated to enable accurate alignment when stacked.

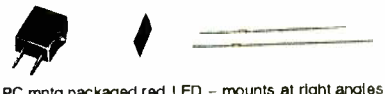
SUBMIN LED'S



These excellent quality 1.5mm Led's are housed in a 6.2x5x2.4mm package with built in resistor for 5V operation (add 470R resistor for 12V). Available in Green (DP £1.73) or red (DP £1.16).

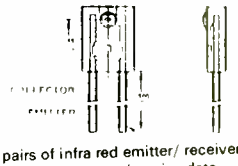
Z2135 Red ..... **3/£1** 100+ 0.15

Z2136 Green ..... **2/£1** 100+ 25



Z2461 PC mntg packaged red LED – mounts at right angles to PCB. 10.5x8x3.9mm. LED is 3mm. Ore type 9301A. **Pack of 10 £1.00** 100+ 0.05; 1k+ 0.04

Z1934 Stackable red LED – white casing round 6x3.5mm. **Pack of 10 for £1.00**



Z1846 2 pairs of infra red emitter/ receiver SDP8406/ 8506 by Honeywell with comprehensive data.

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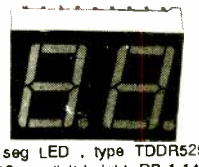

Z2434 Dual 7 seg LED , type TDDR5250 by TFK. Red common anode 13mm digit height. DP 1.14. Our special low price (we have 10000 to clear) **2 for £1.00;** 100+ 0.25; 1k+0.18

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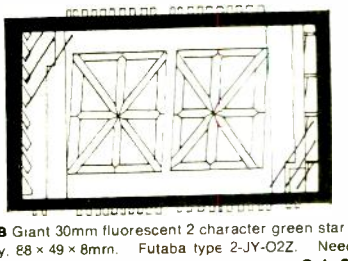

Z5118 Giant 30mm fluorescent 2 character green star burst display. 88 × 49 × 8mm. Futaba type 2-JY-O2Z. Needs 3V and 10-18V. Data supplied **Only £2.00**

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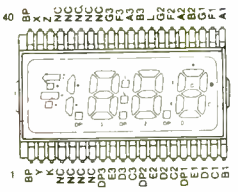
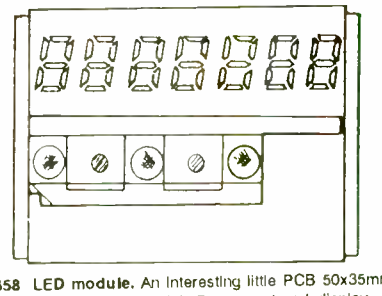
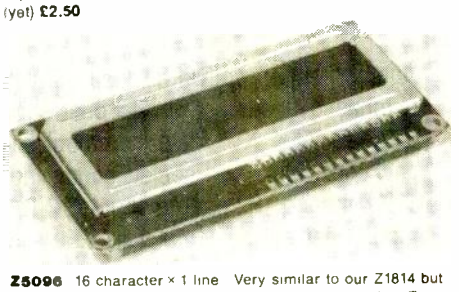


Z2655D Clock or 3 1/2 digit LCD with 40 way connector. 12.7mm character height like H1331CC, DP 4.70. **Our price £2.00**



Z2658 LED module. An interesting little PCB 50x35mm that has mounted on it a 7 digit 7 segment red display, and a plastic moulding under which are 3 surface mount LED's, one each red, yellow and green. On the back of the PCB is a SED5031M chip. Offered without info at present, although we are working on it. Believed to have been the display on a mobile phone. **Only £1 each**

Z2659 LCD module. Probably intended for use in mobile phones. Size 44x28mm. One row of 10 digits + a load of Japanese characters. Uses 2xOKI M5259 chips. No other data (yet) **£2.50**



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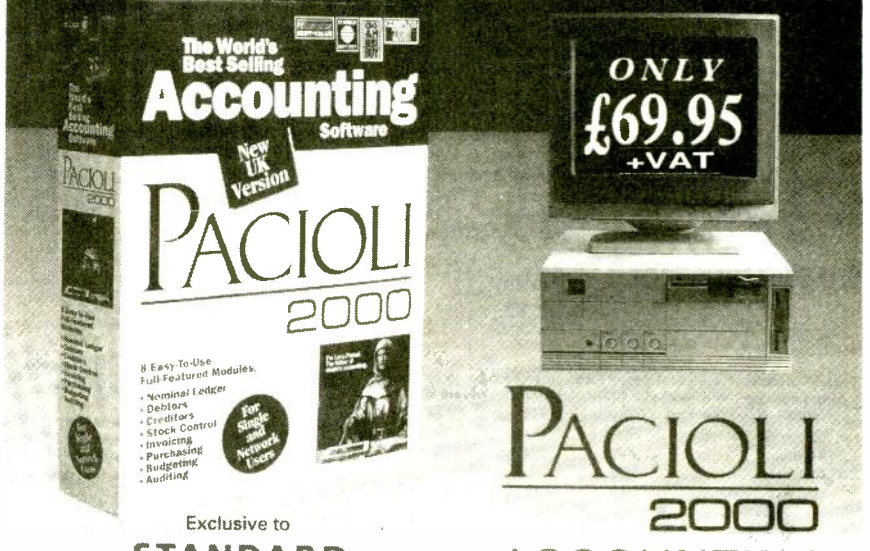

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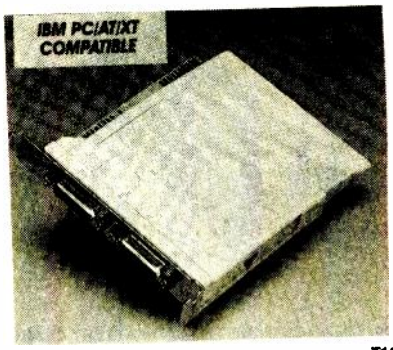

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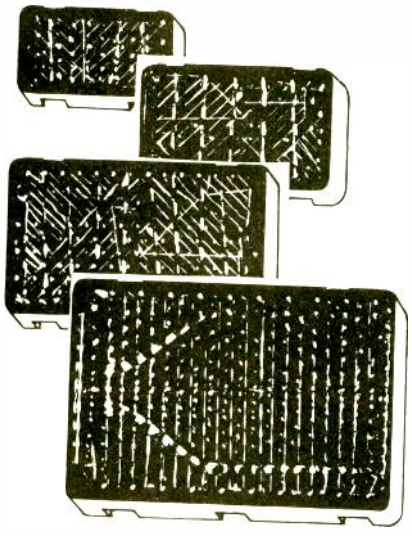

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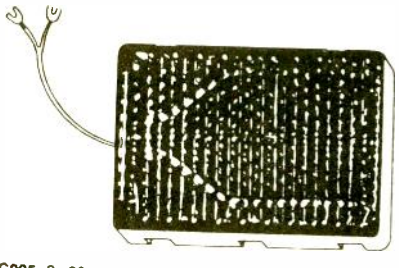

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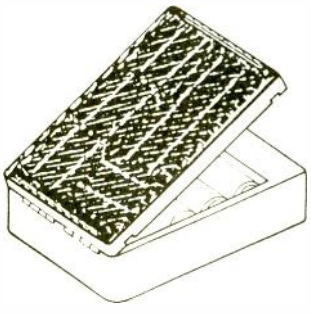

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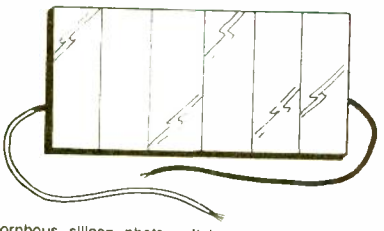

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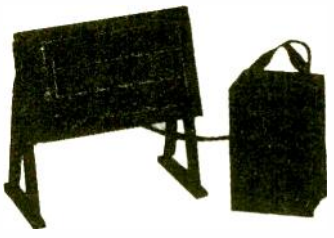

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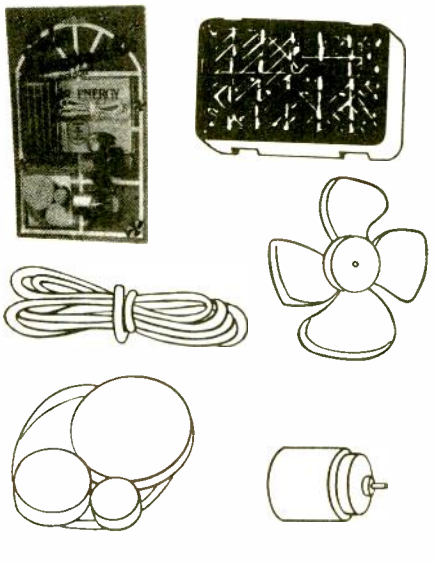

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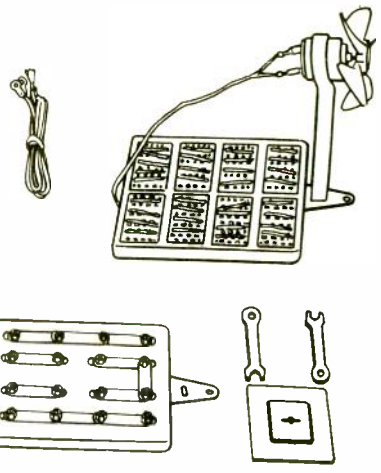

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Y060E **SI1224**

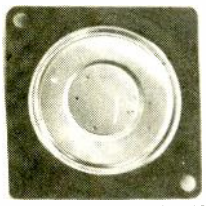
12 - 24V ac/dc

Safety extra low voltage miniature soldering iron. Slim 6W element assembly with fine chisel point tip. 1.25m lead fitted with 2mm plugs. Individually packed on full colour presentation card.

Length.....170mm
Power.12-24V ac/dc 6W

ONLY £2.95

Z5306 Adastra 8 ohm 10 watt white 135mm dia boxed horn speaker, model H52. Adjustable bracket. Very similar to our PS109 @ £6.50, but at a much better price **£3.95** 25+ 2.75



Z5678 Super flat speaker 30 × 30 × 3mm by Fuji, rated 16R 0.4W. DP £1.50.
Our Price ..... **60p** 25+ 0.35 100+ 0.22 1k+ 0.15

Z533 Danavox transducer - used as a speaker in pocket pagers. Impedance 50R. 20mm dia leads 90mm long. Extremely high quality unit.
Prices **50p** 10/ 3.65 50/ 14.80

P111D

8 x 5 inch plastic horn speaker with built-in line matching transformer for 70 and 25V line and 8Ω usage. Transformer tapped at 2, 4, 8 and 16W for 70V line and 1, 2, 4 and 7.5W for 25V line, selectable by rotary switch on rear. Mounting bracket fully adjustable for angle and direction. All white plastic.

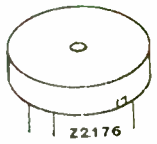
Size ..... 8" x 5"
Output: 70V line ..... 2, 4, 8 or 16W
25V line ..... 1, 2, 4 or 7.5W
8Ω 16W

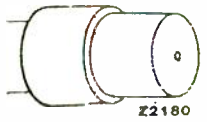
£12.95

SB5 CAR SPEAKERS. 4" air suspension unit with centre coaxial tweeter and crossover. All black plastic cabinet Shelf or door mounting.

Power nom 7W
Power max 20W
Impedance 4Ω
Size of speaker ..... 4" coaxial
Magnet weight 10oz
Dims ..... 120 × 120 × 90mm

REDUCED TO £8.00





A parcel of piezo and magnetic transducers

Code	Manf'r	Type	*P/M	Size	£1 Pack	100+
Z2176	Murata	PKM25-6AO	P	25 × 8	6	0.08
Z2180	Star	QMB-12A	M	15 × 22	4	0.12

* P - Piezo, M - Magnetic

K823 Pack of 10 piezo and electromagnetic transducers, PC mounting and with leads. Various sizes and shapes from 15-30mm dia. Manf'rs include Star and Murata. Supplied with info sheet showing drive circuits etc. **£2.50**

Z2547 Nice compact buzzer 23x17x13mm with 27mm FC, similar to our A381 which sells at 95p. These are marked 6/12V and we've a couple of thousand to clear at **2 for £1.00;** 100+ 0.30; 1000+ 0.20

Z8988 Super high power siren. Std 5" 5W 8R gold horn mounted on an ABS box (ourV216) which contains the driver PCB. Can supply either single or swept tone and works from 6–28V **£8.00**

ALARM BOXES

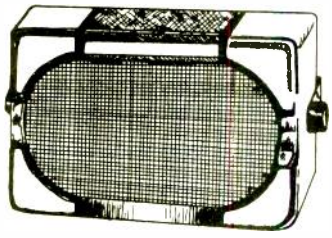
Z5396 24V DC buzzer housed in a bright red surface mounting MK switch box 80x78x40mm with louvred front panel **£2.00**

Z5397 24V LES lamp with red bezel mounted in MK switch box 80x78x40mm with red fascia plate **£2.00**

Z5398 As Z5396 but with white fascia plate **£2.00**

Z5399 As Z5397 but with red box **£2.00**

Z5400 MK surface mntg box in red with 24V buzzer and lamp. Red fascia plate marked 'FIRE ALARM' **£3.50**



High quality foreground music speaker providing excellent music quality for pubs, clubs, etc. Ported bass reflex system contains a 5¼" bass driver, 1" soft dome mid and two piezo tweeters. Modern styled all moulded cabinet. Complete with adjustable wall mounting bracket. Supplied in pairs

Power nom 30W
Power max 80W
Frequency response ..... 80 - 20000Hz
Sensitivity (SPL) ..... 87dB @ 1wm
Speakers ..... 5¼" bass, 1"mid, 2 x 1" piezo tweeters
Overall impedance 4Ω
Dims (each) ..... 275 x 170 x 125mm
Weight (each) 1.8kg

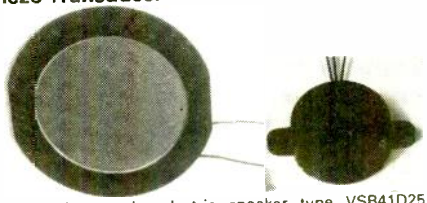
P114B LOUDSPEAKERS

Exceptional quality and value!
Originally sold for over £75 per pair!

OUR PRICE £39.95

For a Better Bargain - Get it from Greenweld!

Piezo Transducer



Z1429 Murata piezoelectric speaker type VSB41D25. Only 2mm thick×50mm dia, weight 3.3gm. Freq. res. 500Hz-20kHz. Z=1.2k at 1kHz. Max input 200mW. Normally £2.33
Our prices ..... **75p each** 10+ 0.52 100+ 0.40

Z1610 Piezo transducer in plastic case 31mm dia×11mm high. 3 wires. Needs 2 resistors and transistor to oscillate (supplied, with circuit). Voltage from 3V upwards by changing R. **70p**

Z2552 Transducer by digisound, type B/C11 in grey plastic housing 16x15x8mm. **Pack of 4 £1.00**

Z2553 Transducer by Digisound, type B/C17 in grey plastic housing 25x26x8mm. **Pack of 3 for £1.00**

Z2642 Miniature piezo mic/sounder as used in paging receivers – measures just 10x7x4mm. **2 for £1.00**

BACK IN STOCK

Z5462 Metal 9V buzzers - like our A391 at 80p. Need 43mm dia hole. Overall size 50mm dia x 26mm deep.

Small Price for a BIG noise!

5 FOR £2.00

100+ 0.20; 1000+ 0.15

CAMERA CLEARANCE

110 and 35mm - all are returns, some have small parts missing, but great value for lenses, electronics etc (most have built in flash units)

Pack of **5 £10**

Miniature 0.1µF 50V glass encapsulated ceramic capacitors by Unitrode

Type No B104ZD2 +80 -20%

2.4mm dia x 4.2mm long. 27mm leads

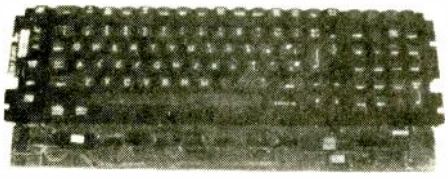
SUPER LOW PRICE!

Pack of 100 £3.00

1000+ 0.02; 6k+ 0.014

Order Code Z2812

12 GREENWELD 27 Park Road Southampton SO1 3TB
Spring Supplement '93
Tel (0703) 236363 Fax (0703) 236307

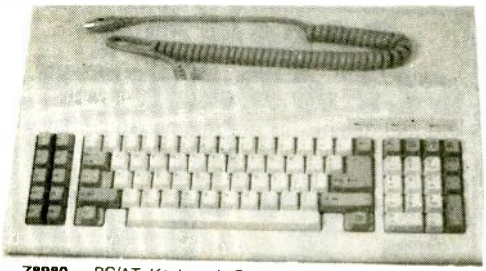


Z8848 Keyboard by Cherry. Room for 104 keys, all normal keys (65) fitted. Chips on board: LS373 × 2, LS374, LM3086 × 2. LS138 × 3, 555, LS08, 6805. Size 442 × 175mm
PRICE: £10.00

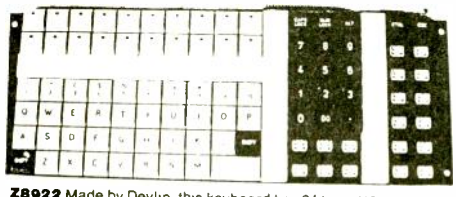
Z8852D Keyboard. Superb brand new high quality keyboard with LCD displaying 1 line of 10 characters and a further line with various symbols. 100 keys, inc seperate numeric keypad. Chips on board are 2x74HC05, 80C48. LCD + driver chip are easily removed. **Amazing low price – only £10.00**

Z8863 Keyboard. High quality unit made by Micro Switch. 69 pale grey and blue keys. 6 red 5mm LED's, 15 various LS chips and socketed D8048 by Intel. Output via 7 way plug and there's a 4 way edge connector too. Keyboard frame is 317 × 128mm. PCB on which it's mounted is 285 × 170mm.
PRICE: £10.00

Z8842 Tatung VT4100 keyboard. Cased 85 key units with separate numeric keypad. With circuit. Has 2 or 3 broken key tops. 450 × 65 × 125mm.
Price **£9.95**



Z8980 PC/AT Keyboard. Standard 84 key, brand new in original packaging offered at a fraction of their original cost! Top quality, made by Alps, they have an excellent touch. Nicely contoured case. Caps Lock, Num Lock, and Scroll Lock LED's, and curly lead with 5 pin DIN plug. **Our Price £19.95**

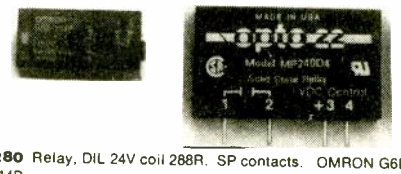


Z8922 Made by Devlin, this keyboard has 94 keys (18 without caps; 20 with removable tops) and runs off a single 5V supply. Serial ASCII output + switch to emulate AT and XT keyboards.
Price **£12.00**

12V relay bargain

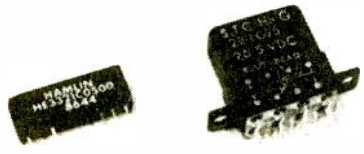
Z2120 Same size and contact arrangement as W853 in our catalogue at £1.42 (15.6 × 10.6 × 10.5mm, SPDT contacts rated 1A @ 28V DC) but different pinout. Standard DIL spacing.
Only ..... **£1.00** 25+ 0.70 100+ 0.60

Z2137 Superb quality potted relay 29x20.5x12.5mm with pins on 0.1 pitch. Coil 12V DC. Single contact relay 5A 12V DC or 5A 230V AC.
Price ..... **50p each** 10+ .39 25+ .31 100+ .25



Z280 Relay, DIL 24V coil 288R. SP contacts. OMRON G6B-1114P.
Price **£1.00**

Z1718 Solid state relay 43 × 25 × 70mm. Control voltage 3-24V DC switches 240V ac 4A. DP £7.82
Price **£3.00**



Z1958 Hamlin SIL reed relay type HE3321CO500. SPCO, 1200R coil. 5V operation. List price on these is over £5!
Our special price **£1.50**

Z218 26.5V sealed relay. 675R DPCO @ 1A. Made by STC 22 × 20 × 10mm
Price **60p**

Z2048 IMO Octal relay, 24V DC coil 2 pole c/o 10A contacts. List price over £5
Our price **£2.50**

Z2310 AX400F-X091. PC mounting reed relay 10.5mm high × 32.5 × 13mm. 5V coil SP break contact. **50p** 100+ 0.32 1k+ 0.25

Z2164 PCB relay with SPCO contacts rated 8A, 250ac. 24V coil. Fully enclosed, size 27.5 × 25.8 × 11 on 0.1 pitch, made by Zetter. Operating range 15V-30V.
Only 75p 100+ 0.35 1k+ 0.25

Z2174 High quality Aromat PC mounting relay, size 35 × 10 × 10mm. 0.1" pitch. Unusually, these are 4 pole changeover. 9V Coil (operates from 5-12V). Pinout printed on relay. Model DS4E-S-DC9V. Contacts rated 2A 30V DC.
Price ..... **£3.00 each** 25+ 2.20 100+ 1.80

Z2433 Hermetically sealed mains relay, miniature plug in type with 4PCO contacts. Size 22.5x29x32mm. DP (1987) 17.75.
Our special low price £4.75

Z2545 Miniature DIL reed relay 19x11x10mm by Pickering, model 97-1-A-12. Single pole make reed rated 10W 0.5A 200V. 12V coil 1000R. **2 for £1.00** 100+ 0.25

Z5178 Ex-equip PCB mntg 12V heavy duty rela – DPCO contacts rated 10A 250V. IMO model 60.42. **£1,50**

Z5179 As above but 3 pole changeover IMO 60.43. **£2.00**

Z2442 PCB mounting relay 30x24x10mm. 4PCO. 1150R coil, operates from 15–30V. **£1.50**

Z2350. Open construction 12V relay with 0.25 tabs. Ideal for car use. Single pole make contact rated 15A. **£1**

TIME DELAY RELAYS

These all originate from the largest component distributor in the UK and are in original packing. Sub min 4 pole changeover plug in type, delay before energize. Same as Omron H3Y4 series

Code	Volts	Time	DP	Price
Z5182	240V ac	5s	25.83	£5.00
Z5198	240V ac	10s	25.83	£5.00
Z5183	110V ac	5s	25.83	£4.00
Z5184	110V ac	10s	25.83	£4.00
Z5185	110V ac	60s	25.83	£4.00
Z5186	110V ac	5m	25.83	£4.00
Z5187	24V DC	5s	24.19	£5.00
Z5188	24V DC	10s	24.19	£5.00
Z5189	24V DC	60s	24.19	£5.00
Z5190	24V DC	5m	24.19	£5.00

Z2728 Teltone M949 polarized (latching) relay, size 28.5x10x10mm. This is used to detect an imbalance in voltage/current of around 1V @ 40mA flowing through the 2 coils. Single pole contact operates when this occurs. Very costly device - but yours for just **£1.60**; 100+ 0.90

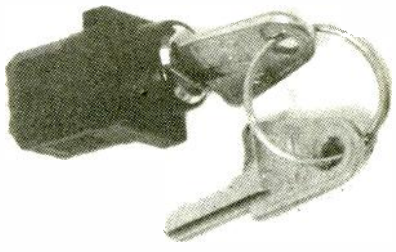
Z2843 12 volt relay, ex-equip but nice and clean. Omron G2L PC mntg 10A 250V ac single pole changeover contacts. **3 for £2.00**

Mercury Switches

Z2118 Metal enclosed in case 7.5mm dia × 9mm long. 10mm flange one end.
Price ..... **2/ £1.00** 100+ 0.25 1k+ 0.18

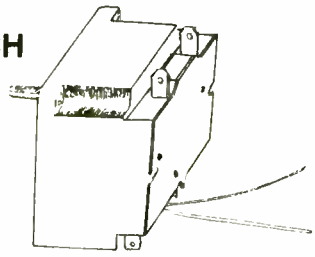
Joystick Switch

Z004 Skeleton Joystick, switch type. Good quality, made by AB. Brass spindle has 44mm long black plastic handle attached. Body has 4 mounting holes. These really are a fantastic bargain!!
ONLY £1.00



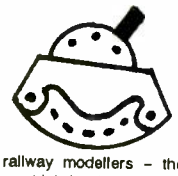
Z2168 Superb quality British made (TOK). Gold plated DPCO contacts. Key can be removed in either position. PC mounting or clip fix - needs 15x15mm cut-out. Ideal for alarms etc.
Price ..... **£1.95** 25+ 1.20 100+ 0.80

TIMER SWITCH



Z5174 Timer switch by Diehl of Germany. Superb geared mains motor, (1 rev per 12 hours) operates a cam that switches 2 change over contacts with centre – off positions rated 16A 250V. Size 60x54x43mm. Spindle is 14x6mm dia.
Only £3.00 100+ £1.50.

POINTS SWITCHES



Great switch bargains for railway modellers – these small switches 18mm wide and 12mm high (excluding lever) and just 4mm thick with 14mm FC come in two versions:

Z2363 2 position, 2 pairs make and 2 pairs break. **Pack of 5 £1.00** 100+ 0.10

Z2364 3 position, 6 pairs contacts (2 pole 3 way). **Pack of 5 for £1.00** 100+ 0.10

Our next publication will be our Summer Supplement, which will only be sent to customers on our database - send an order in now to be included in this mailing!

GREENWELD 27 Park Road Southampton SO1 3TB

Spring Supplement '93

Tel (0703) 236363 Fax (0703) 236307

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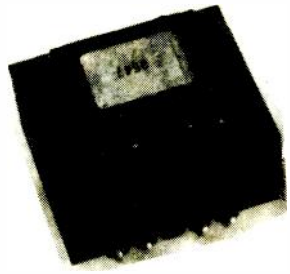


Z4248 Mains transformer, 110/ 240V input via PCB pins. Secondary; 6.5V @ 8VA; 22V @ 8VA; 22V @ 1VA; 1.5-0-1.5V @ 1VA. Nicely made by Skot.
Price **£3.00**

All mains primary. Secondaries as listed.

Z4213 25V 1.5A. Clamp type 70 × 57 × 47mm terminated with wires.
Price **£3.00**

Z8972 Transformer rated 100VA by Majestic, 0–240V prl, 25V 4A sec. 100x85x70mm. **£6.50**

TRANSFORMERS

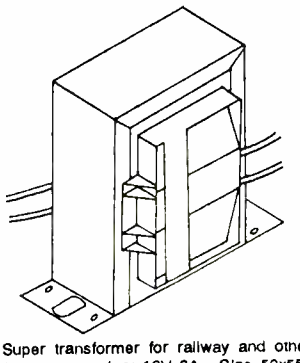
Z7010 0–6, 0–6V each at 0.25A 3VA by Louth, PC mntg. Prl 0–120, 0–120. Size 38.5x32x31mm DP 3.39 **Our Price** £1.50 100+ 0.85

Z7011 0–6, 0–6V each at 0.5A. Total 6VA chassis mntg. Prl. 0–120, 0–120.Size 45x41x37mm. DP 3.95 **Our Price £1.50** 100+ 0.85

Z7012 27V 4A Chassis mntg Prl 0–240V Size 98x83x73mm. DP around 18.00 **Our Price £9.00**

Z7013 40V 1.5A chassis mntg. Prl 0–240V Size 79x65x58mm. DP around 7.00 **Our Price £4.00** 100+ 2.50

Z7014 12V 1.5A PC or drop through mntg. Prl 0–240V Size 57x48x52mm DP around 6.00 **Our Price £3.50** 100+ 2.00



Z5206 Super transformer for railway and other modellers. Mains primary, secondary 16V 3A. Size 50x55x60mm high 61mm FC. Great value for money **only £3.00** 100+ 2.00 1k+ 1.50

Z4369 Very useful 18VA mains transformer with 0-6, 0-6 secondary, each at 9VA giving 6V@ 3A or 12V@ 1½A. PCB mounting 65 × 52 × 28mm.
Excellent value **£2.50**
100+ 1.40

Z4212 Mains transformer - 0-110-120-240V primary, secondary 9- 0-9V 2A and 20V 2A. Size 100 × 75 × 60mm.
Price **£3.00**

Z2305 Neat 6VA PCB mounting low profile mains transformer 53 × 44 × 22mm. Primary 0-120V, 0-120V, Secondary 0-15V, 0-15V, each at 0.2A. DP £8.33
£2.50 100+ 1.80

Z2306 6VA PCB mounting mains transformer 43 × 36 × 36mm. Primary 0-120V, 0-120V, Secondary 0-12V, 0-12V each at 0.25A. DP £6.09.
Our low price £2.50

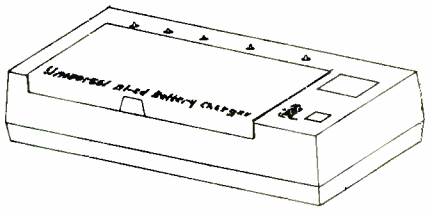
Toroidal Transformers made by Belclere. These are all physically the same size, rated at 35VA but have different windings as listed below. 75mm dia × 33mm thick. Fixing by means of a tapped bush. All mains primaries.

Z4290 Type TR7353 5V 1.4A and 12-0-12V@ 120mA.
Price **£2.50**

Z4291 Type TR7252 12V @ 130mA; 12V @ 80mA; 5-0-5V @ 600mA.
Price **£2.50**

NI-CAD BATTERIES

Code	Type	Rating	1+	25+	100–
X131	AAA	180mA/ H	£1 20	0.85	0.62
X132	AA	500mA/ H	£0 99	0.72	0.55
X133	C	1.2A/ H	£2.20	1.76	1.20
X134	D	1.2A/ H	£2.30	1.82	1.23
X135	PP3	110mA/ H	£3.95	3.26	3.10



A123 NI-CAD CHARGER
Neat attractive instrument will charge 4 different sizes of battery: AA, C, D and PP3 either singly or in any combination. Charge time 7–8hrs for AA, 14–16 hrs for others. Test facility to check if battery needs charging. Size 210x100x50mm
PRICES 6.95 10+ 4.12

LITHIUM BATTERIES

The popular 'coin' type, now available at excellent prices. Individually blister packed *Qty prices exclude VAT*

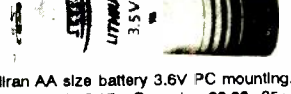
CR2016 £1.00 10+ 0.66

CR2025 £1.00 10+ 0.66

CR2032 £1.00 10+ 0.66

Z2307 Lithium battery ½ AA size. PC mounting 3.7V, 0.85Ah. Individually boxed with instructions DP £4.57.
Our price £2.50

Z1720 Lithium Manganese coin cell. Extremely thin, just 1.6mm × 20mm dia. model 2016. Normally £1.67.
Price **70p**



Z2450 Tadiran AA size battery 3.6V PC mounting. Date code 6/89. DP on these is 5.17. Our price **£2.00** 25+ 1.50 100+ 1.20

Z2452 Lithium battery – Inorganic type by Tadiran, type TL5104. AA size, 3.6V PC tabs. Date code 06/88 **£1.70**

Z2453 As above, but type SL360, date code 4/87. **£1.50**

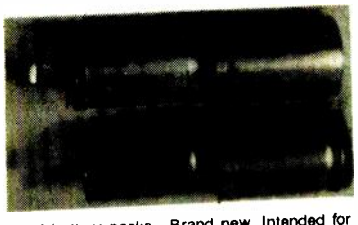
Z2451 Tadiran 0.5AA size battery, 3.6V PC mntg. Date code 8/86. DP 4.58 Our price **£1.75** 25+ 1.35 100+ 1.05

Z2719 Lithium battery. Varta type 6201 3V 1500mAh PC mntg 60mm long x 11.2mm dia. DP 6.00+ **Our Price £2.00**

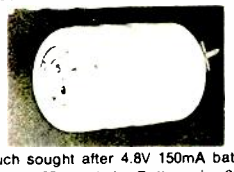
Z2720 Lithium battery Vidor G06/53. 3V 1400mAh PC mntg 50mm long x 15mm dia. Individually boxed. DP 6.00+ **Our Price £2.00**

Z2721 Lithium battery 11mm long x 12.5mm dia. 3V 160mAh PC mntg. DP 3.73. **Our Price £1.20**

Add VAT to quantity prices

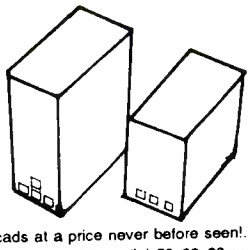


Z2349 Nicad battery packs. Brand new. Intended for use in zonephones comprising 4 x ½A size cells each rated 1.2V 0.45Ah, size 16.1mm dia x 28mm in a plastic housing easily removed. Solder tag connections. DP £9.92
Our price £2.00 100+ 1.00 1k+ 0.70



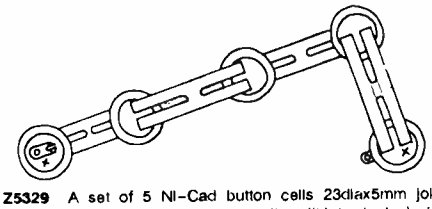
Z4216 Much sought after 4.8V 150mA batteries with PCB mounting tags on 25mm pitch. Battery size 25 × 16 dia. Ideal for paralleling. Some corrosion.
Prices reduced to ..... **50p each** 25+ 0.35 100+ 0.25

Z1830 Saft 40 RF310 back up Nicad battery PC mounting on 70 × 22 5mm centres. Rated 3.6V. 10mAH (20mA). Overall size 76 × 28 × 8mm
Price **£2.00**



Z4150 AA Ni-cads at a price never before seen!. Pack of 8 in a tough plastic case (ex-mobile radio) 56x63x33mm. Either use as a 10V battery pack or remove and use cells individually. Please note these batteries are ex-equip and may have damaged cases, and the odd cell within may be faulty. **Only £1.60 per pack;** 25+ 1.10; 100+ 0.80

Z4149 As above, but 84x66x33mm. Cells are same diameter as AA, but 73mm long. Each cell rated 1.25V 900mA. **£3.50**



Z5329 A set of 5 NI-Cad button cells 23diax5mm joined together in series in an L shape (easily split into singles) giving out 6V @ 250mA. Removed from new equipment. DP £4. **Our Price £1.50;** 100+ 0.80.

Z7009 2.4V 4Ah 2 cell 'D' size nicad stack by SAFT **Only £5.00**

Z9131 12V 24Ah sealed lead acid battery by Dryfit. Not new, but only used for about a year and kept carefully maintained. Size 125x166x175mm. DP 59.33 **Our Price £30.00**

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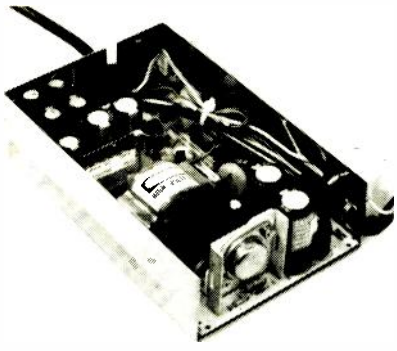
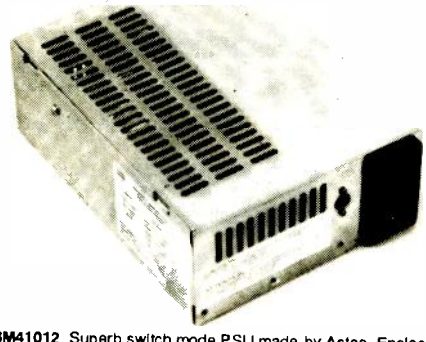
SWITCH MODE PSU's

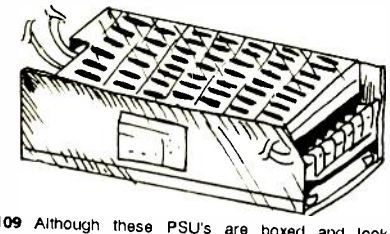


AA12531 Switch mode PSU by Astec partially cased. 160x104x45mm overall with 160x100mm Eurocard PCB. Inputs and outputs are on colour coded flying leads. Input 115/230V 50/60Hz. Outputs: +5V @ 5A; +12V @ 0.15A. Total wattage 50W.
£6.95; 25+ 5.43; 100+ 4.53

Conversion Kit
K725 This kit converts the AA12531 PSU into a much more versatile supply, giving +5V @ 2.5A; +12V @2A; -12V @ 0.1A and -5V @ 0.55A. Complete set of parts and full instructions **£3.50** Instructions only **(K726) £1.00**



BM41012 Superb switch mode PSU made by Astec. Enclosed case 175x136x65mm with switched and fused IEC mains inlet. 160x80mm PCB with output pins extended to external connector. Input 115/230V 50/60Hz. Outputs: +5V @ 3.75A; +12V @ 1.5A; -12V @ 0.4A. Total wattage 65W
£14.95; 25+ 11.70; 100+ 9.75



Z9109 Although these PSU's are boxed and look in excellent condition, we don't believe they are brand new. However they are all full spec working units made by Source Electronics Ltd. model HSE250-30 and offered at a cost substantially below the market price. The units are fully cased and measure 380x125x65mm. Standard mains input and 3 useful outputs: +5V @ 30A, +12V @ 8A and -12V @ 1A. Maximum total wattage is 250 watts. These would cost around £200 from a distributor - **Our price £24.95.**

Farnell NO55P Power Supplies
We've taken delivery of these popular supplies from several different sources, and now have the following models available. All are switch mode 115/230V input rated 55 watts max. Size of cased units 182x112x55mm, uncased size 160x100x40mm.

Z5304 Model 326, cased. Outputs: +5V 3A; +12V 0.1A; -12V 0.1A. **Price £12.95**
Z5334 Model 314. Outputs: +5V 3.5A; +12V 3A -12V 1A. **Price £14.95**

SWITCH MODE POWER SUPPLY BONANZA

7 different models, all offering excellent value for money!

Z5504 197x98mm PCB 50 watt unit: +5V 5A;+12V 1A; -5V 0.5A; -12V 1A. **£9.95**

Z5503 126x76mm PCB. 30 watt unit: +5V 4A; -5V 1A. **£4.95**

Z5505 205x102x45mm uncased unit rated 120W. +5V 6A; +12V 2A; -12V 1A. Also has a number of leads attached, one with a 15 way D socket, and a small PCB with LM339 and other bits on it. **£14.95**

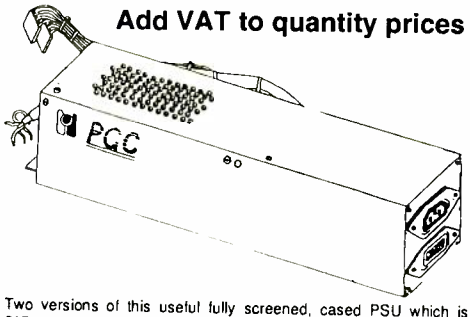
Z5506 Cased unit 205x112x58mm by Source Electronics Ltd, model HSC90-30 90 watts. +5V 10A; +15V 1.5A; -15V 1.5A **£12.95**

Z5507 Cased unit 266x126x65mm by Hitron, model no HSC125-44. 125 watts: +5V 8A; +24V 2.5A; +12V 1.5A; -12V 0.5A. **£17.95**

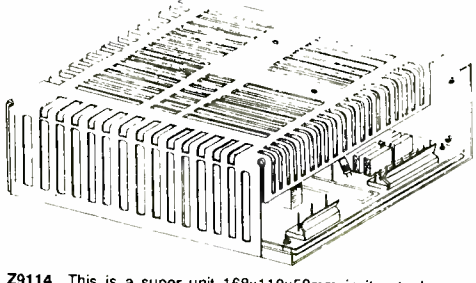
Z5508 Cased unit for monitor 205x130x60mm by Source Electronics Ltd, model HSL80-47. Rated 80 watts. +70V 0.9A; +6.3V 0.7A; +15V 1A; -15V 0.4A. **£16.95**

Z9133 Cased unit 380x128x75mm rated 500 watts by Source Electronics Ltd, model SAX500-02. +28V 16A; +5V 6A, also + and - sense. Super robust unit. **£39.95**

Add VAT to quantity prices



Two versions of this useful fully screened, cased PSU which is 207x65x50mm and made by PGC. IEC mains inlet/outlet on one end of case, outputs on flying leads. These have been removed from pub/club gaming machines for upgrading - all are tested working units. It's useful shape makes it ideal for slotting into computer cases etc.
Z9112 Outputs +5V 5.5A; +12V 1.5A; -5V 0.3A; -12V 0.3A **£11.95** 100+ 5.50
Z9113 Outputs +5V 5A; +12V 2A; -5V 0.3A; -12V 0.3A **£12.95** 100+ 6.00



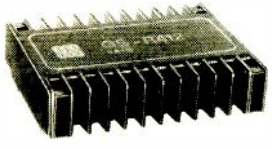
Z9114 This is a super unit 168x110x50mm in its steel case. Again, removed from gaming machines and tested before despatch. Std mains input. Outputs: +5V 3A; +12V 3A; -5V 0.5A; +12V 0.3A. Excellent Value at

£12.50 100+ 5.75

Z5256 Switch mode PSU made by Tamura Corporation. Board 195x100mm with outputs on PCB pins. Input 120/240V ac; Outputs: +5V @ 7.5A; +12V @ 1.25A (2A peak); -12V @ 0.1A. **All this for just £12.95**

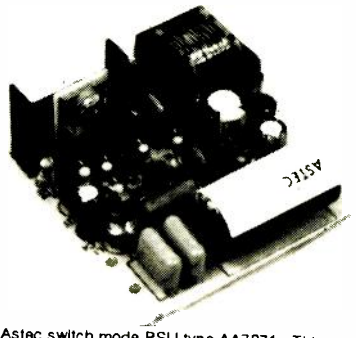
Z5410 Skynet boxed unit 200x108mm PCB with flying leads for input (115/230V) and outputs - 5V @ 7A; 12V @ 3.5A; -12V @ 0.75A **£14.95**

DC-DC CONVERTERS



Z5406D High efficiency step down power regulator module by SGS. This is a GSR400 type, as listed by Farnell at £41.11 each. Output is 7V @ 4A from a DC input of 10-46V. Possible uses include battery charger, or put two together and use 24V lorry battery to power car equipment. **Our special price - just £5.75 each.**

Two 5 watt regulators PCB mounting. DC-DC converters. These are encapsulated in a 51x51x10mm package with output pins on 0.1 pitch. These are ex-equip but guaranteed. DO £59.75.
Z1893 Input 48V (43-52V), output 5V 1A.
Price ..... **£2.50** 100+ 1.00
Z1894 Input 48V (43-52V), output 12V 420mA.
Price ..... **£2.50** 100+ 1.00



Z660 Astec switch mode PSU type AA7271. This small PCB, just 50x50mm will accept 8-24V input and give a stable 5V dc at up to 2A output. The 6 transistor circuit provides current overload protection, thermal cut-out and excellent filtering. Offered at a remarkably low price.
Price £5.00

Z8690 DC-DC CONVERTER BOARD
These panels 220 x 195 require 50V DC input for 5V 19.5A output. Inputs and outputs on DIN41612 connector. These brand new panels made by STZ are now being offered at just:
Prices £7.95 25+ 5.20 100+ 3.89

Z2646 Batac BC345 76x50x25mm with solder tags one end. Unusual one, this. Input 48V 2A DC, output 46V 2.7A AC 60Hz. **£5.00**

Power Supply Parcel

K506 This one's an absolute gem! Contains a selection of conventional and switch mode power supplies, including AA12531, Z660, Z5307/ 8 Z5226/7 + lots more! Parcel of 10 originally selling for £40+.
PRICE £25.00

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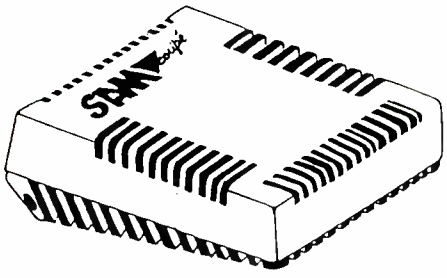
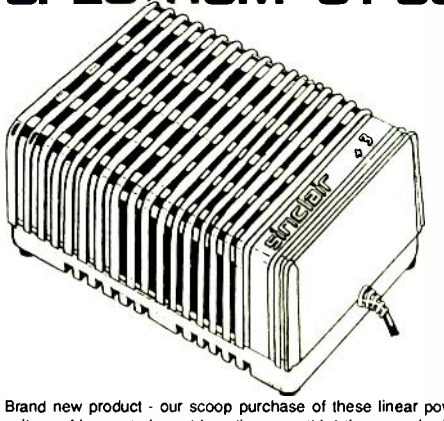
15

SAM POWER SUPPLY & MODULATOR



Z9111 Never heard of the SAM Coupé Computer? Well, the holding company SAMCO went bust, and now someone is trying to resurrect it - but the liquidators were anxious to turn piles of stock into cash, so we purchased all remaining stocks of the Astec made PSU's and can offer them at an amazing price! Inside the 170x150x70mm grey and black vented case is a linear power supply (240V ac in; 5V 2A & 12V 0.1A dc out) **PLUS** a UM1286 UHF colour TV + sound modulator! There are 3 leads: 2.2m phono to co-ax; 2m mains & 1.9m output lead fitted with a 6 pin DIN plug. All brand new stock. All this for just **£9.95** 100+ 4.40

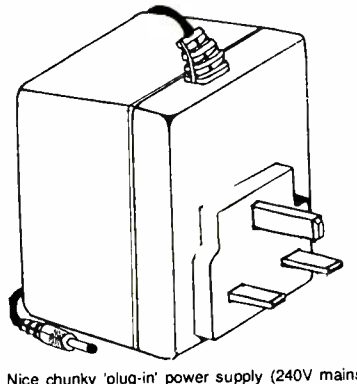
SPECTRUM +3 PSU



Brand new product - our scoop purchase of these linear power units enable you to buy at less than one third the normal price! Attractively cased in a black vented plastic case 155x102x70mm, they have a 1.3m mains lead and an output lead 2m long fitted with a 6 pin DIN plug. Input: 220/240V ac. Output: +5V @ 2A; +12V @ 0.7A; -12V @ 50mA. **Z9110**

£9.95 100+ 4.50

Z5404 Stabilized power supply panel 140x85mm. AC input is rectified and smoothed and is taken via a couple of regulator transistors and a relay to a 12 way terminal block. Probably 24V. **Only £2.25**



Z5439 Nice chunky 'plug-in' power supply (240V mains). Well made unit 85x68x60mm. Complete with 2m lead with 2.5mm power plug. Output 13V dc @ 1.5A. Ideal as battery charger etc Superdeal Price

£4.95 100+ 2.40

Z5278 Plug in wall type 24V ac 100mA output on 2m lead **£1.75** 100+ 1.10

Z5279 Plug in wall type switchable non-regulated 3-6-9V 100mA. Comes complete with multiway reversible spider lead (woth 99p on its own!) **Special Price £2.00** 100+ 1.25

Z5413 Plug in power supply giving 7.5V 600mA on the end of a 2m lead with a 2.5mm power plug. **£2.50** 100+ 1.80

Z975 PSU Mains input via 13A built in plug. Output 14V 600mA AC. Case 92x57x52mm **£3.50**

Z5292D 'Power one' power supply. Conventional unit, 120/240V input, output 15V @ 1.5A fully stabilized. Part enclosed size 123x102x54mm. Comprehensive data supplied **£10.00**

Z5293D 'Power One' power supply. Conventional unit, 120/240V input, outputs +5V @ 2A; + or -12V @ 0.4A; -5V @ 0.4A. Each output uses a 723 regulator and has a preset for adjusting voltage. With data **£14.50**

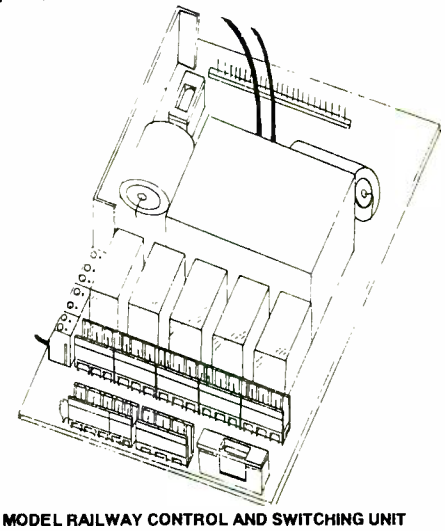
The other item is a high quality 12V 2A power supply kit with current limit protection. This comprises a ready built PCB - you just need to add the power transistors supplied. It comes with a full circuit and instructions, but you'll need a 16V transformer and a heat sink. **Order Code Z5298 Price £3.50**

Z5413 KRP PCB mounting power source 90x65x23mm. 220V ac in ±15V 100 mA DC out. Some of these are ex-equip. DP around 30.00 **Our price £5.00**

Also a wide range of regular power supplies from £3.20 for a basic plug-in 3-12V 300mA unit to a 0-24V 5A bench supply at £90. Details in main Catalogue

LIGHT UP YOUR LAYOUT

K692 Super deal for mo ddellers - we supply a mains power supply, 100 miniature lamps for wiring into your railway layout or dolls house, and 100m of flex. Circuits and details of how to wire up the lamps in series/parallel are prived. Everything for just **£19.95**



MODEL RAILWAY CONTROL AND SWITCHING UNIT

This ready built versatile piece of equipment allows:

* Full forward and reverse control of trains using regulated and smoothed supply (1.5A)*
*Requires 3 components (supplied) to be soldered to each panel.

Relay control of 5 seperate circuits, (10A changeover contacts; ideal for points operation)

* Powering of auxiliary equipment - 2 seperate 5V 1A outputs.

A mains powered panel 185x105mm contains all electronics. All voltages are fully stabilized and both input and output are fused.

Connections, both input and output are by screw terminals which are clipped onto the on-board pins.

The five 12V relays are controlled by transistor circuits which require only 5V 30mA, supplied by the on board power supply.

Supplied uncased with circuit and wiring diagram. (SAE for free copy.)

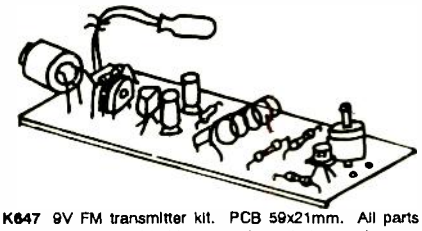
Suitable black ABS plastic case **£3.50**
Order Code Z8897 Price reduced to £14.95

KITS-KITS-KITS-KITS-KITS

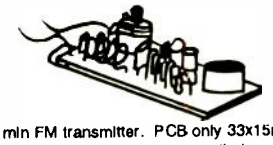
CAR ALARM KIT

K693 A sophisticated little circuit built on to a screen printed, etched, drilled and tinned PCB 75x35mm. Ideal kit for the less experienced constructor. All parts and full instructions included.

ONLY £3.95



K647 9V FM transmitter kit. PCB 59x21mm. All parts and instructions to build this transmitter that operates on 88-108MHz and has a range of up to 1 mile. Powered by PP3 barttrery. **£6.95**



K648 Sub min FM transmitter. PCB only 33x15mm. All parts and instructions to build this transmitter that operates on 88-108MHz. Powered by a single watch cell (supplied). **£6.95**

These kits are not licensable in the UK

Z4190 Disk drive power supply kit. Ideal for powering single 3.5" or 5.25" drive. Mains input, stabilized smoothed outputs, 12V 1A and 5V 1A. Simple, easy to assemble kit with full instructions, at an excellent price **£5.95**

New Range of Simple Kits

Fibreglass roller tinned PCB's, all components and instructions

K2010	Entry/exit delay, up to 5mins. 12V	**£8.70**
K2003	Auto dark flashing LED 9V	**£4.70**
K2004	Dark/light activated relay, SPCO 10A contacts. 9V	**£5.85**
K2007	Improved wiper control 12V	**£6.80**
K2006	Door buzzer 9V	**£5.40**
K2005	DC-DC converter - 24V to 12V 1A	**£8.20**
K2009	Sound switch with SPCO relay 9V	**£7.50**

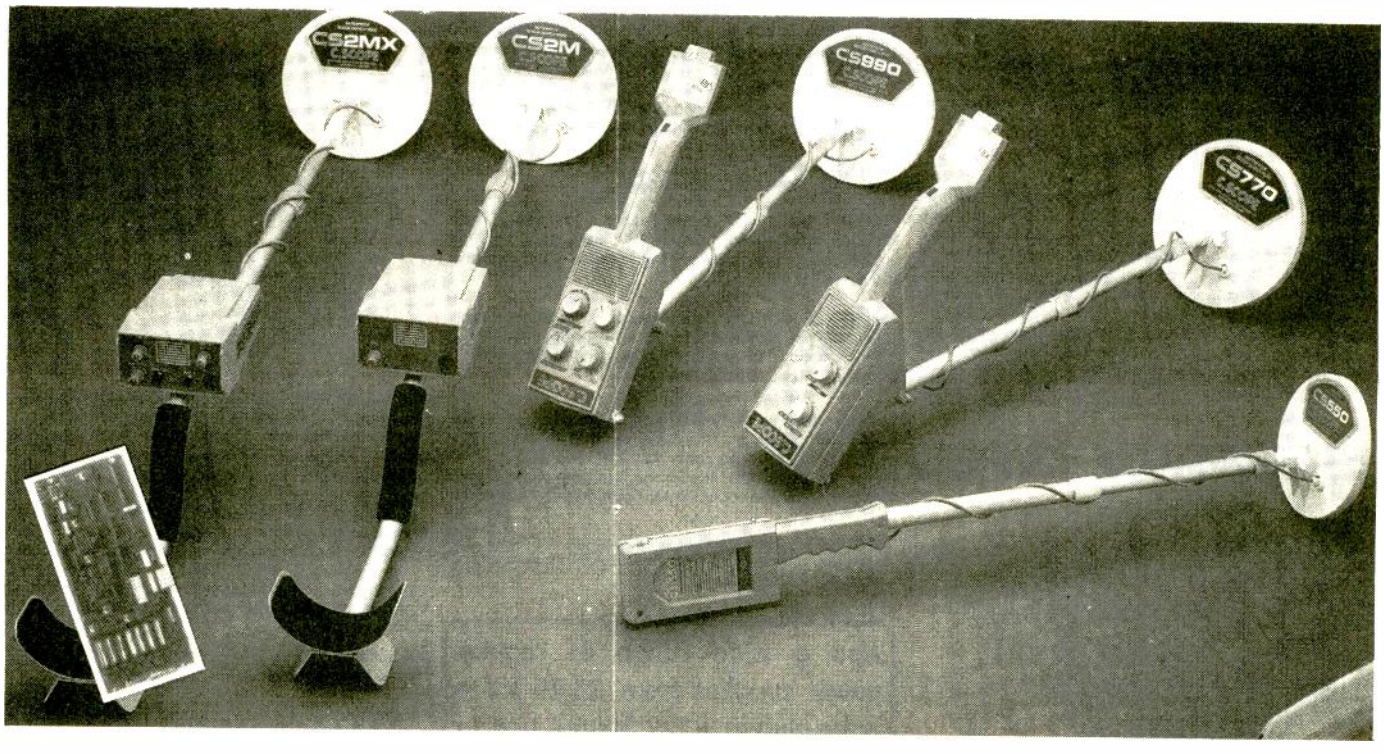
EPROM EXTRAVAGANZA!!

Z5463 Clearout of brand new 2732-20 EPROM's. All in original tubes. Just look at these prices!

75p each; Tube of 15 £7.50 + VAT; 10 tubes £50 + VAT

GREENWELD Spring Sup

Now! from GREENWELD - the world's most sophisticated metal detectors from C.SCOPE We have in stock the entire range of the UK's biggest manufacturer of these fascinating instruments! A full colour brochure is available on request



Extreme lightness and compactness, combined with simplicity of operation makes the **C-Scope CS550** a worthy companion offering a combination of quality and exceptional value.

Easily stored in haversack or car boot, the CS550 will ignore small iron such as nails and give a strong audio signal on good targets such as silver and gold. It is ideal for use by detectorists of all ages and will provide countless hours of metal detecting enjoyment. Do not be deceived by its appearance - it has been responsible for an array of interesting coins and artefacts equal to those found with more expensive machines.

Order Code CS550
PRICE: £79.90

The **C-Scope CS770** has always been a firm favourite with metal detectorists because of its excellent performance for a reasonable price. The variable discrimination permits the user to select the desired level of junk rejection and, as well as an audio signal, a deflection of the meter needle will be seen. Balance and simplicity of operation contribute to the CS 770's success as a firm favourite with serious metal detectorists.

Order Code CS770
PRICE: £169.90

As with all of our metal detectors, the **C-Scope CS990** has recorded thousands of interesting and valuable discoveries.

The discrimination facility is preset to reject iron and silver paper - but it will track down the much sought after silver hammered coins.

In addition to the visual meter, the CS990 also has audio discrimination. This mode, unique to C-Scope detectors, gives a high tone for a target signal and a low tone for a reject making it particularly easy and accurate to use.

Order Code CS990
PRICE: £199.90

The **CS2M** employs an electronic process that gives easy searching on all types of site conditions with outstanding performance.

'Turn-on-and-go' technology - in harmony with the very latest ergonomically-designed handle ensures hours of fatigue free detection.

A single control knob is used to turn the machine on which then becomes a variable discriminator, capable of ignoring ring pulls. Simplicity with high performance - a winning combination

Order Code CS2M
PRICE: £229.90

Similar in design to the CS2M, the **CS2MX** offers the user two discrimination controls. These can be set in a variety of ways (all fully explained in the comprehensive operating manual) to allow target analysis. A sensitivity control permits greater site flexibility and a pin-point button aids precise target location.

Although weighing only 1.4 kgs, the CS2MX can be taken off its stem and carried on a belt for even greater versatility.

Both of the machines in the Series 2 range are renowned for their ability to detect good finds even in the most demanding environment - like a site which is heavily contaminated with junk metal.

Order Code CS2MX
PRICE: £299.90

Finally, a metal detector KIT. A professional discriminating detector in kit form which includes all mouldings and a ready wound search head. The comprehensive 36 page construction manual gives precise building details + troubleshooting guide and instructions for use. When completed, this detector has a specification similar to £250 models. (Manual only £5, refundable on purchase of kit)

Order Code K5000
PRICE: £129.95

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For the professional who demands the highest level of technology, these detectors provide the ultimate choice

CS1220. Metal detecting's all time favourite

- Non motion meter discrimination
- Preset discrimination
- Variable discrimination
- Preset ground control
- All metal mode
- Audio preset discrimination
- Meter preset discrimination
- Tough ABS moulding
- Three part stem
- Battery check
- Sensitivity control

Order Code CS1220
PRICE: £299.90

- Motion and non motion
- Variable discrimination
- Notch discrimination
- Variable ground control
- All metal mode
- Preset meter discrimination
- Three part stem
- Tough ABS mouldings
- Battery check
- Sensitivity Control
- LED Status and Mode select

Order Code MET3
PRICE: £499.90

CS Metadec 3. The professional's machine

- Non motion mode
- Preset Meter discrimination
- Preset ground control
- Tough ABS mouldings
- Three part stem
- Sensitivity Control
- Battery check
- LED Status and Mode select

- Two machines in one
- Three frequencies
- Notch discrimination (accept and reject)
- Variable discrimination
- Variable ground control
- All terrain, weather resistant
- Preset meter discrimination
- All metal mode
- Tough ABS mouldings
- Two part stem
- Armsaver style stem
- Fingertip control
- Battery check
- Sensitivity control
- Perfect balance

Order Code CS4ZX
PRICE: £549.90

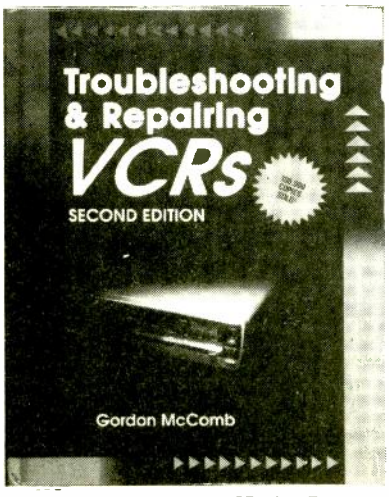
CS Promet 3. Raw power detecting.

Order Code PRO3
PRICE: £399.90

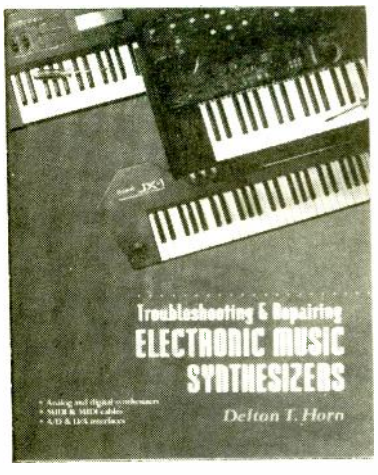
The C-Scope CS4ZX. The ultimate choice for the serious detectorist

ASK FOR A FULL COLOUR BROCHURE ON THESE EXCITING MACHINES

Troubleshooting with Your Triggered Sweep Oscilloscope
190 x 240mm, 300 pages, soft cover, publication date 1992.
Robert Goodman
£16.50 Order Code: MH101
A "how to" book about oscilloscopes, covering techniques for measurements, specifications, choosing a 'scope, test applications, features offered on various types, analogue versus digital. An invaluable guide to getting the most from your oscilloscope, whether your are an hobbyist, technician or engineer.



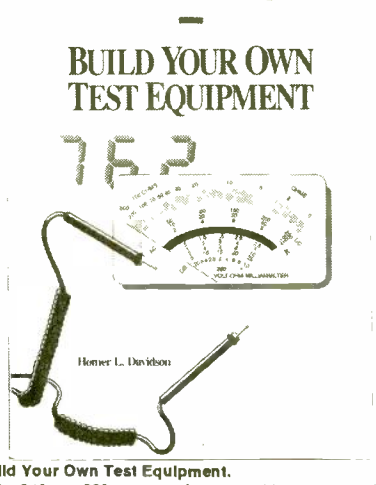
Troubleshooting and Repairing VCR's 2nd Edition
190 x 240mm, 400 pages, hard cover, publication date 1991.
Gordon McComb
£23.95 Order Code: MH102
A guide to fault finding, maintenance and repair of video recorders, for non-experts. This book takes you through all the basic cleaning and repair techniques, that do not appear in the user manuals. Sections on what to tweak and what not, when to consult a professional, what do when coffee is spilt inside a VCR, etc. Save a fortune on unecessary repair shop visits.



Troubleshooting and Repairing Electronic Music Synthesisers
190 x 240mm, 200 pages, soft cover, publication date 1992.
Delton T. Horn.
£14.95 Order Code: MH103
A guide to fault finding, maintenance, repair and customising analogue and digital synth's. Descriptions of circuit techniques, where things often go wrong, MIDI, cleaning, etc. The second section of the book covers more advanced topics, including identifying and correcting problems with DCO's, DCF's, DCA's, power supplies and much more. Don't be without this book if you own a synthesiser, or are trying to repair them.

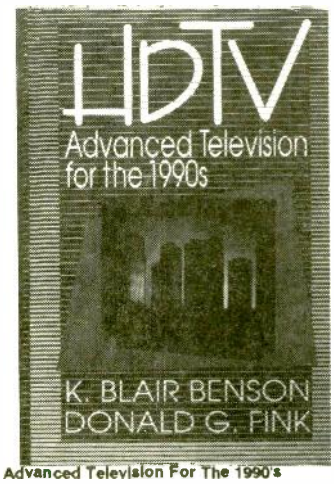
Sound Synthesis
130 x 210, 160 pages, soft cover, publication date 1990.
Terence Thomas.
£13.95 Order Code: MH104
A guide to analogue and digital sound synthesis circuit techniques. Ever thought of building a synthesiser or modifying one you own already? Then this book has all you need to know, over a hundred circuits complete with PCB layouts, anything from voltage controlled filters to MIDI ports. An excellent book in its own right or as a compliment to the above book.

Designing and Building Electronic Filters
190 x 240mm, 240 pages, soft cover, publication date 1992.
Delton T. Horn.
£13.00 Order Code: MH105
An introduction to basic electronic filters and their applications. This book covers passive and active filters from basic principles to quite advanced designs while keeping mathematics to a minimum. Effects of each type of filter detailed with clear frequency response graphs. Easy to read circuit diagrams and text make this book a must for electronics enthusiasts, students and professionals alike.

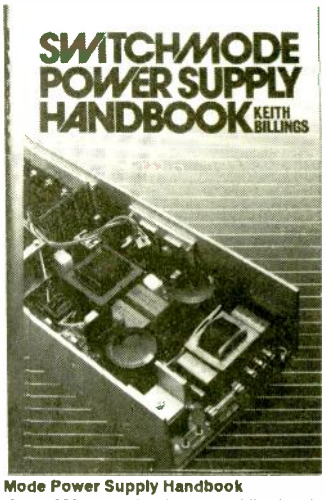


Build Your Own Test Equipment.
190 x 240mm, 280 pages, soft cover, publication date 1991.
Homer L. Davidson.
£13.95 Order Code: MH106
The title says it all, this book carries designs for all types of test equipment. If you are involved in audio, rf, computers, or household equipment repairs, and working to budget this book will have something for you. It also contains information on the tools required, how to solder, how to make strip board circuits and PCB's.

McGraw-Hill Encyclopaedia of Electronics and Computing. 2nd Edition
220 x 280mm, 1040 pages, hard cover, publication date 1988.
Many contributing authors.
£75.00 Order Code: MH107
Something of a Rolls Royce of the book world this one - well, you get what you pay for. Clear diagrams, photographs, and text covering all aspects of modern electronics and computing. Historical notes tracing the development of components and equipment, for example: the first fax machine was developed and used in 1843 (!) by Alexander Bain. Mathematical models and more technical discriptions make the encyclopaedia suitable for all levels of user access. A superb text that no reference bookshelf should be without.



HDTV Advanced Television For The 1990's
160 x 240mm, 500 pages, hard cover, publication date 1991.
K. Blair Benson and Donald G. Fink.
£39.95 Order Code: MH108
Like it or not times are a changing in the television world, so don't be left behind, now that new televions standards are being introduced world wide. HDTV (High Definition TeleVision) Advanced Televion for the 1990's lets you in on the new formats, their implications, transmission techniques, wavelengths and bandwidths - both terrestrial and satellite. European and American formats covered (1250 and 1125 lines). This book is necesary reading for anyone connected with the television trade, and anybody else who wants an overview of tomorrow's TV.



Switch Mode Power Supply Handbook
160 x 240mm, 600 pages, hard cover, publication date 1989.
Keith Billings.
£49.95 Order Code: MH109
Switch mode power supplies have a reputation for being complex, difficult to design and to work with. This book peels away much of the mystery by explaining the design principles and function of every part of a supply, from input filters to the arcane rite of high frequency transformer design. Mathematics is kept to a necessary minimum at all stages. Also included are some very useful complete power supply designs. This is an extremely helpful text if you are considering designing your own switch mode or are in the business of repairing them.

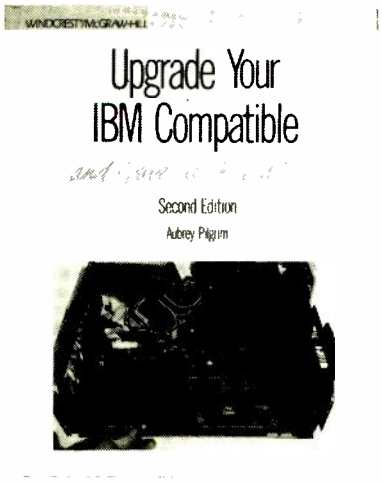
Regulated Power Supplies 4th Edition
190 x 240 mm, 460 pages, soft cover, publication date 1992.
Irving Gottlieb.
£21.95 Order Code: MH110
Similar to the above text except that linear power supplies are covered in more detail. This book focus on more of an overview of techniques, components used, new devices such as the IGBT, also included are example circuits that can be adapted for many designs. Excellent reference work for engineers, technicians and hobbyists.

The Modern Oscillator Circuit Encyclopaedia
190 x 240mm, 185 pages, soft cover, publication date 1992.
Rudolf Graf.
£11.50 Order Code: MH111
From the author of the popular Encyclopaedia of Electronic Circuits, this book is in much the same format, of circuit diagrams and notes, except that it focuses exclusively on oscillators. Digital, audio, RF, crystal controlled, and many other designs covered. Why sit down and design an oscillator, when this book probably contains what you require ?

The Secrets Of RF Circuit Design
190 x 240mm, 400 pages, hard cover, publication date 1991.
Joseph Carr.
£25.95 Order Code: MH112
If you were expecting a book of complex maths and dry text, then you couldn't be more wrong. Clear descriptions of components, how to make inductors, several receiver and other projects, historical notes, antenna theory and designs, along with coverage of the whole radio spectrum, from longwave to microwave, make the book essential and interesting reading for radio hams. Designs of transmitters from something as simple as an ignition coil, will also make the "Secrets of" text valuable to those wishing to experiment with radio.

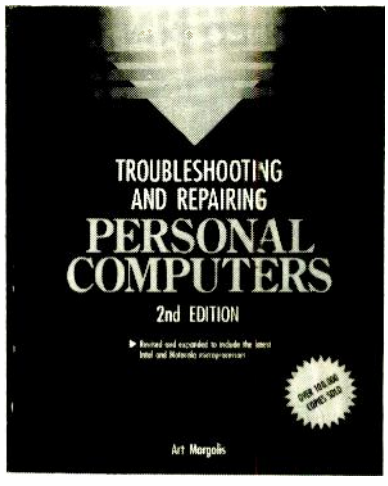
Communicating With Crosstalk XVI and Crosstalk Mark 4
190 x 240mm, 200 pages, soft cover, publication date 1988.
Clifford A. Schaffer.
£15.95 Order Code: MH113
Crosstalk communications software packages are becoming something of a standard in the world of modem users. The book takes te new comer through all the features of modems, uses, how to set them up, and of course how to get the most from the crosstalk package. Note: anyone who has recently bought an Amstrad modem will have been provided with the Mirror coms package; Mirror is very similar and compatible with both versions of Crosstalk.

Dictionary of Computer Terms (Second Edition) **186**
£6.95 PB **D.Downing & M.Covington**
This highly informative book contains approximately 1,000 key terms, including the latest 'computerspeak', in depth discussions, Numerous examples, tables, diagrams and flowcharts, applications of common commands and functions and sample programs in Ada, ALGOL, APL, BASIC, C, COBOL, FORTRAN, LISP, LOGO, PASCAL, PL/I, and Prolog. This book is more than a dictionary it is an indispensable reference book for anyone who uses computers.



Upgrade Your IBM Compatible and Save a Bundle 2nd Edition
190 x 240, 240 pages, hard cover, publication date 1991.
Aubrey Pilgrim.
£22.95 Order Code: MH116
Stuck with 8088/86 based XT ? Can't run new protected mode applications ? DOS5, DRDOS, Windows 3.0 and 3.1 memory shortages ? Display card no match to new graphic cards ? No Coprocessor ? Don't panic! There is no need to throw your computer away, or visit expensive service centres. This is a complete guide on how to upgrade your computer at home, from changing the mother board to adding a coprocessor or more memory. Helpful tips on what you really need for the applications you intend to run, plus much more.

Build Your Own IBM Compatible and Save a Bundle 2nd Edition
190 x 240mm, 240 pages, soft cover, publication date 1991.
Aubrey Pilgrim.
£15.95 Order Code: MH117
Ever looked through a computer magazine and found that you can buy boards and parts to build a PC ? Not sure that you are technically competent enough to do it ? This book explains all that you will need to know about buying boards, what you need for your applications, how to put a PC together, precautions, etc. Now anyone can build a custom designed PC for much less than a professionally built system would cost, and the only tools you'll need is a set of screw drivers and a pair of pliers.



Troubleshooting and Repairing Personal Computers 2nd Edition
190 x 240, 675 pages, soft cover, publication date 1991.
Art Margolis.
£18.95 Order Code: MH119
A technical guide to component level fault finding in PC's and other home computers. More advanced than the two "Save a Bundle" books, this text deals with the nuts and bolts of the electronics on computer boards, voltage levels, memory addressing, processor modes, diagnostic software, SMT repair techniques, ic pinouts, symptoms gallery, etc. A must for the more technically able, repair technicians, and anyone who needs to know in more detail how computers work.

An Introduction to the Amstrad PC's **BP197**
£5.95 **J.W. & R.A.Penfold**
0 85934 172 0 1987 264 x 195mm 80 Pages

Simply PCs
150 x 220mm, 200 pages, soft cover, publication date 1992.
Bob Albrecht.
£11.95 Order Code: MH125
New to the world of personal computers? Lost amid the profusion of jargon and equipment? Then this book is a life line. A simple text that sets out to explain the basics and to help you to chose exactly what you need. Descriptions of PCs, software, disk drives, modems, faxes, printers, operating systems, etc in plain English - something of a first for a computer book.

First Look at NetWare 2.2
190 x 240mm, 140 pages, soft cover.
Publication date1992
Gwynne Larsen and Verlene Leeburg
£6.95 Order Code: MH127
Are there a group of PC's or other computers in your office all working away with their individual software, individual printers, individual disk drives, etc. Well, it might be time for all these individual machines to become a bit more sociable. Networking your computers together can save you money on hardware and software, plus speeding up no end intra-building communications. If you are new to a network or are thinking of investing in one, then this book is ideal for you. It covers the principles of networking, cables, etc, and of course an overview of one of the most common multiuser operating systems.

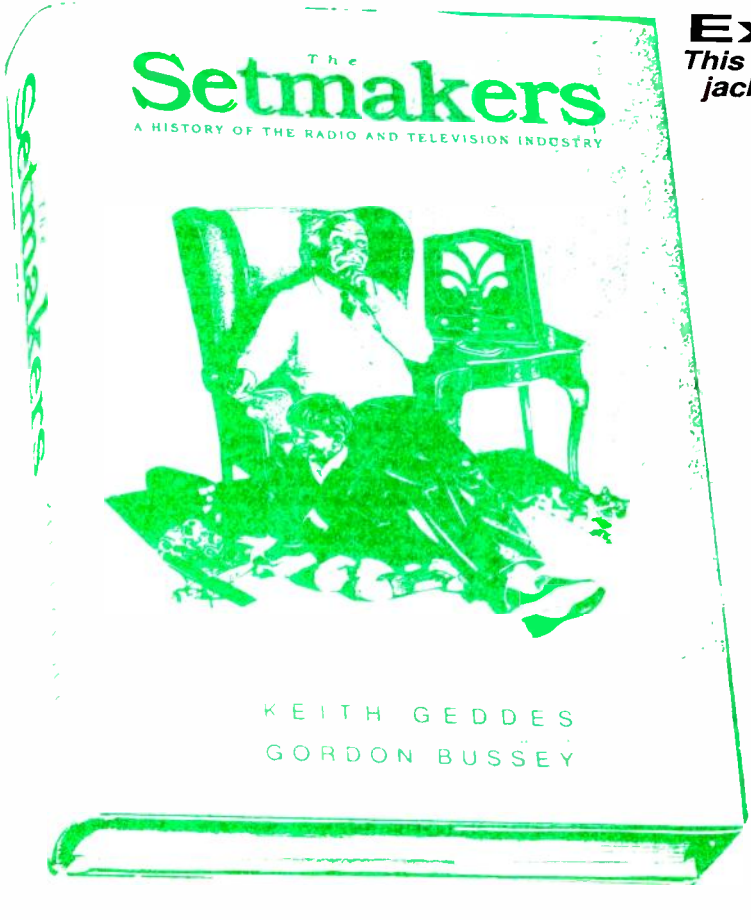
IBM Microcomputers - A Programmers Handbook
150 x 240mm, 500 pages, hard cover, publication date 1990.
Julio Sanchez and Maria Canton.
£44.95 Order Code: MH114
If you have ever written programs on any of the IBM PC/PS2 series computers, you will probably have noticed a lack of instant reference texts. This book is the answer. It contains a wealth of technical data, subroutines, system descriptions, processor and coprocessor data including the 486, video hardware, etc. Everything a PC programmer will need to know.

MS-DOS Batch File Programming 3rd Edition
190 x 240mm, 400 pages, hard cover, includes software, publication date 1990.
Ronny Richardson.
£29.42 Order Code: MH115
Batch file routines tend to be a rather neglected area of software as far as most PC users are concerned. This book goes along way in redressing batch file under utilisation, by provided many useful utilities on a 5.25" disk and a clear guide to creative batch file programming. A batch file need not longer be an irksome little piece of code, one has to write to run various programs; but a useful utility program in its own right.

MS-DOS One Step at a Time **BP327**
£4.95 **N.Kantaris**
0 85934 327 8 1993 198 x 130 mm 128 Pages

A Concise User's Guide to MS-DOS 5 **BP318**
£4.95 **N.Kantaris**
0 85934 318 9 1992 198 x 130mm 144 Pages

Making MS-DOS Work for You **BP139**
£4.95 **N.Kantaris & P.R.M. Oliver**
0 85934 319 7 1993 198 x 130mm 160 Pages



Exceptional Value!!
This superb hardback book with full colour dust jacket is a wonderful trip down memory lane!

This is the story of an industry which has transformed life the world over ... few developments in the twentieth century have been as important as the mass expansion of radio and television throughout the world. Within three generations a 'wireless trade' born in cottage-industry conditions has grown into an industry of dynamic opportunities, exploiting modern technology to its limits.

The Setmakers tells all sides of the story. Packed with the results of two years intensive research — delving into the company archives, talking to the people who were there - from the apprentices to the management. Discovering the behind the scenes lifestyles of the flamboyant pace setters who built the industry — from the early struggles with valves to today's battle for the ultimate chip technology

Superbly illustrated with nearly 500 photographs - *over 100 in colour* - many of which have never been reproduced before. Company archives and personal collections have been searched to find fascinating and evocative contemporary photographs, magazines and adverts. Together with the in-depth research they combine to give a detailed picture of the spectacular rise of the colourful entrepreneurs and the subsequent demise of some, as the industry struggled through lean years

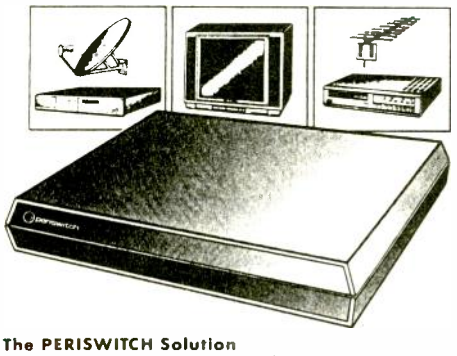
464 pages
243x172mm **£14.95**

GREENWELD Spring Supplement '93

27 Park Road Southampton SO1 3TB
Tel (0703) 236363 Fax (0703) 236307

Switching Units

periswitch



The PERISWITCH Solution

PERISWITCH provides the solution for obtaining the benefits of SCART connection where a satellite receiver (1) and a VCR are installed with a TV having a SCART socket.

PERISWITCH provides three SCART sockets for connection to the VCR, satellite receiver (1) and TV.

PERISWITCH provides all the normally required viewing modes automatically without the need for manual or remote switching.

PERISWITCH provides for stereo audio coupling between stereo satellite receivers, stereo or NICAM stereo VCR's and twin audio channel TV's.

PERISWITCH provides video connection between satellite receivers, VCR's and TV's and RGB connection between satellite receivers (or computers) and TV's.

(1) A camcorder or computer can be connected in place of a satellite receiver

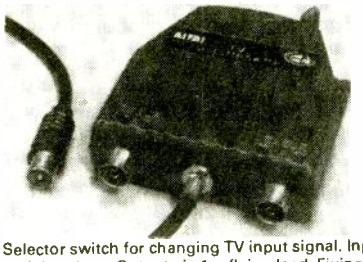
Features

- Compatible with all TV's, VCR's and satellite receivers having standard SCART connectors.
- Operates automatically without manual or remote switching.
- Delivers stereo audio from stereo VCR's and satellite receivers to twin audio channel TV's.
- Delivers RGB signals from appropriate satellite receivers or computers.
- Retains function switching of the TV by the VCR in playback and search modes.
- Maintains recording/viewing/playback options.

DIMENSIONS

Periswitch	W 260mm	H 40mm	D 120mm
Lead Lengths:	AV1–SAT	1.0 Metre	
	AV2–TV	1.0 Metre	
	AV3–VCR	0.5 Metre	

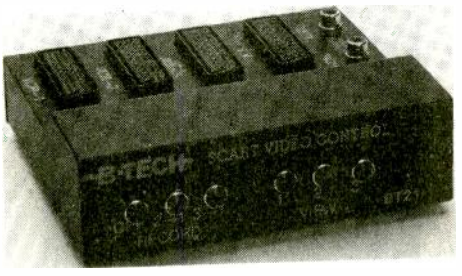
PRICE: £79.95

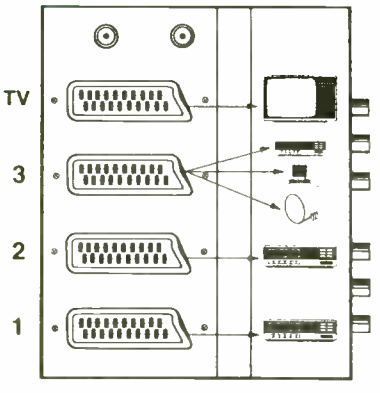


X424 Selector switch for changing TV input signal. Input via co- axial sockets. Output via 1m flying lead. Fixing by screws or adhesive.

Band width	dc to 900MHz
Isolation	80dB min.
Impedance	75Ω
Dims	80×77×27mm
Price	**£4.75** 20+ 3.06

SCART VIDEO CONTROL





Connects up to:

3 Video Recorders (VCR's)
1 Satellite + 2 VCR's
1 Computer + 2 VCR's

Push-button switches to select viewing.

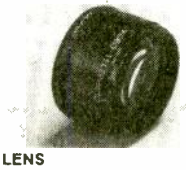
Record from Satellite or another VCR whilst watching TV.

Phono output sockets for TV sound through your Hi-Fi System.

Order Code: BT21

PRICES: £34.95 10+ 25.48

CAMERA LENS



CAMCORDER LENS **TO82A**

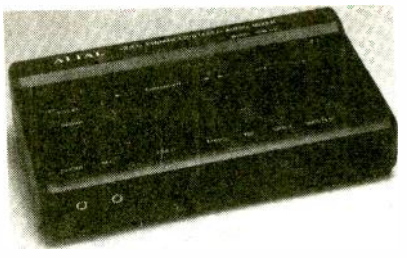
Precision ground reversible camcorder lens providing 0.6X wide angle or 1.5X telephoto magnification. Supplied with lens caps, F46 to M49 adaptor ring and leatherette pouch. Lens diameter: 40mm.

Price ..... **£26.95** 3+ 17.52

CAMCORDER LENS KIT **T082**

Two precision ground camcorder lenses providing 1.6X telephoto and 0.5X wide angle magnification. F46, 52mm and 57 threads on each lens. Supplied with lens caps and leatherette pouch. Lens diameter: 56mm.

Price ..... **£49.95** 2+ 32.47



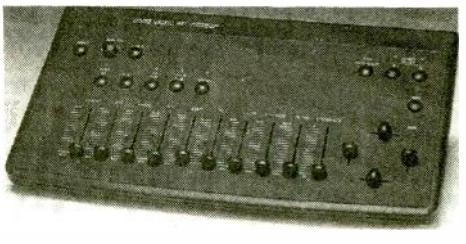
T128D VIDEO ENHANCER/AUDIO MIXER

A 3-channel stereo video sound mixer with a built-in video enhancer, specifically designed for video dubbing. The audio input from the camera/VCR, mic and music sources can be mixed at will, with overall output controlled by a master slider. The video enhancer will clean up the picture on older recordings. Powered by an external 12Vdc power supply (not supplied). Complete with all connecting leads and adaptors.

PRICES: £39.95 5+ 24.79

MX350 3-channel portable stereo video sound mixer. Inputs from camera audio, stereo microphone and music source. Output to video recorder controlled by master volume. Earphone monitor socket. Powered by internal battery or external power supply. Supplied complete with 4 connecting leads and a 6.35mm stereo adaptor.

Prices ..... **£29.95** 3+ 22.58



T130H VIDEO PROCESSOR

A compact and stylish video processor for mixing down video and audio signals with a variety of additional effects. The processor has two AV input channels with phono and S-VHS inputs and two AV outputs with phono and S-VHS outputs. In addition two mic inputs and a stereo music input are provided. The controls over the output mix are:

- Mic, music and AV sound levels with master level
- Video stability, tint and colour controls
- Video enhance and detail controls
- Channels A to B audio and video crossfade
- Video signal insert
- Colour fade in and out with duration control
- AV fade with duration control. Fade to black or white
- Tint in/out control linked to level fader
- Picture wipe facility with in/out control

Operating system	PAL
Video Inputs/outputs	IVp-p, 75R
Fade duration	1 to 6 seconds
Power	12Vdc 300mA
Dims	355 x 220 x 61mm

PRICES: £199.95 2+ 154.10

A much wider range of video equipment is shown in our 1993 Catalogue - 6 pages of products at our usual low prices. Order your copy now - only £2 post free. Why not take out a subscription to our monthly Bargain Lists and our Newsletter, The Greenweld Guardian, at the same time? Only £6 for a year

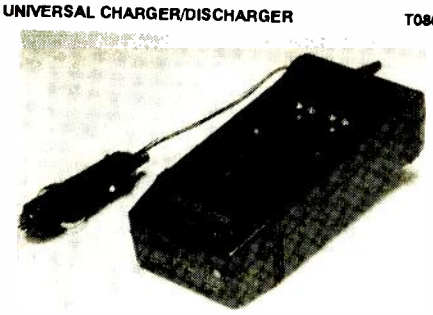
WHY DO YOU NEED A BATTERY DISCHARGER/TESTER FOR YOUR VIDEO POWER PACK?

You probably don't if you've never experienced one of the following symptoms:

1. Premature loss of power once too often when shooting videos.
2. Missed the scene that you've been longing for, just because of a dead battery.
3. Getting less and less running time out of your batteries.
4. Waited hours for a battery to recharge, but only found out that it lasted only for a few minutes.
5. Spending too much money in buying new batteries.
6. Carrying more batteries than you needed because none of them was in peak condition.

These common battery problems originate from what is called "MEMORY EFFECT", which is ceused by repeated incomplete discharge/recharge cycles. What really happens is that when a Nickel Cadmium battery is repeatedly recharged without being fully discharged, the battery's capacity to accept a full charge diminishes with each recharge cycle. Hence the resultant operating time becomes shorter and shorter. The solution to this problem is to always fully discharge your camcorder batteries before charge. The "NICADDY" does this safely, quickly and completely. It revitalizes camcorder batteries suffering from the "MEMORY EFFECT" symptoms. With the "NICADDY" you can also perform checks on your battery packs any time, anywhere. So no more confusion trying to figure out which battery has been charged and which one hasn't.

UNIVERSAL CHARGER/DISCHARGER **T080E**



Introduction

The EL300 is a dual purpose camcorder battery fast charger and battery refresher, with both functions carried out automatically. Once the camcorder battery has been inserted into the EL300 it will be discharged to a preset level prior to recharging. This process prevents the memory effect present in ni-cad batteries which significantly reduces the useful life of batteries.

The EL300 may also be used as a power supply adaptor for powering camcorders.

Instructions for use

1. The EL300 requires 12 - 16Vdc to operate. This can be provided from a car cigar lighter socket using the lead provided or from an external adaptor (not supplied). When using an external adaptor switch the EL300 into normal charge mode, the quick charge mode will damage the adaptor.
2. Select the appropriate voltage for the battery being charged.
3. Insert the battery into the correct place in the carriage, according to battery type and contact position.
4. Select quick or normal charge mode. In normal charge mode a 1000mAh battery will be charged in approximately 1 hour, in quick charge mode this time is reduced to approximately 20 minutes.
5. Apply power to the EL300, battery charging will begin immediately. Should the discharge/charge cycle be required touch the "refresher start" panel.

When using the EL300 as a power supply

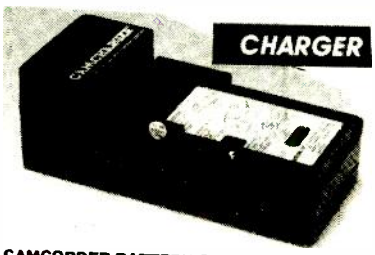
1. Select the appropriate output voltage socket. Polarity orientation should match that of your equipment.

WARNING Incorrect voltage or polarity orientation may damage your equipment.

2. Power up the EL300 from your car cigar lighter socket using the lead provided.
3. Switch on your equipment.

Specification

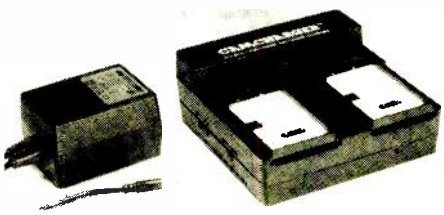
Operating voltage	12 - 16Vdc (car battery) or 12Vdc 800mA adaptor.
Charge current	Normal 1A, Quick 2A.
Refresh current	0.5A
Battery types	6V, 7.2V, 9.6V Ni-Cad battery pack
Supply voltage	6V, 7.2V, 9.6V
Supply current	1.4A max
Dimensions	160 x 80 x 43mm
Price	**£19.95** 5+ 13.96



T080B CAMCORDER BATTERY CHARGER KIT

A universal camcorder battery charger/power supply kit consisting of the charger, cigar lighter socket connecting lead, camcorder power lead, 4 adaptor plugs and a pouch. Compatible with the majority of 6, 7.2 and 9V camcorder batteries.

PRICE: £22.95 5+ 14.20



T080 CAMCORDER BATTERY AUTOCHARGER

A universal camcorder battery autocharger capable of charging a wide range of batteries 6, 7.2 and 9V. To batteries can be cosecutively charged in approximately 3 hours either at home via the AC adaptor or in the car via the DC power lead. Auto cut-off prevents overcharging.

Charging method:	Constant voltage with current limiting
Charge current	1A
Battery types	6V, 7.2V, 9.6V Ni-cad pack (Sony, NP-22,NP-55,NP-77, JVC and Olympus typical)
Operating voltage	220/240Vac or 12-15Vdc 1.5A
Dims	153 x 150 x 63 mm

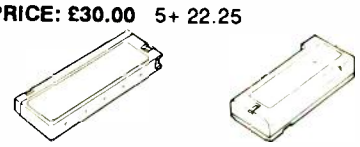
PRICE: £44.95 3+ 26.77

NEW CAMCORDER BATTERIES

Top quality Uniross rechargeable Ni-cad and sealed lead acid camcorder batteries for all popular models.

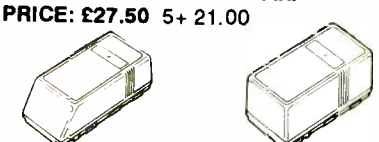
VP66 **VP752** **VP962**

VP66 6v 1700mAh Ni-Cad
PRICE: £27.00 5+ 19.95
VP752 9.6V 1500mAh Ni-Cad
PRICE: £30.00 5+ 22.25
VP962 9.6V 1000mAh Ni-Cad
PRICE: £30.00 5+ 22.25



VP30 **VP22H**

VP30 12V 2300mAh sealed lead acid
PRICE: £31.00 5+ 23.50
VP22H 6V 1700mAh Ni-Cad
PRICE: £27.50 5+ 21.00



VP522 **VP520**

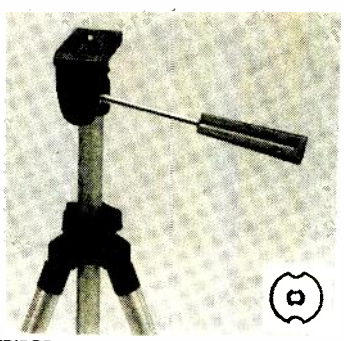
VP522 12V 1500mAh Ni-Cad
PRICE: £40.00 5+29.95
VP520 12V 1500mAh Ni-Cad
PRICE: £45.00 5+ 34.95

We have a sheet available showing which model takes which battery.

T083B TRIPOD

Table top camcorder/camera tripod. Fully adjustable for angle Folds down to a small size for storage in the camcorder bag.

PRICE: £10.95 5+ 7.12



T090 TRIPOD

Camera/video tripod with sturdy 3-section legs with collect locks, 2-way pan-head with lift elevator and rubber shoes for non-slip, scuff free use.

Height 45.5+ (1.16m)
Packed height 15+ (0.38mm)
Weight 0.75kg
PPRICE: £12.95 10+ 8.42

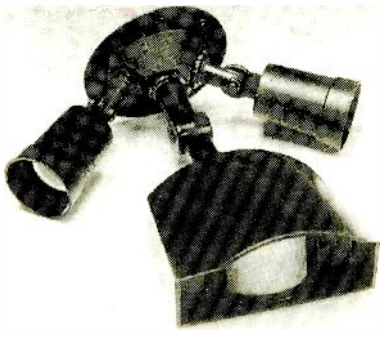
Add VAT to quantity prices

T090D TRIPOD

Video tripod with sturdy 3-section legs and additional radial brackets for greater stability. The height precision 2-way panhead is fluid damped and incorporates two lateral safety hooks, a quick release platform and spirit level. The gear driven centre column has a friction controlled action and folding crank. Adjustable, spiked feet.

Height 61+ (1.55m)
Packed height 24.5+ (0.62m)
Weight 1.8kg
PRICE: £44.95 5+ 29.22

SEVERAL OTHER MODELS ARE SHOWN IN OUR MAIN CATALOGUE

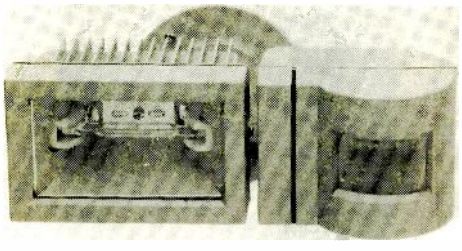


PIR SPOTLIGHT **L135**

Twin spotlight PIR security lamp. The PIR detector and the lampholders fully adjustable for aim. The detector contains a photo cell which prevents daylight operation.

Sensor range	110° fan shaped. 20m
Max load	300W incandescent
Auto reset time	5 sec to 18 min (adjustable)
Power	220/240Vac 50Hz

Price ..... £17.95 6+ 11.67

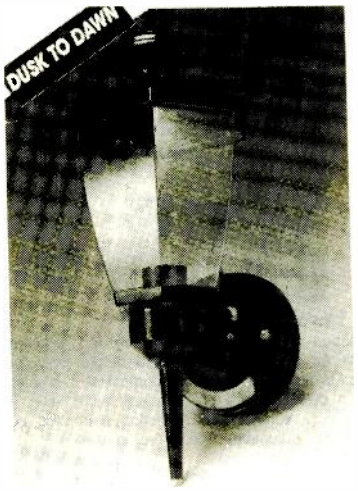


INFRA RED SECURITY HALOGEN FLOODLIGHT

MS900 Superbly styled floodlight with low power consumption. Yhe high intensity halogen tube with a 2000 hour life provides much more illumination than conventional flood lamps.

Decorative wall mountable styling,
Simple hard wiring installation,
Seperate angle adjustment between motion sensor and light fitting,
Detection pattern: 50 x 60ft and 100°,
Wide temperature operating range -30°C to +50°C,
Daylight sensor for auto shut off during daytime,
Manual override with existing wall switch,
110/220/240V ac operation,
Supplied with comprehensive instructions.

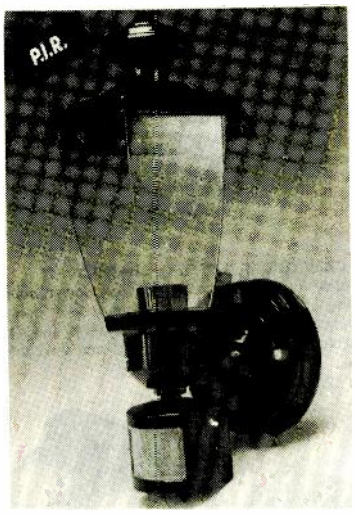
Price **£39.95**



L140 AUTOSENSOR LANTERN

Polycarbonate bodied outdoor coach lamp with a built-in daylight sensor which allows the lamp to switch on at dusk and off at dawn. Protected against weather to IP23. Maximum bulb size: 60W.

Height 360mm
Power 220/240Vac 50Hz
PRICES: £14.95 10+ 10.05

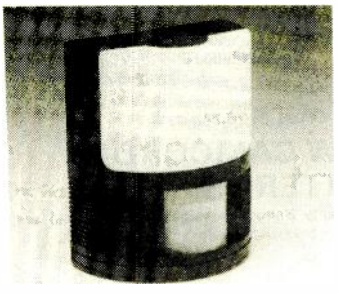


L141 PIR COACH LAMP

Polycarbonate bodied outdoor coach lamp with a built-in PIR detector. The detector is fully adjustable for angle and has ' 'on' time adjustment. A photo-cell prevents daylight operation. Protected against weather to IP23. Maximum bulb size 60W.

Height 330mm
Power 220/240Vac 50Hz
PRICES; £22.95 10+ 15.41

Add VAT to quantity prices



PIR LIGHT/ALARM **L122L**

Battery powered PIR light/alarm in a compact, free standing or wall mounting case. A slide switch on the side controls the function of the unit between manual on, off, auto light and auto light plus alarm. A light sensor prevents daylight operation.

Detection range
Power 4 x C cells
Dims 138 x 113 x 65mm
Price ..... **£12.95** 5+ 8.42

NIGHT SECURITY SENSOR

ES36 This PIR (passive infra-red) detector reacts instantly to body heat and will activate lighting up to 600W when any person enters the detected zone. After a preset time it turns off. Detection range 110° x 12m long. Mounting angle adjustable 15° from vertical and ± 20° horizontal. Lighting adjustable from 5 secs to 10 minutes. Daytime lighting controllable. 230V operation, 600 watts max. Size 110 x 75 x 85mm.

Prices ..... **£29.95** 10+ 23.32

NIGHT SECURITY SENSOR **F603A**

Swivel mounted passive infra red sensor for the detection of body heat. The mounting arrangement allows horizontal and vertical swivel of 180°, allowing difficult to reach areas to be covered by the beams. A built-in adjustable photo detector prevents daylight operation. Adjustable timed on period. Provided with a walk test LED.

Detection range	200°C (fan shaped) 15m
Auto reset time	9 secs to 10 mins (adjustable)
Lighting load	2kW incandescent, 1kW fluorescent
Power	220/240Vac 50Hz

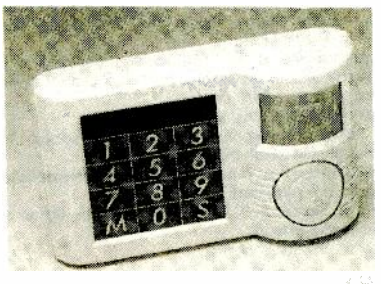
Price ..... **£26.95** 6+ 17.52

PORTABLE PIR ALARM **F601B**

Pocket size portable PIR detector with dual function sounder: two tone chime as an annunciator or a loud 90dB warble as an alarm. Self-contained operation frm 3 x AA batteries (not supplied), low battery is indicated by an LED in the front panel. Supplied with ball-swivel wall mounting.

Detection range	8m (25ft)
Detection angle	80° horizontal x 20° vertical
Power	3 x AA batteries
Exit delay time	30 seconds
Auto reset time	1 minute
Dims	105 x 68 x 44mm

Price ..... **£10.95** 5+ 7.12

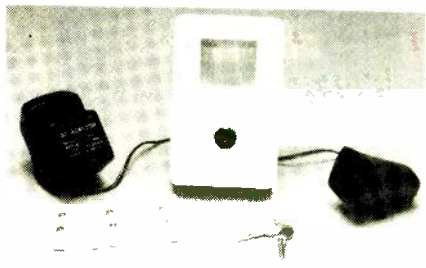


PIR ALARM **F601A**

Self contained portable/wall mounting PIR sensor and alarm. IR sensor has a 89° detection arc with a 10m detection range. The built-in powerful piezo siren sounds on detection. Intelligent walk test and mode verification functions. User programmable security code. Operates from 3 x AA batteries (not supplied).

Coverage	89°, 10m, 12 beams in 2 layers
Power	3 x AA batteries
Dims	115 x 70 x 36mmF601B SC906

Price ..... **£28.95** 3+ 18.82

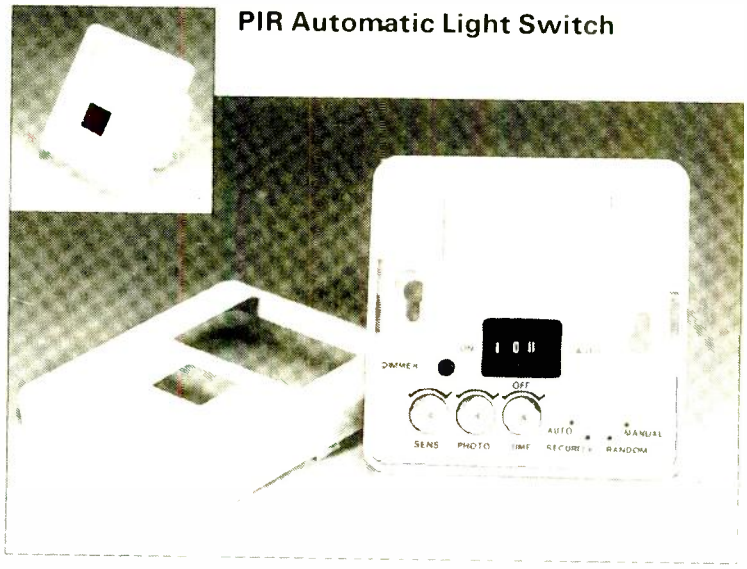


F853 PIR ALARM KIT
A compact kit, ideal for small home installations, garages, caravans, trucks, trailers, boats etc. The kit contains a combined PIR and alarm box, 3 magnetic reed switches, compact siren and power supply. Instruction manual and fixing screws supplied. An alkaline PP3 can be added for power failure protection

PIR coverage	100m²
Exit delay	2,5 mins
Entry delay	15 secs
Alarm reset time	60 secs
Power	12V dc or AC adaptor
Size	140x90x56mm(alarm panel/PIR)

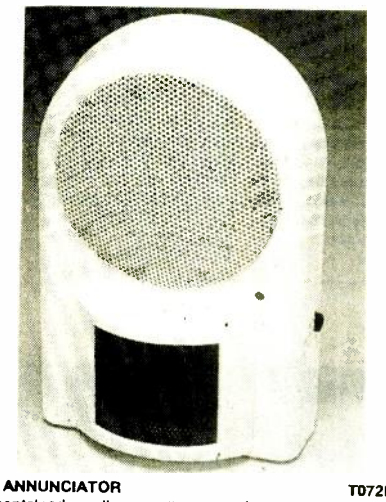
PRICES: £49.95 3+ 31.89

PIR Automatic Light Switch



- ★ Autcmatically switches light on when you enter the room, and off when you leave.
- ★ Flashes the lights on and off rapidly when an intruder is detected.
- ★ Switches the lights on and off at random periods while you are out or on holiday.
- ★ Also acts as a conventional light switch.

F602 The PIR1000 is an automatic, hands free light switch. It turns the light on automatically when you enter the room by detecting you body heat and comparing it room the light will gradually dim over 12 seconds and finally switch off. This avoids any potential hazard from the room suddenly being plunged into darkness. In addition to its main function as an automatic light switch the PIR1000 offers. manual override, in which it will perform like any ordinary light switch, security function in which it will act as an alarm, flashing the light on and off and auto function which will act as a burglar deterrent, switching the light on and off at random times for random periods, simulating occupancy of the house
The PIR1000 offers convenience, safety, energy savings and security in one package.
Price ..... **£27.95** 5+ 21.24



DOOR ANNUNCIATOR **T072B**
Self contained wall mounting or free standing door annunciator. Requires no external contacts, switches reflectors etc. Two tone chime sounds three times when the beam is broken. Requires four AA batteries (not supplied).

Sensing distance	5 - 7m.
Dims	150 x 92 x 67mm

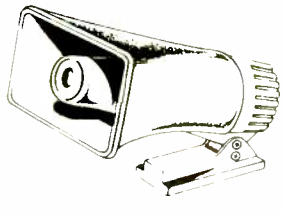
Price ..... **£6.95** 10+ 4.51

WIRELESS DOORBELL **T071D**
Two part wireless doorbell. The transmitter is mounted by the front door and the receiver can be mounted or carried up to 16m (50 feet) away. Provided with self-adhesive pads and screws for mounting (if required). Transmitter requires a PP3 battery, receiver requires two AA batteries.
Dims:

Transmitter	112 x 40 x 30mm
Receiver	93 x 70 x 30mm

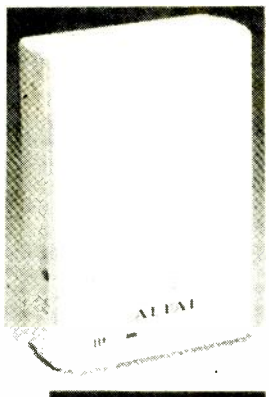
Price ..... **£12.95** 10+ 8.42

A370 Gold coloured horn with fixing plate. Emits high powered wailing note of varying pitch. Output 115dB(A) at 3m. Power 12V DC, 1.5A. 130mm dia × 160mm. 160 cycles per minute.
Prices ..... **£9.95** 10+ 8.06 25+ 6.45



A375 High power siren in all cream plastic. Waterproof heavy duty model. Continuous scream or 160 cycles per minute. Extremely loud, 120dB(A) at 6m. Power 6-12V, 1.5A. Horn 200 × 115mm × 234mm deep.
Prices ..... **£27.50** 3+ 19.60 10+ 15.68

Add VAT to quantity prices

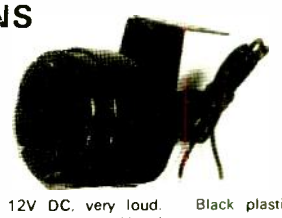


MESSAGE RECORD AND PLAYBACK

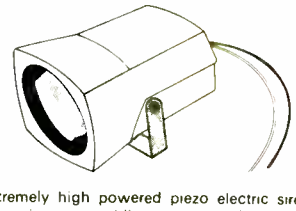
T072A ANNUNCIATOR
A stand alone PIR message annunciator on which your own message, up to 20 secs long can be recorded onto a microchip and played back every time someone is detected by the PIR. Message can be slowed or speeded as required, and can be overwritten at any time, but will be lost when power is switched off. Size 136x92x46mm. Power 4xAA cells or external 6V
PRICES: £29.95 4+ 19.70

Lots of small piezo and other buzzers in our main Catalogue - Only £2 post free

SIRENS



KS10 Siren 12V DC, very loud. Black plastic body 50mm dia × 42mm with metal bracket.
Prices ..... **£6.95** 10+ 5.70 25+ 4.56



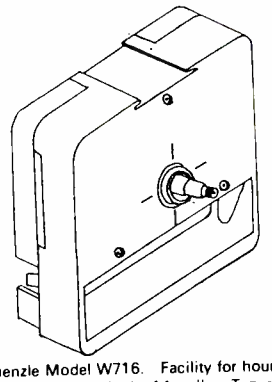
A379 Extremely high powered piezo electric siren which emits an earpiercing, warbling sound. White plastic body, with mounting bracket. Internal IC circuitry. 300mm leads.

Frequency	2.5kHz approx
Output	100dB(A) at 1m typ
Dims	57 × 42 × 37mm
Fixing centres	22mm

Price ..... **£6.95** 10+ 5.62 25+ 3.99

CLOCKS

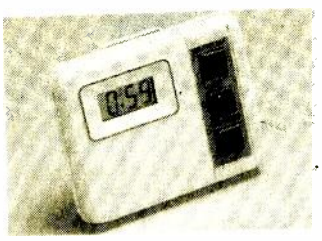
(a) Quartz movement



V1101 Kienzle Model W716. Facility for hour, minute and second hand. Takes single AA cell. Typ current 80µA. Accuracy to within 1 sec/ day. Size 58 x 50 x 16mm weight without battery 26g. Spindle length: 12/ 15/ 21.5mm (h/ m/ s).
Prices ..... **£3.50** 10+ 2.34 25+ 1 87 100+ 1.50

DIGITAL CLOCK **Y137W**
Large LCD digital alarm clock with snooze control and LCD illuminating light. The snooze control silences the alarm for 7 minutes before re-sounding it. Compact and easy to use. Batteries included.

Power	2 x AAA batteries
Dims	95 x 65 x 68mm
Price	**£7.99** 10+ 5.19



COUNTDOWN TIMER **Y137S**
Simple to use electronic countdown time with 19 hours, 59 minutes countdown capability. The internal alarm sounds when the set period has timed out. Hundreds of applications from process control to the kitchen. Free standing, spring clip and magnetic mounting.

Timing period	19 hours 59 minutes
Power	P009H button cell
Price	**£4.25** 10+ 2.76

COUNTDOWN TIMER **Y137T**
Large digit electronic countdown timer with 19 hours, 59 minutes countdown capability. The internal alarm sounds when the set period has timed out. 19mm LCD display. Hundreds of applications from process control to the kitchen. Spring clip or magnetic mounting.

Timing period	19 hours 59 minutes
Power	AAA battery
Price	**£6.70** 10+ 4.36

DIGITAL CLOCK/TIMER **Y137U**
Free standing digital clock with built-in timer. The timer functions initially as a countdown timer, counting down from up to 23 hours 59 minutes and then sounding the alarm. Immediately the alarm sounds the timer switches to count-up mode, indicating the period since the alarm sounded. A separate count-up timer function is provided for general timing. Battery provided.

Dims	87 x 82 x 45mm
Power	1 x AAA battery
Price	**£9.50** 10+ 6.18

2-CHANNEL DIGITAL CLOCK **Y137V**
Large LCD digital alarm clock with two independent alarm functions. The LCD displays time, day and date and alarm status. Compact and easy to use. Batteries included.

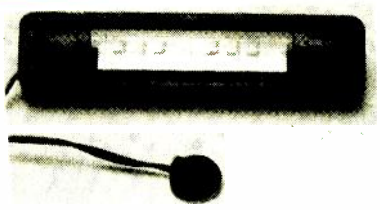
Power	2 x AAA batteries
Price	**£10.95** 10+ 7.11

V1017 Stopwatch - this sports timer has an amazing number of features at an exceptionally low price:

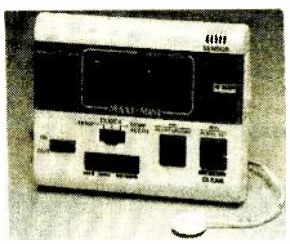
- ★ Hours, mins, secs.
- ★ Day, date, month.
- ★ 1/100th sec chrono with lap/ split control.
- ★ 4 year calendar.
- ★ Beep alarm with chime and snooze.
- ★ 30 sec correction for synchronization.
- ★ 12 or 24 hour display.
- ★ Will count to 23:59:59.
- ★ Complete with instructions (you'll need them!).

All this for just ..... **£3.95** 10+ 2.95

See our main Catalogue for details of clock accessories - hands, dials, chapter rings, pendulums etc

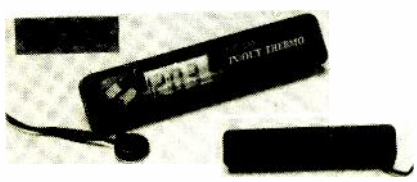


Y137N DIGITAL THERMOMETER
Dual channel inside/outside comparative temp with dual read out display. Dual thermocouple, one internal and one on a 3m extn lead. Free standing or mounted with Velcro strips supplied.
PRICES: **£12.50** 5+ 7.50



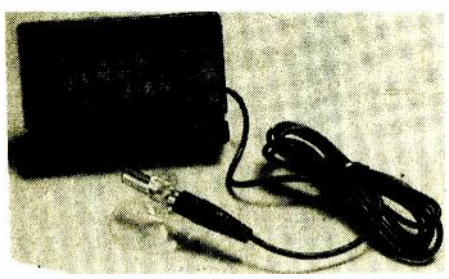
MAX/MIN THERMOMETER **Y137R**
Dual channel inside/outside thermometer with digital clock. The in-built memory can record inside or outside minimum and maximum temperatures and a temperature alert will sound an alarm if the temperature rises to or falls to a preset level. Free standing or can be mounted to a wall with the self-adhesive pad or bracket provided. Battery included.

Temperature range	-50 to +50°C
Resolution	1°C
Power	AA battery
Price	**£12.95** 5+ 8.42



DIGITAL THERMOMETER/CLOCK **Y137Q**
A dual sensor digital thermometer for comparative temperature measurement, for example inside/outside temperature. The thermometer will display temperature in °C or °F, and includes a digital clock. The remote sensor can be mounted up to 3m away from the unit. The backlit LCD display makes it ideal for in-car use. Battery supplied.

Temperature range	-50 to +70°C
Power	1 x AAA battery
Dims	107 x 25 x 13mm
Price	**£8.50** 10+ 5.52



AQUARIUM THERMOMETER **Y137P**
A dual sensor digital thermometer designed for comparative measurements between water and room temperature. The external sensor can be attached to the glass within the tank with the sucker provided. The internal sensor measures room temperature. The thermometer can be attached to the aquarium with the strips provided.

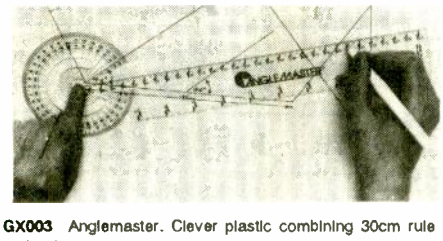
Temperature range	-50 to +70°C
Resolution	0.1°C
Power	P009H button cell
Price	**£7.99** 10+ 5.19

ACHIEVER maths set

A06 ACHIEVER
Age 11–16, Key Stage 3–4
Contents: 30cm folding rule; Beam compass + 3.5" pencil; Set Squares; 2 Shape templates; Pie Chart template; Angle measure; Sharpener; Eraser; Strong moulded box.
PRICES: £8.99 12+ 5.10

A new range of drawing instruments from Geometrix and Weigate.

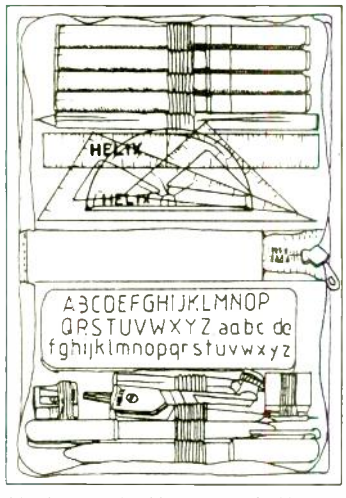
GX001 Geomath – an ingenious all-purpose drawing instrument. Combines 30cm ruler with alpha-numeric stencil, protractor, 45° & 60° set squares, 6ellipses and 6 circles. Made in clear high impact styrene. Overall size 322 x 99mm.
£2.50 10+ 1.76 25+ 1.41



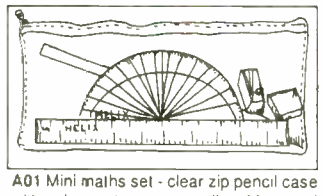
GX003 Anglemaster. Clever plastic combining 30cm rule & protractor.
£2.99 10+ 2.13 25+ 1.71

SPECIAL OFFERS FROM HELIX

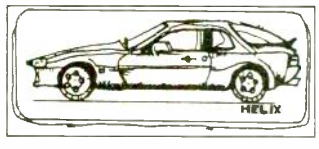
A range of 'Clearance Lines' offering super value for money on top quality product



A24 Ambassador Maths set - Padded zip case with rule, 2 set squares, protractor, stencil, compasses, sharpener, eraser, black & blue ball pens, 4 felt tips and a pencil + free timetable and formulae sheet!
OUR PRICE £5.50

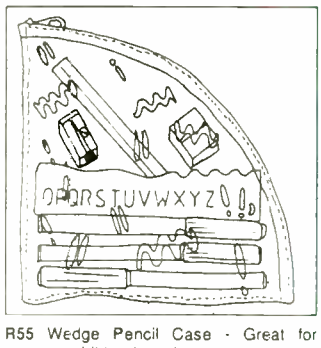


A01 Mini maths set - clear zip pencil case with rule, protractor, pencil, rubber and sharpener.
OUR PRICE 99P

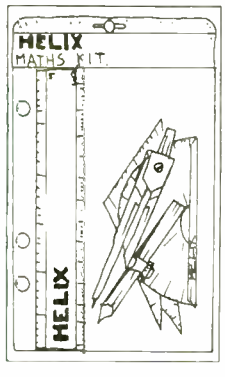


A30 Car Pencil Tin 180x75x20mm
OUR PRICE 99P

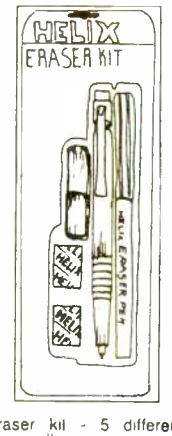
R08 Magic Pencil Box - amaze your friends - a box within a box makes things disappear!
OUR PRICE £1.99



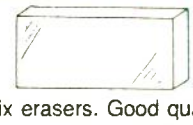
R55 Wedge Pencil Case - Great for younger children! 2 shape templates, 2 letter stencils, 5 felt tips, pencil, eraser and sharpener all in a colourful clear zip case!
OUR PRICE £2.20



Q86 Small maths set - colourful rule, 2 set squares, protractor, and a pair of compasses.
OUR PRICE 99P



E50 Eraser kit - 5 different + refillable pencil
OUR PRICE 99P



Y93021 Helix erasers. Good quality rubbers in blue, yellow and red, each 50x23x10mm. In boxes of **36 for £3.95**

Add VAT to quantity prices

The Ultimate Laser Copy Paper

After trying dozens of different papers to obtain the best possible copy quality, we've found a superb paper from one of the larger paper merchants. It's called Huntsman Silk, and its 115gm weight just oozes quality. You need to see and feel it to appreciate its worth, so ask for a sample sheet if you're interested in buying some.

HS115A 50 Sheets **£2.50**
HS115B 200 Sheets **£8.00**
HS115 Ream of 500 sheets **£16.00**
(See overleaf for cheaper copy/laser paper)

BULK BUYS

One of our suppliers is overstocked on some goods - so if you buy in quantity, we can pass these savings on to you!

AT55 Self coiled telephone extension lead, extends to 5m. White. £2 each, but buy 12 for £10 + VAT, or 48 for £35 + VAT

P1740 Co-ax splitter. 87p each, but buy 50 for £22 + VAT or 250 for £82 + VAT

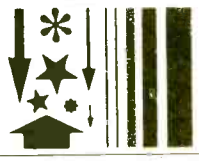
BARGAIN BRIEFCASE

Black plastic briefcase by Helix, model W89 - many uses, e.g. samples, documents, tools, hobbybox, sewing box - even sandwiches! Size 400x270x90mm. Comfortable carrying handle and secure fastenings. Original selling price £9.99

£3.95

GREENWELD Spring Supplement '93

27 Park Road Southampton SO1 3TB
Tel (0703) 236363 Fax (0703) 236307

No		WHITE	RED	GOLD	↕
1	ABCDEFG	○	●	●	4 mm 0.157 inch
2	ABCD	○	●	●	6 mm 0.236 inch
3	AB12	○	●	●	5 mm 0.197 inch
4	AB12	○	●	●	6 mm 0.236 inch
5	ABC12	○	●	●	7 mm 0.276 inch
6	1234567	○	●	●	4 mm 0.157 inch
7	12345	○	●	●	6 mm 0.236 inch
8	ABCD1234	○	●	●	6 mm 0.236 inch
9	ABC123	○	●	●	8 mm 0.315 inch
10		○	●	●	
11	ABCDEFGHIJKL	○	●	●	2,5 mm 0.098 inch
12	ABC	○	●	●	12 mm 0.472 inch
13	1234	○	●	●	12 mm 0.472 inch
14	123456789012	○	●	●	2,5 mm 0.098 inch
15	ABCDEFGHI 1234567	○	●	●	3 mm 0.118 inch
16	AB12	○	●	●	6 mm 0.236 inch
17	Aabc12	○	●	●	8 mm 0.315 inch
18	abcd1234	○	●	●	4 mm 0.157 inch
19	ABC123	○	●	●	10 mm 0.394 inch
20	ABC123	○	●	●	6 mm 0.236 inch

Colours available in DECADRY STANDARD

■ black

○ white

● red

● gold

No		
21	ABCDEFG 12345	2,5 mm 0.098 inch
22	abcd123	5 mm 0.197 inch
23	ABCDEF	5 mm 0.197 inch
24	ABCDEFG	4 mm 0.157 inch
25	abcdef123	4 mm 0.157 inch
26	ABC2	7 mm 0.276 inch
27	AB1	9 mm 0.354 inch
28	AB1	8 mm 0.315 inch

No		↕
29	ABCD	7 mm 0.276 inch
30	12345	7 mm 0.276 inch
31	ABC	10 mm 0.394 inch
32	1234	10 mm 0.394 inch
33	A1	10 mm 0.394 inch
34	A1	5 mm 0.197 inch
35	AB12	9 mm 0.354 inch
36	ABC	18 mm 0.709 inch
37	123	18 mm 0.709 inch
38	ABC12	8 mm 0.315 inch
39	Aab1	7 mm 0.276 inch
40	Aabc1	6 mm 0.236 inch
50	ABCDEFGHIJ 1234	3 mm 0.118 inch
51	ABCDEFGHIJ	4 mm 0.157 inch
52	1234567890	4 mm 0.157 inch
53	ABCDE 123	5 mm 0.197 inch
54	ABCDEFG	6 mm 0.236 inch
55	1234567	6 mm 0.236 inch
56	ABC	8 mm 0.315 inch
57	1234	8 mm 0.315 inch
58	ABC1	10 mm 0.394 inch
59	ABCDEFG12	3 mm 0.118 inch
60	ABCD12	5 mm 0.197 inch
61	ABCDE	8 mm 0.315 inch
62	12345	8 mm 0.315 inch

No		↕
63	ABF	10 mm 0.394 inch
64	ABCDE12	3 mm 0.118 inch
65	ABC12	4 mm 0.157 inch
66	ABI	8 mm 0.315 inch
67	ABabcdl	6 mm 0.236 inch
68	ABCDEFGHIJ12	4 mm 0.157 inch
69	ABCDEFGH12	5 mm 0.197 inch
70	ABCI	15 mm 0.591 inch
71	1237	15 mm 0.591 inch
72	abc12	6 mm 0.236 inch
73	abcdefghijkl	4 mm 0.157 inch
74	abcdefg	6 mm 0.236 inch
75	ABCDE	6 mm 0.236 inch
76	abcd12	6 mm 0.236 inch
77	ABa1	6 mm 0.236 inch
78	ab1	9 mm 0.354 inch
79	ABC12	5 mm 0.197 inch
80	AB12	6 mm 0.236 inch
81	ABC1	6 mm 0.236 inch
82	ABab2	5 mm 0.197 inch
83	ABab12	5 mm 0.197 inch
84	Aabc12	6 mm 0.236 inch
85	ABabl2	5 mm 0.197 inch
86	Aabl	7 mm 0.276 inch
87	ABCabc12	5 mm 0.197 inch
88	ABab12	7 mm 0.276 inch
89	ABab2	6 mm 0.236 inch

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27

No		
201	AI1	10 mm 0.394 inch
202	A12	12 mm 0.472 inch
203	Aa2	12 mm 0.472 inch
204	Aa1	12 mm 0.472 inch
205	AI	15 mm 0.591 inch
206	AI	18 mm 0.709 inch
207	AB	24 mm 0.945 inch
208	23	24 mm 0.945 inch
209	ABCabcd12	3 mm 0.118 inch
210	ABabc12	4 mm 0.157 inch
211	ABab1	6 mm 0.236 inch
212		
213	A2	15 mm 0.591 inch
214	Aabl	10 mm 0.394 inch
215	Aab1	9 mm 0.354 inch
216	Aa2	9 mm 0.354 inch

No		
217	AB	20 mm 0.787 inch
218	23	20 mm 0.787 inch
219	AI	24 mm 0.945 inch
220	12	24 mm 0.945 inch
221		
222		
223		
224		
225	Aal	5 mm 0.197 inch
226	Aal	7 mm 0.276 inch
227	ABat1	4 mm 0.157 inch
228	Aa1	7 mm 0.276 inch
229	Aal	4 mm 0.157 inch
230	Aal	6 mm 0.236 inch
231	Aal	9 mm 0.354 inch
232	Aal	6 mm 0.236 inch
233	Aal	9 mm 0.354 inch

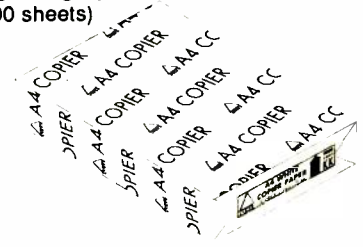
No		
234	Aa1	6 mm 0.236 inch
235	Aa1	9 mm 0.354 inch
236	Aa1	8 mm 0.315 inch
237	Aa1	10 mm 0.394 inch
238	Aal	6 mm 0.236 inch
239	Aal	9 mm 0.354 inch
240	ABI3	6 mm 0.236 inch
241	ABI3	9 mm 0.354 inch
242	Aa1	5 mm 0.197 inch
243	Aa1	7 mm 0.276 inch
244	Aa1	10 mm 0.394 inch
245	Aa1	6 mm 0.236 inch
246	Aa1	9 mm 0.354 inch
247	Aal	6 mm 0.236 inch
248	Aal	9 mm 0.354 inch
249	Aal	6 mm 0.236 inch
250	Aal	9 mm 0.354 inch

A new range of dry transfer lettering in two handy sheet sizes. Decadry Standard 100x200mm (Nos. 1-88) and Decadry Super 125x250mm (Nos. 201-250). All those shown are available in Black; we also stock Nos. 1-20 in White (for our ABS boxes); Red & Gold. Please use the number as the Order Code and specify the colour required. Lettering is shown slightly smaller (93%) than actual size.

PRICES: Standard (1-88) **70p per sheet;** 12+ 0.45; 144+ 0.36
Super (201-250) **95p per sheet;** 12+ 0.60; 144+ 0.48
Quantity Prices exclude VAT. Any mix for qty discount

(a) Paper & Labels

80gsm high grade copier paper, sold in reams (500 sheets)



Code	Description	1+	10+
A701	A3 size 420x297mm	£9.95	5.73
A702	A4 size 297x210mm	£3.70	2.31

Laser Copier Paper

A high quality paper giving excellent results with all laser printers. Price per ream.

A703 A4 size 297x210mm **£4.50** 3.30

ABCABCABC

COPIER LABELS

A4 Copier/laser labels selvedge (margin round all 4 sides for copiers that won't copy edge to edge) 100 sheets to a box.

CODE	LABEL SIZE	SHEET LAYOUT	PRICE
3657	48.5 x 25.4	4 x 11	£23.63
3658	64.6 x 33.8	3 x 8	£23.63
3659	97.0 x 42.3	2 x 6	£23.63
3660	97.0 x 67.7	2 x 4	£23.63

(c) Pads and Rolls

A721 Shorthand notepad, spiral bound 8x5". 80 sheets (160 pages)
1+ 40p; 12+ 0.22; 144+ 0.18

A725 Adding machine rolls. Standard 2¼x2¼". Sold in cases of 20 rolls.
1+ £4.75; 5+ 3.36 25+ 2.68

A721 Fax Roll. Standard for most makes of machine. 210mm wide x 30m long (equivalent to 100 A4 sheets) 12.5mm tube. **Reduced Price:**
£2.95; 12+ 1.80; 72+ 1.68.

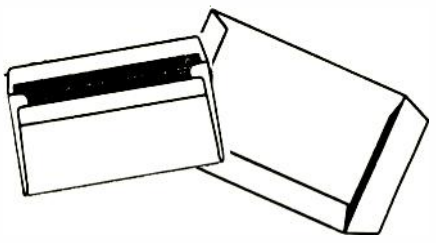
Memo Pads
A4 feint ruled 80 sheets.

		1+	10+	25+
HII	A4 297 x 210	47.p	0.30	0.24

Scrap Pads
Plain pads of 80 sheets.

		Pack of 10	10+	25+
HTT	A5 210 x 148	£2.58	1.65	1.32
HFH	A6 148 x 105	£1.53	0.98	0.78

2129 Scrap block – 90 x 90 x 90 cube glued on one edge containing 1000 sheets of recycled paper. **£2.20** 20+ 1 57

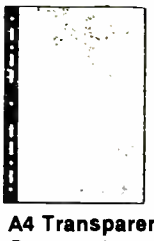


Envelopes
(a) White

		PER 100	1000
HEN01	89 x 152mm 70gsm gummed	£1.27	7.06
HFF	C6, 114 x 162mm 80g self seal	£1.90	10.54
HEE	DL, 220 x 110mm 80g self seal	£1.97	10.62
HGS	DL, 220 x 110mm 80g self seal window	£2.20	12.24
HEN04	C5, 229 x 162mm 90g self seal pocket	£3.94	21.89
HEN05	C4, 325 x 230mm 90g self seal pocket	£8.04	44.68
HEN06	C4, 324 x 229mm 90g self seal pocket	£9.41	52.29

(b) Manilla

HAL	89 x 152mm 70g gummed	88.p	4.86
HAM	89 x 152mm 70g gummed window	£1.36	7.53
HAV	DL, 220 x 110mm 70g gummed	£1.27	7.07
HBC	DL, 222 x 110mm 70g gummed	£1.73	9.64
HBJ	C5, 229 x 162mm 80g gummed pocket	£2.86	15.89
HBM	C4, 325 x 230mm 80g gummed pocket	£4.85	26.99
HOD	C4, 325 x 230mm 80g Self seal Pocket	£5.26	29.24



A4 Transparent Pockets

Open at the top and multipunched to fit most files.
Pack of 100 £4.40; 10+ 2.81

Adhesive Tape

A731 1" wide clar adhesive tape, polypropylene 30 micron
60p; 12+ 0.36; 72+ 0.29

A735 2" wide buff packaging tape, polypropylene 30 micron.
£1.30; 12+ 0.83; 36+ 0.66

Ballpoint Pens

Low cost ball pens with ventillated caps, in 3 popular colours:

Code	Description		
HPE01	Black	10 for £1;	100+ 0.06
HPE02	Blue	10 for £1;	100+ 0.06
HPE03	Red	10 for £1;	100+ 0.06
HPE50	Box of 50, any assortment		£3.95

also fine point:

HPE04	Black	10 for £1.00	100+ 0.06
HPE05	Blue	10 for £1.00	100+ 0.06
HPE06	Red	10 for £1.00	100+ 0.06
HPE55	Box of 50 any assortment	£3.95	

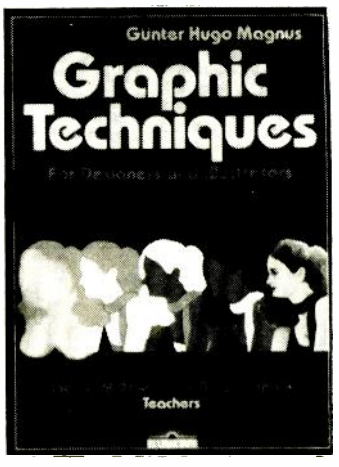
Flip Chart Markers

Low cost, long life, non-show through felt tips.

HB4 4 pens, red blue, black & green in plastic wallet

Pack	10+	25+
£1.33	0.85	0.68

Add VAT to quantity prices



Graphic Techniques **199**
£14.95 HB **Günter Hugo Magnus**
A leading international designer shows the quickest, most efficient ways to prepare brilliant illustrations, layouts, and mechanicals for printing. Magnus also provides practical information on materials and equipment, including new reproduction and printing processes. Students and experienced designers alike will profit from the wealth of information in this book, which includes some techniques original with the author.

An Introduction to Graphic Design **AP101**
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Covering simple typographical terminology and type classifications, the subtleties of designing with type are explored, as are the skills of fitting copy to a page and letterspacing. An essential aid for the student and graphic designer.

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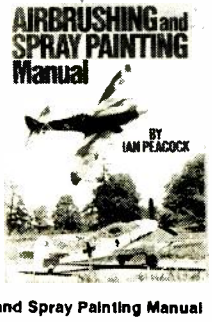
279 x 216mm full colour 128 Pages
Brian Lewis describes different techniques and individual methods of approaching and developing illustration skills.



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Address: .....

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All orders are accepted under our terms and conditions on page 162 of our 1993 catalogue. A copy of this page will be sent on receipt of an SAE

1993 CATALOGUE

Our main Catalogue, 164 pages of regular products is available now for just £2 UK/BFPO, £4 overseas. Amongst the many new items this year are a greatly expanded car equipment section, 7 pages devoted to graphic and stationery supplies featuring goods from Staedtler, Helix and Kuretake amongst others; a radio, TV and tape section with personal stereos, CD players and mini-TV's from Casio; a large increase in the space devoted to Security & Surveillance with many new PIR products; a much bigger video section with lots of camcorder accessories; no less than 17 pages of books, and the complete range of metal detectors from C-Scope, including a kit available only from us. So don't delay, Order today - there's a space on the Order Form overleaf.

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By paying £6 a year UK/BFPO, £12 Overseas, we'll mail you every month details of our latest offers, together with a copy of

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Each issue contains news and information on Greenweld products - particularly surplus lines. There's a feature every month on one or more of our Bargain List items, with constructional details of an interesting project or two.

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Thank you for ordering from GREENWELD - we appreciate your custom. This space is for any suggestions or messages. Please feel free to comment on any aspect of our goods and service

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Please use the Order Form on page 29. Single prices and packs of components with the price shown in bold include VAT - bulk or quantity prices exclude VAT which must be added at 17.5% or the current rate, if different. Payment is accepted by cash (sellotape coins to card), Mint GB postage stamps, PO, cheque, Giro transfer, Transcash, foreign currency bank notes, Access, Visa and Connect. We also accept book and record tokens for any goods and gift vouchers from any of the national chain stores. Add postage at the standard rate of £2.75 per order or £9.50 for next day delivery for any quantity of goods. Next day delivery applies to credit card and cash orders providing the goods required are in stock. Allow clearance time for large cheques.

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Fill in your Name and Address which must include the postcode

Write order clearly and legibly and include prices. Don't forget to include postage and packing charge. Please keep a copy of your order.

If ordering by credit card, ensure all 16 digits (13 for some Visa cards) are written down, and the expiry date. **All** credit card transactions are authorized and processed electronically, to combat fraud.

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Send the completed order to:

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Southampton SO1 3TB
United Kingdom

Most orders are despatched within a day or two, but some may be delayed beacause of temporary non-availability of goods. If this is going to be more than a week, we will advise you.

HOW TO CONTACT US:

By Post	Use the address above
In Person	At the address above (
By Phone	(0703) 236363 (Ansaphone outside normal business hours)
By Fax	(0703) 236307 (24hrs a day, 365 days a year)
By EMail	Compuserve 100014,1463 (This is not ' accessed every day, so if your order is urgent, please use phone or fax)
By Giro	Use a transfer form to send details of your order to us, or pay by Transcash at any PO Our account number is **207 9194**

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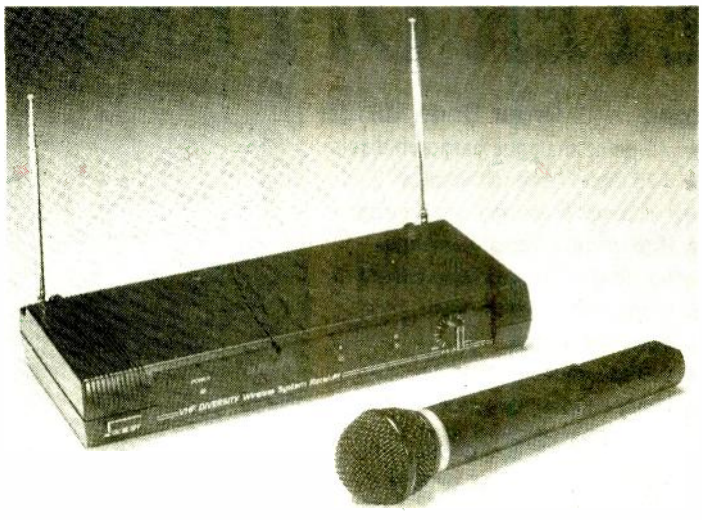
Our terms and conditions of trading are shown on page 162 of our 1993 Catalogue. A copy of this page will be sent on receipt of a self adressed stamped envelope.

OVERSEAS CUSTOMERS: Outside the European Community, deduct VAT. EC customers who can supply their VAT number may also deduct VAT, otherwise VAT is payable at the UK rate on all orders to member states of the EC.



G205 HAND HELD MICROPHONE SYST EM
A portable diversity receiver with tone squelch and noise reduction circuitry. The antenna A-B indicators indicate the switch in channels as the performer moves about. The microphone has an intermediate mute position on the on/off switch to eliminate switch-on pop. Output from the receiver is via a 6.35mm unbalanced socket. Note: the receiver is 12Vdc powered. Recommended power supply: P007D.
PRICE: £190.00 2+ 144.72

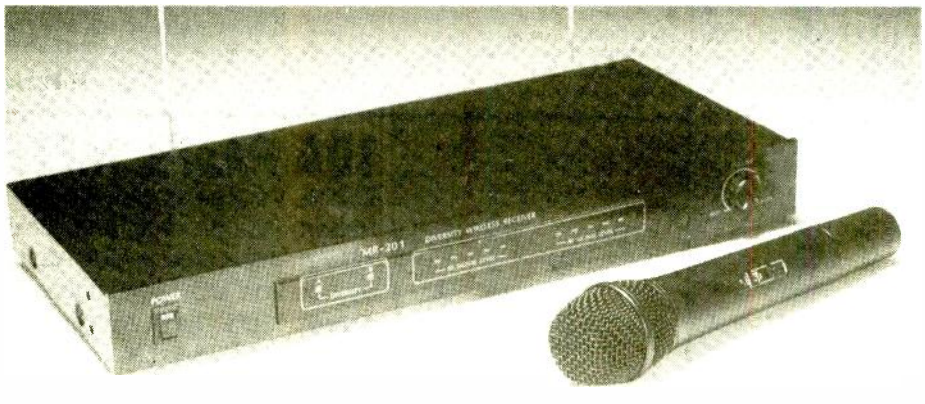
G205A TIE CLIP MICROPHONE SYSTEM
A portable diversity receiver with tone squelch and noise reduction circuitry. The antenna A-B indicators indicate the switch in channels as the performer moves about. The belt-clip transmitter has an intermediate mute position on the on/off switch to eliminate switch-on pop. Output from the receiver is via a 6.35mm unbalanced socket. Note: the receiver is 12Vdc powered. Recommended power supply: P007D.
PRICE £175.00 2+ 132.66

G205B GUITAR TRANSMITTER SYSTEM
A portable diversity receiver with tone squelch and noise reduction circu try. The antenna A-B indicate the switch in channels as the performer moves about. The belt clip transmitter has an intermediate mute position on the on/off switch to eliminate switch-on pop. Input is via a short lead fitted with a 6.35mm plug. Output from the receiver is via a 6.35mm unbalanced socket. Note: the receiver is 12Vdc powered. Recommended power supply: P007D.
PRICE: £175.00 2+ 132.66

Specifications

Receiver	173.8, 174.1, 174.5, 174.8 and 175.0Mz
Frequency response	30Hz to 18kHz
S/N ratio	100dB
RF sensitivity	15dB at S/N 60dB
De-emphasis	50μsec
Power	12Vdc
Transmitter	
Frequency response	30Hz to 18kHz
RF power	5mW
Modulation	FM 15kHz
Spurious emissions	-45dB
Power	9Vdc

Add VAT to quantity prices



G206 DIVERSITY SYSTEM
A professional diversity radio mic system consisting of a hand held radio mic and a 19+ rack mounting (or free standing) receiver. The receiver has balanced and unbalanced outputs, LED bargraph audio out indicators, antenna A-B indicators and output gain control. The microphone features a high sensitivity cardiod capsule and special noise absorption parts to eliminate switch shock and handling noise.
PRICE: £399.00 2+ 308.00

G206A DUAL CHANNEL SYSTEM
A professional dual channel radio mic system consisting of two hand held radio mics and a 19+ rack mounting (or free standing) receiver. The receiver has unbalanced outputs, LED bargraph audio out indicators, gain and squelch controls for each of the channels. The microphones feature high sensitivity cardioid capsules and special noise absorption parts to eliminate switch shock and handling noise.
PRICE: £435.00 2+ 335.00

G206B SINGLE CHANNEL SYSTEM
A professional single channel radio mic system consisting of a hand held radio mic and 19+ rack mounting (or free standing) receiver. The receiver has unbalanced outputs, LED bargraph audio output indicators, gain control and squelch controls. The microphone features a high sensitivity cardioid capsule and special noise absorption parts to eliminate switch shock and handling noise.
PRICE: £229.00 2+ 174.20

G206/A/B SPECIFICATIONS

Receiver	
Receiving frequencies	173.8, 174.1, 174.5, 174.8 or 175.0MHz (173.8 and 175.0 only for G206)
RF sensitivity	12dB/μ for 60dBS/N ratio
S/N ratio	over 108dB
De-emphasis	50μS
Audio output levels	Unbalanced: 0 - 0.5V Balanced (G206 only): 0 to ±0.2V @ 600R
Power	12Vdc or 220/240Vac
Dims	484x44 (1U) x 140mm
Weight	2.7kg
Microphone	
	RF output power 2mW
Spurious emissions	40dB below carrier level, 50dB typical
Pre-emphasis	50μs
Power	9Vdc
Weight	227g
General	
Frequency response	40Hz to 20kHz
S/N ratio	better than 100dB
THD	less than 0.5%
Audio dynamic range	over 100dB, over 118dB with limiting

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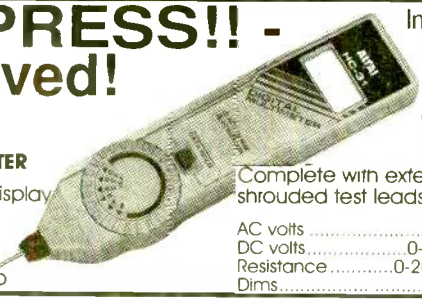

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AC volts	0-2-20-200-500Vac ± 1.2%
DC volts	0-200m-2-20-200-500Vdc ± 1.0%
Resistance	0-200-2k-20k-200k-2M-2MΩ ± 1.0%
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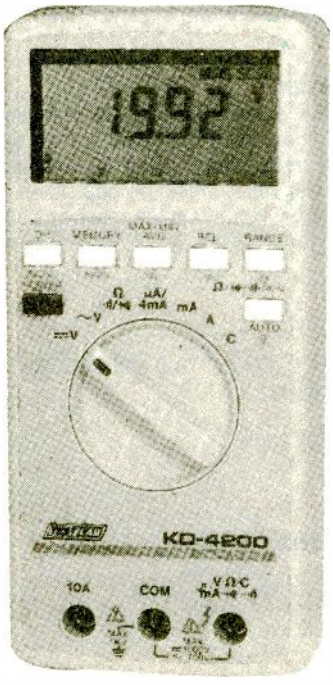
GREENWELD 27 Park Road Southampton SO1 3TB
Tel (0703) 236363 Fax (0703) 236307

Spring Supplement '93

6 STUNNING METER OFFERS!!

10MΩ MULTIMETER



- ✱ 3,999 count resolution
- ✱ 40 segments bargraph
- ✱ Max., min. and average function
- ✱ Ratio measurement Function
- ✱ Error correction function
- ✱ Relative magnitude function

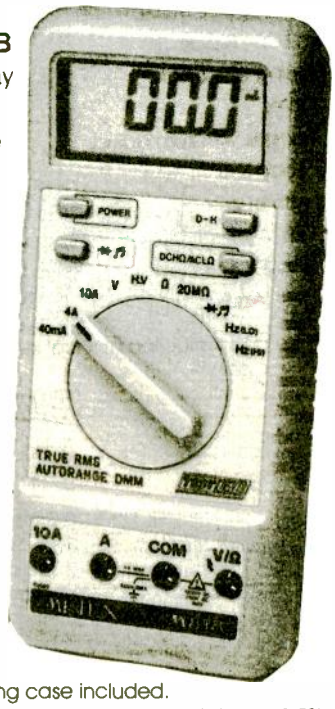
NORMAL SELLING PRICE £120.00!!

Y130
Y130A **£49.95**

AC volts	0-4-40-400-750Vac ±1%
DC volts	0-400m-4-40-400-1000Vdc ±0.5%
AC current	0-40m-400-10Aac ±2%
DC current	0-40-400m-10Adc ±1%
Resistance	0-400-4k-400k-4M-40MΩ ±1%
Frequency (Y130 ONLY)	0-10k-65kHz TTL level (5V)
Temperature (Y130A ONLY)	-50 to 1200°C
Dims	165 x 78 x 35mm

10MΩ Order Code M818B

- ★ 40 point analogue bargraph display
- ★ 3.75 digit 17mm LCD display
- ★ Autoranging voltage and resistance
- ★ High and low frequency ranges
- ★ True RMS AC voltage and current
- ★ Diode and continuity test
- ★ Data hold switch
- ★ Built and tested to IEC 348
- ★ Fully shrouded test leads

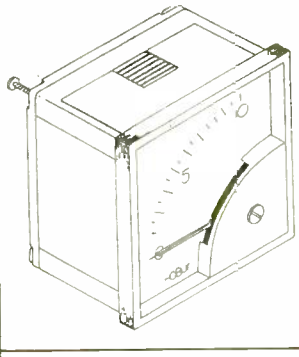


SPECIAL PURCHASE!!
In our 93 Cat at £75!
Now offered at less than half price!

£34.95

Battery, instruction manual and carrying case included.

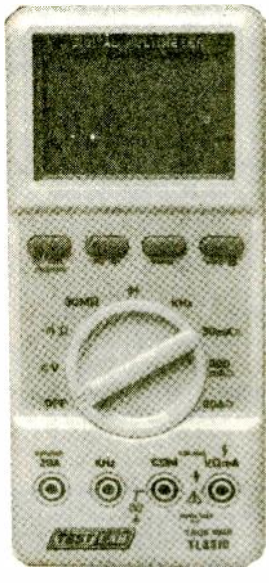
AC volts	0-40-400-750Vac ± 1.5%
DC volts	0-400m-4-40-400-1000Vdc ± 0.5%
AC current	0-4m-40m-400m-2-10A ac ± 1.5%
DC current	0-4m-40m-400m-2-10A dc ± 1.2%
Resistance	0-4k-40k-400k-4M-20MΩ ± 0.8%
Frequency	0-4k-40k-400kHz ± 2%
Dims	187 x 87 x 34mm



10A PANEL METER

Z5335 Very smart panel meter by Hobart, brand new and boxed. 72x72mm, scaled 0-10A AC (can be used on DC - readings will be approx 20% low). Moving Iron model no D72SD. List Price 12.51

OUR PRICE **£4.00**



Y123AC

- 3.75 digit 25mm LCD display (2999 count) with 40 point bargraph
- True RMS measurement
- Auto/manual ranging
- 20A ac/dc measurement capability
- Frequency measurement
- Memory mode for relative measurement
- Data hold
- Diode test
- Full overload protection

NORMALLY SELLS AT £89.95

AMAZING DEAL

£39.95

AC voltage: Auto	0-20-200-700Vac ±1%
Manual	0-30-300-700Vac ±1%
DC voltage: Auto	0-200m-2-20-200-1000Vdc ±0.7%
Manual	0-300m-3-30-300-1000Vdc ±0.7%
AC current	0-30m-300m-20Aac ±1.8%
DC current	0-30m-300m-20Adc ±1%
Resistance: Auto	0-200-2k-20k-200k-2MΩ ±0.8%
Manual	0-300-3k-30k-300k-3M-30MΩ ±0.8%
Frequency	10Hz to 20kHz ±0.5%
Dims	190 x 85 x 40mm

- ★ 19 ranges
- ★ 3½ digit 12mm LCD display
- ★ **Signal injector function**
- ★ Diode test
- ★ Fuse protection
- ★ Automatic polarity and zero
- ★ Test leads with 4mm plugs

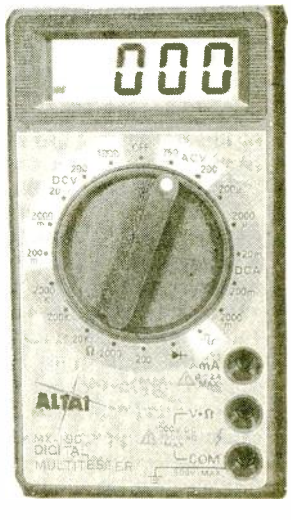
Battery and instruction manual included.

OUR **BIGGEST** SELLING INSTRUMENT!!

SUPERDEAL PRICE

£16.95

10MΩ MX190



AC volts	0-200-750Vac±1.2%
DC volts	0-200m-2-20-200-1000Vdc±0.8%
DC current	0-200μ-2m-20m-200m-2Adc±1.0%
Resistance	0-200-2k-20k-200k-2MΩ±0.8%
Signal injector	50Hz square wave. 5V peak to peak
Dims	126 x 70 x 24mm

USE YOUR ACCESS OR VISA ☎ TEL 0902 712083/773122 (24 HOURS)

AIWA

Part No.	Price
AV-55	
Video Head	VID 2546	£15.62
Pinch Roller	VID 1755	£3.83
Belt Kit	VID 7519	£1.27
Idler Replacement Set	VID 1001	£3.65
Idler	VID 1005	£1.87
Capstan Motor	VID 2160	£25.00
Tension Band	VID 1423	£3.65
Reel Table Rubber Tyre	VID 1335	£1.19
CTL Unit	VID 2637	£61.55
AV-77		
Video Head	VID 2546	£15.62
Pinch Roller	VID 1755	£3.83
Belt Kit	VID 7509	£1.33
Idler Replacement Set	VID 1000	£5.69
FWD Limiter	VID 1002	£3.83
Idler	VID 1004	£1.45
Idler	VID 1005	£1.87
Capstan Motor	VID 2118	£29.36
Tension Band	VID 1423	£3.65
CTL Unit	VID 2567	£47.83
AKAI		
VS-9800		
Video Head	VID 2511	£9.18
Pinch Roller	VID 1756	£3.23
Belt Kit	VID 7506	£1.61
Take Up Idler	VID 1025	£5.27
REW Idler	VID 1026	£6.71
Unloading Idler	VID 1027	£10.54
FF Rubber Tyre	VID 1029	£0.85
FF Rubber Tyre	VID 1030	£0.85
Unloading Idler Rubber Tyre	VID 1207	£0.93
Capstan Motor	VID 2119	£25.34
Drum Motor	VID 2120	£20.20
Cassette Lamp	VID 1943	£0.27
Tension Band	VID 1391	£3.65
Repair Kit	VID 7911	£15.27
Take Up Rubber Tyre	VID 1028	£0.85
ALBA		
VCR-4000		
Video Head	VID 2713	£17.46
Pinch Roller	VID 1787	£3.74
Belt Kit	VID 7596	£2.05
Idler	VID 1049	£3.31
Cassette LED	VID 1981	£1.77
Tension Band	VID 1399	£2.04
AMSTRAD		
VCR-4600		
Video Head	VID 2676	£14.79
Pinch Roller	VID 1758	£3.15
Belt Kit	VID 7593	£1.60
Clutch	VID 1226	£4.76
Gear Holder	VID 1227	£13.14
RF Clutch	VID 1231	£7.39
Cassette LED	VID 1981	£1.77
VCR-9000		
Video Head	VID 2502	£14.68
Pinch Roller	VID 1758	£3.15
Belt Kit	VID 7592	£1.19
RF Clutch	VID 1225	£4.33
Clutch	VID 1226	£4.76
Gear Holder	VID 1227	£13.14
Cassette LED	VID 1981	£1.77
BANG & OLUFSEN		
VHS-65		
Video Head	VID 2506	£14.14
Pinch Roller	VID 1788	£3.15
Belt Kit	VID 7538	£1.36
FF×REW Idler Arm	VID 1020	£1.79
Clutch Plate	VID 1211	£8.52
Capstan Motor	VID 2147	£19.52
Cassette LED	VID 1981	£1.77
DECCA		
VRH-8300		
Video Head	VID 2511	£9.18
Pinch Roller	VID 1814	£3.15
Belt Kit	VID 7812	£1.02
Reel Idler	VID 1036	£2.63
Take Up Clutch	VID 1037	£2.38
Take Up Idler	VID 1038	£1.07
Brake Pad	VID 1361	£0.59
Reel Motor	VID 2169	£28.97
Capstan Motor	VID 2164	£33.80
Loading Motor	VID 2168	£10.62
Cassette Lamp	VID 1947	£0.44
Tension Band	VID 1389	£1.79
Repair Kit	VID 7913	£16.09
Take Up Reel Table Rubber Tyre	VID 1080	£0.68
Supply Reel Table Rubber Tyre	VID 1080	£0.68
FERGUSON		
3-V-30		
Video Head	VID 2647	£9.18
Pinch Roller	VID 1814	£3.15
Belt Kit	VID 7812	£1.02
Reel Idler	VID 1036	£2.63
Take Up Clutch	VID 1037	£2.38
Take Up Idler	VID 1038	£1.07
Brake Pad	VID 1361	£0.59
Reel Motor	VID 2169	£28.97
Capstan Motor	VID 2164	£33.80
Loading Motor	VID 2168	£10.62
Cassette Lamp	VID 1947	£0.44
Tension Band	VID 1389	£1.79
Repair Kit	VID 7913	£16.09
Take Up Reel Table Rubber Tyre	VID 1080	£0.68
Supply Reel Table Rubber Tyre	VID 1080	£0.68
3-V-36		
Video Head	VID 2647	£9.18
Pinch Roller	VID 1813	£3.15
Belt Kit	VID 7543	£1.02
Take Up Clutch	VID 1031	£2.11
Take Up Idler	VID 1038	£1.07
Reel Idler	VID 1039	£3.40
Brake Pad	VID 1361	£0.59
Capstan Motor	VID 2165	£21.86
Loading Motor	VID 2168	£10.62
Front Loading Motor	VID 2168	£10.62
Cassette LED	VID 1981	£1.77
Tension Band	VID 1389	£1.79
Remote Control	IR 9100	£11.01
Repair Kit	VID 7918	£12.51
Mains Transformer	VID 2223	£24.18
Take Up Reel Table Rubber Tyre	VID 1080	£0.68
Supply Reel Table Rubber Tyre	VID 1080	£0.68
Cassette Housing	VID 1099	£21.23
3-V-57		
Video Head	VID 2573	£17.81
Pinch Roller	VID 1813	£3.15
Belt Kit	VID 7540	£0.68
Clutch Mechanism	VID 1083	£15.00
Capstan Motor	VID 2188	£45.96
Loading Motor	VID 2167	£14.11
Front Loading Motor	VID 2168	£10.62
Cassette LED	VID 1981	£1.77
Tension Band	VID 1388	£2.13
Repair Kit	VID 7920	£21.85
Cassette Housing	VID 1315	£21.90
FV-108		
Video Head	VID 2580	£19.73
Pinch Roller	VID 1817	£7.05
Belt Kit	VID 7564	£2.81
Idler Arm	VID 1091	£2.48
Reel Motor	VID 2193	£16.24
Capstan Motor	VID 2190	£26.20
Loading Motor	VID 2412	£6.37
Front Loading Motor	VID 2412	£6.37
Cassette LED	VID 1981	£1.77
Tension Band	VID 1386	£0.85
Repair Kit	VID 7921	£9.97
FV-12L		
Video Head	VID 2581	£25.62
Pinch Roller	VID 1817	£7.05
Belt Kit	VID 7564	£2.81
Idler Arm	VID 1091	£2.48
Reel Motor	VID 2193	£16.24
Capstan Motor	VID 2190	£26.20
Loading Motor	VID 2412	£6.37
Front Loading Motor	VID 2412	£6.37
Cassette LED	VID 1981	£1.77
Tension Band	VID 1386	£0.85
Repair Kit	VID 7921	£9.97
FIDELITY		
VCR-100		
Video Head	VID 2502	£14.68
Pinch Roller	VID 1758	£3.15
Belt Kit	VID 7593	£1.60
Clutch	VID 1226	£4.76
Gear Holder	VID 1227	£13.14
RF Clutch	VID 1231	£7.39
Cassette LED	VID 1981	£1.77
FINLUX		
VR-1030		
Video Head	VID 2558	£45.04
Pinch Roller	VID 1803	£3.83
Idler	VID 1006	£2.89
Tension Band	VID 1432	£5.87
Remote Control	IR 9034	£14.52
Repair Kit	VID 7930	£12.58
VR-2010		
Video Head	VID 2578	£62.15
Pinch Roller	VID 1827	£6.66
Belt Kit	VID 7588	£1.09
Idler	VID 1252	£5.20
Loading Gear	VID 1253	£7.23
Modification Set	VID 1254	£12.78
Tension Band	VID 1431	£4.85
Remote Control	IR 9034	£14.52
FISHER		
FVH-P520		
Video Head	VID 2500	£17.46
Pinch Roller	VID 1788	£3.15
Belt Kit	VID 7532	£1.35
Take Up Idler	VID 1015	£3.65
FF×REW Pulley	VID 1016	£0.93
Idler	VID 1023	£2.89
Tension Band	VID 1378	£2.38
Take Up Reel Table Rubber Tyre	VID 1293	£0.77
Supply Reel Table Rubber Tyre	VID 1293	£0.77
FVH-P530		
Video Head	VID 2500	£17.46
Pinch Roller	VID 1788	£3.15
Belt Kit	VID 7532	£1.35
Take Up Idler	VID 1015	£3.65
FF×REW Pulley	VID 1016	£0.93
Idler	VID 1023	£2.89
Tension Band	VID 1378	£2.38
Take Up Reel Table Rubber Tyre	VID 1293	£0.77
Supply Reel Table Rubber Tyre	VID 1293	£0.77
FVH-P720×720R×721		
Video Head	VID 2500	£17.46
Pinch Roller	VID 1810	£3.04
Belt Kit	VID 7532	£1.35
Gear Idler	VID 1013	£4.51
Idler	VID 1014	£3.06
Loading Gear Set	VID 1230	£1.02
Cassette LED	VID 1981	£1.77
Tension Band	VID 1376	£2.38
Take Up Reel Table	VID 1295	£8.07
Supply Reel Table	VID 1294	£6.55
FVH-P722×725		
Video Head	VID 2501	£25.17
Pinch Roller	VID 1810	£3.04
Belt Kit	VID 7813	£1.19
Gear Idler	VID 1013	£4.51
Idler	VID 1014	£3.06
Loading Gear Set	VID 1230	£1.02
Cassette LED	VID 1981	£1.77
Tension Band	VID 1376	£2.38
Take Up Reel Table	VID 1295	£8.07
Supply Reel Table	VID 1294	£6.55
FVH-P5800×KV		
Video Head	VID 2501	£25.17
Pinch Roller	VID 1818	£3.06
Belt Kit	VID 7568	£3.15
Idler	VID 1093	£4.85
Clutch	VID 1094	£14.59
Cassette LED	VID 1981	£1.77
Tension Band	VID 1377	£2.47
Supply Reel Table	VID 1296	£11.30
FUNAI		
VCR-4600		
Video Head	VID 2676	£14.79
Pinch Roller	VID 1758	£3.15
Belt Kit	VID 7593	£1.60
Clutch	VID 1226	£4.76
Gear Holder	VID 1227	£13.14
RF Clutch	VID 1231	£7.39
Cassette LED	VID 1981	£1.77
VCR-5843		
Video Head	VID 2708	£25.04
Pinch Roller	VID 1758	£3.15
Belt Kit	VID 7615	£1.70
Idler	VID 1364	£2.55
Cassette LED	VID 1981	£1.77
GEC		
V-4004		
Video Head	VID 2506	£14.14
Pinch Roller	VID 1788	£3.15
Belt Kit	VID 7538	£1.36
FF×REW Arm	VID 1020	£1.79
Clutch Plate	VID 1211	£8.52
Capstan Motor	VID 2148	£19.52
Cassette LED	VID 1981	£1.77
Tension Band	VID 1379	£2.38
Repair Kit	VID 7922	£17.24
GOLDSTAR		
GHV-8000×8200×8210×8215		
Pinch Roller	VID 1815	£3.15
Belt Kit	VID 7585	£1.36
Idler	VID 1052	£1.69
Bracket Centre	VID 1223	£13.51
Clutch Gear	VID 1228	£2.29
Limiter Roller	VID 1440	£1.36
Cassette LED	VID 1981	£1.77
Tension Band	VID 1399	£2.04
VCP-4100×4130		
Video Head	VID 2645	£21.23
Pinch Roller	VID 1815	£3.15
Belt Kit	VID 7585	£1.36
Idler	VID 1052	£1.69
Bracket Centre	VID 1223	£13.51
Clutch Gear	VID 1228	£2.29
Limiter Roller	VID 1440	£1.36
Cassette LED	VID 1981	£1.77
Tension Band	VID 1399	£2.04
VCP-4200×4326		
Video Head	VID 2645	£21.23
Pinch Roller	VID 1815	£3.15
REW Belt	VID 7234	£0.43
Cassette LED	VID 1981	£1.77
GRANADA		
VHS-EY1×EY2		
Video Head	VID 2539	£14.75
Pinch Roller	VID 1822	£3.31
Belt Kit	VID 7605	£2.63
Reel Drive Unit	VID 1255	£6.71
Loading Gear A	VID 1268	£1.95
Loading Gear B	VID 1271	£1.36
Capstan Motor	VID 2402	£46.16
Cassette LED	VID 1981	£1.77
Tension Band	VID 1414	£3.52
GRUNDIG		
MVS-400		
Video Head	VID 2596	£15.75
Pinch Roller	VID 1757	£3.06
Belt Kit	VID 7567	£0.85
Idler	VID 0052	£1.69
Loading Gear	VID 1222	£1.57
Clutch Gear	VID 1228	£2.29
Limiter Roller	VID 1440	£1.36
Cassette LED	VID 1981	£1.77
Tension Band	VID 1400	£2.39
Remote Control	IR 8965	£22.53
VS-520 GB		
Video Head	VID 2595	£16.24
Pinch Roller	VID 1821	£9.52
Timing Belt	VID 1482	£8.16
Centre Pulley	VID 1482	£8.16
Cassette LED	VID 1981	£1.77
Tension Band	VID 1401	£3.83
HINARI		
VXL-30×35×4		
Video Head	VID 2518	£21.85
Pinch Roller	VID 1815	£3.15
Belt Kit	VID 7566	£2.38
Clutch	VID 1316	£6.21
Idler	VID 1317	£2.77
Loading Motor	VID 2167	£14.11
Cassette LED	VID 1981	£1.77

HITACHI

Part No.	Price
VT-11	
Video Head	VID 2504	£15.84
Pinch Roller	VID 1788	£3.15
Belt Kit	VID 7538	£1.36
FF×REW Idler Arm	VID 1020	£1.79
Clutch Plate	VID 1211	£8.52
Capstan Motor	VID 2147	£19.52
Cassette LED	VID 1981	£1.77
Tension Band	VID 1379	£2.38
Repair Kit	VID 7922	£17.24
VT-16 S		
Video Head	VID 2505	£25.56
Pinch Roller	VID 1788	£3.15
Belt Kit	VID 7538	£1.36
FF×REW Idler Arm	VID 1020	£1.79
Clutch Plate	VID 1211	£8.52
Capstan Motor	VID 2147	£19.52
Cassette LED	VID 1981	£1.77
Tension Band	VID 1379	£2.38
Repair Kit	VID 7922	£17.24
VT-33×330		
Video Head	VID 2504	£15.84
Pinch Roller	VID 1788	£3.15
Belt Kit	VID 7538	£1.36
FF×REW Idler Arm	VID 1020	£1.79
Clutch Plate	VID 1211	£8.52
Capstan Motor	VID 2148	£19.52
Cassette LED	VID 1981	£1.77
Tension Band	VID 1379	£2.38
Repair Kit	VID 7922	£17.24
VT-61×62×63×64		
Video Head	VID 2628	£24.98
Pinch Roller	VID 1818	£3.06
Belt Kit	VID 7583	£1.61
FF×REW Idler Arm	VID 1020	£1.79
Clutch Plate	VID 1211	£8.52
Capstan Motor	VID 2154	£19.52
Cassette LED	VID 1981	£1.77
Tension Band	VID 1379	£2.38
Repair Kit	VID 7924	£14.68
VT-8000×8500		
Video Head	VID 2509	£15.84
Pinch Roller	VID 1788	£3.15
Belt Kit	VID 7803	£0.77
Take Up Idler	VID 1015	£3.65
Wind Roller	VID 1016	£0.93
FF×REW Idler	VID 1023	£2.89
Capstan Motor	VID 2155	£52.02
Tension Band	VID 1381	£2.21
Remote Control	IR 9097	£16.91
Repair Kit	VID 7928	£13.72
Take up Reel Table	VID 1302	£13.00
Supply Reel Rubber Tyre	VID 1300	£0.85
VT-9300×9500×9700		
Video Head	VID 2509	£15.84
Pinch Roller	VID 1788	£3.15
Belt Kit	VID 7802	£0.93
FF×REW Idler Arm	VID 1019	£2.89
Play Idler	VID 1075	£3.99
FS Brake	VID 1212	£1.99
Capstan Motor	VID 2156	£58.55
Cassette Lamp	VID 1951	£1.02
Tension Band	VID 1382	£2.04
Remote Control	IR 9096	£16.95
Repair Kit	VID 7927	£15.67
Take Up Reel Table	VID 1303	£9.43
ITT		
VR-3913		
Video Head	VID 2511	£9.18
Pinch Roller	VID 1814	£3.15
Belt Kit	VID 7812	£1.02
Reel Idler	VID 1036	£2.63
Take Up Clutch	VID 1037	£2.38
Take Up Idler	VID 1038	£1.07
Brake Pad	VID 1361	£0.59
Reel Motor	VID 2169	£28.97
Capstan Motor	VID 2164	£33.80
Loading Motor	VID 2168	£10.62
Cassette Lamp	VID 1947	£0.44
Tension Band	VID 1389	£1.79
Repair Kit	VID 7913	£16.09
Take Up Reel Table Rubber Tyre	VID 1080	£0.68
Supply Reel Table Rubber Tyre	VID 1080	£0.68
VR-3993		
Video Head	VID 2647	£9.18
Pinch Roller	VID 1814	£3.15
Belt Kit	VID 7523	£2.27
Reel Idler	VID 1036	£2.63
Take Up Clutch	VID 1037	£2.38
Take Up Idler	VID 1038	£1.07
Roller Bar	VID 1363	£4.67
Brake Pad	VID 1361	£0.59
Reel Motor	VID 2169	£28.97
Capstan Motor	VID 2187	£47.57
Loading Motor	VID 2168	£10.62
Front Loading Motor	VID 2168	£10.62
Cassette Lamp	VID 1946	£0.59
Tension Band	VID 1389	£1.79
Repair Kit	VID 7914	£13.42
Take Up Reel Table Rubber Tyre	VID 1080	£0.68
Supply Reel Table Rubber Tyre	VID 1080	£0.68

JVC

Part No.	Price
HR-3300	
Video Head	VID 2511	£9.18
Pinch Roller	VID 1756	£3.23
Belt Kit	VID 7506	£1.61
Take Up Idler Large	VID 1025	£5.27
REW Idler	VID 1025	£5.27
Unloading Idler	VID 1027	£10.54
FF Rubber Tyre	VID 1029	£0.85
Unloading Idler Rubber Tyre	VID 1207	£0.93
Capstan Motor	VID 2119	£25.34
Drum Motor	VID 2120	£20.20
Cassette Lamp	VID 1943	£0.27
Tension Band	VID 1391	£3.65
Repair Kit	VID 7911	£15.27
Take Up Rubber Tyre	VID 1028	£0.85
HR-D110×111×120×121		
Video Head	VID 2647	£9.18
Pinch Roller	VID 1813	£3.15
Belt Kit	VID 7543	£1.02
Take Up Clutch	VID 1031	£2.11
Take Up Idler	VID 1038	£1.07
Reel Idler	VID 1039	£3.40
Brake Pad	VID 1361	£0.59
Capstan Motor	VID 2165	£21.86
Loading Motor	VID 2168	£10.62
Front Loading Motor	VID 2168	£10.62
Cassette LED	VID 1981	£1.77
Tension Band	VID 1389	£1.79
Repair Kit	VID 7918	£12.51
Mains Transformer	VID 2223	£24.18
Take Up Reel Table Rubber Tyre	VID 1080	£0.68
Supply Reel Table Rubber Tyre	VID 1080	£0.68
Cassette Housing	VID 1099	£21.23
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VX-850		
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Belt Kit	VID 7566	£2.38
Clutch	VID 1316	£6.21
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Cassette LED	VID 1981	£1.77
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HS-307		
Video Head	VID 2606	£33.96
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Belt Kit	VID 7542	£1.26
Reel Idler Unit	VID 1040	£8.48
FF Idler Rubber Tyre	VID 1081	£0.77
Capstan Rubber Tyre	VID 1264	£1.36
Cam Gear A	VID 1274	£1.36
Gear 2	VID 1275	£1.53
Cam Gear EE	VID 1276	£1.53
Gear 1	VID 1277	£1.45
Cassette LED	VID 1981	£1.77
Tension Band	VID 1393	£2.89
Take Up Reel Table	VID 1307	£3.31
Supply Reel Table	VID 1299	£3.54
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Video Head	VID 2607	£43.65
Pinch Roller	VID 1808	£3.15
Belt Kit	VID 7559	£3.23
Reel Idler Unit	VID 1040	£8.48
FF Idler Rubber Tyre	VID 1081	£0.77
Capstan Rubber Tyre	VID 1264	£1.36
Cam Gear A	VID 1274	£1.36
Gear 2	VID 1275	£1.53
Cam Gear EE	VID 1276	£1.53
Gear 1	VID 1277	£1.45
Cassette LED	VID 1981	£1.77
Tension Band	VID 1393	£2.89
Take Up Reel Table	VID 1307	£3.31
Supply Reel Table	VID 1299	£3.54
NEC		
N-830 EG×831×832×833		
Video Head	VID 2647	£9.18
Pinch Roller	VID 1813	£3.15
Belt Kit	VID 7543	£1.02
Take Up Idler	VID 1038	£1.07
Reel Idler	VID 1039	£3.40
Brake Pad	VID 1361	£0.59
Capstan Motor	VID 2165	£21.86
Loading Motor	VID 2168	£10.62
Front Loading Motor	VID 2168	£10.62
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Cassette LED	VID 1981	£1.77
Tension Band	VID 1387	£2.55

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N-9013×9014×9033×9034×9053×9054×9055		
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Belt Kit	VID 7601	£3.49
Reel Drive Pulley	VID 1265	£7.31
Cassette LED	VID 1981	£1.77
PANASONIC		
NV-2000×2010		
Video Head	VID 2520	£9.67
Pinch Roller	VID 1757	£3.06
Belt Kit	VID 7600	£1.79
Idler	VID 1054	£0.90
Idler	VID 1055	£0.95
Cam Gear	VID 1221	£0.61
Intermediate Gear	VID 1216	£1.27
Driving Gear	VID 1217	£0.59
Cassette Lamp	VID 1948	£0.25
Tension Band	VID 1397	£3.49
Repair Kit	VID 7901	£10.39
Take Up Reel Table	VID 1312	£11.47
Supply Reel Table	VID 1310	£7.57
NV-300×333		
Video Head	VID 2520	£9.67
Pinch Roller	VID 1787	£3.74
Belt Kit	VID 7521	£1.35
Play Idler	VID 1048	£2.81
Idler	VID 1057	£0.88
Idler Arm	VID 1220	£4.33
Cam Gear	VID 1215	£1.19
Intermediate Gear	VID 1216	£1.27
Driving Gear	VID 1217	£0.59
Reel Motor	VID 2158	£19.52
Capstan Motor	VID 2421	£40.62
Cassette LED	VID 1982	£1.67
Tension Band	VID 1399	£2.04
Repair Kit	VID 7903	£10.89
Take Up Reel Table	VID 1312	£11.47
PHILIPS		
Video Head	VID 2526	£10.45
Pinch Roller	VID 1757	£3.06
Belt Kit	VID 7530	£0.93
Idler	VID 1052	£1.69
Loading Gear	VID 1222	£1.57
Idler	VID 1370	£2.04
Idler	VID 1371	£6.12
Limiter Roller	VID 1440	£1.36
Cassette LED	VID 1981	£1.77
Tension Band	VID 1400	£2.39
Repair Kit	VID 7906	£8.22
VR-6540		
Video Head	VID 2537	£18.57
Pinch Roller	VID 1815	£3.15
Belt Kit	VID 7547	£1.02
Idler	VID 1060	£1.61
Master Cam	VID 1265	£7.31
Reel Motor	VID 2127	£26.85
Loading Motor	VID 2142	£15.48
Cassette LED	VID 1981	£1.77
Tension Band	VID 1420	£5.78
PYE		
DV-761		
Video Head	VID 2621	£57.10
Pinch Roller	VID 1827	£6.66
Belt Kit	VID 7588	£1.09
Idler	VID 1252	£5.20
Loading Gear	VID 1253	£7.23
Modification Set	VID 1254	£12.78
Tension Band	VID 1431	£4.85
SAISHO		
VR-2000×3800		
Pinch Roller	VID 1815	£3.15
Belt Kit	VID 7565	£0.94
Idler	VID 1060	£1.61
Reel Motor	VID 2121	£17.12
Cassette LED	VID 1981	£1.77
SALORA		
SV-8620		
Pinch Roller	VID 1808	£3.15
Belt Kit	VID 7600	£3.31
FF×REW Idler Arm	VID 1233	£3.23
FF×REW Idler Arm	VID 1234	£3.23
FF×REW Idler	VID 1235	£1.87
Cassette LED	VID 1981	£1.77
Tension Band	VID 1394	£3.31
Take Up Reel Table	VID 1308	£5.37
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SAMSUNG		
VH-510×520×611×616×621		
Video Head	VID 2648	£17.88
Pinch Roller	VID 1815	£3.15
Belt Kit	VID 7598	£1.40
Idler	VID 1232	£1.53
Idler	VID 1346	£3.76
Reel Motor	VID 2407	£15.87
Capstan Motor	VID 2409	£27.62
Loading Motor	VID 2142	£15.48
Cassette LED	VID 1981	£1.77
VX-710×720×730		
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Pinch Roller	VID 1759	£3.06
Belt Kit	VID 7608	£2.72
Cassette LED	VID 1981	£1.77
SANYO		
VHR-1100 EX×EE×G		
Video Head	VID 2583	£22.68
Pinch Roller	VID 1787	£3.74
Belt Kit	VID 7558	£1.09
Reel Drive Roller	VID 1076	£6.46
Reel Motor	VID 2198	£15.87
Cassette LED	VID 1981	£1.77
Tension Band	VID 1411	£2.72
VHR-1500 EX×G		
Video Head	VID 2585	£48.28
Pinch Roller	VID 1787	£3.74
Belt Kit	VID 7558	£1.09
Reel Drive Roller	VID 1076	£6.46
Reel Motor	VID 2198	£15.87
Cassette LED	VID 1981	£1.77
Tension Band	VID 1411	£2.72
VTC-M10×11×20×21		
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Pinch Roller	VID 1758	£3.15
Belt Kit	VID 7809	£0.51
Reel Drive Pulley	VID 1079	£7.05
Idler	VID 1219	£1.95
Reel Motor	VID 2179	£20.44
Tension Band	VID 1408	£2.13
Supply Reel Table	VID 1319	£9.77
SENTRA		
VX-5000×8000		
Video Head	VID 2713	£17.46
Pinch Roller	VID 1787	£3.74
Belt Kit	VID 7596	£2.05
Idler	VID 1049	£3.31
Cassette LED	VID 1981	£1.77
Tension Band	VID 1399	£2.04

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What a Life!

Donald Bullock

Quite a lot of jobs came in last weekend. So on Monday morning, bright and early, I breezed off towards the workshop, determined to make good headway.

As I got there the Reverend Goode's ancient chariot swung into the drive and out he struggled. So did his young curate, the Reverend Blande. Between them they brought in a television set and a VCR.

"The Curate's picture rolls, my son" boomed the Reverend. Then he turned to Curate Blande, who handed me the recorder. "I think it's the valve, my son" he piped, pointing at the TV set. "The vicar's video doesn't record properly."

Then they beamed at me, patted my shoulder and clambered into their wagon. As they left they passed old Mr. Simper, who was bringing his TV set along in a pram.

"Everything's deep purple Mr. Bugner" he whined. "It can't be much, 'cos we're old age pensioners and the wife's got housemaid's knee and gout. So we'll let you do it."

Then the phone rang. I answered it.

"This is Reginald Rongun, Mr. Butt. I've accidentally dropped my old video recorder down the stairs. Pop me a letter into the post to say it's finished, will you?"

"Bring it in with £20, Mr. Rongun, then we'll assess the damage and give you a quote. If you say no we retain the deposit for our trouble."

The phone spluttered and went dead. All we had to think about now were the three jobs that had just come in – and the mountain that had built up last week. Steven settled down to the backlog and I pulled the Revered's VCR on to the bench.

The Akai DX4

It was an Akai DX4. While it played all right the recordings made on it were distorted and pulled for five seconds in every fifteen. It was the same in the SP and LP modes. With this type of trouble the first thing I do is to give the machine a thorough clean, paying particular attention to the tape path, the heads, the idler and the pinch wheel. But the fault was still present after I'd done this. I then checked the mechanics, particularly the back tension. This didn't improve matters at all, so I studied the deck with my illuminated magnifier. I soon saw a thin trace of deposits that my original clean hadn't cleared on the audio/control head. My spirit cleaner wouldn't shift it, and in fact removing it was no easy task. It was only as I finished that I saw the well-sucked acid drop stuck amongst the wiring. I gave the machine a final test, pronounced it o.k. and replaced the casing.

TV Sets

Time to look at the Curate's TV set. It was a Toshiba 140R4B colour portable. He'd attached a note which said that after an hour the picture went small, distorted and rolled, and the set growled. So I switched it on, flung a blanket over it and put it aside.

I then put Mr. Simper's set on the bench. It was an 18in. Zanussi, Model 20ZA374-16B, BS700 chassis. We don't get many of these and the sight of it frightened me. The sound was all right but sure enough the screen was bright purple, which meant that the green gun was asleep.

Checks on the tube base panel suggested that the red, green and blue output transistors were all right, so I moved back to the TDA3301B colour decoder chip. As the voltages here were haywire I fitted a replacement. This made no difference. A more careful examination of the tube base panel then showed that the green output transistor's collector connection was loose in its soldered joint. Remaking this restored the green output but the picture was uncertain. I took off the panel and carefully cleaned and reflexed the side-contact connections to the tube. This resulted in a good, stable picture.

Just as I boxed up the Zanussi the Curate's Toshiba started to twist and writhe. It also groaned in sympathy. When I pulled off the back the picture became normal. So I played the hairdryer on to the PCB. The fault eventually returned, but no amount of freezing or flexing would alter it. I decided to dust off the board completely before studying it for hairline cracks or dry-joints.

After a search I found the half-inch dry paintbrush I use for this purpose. I switched the set on again and brushed away amongst the components. Perhaps I'd find a clue to the cause of the trouble whilst tidying up the chassis. The 2SC3715 line output transistor Q404 has no heatsink in this model: it's free-standing, and leant forward a little as I brushed around it. Immediately the picture twisted and writhed. I found that by moving the transistor to and fro I could control the set's antics. So I switched off and studied the joints under the transistor carefully. They appeared to be perfect. Then I tried, gently, lifting the transistor's legs one by one out of their holes. The base and collector leads held firm, but the emitter lead lifted out easily, leaving its solder blob looking intact. Cleaning it off and resoldering cured the trouble.

As I put the back on again the reverend gentlemen returned and gathered up their equipment.

"Good work Donald" boomed the Reverend. "You'll go to heaven I'm sure."

"Good work Donald" piped the curate. "You'll go to, er, heaven I'm sure."

I looked at them earnestly. "But not yet awhile, I hope?"

A Nikkai Portable

My next caller was Mrs. Pysener. Shifty and sallow, she eyed me carefully as she handed me a Nikkai colour portable. It had a silver-grey cabinet with a black back, but nowhere could I see a model number.

"Rolls" she said. "And I might as well tell you that Gumboils have had a go at it. Kept it for a month, said they couldn't get spares, charged me a fortune then kicked me out they did. I don't want none 'o that with you. I'm an old age pensioner, and my husband's got Anne Joiner."

There was an excellent picture but, as she said, it was rolling. I opened up the set and saw that just about every component in the field timebase had been unsoldered and replaced. My confidence dropped from its usual low to zero minus. I didn't have a circuit diagram and could see no sign of a field hold control. Automatic field hold circuits are not amongst my favourites. I made my way around the field timebase as best I could, looking for anything amiss, and gradually got the feeling that I'd had a set like this before, with the same fault. I pondered, then turned the front of the set towards me. It sat there on its well recessed and invisible plinth. Now what was it that I knew but couldn't recall?

Still looking at the front of the set I crouched down so that my eyes were level with the front of the hidden plinth. The rims of three thumb-edge knobs could just be seen. Two of them adjusted the colour and brightness. When I stroked the third one the picture stopped spinning. Yes, I'd had the same palaver before with a similar set and had been fooled again. Gumboils had also been fooled. I put the set back together again and reflected on the time I'd spent on it. And I remembered the time when I had a good memory. I wish I could remember where it went.

Microwaves and Mice

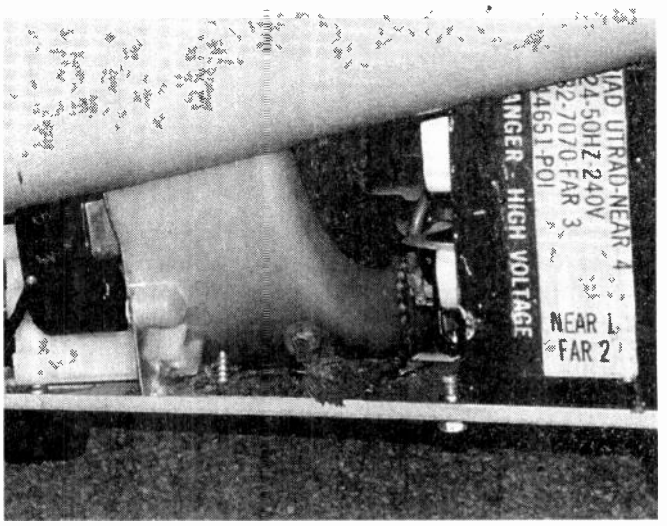
Since Steven's microwave course with Jim Garrod on the Isle of Wight we've been fairly busy with repairs. Last week we had two microwave ovens in, a Zanussi and a Tatung – so they were from totally different parts of the globe. When we opened them up we found in each the skeleton of a mouse. Both had met their ends by getting themselves across the mains input. There were other similarities. In both cases there were a few tiny maggots in the debris of the skeleton and some odd-looking beetle things – blunt and grey-brown, as big as houseflies.

Steven couldn't see how the mice could have got into either of the ovens. There simply wasn't any access. We came to the conclusion that they must have got in during factory assembly.

The Amigo A500

Finally does anyone know anything about the Amigo A500 computer? I don't. Jamie, my eleven year old son, had one given to him on his birthday. It's developed a fault: there's brightness but nothing else on the screen – and the power light doesn't come on. What can it be? He's blaming a chip that he calls Fat Agnes, but it's all Greek to me. I peeped into the keyboard and frightened myself to death.

"When I was his age" I said to Greeneyes "I had a wind-up metal fire engine for my birthday. It was called the Electronic Miracle, the electronics being two torch bulb headlights which I often broke. My father would moan about this but was at least able to mend the thing – and he was a cobbler! How times have changed.



The latest thing in hi-tech mousetraps?

Expertise at MCES

Nick Beer

A recent visit to Manchester Colour Engineering Services (MCES) at Davyhulme to see their operations was particularly interesting. I've used the company's services for many years and have always found them to be nothing short of excellent – and keenly priced.

MCES has concentrated on repairs that no one else attempts on a commercial scale. Without the know-how built up by those at MCES the repair of tuners, modulators and video heads would neither be practical nor economically viable. Others have tried and failed, through not having the right approach and/or methods. But having the necessary expertise and equipment is not enough to ensure a marketable service, i.e. one that meets a trade demand at an appropriate price. MCES has managed to do this through its excellent research and detailed knowledge of the consumer electronics industry.

With its new video heads MCES provides a product rather than a service. In this field it has much competition: success has been achieved through applying the same standards as with repairs – quality materials and attention to detail.

The Tour

I was taken on a conducted tour of the building by managing director John Ayriss who was familiar with the tasks being carried out at each workstation and the need for them. There are in every area jigs that have been purposely designed and built in-house. As no one else provides such repair services no one else makes the equipment required. We thus find control boxes that switch inputs and outputs between tuners/modulators, test equipment and monitors. There's standard equipment as well of course – sweep generators, monitors, scopes etc. – and in addition some equipment that's not commonplace in servicing workshops. Such applications have been discovered and developed by MCES. John Ayriss was able to carry out as well as explain the operations being undertaken at every point – often using jigs he had himself designed. Clearly he's no average MD!

I was continually struck by the fact that a standard service regime is applied no matter what the particular fault with an item sent for repair. For example all the electrolytic capacitors in Grundig i.f. cans are replaced and known likely dry-joints are resoldered. Instead of simply rectifying found faults, units are brought up to a standard which ensures that they won't fail again. Quite often, as with certain LNBs, this results in a unit with a superior performance, reliability and capability than the original.

Tuner and Modulator Repairs

Tuners and modulators all go through standard servicing procedures based on experience of fault conditions built up over a number of years. Once a unit is connected to a power supply, tuning voltage where appropriate, a generator and a monitor its alignment is checked and set. The output from a tuner is fed to a monitor and viewed using off-air signals – reliance is not placed solely on what the test equipment tells you. The unit is tested for mechanical intermittencies under these conditions – by means of a series of sharp taps!

A weak point with modern tuners and modulators is the built-in socket. On an average unit the mounting is best described as flimsy, with the centre pin often simply wave soldered to the PCB. MCES replaces broken sockets with a strong, solid alternative, making a very strong mechanical bond between the socket and the case.

VCR Drums

Many have questioned the wisdom of fitting new heads to video drums. The need seems to be less these days since very reasonably priced new drums are readily available both from third-party manufacturers such as MCES and the original manufacturers. The price of Panasonic heads has fallen dramatically for example. One has to be careful however. Using third-party drums of inferior quality can be a false economy – their life can be appallingly short, with the result that frequent replacement is required, while the alignment quality can be poor, necessitating extensive deck realignment for correct performance to be achieved. Apart from anything else short life can create bad feeling with customers. The benefits of fitting new heads are greater with complex assemblies that have more than the standard two heads.

The re-heading process starts with the stripped drum being thoroughly cleaned using an ultrasonic bath. Some drums are not suitable for rebuilding of course – those with digs or scratches or those that are heavily burred. In such cases MCES can usually supply an equivalent drum.

The replacement heads are obtained from the original equipment manufacturer rather than being generic replacements. This fact, in conjunction with the highly accurate alignment that follows, means that the end product is as good as the original. MCES also stocks drum spares such as relay pins and leads. These are again obtained from the original manufacturer. Some items such as small PCBs are salvaged from damaged drums, enabling a drum with a problem in this area – a crack in the PCB for example – to be rebuilt.

Head Tip Alignment

When it comes to the processes used to align the head chips on the drum one really begins to appreciate the magnitude of the investment that has been made by MCES. Two large alignment jigs dominate the video head laboratory. The older one, which cost MCES £33,000, allows both height and the projection to be aligned. The newer one, which represents an investment of £60,000, carries out projection alignment only but is much faster.

The experts at MCES carry out projection alignment with consummate ease. Monitors show the head in incredible detail, using camera microscopy. The drum to be aligned is clamped on a turntable with the microscope camera lenses diametrically opposite each other at each side of the head. Each image of the tip is fed to a separate monitor along with vertical and horizontal cursors. Digital readout counters are used for each of the three alignment adjustments.

All this enables MCES to claim with confidence that they never supply damaged heads. With this degree of precision monitoring damage of even tiny proportions is immediately evident. When alignment has been completed and the heads have been boxed they are inductance tested using Hewlett-Packard equipment that cost £9,500.

Head projection alignment starts with the tips being

moved out of view of the camera lenses so that these can be focused on the drum surface. At this point the projection counter is zeroed. The head tip is then brought back into view – this is the reason for using a turntable – and focused using a vernier adjuster. Correct tip projection beyond the rim of the drum, 45µm, is indicated by the use of a moire (interference) pattern: this occurs when the relative focus of the drum surface and tip projection are correct. The turntable then brings the second head round for alignment in the same way.

The next process is 180° differential adjustment. This ensures that the two heads are positioned on the drum exactly opposite each other diametrically, to within 1µm. The vertical cursors are used for this purpose, the heads being moved so that they sit within the tramlines.

The third adjustment is for head height. Height difference is established by first setting one head's lower edge to the horizontal cursor on one monitor. The opposite head is then brought round, the height counter is zeroed, and the lower edge of the head is focused by moving the lens to align it with the same cursor. This movement is indicated on the height counter. The difference between the heads is kept to within 0·2µm, the pair being to within 5µm of the 0µm reference.

The laboratory has a large collection of reference drums from the manufacturers. These represent, for each part number, what research has proved to be the manufacturer's average in terms of tip height and projection. This allows MCES to work to the standard thus established. The extremely close tolerances employed by MCES mean that minimal realignment is required when the drum is fitted in the VCR – assuming that a good quality head was previously fitted and that it was correctly aligned. Naturally checks should be carried out to see whether adjustment is required. MCES produced a head height wall chart (No. 3) in 1990 detailing the importance of height alignment. It was distributed to all customers at the time but is unfortunately no longer available.

Once the heads have been correctly positioned, one side at a time, using the micrometer jig and checking with the monitor and counter to confirm correct alignment, they are locked in place with a single screw while still in the jig. They can then be rechecked.

New Drums

The production of new video head drums follows the same process as the latter part of re-heading. New drums obtained from Japan have new head tips inserted and aligned. The same checks are made in the box.

Guarantee

MCES provides a 12-month guarantee with both new and re-headed drums. Drums returned with damaged heads are not covered however. Such damage is caused by clumsy fitting and can be clearly seen using the MCES equipment described above. MCES offers to replace damaged head tips at half price.

LNB Rebuilding

Virtually all the LNBs rebuilt by MCES are of Marconi origin. So this is the process we'll describe here. MCES can however repair various standard LNBs: the range includes Maspro and Nokia, all Marconi types, NJRC, Continental and Amstrad. A great deal of thought and research went into designing the LNB rebuilding process. The result is units that have greater gain and lower noise than the originals, also a closer tolerance figure and better reliability.

One of the head-tip alignment jigs.

MCES currently receives over 800 units a week for rebuilding – yes, 800! They are first stripped and the PCB is cleaned. The case is usually stripped and resprayed and the gasket is disposed of.

PCBs are manually cleaned to remove what can be a lot of corrosion – the result of weathering, water ingress and damage from various sealants. Cleaning in an ultrasonic bath follows – any badly damaged boards are discarded. A computer running PCB-test software is next engaged to diagnose any PCB problems, which are then rectified.

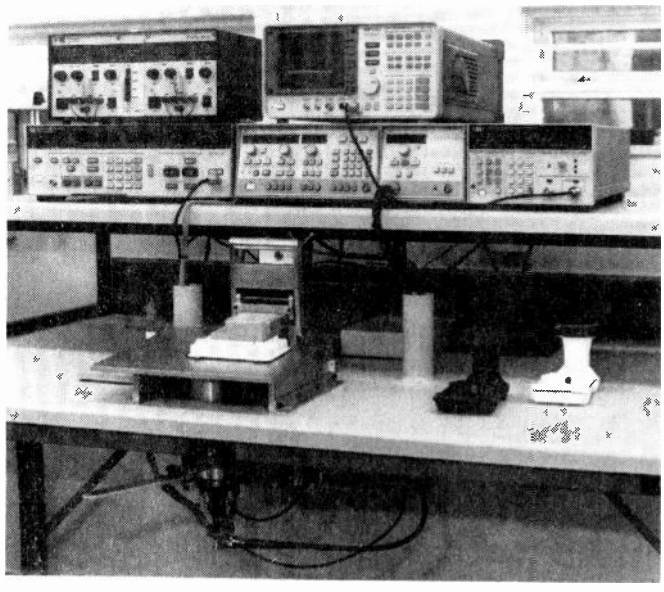
Lower noise figure, higher gain f.e.t.s (three) are then fitted at the front end. MCES has worked in close collaboration with Marconi and other LNB manufacturers to secure the right parts for the job – most are not available through normal/traditional outlets and require infra-red reflow soldering to ensure consistent results.

Reassembly

Since we are dealing with microwave devices reassembly is not just a matter of popping the PCB into the case and screwing it up. Case shape and internal volume tolerances affect the operation of the unit – not least the local oscillator frequency. A specific internal bolt tightening sequence is required to ensure correct seating of the mouldings. Strategically placed pieces of foam add to the accuracy.

The original gasket rightly comes in for criticism from MCES, which has designed its own larger, more flexible type. It's not the absolute ideal, says John Ayriss, but the silicone rubber tube type he would prefer to use simply couldn't be made to the high standard required at an acceptable cost. When you consider the results of pressure tests with the version that is used this seems to be a minor point.

The case and gasket are compressed for sealing at a force of 12·5 p.s.i. The LNBs are then tested for leakage, measurement being in c.c.s per hour. This test takes about 14 seconds and is the equivalent of the LNB sitting in two feet of water for an hour. Whilst I was present randomly selected units showed 0·00 c.c. For this test the LNB is placed on the jig by means of a probe inserted into the feedhorn. Furness Controls manufacture the test equipment used for measuring leakage – gas companies use it extensively and it cost MCES a modest £1,600. The jig to interface this equipment with LNB testing was designed by MCES. Another example of the company's ability to adapt equipment for its own special requirements.



One of the LNB gain and noise measurement systems.

Alignment

The next process is local oscillator adjustment – this is set to the very close tolerance of –1MHz, +1·5MHz. MCES points out that the tolerance of the original local oscillator setting is not at all close – units received for repair vary wildly. One does experience this, particularly with the blue-cap type, when aligning a receiver's i.f. offset to match the LNB – switch LNBs a few times and see how much adjustment is required. The fact that MCES sticks to a close tolerance standard means that when the customer receives LNBs back some alignment/tuning and i.f. offset adjustment may be required.

Gain/Noise Measurement

LNBs are tested for gain and noise figure at four spot frequencies across the band – a Hewlett-Packard noise measurement system is used. With spares backing, the cost of each of the three equipped benches is around £90,000. The idea is first to confirm that the unit performs to the broad specification MCES requires. LNBs are then classified by gain and noise figures as A or G types – A-type devices are supplied south of Stoke on Trent, G-type devices north. Both types are within specification, the subdivision ensuring that equal results are obtained from the Astra satellite's different footprint field strengths.

Testing

Every unit is run for a minimum of twenty hours in one of the numerous test bays in the MCES workshop before being released to the customer. This ensures that, as with MCES's other products, the rebuilt LNBs have an assured quality and reliability.

In Conclusion

The MCES philosophy is to provide a service of the highest standard: this is achieved by careful design of its own processes, using them to a high standard and phenomenal quality control. This doesn't mean that there are never any complaints. According to John Ayriss there's a return rate of one per cent of which over fifty per cent are faultless or have been damaged by the customer – he quotes as an example a 'faulty on fitting' video head with a damaged tip and a finger print on the drum around it.

A visit to MCES confirms its commitment and professionalism.

Ferguson ICC7 Chassis Fault Notes

Alex Mason

The ICC7 chassis is of Thomson design and is used in several current Ferguson models. We have had the following faults to date. Note that the LED mounted on the front control panel shines red for standby, green for go. It can be seen from the rear of the set with the chassis out and can help a lot when fault finding. Another point is that you can't use a bulb as a dummy load for the chopper power supply in place of the line output stage because the chopper circuit requires a 13V supply that's derived from the line output transformer and won't run unless this is present.

Dead set, no light from the LED: Check the voltage at supply pin 16 of the TEA2261 chopper control/driver chip IP01. If low at 1·6V the BA157 rectifier diode DP28 is short-circuit.

Dead set, LED shines red: First check whether the 0·1Ω surge limiter resistor RP62 in the 24V rectifier circuit is open-circuit. The most common cause of a dead set however is failure of the TDA8178F field output chip IF01. Disconnecting IF01 won't prove that it's faulty: some sets will run when it's disconnected, others won't.

Dead set, no LED light, power supply tripping: Check whether DP17 (BA157) is short-circuit. This rectifier produces the error voltage for pin 6 of IP01.

Dead set, LED red for about ten seconds then no light: Scope the line drive waveform at pin 39 of the TA8659 colour decoder/timebase generator chip IV01. If o.k. next check at the base of the BSR51 line driver transistor TL17. If there's no waveform here or a low-amplitude one check whether TL17 is short-circuit, also diodes DF16 (BA157) and DL18 (1N4148). DF16 is in the field output stage: when it goes short-circuit the 24V line rises to 65V before the set shuts down.

Top foldover: Check the 65V rail. If it's sitting at 32V either DL09 (BA157) is leaky or IF01 (TDA8178F) is faulty.

Field collapse: Check whether surge limiter resistor RL11 (15Ω) is open-circuit and/or rectifier DL11 (BA157) is short-circuit. These components are in the 200V rectifier circuit – this supply is used by the field driver stage as well as the RGB output stages. If they are o.k. IF01 (TDA8178F) has probably failed.

No NS correction: Check for –26·8V at the emitter of TG38 or TG84 (both type BD137). If this supply is missing check whether RG87 (2·2Ω) is open-circuit or TG84 is short-circuit or leaky. These components are mounted on the NS correction panel that sits at the right-hand side of the chassis.

TV Fault Finding

Reports from Philip Blundell, AMIEIE, Nick Beer, J.S Ruwala, Keith Cummins, C.R.Taylor, Brian Storm, Eugene Trundle, J.R.Cutts, Richard Newman, Mike Leach, J.K. Potts, Steve Cannon and Paul Hardy

Decca/Tatung 160 Series Chassis

Picture rolls when hot said the report with this set. Sure enough only a few seconds with the hairdryer were needed before line lock was lost. Beside the TDA4503 chip we found a tower of ceramic capacitors connected in parallel, giving a total value of 2,400pF. Fitting the correct 2,700pF Suflex type capacitor in position C113 restored temperature stability. **P.B.**

Hitachi CP14P216 (G7P Mk. 2 Chassis)

The picture on this colour portable would occasionally blank out, leaving a white raster. C711 was dry-jointed – it's by the line output transformer. **P.B.**

Philips G11 Chassis

For no line driver operation on a cold morning check that the line drive coupling capacitor C3110 hasn't dried up. **P.B.**

Philips CTX Chassis

If one of these sets comes in dead check whether R3394 or R3395 is open-circuit. These 27kΩ resistors are rated at 2·5W. **P.B.**

Grundig Remote Control Handsets

When a customer brings in a remote control unit for reassembly and you find yourself faced with the task of establishing the correct home for 29 press-buttons without another one to compare it with, you'll be glad if you have a Konig remote control book. The nice people at Konig have detailed where the buttons go on most Grundig handsets. This may apply to other makes as well. **P.B.**

Panasonic TX2 (Alpha 1 Chassis)

This set was dead because the 2SD965R standby switching transistor Q802 in the power supply was short-circuit. **N.B.**

Ferguson TX9 Chassis

The line frequency was incorrect – just lines across the picture. When the hold control was adjusted the best that could be achieved was an incorrectly phased picture with a bar down the centre. If the phase control was then adjusted line lock was lost again. A new TDA9503 timebase generator chip (IC54) restored correct operation. **N.B.**

B and O 7702 (7XXX Chassis)

The original fault with this set was that it would sometimes be dead with no standby LED display. A colleague had called to see it but on that occasion the fault wouldn't put in an appearance. So he resoldered the e.h.t. transformer and various other connections that can cause problems. Now the fault was permanent. The cause of the trouble was a dry-joint at pin 1 of the standby transformer T2 – one of the primary connections. Open-circuit windings are quite common with these transformers, especially where dry-jointed connections to the pins have been allowed to arc. **N.B.**

Grundig CUC120 and CUC220 Chassis

A Grundig Model A7400 (CUC220 chassis) came in with a field fault. When it was very cold there was lack of field scan at the bottom of the screen – the top was o.k. There was no foldover at the bottom. The cause of the fault was C2768 on the deflection PCB being rather less than the specified 100µF.

Two different deflection PCBs were used in these chassis. One has a TDA1770 field output circuit, the other one using a TDA2655B chip. We've had field distortion with the TDA1770 circuit on a number of occasions, the causes having been the chip itself, D2761 (SKE4G1/04) or R2761 (6·8Ω, 0·75W). **N.B.**

Sony KV2704

The customer's complaint was that the set didn't always start when it was switched on – he would have to operate the switch several times before the set would come on. Resistors R605 and R606 were both o.k., but the h.t. was low at only 80V. The cause of the fault was traced to C623 (33µF, 250V). **J.S.R.**

Philips CP90 Chassis

There was only half an inch of field scan, in the centre of the screen. The voltages around the field output transistors were all o.k. and the drive from the TDA2579 chip was correct. Chassis return resistor R3582 (3·3Ω) was open-circuit. **J.S.R.**

Sony AE1 Chassis

This set could be tuned in perfectly but you couldn't store the channel. As soon as the preset button was pressed the picture would be lost Replacing the M58655P chip IC003 made no difference. I then discovered that there was only –14V instead of –33V at pin 2. Coil L807 was open-circuit (the –14V was coming via a 10kΩ resistor in parallel with the coil). Incidentally the M58655P is an expensive device – the latest quote I had was £17·10 plus VAT. **J.S.R.**

Sony KVX2521U (AE1 Chassis)

This set failed with a violent flash on the screen and an ominous fizzing noise. When I powered it via a variac and an isolating transformer it tried to start then cut out. I was relieved to hear the rustle of collapsing e.h.t.: at least the line timebase seemed to be o.k. While manipulating the variac I noticed a small, twinkling spark beneath the power transformer T601. Its removal didn't reveal anything imme-

diately obvious, but when I examined it with an eyeglass I discovered that there were dry-joints where the windings are connected to pins 17 and 18, with traces of charring. Pin 17 isn't connected to anything external: it's a tie point for separate sections of the transformer's primary winding. When I'd tidied up this little mess, including sleeved joints, I refitted the transformer. A soak test proved that everything was now o.k. **K.C.**

Matsui 1460

To start with the set was dead, with open-circuit mains and supply fuses. Checks showed that the STR451 power supply chip was short-circuit between pins 1, 2 and 3, the SR2M avalanche diode was short-circuit and the 2SD869 line output transistor was low-resistance between its base and emitter. When these items had been replaced the set was powered up. It came on with normal field scanning but there was reduced width and line foldover at the left-hand side of the screen.

After checking the scan-correction circuit I found that the scan coils were arcing to the tube at the top left. Examination of the scan coils after removing them showed that the insulation had burnt with the result that the line scan coils were shorting to each other. In the past I've had noisy coils and open-circuit tag connections to windings: this is the first time I've had windings shorting to each other and arcing to the tube. **C.R.T.**

Panasonic TC21M1R (Z4 Chassis)

We've had two of these sets in recently with the same fault, a slow but sure increase in brightness, culminating in uncontrollable brightness with flyback lines. When the first one came in we carried out checks on the RGB output stage and c.r.t. first anode supplies but found no variations here. A check on the grid network on the c.r.t. base panel however showed that R380 (680kΩ) was open-circuit. In both cases removal of this resistor showed that one end had not been properly inserted through the PCB. **B.S.**

Panasonic TX25T2 (Alpha 2 Chassis)

We've had a batch of these sets in recently with the same complaint – dead with no power supply operation. The cause of the fault was in each case that D851 (C2408M) was either short-circuit or leaky. It provides the 160V supply for the line output stage.

Incidentally does anyone know of a cure when these sets lose the channel 0 or 1 tuning memory, in all cases the tuning memory being reset to 00? **B.S.**

Panasonic TXC74 (Alpha 1 Chassis)

After about twenty minutes the top of the picture would brighten and drop down about two inches, badly distorting the field scan as it did so. We could find nothing amiss in the field drive and output stages despite extensive tests. So attention turned to the scan coils which are unfortunately bonded to the A59EAK00X01 tube and are not available separately. Fortunately a local dealer was able to supply a tube from a scrapped set. Carefully removing this and fitting it to the faulty set solved the problem. **B.S.**

Mitsubishi CT2531 (Euro 4 Chassis)

Here was a case of gross deception by a TV set! The picture was covered with black dots and dashes – not unlike the "darklies" you see on satellite TV displays. They led us to investigate the tuner and i.f. departments first. At high brightness levels however the interference changed to a woodgrain pattern. This led us to suspect a beat effect between the line scan rate and the switch-mode power supply oscillator, and so it was. There was a dry-joint at pin 3 (earth) of IC902, the 12V regulator in the power supply. **E.T.**

Pioneer SD26

If the power supply section of this set doesn't work, possibly squealing, squawking or ticking, with bizarre waveforms in the chopper drive and output stages, check the 2,200µF electrolytic capacitor C852. **E.T.**

Hinari CT11

The fault with this set was tripping. It came to life (minus the tuning voltage) when any one of the plugs from the front panel was disconnected from the main PCB. We then discovered that if the base of transistor Q17 was disconnected the set would work normally. Not having the circuit diagram we don't know what this transistor does for a living, but we've since had several of these sets with the same fault. They seem to work happily without Q17 being in operation. **J.R.C.**

Sony KV1820UB

This one came in as a dead set. Because of its age we were in some doubt as to what the condition of the tube would be, but we decided to have a go at repairing it. A check in the power supply showed that the chopper transistor Q607 and the two resistors R628 and R639 in series with its emitter were all open-circuit. We replaced these items, using a BU208A in the Q607 position, then went straight to the line output stage tuning capacitor C813 (0·016µF, 1·5kV) which was o.k. The gate-controlled switch line output device was also o.k. The 330pF, 1·5kV capacitor C901, which is connected across it, was open-circuit however. When this was replaced normal operation was restored – with, I might add, an excellent picture. **J.R.C.**

Rediffusion 365138 (SP2 Chassis)

The complaint with this set was "a line down the screen and no colour". I'd not come across one of these sets before and didn't have the circuit diagram. It appears to use a Sharp chassis. I found that the fault could be cleared by tapping around the line oscillator and eventually discovered that C605 was dry-jointed. **R.N.**

Philips G90AE Chassis

This set would shut down with a ticking noise from the power supply. We found that the PCB around R3668 (150Ω) was scorched while Tr7652 (BC557C) was leaky. After fitting replacements I checked the set and found that although the h.t. was correct at 95V R3668 was still under stress, while under certain conditions the verticals were ragged. A scope check on the h.t. line showed that there was a lot of noise. The h.t. reservoir capacitor C2630 (47µF) was warm, a replacement finally putting everything right. **R.N.**

Philips FL1·0 Chassis

I sometimes think that the protection circuits in modern sets cause more trouble than the circuits they are supposed to

protect! This nearly new set was no exception. The power supply was in the protection mode. Scope checks suggested that the problem was in the EW correction circuit but this turned out to be o.k. The cause of the trouble was that T7542 in the protection circuit was leaky. We've now had this fault twice. **R.N.**

Philips 2B Chassis

Another 2B set with the power supply stuck in standby. This one could be made to function only when the gate of thyristor 6727 was disconnected. While checking around the standby control circuit I eventually discovered that D6729 had reverse leakage. The set worked normally when this diode was disconnected at one end. It actually feeds the mute circuit, to prevent plops in the standby mode. Sufficient voltage was being passed back via the diode to trigger the thyristor and put the supply into the standby mode. **R.N.**

Tatung TUV9731 (170 Series Chassis)

The problem with this 21in. text set was no tuning from cold. When it had warmed up a bit the tuning would start to work and a normal picture would appear. In the fault condition there was no tuning voltage: the 33V supply was present at pin 17 of the SAB3035 tuning chip but there was no tuning output at pin 15. The chip itself turned out to be o.k., the culprit being the associated 4MHz crystal X001. I used a replacement from a Ferguson satellite TV receiver that was looking rather unwell after mains transformer failure (it uses the same chip and crystal). When this crystal had been fitted the set worked perfectly whether cold or warm. **M.L.**

Samsung CI3312Z

There were signs of a burn up in the line output stage. After replacing various components here we switched on. A loud bang and a bright flash from two of the resistors we'd replaced woke us up. The set continued to work, but the picture was oversized and there would occasionally be arcs from the two resistors previously mentioned. A check on the h.t. produced a reading of 157V at the minimum setting. The manual specifies 125V at D821. The cause of this high voltage was that R807 had increased in value from 11kΩ to 19kΩ. A replacement restored normal operation. **M.L.**

Panasonic TX1752 (U5 Chassis)

The complaint with this set was that there was no picture for thirty minutes after switch on. It then worked perfectly. On the bench we found that this was so – there was no luminance. A lot of time was wasted freezing and testing components in this area. To cut a long story short. the cause of the fault turned out to be hardly visible dry-joints on the pins of the line output transformer. Resoldering provided a complete cure. **J.K.P.**

Panasonic TX24A1 (Alpha 2W Chassis)

This set had an overloaded power supply: it was squealing and the h.t. line was very low at only 25V. A fault in the line output stage was suspected, and indeed disconnecting the supply to it and connecting a dummy load in its place produced the correct h.t. voltage. No obvious shorts could be found, and the line output transistor seemed to be fine. So the line output transformer was suspected – we've had it fail on a few occasions in this chassis. Before replacing it however we thought it a good idea to fit a new output transistor, just in case. When checked out of circuit the old transistor gave the same readings as the new one. But they do give odd readings – about 100Ω across the base-emitter junction, presumably because of an internal resistor. Anyway after fitting the new 2SD1441 the set sprang to life, with the correct h.t. voltage etc. This didn't provide a complete cure however. According to the set's owner it went off again an hour after being returned.

It came back with the same symptoms – low h.t. and squealing. When another 2SD1441 line output transistor had been fitted the set worked all right, and once again the old transistor compared perfectly with a known good one. I assumed that the cause of the fault was base-emitter junction breakdown, but why? – with the internal resistor you can't check the junction in the normal manner. Tracing the base print connection back to the line driver transformer solved the problem: the chassis side of the winding was dry-jointed. Resoldering the transformer connections provided a complete cure. **S.C.**

Panasonic TC21R1 (Alpha 2 Chassis)

"Colour fault" it said on the job card. When I switched the set on I was surprised to see running through the picture the horizontal green and magenta bars you get when the reference oscillator is misadjusted. So I adjusted the trimmer, C637. This altered the frequency but the oscillator wouldn't lock.

To set the oscillator, pin 11 of IC601 must be shorted to chassis. As many an engineer knows, when you do this the effect is as described above.

Now what component is connected between this pin and chassis? Something that could perhaps become leaky? Who said a 10nF ceramic capacitor? Full marks to that person. Yes, the 10nF ceramic capacitor strikes again in yet another position. C642 was the culprit, a replacement soon restoring colour to everyone's cheeks.

These little items seem to be everywhere in Panasonic sets, just waiting to become faulty and give the unwary service engineer a real headache. As I've said before, if in doubt check your 10nFs. A faulty one usually measures between 100Ω and 1kΩ. But the force used to get the capacitor out can result in the short disappearing, thus adding to the confusion. **S.C.**

Sony KV2096

The line output transistor was short-circuit and the 1·25A fuse had blown. As no obvious faults were found these items were replaced. At switch on the transistor instantaneously went short-circuit, the power supply making no attempt to trip. I removed the transistor and checked the h.t. voltage, using a 60W bulb as a load. It was correct at 115V. The line drive was then checked. There seemed to be plenty of oomph, though the waveform was misshapen due to the absence of the line output transistor. The flyback tuning capacitor and the various protection capacitors around the line output stage were next checked but no faults could be found. Changing the line output transformer finally provided a cure. **P.H.**

Ferguson 16A2 (TX90 Chassis)

This set had terrible field linearity. The cause was the 68V zener diode D137 between the collector of TR105 and chassis – it was leaky. This zener diode is not present in the smaller-screen versions of the chassis. **P.H.**

Battle with a Solavox VCR

Dave Mackrill

"It won't play at all now" complained the lady owner, "and it had been going so well." The machine was a Solavox Model NCVR5000. When I unscrewed the case the machine looked like certain Sentra and Alba models, and I noticed a familiar Panasonic 777-type reel idler.

I loaded a cassette and, guess what? – the machine played perfectly. So I left it playing while I sorted out another machine. When I returned to it the test tape was almost at the end. I pressed rewind and left it running, but it stopped sooner than I expected. This time the tape was right at the end. Thinking that I must have selected fast forward by mistake, I pressed rewind again. Nothing happened. I ejected the cassette, loaded a different one and pressed the fast forward button. As the tape wound forwards normally I stopped it and once more selected rewind. The machine had other ideas however: it still wound forwards!

Fault Finding

I managed to borrow a service manual from Vic down the road. It bore the model number VCR-30DAP but no brand name. The "servo-logic" PCB is under the PIF (tuner/i.f.) PCB on the right-hand side. After consulting the "U501 logic circuit" I eyed with suspicion the PU4310 reel motor drive chip IC606, which is near the rear heatsink. I decided to start at the other end however and stuck my digi meter across pins 7 and 8 (see Fig. 1) of the large MN1522-0231 microcontroller chip IC601.

As expected, in fast forward I got a positive voltage at pin 8 with respect to pin 7. In rewind however there was a positive voltage at pin 7 with respect to pin 8 but it was only about 2V instead of the 3·8V shown on the circuit diagram. When I checked from pin 8 to chassis in this mode the reading was over 1V instead of zero or 0·1V.

I disconnected the 10kΩ resistors R636 and R641 that apply bias to the KTC1815 polarity switching transistors Q609 and Q610 and checked the voltages again in both modes. This time the voltages at pins 7 and 8 were normal, the appropriate pin being pulled up to the positive supply line voltage by R663 or R664 when the other one is taken to zero or 0·1V by the switching action of the chip.

Q609 is obviously leaky I thought as I unsoldered and removed it. But no, it was o.k. Maybe something was wrong with Q610 then. It tested o.k. however. I refitted the transistors, reconnected R636 and R641 and then unsoldered the control pins 2, 4, 6 and 8 of the reel motor drive chip IC606. This made no difference. Lots of other tests on components and sections of the circuitry were then carried out, proving conclusively that IC606 was blameless. I finally removed C606 (0·01μF). Bingo! It had a 7kΩ leak. I then checked C607 which read 17nF instead of 0·01μF on the capacitance meter.

To be on the safe side both capacitors were replaced with nice new 0·01μF, 350V types. Fast forward and rewind were then o.k. but a bit sluggish. So a new reel idler was fitted. A deck service completed the repair.

Chewed Tapes

This was not to be the end of the story however. A fortnight later the machine was back with two damaged tapes. Why always two? I checked fast forward and rewind, and the take-up torque in the play mode. As the latter seemed slightly weak the idler was again changed. This improved matters a bit, but I was still not happy.

Suspecting the reel motor, I noticed that it was a special "fat-looking" type. The day was saved however when I discovered that the manual mentions a "reel motor current" (torque) adjustment. So I connected the meter's positive lead to TP601 and its negative lead to TP602, i.e. across the 1Ω, 1W reel motor and drive circuitry current sampling resistor R644 on the servo-logic PCB, put the machine in the still mode and adjusted R649 for a reading of 190mV.

This must be a sort of "quiescent current" state. At last I

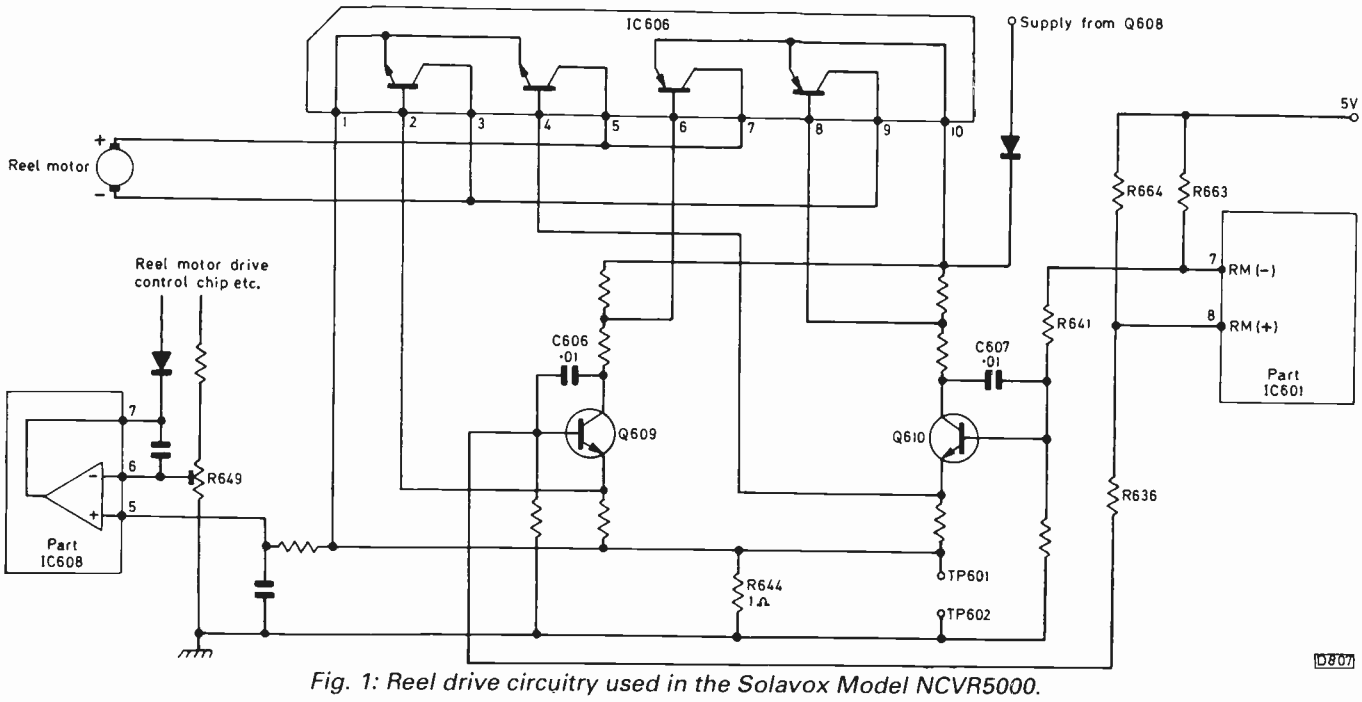


Fig. 1: Reel drive circuitry used in the Solavox Model NCVR5000.

was rewarded with good take-up torque plus powerful fast forward and rewind. Potentiometer R649 is at the right-hand edge of the board and can be tweaked without removing the tuner/i.f. panel.

Presumably the reel motor had been a bit tired after all the excitement, though its spindle seemed free enough. Or perhaps its commutator had become sooty. So I made a note to warn the owner that a replacement motor might be needed before very much longer.

As the two damaged tapes were new I cut out the mangled sections, unwound the tape back to the take-up spool leaders and respliced them. The lady was pleasantly surprised to get them back, albeit with labels attached warning that they were no longer three-hour cassettes.

Editorial note: The Mauritron Technical Publications *Video Recorder and Camcorder Equivalents* book MTP-143 lists the following equivalents of the Solavox NCVR-5000: Nikkai NVR-500RC; Sentra GX8000; Alba VCR3000X, VCR4000X and SVC7414.

Letters

CUSTOMERS WE COULD DO WITHOUT

I seem to get more than my fair share of customers with silly or unusual requests. Here are some examples.

The phone rang and I answered it. "Do you repair videos?" a voice said. "We do, what make is it sir?" "VHS" he replied. When I tried to explain that VHS is a system, not a brand, he just replied "well it says bloody VHS on the front" and put the phone down.

A customer came into our shop and bought two 3·15A fuses. He came back ten minutes later and demanded a refund. When I asked why, he placed two blown fuses on the counter and said "they're faulty – they keep blowing". I pointed out that fuses do tend to blow when there's a fault. He said something I dare not type and left the shop.

A customer came into the shop, looked around and approached the counter. When I said "good morning, sir, can I help you?" he replied "do you sell radio paint?" I stood there and thought why me? but replied "I'm sorry sir, we don't have any in stock". The customer thanked me, left the shop, stopped, turned around and came back in. "Do you know anyone who might have some?" This was too good to miss, so I sent him to the butcher's down the road. I learnt later that he'd gone there and asked for some purple radio paint.

A customer bought a pair of headphones and returned next day complaining that there was no sound. When I asked him how he was using them he placed them on his head and held the 3·5mm jack plug up, saying "there – it still doesn't work".

I was serving in the shop one day when a rather scruffy bloke came in, walked up to the counter and said "do you have any Calor gas portable TVs for my caravan?" When I told him I didn't he asked "well have you got a car exhaust centre piece for my hot-air balloon?" I tried to explain that he was in the wrong shop but he threw a fit and left.

Radio paint came back on another occasion. He pointed at a short-wave radio on display and said "they're Japanese, aren't they?" When I confirmed that they were he asked "can they receive foreign English?" "Yes" I said. "do you want to buy one?" He said no and promptly left, never to be seen again.

I keep thinking why me?!

P.J. Roberts,
Fishponds, Bristol.

COULD DO BETTER

What's wrong with our industry? Last week I had occasion to send away to Akai UK Ltd. for some parts. The order was sent on the appropriate letterhead paper with clear instructions as to the parts required and the customer's cheque for the correct amount. I waited and waited, then phoned and was assured that the parts would be sent on receipt of the order. Then lo and behold a letter came from Akai to say "sorry, but we don't supply members of the general public". Result, one angry technician and one very irate customer.

When I enquired further I was told that the letterhead was printed by a computer and not a printer. I explained that I'd bought the computer for business use to save me money and time. Therefore I print my own letterheads, photocopy them and save god knows how much. Not good enough said Akai. Moral, don't believe that a computer will save you money, or that ordering parts is easy, quick and efficient.

Another thing I've noticed is that when phoning about or ordering the cheaper (special offers) ranges of spares or test equipment all too often you can't get them. A recent encounter was with Willow Vale. I phoned about a capacitance meter at £32·50, order code 12168. "Yes" I was told, "we've eight in stock." So I hot-footed it over to Reading, with the cash in my hot, grubby fingers. When I got there half an hour after phoning I was told not only that they didn't have any but that they don't sell them! I was offered one at £82.

Tut, tut, boys! It wasn't the first time, in dealings with many firms, that this sort of thing has happened.

D. Maitland Hill, DMH Electronics,
Basingstoke, Hants.

ANY SUGGESTIONS?

You've published several informative articles (e.g. September 1992) on removing and replacing surface-mounted devices. I can't however recall having seen anything on removing conventional components from plated-through-hole (PTH) PCBs. I'm involved in servicing car radio-cassette players and it's a problem I come across quite often.

One way to remove say a DIL chip is to remove the solder from the holes, around the component legs. I've tried desoldering braid, an Oryx pump and a combined pump and soldering iron of the type supplied by Willow Vale. They all work quite well – sometimes! If the solder is removed at the first attempt all is well. If not, repeated applications fail to remove the solder cleanly. I've tried using extra flux (RS 555-869, which is very good for normal purposes) but this often makes matters worse. I intend to try using a hot-air tool, which I feel will be successful where the device concerned is mounted so that it can be heated without damaging other components.

This won't however provide solutions to two of the most intractable problems I come across when working on some Philips car radio-cassette players (22DC681 for example). It's often necessary to replace lamps in these. This involves removing the front, vertically-mounted PCB from the main, horizontally mounted PCB. There are many interconnections between the two – the front unit contains the LC display and push-buttons and is very difficult to remove. It's not possible to use a hot-air tool here as there are plastic parts that would

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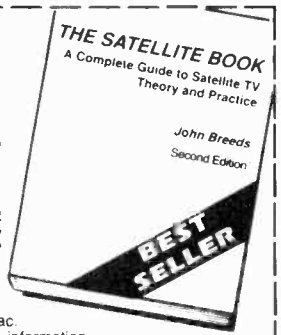

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be damaged in the vicinity. The connecting pins are of square section: the problem is in getting the solder from between the four corners of the square and the hole. The job would be easier if the pins were a loose fit in their holes. But they are usually a fairly tight fit.

The other problem is removal of the output chips, which are mounted on a plastic frame before insertion into the PCB. This frame spaces the leads accurately and makes fitting them into the board easy, but the frame fits right down on to the PCB, effectively blocking the plated-through holes. This makes it difficult to remove solder from the other side because air can't enter. When a pump is placed on the other side and its plunger is released the latter rises only very slowly, as air leaks in. There isn't enough "suck" to remove the solder.

I'd be very interested to hear from anyone who has solutions to these problems – ones that give good, clean results and don't require investment in expensive equipment.

G. Davies, Geoff Davies Radio,
Rugby, Warwicks.

THOSE BRASS BUSHES

With reference to Chris Watton's note on Sharp/Orion decks (December issue, page 96), the brass bushes are available from Willow Vale Electronics (stock no. 27998KT) and cost around 80p. The kit comes with a black washer and knurled brass bush. As the bush is a loose fit on the motor shaft I use a very small amount of fast-drying Araldite to secure it. I always replace the bush and fit a new reel idler (genuine type only) and find that this provides a one hundred per cent cure with no comebacks. The bush will fit Orion/Sharp/Amstrad and any other similar decks.

S.J. Caine, SJC Electronics,
Chippenham, Wilts.

AN UNUSUAL FAULT

A customer recently brought us a Boots Model CTV1410 (Tatung 160 chassis) with a most unusual fault. The picture geometry was correct from top to bottom but was cone shaped between the sides of the screen, absolutely symmetrical and with straight sides. The picture width at the top was almost correct, but at the bottom it was only half the width of the screen.

All the waveforms in the line and field output stages were correct. We replaced various capacitors in the line output stage, more in desperation than anything else, to no avail. When contacted Mr. Tatung thought that it might be the scan coils, but admitted that he didn't know. Nor did I. Eventually, while showing a visiting engineer the fault, the set emitted a fizzing sound and a dark brown smell! The picture corrected itself except for a slightly ragged right-hand edge and an unlocked frame. The line output transformer was cooking, a new one solving the problem.

As this was such a strange performance I thought others might like to know about it.

P. D'Alquen, D'Alquen and Blackburn,
Pickering, N. Yorkshire.

POLARISER MODIFICATION

The bit about the ITT Nokia SAT1100 modifications in the nuary Satellite Notebook caught my eye. I've just modified receiver as follows. By placing a low-value resistor in es with the 17V d.c. applied to the LNB, horizontal chan- were received all right. So a relay, powered by the ser signal, was used to short out the resistor, making all

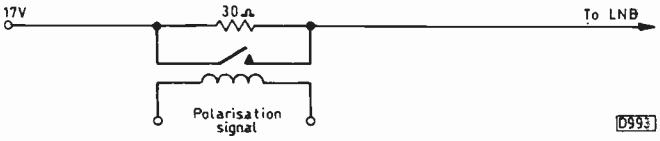

Fig. 1: Simple polarisation modification for the ITT Nokia SAT1100.

channels available from the handset. I used P0 for vertical polarisation, P4 for horizontal. Fig. 1 shows the circuit.

Mark Adlington,
Sawtry, Cambs.

Nick Beer comments: A simple and effective idea. The design lacks regulation, and in production terms has the disadvantages of the mechanical unreliability introduced by the relay and the heat dissipation introduced by the resistor. But as a personal modification it's great!

A BBC B COMPUTER FAULT

Thank you for Arthur Rumbelow's article on the BBC Model B computer (January). The following power supply fault I had recently may be of interest to others. At power up the computer sometimes just beeped continuously, with all the LEDs flickering. Eventually the fault became so bad that my son demanded action! On investigation I found that in the fault condition all the power supply lines were low. The cause of the fault was C9 in the power supply going low in value. It's mounted next to a resistor that runs quite warm, so the fault could become a common one as these power supplies age.

Paul Hardy,
Reading, Berks.

CAMCORNER

With reference to the problem with a Ferguson GRC7/Ferguson 3C03 described by David Woodnott (January), JVC have available a Focus Helicoid Kit for this model. Its cost is very small compared to that of a new lens. If the focus assembly of a lens is crossthreaded because of impact damage it's not good practice to reverse the situation by further application of force. The focus drive is very light, and damage to the focus assembly threads often causes intermittent lens jamming.

Steve Beeching,
Newark, Notts.

CAMCORDER BATTERY PROBLEMS

I was very interested in the Test Case 361 (January) reference to failure of an auxiliary 6V supply to operate a camcorder. Early last year I purchased a Panasonic NVS5B palmcorder in a bit of a rush for a particular purpose. Many others will know what I am about to say – that the batteries are a pain in the er. . . neck. It says quite clearly "6V DC batt operation" on the base of this camcorder, under the model number, and at the rear where the battery clips on it says "DC IN 6V" – I feel sure that this refers to the d.c. input socket from the mains power pack. Neither of the two camcorders that I have had (one was exchanged because of a fault) will operate with a 6V supply however. As a nicad battery let me down I purchased and fully charged a 6V 7Ah lead-acid battery but was again thwarted.

On investigation I found that the camcorder requires something like 6·1V to operate, consuming about 1·1A in the record mode. By monitoring the voltage (7·2V) produced by

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a fully-charged 6V, 1·8Ah battery I was able to establish that the camcorder shut down at just over 6V. A check with a nicad battery, discharging it through a fixed wire resistance at the same current (1·1A), showed that it took about fifteen minutes for the output voltage to drop from 7·2V to 6·1V, the camcorder's cut-off point. The voltage then stayed at 6V for just about the length of time that it should have done. Had one been able to reduce the camcorder's cut-off voltage to say 5·9V then, all things being equal (temperature, battery properly discharged/charged and so on), it would have been possible to get a full 45 minute recording with the battery supplied instead of the ten minutes that was all I was able to get. In view of this wouldn't it have been better to specify a 7·2V nicad battery instead of a 6V one?

With any type of battery for which there is a stated Ah discharge rate, surely if it won't give the stated voltage while delivering the stated current for the stated time it shouldn't claim to be able to do so?

A further point with nicad batteries is the so-called memory effect, caused by topping up the charge after a short period of use. The instruction on my spare battery states "fully discharge before recharging". To me this suggests that the battery should be discharged using a suitable bulb until this fails to glow. With my Panasonic camcorder however the automatic mains charger/power supply, which has a built-in automatic discharge and recharge feature, has 5·62V as the quoted discharge point, which I wouldn't call anywhere near "fully discharged". So who is right?

I resolved my battery problems by purchasing another 6V 7Ah lead-acid battery, connecting the two batteries in series then using a regulator to supply 7·2V, which is the starting point with a charged nicam battery. The lead-acid batteries can discharge to approximately 9V before the regulator action fails. This has enabled me to spend all day filming without having to worry about battery failure. If I need to do so I can recharge direct from my car cigar lighter. The only problem is the extra weight I have to carry, but this can be put down whilst filming.

I would welcome other people's views on these points.

John F.J. Kendall,
Herne Bay, Kent.

HELP WANTED

Can anyone supply a scrap Ferguson 1790 chassis or alternatively the sound demodulator can (part no. 06D0-214-002)? Roger Burchett, 12 Ormonde Road, Hythe, Kent (0303 267 969).

Wanted, Philips VR2022/05 VCR, working or non-working. G. Angelini, 853 Govan Road, Glasgow G51 3DL (041 445 2663).

Wanted, TV coin-operated meter boxes, preferably Smiths or Coinmechs, £1 or at least 50p type, or any other make as long as they are supplied with keys. G.H. Jones, Einion Electrics, Bridge Street, Llanfair Caereinion, Powys SY21 0RZ (0938 810 539).

Can anyone supply the transcoder that plugs into the back of the Pye/Philips 20VR22 VCR to enable it to be used with remote control? Barry J. Carleton, 0624 824 646 daytime, 0624 833 702 evenings.

Can anyone supply new or secondhand a front panel (operation panel) for the Amstrad SRX200 satellite TV receiver? The Amstrad part no. is 240068 – it's apparently no longer available. Philip Pick, Sight and Sound, 1 Stonewall Cottage, Hill Top Farm, Caythorpe Heath, Caythorpe, Lincs NG32 3EU (0400 73448).

Required, an oil-filled LOPT for the Murphy V310 dating from circa 1957. N.F. Plant, 3 Arthur Moody Drive, Carisbrooke, Newport, Isle of Wight (0983 520 087).

Can anyone supply Module CMR800 (the r.f./i.f. unit) for the ITT Model 1600/1? Also loan of a manual for the set would be appreciated. V. Jeremy, 7 Tai Penyard, Penyard, Methyr Tydfil, Mid-Glamorgan, S. Wales.

Wanted: Circuit diagram or other service information for the Network 14FRE colour portable. E.J. Edwards, FFF, 7 Field House, 2A Low Wood Road, Birkenhead, Merseyside L41 2SR. 051 647 5156.

Wanted: A service sheet or photocopy of the manual for the Sony Model KV2782 multistandard TV set. Will pay reasonable price. D. Benyon, Marshland View, St. Anne's Hill, Bude, Cornwall EX23 0LT. 0288 353 373.

Can anyone supply a rear cover for a Philips G6 set – Model G25K502 or similar – and perhaps some salvaged parts? Brian Renforth, 174 Helmsley Road, Sandyford, Newcastle-upon-Tyne NE2 1RD.

Wanted: 50MHz bandwidth oscilloscope. G. Cannon, 16 St. Cuthbert's Road, Holy Cross, Wallsend, Tyne and Wear NE28 7JF. 091 262 0712.

Can anyone supply a front control panel – on/off switch, tuning, etc. – for the Rediffusion Mk 4 chassis type 564058 (teletext)? H.S. Downing, 16 Mayfield Crescent, Lower Stondon, Henlow, Beds SG16 6LF. 0462 850 244.

Has anyone a circuit diagram for the Akura CX10 colour TV receiver? D.J. Long, 15 Wellholme, Brighouse, W. Yorkshire HD6 4AF.

Wanted: Circuit diagram for a Philips PM3225 oscilloscope and a line output transformer for the Hinari TV-VCR Model VTV200. G. Howes, 5 The Firs, Worlingham, Beccles, Suffolk NR34 7DP. 0502 713 942.

Has anyone a stock of LOPTs for the Panasonic U3 chassis? Roger Burchett, 12 Ormonde Road, Hythe, Kent CT21 6DN. 0303 267 969.

Does anyone know of a source of remote controls and/or AV adaptors for Philips V2000 series VCRs? S. Sheppard, 12 Bedford Road, Harrow, Middx HA1 4LZ. 081 863 5150.

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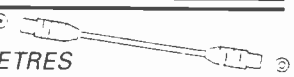

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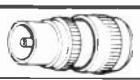

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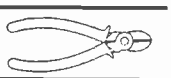

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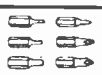

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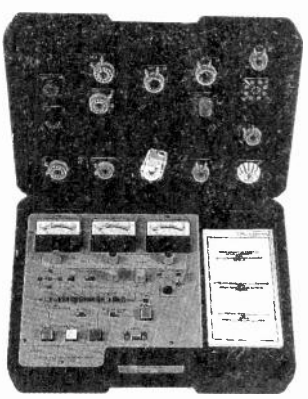

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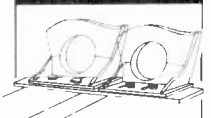

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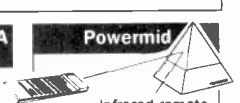

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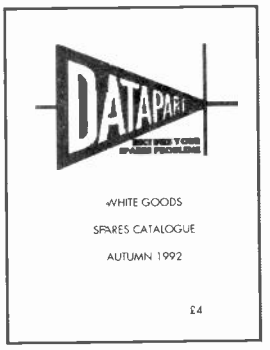

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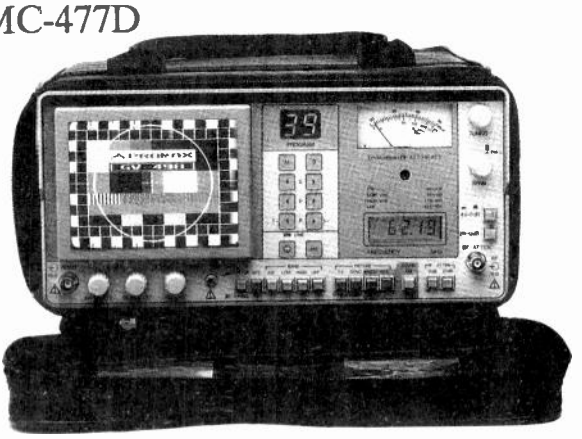

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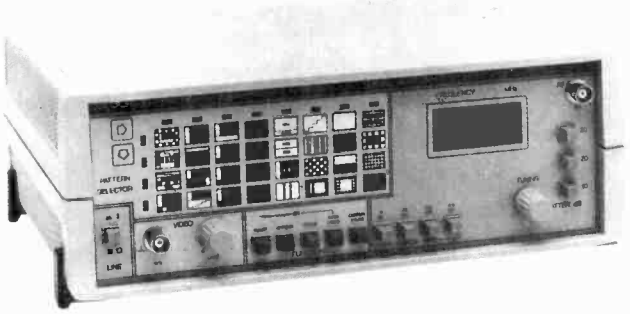

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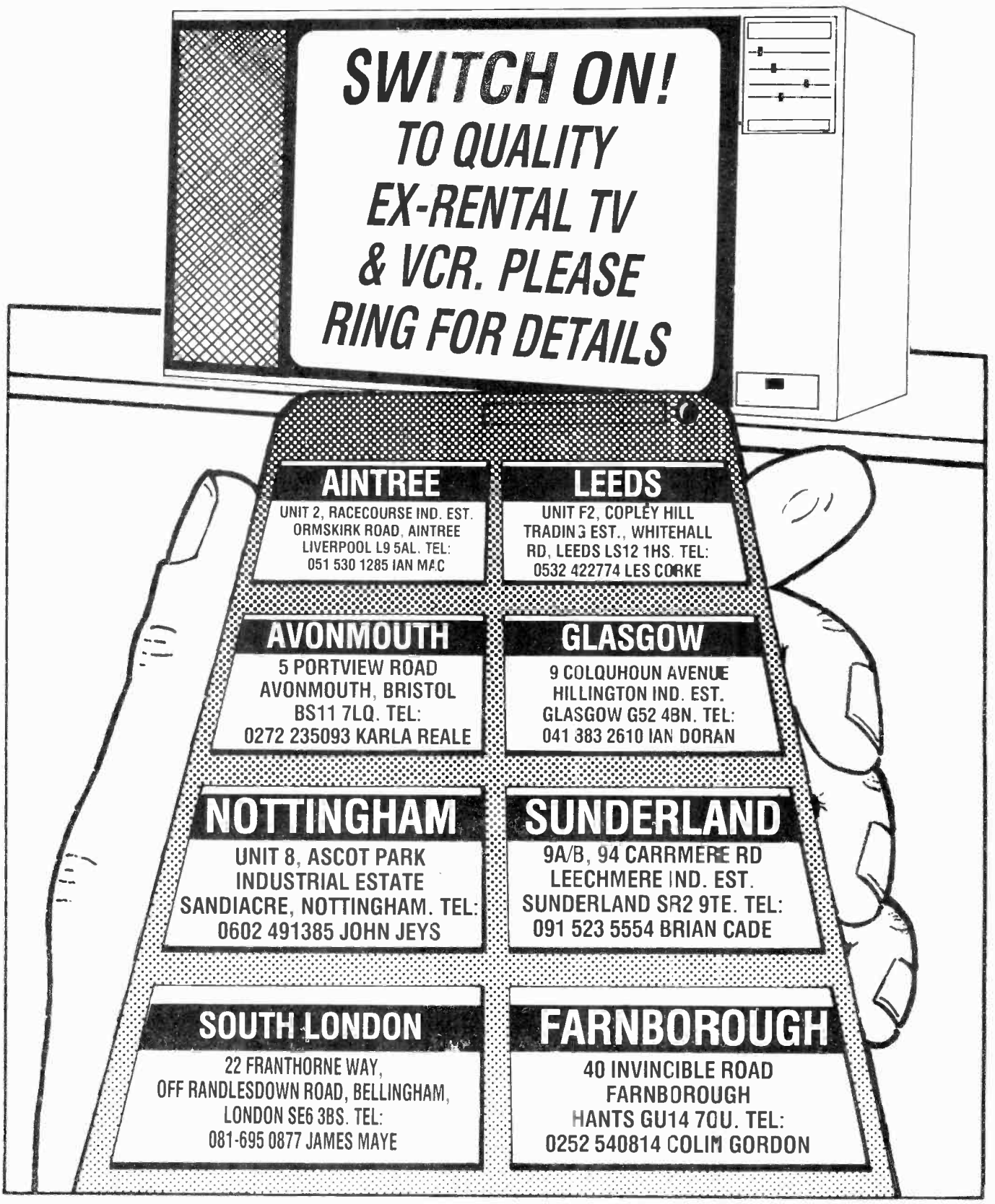

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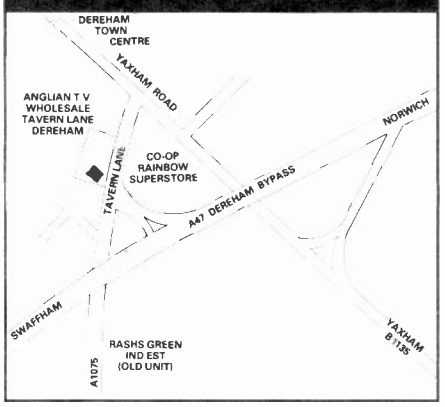

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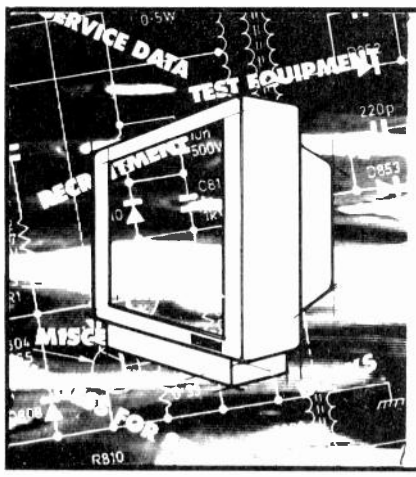

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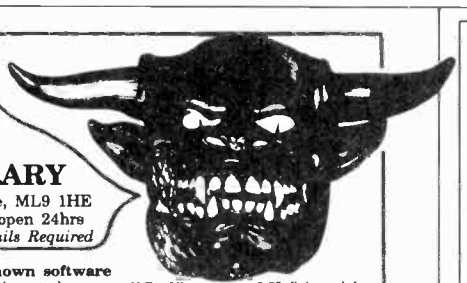

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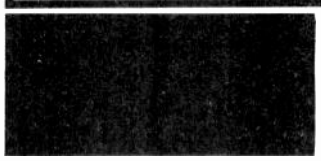

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BD439	30p
BD439	50p
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TDA2581	£2.00
TDA2591	£1.00
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TDA2611A	£1.00
TDA2611AQ	£1.00
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TDA2653	£4.00
TDA2640	£2.00
TDA2593	£1.00
TDA3047	£1.00
TDA3048	£3.00
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TDA3190	£1.00
TDA3300B	£5.00
TDA3301	£3.00
TDA3505	£3.00
TDA3506	£3.00
TDA3561	£3.00
TDA3560	£4.00
TDA3561A	£3.00
TDA3566	£3.50
TDA3564	£4.00
TDA3565	£3.00
TDA3571A	£2.75
TDA3581	£3.00
TDA3590	£3.00
TDA3591	£1.00
TDA3592A	£3.00
TDA3650	£7.00
TDA3651	£3.00
TDA3651AQ	£3.50
TDA3652	£3.50
TDA3653AQ	£2.00
TDA3654	£2.00
TDA3654Q	£2.00
TDA3710	£3.50
TDA3800	£4.00
TDA3180	£2.00
TDA4260	50p
TDA4501	£3.00
TDA4505N4	£3.00
TDA4420	£2.00
TDA4439	£2
TDA4600	£3.00
TDA4601	£2.00
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TDA8703	£3
TDA9403	£1.50
TDA9503	£3.00
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TDD1610S	50p
TDE306P	£2.00
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MJE511	25p
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MJE660	25p
MJE661	25p
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A1223	25p	BF182	20p
A1233	25p	BF184	20p
AC106	25p	BF194	10p
AC121	25p	BF195	10p
AC124	25p	BF196	10p
AC128	25p	BF197	12p
AC137	25p	BF198	10p
AC151	25p	BF199	10p
AC131	25p	BF200	20p
AC138	25p	BF222	10p
AC152	25p	BF224	15p
AC153K	25p	BF238	20p
AC142K	25p	BF240	16p
AC169	25p	BF244	40p
AC176	25p	BF245b	20p
AC178K	25p	BF255	20p
AC179	25p	BF256	20p
AC186	25p	BF257	20p
AC188	25p	BF258	25p
ACY21	25p	BF262	15p
AD143	50p	BF263p	25p
AD149	50p	BF264	15p
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BF137	20p	BF394	10p
BF157	20p	BF419	30p
BF160	20p	BF422	15p
BF161	20p	BF423	15p
BF164	60p	BF448	30p
BF179	30p	BF470	30p
BF180	20p	BF471	30p
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90D4-106-003	£1.00
90D3-038-001	£5.00
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I.C.s

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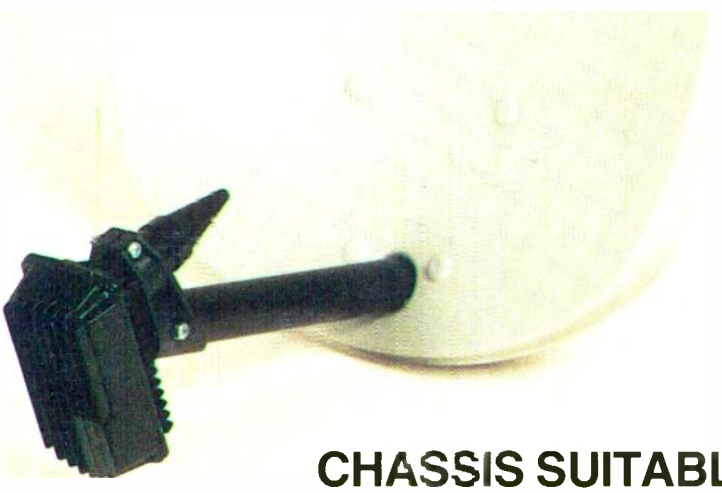

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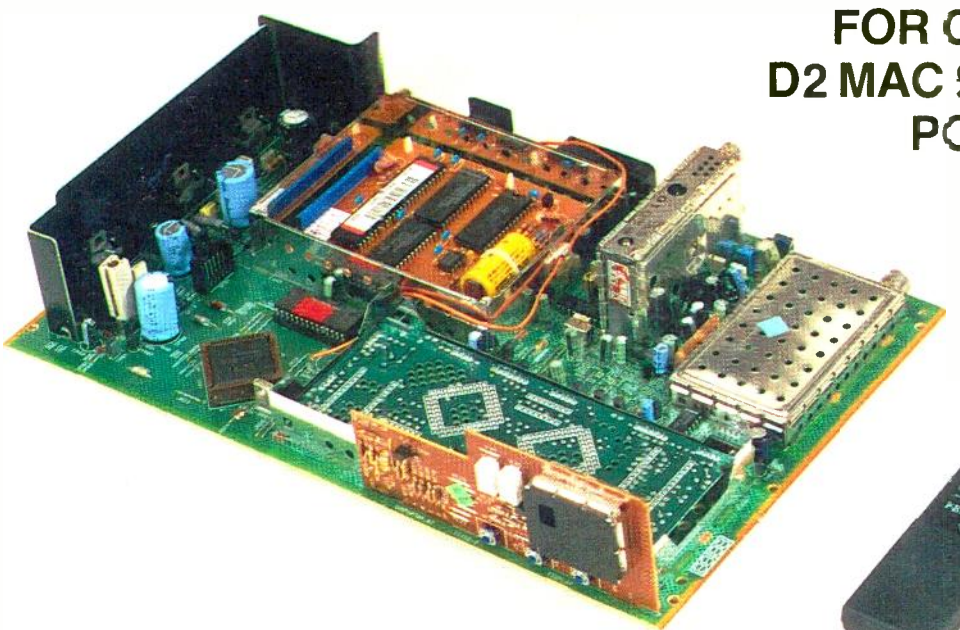

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