JANUARY 1992 £1·95

TELEVISION

SERVICING · VIDEO · SATELLITE · DEVELOPMENTS

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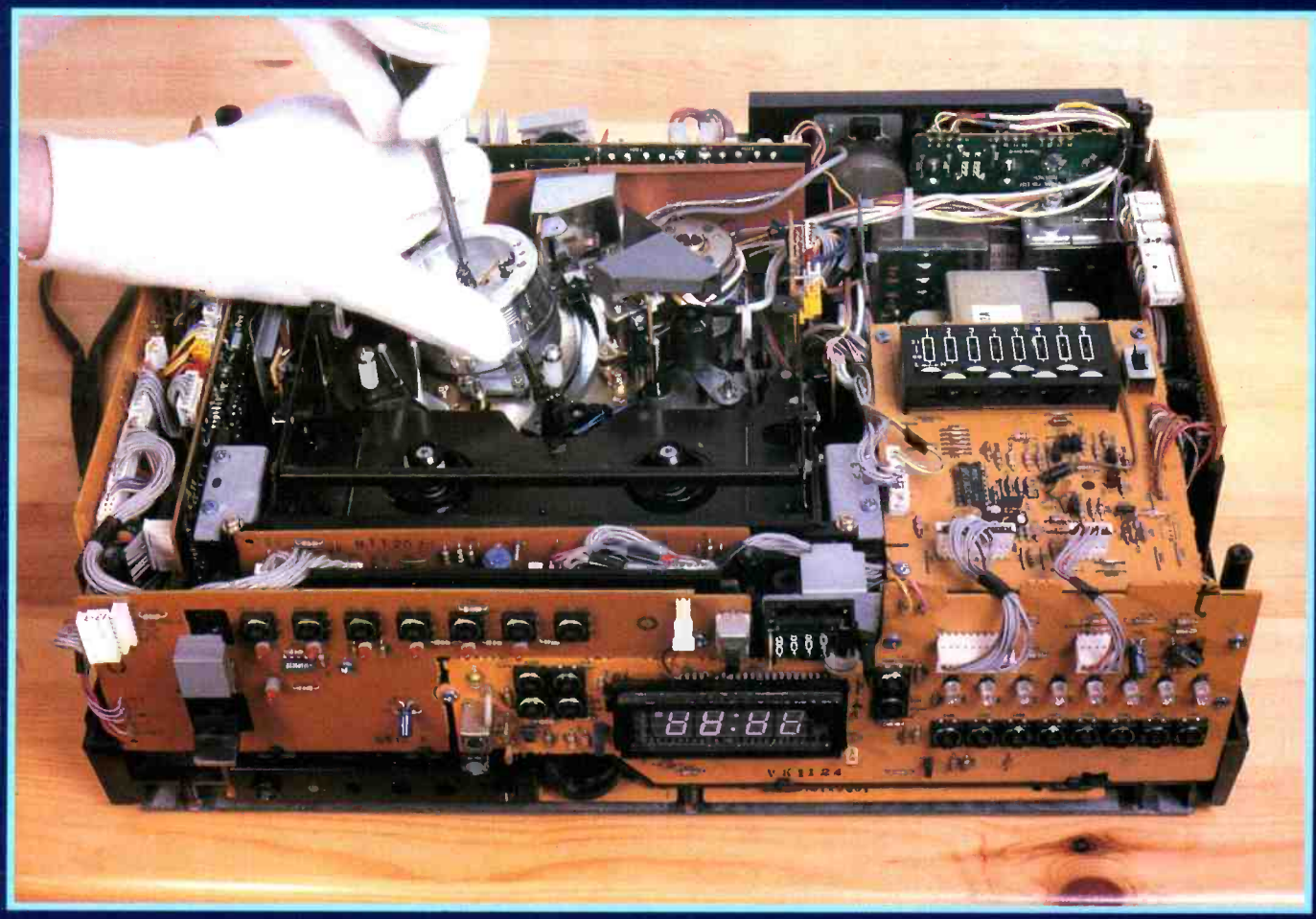

Servicing the Ferguson 3V29 VCR
The B and O Link System • DX-TV
Camcorder and CD Player Servicing
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TV Fault Finding • VCR Clinic

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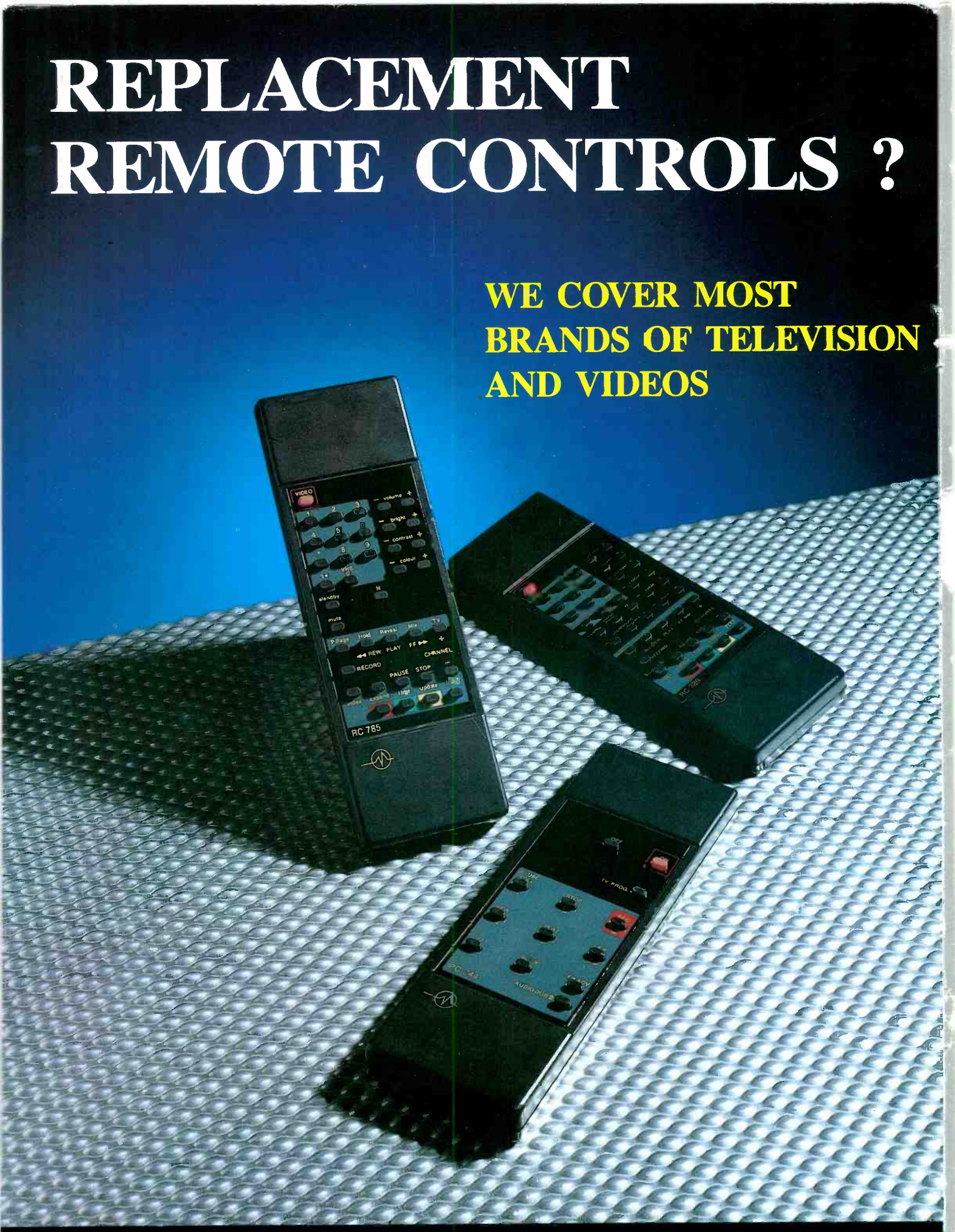

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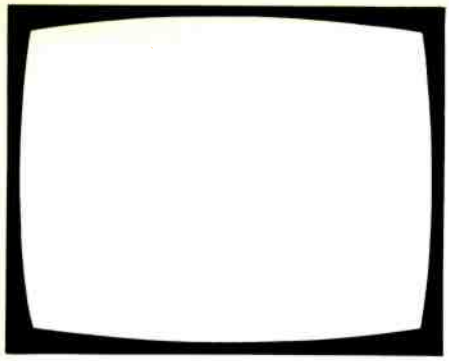

TELEVISION

January 1992

Vol. 42, No. 3 Issue 495

On sale December 18th

CORRESPONDENCE

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 Dept., Reed Business Publishing Group, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

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Indexes to Vols. 37 and 38 are available at £1 each from the Editorial office (address above). Photostats of the indexes to Vols. 31-36 can be supplied at £1 each. Make cheques etc. payable to Reed Business Publishing Ltd.

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We regret that we cannot answer technical queries over the telephone nor supply service sheets. We will endeavour to assist readers who have queries relating to articles published in *Television*, but we cannot offer advice on modifications to published designs nor comment on alternative ways of using them.

this month

OUR NEXT ISSUE DATED FEBRUARY WILL BE PUBLISHED ON JANUARY 15

AAY32	9p
AC107	40p
AC125	30p
AC126	30p
AC127	30p
AC128	35p
AC128K	40p
AC141K	45p
AC142K	45p
AC176	22p
AC167K	28p
AC187	25p
AC187K	40p
AC188	25p
AC188K	40p
ACY18	48p
ACY19	48p
AD149	60p
AF125	50p
AF127	50p
AF139	30p
AF239	30p
BA145	10p
BA148	10p
BA145	6p
BA157	12p
BB105B	18p
BB205B	24p
BC107	8p
BC108	8p
BC109	8p
BC109C	10p
BC118	11p
BC140	20p
BC141	20p
BC142	20p
BC143	20p
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BRY49	38p
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BSX20	15p
BSX26	18p
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BT106	180p
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3N143	65p
DIODES	
Rectifier Diodes	
BY100	40p
BY103	32p
BY127	8p
BY133	8p
BY164	40p
BY179	35p
BY184	32p
BY196	20p
BY206	11p
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BY225	120p
BY226	18p
BY227	19p
BY228	28p
BY296	20p
BY298	23p
BY299	22p
BYX10	15p
BYX55/350	30p
BYX55/600	25p
BYX70/500	32p
BY70/800	36p

OA47	10p
OA90	10p
OA91	10p
OA200	10p
OA202	10p
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IN.4001	3p
IN 4002	3p
IN 4003	3p
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IN 4007	4p
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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	6p
1.3W BZX61 RANGE 2V7 to 39V	10p
CRYSTALS	
Freq in MHz	
1.0	260p
2.0	200p
2.4576	180p
3.276	115p
3.579	95p
4.0	110p
4.194	130p
4.43	96p
5.0	130p
6.0	115p
8.0	125p
8.867	125p
10.0	140p
11.0	250p
12.0	120p
14.0	125p
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
DAF96	80p
DL92	80p
DY86	70p
DY87	80p
DY802	90p
EABC80	85p
EB91	50p
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ECL86	90p
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EF183	75p
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EL500	100p
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EZ35	80p
EZ80	90p
EZ81	70p
PC97	100p
PCC85	60p
PCF80	100p
PCF200	135p

PCF801	110p
PCF802	80p
PCF806	115p
PCH200	100p
PCL81	65p
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PL36	120p
PL82	60p
PL83	60p
PL84	80p
PL95	180p
PL500	110p
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	150p
AN241	135p
AN252	150p
AN259	250p
AN262	140p
AN271	230p
AN274	250p
AN301	330p
AN303	250p
AN304	360p
AN305	320p
AN315	210p
AN316	350p
AN360	100p
AN362	140p
AN366	150p
AN503	450p
AN610	160p
AN612	160p
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AN3312	350p
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AN3830K	800p
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AN6350	610p
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AN6360	400p
AN6362	480p
AN6371	510p
AN6387	560p
AN6811	130p
AN6884	240p
AN7105	210p
AN7110	130p
AN7114	150p
AN7115	150p
AN7116	130p
AN7120	130p
AN7130	110p
AN7140	450p

AN7145	195p
AN7146	210p
AN7154	180p
AN7156	240p
AN7168	260p
AN7178	270p
AN7222	300p
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
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BA658	380p
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BA4403	220p
BA5101	400p
BA5102	220p
BA5204	200p
BA5402	230p
BA5406	280p
BA5408	180p
BA6104	250p
BA6208	250p
BA6209	260p
BA6304	190p
BA6305	200p
BA6309	125p
BA6410	220p
BA6411	250p
BA6993	150p
BA7001	150p
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BA7755	150p
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BA8500	800p
BA8504	500p
CA3011	110p
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CA3028A	95p
CA3048	190p
CA3052	190p
CA3054	95p
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CA3060	280p
CA3065	210p
CA3080E	60p
CA3085	135p
CA3088E	200p
CA3089E	150p
CA3090Q	250p
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CA3130S	100p
CA3134E	280p
CA3140E	38p
CA3160	85p
CA3661E	140p
CA3162E	450p
CA3189E	230p
CA3193E	230p
CA3240E	90p
CA3260E	170p
CA3290E	150p
CX108	960p
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
HA1144	380p
HA1156	110p
HA1197	150p
HA1199	145p
HA1319	240p
HA1338	300p
HA1339A	350p
HA1367	300p
HA1368	160p
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HA1377	160p
HA1388	320p
HA1389	210p
HA1392	200p
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HA1457	120p
HA11219	280p
HA11221	180p
HA11225	150p
HA11235	145p
HA11251	240p
HA11423	210p
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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
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KA2212	80p
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KA2214	150p
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KA2263	100p
KA2264	100p
KA2284	100p
KA2401	150p
KA2412	350p
KA2912	125p
KA2914A	300p
LA1130	240p
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LA1185	150p
LA1201	75p
LA1210	140p
LA1222	80p
LA1230	130p
LA1231	210p
LA1364	200p
LA1365	120p
LA1368	220p
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LA1460	220p
LA2000	150p
LA2101	270p
LA2200	190p
LA3101	160p
LA3160	120p
LA3201	80p
LA3210	65p
LA3220	100p
LA3300	140p
LA3301	110p
LA3350	110p
LA3361	100p
LA3375	300p
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LA4031	140p
LA4032	140p
LA4051	160p
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LA4112	120p
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LA4190	300p
LA4192	160p
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LA4201	120p
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LA5112	120p
LA5523	150p
LA5527	150p
LA5700	300p
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LA6358	100p
LA7011	220p
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LA7040	280p
LA7042	280p
LA7046	300p
LA7224	150p
LA7505	250p
LA7507	250p
LA7520	200p
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LA7910	150p
LA7940	200p
LC7131	260p
LC7132	400p
LC7137	450p
LF347	110p
LF351	45p
LF353	48p
LF355	60p
LF356	60p
LF357	70p
LF398	300p
LM301	26p
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LM311	35p
LM318	120p
LM319	165p
LM324	30p
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LM392	100p
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LM723	40p
LM741DIL	18p
LM741MET	45p
LM747	55p
LM748	30p
LM1458	30p
LM1889	300p
LM3900	40p

LM3909	80p
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LM3915	160p
LM3916	270p
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M50119P	525p
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M58659	450p
M58725P	500p
M51102	290p
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MAB8441P	650p
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MB3712	140p
MB3713	130p
MB3714	270p
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MB3722	280p
MB3730	160p
MB3731	300p
MB3756	230p
MB3759	200p
MB8719	360p
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MC1469	290p
MC1488	50p
MC1489	50p
MC1496	65p
MC3302	70p
MC3401	45p
MC3403	60p
NE555	20p
NE556	40p
NE565	110p
NE566	130p
NE567	115p
NE571	290p
NE592	85p
NE5532P	140p
SAS560	110p
SAS570	110p
SAA1006	300p
SAA1008	450p
SAA1010	400p
SAA1020	450p
SAA1024	250p
SAA1025	250p
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SAA5050	650p
SAB3013	200p
SAB3035	600p
STA301A	200p
STA401A	220p
STA403A	270p
STA404	290p
STA405A	280p
STA431A	250p
STA432A	220p
STA434A	270p
STA435A	270p
STA441C	220p
STA456C	240p
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STA901M	280p
STA8012	260p
STK0025	420p
STK0029	360p
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STK0040	520p
STK0049	510p
STK0050	440p
STK0059	620p
STK0060	820p
STK0070	1100p
STK0080	580p
STK011	370p
STK015	490p
STK016	800p
STK025	700p
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STK080	600p
STK082	580p
STK084	660p
STK085	1050p
STK086	870p
STK420	400p
STK430	500p
STK433	490p
STK435	400p

STK436	490p
STK437	500p
STK439	550p
STK441	680p
STK443	740p
STK457	500p
STK459	560p
STK460	720p
STK461	620p
STK463	780p
STK465	720p
STK501	580p
STK561	550p
STK563	480p
STK583	600p
STK734B	510p
STK745	600p
STK760	600p
STK770	750p
STK772B	480p
STK780	650p
STK1039	550p
STK1040	700p
STK1049	800p
STK1050	750p
STK1060	760p
STK1070	940p
STK1080	990p
STK2025	700p
STK2028	560p
STK2029	480p
STK2038	900p
STK2048	950p
STK2110	680p
STK2120	820p
STK2125	650p
STK2129	610p
STK2139	800p
STK2155	950p
STK2230	470p
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STK2250	760p
STK3041	460p
STK3042	490p
STK3044	575p
STK3062	600p
STK3082	700p
STK3083	550p
STK3102II	600p
STK3152II	990p
STK3156	560p
STK4017	450p
STK4019	600p
STK4021	425p
STK4025	800p
STK4026	600p
STK4028	620p
STK4032II	650p
STK4036	500p
STK4038	680p
STK4042II	900p
STK4044	1000p
STK4046	1100p
STK4048	1280p
STK4060	580p
STK4101	650p
STK4111	650p
STK4112	950p
STK4121	600p
STK4122	560p
STK4131	650p
STK4132II	750p
STK4141II	420p
STK4142	800p
STK4151	680p
STK4152	950p
STK4161	800p
STK4162	800p
STK4171	850p
STK4172II	800p
STK4181	820p
STK4182II	800p
STK4191	1000p
STK4192	1000p
STK4231II	990p
STK4272	720p
STK4273	650p
STK4301	700p
STK4311	800p
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STK4843	720p
STK4853	900p
STK4863	850p
STK4873	990p
STK4893	1400p
STK4913	1180p
STK5314	550p
STK5315	600p
STK5322	620p
STK5324	520p
STK5325	580p
STK5331	400p
STK5332	220p
STK5333	700p
STK5335	450p
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STK5342	300p
STK5361	420p
STK5372	300p
STK5412	650p
STK5421	625p
STK5422	600p
STK5431	650p
STK5434	650p
STK5436	600p
STK5441	500p
STK5451	480p
STK5457	425p
STK5461	700p
STK5462	500p
STK5466	860p
STK5467	500p
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STK6822	1200p
STK6922	600p
STK6932	600p
STK6962	320p
STK6972	630p
STK6981B	850p
STK6982	800p
STK7216	500p
STK7217	560p

STK7226	800p
STK7308	410p
STK7309	450p
STK7310	550p
STK7348	410p
STK7356	650p
STK7358	650p
STK7402	660p
STK7404	400p
STK7406	800p
STK7408	880p
STK7410	1200p
STK7554	1000p
STK7561	700p
STK7563	950p
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STR440	520p
STR441	440p
STR450	610p
STR541	380p
STR452	680p
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STR454	470p
STR455	500p
STR456	600p
STR457	680p
STR470	680p
STR1096	380p
STR1195	450p
STR1229	450p
STR2005	580p
STR2012	650p
STR2013	460p
STR2024	650p
STR2105	680p
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STR3115	580p
STR3123	490p
STR3125	580p
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STR3212	330p
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STR50213	650p
STR53041	650p
STR53043	650p
STR54041	500p
STR55041	650p
STR58041	480p
STR59041	650p
STR60001	650p
STR61001	750p
STR80145	700p
STRD1806	800p
STRD1816	800p
T2800D	52p
TA7054	190p
TA7061	115p
TA7063	70p
TA7066	120p
TA7073	200p
TA7089	300p
TA7119	150p
TA7120	55p
TA7130	80p
TA7137	83p
TA7140	130p
TA7157	140p
TA7176	240p
TA7193	400p
TA7200	200p
TA7203	180p
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TA7271	400p
TA7272	260p
TA7273	350p
TA7274	260p
TA7280	330p
TA7281	270p
TA7282	260p
TA7283	260p
TA7288	260p
TA7299	400p

TA7310	100p
TA7312	120p
TA7313	110p
TA7314	210p
TA7315	200p
TA7317P	240p
TA7324	200p
TA7325	90p
TA7328	200p
TA7335	200p
TA7336	250p
TA7341	250p
TA7343	250p
TA7357	400p
TA7358	200p
TA7401	400p
TA7607	270p
TA7608	360p
TA7609	270p
TA7611	280p
TA7612	360p
TA7614	230p
TA7616	400p
TA7621	520p
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TA7630	300p
TA7632	400p
TA7640	160p
TA7641	170p
TA7658	130p
TA7668	160p
TA7680	480p
TA7688	250p
TA7698	720p
TA7699	1200p
TA7705	300p
TA7750	200p
TA7757	250p
TA7769	300p
TAA550	25p
TBA120S	40p
TBA396	70p
TBA520	120p
TBA530	120p
TBA540	100p
TBA560	120p
TBA800	40p
TBA810AS	60p
TBA820	65p
TBA820M	40p
TBA920	120p
TBA950	100p
TBA990	80p
TC4621AF	225p
TC5020	220p
TC5054	280p
TC5065BP	150p
TC5081AP	180p
TC5082P	170p
TC5501P	550p
TC8565P	2400p
TC9106	500p
TC9109	450p
TC9121P	580p
TC9122P	430p
TC9123	600p
TC9125BP	410p
TC9132	400p
TC9134	750p
TC9142	320p
TC9143	300p
TC9145	150p
TC9147BP	700p
TC9148	200p
TC9149	225p
TC9150	425p
TC9152	425p
TC9153	300p
TC9154AP	275p
TC9156	300p
TC9163	375p
TC9164	400p
TC9172P	300p
TC9176P	500p
TC9178AF	1600p
TC9179F	2000Pp
TC9305	300p
TCA740	130p
TCA940	100p
TCEP100	100p
TD62308AP	200p
TD62381	200p
TD62382	200p
TD62506	200p
TD62705	250p
TD62781AP	250p
TD62795	200p
TD62803	700p
TD6304AP	300p
TD6306P	350p
TD6350P	200p
TD6359N	500p
TD6359P	300p
TDA1001	200p
TDA1002	200p
TDA1003	150p
TDA1005A	220p
TDA1008	350p
TDA1010A	100p
TDA1011	120p
TDA1012	120p
TDA1013A	120p
TDA1015	100p
TDA1016	200p
TDA1020	150p
TDA1022	350p
TDA1023	200p
TDA1024	200p
TDA1025	320p
TDA1028	220p
TDA1029	250p
TDA1035	120p
TDA1037	190p
TDA1044	250p
TDA1048	225p
TDA1053	400p
TDA1054	200p
TDA1059	80p
TDA1060	190p
TDA1062	200p
TDA1070	400p
TDA1072	300p
TDA1074	420p
TDA1082	290p
TDA1083	200p
TDA1085	400p
TDA1097	550p
TDA1151	80p
TDA1154	50p
TDA1170	85p
TDA1180	140p
TDA1190	90p
TDA1200B	80p
TDA1220	150p
TDA1235	350p
TDA1236	295p
TDA1270	150p
TDA1327	250p
TDA1330	150p
TDA1352	200p
TDA1410	219p
TDA1412	100p

LINEAR IC's — Cont.

TDA1420 200p
TDA1470 140p
TDA1510 380p
TDA1512 200p
TDA1514A 450p
TDA1515A 200p
TDA1516Q 350p
TDA1518 300p
TDA1520 350p
TDA1521 300p
TDA1522 200p
TDA1524 350p
TDA1540 420p
TDA1541 1600p
TDA1596 260p
TDA1670A 300p
TDA1675 250p
TDA1701 320p
TDA1770A 300p
TDA1870A 300p
TDA1872A 450p
TDA1904 120p
TDA1905 150p
TDA1908A 90p
TDA1940 280p
TDA1941 300p
TDA1950 280p
TDA2002 70p
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TDA2004 90p
TDA2005 90p
TDA2006 70p
TDA2007 180p
TDA2008 175p
TDA2009 160p
TDA2010 100p
TDA2020 140p
TDA2030 80p
TDA2038 900p
TDA2040 200p
TDA2048 750p
TDA2054M 120p
TDA2151 300p
TDA2161 170p
TDA2170 300p
TDA2270 340p
TDA2320 80p
TDA2510 450p
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VP88/VS1/2/4/5/10/VS9700/VSP1 £15.00

AMSTRAD
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AWA
ATVI £8.00

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8909/8911 £8.00
8930/8931/8933/8940 £8.00
8942 £23.00
8945 £20.00
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8950 £17.00

BLAUPUNKT
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RTV301/RTX250 £10.00
RTV306/307/309/311/315/316/520 £20.00
RTV310/311/A/312/317/319/320 £16.00
RTV324/325 £20.00
RTV328 £20.00
RTV424 £50.00
RTV444 £50.00
RTX260 £33.50

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VRP20 £10.00
VRP25 £10.00
VRP30 £33.50

BRANDT ELECT
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VK32/33/36/37/38/39/45/48/49/312/313/319/329/419S £7.00
VK329 £23.00
VK426/429/438/439/455 £19.00
VK437 £24.50
VK445 £17.00
VK449 £33.00
VK849 £30.00

CANON
VR10 £10.00
VR30A30B30E/40A £33.50

DAEWOD
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VCP 11 RAF £22.00

DECCA
8300 £10.00
8400/8500 £6.50

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EVR 101 £23.00
VR70/71/7480/81/9091 £8.50
VR 8596 £23.00
VR 97 £33.00

EDISON
VC2130/2133/2135/2140/2830/2930/2932/2934/3122 £6.50
VK2132/512 £23.00
VK2436/2340 £6.50
VK2530/2532/2631/2541 £16.00
VK2632 £17.00
VK2637 £30.50
VKH2545 £24.50
VKH2639/2439 £33.00

FUNAI
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VCR4600/5400/5800 £12.00

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910/FVHP6207/11/9059/6908/911/9159/6500 £13.00
VBS3500/7500/7600/9900/VBS3500/7100/7600/
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FVH711/715/721/722/FVHD720 £15.00

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G.E.C.
4000H/4001H/4002H £16.00
V4001HV4004 £16.00

GRANADA
CS10S2 £21.50

GRAETZ
4312/4605/4905/4912/4913/P4833/TR4605/4812/4905/4912/TR4913/4914/4943 £6.50
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GRUNDIG
VS400/410/440/450/460/500/505/510 £17.00

HINARI
VXL2/VXL3/VXL4/VXL20/VXL25/VXL35 £13.00
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VT3000 £10.00
VT4000/4200/5000/5500 £15.00
VT77/680/3000/6500/7000/8000/8030/8040/8100/8300/VT8500/8700/9000/9300/9500/9700/9900 £13.50
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VT65 £35.00
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VT150 £35.00
VT530 £25.00

H.M.V.
HV1000/2000/3000 £6.50
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ITT
VR3605/3905/3935/3943/3954/3985/3993 £6.50
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VR3986 £20.00

JVC 3HSS
HR2200/HR3300/HR3320/HR3330/HR3350/HR3360/HR3660/HR3750/HR3860/HR4100 £6.50

FERGUSON 3HSS
3292/8903/8906/8907/8908/8909/8922/8928/VO13/V063/V22 £6.50

JVC 3HSSL PIN
HR3660/HR7600/HR7610/HR7650/HR7700/HRD110/HRD111/HRD120/HRD121/HRD220/HRD225/HRS100 £6.50

FERGUSON 3HSSL PIN
8904/8924/8941/8943/8944/3V16/3V23/3V24/3V31/3V353/V363/V383/V393/V48 £6.50

JVC 3HSSVA
HRD140/HRD141/HRD143/HRD150/HRD157/HRD158/HRD160/HRD610/HRS10 £15.75

FERGUSON
8947/8948/3V42/3V44/3V45/3V46/3V47/3V52/3V54/3V55/3V563/V57 £15.75
8950/8951/3V64/FV10/FV11/3V65/FV20/FV21/FV22/FV26 £17.00
3V48 £24.50
3V433/V53 £31.50
8930/8940/3V29/3V30 £10.00
8945 £24.00
3V00 £10.00

JVC
HRD170/171/210/211 £17.00
HRD565/666 £24.50
HRD725/HRD755 £31.50
BR7000E/BR7000S £30.00
HR7200/7300/7350/2650 £7.20
HRD455 £20.00
HRD520 £22.00

JVC & FERGUSON
3V32/8942/HR7655 £23.00
HRD180/3V53/FV12L/HRD230 £30.50
HRD370/3V58/FV13/HRD430/HRD470/HRD250 £31.00 £27.00

KENWOOD
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LOGIK
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VR950 £21.50

LOEWE
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OC50/OC55/OC60/OC65 £15.00

LUXOR
9225 £21.50

MATSUI
VX500E/VX600A/VX800A/VX810A/VX880A/VX770B/VX773B £13.50
VCRL3/VX730 £15.00
VX765/VX755 £16.00
VX735A/VX755A/VX765/VX850 £17.50

MITSUBISHI
HS303/HS304/HS320/HS700/HS306/HS318/HS710 £19.50
HS307 £23.00
HS319 £37.00
HS330 £37.00
HS338 £40.00
HSE11 £30.00
HS3000/HS301/HS302/HS310 £37.00
HS200 £23.50
HS337/HS347 £6.50 £22.00

NATIONAL PANASONIC 4HSS-3HSSN
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NATIONAL
NV777/NV330 £17.00
NV430 £14.25
NV460 £16.50

NATIONAL
NV730/NV770 4 Head £18.50
NV366 £18.50
NV180 £25.00
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NV788 £43.50
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NVG50 £30.00
NVG45/NVG46 £30.00
NVH70 £60.00
NV688 £32.00
NV600 £23.00
NVH65 £50.00
NVG7/NVG9/NV230 £18.00

N.E.C.
N9011/N9012/N9013E/N9014E/N9014G/N9015/N9016/N901A/N902A/N9033/N9034/N9064/N9063/N9065/N9066/N906A £20.00
N911A/N915A/N916A/N917 £27.00
PCV754/PV2300/PV2400/PV760/PV794/PV770/PV774/PVC763E £18.00
N380/N381/N830/N831/N832/N833/N834/N835/N836 £7.00
8261/AH1 £45.00

NORDMENDE
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V1001/V1005/V1015/V1025/V1035/V1041/V1055/V1065/V1105/V2005 £18.00
V110/V333 £20.00
V101/V102/V103/V112/V141/V142/V200/V300/V3005/V300/V301/V302/V350/V500 £7.00
V1205/V1215/V1235/V1245 £20.00
V1305 £33.50
V380 £27.00
V502/V503/V5005 £37.00

ORION
VH3/VH555/VH600/VH700/VH844/VH900/VH1000 (ALL MODELS) £13.00

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VR6711 4 HEAD £41.00
6920/VR6440 £58.00
VR6441/VR6540/VR6541/VR6640/VR6642 £14.00

RANK
BV6900AS £18.00
N830EA/RV300/RV310/RV320/RV330/RV340/RV350/RV380 £7.00

REDSON
MR100 £17.00

SABA
2A102A/702B20 £23.00
4A104/B20 £33.50
6A10/6A70 £33.00
8A10/VR6038 £39.50
CVR6083/VR6006/VR6007/VR6008/VR6009/VR7006/VR7007 £18.50
PVR6068/PVR6070/PVR8070/VR2000/VR6000/VR6010/VR6012/VR7000/VR9010 £7.00
VHR7000/VR5005 £15.00
VR6004/VR6005/VR6011/VR6013/VR6014/VR6020/VR6022/VR8014/VR6023/VR6024/VR7004/VR7011/VR7014/VR7720/VR7730/VR8011 £7.00
VR8018/VR7018 £30.00
VR6028 £27.00
VR7016 £24.00

SAISHO
VR100/VR605/VR705/VR805/VR905/VR1000/VR1100/VR1200/VR1600 £13.50
VR3300/VR3600/VR3650/VR3800 £16.00
VR3200/VR3500 £16.00
VR3300/VR3600 £16.00

SALORA
6500/6600 £21.50

SAMSUNG
SVX301/VB900/VB910/VVT510/VT320/VT5600/VX510/VX511/VX520/VX618/VX626/VX627/VX717 £19.00

SANYO
VTC5000/VTC5400/VTC6000/VTC6500/VPR5000/VTC1500/VTCM10/VTCM11/VTCM20/VTCM21/VTCM25/VTC2000/VTC5100/VTC5159/VTC5300/VTC5400/VTC5350/VTC5370/VTCNX10/VTCNX15/VTCNX20/VTCNX30 £18.50
VTC5500/VTC5550/VTC9100/VTC9300/VTC9350/VTC9355/VTC9455/VTC9500 £19.00
VHR1110/VHR1150/VHR1300/VHR1700/VHR2300 £16.00
VHR3200/VHR3270/VHR3100/VHR3150/VHR3300/VHR3400 £18.00
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SHARP
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VC582/VC583/VC651/VC681/VC750/VC780/VC781/VC683/VC684/VC6000/VC6200/VC6300/VC7300/VC7700/VC7750/VC8000/VC8300 £31.00

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DSR-35R (FOR C20/C30/C40/SLF1UB/SLF1E) 2 PIN £15.00
DSR-43R (FOR SLC7 RANGE/SL5000/SL5100/SL3000) 1 PIN £13.00
DSR-21R (FOR SLC8/C9) £30.00

TOSHIBA
V21/V31/V33/V50/V51/V53/V9600 £14.50
V55/V57 £7.00
V71/V73/V74/V75/V81/V82/V83/V84/V85/V86/V87 £14.00
V63 £18.00
V93 £20.00
V9680 £42.00
V5470/V5480 £18.00
V8600/V8700 £38.00

TRIUMPH
VR9500/VR9501/VR9525 £13.00

VCR PINCHROLLERS

AKAI
VS9300, VS9500, VS9700, VS9800 £2.50
VS1, VS2, VS3, VS4, VS5, VS6, VS9, VS10 £3.20
VS105, VS112, VS115, VS116, VS126, VS244, VS245, VS247, VS248, VS515, VS516 £2.50
VS201, VS301, VS303, VS304, VS603, VS606, VS607, VP58-P82 £2.50
VS125, VS155, VS165, VS220, VS240, VS250, VS512, VSX9 £2.50

AMSTRAD
VCR4500, VCR4600, VCR4600 MKII, VCR4700 £2.50
VCR5200 £3.20
VCR7000 £3.20

FERGUSON
3V00, 3V16, 3V22, 3V23 £2.50
3V29, 3V30, 3V31, 3V32 £2.50
3V35, 3V36, 3V38, 3V39, 3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 3V58, 3V59, 3V64, 3V65, FV10, FV11, FV12, FV14 £2.50

FISHER
FVHP420, FVHP520, FVHP530 £3.20
FVHP615, FVHP710, FVHP715, FVHP716, FVHP722, FVHP725, FVHP830 £3.20
FVHP905, FVHP970, FVHP980, FVHP990 £3.20

HITACHI
VT11, VT33 £2.50
VT61, VT62, VT63, VT64, VT65, VT86, VT88, VT110, VT122, VT120, VT128, VT130, VT135, VT138, VT150, VT168, VT220 £2.50
VT5000, VT8000, VT9300, VT9500 £2.50

ITT
VR3605, VR3905, VR3935, VR3985, VR3986, VR3993, VR3994 £3.20
VR3913, VR3914, VR3943, VR3954, VR3963, VR3984 £3.20

JVC
HR300, HR3330, HR3360, HR3660, HR4100, HR7700 £2.50
HR7200, HR7300, HR7600, HR7610, HR7650, HR7655 £2.50
HRD110, HRD111, HRD120, HRD121, HRD140, HRD150, HRD160, HRD225, HRD455, HRD565, HRD725 £2.50

MITSUBISHI
HS200, HS300, HS301, HS302, HS303, HS304, HS310, HS320, HS700 £2.50
HS306, HS307, HS400, HS710 £2.50

NATIONAL
NV100, NV180, NV300, NV333, NV340, NV366, NV600, NV688, NV777, NV788 £2.50
NV230, NV370, NV430, NV460, NV730, NV810, NV830, NV850, NV870, NV890, NV2000, NV2010, NV3000, NV7000, NV7200, NV7800, NV8600, NV8610, NV8620, NVG14 £2.50
NVG7, NVG19, NVG12, NVG18 £3.20
NVG21, NVG25, NVH65 £3.20

PHILIPS
VR6460 £2.50
VR2020, VR2021, VR2022, VR2023, VR2024 £3.20

SANYO
VHR1100, VHR1300, VHR1500, VHR2300 £3.20
VTC5000, VTC5150, VTC5500, VTC9300, VTCM10, VTCM20 £2.50

SHARP
VC381, VC386, VC2300, VC3300, VC7300, VC7700, VC8300, VC9100, VC9300, VC9500, VC9700 £3.20
VC387, VC481, VC483, VC486, VC496, VC581, VC582, VC583, VC585, VC651, VC681, VC685, VC750, VC780, VC781, VC785, VC787, VC793, VCT72 £3.20

SONY
SLC5, SLC6, SLC7 £3.20
SLC9, SLC20, SLC24, SLC30, SLC33, SLC44, SLHF100, SLF1, SLF11, SLF25, SLF30, SLF60, SLF100 £3.20

VCR BELT KITS

AKAI
VP7100 £1.60
VS-1 £1.50
VS2EG £1.00
VS4 £1.20
VS5EG £1.00
VS9300 £1.60
VS9500 £1.55
VS9700 £1.60
VS9800 £1.55

AMSTRAD
TVR1-2-3 £2.10
VCR4600 & MKII £2.10
VCR4700 £2.10
VCR5200 £2.10
VCR7000 £0.80

FERGUSON
3292, 3V00, 3V01, 3V16, 3V22 £1.50
3V23 £0.65
3V29, 3V30 £1.20
3V31, 3V32 £0.85
3V35, 3V36 £0.80
3V38, 3V39 £0.80
3V42, 3V43 £0.65
3V44, 3V45 £0.65
3V34, 3V54, 3V55 £0.65
3V58, 3V59, 3V64, 3V65 £1.40
8950, 8951, FV10, FV11, FV12, FV13, FV14 £1.40

FISHER
VBS7000 £2.45
VBS9000 £1.20
FVHP520, FVHP530 £0.80
FVHP710, FVHP716 FVHP722, FVHP905, FVHP906, FVHP907, FVHP910 £1.20
FVHP615, FVHP715, FVHP725, FHP830 £1.30 £1.20

GEC
4005 £1.50

HITACHI
VT11, VT33 £1.00
VT5000 £1.20
VT5500 £1.30
VT8000 £0.60
VT8500 £0.60
VT9300 £0.50
VT9500 £0.50

HITACHI
VT9700 £0.60
VT14, VT17, VT19, VT35, VT38, VT88, VT52, VT62, VT64, VT65, VT86 £1.20 £1.50

ITT
VR3605, 3905, 3935, VR3985 £1.00
VR3913, VR3914 £1.00

JVC
HR3300, HR3330 HR3360, HR3660 £1.50
HR4100 £1.80
HR7200 £0.70
HR7600 £0.80
HR7610 £0.95
HR7650 £0.75
HR7655 £0.90
HR7700 £0.77
HRD110, HRD111, HRD120, HRD225, HRD250, HRD455, HRD565, HRD566, HRD725, HRD755 £1.00
HRD170, HRD180, HRD230, HRD370, HRD430, HRD530 £1.30

MITSUBISHI
HS200 £2.00

NATIONAL
NV300 £1.60
NV333 £1.35
NV777 £1.00
NV2000 £1.50
NV3000 £1.60
NV7000 £0.95
NV7200 £0.90
NV8600 £1.60
NV7500, NV7800 £1.10
NV340, NV366 £1.40
NV600, NV788 £1.20
NV230, 250, 280, 370, NV380, 430, 450, 460, NV465, 600, 630, 730, NV810, 830, 850, 870, NV890 £1.35

PHILIPS
VR6460 £1.70

SANYO
VTC5000 £0.75
VTC5300 £1.00
VTC5500 £0.95
VTC9300 £2.20
VTC1100, 1300, 1500 £1.00

SHARP
VC381, VC383, VC386 £1.25
VC6300 £1.50
VC7300, 7700, 7500 £1.50
VC8300 £1.50
VC8381, VC9100 £1.25
VC9300, VC9500 £1.35

SONY
SL-C5, SL-C6 £1.40
SL-C7 £1.40
SL-C9 £1.65
SL8000, SL8080 £2.00

TOSHIBA
V55, V57 £0.85
V5250, V5280 £2.30
V5480 £2.10
V5475 £1.60
V7540 £1.60
V8600 £1.50
V9600 £0.85

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ANTEX C15W 240V Soldering Iron 240Vcm £6.50p
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IDLERS & PULLEYS REPLACEMENTS

		Reference	
AMSTRAD			
VCR7000		150280	£1.50
AKAI			
VS1-2, VS4-5, VS15	FF-REW IDLER	M1327773	£4.50
VS1-2, VS4-5, VS15	T-UP IDLER	BV327815	£6.00
V9700	IDLER	BV321979	£6.00
VS125, 126, 155, VS165, 240, 244, VS245, 247, 248, VS250, 512, 515, 516	IDLER ASSY	MZ366960J2	£11.00
FERGUSON			
3V16-22	T-UP IDLER	PU47752	£4.50
3V16-22	T-UP IDLER	PU49280	£6.30
3V23, 3V29-30, 3V31-32, 3V35	REEL IDLER	PU48967	£3.00
3V23	ROLLER ASSY	PU49042A	£4.00
3V29-30, 3V31-32, 3V35-36, 3V38-39, 3V49	T-UP IDLER	51402	£1.45
3V29-30,3V31-32	T-UP CLUTCH	PU51380	£2.60
3V35-36, 3V38-39, 3V49	REEL IDLER	PU55374	£2.85
3V35-36, 3V38-39, 3V49	T-UP CLUTCH	PU55373	£2.25
3V58-59, 3V64-65, FV10-11, FV12-13, FV14	IDLER ARM	PU58645	£2.50
3V42	CLUTCH ASSY	PU55822	£13.50
3V44	CLUTCH ASSY	PU57658	£11.50
3V42, 43, 48, 53, 56	T-UP CLUTCH	PU56043-1-4	£2.80
3V42, 43, 48, 53, 56	SUPPORT CLUTCH	PU56044-1-5	£2.80
FISHER			
FVHP520, FVHP530	FF-REW PULLEY	HI638531	£1.00
FVHP615	COMP. IDLER ASSY	FI1430420400300	£3.30
FVHP615	GEAR IDLER ASSY	FI1430490400900	£5.50
FVHP840	REEL T-UP ASSY	FI1430410400900	£6.50
FVHP905, 906, 908, FVHP910, 916	GEAR IDLER ASSY	FI1430490402400	£6.20
FVHP975, 990, 999, FVHP5000, 5100	IDLER	FI1430420400700	£5.20
GOLDSTAR			
	IDLER	435033A	£2.50
HITACHI			
	FF-REW IDLER	6886971	£1.50
	PLAY IDLER	V-6861482	£3.20
VT11-33, VT63-64, VT14, 17, 19, 38, 57, VT86, 88	CLUTCH ASSY	6879515	£7.50
VT120-220	CLUTCH ASSY	6886824	£7.50
VT8000-8300, VT8500-8700	FF-REW IDLER	6413663	£2.80
VT8000-8300, VT8500-8700	PLAY IDLER	6414221	£3.60
VT8000-8300 VT8500-8700	FF-REW PULLEY	6383531	£0.80
VT9300-9500	FF-REW IDLER	8681471	£3.30
VT9300-9500	PLAY IDLER	6861482	£3.20
VT9300-9500	IDLER	681505	£3.00
	IDLER	687043	£3.80
VT11-33, VT63-64	FF-REW IDLER	6886971	£1.50
HINARI			
VXL3, VXL20	REEL IDLER	40000009	£1.50
ITT			
VR3905, VR3906	T-UP IDLER	PU51402	£1.45
VR3906	REEL IDLER	PU55374	£2.85
VR3913, VR3943	REEL IDLER	PU48967	£3.00
JVC			
HR330, 3660, 4100	T-UP IDLER SML	PU49280	£6.00
HR7200, HR7600, HR7650, HR7655	T-UP CLUTCH	PU53462A	£3.00
HR7200, HR7600 HR7650, HR7655, HR7700	REEL IDLER	PU48967	£3.00
	ROLLER ASSY	PU49042A	£4.00
HR3300, 3660, 4100	T-UP IDLER LRG	PU47752	£4.50
HR7200, 7600, 7650 HR7655, HRD110, HRD120-121, HRD225	T-UP IDLER	PU51402A	£1.45
HRD110, HRD120-121, HRD225	T-UP CLUTCH	PU55373	£2.25
HRD110, HRD120-121, HRD225	IDLER ARM	PU55374-3-8	£2.85
MATSUI			
VX730, 735, 750, 755, VX810, 820, 880, 990	CLUTCH	850A00005	£6.50
MITSUBISHI		Reference	
HS306, 307, 318, 319, HS410, 710	GEAR ASSY	522P00201	£6.25

IDLERS & PULLEYS REPLACEMENTS — Cont.

NATIONAL			
NV322, NV600, NV688, NV777, NV788	IDLER UNIT	VXP0463	£3.00
NV333	IDLER ARM	VXL0997	£3.60
NV333, NV366	IDLER UNIT	VXP0401	£0.75
NV333, NV366	PLAY IDLER	VXP0433	£3.00
NV333, NV3000	ACTION GEAR	VDG0016	£0.60
NV333, NV2000, NV3000 NV7800	LOADING GEAR	VXP0325	£2.00
NV333, NV2000, NV3000,	INTERMEDIATE GEAR	VXG0017	£0.65
NV333	CAM GEAR	VXG0158	£1.00
NV366	IDLER ARM	VXL0997	£3.60
NV370, NV430, NV730, NV830, NV850, NV870, NVG7, NVG10, NVG12, NVG18	IDLER ARM	VXP0521	£1.70
NV370, NV430, NV870, NV730, NV830, NV850	CAM GEAR	VDG0200	£1.20
NV730	IDLER UNIT	VXP0581	£2.50
NV2000, NV3000	IDLER UNIT	VXP0331	£1.20
NV2000, NV3000	IDLER UNIT	VXP0329	£1.20
NV2000, NV3000	CAM GEAR	VDG0069	£1.00
NV2000, NV3000	ACTION GEAR	VDG0016	£0.60
NV7000, 7200, 7800	IDLER UNIT	VXP0344	£1.00
NV7000, 7200, 7800	CLUTCH	VXP0343	£5.50
NV8400, NV8600, NV8610, NV8620	IDLER UNIT	VXP0245	£1.20
NV8600, NV8610, NV8620	PLAY IDLER	VXP0243	£1.20
NV8620	CLUTCH	VXP0343	£5.50
NV600	IDLER	VXP0488	£3.50
NVG21-25, NVG40-45	PULLEY UNIT	VXP0767	£5.80
ORION			
VH200-201 VH555-700, VH844-900, VH1000-1500, VH1800, VP200, VH530 VH535-630, VH635-640, VH893-1440, VH2500-2600, VH2700-4010, VH5010	IDLER	850A200004	£3.50
	IDLER	850A200005	£6.50
PHILIPS			
DV464, VR6462, VR6463, VR6660, VR6860	IDLER	52220334	£2.50
VR6460, VR6520, 6920	IDLER ARM	40340162	£1.70
DB532, VR6542, VR6843	REEL IDLER		£7.50
SANYO			
VHR110, VHR1300, VHR1500	IDLER	1430662T14730	£5.00
VTC5000, VTC5150	FF-REW IDLER	1430741T20001	£3.00
VTC9100, VTC9300	IDLER	1430551T01400	£1.20
VTC9300	FF ROLLER ASSY	1430547T00200	£2.20
VTCM10-20	REEL DRIVE PULLEY	1430662T10350	£5.00
VHR2100, VHR2300	IDLER	6130374899	£5.00
VTC5000, VTC5150	PULLEY	143-0-662T-01201	£5.20
VTCM10	PULLEY	143-0-662T-10350	£5.50
SHARP			
VC651, VC681, VC685	IDLER ASSY	NPLYV0107GEZZ	£6.15
VC7300, VC7700	PLAY IDLER KIT	NPLYV0041+ NDA1V1007	£5.00
VC381, VC383, VC386, VC8381, VC9100, VC9300, VC9500, VC9700	IDLER	NIDL0005GEZZ	£1.50
VC300, VC387, VC481, VC482, VC483, VC496, VC571, VC585	IDLER	NIDL0006GEZZ	£1.50
VC780-781, VC785-787, VC793-VCT72	REEL IDLER	NPLTV0111GEZZ	£7.00
SAISHO			
VR1100, VR1200, VR1200HQ, VR1600, VR2500, VR3300, VR3500, VR3600	CLUTCH	850A20000	£6.50
SAMSUNG			
VT510-511, VT520-610, VT611-616, VT620-621-626	IDLER WHEEL	65224704220	£1.50
VT510-511, VT520-610, VT611-616, VT620,621, 626	IDLER COMPLETE	69000250330	£4.50
SONY			
C6	IDLER KIT ASSY	A 6706391	£3.50
C7	IDLER ASSY	X 36533100	£3.80
SL-C5, SL-C7	REW PULLEY	A-6706-348-B	£4.00
SL-C6	REW PULLEY	A-6706-391-A-B	£3.00

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VIDEO MOTORS

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FERGUSON & JVC		
PU 45979, 3V16, 3V22, HR3300, HR3660	CAPSTAN MOTOR	£21.00
PU 55371V, 3V35, 3V36, 3V38, 3V39, 8943, 8944, HRD110, HRD120, HRD121, HRD225	CAPSTAN MOTOR	£19.50
PU 46414, 8904, 8922, HR3300, HR3320, HR3330, HR3360, HR3600, HR3660	DRUM MOTOR	£19.50
PU 51381V, 3V39, 3V30, 8930, HR7200, HR7300	REEL MOTOR	£26.50
PU 58635V, 3V58, 3V59, 3V64, 3V65, 8950, 8951, FV10B, FV11R, FV12L, FV13H, FV20B, FV21R, FV22L, HRD170, HRD180, HRD230, HRD370, HRD430	CAPSTAN MOTOR	£29.00
PU 58636W, 3V58, 3V59, 3V64, 3V65, 8950, 8951, FV10B, FV11R, FV12L, FV13H, FV14T, FV20B, FV21R, FV22L, HRD170, HRD180, HRD230, HRD370, HRD430, HRD530	REEL MOTOR	£18.00
3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8945, 8947 8948, HRD140, HRD150, HRD455, HRD565, HRD725, HRD755, HRP50, R73AF	LOADING MOTOR	£8.00
MITSUBISHI		
288P02801, HS300, 301, 302, 310	MOTOR REEL SPOOLING	£33.50
288P02806, HS303, 304, 320, 330, 700	MOTOR REEL SPOOLING	£31.50
288P03401, HS303, 700	MOTOR REEL TAKE-UP GEN	£21.00
NATIONAL		
MYN 135V5L, NV332, NV333, NV340, NV366	REEL MOTOR	£13.50
VEM0212, NV730/NV770	MOTOR REEL GEN	£30.00
SANYO		
4-529V-10800 (RM11), VTC5000, VTC5150	REEL MOTOP	£6.30
SHARP		
RMOTV 1008GEZZ, VC200, VC381, VC384, VC385, VC386, VC483, VC3300, VC8381, VC9100, VC9300, VC9500, VC9700	REEL MOTOR	£13.50
RMOTV 1007GEZZ, VC387, VC483, VC486, VC585	REEL MOTOR	£16.50
RMOTV 1010GEZZ, VC300, VC402, VC471, VC477, VC481, VC482, VC488, VC496, VC500, VC571, VC581, VC582, VC583, VC584, VC5F3, VC8481, VC8581	REEL MOTOR	£16.00
SONY		
BHF 1100D, SLC7	CAPSTAN MOTOR	£25.00

CASSETTE HOUSING

FERGUSON & JVC	
3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, HRD110, HRD120, HRD121, HRD225	£24.00
3V42, 3V43, 3V44, 3V45, 8945, 8947, HRD140, HRD141, HRD150, HRD455, HRD725	£24.00
8948, 8950, FV10B, FV12L, FV13H, FV14T, FV20B, FV21R, FV22L, HRD230, HRD430, HRD530	£24.00
3V58, 3V59, 3V64, 3V65, FV11R, HRD170, HRD180, HRD370	£24.00

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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(ESP)	£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, 19FX1MT, 18G2, 1602M7, 1602GE, ADM-16B, KV-2092UB, 2096UB	£22.00

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2114	150p
2532	310p
2716	150p
2732	250p
2732A	280p
2764	180p
27C64	480p
27128	190p
27256-25	380p
27512	500p
4116	50p
4164-15	110p
4164-12	120p
4164-10	130p
41256-15	130p
41256-12	140p
41256-10	150p
41464-12	240p
41464-10	250p
6116	110p
6264-15	160p
6264-12	200p
6264-10	210p
62256-12	450p
6502	300p
6502A	360p
65C02	930p
6522	280p
6551	380p
6800	210p
6802	220p
6803	500p
6808	500p
6809	500p
6810	150p
6818	380p
6821	130p
6840	290p
6845	370p
6850	110p
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	240p
8253	210p
8255	200p
8256	700p
8257	220p
8271	3400p
8279	270p
8283	400p
8284	440p
8287	260p
8288	650p
8748	700p
8755	800p
Z80ACPU	110p
Z80ABCPU	200p
Z80ADMA	300p
Z80AP10	170p
Z80BP10	200p
Z80ACTC	170p
Z80BCTC	250p
Z80AS10	350p
Z80AS10-1	300p
Z80AS10-2	300p
Z80ADART	350p
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

SIMMS

256K × 9-80	1300p
256K × 9-70	1500p
1MB × 9-80	3800p
1MB × 9-70	4000p

SIPS

256K × 9-80	1400p
256K × 9-70	1600p
1MB × 9-80	3900p
1MB × 9-70	4100p

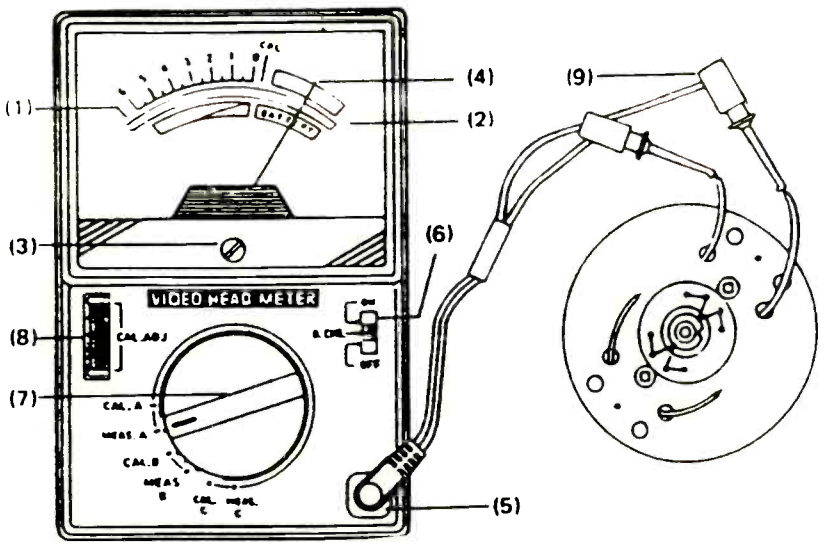
OPTO COUPLERS

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

LED DISPLAY

MAN74	100p
MAN8910	200p
OL747	120p

VIDEO HEAD TESTER



1. Mechanical Position of Pointer
2. Scale Plate
3. Pointer Adjusting Screw
4. Pointer
5. Measuring Socket
6. Power ON/OFF and Battery Check Switch
7. Range Selector Rotary Switch
8. CAL. ADJ (calibration volume)
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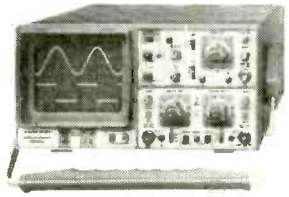
HAMEG are Europe's top selling **DUAL TRACE OSCILLOSCOPES**. Select from four superb models. All, with the exception of the HM 1005, incorporate a useful **COMPONENT TESTER**. Size - all models - 285mm x 145mm x 380mm. Clear display 8cm x 10cm. Mains supply: 110/220.240V AC 50/60Hz.
All supplied with **2 PROBES, a COMPREHENSIVE MANUAL** and a **2 YEAR WARRANTY**.

HM203-7 20MHz STANDARD

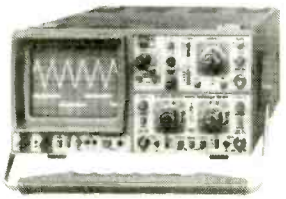


SPECIFICATION
* 2 Channels
* Bandwidth: DC - 20MHz
* Sens: Ch.!, Ch.2, 1mV/cm
*Timebase: 0.1s - 20ns/cm
* Triggering: DC - 40MHz
* Active TV - Sync - Separator
* Variable hold-off
* Trigger LED indicator
* Calibrator: 1KHz Square wave
* Component tester
* Plus many features

Price £338.00 + £59.15 V.A.T. **FREE Specialist Carrier Delivery**

HM604 60MHz UNIVERSAL

SPECIFICATIONS
* 2 Channels
* Bandwidth: DC - 60 MHz
* Sens: Ch.1, Ch.2, 1mV/cm
* Timebase : 2.5s - 5ns/cm
* Triggering: DC - 80MHz
* Active TV - Sync - Separator
* After delay trigger
* Sweep delay
* Delay line
* Trigger LED indicator
* Calibrator: 1KHz & 1MHz Sq. Wave
* Component tester



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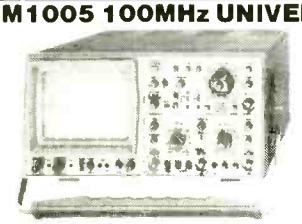
HM1005 100MHz UNIVERSAL

3 CHANNELS - UP TO 6 TRACES

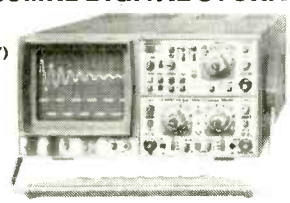


SPECIFICATION
*3 Channels
* Bandwidth: DC - 100MHz
* Sens: Ch.1, Ch.2, Ch.3, 1mV/cm
* Timebase A: 2.5s - 5ns/cm
* Timebase B: 0.2s - 5ns/cm
* Triggering DC - 130MHz
* After delay trigger
* Delay line
* Trigger LED indicator
* Overscan LED indicator
* Active TV - Sync - Separator
* Calibrator: 1KHz & 1MHz Sq. Wave

Price £792.00 + £138.60 V.A.T. **FREE Specialist Carrier Delivery**

HM205-3 20MHz DIGITAL STORAGE

SPECIFICATION
* Digital Storage
* Analogue real time (Same as 203-7)
* Bandwidth: DC - 20MHz
* Sens: Ch.1, Ch.2, 1mV/cm
* Timebase Digital: 5s-1μs/cm
* Triggering DC - 40MHz
* Active TV - Sync - Sampling
* Max sampling rate: 2 x 20MHz
* Memory: 2 x 2048 x 8 Bit
* Dot joiner
* Printer/plotter output



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Tests and rejuvenates blue, green and red guns separately. Fitted with delta and P.I.L. sockets. Compact size 120 x 65 x 60mm. Supply 240V AC

Price £32.00 + £5.60 V.A.T.

DIGITAL CAPACITANCE METER

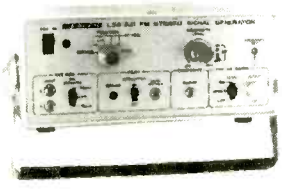
* High accuracy.
* 0.1pf-2,000μf.
* LCD display.
* 8 ranges.
* Accuracy +/- 0.5%. Full scale +/- 1 digit.
* Inc. protective case.

Price £39.99 + £6.99 V.A.T.

LEADER FM STEREO SIGNAL GENERATOR

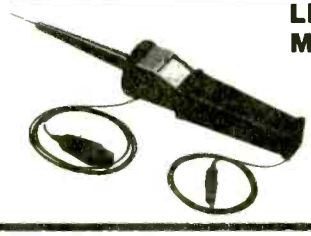
At last! A generator specifically designed for testing and fault finding on FM stereo and monaural VHF receivers including stereo multiplex circuits.

FEATURES
* Carrier frequency 100 +/- 1MHz (adjustable).
* Output level 0.1mV - 10mV.
* Pilot signal 19KHz +/- 2Hz.
* L & R separation over 50dB.
* External Modulation 50Hz - 15KHz.
* Pre-emphasis 50μs, 75μs & off.
* Comprehensive test lead set included.
* Mains powered.
* Size: 80 x 200 x 250mm.



Price £299.00 + £52.33 V.A.T.

LEADER HIGH VOLTAGE METERED EHT PROBE

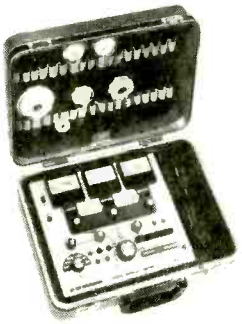


Light weight, easy-to-grip high-impact plastic handle with arc-over protection and no need of extra equipment. An indispensible item in your TV service kit. Measures up to 40kV DC with safety and the greatest of ease. Entirely self-contained. Connect the lead clip to chassis and probe tip to the check point, read the meter for voltage.
A must for the Health and Safety at Work Acts.

Price £66.00 + £11.55 V.A.T.

B & K PRECISION CRT ANALYSER-RESTORER

The number one CRT Test Instrument. Over 5000 U.K. Television engineers wouldn't be without it.



* All CRT's checked identically, including all in-line and one gun types * Tests all three guns of colour CRT's simultaneously under actual operating conditions (model 490) * Exclusive multiplex technique (model 490) * Measure true dynamic beam current that actually passes through G1 aperture to screen * Measures all shorts and leaks - preserving more CRT's * Tests focus electrodes lead continuity finding faults that **other testers miss** *Uses most powerful restoration method known with minimum danger to CRT * Rejuvenated CRT's guaranteed as new for two years * Obsolescence proof - perpetual set up chart updated and new adaptors developed * Tests and rejuvenates VDU's and oscilloscope tubes * A range of over 40 CRT base adaptors available * Increase profit * Pays for itself in months.

Prices

Model 490 Tri-dynamic three meter instrument inc. 6 common adaptors	£446.00 + £78.05 V.A.T.
Without adaptors	£393.00 + £68.77 V.A.T.
Model 480 Single meter instrument inc. 6 common adaptors	£334.00 + £58.45 V.A.T.
Without adaptors	£281.00 + £49.18 V.A.T.

SADELTA SIGNAL STRENGTH METERS

The Sadelta Field Strength Meters have been designed to facilitate the dish alignment of satellite TV systems and aerial alignment of VHF/UHF television and radio systems. Signal levels can be accurately measured on the TC402-C and the TC90, allowing the evaluation of signal conditions for satisfactory operation. Both models have a clear LCD direct frequency readout, coupled to a multiturn tuning control enabling precise channel identification.

TC402-C VHF & UHF

FEATURES
* Three bands:
  Low VHF: 45-110MHz
  High VHF: 110-300MHz
  UHF : 470-862MHz
* Digital display for direct frequency readout.
* Built-in monitor loudspeaker AM/FM.
* Signal measurement from 20μV to 100mV.
* Powered by eight 1.5 AA batteries.
* Fully portable with sturdy carrying case.

Price 259.00 + £45.33 V.A.T.

TC90 VHF-UHF- SAT.

FEATURES
* Five bands:
  Low VHF : 45-110MHz
  High VHF : 110-300MHz
  Hyper VHF : 300-470MHz
  VHF : 470-862MHz
  Satellite : 950-1750MHz.
* Digital display for direct frequency readout.
* Signal measurement VHF/UHF 20μV to 3V.
* Signal measurement satellite -70dBm to -10dBm.
* Audible indication of satellite signal level.
* Built-in-monitor loudspeaker AM/FM (not satellite).
* Powered by rechargable battery (complete with charger 220/240V AC).
* Fully portable with sturdy carry case.

Price £470.00 + £82.25 V.A.T.

BLACK STAR COLOUR PATTERN GENERATOR

THE 'ORION' THREE-IN-ONE

PAL VHF/UHF - PAL VIDEO COMPOSITE - R.G.B.

The Orion is a compact, bench instrument offering a wide range of patterns and facilities at a truly low cost.

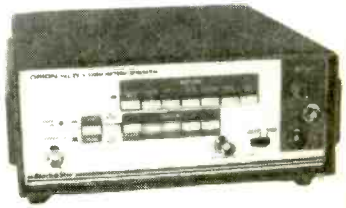
In addition to a switchable sound carrier facility which allows use with the majority of PAL TV systems, the Orion provides highly flexible RGB outputs, ensuring compatibility with most video monitors.

More than 50 pattern combinations can be selected, including those for testing static and dynamic divergence, video amplifier linearity, colour purity, general colour performance, focus etc.

A separate video input to modulate camera signals; fully variable RF and video output levels facilitating AGC testing; trigger output allowing easy triggering of difficult oscilloscope waveforms; external sound modulation input via DIN connector for frequency response testing of TV sound systems; adjustable wide frequency coverage of VHF and UHF TV bands.

Just some of the features making the Orion Pattern Generator an indispensible tool in the manufacture, test, and servicing of televisions, and computer and video monitors.

FEATURES
* Colour bars, purity, greyscale, crooshatch, dots, focus, etc.
* VHF/UHF Channels.
* 5.5MHz, 6.0MHz, 6.5MHz Sound Carriers.
* Internal/External Sound.
* External Video Output.
* Trigger Output.
* PAL B,D,G,H,I,K.
* Separate R, G, B and sync. D/P's.
* RGB @ TTL & 1V.
* Green + 0.3V Syncs.
* Composite Video Output.
* Variable RF/Video Output.
* Switchable Video Polarity.
* Mains powered 220/240V AC 50/60Hz.
* Size: 98 x 219 x 240mm.



Price £209.00 + £36.58 V.A.T.

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1uf at 400v	.25
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4.7uf at 400v	.35
10uf at 250v	.35
10uf at 400v	.75
22uf at 250v	.40
33uf at 250v	.55
47uf at 250v	.65
100uf at 250v	1.25

(All the above are pcb mounting)

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GRUNDIG CUC2410 18"/26"	19.95
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THORN 9000	8.00
UNIVERSAL	5.95

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TYPE	PRICE
BC307	10
BC327	10
BC337	10
BC547/8	10
BC557/8	10
BC639	20
BC640	20
BD238	40
BD677	65
BF337	30
BF422	35
BF423	35
BF458	35
BF460	95
BF757	70
BF871	95
BR103	75
BT151/800	1.35
BU126	1.95
BU208A	1.45
BU208D	1.95
BU326A	1.95
BU426A	1.45
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BU508AF	1.95
BU508D	1.95
BU508DF	2.50
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BU907	2.95
BU908	2.95
BUT11AF	2.75
BUT12A	2.95
BUT56A	2.75
BUX84	80
R4050	2.95
T9053V	3.50
T9054V	3.50
T9064V	1.95
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TIP41C	50
TIP42C	50
TIP112H (TO167V)	75
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2SD1398	2.50
2SD1453	2.95
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7812	50

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Hitachi VT17/19	34.95
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Panasonic NV333	9.50
Panasonic NV366	24.95
Panasonic NV370	12.50
Panasonic NV430	19.95
Panasonic NV688	33.50
Panasonic NV730	23.95
Panasonic NV777	27.50
Panasonic NV788	38.50
Panasonic NV2000/7000	9.50
Panasonic NVG7/9	19.50
Panasonic NVG10/12	19.95
Panasonic NVG18	29.95
Panasonic NVG20/21	29.95
Panasonic NVG30/40	24.50
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Philips 6462/6560 Genuine	42.95
Philips 6467	37.95
Philips 6760 Genuine	39.95
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Sanyo VHR2300/3200	19.95
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Sharp VC581/681	17.50
Sony C5/6/7	14.95
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Capacitor Back-up	2.50
Pinch Roller	3.95
Reel Idler	3.95
Reel Pulley	1.95
Video Head	21.50

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Belt Kit	1.95
Pinch Roller	3.95
Reel Idler	3.95
Reel Pulley	1.95
Video Head	21.50

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Belt Kit VCR4500	1.95
Belt Kit VCR4600	1.95
Modification Kit	6.95
Video Head VCR4500	18.75
Video Head VCR4600	18.75

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Take-Up Clutch (Large)	5.95
Take-Up Clutch (Small)	5.95
Video Head	9.50

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Repair Kit	12.95
Belt Kit	1.80
Capstan Motor	32.50
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Loading Belts (5)	1.95
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Reel Idler	2.95
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Take-Up Idler	1.85
Tension Band	2.45
Video Head	9.50

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Repair Kit	12.95
Belt Kit	1.95
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Tension Band	2.45
Video Head	9.50

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Repair Kit	14.95
Belt Kit	1.50
Cassette Housing	25.95
Clutch Assembly	12.95
Pinch Roller	3.95
Remote Control	15.95
Video Head	19.50

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Repair Kit	11.95
Belt Kit	1.75
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Pinch Roller	3.95
Reel Idler	2.75
Reel Motor	15.95
Video Head	23.50

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Clutch Assembly	5.95
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Reel Idler	5.95
Video Head	17.50

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Belt Kit	1.95
Clutch Assembly	19.95
Reel Idler	5.95
Video Head	17.50

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FF/REW Idler	2.95
FF/REW Pulley	.95
Play Idler	3.95
Video Head	17.50

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Belt Kit	1.95
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FF/REW Pulley	.95
Play Idler	3.95
Remote Control	15.95
Video Head	17.50

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Belt Kit	1.95
Capstan Motor VT11E	26.95
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Clutch Assembly	7.95
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Tension Band	2.95
Video Head	17.50

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Capstan Motor	27.50
Clutch Assembly	7.95
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Pinch Roller	3.95
Repair Kit	17.95
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Belt Kit	1.95
Clutch Assembly	7.95
FF/REW Idler	3.75
Pinch Roller	3.95
Repair Kit	18.50
Video Head VT120E	24.95
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Mode Switch	3.95
Pinch Roller	3.95
Reel Idler (Genuine)	2.95
Tension Band	2.45
Video Head NV230	22.50

NV333/366

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Belt Kit	1.95
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Play Idler (Genuine)	4.95
Reed Idler (Genuine)	1.25
Reel Motor	17.95
Tension Band	2.45
Video Head NV333	9.50
Video Head NV366	24.95

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Mode Switch	3.95
Pinch Roller	3.95
Reel Idler (Genuine)	2.95
Tension Band	2.45
Video Head	12.50

NV730

Repair Kit (Genuine)	12.95
Belt Kit	1.95
Mode Switch	3.95
Pinch Roller	3.95
Reel Idler (Genuine)	3.95
Reel Motor	29.95
Remote Control	15.75
Tension Band	2.45
Video Head	23.95

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Pinch Roller	3.95
Reel Idler (Genuine)	3.95
Video Head	23.95

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Repair Kit (Genuine)	21.50
Belt Kit	1.95
Pinch Roller	3.95
Play Idler (Genuine)	1.25
Reel Idler (Genuine)	1.25
Video Head	9.50

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Repair Kit (Genuine)	17.50
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Play Clutch (Genuine)	4.95
Reel Idler (Genuine)	1.25
Video Head	9.50

NVG7/10/12

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Belt Kit	1.95
Mode Switch	3.95
Pinch Roller	3.95
Reel Idler (Genuine)	2.95
Video Head (NVG7/9)	19.50
Video Head (NVG10/12)	19.95

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Pinch Roller	3.95
Reel Idler	2.95
Video Head	12.50

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Pinch Roller	4.50
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Video Head (Genuine)	42.95

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Pinch Roller Assy	12.95
Video Head (Genuine)	39.95

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Reel Motor (Genuine)	14.95
Video Head	17.50

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Pinch Roller	3.95
Reel Idler (Genuine)	3.95
Reel Motor (Genuine)	18.95
Video Head	17.50

VC681

Belt Kit	2.50
Pinch Roller	3.95
Reel Pulley (Genuine)	7.95
video Head	17.50

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Belt Kit	2.95
Pinch Roller	3.95
Reel Pulley (Genuine)	7.95
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Output power	2 × 60W stereo 0.1% THD
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Signal to noise ratio	80dB
Frequency response	20-20000Hz
Input sensitivity	100mV-3V adjustable
Input impedance: Low level input	20kΩ
Output impedance	4Ω
Power	14.4V dc 15A
Dims.	240 × 120 × 50mm

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2-WAY Hand Held Crystal Control Transceivers. Built-in Telescopic Aerial, call button, transmitter receive key, on air indicator. Each unit requires PP3 battery for operation (not supplied)

Operating Frequency	49MHz
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Frequency Tolerance	+ or - 0.005%
Range 1-2Kilo	open field (Depends on conditions)
Oscillation	Crystal Control
Power Pack	9V DC (PP3 battery 1 pair in box)

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NEW

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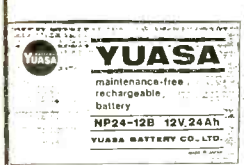

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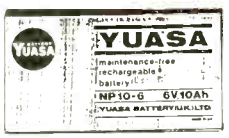

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Weights: NP10-6 2.2kg NP24-12B 22.7kg NP24-12B has bolt style terminals NP10-6 is spade style

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Input voltage	240Vac 50Hz
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Output current	5A continuous
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1+ 10+
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THIS UNIT SUBJECT TO DESIGN CHANGE

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Dims	160 × 88 × 110mm

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Made in U.K.

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Frequency 105-109MHz FM
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PRICE: £9.99

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MOTORS

Description		Order	Price
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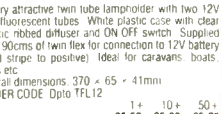
TWIN FLUORESCENT LAMP — 12V



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EBF83	1.70
EBF89	1.20
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ECC81	3.15
ECC82	2.75
ECC83	3.05
ECC84	0.75
ECC85	1.85
ECC88	3.60
ECC189	3.60
ECF80	1.55
ECF82	1.45
ECF83	2.10
ECH35	4.30
ECH42	1.70
ECH81	1.30
ECL80	0.90
ECL82	1.35
ECL84	1.30
ECL85	1.30
ECL86	3.10
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EF80	0.60
EF85	0.60
EF86	2.50
EF95	0.90
EF183	0.75
EF184	0.75
EH90	0.60
EL34	4.55
EL36	1.60
EL81	8.65
EL84	2.50
EL86	1.35
EL509	9.50
EL519	9.50
EM84	1.35
EM87	2.35
EY86/87	0.75
EY88	1.00
EY500A	3.35
EZ41	3.65
GY501	1.80
GZ32	3.15
GZ34	4.55
KT66	24.20
KT88	17.35
KT88 G.L	51.68
PC86	0.60
PC84	0.60
PCC85	0.85
PCC88	1.15
PCC89	0.85
PCC189	1.10
PCF80	0.80
PCF82	0.80
PCF86	1.50
PCF87	1.50
PCF200	3.10
PCF201	3.10
PCF801	1.50
PCF802	1.25
PCF805	1.45
PCL82	1.80
PCL83	3.95
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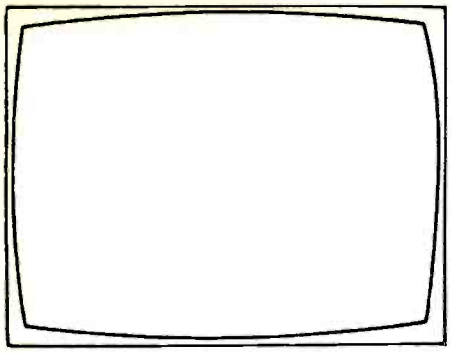
UBC81	3.20
UCH42	3.55
UF41	4.40
UL84	1.35
UY41	6.20
UY85	1.10
2021	2.75



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COVER PHOTO
This month's cover photograph shows a Ferguson 3V29 receiving servicing attention. See article on pages 180-3.

REED BUSINESS PUBLISHING GROUP

THE MAC WINDOW CLOSING?

Is Europe to have HDTV in the foreseeable future? If so, which transmission standard is to be used and how do we go about implementing the required broadcasting policy? These are important questions since a great deal, not least by way of technological investment, is at stake. But one can't help feeling gloomy about the prospects as the various interested parties continue to argue about it.

The European Commission's 1986 directive on satellite broadcasting standards expires at the end of December. What the broadcasters and other interested parties, in particular the European setmakers, have been arguing over is the terms of a successor directive. At the moment the Commission proposes that from January 1st 1995 European broadcasters using PAL or SECAM, which means virtually all TV broadcasters, will have to transmit the channels simultaneously in the D2-MAC standard. This proposal, a climb down from the earlier insistence on simulcasting from 1993, has been approved by the European Parliament. Other proposals are that digital TV should be allowed to develop alongside the development through D2-MAC to HD-MAC, that the new directive's expiratory date should be 1999 instead of the 2001 suggested in the original draft, that D2-MAC decoders should be mandatory in large-screen CTV sets but not small-screen ones and that the EC should provide financial support for the simulcast transmissions. The EC's telecommunications commissioner Filippo Maria Pandolfi has been hoping to persuade manufacturers and broadcasters to sign a legally binding memorandum of understanding, which would run parallel with the directive, committing them to a common HDTV strategy.

It's clear that the broadcasters do not want to enter into any such commitment. They are hoping to continue to use PAL/SECAM as at present and see no reason for doubling their transmission costs from 1995. When you consider the parlous state of satellite TV broadcasting at present this is understandable. It's far from certain that the future of the satellite TV broadcasters will improve to any marked extent over the next few years even when the recession does end and advertising increases. One has also to consider the man in the middle, the viewer. It has been estimated that equipping large-screen sets with a D2-MAC decoder would increase the average price to around £770, considerably more than viewers are used to paying. This would clearly not go down well. Viewers would rightly ask why they should have to pay extra to receive a marginally improved picture which will at the same time be available to them in the usual form, receivable on the sets they already have.

The manufacturers' case is understandable. A considerable investment has already been made in MAC. It's an excellent system, capable of being upgraded with little difficulty. The patents could be used, as the PAL ones were, to provide a degree of protection. (The only slight problem here is that National Transcommunications Ltd., which as successor to the IBA's engineering side holds the basic patents, has been sold to a management company which clearly aims to sell it on at a later date, so no one can tell who will end up owning the patent rights.) It would be nice for Europe to adopt and develop its own HDTV technology, especially as the system is a proven one that's in advance of any currently available alternative. To drop MAC and go for a digital alternative, the next generation, would be to put HDTV in Europe back by several years and maybe lose for European manufacturers a substantiasl market.

This aspect is something of a gamble however. With 16:9 aspect ratio sets costing around £3,000, how much will HDTV sets end up costing? The figure for Japanese sets (MUSE/NHK standard) is currently around £17,000. One can't, somehow, see many sets being sold in the UK at that sort of figure! Prices will come down of course. The development of advanced chips will make a substantial contribution to this. But chip development programmes don't come cheap. Even the Japanese and US semiconductor manufacturers are having to establish joint development programmes to spread the cost. One recalls too the horror story of that ITT chip for BSB. Chips will go only so far with cost cutting however. The major cost, as always, will be with the display device. A large, HDTV tube is not going to come cheap.

Any technology has a time limit during which it's either adopted or falls by the wayside, and no directives can alter that. It increasingly looks as though the long debate about European HDTV is going to result in MAC being an interesting technology that never made it. The time scale is no longer in its favour. It seems unlikely that HDTV will be a major consumer product in Europe this century. It's going to take at least ten years for HDTV to take off, and by that time the digital alternative will be available. It could be the US manufacturers who will benefit from that. It could also be that the Japanese will quietly drop the MUSE system if it doesn't get established in the market soon and go for a digital alternative.

CORRECTIONS

"Grundig CVC2410 chassis" last month on page 100, TV Fault Finding, should have read CUC2410 chassis. The acknowledgement at the end of the B and O 39XX article (September, page 807) should have been to Hans Rackham, not Rackman. Our apologies.

Letters

CHANNEL 5 PROBLEMS

Under the terms of the 1990 Broadcasting Act the Channel 5 operator will be responsible for retuning equipment affected by Channel 5 transmissions. This sounds like a neat answer to the problem. But, as is often the case when politicians become involved in technical matters, they either grasp the wrong end of the stick or, more likely, miss the stick altogether. To speak of retuning is a gross simplification of the problems involved.

We have a large number of customers, both domestic and commercial, who have u.h.f. distribution systems that carry far more than four local off-air channels and the output from a VCR. A typical system might carry four local off-air channels, two extra BBC-1 and/or ITV regions, two VCR outputs and one satellite receiver output. There may be a second satellite receiver output or the output from a surveillance camera. Such systems are becoming increasingly common.

Correct channel planning has to take into account the shortcomings of the modern TV set, so the channel relationships n + 5 and n + 9 have to avoided. As a simple aerial rigger, I don't know why some modern TV sets have such poor image rejection: I just regard it as a fact of life. Obviously n + 1 can't be used. In the case of a domestic system, for cost reasons the VCR's and satellite receiver's built-in modulators are almost always used. As many channels as possible are fitted within the tuning range (nominally chs. 29-41) of these modulators. Channel planning can obviously be a bit tight. As an example, one of our customers has the following system: local off-air signals on chs. 23, 26, 29 and 33; VCR-1 output on ch. 36; satellite TV receiver output on ch. 39. Originally there was a VCR-2 output on ch. 31, crammed between two off-air channels, but this had to change when our customer bought a new Ferguson TV set for his study. On this set ch. 36 had to go. VCR-2's modulator would just reach ch. 42, so there it stayed. The system also carries two remote ITV regions on chs. 59 and 61.

What will the Channel 5 operator be prepared to pay for in such a case? The aim will obviously be for a cheap solution, but I for one am not prepared to waste my time shuffling channels from one theoretically incorrect line-up to another in the hope that eventually I'll find one where the wavy lines aren't too noticeable. In the case of the system outlined above, the only legitimate approach is to install a modulator at the head-end for VCR-1, operating on a channel outside the ch. 29-41 band. Good quality modulators cost about £100. Audio and video cables would be required, together with new channel-pass filters, a leveller etc. If the new transmission was on a channel with an unfortunate relationship with another channel in use, then the latter would have to be moved as well. It begins to sound like at least £250 plus VAT to me. Will the Channel 5 operator pay this? I don't think so. Speaking as someone with a pile of unsaleable BSB receivers in my stockroom, I've become extremely cynical in these matters. They'll come up with some lame excuse like "we accept responsibility for only one VCR or satellite receiver per household"!

Many SMATV systems in which a large number of satellite channels are carried at u.h.f. are in operation. Often the channel planning leaves only a four-channel gap for subscribers' VCRs. Either one or two existing channels will have to be moved, or Channel 5 will have to be demodulated then remodulated on to say ch. 68. Even when a six-channel gap has been left in anticipation of Channel 5, another problem arises. Because we haven't been told exactly which channel will be used for the new transmissions, there will inevitably be n + 5 and n + 9 clashes. These matter with a large SMATV system because of the number and variety of TV sets and VCRs in use. Who will pay for all this work?

Incidentally, I see that Sky has agreed to compensate Comet, in an out of court settlement, for its mountain of unsold BSB equipment. The figure is reputed to be in the region of £5m. As a small independent dealer, I look forward to receiving my compensation from Sky for the BSB receivers gathering dust in my stockroom.

Bill Wright, Wright's Aerials,
Micklebring, Rotherham, S. Yorkshire.

ASPECT RATIO

The August leader on the HD-TV debate assumed without any basis in fact that the 4:3 aspect ratio of existing TV, old films and photographs is based on this being the aspect ratio of human perception. The assumption is nonsense for the following reasons.

First, as far as cinema films are concerned an aspect ratio of about 4:3 was chosen mainly because it was easier to produce cameras, projection equipment, screens etc. with an aspect ratio of this order. Some early systems used different ratios, for example 5:4 and 1:1 were used. The 4:3 ratio was eventually adopted as the standard for the cinema, but human perception was not a factor in this.

Secondly, the old Kodak box Brownie cameras produced photos of approximately 1·52:1 which is wider than 4:3, similarly the standard 35mm still cameras produce photographs with an aspect ratio of about 1·7:1, i.e. roughly 16:9.

Thirdly, during the Sixties the Japanese amongst others did some research on the aspect ratio of human perception. The results were published in the SMPTE Journal. It was found that the human perception aspect ratio is between 2:1 and 2·2:1 – the latter aspect ratio happens to be that of the 70mm Todd AO format. Cinemascope and Panavision have an aspect ratio of 2·35:1. The standard wide-screen aspect ratio for unsqueezed prints (including VistaVision prints) was allowed to be between 1·66:1 through to 1·85:1. A survey on picture aspect ratio preference was included in the research. The results, also published, showed that almost all those surveyed preferred an aspect ratio of about 2·11:1 or greater for all forms of picture, including films and stills. So much for the 16:9 ratio being "decidedly uncomfortable" as you put it! Obvious to most is the fact that because human eyes are horizontally displaced, with the left eye able to see farther to the left than the right one can and vice versa, perception is somewhat elongated in the horizontal plane compared to the vertical plane.

Fourthly, the aspect ratio of current TV screens was determined mainly by tube manufacturing constraints. Even here there were arguments, with the original tubes having an aspect ratio of 5:4 while the transmitted picture was standardised at 4:3. There are not as many restraints today, and most standard tubes are at present 4:3.

With respect to the HD-TV debate, I feel that as usual the interested parties cannot see the wood for the trees in as much as they say that they cannot make tubes with a proper Cinemascope aspect ratio of 2·35:1 because of mechanical difficulties. Perhaps this is so, but I predict that in five years' time the TV set will be a flat picture framed

device no thicker than 2-3in. that will hang on the wall. Its display will be either liquid crystal or some sort of LED matrix. In any event the picture tube as we know it will rapidly become a thing of the past and any restraints it imposed on picture aspect ratio (and size for that matter) will disappear. Because of this I think that it's very short-sighted of those choosing the HD-TV system to limit the aspect ratio to 16:9. Once again we'll have to put up with cropped pictures. Surely this is the time to adopt the same standard as the cinema industry once and for all.

Finally, you suggested that there's not much present wide-screen product to show apart from westerns and spectaculars. Rubbish! Almost every film made since 1952 has been made in the Cinemascope/Panavision format. Unfortunately most TV stations show cropped versions of Cinemascope prints. Hence your writer, who probably watches too much TV and doesn't go to the movies often enough, is not aware that with wide-screen films quite a lot of activity goes on outside the immediate action area. This is often in the form of visual gags, but is usually in the form of continuity activity to give even more realistic effects to and hence enhance the enjoyment of the film. There is no problem for TV companies in producing wide-screen TV shows.

John W. Dagg,
Masterton, New Zealand.

DMM RESISTANCE RANGES

Little mention was made of the resistance ranges in David Botto's interesting article on choosing a digital multimeter (October/November issues). If, like me, you opt for a cheapo hand-held model, watch that this is adequate. The minimum requirement should be regarded as a maximum possible reading of 10MΩ. My meter, which has given many years of useful service and is called an ISI, is autoranging. I find this most helpful as, when checking through a particular section of circuitry, several voltage or resistance ranges will usually be required. The autoranging facility changes the range automatically. This obviously saves wear on the switch – and the operator.

Dave Mackrill,
St. Leonards-on-sea, East Sussex.

STUCK IN STANDBY

We have had problems with the Amstrad SRD400 satellite receiver being stuck in standby. The following information was sent to us by Amstrad and might be helpful to others. To reset the microcomputer chip when the unit is stuck in standby, proceed as follows:

(1) Disconnect the unit from the mains supply.
(2) Remove the top cover.
(3) Remove the decoder PCB and position it safely upside down. Note that the decoder PCB is not powered down in standby.
(4) Apply power to the unit.
(5) Add a 1kΩ resistor temporarily between pin 5 of IC104 and chassis.
(6) Press Standby. The display will show "8".
(7) Press H/V twice followed by audio. The display will show "– – – –".
(8) Enter a PIN number, e.g. "1234". The display will show "1 1 1 1".
(9) Remove the 1kΩ resistor.
(10) Press audio.
(11) Press standby on/off and confirm that the unit is now reset.

By word of explanation, once step (6) is actioned the microcomputer chip tries to talk to the non-volatile RAM chip IC104, but the added 1kΩ pull-down resistor corrupts the data from the microcomputer chip so that the RAM can't respond with the stored PIN. The microcomputer chip then thinks that no PIN is stored and allows the user to enter a new PIN.

If this doesn't cure the problem, replace IC104.

G. Rees,
Walkden, Worsley.

SOVEREIGN CTV6000 AV OPERATION

Following my short article on the Sovereign CTV6000 14in. colour portable in the August issue, a couple of queries were received about VCR incompatibility (flag waving). The problem can be overcome by adding a diode (1N4148 or similar) from pin 11 (anode) of the TDA1180 field timebase chip to pin 16 (cathode) or any other convenient point at chassis potential. Should there be a slight tendancy for ragged verticals to be present with off-air transmissions after carrying out this modification, it can be made switchable by fitting a suitable single-pole switch between the diode and chassis. Ingenious types might like to try fitting a small microswitch at the back of the push-button tuner in order to provide automatic VCR switching on one channel.

John C. Priest,
Blackpool, Lancs.

WARNING

I traced the cause of a fault on a Ferguson 3V43 to a loading motor/mode plastic cam with broken teeth. No part number is given in the service manual. So I enquired at Ferguson and was told that I would have to purchase the motor assembly complete, as supplied to them by JVC. The Ferguson part number is POS36689W. I had a complete unit in stock, obtained from JVC, part number 36689W, but after half a morning's work I found that the cam units differ in the number of teeth. So take warning. Don't try to be too clever!

K.P., Rudolf's Electronics,
Blackburn, Lancs.

SELF-TAPPING SCREWS

Back in the February 1990 VCR Clinic there was a tip about easing in self-tapping screws with oil. In my view this is bad practice, as done two or three times the plastic will fall apart. My method is to turn a self-tapper (or any screw into plastic) anticlockwise until the thread is engaged, then tighten.

R. Goodman,
London SW18.

PLASTICS POLISHES

It's not often that one comes across a product which does all it claims, even less often one that performs miracles. But this is exactly what I've come across. Greygate Plastic Polish is an industrial product used for cleaning windows and acrylic baths. I'm told that it was originally developed for use on the windscreen of Spitfires. But it's also superb for removing scratches from plastic. I tried it out in disbelief on the case of an early Sony portable TV set. Amazing! It removed shallow scratches and made deep ones much less visible. Any snags? Yes, you can buy it only in cartons of one dozen at £19.70 plus VAT. But it's far

more effective, and cleaner, than using Brasso or whatever.

Greygate also makes a product which is ideal for cleaning Bakelite. It's called Paste Polishing No.5 and was made for the GPO for polishing the old black phones. I use it for getting a superb shine on Bush radio and TV cabinets. Once you try it you'll use nothing else. The address is Greygate Chemical Products Ltd., Firtree Lane, Groby, Leicestershire LE6 0FH (0533 877 777).

Andrew Emmerson,
Northampton.

SETMAKERS' FEEDBACK

The letters column is always a source of mild amusement and information. Like everyone else, I either agree or disagree with every letter published. I feel however that I must reply to the one from Bernie Hinton (December) on Donald Bullock's experience with a Ferguson FV31R. To provide a monthly article, you inevitably say the wrong thing on occasions and make the odd mistake or three, but if you worry about it you'll never write anything. So to Donald Bullock, you're a naughty boy and don't do it again, but please keep on writing. And to Bernie Hinton, *Ferguson Feedback* is available only to Ferguson dealers, so many service departments don't get a chance to see it unless a copy can be begged from one of the larger shops. But we still have to repair all makes of equipment, including many Ferguson products. How can the thousands of small shops get this information, which is not included in the service manuals?

While on the subject, I might as well go the whole hog and ask whether manufacturers would be prepared to release their stock fault and in-house service information to small "repair only" shops, in the interests of better servicing?

John Hopkins, The TV Workshop,
Felixstowe, Suffolk.

Editorial note: *Television* would welcome the opportunity to help manufacturers to disseminate such information, which we do to some extent already.

Teletopics

JAP HD-TV HOURS INCREASE

Hours of HD-TV transmissions in Japan were increased to eight a day on November 25th. To emphasise the significance of this step the Hi-Vision Promotion Association held an international symposium at which Mitsuhiro Wada, director general of NHK's satellite broadcasting department, set two targets. He wants to see sets on sale at under Y1m (about £4,300) and a million sets in use as soon as possible. At present the sets costs around Y4m (£17,200), putting them for the time being beyond the means of most viewers. The development of highly integrated chip sets for the Japanese HD-TV system seems to be the most hopeful approach to cost reduction, and to this end several joint development programmes have been started to share the huge costs involved. It has been estimated that some 33,000 HD-TV receivers were sold in Japan during 1991, mainly to businesses and hotels for demonstration purposes. There's to be a three-year test broadcasting period in Japan.

Meanwhile in Europe there's been no progress in adopting a common approach to the development and introduction of HD-TV. The European Commission has been trying to impose a directive that would force broadcasters to use the D2-MAC system for all future satellite TV transmissions as part of a compatible path leading to the adoption of HD-MAC. The European Parliament has backed a more flexible approach. Most broadcasters however simply seem to want to go on using PAL/SECAM and any enhanced versions of these standards that may come along.

SATELLITE TV

According to the *Financial Times* satellite monitor there was a significant increase in satellite TV installations in October, with over 100,000 new dishes installed. Substantial promotional activity along with discount deals are thought to have fuelled the increase. FilmNet has been sold by the Swedish office products group Esselte to a consortium led by the Swiss holding company Compagnie Financiere Richemont, which is part of the South African tobacco and luxury goods group Rembrandt. The price is believed to have been around £79m. It seems that the cause of Astra 1B's misfunctioning is interference picked up on the satellite's wiring and getting into the attitude control system's memory. Engineers at the Berzdorf control centre are now transmitting safety data to block the entry of code-like noise into the memory. On a lighter note, muralist and decorative artist Mark Lewis of Flat 5, 62 Waverley Road, Southsea, Portsmouth, Hants PO5 2PR (0705 863 415) is brightening up the dish scene with decorative plastic covers that clip securely on all Amstrad dishes, including the black-mesh version. The designs are quite striking. Prices are from £20 per cover.

CABLE TV

Figures released by The Cable Television Association show that houses connected to broadband cable networks rose from 116,759 in October 1990 to 220,728 in October 1991, an increase of 89 per cent. This is the largest increase achieved to date in any twelve-month period. The number of franchises in operation is now 44, an increase of 19 per cent over the year. When old cable networks are added, the total number of cable TV subscribers rises to 444,880. The overall ratio of subscribers to houses that have cable available is 20.8 per cent.

The National Grid Company, which controls the bulk of electricity distribution in England and Wales, is understood to be considering the use of its power cables to distribute TV to electricity consumers. Use of encoding/decoding make it possible to transmit TV signals via the network, and it's believed that NGC has achieved significant advances in this technology.

CD-TV UPGRADES

Commodore has announced upgrades to its CD-TV multimedia system. The advanced video mode (AVM) card will improve the CD-TV picture quality, enabling up to four million colours to be displayed – this compares with the initial 4,096 colours. According to Commodore this will enable CD-TV decks to play Kodak/Philips Photo-CD discs. Commodore is currently negotiating with Kodak for a licence. The AVM card will slot into the back of a CD-

TV player and is expected to cost around £50. The second upgrade is the A690 CD-ROM drive, which enables an Amiga computer to be used as a CD-TV player. Its price is expected to be less than £350.

RITZ TAKEOVER

The US video rental company Blockbuster which has 1,934 stores, almost all in the USA, has made a recommended offer of £75m for Cityvision which runs the Ritz chain in the UK. Ritz is the UK's largest video rental company, with 875 outlets. Blockbuster wants to use it as a basis for expansion in Europe. Cityvision's profits have declined over the past year. Its pre-tax profits for the last financial year were £16.4m on turnover of £78.4m. During the first six months of the present financial year profits fell to £3.5m on turnover of £39.8m and a warning was issued that second-half profits would be still lower. Philips has an option to buy a fifty per cent stake in Cityvision if the deal goes through.

TRADE NEWS

Datapart, Electron House, 100 Great Barr Street, Birmingham B9 4BB (021 766 5551) has been appointed national distributor for Crown Corporation.

Wizard Distributors of Manchester have produced their 1992 catalogue which is now available to trade customers. Completely redesigned, this latest edition contains many new items including satellite spares and Loewe parts. Trade customers who require a copy should contact Wizard Distributors, Empress Street Works, Empress Street, Manchester M16 9EN – telephone 061 872 5438, fax 061 873 7365.

PSL, the Kent based UK representative for Nokia Display Techniques of Germany, has for eight years supplied UK setmakers with Nokia colour picture tubes. It is now able to offer individually boxed new tubes to the service industry. The complete Nokia range is available, including full square, full square flat and the new Nokia Black Planigon tubes in 21, 25 and 28in. sizes, normally for next day delivery. Full details can be obtained from Purchasing Supplies (UK) Ltd., Unit J6, Springfield Enterprise Park, Springfield Road, Gravesend, Kent DA11 8HL. Telephone 0474 320 450, fax 0474 320 345.

Audio and video components/accessories distributor HRS Electronics, which was acquired by the Ring Group of companies last October, has appointed Martyn Brunger managing director and Chris Springhall operations director.

Satellite equipment distributor Micro-X has gone into liquidation.

SONY DEVELOPMENTS

Sony has announced growing support for its Mini Disc system and technical developments that could provide much longer playing time. Also unveiled are a DAT speech recorder, a two-hour Hi-8 video tape and a new range of anti-vibration audio tapes. Companies with MD licences now include Aiwa, Columbia Japan, Kenwood, Pioneer, Sanyo, Sharp, TDK and Teac. It's understood that some 300-500 titles will be available in time for the hardware launch. Within two-three years, technical advances in magneto-optical recording technology could enable the 2.5in. discs to store 74 minutes of full 16-bit digital audio, the equivalent of CD quality. The aim however would be to increase the recording time to 120 or even 180 minutes rather than add to the resolution. DAT-NT (no tracking) recorders intended for high-quality speech recording are to be launched this spring. They will use postage-stamp sized cassettes to record up to 120 minutes of 12-bit digital audio and are expected to sell for under £200. The serial copyright management system will be incorporated. The two-hour (four in the LP mode) Hi-8 tape will be of the metal evaporated type for camcorder use. The Esprit I, II and IV audio cassettes have shells designed to absorb vibration rather than transmit it to the tape – the company believes that most home taping is done for in-car and personal stereo use.

PHILIPS WIDEBAND HYBRID AMPLIFIERS

A range of low-noise wideband (40-860MHz) hybrid amplifiers with gains from 12-30dB has been introduced by Philips. They are said to be unconditionally stable despite virtually any line mismatching. There are eleven modules for aerial systems, RATV, MATV, u.h.f./v.h.f., cellular radio and instrumentation applications. Operation is at 12V. There is also a range for i.f. use in satellite TV and cellular radio receivers and for use in h.f. measuring and general-purpose equipment. The OM929 has a bandwidth of 10-2,000MHz and the OM956/2 a bandwidth of 950-1,750MHz.

VIDEO NEWS

Sharp is to introduce the world's first twin-lens 8mm camcorder, Model VL-MX7, in March at around £1,000. It has a 6-48mm ×8 zoom lens and a 4mm super wide-angle lens with a field of view almost equivalent to that of the 28mm lenses used in 35mm SLR cameras. Weight is 890g with battery and cassette. Other features include a picture-in-picture effect to enable users to combine pictures from both lenses into a single frame, various wipe and fade effects, a colour LCD viewfinder, hi-fi stereo sound and digital focus, white-balance and exposure control.

Sharp also plans to launch a series of mid-drive, centre-loading midi-sized VCRs. The tape handling mechanism will be centre-mounted on a three-point honeycomb chassis to reduce vibrations from the motor. The audio, video and control circuits are separated to reduce interference. The first model will be the VC-A33HM at £299. Features include auto-tracking, a quick-start mechanism, index search and a one year/eight event timer.

Nokia has launched three VCRs that feature an improved version of its ASO picture enhancement system called ASO Plus. Models VR3782, VR3742 and VR3722 have suggested prices of £520, £350 and £330 respectively.

The Akai VS410 and VS510 at £350 and £450 respectively feature the company's Intelligent HQ picture enhancement system. Model VS510 has LP, a shuttle ring and Nicam.

Nicam VCRs have also been introduced by Panasonic (Model NV-F55) at £460, Ferguson (Model FV58T) at £570 and Philips (Model VR712) at £479.

The Philips 41DV2 VCR is a compact model measuring 360 × 87 × 330mm. Its suggested retail price is £349. Philips has also launched a full-size VHS camcorder, Model VKR6860, at £1,000. Its features include a ½in. CCD image sensor with 450,000 pixels, a two-speed zoom lens, four fast shutter speeds and VITC compatibility. The £2,300 VKR9550 S-VHS camcorder is being withdrawn due to problems with the 700,000-pixel CCD image sensor and its customised peripheral components, including the auto-focus system.

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Servicing the Ferguson 3V29 VCR

Joe Cieszynski

This popular VCR of early Eighties vintage was designed and built by JVC but was distributed by a number of manufacturers under their own brand names and model numbers. It came on the market at the time of a video boom, and in consequence was sold and rented in large numbers. Ten years later many of these machines are circulating on the secondhand market in excellent order, having stood the test of time. Because of their reliability and a ready supply of cheap spares, these machines are often well worth overhauling. In this article I'll be highlighting some common problems. I'd also point out that these machines are ideal for training purposes: they are basic, easily accessible for servicing, spares are cheap, advice is not difficult to come by and, should you do something silly to them, they are usually very forgiving.

The basic JVC version is Model HR7200, but in the UK the Ferguson 3V29 is more often encountered. Other guises include the Decca/Tatung VHR8300, the Granada VHSWJ1 and the ITT TR3913. It's a basic model with a single-event timer and wired remote control. The 3V30 (JVC HR7300) looks much the same but has a multi-event timer and Dolby sound: it was distributed through Thorn rental outlets as the Baird 8930. The various manufacturers who marketed these machines had their own customised front panels, which enabled the layout of the controls to be varied. They are quickly identifiable however by their characteristic pop-up cassette housing, the large preset tuning cover to the right of this and the three-position standby/on/timer switch at the front left.

Modifications and Variations

During the two-three years when these machines were in production several major modifications and additions were introduced. This is something that must be taken into account when using circuit/layout diagrams for fault finding and when considering the use of panels from a scrap machine. The main changes are outlined below. Fig. 1 shows the basic panel layout.

The luminance/chroma/audio (YCA) board at the bottom of the machine underwent three major design changes during production, the modifications being confined mainly to the luminance and f.m. circuitry. In the earliest version all the YCA circuits are on the main panel. The second version had a noise-cancelling circuit added using a chip designated IC1 (not to be confused with the audio processor chip which is also labelled IC1): this circuit couldn't be contained on the main panel, so a sub-panel mounted beneath the presetter board was added. Connectors 161-162 and 171-174 were added to the main panel to link it to the sub-panel. The third version has an enlarged sub-panel to accommodate extra noise-cancelling circuitry, while the main panel has extra interconnection sockets. In addition, with this version the f.m. and luminance signal paths on the main panel were altered drastically, making it difficult if not impossible to trace signals using one of the earlier diagrams.

Another major area of change is the motor drive amplifier (MDA) circuit and board. In the earliest machines the drum MDA circuit consists almost entirely of discrete components: the board is mounted vertically in front of the cassette housing. A little afterwards the twenty nine transistors were replaced by a single HA13008 chip. The modified PCB is mounted in the same position. Subsequently the main servo board on the left-hand side was redesigned to accommodate the drum and capstan MDA circuits – the compartment forward of the housing was left vacant. The servo and MDA circuits remained unchanged, i.e. the same chip set was used, only the board layout being different.

A new microcomputer/system control board was introduced at the same time as the combined servo/MDA panel. The later version has a different plug/socket arrangement. Thus the two boards are not interchangeable, though the individual chips are.

There's also a version (Baird 8940/JVC HR7350) with stereo sound: this has a new servo chip set, the circuitry bearing no resemblance to the earlier versions – not even the i.c. circuit reference numbers are the same. The main change here is the replacement of the 28-pin HA11711 servo chip with a 40-pin BA851A (IC2 on the new board). Two BA6302A chips replace the three VC1029 frequency-voltage converter chips. In the earlier circuits the third VC1029 is used for reel motor control during visual search: in this later version IC8 doubles as capstan speed control for playback/record and reel motor control during search. Another significant change in the 8940 is the accommodation of the Dolby stereo sound PCB in the vacant compartment in front of the cassette housing. This is worth noting as it is not unknown for an unsuspecting engineer to look for an MDA fault on the Dolby stereo sound board! This model was amongst the first of the stereo VCRs, prior to hi-fi sound: it was not a great success because the stereo sound still used the lateral audio tracks and, as a result of the low tape speed (23·39mm/sec), the audio quality was nothing like hi-fi.

The majority of machines have an f.m. test point (TPFM) atop the deck terminal 1 board. In the 8940 the f.m. test point is on the servo panel: it's towards the rear of

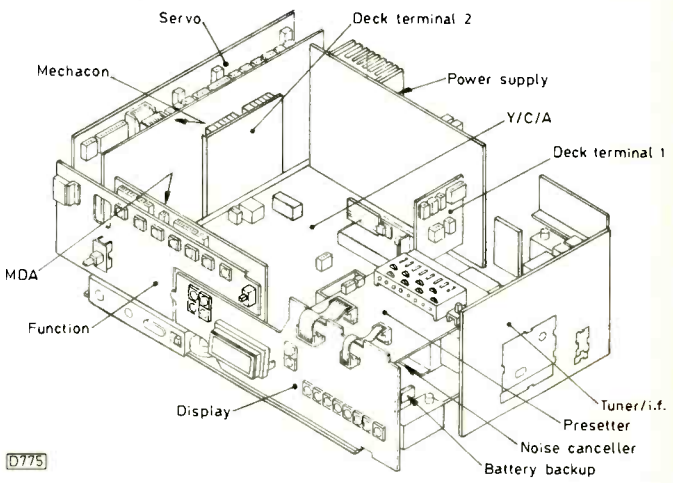


Fig. 1: Panel layout. The earliest versions didn't have the noise-canceller board or battery back-up. On later versions the MDA circuit was put on to the servo board, leaving an empty compartment behind the function board. On the stereo sound version this compartment was used to house the additional audio circuits. The deck terminal 2 board is needed only with the combined servo/MDA board: it was added to accommodate the interconnections between the MDA, the system control and the motors.

the board and is designated TP9.

Another addition with the 8940 is a ni-cad battery and charger circuit to provide clock and timer back-up in the event of mains failure. These items are located next to the noise-canceller sub-panel beneath the presetter board.

In some cases it's possible to interchange panels between different versions of the machine, but this is rarely possible without having to carry out modifications.

Basic Mechanical Overhaul

In most cases a 3V29 can be restored to normal working order by replacing the pinch roller, the loading belt and the cassette lamp. This should of course be accompanied by thorough cleaning of the tape path. If this basic overhaul has restored normal operation, it simply remains to check the tape path for signs of tape curl, the reel idler operation, the take-up spool torque, the condition of the heads, and the tuning presets. Once these points have been attended to and any repairs required have been carried out the average machine will be ready to give a further four-five years of trouble-free operation. Many other problems arise quite frequently however. A more detailed account of these and how to cope with them follows.

Mechanical Faults

A pinch roller that has done more than a thousand hours of service generally needs replacement because it becomes concave, see Fig. 2. Thus the tape will slide up or down with respect to the audio/control head. The result is poor quality h.f. audio response or poor tracking due to loss of the CTL pulses. Both symptoms can be intermittent. Creasing of the tape edge may also occur.

The same symptoms can be caused by a distorted pinch-roller mounting bracket. It becomes distorted when excessive pressure is applied whilst removing the pinch roller fixing screw. It's worth checking for this during each routine service. Fig. 3 shows the method of checking the mounting.

The back-tension band is not a source of trouble with these machines. If it appears to be well worn however it should be replaced. According to the service manual the torque should be set at between 30-40g-cm, using a back-tension cassette. The only correct way to set back tension is to use some form of tension gauge. If you are working on only the occasional machine however, out of interest rather than as a repair service, the 3V29 is, unlike many other models, very tolerant and will often allow you to set the tension using the method outlined below (see Fig. 4) – but I must emphasise that you do so at your own risk. Tension is adjusted by moving the foot (A) from left to right. Without a tension gauge, fitting a new band in the same mechanical position as the old one will usually give you approximately the correct tension. Where the original band has been moved (you can tell if the locking glue has been broken), approximately correct tension should be obtained by aligning the slot in the foot with the adjacent hole in the chassis. This forms a good starting point when you do use a tension gauge.

The loading belt in this machine is notorious. When it stretches it will either fail to close the after-load switch, as a result of which the machine will unload after about ten seconds, or it will fail to close the unload switch, with the result that the motors continue to rotate after unloading and the cassette housing won't open. Both symptoms may be intermittent.

To replace the belt, remove the loading motor assembly

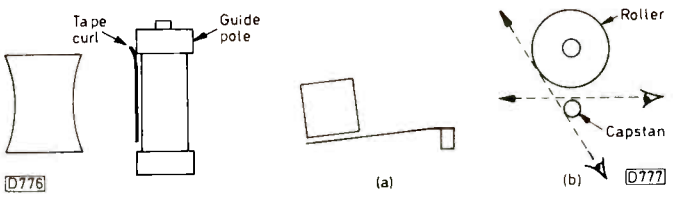


Fig. 2 (left): A concave pinch roller results in uneven pressure on the tape, which will slip up or down on the exit guide pole. It's best to check the pinch roller by removing it.

Fig. 3 (right): It's essential that the pinch roller is vertical. A distorted pinch roller mounting bracket is shown at (a). The pinch roller can be checked, see (b), by pressing the roller towards the capstan with a finger, leaving just a narrow gap through which the roller can be sighted. Use the capstan as a reference. Check from two angles, as shown, for zenith and azimuth distortion.

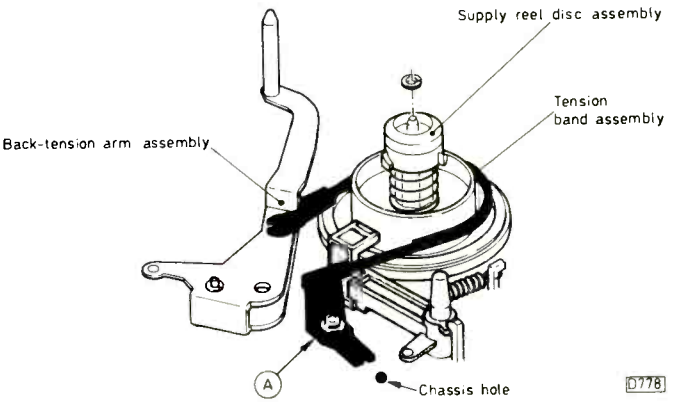


Fig. 4: The back-tension assembly.

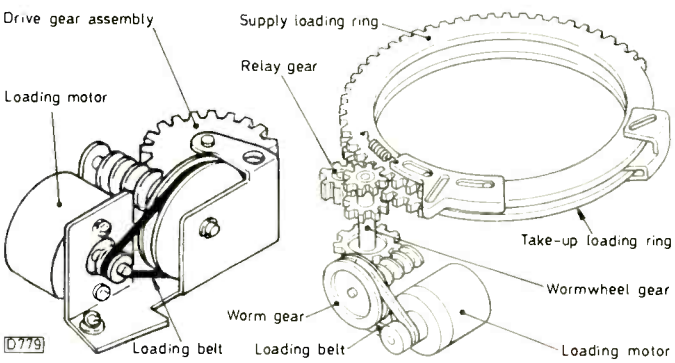


Fig. 5: The loading block and loading rings. The simplest way to replace the belt is to remove the block, but note that the rings are then free to move and can thus become unmeshed.

(see Fig. 5) and release the circlip. But beware: when the motor assembly has been removed the two loading rings are free to move and, after reassembly, may be out of mesh. This problem can occur even when you take great care as you remove and replace the assembly. What usually happens is that the gears on the motor block rotate as you change the belt. Thus when the motor block is reinserted the gear teeth no longer locate with those in the rings. One's natural instinct is to gently juggle the motor block until the teeth are aligned, but this is when the rings move out of mesh. What you should do is to lower the motor block on to the rings and, if the teeth don't engage immediately, gently rotate the motor pulley until they do. The operation isn't difficult: I've managed it successfully in a customer's front room on many occasions.

If the rings do become unmeshed, remove the loading block, fully retract both the slant poles, look to see that the

teeth on both rings are aligned above each other, then reinsert the loading motor block. Now check the loading, ensuring that the guide rollers locate firmly in the V notches.

You may occasionally encounter a machine in which the loading motor has lost its torque, or where a tooth on one of the drive gears has come adrift. These are not common problems with the 3V29 however.

Still connected with the loading belt, another problem you might encounter is the afterload switch actuation bar sticking. This bar is on the top of the deck, running beneath the supply spool, the back-tension arm and the sub-deck. It has a hook at one end – this presses against the switch when loading is complete. The bar sticks because the hook is bent: the latter occurs because many engineers do this in a vain attempt to correct the fault caused by a stretched loading belt (they are usually not aware that the belt is the culprit, and bending the bar seems to be the obvious cure).

It's not possible to straighten the bar from beneath the deck – this will introduce a kink that will cause sticking – and the bar cannot be removed as it's secured to the chassis by rivets. The best thing to do is to remove the back-tension arm, the sub-deck and the loading rings, after which the bar can be straightened from above, using a wide, flat-bladed screwdriver and some gentle percussion.

As with many other VCRs, the take-up clutch is a common cause of trouble. Intermittent tape spillage into the machine, or the machine going into the stop mode during play, are more often than not caused by a defective clutch or the take-up idler which is between the clutch and the take-up spool.

The manual quotes a take-up torque of between 60-150g-cm. A torque gauge is not essential however. Diagnosis of a defective clutch can usually be carried out by playing the latter part of a three-hour tape and watching the spool operation for a brief period: you will see the spool begin to stall.

The reel idler also gives its fair share of trouble. Apart from poor fast winding and failure to reel the tape into the cassette when unloading, the reel idler is also the main cause of poor visual search performance. During search the reel motor comes under the control of a servo that uses the control-track pulses for feedback. If the idler is worn or dirty, the servo will not be able to maintain proper control of the nine times normal tape speed.

Another cause of poor search is a slightly dirty CTL head. The head may provide sufficient output for normal play, but in the search modes the CTL output falls and the servo accelerates the reel motor to the full fast-wind speed.

Occasionally, apparent failure of the reel idler may be due to distortion of the plate spring behind the idler. This spring keeps the idler pressed against the motor pulley when it's jockeying between the two spools. If the spring is distorted the idler won't throw over. You can usually straighten and retension the spring.

Unlike other makes that I could mention, the reel motor rarely gives trouble. Before you condemn it I would recommend that you rule out all other possibilities.

Because of the age of these machines, worn or hardened spool carrier tyres are common. If they need to be renewed it's advisable to replace the clutch and the reel idler at the same time (unless new ones have recently been fitted).

The guide rollers should never fail. But thousands have had to be replaced because they have been adjusted without releasing the locking screw at the rear base. If the top of the roller appears to be chewed, scope the f.m. waveform while a known good tape is being played and look for signs of dropout. If dropouts are evident it's best to remove both rollers and inspect the shafts. Look for scouring caused by the locking screws. I always replace the guide roller(s) when scouring is evident – experience has shown that a lot of time can be wasted trying to set the rollers when in fact they've become distorted.

Here's a practical hint when adjusting the guide rollers. Holes in the V notches make it possible to release and secure the hexagonal locking nuts with the machine in the play mode. After adjustment it's advisable to secure the screws with the rollers in this position, as otherwise they have a tendency to move out of alignment when unloading.

A number of things can cause poor tracking and a poor f.m. waveform. When you feel that you've tried everything possible to correct this situation the slant pole(s) are suspect. In several machines I've come across a slant pole has worn at the point where the tape runs round. In all cases the wear has been almost unmeasurable and invisible but a replacement pole has cured the problem.

A common problem occurred in the early days when someone would fit the drum rotor back on its shaft in the wrong position. This puts the PG magnets out-of-phase with the video heads, causing all sorts of upsets. Most engineers today are aware of this problem, but do bear it in mind if you have to remove the rotor: the locking screw must locate against the flat on the shaft.

The cassette housing is robust and quite reliable. Occasionally you come across one where fluff or fur have become entangled around the damper fan mechanism, the result being that the housing won't come right up. The main problem with the housing itself is refitting it after service. If it's too far back, i.e. away from the front of the player, the machine may eject the cassette whilst in the play mode. If it's too far forward it will fail to eject at all. There was originally a housing alignment jig, but I doubt whether many people ever used it. In the main, correct operation will be obtained when the housing is fitted loosely, pulled fully forward, then pushed back about one millimetre. Secure the housing then check its operation by playing a tape then pressing eject, preferably with your hand over the housing just in case!

The capstan motor is on the whole reliable but is occasionally responsible for wow and flutter. The main complaint about it however is the noise it produces – the motor tends to hiss constantly when running. Before you spend a large amount of money on a replacement note that they are like this from new.

The drum motor is equally reliable, but you can come across one where a Hall element has failed or where the PCB breaks inside the motor, the result being that it either takes off at full speed or runs at a snail's pace. I also had one machine in which patterning and noisy chroma were caused by a defective rotary transformer. The f.m. waveform in one channel was clearly noisy, and a replacement lower drum assembly (after replacing just about everything else) provided a cure.

Electronic Faults

In its youth the 3V29 had its fair share of electrical faults. This was quite unlike the earlier 3V00/3V16/3V22 series which mainly suffered from mechanical failure such as distorted loading arms and gears. I should add that many of us were at the time tired of rebuilding those machines and viewed an electrical fault as a relief!

Electrical faults with the 3V29 are rare nowadays. When they do occur, a replacement panel from a scrap machine can usually be quickly found. But many electrical faults are

easy to trace, and repair is often quicker than realigning a replacement panel. Here's a rundown on the more common faults I've had.

Any of the five fuses on the power supply panel can fail due to age – they rarely fail because of a fault condition. With a dead machine it's prudent to start by making a quick check on these fuses. At the start I mentioned that the 3V29 is very forgiving. By this I meant that should a spanner or meter probe fall into the works the only damage suffered is very often a blown fuse on the power board. This cannot be said of certain other VCRs.

Dry-joints can occur anywhere. Some of the more common ones are as follows:

(1) At Q101 on the YCA panel. The result is loss of the "all time 9V" supply and hence all the switched supplies.

(2) At the tuning block assembly or associated transistors (presetter board). The symptoms are won't tune or intermittently jumps off tune.

(3) At the connector terminals on top of the full erase head. The symptoms are as follows: the picture and sound are recorded correctly (the old video tracks are erased by the h.f. f.m. signal while the sound track is erased by the audio dub head) but colour patterning is evident because the f.m. doesn't remove all the l.f. chroma of the previous recording.

(4) At various transistors in the audio stages (YCA panel). The symptom is intermittent sound, perhaps only when recording.

These machines can suffer from breaks in the wiring looms. They occur where a wire enters the plug connector. As the breaks are usually within PVC sleeving they are not obvious. Once you've located a break, the best way of dealing with it is to remove the terminal pin from the plug and remake the connection by soldering the wire to the pin, which can be removed by pressing the barb in gently with a fine screwdriver. When reinserting the pin, be sure to open the barb first otherwise the pin will push out as you reconnect the plug.

Cracks in the servo panel can result in the capstan motor taking off at full speed due to loss of the FG signal. These cracks occur in two places: in the top left-hand corner, by plug 61/62, and along the bottom edge close to Q2. The most effective repair is to hard wire across the print using insulated wire.

With any older VCR failure of the stop sensor lamp is the most common cause of an inoperative machine. Just once in a while however a new lamp doesn't restore operation with a 3V29. Where this is the case the most likely suspect is the feed transistor Q1, which is mounted on the deck terminal 1 board. When replacing this, note that it's a pnp device. A BC307 usually works.

With any electronic equipment, ensuring that all the power supply lines are present and correct is an essential initial check. As with most VCRs the 3V29 has a number of supply lines that are switched to change the mode, i.e. the Play 9V, Rec 9V, E-E 9V etc. lines. Supply switching is carried out by a set of mode-control transistors on the YCA panel. An open-circuit transistor results in loss of the relevant supply. Problems also occur when one of the transistors is leaky, with the result that the supply is permanently present. This can be interesting. With a leaky E-E switch transistor for example the machine will record correctly but operation of the luminance, chroma and servo circuits in the play mode is totally incorrect as the circuits receive both the Play and E-E supplies. Fig. 6 provides an outline of the mode-control circuit.

Small isolating inductors are used to prevent interaction between circuits via the supply lines. Occasionally one of

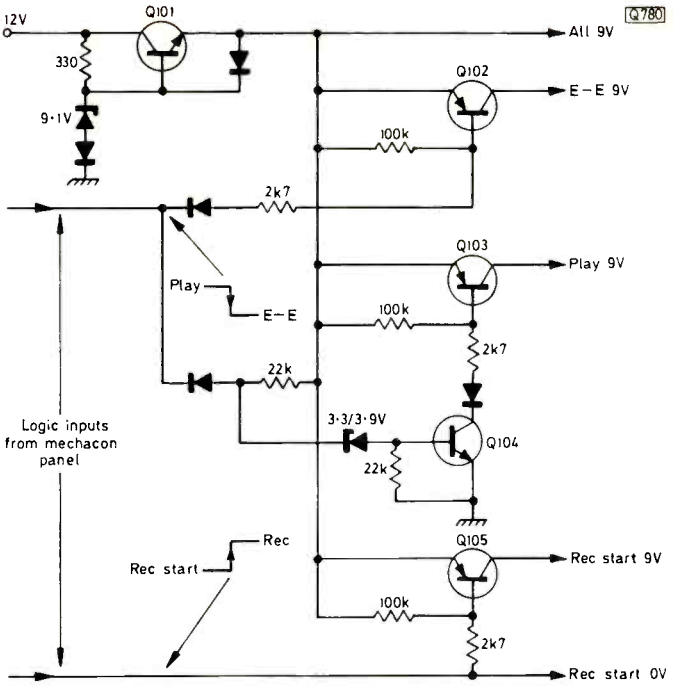


Fig. 6: The mode-control circuit. It's on the YCA board.

these coils goes open-circuit, the result being failure of one small area of the circuit.

Watch out for failure of the 32V tuning supply. The regulator consists of Q8 and IC3, which are on the tuner/i.f. panel. An unregulated 40V supply feeds the circuit. This has its own 315mA fuse (F5) on the power supply panel.

Failure of the reel motor to operate can be due to a defective circuit protector (CP2) on the mechacon panel. It's shown as a 10Ω resistor in some circuit diagrams but in even the earliest machines I've never found anything other than a circuit protector.

IC12 on the mechacon panel tends to be blamed for other reel motor faults. It's a reliable device however and I've found that the cause of the fault usually lies elsewhere. Possibilities include regulator Q2 on the main chassis, behind the drum motor, an inverter in IC8 on the mechacon panel and faults in the wiring looms.

Chip failure is not frequent but does occur. In my experience two of the most troublesome devices are the VC1029 frequency-voltage converter chips and the IR2403 logic inverter chips. The operational amplifiers in the VC1029 chips (servo and MDA panels) fail occasionally. The IR2403 contains seven separate inverters. It's not uncommon for one of the outputs to become permanently short-circuit to the negative side of the supply, a fault that can be confirmed with an ohmmeter. This type of chip is used extensively on the servo and mechacon panels.

If visual search results in loss of line lock with the tape accelerating to the fast wind speed, clean the CTL head and check that it's correctly aligned. During search the reel motor comes under the control of a servo that uses the control track pulses for feedback.

If the front display is dim and patchy forget it! The vacuum fluorescent display is a thermionic device which, as with all such devices, loses emission.

In Conclusion

Given an overhaul the majority of these machines should be able to provide another four or five years service. They and their clones have proved to be the true workhorses of the video world.

Test Report: Beckman Industrial Scopemate 2

David Botto

The Beckman Industrial Scopemate 2 is an i.c. and component tester with a whole lot of extra features. It has been designed with the concerns of the TV/video/computer engineer expressly in mind, is nicely built and looks good on the bench. The keyboard is well laid out and clearly labelled. Some instrument keyboards I've come across have a spongy feel. This is not the case with the Scopemate 2, whose keys are positive in use and have that gentle, responsive touch that comes with the use of top-quality key switches. This is an important point with an instrument you'll be using every day. A comprehensive set of test leads is supplied with the instrument.

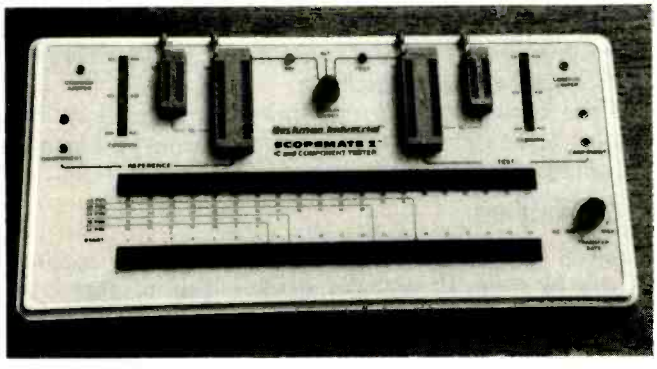
Mode of Operation

The component tester is used with an oscilloscope to provide the display, and is an extremely useful adjunct if your scope doesn't incorporate a tester. Fig. 1(a) shows the tester's basic mode of operation. An a.c. voltage is connected across two resistors, R-low and R-high, the latter representing the tester's internal circuitry. With the arrangement as shown, almost the full a.c. voltage is applied to the scope's X (horizontal) input. This will produce a horizontal line on the screen, see Fig. 2(a). If a short-circuit is now placed across the test sockets the display will consist of a vertical line, see Fig. 2(b), because the a.c. voltage is now applied to the scope's Y (vertical) input.

When a component is connected across the test sockets, a.c. flows through it. The result is a waveform display that depends on the characteristics of the component. The scope's X axis displays the voltage across the component while its Y axis displays the current that flows through the component. For example, when a diode is connected to the test sockets with the polarity shown in Fig. 1(b) it will conduct only when the a.c. waveform at its anode is positive-going with respect to its cathode. The pattern thus produced is shown in Fig. 2(c). Reverse the diode and the pattern will be as shown in Fig. 2(d). A capacitor connected across the test sockets produces an ellipse – see Fig. 2(e).

Output Current

The Scopemate 2 supplies, via an internal current limiting resistor, 12V a.c. at 50Hz to the component being tested. Use of this resistor limits the maximum short-circuit current through the component to approximately 300μA.



For a complete description of the basic working principles of a component tester, see my articles in the July and August 1990 issues of *Television*.

Connections

I encountered no problems in connecting the Scopemate 2 to my oscilloscope. The instrument is connected to the a.c. mains supply via a small, external 240V a.c. mains transformer. Its X and Y outputs are connected to the scope's X and Y inputs via two substantial leads that look as though they'll stand up to workshop conditions.

Once the Scopemate 2 has been connected up, the scope is set to its X/Y mode and the tester is switched on by means of its combined on-off switch/transfer rate control. The setting up procedure is straightforward and is fully described in the operating manual.

Use

To use the tester in its simplest mode, two test leads equipped with miniature crocodile clips are plugged into the two right-hand 4mm test sockets. These leads are then connected to the component being tested. If the component is open-circuit you get the display shown in Fig. 2(a). If it has gone short-circuit the display is as shown in Fig. 2(b).

I found that the Scopemate 2 will test popular digital and analogue chips, including DTL, TTL and CMOS types; linear devices such as operational amplifiers, comparators and voltage regulators; LSI chips such as microprocessors and peripheral devices with a maximum of 40 pins; and various other devices such as opto-isolators and custom logic arrays.

The four zero-force i.c. insertion sockets are craftily designed to accept in-line chips with various numbers of pins and widths. Since the Scopemate 2 tests transistors I felt that it might have been an idea to have included pre-wired transistor test sockets. In practice however I soon found it easy to insert the leads of a small transistor into the first three sockets of one of the i.c. holders.

The Scopemate 2 will also test diodes, capacitors, resistors, inductors, transformers etc. It checks for the short- and open-circuit conditions and, with semiconductor devices, diode action and leakage. It's also useful as a continuity tester. Beckman Industrial's claim that if a component will fit into one of the i.c. sockets, or can be connected between the two clip leads, it can probably be tested by the Scopemate 2 appears to be justified.

Testing a component is fast and easy, because the instrument generates simple patterns which are displayed and compared on the screen of an oscilloscope. Any leakage or shorting in a component is instantly apparent to the eye.

The Scopemate 2's panel has two 20-pin and two 40-pin zero-insertion force i.c. sockets. In addition there are two 40-pin "common" strip sockets.

Where the Scopemate 2 really scores is that it enables comparative tests to be carried out. A known good component can be connected to the left-hand section of the tester and a suspect component of the same type to the right-hand section. By means of Scopemate 2's display

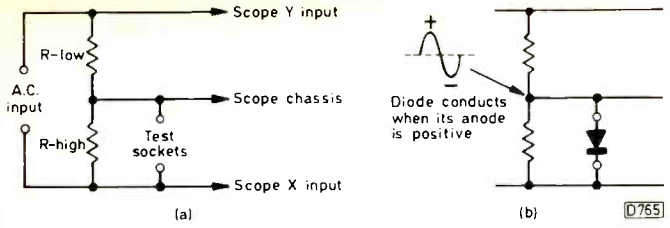


Fig. 1: The tester's basic mode of operation (a) and the effect of connecting a diode to the test sockets with the polarity shown at (b) – see waveform (c) in Fig. 2.

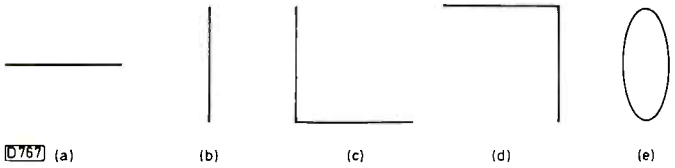


Fig. 2: Some of the many waveforms produced. (a) The open-circuit condition. (b) The short-circuit condition. (c) Diode connected as in Fig. 1(b). (d) Diode with connections reversed. (e) Ellipse produced by a capacitor.

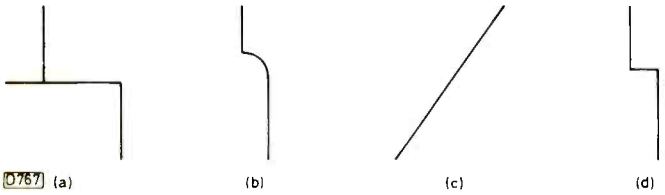


Fig. 3: Some further waveforms. (a) At pin 3 of a 723 voltage regulator; (b) at pin 3 of a 555 timer; (c) resistor; (d) zener diode.

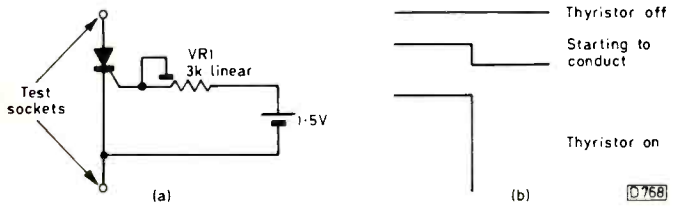


Fig. 4: Testing a thyristor. (a) Connections. (b) Waveforms produced.

select switch the waveforms produced by both components can be compared either by selecting test and reference in turn or by means of the alt mode. When this latter mode is used the trace pattern alternates between the two components at a rate determined by the setting of the transfer rate control – this controls the frequency of an internal clock oscillator which in turn controls, via a drive amplifier, a switching relay.

Some further waveforms that are produced by various components when connected to the Scopemate 2 are shown in Fig. 3(a)-(d).

Practical Tests

The ability to test electrolytic capacitors is one of the most useful functions of a component tester. Scopemate 2's operator's manual states that it should not be used to test electrolytics however. The reason for this is the suggestion that misleading waveforms may be displayed when an a.c. voltage is applied to an electrolytic capacitor. Now I'm not saying that you should disregard the manual's recommendations. I've successfully checked electrolytic capacitors with numerous component testers and bridge circuits however, all of which applied a low-current a.c. voltage to the electrolytic capacitor being tested. So I decided to use the Scopemate 2 to check a wide range of electrolytics. The instrument tested the lot perfectly, no problems being encountered.

I found that Scopemate 2's i.c. testing facilities are invaluable in the workshop. The i.c. to be tested is plugged into one of the zero-insertion force i.c. sockets in the test section of the instrument. Each numbered pin switch provided corresponds with an i.c. pin number. By pressing the pin switches in turn, according to the number of pins on the i.c., you can view the waveform at each pin. By inserting a known good chip of the same type in the reference section of the instrument and then using the transfer control the waveforms at each of the pins of the two chips will be displayed alternately.

CMOS devices can be tested provided they are industry-standard items that incorporate the usual protective diodes at each pin. If in doubt it's best to refer to the manufacturer's data sheet.

In-circuit tests are a helpful feature. Before making such tests, disconnect the equipment from the mains supply and make sure that the power supply capacitors are discharged. In the case of a TV set the c.r.t.'s final anode capacitance must also be discharged. While carrying out practical tests I found that many transistors, diodes, capacitors, transformers, LEDs etc. can be tested in-circuit.

When using the Scopemate 2 to check equipment you regularly service it's a good idea to make a note of key "signature" waveforms and draw them in the service manual.

Additional Tests

Scopemate 2's usefulness can be considerably extended by means of 16-, 20-, 24- or 40-pin extender test cables. Use of such cables enables the waveforms produced by a suspect PCB to be compared with those produced by a known good one. Here again the transfer mode is used.

The operator's manual is easy to understand, but a few additional pages would have made all the difference. In my view anyone not familiar with the use of a component tester could miss out on many of the extensive tests the Scopemate 2 can carry out.

A wide range of zener diode voltages can be accurately measured for example. Large-value capacitors can be checked by manipulating the oscilloscope's controls. How to do this is not explained in the manual. It's also possible to carry out effective thyristor tests. To do this all you need is an external 1.5V battery and a linear wirewound control. Connect the thyristor as shown in Fig. 4(a) and a horizontal line will be displayed. As the resistance presented by VR1 is gradually reduced the waveforms shown in Fig. 4(b) will be seen.

In fact virtually all the tests described in the August 1990 issue of *Television* and a lot more besides can be carried out using the Scopemate 2. This includes the signature testing methods described in the earlier articles.

Conclusion

Scopemate 2 is available from Beckman Industrial Ltd., Astec Building, High Street, Wollaston, Stourbridge, West Midlands DY8 4PG – telephone 0384 202 620. It's made in the USA and costs £310 plus VAT. This cost would soon be recovered in a busy workshop. The instrument comes complete with a comprehensive set of test leads: sets of i.c. extension leads can be supplied at extra cost.

My thanks to Sue Round of Beckman Industrial for arranging to lend me a Scopemate 2 for evaluation.

TV Fault Finding

Reports from Ed Rowland, Nick Beer, Mick Dutton, Ray Crockit and E.M. Beddow

Grundig CUC2201 Chassis

This portable colour set would sometimes trip for about twenty minutes before coming on, after which it would run without further trouble. At other times it would work for days on end without the fault occurring. There were no dry-joints, and heating/freezing suspect components had no effect whatsoever. The cause of the trouble turned out to be the set-h.t. control R637 (1kΩ) **E.R.**

Saisho CM16TT

This set was brought to us because it was intermittently dead. The customer asked whether the colour could be checked as it was also faulty. The STK7308 regulator chip was the cause of the power supply problems. When it had been replaced we had good pictures with unlocked colour. A judicious tweak of the APC control restored normal colour, which was fortunate as we'd no manual. **E.R.**

ITT CVC1175 Chassis

This dead set had been checked at the air base where its owner worked. The technician had diagnosed a faulty line output transformer. The trouble was in fact due to the 115V line reservoir capacitor C716 (10μF, 350V). It looked o.k. until it was unsoldered, when it was found to be leaking electrolyte. **E.R.**

Panasonic TC297NP

The complaint was that the picture became unwatchable after three-four hours. So the set was put on soak test. Sure enough after about three hours flyback lines appeared on the screen and the picture lost definition. As we didn't have the service manual we decided to freeze all the capacitors in the line output and video stages. This did us no good. It was only when we noticed C356 (1μF) on the c.r.t. base panel that our luck changed. Freezing this capacitor cleared the fault completely, and on unsoldering it one of the legs dropped off. No further trouble was experienced after fitting a replacement. **E.R.**

B and O 33XX Chassis

This set was stuck in standby. The cause was an excessive line output stage load. A check showed that the output transistor was o.k. and subsequent tests revealed a primary-to-secondary short in transformer 5T11. **N.B.**

Salora J Chassis

This set was stuck on channel number 3. If you pressed the other buttons the channels came up but didn't latch. Also some didn't do as they should – number 4 produced number 1 for example. There was a fairly obvious link in the lines between the SAA1251 control chip and the front keyboard. The switching transistors in these lines have been known to give trouble. The appropriate one, TC11, read o.k., as did all the others. A replacement SAA1251 made no difference, and all the pull-up, down and feed resistors had the correct values. Print continuity was o.k., and the M293B1 programme chip was all right. For want of anything better to do I replaced TC11. This cured the problem, though the transistor still read right when tested out of circuit. **N.B.**

Sony KV2092

This set would intermittently remain dead when an attempt was made to start it from standby. A quick check when the fault was present showed that there was no 115V supply at the h.t. fuse. The cause was a dry-joint on the resistor mounted in the L602 position. It's an 0·68Ω fusible type. Neither the resistor nor the coil is shown in the circuit diagram. Whichever is fitted is between the chopper transformer and the anode of the 115V rectifier D601. I've also had this resistor go open-circuit when the line output transistor has gone short-circuit. This has happened before or in addition to failure of F602. **N.B.**

Toshiba 285T5BZ

This large-screen set had failed before, when it wouldn't start from standby. The cause had been failure of the TDA4601 chip IC801. Here we were twelve months later with the same problem. A phone call to Toshiba technical was all that was needed. Replace the i.c., change R818 to 15kΩ and C845 to 100μF and all would be well. It was. **N.B.**

Salora Small-screen L Chassis

In the August issue, page 717, we referred to the front panel controls doing the wrong thing with these sets – fault (7) in the list. Our latest experience has been that simply re-enabling and storing will cure such problems. If the set comes back again, follow the previous advice (replace the SAA1293 and MDA2061 chips). **N.B.**

Philips KT3 Chassis

After the set had been running for many hours the field would contract, with severe foldover at the bottom. T1530, one of the field output transistors, had a thermal fault. Fitting a new BD233 put matters right. **N.B.**

Sony KV2752UB

This monster set had been causing a local dealer some grief. The symptom was severe EW distortion – there was no correction and gross vertical overscanning. The chip and the transistors on the scan-correction PCB had been checked/changed, as had most of the other likely components. A check on the underside of the main chassis showed that the correction PCB plugging and unplugging had resulted in dry-joints at its socket. These were resoldered and it was while doing this that I saw the real cause of the problem – L802 was dry-jointed at its busy end. **N.B.**

Grundig GSC200 Chassis

The ticket with this portable said no results. When we took the back off we found that R607 in the start circuit had

sprung open. R621 was also open-circuit, so there was no h.t. After replacing R621 and resoldering R607 the set worked normally until the end of the day. Next morning there was a loud thumping noise when the set was switched on and R607 sprung open. In the past we've had problems with the e.h.t. regulating thyristor TY503, so this was replaced and the set was given a soak test. As the fault persisted we had to investigate further. It seemed that the problem was in the regulation when the set was cold: when the 5V supply to IC2511, which is a TTL device, was checked it was found to be only 2·8V and varying. The fault was caused by the 4·7V zener diode Di2502. **M.D.**

Fidelity CTV20T

There was no sound and a check at pin 13 (volume control) of the TDA8190 audio chip IC3 showed that there was no voltage at this point. We suspected that the remote control chip IC2 was holding down the voltage via R46, but when this resistor was disconnected there was still no volume control voltage. The cause of the problem was traced to R59, which is in series with the slider of the volume control. It had increased in value from 100kΩ to over 2MΩ. **M.D.**

Ferguson TX90 Chassis

Field collapse it said on the ticket. We thought it would be a quick resoldering job but the joints were perfect and there was h.t. at the field output stage. The mid-point voltage was low at 22V however. Drive from the TDA4501 chip was fine. The cause of the problem was R198 (6·8kΩ) in the chain that supplies the base of TR104. It had gone high in value, upsetting the field output stage biasing. **M.D.**

Sony KV2066

The customer complained that the set sometimes took a long time to come on from cold – as long as half an hour. Checks around IC601 showed that there was no voltage at pin 4, the standby line. R632 (2·2MΩ) had gone open-circuit. **M.D.**

Ferguson TX90 Chassis

The line output transistor was short-circuit. When a replacement was fitted and the set was switched on there was a smell of burning. Before I could locate its source the transistor blew again. Suspecting the line output transformer I removed it and provided the replacement transistor with a resistive load, so that the drive waveform could be checked. All was well. When the transformer's primary winding was reconnected, via flying leads, the transistor again failed.

After fitting a new transformer and transistor I ran up the set using a variac. The correct h.t. voltage was obtained with only 220V input. With 240V input the verticals were bent. Also I found that the h.t. potentiometer didn't work. Checks in the regulating circuit showed that Tr107 and Tr108 were short-circuit. They'd probably been damaged by the faulty transformer. Replacing them restored normal operation. **R.C.**

Decca 80 Chassis

The problem with this set was intermittent field collapse. When I first saw the symptom there was a band of picture about one and a half inches high across the screen. This suggested a faulty field timebase chip, especially as the supplies were in order and all the capacitors had been replaced about a year ago for a similar fault. Changing the chip did provide a cure, long enough for the set to be soak tested for some hours then returned to its owner. A day later however the phone rang. Same fault. Call and find that the 32V supply is low. As I couldn't find any definite fault I decided to resolder all the joints in the area of the line output transformer and its associated rectifier diodes. This seemed to do the trick, but some days later the fault reappeared.

The set was brought back to the workshop and subjected to shock and vibration tests. This produced a slight increase in height. As the height was evidently trying to increase I thought I'd help it by adjusting the height control. No good. Out of desperation I tried the hold control. This produced full height! As I didn't have a replacement I removed it and cleaned the centre metal sliding contact, which was well tarnished. No problems after that. Why do these faults never show up at the start? **R.C.**

Ferguson TX100 Chassis

A common fault with these sets is field collapse due to failure of the TDA3652 field output chip. As this chip is no longer available a TDA3654 has to be fitted. We've started to experience problems when this is done: the results can be no scan at all, severe cramping or inability to set up the field hold correctly – despite changing the value of the resistor (R96) in the drive line from 6·8kΩ to 3·3kΩ as suggested in the sheet that comes with the chip. This chip is also used in some Sony sets, but in this case with a 1·5kΩ resistor in series with the drive. So we've tried 1·5kΩ in the Ferguson chassis and have found that the chip then works perfectly.

When contacted Ferguson commented that R96 can be reduced to 2·2kΩ if problems are experienced but that the TDA3654 must be obtained from them, also that they've had a lot of complaints about TDA3654 chips obtained from other sources. Sony however said it didn't matter where the chip came from as long as the value of the resistor was altered. **E.M.B.**

Sony KV2096

This set came in with a report saying that it was dead, also that the EW correction was poor. We soon found that the chopper transistor was short-circuit due to dry-joints on the 680Ω snubber network resistors. These should have been resoldered using the special solder that Sony supply with the mains switch modification kit. We were told that the switch modification had been carried out, but whoever had done it had fitted the wrong switch. We obtained the correct switch kit from Sony, fitted it and repaired the power supply. The result was a good picture, but we couldn't obtain straight verticals even with the pincushion amplitude control at one end of its travel. This was eventually traced to C527 having gone low in value. It should be 470μF but read 350μF when checked with our capacitance meter. **E.M.B.**

Philips System 4 Chassis

We've had several of these sets in which the field output chip has failed only a week or so after a replacement had been fitted. Replacing the electrolytics associated with this chip cures the problem. One in particular falls in value, from 100μF to about 70μF. It can also cause flyback lines to creep down the screen. **E.M.B.**

Satellite TV Receiver Project

Part 2

C.W. Murray

The receiver is built on two PCBs, both 11 × 16cm, one for the receiver circuitry and the other for the power supply. Figs. 2 and 3 show the component layouts, Figs. 5 and 6 the track patterns. Single-sided boards with a minimum of links are used in preference to double-sided ones as this makes it easier for those who have suitable facilities to make their own PCBs for the project.

Construction

Construction of the signals board is straightforward. Start with the links and resistors, moving on to higher components. Use sockets for the i.c.s. The LED indicator lamps and their associated switches are PCB mounted. A connector (CN14) is provided for the tuning controls.

If the power supply PCB is to be free standing, the specified heatsink should be used. Don't be tempted to use the slot in the heatsink for mounting the chips and transistor: drill and tap suitable holes – 6BA is a reasonable size. Remember to use insulating kits with IC5 and Q2. It's easier to fit the heatsink mounted devices to the heatsink then solder them to the board once the heatsink has been attached to it.

If the power supply is to be fitted in a metal case, the left-hand section of the PCB can be cut down to leave a 3mm earth track and the metal case can be employed as the heatsink, using a spacer made of heavy-gauge aluminium sheet. Refer to the previous note on heatsink capacity.

Connector pinning is shown on the circuit diagrams and must be followed carefully. Note that the power connector pinning differs on the signals and power supply PCBs. Check all connections thoroughly prior to testing the unit.

Setting Up

Before starting on the test and set-up procedure, check that all components have been fitted correctly, e.g. i.c.s inserted the right way round etc., and that there are no solder bridges.

Test the power supply as a separate module before connecting it to the signals board. Proceed as follows.

(1) Set all presets to their mid-positions and remove fuses.

(2) Switch on and check that the following voltages, relative to 0V, are present: 40V at the input to F2, 27V at the input to F3 and 13V at the input to F4. These are approximate values.

(3) If o.k., switch off and fit fuses. Switch on and check the following voltages at CN2: pins 2/3 5V ± 0·25V; pins 4/5 12V ± 0·5V.

(4) Set up the 28V supply. Monitor pin 8 of CN2, adjusting VR1 for 28V ± 0·1V.

(5) Set up the 13/17V supply. Monitor at pin 10 of CN2. Adjust VR3 for 17V ± 0·1V. Short pin 9 to 0V then adjust VR2 for 13V ± 0·1V. Remove the short.

(6) Set up the current source. Place a short across CN3 and monitor the voltage across R23. Adjust VR4 for 90mV ± 5mV. Short pin 1 of CN2 to 0V then adjust VR5 for 1·89V ± 0·1V. Remove the short.

This completes the setting up.

Connect the power supply to the signals panel. It's very important to check the connections between the two panels

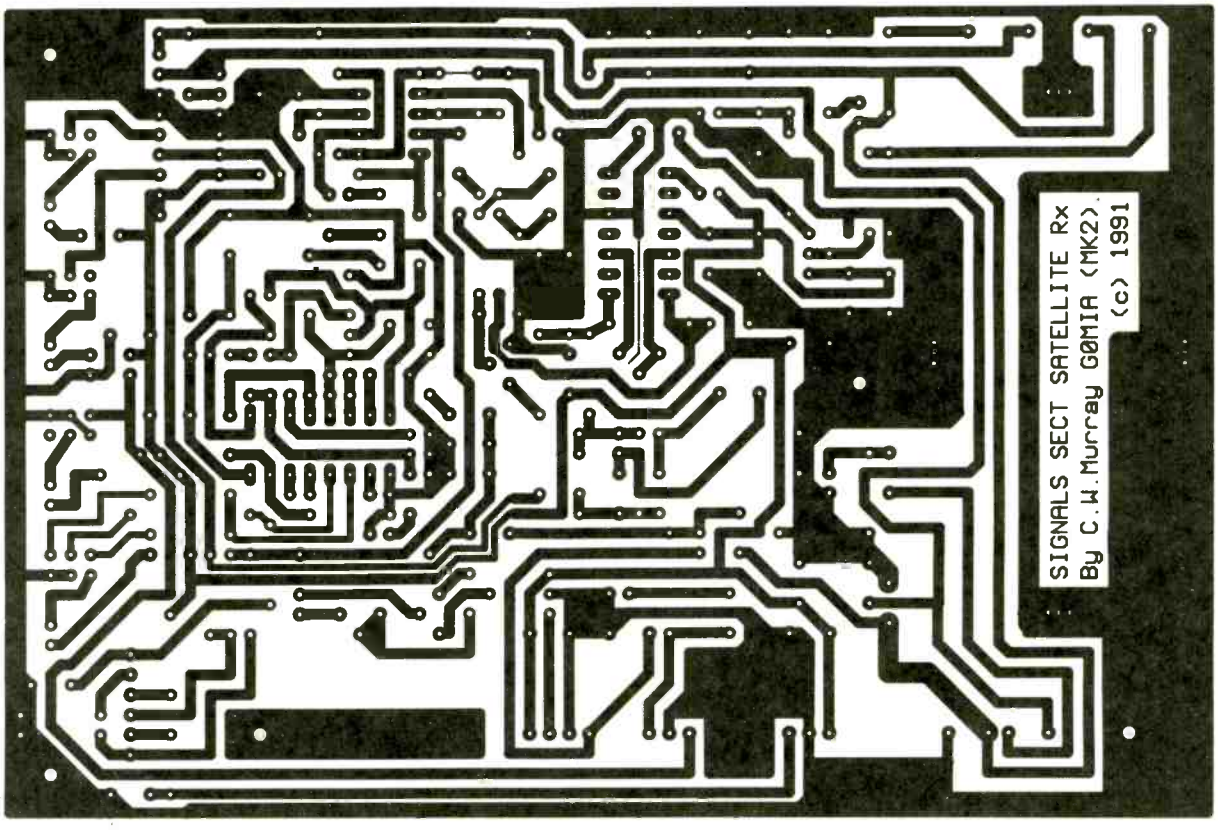


Fig. 6: Print pattern, receiver PCB.

carefully before switching on – any errors could lead to irreparable damage to the signals panel, so be careful! To set up the signals panel you need access to a dish and LNB which are ideally pointing at Astra or a similar Ku band satellite and have been checked with another receiver or set up using a signal-strength meter. Failing this, the dish and LNB should be set up to point approximately at Astra: under these conditions access to a frequency meter is invaluable. The signals panel setting-up procedure is as follows.

(1) Connect the receiver to a suitable LNB whose supply is provided via the coaxial cable connected to the i.f. block (centre conductor is at 13/17V, outer at 0V). If necessary connect the polar rotator to connector CN3 on the power supply PCB. Pulse-type or mechanical polar rotators cannot be driven directly by this receiver. Connect the receiver's output to a u.h.f. TV set tuned to the modulator's channel 36 output.

(2) Switch on and check that the grain pattern displayed by the TV set changes. Turn VR6 and VR9 fully anticlockwise.

(3) Adjust the vision tuning slowly from end to end: stop when something resembling a distorted picture appears. Leave the tuning control then slowly back off VR6 until the picture becomes clearer. Next adjust VR6 in conjunction with the tuning control for optimum picture quality – note that the TV set may also require fine tuning at this stage, so considerable patience and care are needed in making these adjustments.

(4) At this point make any fine adjustments to the dish needed to achieve a clear sparkly-free picture.

(5) Adjust the sound tuning until the main mono subcarrier is found, then adjust to the centre of the tuning range for this subcarrier. Adjust VR9 for maximum volume at both settings of SW5.

(6) Monitor the voltage at pin 7 of IC4 with respect to 0V. Adjust VR8 in conjunction with the vision tuning control for 14V ± 1V and optimum tuning – these controls are interactive.

(7) VR11 and VR12 set the offset and sensitivity of the signal-strength meter. Set the tuning to mid-travel and cover the LNB's feedhorn with tin foil or other suitable material to block the signal. Adjust VR11 to give a very small positive reading. Remove the foil and tune to the nearest signal. Adjust VR12 for a reading of around three-quarters of full-scale deflection with a good, sparkly-free picture.

This completes the setting-up procedure. Use a frequency meter to set the tuning as follows. With the meter connected to CN5 the frequency to which the receiver is tuned can be calculated. The following equation assumes that the DRO in the LNB is set at precisely 10GHz:

$$Fc = (Fm \times 128) - (479{\cdot}5 + Fd)$$

where Fc is the channel frequency in MHz, Fm is the frequency meter reading in MHz, 479·5 is the second i.f. (of the i.f. block) and Fd is 10,000 (i.e. the LNB local oscillator frequency). Divide Fc by 1,000 to give the frequency in GHz. This equation assumes that the prescaler in the i.f. block divides by 128. If necessary alter in accordance with the module used.

I would like to thank Mike Willis for constructing and testing the prototype and to dedicate this article to everyone at Surrey University who took an interest in and helped inspire this project.

The approximate estimated cost of the receiver is £120, exclusive of the case and dish etc.

What a Life!

Donald Bullock

The lady brought this 20in. set along and explained that it was her husband's. "'E said to let you do it" she added. The label said it was a Goodmans CVT2T, which was a new one on me. When I switched it on there was a rustle of e.h.t. but the set was otherwise dead. After a brief bout of meditation I increased the first anode supply, using the potentiometer on the line output transformer. This produced brightness on the screen, but nothing I did got me any further. Nor could I find any reference to Goodmans Television anywhere amongst my papers and data. So I rang my valued friend Peter Ambrose at Comet. He's a technical wizard who sounds like twenty five but is, he assures me, as ancient as I am.

A Nikkai Chassis

"It's actually a Nikkai chassis" he said. "On the left-hand side, close to the on-off switch, you'll see a small transformer designated EM104. Its windings are bound with yellow ticky-tacky tape. The secondary winding feeds a rectifier diode, D102, which should have 11V at its cathode to feed the front panel control circuitry. But you'll find that this voltage is missing because the fuse in the transformer's primary section is open-circuit."

"Well, thanks" I said, "now where do I get a replacement?"

"You'll have a job" he replied, "they're like gold dust."

I checked for 11V at the cathode of the diode and, as he predicted, it was absent. So I took out the transformer and checked across its primary connections. There was an open-circuit, again as predicted. When I telephoned Nikkai I was told that they had no stock, so I gingerly picked away the yellow ticky-tacky and found the open-circuit thermal fuse. After replacing it with one from my junk box I switched on again. Up came an excellent picture. I wish I knew as much about these things as Peter – and that I sounded as bright. I dunno what fuel he runs on but wish I could get some. Next day I had a similar set, this time wearing a Solavox jacket. The symptoms were the same and, armed with my new knowledge, I had the transformer out and repaired in no time. Thanks, Peter.

JVC HRD520

Feeling buoyant for once I picked up a JVC HRD520EK VCR. "Severe tracking troubles" said the ticket. Its own recordings played perfectly, but those made on other machines and from video libraries were unwatchable, with the tracking control having no effect. I worked through the tracking circuitry but couldn't find anything wrong then, reluctantly and carefully, I gently adjusted the tape guides. The right-hand one turned easily by hand: setting it up with a first-class tape then sealing it brought perfect results. Why hadn't I tried that first?!

Amstrad VCR4600

An Amstrad VCR4600 had been brought in with a cassette jammed inside. When I tried it the idler seemed to be slipping. So I took it out, fitted another and tried again. The machine groaned and whirred, but the tape didn't move. The drive belt underneath had flown off its pulley wheel. After cleaning and refitting it I got a repeat performance. So I took out the cassette manually and tried another one. This time the machine worked perfectly. When I examined the cassette I saw that it had jammed solid because one of the tape pillars had broken. When the owner called I told him that the cassette had caused the trouble and would do so again if he tried to play it.

Fault Indexes

I've had on one side recently for the purpose of reviewing them some of the advertised TV Fault Indexes, and have referred to them from time to time to see how helpful they are. The answer is very. Recently I had a Solavox NVCR5000 with a strange fault. It was dead, with only the standby beacon lit. When I looked it up I found a reference to a similar fault in this model, only this time the symptom was a muddled clock display. The Indexes referred me to page 288 of the February 1991 issue of *Television*. I looked this up and found that a modification involving a 4·7kΩ resistor would bring about a cure. Then I noticed that the article was one of mine. Good thing I write these things down! The modification had already been done, but the resistor was far smaller than any that I use, and it was open-circuit. Then I recalled the correspondence that followed my article. The general consensus was that replacing the "battery" capacitor was a better solution. I did this and found that it worked. It will be interesting to see whether this provides a lasting cure.

Sony KV2060

The next job was Mr Moggie's Sony KV2060UB TV set. "The picture went into a line" he piped, "it can't be the tube because the sound's all right." As the field had collapsed I homed in on the UPC1378H field output chip IC551 and checked its voltages. The supply voltage was correct and the others weren't too far out. There was also a healthy input from the timebase generator chip IC501, via R515. So I phoned J.J. Components for a replacement UPC1378H. When it arrived next morning I fitted it. Up came the field, but there was no field hold. None of the pretty preset potentiometers were labelled hold, and I feared that there was't such a thing. But the circuit told me that there was. It's grouped with the brightness, contrast and colour controls under the front plinth of the tube surround. Adjusting it produced solid locking, in fact an excellent picture. Super set, but flimsy cabinet.

Ferguson TX90 Chassis

The next set was another case of field collapse, but there were oddities this time. It was a Ferguson TX90 – the 20in. version. After ensuring that the field output transistors weren't footloose I checked them. As they were o.k., without further ado I removed the line output transformer to gain access to R268, the 22Ω fusible resistor cunningly concealed within the line output stage screening box. It's in the 100V feed to the field output transistors, and was open-circuit. A replacement brought back the field scan, but there was a dark horizontal line across the centre of the picture, as though the tube's screen had been burnt by being left in the field collapse condition. But I wasn't sure about this. So I applied my degaussing wand to the tube's neck and moved the picture about on the screen. The line moved with it. After some searching I found that R203

(10Ω) was open-circuit. A replacement cured this odd fault.

Stuck on Channel 1

Major Crust came in reeking of hair oil, with his hair smoothed flat and his moustache tweezed to a pair of points. He brought with him a 22in. Hitachi CPT206 and complained that it was stuck on channel 1.

"I'll spend up to forty quid on it" he announced in his military voice. "If it's any more I'm off to Ripoffs for one of their reconditioned ones."

I'd no room on the bench but made some and then plugged in his set. His diagnosis was correct.

"Two things bother me, Bullock. First, why was this blasted thing packed up, and the other is why are we here? On this Earth I mean..."

"Just a minute Major" I said, before throwing a fat old catalogue on the floor. I stood on it and tried the touch-tune buttons again. The situation was no better, and I saw the Major's eyes narrowing. So I returned the catalogue to the shelf and took down the bottle of surgical spirit. This made his eyes narrower still. I gave the buttons a brisk wash, dried them then tried again. They all now worked perfectly.

"Good God" spluttered the Major, "you've got a magic touch."

"It's nothing" I said modestly. "But you were asking why your set had packed up, and why we're here. I've the answers for you. Your set packed up because you changed channels while your hands were soaked in hair oil, I'm here to put it right for you and you're here to pay up and take it away."

"But you didn't even take the back off" he said, "how much are you going to charge me for that dab of spirit?"

"Tuppence will cover it, Major – but for knowing where to dab it, £9.98. A tenner to you."

He paid up and carried the set towards the door, muttering about why we're here...

Hitachi CPT1476

I then picked up a 14in. Hitachi CPT1476 and wondered whether I had any STR4211 power chips left. But this one had a field fault – cramping at the top. In such cases I suspect passive causes, like dry-joints or dried out electrolytics. One way of stressing the field circuit in this model is to press the plastic handle of my dusting brush between the power chip heatsink and the UPC1378H field output chip IC601. When I did this normal field linearity was restored. Out came my magnifying glass and I saw that a couple of the chip's pins were working loose. Resoldering them put matters right.

Philips KT3 Chassis

The final set that day was brought in by Warder Phil. It was a Philips 16CT3015 – the KT3 chassis – and was dead. As I was taking the back off Phil started to tell me about his job looking after "the bad, the mad and the sad". Whilst he was on about them I noticed that one of the main fuses had blown. So I checked the diodes in the bridge rectifier circuit. One of them, D6295, was leaky. So I replaced it, fitted another fuse and switched on. The fuse went again, but not before I'd spotted a glow through the white plastic skin of the posistor in the degaussing circuit, R6292. When I opened it I found that it was a pot of black grit. Fitting another, plus a new fuse, cured the trouble.

AN236 £2.30 AN5010 £2.95 AN5256 £2.20 AN5510 £2.85 AN5521 £2.20 AN6135 £1.40 AN6248 £2.00 AN7120 £1.25 AN7143 £2.45 AN7168 £2.50 BA308 £1.30 BA3506 £2.10 BA5102 £2.30 BA5402 £2.50 BA6109 £1.75 HA1124 £1.45 HA1137 £1.50 HA1377 £1.80 HA11235 £1.55 HA11423 £2.00 HA11714 £3.80 HA11715 £2.10 HA12017 £1.18 HA13001 £1.85 HA13002 £2.80 LA1460 £2.05 LA4102 £1.12 LA4445 £2.15 LA4460 £1.65 LA4505 £2.50 LA4510 £1.50 LA4555 £2.05 LM1011N £1.80 LM1111 £1.80 LM318 £1.15 LB1405 £2.20 M5106P £1.80 M5152L £1.50 M5218L £1.90 M50115 £2.50 M54543L £2.85 STA401 £3.00 STA441 £2.25 STK011 £3.70 STK015 £4.90 STK035 £8.75 STK043 £9.00 STK056 £8.20 STK050 £19.00 STK077G £6.50 STK078 £6.20 STK080 £1.50 STK082 £5.80 STK084 £6.60 STK086 £8.70 STK0029 £3.80 STK0035 £9.50 STK0039 £4.10 STK0040 £5.20 STK0049 £5.30 STK0050/2 £4.40 STK0059 £6.20 STK0060 £8.20 STK0080 £5.80 STK435 £4.20 STK437 £5.30 STK439 £5.80 STK441 £7.00 STK457 £5.20 STK459 £5.80 STK461 £6.20 STK465 £7.50 STK563 £4.80 STK772B £4.80 STK1030 £8.00 STK1039 £5.50 STK1045 £8.80 STK1049 £8.00 STK1050 £7.50 STK1070 £9.40

STK2025 £7.00 STK2028 £5.60 STK2029 £5.80 STK2038 £9.00 STK2129 £6.10 STK2145 £9.00 STK2155 £10.00 STK2230 £4.90 STK2240 £8.50 STK2250 £7.60 STK3041 £4.71 STK3042 £4.90 STK3044 £5.75 STK4024/2 £9.50 STK4026 £6.00 STK4026/2 £7.10 STK4028/2 £5.80 STK4060 £5.80 STK4121 £6.50 STK4121/2 £7.00 STK4141/2 £4.40 STK4151/2 £7.00 STK4152/2 £10.00 STK4161/2 £8.50 STK4171/2 £9.10 STK4172/2 £10.50 STK4181/2 £8.50 STK4182/2 £10.00 STK4191/2 £11.00 STK4191-5 £18.50 STK4231/2 £16.00 STK4311 £8.00 STK4332 £4.50 STK4362 £6.25 STK4372 £6.00 STK4392 £7.20 STK4432 £9.00 STK4773 £9.00 STK4803 £7.50 STK4833 £8.50 STK4843 £7.50 STK4853 £9.00 STK4873 £11.00 STK4913 £12.20 STK5314 £5.80 STK5315 £6.50 STK5324 £5.50 STK5325 £5.80 STK5331 £5.00 STK5332 £2.50 STK5333 £10.00 STK5338 £5.00 STK5339 £7.00 STK5361 £4.60 STK5392 £8.15 STK5451 £5.00 STK5461 £8.50 STK5471 £4.20 STK5481 £4.50 STK5482 £4.00 STK5730 £6.00 STK6325A £8.00 STK7216 £5.20 STK7217 £5.80 STK7308 £4.50 STK7309 £4.70 STK7348 £4.50 STK7404 £4.00 STK8050 £8.80 STK8250 £5.80 STRD1816 £10.00 STR3370 £5.80 STR3380 £5.00 STR381 £4.90 STR441 £4.40 STR450A £6.10 STR451 £3.80 STR455 £5.00 STR456A £6.00 STR1096 £3.80

STR2013 £4.60 STR3125 £5.80 STR4090 £5.80 STR5412 £4.50 STR6020 £4.50 STR11006 £6.00 STR40090 £3.65 STR50103A £3.25 STR50113 £4.89 STR50213 £6.50 STR54041 £5.80 STR58041 £4.80 TA7070 £1.15 TA7130 £0.70 TA7205 £0.89 TA7282 £2.48 TA7604 £2.35 TBA120S £0.40 TBA120P £0.40 TBA120U £0.48 TBA800 £0.45 TBA520 £1.00 TBA540 £0.85 TCA650 £2.85 TCA830 £0.70 TCA900 £1.00 TDA440 £1.85 TDA1002 £1.85 TDA1011 £1.00 TDA1012 £1.05 TDA1010A £1.00 TDA1015 £1.05 TDA1028 £2.08 TDA1029 £2.40 TDA1035T £1.20 TDA1037 £1.80 TDA1044 £2.20 TDA1047 £3.60 TDA1054M £1.82 TDA1059 £0.80 TDA1060 £1.75 TDA1072 £2.10 TDA1085 £3.80 TDA1170 £0.89 TDA1190 £0.95 TDA1270 £1.85 TDA1410 £2.00 TDA1515A £2.35 TDA1908 £0.90 TDA1412 £0.90 TDA2002 £0.75 TDA2004 £0.90 TDA2005 £0.90 TDA2006 £0.70 TDA2009 £1.85 TDA2030 £0.85 TDA2161 £5.00 TDA2270 £2.65 TDA2320 £0.70 TDA2540 £1.00 TDA2577 £1.75 TDA2581 £1.30 TDA2582 £1.50 TDA2590 £1.85 TDA2591 £1.75 TDA2900 £4.65 TDA2700 £2.85 TDA2822 £0.70 TDA2653 £3.40 TDA3190 £0.95 TDA3310 £1.10 TDA3410 £3.65 TDA3500 £6.00 TDA3506 £3.00 TDA3540 £2.75 TDA3541 £1.80 TDA3560 £2.85 TDA3561A £2.15 TDA3561 £2.15 TDA3590 £3.00

TDA3651 £2.10 TDA3651A £2.40 TDA3652 £2.20 TDA3654 £1.95 TDA3653 £1.50 TDA4100 £3.95 TDA4503 £3.05 TDA4505 £3.00 TDA4510 £3.10 TDA4600 £1.90 TDA4600-2 £1.75 TDA4600-3 £1.75 TDA4610 £1.95 TDA5630 £3.25 TDA5650 £4.10 TDA5800 £3.20 TDA7231 £4.15 TDA7240 £2.90 TDA8145 £1.05 TDA8153 £3.15 TDA8170 £3.00 TDA8185 £4.80 TDA8190 £2.80 TDA8196 £1.50 TDA9045 £3.10 TDA9503 £2.21 UPC554 £1.50 UPC1023 £0.50 UPC1032 £0.58 UPC1377 £1.60 UPC1382 £0.80 UPC1394 £1.20 UPC1188 £2.45 UPC1031 £1.05 UPC4558 £0.50 AC141 £1.80 AC142 £2.20 ACY20 £3.60 AU113 £3.85 BC141 £0.30 BC107 £0.07 BC108 £0.07 BC177 £0.28 BC178 £0.12 BC183 £0.07 BC184 £0.07 BC213 £0.06 BC478 £0.17 BD124 £1.05 BD131 £0.90 BD135 £0.25 BD140 £0.18 BD201 £0.30 BD234 £0.30 BD241 £0.38 BD243 £0.48 BD246 £0.50 BD317 £1.40 BD441 £0.38 BD442 £0.38 BD683 £0.48 BD736 £0.70 BD711 £0.48 BF459 £0.18 BF469 £0.28 BF471 £0.26 BF966 £0.38 BU104 £0.80 BU108 £0.80 BU126 £0.68 BU181 £1.80 BU205 £0.68 BU208 £0.68 BU208A £0.70 BU208A(JAP) £0.90 BU208D £1.15 BU312 £1.00 BU326 £0.75 BU406 £0.78 BU406D £0.90

BU407 £0.55 BU407D £0.88 BU408 £0.80 BU408D £0.88 BU426 £0.70 BU500 £1.05 BU508A £0.75 BU508D £0.85 BU526 £0.78 BU536 £1.05 BU508DF £1.25 BU508AF £1.10 BUT11A £0.70 BUT12 £0.85 TIP30 £0.25 TIP31 £0.20 TIP31A £0.22 TIP33 £0.50 TIP32B £0.25 TIP32A £0.23 TIP41 £0.20 TIP41A £0.20 TIP41C £0.22 TIP42 £0.20 TIP42C £0.23 TIP110 £0.45 TIP120 £0.42 MJE340 £0.25 MJE371 £0.55 MJE521 £0.35 2N1893 £0.30 2N3053 £0.25 2N3055 £0.38 2N3773 £1.00 2SA342 £0.33 2SA490 £0.58 2SA679 £1.95 2SA715 £0.75 2SA726 £0.30 2SA532 £2.50 2SA639 £0.80 2SA734 £0.95 2SA794 £2.25 2SA861 £0.70 2SA885 £0.75 2SA893 £0.50 2SA899 £0.60 2SA937 £0.38 2SA1060 £1.45 2SA1076 £2.55 2SA1141 £1.60 2SA1220 £1.10 2SA1232 £2.50 2SA1250 £3.98 2SA1283 £1.00 2SA1306 £0.80 2SB175 £0.69 2SB337 £1.45 2SB407 £1.45 2SB435 £1.98 2SB524 £0.65 2SB559 £0.60 2SB621 £0.30 2SB646 £0.70 2SB681 £4.00 2SB688 £1.15 2SB701 £1.22 2SB717 £0.70 2SB757 £1.80 2SB775 £1.50 2SB829 £2.95 2SB861 £1.00 2SB941 £1.35 2SC281 £0.50 2SC352 £0.90 2SC382 £1.00 2SC454 £0.43 2SC460 £0.10 2SC497 £2.88 2SC506 £3.95

2SC535 £0.35 2SC681 £1.15 2SC683 £3.00 2SC741 £1.00 2SC783 £0.20 2SC828 £3.15 2SC840 £3.50 2SC901A £3.05 2SC998 £1.80 2SC1030 £1.75 2SC1106 £2.60 2SC1115 £2.45 2SC1170 £3.00 2SC1185 £1.08 2SC1342 £2.30 2SC1413 £1.35 2SC1429 £3.05 2SC1445 £1.30 2SC1507 £6.00 2SC1577 £1.12 2SC1678 £1.45 2SC1682 £1.90 2SC1760 £2.50 2SC1875 £2.00 2SC1881 £1.85 2SC1913 £1.90 2SC1970 £1.60 2SC2023 £1.45 2SC2147 £1.15 2SC2298 £2.10 2SC2486 £1.30 2SC2591 £2.60 2SC2681 £3.80 2SC2751 £4.10 2SC2938 £3.25 2SC3091 £3.30 2SC3178 £3.60 2SC3262 £2.80 2SC3883 £2.20 SD128 £2.70 SD199 £2.00 SD200 £3.10 SD299 £1.90 SD330 £0.45 SD401 £2.40 SD523 £1.45 SD560 £4.00 SD621L £0.70 SU837 £0.68 SD898 £0.58 SD882 £4.40 SD820 £1.40 SD836 £3.85 SD838 £2.50 SD850 £1.10 SD985 £0.40 SD1153 £0.80 SD1273 £1.50 SD1276 £2.40 SD1397 £1.40 SD1398 £2.00 SD1439 £1.40 SD1453 £4.80 SD1554 £3.00 SD1492 £4.25 SD1441 £3.65 SD1427

TRIACS

TIC225D £0.65 TIC106D £0.68 TIC126D £0.73 TIC226D £0.65 TIC263M £2.15 15 80H £2.25 15 85R £2.25 BT139 £2.65 BT120 £2.73 800H £4.25

BELT KITS

VS1/VS2/VS5 £0.90
VS9300 £1.45
VCR4600 £2.00
VCR7000 £1.45
3V22/3V00 £1.40
3V23 £0.60
3V29/3V30 £0.80
3V42/43 £0.60
3VS81/V10/14 £1.35

HINARI VXL8/9

VT11/17/33 £0.90
VT5000 £1.10
VT8000 £0.50
VT9300 £0.45
VT64/65/86 £1.50
HR3300/HR3660 £1.40
HR7200 £0.80
HR7700 £0.60
HRD110/220 £1.00
NV333 £1.20
NV370 £1.45
NV730 £1.45
NV2000 £1.40
NV3000 £1.50
NV7000 £0.90

NV67/10 £0.70
VTC5000 £1.95
VC381/386 £1.15
VC6000/6300 £1.35
VC7000/7500 £1.40
VC9300/9500 £1.20
SLC5/6/7 £1.30

REPLACEMENT VIDEO HEADS

JVC/FERG 3HSSV £6.40
JVC/FERG 3HSSVL £6.40
JVC/FERG HRD170/210/FV10/FV20 £20.15
JVC/HR7655/3V32 £17.32
JVC/FERG HRD110/3V64 £16.08
JVC/FERG HRD140/160/150 £17.49
JVC/FERG HRD725/755/3V43/53 £36.00
JVC HRD455 £23.13
JVC/FERG HRD180/3V59 £29.43
AKAI VS2/3/5 £15.00
AKAI VS105/125/220 £16.93
AMSTRAD VCR 4600 PCF2 £12.00
AMSTRAD VCR 9000 PCF1 £12.00
AMSTRAD 3HSSR VCR7000 £12.48
FISHER FVHP610/615/715 £14.85
GOLDSTAR GHV122/1245 £18.99
HITACHI VT17/18/19 £24.50
HITACHI VT8500/9300 £12.65
HITACHI VT11/33 £12.50
HITACHI VT5000/4000 £14.50
HITACHI VT120/220 £20.40
HITACHI VT63/64 £20.90
HITACHI VT130/138 £27.72
HITACHI VT65 £29.17
MITSUBISHI HS300/301/302 £25.00
MITSUBISHI HS303/304 £21.00
MITSUBISHI HS306/710 £23.85
PANASONIC NV370 £8.00
PANASONIC NV688 £28.50
PANASONIC NV600 £27.83
PANASONIC NV730 £18.85
PANASONIC AG6100 £30.00
PANASONIC NV450/NVG10 £16.00
PANASONIC NV366 £18.50
PANASONIC NV366 (Original) £36.72
PANASONIC 3HSSN £6.40
PANASONIC NV330/777 £16.45
PANASONIC NVG30/130 (O) £22.12
PANASONIC NVG45/NVG46 £30.77

LOADING BELTS

JVC/FER3V29 £0.30
JVC/FER3V35 £0.35
HITACHI VT11 £0.30
HITACHI VT9300 £0.38

PINCH ROLLERS

VS9300/9800 £2.50
VS1 2 3 5 10 £2.50
VS105/244/516 £2.50
VS125/240/512 £2.50
VCR4500/4600 £2.50
VCR7000 £3.00
3V00/3V22 £2.50
3V29/3V32 £2.50
3V48/FV10/FV14 £2.50
FVHP615 830 £3.00
VT11/33 £2.50
VT61/220 £2.50
VT8000/9000 £2.50
HR3300/3660 £2.50
HR7200/7655 £2.50
HRD150/725 £2.50
HS200/304/700 £2.50
HS300/400/710 £2.50
NV100/340/788 £2.50
NV2000/7000 £2.50
NVG7/12/18 £3.00
VR2020/2024 £3.00
VHR1100/2300 £3.00
VTC5000/9300 £2.50
VC381/8300 £3.00
VC481/583 £3.00
VC651/793 £3.00
SLC5/6/7 £3.00

Long-distance Television

Roger Bunney

October was a rewarding month, with a liberal sprinkling of Sporadic E signals, some spectacular F2 layer propagation and, for those suitably located, tropospheric enhancement in Bands I and III and at u.h.f. We've now just passed the peak of Solar Cycle 22, but with the recent high sunspot counts F2 propagation and the related maximum usable frequencies should remain high. First however the SpE log:

5/10/91 +PTT (Switzerland) ch. E2; DR (Denmark) E3; TVE (Spain) E3.
6/10/91 TVE E2, 3, 4.
7/10/91 TVE E2, 3, 4; RTP (Portugal) E3.
9/10/91 TVE E2, 3, 4.
13/10/91 DR E3; TVE E2.
15/10/91 TVE E3; RAI (Italy) IA; ARD (Germany) E2; +PTT E2, 3.
17/10/91 TVE E2, 3.
19/10/91 TSS (USSR) R1; RAI IA, B; TVE E2, 3; +PTT E3; JRT (Yugoslavia) E3, 4; DR E3; SVT (Sweden) E2; C+ (France) E2.
20/10/91 DR E3; RAI IA.
21/10/91 RAI IA; TVE E2; TSS R1, 2 (Eesti).
22/10/91 TVE E2, 3.
23/10/91 C+ L1; TVE E2, 3; TSS R1; CST (Czechoslovakia) R1.
24/10/91 TVE E2, 3; RAI IA; RTP E2; C+ L2; MTV (Hungary) R1.
26/10/91 TSS R1; +PTT E2.
27/10/91 TSS R1.
28/10/91 +PTT E3; DR E3; TVE E3.

There was auroral activity on the 28th, from 1530-2000 BST, with identified reception from RTE (Eire) ch. I and RAI ch. IA and unidentified programmes on chs. R2, E2, E3, E6 and E8.

There was a tropospheric opening on the 10/11th, with Band III/u.h.f. signals from the Benelux countries, Germany (ZDF, NDR and ARD) and France. In addition Scottish TV was seen in the south. A slight lift on the 22nd produced signals from Eire and the Benelux countries. The most dramatic opening occurred on the 24/25th however, with extensive reception from Germany (NDR, WDR, ZDR and West 3), Denmark (TV1 and 2), Norway (in Band III), and Finland (YLE-1 ch. E7, YLE-2 ch. E9).

From the 7th, F2 layer propagation started to occur – Tim Anderson has the honour of logging the first F2 reception (Ghana ch. E2) of the season. From the 10th, signals were received regularly. This is the F2 log:

10/10/91 Dubai ch. E2.
11/10/91 Dubai E2.
13/10/91 Dubai and Iran E2.
14/10/91 Dubai E2.
15/10/91 Dubai E2; TSS R1.
16/10/91 TSS R1; Dubai E2; RTQ 0 (formerly DDQ 0) ch. 0 (Australia) at 1015 BST; ZTV (Zambia) E2.
17/10/91 TSS R1; unidentified Arabic ch. E2 and 525-line ch. A2 signals at 1040.
18/10/91 TSS R1; Dubai E2; Thailand E2 (with 3 logo); DTQ 0 (formerly ABMN 0) ch. 0; New Zealand ch. 1; RTM (Malaysia) E2; ZTV E2; Dubai E2.
20/10/91 TSS R1; Dubai E2; IRIB (Iran) E2.
21/10/91 Iran E2.
22/10/91 Iran E2.
23/10/91 Dubai E2; Iran E2.
24/10/91 Dubai E2; Iran E2; TSS R1.
25/10/91 Dubai E2; Iran E2; TSS R1.

All in all a remarkable month, with some excellent F2 reception. Just for the record, and if you have a scanner, ZTV ch. E2 has a +10kHz offset, Thailand ch. E2 a -8kHz offset and Malaysia ch. E2 has zero offset. Note the changed identifications for Australian stations.

My thanks to the following for sending in really excellent logs: Roger Fussell (Torpoint), Simon Hamer (Powys), Ryn Muntjewerff (Holland), David Glenday (Arbroath), Tim Anderson (St. Leonards), Cyril Willis (King's Lynn), Garry Smith (Derby) and Brian Williams (Penarth).

Before going any further a correction is required. In my review of the *Ku Satellite TV* book in the November column I gave the number of pages as 3,432. The effect of old age perhaps? This should have read 432 pages. My apologies to anyone who bought the book on this misunderstanding. It's still a very good book.

News Items

Sweden: It appears that the M3 consortium, consisting of Rikstelevision and Kinnevik, has been awarded the six-year licence for the new commercial terrestrial channel. Kinnevik operates the London-based TV3 satellite service.
Finland: The first ch. E12 transmitter has opened at Pyhavuori, for TV-3.
Germany: Progress in providing regional TV in the eastern region has been very slow. NDR-1 is expanding into Mecklenburg-Vorpommern using its own plus ARD material. Mitteldeutschen Rundfunk is to commence broadcasting this January, with its headquarters at Leipzig. DFF is being disbanded. RTL+, Pro 7, Sat 1 and Tele 5 have as yet, for political reasons, gained no foothold in the east. ZDF has been given permission to expand eastwards and already has one transmitter in operation.

ZDF Marlow has changed from ch. E43 to ch. E46 (vertical) with increased e.r.p. Tele 5 has been given a licence permitting it to operate in Schleswig-Holstein.
Eastern Europe: The East European broadcasting organisation OIRT has decided to carry out research and development into improving the Secam colour system. It's felt that this would present fewer difficulties than converting to PAL Plus.
Ghana: Last month we mentioned the restart of services in the Tamale region. Two 5kW transmitters are now being installed at Amedzofe and Akatsi (Volta region). A further transmitter is to be installed at Sunyani (Brong Ahafo region). Consideration is being given to building a new transmitter at Ajangote, Accra, to transmit CNN International material.
Eire: The Broadcasting Commission has withdrawn the TV3 licence, halting for the time being any progress in starting the projected commercial network.
Switzerland: The subscription-based Telecine Romandie service on ch. E69 has reopened. There's competition from La Cinq and M6, providing services for the Geneva area from Mont Blanc on chs. E54 and E51 respectively, at 250W e.r.p.
Chile: The La Red station that opened on ch. A4 in Santiago hopes to extend operations throughout the country.
Cyprus: There are reports of PAL instead of SECAM being used in both parts of the country. Does anyone have any definite information on this?

50MHz Amateur band: News via the Six Metre Group. Class A operators in the Lebanon can now use the band, with outputs up to 100W into any aerial. Estonia has given temporary permission for 50MHz operation. The Polish authorities are planning to allow use of the band, probably before the end of the year. Spain has allowed ninety Class A operators to use the 50-52MHz band for a year on an experimental basis, with a maximum output of 30W e.r.p. using CW and SSB only.

Satellite TV

Reader Darren Salter tells us that a post-graduate medical service called Medical Television Network, funded by British Aerospace, is now being carried by the Eutelsat I F4 satellite at 7°E. Times are not known, but the channel is 11·64GHz horizontal.

Turner Broadcasting of Atlanta, having purchased the Hanna-Barbera library of children's material and with access to other film distributors including MGM, intends to launch a World Children's channel. It seems that the European area may be the first to receive this, though the project is a long-term one that might take several years to come into operation.

The South African satellite-distributed service M Net may be allowed to start an entertainment channel.

HD-TV test transmissions are now being broadcast in Japan for eight hours a day via the BS-3a satellite. November 25th was "Hi-Vision Day", when the extended service started.

A new service Campus TV, produced by French students, is being brought into operation via Eutelsat II F2 at 10°E, the channel being 12·54GHz vertical. Test transmissions have been seen. Another service seen on test via this satellite is Mega 10, financed by the Turkish Democratic party. Channel is 10·987GHz horizontal.

Launch of the first Intelsat K satellite has been put back to March. Intelsat VI F5 has taken over from VI F2 at 24·5°W – F2 is to move to 60°E in early 1992. Intelsat VI F1 will take up position at 27·5°W in early January.

Filmnet has been seen testing via the Eutelsat satellite at 13°E using D2-MAC with and without Eurocrypt. It seems likely that Filmnet will eventually opt for this system – you've been warned! Scansat is now operating with D2-MAC/Eurocrypt on all downlinks.

Winter-time Propagation

At the start of this column I mentioned the sustained high sunspot activity now that we've just passed the peak of Solar Cycle 22. High sunspot activity ionises the F2 layer at about 230 miles above the Earth's surface, allowing v.h.f. signal reflection over great distances – as the F2 log reports, reception in the UK from Australia, New Zealand and other distant parts has recently been experienced. Such reception tends to be restricted to the lower part of Band I. With high ionisation levels more than one reflection can occur – it's in this way that we get reception from the antipodes. Unfortunately multiple reflection produces poor picture quality, with severe ghosting or smearing.

Since ionisation of the F2 layer occurs because of solar radiation, it follows that the centre part of the reflection path must be exposed to the sun. Hence F2 layer propagation is a daytime phenomenon. If you live in London, from about 0830 GMT there's the possibility of receiving the first distant ch. R1 Russian signals – one or more during an intense opening. Look out for clocks to give an indication of the time zone being received. By 0900-1000 you could be lucky and receive signals from Australasia. Australian ch. 0 signals can be strong though the picture is difficult to resolve. The mid-morning period may bring signals from the Gulf – these can last for some hours. Lunchtime may bring signals on a southerly path from Zimbabwe ZTV and Kenya VOK. Early in the afternoon signals from Nigeria and Ghana may put in an appearance, while from about 1430 the aerial should be swung to the west for possible American reception – this produces a characteristic 60Hz (field rate) buzz, and if you are lucky enough to see a signal it may be rolling. Once locked, it will lack height.

Transequatorial skip propagation from the south may occur from about 1700 GMT as the breakup of the daytime F2 layer produces clouds of ionised gas that once again reflect signals across the Equator into southern Europe. Propagation can last for an hour to up to 2100.

F2/TE propagation can occur until early March – it's a winter-time phenomenon. Use of a wideband scanner assists with the location of very low-level signals, before they can produce an image on the screen. It also enables offsets to be measured, which helps with identification. The nominal vision carrier frequency for the Australian ch. 0 is 46·25MHz; New Zealand ch. 1 is 45·25MHz; ch. E2 is 48·25MHz; ch. R1 is 49·75MHz; chs. A2 and E3 are 55·25MHz.

MS Propagation

Though it's not exclusively a winter-time phenomenon, another propagation mode that can be exploited during winter when signals are sparse is meteor-scatter propagation. This occurs when meteors (space debris) burn up on coming into contact with the layers that surround the Earth. Meteors produce intense though short-lived ionisation as they burn up, usually at a height of around

seventy miles, i.e. in the E layer. This ionisation will reflect incident v.h.f. signals, generally in Band I though with intense ionsiation reflection at up to Band III occurs. Since reflection is in the E layer, reflection distances are the same as with SpE reception, i.e. 500-1,500 miles.

High-gain equipment is required for MS reception – this applies to aerials, preamplifiers and receivers – while the latter should be able to lock quickly to short signal flashes. These typically last for a few seconds, though they can last for ten seconds or more. For random signal reception you tune to a Band I channel and wait. MS can occur at any time of the day or night, though the morning period is usually more rewarding. Random MS DXing can be very time consuming, but at certain times of the year there are regular meteor showers that normally produce a high incidence of burn-ups with an increased level of reception.

The following list of 1992 meteor showers has been provided by George Spalding of the British Astronomical Association:

Quadrantids January 1-6th, peaking at 1000 on the 4th.
Virginids April 7-18th, peaking on the 12th.
Lyrids April 19-25th, peaking at 2100 on the 21st.
May Aquarids April 24th-May 20th, peaking on May 5th.
Delta Aquarids July 15th-August 20th, peaking on July 29th and August 6th.
Capricornids July 15th-August 25th, peaking on July 31st.
Perseids July 23rd-August 20th, peaking at 0900 on August 12th.
Orionids October 16-27th, peaking on the 22nd.
Taurids October 20th-November 30th, peaking on November 3rd.
Leonids November 15-20th, peaking at 1000 on the 17th.
Geminids December 7-16th, peaking at 1600 on the 13th.
Ursids December 17-25th, peaking on the 23rd.

Steve's Camcorner

Steve Beeching, T. Eng.

An increasing number of the new camcorders that are coming on to the market have no camera setting up controls. Instead, they have EVRs – electronically variable resistors. The controls are in fact buried at an address location within an EEPROM (electronically erasable programmable read only memory). The data stored at the relevant location is fed to a digital-to-analogue decoder which produces the appropriate d.c. level for the required control setting. Functions such as luminance level, colour matrixing and even the auto-iris setting are stored in this way. Examples of models with this feature are the Panasonic NV-S1, NV-G1, NV-G2 and the JVC palmcorder range.

To alter an EVR value you require a microprocessor controlled EVR jig. Under the control of a ROM this uses hexadecimal codes to gain access to the EVRs and alter them. The codes allow for 256 control levels to be used.

Be warned: if you carry out camcorder repairs, don't attempt to replace the lens assembly in a Panasonic G series model without measuring the correct reference levels and without access to an EVR jig. Otherwise, believe me, you will be in it deep. My prediction is that EVR control will be increasingly used in camcorders and also VCRs: it makes computerised adjustment on an assembly line in the factory quick and cheap. The problem is that the EVR jigs required for servicing cost between £200 and £400 each. The cost will have to be borne by specialist service centres and charged to dealers (even under guarantee) and to the public. Dealers who expect EVR controlled video equipment to be repaired for the cost of a manufacturer's claimback are going to be in for a nasty surprise quite soon!

Sharp VLC73

The problem with a Sharp VLC73 was that at power on only a small current, less than 100mA, was drawn before it switched off again. This suspiciously low current suggested a power supply problem, supported by the fact that the 9·4V rail was missing. The power board was removed for checking, with the aid of extension leads from various JVC kits.

We found that pin 10 of IC901 was low while the base of Q909 was high: this was a bit puzzling as they are both connected (or supposed to be) to a single run of print. What had happened was that C927 had leaked slightly and corroded the print running beneath it – the print that connects Q909 and IC901. A piece of miniature cable was used to link Q909 and IC901, while operation was restored by replacing C927.

Sony TR55

Two months after I fitted a capstan motor to a Sony TR55 because the FG signal was missing it came back with the complaint "snow outside". After cross-examining the owner I came to the conclusion that the problem was overloading because the iris didn't shut down. Strangely enough, in between the initial telephone call and the customer's arrival with his TR55 I received a Grundig Technical Bulletin that referred to the VS8300, which is not sold in the UK but is a TR55 clone. The note in the bulletin referred to the iris staying closed and described how to strip down the optics to clean the iris blades, which can stick in the closed position. When I stripped down the TR55's optical block I found traces of oil on a tail part of one of the iris vanes. The oil, probably from the zoom drive motor, had made its way around the lens and into the iris assembly via a screw. Cleaning provided an effective cure, but great care was needed.

Toshiba A1-420

A Toshiba A1-420 caused its owner, myself and the dealer some major upsets. The batteries didn't seem to last very long before "battery low" appeared in the viewfinder, followed by power switch off. The batteries were initially blamed, but the dealer (Fletch) subsequently found, with the owner, that they were not responsible. So we had the camcorder in, stripped it down and tried to adjust the low-battery indicator preset R650. It's mounted on the inside of a mother PCB which has another PCB on top of it. So both PCBs had to be removed, refitted together and then reconnected to the deck assembly, which is not the easiest of tasks. Then the camera head had to be connected to re-establish the power. Unfortunately the lead required to connect the motor drive on the deck to the mother PCB was not included in the lead kit, but I found a JVC one that fitted.

R650 was set for 9·3V in the battery-low condition, not according to the manual which is nonsense. After reassembling the camcorder it was returned, but came back some weeks later with the same complaint. We repeated the adjustment and left the camcorder on soak

test all day. At the end of the day the battery-low indicator came on at 9·6V. R650 and its associated resistors (R601/2) were cleared of suspicion when we found that the voltage from the micro varied between 2·15V (for 9·3V battery low) to 2·2V (for 9·6V). This shouldn't be, as the microcomputer chip should be internally referenced to produce the battery-low indication at a given single voltage level, not one that varies. Toshiba eventually managed to supply a new chip (IC601). When it was fitted and R650 was set so that the battery-low indication came on at 9·3V we found that the variance when hot was only to 9·4V, a much more stable situation.

JVC GRC2

Circuit protector CP1, which feeds a 5V d.c./d.c. converter in the JVC GRC2, kept blowing. Initially the cause was a mystery. Eventually however a high-pitched whistling came from the main PCB, which was lying on the bench all on its own. While checking around I found that IC12, an LC4011 logic chip, had a section which produced a squarewave output for no reason at all. This output went to a small bistable on/off relay which chopped the 9·6V supply and obviously upset the d.c./d.c. converter. Rather like a line output stage, if the triggering is interrupted a large current can flow. Hence the failure of CP1.

Ferguson FC08

There was no fast forward or rewind with a Ferguson FC08. In addition the functions were intermittent. When I stripped it apart I found that the capstan motor stopped when the servo PCB was flexed. Seeing that the d.c./d.c. converter had been replaced, I came to the conclusion that someone else had also attempted to find the cause of the fault.

After checking all the way through the servo only to find that it was operating normally I checked beneath the PCB, which was difficult. A large capacitor, C7, was fouling the capstan motor spool belt pulley – repositioning it cured the problem. As it's next to the d.c./d.c. converter it was difficult to decide whether whoever had changed the converter had moved C7.

Tandy Head Cleaning Cassette

A Tandy Video Care head cleaning cassette in a Panasonic NV-MS1 had reached the end of the tape. As it didn't have a clear section for the machine's end sensor to realise this, it was probably responsible for jamming the mechanism and the demise of the loading motor i.c.

Panasonic NV-G45

We deal with VCRs (and a few TV sets) as well of course. Some problems were being caused by a Panasonic NV-G45. A tape provided by the customer showed that there was no video head drum servo lock in the record mode. The symptom shows as the head crossover point wandering up and down the screen. Additional symptoms were poor capstan servo lock with sound pitch variation. Neither the dealer nor ourselves were able to confirm these symptoms. I'm glad that I was able to phone my friend SG (Super Gerald) at Panasonic. He came up with a circuit upgrade to deal with the problem. A 150kΩ resistor and a 15nF capacitor are added in parallel across R338 on the YC panel – this appears to be part of the sync separator circuit. Closer inspection of the results produced by the owner's tape showed that servo lock was lost when a rapid screen change from very dark to light occurred. This probably made the video signal ride up and down on the d.c. level, affecting the sync slicing.

HELP WANTED

Can anyone supply a circuit diagram photocopy plus any other details for a Connexions CX2450 satellite receiver? *All costs would be paid. Oliver Rogers, Lower Polgrain, St. Wenn, Bodmin, Cornwall PL30 5PS.*

Can anyone supply service data or the complete valve line up for the Armstrong 127 valve stereo tuner-amplifier? All expenses paid. Roy Bailey, 51 Robin Gardens, Walterlooville, Hants PO8 9XF. Answerphone 0705 241 344.

Can anyone supply a mains transformer (code 7000 4134) for the Bush audio system 1500 music centre Model BS3049, or alternatively supply VA rating and voltage output details? D. Ford, 34 St. Winifred's Road, Bridgend, Mid-Glamorgan CF31 4PL.

We urgently require MCM 0464 L7 i.c.s – it's a 16-pin Motorola memory chip. Will buy a quantity of new or used. Allan Bone, PO Box 97, Coolangatta, Queensland, 4225, Australia.

Can anyone supply a circuit diagram for the Telefunken TR1200 hi-fi tuner-amplifier? B.J. Brandon, 8 Moor Park Avenue, Rochdale, Lancs OL11 3JG.

Can anyone supply a service manual or circuit diagram for the Sharp C1001SP portable TV receiver? D. Joyner, 12 Oakland Road, Banbury, Oxon OX16 9DT. 0295 253 054.

Can anyone supply the six-position switch and cable (record input selector) for the Technics' SUV2 amplifier? E.J. Edwards, 22 Bryn Hir, Cwmbach, Aberdare, Mid-Glamorgan CF44 0ET. 0685 881 694.

Can anyone sell me a 26in. Grundig 7200 or 7400 or alternatively a 22in. 4200 or 4400 for spares? L.A. Kellas, 10 More Close, Purely, Surrey, CR8 2JN. 081 668 6634.

Can anyone suggest how to remove teletext interference with the ITT FT110 chassis? E.G. Terry, Smiths Radio Ltd., 91 Lewes Road, Brighton BN2 3HZ. 0273 605 309.

Can anyone supply test cards for use with the Mullard high-speed valve tester? John Hulin, 1 Hill View, Conford, Liphook, Hants GU30 7QW. 0483 275 997 (work)/0428 751 469 (home).

Has anyone any waveforms or other information for the Fara/Sovereign C140 TV set? E. Faulkner, 53 Langdale Road, Runcorn, Cheshire.

Wanted – a good second-hand LOPT for the Panasonic Model TC381G. C. Taylor, 12 Reeds Close, Reedsholme, Rossendale, Lancs BB4 8ND.

Can anyone supply a Sanken stereo Model SI1525HD? Leon Electronics, 11 Woodend Close, Three Bridges, Crawley, West Sussex. 0293 520 536.

Can anyone supply or advise on the source of TDA2653 chips, used in the Grundig CUC720 chassis? We require a couple. Joseph M. Borg, Evergreen, 94 Mill Street, Mosta, Malta.

Can anyone supply a service manual or circuit diagram for the BBC Master Compact colour monitor. C. Morris, 30 Southcourt Road, Penylan, Cardiff CF3 7DB. 0222 490 766.

Does anyone have a service sheet or other information for a Hartley or James Scott CT436 valve oscilloscope? Donald Bills, 69 Greenfields Road, Kingswinford DY6 8EG.

Fault Finding in Toshiba CTV Power Supplies

John Coombes

Toshiba has used a number of different power supply arrangements in its CTV receivers over the years. This article summarises our fault experiences with various models. Note that all these power supplies will operate with a 60W bulb as a dummy load.

Model 261T4B

Model 261T4B is a 26in. set dating from 1984. The 2SD1432 chopper transistor Q804 is controlled by a TA7265AP chip. It's a fairly complex arrangement since the chopper and line output stages share the same transformer T802.

A dead set can be a bit of a problem. The obvious thing to do is to check the 2AT mains fuse F801. If it's open-circuit or blown, check the TVR4J mains bridge rectifier diodes D801-4 and the 2SD1432FA-1 chopper transistor Q804 for shorts. Another item that can go short-circuit is the 1N4148 diode D807 in the start-up circuit.

If the chopper transistor is short-circuit the operation of the TA7265AP chopper control chip IC801 should be checked, with the mains supply disconnected. Connect the positive terminal of a 9V battery to pin 6 of IC801 and the negative terminal to the chassis side of R802. If all is well there should be a 2·6V peak-to-peak sawtooth waveform at a little less than line frequency at pin 9. If this waveform is missing, check whether R815 (16kΩ), R816 (1·6kΩ) or R852 (5kΩ) is open-circuit or C811 (0·0056μF) is short-circuit. The chip itself is suspect if these items are in order. Check it by replacement.

If still in trouble, check the drive waveform at the base of the chopper transistor. It should be as shown in Fig. 1. If it's missing or of incorrect shape, check IC801 and the components in the circuitry connected to pins 1-4 as necessary. Also check the regulation action of IC801. The easiest way to do this is to connect a 50kΩ potentiometer across C809 (2·2μF). Adjustment of the potentiometer should vary the mark-space ratio of the drive waveform at the base of Q804. If this is incorrect, check Q804's base-emitter junction. If Q804 is o.k., set the potentiometer to the point where IC801 is just prevented from providing an output. Next, check for shorts across the 140V line, i.e. across C466 (470μF). Then remove R416 to prevent operation of the line output transistor. At this point remove the 9V battery and apply power. First check the start-up circuit. There should be 9·6V at the emitter of Q805 (2SC2552). If not, check Q805, Q806 (BC547B), R803 (6·2kΩ, 7W), R804 (100kΩ, 2W) and zener diode D806 (05Z10X). Check D807 (1N4148) for leakage. If everything is in order, remove the potentiometer, check the mains input circuit and set up the h.t. and l.t. voltages. Finally reconnect R416.

Model 212R4B

Model 212R4B is a 21in. set dating from 1985. It uses a self-oscillating chopper transistor (Q802, type 2SC3678) with IC801 (SI8100D) in the control loop.

For no results/dead set, first check the mains input circuitry. Fuse F801 (2AT) may be open-circuit or blown. If the fuse is open-circuit it could simply have failed or a quick-blow instead of an anti-surge type may have been fitted. If the fuse has blown, check the TVR4J mains bridge rectifier diodes D801-4, the 0·0047μF protection capacitors C803-6 and the 120μF reservoir capacitor C801 for shorts. If the mains input circuit is o.k., check whether the chopper transistor Q802 is short-circuit. Next check whether R810 (0·33Ω, 2W), which is in series with Q802's emitter, is open-circuit. If so, IC801 must also be replaced. If R810 is o.k., check whether the surge limiter resistor R801 (6·2Ω, 9W) is open-circuit. Should it be faulty, before replacing it check C814 (22μF, 50V) and D810/1 (both type BYV95C) by replacement. These items are in Q802's base circuit. If everything is o.k. so far, suspect the chopper transformer T802. Check it by replacement.

If the fuse is o.k., check whether R824 (51kΩ, 1W) or R825 (100kΩ) is open-circuit. If necessary check the optocoupler DR10 (TLP631GB): replace it if the voltage between pins 5 (collector) and 4 (emitter) is more than 5V. If the voltage is less than 5V, check the associated circuitry including Q802 and Q803 (BC337) – the d.c. conditions should be checked very carefully.

DR10 can be responsible for the set being stuck in standby and for low h.t. It can also prevent the set going into standby and giving snowy vision.

A slight rise in the value of R810 will result in low h.t.

Model 255T7B

Model 255T7B is a 25in. set dating from 1987. It uses a TDA4601 type chopper power supply. Be careful when working on this chassis as the mains bridge rectifier's reservoir capacitor C810 can hold a heavy charge.

In the event of no results, check for 300V across C810 (330μF). If this voltage is absent, check the 3·15AT mains fuse F801 by replacement. Should fuse blowing continue, check for shorts in C810, the bridge rectifier D801 (RBV406M) and the 2SD1548 chopper transistor Q802. If the fuse holds but there's still no 300V supply, check whether the surge limiter resistor R801 (6·2Ω, 15W) is open-circuit.

If the chopper transistor is o.k. but the 145V h.t. supply is missing, check the RU4A rectifier diode D809 and its 330μF reservoir capacitor C824. Note that the h.t. passes via a standby switching circuit involving Q803 and associated components.

No h.t. could be due to no start-up supply for the TDA4601 chopper control chip IC801. Check whether D805 (BYD33J) or R818 (20kΩ, 3W) is open-circuit or C820 (100μF, 50V) is short-circuit. If the voltage at pin 9 of IC801 is only 8V or so one of the bridge rectifier diodes in D801 could be open-circuit. If still in trouble, check IC801 by replacement.

If the h.t. is low at 60V, check whether zener diode D812 (04AZ6·2Y) is open-circuit. D807 (BYD33J) going

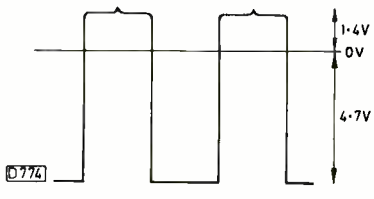


Fig. 1: Correct drive waveform at the base of the chopper transistor Q804 in the Toshiba Model 261T4B.

open-circuit will result in an even lower h.t., maybe only 40V. If the voltage on the h.t. line is only 1-2V, check whether R825 (62Ω) is open-circuit.

If the set won't leave the standby mode, check the voltage at pin 6 (power on/off) of the M50436-588SP microcontroller chip QA01. If the reading is 5V (standby) QA01 or possibly QA09 (BC557A) is faulty. Check them by replacement. If necessary move over to the power supply and check whether Q804 (2SA1321) in the switching circuit is short-circuit. To prove whether the fault is in the remote control section or the power supply, switch off, short across the collector and emitter of Q805 and switch on. If this brings the set to life check Q805 then check the remote control system. Note that only the 145V line is switched in this way.

Models 175R9B and 215R8B

Models 175R9B (17in.) and 215R8B (21in.), which date from 1988/9, have a series chopper power supply with the chopper transistor in the STR-D4420 chip Q801.

No standby operation can be caused by a faulty M34300N4-583SP microcontroller chip (QA01). Check the d.c. conditions very carefully. The 5V supply should be present at pin 42 (see below). For standby switching, pin 33 varies between 0/5V.

For no results, the first thing to check is the 2AT mains fuse F801 – by replacement. If the replacement blows, check the mains filter capacitors C801/2 (0·1μF), the bridge rectifier D801 (LB156) and the protection capacitors C803-6 (0·0047μF) for shorts. The chopper chip IC801 could be shorted to chassis.

If the fuse is o.k., check whether the surge limiter R801 (6·2Ω) is open-circuit. The 120V h.t. supply will be missing if the R2M protection zener diode D808 has gone short-circuit. In this event, check whether R823 (1·2kΩ) or C815 (0·33μF) is open-circuit. The chopper transformer T802 could be open-circuit. Other things to check if necessary are the 0N3111 optocoupler DR01 (by replacement) and the 5V supply circuitry – the C78MR05 regulator Q805, rectifier diode D814 (BYD33J), reservoir capacitor C817 (1,000μF, 25V) and coil L812. A defective chopper chip (Q801) can cause loss of the h.t. supply – also check that R810 (220kΩ) between pins 2 and 3 isn't open-circuit.

Model 218D9B

The final set in this round-up is the 21in. Model 218D9B which dates from 1989. Its chopper circuit is of Thomson-SGS origin, with a master and slave control chip arrangement – Q803 (TEA2164) and Q807 (TEA5170).

If the set is stuck in standby, first check Q811 (BC557B), Q809 (BC547B) and Q814 (2SA1297Y). In this mode the h.t. will be low at 60V but there will be sufficient output to power the L78MR05 5V regulator Q806. Either of the control chips could be faulty. As a check, Q807 can be powered by a 9V battery (positive terminal to pin 2). If it's working, there will be a pulse output at pin 3. This is coupled via T804 to the other control chip Q803 (differentiated pulse input at pin 6). If Q807 is working, replace Q803. If still in trouble, check whether the M37100M8-583 microcontroller chip QA01 is faulty.

For no results, check the 2AT mains fuse F801 by replacement. If it fails again, check the mains filter capacitors C801/6 (0·1μF) and C802-5 (1,000pF), the bridge rectifier D803 (RBV406M), the protection capacitors C811-4 (4,700pF) and the 2SC4199A chopper transistor Q804 for shorts/leakage.

If the fuse is o.k., check that start-up supplies are present at pins 9, 15 and 16 of Q803 (TEA2164) – the common element in this feed is R810 (68kΩ, 3W), which can go open-circuit. If Q803 is operating in its start-up mode, sufficient voltage should be produced to power Q807 (TEA5170) on the secondary side of the circuit. If there's no voltage at pin 15 of Q803, check whether R817 (6·8Ω, 5W) is open-circuit. A change in the value of R815 (68kΩ) will stop Q803 working. As previously mentioned, a check on the master/slave chip system can be carried out by using a 9V battery to power Q807. Make sure that the output from the mains bridge rectifier, across reservoir capacitor C818 (270μF), is arriving at pin 3 of the chopper transformer T803.

This power supply has over/under voltage and excess current protection. In the excess current condition Q803 shuts down. The clue here is a substantial charge on C828 (4·7μF) which is connected to pin 3. Switch off, discharge C828 by connecting a 10kΩ resistor across it, then switch on. If Q803 trips, check for heavy loading. Q804 (2SC4199A), C861 (390pF, 2kV) or D812 (BYD33J) could be short-circuit or T803 could have shorted turns.

ECONOMIC DEVICES 32 TEMPLE STREET, WOLVERHAMPTON, WV2 4AN

1580H	3.72
1585R	3.72
17052	4.50
17053	2.31
17074	9.30
17089	3.28
17127	1.88
17376	1.58
1N4001	0.03
1N4002	0.06
1N4003	0.03
1N4004	0.05
1N4005	0.05
1N4006	0.08
1N4007	0.05
1N4148	0.03
1N4448	0.03
1N5401	0.13
1N5402	0.13
1N5403	0.18
1N5404	0.11
1N5408	0.11
1N914	0.03
1S1555	0.03
1S44	0.10
1S921	0.05
2N2219A	0.29
2N3053	0.28
2N3054	0.99
2N3055	0.74
2N3442	1.12
2N3702	0.10
2N3703	0.18
2N3705	0.15
2N3706	0.14
2N3707	0.11
2N3711	0.24
2N3771	1.55
2N3772	1.40
2N3773	1.38
2N3819	0.46
2N3823	1.17
2N3904	0.09
2N4101	1.73
2N4240	2.68
2N4444	2.85
2N4905	9.99
2N5293	0.50
2N5294	0.82
2N5296	0.74
2N5297	0.50
2N5298	0.61
2N6109	1.58
2N6130	0.85
2N6133	1.25
2N6292	0.60
2SA202A	0.65
2SA1208	0.24
2SA769	1.17
2SA771	0.96
2SA968	2.44
2SA1006	0.79
2SA1011	0.99
2SA1015	0.08
2SA1020Y	0.29
2SA1027R	0.45
2SA473	0.49
2SA766S	4.95
2SC1173Y	0.99
2SC1474	1.25
2SC1509	1.25
2SA1095	5.50
2SA1103	5.74
2SA329	0.40
2SA489	1.17
2SA490	0.66
2SA493	2.25
2SA562	0.13
2SA564	0.97
2SA614	4.35
2SA628	0.37
2SA639S	0.62
2SA659	0.49
2SA673	0.08
2SA684	0.28
2SA697	0.77
2SA699	1.18
2SA748	1.95
2SA835	2.50
2SA836	0.49
2SA844	0.24
2SA872	0.13
2SA884	2.15
2SA937R	0.97
2SA940	0.47
2SA950	0.50
2SA951	1.70
2SA966-Y	0.28
2SA999	0.75
2SB186	0.40
2SB688	1.23
2SB774	0.44
2SB185	1.13
2SB400	0.40
2SB405	1.03
2SB511	0.99
2SB54	1.38
2SB546	0.51
2SB56	2.64
2SB618A	5.82
2SB631	2.00
2SB643	0.19
2SB681	1.79
2SB695	3.43
2SB774	0.44
2SB819	0.60
2SC1089	1.45
2SC1101	3.22
2SC1128	0.66
2SC1307	5.06
2SC1449	0.41
2SC1941	0.56
2SC558	3.69
2SC1096	0.47
2SC1114	1.12
2SC1116	3.02
2SC1129	1.65
2SC1131	0.72
2SC1158	3.33
2SC1162	0.29
2SC1172	2.55
2SC1195	2.72
2SC1213	0.13
2SC1226	0.90
2SC1306	1.12
2SC1317	0.16
2SC1364	0.28
2SC1383	1.20
2SC1391	2.45
2SC1398	0.41
2SC1413A	1.96
2SC1447	1.07
2SC1475	0.60
2SC1505	1.00
2SC1514	1.76
2SC15730	0.24

2SC1583	0.28
2SC1617	3.89
2SC1678	1.98
2SC1741	0.21
2SC1810	2.06
2SC1815	0.20
2SC1826	0.69
2SC1829	4.14
2SC1875	3.71
2SC1893	3.85
2SC1921	1.37
2SC1923	0.13
2SC1929	2.35
2SC1942	0.56
2SC1959	0.13
2SC1957	0.49
2SC1953	1.93
2SC1962	1.61
2SC1969	1.79
2SC1983	0.99
2SC1985	0.60
2SC2009	0.33
2SC2029	0.33
2SC2028	2.11
2SC2063	0.99
2SC2078	0.57
2SC2073	0.49
2SC2085	1.65
2SC2091	1.30
2SC2141	1.30
2SC2166	0.92
2SC2216	0.69
2SC2233	0.74
2SC2236	0.24
2SC2278	1.14
2SC2314	0.44
2SC2335+Kit	14.93
2SC2551	0.29
2SC2565	3.54
2SC2570	0.46
2SC2577	1.50
2SC2578	5.24
2SC2671	0.62
2SC288A	1.70
2SC3153	2.21
2SC372	0.28
2SC373	0.09
2SC383	1.33
2SC388	0.57
2SC394V	0.16
2SC403C	0.60
2SC458	0.08
2SC495	0.41
2SC515A	1.85
2SC536	0.13
2SC537	0.54
2SC605L	1.16
2SC620	1.46
2SC643A	1.54
2SC668	0.67
2SC681	3.30
2SC682	1.88
2SC684	1.65
2SC693	0.63
2SC710	0.11
2SC711A	0.25
2SC717	0.19
2SC734	0.20
2SC783	1.35
2SC790Y	3.65
2SC828	0.28
2SC867A	5.52
2SC876	0.96
2SC930	0.30
2SC935	1.15
2SC940	4.68
2SD299	9.47
2SD355	0.64
2SD467	0.55
2SD869	2.47
2SD1128	0.94
2SD1138	0.71
2SD1273	0.79
2SD1453	1.48
2SD152K	2.64
2SD198	1.84
2SD234	0.90
2SD235	0.51
2SD24	2.29
2SD257	1.98
2SD313	0.41
2SD325D	2.26
2SD350	2.72
2SD401	1.40
2SD414	1.98
2SD471	0.85
2SD560	1.50
2SD600	1.55
2SD601R	0.65
2SD613	0.61
2SD636	0.13
2SD639-R	0.24
2SD655	0.19
2SD657	2.80
2SD661A	0.80
2SD731	1.95
2SD773	0.21
2SD811	6.84
2SD837	0.74
2SD841	1.23
2SD856	0.64
2SD857Q	1.84
2SD882	0.29
2SD894	0.38
2SD898	1.93
2SK105H	0.24
7805-T022	0.23
7808	0.44
7812-T022	0.35
7815	0.64
7905	0.41
AD142	2.03
AD143	1.93
AD145	1.60
AD161	0.99
AD162	0.92
AF114	2.47
AF115	5.94
AF118	1.20
AF127	0.57
AF139	0.28
AF178	0.41
AF179	0.36
AF180	0.55
AF181	0.33
AF186	1.32
AF239	0.36
AF279	0.33
AN115	3.98
AN155	1.89
AN206	2.58
AN208	3.55
AN210	1.56
AN211	3.25

AN214D	1.13
AN235	4.65
AN236	3.03
AN240P	0.99
AN241	1.23
AN245	5.77
AN253	1.80
AN262	1.37
AN271	1.79
AN295	8.28
AN301	5.26
AN302	3.99
AN305	4.10
AN315	1.30
AN316	4.95
AN318	7.42
AN320	1.65
AN321	1.27
AN322	7.62
AN337	3.71
AN340P	1.53
AN355	1.65
AN362	1.50
AN370	3.95
AN5111	3.43
AN5120N	4.50
AN5132	5.08
AN5250	5.04
AN5256	1.02
AN5612	3.18
AN5613	4.20
AN5630	3.53
AN5701N	1.66
AN6250	1.75
AN6300	3.91
AN6310	4.54
AN6340	5.62
AN6341	2.22
AN6363	16.00
AN6531	2.17
AN6551	0.69
AN6552	0.68
AN6610	1.79
AN7111	1.14
AN7115	1.45
AN7145	2.17
AN7146	2.06
AN7151	2.37
AN7156	2.70
AN7158	2.65
AN7218	0.79
AN7223	4.99
AU107	7.72
AU110	5.69
AU113	14.63
AY106	2.80
BA524	1.02
BA301	0.54
BA1310	1.50
BA1320	1.38
BA1332	4.14
BA1330	0.79
BA145	0.19
BA148	0.11
BA154	0.03
BA155	0.12
BA156	0.05
BA159	0.09
BA182	0.19
BA222	1.15
BA302	1.24
BA311	0.57
BA312	1.48
BA313	0.76
BA317	0.04
BA318	0.03
BA328	2.22
BA333	1.37
BA335	0.69
BA5102A	1.23
BA511	1.43
BA514	1.00
BA521	1.20
BA524	1.02
BA526	0.79
BA527	1.55
BA532	1.20
BA536	1.51
BA6209	1.34
BA656	0.79
BA7100	1.79
BA841A	9.27
BA843	1.10
BA854	5.76
BAV18	0.06
BAV19	0.24
BAV20	0.36
BAV21	0.10
BAW62	0.11
BAX12	0.49
BAX13	0.11
BAX18	0.94
BC107B	0.19
BC108B	0.37
BC109B	0.14
BC113	0.14
BC119	0.36
BC126	0.11
BC132	0.14
BC135	0.14
BC137	0.29
BC138	0.08
BC139	0.31
BC140	0.30
BC141	0.24
BC142	0.26
BC143	0.34
BC147	0.14
BC148B	0.03
BC148C	0.11
BC149B	0.13
BC153	0.14
BC154	0.14
BC159	0.09
BC160	0.39
BC161	0.28
BC168	0.03
BC169C	0.16
BC170	0.09
BC171	0.07
BC172B	0.18
BC173	0.17
BC174B	0.27
BC177	0.35
BC178	0.26
BC179	0.17
BC182	0.07
BC182LB	0.14
BC183LB	0.09
BC184	0.09
BC184LB	0.13
BC186	0.19
BC187	0.28
BC204	0.35

BC207	0.19
BC212B	0.26
BC213L	0.03
BC214	0.10
BC225	0.40
BC237	0.03
BC238	0.10
BC238B	0.08
BC239B	0.03
BC251A	0.33
BC294	0.50
BC300	0.38
BC301	0.35
BC302	0.34
BC303	0.26
BC307A	0.13
BC308A	0.11
BC309	0.03
BC317A	0.13
BC327	0.09
BC328	0.11
BC337	0.09
BC338	0.12
BC368	0.08
BC440	0.09
BC441	0.39
BC454	0.36
BC460	0.33
BC461	0.47
BC462	1.12
BC463	0.30
BC478	0.16
BC479	0.41
BC532	0.28
BC546	0.08
BC547	0.03
BC548	0.10
BC549	0.05
BC550	0.12
BC556	0.13
BC557	0.05
BC558	0.08
BC559	0.10
BC560C	0.20
BC635	0.22
BC637	0.24
BC638	0.20
BC639	0.16
BC640	0.05
BCX34	0.55
BD115	0.36
BD116	0.70
BD124	1.31
BD131	0.26
BD132	0.19
BD133	0.53
BD135	0.24
BD136	0.36
BD137	0.43
BD138	0.28
BD139	0.39
BD140	0.35
BD144	0.51
BD150	1.12
BD157	0.19
BD160	1.60
BD163	0.71
BD166	0.69
BD175	0.28
BD179	0.30
BD181	0.99
BD182	0.47
BD183	0.99
BD184	1.20
BD187	0.80
BD189	0.65
BD190	0.55
BD201	0.38
BD202	0.60
BD203	0.44
BD204	0.45
BD207	1.73
BD222	0.52
BD225	0.48
BD228	0.63
BD229	0.80
BD231	0.50
BD232	0.49
BD234	0.43
BD237	0.09
BD238	0.09
BD239	0.45
BD240	0.57
BD241	0.39
BD242	0.37
BD243A	0.62
BD243C	0.38
BD244	0.42
BD244C	0.58
BD245	0.67
BD246	0.77
BD253	0.99
BD278A	0.70
BD317	1.40
BD318	2.72
BD375	0.42
BD380	0.39
BD410	0.33
BD433	0.26
BD434	0.28
BD435	0.47
BD436	1.14
BD437	0.29
BD438	0.52
BD441	0.69
BD442	0.39
BD509	1.64
BD510	1.08
BD519	0.78
BD529	0.93
BD530	1.00
BD533	0.67
BD534	1.40
BD535	0.38
BD536	0.46
BD537	0.40
BD538	0.75
BD544B	0.75
BD677	0.55
BD679	0.43
BD680	0.49
BD681	0.45
BD696	2.47
BD699	0.80
BD700	3.70
BD707	0.49
BD709	0.80
BD710	0.80
BD809	0.52
BD810	0.45
BD879	0.74
BD895	2.22
BD901	0.44
BD902	0.58
BDW83C	1.20
BDW84C	1.34
BDX32	1.65
BDX53A	0.46
BDX53B	3.35

BDX54B	0.33
BDX63A	1.45
BDX63A	1.96
BDY20	1.98
BDY81	1.18
BF115	0.39
BF117	0.66
BF118	0.67
BF121	0.25
BF123	0.16
BF127	0.13
BF137	0.29
BF153	0.58
BF154	0.24
BF157	0.33
BF158	0.09
BF159	0.18
BF160	0.31
BF167	0.38
BF173	0.05
BF177	0.55
BF178	0.39
BF179	0.29
BF180	0.36
BF181	0.64
BF182	0.34
BF183	0.38
BF184	0.39
BF185	0.39
BF194	0.14
BF195	0.06
BF196	0.14
BF197	0.24
BF198	0.17
BF199	0.03
BF200	0.37
BF218	0.36
BF224	0.19
BF237	0.65
BF240	0.09
BF241	0.17
BF245	0.50
BF245B	0.49
BF246A	2.67
BF255	0.09
BF256	0.28
BF257	0.34
BF258	0.33
BF259	0.30
BF262	0.57
BF263	0.57
BF271	0.34
BF273	0.20
BF274	0.34
BF324	0.32
BF336	0.29
BF337	0.31
BF338	0.38
BF355	0.46
BF362	0.99
BF363	0.24
BF371	0.50
BF391	0.25
BF419	0.62
BF422	0.13
BF423	0.33
BF435	2.61
BF450	0.18
BF451	0.11
BF457	0.41
BF458	0.29
BF459	0.66
BF460	1.24
BF469	0.33
BF470	0.26
BF471	0.21
BF472	0.23
BF479	0.62
BF480	0.89
BF491	0.50
BF506	0.43
BF532	0.45
BF596	0.18
BF597	0.14
BF694	0.22
BF757	0.26
BF759	0.29
BF761	0.43
BF762	0.42
BF869	0.09
BF870	0.30
BF960	0.26
BF966	0.56
BF970	0.68
BFR39	0.35
BFR61	0.92
BFR62	0.49
BFR79	0.37
BFR81	0.29
BFR89	1.63
BFR90A	0.63
BFX29	0.33
BFX84	0.37
BFX85	0.31
BFX86	0.36
BFX87	0.55
BFX88	0.34
BFY50	0.30
BFY51	0.33
BFY90	1.16
BLY49	2.20
BR100	0.23
BR101	0.78
BR103	1.03
BR303	1.20
BRC84	2.08
BRX44	0.60
BRX45	0.71
BRX46	0.30
BRX49	0.29
BRY39	1.13
BRY44	0.34
BSS38	0.17
BSTB0140G	4.93
BSTC0246	6.99
BSTC0233	1.71
BSTC1233	6.66
BSTD1043	2.85
BSV57B	1.04
BSW68	0.60
BSX19	0.34
BSX20	1.12
BSY52	0.50
BT106	1.15
BT108	1.45
BT119	1.65
BT120	1.23
BT121	2.48
BT123	1.86
BT151-800R	1.10
BTT6018	1.36
BU106	2.48
BU110	2.57
BU111Y	4.16
BU124	1.48
BU125	2.48

BU126	1.10
BU204	1.58
BU205	1.15
BU206	1.18
BU207	0.72
BU208	1.13
BU208	1.13
BU208A	1.12
BU208D	1.38
BU209	1.75
BU226	1.07
BU326A	0.99
BU406	0.42
BU406D	1.24
BU407	0.54
BU412	8.97
BU426A	0.64
BU500	1.53
BU508A	1.50
BU536	1.53
BU608	1.54
BU705	2.67
BU806	0.79
BU807	0.49
BU826A	1.86
BUW84	0.68
BUX84	0.50
BUX85	0.74
BY126	0.74
BY127	0.09
BY133	0.06
BY164	0.64
BY176	0.93
BY179	0.85
BY182	0.54
BY187	0.79
BY189	1.76
BY198	0.16
BY207	0.17
BY208	1.86
BY210-400	0.18
BY210-600	0.35
BY210-800	0.19
BY223	1.98
BY224-600	4.95
BY226	0.15
BY227	0.20
BY228	0.36
BY229-600	1.20
BY229-800	0.87
BY255	0.11
BY295-600	1.28
BY298	0.11
BY299	0.11
BY407	0.90
BY409	1.49
BY448	1.40
BY713	1.12
BYW56	0.19
BYX55-600	0.19
BYX71-600	0.77
BYX71-350	0.88
BYY56	1.48
C20	1.95
C106M	0.66
CA3046	0.82
CA3089	1.24
CA3090AQ	1.98
CA3094	1.72
CA3131EM	3.12
CD4001	0.13
CD4002	0.24
CD4008	1.35
CD4011	0.20
CD4012	0.16
CD4013	0.33
CD4016	0.25
CD4017	0.30
CD4020	0.75
CD4021	0.39
CD4023	0.16
CD4025	0.28
CD4028	0.84
CD4040B	0.29
CD4047	0.75
CD4049	0.21
CD4052	0.35
CD4066	0.29
CD4069	0.16
CD4070	0.24
CD4081	0.14
CD4093	0.40
CD4511	0.38
CD4528	0.52
CD4556	1.47
CRO2AM-8	1.70
CV12E	2.68
CX095D	3.14
CX104	8.77
CX108	5.52
CX109	6.84
CX130	8.76
CX135	7.50
CX136	11.49
CX139	11.17
CX157	5.52
CX158	10.45
CX177	8.80
CX187	5.26
CX755	12.95
CX885A	6.85
E1222	0.40
E5024	0.28
E5386	0.25
GD243	5.03
GF758	1.07
HA11215	1.75
HA11211	2.53
HA11225	1.12
HA11229	2.15
HA11235	1.73
HA11244	3.71
HA1125	4.29
HA1137W	1.38
HA1138	2.88
HA11414	2.25
HA1156	0.54
HA1160	5.77
HA1166X	6.73
HA1167	6.60
HA11706	3.61
HA11705	8.00
HA11703	3.45
HA11701	2.98
HA11710	3.45
HA11713	3.35
HA11711	9.90
HA11715	10.19
HA11714	7.76
HA11716	6.10
HA11725	18.26
HA11756	13.50
HA11781	18.95
HA1180	5.15

HA1196	0.66
HA13001	1.30
HA1306	2.26
HA13402	7.06
HA13403	11.86
HA1342A	8.98
HA1364	12.25
HA1367	2.73
HA1368R	4.95
HA1368	1.95
HA1374A	2.88
HA1377	1.59
HA1388	1.87
HA1389R	2.05
HA1389	2.47
HA1392	4.38
HA1394	2.55
HA1397	2.55
HA1398	2.55
HA1406	2.07
HA1452	0.85
HA1457W	2.23
HD38702-A23	4.76
HD38750A53	5.77
HD38750A-78	8.53
HD38800A50	14.12
HD44801A05	14.07
HISH1010	14.60
HISH1002	9.50
HM6211	14.55
HM6231	12.30
HM6232	7.20
HM6251	5.69
HM7103	2.97
HM9032	4.00
HM9012	3.22
HT4207	11.99
ICH28I	1.20
KA2101	0.57
KC581C	7.92
KC582C	4.85
L200CV	1.27
LA1201	0.75
LA1210	1.04
LA1230	1.18
LA1231	1.07
LA1357N	3.06
LA1363	1.05
LA1364	3.02
LA1365J	0.70
LA1385	1.53
LA1387	3.18
LA3350	1.43
LA3361	0.71
LA3390	5.52
LA4032P	2.36
LA4100	0.87
LA4101	0.82
LA4102	0.75
LA4112	0.94
LA4125	2.21
LA4138	3.10
LA4140	0.70
LA4192	1.32
LA4220	1.25
LA4420	1.72
LA4422	1.07
LA4430	1.41
LA4440	1.51
LA4445	1.25
LA4460	1.30
LA4461	1.25
LA5112N	1.38
LA7020	3.41
LA7025	11.97
LA7027	10.92
LA7040	1.32
LA7042	2.47
LA7800	1.23
LA7801	1.23
LA7820	1.51
LB1274	1.90
LC7800	1.55
LD3120	1.12
LD3150	2.75
LM383	1.10
LM1017N	1.81
LM1877	1.97
LM2808	5.94
LM2877	7.75
LM324N	0.36
LM339N	0.43
LM340K	11.85
LM348N	2.15
LM380N	1.50
LM6402A093	10.15
LM6416	11.08
LM748	0.71
LM8360	3.54
LM8361	2.67
LR3419	9.37
LR3471	9.37
LU1141	7.27
LU52012	19.75
LU52011	15.65
LU03112	12.37
M21C	1.32
M23C	1.98
M192B1	2.37
M293	4.98
M51102L	1.71
M5115P	5.24
M51203L	3.15
M51231P	1.68
M51301P	4.53
M51353P	6.93
M51381P	5.98
M51393AP	4.50
M51394P	3.77
M5142P	6.84
M5144P	8.25
M51515BL	2.54
M51516L	1.88
M51521L	0.54
M5192	3.13
M5194AP	6.27
M5231L	0.52
M53274P	1.23
M54532P	1.12
M54544L	1.46
M58478P	8.77
M58485P	5.77
MA8001	0.82
MAA4004	11.46
MB3705	1.98
MB3712	1.85
MB3713	1.69
MB3730	1.76
MB3731	1.98
MC13002	2.47
MC1310P	1.95
MC1327P	0.41

MC1330P	1.75
MC1350P	1.56
MC1351P	1.25
MC1352P	1.40
MC1357P	0.57
MC1358P	1.48
MC14493P	3.64
MC14497	7.10
MC14511BCP	1.10
MC1458P	5.18
MC1712	3.88
MC3340	1.40
MC5192	21.94
MC7724CP	3.49
MCR106-56	1.56
MCR220/7	1.25
ME0411	0.75
ME6002	0.26
ME6102	0.28
ME9002	0.45
MEA2901	2.74
MEM4956	1.65
MJ2501	1.40
MJ3000	2.36
MJE2955	0.66
MJE3055	1.15
MJE340	0.38
MJE520	0.49
ML231	0.99
ML232B	1.65
ML237B	1.95
ML238	5.65
ML923	3.30
ML926	3.45
MM5314N	8.99
MM5316N	3.50
MM5318N	3.11
MM5369N	2.01
MM5387AAN	1.20
MM5841N	6.93
MN1400VL	14.68
MN1435VX	13.20
MN1455	14.04
MP1192	15.55
MP2794	4.00
MC1355C	1.98
MPF256C	0.60
MPS6570	0.48
MPSA42	0.22
MPSA55	0.15
MPSA56	0.11
MPSA92	0.15
MPSU05	0.86
MPSU10	2.84
MPSU56	1.25
MPSU60	2.21
MR818	0.33
MR854	0.75
MR914	0.80
MRF477	24.77
MSM5840H	14.91
MVS460-02	0.61
NE542	2.75
NE555	2.01
NE556	0.41
NE565N	1.18
OA202	0.11
OA47	0.24
OA91	0.14
OA95	0.16
OC28	9.07
OC35	1.05
OC36	7.52
OC44	1.95
OC45	0.18
OC72	0.44
OC75	0.29
ON236	1.06
ON782	1.65
OT121	1.45
PT6042	3.58
PT8504	5.65
R1038	1.81
R1039	2.19
R2008B	1.33
R2009	1.98
R2010B	2.98
R2029	1.33
R2030	1.33
R2257	2.38
R2265	1.49
R2306	0.75
R2322	0.67
R2323	0.24
R2354A	0.59
R2354B	2.01
R2441	1.36
R2461	0.95
R2540	1.65
R2540X	1.86
R2615	0.67
RCA2060	2.00
RGP01-15	0.70
RGP10	0.27
RGP30M	0.29
RM11C	0.85
RT905A	3.28
S1299	5.34
S2055AF	3.41
S2802	2.90
S2818	0.85
S3702S	5.21
S6080B	10.46
SA8063	15.55
SAA1006	3.34
SAA1020	5.77
SAA1025	0.90
SAA1024	2.50
SAA1075	1.55
SAA1121	9.23
SAA1124	2.60
SAA1130	9.90
SAA1174	5.99
SAA1250	4.12
SAA1251	3.20
SAA1351	7.98
SAA3027P	6.18
SAA5000	3.30
SAA5010	3.53
SAA5012	5.50
SAA5020	5.78
SAA5030	6.33
SAA5050	4.53
SAB1009B	5.98
SAB3011	4.15
SAB3013	3.62
SAB3021	10.19
SAB3024	6.36
SAB3209	5.82
SAB3210	3.21
SAF1032P	4.27
SAF1039	1.95
SAS5010	8.39
SAS560S	1.91

SAS560T	2.06
SAS570T	2.06
SAS570S	1.95
SAS580	2.87
SAS6600	1.33
SAS660	2.97
SAS6700	1.33
SAS670	3.96
SAS6710	2.21
SBA750	1.61
SC84203	19.35
SDA2006	11.76
SDA2010	20.50
SDA2112/2	12.96
SG264A	9.37
SG613	12.37
SG629	1.81
SG6533	16.45
SI1630HD	20.62
SKE2F1/04	1.25
SKE2G3/04	0.73
SKE4F1/06	0.30
SKE4F2/08	0.89
SKE4F2/06	0.85
SKE4F2/10	0.99
SKE5F3/10	0.89
SKE4G104	0.54
SKS1/10	2.15
SL1310	3.14
SL1430T	2.31
SL414	3.69
SL432A	3.44
SL439	2.48
SL471	4.45
SL480	7.24
SL490	1.15
SL901B	2.06
SL918A	9.07
SN16861AND	1.61
SN16966N	11.07
SN29715N	6.04
SN29717N	7.19
SN29716N	3.66
SN29715N	6.04
SN29722	11.95
SN29723AN	14.46
SN29764AN	2.60
SN29767	4.55
SN29770BN	7.71
SN29772BN	5.75
SN29771BN	5.59
SN29773	2.58
SN29791	1.67
SN29798N	5.56
SN7400N	0.61
SN7401N	0.36
SN7402N	0.64
SN7404N	0.52
SN7410N	0.27
SN74121	0.29
SN74141N	0.16
SN74151AN	1.51
SN74154N	1.27
SN74175	1.52
SN74190	1.35
SN7420N	1.51
SN7430	0.49
SN7440N	0.27
SN7442	0.74
SN7472	1.53
SN7474N	0.44
SN7490AN	0.75
SN74LS26N	1.45
SN76001N	0.45
SN76013ND	7.45
SN76023ND	2.57
SN76033N	2.68
SN76110N	0.49
SN76115AN	0.41
SN76131	0.66
SN76227N	2.45
SN76226DN	2.17
SN76228N	3.27
SN76242	5.23
SN76243	5.23
SN76396	2.90
SN76533N	1.75
SN76532N	3.03
SN76545	1.65
SN76549	2.37
SN76570	3.08
SN76611	2.59
SN76620	2.59
SN76630	2.55
SN76660N	2.48
SN76666N	1.20
SN76708	4.86
SN76709N	9.63
SN76707N	3.69
SN76705N	2.97
SN76730	5.54
SN76810N	0.60
SN76832N	1.35
SN94042	4.35
SP5422	1.83
STA401	2.22
STA441C	2.22
STA471C	2.22
STK0029	5.70
STK0039	5.21
STK0040	7.17
STK0050	7.83
STK011	4.48
STK014	12.25
STK031	12.95
STK040	13.34
STK054	9.35
STK058	27.50
STK077	9.27
STK1039	5.29
STK2110	15.47
STK2145	13.77
STK2240	10.94
STK2250	18.80
STK3042	4.81
STK3044	5.67
STK4019	13.87
STK433	6.18
STK4332	5.37
STK435	6.02
STK4352	1.65
STK436	7.26
STK437	9.50
STK4372	5.42
STK460	9.85
STK466	10.10
STK501	6.32
STK502	8.53
STK5314	9.48
STK5333	7.70
STK5730	4.55
STK7216	5.19
STK772	3.71

STR1096	3.94
STR4090	14.60
STR440	6.18
STR451	5.77
STR454	6.68
STR50103A	3.71
STR6020	6.16
T6016V	1.08
T6021V	0.40
T6036	0.67
T6037	2.11
T6044V	0.97
T6045	1.20
T6049	1.45
T6052V	0.87
T6058	4.95
T6059	4.22
T9003V	1.25
T9013V	4.95
T9014V	2.42
T9016	1.02
T9017V	1.25
T9019V	1.00
T9034V	1.34
T9035V	1.49
T9051	9.32
T9054V	0.99
T9057V	3.44
T9064	2.40
T9065V	3.86
TA7027	4.80
TA7050	1.74
TA7051	1.74
TA7054	2.55
TA7060AP	0.71
TA7061AP	0.64
TA7069	3.13
TA7070P	1.83
TA7072P	2.57
TA7074P	1.98
TA7076P	7.50
TA7089P	3.10
TA7092P	8.63
TA7093P	3.99
TA7108P	1.61
TA7109	1.78
TA7120P	0.64
TA7122B/P	0.59
TA7124P	2.34
TA7129P	1.90
TA7130P	0.62
TA7136AP	1.89
TA7137P	1.21
TA7146P	5.87
TA7149P	2.31
TA7152P	3.16
TA7161P	16.54
TA7169	4.53
TA7172P	1.41
TA7176P	1.75
TA7193P	5.05
TA7204P	1.95
TA7205P	1.05
TA7207P	1.63
TA7208P	2.15
TA7210P	1.45
TA7214P	3.63
TA7215P	1.98
TA7217AP	1.40
TA7222	1.23
TA7226	4.22
TA7229P	4.66
TA7230P	1.30
TA7233P	1.71
TA7240AP	2.14
TA7245P	1.78
TA7310P	1.10
TA7313AP	0.60
TA7314	3.50
TA7323P	3.15
TA7325P	1.63
TA7339P	2.50
TA7340P	5.95
TA7607AP	1.95
TA7609	1.89
TA7611AP	2.34
TA7616P	5.25
TA7622AP	2.92
TA7628P	1.45
TA7629P	2.51
TA7630P	1.81
TA7640AP	1.04
TA7672P	2.75
TA7676P	4.12
TA7726P	10.25
TAA320A	1.27
TAA350A	6.59
TAA550	0.25
TAA570	1.85
TAA661B	0.95
TAA691	8.58
TAA700	2.37
TAA930	4.36
TAA970	2.83
TAG626-600	1.34
TBA120AS	1.45
TBA120SB	0.40
TBA120T	0.57
TBA120U	0.46
TBA120A	1.05
TBA1440	1.46
TBA1441	2.55
TBA395	0.66
TBA396	0.41
TBA400	2.26
TBA440C	2.34
TBA480Q	1.07
TBA510	2.50
TBA520	1.20
TBA530	2.45
TBA540	1.72
TBA560C	1.40
TBA570Q	1.60
TBA570A	1.71
TBA673	5.94
TBA700	0.66
TBA720	4.32
TBA730	3.55
TBA750Q	4.95
TBA800	1.08
TBA810P	1.61
TBA810S	1.61
TBA810T	1.71
TBA820	0.52
TBA820M	0.41
TBA890	3.50
TBA920	1.65
TBA940	3.30
TBA950	1.55

TBA970	3.86
TBA990	0.57
TCA270S	1.00
TCA270SQ	0.80
TCA290A	2.39
TCA420A	2.14
TCA440	1.89
TCA640	1.65
TCA650	3.05
TCA660B	0.41
TCA730	6.50
TCA750	2.17
TCA800Q	1.60
TCA830S	2.37
TCA890	5.44
TCA900	1.99
TCA910	1.65
TCA940	3.30
TCA940E	2.93
TCA4500	3.95
TD3F800R	6.51
TD3F900H	6.37
TD6361N-DS	5.25
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TDA1003A	1.34
TDA1005A	2.02
TDA1006A	7.00
TDA1011	0.95
TDA1010	1.04
TDA1011A	1.36
TDA1028	2.40
TDA1034B	2.17
TDA1035T	1.70
TDA1036	2.64
TDA1037	2.68
TDA1037D	2.05
TDA1044	2.03
TDA1047	2.78
TDA1059B	0.33
TDA1060	2.39
TDA1082	4.51
TDA1151	0.49
TDA1190	1.27
TDA1190Z	3.96
TDA1200	0.87
TDA1235	4.15
TDA1236	3.60
TDA1270	1.73
TDA1327A	6.93
TDA1412	0.74
TDA1420	1.52
TDA1470	2.45
TDA1470P	4.25
TDA1506	4.45
TDA1510	4.60
TDA1512	2.47
TDA1515	2.88
TDA1522	1.23
TDA1559	3.15
TDA1670	2.47
TDA1770	2.31
TDA1905	0.90
TDA1908	4.83
TDA1940	3.89
TDA1950	2.34
TDA2005	1.24
TDA2006	0.95
TDA2004	1.23
TDA2002	0.90
TDA2003	0.62
TDA2030	1.23
TDA2140	5.16
TDA2150	4.48
TDA2151	4.18
TDA2160	1.98
TDA2161	4.78
TDA2170	3.21
TDA2270	2.06
TDA2520	2.37
TDA2522	14.78
TDA2524	0.41
TDA2525	3.54
TDA2532	0.41
TDA2530	0.41
TDA2541	2.14
TDA2540	1.07
TDA2545A	2.15
TDA2560	2.50
TDA2575A	3.63
TDA2578A	2.95
TDA2576A+Kit	12.35
TDA2581	1.60
TDA2582	1.98
TDA2591	2.15
TDA2594	2.45
TDA2593	1.23
TDA2595	2.29
TDA2600	4.12
TDA2611AQ	1.30
TDA2611A	0.62
TDA2612Q	6.58
TDA2620	1.66
TDA2630	4.55
TDA2631	2.24
TDA2640	3.80
TDA2652	9.53
TDA2653	5.16
TDA2654	4.76
TDA2670	3.16
TDA2680	3.20
TDA2740	10.14
TDA2780AQ	7.99
TDA2795	1.43
TDA2791	4.43
TDA2910	13.25
TDA3300B	5.95
TDA3330	4.62
TDA3506	4.40
TDA3501	5.50
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TDA3510	4.55
TDA3520	9.71
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TDA3541	2.22
TDA3560	5.83
TDA3571Q	9.06
TDA3576	11.55
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TDA3591	6.45
TDA3592A	4.53
TDA3650	13.01
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TDA3651	1.99
TDA3651A	1.81
TDA3950	3.30
TDA4050B	3.95
TDA4280	4.71
TDA4290	2.95
TDA4400	2.06
TDA4420	2.30
TDA4422	3.51
TDA4427S	2.65
TDA4431	1.98

TDA4440	1.65
TDA4442	3.18
TDA4500	4.75
TDA4600-2	1.92
TDA4610	5.99
TDA4620	7.75
TDA5500	13.00
TDA5700	1.73
TDA7270S	5.77
TDA8190	3.24
TDA9403	1.50
TDA9503	1.56
TDA9513	2.09
TDD1613S	1.22
TDE1081	7.24
TEA1002	4.93
TEA1009	1.65
TEA1014	1.48
TEA1020SP	4.93
TEA2018A	1.83
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TIC44	0.72
TIC45	0.55
TIC47	0.77
TIP120	0.55
TIP110	0.28
TIP112	0.38
TIP117	0.95
TIP121	0.40
TIP126	0.38
TIP132	0.41
TIP137	0.96
TIP29	0.84
TIP2955	0.79
TIP29A	0.28
TIP29B	0.62
TIP29C	0.33
TIP29D	0.75
TIP3055	0.69
TIP30A	0.41
TIP30C	0.40
TIP31A	0.34
TIP31B	0.28
TIP31C	0.39
TIP32A	0.35
TIP32B	0.46
TIP32C	0.54
TIP33	0.63
TIP33A	0.89
TIP33C	0.95
TIP34	1.20
TIP41A	0.29
TIP41B	0.29
TIP41C	0.31
TIP42A	0.29
TIP42B	0.79
TIP42C	0.35
TIP47	0.65
TIS43	0.64
TIS90	0.28
TL011CP	1.65
TL494CN	1.12
TL072CP	0.41
TMP4320	9.50
TMS1024NLL	13.93
TMS1025N	14.60
TMS3720ANS	2.06
TMS3748NS	10.95
TMS3755	9.66
TMS4034	1.00
TUA2000	9.33
TV106	2.97
TY6010B	2.97
ULN2204	8.50
UPC1360C	2.30
UPC1366	1.48
UPA81C	0.64
UPC1003	5.85
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UPC1032H	0.82
UPC1043C	4.29
UPC1158H	0.63
UPC1161C	4.68
UPC1182H	2.19
UPC1186H	0.71
UPC1181H	0.95
UPC1185H	4.12
UPC1188	2.06
UPC1212C	0.80
UPC1225H	1.89
UPC1230	2.14
UPC1238	1.38
UPC1278H	1.89
UPC1351C	1.81
UPC1350C	1.38
UPC1353	2.60
UPC1363	1.02
UPC1362	1.68
UPC1365C	1.65
UPC1360C	2.30
UPC1378H	1.07
UPC141C	0.95
UPC1458	0.66
UPC151C	2.95
UPC2002	1.08
UPC30C	2.51
UPC324C	0.99
UPC32C	4.94
UPC339C	2.95
UPC41C	2.99
UPC4558C	0.41
UPC474	5.11
UPC554C	1.43
UPC575C2	1.55
UPC580C	2.73
UPC587C2	1.34
UPC592H	2.01
UPC595	1.15
UPC596	2.31
UPD1514C	4.76
UPD2819C	4.98
UPD553-164	18.43
UPD8049C-1	11.50
XOD22CE	5.75
XOD29CE	7.09
XOD31CE	6.38
XOD35TA	7.27
XOD40TA	5.52
XOD42CE	3.19
XOD43CE	2.75
XOD55GE	5.02
XOD57GE	6.00
XOD65CE	6.35
XOD74GE	18.93
XOD77GE	6.35
XOD79CE	4.95
XOD92CE	10.31
XOD96CE	6.60
XO109CE	13.61
XO113CE	10.97
XO195CE	9.60
XO204CE	11.96
XO261CE	8.98
2PY120	5.94

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VCR Clinic

Reports from Eugene Trundle, Nick Beer, John Edwards, Bob McClenning, S. DaCosta, Alfred Damp, Michael Dranfield and Mike Leach

Sony SLV401

Although playback of tapes recorded by other machines was fine, anything that this machine recorded then played back came out very poorly, with streaks, worms and dots on the picture. The cause was worn video heads. When we found that the trade price of the upper drum assembly is just over £100 we decided to try resetting the luminance record current. In the Sony alignment details the instruction is to set the current for 2·2V at the appropriate test point. We found that the machine recorded perfectly all right when the voltage at this test point was 1·2V, but we had to warn the customer that the pictures would deteriorate sooner or later as the heads wore down further. **E.T.**

Fisher FVH-P615

Here was another case where the cost of spares pushed us into mending rather than replacing. The trouble was juddering E-E pictures and a very strange video waveform from the tuner module, which includes the u.h.f. tuner, the i.f. section and the demodulators. The source of the trouble seemed to be in the vision a.f.c. section, but the service manual gives no circuit details – the black-box approach. Sanyo, who handle Fisher spares, quoted us £93.73 plus VAT (trade price) for this mystical module. We went into it with a hairdryer and freezer and found that C12 (0·47μF, 50V) was the cause of the trouble. An 0·47μF, 35V tantalum bead replacement (blue one, Les!) put all to rights. **E.T.**

Sanyo VMH100P

If you get one of these camcorders that provides no chrominance signal output to the TV set's (or copy VCR's) S terminal, check the continuity of the S-connecting lead before dismantling the camcorder. We've had two with open-circuits in the chroma wire – it's probably a batch problem. **E.T.**

Matsui VX820/Saisho VR1200

According to the customer this machine had been afflicted by a power surge or something similar. All the unswitched supplies from the multiregulator were present but there were no switching signals for the others. This was caused by loss of the 12V supply as the 2SD1207 regulator transistor Q2 was short-circuit base-to-emitter. **N.B.**

Panasonic NV-G40B Scanner

This scanner powered up and everything, including the red light, worked. But it wouldn't read codes. The cause of this was that the 1μF, 50V coupling capacitor C02 was open-circuit. It's a surface-mounted, can-type non-polarised electrolytic. Spares are not easy to obtain. **N.B.**

Salora SV8600/Mitsubishi HS337

This machine allegedly stopped in the play mode. It ran faultlessly until I got in and provoked it. The pinch roller was distorted, apparently because of spillage that entered courtesy of the tape (the tape path was coated). A good clean and a new roller were all that was required. For those who don't have an NCS or Mitsubishi account, genuine rollers are available from Willow Vale. **N.B.**

JVC HRD320

This machine would accept a tape very slowly, then eject it and switch off. Sometimes it would try lace-up/fast forward/rewind etc., accompanied by unhealthy noises (crunching and groaning) from the mechanism, then shut down. Checks on the STK5481 regulator chip, always a good place to start, showed that pin 3 was at 1V instead of 5V and pin 4 at 0·7V instead of 12V. Replacing the regulator restored normal operation. **J.E.**

Ferguson FV26D

This machine accepted a tape but there were no deck functions. When eject was selected the cassette was returned but a loop of tape was left caught around the left-hand roller guide. Quick checks at TP801 and TP802 showed that the 12V and 5V supplies were missing. Circuit protectors CP601 and CP602 were o.k., the culprit being the STK5481 regulator chip. This chip is prone to failure and it pays to check the voltages around it before carrying out any other work on the VCR. As a guide, the following voltage readings were obtained with a working machine, using a 10MΩ/volt DMM. Pin 1 3·4V; pin 2 8·4V; pin 3 5·2V; pin 4 12V; pin 5 0·2V; pin 6 12V; pin 7 13·2V; pin 8 18V; pin 9 11·9V; pin 10 13V; pin 11 18V; pin 12 0V. **J.E.**

Ferguson 3V30/JVC HR7300

The cause of this fault eluded us for nearly a year. Very occasionally the customer reported that on pressing play, record or timer record the machine would load then unload. We had tried the usual causes – the belts and pulse inputs to the microcomputer chip. Then finally the fault put in an appearance for us: the pinch-roller solenoid disengaged before our eyes. Transistor Q4 had gone slightly leaky from base to emitter. Happiness is a niggling fault put to rest! Bear in mind that the holding drive transistor is a definite possibility for this sort of trouble. **B.McC.**

JVC HRD211

This machine came in dead. The famous STK5481 chip was faulty. Replacing this chip brought the machine to life but it was very confused. The record and pause lights were both on, the loading motor ran continuously in the loading direction and the tray moved in and out. A new microcontroller chip put matters right. **S.DaC.**

Panasonic NV-D38

The clock lit but the machine wouldn't work because the regulated 5V supply was missing. Q2006 (2SD1330) on the main PCB was open-circuit base-to-emitter. Tuning in an off-air programme was impossible and as a result the picture-in-picture feature was inoperative. We found that the 45V line was loaded down, reading only 18V. This was

due to the AN5043 chip IC7551 being faulty – it was rather hot. **S.DaC.**

Hitachi VT17

After playing for a few hours this machine would loose speed and eventually stop. When we opened it up we found that all the chips had been replaced and a new capstan motor had been fitted. Someone had been beaten by this one! We found that the flywheel became stiff when the fault occurred. All that was needed was cleaning and lubrication. **S.DaC.**

Toshiba V210

A vertical black bar moved across the screen in the E-E tuner mode. It didn't appear in the E-E Aux mode, which narrowed the field of search to the off-air circuitry. An oscilloscope check showed that there was ripple on the detected video from the i.f. unit, but replacing this module made no difference. The tuner unit was the next logical suspect, especially as there was no discernible ripple on the supply lines. A replacement tuner put matters right. **A.D.**

Akai VS15

This machine came in because there was no fluorescent display. When we dismantled it the display worked. We left the machine on test with all the boards accessible. After a time the fault started to come and go. Waveforms were present at all the grids and segments of the display. The cause of the fault was eventually traced to the display filament rectifier going open-circuit intermittently. **A.D.**

Hitachi VT410

The problem with this machine was intermittent audio recording due to loss of bias. We traced the cause to a switch within IC401 closing. This occurred because the voltage at pin 5 fell below 11·3V, thus activating the switch. C431 was found to have a 2MΩ leak. Note that according to the diagram pin 5 has to go high for the switch to close: in fact it has to go low. **A.D.**

Akai VS33

After half an hour the E-E mode tuner picture was replaced by a blue screen. We traced the off-air signal on the E-E route from the i.f. unit to the base of transistor TR113 on the main board. It was missing at the emitter of this emitter-follower transistor. This was due to the action of IC201, TR106 and TR109 earthing TR113's emitter. Both the chip's oscillators were working but there was a sync pulse problem. Replacing the LVA519S chip IC801 cured the fault. **A.D.**

Akai VSF33

When play was selected there was a hum bar on the E-E picture while the playback picture consisted of noise and a hum bar. All the supply lines were correct except for the "limit 12V" rail which was low at 8·5V. A check at the junction of the limit-12V reservoir capacitor C7 and resistor FR4 showed that a large ripple was present, but replacing C7 made no difference. This point is also connected to the collector of TR7, the power-on transistor for the "idle 5V" supply which is derived from TR6. We found that the supply to TR6 was missing because FR2 was open-circuit. The "idle 5V" supply was drawing current via TR6 and TR7, overloading the "limit 12V" supply. **A.D.**

Hitachi VT33

This VCR would shut down after five seconds. The drum and capstan motors both worked but a hunting sound came from the drum. At start up a scope check showed that there were squarewaves on the 9·5V supply to the servo: the supply was also trying to rise to 10·5V. Replacing the STK5421 chip IC151 on the regulator board cured the fault. **A.D.**

Matsui VX800/Saisho VR1000

Fast forward and rewind worked but there was no drum rotation, also no E-E picture – just a blank, noise-free raster. The cause was F2001 of course. It's an N20 (800mA) ICP. To avoid having to remove the front PCB etc. you can replace it from above by lifting out the power supply. After replacing F2001 everything worked all right until play was selected. The tape then loaded but as soon as it touched the head drum the tape stuck to the drum and the motor stalled, blowing F2001 again. This was due to sticky gunge on the drum. A good clean and polish plus a new ICP put matters right. Normal current through the ICP is 260mA in the E-E mode, 360mA in the play mode. **M.Dr.**

Hinari VXL9

When play was selected this machine would load then unload straight away. Fast forward and rewind were o.k. After a very unsuccessful search with the scope the machine was put to one side while a manual was obtained. It was not up to the usual Hinari standard: the circuit diagram had to be viewed through a magnifying glass as it's all on a single page. Checks around the TD6364NPAL digital servo controller chip IC102 showed that drum switching pulses were present at pin 18 but there was no head switching squarewave at pin 9. Since the 5V supply was o.k. at pin 38 it seemed that the chip was faulty. As a check a Matsui VX820 that was waiting for a new carriage was pressed into service – its head switching signal was fed to the Hinari VCR, which then played but with the drum rotating too fast. Normal operation was restored after obtaining and fitting a new TD6364NPAL chip. **M.Dr.**

Sharp VC488

This VCR caused me a bit of a turn. The reported fault was no rewind. Just the usual idler replacement and clean up I thought. After doing this I inserted a test tape, but there was no picture. As the heads appeared to be dirty I gave them a good scrub and tried again. No better. It's an upmarket hi-fi machine so I thought I'd better check on the price of heads with Willow Vale before giving the customer a quote. I'm glad I did. I was told that they are not held in stock and asked if I was sitting down! The trade price is £173 plus VAT. So I decided not to order. I returned to the bench and wondered what to tell the customer. Then I noticed that the playback picture had improved significantly while I'd been on the phone. A quick tweak on the tracking control was all that was needed. The situation was that the machine wouldn't work from cold, so I sprayed some freezer here and there. The cause of the fault was dried up electrolytics in the power supply. After replacing C952/3/4/5, C961 and C963 the machine worked normally at all temperatures. I still can't believe the price of those heads though! **M.L.**

The Bang and Olufsen Link System

Nick Beer

The Bang and Olufsen MCL (master control link) or Link system provides integration and complete control of a B and O entertainment system from various locations. The futuristic vision of audio and video equipment all around the house being controlled by use of a master system has with B and O products been a reality for some years now. A TV receiver, VCR and hi-fi installation as either a combined entertainments centre or in separate form in one or two rooms can be controlled and, where appropriate, heard or watched in any other suitably equipped room. This article will probably be of mainly general interest since few homes are equipped with the Link system. B and O products do tend to fascinate however.

B and O has its own terminology that goes with the Link system. We'd better keep to it. A room containing a TV set, VCR etc. is referred to as the main room. Further rooms adapted for the system are called local rooms. The link itself is a paired transceiver and relay unit.

The minimum hardware required in a local room is a link and a pair of speakers. The link consists of an infra-red transceiver and a relay box. Remote control commands from the handset are received by the transceiver which has to be positioned on a wall so that it can see them. In conjunction with the relay box, it controls the on/off switching of the speakers in the local room. It also controls the flow of command data from the handset back to the master system in the main room via the audio link leads. Figs. 1 and 2 show the transceiver and relay box circuitry. When a received command has been carried out, data is returned from the master system to the transceiver, via the relay box, and a confirmed status signal is sent back to the remote control unit. This is of use only when the remote control unit is a transception device (see below).

The speakers connected to the link provide sound from the selected source. Where the local room is equipped with a TV set its video input can also be from any appropriate source. Stereo speakers in a TV set can be used instead of the external ones for audio only reproduction. When the TV set is a 39XX, 316X or 326X series type there's no need for a link transceiver as the one built into the set can be used.

Even when only currently available equipment is used

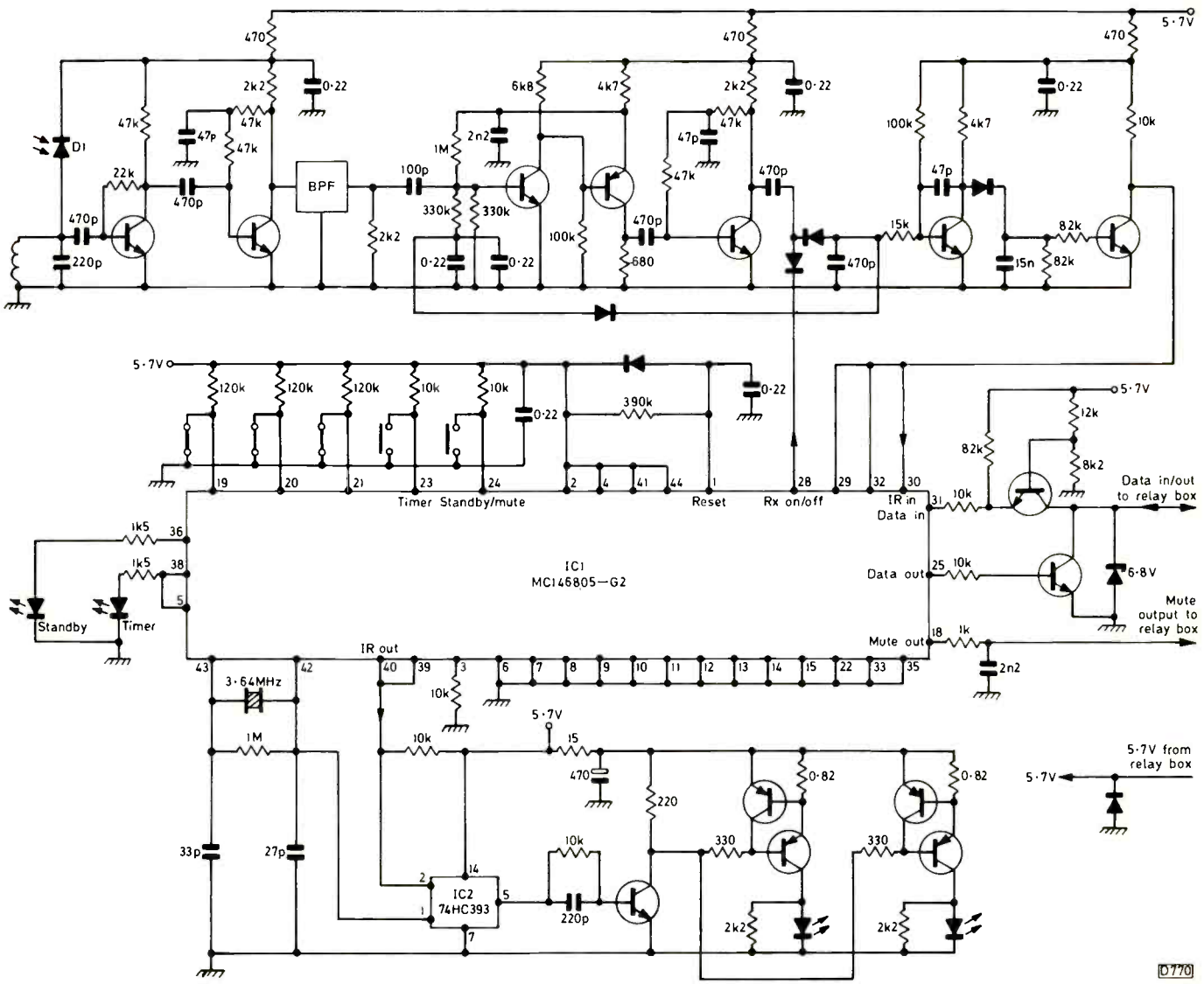

Fig. 1: The MCL2A transceiver circuit.

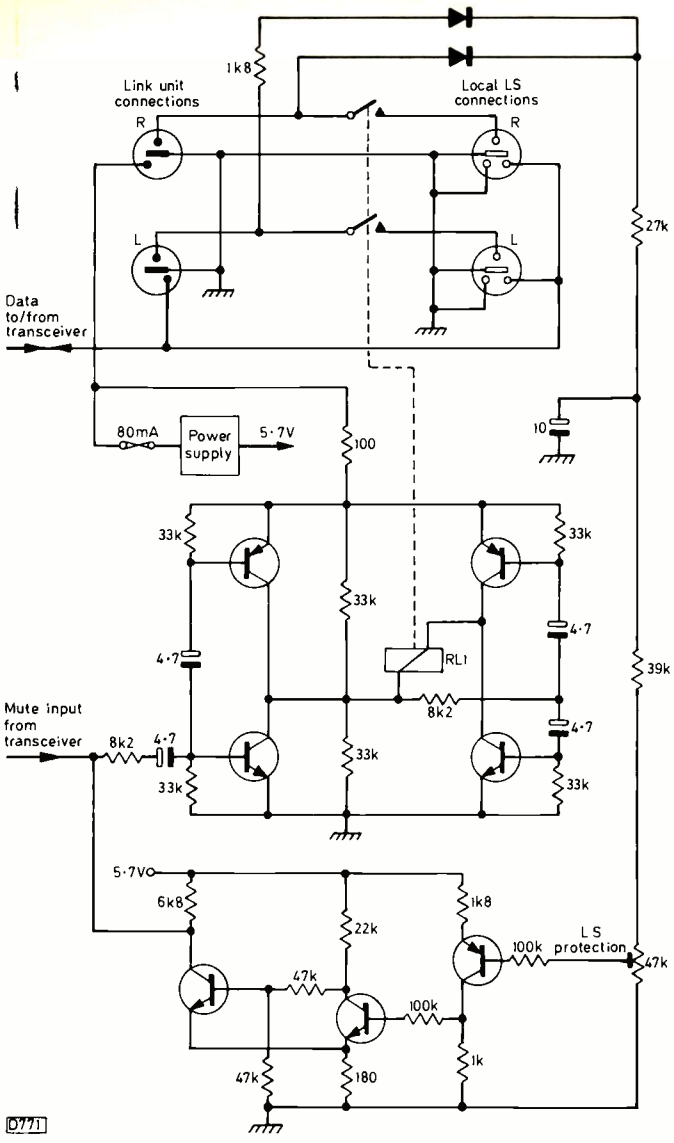

Fig. 2: The MCL2A relay box circuit (regulated power supply not shown).

the system allows for a vast number of permutations. When current equipment is used in conjunction with items from previous ranges there's an almost incredible range of possibilities. As this article is intended as an introduction, we'll not discuss specific combinations and their operation.

Consider an integrated system with a hi-fi installation, TV set, VCR and a satellite receiver (simple systems may use just hi-fi equipment for example). The video items, in this case TV set, VCR and satellite receiver, are normally in the same room. It's fairly common for the hi-fi installation to be in another room however. This is where one important consideration arises. Systems are referred to as either one- or two-room situations and the master units are programmed accordingly. This is done as part of the option programming routine. The reason for this is as follows. If you have a TV and hi-fi master in the same room, controlled by a single remote control unit, a certain amount of confusion could arise unless arbitration is used. This takes the form of selective muting of the IR receivers in the master units.

Connections

The audio and video units can be integrated without being part of a link system. But in either case the interconnections are the same, see Fig. 3. Here the hi-fi master has all the audio equipment connected to it in the traditional manner (though B and O tend to use DIN plugs). The hi-fi master is also connected to the TV set via a seven-pin DIN lead between its aux or tape-2 socket and the TV set's aux-1/link socket. VCR(s) are connected to the TV set via their aux-2 scart socket(s). The satellite receiver may be internal (Beosat LX in the older L/LX00/02 series 37XX and 38XX chassis or Beosat LM in the 39XX chassis) or external (Beosat RX). The external unit is daisy-chained at r.f. and scart-linked to the VCR. With the 39XX chassis a second VCR can be connected via the AV DIN, aux-3 or a second scart connector. At the time of writing there are no S-VHS B and O VCRs, but the 39XX chassis does incorporate an S socket. All scart leads need to be connected as virtually all B and O video equipment uses on-screen menus or displays fed via RGB inputs. Otherwise, i.e. with composite video/r.f. connection, the displays would usually be in monochrome.

Where extra scart capability is required the aux-1 AV expander unit is available. This device is not passive: it has microcomputer control, and is thus another item connected to the data bus. In Fig. 3 one of these is shown connected to a 39XX series TV receiver – it's presence is noted on the on-screen system map automatically (TV shift text).

To incorporate a link system, the relay box in the first local room is connected to the speakers-2 output on the hi-fi master unit via a special multipin speaker DIN plug. The transceiver is connected to the relay box via its 5mm lead. Further links in other local rooms are simply parallel connected to the preceding relay box. Each local room

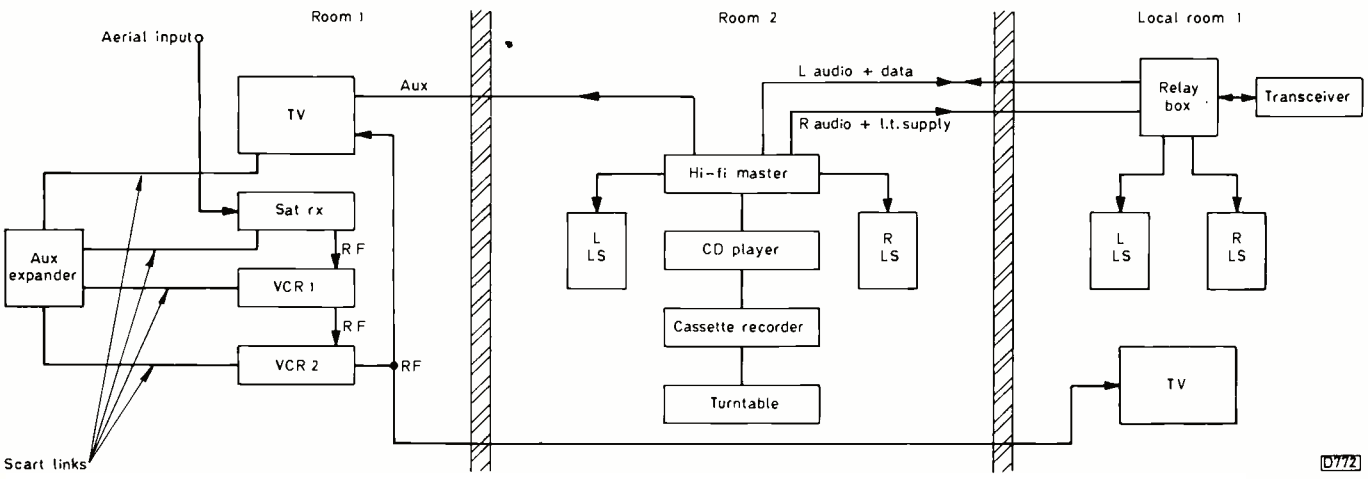

Fig. 3: Typical set up with two main rooms and a local room.

would also need to have a TV set and a coaxial feed from the main room for full advantage of the possibilities to be obtained. In this way TV, VCR and satellite signals can be viewed as well as heard in each local room.

Remote Control Handsets

For some time all remote-control B and O equipment has come with a handset known as the Beolink 1000 as standard, included in the price. It will control a TV set, VCR and satellite receiver and hi-fi gear as well as the light control unit. It's a transmit only unit, with no on-board display. The retail price is less than £100.

There are now two other handsets which are options. Both are two-way communications units that will operate with any suitably-equipped products. The Beolink 5000 is of similar design and appearance to the 1000 but has in addition a twin-sided, transparent LCD screen and extra buttons. The display enables the selected function and feedback data to be viewed. In this respect the 5000 is not as complete as an MCP or the 7000 (see later), but it's very good. There are buttons on both sides of the unit. Some of the less frequently used ones are in a trough at the back. A nice feature is that you can use a button on the top, the handset display confirms this, but when you then press a button on the back the display scrolls over so that it reads from the back. Some of the buttons have been included to reduce keystrokes – menu for example obviates shift text. Cursor keys have also been added. These are laid out at the foot of the handset in a very user-friendly way.

The Beolink 7000 is something else. It's a full-feature, interactive, two-way communication control centre. Its controls are all touch-sensitive pads on glass. When you use the main ones more options are displayed on the screen. You get these options simply by touching them on the screen. The unit guides you to where you want to be by showing you relevant options based on the function selected. If you put the unit down on a flat surface the control fascia sits up at an angle of about 45°, pivoting in the centre of the handset. When picked up the unit folds flat again. This feature can be switched off via the menus. Everything, from light controllers (local and global) to hi-fi and video products, can be controlled by this handset. It's stunning!

Master Control Panel

Prior to these two new handsets the master control panel (MCP) was the only transception unit. It has appeared in a number of guises, basically matching the appearance of the top-of-the-range hi-fi separates system of the time, i.e. the MCP5000 (Beosystem 5000), MCP5500 (Beosystem 5500) and MCP6500 (Beosystem 6500). These MCPs contain every possibility for full hi-fi system remote control, indeed the only controls on the audio units are standby, mute, door open/close and step as appropriate. The MCP also has a display to show everything from clock to track number, counter and frequency.

System Operation

Most systems will be used, at least initially, with a Beolink 1000 handset. Operation is as follows. The required unit in a main room is selected by pressing the appropriate handset key. The numeric keypad and deck function keypad are then universal, i.e. TV 1 selects channel one on the TV set, radio 1 selects preset programme one, CD 1 selects CD track one etc. The first press activates the unit. When on-screen menus are used the pattern is also pretty universal. The selected line of the menu is in a different colour to the other options. To move from one option to the next you use the fast forward and rewind keys. To select an option, press play. To cancel a menu, press stop. To alter a selection or value within a menu option use step keys left and right. All this is very logical, but as usual some customers take a long time to get used to it.

When in a local room you sometimes have to prefix the command by link. Otherwise the operation is the same as in a main room.

The master control panels are basically hi-fi control units but also provide limited control of TV and VCR functions through the universal deck function and numerical keypads. TV sets are addressed as aux-1, VCRs as aux-2/3. Depending on the model and software version, some anomalies can occur here, e.g. switches on but won't switch off, or comes on with no picture.

Powerlink

A recent development with speaker connections is Powerlink. On hi-fi masters and TV sets of later manufacture there are two 8-pin DIN sockets that are fed with left- and right-hand channel information. Each speaker unit then produces whichever information is desired. When the speakers have display panels (Beolab) data on source is displayed, including preset/track number and level. Many speakers can be coupled together, one from the other, and switched to produce the desired channel. This can be useful when the speaker locations are not equidistant from the amplifier. Powerlink can be run from the amplifier to the nearest speaker and the next one can be fed from that point. The alternative, traditional connection, Speaker Link, uses conventional looking plugs with extra pins that carry data.

Complications and Upgrades

Complications inevitably arise when a product that is to be connected to previous purchases is sold. Due to incompatibility the new item may not work when delivered, or some functions may not be obtainable. Such problems are usually surmountable, but it's best not to find out about them on delivery. To avoid such problems we use a system in which the salesman fills out a specially designed form at the time of the sale. It lists previously purchased equipment, that now being bought, functions especially desired, layout of the equipment in the house, etc. This is passed to the service department where it's checked and any upgrades/modifications required are inserted, together with the cost as appropriate. The salesman is then aware of the work that will be required to carry out installation and can arrange for it to be done with any charges added to the bill.

These upgrades or modifications usually involve replacing or adding chips in order to modify the software that controls the unit. Such jobs are seldom difficult or time consuming. Equipped with an antistatic mat and the relevant i.c.s, our specialist B and O salesman can undertake most modifications.

Fault Finding

When systems go wrong it's not always simply a matter of collecting a unit and providing a loan one. It's first necessary to determine which item is faulty, then work out

HCTV dispells myth and thrives in the face of adversity

There is a popular misconception that the sale of ex-rental and B-Grade television and video equipment is the type of business only to be found operating out of the back door of a garage. It is thought by some to be an unstable and unreliable kind of business and therefore anyone purchasing goods from such a source is deemed to be taking a high risk.

As always, you will find some outfits that will fit exactly the above description, but many will be surprised to hear that the market has matured to such an extent that one company in particular has expanded to five branches, has the approval of some of the country's largest engineering firms, employs 50 per cent of its staff in support and engineering roles and has a 15-year trading history.

Service with knowhow

HCTV, headquartered in Erdington, Birmingham, is one of the most respected and established businesses in the market. Set up 15 years ago, it now has branches in London, Preston, Oxford and Cardiff as well as Birmingham. The company puts a strong emphasis on service and it has workshops in Birmingham and London where all equipment is checked, cleaned, serviced and polythene-wrapped before being shipped to customers. Its 25 engineers are kept up to date on the latest technology and HCTV has an enviable record of recruiting the right people.

John Henderson, general manager, explains: "We watch what we buy and we pitch ourselves in the right place. We know from our lengthy experience, for example, that some makes and models are more popular in certain areas of the country than others and we stock our branches accordingly. A lot of people have been squeezed out of the market because they did not know enough. We make sure that our engineers keep up with the standards."

Competitive pricing

HCTV's reputation for quality goods is affirmed by the fact that they are approved by both Teleprice and Clydesdale, two of the country's largest engineering firms. But as well as being assured of good service, customers can also expect a good price. "Because we have five branches, we have a large volume buying power and we can pass on those price benefits to our customers," says Henderson. "We have a bigger selection of ex-rental and B-Grade stock than anyone in the UK and if customers want something specific, our national coverage means that we can keep an eye out for it."

The company's newly installed computerised stock control system monitors its twice-weekly deliveries to all of its branches making sure that each branch is well stocked with its own particular best sellers.

Far and wide

HCTV has seen a number of its competitors fall by the wayside recently but has managed not only to keep its head above water but to go from strength to strength. Demand from abroad has led to an export business and HCTV now ships container loads of products as far away as Russia, Greece and Dubai.

Far from being a fly-by-night outfit operating from a garage, HCTV, the largest independent in its line of business, competes strongly with the publicly-owned corporate companies that are unable to offer the same value for money. And far from taking a risk by buying from HCTV, it will probably be one of the safest purchases you'll make.

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how best the system can be run without it. Remember that with a Link system amplifiers are not just amplifiers – they are the heart of the system. The service engineer has to have an electrician's experience of tracing faults in cabling, often in trunking or under floors, combined with the ability to carry out complex repairs in the customer's house. It may seem to be asking rather a lot, but it can all be successfully managed.

In Conclusion

Considering the problems encountered with other consumer electronics hardware, it's surprising how well the average B and O Link system user gets on. Operational queries inevitably arise however. These can mean that the dealer has to try it himself, read the instruction books/PCG, or consult B and O for an answer – fortunately B and O provides a superb back-up. It's best of course to be fully conversant with such a system at the outset, but how many engineers/installers are able to acquaint themselves with sophisticated new products before they start to encounter them in the course of their day-to-day work? In the case of something as complex as the Link system however it's almost essential.

Such problems are minimised by the fact that only B and O Centres sell and install such equipment. Despite the good sense of users returning to a B and O Centre for service, no doubt many will look elsewhere – and that could be you! Fortunately the equipment has to date proved to be extremely reliable.

CD Player Casebook

Reports from Mike Leach, Philip Blundell, AMIEIE, S. DaCosta and Brian Storm

Toshiba SL3258 Midi System

No CD sound was the complaint with this Toshiba midi system. Just the odd thump and bang could be heard from the loudspeakers. A quick glance at the circuit diagram told me that a CXK5816M RAM chip is used in the CD decoder. As mentioned before, failure of this chip is a common complaint with various CD players. Access to the CD electronics in this model is difficult to say the least. The electronics for the whole system are on a single PCB. It appears that the only way to fault find on the CD section is to remove everything from the cabinet, including the mains transformer and CD mechanism, and spread it all out on the bench. This done I replaced the RAM chip (circuit reference Q707) and, as with all machines that are difficult to work on, this failed to provide a cure. I was convinced of being in the right area however. There's very little other than the DA converter chip Q801 or the decoder chip Q706 that could cause such a fault symptom. As it's the easier one to replace, I changed the DAC chip first. This didn't provide a cure either. Checks around the CXD1135Q decoder chip produced faint music when the data lines to and from the RAM chip were scoped and also when the output pins to the DAC chip were touched. It's not an easy chip to change by any means, but a replacement cured the fault. The Pyropen came in very handy here, but it took me as long to put the machine back together again as it did to replace the chip. **M.L.**

Rotel RCD855

The fault symptom with this player was skipping and jumping on the first few tracks of a disc. A knocking noise could be heard from the CD mechanism when the fault occurred. Slight pressure applied to the disc clamp with the forefinger enabled the vibration of the knocking to be felt. When further pressure was applied the fault disappeared and the machine worked perfectly. A new clamp assembly restored normal operation. **M.L.**

Philips CD160

Here's an unusual one! This machine read the table of contents all right and found the track, but it wouldn't play and the time display didn't appear. I suspected the M4804 decoder chip but it's no longer available, so I contacted the nice man at Philips. He said an SAA7210 could be used provided other components were changed, but suggested replacing the MAB8441 microcomputer chip first. He was right. Thanks R.N. **P.B.**

Sony CDP-M35

The display said "no disc" when one was inserted. The disc didn't rotate and the lens didn't focus. We found that the connector between the laser assembly and the main PCB was only half pushed in. This has been the case with a number of players of different makes.

With another of these machines the tray opened and the sled motor moved to the outer position when power was applied. A new LA8550 sled/tray drive chip was required. **S.DaC.**

Sony D100

This player was dead. A replacement Wickman fuse, F25X, was all that was required. **S.DaC.**

Technics SLP500

This machine skipped and jumped from track 1 to track 6 when first taken from the box and tried. Beyond track 6 it worked all right. A new laser unit was required. **S.DaC.**

Technics SLP550

We've had a few of these machines with complaints about intermittent sticking or skipping. The SLP550, along with its close relatives the SLP770 and SLP990, usually benefits from the following attention. First, clean the laser lens and the turntable. Then remove, clean and polish the two guide shafts. If there are any fine scratches on the shafts – this usually happens only with dusty units – replace them (part no. SUXD78-1). When they have been cleaned and reinstalled, lubricate them lightly with SZZOL32 grease. Finally, check the mechanical adjustments (first) then the electrical adjustments. **B.S.**

Technics SLXP1 and SLXP2

We've had some of these portable CD players in with the 6·8Ω, 1W surface-mounted resistor R31 in varying states of distress. In one case the condition was so bad that a small

hole had been burnt in the bottom cover. Sometimes ICP11 (a two-legged, transistor-shaped fuse) goes open-circuit.

The instruction books for these machines clearly state that any batteries other than Technics SHCDB8 type must be removed before the a.c. adaptor/charger unit is used. Sure enough we found that in each unit there was a proprietary rechargeable, an ordinary alkaline or a common AA type battery. The Technics SHCDB8 has a charging current of 700mA, via R31. As the player with the hole burnt in the bottom also had a hole in the main PCB, failure to observe this instruction can be an expensive mistake. **B.S.**

TEST CASE

349

Each month we provide an interesting case of TV/video servicing to exercise your ingenuity. These are not trick questions but are based on actual practical faults.

Mr. Field wasn't at home when Philbert called to look at his TV set. Mrs. Field was there, but she'd never seen the lines on the picture. Philbert closely examined the display. Seeing only the scanning lines, he went on his way. A few days later there was another call about the same trouble. Once more Mr. Field had been borne away by the 8.29, and again Philbert could see only the coloured lines that made up the picture. He removed the rear cover and tapped the PC boards with the handle of a screwdriver. This made no difference. So he loaded the set into his van and took it back to the workshop. It was a Sony Model KV–M2120U, which is fitted with the BE1 chassis – a modern set using, apart from the picture tube, similar technology to other makes of receiver.

The horizontal lines that so troubled Mr. Field could be seen in the workshop. Starting about an inch from the top of the screen and extending an inch downwards, there were six faintly visible coloured lines – two blue, two green and two red, in that order, each the height of a single scanning line. While the picture responded to operation of the brightness, contrast and colour controls the lines didn't. They could be seen most clearly on a plain grey raster from a pattern generator. If the set was switched to the AV mode with no signal input they could still be seen but were nearer the top of the screen.

What were we to make of this? If it had been a blanking fault the lines would have been white or grey but these lines, though faint, were clearly in the three primary colours. Since RGB signals exist only after the PAL decoding process, attention was turned to this area. Matrixing and RGB drive signal generation occur in the TDA3505-V9 chip IC302, which is on board B. Most of what goes on in this chip in the way of blanking and clamping is controlled by the sandcastle pulse that enters at pins 10 and 11. There's no oscillogram of this crucial waveform in the manual, but by good luck we had another set fitted with the BE1 chassis in the workshop. Checks showed that the shape of the sandcastle pulses in the two sets was the same.

The conditions around the RGB chips in the two sets were next compared: voltages and waveforms corresponded closely throughout. The RGB drive signals at pins 1, 3 and 5 in the faulty set were then examined, with a plain black-level input signal. We found that there was a positive pulse on each drive waveform, shortly after the field sync pulse. A double-beam oscilloscope showed that these pulses were slightly offset in time for R, G and B. Obviously these spurious pulses were the cause of the horizontal coloured lines at the top of the screen! The excitement caused by this discovery was much dampened by the fact that the self-same pulses were found to be present in the good set, at the same points in the field blanking period. Yet the good set didn't display any coloured lines at the top of its screen.

At this point it was seriously suggested that the drive signals from the faulty set should be hooked to the cathodes of the picture tube in the good set in an attempt to narrow down the field of search. Wiser counsels prevailed, though the lines would have been displayed had we followed this course of action. What fundamental point had been overlooked? Which part of the set should we have been investigating? See next month for the answer and another of our Test Case puzzles.

ANSWER TO TEST CASE 348
— page 129 last month —

The sort of problem described last month had a nice old-fashioned feel about it in these days of data bases, programme memory latches and the like! Such symptoms were being tackled ten, twenty and thirty years ago, probably by banging electrolytic capacitors across high-voltage points as CE was doing. The main symptom he was working on in an ITT CVC801-chassis set was a horizontal black-white hum bar across the picture, which was also very torn and distorted. The output from the power supply had no significant mains-rate ripple, and the horizontal bar disappeared when the aerial was disconnected. This and the fact that the set couldn't tune in the upper half of the u.h.f. TV band were very significant clues!

This set uses varicap tuning, for which a tuning voltage supply of about 30V is required. It's obtained from a ZTK33B voltage regulator on the tuner control module. This is in turn fed from the line output transformer derived 90V supply. D504 is the relevant rectifier, with C514 its reservoir capacitor. Both of these items are on the main PCB. A check here showed that there was a 78V peak-to-peak ripple on the 90V line – C514 had gone open-circuit.

Thus the voltage (average) on the tuning line was low while the supply's impedance was high. As a result the higher channels couldn't be tuned in and hum was being picked up. This hum was being superimposed on the tuning supply.

Published on the third Wednesday of each month by Reed Business Publishing Ltd., Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Filmsetting by Trutape Setting Systems, 220-228 Northdown Road, Margate, Kent. Printed in England by the Riverside Press Ltd., St Ives plc. Distributed by IPC Marketforce, Kings Reach Tower, Stamford Street, London SE1 9LS (071 261 5000). Sole Agents for Australia and New Zealand — Gordon and Gotch (A/sia) Ltd; South Africa — Central News Agency Ltd. ISSN 0032-647X.

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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 £3.00 ref 5P191R
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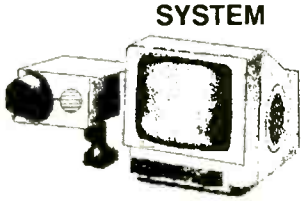
CABLE TIES. 142mm x 3.2mm white nylon pack of 100 £3.00 ref 3P104R. Bumper pack of 1,000 ties £14.00R

VIDEO AND AUDIO MONITORING SYSTEM



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Brand new units consisting of a camera, 14cm monitor, 70 metres of cable, AC adapter, mounting bracket and owners manual. 240v AC or 12v DC operation complete with built in 2 way intercom £99.00 ref 99P2R

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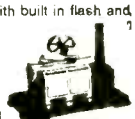

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SAA1250	£2.60
SAA1251	£8.50
SAA1276	£4.50
SAA1290-02	£10.70
SAA1293-02	£14.00
SAA3027	£6.00
SAA5000	£3.00
SAA5010	£5.80
SAA5012	£6.60
SAA5020	£5.80
SAA5030	£9.00
SAA5040A	£5.00
SAA5040B	£9.90
SAA5041	£9.50
SAA5050	£14.00
SAA5231	£9.00
SAB3013	£4.50
SAB3037	£11.00
SAF1032P	£6.00
SAF1039P	£2.00
SAS560	£3.50
SAS570	£3.00
SAS580	£3.50
SAS590	£3.50
SL1430	£2.80
SL1431	£2.80
SL1432	£1.10
SL471DP	£2.20
SL480	£3.30
SL490	£3.00
SL901B	£3.00
SL917B	£2.50
SN76670N	£1.25
SSA1075	£5.90
SSA1250	£3.50
ST082	£12.00
ST1195	£5.50
STA401A	£3.75
STA441C	£3.00
STK0029	£4.30
STK043	£10.00
STK082	£12.00
STK2029	£8.50
STK2125	£12.00
STK2250	£9.20
STK3041	£5.70
STK40090	£8.00
STK4121 II	£8.75
STK4141 II	£6.90
STK4142 II	£10.00
STK4151	£11.50
STK4171 II	£9.00
STK430	£6.00
STK4311	£10.20
STK433	£7.50
STK435	£8.00
STK4352	£5.80
STK437	£10.00
STK4392	£7.00
STK441	£10.50
STK459	£11.00
STK461	£10.50
STK463	£14.50
STK465	£12.00
STK5315	£6.50
STK5322	£6.50
STK5325	£5.50
STK5331	£6.00
STK5332	£3.50
STK5333	£12.00
STK5338	£6.00
STK5361	£6.25
STK5421	£6.50
STK5422	£5.00
STK5434	£6.50
STK5451	£5.30
STK5471	£5.25
STK5476	£6.00
STK5481	£5.00
STK5482	£5.20
STK5720	£7.00
STK5730	£5.25
STK6962	£3.20
STK6972	£6.00
STK7216	£6.10
STK7308	£5.75
STK7309	£7.00
STK7348	£5.00
STK7356	£6.50
STK7358	£6.50
STK772B	£4.75
STR1096	£3.60
STR3125	£5.50
STR40090	£8.00
STR4211	£5.95
STR440	£5.00
STR441	£5.00
STR451	£4.95
STR454	£4.85
STR50020	£7.90
STR50103A	£5.50
STR5412	£5.95
STR58041	£6.75
STR6020	£4.90
STR8050	£14.15
SVM993C	£2.00
TA4180	£3.00
TA4193	£5.00
TA4194	£5.50
TA4301	£4.50
TA4345	£3.40
TA4350	£6.00
TA7120	£1.25
TA7137	£1.25
TA7176	£2.50
TA7176AP	£2.40
TA7193AP	£4.00
TA7193P	£6.00
TA7205	£1.75
TA7205AP	£1.25
TA7222	£2.25
TA7223	£2.50
TA7227P	£2.30
TA7230P	£1.65
TA7232P	£1.50
TA7233P	£2.10
TA7240	£2.50
TA7241	£2.50
TA7241AP	£3.00
TA7243	£3.30
TA7245	£4.50
TA7267P	£2.80
TA7270P	£2.50
TA7271P	£3.25
TA7274	£2.60
TA7280	£3.00
TA7280P	£3.00
TA7281	£2.75
TA7281P	£2.75
TA7299P	£3.00
TA7302	£1.30
TA7303	£1.10
TA7310	£1.75
TA7312	£1.75
TA7313	£0.90
TA7313AP	£1.40
TA7314	£2.00
TA7323	£3.25
TA7325	£2.00
TA7325P	£1.50
TA7328	£2.00
TA7335	£1.50
TA7335P	£4.20
TA7342	£2.10
TA7343	£1.75
TA7350	£2.10
TA7358	£1.50
TA7607	£3.50
TA7607AP	£2.40
TA7609P	£2.70
TA7614	£2.50
TA7628P	£2.40
TA7629	£4.00
TA7629P	£2.75
TA7630P	£2.00
TA7640	£2.00
TA7658	£2.00
TA7668	£2.00
TA7680	£4.80
TA7681AP	£5.75
TA7687	£2.00
TA7698A	£6.85
TA7698AP	£7.50
TA770SP	£1.50
TA7709	£2.50
TA7738	£2.50
TA78L010P	£1.75
TA8101N	£4.25
TA8102P	£4.25
TA8644	£5.50
TAA310A	£2.00
TAA550	£2.10
TBA120S	£0.50
TBA530	£1.00
TBA560	£1.00
TBA750Q	£4.20
TBA800	£0.85
TBA820M	£0.45
TBA920S	£1.00
TCA640	£3.75
TCA650	£3.95
TCA660B	£3.50
TDA1005	£2.50
TDA1010A	£1.10
TDA1011	£1.20
TDA1013	£2.75
TDA1013A	£1.90
TDA1015	£1.20
TDA1020	£2.50
TDA1022P	£4.50
TDA1035	£1.90
TDA1035T	£1.90
TDA1037	£2.90
TDA1044	£2.50
TDA1044U	£1.50
TDA1057	£2.00
TDA1082	£3.50
TDA1083	£1.70
TDA1151	£1.50
TDA1154	£2.70
TDA1170S	£1.20
TDA1180	£1.80
TDA1180P	£3.00
TDA1190	£1.90
TDA127DM	£4.10
TDA1365	£4.90
TDA1412	£1.00
TDA1470	£5.00
TDA1501A	£3.20
TDA1506	£8.50
TDA1510	£3.20
TDA1510A	£3.20
TDA1512	£1.00
TDA1515A	£2.50
TDA1520	£3.95
TDA1670A	£2.60
TDA1701	£3.00
TDA1770A	£3.00
TDA1870A	£2.60
TDA1905	£1.40
TDA1908A	£1.75
TDA1940	£1.80
TDA1950	£2.50
TDA2002	£1.40
TDA2003	£1.30
TDA2004	£1.70
TDA2005	£1.70
TDA2005S	£2.95
TDA2006V	£1.95
TDA2020	£3.50
TDA2030	£1.10
TDA2030H	£2.00
TDA2030V	£1.75
TDA2040	£2.00
TDA2151	£3.00
TDA2161	£1.75
TDA2170	£3.00
TDA2270	£2.20
TDA2320	£0.90
TDA2510	£4.30
TDA2521/3	£9.75
TDA2522Q	£10.75
TDA2530Q	£4.25
TDA2532	£3.00
TDA2532Q	£3.00
TDA2540	£2.75
TDA2541	£2.00
TDA2543	£5.25
TDA2560	£3.75
TDA2560Q	£1.10
TDA2576A	£2.90
TDA2577	£2.80
TDA2578	£3.00
TDA2578A	£2.80
TDA2579	£3.50
TDA2581Q	£2.50
TDA2582	£2.55
TDA2590	£2.00
TDA2591	£2.70
TDA2593	£1.50
TDA2594	£3.00
TDA2600	£6.80
TDA2611A	£1.00
TDA2640Q	£3.50
TDA2653A	£2.75
TDA2822	£2.00
TDA3190	£0.95
TDA3303	£15.00
TDA3330	£5.50
TDA3540	£4.00
TDA3541	£2.25
TDA3560	£3.40
TDA3561	£2.50
TDA3562A	£5.00
TDA3565	£3.00
TDA3571BQ	£5.50
TDA3590	£3.00
TDA3651	£3.00
TDA3651AQ	£6.50
TDA3652	£7.50
TDA3653	£4.00
TDA3654	£2.80
TDA3810	£2.90
TDA3950	£3.00
TDA440	£2.00
TDA4420	£2.45
TDA4422	£3.95
TDA4500	£3.80
TDA4501	£4.00
TDA4503	£4.50
TDA4505	£3.95
TDA4510	£4.40
TDA4600	£2.60
TDA4600-2	£2.60
TDA4601	£2.10
TDA4610	£4.50
TDA5101	£2.00
TDA7250	£5.50
TDA7270	£6.00
TDA7607AP	£2.40
TDA8180	£6.00
TDA8190	£3.80
TDA8341	£3.00
TDA9503	£2.55
TDA9513	£2.95
TEA1009	£2.00
TEA1014	£2.00
TEA1039	£2.00
TEA2018	£2.10
TEA2018A	£2.10
TEA5101	£6.00
TL011CP	£2.00
TL072CP	£2.00
TMM 2114AP	£5.75
TMS1944AN2L	£2.00
TMS1952	£2.50
TMS1956	£2.30
TMS1965NL	£2.00
TMS3450	£2.10
TMS3615	£1.75
U410B	£1.60
U416B	£1.60
UA767PC	£1.20
UA78/10	£2.00
UA78M15	£2.00
UAA1008DP	£2.00
UC3844S	£5.00
UPC1185H2	£2.50
UPC1185H2	£5.00
UPC1225H	£2.75
UPC1230	£3.00
UPC1238V	£2.10
UPC1263	£2.20
UPC1288V	£2.95
UPC1361C	£3.90
UPC1362C	£4.50
UPC1363	£1.90
UPC1365	£3.50
UPC1377C	£2.20
UPC1378H	£2.00
UPC1379	£2.20
UPC1382	£1.50
UPC1394	£1.70
UPC1420A	£7.00
UPC1458	£1.95
UPC1513HA	£2.00
UPC1520CA	£2.48
UPC339C	£0.70
UPD4011	£1.75
UPD4066	£1.95

TRANSISTORS

2N3773	£1.90
2SA1095	£5.50
2SA1102	£1.90
2SA1112	£0.95
2SA1124	£0.35
2SA1220	£1.10
2SA1386	£4.70
2SA564	£0.40
2SA673	£0.20
2SA942	£0.35
2SA985	£0.95
2SB1016	£1.50
2SB772	£0.40
2SB775	£1.60
2SB819	£0.55
2SB965	£2.30
2SC1413A	£2.50
2SC1826	£1.80
2SC1942	£2.10
2SC1983	£1.30
2SC2003	£0.25
2SC2027	£4.50
2SC2230	£0.50
2SC2238	£0.75
2SC2331	£1.00
2SC2335	£1.50
2SC2531	£0.26
2SC2564	£3.04
2SC2570	£0.55
2SC2577	£1.50
2SC2592	£0.95
2SC2621	£1.25
2SC2631	£0.30
2SC2632	£0.30
2SC2655	£0.60
2SC2958	£2.50
2SC2979	£3.00
2SC3153	£3.40
2SC3402	£0.40
2SC3519	£4.60
2SC3678	£1.25
2SC3715	£4.80
2SC458	£0.20
2SC789	£2.50
2SD1047	£2.75
2SD1051	£0.85
2SD1128	£1.50
2SD1138	£0.85
2SD1159	£0.75
2SD1207	£0.75
2SD1273	£1.00
2SD1275	£1.30
2SD1288	£1.70
2SD138	£0.85
2SD1391	£4.20
SDC1397	£3.75
2SD1398	£2.25
2SD1426	£4.50
2SD1453	£1.60
2SD1455-2SD1730	£3.10
2SD1496	£4.00
2SD1497	£2.60
2SD1497-02	£5.95
2SD1497-06	£5.95
2SD1650	£3.50
2SD1877	£2.30
2SD639	£0.35
2SD667	£1.00
2SD725	£3.70
2SD787E	£0.30
2SD811	£2.95
2SD836	£1.10
2SD837	£0.80
2SD845	£2.70
2SD868	£3.50
2SD869	£3.00
2SD870	£3.50
2SD871	£4.50
2SD895	£2.00
2SD898	£2.75
2SD898B	£2.75
2SD900B	£4.00
BC107B	£0.10
BC108	£0.10
BC108B	£0.10
BC115	£0.16
BC118	£0.12
BC147A	£0.07
BC159	£0.09
BC171	£0.09
BC172	£0.09
BC172C	£0.07
BC182L	£0.09
BC183	£0.09

A.Z. ELECTRICS

Stock items despatched by return

Access & Visa Accepted

TDA8180 ORIGINAL £9.50

TRANSISTORS

BC184	£0.09	BD244	£0.30	BU406	£0.90
BC212	£0.09	BD244C	£0.30	BU406D	£1.50
BC213	£0.09	BD434	£0.80	BU426A	£1.00
BC214A	£0.07	BD508	£0.90	BU500	£1.00
BC214B	£0.07	BF195	£0.07	BU508A	£1.00
BC214L	£0.09	BF196	£0.15	BU508AF	£1.70
BC237	£0.07	BF197	£0.15	BU508D	£1.00
BC23B	£0.07	BF198	£0.07	BU806	£0.75
BC307	£0.12	BF199	£0.14	BU807	£0.75
BC308B	£0.07	BF244	£0.40	BUT11	£0.95
BC327-25	£0.07	BF259	£0.22	BUT11AF	£1.95
BC328-40	£0.05	BF422	£0.15	BUW84	£1.65
BC337	£0.07	BF458	£0.22	BUX84	£0.60
BC372	£0.95	BF459	£0.22	SD12659	£0.75
BC392	£1.50	BF469/BF471		T9064V	£2.28
BC441	£0.25		£0.25	TIP110	£0.45
BC461	£0.25	BF471	£0.25	TIP112	£0.45
BC547	£0.07	BF472	£0.25	TIP29	£0.30
BC548	£0.07	BF870/BF472		TIP30	£0.45
BC549	£0.07		£0.25	TIP31	£0.30
BC557	£0.30	BU108	£0.75	TIP32	£0.30
BC559B	£0.07	BU126	£0.70	TIP41	£0.27
BC639	£0.18	BU208	£1.00	TIP42C	£0.40
BC640	£0.30	BU208A	£1.00	TIP47	£0.98
BD131	£0.50	BU208D	£1.00	TIPL791A	£1.20
BD132	£0.40	BU208T	£1.00	ZTR604	£0.55
BD137	£0.35	BU208T		ZTX650	£0.70
BD237	£0.22	(TOSHIBA)			
BD238	£0.22		£1.00		
BD243B	£0.30	BU326A	£1.00		
BD243C	£0.40				

DIODES AND THYRISTORS

BA157	£0.07	BY206 (BYB96R)		OA91	£0.20
BR100	£0.20		£0.55	OT112	£2.20
BR101	£1.40	BY210/800/BYV96		RGP15G	£0.45
BR103	£0.75		£0.55	RGP15J	£0.55
BR303	£1.50	BY227	£0.20	RGP15K	£0.35
BRY56	£0.75	BY228	£0.50	RGP30K	£0.70
BT116	£2.50	BY229	£1.15	RHI	£1.30
BT128P	£4.50	BY299	£0.50	RM11C	£0.45
BT129P	£4.50	BY96D	£0.30	SG264	£8.50
BT151/800R		BYV96D	£0.55	SG613	£12.00
	£1.75	BYW56	£0.50	SKB02	£0.60
BY126	£0.20	BYW96E	£0.50	SKB08	£1.20
BY127	£0.08	BYX10	£0.50	SKB202	£0.90
BY133	£0.20	BYX55/600	£0.55	SKB208	£1.10
BY164	£0.90	FB2506	£1.50	SKE102	£0.60
BY164/SKB202		IN4001	£0.06	SKE1M15	£0.65
	£0.90	IN4002	£0.06	SKE2G202	£0.75
BY179	£1.10	IN4004	£0.10	SKE2G304	£1.30
BY179/SK208		IN4005	£0.10	SKE4F104	£0.45
	£1.10	IN4006	£0.08	SKE4F106	£0.45
BY184	£0.65	IN4007	£0.08	SKE5F310	£2.20
BY189	£2.00	IN4148	£0.10	SR2M	£0.75
BY190	£2.00	IN5408	£0.25	T9053V	£1.40
BY223	£2.00	KBL08	£1.95	T9064V	£2.28

ASK FOR SEMICONDUCTORS NOT LISTED

VIDEO HEADS

AMSTRAD

3HSSR-VCR7000 (Saisho/Orion) £18.00
PSF1-VCR4500,5200,9000 ..... £15.00
PSF2-VCR4600,4700 ..... £15.00
PSF3-VCR6000 ..... £21.50

FERGUSON

3HSSV-2 Head universal £7.50
3HSSVA-3V42,44,45,46 etc £20.00
3HSS4VB-3V32/HR7655 ..... £25.00
3HSS4VC-3V48/HRD565 ..... £26.00
3V48,58,59,65,FV10,11,
12,13,14,20,21,26
And most other Fergusons ..... POA

HITACHI

3HSSHA-VT8000,9000 series £17.00
3HSSHB-VT11,33 etc £17.00
10082-VT120,220 ..... £29.00
10081-VT130,135 ..... £30.50

PANASONIC

3HSSN-2 Head universal £7.50
3HSSU1N-NV100,370,380/Philips VR6460 ..... £11.00
3HSSU2N-NV230,470,480,G9,10,
11,15PX £21.00
3HSSU3N-NV430,460 ..... £16.00
3HSS3N-NV777,330 ..... £18.50
3HSS4NB-NV730 ..... £26.00
3HSS4NA-NV366 ..... £24.00
NVG30,33,40,45,46,130, & most
other Panasonics ..... POA

SANYO

3HSSSY-VHR1100,1110,1300 ..... £20.00
3HSS3SY-VHR1500 ..... £34.00

SHARP

3HSSSP-VC9300,9500,9700,381,481,
482,483,486 etc £17.00
3HSSSPB-VC581,583,651,670 etc £17.00
VC7000,8000 series (Brass) £42.00

OTHER MAKES

Alba 4000, Goldstar 8000, Sentra 8000, Solavox
1000 ..... £22.50
Fisher FVHP510,520,530,615,710 etc £18.00
Fisher VBS7000,9000 etc £25.00
Hinari VXL2,4,3,20,25 ..... £18.00
Hinari VXL5,6,20H £15.00
Mitsubishi HS306,710 ..... £30.00
Orion VC150,180,VH1,2,3 etc £18.00
Saisho VR100,605,705,805,905 ..... £18.00
Samsung Universal 2 Head £24.25
Toshiba
V71,73,74,75,81,82,83,84,85,87 ..... £20.00
Toshiba V93 ..... £21.00

ASK FOR VIDEO HEADS NOT LISTED
The above heads are new.

BELT KITS

Belt Kits for most models are stocked. Some examples are:

AKAI
VS1,2,5 ..... 1.20
VS4,6,9,15 ..... 1.10
Ask for models not listed.

AMSTRAD
TVR1,2,3, VCR4600, 4700,5200 ..... 1.90
Ask for models not listed.

FERGUSON/JVC
3V003/V163/V22 etc. 1.60
3V29/3V30 ..... 1.20
3V35/36/38/39 ..... 1.10
3V42/43/44/45/485/354/
5557 ..... 1.00
Ask for models not listed. Loading belts on certain models also available.

FISHER
FVHP520/530 ..... 1.00
FVHP615/620/622/710/711/
715/716/720/721/725/830/
840 ..... 1.00
FVHP905/906/907/908/910/
911/915/916 ..... 1.20

GRUNDIG
VS4004/4040/450/
460 ..... 0.65
VS180/200/220/262/
265/267 ..... 2.20
VS310/315/320/380/
385 ..... 2.40
Ask for models not listed.

HITACHI
VT11/14/17/19/33/435/
38/39/68 ..... 1.30
VT8000/8500 ..... 1.00
VT9300/9500/9700 ..... 1.00
Ask for models not listed.

PANASONIC
NV230/250/280/370/380/
430/450/460/465/485/630/
810/830/850/870/890 ..... 1.60
NV300/330/332/333/430/
366 ..... 1.60
NV7000/7200/2000/
2010 ..... 1.50
Ask for models not listed.

PHILIPS
VR6367/6467/6561/6751/
6760/ 2.25
VR6460/6920/6520 ..... 2.40
Ask for models not listed.

SANYO
VTC5000/5150/6500 ..... 0.65
VHR1100/1300/1500 ..... 1.00
Ask for models not listed.

SHARP
VCF3/VC402/500/571/581/
582/583/584/585 ..... 1.10
VC9300/9500/9700 ..... 1.95
VC8000/8300 ..... 1.95
Ask for models not listed.

Many other belt kits in stock. Examples are Alba, Funai, GEC, Goldstar, Granada, Grundig, Hinari, ITT, Mitsubishi, NEC, Orion, Saisho, Samsung, Schneider, Sony, Tensai etc.

NEW LINES

LOPT Hitachi CPT1476 ..... £18.00
LOPT Hitachi CPT2276 etc £19.00
LOPT Matsui 1440 ..... £18.00
Trip Grundig CUC2401 etc. £17.00
OTHER GRUNDIG TRIPLERS IN STOCK

LINE OUTPUT TRANSFORMERS

Decca 100 ..... 9.50
ITT CVC20 ..... 12.50
ITT CVC25/30/32 ..... 9.50
ITT Compact 80 Series 110 ..... 16.75
ITT Compact 80 Series 90 ..... 19.75
ITT CVC45 ..... 18.00
ITT 1109F 14.00
ITT CVC1204 ..... 11.50
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Sony – Please state model for price
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VIDEO MOTORS

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Ferguson FV260 ..... £14.50
Hitachi 8000,8300,8500 ..... £8.50
Sanyo VTC5000,5150,5400,5300,6500 ..... £7.50
Sharp VC9300, 9500 etc, Original £15.00
Panasonic NV333,366 Original £13.20
All other Panasonics ..... POA

CAPSTAN MOTORS

Ferguson 3V35,36 Original £22.50
Ferguson/JVC (Mechanical models) £20.00
Hitachi VT11 Original £30.00
Hitachi VT33 Original £32.00
Hitachi VT64 Original £19.75
Hitachi VT8000 series Original £34.50
Hitachi VT9000 series Original £34.50
Sharp VC7000 series Original £30.50

MODE CONTROL MOTORS

Ferguson 3V42,43,44,45,48,49,52,53 ..... £6.00
Ferguson 3V58,59,65,FV10,11,12,13,14,
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IDLER ASSEMBLIES

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3V29/30 Take up Clutch £2.85
3V29/30 Reel Idler £3.00
3V35 Reel Idler £3.00
3V35,36,38,39 Take up Clutch £2.85
3V58,59,64,65,FV10,11,12,13,14 Idler Arm £1.80
Clutch Assembly 3V44,45,48,49,52,53,
54,55 ..... £14.00
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FVHP615,905,910, Idler Assembly Original £5.00
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FVHP905,910 Gear Idler Assembly £5.00
FVHP520,530 Idler £3.00
FVHP520,530 Pulley £0.70

HITACHI

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PHILIPS

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DV464,6462,6463,650 etc. Idler Mod. Kit £4.50
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VR6542 Reel Drive Pulley £7.75
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NV600,688 Idler VXP0515 ..... £3.00
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NV333,366 etc. Idler VXP0401-NV700,7200,
7800 Idler VXP0344 ..... £0.90
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FOR PARTS NOT LISTED

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Reel Drive Pulley Unit VTC5000,5150,6500 ..... £5.00
Idler Roller Assembly VTC5000,5150,6500 ..... £2.25

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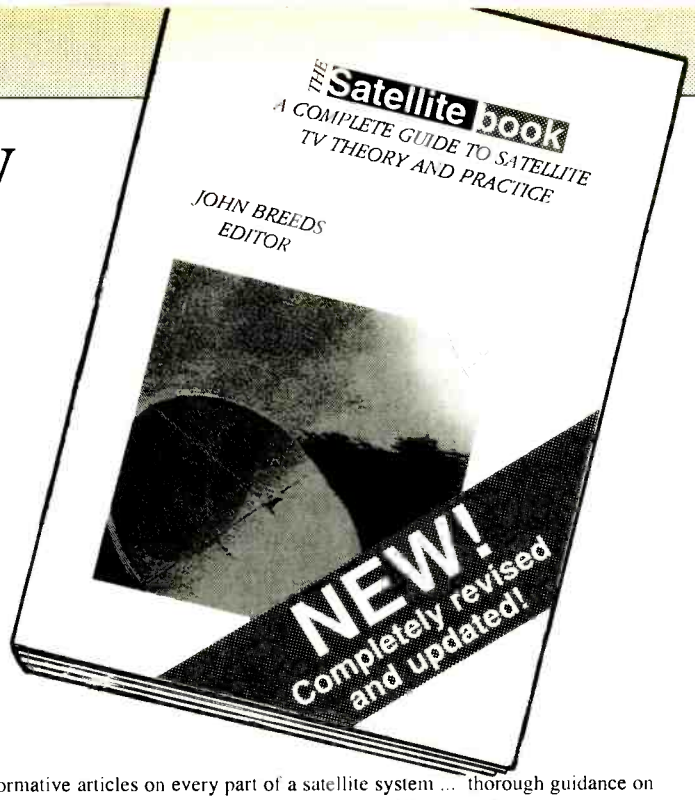

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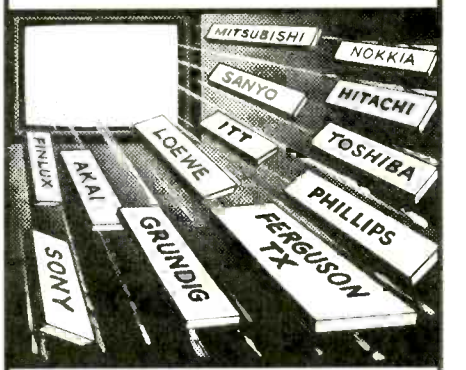

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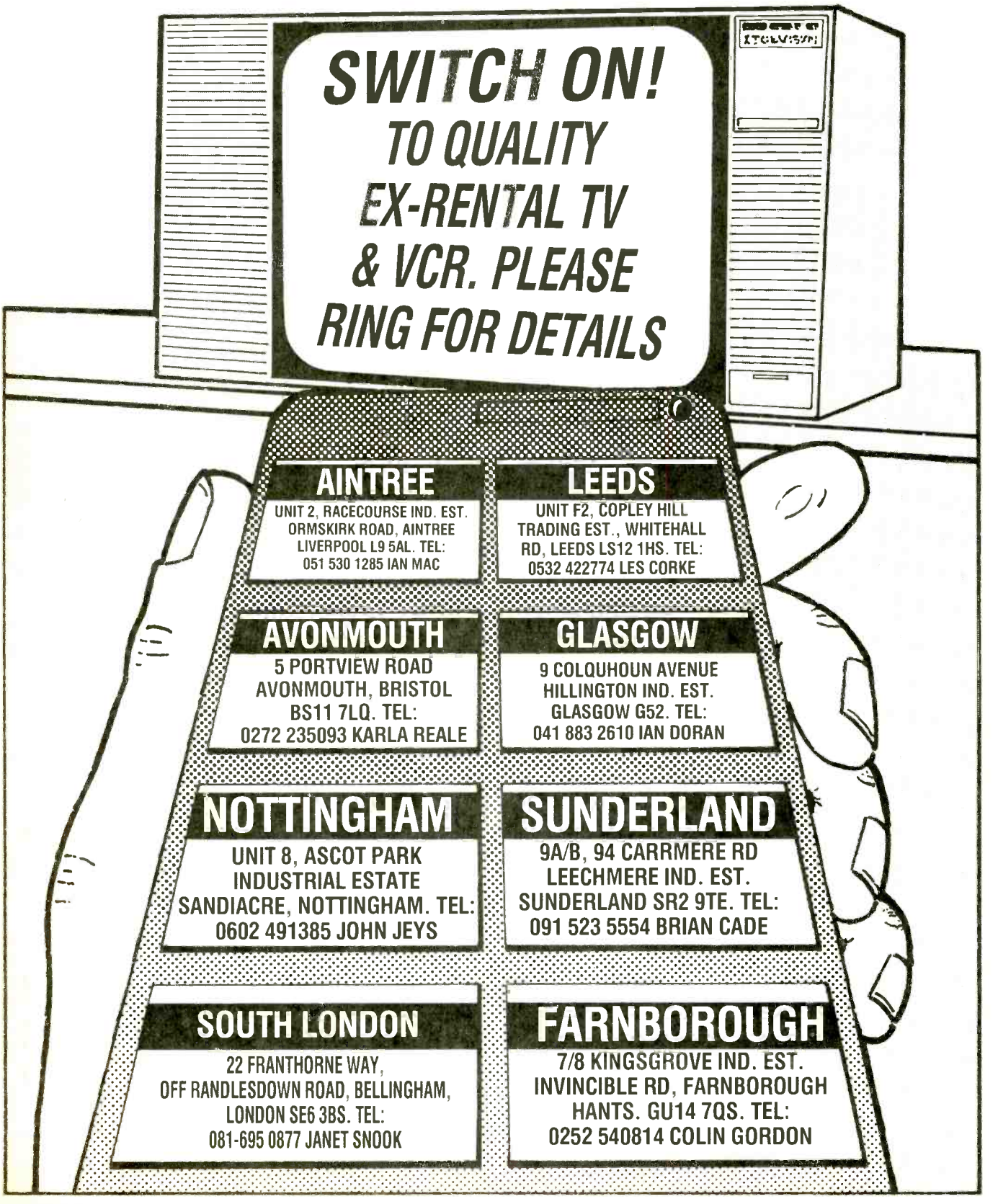

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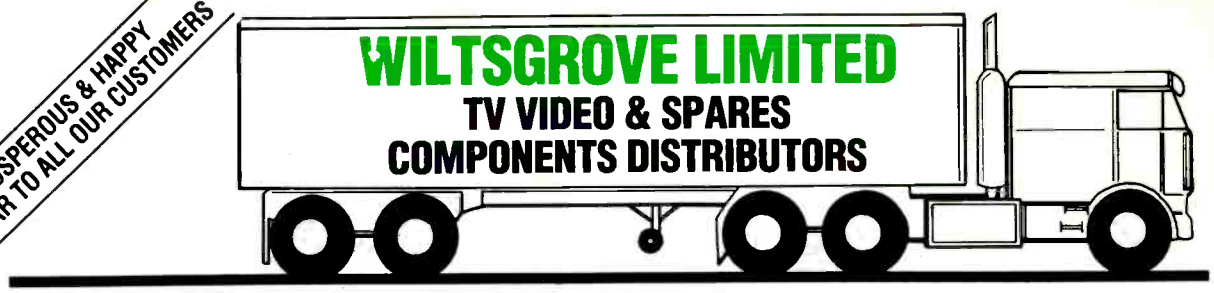

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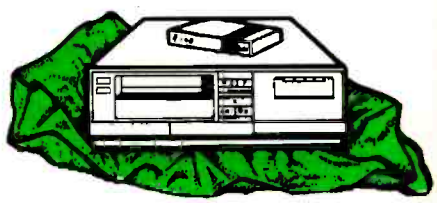

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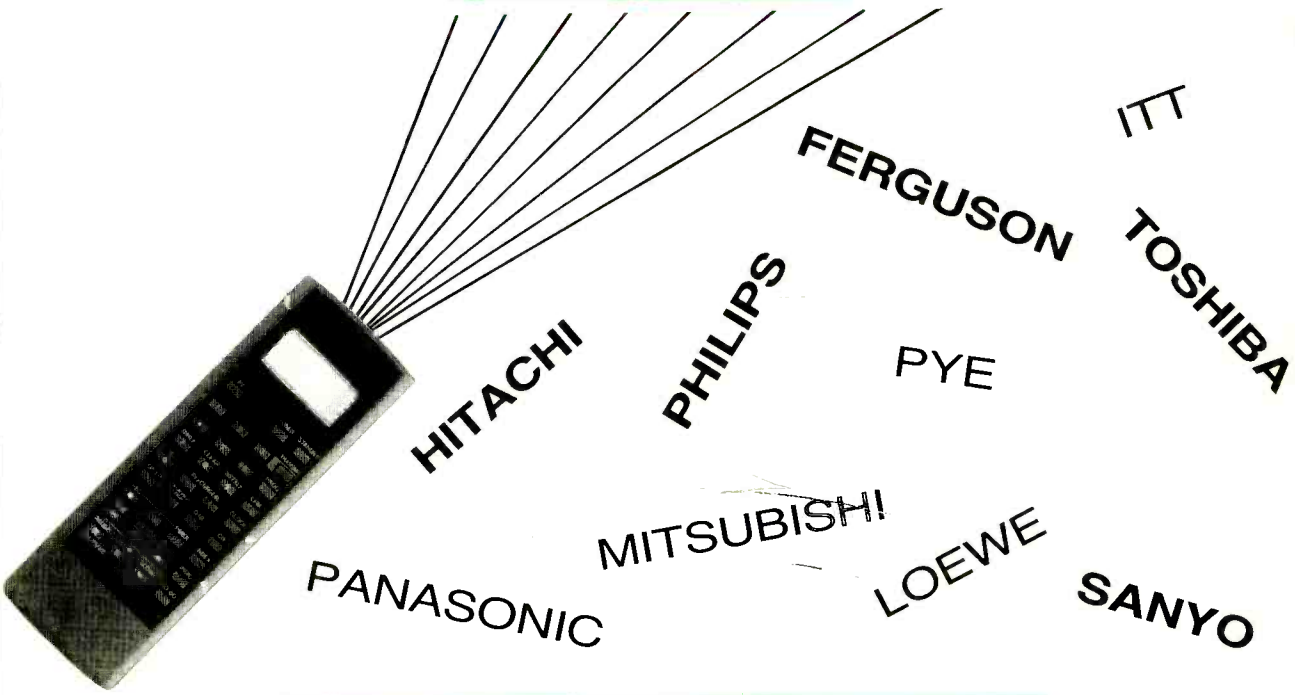

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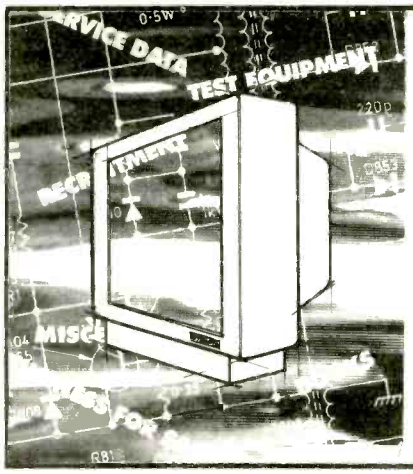

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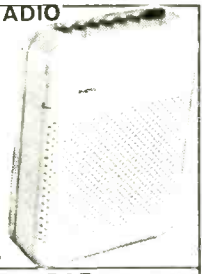

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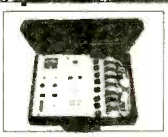

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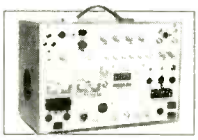

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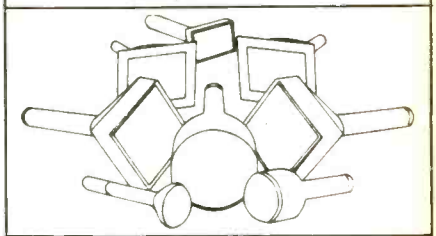

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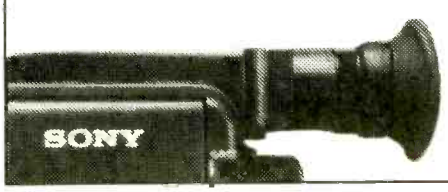

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4 Amp for Video Power Supply

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Decca 100 LOPT Panel and Frame £5.00
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RELAYS 35p 5V-12V-24V-48V Large and Small

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G11 TEXT IN RED HAND SET £12.50
G11 HAND SET ULTRASONIC £10
PHILIPS RC5 EASY CONTROL £10

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TVR3 Power Supply. £5. Amstrad Television Tuner UHF. Small. Fits most Amstrads. £6.

SENDZ
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PHILIPS SBC 521 RF SIGNAL GENERATOR £95
PHILIPS SBC 522 RGB1 GENERATOR £90
PHILIPS SBC 850 ANALOG MULTIMETER £11.50
PHILIPS SBC 520 L.F. FUNCTION £75.00
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Fit most sets AMSTRAD VIDEO HAND SET WITH LCD £10
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Burglar Alarm Has time delay to set £2
Mains Transformer £6.00 240v In 110v to 120v out 1 amp post £3

SENDZ COMPONENTS

TO ORDER SEE BACK PAGE

LA11440	£1.00
TAA7750	50p
HA 411485	£1.00
UPC1373	50p
M58657P	£1.00
M491BB1	£3.00
M50441/550	£1.00
M58658P	£1.00
Receiver TX100 Panel I.C. No. SAB3035 —MAB8440P D066 —SAA1060 —PCF8571P	£6.00
New Model Philips Meter	£20.00
700 Hills Meter	£12.00
4 Types Fidelity front panels with i.c. & pots	£2.00 each
BB 103	10p
BB 105A×12	£1.00
BB 105B×12	£1.00
BB 105G×12	£1.00
BB121a	10p
47	10p each
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DG3P EQV-BY228	10 for £1.00
2 amp bridge rec. wire end	15p
SKE4G2/02	15p
Eqv. BYX71/600 500ns.	

Thorn Spares

9000 Frame panel	£8.00
9000 Cyclops panel	£1.50
3 Way regulated adaptor 240V 6V/ 7.5/9V/300mA	£3.50
Rank/Toshiba preh unit 0354	£9.50
4 Push button unit preh	£1.00
6 Push button VHF/UHF for v/cap. GEC-Decca type	£7.00
7 Push button for CVC5 ITT	£8.00
KT3 12 Push button unit	£2.00
KT3 (Export) 12 P.B.u	£2.00
6 Push button Unit Thorn	£1.00
6 Push button GRC	£6.00
6 Push button PYE 731	£6.00
Hearing aid unit	£3.00
Rank Z718.4 P/B/Unit MECH	£4.00
7 Button Unit GEC with Lamps	£7.00
697 Push Button Unit	£6.00
Z916B panel	£5.00
T513AP panel	£5.00

TT14 GEC TEX-DECODER

13 IC Panel with cable form £9.50

PHILIPS

Decoder SAA IC 5020-5030 5040B-5050

K40 Text Panel £8.00

KT3-K30

OF-425		
OF-555	E.W.	50p
OF-513	correction	10p
OF-557		50p

DIODES

Bridge KBF4/8	40p
BY 126	10p
BY 127	10p
BY 133	10p
BY 134	10p
BY 176	25p
BY 179	40p
BY 184	25p
BY 187	10p
BY 190	40p
BY 196	30p
BY 198	10p
BY 208/4	8p
By 206 – BY 407 Eqv.	8p
BY 208/800	8p
BY 210/400	5p
BY 210/800	10p
BY 223	60p
BY 224/600: 4.8A/600v bridge	50p
BY 226	15p
BY 227	15p
BY 228 1500v	20p
Flat BY229 black	15p
BY 229 Red	20p
BY 229/400	30p
BY 229/600 Tag	30p
BY 237	5p
BY 254	10p
BY 255	£30p
BY 298	10p
BY 299	10p
BY 406	8p
BY 527	20p
BY 407a	10p
BY 448	10p
BY 500/200 — 5 amp	8p
BY 527	10p
BY 602	10p
BYV 26C	11p
F247	10p
GP20G	5p
GRP30G (TX10)	30p
XK 3102	50p
BYV 26/200	20p
Bridge TX110 800/3 amps	30p
KBPC35-02 Bridge	£1.50
Bridge Rec. D35B10	40p

K35 Decoder	£8.00
K35 Sound OP	£4.00
Thick Film Daughter KT3 3122-127-43891	£3.00
12 C.H. K30 Tex Rec Front Panel with I.C.	£5.00
K35 IF	£5.00

Plug In

K4 Focus Pot	£1.00
Fidelity Tube Base with transitor & focus pot	£1.50
Bush Tube Base on panel	£1.00
TX10 Tube Base on Panel	£3.00
1100 L.O.P.T. Green Spot	
TX100 Thorn	

Line Transformers

G9 Lopt	£4.00
6 Diode Tripler. Mullard	75p
Line O.P. Trans. Mono T.X. 12"-14" Philips G8	
27482	£10.00
4822	£10.00
10273	£10.00
Thorn 1690 LOPT	£7.50
2J/pots 3.500 1 off each type	£3.00
G8 Trans. Philips	£7.00
G11 Split Diode	£12.00
CVC820 Split Diode ITT	£10.00
Thorn B/W AD5308F + Stik + Lead	£1.50
GEC 2040	£3.00
GEC2110	£7.00
Mullard AT 2036	£1.50
Pye 160 Line Trans	£3.00
Pye mono	£3.00
Rank mono T704A	£3.50
Split Diode Trans	£7.00
GEC 20 AX Rank Z522	£3.00
Rank L.O.P.T. Z970	£3.00
CVC800 Line Trans	£6.00
CVC825 Split Diode	£10.00
CVC 45	£5.00
GEC Portable G10T2041	£3.00
GEC Portable G10T2046	£3.00
EHT Split Diode Leads ITT	£1.00
3500 L.O.P.T. & HT Trans	each £2.00
LOPT Rank Z763	£5.00

Universal Tripler

with small focus pot. Green type £7.00

Black Triplers

KT3 Triplers	£6.00
S.T.C. Universal Tripler	£6.00
ITT CVC 5-8-9	£3.50
Rank T25LE Tripler	£2.00
Rank 11TCP A-823	£3.50
TU 25 30K Rank	£3.00
11 TEZ Rank	£3.00
G9 Philips	£4.00
GEC 2110	£4.00
3500 Thorn	£3.00
8500 Thorn	£4.00
9000 Thorn	£7.00
9500 Thorn	£4.50
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2040 GEC	£3.50
GEC TVM25 Tripler	£2.00
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Decca 80 100	£4.50
Grundig TVK 52	£2.50
11TBO Pye 731	£3.00
11THY	£4.00
D22 for Pye 18" colour portable	£4.00
LP 1193/63	£4.00
BG 100/41	£3.25
ERO Tripler print type with foacs PO7	
BG2087	£5.00
T/text ultrasonic rec'r panel 12-14V. 20 for £5.00 200 for £25.00	£14.00
GEC 8 touch unti assy complete with all I.C.'s + pots	£4.00
G11 E.W. Transformer	50p
G11 E.W. coils	£1.00
G11 Transient Suppressors 245V	20p
G11 Sean Coils	£5.00
G11 100K tuner pots 12 for	£1.00
KT3 IF panel	£6.00
KT3 line OSc transformer	£1.00
KT3/K30 infra-red receiver head	£1.00
K30Drawer unit with IC's (home)	£10.00
K30 drawer unit with IC's (export)	£10.00
KT3 AE Sockets	50p
KT3 receiver panel	£8.00
KT3 line driver transformer	50p
Oye, K30, GEC, etc. Pre-mains stand-by switch	£1.00
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NPN PNP 80V 6 Amp TO66 O.P. Trans. pair	25p
5 button touch tuner BBC1/2 ITV1/2 video with ic SAS 560T/570T	£7.00
Control panel 5 sliders + mains lead	£1.50
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Tube base + base unit for 820 Euro chassis	£4.00
CEC Line O/P Trans. & Rec Stick for Portable	£3.00
CVC 20/25/30/35/40 decoder panel	£10.00
CVC 20/25/30/35/40 decoder panel (untested)	£5.00
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40K Transducer	50p
PHILIPS NE511N	£1.20
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+12V/LM 340T12	50p
+18V/MC78M18	20p
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MC 7724cp	40p
MC 7824	40p

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U 19885	40p
U 3832	15p
U 3845	15p
MR 508	10p
MR 501	10p
MR 502	10p
BCW 71R	30p
BYF 1202	10p
BYF 1204	10p
BYF 3126	40p
BYF 3214	40p
BYX 10	10p
BYX 36/600	35p
BYX 38/300	25p
BYX 49/600R	75p
BYX 55/350	10p
BYX 55/600 (Bead)	10p
BYX 36/600	50p
BYV 95B	10p
BYV 95C	12p
BYV 96D	10p
BYZ 106	10p
BPW 41	15p
BYW 56 2A/1000v G11	8p
BYW 29/50	15p
BYW 95C	10p
BZU 15/24	54p
BZY 93c75	50p
BZW 15/18	30p
BZW 15/30	30p
BZW 70c6v2	10p
BZW 79.3v	10p
Bush Thyristor RCA 76122	£1.00
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Chassis type Transformer 240v/12 Volts 500ma	75p
CVC 20 tube base	£2.00
Tube Base Rank & G11	£1.20

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KBL005	30p
KBL02	30p
KBP104	30p
W02	15p
W004	15p
W005	20p
800V Bridges 2½ Amp	30p
G11 Drawer ASS 3 pots Mains Switch and Lead	£2.00
K30 Drawer Ass with pots cable forme	£1.00
TX10 Drawer with 8 way pots. ass	£2.50
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Philips Coaxial Cable Stripper SBC325	£7.50
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10 mixed tube bars	£4.00
5000 Diodes-Resistors	£3.00 pack
*D/P push mains switch	20p each
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Philips Silicon Grease	£1.50 each
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500gm 60/40 Solder reel	£6.00
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CV 8617	10p
Y 716	10p
Y 729	30p
Y 730	10p
Y 827: 6A/1KV	20p
Y 860	30p
Y 933	5p
Y 969	50p
Y 997	30p
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R 1038	40p
R 1039	40p
R 2009	80p
R 20106	£1.00
R 2029	50p
R 2210	60p
R 2257	60p
R 2265	50p
R 2305	50p
R 2306	30p
R 2322/2323	pair 80p
R 2323	15p
R 2396	50p
R 2461	80p
R 2030	50p
R 2433=BD124	30p
R 2540	£2.00
R 2737	40p
R 2738=TIP41	30p
R 2775=TIP41c	40p
R 3129=TIP47	40p
T 6068V	50p
R 4050	£1.00
S 2008b	80p
2SD898B	£1.00
2SC1942	£1.00
Hitachi sets etc.	
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BU 124	50p
BU 126	80p
BU 180h	£65p
BU 204	60p
BU 205	75p
BU 206	£1.00
BU 207	£1.00
BU 208	80p
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BU 326	£1.00
BU 407	60p
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BUX 85	50p
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TIC 116m	30p
TIC 116n/Y 1003	30p
TIC 126N	30p
TIC 225S	30p
TIC 226E	30p
TIC 226m	30p
TIC 236m	30p
TAG 226/600	30p
TICV 106D (T092 case 2A/400V)	10p
TIP 29	25p
TIP 30	25p
TIP 30A	25p
TIP 30B	25p
TIP 30C	25p
TIP 31	25p
TIP 32	25p
TIP 33B	50p
TIP 33C	70p
TIP 34A	50p
TIP 34B	60p
TIP 34C	70p
TIP 35B	50p
TIP 35C	70p
TIP 35D	80p
TIP 36	50p
TIP 36C	70p
TIP 41	15p
TIP 41B	40p
TIP41D	70p
TIP 42	10p
TIP 42/BRC 6109	10p
TIP 48	40p
TIP 49	30p
TIP 57	30p
TIP 100	30p
TIP 102	30p
TIP 110	70p
TIP 115	50p
TIP 117	50p
TIP 125	35p
TIP 126	40p
TIP 127	40p
TIP 130	30p
TIP 131	6p
TIP 136	30p
TIP 140	50p
TIP 142	80p
TIP 640	50p
TIP 2955	35p
TIP L761A-1000V/4Amp	75p
T6032	30p
T6036	40p
T6040	40p
T6047	40p
T6049	40p
T6051	40p

Philips Handset IC	£3.00
SAA3010P	£3.00
MAB8461/WO63	£3.00
MAB 8420P-C031	£3.00
MAB 8400B-6	£3.00
MAB 8440P-D070	£3.00
MAB 8440P-D033	£3.00
MAB 8440P-D056	£3.00
MAB 8441P-T001	£3.00
MAB 8441P-T132	£2.00
M58484P	£2.00
Hand Sets — Fidelity	£15.00 to £35.00
ITT 8 and 6 Push Button	£1.00
Pye 725 LOPTs	£6.00
Pye 731 LOPTs	£6.00
Thorn 8500-8800 LOPTs	£5.00
CMC 301 front panel	£5.00
CMC 303 front panel	£5.00
CMC 302 Panel with TC mains switch etc	£5.00
CMD 800 Decoder	£8.00
C7 Hand Set	£6.00
3 I.C. Power Supply G11 Full Remote Receiver Panel	£3.00
Meters Hills 520	£17.00
Meters Hills 420	£10.00
Hills HD5000 Digital Meter 1000V DC 750AC 10 Amp 20 MRG Rangers	£28.00
HT100 Multimeter	£6.75
HT300 Multimeter	£7.75
HT500 Multimeter	£9.00
HT700	£15.00
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Works at 24 feet — Sound repeater. Works off 9 volt battery £8.00
Fits in top pocket.

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TOSHIBA HAND SETS

CT9185 CT9176 CT9133 CT938
CT9144 CT9185 CT9193 CT9393
CT9384 £4.00 each

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TOSHIBA HAND SETS

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THORN

VCR Front Diaplay Panel £7.00
Large type ITT TV and V.C.R. Handset £15.00
GEC Ultrasonic 8CH Full Remote £10.00

G11 Full Remote Ultrasonic	£10.00
G11 Ultrasonic Teletext Handset	£10.00
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New Replacement for G11 Ultrasonic Full Remote	£12.00
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Decca RC 11	£14.00
Decca RC 12	£14.00
G11 Infra-red full teletext	£20.00
Dynatron-Full remote CTV 62, 63, 64	£19.00
Hitachi infra red handset	£18.00
Philips full remote KT3, 16C928/20C934; 7228/7324; K12 26C 797/1ST 66K 182b	£12.00
GEC infra red full remote 8 channel (I.C.SAA1250)	£14.00
Philips infra red full remote 9 channel for 60 CP2605	£6.00
Philips infra red full remote 12 channel for 60 CP2605	£12.00
K35	70p
KT3/K30 T/Text	£12.50
KT3/K30 Full remote	£15.00
KT3 Power supply	£4.00
GEC infra-red 2236-2026	£4.00
GEC 8 button full remote	£14.00
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RC4001 KT3 and Teletex	£14.00
IT CVC 32 handset repaired	£15.00
CVC 32 Hand Set	£15.00
CVC 45 3 and 2 Pin	
TX10 Hand Set Text	£12.50
TX9 with Text	£12.50
TX9 & TX10 button print	£2.00
TX10 Focus Pots	£5.50

ITT

T/V & Video Processor. 1200 Type £10.00

PHILIPS

UNIVERSAL HAND SET £12.00 RC5 KT3 – K45

We have all parts for Philips Handsets

RC5353	£15.00
RC5300	£12.00
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TEXT-TYPE

Replace Hand Set for Philips KT3-K30, K4 etc £12.30

THORN HAND SETS

9000 – 9600 – TX9 – TX10 – TX100 Text and Non-Text £10.00

PHILIPS

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Thorn TX Tuner V/Cap eqv. to ELC1043	£4.50
Min. UHF Tuner 40dB gain 2"x4.1/2"x 1½"	£1.50
AMSTRAD Tuner	
Thorn TX10 Export V/Cap UHF. VHF	£3.00
V/Cap Rank UHF Z7761/Unit	£6.00
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NEW GS Tuner V/Cap	£3.50
T206 Push Button Unit	£7.00
ELC2000 on Panel	£2.50
GEC 2110 V/Cap	£5.00
ELC1043 (Ex Panel)	£3.75
ELC2000	NEW £4.00
ELC2003	£4.00
GEC Tuner V/Cap Hitachi After 1979 ET548, ET547, ET541B	£8.00
ET546	£6.00
Monitor Astec UM1233	50p
UE33-B01 Amstrad UHF Tuner	£5.00
VHF/UHF EG522F	£6.00
ASTEC UM1183	£10.00
V314 (VHF)	£5.00
V334	£4.00
U321	£6.00
U322	£8.00
U341 UHF	£6.00
U342 (UHF)	£5.00
U343 Phono	£5.00
U343C	£6.00
U344C	£10.00
U411 UHF	£4.00
UVF10	£8.00
U.V. 411 Tuner	£8.00
U.V. 412	£8.00
U.V. 417	£5.00
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Fidelity/Amstrad 2000 V/Cap Tuner	£5.00
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VHF	£3.00
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UE2-B31 Fidelity V/Cap T/Unit	£6.00
UHF-VHF V/Caps on panel	£3.00
TUTA(CH) 20 Turn Pot	40p
U321 on panel	£6.00
Tuner unit VHS Sylvania GTR Videon	
MTS 900	£2.50
Mullard Video Modulator. Application video tape recorders. TV cameras, video games, closed circuit TV, C.C.T.V. system. Data supplied	£10.00
4 Button Rank Z18 Tuner	£4.00
TRS 2506 AC mains filter 0.1+ (03x2) 11" leader & earth clip	25p
NEW U321 Mullard	£4.00

U944	£5
Astec 230V/.6A Switch Mode Power Supply	£5.00
Astec UM1623 VHF	£2.00
Astec UM1286	£4.00
VHF/UHF Tuner S Band	£3.00
UHF/VHF Tuner EGG13F	£6.00
ENV-5765G2 VHF/UHF	£5.00
Change over switch co-ax type box with lead	50p
TX90MOD 37141B	
The Sweep Tuning System TX9 139/001	£12.00
UF745 BAV	
UHF Tuner and IF in one can Small	£5.00
KT3 Luminance	75p
UF7548	£5
Co-Ax Belling Lee Plug	14p
Co-Ax Splitter	£1.00
Infra Red Emitting Diode	20p
NE2861 Small Neon Lamps	
GEC & Philips	5p
Mullard 5 Watt Amps. LP1162 New	75p

S.W. Filters

HW2011	50P	S.W. Filters	
HW2013	50P	SW185	£1.00
SW453	50P	SW153A	50P
SW150	£1.00	SW154	50P
HW2013	50P	SW173	50P
RW303	50P	F1035B	50P
SY2153	50P	F1045A	50P

BF694	10p
BF758	30p
BF760	30p
BF734	15p
BF743	10p
BFT84	8p
BFW11	20p
BFX29	30p
BFX84	25p
BFY50	15p
BFY52	20p
BFY90	25p
BLY49	25p
BPW41	25p
BRC116	25p
BRX43	15p
BRX48X	10p
BRY56	30p
BSS68	10p
BSY79	10p
BSY95a	10p
BTY81	20p
BSX19	17p
BSX20	17p
FT3055	30p
TCE82	30p
TCE520	30p
2N930	5p
2N2221	8p
2N2222	8p
2N2906	10p
2N3055	40p
2N3566	10p
2N3702	10p
2N3711	10p
2N3583	50p
2N3904	15p
2N4355	10p
2N4442	£1.00
2N4444	£1.00
2N5278	20p
2N5296	40p
2N5983	30p
2N6099	40p
2N6109	40p
2N6130	50p
2N6133	20p
2N6348	20p
2N6399	10p
2SA437	20p
2SA673P	10p
2SA844P	10p
2SC643A	£1.00
2SA992	10p
2SB474	30p
2SB566	10p
2SB686	75p
2SC515A	£1.00
2SC772	20p
2SC381	10p
2SC458	50p
2SC491	50p
2SC732	10p
2SC733	10p
2SC940	£1.00
2SC1030	£1.00
2SC1061	30p
2SC1162 C/18	30p
2SC1514	30p
2SC1520	25p
2SC1546	20p
2SC1617	£1.00
2SC1725	20p
2SC1740	20p
2SC1756	50p
2SC1942	£1.00
2SC2027	£1.00
2SC2068	20p
2SC2073	8p
2SC2229	15p
2SC2688	20p
2SC3795	30p
2SC3973B	30p
2SC7350	15p
2SD180 TO3 80v/6A	15p
2SD200	£2.00
2SD401	£1.00
2SD716	£1.00
2SD787	30p
2SD789	30p
2SD820	£1.00
2SD868	75p
2SD880	30p
2SD1264	£1.00
2SD1266	£1.00
2SD1415	£1.00
2SD1427	£1.00
2SD1432	£1.00
2SD1576	£1.00
2SD1577	£2.00
2SD1878	£1.00
2SK30A	10p
BC107	10p
BC108	10p
BC109	5p
BC113	10p
BC114	10p
BC115	10p
BC116	10p
BC117	20p
BC119	20p
BC125	10p
BC126	10p
BC139	10p
BC140	30p
BC141	25p
BC143	25p
BC147	10p
BC148	10p
BC149	10p
BC153	10p
BC154	10p
BC157a	10p
BC158	10p
BC159	10p
BC160/16	25p
BC171	5p
BC172	5p
BC173	5p
BC174	5p
BC183	5p
BC184	5p
BC204	5p
BC207	5p
BC212	5p
BC213	5p
BC214	5p
BC237	5p
BC238	5p
BC239	5p
BC250	5p
BC251	5p
BC252	5p
BC262	10p
BC263b	20p
BC294	30p
BC298	10p
BC300	30p
BC301	30p
BC303	30p
BC307	7p
BC308	7p
BC309	10p
BC327	10p
BC328	10p
BC328/338 pair	15p
BC337	10p
BC338	10p
BC347	10p
BC349b	10p
BC350	20p
BC365	10p
BC368	10p
BC369	10p
BC384	10p
BC394	10p
BC413	10p
BC414	10p
BC416	10p
BC440	30p
BC454	10p
BC455	10p
BC456	10p
BC460	25p
BC462	10p
BC463	10p
BC478	10p
BC527	10p
BC532	10p
BC546	10p
BC547	10p
BC548	10p
BC556	10p
BC557	10p
BC558	10p
BC559	10p
BC635	10p
BC636	10p
BCX31	25p
BCX32	25p
BD116	25p
BD124	30p
BD124 (metal)	30p
BD130Y	25p
BD131	30p
BD132/238	30p
BD135	25p
BD136	30p
BD138	30p
BD140	30p
BD176	25p
BD182	£1.00
BD183	70p
BD202	30p
BD204	30p
BD207	60p
BD221	20p
BD222	30p
BD228	30p
BD226	20p
BD233	30p
BD234	25p
BD235	30p
BD238	30p
BD239	15p
BD240	50p
BD243c	30p
BD244	50p
BD250a	30p
BD252	20p
BD253B	50p
BD331	20p
BD373b	20p
BD416	25p
BD433	25p
BD437	25p
BD438	30p
BD439	30p
BD544D	40p
BD650	50p
BD678	30p
BD681	30p
BD682	30p
BD507	50p
BD508	30p
BD509	30p
BD517	30p
BD519	30p
BD534	30p
BD535	30p
BD544D	30p
BD562	30p
BD610	40p
BD646	50p
BD676A	30p
BD807	20p
BD826	50p
BD933	30p
BD939	30p
BD948	30p
BDT31A	50p
BDX75	20p
BDV648	50p
BDU65	50p
BF761	30p
BF769	30p
BF788	20p
BF819A	30p
BF858	30p
BF869	30p
BF871	30p
BFR52	7p
BFR81	15p
BFS60	10p
BFT42	20p
BFT57	20p
BFW11	£1.00
BFX85 100V. Lamp	30p
BSD215	50p
MRT366	20p
AN6350	£2.00
BRC-M-200	40p
BRC-M-300	50p
BRC 1693	£1.00
BRC 3064	£1.00
BTT822	£1.00
BTT6016	£1.20
BTT6018/ML237B	£1.50
BTT6218	£1.50
BTT8123	£1.00
BTT8224	£1.00
BUP22A	£1.00
CA270AE	50p
CA270CW	50p
CA270CE	50p
CA920AE	£1.00
CA1310	50p
CA3046	50p
CA3065Q	50p
CA3094AE	50p
CA3123	40p
CA3146	£1.00
CA3189	40p
CBF16848	50p
CD4510	30p
CD4555BE	30p
DM7492	50p
HA1124A	40p
HA1196	40p
HA1370	£2.00
HA1377	£3.00
HA11223	40p
HA11423	£1.00
HA11440	50p
HA11484	£3.00
HA11485 Ant	£1.00
HA17458	50p
HEF4001	10p
HEF4518B	25p
HEF4011AF	10p
HEF4013B	30p
HEF4006BP	20p
HEF4528	20p
HD3890C	£3.00
KS7310 1001012	£1.00
LA3220	50p
LA4102	£1.00
LA4261	£1.00
LA7830	£2.00
LA7831	£2.00
LM111N	£1.00
LM1017N	25p
LM1863	£3.00
MC1455P1	£5.00
M913	£2.00
M1024=SAA	£2.00
M1025=SAA	£2.00
MS8401A-84RS	£3.00
MC4760	£1.00
MC1307	75p
MC1312	
MC1330 GN76530	£1.00
MC1352	£1.00
MC1358	£1.00
MC1496	50p
MC14002	15p
MC14013	25p
MC14016	25p
MC14066	30p
MC14514	50p
MC1748	80p
MEM4956	£1.00
ML231	£2.50
ETT6016	£2.00
ML232	£1.00
ML236E	£1.00
ML237B	£1.00
ML2388	£4.00
ML239	£2.00

Thyristors

Philips Kits OT121	50p
IR106A	30p
BT151/500	20p
BT106 Plastic	30p
BT106 Metal	£1.20
BT119	£1.00
BT120	£1.00
BRC4443	75p
G11 Thyristor	60p
Decca 3D-100	60p
2N4441	£1.00
MCR72-6	25p
OT112	£1.00
TF320M	£1.00
HO441	£2.00
IR62	£2.00
170881	£2.00
17089R	£2.00
17053R	£2.00
SP2M	50p
RCA Line Thyristor	
CQ1240H	£2.00
CQ1240R	£2.00

Thermistors

PTH8G180M	75p
G8 Degaussing	35p
Philp type VA1104	70p
TTT2256312	15p
PTH451 AOR	15p
P137P Fits Pye & PT34	20p
Degaussing Thermistor (fits most sets)	20p
POS 009 Philips	50p
POS 016 Philips	50p

THORN	
ML926	£1.00
MAB8400B-C	£2.00
MAB8440 P-D070	£2.00
MAB8441 PT001	£3.00
MAB8420PC035	£2.00
MAB8422P-C005	£2.00
MAB8430P	£2.00
MAR8400XX	£3.00
M708LB1	£2.00
MM5387	£1.00
MM5611	£1.00
MM5840	£3.00
PCD8571P	£3.00
K35 Philips Receiver IC	
MA1250 BJC	£3.00
M491BB1	£3.00
M5840H-84RS	£5.00
MM5290N-4	75p
MM5310BN	£4.00
MN650	£1.00
MN1250BJC	£2.00
MR1366	20p
N64100	£1.00
NE555P	60p
NE555	60p
NE556	50p
NE646	50p
HD38980C	£3.00
IL-1	20p
OPT600	20p
OPT601	20p
PH2369	10p
PCD8571P	50p
PCD8572P	£2.00
SAA661	£1.00
SAA661	£1.75
SAA1021	£4.00
SAA1024	£2.50
SAA1073	£3.00
SAA1074	£3.00
SAA1075	£3.00
SAA1124	£2.00
SAA1130	£2.50
SAA1174	£3.00
SAA1176	£2.00
SAA1250	£3.00
SAA1251	£4.00
SAA1272	£3.00
SAA1274	£3.00
SAA1276	£3.00
SAA1292	£10.00
SAA1293	£6.00
SAA3027P	£4.00
SAA5000A	£1.50
SAB3013	£2.00
SAB3037	£2.00
SAB3205	£3.00
SAB3210	£2.00
SAB4209	£2.00
TBO0124	£1.00
SAA3088P	£3.00
SAA5000A	£2.00
SAA5010	£2.20
SAA5012A	£5.00
SAA5020	£3.50
SAA5025D	£3.00
SAA5030	£4.50
SAA5040	£2.00
SAA5040A	£3.00
SAA5042A	£3.00
SAA5043	£4.00
SAA5050	£4.50
SAA5051	£2.00
SAA5052	£2.00
SAA5053	£2.00
SAA5240	£5.00
SAA5241 P/A TEX IC	£5.00
SAF1032p	£2.50
SAF1039	£2.00
SAS570T	75p
SAS660	£1.00
SAS670	£1.00
SAS580	75p
SAS590	75p
SAS3210	£2.00
SL437F	£4.00
SL471	50p
SL480	£1.00
SL901B	£4.50
SL971B	£3.00
SL918	£4.50
SL1430	£1.00
STK4793	£3.00
STK5471	£3.00
STR58041	£5.00
TA7122	£1.15
TAA320A	50p
TAA470	£1.50
TAA570	75p
TAA611B	£1.00
TAA621	£2.00
TA7108P	£1.00
TA7117	50p
TA7120P	50p
TA7315AP	50p
TA7137P	50p
TA7193AP	£3.00
TA7240AP	£3.00
TA7265	£3.00
TA7609P	50p
TA7227P	£1.00p
TA7265AP	£3.00
TA7608AP	£3.75
TA7680AP	£3.00
TA7750P	30p
TBA120A	40p
TBA120AS	50p
TBA120SA	40p
TBA120B	40p
TBA120SB	40p
TBA120T	50p
TBA120SQ	£1.00
TBA120U	75p
TBA120Q	30p
TBA120C	40p
TBA1440	£1.00
TBA1441	£2.00
TBA231	75p
TBA395Q	50p
TBA396Q	£1.00
TBA396	75p
TBA440P	£1.00
TBA1440C	£1.00
TBA480Q	£1.00
TBA520	£2.00
TBA530	£2.00
TBA540	£1.00
TBA560CQ	£1.00
TBA570	£1.50

TV Crystals

4MHz	
4.433-619	
6MHz	
8.867238	
11.059.000	
Large or small	50p each
Antistatic Isolators	
Disc Type Black	10p

Filters

CSA 3.97M		15p
6MEG	CDA	25p
6MHz	SFE	12p
SFE 5.5MHz		20p
SFD460B		15p
CSB455A		15p

TBA625	50p
TBA651	£2.00
TBA673	£1.00
TBA750Q	£2.50
TBA781	£1.50
TBA800	50p
TBAX10AP	60p
TBA810S	60p
TBA820	60p
TBA820M	25p
TBA920	£1.50
TBA920Q	£1.50
TBA990Q	£1.00
TMS1000NL	£2.00
TMS1943 N2L (clockchip)	£1.00
TMS9980	£4.00
TMS9901	£1.00
TMS2708JG45	45p
TMS2716JL	£1.00
TMS3529	£1.00
TMS3720ANS	£3.00
TMS4014	70p
TX-012	£1.00
TMS9902	£1.20
ULN2004P	£1.50
ULN2216	75p
UPC566H	£1.00
UPC585C	£1.00
UPC1009C	£2.00
UPC1031H	£2.00
UPC1353C	£1.00
UPC1363C	£2.75
UPC1364C	£2.00
UPC1365C	£2.00
UPC1366C	£1.00
UPC1378H	£2.00
UPC1514C	£3.00
UPC2002	35p
UPD1943G	£2.00
UPD8049HC	£2.00
SN29848	50p
SN29770BN	£2.00
SN29771BN	£2.00
SN29772BN	£2.00
SN76001	£1.00
SN76013ND	£2.00
SN76018	£1.00
SN76110N	£1.00
SN76115AN	50p
SN76131	50p
SN76141N	£1.00
SN76226	£1.00
SN76227N	£1.00
SN76228N	£1.00
SN76270	£1.00
SN76532N	£1.00
SN76545N	£3.00
SN76546	£3.00
SN76550	30p
SN76552	30p
SN76570	£1.00
SN76620	50p
SN76660N	40p
SN76620AN	50p
SN76666	£1.00
SN76705N	£1.00
SN76707N	75p
SN76708AN	75p
SN76720	£1.00
SN76709N	£2.00
UA783P3C	40p
BT100A/102	40p
BT138/10A	70p
BT146	30p
TBA540Q	£1.50
TCA270	£1.00
TCA270Q	£1.00
TCA270S	£1.00
TCA270SQ	£1.00
TCA740	£1.00
TCA830	£1.50
TCA830	£1.00
TCA940	£1.00
TCEP100	£1.00
TCE120CQ	£1.00
TCE520	30p
TDa6306P	£3.00
TDEA440Q	50p
TDA1003A	£1.00
TDA1110	£1.00
TDA1013	£1.00
TDA1012	£1.00
TDA1013A	£1.00
TDA1060A	£1.50
TDA1035SB	£1.00
TDA1072	£1.00
TDA1150	50p
TDA1151	30p
TDA1154	50p
TDA1170S	£1.00
TDA1180	£2.00
TDA1190	£1.00
TDA1200	75p
TDA1270	£1.50
TDA1327A	69p
TDA1365	£3.00
TDA1512	£2.00
TDA1540P	£3.00
TDA1670A	£2.00
TDA1908A	£1.00
TDA2002	£1.00
TDA2003	25p
TDA2004	£2.00
TDA2008	£2.00
TDA2010	£1.00
TDA2020	£1.00
TDA2030	£2.00
TDA2140	£3.50
TDA2160	£1.00
TDA2320	50p
TDA2345A	£1.00
TDA2601	£3.00
TDA3640	£2.00
TDA2522	£5.00
TDA2530	£1.50
TDA2532	£1.00
TDA2540	80p
TDA2541	£1.00
TDA2542	£1.00
TDA2545	£2.00
TDA2546	£2.00
TDA2556	£1.00
TDA2560	75p
TDA3565	£3.00
TDA2575A	£1.00

TDA2577A	£2.00
TDA2578A	£2.00
TDA2579A	£2.00
TDA2581	£2.00
TDA2591	£1.00
TDA2593	£3.00
TDA2560	50p
TDA2556	£1.50
TDA2600	£3.00
TDA2611A	£1.00
TDA2611AQ	£1.00
TDA3651A	£1.00
TDA3652	£2.50
TDA2653	£4.00
TDA2640	£2.00
TDA2593	£1.00
TDA3047	£1.00
TDA3048	£3.00
TDA3083	£2.00
TDA3190	£1.00
TDA3300B	£5.00
TDA3301	£3.00
TDA3505	£3.00
TDA3506	£3.00
TDA356[illegible]	£3.00
TDA3560	£4.00
TDA3561A	£3.00
TDA3622ZA	£3.00
TDA3566	£3.50
TDA3564	£4.00
TDA3565	£3.00
TDA3571A	£2.75
TDA3581	£3.00
TDA3591	£3.00
TDA3981	£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
TDA3810	£2.00
TDA4260	50p
TDA4501	£3.00
TDA4505N4	£3.00
TDA4420	£2.00
TDA4600/2D Dil	£1.00
TDA4600-2 Flat	£3.00
TDA4601	£2.00
TDA8190	£3.00
TDA9403	£1.50
TDA9503	£3.00
TDB2033	£1.00
TDD1610S	50p
TD6306P	£2.00
TDA1060	£3.00
TEA1009	50p
TEA1039	£2.00
TEA1060	£2.00
TEA2017	£2.00
TEA5114	£1.00
TDA3300B	£6.00
SIL4516	50p
SN16861NG	50p
SN16862AN	£1.00
SN16964AN	50p
SN29764AN	£1.00
UA721	40p
UA7300	40p
MPS43A	25p
MJ13005	30p
MJE5IT	25p
MJE340	28p
MJE660	25p
MJE661	25p
MJE3055	£1.00
MJE2801	30p
MJE2955	50p
MJE13005	50p
Sanikron Diode	30p

Transistors

A1222	25p	BF181	20p
A1223	25p	BF182	20p
AC106	25p	BF184	20p
AC121	25p	BF194	10p
AC124	25p	BF195	10p
AC128	25p	BF196	10p
AC137	25p	BF197	12p
AC151	25p	BF198	10p
AC131	25p	BF199	10p
AC138	25p	BF200	20p
AC152	25p	BF222	10p
AC153K	25p	BF224	15p
AC142K	25p	BF238	20p
AC160	25p	BF240	16p
AC176	25p	BF244	40p
AC178K	25p	BF245b	20p
AC179	25p	BF255	20p
AC186	25p	BF256	20p
AC188	25p	BF257	20p
ACY21	25p	BF258	25p
AD143	50p	BF262	15p
AD149	50p	BF263p	25p
AD161/162 pair	40p	BF264	15p
AF17A	25p	BF273	10p
AF139	25p	BF274	10p
AF181	£1.00	BF324	25p
AF239	25p	BF337	50p
AF367	25p	BF355	30p
AL102	£1.75	BF362	20p
AU110	£1.50	BF363	15p
BLY49	50p	BF367	15p
BF115	20p	BF391	15p
BF121	20p	BF394	10p
BF127	20p	BF419	30p
BF137	20p	BF422	15p
BF157	20p	BF423	15p
BF160	20p	BF448	30p
BF161	20p	BF470	30p
BF164	60p	BF471	30p
BF179	30p	BF597T	10p
BF180	20p	BF694	10p

Thorn Transformers

DT2107/2R	£10.00
90D3405-003	£10.00
90D4106-003	£1.00
90D3403-001	£5.00
OT204150	£3.00

I.C.s

MA721PC	£1.00	UPD1141LC-2	£1.00
MS8430-8505P	£1.00	MN1250BJC	£1.00
TD6359P	£1.00	MS8041-5505P	£1.00
MS8657P	£1.00	M491BB1	£2.00
PCD8572	£1.00	HA513385	£1.00
HD7410C86P	£1.00		