NOVEMBER 1991 £1·80

TELEVISION

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FREE 132-PAGE CATALOGUE

Servicing the Panasonic NV777/788
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DX-TV•CD Player Fault Reports
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TV Fault Finding•VCR Clinic

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TELEVISION

November 1991 **Vol. 42, No. 1 Issue 493**

On sale October 16th

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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QUERIES
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 DECEMBER WILL BE PUBLISHED ON NOVEMBER 13

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
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AF239	30p
BA145	10p
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BB105B	18p
BB205B	24p
BC107	8p
BC108	8p
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BFY64	25p
BFY90	45p
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BR303	85p
BRY49	38p
BRY56	33p
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BSX26	18p
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TIS93	20p
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VN10KM	60p
VN66AF	100p
VN88AF	115p
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2N3054	40p
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2N3442	85p
2N3585	120p
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2N3708	9p
2N3710	12p
2N3711	12p
2N3771	85p
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2N4037	25p
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2N4401	12p
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2N4443	76p
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2N5061	20p
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2N5192	50p
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2N5294	30p
2N5296	30p
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2N5366	25p
2N5401	12p
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2N5496	80p
2N6107	40p
2N6109	40p
2N6292	40p
2N6385	120p
2N6403	160p
3N143	65p

DIODES

Rectifier Diodes

BY100	40p
BY103	32p
BY127	8p
BY133	8p
BY164	40p
BY179	35p
BY184	32p
BY196	20p
BY206	11p
BY207	11p
BY208	18p
BY210	22p
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
IN.914	2p
IN.4001	3p
IN.4002	3p
IN.4003	3p
IN.4004	3p
IN.4005	3p
IN.4006	3p
IN.4007	4p
IN.4148	2p
IN.5400	9p
IN.5401	8p
IN.5402	8p
IN.5403	8p
IN.5404	8p
IN.5405	11p
IN.5406	12p
IN.5407	12p
IN.5408	12p
RGP15	15p
RGP30	16p
SKE4F2/06	60p
SKE4F2/08	80p
SKE4F2/10	100p
SR2M	60p

I.C. SOCKETS

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

ZENERS

400 MW
BZY88 RANGE
2V7 to 39V 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	95p
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	26p
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
EBF80	60p
EBF89	60p
ECC82	90p
ECC83	120p
ECC84	80p
ECC85	90p
ECH81	100p
ECH84	90p
ECL80	65p
ECL82	80p
ECL84	100p
ECL85	80p
ECL86	90p
EF80	80p
EF85	80p
EF89	85p
EF183	75p
EF184	85p
EL34	280p
EL36	90p
EL84	100p
EL95	85p
EL500	100p
EL504	130p
EY86	70p
EY87	70p
EY88	80p
EZ35	80p
EZ80	90p
EZ81	70p
PC97	100p
PCC85	60p
PCF80	100p
PCF200	135p

PCF801	110p
PCF802	80p
PCF806	115p
PCH200	100p
PCL81	65p
PCL82	80p
PCL84	60p
PCL85	80p
PCL86	80p
PCL805	80p
PFL200	110p
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
AN3215K	650p
AN3310	350p
AN3312	350p
AN3320K	800p
AN3331K	900p
AN3792	400p
AN3794	450p
AN3795	500p
AN3821	800p
AN3821K	900p
AN3822K	900p
AN3830K	800p
AN3990K	300p
AN3991K	400p
AN5010	450p
AN5011	400p
AN5015	350p
AN5020	200p
AN5025	250p
AN5030	550p
AN5033	500p
AN5034	500p
AN5111	550p
AN5132	250p
AN5135	600p
AN5138	450p
AN5150	600p
AN5151	600p
AN5215	100p
AN5250	150p
AN5256	150p
AN5260	350p
AN5262	175p
AN5265	150p
AN5352	600p
AN5355	450p
AN5410	375p
AN5411	450p
AN5421	150p
AN5429	420p
AN5431	300p
AN5440	400p
AN5510	400p
AN5512	250p
AN5515	200p
AN5520	550p
AN5521	250p
AN5612	400p
AN5613	200p
AN5615	300p
AN5620	330p
AN5622	350p
AN5625	400p
AN5712	350p
AN5722	140p
AN5730	160p
AN5732	160p
AN5753	170p
AN5763	460p
AN5790	300p
AN5791	350p
AN5836	450p
AN5862	300p
AN6135	150p
AN6238	400p
AN6247	200p
AN6270	400p
AN6300	600p
AN6306	550p
AN6307	250p
AN6320	300p
AN6328	400p
AN6332	450p
AN6337	420p
AN6341	350p
AN6344	440p
AN6350	810p
AN6359	810p
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
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BA516	150p
BA521	160p
BA524	240p
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BA527	95p
BA532	140p
BA534	290p
BA536	180p
BA546	180p
BA612	160p
BA656	150p
BA658	380p
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BA1330	160p
BA1360	160p
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BA5101	400p
BA5102	220p
BA5204	200p
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BA7007	200p
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BA7767AS	200p
BA8500	800p
BA8504	500p
CA3011	110p
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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	950p
CX134A	950p
CX136	600p
CX139	1450p
CX139A	750p
CX141	750p
CX143	800p
CX143A	1250p
CX145	725p
CX150B	325p
CX158	825p
CX175	325p
CX186	750p
CX187	825p
CX804A	775p
CX832	825p
CX867	575p
CX868	525p
CX877	300p
HA1125	150p
HA1137W	135p
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HA1156	110p
HA1197	150p
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HA1372	300p
HA1377	160p
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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
KA2209	125p
KA2210	230p
KA2212	80p
KA2213	130p
KA2214	150p
KA2261	100p
KA2263	100p
KA2264	100p
KA2284	100p
KA2401	150p
KA2412	350p
KA2912	125p
KA2914A	300p
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LA1201	75p
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LA1222	80p
LA1230	130p
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LA1364	200p
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LA1368	220p
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LA1460	220p
LA2000	150p
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LA2200	190p
LA3101	160p
LA3160	120p
LA3201	80p
LA3210	65p
LA3220	100p
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LA3375	300p
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LA4032	140p
LA4051	160p
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LA5112	120p
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LA5700	300p
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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
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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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LM723	40p
LM741DIL	18p
LM741MET	45p
LM747	55p
LM748	30p
LM1458	30p
LM1889	300p
LM3900	40p

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LM3916	270p
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MAB8441P	650p
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MB3714	270p
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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
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STK0070	1100p
STK0080	580p
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STK016	800p
STK025	700p
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STK078	620p
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
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STK463	780p
STK465	720p
STK501	580p
STK561	550p
STK563	480p
STK583	600p
STK734B	510p
STK745	600p
STK760	600p
STK770	750p
STK772B	480p
STK780	650p
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STK1040	700p
STK1049	800p
STK1050	750p
STK1060	760p
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STK2025	700p
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STK2029	480p
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STK2250	760p
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STK3044	575p
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STK3082	700p
STK3083	550p
STK3102II	600p
STK3152II	990p
STK3156	580p
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STK4019	600p
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STK4028	620p
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STK4038	680p
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STK4046	1100p
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STK4060	580p
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STK4111	650p
STK4112	950p
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STK4122	560p
STK4131	650p
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STK4142	800p
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STK4161	800p
STK4162	800p
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STK4172II	800p
STK4181	820p
STK4182II	800p
STK4191	1000p
STK4192	1000p
STK4231II	990p
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STK4273	650p
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STK4773	900p
STK4793	1100p
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STK4833	810p
STK4843	720p
STK4853	900p
STK4863	850p
STK4873	990p
STK4893	1400p
STK4913	1180p
STK5314	550p
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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
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STK5457	425p
STK5461	700p
STK5462	500p
STK5466	850p
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STK6922	600p
STK6932	600p
STK6962	320p
STK6972	630p
STK6981B	850p
STK6982	800p
STK7216	500p
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STK7310	550p
STK7348	410p
STK7356	650p
STK7358	650p
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STK7404	400p
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STK7408	880p
STK7410	1200p
STK7554	1000p
STK7561	700p
STK7563	950p
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STR370	580p
STR371	600p
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STR381	490p
STR383	570p
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STR450	610p
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STR452	680p
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STR1195	450p
STR1229	450p
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STR2012	650p
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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
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TA7157	140p
TA7176	240p
TA7193	400p
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TA7203	180p
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TA7226	290p
TA7227	190p
TA7229	300p
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TA7232	250p
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TA7241	260p
TA7242	290p
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TA7245	450p
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TA7272	260p
TA7273	350p
TA7274	260p
TA7280	330p
TA7281	270p
TA7282	260p
TA7283	260p
TA7288	260p
TA7299	400p

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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	150p
TA7641	170p
TA7658	130p
TA7668	160p
TA7680	480p
TA7688	250p
TA7698	720p
TA7699	1200p
TA7705	300p
TA7750	200p
TA7757	250p
TA7769	300p
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TBA520	120p
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TBA560	120p
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TBA950	100p
TBA990	80p
TC4621AF	225p
TC5020	220p
TC5054	280p
TC5065BP	150p
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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	1 600p
TC9179F	2 000Pp
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
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TDA1005A	220p
TDA1008	350p
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TDA1011	120p
TDA1012	120p
TDA1013A	120p
TDA1015	100p
TDA1016	200p
TDA1020	150p
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TDA1024	200p
TDA1025	320p
TDA1028	220p
TDA1029	250p
TDA1035	120p
TDA1037	190p
TDA1044	250p
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TDA1053	400p
TDA1054	200p
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TDA1060	190p
TDA1062	200p
TDA1070	400p
TDA1072	300p
TDA1074	420p
TDA1082	290p
TDA1083	200p
TDA1085	400p
TDA1097	550p
TDA1151	60p
TDA1154	50p
TDA1170	85p
TDA1180	140p
TDA1190	90p
TDA1200B	80p
TDA1220	150p
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TDA1236	295p
TDA1270	150p
TDA1327	250p
TDA1330	150p
TDA1352	200p
TDA1410	219p
TDA1412	100p

LINEAR IC's — Cont.

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TDA1940	280p
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TDA1950	280p
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TDA2005	90p
TDA2006	70p
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TDA2020	140p
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TDA2038	90p
TDA2040	200p
TDA2048	750p
TDA2054M	120p
TDA2151	300p
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TDA2540	100p
TDA2541	120p
TDA2542	150p
TDA2543	300p
TDA2545	200p
TDA2556	350p
TDA2560	120p
TDA2575A	100p
TDA2577A	160p
TDA2578A	200p
TDA2579	250p
TDA2581	120p
TDA2592	130p
TDA2590	170p
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TDA3082	300p
TDA3083	250p
TDA3190	100p
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NV180	£25.00
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NV788	£43.50
NV810/NV830	£35.00
NV850/NV950	£38.00
NV870/NV890/NV970	£48.00
NVG33	£38.00
NVG30/NVG31/NVG130	£20.00
NVG10/NVG11/NVG12/NVG14/NVG15/ NVG16/NVG120/NV250/NV280/ NV450/NV465	£16.50
NVG18	£30.00
NVG20/NVG21/NVG22/NVG25/NVG28/ NVG200/NVD48	£25.00
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/N9054/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	
4609-460/V100/V140/V200/V250/ V304/V341/V450/V550	£7.00
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

PHILIPS	
VR6460/VR6520/VR6920/64VR60/ VR6420	£8.50
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	
2A10/2A70/2B20	£23.00
4A10/4B20	£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
VR6018/VR7018	£30.00
VR6028	£27.00
VR7016	£24.00

SAISHO	
VR100/VR605/VR705/VR805/VR905/ VR1000/VR1100/VR1200/VR1600	£13.50
VR3300X/VR3600X/VR3650/VR3800	£15.00
VR3200/VR3500	£16.00
VR3300/VR3600	£16.00

SALORA	
6500/6600	£21.50

SAMSUNG	
SVX301/VB900/VB910/VVT510/VT320/ VT5600/VX510/VX511/VX520/VX616/ VX626/VX627/VX717	£19.00

SANYO	
VTC5000/VTC5400/VTC6000/VTC6500/ VPR5000/VTC1500/VTCM10/VTCM11/ VTCM20/VTCM21/VTCM25/VTC2000/ VTC5100/VTC5150/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
VHR1100/VHR1200	£18.00
VHR1500/VHR2500	£28.00

SHARP	
VC300/VC381/VC383/VC386/VC387/ VC388/VC482/VC483/VC486/VC3300/ VC8381/VC9100/VC9300/VC9500/ VC9700/VC9400/VC9600	£14.00
VC582/VC583/VC651/VC681/VC750/ VC780/VC781/VC683/VC684	£14.00
VC6000/VC6200/VC6300/VC7300/ VC7700/VC7750/VC8000/VC8300	£31.00

SONY	
DSR-19R (FOR SL-T 9ME)	£39.00
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	£3.20
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	£1.50
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,	£1.20
FVHP905, FVHP906, FVHP907, FVHP910	£1.30
FVHP615, FVHP715, FVHP725, FHP830	£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,	£1.20
VT52, VT62, VT64, VT65, VT86	£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

SOLDERING IRON

ANTEX XS25W 240V Soldering Iron 240Vac	£6.50p
Spare Element for XS25W 240V	£3.40p
ANTEX C15W 240V Soldering Iron 240Vcm	£6.50p
Spare Element for C15W 240V	£3.40p

DESOLDERING PUMP

Desolder Pump	£3.50p
Spare Nozzle	£0.60p
SOLDER MOP	£0.65p

SOLDER

18 SWG	500g	£5.00p
20 SWG	500g	£6.50p

SOLDERING IRON STAND

Soldering Stand	£2.60p
Spare Sponge	£0.55p

FLOPPY DISCS

5¼ inch DSDD (10 in box) Branded Name	£6.00
5¼ inch DSDD (bulk pack) 25	£10.00
3½ inch DSDD (10 in box) Branded Name	£11.00
3 inch CF2 Branded Name	£2.10
3 inch CF2D Branded Name	£2.50

MOD KIT TAPE CREASING FOR AMSTRAD
VCR450, 4600, 4700 620p

SERVICE KITS

Each Kit Contains Belts Set, Pinch Roller, Tension Band & Idler Tyres

NATIONAL	
NV300/NV340	£5.80p
NV7000/NV7200	£5.50p
NV2000	£6.25p

JVC & FERGUSON	
3V35-36,38-39	£5.50p
3V29/30	£6.25p
HRD110/111/120/225	£5.50p
HR7200	£6.25p

HITACHI	
VT11/VT33	£6.25p

FISHER	
SERVICE KIT	£5.50

HITACHI T.V.	
OUTPUT MODULE HM 6251 REF: 2370551	£6.50

SERVICE AIDS

SERVISOL PRODUCTS	
V. HEAD CLEANER	125p
SWITCH CLEANER	130p
SILICONE GREASE	150p
FREEZE IT	140p
FOAM CLEANER	140p
ANTI-STATIC	140p
AEROKLEANE	125p
AERO DUSTER	140p
PLASTIC SEAL	130p
GLASS CLEANER	130p

If you purchase more than one Servisol product postage will be £2.00

UNIVERSAL TRIPLERS 450p

SONY ON/OFF SWITCHES 200p

SONY THYRISTOR SG264A 600p SG613 1000p

PHILIPS SWITCHES 150p
K30, K35, K40, KT3, KT4

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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	435038A	£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,	IDLER	850A200004	£3.50
VP200, VH530 VH535-630, VH635-640, VH893-1440, VH2500-2600, VH2700-4010, VH5010	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

CASSETTE DC MOTORS

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

CASSETTE TAPE HEADS

MONO HEAD	£0.90
STEREO HEAD	£1.50
MINI HEAD	£2.30
AUTO REVERSE HEAD	£2.60

VIDEO MOTORS

AMSTRAD		
VCR 7000	REEL MOTOR	£17.00
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 MOTOR	£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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PANASONIC VIDEO LAMPS	£0.50

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1-439-256-11	KV-2704EC, 2704UB, 2704ET, 2704E(A), 2704E	£40.00
1-439-286-21	KV-2215UB, 2217UB, 2215EI, 2215FE, 2212EX, 2215ET	£30.50
1-439-289-21	KV-2705F, 2705FE, 2705UB, 2705E, 2706UB, 2720EC	£40.00
1-439-303-00	KV-2064EC, 20PS1, 2082ME7, 2056EC, 2060SA, KV-2062E(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), 1773R	£21.50
1-439-363-21	KV-19HT1A, 19FX1MT, 18G2, 1602M7, 1602GE, ADM-16B, KV-2092UB, 2096UB	£22.00

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2732A	280p
2764	180p
27C64	400p
27128	190p
27256-25	300p
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

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256K × 9-70	1500p
1MB × 9-80	3800p
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1MB × 9-80	3900p
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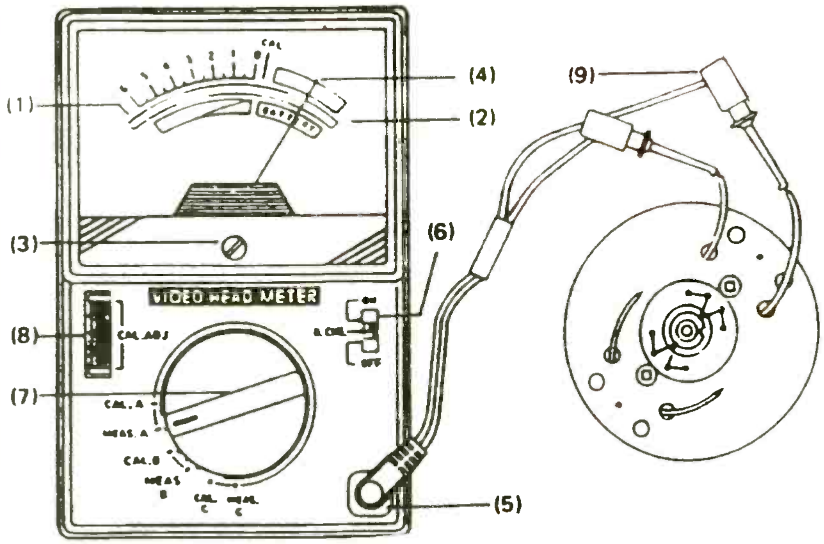
4N26	50p
4N27	50p
4N28	50p
4N29	90p
4N30	90p
4N31	90p
4N32	100p
4N33	100p
4N36	58p
4N37	58p
4N38	68p

LED DISPLAY

MAN74	100p
MAN8910	200p
DL747	120p

VIDEO HEAD TESTER



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FVH 615/725	£1.10p
FVH 905/910	£1.10p
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VIDEO SERVICE KITS FROM	£4.99p			TA7241	260p	2SA-726	25p	2SB0548	40p	2SC-1345	30p	2SC-2238	60p	2SD-523	150p
3V35/3V45 CASSETTE HOUSING	£24.99p			TA7270	250p	2SA-733	20p	2SB-554	350p	2SC-1359	20p	2SC-2240	25p	2SD-525	70p
VT33/VT65 CASSETTE HOUSING	£24.99p			TA7271	250p	2SA-748	90p	2SB-557	300p	2SC-1368	40p	2SC-2274	30p	2SD-526	70p
VR6467 CASSETTE HOUSING	£17.99p			TA7272	260p	2SA-765	300p	2SB-558	300p	2SC-1382	40p	2SC-2275	50p	2SD-560	50p
3V35 CAPSTAN MOTOR	£22.99p			TA7274	260p	2SA-769	130p	2SB-560	35p	2SC-1383	35p	2SC-2278	75p	2SD-570	40p
VT11/VT33 CAPSTAN MOTOR	£24.99p			TA7280	299p	2SA-771	130p	2SB-561	20p	2SC-1384	35p	2SC-2320	25p	2SD-571	30p
		MB3732	300p	TA7281	275p	2SA-777	50p	2SB-562	35p	2SC-1393	30p	2SC-2335	120p	2SD-592	20p
AN3822X	795p	STK441	700p	TA7299	399p	2SA-794	60p	2SB-564	70p	2SC-1398	70p	2SC-2371	45p	2SD-600	80p
AN5435	250p	STK430	500p	TA8201	350p	2SA-798	55p	2SB-566	110p	2SC-1399	60p	2SC-2427	80p	2SD-612	40p
AN5900	150p	STK433	490p	TA8205	395p	2SA-817	25p	2SB-568	40p	2SC-1403	250p	2SC-2440	70p	2SD-613	70p
AN7161	320p	STK459	600p	TA8210	350p	2SA-841	40p	2SB-595	80p	2SC-1413A	240p	2SC-2458	30p	2SD-856	80p
AN7171X	395p	STK463	780p	TA8214	350p	2SA-844	15p	2SB-596	75p	2SC-1417	20p	2SC-2482	40p	2SD-636	25p
AN7172X	350p	STK465	750p	TA8215	390p	2SA-861	50p	2SB-618	325p	2SC-1445	250p	2SC-2500	30p	2SD-637	20p
AN7178	275p	STK0029	400p	TA8216	590p	2SA-872	20p	2SB-631	40p	2SC-1446	60p	2SC-2501	85p	2SD-639	25p
BA718	199p	STK0040	550p	TEA2018A	140p	2SA-893	15p	2SB-632	40p	2SC-1447	75p	2SC-2502	90p	2SD-641	310p
BA6109	180p	STK2025	750p	TDA1044	275p	2SA-896	35p	2SB-633	50p	2SC-1454	320p	2SC-2537	450p	2SD-666	25p
BA6208	199p	STK2129	699p	TDA1170	150p	2SA-899	60p	2SB-641	20p	2SC-1473	30p	2SC-2546	20p	2SD-667	25p
BA6209	199p	STK2250	800p	TDA1515	250p	2SA-900	35p	2SB-643	20p	2SC-1474	45p	2SC-2550	70p	2SD-669	40p
BA6219	250p	STK3062	650p	TDA1908A	100p	2SA-905	20p	2SB-644	25p	2SC-1475	45p	2SC-2555	150p	2SD-687	60p
BA6222	199p	STK4121	699p	TDA2003	100p	2SA-915	30p	2SB-647	30p	2SC-1507	50p	2SC-2564	230p	2SD-716	120p
BA6238	199p	STK4131	650p	TDA2005	130p	2SA-916	30p	2SB-648	55p	2SC-1509	45p	2SC-2565	260p	2SD-718	130p
BA6239	250p	STK4132	699p	TDA2030	130p	2SA-917	35p	2SB0649	40p	2SC-1514	40p	2SC-2570	50p	2SD-721	150p
BA6229	250p	STK4141	650p	TDA2270	340p	2SA-921	10p	2SB-673	80p	2SC-1520	85p	2SC-2575	25p	2SD-725	350p
BA6259	300p	STK4142	750p	TDA2577	200p	2SA-940	50p	2SB0681	250p	2SC-1550	60p	2SC-2577	125p	2SD-745	250p
CNX62A	300p	STK4151	680p	TDA2579	250p	2SA-950	25p	2SB-686	120p	2SC-1567	60p	2SC-2579	130p	2SD-748	150p
HA1377	199p	STK4152	900p	TDA2600	575p	2SA-958	70p	2SB-688	130p	2SC-1568	60p	2SC-2580	175p	2SD-761	50p
HA1392	230p	STK4161	799p	TDA3560	350p	2SA-962	60p	2SB-695	325p	2SC-1573	40p	2SC-2581	200p	2SD-773	30p
HA1394	250p	STK4162	799p	TDA3561	350p	2SA-964	65p	2SB-705	200p	2SC-1577	800p	2SC-2582	40p	2SD-781	30p
HA1397	250p	STK4171	850p	TDA3562	350p	2SA-965	25p	2SB-716	30p	2SC-1584	600p	2SC-2603	20p	2SD-788	30p
HA11225	160p	STK4172	899p	TDA3565	300p	2SA-966	25p	2SB-717	70p	2SC-1627	30p	2SC-2611	40p	2SD-789	25p
HA11235	160p	STK4181	899p	TDA3651	200p	2SA-968	70p	2SB-718	70p	2SC-1667	150p	2SC-2631	40p	2SD-792	340p
HA11423	210p	STK4191	999p	TDA3654	199p	2SA-970	15p	2SB-738	25p	2SC-1669	85p	2SC-2634	40p	2SD-794	60p
HA11711	650p	STK4192	999p	TDA4500	395p	2SA-984	30p	2SB-744	60p	2SC-1670	85p	2SC-2660	85p	2SD-822	400p
HA11724	800p	STK4372	600p	TDA4501	450p	2SA-985	65p	2SB-755	310p	2SC-1675	20p	2SC-2688	50p	2SD-836	85p
HA13001	199p	STK5332	350p	TDA4503	400p	2SA-992	30p	2SB-757	350p	2SC-1677	80p	2SC-2753	50p	2SD-837	80p
HA13108	350p	STK5333	699p	TDA4505	395p	2SA-999	20p	2SB-764	25p	2SC-1708	20p	2SC-2781	50p	2SD-1047	200p
HA13118	299p	STK5338	399p	TDA4510	375p	2SA-1015	20p	2SB-772	45p	2SC-1722	60p	2SC-2785	50p	2SD-845	250p
HA13119	299p	STK5372	399p	TDA4600	200p	2SA-1016	20p	2SB-792	45p	2SC-1756	40p	2SC-2791	325p	2SD-850	250p
HA13403V	550p	STK5211	699p	TDA8170	300p	2SA-1020	30p	2SB-793	35p	2SC-1758	30p	2SC-2792	275p	2SD-859	100p
LA4270	275p	STK5325	650p	TDA8180	500p	2SA-1048	20p	2SB-817	200p	2SC-1760	85p	2SC-2944	175p	2SD-863	70p
LA4440	240p	STK5315	650p	TDA8190	300p	2SA-1060	90p	2SB-837	60p	2SC-1775	20p	2SC-3078	40p	2SD-869	320p
LA4445	250p	STK5434	699p	UPC1031	180p	2SA-1062	125p	2SB-856	60p	2SC-1815	15p	2SC-3156	325p	2SD-870	320p
LA4460	160p	STK5422	650p	UPC1185	240p	2SA-1094	190p	2SB-857	60p	2SC-1819	50p	2SC-3179	200p	2SD-871	320p
LA4461	160p	STK5466	850p	UPC1188	399p	2SA-1095	275p	2SB-861	60p	2SC-1845	20p	2SC-3182	250p	2SD-880	40p
LA4465	299p	STK5476	600p	UPC1230	210p	2SA-1102	180p	2SB-886	65p	2SC-1846	45p	2SC-3284	175p	2SD-882	70p
LA4466	299p	STK5481	499p	UPC1225	220p	2SA-1104	200p	2SC-789	50p	2SC-1848	45p	2SC-3298	120p	2SD-898B	260p
LA4475	399p	STK5490	550p	UPC1277	240p	2SA-1106	200p	2SC-790	80p	2SC-1875	260p	2SC-3506	250p	2SD-917	180p
LA4476	399p	STK7226	850p	UPC1278	240p	2SA-1110	60p	2SC-815	15p	2SC-1890	20p	2SC-3281	299p	2SD-951	175p
LA4495	399p	STK7308	475p	UPC1288	250p	2SA-1123	40p	2SC-828	25p	2SC-1906	30p	2SD-198	180p	2SD-982	80p
LA4496	399p	STK7348	450p	UPC1318	350p	2SA-1141	200p	2SC-829	20p	2SC-1909	250p	2SD-200	210p	2SD-985	80p
LA4500	230p	STR441	450p	UPC1363	199p	2SA-1142	65p	2SC-839	25p	2SC-1913	100p	2SD-234	40p	2SD-1128	80p
LA4505	260p	STR451	499p	UPC1365	299p	2SA-1145	60p	2SC-929	20p	2SC-1914	30p	2SD-235	40p	2SD-1134	80p
LA4508	260p	STR50103	399p	UPC1378	210p	2SA-1146	190p	2SC-941	25p	2SC-1922	275p	2SD-288	80p	2SD-1135	90p
LA4700	399p	SR2M	80p	UPC1394	190p	2SA-1147	190p	2SC-945	20p	2SC-1923	20p	2SD-299	160p	2SD-1138	60p
LA7520	300p	STR4211	499p	UPC1420	525p	2SA-1156	60p	2SC-959	65p	2SC-1941	40p	2SD-313	40p	2SD-1153	50p
LA7530	400p	STR4090	595p	TRANSISTORS		2SA-1180	200p	2SC-984	40p	2SC-1942	190p	2SD-315	75p	2SD-1207	50p
LA7800	180p	STR40090	595p	TIPL791A	130p	2SA-1220	50p	2SC-998	300p	2SC-1945	350p	2SD-325	45p	2SD-1265	100p
LA7801	195p	STR5412	450p	BUT11AF	120p	2SA-1232	175p	2SC-1162	35p	2SC-1969	160p	2SD-331	80p	2SD-1267	140p
LA7820	299p	STR6020	450p	BUT11A	85p	2SA-1262	65p	2SC-1172	150p	2SC-1980	25p	2SD-400	20p	2SD-1273	100p
LA7830	225p	STR50020	650p	BUT56A	120p	2SA-1265	150p	2SC-1173	45p	2SC-1986	60p	2SD-401	50p	2SD-1275	125p
M293B1	695p	STR54041	550p	BU508AF	100p	2SA-1282	35p	2SC-1195	200p	2SC-2003	25p	2SD-414	40p	2SD-1276	125p
M490BB1	850p	STR58041	550p	BU508DF	130p	2SA-1302	299p	2SC-1212	60p	2SC-2009	60p	2SD-421	60p	2SD-1397	200p
M491BB1	850p	STR59041	650p	S2000AF	150p	2SB-507	100p	2SC-1213	60p	2SC-2022	60p	2SD-424	350p	2SD-1398	170p
M54543L	400p	STRD1806	599p	S2055AF	150p	2SB-509	100p	2SC-1214	40p	2SC-2026	45p	2SD-426	300p	2SD-1426	275p
M54544L	400p	STRD1816	599p	SG613	850p	2SB-511	100p	2SC-1222	20p	2SC-2057	25p	2SD-427	300p	2SD-1427	275p
M54545L	400p	SAA1251	400p	SG264A	550p	2SB-1016	80p	2SC-1226	75p	2SC-2068	50p	2SD-428	300p	2SD-1432	400p
M54548L	450p	SAA1291	900p	2SA473	35p	2SB-512	100p	2SC-1306	75p	2SC-2073	50p	2SD-438	45p	2SD-1439	200p
M54549L	450p	SAA1294	1250p	2SA672	30p	2SB-514	100p	2SC-1317	25p	2SC-2120	15p	2SD-461	100p	2SD-1441	200p
M54644L	400p	SAA5000	250p	2SA673	20p	2SB-527	40p	2SC-1318	25p	2SC-2153	25p	2SD-468	25p	2SD-1453	170p
M54648L	450p	TA7193	400p	2SA677	60p	2SB-528	40p	2SC-1327	20p	2SC-2229	20p	2SD-471	30p	2SD-1497 02	520p
M54649L	400p	TA7240	260p	2SA683	25p	2SB-531	200p	2SC-1328	25p	2SC-2230	30p	2SD-476	60p	2SD-1497 06	520p
MB3730	200p			2SA684	40p	2SB-534	200p	2SC-1344	30p	2SC-2236	30p	2SD-478	100p	2SJ-50	425p
				2SA697	35p	2SB-536	60p								
				2SA715	20p	2SB-537	60p								
				2SA722	40p	2SB-544	60p								
						2SB-545	150p								
						2SB-546	70p								

EAST CORNWALL COMPONENTS

SEND FOR OUR 1991/92 CATALOGUE — 132 FULL PAGES £2.00 — INCLUDE PRE-PAID ENVELOPE ORDER FORM — VELMAN KIT CATALOGUE LATEST SPECIAL OFFER

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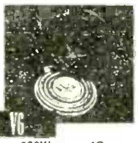
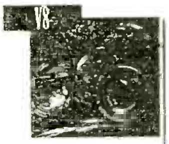
HIGH PERFORMANCE CAR SPEAKERS by EMMINENCE MADE IN U.S.A

HIGH PERFORMANCE DRIVER



200W max—4Ω
£35.99 (normally £39.00)



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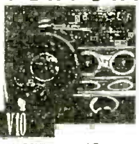

400W max—4Ω
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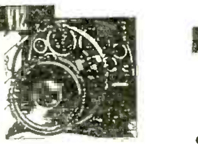

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19-57mm 25p 60-94mm 29p
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UNIVERSAL
High quality 12 Volt Universal Video Cassette Recorder Lamp and Head Lead length Approx 30cm
ORDER CODE VID LAMP
Price — 60p

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3V00 HR3330EK
FERGUSON VHSTJ1
3V22/HR3320EK
ALL £8.00 EACH

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Description		Order	Price
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	12V CCW 5mm Shaft	VID 2103	6.25
	12V CW 7mm Shaft	VID/2105	6.85
	12V CCW 7mm Shaft	VID 2106	6.85
	12V CW 10mm Shaft	VID 2114	4.00
	9V CW 10mm Shaft	VID/2115	4.95
	9V CCW 10mm Shaft	VID/2107	5.40
SHARP	Reel VC9300/9700	VID/2121	21.35
	Reel VC483H	VID 2122	22.00
	Loading 93 93 9700	VID 2142	21.60
	Capstan VC9100 9300	VID/2116	52.45
	Drum VC200 9300 9500	VID 2139	54.20
SANYO	Reel VIC-5150	VID/2123	7.15
	Reel Beta M10-50	VID 2179	27.30
	Reel VHR1200 1300	VID 2198	16.30
SONY	Capstan SL-C6E/ES	VID/2160	35.00
	Drum BHF 1100D	VID 2118	43.65
JVC	Capstan PU45979	VID/2119	47.35
	Drum HR3300 3330	VID 2120	28.10
	Reel HR7700	VID/2162	68.10
	Capstan HR7700	VID/2163	81.95
	Reel HR220 2650	VID/2175	78.50
	Capstan HR2650	VID/2174	60.80
FERG	Reel 3V23	VID/2162	68.10
	Capstan 3V23	VID/2163	81.95
	Capstan 3V35 36 38 39	VID 2165	32.50
	Load 3V42-48 54 55	VID/2167	15.75
	Capstan 3V44 45 48 54	VID/2188	67.75
HITACHI	Capstan VT33	VID/2148	37.10
	Capstan VT-5000	VID 2149	49.75
	Capstan VT-8000 8500	VID/2155	76.65
	Capstan VT-9300 9500	VID 2156	88.30
	Drum VT-5000 5500	VID/2157	44.75
NAT PAN	Reel NV333 366	VID/2158	26.70
	Reel NV7000E	VID/2159	37.10

CW = Clockwise CCW = Anti-clockwise

TWIN FLUORESCENT LAMP — 12V

A very attractive twin tube lampholder with two 12V BW fluorescent tubes. White plastic case with clear plastic ribbed diffuser and ON OFF switch. Supplied with 90cms of twin flex for connection to 12V battery (Red stripe to positive). Ideal for caravans, boats, vans etc.
Overall dimensions 370 × 65 × 41mm
ORDER CODE Opto TFL 12

	1+	10+	50+
Price	£6.50	£6.00	£5.25

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Identical to above unit but single tube
12V dc 8 Watts Dims 360 × 62 × 37mm
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SPARE TUBES 8W

Replacement tube for above Twin and Single fluorescent lamps. Fits most 12V fluorescent lamps, Philips etc. Tube length approx 300mms (inc pins).
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PORTABLE FLUORESCENT LAMP — 12V

Free-standing or hanging with 15ft cable terminating in cigar lighter plug. For use in car, boat, van or home emergency. 12V dc. EVEN FLOATS IN WATER!
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FERGUSON		
3V00 3V01/3V29	VID 2511	15.85
3V16/3V22/3V23 3V24 3V30 3V31 3V35/3V36 3V38 3V39 8903	VID 2647	15.85
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VT11 VT14 VT33	VID 2504	28.20
VT3000	VID/2511	15.85
VT4000 4200 5000	VID/2503	29.15
VT6500 7000 8000 V&8000 8500 9000 9300 9500 9700 9900	VID 2509	28.20
JVC		
HRD 110E 110EG 111 120 121/225/ 2200/3660 7600/7610 7650 7700	VID/2647	15.85
HR3300 4100 7200	VID 2511	15.85
N.E.C.		
N830 831 833	VID 2647	15.85
PVC-2300 2400	VID/2543	23.00
NATIONAL PANASONIC		
NV100/370 380	VID/2526	18.50
VEH121 333	VID/2520	15.85
VEH0174/NV366	VID 2521	46.75
NV730	VID 2528	47.85
SANYO		
VTC5000	VID 2530	34.00
SHARP		
VC200 300 330	VID/2536	28.65
VC381 481	VID 2537	29.75
VC581 583	VID 2539	29.95
VC483 486	VID 2541	49.00
SONY		
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SL-C9	VID/2544	44.15
SL-C20 C24 C30	VID/2545	27.75
SL-8000	VID 2543	23.00
TOSHIBA		
V5470 5480	VID 2547	32.75
V9600	VID/2548	29.50
V73/81/8385	VID 2597	24.95

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NEC N830 N833	£3.30
ORION VH-1/2	£3.45
PANASONIC NV100 180 332/333/366 600E 777 778	£3.45
2000 230 3000 370 430/ 460 465/7000/7200 730 780/810/8200 830 8400/ 850 8600 8610/870/890	£3.45
PHILIPS VR 6460	£3.45
VR 6560	£6.95
SANYO VTC3000	£3.45
VTC5000 5150 5300 5350 5400 5500/6000 6500 9100 9300 m10/11 20/21/30/31/ M50	£3.45
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HITACHI	6886971	1.95
PANASONIC	VXP 0344	2.25
PANASONIC	VXP 0251	2.05
SANYO	REEL DRIVE PULLEY VTC 5150 143-0-662T-01201	7.20
SHARP	NIDL 0005 GE22	2.05
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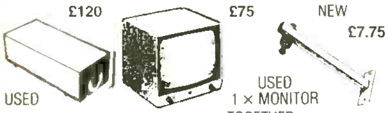

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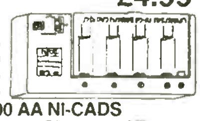

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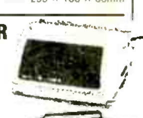

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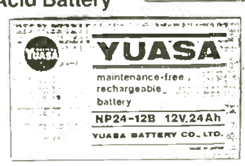

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COVER PHOTO
This month's cover photograph shows a Panasonic NV777 VCR with the covers removed. See servicing article on page 28.

REED BUSINESS PUBLISHING GROUP

What did you tape last night?

Despite the fact that the VCR has been a standard item of domestic equipment for many years now little was known about owners' use of their machines for time-shifting until recently, when BARB (the Broadcasters' Audience Research Board) started to check on playback viewing. Since the ability to time-shift programmes is one of the basic advantages provided by the VCR, it's surprising to find how little use is made of it. BARB's research reveals that there is now measurable taping with four out of five networked programmes, while only one per cent of UK viewers appear to make use of the time-shift facility. In the four weeks to September 1st only eleven programmes had playback audiences that exceeded 900,000. They included three movies and five episodes of *Coronation Street*. Time-shifting added about two per cent to the various networks' viewers, which works out at about half an hour a week per viewer. The terrestrial channels and satellite TV attract what time-shifting there is evenly, films and soaps being the main items that are time-shifted. The public is certainly being rather unenterprising in its use of the VCR. Is this possibly to do with the problems that so many people have in setting their timers? Or is it that so many people simply switch on and watch what comes? Whatever the answer is, it appears that VCRs are used almost entirely for viewing bought/hired tapes. This being so it's strange that playback-only machines never caught on. Perhaps the price differential was not enough to make such machines an attractive proposition. This unimaginative use of video could be bad news for the prospects of CD-I and CD-TV as mass-market products.

At the Funkausstellung

The main interest at the 1991 Berlin Consumer Electronics Show was HD-TV and those 16:9 aspect-ratio sets. HD-TV will not be with us for some years, as the authorities and broadcasters continue to argue about what standard to adopt. But those expensive 16:9 sets are due to start appearing in the shops any day now – though in very small quantities at first. It seems that the public showed little interest in 16:9 TV at the Funkausstellung. Is this so surprising? To this observer at least, the 16:9 screen looks not so much a larger one as a screen with the top and bottom chopped off. A small, shall we say slim-line, screen in fact. If this is the public's perception of wide-screen TV, it's future must be in some doubt. Japanese manufacturers seem to be taking to the 16:9 format however – a number of working 16:9 camcorders were on show.

At a special press presentation Thomson showed a prototype HD-MAC decoder the size of a standard VCR. The company is developing a set of eleven chips to reduce the size of the decoder. It will use SGS-Thomson 0·8 micron technology and should be available to setmakers by late 1993, at a price of around £1,900. By 1997 a futher chip set using 0·5 micron technology should be available, enabling a decoder to be fitted into a 16:9 receiver neatly.

Faraday

Last month saw, on September 22nd, the two hundredth anniversary of the birth of Michael Faraday who, amongst many other things, discovered the principle of the electric generator and motor. His father was a blacksmith who died when Faraday was thirteen. He was thus forced to leave school and seek work, taking up an apprenticeship with a bookbinder. The crucial break came when, at 22, he was hired by Sir Humphry Davy, director of the Royal Institution of Great Britain and famed as the inventor of the miner's lamp. At this time Faraday was self-taught and without any qualifications: he was within a few years to become Britain's foremost analytical chemist however. An early discovery was stainless steel – the rustless razor. In 1820, at the age of 29, he read of the discovery that a wire carrying an electric current would deflect the needle of a compass. His subsequent work in this field led him, in 1831, to lay down the laws of electromagnetic induction. Three years later he discovered the laws of electrolysis, which led to the electroplating industry. Ten years after that he linked magnetism and light, showing that a magnetic field could rotate the plane of polarisation of a light beam – the Faraday effect. These and other innovative work were great achievements: just how do you achieve such successes with so few clues? It seems that it was through a long process of patient research – observation and experimentation. That he managed it all with negligible mathematic knowledge might perhaps give those of us who always falter when it comes to maths just a little reassurance. . .

Equivalents

Following an appeal to readers earlier this year we were able to publish a number of VCR and TV equivalents lists. While they covered a lot of ground there's much additional information of this sort that would be helpful to readers. Comprehensive equivalents lists for TV sets/chassis and video equipment have been published by Mauritron Technical Services, 8 Cherry Tree Road, Chinnor, Oxfordshire OX9 4QY and Technical Information Services, 76 Church Street, Larkhall, Lanarkshire ML9 1HE.

The BBC Debate

The Home Secretary Kenneth Baker intends to produce next year a discussion paper setting out various possible options for the future of the BBC, whose Royal Charter runs out in 1996. The declared aim is to consult with the public and to look into all aspects of the services provided by the BBC, its finances and how it should operate. In an address to the Royal Television Society Mr. Baker commented that "there is clearly a role for public service broadcasting, but that role will have to be defined more explicitly". Since the role of the BBC is perfectly clear, one can't help suspecting that what he really means is that it should be curtailed. There are danger signals ahead.

The Video Bench

Steve Beeching, T.Eng.

We find that communications with dealers are poor at the best of times. Some of them could do with a kick up the backside for assuming that engineers are psychic. Telepathetic, yes possibly, but not psychic.

A Couple of Nicam VCRs

The fault report with a JVC HRD860 Nicam/hi-fi sound VCR that came in the other day read "audio E-E fault". Neither Darron nor I could find an audio fault, so we contacted the dealer. His engineer explained that it was a peculiar audio fault that sounded a bit like an echo and was somewhat "ambient" – like talking with one's head in a bucket.

No fault was found until some time later when we were wandering through the audio selector switches. The hi-fi/normal/mix button selects hi-fi left and right or normal or both. What's more on this model it functions with E-E monitoring as well as during playback. Demodulated Nicam audio and normal f.m. are mixed, the "ambient effect" being due to the time difference between the two channels.

Another HRD860 came in with a definite Nicam fault. The audio was very distorted, with a lot of background hiss. It sounded like an off-tune m.w. radio receiver.

No fault with the data or clock signals could be seen and all the crystal frequencies were correct. The DA converter chip was replaced, but this made no difference. As I had to get the machine back to the dealer, a new panel was fitted and aligned.

When a bit of time was available later that month a more detailed investigation led me to the expander chip. Its inputs and outputs were checked with the scope locked to the L/R switching signal. Fig. 1 shows the input, the L/R switching and the correct and incorrect output waveforms. The data signal starts at the right-hand side of its "window" and moves to the left with increasing volume. On average the audio leaves the data about half way through. The output from the faulty expander filled the window however. As a result the DA converter was overloaded. It was the expander chip that was faulty of course.

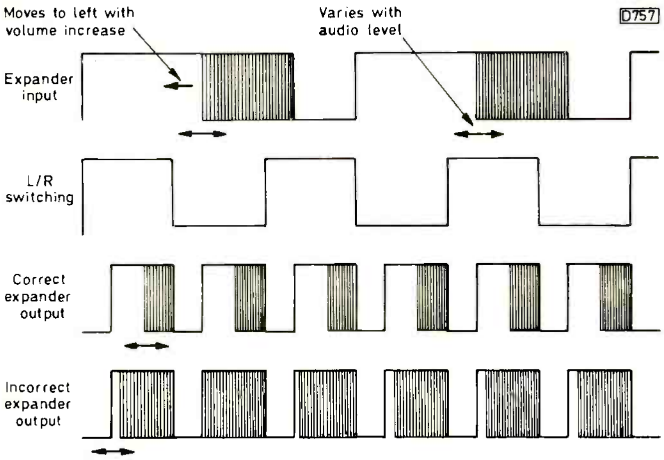

Fig. 1: Expander chip waveforms, JVC Model HRD860.

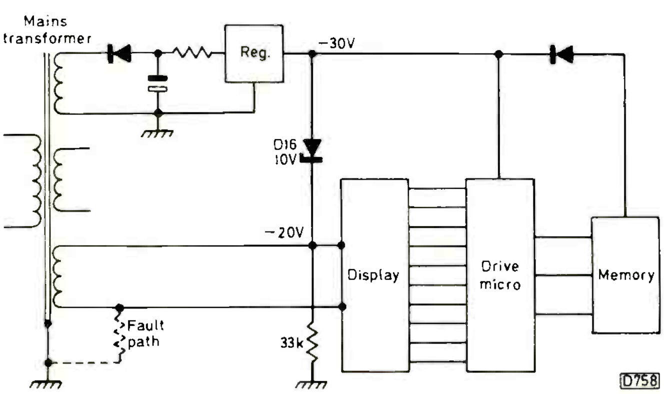

Fig. 2: Simplified circuit to show the cause of the problem with a JVC Model HRD500.

HRD500 Power Fault

A peculiar problem with a JVC HRD500 had Darron perplexed for some time. Replacement of the timer/display PCB had been requested. The symptoms were a dim display with R5, a fusible 220Ω resistor in the −30V power supply, going open-circuit. Damage was also sustained by the 10V zener diode D16 in the timer and tuning memory circuit and the −30V supply regulator transistor Q1. The dealer and Darron had replaced these items.

The problem and the failures suggested a severe overload on the −30V supply. Since D16 is linked to the display the latter could have been at fault. After fitting three or four more fusible 220Ω resistors, a couple of zener diodes, a new memory chip and a replacement display we were getting nowhere.

On one occasion the machine ran all right for a whole day – until we reassembled the power unit in the VCR, when the display dimmed and another 220Ω resistor went open-circuit. Ah, I hadn't mentioned that the fault was intermittent, had I? It's so common these days that I forget.

We made a small drawing of the power supply circuit, see Fig. 2, in order to try to make sense of the situation. It was soon obvious that for D16 to be involved the loading had to be in the fluorescent display, but this had been replaced. A d.c. resistance check then showed that the a.c. supply for the filament, normally a high-resistance path, measured 40Ω to chassis when the power unit was moved. The cause of the trouble was a faulty mains transformer, a new one providing a complete cure.

Had the dealer managed to obtain a complete (and expensive) timer/display PCB from JVC it wouldn't have helped!

A Two-speed Model

A dual-speed JVC VCR came in because there were noise bars instead of thin lines in the cue and review modes. The dealer's engineers had replaced a chip in the f.m. preamplifier section but this hadn't helped.

We quickly traced the cause of the problem to a non-operational LP video head which produced noise instead of an f.m. carrier. It would have been easy to assume that the output from the head was f.m., except that the envelope didn't vary when the tracking was altered by judicious application of a finger to the head drum.

The heads had been changed previously because of a hi-fi audio fault. Unfortunately we had to fit another new drum to prove that the heads weren't defective. The cause of the elusive fault was in the lower drum: a new assembly and alignment put matters right. I didn't delve into what exactly had failed however.

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A Look at Chopper Power Supplies

J. LeJeune

In my youth it was my lot to have to design chopper power supplies for use with cable TV systems. Ah well, everyone has some cross to bear! The basic idea of the switch-mode power supply, to give the arrangement its correct name, is a good one. In a "conventional" multi-voltage power supply, especially where some current demands are over 250mA, a lot of power is lost and consequently heat is generated where voltages are dropped using large power resistors. A series regulator is also wasteful in terms of dissipation.

Switch-mode power supplies of recent design have all been of the shunt type, with a transformer used to provide from individual windings the rails required in the equipment. Each winding can be optimised for the load it has to supply, and all the windings are interlocked by tight coupling to the core of the transformer. This arrangement provides regulation of all the supplies derived from the transformer in one go, and can also be used to provide mains isolation.

Cable Network Supplies

With a cable TV network the repeater amplifiers are powered via the signal-carrying coaxial cable. A static regulator at each amplifier is inefficient, and the number of repeaters that can be powered from any one point is seriously reduced when static regulators are used. Say the repeaters require a 20V supply. A 65V d.c. supply can be sent with the signal via the cable and quite a large voltage drop can be tolerated before the regulation with repeaters at the extremities of the system suffers. Use of a simple passive regulator will throw away 45V at say 200mA, resulting in a loss of 9W. In addition to this disadvantage it's not a good idea to use d.c. with cable networks because electrolysis at connectors results in high corrosion rates. So 65V a.c. is used with on-board rectification. This gives us $65 \times 1{\cdot}4 = 91$V d.c. to play with. Conventional 50Hz transformers with an input voltage selector at the primary and low-voltage secondaries can of course be used with such a system. But switch-mode power supplies with their high efficiency are more advantageous. Fewer injection points are needed, with a cost saving, and no input voltage selection is necessary. There's also a weight saving, which is important with equipment that has to be mounted on walls or up poles. This weight saving is brought about by the use of ferrite-cored transformers, which can be employed with the h.f. operation of a switch-mode power supply – the transformers are also smaller.

Basic Series Chopper Circuit

Early switch-mode power supply designs used in TV chassis such as the Thorn 3000/3500 were of the series type, supplying a single stabilised output. If other, lower, voltages were required they had to be "dropped" from the stabilised line (see Fig. 1). This defeated the primary usefulness of the system, so the series-type chopper power supply soon ceased to be used where more than one stabilised rail was needed.

We'll briefly outline the operation of the arrangement shown in Fig. 1. Chopper transistor Tr1 is switched on and off by a variable mark-space ratio squarewave drive waveform. When the load increases, the output voltage will tend to fall. This is sensed by the comparator, which adjusts the chopper drive. Tr1 is thus switched on for a longer period during its on/off cycle, increasing the supply to the load. Inductor L1 acts as the energy reservoir for the system. When Tr1 is switched off, the voltage at its emitter swings negatively and the efficiency diode D1 conducts. This clamps the feed end of L1 at chassis potential and the stored energy supplies the load.

Shunt Circuit with TDA4600

In a TV set several rails with widely different voltage and power requirements have to be provided. These can be supplied by a shunt-mode chopper circuit. As an example we'll consider the very common arrangement based on the TDA4600 control chip: Fig. 2 shows the circuit as used in the Mark III version of the Ferguson TX9 chassis.

The mains input is fed to a standard bridge rectifier (D62-5) which produces some 350V across its reservoir capacitor C140. This supply feeds the primary winding of the chopper transformer T1. The earthy end of this winding is connected to chassis via the chopper transistor Tr62. Drive for the base of Tr62 is provided by the TDA4600 chip IC57. As Tr62 is switched on and off, so the d.c. supplied to the primary of the transformer is chopped. This chopped d.c. looks like a.c. to the transformer, and a simple transformation from the primary to the secondary windings provides, after rectification, the stabilised output rails. One might be tempted to accept this simplistic view as being all there is to switch-mode power supply operation. If only it was that simple!

The cycle of events is rather more complicated. When Tr62 is switched on, current flows in the primary winding of T1. Because Tr62's load is inductive, the current flowing in the primary winding will rise relatively slowly, not instantaneously as it would if the load was resistive. The reason for this is that the transformer's core will be magnetised as current flows in the primary winding. Because the flux is changing (increasing), an opposing current is set up. The net result is the production of a current ramp waveform. As the current increases, so does the flux in the core. If this was to continue unchecked the core would eventually saturate. Before this happens Tr62 is switched off, interrupting the current flow. With nothing to maintain it, the flux now collapses quickly, producing a reverse current flow in the windings coupled to the core. As a result D67, D69, D70 and D71 conduct, charging their respective reservoir capacitors. Tr62 is subsequently

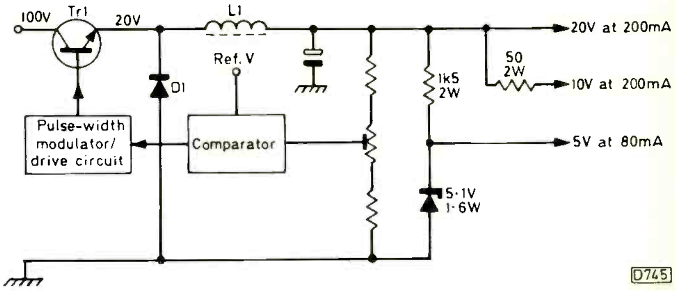

Fig. 1: Basic series chopper arrangement, which provides a single stabilised output.

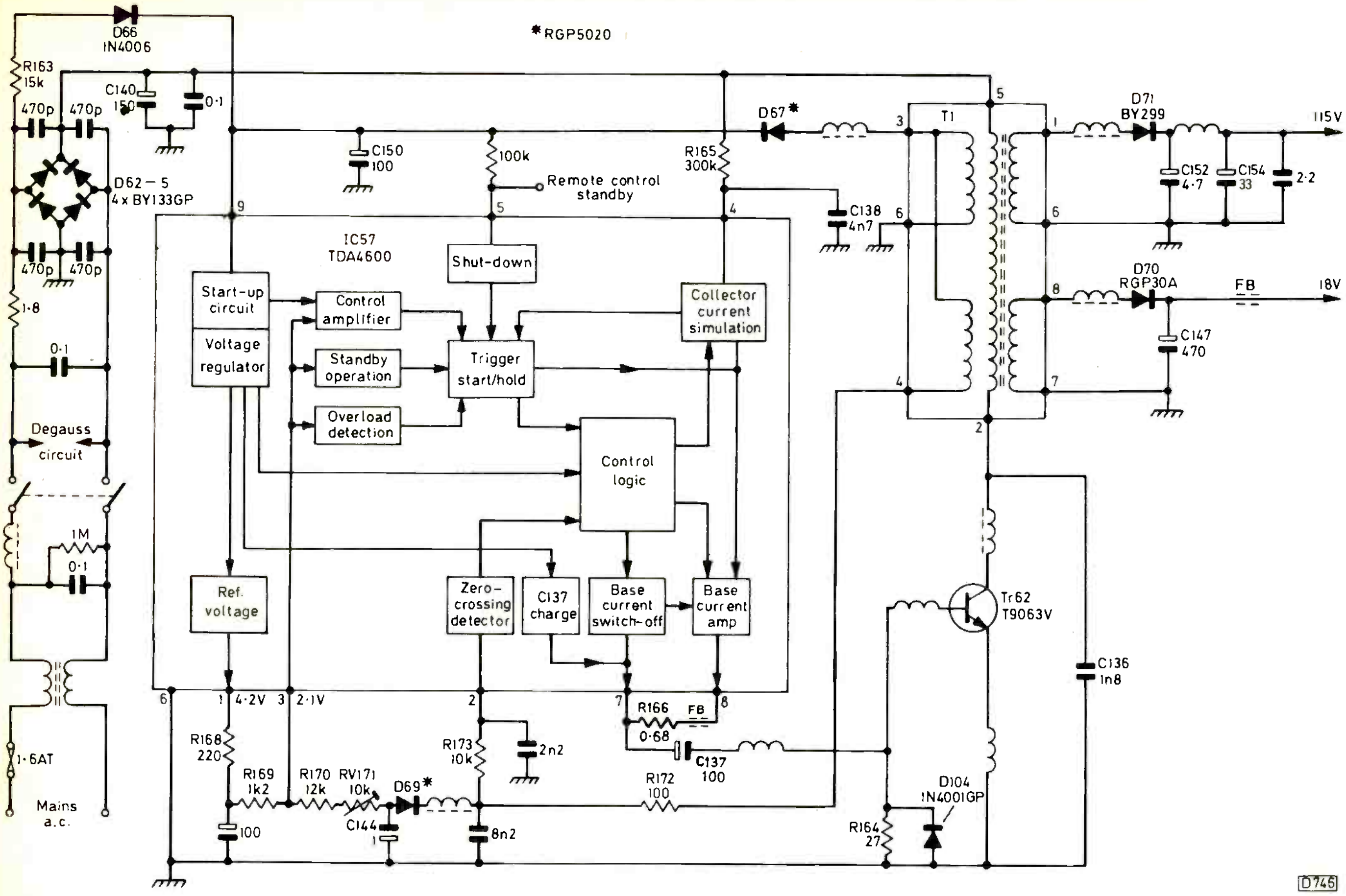

Fig. 2: The shunt chopper circuit with TDA4600 control chip used in the Ferguson TX9 Mk. III chassis.

switched on again by the chip and the cycle is repeated. IC57 controls the on/off switching cycle by sensing the transformer's output and the a.c. conditions within it.

At switch-on there's no supply from D67 at the chip's supply pin 9. To get things going D66 charges C150 from the mains supply via R163. Because of R163, the voltage across C150 rises slowly. When the voltage at pin 9 of the chip rises to 7·5V, short pulses are delivered to the base of Tr62 so that it conducts briefly once each cycle. The object of this exercise is to provide a supply for D67, which conducts to increase the voltage across C150. When this voltage reaches 12·5V D66 is reverse biased, IC57 has its normal operating voltage and the chopper supply is fully operational. In other words a soft-start action has been provided.

Regulation depends on the voltage at 3 of IC57. An internal voltage regulator produces a reference voltage of 4·2V at pin 1, which is linked to pin 3 via R168 and R169. The winding between pins 3 and 4 of the transformer provides feedback for regulation purposes. D69 rectifies the output from the feedback winding, developing across C144 a negative voltage that's proportional to the power supply outputs. This voltage is fed to pin 3 of the chip via RV171 and R170, backing off the positive voltage from pin 1. The resultant voltage, about 2·1V, is sensed by the logic in the chip and is used to adjust the conduction time of Tr62. As an example, if the output from T1 is excessive D69 will provide a greater negative potential across C144 and the internal logic will shorten the on time of Tr62 accordingly.

Pin 2 of the chip receives an a.c. input from the same reference winding, via R172/3. This pin feeds a zero-crossing detector which senses the point at which the feedback waveform passes through zero. The significance of this relates to the fact that D70/71 conduct when Tr62 switches off, transferring the energy stored in T1 to the load. As the flux in T1 collapses, the feedback waveform passes through zero. This is the point at which Tr62 must be switched on again. The zero-crossing detector tells the control logic in the chip to do this.

The supply's frequency of operation is not locked to the line frequency. In normal service it free runs at between 18-23kHz.

Whilst Tr62 is conductive pin 4 of IC57 is open-circuit. C138 then charges from the 350V rail via R165. When Tr62 is cut off by the drive at pin 7, pin 4 is earthed and C138 is discharged. Thus there's a sawtooth waveform at pin 4. This serves two purposes. Since Tr62 is a power device it has a low current gain in the region of 20-30. As Tr62's collector current increases, its gain falls and a greater base drive is required to hold it saturated. This is achieved by using the rising ramp voltage at pin 4, after amplification, to provide a rising current drive ramp at pin 8. In addition, protection in the event of an overload on one of T1's secondaries is achieved by sensing the amplitude of the ramp waveform at pin 4: should its peak-to-peak amplitude reach 4V the control logic reduces the width of the drive pulse at pin 8. A short-circuit across the 115V line will reduce the base drive on/off time further.

Fault Finding

Thus the time-constant of C138 and R165 determines the maximum current passed by the chopper transistor. Should the value of either of these components alter, Tr62 could be subjected to a current overload. This sort of trouble can occur when an unsuitable type of resistor is used in the R165 position: it should be a metal-glaze resistor with a working voltage of 500V. In many designs two resistors in series are used in this position. R166 at pin 8 sets Tr62's maximum base drive current. Problems have been experienced with this small wirewound component – check it should Tr62 fail for no apparent reason.

Failure of Tr62 is usually catastrophic, as a result of punch-through between its collector and base. Thus 350V appears at pins 7 and 8 of the chip which dies. C137 generally suffers and R164 and D104 will also be damaged.

When repairing a power supply that's been damaged in this way it's as well to check that the base drive from the chip is o.k. before replacing Tr62 and applying the mains supply. Use a 4·5V battery to simulate the action of the transformer's reference winding – connect its positive terminal to chassis and its negative terminal to the anode of D69. Then use a bench power supply to provide 12V at pin 9 of the chip. A short train of pulses should be seen at pin 8 as the chip tries to get Tr62 going. The pulses will not be present for long as there's no zero-crossing information at pin 2 – the chip thinks the start-up has been aborted, which of course it has.

Though IC57 provides comprehensive protection this is insufficient to prevent destruction of Tr62 when components in its collector circuit are defective. The snubber capacitor C136 is included to delay Tr62's collector voltage rise time at switch off, thus reducing the dissipation in Tr62. Should the value of C136 change or T1 have shorted turns Tr62 will be rapidly destroyed, with the previously mentioned trail of destruction amongst its base circuit components. C136 and T1 are best checked by substitution. It can be expensive in terms of silicon to track down failure here.

Hum Cancellation

Hum reduction is a feature of most switch-mode power supplies. With the circuit shown in Fig. 2, any ripple on the 350V line will be reflected in the d.c. feedback to pin 3. Thus the mark-space ratio of the chopper transistor's base drive waveform will be modulated to compensate. Connecting pin 5 to chassis gives remote control standby operation.

Safety

A final word about safety. Since the d.c. supplied to a chopper circuit is usually derived from a bridge rectifier connected directly across the mains input, it follows that circuitry on the primary side of the chopper transformer is at peak mains potential. Thus care should be exercised when fault-finding and carrying out repairs. An isolation transformer helps, but there are still some hefty voltages present at considerable power.

A Neptune 171

John C. Priest

One of these 12in. monochrome portables, of East European origin, came in recently with the complaint that it went off after a quarter of an hour. When we put it on the bench and switched it on we immediately got a picture and sound. Half an hour later it showed no sign of going off, so we put it on one side to play to itself while more urgent (and profitable) matters were dealt with. It ran quite happily without fault for three days. I was considering the possibility of a faulty mains socket when the picture and sound went, leaving a slightly noisy raster.

Test Procedure

By the time the back had been removed the fault had of course cleared. So after spending a short while checking for dry-joints in the area of the tuner and its 30V supply the set was once more put to one side. Some time later I noticed that the screen had blacked out. Turning up the volume showed that the sound was still present, so attention was turned to the line output and driver stages. The main semiconductor devices here were first checked and found to be o.k. Then the line output transformer was checked for continuity of the windings and dry-joints. Everything was in order.

Voltage checks showed that the 10·9V l.t. supply was not present at the collector of the line output transistor though it was present at the anode of the efficiency diode D406. This diode had measured o.k. both in circuit and out, but a replacement brought the set back to life. The original had rather smeary markings which were difficult to make out, possibly DYP-071 350R. Anyway, a BY223 fitted the heatsink and print and as this device stands up to the demands of the Philips G11 chassis we felt that it should be all right in a small mono portable TV set.

While tracing the cause of the fault we had established that the TBA950 sync/line generator chip U251 was producing a line-frequency squarewave output at pin 2. When the raster was restored however there was a distinct lack of line sync. We found that the sync waveform from the labelled pin of the i.f. module was not present at the TBA950 end of the series resistor. All the chips in this set have sockets, so the quickest check was simply to plug in a new TBA950. Fortunately this cleared the fault. The original trouble about which the customer had complained, the loss of signals, turned out to be due to a lazy BF970 oscillator transistor in the tuner.

Background Information

This is a solidly built little portable. Its robust PCB is held in a metal frame that slides horizontally into the black, wedge-shaped cabinet. The simple l.t. bridge rectifier plus series regulator power supply is fed from a substantial mains transformer that's mounted in the middle of the PCB and supported by two screws through the bottom of the cabinet. The u.h.f. tuner and i.f. module are mounted to the right of the chassis, the line output transformer is to the left, the six-position channel selector switch unit is along the front left-hand edge of the chassis while the tuning potentiometers are in the centre, behind a small flap. The contrast, brightness and volume/on-off rotary controls are to the right. Component layout is uncluttered and the circuitry uncomplicated, so repair of these sets should present no problems.

The set that came in was less than a year old. A few years ago a couple of imported sets with a similar chassis but with a mechanical u.h.f. tuner and the controls mounted at the top of the white cabinet came in. They were of Czechoslovakian manufacture, but this latest set gave no clue as to its origin other than a couple of production labels inside with Cyrillic script – all the other markings were in English.

You will probably meet a number of similar sets sold, under various names, by mail-order companies, mini-markets and discount shops.

Teletopics

VIDEOPHONES

Could the videophone, enabling callers to see each other, become one of the next mass-selling consumer electronic products? Quite possibly, since Amstrad aims to start selling videophones by September 1992. The price will be all important of course – at this stage Amstrad is unwilling to suggest a firm figure but something in the £250 to £500 range seems likely. Development is being undertaken by Amstrad in conjunction with GEC Marconi, who will be responsible for the data-compression system used. The units will have an in-built camera and a flip-up, 3 × 4in. colour display. They will work via an ordinary telephone socket, providing "extremely acceptable" picture quality.

BT has estimated that by 1995 the European videophone market will be worth £1.7bn a year. It has developed prototype videophones for use with integrated services digital networks (ISDNs) – BT charges £400 to instal an ISDN socket and an annual rental of £360. This should ensure a higher quality picture than with an ordinary telephone line. The units have a 9 × 4in. display with a 4in. built-in camera above. Price could be anything from £2,000 to £5,000, but is expected to fall dramatically as the service develops. Possible features include a switch to give self-viewing and another to remove viewing access.

Various other phone/video products have been developed by BT. One is a PCB for slotting into a personal computer. This, with an associated, separate camera, would result in much improved picture quality using the computer's monitor. Another is videophone multipoint, which would enable a number of videophones linked via a 64kbit/sec line to be used simultaneously for group discussions etc. So that the speaker is in view, the cameras are voice-operated.

The Cable Television Association reports that cable TV companies throughout the UK are connecting in the region of two thousand telephone lines a month and that the figure is accelerating. The number of telephone lines linked via cable TV networks now stands at over 11,500. A report by CIT Research suggests that by the year 2000 700,000 households and 100,000 businesses in the UK will take their telephone lines via cable TV networks, representing ten per cent of the telecommunications market with revenues of some £1.35bn a year.

CHANNEL 5

ITC engineers have been investigating the possible Channel 5 coverage and the implications of the new channel for domestic video equipment. It's expected that subject to international clearance six additional transmitting sites will be used, bringing the total to 31. Coverage would be increased to 73 per cent of the population and many localities would be able to have local programming. Under the terms of the 1990 Broadcasting Act, the Channel 5 operator will be responsible for retuning equipment affected by the Channel 5 transmissions. It's expected that some 2.4m VCRs will have to be retuned.

TRADE NEWS

Annual UK production of TV sets by Japanese manufacturers is expected to reach 4m this year and rise to 6.8m in 1995. VCR production is expected to rise from 1.7m this year to 2.9m in 1995. Last year the UK had a TV receiver trade surplus of £271m.

Thomson Consumer Electronics has received an order for 30,000 BBC Select decoders. Production of Thomson's cheaper VCRs is to be moved from Berlin to Singapore (see Singapore Briefing, page 882 last month). TCE plans to open a new plant for the production of up-market VCRs in Germany later next year. As with the Berlin plant, which will now produce exclusively for JVC, the new plant will be a joint venture with JVC.

Philips has signed preliminary DCC technology licensing agreements with Sanyo, Sharp, Yamaha and Tandy.

Wizard Distributors, Empress Street Works, Empress Street, Manchester M16 9EN (telephone 061 872 5438) has been appointed official distributor of spares for Loewe Opta products to trade customers throughout the UK. A similar agreement has been reached with Sakura Ltd. for the supply of satellite receiver components. Wizard has also added computer spares to the range of parts available for Schneider equipment.

NEBS has introduced a new two-part form to simplify service and repair paperwork. It acts as an invoice and customer receipt and enables a record of work done/required and parts supplied etc. to be kept clearly. There are also service call cards. These well laid out forms could be very helpful for smaller firms. For details contact NEBS Business Stationary, Sovereign Way, Chester West Park, Chester CH1 4QU (telephone 0244 390 222).

VIDEO STILL CAMERA SYSTEMS

Fuji has developed, mainly for professional use, a still video camera system that records 21 400,000-pixel images on an 8Mbit memory card, using data-compression technology. The card can be plugged into a computer workstation where the images can be manipulated. Fuji admits that the resolution is not up to conventional photographic quality but points out that it is adequate for many commercial applications, such as desk-top publishing, and has the advantage of image processing flexibility. The data-compression chips were developed jointly by Fuji and Toshiba. Images can also be printed, displayed on a TV screen or transmitted over an ISD network. The camera is due to be launched next year in the Japanese and North American markets at an equivalent price of around £2,875. Fuji intends to pursue a five-ten year programme of further development.

Canon is to set up a High Street print service for users of its Ion disc still video cameras. It hopes that at least a hundred outlets in the UK will be able to provide the service by the end of next year. The cameras have not sold well to date – some 3,500 have been bought in the UK. They store up to fifty images on a 2in. disc. Image quality is similar to that of a Polaroid print.

SATELLITE TV

BSkyB, which is still losing around £1.6m a week, has added a sixth channel to its services. The Comedy Channel is scrambled and is available to subscribers to one or both of the BSkyB film channels. According to the *Financial Times*' satellite monitor there were some 62,000 dish installations during August. BSkyB claims that its services are now available to over 2.4m households in the UK, with a total of some 1.64m individual dish installations.

Amstrad has added a PAL/D2-MAC receiver to its range. Model SRD600 has a suggested price of £499 with a 60cm dish. The company showed a combined TV/satellite receiver/decoder and various VCR/satellite receiver combinations at the Berlin Consumer Electronics Show.

Amstrad has now sold nearly two million dish installations and claims 86 per cent of the UK market and 50 per cent of the European market.

Fujitsu has developed a chipset that reduces the number of i.c.s required to process the Japanese MUSE HD-TV signals from some 100 to 31. Using a number of processors to manipulate individual frames simultaneously reduces the number of memory chips required. Fujitsu claims that the chipset enables the price of MUSE receivers to be reduced by about £6,500. Toshiba/Motorola and Sanyo/LSI Logic are amongst other groups working on the development of MUSE chipsets.

CD-I LATEST

Philips has confirmed that its Compact Disc Interactive system is to be launched in the USA this autumn. The player, Model CDI901, will have a list price of $1,000 but will probably sell for around $800. It's expected to be available in some 1,000 outlets and will be supported by interactive kiosks and trained in-store demonstrators. There will be a catalogue of over 50 CD-I titles at the launch. GoldStar is developing a low-cost CD-I player that's expected to be available next year at around $500.

Philips and Kodak have now finalised their Photo CD standard and will begin marketing Photo CD players next summer.

LASER DISC NEWS

According to the European Laser Disc Association sales of Laser Disc players in France and Germany should have reached the 75,000 mark by the end of the year. The disc catalogue in both languages now has some 400 titles – a further 150 titles are due for release shortly.

HD-TV CONFERENCE

The HDTV 92 conference and exhibition are to be held at the Business Design Centre, Islington Green, London N1 on December 9-10th 1991. HDTV 92 is concerned with "the business of high definition and new television systems", primarily from the software/studio/programme maker point of view. The attendance charge for the two days is £499·38 inclusive of VAT. Contact Meckler Ltd., 247/9 Vauxhall Bridge Road, London SW1V 1HQ (telephone 071 931 9985) for further details.

TV NEWS

Philips has announced its first 16:9 aspect ratio, 100Hz field rate TV set in the UK. Model 8906 has a price tag of £3,500 which includes the Philips Home Cinema audio system. Amongst the set's features are a movie-expand system to enlarge 4:3 pictures to 16:9, an 86cm tube, a colour-transient improvement circuit, a Nicam decoder, detachable speakers, PIP, Fastext and two scart, three S video and a phono audio socket. In addition Philips is to introduce three 4:3 aspect ratio TV sets with 100Hz field scanning and Nicam sound in the 59, 66 and 79cm screen sizes.

Nokia introduced a novel remote control handset called the TV mouse at the Berlin Consumer Electronics Show. It relies on the action of a small internal ball bearing that moves as the unit is tilted to the left, right, upwards or downwards or is held straight. As the bearing moves, light from IR diodes is blocked. This triggers, in conjunction with simplified button operation, the required commands. The unit also controls Nokia's VCRs. It will be available in the UK with a new range of stereo TV sets at the end of the year.

Two new ranges of c.r.t.s have been announced by Philips. The Cineline range has the 16:9 aspect ratio and will be produced in 36, 32 and 28in. screen sizes. The tubes are designed for 1,250-line scanning and have the new Philips DAF (dynamic astigmatism and focusing) gun for correct focusing over the entire screen area. They have Invar masks and Philips' own black matrix system. Philips' enhanced black matrix system and Invar masks are also a feature of the 4:3 aspect ratio Black Line S range. Its new Polygon overlapping electron gun system gives a sharp, clean spot.

ASTRA 1B

Problems with Astra 1B have been traced by the satellite manufacturer's engineers to misfunctioning chips in the on-board attitude control system. The craft is now being controlled from Astra's Betzdorf Satellite Operations Centre.

VIDEO NEWS

A large number of camcorders have been launched this autumn. One interesting technical development is digital signal processing. In the Sony CCD-TR105 for example the output from the CCD image sensor is fed to a gain controlled amplifier and then to an AD converter, after which matrixing, white balance, aperture and gamma correction, are carried out in digital form under the control of a microcomputer. DA conversion then gives analogue luminance and chrominance outputs to feed to the record section of the camcorder. Sony claims that this digital signal processing makes possible the camcorder's compact, lightweight design and high-quality performance. Other features are hi-fi stereo sound; six times variable-speed power-zoom and a full-range autofocus system with macro facility; manual override controls for focusing and shutter-speed adjustment up to 1/4,000 of a second; backlight compensation; a one-page digital superimposer (titles can be stored and displayed in a choice of eight colours, with scrolling and background reverse); insert edit and edit search, with an external connection for a Sony edit controller; high-quality playback capability of Hi-8 recorded tapes; and a black fader for smoother scene changes. All this in a 630g camcorder for £800 including case and accessories.

Hitachi's two new lightweight Video 8 camcorders, Models VM-E23 and VM-E25, also employ a digital signal processor (DSP). The claim is that by integrating most of the image processing into a single DSP chip space is saved, reliability is improved and picture quality is enhanced. Auto white balance and auto iris are also digitally controlled. The VM-E23 has a ×64 digital zoom, a ×8 optical zoom, five fast shutter speeds and a program auto-exposure system. It weighs 830g and has a price tag of £800. The VM-E25 has a twist-and-shoot mechanism and hi-fi stereo sound. It weighs 760g and has a suggested price of £900.

Sony's CCD-TR705 is a palmcorder that features Hi-8 technology. It has a 440,000-pixel image sensor and hi-fi stereo sound. The shutter speed can be adjusted down to 1/10,000 of a second. Sensitivity is two lux and extensive user controls are provided. A newly-designed tape stabiliser mechanism to reduce jitter uses a special tungsten tape guide between the supply reel and the drum. Associated with this the drum geometry has been changed, with a lower drum window incorporated to improve tape-to-head contact and output. There are full edit facilities and a credit-card sized IR handset to control playback, recording and zoom – a hold switch prevents accidental operation. The camcorder weighs 800g and has a suggested price of £1,000.

Panasonic's NV-S5 is a lightweight (680g without battery and tape) VHS-C camcorder with a digital image stabiliser and various digital effects including still picture, strobe and mirror – this gives kaleidoscopic picture effects. Suggested price is £900.

Canon's two Slimline Video-8 camcorders, Models UC10 and UC20, use the new lightweight MC-5LT chassis (weight 165g). The UC10 has a 320,000-pixel and the U20 a 470,000-pixel ⅓in. image sensor. At 580g the UC10 costs £800 while the 710g U20 with hi-fi stereo sound has a suggested price of £950.

Mitsubishi's two VHS-C palmcorders, Models CX1 and CX4, both weigh less than 600g and feature six-event settings for specialised shooting situations. The CX1 is priced at £700. The CX4, which has a twin gyro image stabiliser that senses movement along the horizontal and vertical axes, has a suggested price of £850.

Nikon's NV3100 Video-8 camcorder weighs just 590g and is priced at £800. Features include a ×6 zoom, LP operation and remote control. The VN7000 adds Hi-8 picture quality. It weighs 790g and has a suggested price of £1,000.

Akai has launched two lightweight VHS-C camcorders that feature its Intelligent HQ picture enhancement system. Both models weigh 750g. Model PVS-C20 has a price tag of £650 and Model PVS-C40 a suggested price of £750.

Philip's new camcorders include the VHS-C Model VKR6870 and the S-VHS-C Model VKR9010 which has hi-fi stereo sound and LP operation. Both are priced at £800.

Two new S-VHS-C camcorders, Models NV-S7 and NV-S9, have been announced by Matsushita in Japan. They have a digital image stabiliser plus digital zoom, strobe and snapshot recording, still mix and wipe, hi-fi stereo sound and a new 360,000-pixel ⅓in. image sensor. No details of a European launch have been released.

CD Player Casebook

Reports from Mike Leach, Alfred Damp, Michael W. Bliss and P.J. Roberts

Kenwood DP710

This machine came in a few months ago because it wouldn't read the discs. Since the turntable spun too fast the diagnosis was a faulty laser unit. A new unit was ordered, but a complete deck assembly with a different type of laser unit – it appeared to be a Sony KSS150A – was supplied because the original type is no longer available. Fitting it cured the problem, and the machine was returned to the customer.

It came back recently, again because it wouldn't read the discs. This time the turntable wouldn't spin at all. A quick inspection once more led me to the laser. With no disc in the machine there was very little focus coil movement. As the focus drive waveforms were o.k. I suspected the new laser. But with the machine turned upside down and a disc in the tray the player worked normally! It seemed that the coil found it easier to focus on the disc in the upside-down position. The trouble is that it carried on working correctly when the machine was turned upright again. I've now got to convince Kenwood that the laser unit is faulty.

In cases like this it's sometimes possible to lubricate very slightly the pivot around which the focus coil moves up and down. But it's not possible with this type of laser as the coil has no pivot as such – it moves up and down by what appears to be thin rubber attached to the coil. Presumably in this case the rubber was too springy, thus slowing the focus coil action with the result that there was no focus.

M.L.

JVC CAE21LBK

This JVC midi system had been a problem – a big problem. It came to me after two new laser units (type Optima 4), an 80-pin YM3805 signal processor chip and various other bits had been fitted elsewhere. The complaint was that it wouldn't read discs, which it certainly wouldn't. The disc rotated extremely fast while the sled assembly sped to the outer edge of the disc then returned. That was it. I pressed the open/close button and the disc almost flew out of the tray.

My first thoughts related to the signal path. Maybe there was no r.f. signal? I connected the scope to the r.f. test point and saw that the eye pattern started to appear then disappeared as the turntable sped faster. I assumed that the r.f. section was o.k., though I could have been wrong. The laser power was o.k., and the bit of r.f. waveform that was present was of the correct amplitude.

Servicing these players is no joke. As with most modern-day players/midis, the leads aren't long enough for the board to be taken out for servicing. All in all it was a bit of a struggle. Anyway, scope checks around the tracking servo (I knew that the machine was focusing all right) lead me in the right direction. Adjusting the tracking gain and offset controls made no difference at all to the tracking waveform. At the emitters of Q801/2 the tracking drive was low. Checks were then carried out around the YM3805 signal processor. Everything seemed to be in order apart from the voltage at pin 21, the TRHD signal. This pin should have been at 4·9V but was low at 1·5V.

The TRHD output from the YM3805 chip helps to generate the tracking error signal. It's fed to the base of Q803 in the tracking servo via a 10kΩ resistor. The voltage at the base of this transistor should have been −1·1V, but was 1·5V, thus upsetting the tracking servo. R827 (100kΩ) links Q803's base to the −12V rail. It was found to be open-circuit under load! When removed and checked it read 98kΩ, which seemed to be near enough, but when checked in situ it gave an open-circuit reading. Fitting a replacement restored normal operation. **M.L.**

Hinari DK100

The symptoms with this player were the same as those with a DK200 reported by V.W. Cox in the September Casebook, i.e. at switch on the arm slammed against the outer stop. In this case R122 (1Ω) was open-circuit.

M.W.B.

Sony CDP-M20

Only noise came from the audio outputs. Checks showed that the EFM was correct and that the signals arriving at the DA converter chip IC10 were apparently correct. So

IC10 was replaced. As this made no difference we had to assume that the data fed to IC10 was incorrect. Checks were then made around the digital signal processor and 16Kbit RAM chips. Replacing the RAM restored normal operation. **A.D.**

Philips CD104/304

These machines use double-sided PCBs with holes that are copper plated to link the two sides. This through-hole plating can go open-circuit, causing all sorts of problems. The most common is that the machine won't read the TOC or play. I've found that the best thing to do is to push through a length of 22 SWG TCW whilst heating the solder that's visible on the ground plane side of the linking hole, then cut and solder both ends.

Other problems I've had with these players have been as follows: thickened lubricant on the disc clamp and turntable spindle; worn turntable height adjustment screw (carbon screw); dry-joints on the voltage regulators; a build-up of debris under the turntable motor's rotor; and dry-joints on the servo and decoder PCBs.

Other faults have been caused by power supply problems. Hum on sound (both channels) occurred when the −18V supply was high while sound distortion (both channels) occurred when this supply went low. The 12V supply going high resulted in skipping during the first part of any track. Thus a quick check on the power supply outputs can save you a lot of time that might otherwise be spent chasing wild geese.

On one occasion a fault was caused by very fine breaks in some of the PCB tracks leading to the microcomputer chip.

We've found that the laser units used in these models seldom fail. So if a player that refuses to work comes in, don't straight away condemn the laser unit.

These are very good quality, well-built players: it's well worth spending money on keeping them going. **P.J.R.**

Satellite TV Notes

S. Pearson

Some satellite TV channels, for example the French TV5 channel via Eutelsat II-F1 at 13°E, have a mono sound carrier at 6·6MHz or thereabouts. This is something that the Amstrad SRD400 satellite TV receiver can't handle. Using a short-wave receiver I discovered that such audio subcarriers are present at the receiver's baseband video output socket. Thus a simple sound i.f. adaptor can be made to add to the receiver for reception of these "non-standard" sound channels.

A suitable sound i.f. adaptor can be provided very simply by using the sound panel from a scrap GEC C2110 series chassis – other sound i.f. panels could no doubt be used in a similar manner. Fig. 1 shows the connections required to the GEC C2110 panel and the power supply circuit used in the prototype. The satellite receiver's video output signal is loosely coupled to the sound panel's input via a 12pF capacitor. Coils L198 and L199 on the panel can be tuned to the required frequency by ear. P199 (panel PC471) sets the audio output level.

On the prototype unit I removed the audio amplifier chip IC181 and took the demodulated audio output via C192 (0·1μF) to a VCR's audio input socket. Alternatively you could leave IC181 on the panel and connect an external speaker to it. I found one puzzling problem with the former approach – perhaps someone could throw some light on it.

If the Amstrad SRD400's baseband video output is connected to a VCR the picture flickers like mad when viewed via the machine's r.f. modulator, though recordings made in this way are fine – I've tried this with three different VCRs. The adaptor is being used with a Goodmans/Daewoo VCR which has switched sockets for the baseband inputs instead of the more usual switch on the front panel. I solved the problem by feeding the satellite receiver's r.f. output to the VCR's aerial input socket with the sound adaptor connected to the audio input socket. It works with this particular VCR as the video and audio inputs are independently switched.

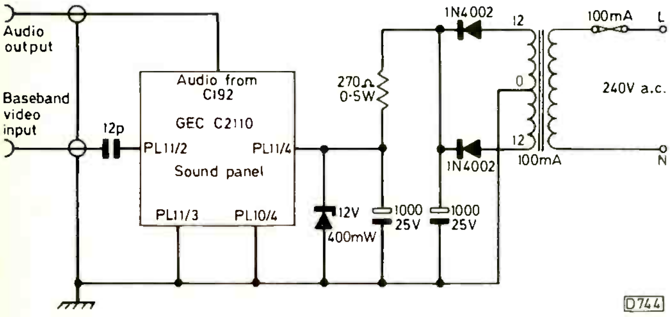

Fig. 1: Use of the sound panel from the GEC C2110 series chassis as an i.f. adaptor to obtain extra sound channels with a satellite TV receiver.

Two-satellite Dish Alignment

To simplify dish alignment to either Eutelsat or Astra I cut two small nicks in the dish's bracket, near the large securing nut, using a hacksaw. This enables the dish to be realigned simply by lining up the saw cuts by eye. Obviously the elevation angle also has to be changed slightly, but this can be done using the bracket's elevation scale. These notes apply to the standard 60cm dish.

General Points

Finally I'd like to raise some general points on the subject of satellite TV.

(1) There seem to be two types of F connector available, with different centre hole diameters – a small hole for RG59 coaxial cable or a large hole for low-loss coaxial cable. I feel that to avoid a mismatch where the cable enters the connector it's important to use one with the correct diameter hole. The inner dielectric of the cable should be a close fit through the hole and lie flush where exposed at the front of the connector. It's not unknown for installers to use the wrong type of F connector for the cable being used.

(2) A rubber boot that covers the F connector completely is now available from RS components.

(3) If you find it difficult to drive cable clips into a problem wall without destroying no end of clips, or mashing the cable, try drilling 5mm holes in the wall, plugging them with short lengths of 6mm wooden dowel, then driving the clips into the plugged holes. Clips can in this way be fixed to high spots on old stone walls. This avoids the cable being forced into the recessed mortar joints, with sharp kinks being made in it.

TV Fault Finding

Reports from Philip Blundell, AMIEIE, Ian Bowden, Steve Cannon, Alan Smith, Michael Dranfield, Ed Rowland, Paul Hardy and Stephen Leatherbarrow

Grundig T55-340 (CUC3400 Chassis)

Several of these sets have come to us dead and tripping. So far the causes have been: the set-h.t. control R637 intermittently or permanently open-circuit; D666 (BYV16) short-circuit; D664 (BA159) short-circuit; or IC686 (78M05) short-circuit. **P.B.**

Philips GR1-AX Chassis

There was no picture or sound, but the remote-command received LED flashed when the handset was tried. A quick check showed that the 95V output from the chopper power supply was low at 10V. I next made a few resistance checks on the power supply outputs and found that a reading of 60Ω was obtained across the +9 (10V) supply. The culprit was the sound chip, but although disconnecting the chip removed the short the symptoms remained the same.

A quick read through the circuit description was called for. In order to start the power supply requires 15V across D6613, which is a BYX79C15 zener diode. There was only 10V because D6613 was leaky. A new zener diode and sound chip restored normal operation. **P.B.**

Grundig CUC44XX/46XX

Models with teletext have a dealer facility that puts the station identification on all the time – it's normally on for only a few seconds at channel change. The procedure isn't given in the instruction book, but customers seem to find it by accident. To remove the permanent station display identification, switch to TV then to reveal with the remote control handset. To bring it back on, repeat the process. **P.B.**

Philips CTX Chassis

This set suffered from line tearing. It was much worse in the VCR position. The dealer had already changed the TDA2577 chip and the VCR switching components T7374, D6374, etc. As the tearing varied with the picture content I homed in on the sync separator section. C2378 (1μF) had dried up. **P.B.**

B and O 7702

The complaint was of intermittent loss of colour. It would tend to disappear more regularly with a high-brightness scene and a fairly high setting of the contrast control. When the fault was present, very weak, flickering inverse-phased chroma could be seen on the screen. The reason for this link was a very slight reduction in height with increased beam current: this resulted in a change in the width of the field flyback pulses that are taken from the deflection PCB via the field blanking circuit 70TR11/10 etc. to pin 28 of the TDA3300 colour decoder chip 70IC1. If the height control was adjusted in one direction the colour would come and go. The cause of the fault was the chip itself – it should work correctly with a wide range of pulse widths. **I.B.**

Salora 15L37

This set had a very dark picture. The colour level appeared to be normal but the luminance was low. We traced the luminance signal to pin 36 of the TDA3301B decoder chip IF01, where it's clamped and level-shifted before emerging at pin 34. The signal level at pin 34 was very low. A check on the components connected to this pin led us to the 220Ω preset PF01 which was open-circuit. Replacing this preset restored the amplitude of the luminance signal. **I.B.**

Sony KVM2511 (AE1 Chassis)

On occasions this set wouldn't come out of standby. The exact symptoms were as follows. On selecting standby the red LED lit but when a programme was selected to power the set the LED went out but the set didn't come on. Now these sets have a standby set-h.t. preset which in some cases was apparently misadjusted during production. We checked the h.t. when the set was up and running and found that it was correct at 135V. But when standby was selected the h.t. rose to 143V. When we attempted to power the set again the protection circuits sensed the increased h.t. voltage and shut the set down. After turning the set off completely at the on/off switch and waiting a couple of seconds the set could be switched on again and worked normally. We then set the standby set-h.t. control for 135V in the standby mode, after which everything was o.k. We've had to do this with several sets since then. **S.C.**

Philips K40 Chassis

This set came to us with a note to say that it destroyed line output transistors. Sure enough the BU508A was short-circuit collector-to-emitter, so a replacement was fitted and the set was switched on. As the picture and sound came up we put it on soak test. Whilst I was working on something else I heard the squeal of an overloaded power supply. Yes, it was the K40 and the line output transistor had failed again. We were going to have to maintain close observance whilst it was running on test to see whether there were any clues before the transistor failed again. We also decided to fit the higher rated BU508V, which would probably handle the fault condition better and give us a bit more time to watch for any clues.

With the set running on test we watched it like a hawk. After a short while the picture shifted to the left and the width reduced drastically. I dived for the on/off switch and managed to save the new transistor, but where was the fault? We replaced C2161 and C2163 in the line output transistor's collector circuit – they've given us trouble before – but this time they weren't guilty. We did discover however that the fault could be instigated by knocking the set or tapping the chassis. Dry-joint time, but none could be found in the line output stage. What about the line driver stage? This is on the bottom power supply panel, and when this was removed an obvious cracked and dry-joint was found on the line driver transformer. Resoldering it cured the problem. We have had this problem with quite a few sets from various manufacturers, but the usual symptom is intermittent loss of the picture. **S.C.**

Ferguson 41P3 (IKC2 Chassis)

When this three-month old set was switched on the standby light lit but the power supply was tripping. A check on the 107V h.t. rail at test point BP50 showed that is was at 50V-75V between trips. On the assumption that the cause of the trouble was heavy loading in the line output stage a check was made around the line output transformer and associated components. This revealed that the BA157 180V rectifier DL11 was short-circuit. In addition the associated series surge limiting safety resistor RL11 was open-circuit. This of course removed the short-circuit diode from the load: funny, I thought, the set trips when no current is drawn from the 180V rail! Anyway after replacing these two components the set still tripped out because I'd forgotten to reconnect the scan coil plug – it had been removed to get at RL11. **M.Dr.**

Binatone Colortron 01/9014

A very common fault with these 14in. colour portables is failure of the line output transformer – it usually burns out in a big way! Be sure to get the right one when ordering a replacement. Two types were fitted. They can be identified by the numbers, CF82 or CF65A. The two are interchangeable but give different focus voltages depending on the type of tube fitted. If you fit the wrong one the result will be a blurred picture. **M.Dr.**

Logik/Ferguson TX90 Chassis

The complaint was of a snowy picture. Tuner I thought, but on going through the channels I found that some were still tuned in. Perhaps children had pressed the tuning buttons? I retuned channels 1-4, but when these were re-selected they had disappeared. Further checks showed that channels 1-8 couldn't be stored in memory, though channels 9-16 would store o.k. Tuning and memory are handled by the M293B1 chip IC902 on the left-hand subpanel. As the 25V memory supply voltage was correct a new chip was fitted. This cured the problem. **M.Dr.**

Fidelity AVS2000

The fault report read "stuck on channel 8". This was true, but there was no audio either. The middle fuse (1A) of the three attached to the side of the record deck had blown. This fuses the bridge rectifier on the audio panel. Lifting R379, the feed to the 12V regulator, proved that the fault was due to the bridge or the audio output chips. The bridge was innocent, but both IC4 and IC5 were short-circuit. Two new TDA1908As and a new fuse restored normal operation. Stuck on ch.8 was of course due to there being no 12V supply to the M104B1 chip. **A.S.**

Philips CF1 Chassis

The problem with this 14in. colour portable was field collapse, accompanied by sound from a foreign radio station. This indicated that there was an i.f. fault as well. A look at the circuit diagram showed that the field timebase and i.f. sections of the receiver are both supplied from the same source. Tracing back revealed that R3583 (1Ω) was open-circuit. **E.R.**

Salora J Chassis

This set was dead with the h.t. filter resistor RB713 open-circuit and the two Ipsalo transistors TB700/1 short-circuit. These items were replaced and after resoldering several suspect joints, including one that, at CB712, looked as if it could possibly have been responsible, I switched the set on. The on/off switch had to be pressed several times before the set would come on, then after about half an hour the two transistors failed again. At this point I rather belatedly decided to consult Nick Beer's article on the J chassis (December 1989). As a result CB712, CB726, RB703 and RB705 in the Ipsalo transistors' base drive circuits were replaced. RB705 was difficult to locate as it was designated CB705 on the PCB! Two new transistors and a filter resistor then had the set working normally. **E.R.**

Ferguson TX9 Chassis

Intermittent loss of colour was the fault with this set. I dived in and changed the TDA3560 colour decoder chip, the delay line and the crystal, but this didn't cure the fault. Scope checks around the chip with colour bars present proved inconclusive. Oscillator adjustment in accordance with the instructions in the manual didn't produce the desired effects: the colour didn't lock very well and was very weak. I eventually found that the delay line balance control RV67 didn't do what it's supposed to do. On removal it was found to be open-circuit. Replacing it provided a cure. **P.H.**

Philips K30 Chassis

A colleague had spent some time on this set, trying to cure permanent tripping. He'd proved that there was an a.c. load on the power supply by disconnecting the drive to the line output transistor. In this condition the power supply would drive a 100W bulb. The line output transformer's secondary windings had been disconnected one at a time, and the line output transistor and transformer had been replaced. After such a thorough investigation there was very little left to check. Disconnecting the scan coils made no difference. Changing the flyback tuning capacitor C1567 (8·2nF, 1·5kV) got the set working – it was open-circuit. The original line output transformer was refitted, but it had met its Waterloo. **P.H.**

Philips KT4 Chassis

This set was dead. Having got the power supply out I carried out some cold checks. T7182 (BC547) in the standby circuit was open-circuit. **P.H.**

Ferguson TX10 Chassis

We've had this fault several times recently. You find that the picture is blanked except for the final inch or so at the right-hand side, where the picture content is correct. A check on the RGB h.t. line, which is normally at 205V, will produce a low reading of typically 55V. A scope check will show excessive line-rate ripple on this supply. The cause is the relevant reservoir capacitor, which is C726 (22μF). **S.L.**

Hitachi CPT1471 Mk 1

The complaint was of tripping and going dead, accompanied by ticking or arcing noises. This was caused by the usual power supply problems. A kit is available, including the STR6020 power supply chip, the field chip feed/supply transistor etc. After fitting these items the set gave us new symptoms. Although the power supply was now working well the field scan was accompanied by text lines and the flyback blanking was very poor. The field generator and driver stages, also the line oscillator and blanking circuits, are all within the LA7801 chip. Replacing this restored normal operation. It presumably died during the power supply's failure. **S.L.**

Letters

TIME WASTERS

While reading through some back issues I came across a correspondence on repair charges. It seems to me that we've been our own worst enemy in this respect. My particular concern is with time wasters. We've all had them, and there will always be people (you can't call them customers) who want something for nothing. Many TV/video repair advertisements offer a 24-hour service, free estimates, free call-out etc. No wonder that time wasters think nothing of calling out two or three different firms for quotations. They assume that we've nothing to lose. After all, repairing TV sets and VCRs can't be that difficult, otherwise why would so much free service be on offer? Can we blame the time wasters for thinking in this way?

But TV and video servicing to a high standard involves dedication, a lot of head-scratching, and technical know-how that has to be constantly up-dated. Just stop and think about your job. Is it really as the public seems to see it? Of course not. So let's get with it and start respecting ourselves and valuing our craft as it deserves.

My business was also guilty of offering too much free service. Yes, the phone never stopped, but detailed analysis of all calls over a six months' period showed that there was a very high percentage of time wasters. They represented a substantial loss in terms of wasted time, effort and money. Each and every time waster stops productive, profit-making work and often prevents calls on likely paying jobs because you're over-booked.

No matter how busy or slack we are our policy now is to make a fixed charge to cover time, petrol etc. when called out for fault assessment and a repair estimate. If our estimate is accepted however we don't make the call-out charge. These conditions are made clear on the phone before a call is booked in. We've found that this policy enables us to avoid time wasters as far as possible. Our overheads have been substantially reduced – yet the phone is as busy as before.

We're in business to make a living. Yes, job satisfaction is important, but it should be considered as a bonus, not a reason for running a business. If in doubt, ask your bank manager!

If you think that by carrying on with a free this, free that policy you are on to a winner, be prepared for the public to regard TV/video servicing as a low-grade job.

So let's get with it. There's plenty of work out there. Stop throwing your hard-earned knowledge away and don't worry about the cowboys. They never live long – let them have the time wasters.

John Edwards,
Bromley, Kent.

WORKSHOP MANAGEMENT PROGRAM

It's not very often in this day and age that one is able to applaud good service, but the service we have had from a software firm is second to none. It relates to a complete workshop management program. We purchased the original one in February, and although it was good we felt that with a few additions/modifications it could be even better. The firm not only accepted our suggestions but added a few new ideas of their own and sent these to us. The result is a program of outstanding quality at a price that's well within the means of any good workshop.

Just a little about what the program does. After booking in an item the program takes the repair through all its stages and finally keeps a record in the archive file until you decide either to dump it for good or to file it outside the system on a monthly disc. It can search its record by job number, make of unit or customer's name. Repair details stored include parts ordered/received/fitted, the engineer concerned, when the unit was collected/delivered and miscellaneous information such as "scratched cabinet" or "loose back cover", things it might be useful to be able to refer back to at a later date. The program can automatically send out up to ten standard letters that incorporate the job no., title, name and address – this is very useful for getting overdue items collected. It lists repairs still to be looked at as well as parts to order and to be fitted. A menu-driven system contols the data to disc to back-up and archives. The old records can be taken out and put on to separate discs so that the records for say only the last three months are current, giving more efficient back-up. A complete job card, label, customer receipt and invoice are provided. Without doubt the program is a great asset to a repair department.

I have no connection with the authors of the program other than as a customer and have nothing to gain from singing its praises, but I do feel that the service I have been given deserves wider acknowledgement. The firm concerned is TBR Software, 369 Chepstow Road, Newport, Gwent (telephone 0633 282 556). I came to hear of it through the pages of *Television*.

Geoff Fardon, Station Television,
Llanelli, Dyfed.

THANKS

I'd like to thank the many readers who wrote in following my reminiscences in "Fifty Years in Radio and TV". Without their letters we would not have known for example about the true origin of the two-pin plug, the spot where Blumlein fell or the true meaning of H2S (though I still like mine better!). I'm sure everyone understands that they were only the personal recollections of someone as fallible as the next man, and who like most people never had the time to keep a diary. As well as sparking off memories in us old-timers, I hope they entertained the younger generation of readers who perhaps have never changed a valve, ridden behind a steam locomotive or endured the "Crazy Gang" live!

It was a change to write hindsight. In the past foresight was needed. It took two months at least to get a piece from the pen to the newsagent's shelf, and at times inspired guesswork was required when definite information on latest developments was hard to obtain. Fortunately we were right most of the time! ' 's good to see that today's contributors are as forward looking and our readers as hawk-eyed as ever!

Harold Peters,
Lowestoft, Suffolk.

BEOVISION CORNER

In the September issue Paul Glazebrook asked for information on removing teletext lines with the B and O 3400 series 323X chassis. There's an official modification for this, to add the extra field flyback blanking circuit shown in Fig. 1. Take the input from the collector of 2TR8, at the bottom centre of board PCB3. Mount the added components at the top right-hand side of the board. The

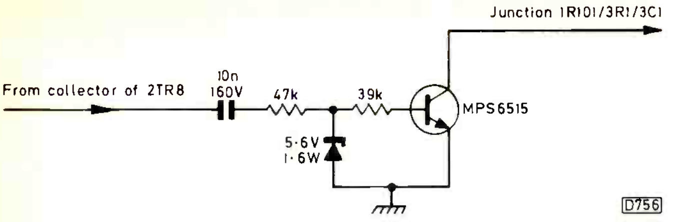

Fig. 1: Extra flyback blanking circuit for the B and O 3400 series 323X chassis to remove teletext lines.

blanking pulse is injected in the control-grid circuit of the 12HG7 luminance output pentode.

Can anyone supply part of the convergence drawer for a B and O 5000 type 3905 colour set? It's the larger part with the speaker grille finish, part no. 3131095. Alternatively I would take a complete drawer. It's required to complete restoration of the set. I'd gratefully pay for parts and postage.
C.R. Taylor, 8 Echo Barn Hill,
Kendal, Cumbria LA9 5NA.

OCR SCANNER TIP

A Panasonic Model FX-RS505 OCR scanner just out of guarantee got worse and worse and finally read nothing – it's a device to read printed text and pictures into a computer. I couldn't see anything obviously wrong when I opened it up for a visual check and to look for any adjustments. So there loomed the prospect of an expensive repair and a long wait. I then noticed that the mirror which slopes upwards was covered with an almost imperceptibly fine film of dust. Carefully cleaning it provided a complete cure.

There was nothing in the manual about cleaning this mirror. The mind boggles at the likely cost of sending the scanner to the repair agents via the shop just to clean this item.
John de Rivaz, B.Sc. (Eng.), AMIEE,
Porthtowan, Cornwall.

SAGA OF A G11

Here's a little story for those of you who think, like me, that they can do G11s blindfolded. The phone rang and a worried voice said "I've got a bit of a problem with my television". When I called on the customer I found that I'd misplaced my 4BA nut spinner, so I had to use my neon screwdriver on the three back bolts. I should have taken that as an omen.

With the back off I swung open the power panel and was confronted with a red 470μF h.t. reservoir capacitor. Sharp intake of breath. "Who did the last repair then?" "It's gone wrong only once in the past – my son-in-law who works for BT fixed it by soldering a dry-joint. This time I took the back off because the set was whistling and soldered that bit (pins 15 and 16 on the dynamic correction panel). After that it went bang."

I told him that it would have to go back to the workshop, and explained about the damage that can occur when the 470μF capacitor is a red one – the BU208A and TDA2600 ruined and a star-shaped hole in the tube neck. Seeing the look of horror on his face, I softened the blow by checking the BU208A. As it was all right I told him that the capacitor, having lasted all these years, was unlikely to be faulty but would nevertheless have to be changed to prevent damage during my three-months' guarantee period.

Back at the workshop I found that I'd run out of G11 capacitors – we don't keep much of the old stuff now. I could get one next day from NEC however. It arrived on time but when I removed the red one I found that the two VDRs (015 and 017) had burnt out against the can. Both mains fuses had blown, two of the bridge diodes had gone short-circuit, both thyristors were leaky and two resistors (R19 and R53) had burnt up. Due to a crack in the board there was no h.t. adjustment.

After replacing these items I wound up the mains input slowly using a variac. This showed that there was field collapse. A new TDA2600 gave me a raster with pincushion distortion – the BD238 EW modulator driver transistor had succumbed. Having done all this I was stuck with a noisy push-button channel selector unit. At my age I should know better than to say "this won't take long"!
John Hopkins,
Felixstowe, Suffolk.

HELP WANTED

I've been repairing TV sets and VCRs as a hobby for about five years and would like to start a servicing career. The trouble is that being nineteen and self-taught, with only limited qualifications, it's difficult to find an employer who is interested. If anyone would be prepared to take me on as a trainee technician would they please write to the address below.
Robert Ingleby, 8 Gilbert Mead,
Hayling Island, Hants PO11 0RE.

Can anyone supply a service manual or circuit diagram for a Commodore 1901 colour monitor? It may be of Samsung manufacture. Also does anyone have information or connection details for the MA1043LR clock module made by NS Electronics (National Semiconductors)?
John Walker, Eng. Tech., 14 Leamside,
Leam Lane Estate, Gateshead NE10 8NT.
091 469 0157.

Can anyone supply an AN239 chip for the Panasonic TC275G colour receiver?
Roy Goodall, 15 Bainbridge Road,
Bolsover, Derbyshire S44 6UD.
0246 827 365.

Has anyone in the Lancashire/Yorkshire area an Hitachi 17FHP22 tube or a set with a good one in it? I'm in the process of restoring an old CSP680.
H. Keighley, 117 Bradford Road,
Riddlesden, Keighley, Yorks BD20 5JH.
0535 603 012.

Can anyone supply a circuit diagram/manual for the Alba CTV10, also a working push-button channel selector unit?
Irving Finch, Engineering Faculty,
Luton College of Higher Education,
Park Square, Luton LU1 3JU.
0582 34 111, ext. 249 or 0582 576 693 (home).

Can anyone suggest how to get an Amstrad PC CM colour monitor to work with an Atari 520 STFM?
Steven Postgate, 10 Newman Close,
Wittering, Peterborough PE8 6EF.

Servicing the Panasonic NV777/788

Nick Beer

Amongst the various VCRs that have been marketed by Panasonic in the UK these two are a bit special. They are very similar, though by no means identical, top-of-the-range models dating from 1983-4. The NV777 was the first to appear: its features include front loading, an eight-event timer, infra-red remote control, reverse play and variable-speed slow motion. The later NV788 has the additional benefit of two-speed operation. While the LP quality is not as good as that with the NV730, a later machine that was on the market simultaneously for a short while, it's certainly better than that with the NV688, Panasonic's first consumer dual-speed model in the UK.

The mechanisms are a cross between the NV366 and the NV7200 series, with slight modifications. Anyone familiar with these mechanisms will soon find themselves at home with the NV777 and NV788.

Points to note

The NV788 has index searching, which means that there's an extra head at the front centre of the direct-drive unit. It inserts itself in the cassette cutout at this point when a cassette is loaded and is known as the MR head. The annoying thing is that the lead to the head, which is plugged at only the system control PCB end, is fed to the top of the mechanism through the large loading belt. Thus belt replacement involves undoing the PCB and all the lead retainers, then unplugging the lead, passing it through the old belt and threading it through the new one before this is fitted.

The still/slow performance is good. The still lock controls are accessible without removing covers. There's a small rubber strip on the right-hand side of the machine (viewed from the front): when this is removed the controls can be adjusted through the exposed hole.

At this stage of their life these machines, particularly the NV788s, will have begun to get a bit noisy. The reel motors tend to tick and buzz and the mains transformer can also buzz loudly when old. The power supply circuits are straightforward and, in our experience, have been very reliable.

Dismantling

The top cover is held on by four screws, one at each corner. With this removed you can take out the screening can by slackening the red screws and sliding it off. The heads can then be cleaned.

The front of the machine is clipped as well as being held by screws across the top. To remove the front you first have to take off the metal bottom plate, which is held by brass-coloured screws. Doing this allows the clips across the bottom of the front to be undone.

After removing these three items the cassette carriage can be taken out. Undo the four red securing bolts, one at each top corner, taking care of the earthing leads that will now be free. The small PCB mounted in the right-hand corner, over the mechanism, will also have to be removed – it's secured by three red screws. Lay it on the adjacent PCBs, with foam or something similar between for safe operation. If you want to remove the carriage completely, for example to replace mechanical parts, undo the multipin connector at the rear right-hand side. To run the mechanism with no tape or carriage, leave this plug connected, lift the carriage out and tip it upside down on to a piece of foam placed over the adjacent timer/presetter PCB. If you now insert a cassette into the carriage, bottom side up of course, the machine will run as the photosensors are on the side of the carriage and the emitter is in the machine. Note that in the rewind mode the machine will cut out if the take-up reel is not spun by hand, as this is where the reel-rotation sensor is situated.

One uncommon feature of these machines is that when the cassette carriage is removed you see a metal plate that's mounted over the reel drive and brake mechanisms beneath, with only the two reel turntables protruding. To replace the idler, brake band etc. this plate has to be removed. It's secured by two circlips, one large and one small one. The latter is usually damaged when it's removed, so it is useful to stock some spares. If you use the Panasonic VUD kit you'll find that all relevant circlips are included. Use of small circlip pliers helps to avoid damage. Remember to refit this plate before refitting the carriage.

Mechanical Servicing

Mechanical servicing follows the procedures for the NV333/366/7000/7200. We'll deal here with replacement of the parts included in the Panasonic 1,000-hour maintenance kit, which was reviewed by Ian Bowden in the October 1988 issue, and some other commonly required replacements. The kit is type VUD4090KIT.

Video Head Replacement

To replace the video heads, part no. VEH0201 for the NV788 and VEH0177 for the NV777, remove the single bolt that secures the discharge angle on top of the drum, then the two bolts that hold the upper and lower drum together. The drum connections are via flying leads from the lower drum to a PCB on the upper drum. There are quite a lot of leads in the NV788: although the colours are marked to show where the leads go, it's wise to draw a diagram before you start – the letters, K for black etc., are not all obvious. Take care when soldering the leads, which vary in length, as they are easy to damage and there are no spares – a new DD unit will be the unfortunate consequence of broken leads, unless you dare trying to take the unit apart and run in a new lead!

The heads are quite expensive and do fail. Very good rebuilds are available from MCES Ltd, 15 Lostock Road, Davyhulme, Manchester M31 1SU. Unfortunately however there's a tendency for the drum to become burred, which means that it's not suitable for rebuilding. This is caused by excessive back tension or poor tapes. These factors also cause excessive audio/control head wear, which has been a problem with some of these machines. The back tension should be checked and, if necessary, reset whenever one of these machines comes into the workshop.

Back Tension

The back-tension specification is the usual 25-30g, measured with a Tentelometer half way through a three-hour tape. For good noise suppression and quality in the trick modes the back tension should be set near the top of the specified range, i.e. typically at 28-30g. Don't fall into the trap of setting it higher than this in order to get better results. Doing this is quite unnecessary: the trick is to adjust the back-tension post landing position carefully then compensate by adjusting the soft-brake band. This will give you correct back tension and trick-mode operation.

The Audio/control Head

Audio/control head wear is comparatively common, especially with the NV788, and as just mentioned is made much worse if the back tension is excessive. The deck needs to be fairly clear for head replacement. Though it's not essential to remove the cassette carriage, life is made a lot easier if you do – and anyway you'll probably be replacing the idler etc. at the same time. The head has the usual three-screw mount. The centre screw is threaded into the base of the head assembly and so needn't be removed until the head is taken out. The rearmost screw (left-hand side viewed from the front) is the counterspring holder: it's best to remove this one last. The foremost, right-hand side screw is threaded into the mechanism and thus has to be removed – it's best to do this before the counterspring one.

After removing it the tilt screw can be fitted to the new head. First note the approximate protrusion into the head so that the new head will be roughly aligned when fitted. Then fit the new head, ensuring that the indentation at the front fits over the pip, about which it pivots, on the mechanism. Fit the azimuth screw, roughly in place, then fit the counterspring screw to the correct tension, i.e. don't over compress the spring. Finally align the head using a standards tape. Align the tilt carefully in order to prevent tape-path crinkling – watch the tape travel around the adjacent guides and posts.

Idler Replacement

Idler replacement is a bit more involved and tricky than one would like. Remove the top and bottom covers, then the front and the cassette carriage. The metal plate has to come out next. Remove the retaining circlip at the top of the take-up spool, after which the spool can be pulled off – take care not to lose any washers underneath it. Next remove the reel motor underneath in its plastic frame. This is done by taking out the three brass bolts/screws that hold it. At this point take a careful look at the idler from underneath: note the position of the spring at the rear of its arm. Use a screwdriver blade to move the nylon lever to

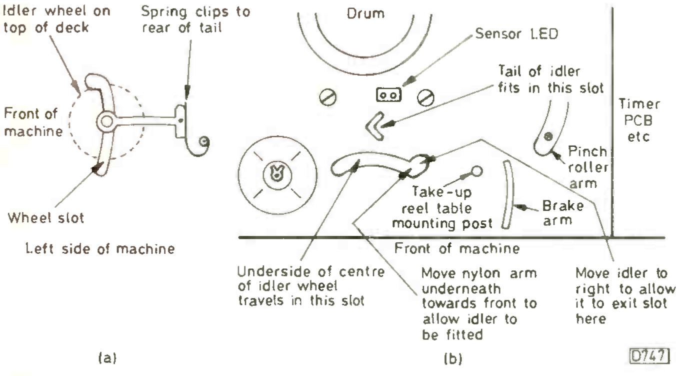

Fig. 1: Replacing the idler. (a) Underside of the mechanism (simplified) showing the nylon arm and spring positions when fitting the idler. Machine is on its left-hand side. (b) A simplified view of the upper side of the mechanism, with the take-up reel table and the idler removed.

next month in

TELEVISION

● SERVICING THE FINLUX 1000 CHASSIS
The sets in the Finlux 1000 series have been on the go for a good number of years now. Apart from a couple of points they have proved to be very reliable. This means that any problems that do occur can be difficult to handle due to engineers' lack of familiarity with the chassis. Fortunately the circuitry is straightforward, so that servicing is reasonably simple. Steve Cannon provides general guidance plus a faults list. Armed with this, you should have no difficulties when a 1000 chassis comes along.

● SATELLITE TV RECEIVER PROJECT
Charles Murray, I.Eng., AMIED, G0MIA, has so far designed two satellite TV receivers. It's a good way of coming to grips with the requirements of satellite TV reception! Next month he describes his Mk 2 receiver. The tuner/i.f. block is bought in of course – it's an Astec unit. The rest of the receiver uses just a few i.c.s. Construction is on two PCBs. As the receiver is intended for use in exploring and monitoring satellite TV it doesn't offer hi-fi stereo or video outputs for a VCR etc.

● FIVE DECADES OF STEREO TV!
The BBC launched its Nicam 728 TV plus stereo sound service on August 31st this year. However the Corporation has been experimenting with stereo sound transmission since the Fifties! Keith Hamer and Garry Smith fill in the history and provide a technical specification for the Nicam 728 system.

● SERVICING THE FISHER FVH-P520
This popular VHS machine dates from 1982-3. Features include freeze frame and wired remote control. John Coombes provides a run-down on fault-finding procedures.

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the front of the machine, carefully unhook the spring then, from above, move the idler towards the space vacated by the take-up spool along its slot. The idler's tail can now come through the expanded slot and the idler will come out.

Fit the replacement in the reverse order, ensuring that you place the spring correctly on the idler's tail. See Fig. 1.

Capstan Motor

The capstan motor is a direct-drive unit. Note that the part number is given incorrectly as VEM0165 in the mechanism photograph in the manual for the NV777. The correct part no. is VEM0164. The capstan motor is quite pricey but rarely fails. Capstan servo problems can be caused by dry-joints or breaks on the small PCB for the FG circuit at the base of the capstan motor.

Mode Switches

The mode switches are very reliable and align in the standard manner, notch to notch in the eject mode.

Belt Replacement

Apart from the previously mentioned problem with the large loading belt in the NV788, belt replacement is straightforward. The kick-pulley belt (part no. VDV0138) simply fits over pulleys at either end and should be removed first and fitted last. To replace the large loading belt (part no. VDV0135) you have to remove the DD unit connector at the drum end (unlike the NV7000/7200/7800 where you have to ferret around the loom, tracing it back to the PCB end) and the small plastic belt cover which is secured by a single bolt. This belt has to be taken off the intermediate loading pulley before the small loading belt (VDV0122) can be replaced. Therefore the best policy is to remove all three belts and fit them in the following order: small loading, large loading and kick pulley.

Pinch Roller

To replace the pinch-roller arm (roller only part no. VXP0518), first remove the cassette carriage, then the cassette blinder release bracket. The arm is held by a single circlip about the centre pivot. Take care not to over-stretch and damage the spring.

Impedance Roller

A single nut secures the impedance roller in the usual manner. Take care to ensure smooth travel of the tape over it when it's aligned. Also take care not to lose the roller's inner sleeve when removing the old one. The replacement will usually be plastic, unlike the original metallic version.

Brake Band

The brake band clips into the back-tension lever at one end and is bolted through its slot at the other end. See the previous notes about adjustment. For correct back tension the right-hand edge of the washer under the head of the bolt usually needs to just cover the inner edge of the right-hand side of the slot in the band – anyway this is a good starting position for adjustment.

FAULTS LIST

The following is a list of the main troubles we've had with these machines.

(1) Low sound level or poor h.f. response. The audio/control head in these machines tends to wear out. Part nos. are VBR0061 for the NV777, VBR0067 for the NV788. The fault is particularly noticeable with the NV788 in the LP mode, since the head-to-tape speed is slower. After replacing the head, check the back tension and audio bias.

(2) Poor or noisy rewind/fast forward. This is usually due to a faulty idler (VXP0463) or reel motor (KFN56FB8A).

(3) Tape remaining counter reads four hours with certain three-hour tapes. You can't correct this fault – it's a design quirk!

(4) Squeaks in play. The squeak stops when pause is selected. This is usually due to a noisy pinch roller. Replace it and clean the tape path. Also lubricate the reel shafts with a very small amount of thin oil.

(5) As (4) but continues in pause. Suspect a noisy discharge angle (VXA1584).

(6) Goes into play then immediately returns to stop. Large loading belt (VDV0135) faulty. It's worth replacing all three belts at the same time.

(7) Noisy picture during or following trick-mode operation. Check the head switching relay(s) by substitution.

(8) Loses timer and clock information during a power interruption. Replace the back-up battery (VSB0004). When this is fully charged it should give a reading of approximately 4·25V, falling to 4·07V after 48 hours' discharge. An eight-hour charge should allow a 48-hour discharge. When fully charged the battery will last for 72 hours on average. The battery, usually consisting of three NiCd cells, is on the timer PCB.

(9) Doesn't accept a cassette/other loading problems. Replace broken or dirty cassette up and down switches on the side of the cassette carriage.

(10) Machine is affected by mains-borne noise, e.g. when a fluorescent light is switched on or off. The unit then for example enters the stop mode. If this hasn't been done during production, add a 1μF, 50V electrolytic capacitor between pin 9 of IC7505 (positive lead) and chassis (negative lead), on the print side of the board. The component is C7552, part no. ECEA1HS010.

(11) Remote control unit doesn't work. The remote control units are straightforward and all the usual advice applies, i.e. check batteries, LEDs etc. as necessary. The only stock fault is failure due to the legs of the ceramic resonator (CSB420) fracturing, usually as a result of the unit being dropped once too often.

(12) Various Y/C faults, e.g. unlocked colour. As these machines have aged, dry-joints have become quite common on the Y/C board (the lower PCB, beside the bottom of the mechanism). Try resoldering suspect chassis connections, the flying leads and the large hybrid chips on this board. Also check relay contacts.

What a Life!

Donald Bullock

"My wife accidentally upset a little fairy last night Mr. Bollard" said the hesitant young man at the door. "Can you have a look at it?"

I followed him out to his car. As he stopped I touched his elbow. "Look, it might just be me" I said, "I feel a bit odd today. Every day come to that. I don't quite..."

A Saisho CT141X

He took a Saisho CT141X colour portable from the boot and handed it to me. "It went in there" he said, pointing to a slot near the tube neck.

I eyed him closely. "The fairy went in there because your wife upset him, or maybe her?" I asked. "And you want me to coax her out. Is that it?"

"I'm talking about washing-up liquid" he said. "My wife upset some into the set. We'd like you to see what you can do."

"I don't feel too optimistic" I said "but I'll have a go. I hope it's kind to my hands." Laughing at my little joke, I took the set back to the workshop.

The liquid must have gone in some while before since the chassis looked quite dry and some of the jumpers were corroded. The STR50103 power chip was soapy, so I took it out, cleaned it and compared its resistance readings with a new one. Shedding a tear I fitted the new one. Before doing so I cleaned this part of the panel and got to work with the hairdryer. Then I checked the bridge rectifier diodes and found that one of them was short-circuit. In went a new BY127. The 5·6Ω, 5W surge limiter next door had laid down its life in sympathy, so this was also replaced.

The Switch On

Feeling uncertain if not actually afraid, I crouched back and switched the set on. It came to life but there was no field scan. The obvious thing to do was to replace the UPC1378H field output chip IC402. This restored the raster but there was a sizzling from the tube base panel, followed by a whisp of smoke. It was damp. I discarded the tube's socket, cleaned up the panel, fitted another socket and tried again. This time there was a picture of sorts, but with no sync and flaring, distorted colour. The huge 48-legged UPC1420CA chip IC401 contains the colour decoder and the sync and timebase generator stages. After cleaning this area of the panel I fitted a replacement. This restored the sync but did nothing for the colour.

So it was now a question of checking through the chroma circuit. My Mastercare manual is a rather poor photocopied affair with no waveforms. Nevertheless I found that the waveform at pin 5 of IC401 looked decidedly dodgy. This pin feeds the 2SA733 chroma delay line driver transistor Q602. A check showed that the latter had a collector-base leak, but the colour was still far from right when it had been replaced. Further time-consuming checks revealed corrosion across C609's leadout wires. It's a 2·2μF, 50V electrolytic that decouples pin 4 of the chip. Cleaning the board and fitting a new capacitor restored the colour, and in fact the picture was now of excellent quality. However the time I'd spent on the set was out of all proportion to any charge I could make. I replaced the back and put the set on soak test (ha ha!).

An hour later there was field collapse. After withdrawing the chassis and switching the set on again the raster was back. I searched for a dry-joint around the new field output chip. The joints looked satisfactory, but I did some resoldering here and there. All now seemed to be well, so I returned the set to the soak test bench and got on with the next job.

Dead Ferguson FV31R

This was a Ferguson FV31R VCR that was dead – its mains fuse had come to a violent end. The cause was failure of the BA159 start-up supply rectifier DP11. When I replaced it the machine sprang to life. It's a flimsy model with panels that have those nasty little resistors tacked all over the print side. A never-soldered one was dancing about loose inside the case. A free bonus, I supposed. The screws that secure the top panel to its frame are minute, almost watch screwdriver jobs. So are the top cover fixing screws. An unattractive recorder to work on, though the results are excellent: after recording and playing back bits of live television I had, on one occasion, to press the pause button to check that I was in fact watching a recording and not a live transmission.

A Call from Greeneyes

As I finished the FV31R Greeneyes gave me a call on the intercom.

"First, can I give your old brown suit to the jumble? Secondly I've just phoned Davey Ruggles about some little glass tables. Thirdly he's got a TV that needs repair. He's coming round."

"No, o.k. and blast" I replied.

I gave the Saisho another glance. Field collapse, so I opened it up and started off once more. When the little service switch was wiggled sideways the field scan was restored. I pirated a similar switch from another set, fitted it, and got a solid raster. I was growing tired of the Saisho, the fairy and the hesitant young man. In fact I was getting hungry and had a slight headache. The screwdriver boxed up the set with minimal help from me and I put it back on soak test.

Davey Ruggles' TX10

Then Davey Ruggles' van pulled into the drive, its tyres down to the canvas. He pulled a Ferguson set from amongst the mats on board and we put it on the bench. I opened it up to see the TX10 chassis, with the focus control cracking up as they do. There was a set under the bench just like Davey's. I'd had to tell its owner that the tube had gone, so he'd left the body with me for spares. In no time I'd fitted its focus control in Davey's set. Having set up the picture I took the set back to the van. Couldn't really charge for that.

As Davey left I saw that the Saisho's raster had once more collapsed. No amount of violence towards the cabinet would get it back up, so I told the set what I thought of it and took it apart again. When I switched the set on the raster was all right. Twenty minutes later it collapsed. It took me quite a time to establish that the set did this consistently when boxed up but behaved perfectly when it was out of its cabinet. I put it aside as Mrs. Ruff came in with her Akai VS112EK VCR.

"Sometimes it just wouldn't start up, Mr. Billhook" she said. "At other times it worked perfectly for weeks. Then old Pukey had a go and now it won't work at all."

"Who's old Pukey?" I asked.

"The lodger of course" she said. "If he's messed it up he's out."

As I put the machine on the bench I heard something rattling inside. When I took the bottom off I found that the drive mechanism had been got at. The securing plate, with its microswitch, had been taken off and among the bits adrift were two large white channelled cogs, a pair of smaller ones, a couple of shaped metal pieces and a couple of plastic mouldings. I also found a few circlips and a pair of coiled springs about an inch long.

I studied the manual and followed the well-illustrated procedure for reassembling it all. At the end I'd the two springs left over and the mechanism jammed as the machine began to initiate. After puzzling for an hour over where the two springs should go I telephoned Akai. I was told that they should be curled around inside the channels in the underside of the two smaller gear-loading cogs. Having done this I set up the timing and found that the machine worked well – sometimes. At other times it seized half way through loading. I was back with the original fault.

Akai knew about this when I contacted them again. The fault arises as the machines age. The large plastic cogs get tired and misshapen and then sometimes prevent operation. They are surprisingly cheap from Akai. Fitting replacements completed the job.

When Mrs. Ruff returned I told her that the time her machine had taken to be put right would have to be reflected in the charge, which would be enough to buy several bottles of Spanish whisky. At this her eyes narrowed. She paid up and, clutching the machine, made for the door. "Start packing Pukey" she muttered.

I turned to the dreaded Saisho and took a more careful look at the circuit. The field drive comes from the large UPC1420CA chip I'd replaced at the start of the saga. Pins 21-24 are associated with the vertical deflection. So I resoldered these four legs, boxed the set up and put it on test again.

End of the Saisho Saga

It was still working merrily next day when the young man returned, this time with his wife. I showed them the picture, which was excellent, and told them that the charge would be £45.

"Lotta money" she said. "We won't bother. Crubbs Foodstore has new colour sets for ninety five quid. Put it as it was". And off they went.

I limped back to the house and found that Greeneyes was on the phone. She turned to me as I went in.

"There's someone on the phone who's upset a cup of coffee into their portable TV" she said. "Smoke came out of the back before it went bang. They don't want to spend much on it. Want to know if you'll see whether it's worth doing."

I pulled a face and patted the air in front of me. "I'm not quite myself at the moment. When I've simmered down I'll tell you why I want to become a traffic warden."

Greeneyes mentioned Davey. "What did you charge him?" she asked.

"Nothing" I said, "he's an old friend and needs all he's got for some new tyres on his van. It's his living." Then I noticed that we were sitting around a large new mat. On top of the original.

"From Davey" said Greeneyes.

"But you didn't need a mat" I said, "you wanted a couple of glass tables."

"I saw his tyres too – oh, and I gave him that old brown suit you didn't want."

Video Output Circuits

George Wilding

The main factors that limit the h.f. response of a video output stage used to be quoted as collector load resistance and total output shunt capacitance, though the response could always be boosted by including precise-value peaking coils. Nowadays you are more likely to find reference to the time taken to charge or discharge the total output capacitance, or the time taken by the tube's input capacitance to do the same.

HF Response

This different way of putting things highlights three aspects of circuit action. First, that despite a tube being a voltage-controlled device the drive source impedance must be low enough to enable the input capacitance to charge and discharge very rapidly in response to h.f. changes in the waveform. Secondly that the charge and discharge times may not be the same, which is true unless steps are taken to equalise them. Thus the h.f. response may be asymmetrical. Thirdly that the value of the output stage's load resistor is not the sole factor in establishing the top h.f. response. In other words the output waveform rise and fall times may be dissimilar, something that can be especially unwanted with data displays etc.

Fig. 1 illustrates this effect. It shows a basic video output transistor which is assumed to be biased to the mid-point of its characteristic. Thus the leading edge of a negative-going step input waveform will reduce the collector current and increase the collector voltage because of the reduced voltage across the load resistor. This cannot occur instantaneously however because there is always some stray collector-chassis capacitance present. As a result, the shape of the amplified and inverted output waveform is rounded instead of being a step – the new potential reached at the collector following the negative-going step input depends on the time taken by the shunt capacitance to charge. When the input step waveform is positive-going the shunt capacitance is discharged via the transistor instead of being charged via the load resistor. Once more the output waveform is curved instead of being a step, but this time the curve is of much shorter duration because the transistor's impedance is much less than that of the load resistor.

Thus the rise time of the output waveform is determined by the time-constant of the load resistor and the shunt capacitance while the fall time is determined by the transistor's impedance (plus the emitter resistance) and the shunt capacitance. Clearly if the pulse duration is less than

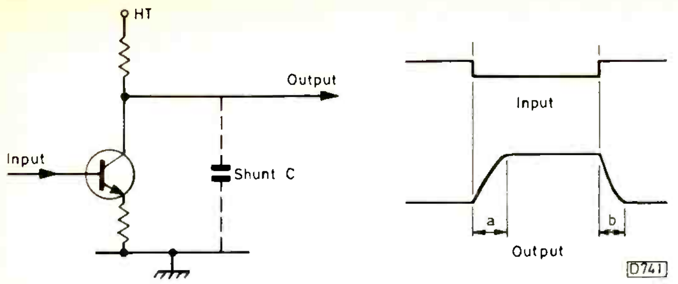
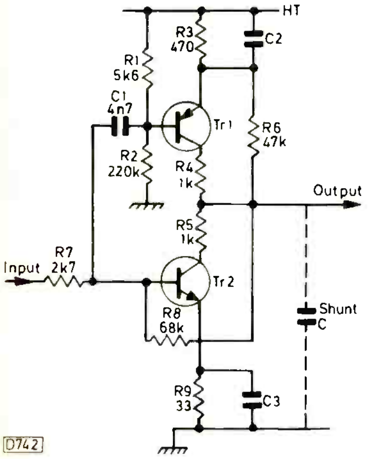


Fig. 1: Basic class A video output stage circuit, showing the effect of the load shunt capacitance with a squarewave input. When the transistor is switched off, the shunt capacitance has to charge via the load resistor, producing the lengthy output rise time a. When the transistor is switched on, the shunt capacitance is discharged via the much lower resistance of the transistor and its emitter resistor. Thus the output waveform fall time b is much less than the rise time a.



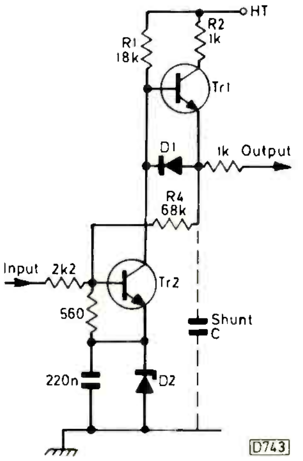


Fig. 2 (left): Basic complementary-symmetry video output stage circuit.

Fig. 3 (right): Class A video output transistor stage with an emitter-follower transistor added to reduce the output waveform's rise time with a squarewave input.

either time-constant the shunt capacitance will begin to charge/discharge before the previous charge/discharge has been completed. If the pulse repetition frequency is high, the output waveform will be a poor reflection of the input waveform.

Circuit Techniques

Various output stage circuits have been devised to reduce and equalise the shunt capacitance charge/discharge times, also to provide other advantages such as reduced transistor dissipation and improved tolerance to power supply variations.

The usual approach is to use a pair of output transistors connected across the supply, with the top one charging the output capacitance while the lower one discharges it. NPN transistors may be used in both positions or a complementary pair of pnp/npn transistors can be used. Fig. 2 shows an example of the latter arrangement. The lower transistor Tr2 has d.c. input coupling while the input signal is a.c. coupled to the base of the upper transistor Tr1 by C1.

Complementary-symmetry Circuit

Tr2's collector load is provided by R4/Tr1 with R6 in parallel. R4 and R5 also limit the power dissipation of the transistors and provide protection against tube flashovers. The values of the emitter resistor decoupling capacitors C2 and C3 are selected to provide compensation, i.e. by being relatively small in value negative feedback is introduced by the emitter resistors at the lower and medium frequencies, reducing the gain at these frequencies to improve the overall linearity. The ratio of R8 to R7 determines the overall negative feedback and thus the stage gain, and also improves the stage's tolerance to h.t. variations. The base of Tr1 is forward biased by R1/2. C1 couples mainly the higher frequencies and transients to the base of Tr1. Though both transistors operate mainly as class A amplifiers, with high-amplitude h.f. signals the operation veers towards class B. Overall power dissipation with this circuit is much better than with a single-transistor stage.

Two NPN-transistor Circuit

Use of a pair of npn transistors in a circuit such as that shown in Fig. 3 is a rather more common arrangement. Here Tr2 is a conventional class A amplifier but the value of its load resistor R1 is much higher than with a single-transistor circuit. This is made possible through the use of Tr1 as an emitter-follower to discharge the output capacitance when the signal at the collector of Tr2 is positive-going. R2 is included simply to reduce the dissipation in Tr1. With a positive-going input at the base of Tr2 the output capacitance is rapidly discharged via D1, Tr2 and D2.

Emitter-follower Output

A third way of improving and equalising the h.f. response is to take the entire output from an emitter-follower stage. Though an emitter-follower has less than unity gain its low output impedance means that the current gain is high, while removal of the output capacitance from the load resistor of the previous voltage-amplifier stage means that a much higher load resistor value can be used here. This more than compensates for the voltage loss introduced by the emitter-follower and markedly improves the h.f. performance.

Causes of Shunt Capacitance

Various factors contribute to the output capacitance seen by a video output stage. These include each drive lead in a ribbon type connector. Lead capacitance to chassis can be taken as being about 10pF, while that between adjacent leads is about 6pF. Thus a very significant improvement in the capacitive loading is obtained by mounting the output transistors on the c.r.t.'s base panel. Cross-lead capacitance has in practice far less effect than this figure suggests however, since if two adjacent leads carry identical signals the capacitance is nullified. With RGB amplifiers the output voltage difference between any two stages ranges from zero to about thirty per cent of the peak-to-peak value on many scenes. Thus the effective capacitance between adjacent leads is no more than about a third of the nominal value.

Input Capacitance

Because the input capacitance of a common-emitter transistor amplifier is high – it's largely determined by the transistor's collector-base feedback capacitance, and varies with gain – a low-impedance drive is required. This is quite a complex matter and is fortunately taken care of by i.c. designers in modern TV sets.

Choosing a Digital Multimeter

Part 2

David Botto

Last month we took a brief look at digital multimeter operation, types of DMM and basic characteristics. Time to consider the various features offered by DMMs so that an informed choice can be made.

Most hand-held DMMs use a liquid crystal display (LCD) for the readout, with seven-segment numbers. Some early models had LCD panels that became dim and hard to read after a year or so as the display changed from black to a dirty, unreadable grey. In time some segments failed to light at all. The LCD technology used with today's DMMs has improved however and fading is no longer a problem with good-quality meters. But before purchasing a DMM with an LCD panel it's important to check that the digits are jet black: you can then be reasonably sure that it will stay like this for many years. An advantage with an LCD panel is that lots of function annunicators can be included in the readout.

Bench DMMs may use an LCD display panel, LEDs or a vacuum fluorescent display.

How Many Digits?

How many digits do you need? This is the question most often asked by the first-time DMM buyer. A 3·5 digit display means that the meter has a maximum reading, or count, of 1999. Until quite recently this was the accepted standard for TV/video/microcomputer repair work. It's fine for outside servicing.

Greater accuracy and resolution are preferable on the bench, where the long-suffering TV/video/microcomputer engineer has to struggle with the latest state-of-the-art equipment. A DMM with at least a 3⅔ (maximum reading 3000) or a 3¾ (3200-4999 counts) display is better.

The reason for this is simple. Suppose you are measuring 1·856V with a 3·5-digit DMM on its 2V range. The reading you'll get is 1·856V. But if you wished to measure 2·051V you would have to switch up to the 20V range, where the reading you'd get would be 2·05V, which is not such an accurate result. With a 3200 count DMM however the 2V range becomes 3·2V and 2·051V reads out as that.

A 4·5 digit meter has a maximum readout of 19999, ten times the resolution with a 3·5 digit meter. Personally I feel that for normal TV/video/microcomputer work a 3¾-digit meter has at the present time sufficient accuracy.

Resolution is the smallest increment of change that a DMM can indicate on a particular range. For example the smallest change in value a 3·5-digit meter can read on its 2V range (a.c. or d.c.) is 0·001V. With a 4·5-digit meter the resolution is ten times greater, i.e. 0·0001V. On the 2kΩ range a 3·5-digit meter has a resolution of 0·001kΩ, i.e. 1Ω.

Sensitivity is the smallest voltage change that a DMM can indicate on its lowest range. For example a 3·5-digit DMM whose lowest range is 200mV has a maximum sensitivity of 0·1mV or 100μV. With a 4·5-digit meter on the same range the sensitivity is 0·01mV or 10μV.

Accuracy

It's no good having a DMM with lots of digits if you can't rely on its accuracy. Looking at a 1·9998V readout is of no help if the actual voltage is 2·0004V. DMM accuracy is quoted as an error percentage (±X per cent). This is where construction quality and stability are important. But as with any piece of electronic gear, calibration accuracy tends to drift with age.

Since the d.c. voltage supplies in modern TV sets and video equipment must be set to a high standard of accuracy, for TV/video/microcomputer servicing you need a well-designed, robust instrument with an accuracy of at least ±0·5 per cent. Unless critical circuit voltages are spot-on, equipment won't work properly – if at all.

DMMs are rated to measure accurately at a specified room temperature – around 23°C. Most however will work accurately over a fairly wide temperature range.

A high-performance, quality instrument is generally guaranteed to retain its specified accuracy for at least a year. After that it's necessary for the maker or a specialist firm to recalibrate the DMM. You'll notice that most manufacturers of low-cost DMMs don't specify long-term accuracy.

Some DMMs do however retain their accuracy. Twelve years ago I bought an inexpensive DMM from Tandy. This instrument has lived a hard and busy life. Despite this it has retained its specified ±0·8 per cent accuracy.

Ranges

D.C. voltage ranges of 200mV to 1kV with a.c. voltage ranges of 200mV to 750V are essential for TV/video/microcomputer servicing. Ability to measure a.c. and d.c. up to a maximum of at least 10A is also a requirement.

E.H.T. up to 40kV can be measured with an e.h.t. probe plugged into the DMM. I prefer to use a separate, specialised e.h.t. probe with its own built-in meter however. These are available from Heathkit, B & K Precision Test Instruments and Beckman Industrial. When high voltages are measured with an e.h.t. probe plugged into a DMM, damage can be done to both the DMM and the engineer should the earth lead become disconnected from chassis. So be warned. E.H.T. is the one thing that can wreck an otherwise apparently indestructable DMM.

It's useful to have a bar graph (analogue) scale. With this the TV/video engineer has the best of both worlds – analogue and digital displays on the same multimeter. The bar graph display can be used for nulling and peaking measurements – then, if desired, a final accurate measurement can be made with the digital readout. Before buying your DMM, check that its bar graph has a fast update – a 20 per second rate is good. A slow update bar graph is useless for many measurements. Updating is handled by a microcomputer within the DMM. It may also enable the DMM to change ranges (not functions) without the need for manual switching. Decide for yourself whether or not you need a bar graph display.

RMS Measurements

For some applications a DMM that measures true r.m.s. is desirable. It's more expensive to manufacture however, so the price rises accordingly. The r.m.s. (root mean square) value of a sinewave is obtained by multiplying the peak current by 0·707 – see Fig. 1(a). The average value of a sinewave is 0·637 times the peak value. The majority of DMMs respond to the average value but are scaled to give the r.m.s. value readings. Such instruments are known as average-sensing or average-responding DMMs. They respond to a much narrower band of frequencies, typically 40-500Hz, than a true r.m.s. meter. When an a.c. waveform is more complicated – see Fig. 1(b) – or consists of several different harmonics – Fig. 1(c) – it becomes more difficult to measure.

Crest factor is the ratio of peak signal value to r.m.s. value, and defines the limits within which a true r.m.s. meter will measure accurately. A true r.m.s. DMM responds to higher frequencies than an average-sensing instrument, perhaps to 20kHz.

Plenty of complex a.c. waveforms are present in TV/video equipment. If your servicing is all done in the workshop an oscilloscope can be used to give an easy reading of the value of such waveforms. But it's often convenient to be able to measure r.m.s. values directly with a DMM. If you decide that true r.m.s. measurement is a must, bear in mind that this will add quite a bit to the price.

Features

A DMM that's able to measure frequency enables you to check line drive and other signal frequencies in TV receivers quickly. You'll also be able to check the various critical frequencies in VCRs, camcorders and CD players.

If you decide that frequency measurement is a feature you require, be sure to obtain a DMM with an upper limit of at least 20kHz, preferably higher – some DMMs measure up to 10 or 20MHz.

When used with a special probe some DMMs provide temperature measurement. You can thus check transistor and component temperatures without burning your fingers. If the meter you select doesn't have temperature ranges you can buy an adaptor/probe that turns it into a temperature meter.

Data hold freezes the reading displayed when a button is depressed. Reading hold is a similar feature. Peak hold retains the highest value obtained during a measurement that involves varying voltage or current levels.

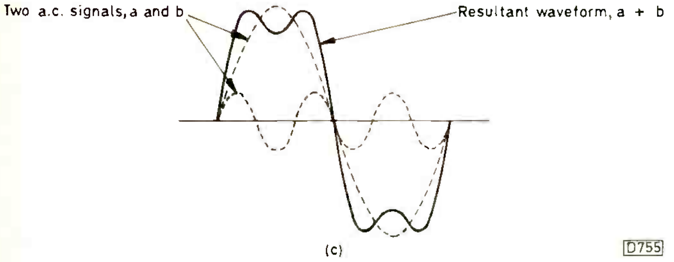


Fig. 1: The average, r.m.s. and peak-to-peak values of a sinewave signal are shown at (a) and apply with both voltage and current measurements. Most DMMs respond to the average value but are calibrated for r.m.s. values. Non-symmetrical waveforms, for example (b), or those that consist of several harmonics, e.g. (c), are more difficult to measure.

A min-max function enables you to hook the DMM to the equipment under test and attend to other matters while the meter automatically stores the highest, lowest and true average (mean) of all its readings. This function is available with the Fluke Model 83, the B & K Model 2912 and the Beckman Industrial Model DM97. It's handy when dealing with intermittent faults.

Many DMMs contain a piezoelectric buzzer that gives audible continuity checks. There's a cheerful beep when the resistance being checked is less than about 100Ω. This is a great help when PCB tracks are being checked for breaks and lead destinations are being traced, since you don't have to look at the DMM.

Nearly all DMMs feature auto-polarity, which means that if you reverse the leads on a d.c. voltage or current range the meter indicates the value with a minus sign prefix.

Some DMMs now have inductance ranges. The Solex SM666 for example measures inductance values between 20mH and 20H.

A notable development is the Tandy Voice Meter which was reviewed in the February 1991 issue. This 3⅔-digit instrument not only displays the measured value but also announces it in a clear voice.

Guarantee

Check the guarantee period before making your purchase. DMMs are reliable, but failure outside a short guarantee period would be disastrous. DMM guarantees range from ninety days to three years, with parts and labour warranty.

Safety

Virtually all modern DMMs have protection against damage by accidental overloading. Since most DMMs are housed in a moulded plastic case an electric shock from the meter itself is unlikely, but make sure that the test input

METER SUPPLIERS

Avo/Megger: Megger Instruments Ltd., Archcliffe Road, Dover, Kent CT17 9EN. Tel. 0304 202620.
Beckman Industrial: Beckman Industrial Ltd., Astec Building, High Street, Wollaston, Stourbridge, West Midlands DY8 4PG. Tel. 0384 442 394.
BK Precision: Canadian Instruments and Electronics Ltd., The Bass Building, Widdowson Close, Blenheim Industrial Estate, Bulwell, Nottingham NG6 8WB. Tel. 0602 770 075.
Cirkit: Cirkit Distribution Ltd., Park Lane, Broxbourne, Herts EN10 7NQ. Tel. 0992 444 111.
Fluke/Philips: Philips Test and Measurement, Colonial Way, Watford WD2 4TT. Tel. 0923 240 511.
ITT: RS Components Ltd., PO Box 99, Corby, Northants NN17 9RS. Tel. 0536 201 234.
Metex: East Cornwall Components, 119 High Street, Wem, Shropshire SY4 5TT. Tel. 0939 32 689.
Micronta: InterTan UK Ltd., Tandy Centre, Leamore Lane, Walsall WS2 7PS. Tel. 0922 710 000.
Solex/Soar: Analogue Numeric Devices Ltd., 25 Swannington Road, Cottage Lane Industrial Estate, Broughton Astley, Leicestershire LE9 6PD. Tel. 0455 283 486.

sockets are recessed so that you won't place a finger on an unused socket and get a nasty shock. The test prods should have a finger protecting guard at the business end and a moulded plug, often angled, at the socket end.

If the internal high-energy fuse in a DMM blows as a result of an accidental overload, be sure that the replacement is of the correct type and rating. If it isn't and the meter is again overloaded it could be damaged, with possibly internal arcing, fire, an explosion and an electrical shock hazard for the user.

The Choice

For the TV/video/microcomputer service engineer who works mostly at the bench a good-quality, hand-held DMM with plenty of functions and ranges and at least a 3⅔- or 3¾-digit display is a suitable choice. Such a DMM is relatively expensive, but the money is not wasted: it should be a profitable long-term investment.

For the outside engineer a wide variety of reasonably-priced 3·5-digit meters are available. It's best to get one that has the widest possible range of functions. Examples are the Beckman Industrial DM27XL, the Cirkit TM175 and the B & K 388HD.

Table 1 is included to provide a guide to DMMs suitable for TV/video/microcomputer servicing. It lists only a relatively small number of the excellent DMMs that are now available – if every DMM was included the table would take up many pages of this issue. Before buying a DMM, get a copy of the manufacturer's product brochure.

In conclusion I hope that this article has given you a reasonable understanding of the basics of DMM operation and the factors to consider when making a choice.

Thanks are due to Megger Instruments, Sue Round of Beckman Industrial, B & K Precision Test Instruments, Philips Test and Measurement, Louise of InterTan UK and Solex International for supplying technical information, catalogues and photographs.

Table 1: Digital multimeter specifications.

All meters have an LC display, a continuity test, overload protection and battery operation unless otherwise indicated. Prices exclude VAT.

Avo

M2004: Hand-held meter with 3¾-digit display. Autoranging; bar graph; diode test; d.c. accuracy 0·7 per cent; one current range (10A). £108.

M2005: As M2004 plus 3mA-10A a.c./d.c. ranges and range hold. 0·5 per cent d.c. accuracy. £116·50.

M2006: As M2004 plus data hold and 300μA-10A a.c./d.c. ranges. 0·25 per cent d.c. accuracy. £156.

M2007: As M2004 plus peak hold. 0·1 per cent d.c. accuracy. £212·50.

M2008: As M2007 plus true r.m.s. reading. £247·50.

M2036: Bench meter with 4¾-digit display. Autoranging; 300μA-15A a.c./d.c. ranges; bar graph; diode test; data, peak and range hold; true r.m.s. reading; 0·05 per cent d.c. accuracy. £355.

M2037: As M2036 plus decibel measurements. £378.

M2042: As M2037 less autoranging and data, range and peak hold but with 300Ω-300MΩ resistance ranges and 3mA-20A a.c./d.c. ranges. £525.

M801: Hand-held meter with 3·5-digit display. Diode test; d.c. accuracy 0·5 per cent. £64.

M806: Hand-held meter with 3·5-digit display. Autoranging; bar graph; 200mV-600V a.c. ranges; diode test; data and range hold; temperature measurement; d.c. accuracy 0·5 per cent. £89.

TD20: Probe meter with 3·5-digit display. Autoranging; 2V-500V a.c. ranges; data hold; d.c. accuracy 0·5 per cent. £61·60.

Beckman Industrial

HD153: Hand-held meter with 3·5-digit display. Autoranging; diode test; audible read-out tone; logic test; range hold; d.c. accuracy 0·25 per cent. £129·95.

4410B: Hand-held meter with 4·5-digit display; diode test; true r.m.s. reading; d.c. accuracy 0·07 per cent. £245.

360B: Bench model with 3·5-digit display. Diode test; 20Ω range measures 0·01Ω; true r.m.s. reading; d.c. accuracy 0·1 per cent; temperature measurement. £286.

850: Hand-held meter with 4·5-digit display. Diode test; frequency measurement; data hold; true r.m.s. reading; d.c. accuracy 0·05 per cent. £185.

DM27XL: Hand-held meter with 3·5-digit display. Capacitance measurement; diode test; logic test; frequency measurement; transistor test; full annunicator set; d.c. accuracy 0·5 per cent. £79.

DM71: Probe meter with 3·5-digit display. Autoranging; diode test; data and touch hold; no current ranges. £42.

DM78: Pocket-size meter with 3·5-digit display. Autoranging; diode test; no current ranges; d.c. accuracy 0·7-2 per cent. £24·50.

DM97: Hand-held meter with 3¾-digit (4000 count) display. Autoranging; bar graph; capacitance measurement; diode test; logic test; frequency measurement; data and peak hold; min-max; full annunicator set; d.c. accuracy 0·3 per cent. £95.

B&K Precision

2911: Hand-held meter with 3¾-digit (3999 count) display. Autoranging; bar graph; diode test; temperature measurement with optional probe; d.c. accuracy 0·5 per cent. £59.

2912: As 2911 plus capacitance and frequency measurement; peak and data hold; min-max. D.C. accuracy 0·3 per cent. £89.

377: Compact test bench with 3·5-digit display. Diode, transistor and logic tests; capacitance and frequency measurement; temperature measurement with optional probe; d.c. accuracy 0·5 per cent. £57.

388HD: As 377 plus current measurement to 20A. Slightly larger case. £73.

2802B: Probe meter with 3·5-digit display. Autoranging; diode test; data hold; no current ranges; d.c. accuracy 0·7 per cent. £34.

2860: Ruggedised hand-held meter with 3·5-digit, 0·8in. display. Diode test; 500V a.c./d.c.; d.c. accuracy 0·5 per cent. £57.

2833: Bench model with 4·5-digit display. Mains powering via adaptor. Diode test; frequency measurement; peak and data hold; decibel measurements; d.c. accuracy 0·05 per cent; no continuity test. £212.

2704: Hand-held meter with 3·5-digit display. Diode and transistor tests; capacitance measurement 1pF-20μF; resistance measurement 200Ω-2,000MΩ; temperature measurement with optional probe; d.c. accuracy 0·5 per cent. £54.

2703: As 2704 less transistor test and capacitance measurement. D.C. accuracy 0·8 per cent. £34.

2907: Hand-held meter with 3·5-digit display. Logic test; capacitance measurement; peak hold; true r.m.s. reading; d.c. accuracy 0·1 per cent. £139.

2906: As 2907 less peak hold, capacitance measurement and true r.m.s. reading but with transistor test and temperature added. D.C. accuracy 0·25 per cent. £90.

2905: As 2906 less logic test and temperature measurement. D.C. accuracy 0·5 per cent. £74.

2940: Hand-held meter with 4·5-digit display. Diode test; data hold; frequency measurement; d.c. accuracy 0·05 per cent. £141.

2945: As 2940 plus true r.m.s. reading and temperature measurement. £221.

Cirkit

TM115: Hand-held meter with 3·5-digit display. Diode and transistor tests; d.c. accuracy 0·5 per cent. £28·91.

TM135: Hand-held meter with 3·5-digit display. Diode and transistor tests; capacitance and temperature measurement; d.c. accuracy 0·5 per cent. £39·96.

TM175: Hand-held with 3·5-digit display. Logic, diode and transistor tests; capacitance and frequency measurement; d.c. accuracy 0·5 per cent. £49·99.

TM5315B: Hand-held meter with 3·5-digit display. Diode test; d.c. accuracy 0·8 per cent. £17·38.

TM5365: Hand-held meter with 3·5-digit display. Diode, transistor and logic tests; capacitance and frequency measurement; d.c. accuracy 0·5 per cent. £32·96.

TM5375: Hand-held meter with 3·5-digit display. Diode test; frequency measurement; d.c. accuracy 0·5 per cent. £31·96.

Fluke (Philips)

45: Bench meter with 5-digit fluorescent readout. Dual display; diode test; data and touch hold; min-max; decibel measurements; frequency measurement; true r.m.s. reading; RS232 interface; d.c. accuracy 0·02 per cent. Mains powered with optional rechargeable battery. Temperature measurement with probe. £499.

73: Hand-held meter with 3¾-digit display. Autoranging; bar graph; d.c. accuracy 0·7 per cent. £85.

75: As 73 plus range hold, diode beeper and autoranged mA ranges; d.c. accuracy 0·5 per cent. £112.

77: As 75 plus touch hold. D.C. accuracy 0·3 per cent. £125.

83: Hand-held meter with 3¾-digit display. Autoranging; bar graph; diode test; data, range and touch hold; capacitance and frequency measurement; min-max; conductance measurement to 100,000MΩ; temperature measurement with probe; d.c. accuracy 0·3 per cent. £179.

85: As 83 but d.c. accuracy 0·1 per cent. £199.

87: As 85 but 4·5-digit display plus true r.m.s. reading, special analogue pointer and peak min-max. £269.

ITT

MX547: Bench model with 3¾-digit (4000 count) display. Mains powered. Autoranging; data and peak hold; full annunicator set; true r.m.s. reading; temperature measurement; d.c. accuracy 0·1 per cent. £269.

MX570: Hybrid analogue (moving-coil) and digital meter with 3¾-digit (4000 count) display. Autoranging; diode test; data, range and peak hold; full annunicator set; d.c. accuracy 0·5 per cent digital, 2 per cent analogue. £165.

Metex

M818B: Hand-held meter with 3¾-digit display. Autoranging; bar graph; diode test; data hold; frequency measurement; true r.m.s. reading; d.c. accuracy 0·5 per cent. £65·50.

M3630B: Hand-held meter with 3·5-digit display. Bar graph; capacitance measurement; diode and transistor tests; d.c. accuracy 0·3 per cent. £64·50.

M4650B: Hand-held meter with 4·5-digit display. Bar graph; capacitance measurement; data hold; diode and transistor tests; frequency measurement 0-200kHz; d.c. accuracy 0·5 per cent. £88·50.

Micronta (Tandy)

22-164 Voice Meter: Hand-held meter with 3⅔-digit display. Autoranging; diode test; full annunicator set; d.c. accuracy 0·8 per cent. £79·95 inc. VAT.

22-165: Probe meter with 3·5-digit display. Autoranging; data hold; full annunicator set; no current ranges. £24·95 inc. VAT.

22-194: Hand-held meter with 3·5-digit display. Diode and transistor tests; capacitance measurement; d.c. accuracy 0·8 per cent. £59·95 inc. VAT.

Soar

ME530: Hand-held meter with 3·5-digit display. Autoranging; diode test; full annunicator set; d.c. accuracy 0·35 and 0·5 per cent. £51.

ME4040: Hand-held meter with 3¾-digit display. Autoranging; bar graph; diode test; data hold; full annunicator set; frequency measurement; d.c. accuracy 0·3 per cent. Mains powering via ADP adaptor. £109.

Solex

SM666: Hand-held meter with 3·5-digit display. Diode and transistor tests; inductance and capacitance measurement; full annunicator set; d.c. accuracy 0·5 per cent. £79.

The above list is only a selection from various ranges to indicate the variety of DMMs available.

VCR Clinic

Reports from Philip Blundell, AMIEIE, Ed Rowland, John Edwards, Mick Dutton, Graham Richards, S. Da Costa, E.M. Beddow, Roger Burchett and Nick Beer

Philips VR6185 (later 5V version)

How's this for a saga! The machine came in from another dealer with the complaint that it was dead. There was no clock, no signals were present and there was no deck activity. But the power supply was working. A check showed that the Wickman fuse on the family board was open-circuit, but replacing it didn't change any of the symptoms. Checks were carried out around the P8051A-H1-2-D2 syscon chip. Its supplies were present, the reset worked and the clock oscillator was o.k., but it gave no output. So a replacement was ordered. With this fitted the deck initialised but there was gibberish on the display and none of the keys worked. A new TMP47C870N chip cured that. We'd no playback colour however. As the paint seals on the H-PLL control had been broken it was reset as per the manual. Finally all was well! I kept the machine for a few days on test however, just to be on the safe side. **P.B.**

Grundig VS310

The symptoms here were that F1 flashed on the display and the machine wouldn't take in a cassette. A check can be made on the cassette-in switches at connection 3 of plug L12. The voltage here should be 5V until the switches close, when it should drop to zero. But the voltage never rose above 1V. A new M722AB1 chip was required. **P.B.**

Philips VR2334

I've had this fault on three of these machines now. The deck doesn't initialise and there's no clock display. With the first one that came along I temporarily fitted a new A630 panel. This proved that the fault was here. Scope checks showed that pin 38 (bus data in/out) of the 8050 chip was being held down. The chip had an internal leak. **P.B.**

NEC N831

When the covers of this NEC machine were removed I found a JVC HRD120 (Ferguson 3V35). Lucky that. The problem was no record or playback colour. A quick run round with the frequency counter showed that all the oscillators were running at the correct frequency. So why was the colour-killer operating? The colour/monochrome switching line was at mono because the colour/mono/test switch was leaky! **P.B.**

Philips VR6548

This model is a Sharp clone. Until this one came in the only problem I've had with these VCRs has been with the cassette tray – the symptom is intermittent failure to accept a cassette. Fitting the modified tray switch kit, part number 4822 214 32583, usually puts matters right. This particular machine also seemed to stall the loading motor at odd times. The cause was a faulty mode control switch, part no. 4822 276 12482. **P.B.**

Sanyo VTC5150

Fast forward and rewind were o.k., but when play was selected the tape would lace up then, after a few seconds, unlace. The fact that the loading motor continued to run after the tape was fully laced drew attention to the after-load switch. It closed but the contacts were oxidised. A squirt of Electrolube cleared the trouble. **E.R.**

Mitsubishi HS307

We don't know whether this trade has a patron saint. If so he wasn't in a very benign mood when this machine came along. The complaint was that it sometimes failed to record the sound. We removed the plugs on the audio/control head and hard-wired the leads to the panel. This cured the problem and we though that was it. Two days later however the customer rang to say that although the sound was now being recorded it became distorted after an hour. The machine would then stop playing. A check showed that after an hour the capstan speed became erratic. The capstan motor would then stop altogether, after which the machine would work only in the rewind mode. Freezing the MN6168MBB chip IC4A1 got the capstan motor running again and a replacement chip restored normal operation. Luckily we obtained one from a scrap machine, as the customer made it plain that he wouldn't pay for attending to a fault that wasn't present when the machine came in initially. Now how do you argue with that? **E.R.**

Matsui VX800

The symptoms were slow rewind and fast forward, also tape chewing in the play mode. We initially suspected the clutch/idler assembly, but while running through the mechanical operations without a tape in we noticed that in the play mode the reel motor didn't rotate. A check showed that there was only 0·5V across its terminals. The culprit turned out be the 2SD1246 transistor Q2022 which was short-circuit base-to-emitter. It forms a low-resistance chassis return for the motor, which instead was relying on a couple of low-value resistors that are in parallel with the transistor. **J.E.**

Mitsubishi HS-B20

Playback and the tape functions were o.k. but there was no E-E picture or sound. Channel selection was shown on the display and the tuning indicator searched normally for a station to lock to, but as none was found the search continued in vain, the monitor's screen remaining blank. A check on the voltages around IC101 in the i.f./a.g.c. can showed that pin 2 was at a much lower voltage than its normal 5V. So the a.g.c. wasn't working and the signal was cut off. The cause was the 0·1μF, 35V tantalum capacitor C105 which was leaky. **J.E.**

Matsui VX880

This machine would accept a cassette then almost immediately eject it, after which it would switch off. We noticed that during the attempt to load the tape the cassette-in symbol flickered on then, as the tape was ejected, off. The after-load leaf switch mounted on the carriage was o.k. We then made a careful study of the action of the mechanism during the cassette loading operation. This showed that the leaf switch is activated by a lever driven by the side-mounted rotary cam, which is in turn driven directly by the loading motor. The lever pressed the leaf switch home all right but immediately returned back a small way so that the switch went open-circuit again. During the loading process the motor spun normally, but as soon as the cassette reached the bottom the motor reversed by about three revolutions. A meter connected across its terminals showed no reverse voltage when this occurred, thank goodness. A new loading motor cured the problem. **J.E.**

Saisho VR3600/Orion VCR-MD3

This machine cut out after a short while, i.e. it returned to standby, and wouldn't accept a cassette. I noticed that there was no sign of any jog from the loading mechanism, and when I tried to advance it by hand it was as solid as a rock. When the gearing on the tape transport was stripped down I saw that the master cam gear had disintegrated. After fitting a replacement and rebuilding the mechanism the machine ran smoothly. **G.R.**

Panasonic NV370

The E-E picture was half white and half black, i.e. there was hum on vision. C1102 (2,200μF) in the power supply was open-circuit. The playback picture was only slightly affected. **G.R.**

Hitachi VT410

The complaint was of vertical black and white bars instead of a picture during the first fifteen minutes of playback. On test we found that a tap on the panel would clear the fault. The signal appeared to be getting lost within IC202, but a replacement made no difference. We then found that connecting a scope probe to pin 14 of IC203 would remove the black and white bars, leaving snow on the screen. It seemed that the f.m. demodulator wasn't operating correctly and that as a result the dropout compensator was working overtime, causing instability in the form of the bars. Replacing IC201 cured the fault but it was impossible to prove which part of the chip was defective. **M.D.**

Philips VR6467

When a tape was being played there was no sound or vision, just a blank screen. This was due to absence of the 10V supply at the head amplifier panel. Transistor 7607 (BC328) was open-circuit. **M.D.**

Panasonic NV370

The picture was o.k. with some tapes but with others there was rolling and a small white bar was visible at the bottom of the screen. Playback of the machine's own recordings was o.k. except for the white bar. After a lot of deck realignment we established that the fault was being caused by the drum assembly. The rotor base at the bottom had shifted slightly out of position, so that the pole switching was incorrect. Slight adjustment by loosening the hex nut in the base and realigning it put matters right.

All was now o.k. except for cue. When this was selected the machine ran in the cue mode but when the button was released it still ran in the cue mode though the cue sign disappeared from the display. The AN3822 capstan chip was faulty, pin 17 being virtually open-circuit when a check was made between here and chassis.

A common problem with these machines is a dew indication. Touching the dew sensor on the deck with the tip of a hot soldering iron for about 20-30 seconds usually provides a lasting cure. If the dew indication is erratic however the sensor is at fault. **S.DaC.**

Amstrad VCR4600 Mk II

The report over the telephone was "not rewinding". In due course I took the top off and saw a spotless mechanism – would that they all were! The machine worked perfectly when it had warmed up. It was left overnight then sometimes failed to respond to any deck command, including eject, though the display changed to show the appropriate symbol.

On this machine the mode switch is operated via a bell crank and levers. Cleaning and greasing cleared the fault. A linkage like this is asking for trouble as there are too many points of friction and potential wear.

A few months later the mode switch itself started to play up, giving no rewind or fast forward. **R.B.**

Grundig VS310

Warble on sound was the complaint with this machine, which had already been somewhere else for repair. When we tested it the sound was indeed poor. We were told that the capstan belt and motor had been replaced. After checking that the power supply voltages and ripple levels were o.k. we removed the chassis screws and hinged it out so that we could watch the flywheel and belt running. There was a noticeable vibration with the belt, which looked new but didn't seem to be as tight as one would expect. When a new, original Grundig belt was fitted everything was all right. The old belt had a lot more stretch than the new one and was obviously not a proper Grundig spare. The usual fault with these belts is that they split and break, maybe due to the hard rubber of which they are made. **E.M.B.**

Mitsubishi HS-B30

This machine had been playing around for some time. A couple of calls had been made but nothing amiss had been found. Eventually we saw what was happening. The drum motor would slow to the point where line lock was lost on the TV set. When the wires that connect the drum motor to the servo panel were moved normality was restored. We removed the drum motor and found that the connector plug hadn't been pushed home fully. Refitting it restored normal operation. **E.M.B.**

Panasonic NV-M10

This camcorder was accused of not focusing. Indeed on test the image from the camera head was very strange. The centre could be focused fairly well manually, but it was as if a special-effects filter was fitted – the edge of the image was severely defocused. In addition the unit made no attempt to auto-focus. The cause of the auto-focus fault was that the lens focus ring moved much too freely: the bracket that holds the auto-focus motor and its gearing to the side of the lens was bent, so the gear wasn't contacting the focus ring. The bracket is made of very thin aluminium. A faulty lens was the cause of the focus fault. Putting two and two together I came to the conclusion that the unit had been dropped. **N.B.**

ECONOMIC DEVICES 32 TEMPLE STREET, WOLVERHAMPTON, WV2 4AN

1580H	3.72
1585R	3.72
17052	4.50
17053	5.61
17074	9.30
17089	3.45
17127	2.50
17376	1.58
1N4001	0.04
1N4002	0.06
1N4003	0.06
1N4004	0.05
1N4005	0.05
1N4006	0.08
1N4007	0.06
1N4148	0.03
1N4448	0.05
1N5401	0.11
1N5402	0.13
1N5403	0.18
1N5404	0.10
1N5406	0.16
1N914	0.04
1S1555	0.18
1S44	0.10
1S921	0.10
2N2219A	0.29
2N3053	0.35
2N3054	0.99
2N3055	0.75
2N3442	1.16
2N3702	0.10
2N3703	0.18
2N3705	0.15
2N3706	0.14
2N3707	0.16
2N3711	0.11
2N3771	1.55
2N3772	1.55
2N3773	1.61
2N3819	0.40
2N3823	1.17
2N3904	0.63
2N4101	1.33
2N4240	2.68
2N4444	2.85
2N4905	9.99
2N5293	0.50
2N5294	0.50
2N5296	0.55
2N5297	0.50
2N5298	0.61
2N6109	1.58
2N6130	0.85
2N6133	1.25
2N6292	0.60
2SA202A	0.65
2SA1208	0.26
2SA769	1.17
2SA771	0.96
2SA968	2.44
2SA1006	1.50
2SA1011	0.99
2SA1015	0.20
2SA1020Y	0.36
2SA1027R	0.45
2SA473	0.54
2SA766S	4.95
2SC1173Y	1.25
2SC1474	1.25
2SC1509	1.35
2SA1095	3.45
2SA1103	5.74
2SA329	0.40
2SA489	1.17
2SA490	1.32
2SA493	2.25
2SA562	0.57
2SA564	0.97
2SA614	4.88
2SA628	0.37
2SA639S	1.75
2SA659	0.49
2SA673	0.28
2SA684	0.97
2SA697	0.80
2SA699	1.25
2SA748	1.95
2SA835	2.50
2SA836	0.49
2SA844	0.35
2SA872	0.99
2SA884	2.15
2SA937R	0.97
2SA940	0.47
2SA950	0.50
2SA951	1.75
2SA966-Y	0.52
2SA999	0.75
2SB186	0.40
2SB688	1.52
2SB774	0.44
2SB185	1.13
2SB400	0.40
2SB405	1.03
2SB511	0.99
2SB54	1.39
2SB546	0.74
2SB56	2.80
2SB618A	5.82
2SB631	2.00
2SB643	0.38
2SB681	3.96
2SB695	3.43
2SB774	0.44
2SB819	0.60
2SC1089	1.45
2SC1101	3.22
2SC1128	0.66
2SC1307	5.06
2SC1449	0.50
2SC1941	0.56
2SC558	3.69
2SC1096	0.47
2SC1114	3.25
2SC1116	4.95
2SC1129	1.65
2SC1131	0.72
2SC1158	3.33
2SC1162	0.55
2SC1172	2.22
2SC1195	3.35
2SC1213	0.30
2SC1226	1.46
2SC1306	1.98
2SC1317	0.50
2SC1364	0.49
2SC1383	1.20
2SC1391	2.45
2SC1398	0.41
2SC1413A	1.96
2SC1447	2.07
2SC1475	0.60
2SC1505	1.00
2SC1514	1.76
2SC15730	1.10

2SC1583	0.34
2SC1617	3.89
2SC1678	1.98
2SC1741	0.21
2SC1810	2.06
2SC1815	0.20
2SC1826	0.69
2SC1829	3.35
2SC1875	4.50
2SC1893	3.85
2SC1921	1.37
2SC1923	0.30
2SC1929	2.35
2SC1942	2.17
2SC1959	0.20
2SC1957	0.95
2SC1953	1.93
2SC1962	1.93
2SC1969	1.79
2SC1983	1.32
2SC1985	0.60
2SC2009	0.34
2SC2029	1.15
2SC2028	2.11
2SC2063	0.99
2SC2078	1.10
2SC2073	2.73
2SC2085	1.65
2SC2091	1.30
2SC2141	1.30
2SC2166	0.98
2SC2216	0.69
2SC2233	1.20
2SC2236	0.69
2SC2278	1.14
2SC2314	0.87
2SC2335+Kit	7.00
2SC2551	0.29
2SC2565	4.65
2SC2570	0.46
2SC2577	1.50
2SC2578	5.24
2SC2671	0.62
2SC288A	1.85
2SC3153	3.20
2SC372	1.40
2SC373	1.16
2SC383	1.33
2SC388	0.63
2SC394V	0.81
2SC403C	0.60
2SC458	0.19
2SC495	0.92
2SC515A	1.85
2SC536	0.13
2SC537	0.54
2SC605L	1.16
2SC620	1.46
2SC643A	1.54
2SC668	0.67
2SC681	4.40
2SC682	1.88
2SC684	1.65
2SC693	0.63
2SC710	0.15
2SC711A	0.25
2SC717	1.28
2SC734	0.20
2SC783	3.98
2SC790Y	3.65
2SC828	0.28
2SC867A	5.53
2SC876	0.96
2SC930	0.30
2SC935	1.15
2SC940	4.68
2SD299	9.47
2SD355	0.64
2SD467	0.55
2SD869	3.75
2SD1128	0.94
2SD1138	0.95
2SD1273	0.96
2SD1453	1.50
2SD152K	2.64
2SD198	3.87
2SD234	0.90
2SD235	0.60
2SD24	2.29
2SD257	1.98
2SD313	0.55
2SD325D	2.26
2SD350	3.71
2SD401	1.40
2SD414	1.98
2SD471	2.13
2SD560	1.50
2SD600	2.98
2SD601R	0.65
2SD613	0.74
2SD636	0.20
2SD639-R	0.34
2SD655	0.98
2SD657	2.80
2SD661A	0.80
2SD731	1.95
2SD773	0.60
2SD811	6.84
2SD837	0.90
2SD841	1.37
2SD856	0.69
2SD857Q	1.84
2SD882	0.35
2SD894	1.75
2SD898	2.55
2SK105H	2.15
7805-T022	0.44
7808	0.45
7812-T022	0.35
7815	0.64
7905	5.90
AD140	1.06
AD143	1.93
AD145	1.60
AD161	1.08
AD162	1.08
AF114	2.47
AF115	5.94
AF118	1.20
AF127	0.57
AF139	0.40
AF178	1.45
AF179	0.36
AF180	0.55
AF181	0.53
AF186	1.32
AF239	0.53
AF279	0.88
AN115	3.98
AN155	1.89
AN206	2.58
AN208	3.55
AN210	1.56
AN211	3.25

AN2140	2.40
AN235	4.65
AN236	3.33
AN240P	0.99
AN241	1.71
AN245	5.89
AN253	1.80
AN260	3.85
AN272	7.92
AN295	8.28
AN301	5.26
AN302	3.99
AN305	8.88
AN315	2.46
AN316	4.95
AN318	7.16
AN320	5.47
AN321	2.25
AN322	7.62
AN337	5.37
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	1.86
AN5612	2.71
AN5613	4.20
AN5630	3.95
AN5701N	1.66
AN6250	1.75
AN6300	2.73
AN6310	4.54
AN6340	5.62
AN6341	2.22
AN6363	16.00
AN6531	1.95
AN6551	0.69
AN6552	0.68
AN6610	1.18
AN7111	1.14
AN7115	2.52
AN7145	2.17
AN7146	9.90
AN7151	2.37
AN7156	2.70
AN7158	2.67
AN7218	0.80
AN7223	4.99
AU107	7.72
AU110	5.69
AU113	14.63
AY106	2.80
BA524	8.94
BA301	0.87
BA1310	1.50
BA1320	1.38
BA1332	4.14
BA1330	2.75
BA145	0.19
BA148	0.11
BA154	0.40
BA155	0.12
BA156	0.05
BA159	0.09
BA182	0.19
BA222	1.15
BA302	1.24
BA311	0.65
BA312	1.45
BA313	0.76
BA317	0.04
BA318	0.09
BA328	2.22
BA333	1.37
BA335	6.27
BA5102A	1.49
BA511	1.95
BA514	1.00
BA521	1.20
BA524	8.94
BA526	7.98
BA527	2.98
BA532	1.20
BA536	1.56
BA6209	1.27
BA656	1.51
BA7100	11.35
BA841A	9.27
BA843	3.96
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	0.20
BC132	0.14
BC135	0.14
BC137	0.18
BC138	0.34
BC139	0.33
BC140	0.30
BC141	0.32
BC142	0.26
BC143	0.34
BC147	0.14
BC148B	0.13
BC148C	0.11
BC149B	0.13
BC153	0.14
BC154	0.14
BC159	0.16
BC160	0.40
BC161	0.28
BC168	0.36
BC169C	0.16
BC170	0.16
BC171	0.07
BC172B	0.27
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	0.25
BC187	0.28
BC204	0.35

BC207	0.19
BC212B	0.26
BC213L	0.10
BC214	0.10
BC225	0.40
BC237	0.10
BC238	0.10
BC238B	0.08
BC239B	0.25
BC251A	0.31
BC294	0.50
BC300	0.38
BC301	0.35
BC302	0.53
BC303	0.48
BC307A	0.13
BC308A	0.11
BC309	0.17
BC317A	0.13
BC327	0.09
BC328	0.11
BC337	0.09
BC338	0.12
BC368	0.17
BC440	0.69
BC441	0.39
BC454	0.36
BC460	0.42
BC461	0.47
BC462	0.51
BC463	0.30
BC478	0.32
BC479	0.41
BC532	0.28
BC546	0.08
BC547	0.10
BC548	0.10
BC549	0.10
BC550	0.12
BC556	0.13
BC557	0.08
BC558	0.10
BC559	0.10
BC560C	0.20
BC635	0.22
BC637	0.24
BC638	0.20
BC639	0.19
BC640	0.24
BCX34	0.55
BD115	0.36
BD116	0.70
BD124	1.31
BD131	0.42
BD132	0.42
BD133	0.53
BD135	0.36
BD136	0.36
BD137	0.43
BD138	0.28
BD139	0.39
BD140	0.35
BD144	1.43
BD150	0.75
BD157	0.67
BD160	1.60
BD163	0.71
BD166	0.69
BD175	0.28
BD179	0.30
BD181	0.99
BD182	0.99
BD183	0.99
BD184	1.21
BD187	0.80
BD189	0.65
BD190	0.55
BD201	0.41
BD202	0.60
BD203	0.46
BD204	0.45
BD207	1.73
BD222	0.52
BD225	0.42
BD228	0.63
BD229	0.80
BD231	0.50
BD232	0.49
BD234	0.43
BD237	0.36
BD238	0.28
BD239	0.45
BD240	0.57
BD241	0.39
BD242	0.37
BD243A	0.62
BD243C	0.41
BD244	0.42
BD244C	0.58
BD245	0.67
BD246	0.95
BD253	1.05
BD278A	0.70
BD317	1.40
BD318	2.72
BD375	0.42
BD380	0.39
BD410	0.33
BD433	0.39
BD434	0.37
BD435	0.49
BD436	1.14
BD437	0.34
BD438	0.52
BD441	0.69
BD442	0.50
BD509	1.64
BD510	1.08
BD519	0.78
BD529	0.93
BD530	1.05
BD533	0.67
BD534	1.40
BD535	0.38
BD536	0.50
BD537	0.50
BD538	0.67
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	0.60
BD709	0.80
BD710	0.88
BD809	0.52
BD810	0.67
BD879	0.74
BD895	2.18
BD901	0.56
BD902	0.58
BDW83C	1.20
BDW84C	1.34
BDX32	1.65
BDX53A	0.46
BDX53B	3.35

BDX54B	0.33
BDX63A	2.09
BDX63A	1.96
BDY20	1.98
BDY81	1.18
BF115	0.39
BF117	0.66
BF118	0.67
BF121	0.25
BF123	0.13
BF127	0.13
BF137	0.29
BF153	0.58
BF154	0.26
BF157	0.33
BF158	0.18
BF159	0.18
BF160	0.31
BF167	0.38
BF173	0.34
BF177	0.55
BF178	0.40
BF179	0.36
BF180	0.36
BF181	0.32
BF182	0.34
BF183	0.39
BF184	0.43
BF185	0.39
BF194	0.14
BF195	0.14
BF196	0.14
BF197	0.24
BF198	0.17
BF199	0.17
BF200	0.37
BF218	0.36
BF224	0.17
BF237	0.65
BF240	0.19
BF241	0.17
BF245	0.50
BF245B	0.49
BF246A	2.67
BF255	0.20
BF256	0.25
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	0.33
BF337	0.31
BF338	0.38
BF355	0.45
BF362	0.99
BF363	0.50
BF371	0.50
BF391	0.25
BF419	0.65
BF422	0.15
BF423	0.33
BF435	2.61
BF450	0.35
BF451	0.11
BF457	0.41
BF458	0.49
BF459	0.66
BF460	1.24
BF469	0.33
BF470	0.26
BF471	0.25
BF472	0.33
BF479	0.61
BF480	0.89
BF491	0.50
BF506	0.43
BF532	0.45
BF596	0.18
BF597	0.27
BF694	0.22
BF757	0.34
BF759	0.29
BF761	0.43
BF762	0.42
BF869	0.49
BF870	0.30
BF960	0.26
BF966	0.51
BF970	0.49
BFR39	0.35
BFR61	0.92
BFR62	0.50
BFR79	0.37
BFR81	0.29
BFR89	1.63
BFR90A	0.63
BFX29	0.34
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	0.79
BR303	1.20
BRC84	2.08
BRX44	0.60
BRX45	0.81
BRX46	0.30
BRX49	0.56
BRY39	1.13
BRY44	0.34
BSS38	0.24
BSTB0140G	4.93
BSTC0246	6.99
BSTC0233	6.12
BSTC1233	4.34
BSTD1043	2.85
BSV57B	1.04
BSW68	0.60
BSX19	0.34
BSX20	1.12
BSY52	0.50
BT106	1.18
BT108	1.45
BT119	1.76
BT120	2.17
BT121	2.48
BT123	1.98
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	1.27
BU207	1.65
BU208	1.12
BU208	2.35
BU208A	1.12
BU208D	2.06
BU209	1.75
BU226	1.07
BU326A	0.99
BU406	1.49
BU406D	1.24
BU407	0.54
BU412	5.29
BU426A	1.67
BU500	1.53
BU508A	1.50
BU536	1.53
BU608	1.54
BU705	2.67
BU806	0.98
BU807	0.55
BU826A	1.95
BUW84	0.68
BUX84	0.50
BUX85	0.74
BY126	0.13
BY127	0.09
BY133	0.15
BY164	0.64
BY176	0.93
BY179	0.85
BY182	1.05
BY187	0.79
BY189	1.76
BY198	1.62
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	0.60
BY229-600	1.20
BY229-800	0.90
BY255	0.11
BY295-600	1.28
BY298	0.20
BY299	0.20
BY407	0.90
BY409	1.49
BY448	1.40
BY713	1.12
BYW56	0.19
BYX55-600	0.19
BYX71-600	0.85
BYX71-350	0.88
BYY56	1.48
C20	1.95
C106M	0.76
CA3046	1.55
CA3089	1.24
CA3090AQ	3.25
CA3094	1.72
CA3131EM	3.12
CD4001	0.19
CD4002	0.27
CD4008	1.35
CD4011	0.20
CD4012	0.24
CD4013	0.33
CD4016	0.25
CD4017	0.30
CD4020	0.75
CD4021	0.39
CD4023	0.28
CD4025	0.64
CD4028	0.84
CD4040B	0.45
CD4047	1.06
CD4049	0.24
CD4052	0.35
CD4066	0.29
CD4069	0.29
CD4070	0.24
CD4081	0.14
CD4093	0.40
CD4511	0.44
CD4528	0.52
CD4556	1.47
CRO2AM-8	1.70
CV12E	2.68
CX095D	3.14
CX104	8.77
CX108	5.52
CX109	7.20
CX130	8.76
CX135	7.50
CX136	11.49
CX139	11.83
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	4.29
HA11229	2.15
HA11235	3.14
HA11244	2.97
HA1125	4.29
HA1137W	1.38
HA1138	3.75
HA11414	2.25
HA1156	1.16
HA1160	5.77
HA1166X	6.73
HA1167	6.60
HA11706	3.61
HA11705	8.00
HA11703	3.45
HA11701	3.37
HA11710	3.45
HA11713	2.90
HA11711	9.90
HA11715	10.19
HA11714	7.76
HA11716	6.10
HA11725	18.26
HA11756	13.50
HA11781	21.15
HA1180	5.15

HA1196	7.43
HA13001	1.63
HA1306	2.26
HA13402	7.06
HA13403	11.86
HA1342A	8.98
HA1364	12.25
HA1367	2.75
HA1368R	2.45
HA1368	1.95
HA1374A	2.88
HA1377	1.59
HA1388	1.87
HA1389R	2.05
HA1389	2.69
HA1392	4.38
HA1394	2.65
HA1397	2.75
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	1.00
KC581C	7.92
KC582C	4.85
L200CV	1.27
LA1201	0.75
LA1210	1.56
LA1230	1.18
LA1231	3.04
LA1357N	3.06
LA1363	1.05
LA1364	3.02
LA1365J	0.70
LA1385	1.53
LA1387	3.18
LA3350	1.43
LA3361	1.00
LA3390	5.52
LA4032P	2.35
LA4100	1.25
LA4101	1.30
LA4102	0.75
LA4112	1.35
LA4125	2.25
LA4138	3.10
LA4140	0.70
LA4192	1.23
LA4220	1.25
LA4420	1.72
LA4422	1.28
LA4430	1.47
LA4440	1.99
LA4445	1.74
LA4460	1.50
LA4461	1.37
LA5112N	0.74
LA7020	13.86
LA7025	11.97
LA7027	10.92
LA7040	9.20
LA7042	4.05
LA7800	1.36
LA7801	3.21
LA7820	2.95
LB1274	1.90
LC7800	9.20
LD3120	1.13
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	1.82
LM8360	3.87
LM8361	2.95
LR3419	9.37
LR3471	9.37
LU1141	7.27
LU52012	20.62
LU52011	14.95
LU03112	12.37
M21C	1.32
M23C	1.98
M192B1	2.37
M293	7.09
M51102L	1.75
M5115P	5.24
M51203L	3.15
M51231P	1.68
M51301P	4.53
M51353P	6.93
M51381P	5.98
M51393AP	4.50
M51394P	14.50
M5142P	6.85
M5144P	8.25
M51515BL	2.75
M51516L	1.95
M51521L	1.50
M5192	3.13
M5194AP	6.27
M5231L	1.05
M53274P	1.33
M54532P	1.45
M54544L	1.61
M58478P	6.75
M58485P	7.99
MA8001	0.82
MAA4004	11.46
MB3705	1.98
MB3712	1.85
MB3713	1.69
MB3730	2.31
MB3731	2.48
MC13002	2.99
MC1310P	1.95
MC1327P	1.33

MC1330P	1.98
MC1350P	1.56
MC1351P	1.25
MC1352P	1.40
MC1357P	2.15
MC1358P	1.48
MC14493P	3.99
MC14497	7.10
MC14511BCP	1.10
MC1458P	5.18
MC1712	3.88
MC3340	1.40
MC5192	19.50
MC7724CP	3.49
MCR106-56	1.56
MCR220-7	1.25
ME0411	0.75
ME6002	0.26
ME6102	0.28
ME9002	0.45
MEA2901	2.06
MEM4956	2.50
MJ2501	3.30
MJ3000	2.37
MJE2955	0.84
MJE3055	1.15
MJE340	0.49
MJE520	0.49
ML231	0.99
ML232B	3.01
ML237B	1.95
ML238	5.65
ML923	3.30
ML926	3.45
MM5314N	8.99
MM5316N	3.50
MM5318N	3.11
MM5369N	2.01
MM5387AA-N	1.20
MM5841N	6.93
MN1400VL	13.65
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	12.09
MVS460-02	0.61
NE542	2.75
NE555	0.35
NE556	0.65
NE565N	1.18
OA202	0.11
OA47	0.16
OA91	0.14
OA95	0.16
OC28	9.07
OC35	1.06
OC36	7.53
OC44	1.95
OC45	0.18
OC72	0.44
OC75	0.44
ON236	1.06
DN782	1.65
OT121	1.45
PT6042	3.58
PT8504	5.65
R1038	2.19
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	1.36
R2322	0.67
R2323	0.76
R2354A	0.60
R2354B	2.01
R2441	1.36
R2461	0.95
R2540	1.65
R2540X	3.30
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	3.75
S2802	2.90
S2818	4.05
S3702S	5.21
S6080B	9.98
SA8063	15.55
SAA1006	3.34
SAA1020	5.77
SAA1025	4.40
SAA1024	2.50
SAA1075	4.25
SAA1121	9.23
SAA1124	2.60
SAA1130	9.90
SAA1174	5.99
SAA1250	3.95
SAA1251	3.20
SAA1351	8.11
SAA3027P	6.25
SAA5000	3.25
SAA5010	3.55
SAA5012	5.50
SAA5020	5.78
SAA5030	6.33
SAA5050	4.90
SAB1009B	5.98
SAB3011	7.34
SAB3013	3.62
SAB3021	5.70
SAB3024	6.36
SAB3209	5.82
SAB3210	3.21
SAF1032P	4.27
SAF1039	1.95
SAS5010	8.39
SAS560S	1.91

SAS560T	5.42
SAS570T	5.42
SAS570S	1.95
SAS580	2.85
SAS6600	1.33
SAS660	2.97
SAS6700	1.33
SAS670	3.96
SAS6710	2.21
SBA750	1.61
SC84203	19.35
SDA2006	17.10
SDA2010	15.08
SDA2112/2	12.96
SG264A	9.25
SG613	12.37
SG629	8.27
SG6533	14.28
SI1630HD	20.62
SKE2F1/04	1.25
SKE2G3/04	0.73
SKE4F1/06	0.30
SKE4F2/08	1.07
SKE4F2/06	0.85
SKE4F2/10	0.99
SKE5F3/10	1.36
SKE4G1/04	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	2.37
SL901B	8.32
SL918A	9.07
SN16861ANO	0.82
SN16966N	10.25
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	0.65
SN7404N	0.52
SN7410N	0.27
SN74121	0.45
SN74141N	2.65
SN74151AN	1.51
SN74154N	1.27
SN74175	1.52
SN74190	1.35
SN7420N	0.34
SN7430	0.49
SN7440N	0.27
SN7442	0.74
SN7472	1.54
SN7474N	0.44
SN7490AN	0.75
SN74LS26N	1.45
SN76001N	1.65
SN76013ND	7.45
SN76023ND	3.91
SN76033N	2.68
SN76110N	0.90
SN76115AN	1.61
SN76131	1.71
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	4.87
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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	1.23
SN76705N	2.97
SN76730	5.54
SN76810N	0.60
SN76832N	1.35
SN94042	4.35
SP5422	1.83
STA401	2.75
STA441C	3.13
STA471C	2.70
STK0029	5.70
STK0039	5.25
STK0040	7.17
STK0050	11.96
STK011	5.08
STK014	12.25
STK031	12.95
STK040	13.34
STK054	9.35
STK058	27.50
STK077	9.28
STK1039	5.75
STK2110	11.95
STK2145	13.77
STK2240	10.95
STK2250	18.95
STK3042	6.08
STK3044	5.75
STK4019	13.87
STK433	6.18
STK4332	5.37
STK435	6.02
STK4352	1.95
STK436	7.26
STK437	9.50
STK4372	5.99
STK460	9.85
STK466	10.10
STK501	6.32
STK502	7.25
STK5314	9.48
STK5333	8.47
STK5730	3.67
STK7216	9.45
STK772	3.71

STR1096	4.78
STR4090	12.65
STR440	6.18
STR451	5.77
STR454	4.96
STR50103A	4.99
STR6020	6.16
T6016V	1.09
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
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T9054V	0.99
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TA7027	4.80
TA7050	1.74
TA7051	1.74
TA7054	2.55
TA7060AP	0.71
TA7061AP	1.27
TA7069	3.13
TA7070P	1.68
TA7072P	2.57
TA7074P	1.98
TA7076P	7.50
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TA7092P	9.94
TA7093P	3.99
TA7108P	1.61
TA7109	3.71
TA7120P	0.64
TA7122BP	0.87
TA7124P	2.34
TA7129P	1.90
TA7130P	1.27
TA7136AP	1.89
TA7137P	1.21
TA7146P	5.87
TA7149P	3.26
TA7152P	3.16
TA7161P	16.54
TA7169	7.80
TA7172P	1.41
TA7176P	1.75
TA7193P	5.05
TA7204P	1.95
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TA7207P	1.68
TA7208P	2.15
TA7210P	1.45
TA7214P	3.63
TA7215P	2.58
TA7217AP	1.45
TA7222	1.95
TA7226	4.22
TA7229P	4.66
TA7230P	1.35
TA7233P	1.98
TA7240AP	2.20
TA7245P	1.95
TA7310P	2.15
TA7313AP	0.60
TA7314	3.50
TA7323P	3.15
TA7325P	1.63
TA7339P	2.50
TA7340P	5.95
TA7607AP	1.95
TA7609	2.35
TA7611AP	2.34
TA7616P	5.25
TA7622AP	4.21
TA7628P	1.73
TA7629P	2.51
TA7630P	0.95
TA7640AP	1.95
TA7672P	2.75
TA7676P	5.03
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	0.92
TBA120A	1.05
TBA1440	1.78
TBA1441	1.95
TBA395	0.66
TBA396	1.20
TBA400	2.39
TBA440C	2.34
TBA480Q	1.30
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	1.85
TBA720	4.32
TBA730	3.55
TBA750D	4.95
TBA800	1.08
TBA810P	1.61
TBA810S	1.61
TBA810T	1.75
TBA820	0.66
TBA820M	0.82
TBA890	3.50
TBA920	1.65
TBA940	1.87
TBA950	1.55

TBA970	3.86
TBA990	1.98
TCA270S	3.47
TCA270SD	1.05
TCA290A	2.39
TCA420A	2.16
TCA440	1.89
TCA640	2.25
TCA650	3.05
TCA660B	2.60
TCA730	6.50
TCA750	2.25
TCA800D	1.60
TCA830S	2.38
TCA890	5.44
TCA900	2.04
TCA910	1.65
TCA940	3.30
TCA940E	2.93
TCA4500	3.95
TD3F800R	6.51
TD3F900H	6.37
TD6361N-DS	5.25
TDA1001B	2.31
TDA1003A	1.47
TDA1005A	2.02
TDA1006A	7.00
TDA1011	1.14
TDA1010	1.10
TDA1011A	1.36
TDA1028	2.45
TDA1034B	2.42
TDA1035T	1.70
TDA1036	2.64
TDA1037	2.68
TDA1037D	2.05
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TDA1047	3.25
TDA1059B	0.80
TDA1060	2.60
TDA1082	4.51
TDA1151	0.95
TDA1190	1.27
TDA1190Z	2.48
TDA1200	1.51
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TDA1412	1.08
TDA1420	1.52
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TDA1470P	4.25
TDA1506	4.45
TDA1510	4.60
TDA1512	2.57
TDA1515	2.55
TDA1522	1.99
TDA1559	3.15
TDA1670	2.47
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TDA1905	1.27
TDA1908	4.83
TDA1940	3.89
TDA1950	2.50
TDA2005	1.56
TDA2006	1.05
TDA2004	1.37
TDA2002	0.90
TDA2003	0.79
TDA2030	1.05
TDA2140	5.16
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TDA2151	4.18
TDA2160	4.01
TDA2161	4.78
TDA2170	3.21
TDA2270	2.50
TDA2520	2.37
TDA2522	14.78
TDA2524	4.50
TDA2525	5.58
TDA2532	2.50
TDA2530	2.70
TDA2541	2.14
TDA2540	0.99
TDA2545A	2.15
TDA2560	2.50
TDA2575A	0.50
TDA2578A	2.95
TDA2576A+Kit	12.35
TDA2581	1.60
TDA2582	1.98
TDA2591	2.15
TDA2594	2.45
TDA2593	1.99
TDA2595	2.57
TDA2600	7.00
TDA2611AQ	1.79
TDA2611A	1.25
TDA2612D	6.58
TDA2620	1.96
TDA2630	2.50
TDA2631	2.73
TDA2640	3.80
TDA2652	9.53
TDA2653	5.16
TDA2654	4.73
TDA2670	2.48
TDA2680	3.20
TDA2740	10.14
TDA2780AD	7.99
TDA2795	2.78
TDA2791	1.81
TDA2910	13.25
TDA3300B	6.55
TDA3330	4.62
TDA3506	4.40
TDA3501	5.50
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TDA3592A	4.99
TDA3650	13.01
TDA3651AQ	2.17
TDA3651	1.99
TDA3651A	2.50
TDA3950	4.50
TDA4050B	3.95
TDA4280	7.20
TDA4290	2.95
TDA4400	2.27
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TDA4422	8.32
TDA4427S	3.71
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TDA4440	1.95
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TDA4500	4.75
TDA4600-2	1.92
TDA4610	5.99
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TDA5500	14.20
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TDA7270S	6.35
TDA8190	3.24
TDA9403	1.50
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TDA9513	3.15
TDD1613S	1.22
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TEA1002	4.93
TEA1009	1.85
TEA1014	3.00
TEA1020SP	4.93
TEA2018A	1.52
TIC106M	0.67
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TIP120	0.55
TIP110	0.34
TIP112	0.49
TIP117	0.95
TIP121	0.40
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TIP132	0.75
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TIP29D	0.75
TIP3055	0.69
TIP30A	0.41
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TIP31A	0.34
TIP31B	0.38
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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	0.31
TIP41C	0.39
TIP42A	0.29
TIP42B	0.79
TIP42C	0.50
TIP47	0.65
TIS43	1.34
TIS90	0.21
TL011CP	1.65
TL494CN	4.65
TL072CP	0.65
TMP4320	9.50
TMS1024NLL	6.50
TMS1025N	14.60
TMS3720ANS	4.95
TMS3748NS	10.95
TMS3755	9.66
TMS4034	1.00
TUA2000	9.33
TV106	1.76
TY6010B	2.97
ULN2204	8.50
UPC1360C	2.30
UPC1366	1.63
UPA81C	0.65
UPC1003	5.95
UPC1025H	2.90
UPC1028H	2.00
UPC1032H	0.82
UPC1043C	4.29
UPC1158H	3.94
UPC1161C	4.68
UPC1182H	2.19
UPC1186H	1.05
UPC1181H	0.95
UPC1185H	4.12
UPC1188	2.99
UPC1212C	0.80
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UPC1351C	1.81
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UPC1365C	1.65
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UPC1378H	1.25
UPC141C	4.95
UPC1458	1.85
UPC151C	2.95
UPC2002	1.48
UPC30C	2.51
UPC324C	0.99
UPC32C	4.94
UPC339C	2.95
UPC41C	2.99
UPC4558C	0.51
UPC474	5.11
UPC554C	1.85
UPC575C2	1.55
UPC580C	2.73
UPC587C2	1.34
UPC592H	2.15
UPC595	2.95
UPC596	1.98
UPD1514C	4.76
UPD2819C	4.98
UPD553-164	12.19
UPD8049C-1	11.50
XOD22CE	5.75
XO029CE	7.09
XD031CE	6.38
XO035TA	7.27
XD040TA	5.52
XO042CE	3.19
XO043CE	2.75
XO055GE	5.02
XDD57GE	6.00
XO065CE	6.35
XO074GE	17.14
XO077GE	6.35
XO079CE	4.95
XO092CE	10.31
XD096CE	6.60
XD109CE	13.61
XO113CE	10.97
XO195CE	9.60
XO204CE	11.96
XO261CE	8.98
2PY120	4.77

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AS DISTRIBUTORS OF QUALITY VIDEO SPARES FOR THE LAST TEN YEARS, WE FULLY UNDERSTAND THE REQUIREMENTS OF THE REPAIR TRADE. THERE IS A CERTAIN QUALITY WHICH MUST BE MAINTAINED IN ORDER TO EXECUTE HONEST, RELIABLE REPAIRS. THEREFORE, WE GUARANTEE THAT ALL VIDEO SPARES SUPPLIED BY US ARE OF THE FINEST QUALITY AND WE CAN ASSURE YOU THAT ALL STOCKED ITEMS WILL BE DISPATCHED THE SAME DAY.

	Part No.	Price
AIWA		
AV-66		
Video Head	VID 2546	£16.95
Pinch Roller	VID 1755	£3.76
Belt Kit	VID 7519	£1.65
Idler Replacement Set	VID 1001	£3.22
Idler	VID 1005	£1.65
Capstan Motor	VID 2160	£22.81
Tension Band	VID 2160	£3.22
Reel Table Rubber Tyre	VID 1335	£0.90
CTL Unit	VID 2637	£59.75
AV-77		
Video Head	VID 2546	£16.95
Pinch Roller	VID 1755	£3.76
Belt Kit	VID 7509	£1.95
Idler Replacement Set	VID 1000	£5.62
FWD Limiter	VID 1002	£3.37
Idler	VID 1004	£1.27
Idler	VID 1005	£1.65
Capstan Motor	VID 2118	£28.50
Tension Band	VID 1423	£3.22
CTL Unit	VID 2567	£46.43
AKAI		
VS-9800		
Video Head	VID 2511	£12.36
Pinch Roller	VID 1756	£2.85
Belt Kit	VID 7506	£1.65
Take Up Idler	VID 1025	£4.65
REW Idler	VID 1026	£5.92
Unloading Idler	VID 1027	£9.30
FF Rubber Tyre	VID 1029	£0.74
FF Rubber Tyre	VID 1030	£0.75
Unloading Idler Rubber Tyre	VID 1207	£0.82
Capstan Motor	VID 2119	£42.31
Drum Motor	VID 2120	£18.73
Cassette Lamp	VID 1943	£0.35
Tension Band	VID 1391	£3.22
Repair Kit	VID 7911	£13.08
Take Up Rubber Tyre	VID 1028	£0.75
ALBA		
VCR-4000		
Video Head	VID 2713	£22.31
Pinch Roller	VID 1787	£3.50
Belt Kit	VID 7596	£3.99
Idler	VID 1049	£3.75
Cassette LED	VID 1981	£1.35
Tension Band	VID 1399	£2.40
AMSTRAD		
VCR-4600		
Video Head	VID 2676	£19.68
Pinch Roller	VID 1758	£2.95
Belt Kit	VID 7593	£1.95
Clutch	VID 1226	£4.32
Gear Holder	VID 1227	£11.70
RF Clutch	VID 1231	£6.52
Cassette LED	VID 1981	£1.35
VCR-9000		
Video Head	VID 2502	£14.72
Pinch Roller	VID 1758	£2.95
Belt Kit	VID 7592	£1.05
RF Clutch	VID 1225	£3.82
Clutch	VID 1226	£4.32
Gear Holder	VID 1227	£11.70
Cassette LED	VID 1981	£1.35
BANG & OLUFSEN		
VHS-65		
Video Head	VID 2506	£14.28
Pinch Roller	VID 1788	£1.58
Belt Kit	VID 7538	£7.20
FF/REW Idler Arm	VID 1020	£1.65
Clutch Plate	VID 1211	£8.92
Capstan Motor	VID 2147	£28.05
Cassette LED	VID 1981	£1.35
DECCA		
VRH-8300		
Video Head	VID 2511	£12.36
Pinch Roller	VID 1814	£2.77
Belt Kit	VID 7812	£1.22
Reel Idler	VID 1036	£2.70
Take Up Clutch	VID 1037	£2.86
Take Up Idler	VID 1038	£1.55
Brake Pad	VID 1361	£0.36
Reel Motor	VID 2169	£28.12
Capstan Motor	VID 2164	£37.18
Loading Motor	VID 2168	£9.30
Cassette Lamp	VID 1947	£0.50
Tension Band	VID 1389	£1.60
Repair Kit	VID 7913	£18.52
Take Up Reel Table Rubber Tyre	VID 1080	£0.60
Supply Reel Table Rubber Tyre	VID 1080	£0.60
FERGUSON		
3-V-30		
Video Head	VID 2647	£12.95
Pinch Roller	VID 1814	£2.77
Belt Kit	VID 7812	£1.22
Reel Idler	VID 1036	£2.70
Take Up Clutch	VID 1037	£2.86
Take Up Idler	VID 1038	£1.55
Brake Pad	VID 1361	£0.36
Reel Motor	VID 2169	£28.12
Capstan Motor	VID 2164	£37.18
Loading Motor	VID 1947	£0.50
Cassette Lamp	VID 1389	£1.60
Tension Band	VID 7913	£18.52
Repair Kit		
Take Up Reel Table Rubber Tyre	VID 1080	£0.60
Supply Reel Table Rubber Tyre	VID 1080	£0.60
3-V-36		
Video Head	VID 2647	£12.95
Pinch Roller	VID 1813	£2.95
Belt Kit	VID 7543	£1.05
Take Up Clutch	VID 1031	£3.00
Take Up Idler	VID 1038	£1.55
Reel Idler	VID 1039	£3.07
Brake Pad	VID 1361	£0.36
Capstan Motor	VID 2165	£22.87
Loading Motor	VID 2168	£9.30
Front Loading Motor	VID 2168	£9.30
Cassette LED	VID 1981	£1.35
Tension Band	VID 1389	£1.60
Remote Control	IR 9100	£11.92
Repair Kit	VID 7918	£18.09
Mains Transformer	VID 2223	£20.38
Take Up Reel Table Rubber Tyre	VID 1080	£0.60
Supply Reel Table Rubber Tyre	VID 1080	£0.60
Cassette Housing	VID 1099	£21.33
3-V-57		
Video Head	VID 2573	£16.50
Pinch Roller	VID 1813	£2.95
Belt Kit	VID 7540	£0.80
Clutch Mechanism	VID 1083	£13.97
Capstan Motor	VID 2188	£44.62
Loading Motor	VID 2167	£11.40
Front Loading Motor	VID 2168	£9.30
Cassette LED	VID 1981	£1.35
Tension Band	VID 1388	£1.95
Repair Kit	VID 7920	£17.58
Cassette Housing	VID 1315	£21.33
FV-10B		
Video Head	VID 2580	£25.68
Pinch Roller	VID 1817	£11.25
Belt Kit	VID 7564	£2.50
Idler Arm	VID 1091	£2.88
Reel Motor	VID 2193	£15.04
Capstan Motor	VID 2190	£25.53
Loading Motor	VID 2412	£5.62
Front Loading Motor	VID 2412	£5.62
Cassette LED	VID 1981	£1.35
Tension Band	VID 1386	£1.65
Repair Kit	VID 7921	£14.16
FV-12L		
Video Head	VID 2581	£37.81
Pinch Roller	VID 1817	£11.25
Belt Kit	VID 7564	£2.50
Idler Arm	VID 1091	£2.88
Reel Motor	VID 2193	£15.04
Capstan Motor	VID 2190	£25.53
Loading Motor	VID 2412	£5.62
Front Loading Motor	VID 2412	£5.62
Cassette LED	VID 1981	£1.35
Tension Band	VID 1386	£1.65
Repair Kit	VID 7921	£14.16
FIDELITY		
VCR-100		
Video Head	VID 2502	£14.72
Pinch Roller	VID 1758	£2.95
Belt Kit	VID 7593	£1.95
Clutch	VID 1226	£4.32
Gear Holder	VID 1227	£11.70
RF Clutch	VID 1231	£6.52
Cassette LED	VID 1981	£1.35
FINLUX		
VR-1030		
Video Head	VID 2558	£39.81
Pinch Roller	VID 1803	£3.99
Idler	VID 1006	£2.88
Tension Band	VID 1432	£5.17
Remote Control	IR 9034	£13.46
Repair Kit	VID 7930	£12.76
VR-2010		
Video Head	VID 2578	£56.31
Pinch Roller	VID 1827	£10.35
Belt Kit	VID 7588	£1.42
Idler	VID 1252	£3.97
Loading Gear	VID 1253	£6.37
Modification Set	VID 1254	£10.35
Tension Band	VID 1431	£4.27
Remote Control	IR 9034	£13.46
FISHER		
FVH-P520		
Video Head	VID 2500	£21.95
Pinch Roller	VID 1788	£2.95
Belt Kit	VID 7532	£1.99
Take Up Idler	VID 1015	£4.87
FF/REW Pulley	VID 1016	£0.78
Idler	VID 1023	£2.70
Tension Band	VID 1378	£2.10
Take Up Reel Table Rubber Tyre	VID 1293	£1.35
Supply Reel Table Rubber Tyre	VID 1293	£1.35
FVH-P530		
Video Head	VID 2500	£21.95
Pinch Roller	VID 1788	£2.95
Belt Kit	VID 7532	£1.99
Take Up Idler	VID 1015	£4.87
FF/REW Pulley	VID 1016	£0.78
Idler	VID 1023	£2.70
Tension Band	VID 1378	£2.10
Take Up Reel Table Rubber Tyre	VID 1293	£1.35
Supply Reel Table Rubber Tyre	VID 1293	£1.35
FVH-P720/720K 721		
Video Head	VID 2500	£21.95
Pinch Roller	VID 1810	£3.30
Belt Kit	VID 7532	£1.99
Gear Idler	VID 1013	£4.65
Idler	VID 1014	£4.05
Loading Gear Set	VID 1230	£1.50
Cassette LED	VID 1981	£1.35
Tension Band	VID 1376	£2.10
Take Up Reel Table	VID 1295	£7.12
Supply Reel Table	VID 1294	£5.77
FVH-P722/725		
Video Head	VID 2500	£21.95
Pinch Roller	VID 1810	£3.30
Belt Kit	VID 7813	£1.05
Gear Idler	VID 1013	£4.65
Idler	VID 1014	£4.05
Loading Gear Set	VID 1230	£1.50
Cassette LED	VID 1981	£1.35
Tension Band	VID 1376	£2.10
Take Up Reel Table	VID 1295	£7.12
Supply Reel Table	VID 1294	£5.77
FVH-P980K/KV		
Video Head	VID 2501	£24.43
Pinch Roller	VID 1818	£3.05
Belt Kit	VID 7568	£2.40
Idler	VID 1093	£4.20
Clutch	VID 1094	£13.52
Cassette LED	VID 1981	£1.35
Tension Band	VID 1377	£2.10
Supply Reel Table	VID 1296	£9.97
FUNAI		
VCR-4600		
Video Head	VID 2676	£19.68
Pinch Roller	VID 1758	£2.95
Belt Kit	VID 7593	£1.95
Clutch	VID 1226	£4.32
Gear Holder	VID 1227	£11.70
RF Clutch	VID 1231	£6.52
Cassette LED	VID 1981	£1.35
VCR-5843		
Video Head	VID 2708	£24.31
Pinch Roller	VID 1758	£2.95
Belt Kit	VID 7615	£3.67
Idler	VID 1364	£2.25
Cassette LED	VID 1981	£1.35
GEC		
V-4004		
Video Head	VID 2506	£14.28
Pinch Roller	VID 1788	£2.95
Belt Kit	VID 7538	£1.58
FF/REW Arm	VID 1020	£1.65
Clutch Plate	VID 1211	£8.92
Capstan Motor	VID 2148	£25.20
Cassette LED	VID 1981	£1.35
Tension Band	VID 1379	£2.10
Repair Kit	VID 7922	£16.50
GOLDSTAR		
GHV-8000/8200/8210/8215		
Pinch Roller	VID 1815	£4.72
Belt Kit	VID 7585	£2.39
Idler	VID 1052	£1.92
Bracket Centre	VID 1223	£25.81
Clutch Gear	VID 1228	£2.02
Limiter Roller	VID 1440	£1.20
Cassette LED	VID 1981	£1.35
Tension Band	VID 1399	£2.40
VCP-4100/4130		
Video Head	VID 2645	£63.81
Pinch Roller	VID 1815	£4.72
Belt Kit	VID 7585	£2.39
Idler	VID 1052	£1.92
Bracket Centre	VID 1223	£25.81
Clutch Gear	VID 1228	£2.02
Limiter Roller	VID 1440	£1.20
Cassette LED	VID 1981	£1.35
Tension Band	VID 1399	£2.40
VCP-4200/4326		
Video Head	VID 2645	£63.81
Pinch Roller	VID 1815	£4.72
REW Belt	VID 7234	£0.37
Cassette LED	VID 1981	£1.35
GRANADA		
VHS-EY1/EY2		
Video Head	VID 2539	£16.50
Pinch Roller	VID 1822	£7.20
Belt Kit	VID 7605	£2.25
Reel Drive Unit	VID 1255	£6.45
Loading Gear A	VID 1268	£1.72
Loading Gear B	VID 1271	£1.20
Capstan Motor	VID 2404	£39.37
Cassette LED	VID 1981	£1.35
Tension Band	VID 1414	£5.62
GRUNDIG		
MVS-400		
Video Head	VID 2596	£15.87
Pinch Roller	VID 1757	£3.00
Belt Kit	VID 7567	£1.87
Idler	VID 1052	£1.92
Loading Gear	VID 1222	£2.25
Clutch Gear	VID 1228	£2.02
Limiter Roller	VID 1440	£1.20
Cassette LED	VID 1981	£1.35
Tension Band	VID 1400	£2.32
Remote Control	IR 8965	£20.56
VS-520 GB		
Video Head	VID 2595	£29.00
Pinch Roller	VID 1821	£12.12
Timing Belt	VID 1482	£7.20
Centre Pulley	VID 1482	£7.20
Cassette LED	VID 1981	£1.35
Tension Band	VID 1401	£3.37
HINARI		
VXL-30/35/4		
Video Head	VID 2518	£21.00
Pinch Roller	VID 1815	£4.72
Belt Kit	VID 7566	£2.10
Clutch	VID 1316	£5.47
Idler	VID 1317	£3.22
Loading Motor	VID 2167	£11.40
Cassette LED	VID 1981	£1.35
HITACHI		
VT-11		
Video Head	VID 2504	£19.94
Pinch Roller	VID 1788	£2.95
Belt Kit	VID 7538	£1.58
FF/REW Idler Arm	VID 1020	£1.65
Clutch Plate	VID 1211	£8.92
Capstan Motor	VID 2147	£28.05
Cassette LED	VID 1981	£1.35
Tension Band	VID 1379	£2.10
Repair Kit	VID 7922	£15.62
VT-16 S		
Video Head	VID 2505	£23.18
Pinch Roller	VID 1788	£2.95
Belt Kit	VID 7538	£1.58
FF/REW Idler Arm	VID 1020	£1.65
Clutch Plate	VID 1211	£8.92
Capstan Motor	VID 2147	£28.05
Cassette LED	VID 1981	£1.35
Tension Band	VID 1379	£2.10
Repair Kit	VID 7922	£16.50
VT-33/330		
Video Head	VID 2504	£19.94
Pinch Roller	VID 1788	£2.95
Belt Kit	VID 7538	£1.58
FF/REW Idler Arm	VID 1020	£1.65
Clutch Plate	VID 1211	£8.92
Capstan Motor	VID 2148	£25.20
Cassette LED	VID 1981	£1.35
Tension Band	VID 1379	£2.10
Repair Kit	VID 7922	£16.50
VT-61/62/63/64		
Video Head	VID 2628	£24.25
Pinch Roller	VID 1818	£3.05
Belt Kit	VID 7583	£7.20
FF/REW Idler Arm	VID 1020	£1.65
Clutch Plate	VID 1211	£8.92
Capstan Motor	VID 2154	£17.20
Cassette LED	VID 1981	£1.35
Tension Band	VID 1379	£2.10
Repair Kit	VID 7924	£15.81
VT-8000/8500		
Video Head	VID 2509	£15.96
Pinch Roller	VID 1788	£2.95
Belt Kit	VID 7803	£0.99
Take Up Idler	VID 1015	£4.87
Wind Roller	VID 1016	£0.78
FF/REW Idler	VID 1023	£2.70
Capstan Motor	VID 2155	£50.50
Tension Band	VID 1381	£1.80
Remote Control	IR 9097	£12.63
Repair Kit	VID 7928	£14.79
Take up Reel Table	VID 1302	£11.47
Supply Reel Rubber Tyre	VID 1300	£0.67
VT-9300/9500/9700		
Video Head	VID 2509	£15.96
Pinch Roller	VID 1788	£2.95
Belt Kit	VID 7802	£1.10
FF/REW Idler Arm	VID 1019	£2.62
Play Idler	VID 1075	£4.20
FS Brake	VID 1212	£2.25
Capstan Motor	VID 2156	£57.81
Cassette Lamp	VID 1951	£0.90
Tension Band	VID 1382	£1.80
Remote Control	IR 9096	£12.63
Repair Kit	VID 7927	£14.79
Take Up Reel Table	VID 1303	£8.32
ITT		
VR-3913		
Video Head	VID 2511	£12.36
Pinch Roller	VID 1814	£2.77
Belt Kit	VID 7812	£1.22
Reel Idler	VID 1036	£2.70
Take Up Clutch	VID 1037	£2.86
Take Up Idler	VID 1038	£1.55
Brake Pad	VID 1361	£0.36
Reel Motor	VID 2169	£28.12
Capstan Motor	VID 2164	£37.18
Loading Motor	VID 2168	£9.30
Cassette Lamp	VID 1947	£0.50
Tension Band	VID 1389	£1.60
Repair Kit	VID 7913	£18.52
Take Up Reel Table Rubber Tyre	VID 1080	£0.60
Supply Reel Table Rubber Tyre	VID 1080	£0.60
VR-3993		
Video Head	VID 2647	£12.95
Pinch Roller	VID 1814	£2.77
Belt Kit	VID 7523	£1.20
Reel Idler	VID 1036	£2.70
Take Up Clutch	VID 1037	£2.86
Take Up Idler	VID 1038	£1.55
Roller Bar	VID 1363	£3.75
Brake Pad	VID 1361	£0.36
Reel Motor	VID 2169	£28.12
Capstan Motor	VID 2187	£46.18
Loading Motor	VID 2168	£9.30
Front Loading Motor	VID 2168	£9.30
Cassette Lamp	VID 1946	£0.49
Tension Band	VID 1389	£1.60
Repair Kit	VID 7914	£19.12
Take Up Reel Table Rubber Tyre	VID 1080	£0.60
Supply Reel Table Rubber Tyre	VID 1080	£0.60
JVC		
HR-3300		
Video Head	VID 2511	£12.36
Pinch Roller	VID 1756	£2.77
Belt Kit	VID 7506	£1.65
Take Up Idler Large	VID 1025	£4.65
REW Idler	VID 1025	£4.65
Unloading Idler	VID 1027	£9.30
FF Rubber Tyre	VID 1029	£0.74
Unloading Idler Rubber Tyre	VID 1207	£0.82
Capstan Motor	VID 2119	£42.31
Drum Motor	VID 2120	£18.73
Cassette Lamp	VID 1943	£0.35
Tension Band	VID 1391	£3.22
Repair Kit	VID 7911	£13.08
Take Up Rubber Tyre	VID 1028	£0.75
HR-D110/111/120/121		
Video Head	VID 2647	£12.95
Pinch Roller	VID 1813	£2.95
Belt Kit	VID 7543	£1.05
Take Up Clutch	VID 1031	£3.00
Take Up Idler	VID 1038	£1.55
Reel Idler	VID 1039	£3.07
Brake Pad	VID 1361	£0.36
Capstan Motor	VID 2165	£22.87
Loading Motor	VID 2168	£9.30
Front Loading Motor	VID 2168	£9.30
Cassette LED	VID 1981	£1.35
Tension Band	VID 1389	£1.60
Repair Kit	VID 7918	£18.09
Mains Transformer	VID 2223	£20.38
Take Up Reel Table Rubber Tyre	VID 1080	£0.60
Supply Reel Table Rubber Tyre	VID 1080	£0.60
Cassette Housing	VID 1099	£21.33
MATSUI		
VX-850		
Pinch Roller	VID 1815	£4.72
Belt Kit	VID 7566	£2.10
Clutch	VID 1316	£5.47
Idler	VID 1317	£3.22
Cassette LED	VID 1981	£1.35
MITSUBISHI		
HS-307		
Video Head	VID 2606	£71.56
Pinch Roller	VID 1808	£2.77
Belt Kit	VID 7542	£1.50
Reel Idler Unit	VID 1040	£8.48
FF Idler Rubber Tyre	VID 1081	£0.67
Capstan Rubber Tyre	VID 1264	£1.20
Cam Gear A	VID 1274	£1.20
Gear 2	VID 1275	£1.20
Cam Gear B	VID 1276	£1.27
Gear 1	VID 1277	£1.27
Cassette LED	VID 1981	£1.35
Tension Band	VID 1393	£2.55
Take Up Reel Table	VID 1307	£2.92
Supply Reel Table	VID 1299	£2.70
HS-318		
Video Head	VID 2607	£42.37
Pinch Roller	VID 1808	£2.77
Belt Kit	VID 7559	£2.85
Reel Idler Unit	VID 1040	£8.48
FF Idler Rubber Tyre	VID 1081	£0.67
Capstan Rubber Tyre	VID 1264	£1.20
Cam Gear A	VID 1274	£1.20
Gear 2	VID 1275	£1.20
Cam Gear B	VID 1276	£1.27
Gear 1	VID 1277	£1.27
Cassette LED	VID 1981	£1.35
Tension Band	VID 1393	£2.55
Take Up Reel Table	VID 1307	£2.92
Supply Reel Table	VID 1299	£2.70
NEC		
N-830 EG/831/832/833		
Video Head	VID 2647	£12.95
Pinch Roller	VID 1813	£2.95
Belt Kit	VID 7543	£1.05
Take Up Clutch	VID 1031	£3.00
Take Up Idler	VID 1038	£1.55
Reel Idler	VID 1039	£3.07
Brake Pad	VID 1361	£0.36
Capstan Motor	VID 2165	£22.87
Loading Motor	VID 2168	£9.30
Front Loading Motor	VID 2168	£9.30
Cassette LED	VID 1981	£1.35
Tension Band	VID 1389	£1.60
Repair Kit	VID 7918	£18.09
Mains Transformer	VID 2223	£20.38
Take Up Reel Table Rubber Tyre	VID 1080	£0.60
Supply Reel Table Rubber Tyre	VID 1080	£0.60
Cassette Housing	VID 1099	£21.33
N-895		
Video Head	VID 2514	£49.68
Pinch Roller	VID 1813	£2.95
Belt Kit	VID 7540	£0.80
Clutch Mechanism	VID 1082	£13.01
Capstan Motor	VID 2166	£50.43
Loading Motor	VID 2167	£11.40
Front Loading Motor	VID 2168	£9.30
Cassette LED	VID 1981	£1.35
Tension Band	VID 1387	£2.25
Remote Control	IR 8947	£20.37
Repair Kit	VID 7919	£22.18
Cassette Housing	VID 1315	£21.33
N-9013/9014/9033/9034/9053/9054/9055		
Video Head	VID 2695	£39.50
Pinch Roller	VID 1828	£7.27
Belt Kit	VID 7601	£2.85
Reel Drive Pulley	VID 1265	£6.52
Cassette LED	VID 1981	£1.35
PANASONIC		
NV-2000/2010		
Video Head	VID 2520	£12.36
Pinch Roller	VID 1757	£3.00
Belt Kit	VID 7800	£1.75
Idler	VID 1054	£0.85
Idler	VID 1055	£0.80
Cam Gear	VID 1221	£1.12
Intermediate Gear	VID 1216	£1.12
Driving Gear	VID 1217	£0.90
Cassette Lamp	VID 1948	£0.22
Tension Band	VID 1397	£3.38
Repair Kit	VID 7901	£18.47
Take Up Reel Table	VID 1312	£10.12
Supply Reel Table	VID 1310	£8.62
NV-300/333		
Video Head	VID 2520	£12.36
Pinch Roller	VID 1787	£3.50
Belt Kit	VID 7521	£1.63
Play Idler	VID 1048	£2.34
Idler	VID 1057	£0.85
Idler Arm	VID 1220	£3.82
Cam Gear	VID 1215	£0.99
Intermediate Gear	VID 1216	£1.12
Driving Gear	VID 1217	£0.90
Reel Motor	VID 2158	£18.95
Capstan Motor	VID 2421	£39.43
Cassette LED	VID 1982	£1.47
Tension Band	VID 1399	£2.40
Repair Kit	VID 7903	£10.42
Take Up Reel Table	VID 1312	£10.12
PHILIPS		
Video Head	VID 2526	£13.86
Pinch Roller	VID 1757	£3.00
Belt Kit	VID 7530	£1.25
Idler	VID 1052	£1.92
Loading Gear	VID 1222	£2.25
Idler	VID 1370	£1.98
Idler	VID 1371	£5.40
Limiter Roller	VID 1440	£1.20
Cassette LED	VID 1981	£1.35
Tension Band	VID 1400	£2.32
Repair Kit	VID 7906	£8.92
VR-6540		
Video Head	VID 2537	£18.73
Pinch Roller	VID 1815	£4.72
Belt Kit	VID 7547	£0.90
Idler	VID 1060	£1.81
Master Cam	VID 1265	£6.52
Reel Motor	VID 2127	£26.06
Loading Motor	VID 2142	£14.35
Cassette LED	VID 1981	£1.35
Tension Band	VID 1420	£5.10
PYE		
DV-761		
Video Head	VID 2621	£82.18
Pinch Roller	VID 1827	£10.35
Belt Kit	VID 7588	£1.42
Idler	VID 1252	£3.97
Loading Gear	VID 1253	£6.37
Modification Set	VID 1254	£10.35
Tension Band	VID 1431	£4.27
SAISHO		
VR-2000/3800		
Pinch Roller	VID 1815	£4.72
Belt Kit	VID 7565	£0.97
Idler	VID 1060	£1.81
Reel Motor	VID 2121	£16.45
Cassette LED	VID 1981	£1.35
SALORA		
SV-8620		
Pinch Roller	VID 1808	£2.77
Belt Kit	VID 7600	£2.85
FF/REW Idler Arm	VID 1233	£2.70
FF/REW Idler Arm	VID 1234	£2.85
FF/REW Idler	VID 1235	£1.12
Cassette LED	VID 1981	£1.35
Tension Band	VID 1394	£2.92
Take Up Reel Table	VID 1308	£4.72
Supply Reel Table	VID 1305	£4.12
SAMSUNG		
VI-510/520/611/616/621		
Video Head	VID 2648	£24.62
Pinch Roller	VID 1815	£4.72
Belt Kit	VID 7598	£1.57
Idler	VID 1232	£1.35
Idler	VID 1346	£3.37
Reel Motor	VID 2407	£13.04
Capstan Motor	VID 2409	£25.06
Loading Motor	VID 2142	£14.35
Cassette LED	VID 1981	£1.35
VX-710/720/730		
Video Head	VID 2648	£24.62
Pinch Roller	VID 1759	£3.50
Belt Kit	VID 7608	£4.12
Cassette LED	VID 1981	£1.35
SANYO		
VHR-1100 EX/EE/G		
Video Head	VID 2583	£25.68
Pinch Roller	VID 1787	£3.50
Belt Kit	VID 7558	£2.49
Reel Drive Roller	VID 1076	£5.70
Reel Motor	VID 2198	£13.04
Cassette LED	VID 1981	£1.35
Tension Band	VID 1411	£2.40
VHR-1100 SP/1200/1300/1500		
Video Head	VID 2583	£25.68
Pinch Roller	VID 1787	£3.50
Belt Kit	VID 7558	£2.49
Reel Drive Roller	VID 1076	£5.70
Reel Motor	VID 2198	£13.04
Cassette LED	VID 1981	£1.35
Tension Band	VID 1411	£2.40
VTC-M10/11/20/21		
Video Head	VID 2530	£23.75
Pinch Roller	VID 1758	£2.95
Belt Kit	VID 7809	£0.45
Reel Drive Pulley	VID 1079	£6.95
Idler	VID 1219	£1.73
Reel Motor	VID 2179	£17.39
Tension Band	VID 1408	£1.87
Supply Reel Table	VID 1319	£8.62
SENTRA		
VX-5000/8000		
Video Head	VID 2713	£22.31
Pinch Roller	VID 1787	£3.50
Belt Kit	VID 7596	£3.99
Idler	VID 1049	£3.75
Cassette LED	VID 1981	£1.35
Tension Band	VID 1399	£2.40

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Long-distance Television

Roger Bunney

There was a steady decline in Sporadic E propagation during August, with infrequent openings, particularly towards the end of the month. The 7th was perhaps the most active day, with signals from North America in evidence. During mid-August the Perseids meteor shower caused considered press comment. It had its moments for Meteor Scatter enthusiasts, with signals reaching as high as Band III. The MS displays were evident in the night sky: I witnessed a particularly brilliant burn-up, with the meterorite streaking across the sky as a white slash of light. Tropospheric propagation, helped by true summer weather conditions and stable high-pressure systems, gave a lift to both reception and flagging spirits! The collated SpE log for the UK is as follows:

5/8/91	RAI (Italy) ch.IA; JRT/HTV (Yugoslavia) ch. E3.
6/8/91	RAI IA; TVE (Spain) E2, 3; +PTT (Switzerland) E2, 3; NRK (Norway) E2; DR (Denmark) E3.
7/8/91	TVE E2, 3, 4; TVE-2 E2; RAI IA, B, C; C+ (Canal Plus) L2, 3, 4; +PTT E2, 3; DR (Denmark) E3; JRT E4; MTV (Hungary) R2; CST (Czechoslovakia) R1, 2; SVT (Sweden) E2, 3, 4; NRK E2, 3, 4; TSS (USSR) R1, 2, 3; RUV (Iceland) E3, 4; ARD (West Germany) E2; RTP (Portugal) E3. In addition Band III SpE was noted and Simon Hamer received unidentified North American signals on chs. A2 and 3.
8/8/91	TVE E3; RAI IA, B.
9/8/91	TVE E3; RAI IA; NRK E2.
10/8/91	SVT E2, 3; TSS R1, 2; NRK E2, 3; DR E3; TVE E3.
11/8/91	RAI IA, B; JRT E3, 4; MTV R1, 2; C+ L2, 3; TSS R1, 2; DR E3; NRK E2, 3; TVP (Poland) R1, 2.
12/8/91	CST R1; DR E3; NRK E3.
13/8/91	RAI IA, B; C+ L2, 3; TVE E2, 3; ARD E2, 3; ARD E3; TVP R1, 2; TSS R1-7 (the Band III signals logged by Simon Hamer); JRT E3, 4; EPT (Greece) E3; RTSH (Albania) IC; MTV R1-4.
14/8/91	+PTT E2; TVE E2; SVT E2.
15/8/91	TVE E2, 3, 4.
16/8/91	TVE E2; RAI IA, B; JRT E3; SVT E3.
17/8/91	+PTT E2, 3; ARD E2; TVE E2; JRT E3; RAI IA, B; TSS R1; DR E3; TVR (Rumania) R2.
18/8/91	TVE E2, 3; C+ L2; ARD E2, 3, 4; ORF (Austria) E2a; RAI IA; JRT E3; NRK E2, 3, 4; SVT E2, 3, 4; TSS R1; CST R1; RUV E4.
20/8/91	ARD E2; TVE E3; RAI IA.
22/8/91	CST R1; JRT E3; TSS R1, 2; RAI IA; TVE E2, 3; C+ L2.
23/8/91	CST R1, 2; JRT E3; TVE E3.
24/8/91	RAI IB; +PTT E2, 3, 4; C+ L2; ORF E2a, 4; ARD E2, 3, 4; NRK E2; CST R1, 2; SVT E2; RUV E4; TVP R1; TVR R2.
25/8/91	TVE E2, 3.
26/8/91	TVE E2; RAI IA.
29/8/91	RAI IA; TVE E3.

August 8th was the most active day for MS reception, while auroral activity was present on the 8th, 9th, 12th and 13th. On the latter date reflection occurred at up to Band III. Tropospheric propagation gradually improved from the middle of August, when there was a stationary high-pressure system with hot days and clear nights. From the 14th there was tropospheric reception from West Germany, the Benelux countries and France on most days. The most dramatic reception occurred during late August/early September, when extensive loggings were made of German, Danish and Scandinavian stations in Band III and at u.h.f. In the south west reception was mainly from Spain and Ireland.

David Glenday spent a caravan holiday in a pine-forested valley in Scotland during August. Despite 1,000ft hills all round he managed to receive Band III signals from Norway. So don't give up, wherever you happen to find yourself! Mark Baldwin in Northampton received TVE-1 ch. E11 Montanchez (45kW) and a weak signal from Zamora ch. E37 (160kW) via tropospheric ducting on the 10th – an excellent catch so far north. Of relevance to F2 reception, Robert Copeman writes that the identifications RTQ-0 and WIN Queensland are now being used by DDQ-0.

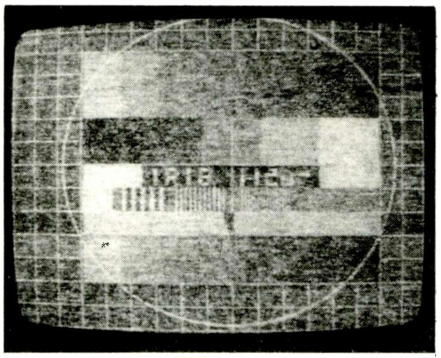
My thanks to the following for sending in reception logs and reports: David Glenday, Arbroath; Peter Schubert, Rainham; Roger Fussell, Torpoint; Simon Hamer, Powys; Cyril Willis, King's Lynn; Mark Bladwin, Northampton; Brian Renforth, Newcastle; and Brian Williams, Penarth.

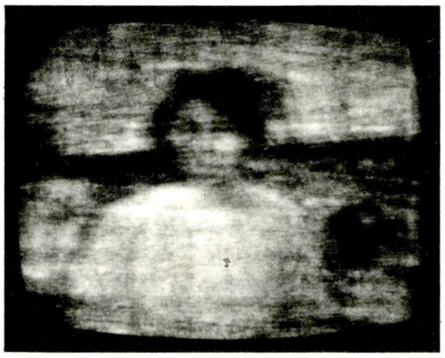
News Reports

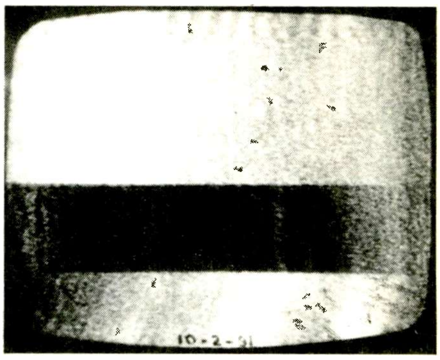
Poland: Apparently a 2,120ft high radio/TV tower near Lodz, 72 miles west of Warsaw, collapsed during renovation work. The tubular structure with 85 sections weighed 420 tons.

UK: Star TV, which is aimed at an "all-black" audience, has been given a ten year licence by the ITC and should be available, primarily via cable networks, from next April. LWT is to provide facilities and training.

Denmark: The government has given Kanal Danmark the go-ahead to form a third network. The Copenhagen-based private station will work with five other existing







Left: A weak Iranian (IRIB) test pattern received by Ian Waller via Intelsat VA F11 at 63°E. This was a low on the horizon signal. Centre: Thailand TV received by Anthony Mann in Perth, Western Australia, showing smudgy multi-path propagation. Right: An unidentified ch. E2+ test pattern received via F2 propagation by Ryn Muntjewerff in Holland. Any ideas?

commercial stations to offer both national and regional advertising.

Japan: NHK at present provides a one-hour daily HD-TV service, known as Hi-Vision. A full-time HD-TV service is to be started when the BS-3b satellite comes into operation. Programmes will be supplied by NHK and commercial broadcasters.

Latvia/USSR: Some four and a half million people in Riga, Tbilisi and Moscow can now receive via satellite three scrambled West European channels. The decoder required is made by Jerrold and costs about £1 a month to rent. The systems hope to be profitable by 1993.

Italy: Tele Piu's three-channel pay-TV service, which started in early July, has proved to be a great success. The encryption system, which involves a complete management service for invoicing, repairs etc., has been provided by the Dutch company Irdeto.

India: The FUBK test pattern is now being used in India: Delhi ch. E4 carries the identification "CH04 DELHI".

Miscellany

The Jersey Post Office has issued a commemorative stamp set featuring satellite services. There are two 20p and two 26p stamps. The 20p ones feature oceanography and Earth resolution, the 26p stamps meteorology (Meteosat) and telecommunications (Olympus). Issued on March 19th, the attractive "Europa 91" set is still available from the Jersey Post Office, Dept 304, Postal Headquarters, St. Helier, Jersey JE1 1AB, Channel Islands. The price is £1·47 including postage – add a further 50p for air-mail postage overseas. Cheques should be made payable to The Treasurer of the States.

In his Technical Topics column in the RSGB journal *Radio Communication* Pat Hawker mentions a new type of lamp bulb developed by Philips. The QL Lamp will also be marketed by GE-Thorn and Sylvania. Its significance from the radio angle is that it works by r.f. induction. Discussions on the operating frequency have suggested 2·65MHz, though consideration of 6, 13 and 27MHz have been suggested in the USA and 13·56MHz has already been used. One can only speculate on the harmonic problems that could arise with 27MHz bulbs – 2 × 27MHz = 54MHz, Band I centre! I shudder at the thought of the house mains wiring acting as a giant radiating aerial.

Interference has always been a prime concern of DXers. In recent times the increasing use of baby alarms, walkie-talkies and other low-power devices operating in the 49·82-49·98MHz band has led to the loss of ch. R1. In theory the output from such devices should not exceed 10mW, but in my experience the output levels from some units provide a coverage with a radius of up to a mile. Radio amateurs have noticed that some devices operate outside the allocated band – the Tomy Walkabout baby alarm for example was measured at 51·035MHz.

In a recent issue of *Six News* Chris Gore, G3WOS, mentions extremely high-level hash experienced, especially on wet and windy days, at 50MHz. Using a portable radio he traced the cause to an electric pole that supplied a water pumping station. No, not a cracked insulator: a mains wire insulation had broken down and was arcing to an insulator wire tie. Chris also tells of intermittent high-level 50MHz radiation that was traced to a house one and a half miles away. The interference disappeared when the doorbell was pressed, a light was switched on or the phone was answered. Its cause was a burglar alarm mains on/off switch. The current pulse produced by pressing the doorbell etc. stopped the burglar alarm switch arcing – oddly enough at 50MHz.

We're always interested to hear from others about their radio/TV interference problems.

Satellite TV

Olympus is now back in position at 19°W and has resumed normal operation. It left orbit on May 29th, following error commands from the Fucino uplink station. This was a dramatic rescue by British Aerospace.

Following its launch on August 14th, the Intelsat VI F5 craft at 36°W has been under test. It has 38 C band and ten Ku band transponders.

Super Channel is transmitting a daily one-hour US news service provided by the Consumer News and Business Channel (CNBC), also a breakfast time news package from the same source prepared for the European market. CNBC hopes to rival CNN in providing news services to Europe.

The music channel MTV plans an expansion to three channels by the end of 1993, using video compression to provide the three channels via a single transponder.

Book Review

The fourth edition of *Ku-Band Satellite TV, Theory, Installation and Repair*, by Frank Baylin and Brent Gale, has been published by Baylin Publications, Boulder, Colorado, USA. The emphasis is definitely on the practical side, with a mass of photographs and drawings – even going into detail on installing a large dish in deep snow! This edition has additional contributions by that well-known hacker John McCormac. It has been considerably expanded and is pretty well up to date.

The first parts of the book cover the basics and general theory of satellite launching, downlinks, path loss and orbits. It then deals in considerable depth with the hardware – dishes, feedhorns, polarisers, LNBs, cables, actuator drive systems, receivers, demodulation and scrambling/decoding. There's a very long and in-depth treatment of system installation, both large and small: footings, alignment of polar and horizon mounts, distribution systems and interference are all covered. I was particularly interested in a discussion of the polyrod lens feed system and a section on retrofitting Ku-band hardware in a C-band feed, something I've experimented with and achieved some success. At the end of the book there are several appendices, notes on test equipment, lots of footprints, a glossary of terms, a list of useful addresses and technical data.

The book has 3,432 pages in an 8·5 × 11 in. format and weighs 21 lb. Considering the amount of information it contains, the book represents extremely good value at £23 including UK mainland postage (add a further ten per cent for air mail in Europe and twenty per cent for air mail elsewhere around the world). I can honestly recommend it. Orders should be sent to J. Vincent Technical Books, 24 Riverside Gardens, Purley, Reading, Berks RG8 8BX. Telephone or fax 0734 414 468. If ordering from outside the UK, ensure that any draft is drawn on a London bank.

Ferguson/Thorn Rental TV Models/chassis

Alexander Allan

Following the video equivalents listing in the August issue, mainly relating to Ferguson/JVC/Thorn rental VCRs, readers may find the Ferguson/Thorn rental TV chassis/model listing in Table 1 helpful. The three-figure numbers have a prefix number that indicates the rental chain. These are 5 for DER, 8 for Radio Rentals and 7 for Multibroadcast, Focus and TVVC. Thus the 5170 is a DER set using the TX9 chassis and is more or less identical to the 8170 and 7170. The TX100 range was not customised for the rental market and thus retains the Ferguson or Ultra model numbers. Two trial models fitted with the TX100 chassis, the S7971 and S7981, were extensively tried out by the rental companies in selected regions. This list includes models from 1979 to October 1980.

It would be interesting to have similar listings for other brands. I recently had a Solavox CTV set in and had trouble finding an equivalent ITT remote control handset, and I'm totally confused by the number of VCRs that use say Sharp or Sanyo mechanisms.

Although I have only recently joined the league of self-employed, I have to endorse Steve Beeching's views on the trade (Letters, March). Try obtaining information on say an Ericsson personal computer (an on-going problem of mine) and you begin to see the way in which the technology is going and the approach to providing information and spares. On the subject of computers, many publications suggest that it's not worthwhile trying to repair a faulty power supply as the unit is cheap and easy to replace. At say £50 plus VAT I suppose a replacement is cheaper than the cost of undertaking diagnosis and repair. But where do you get them from? I was told by one supplier that PSUs are not available to the public for safety reasons. They are a lot safer than the floating chassis used in today's CTV sets!

Table 1: Thorn rental models/chassis

Model	*Chassis*	311	TX10	22D1	TX100	3760	TX9	6013	TX10	37100	TX9
101	9900	757	9000	22D2	TX100	3763	9600	6019	TX10	37101	TX9
102	9900	773	9000	22D3	TX100	3764	9600	6021	TX9	37103	TX9
111	9900	776	9600	22G1	TX100	3765	TX10	6023	TX9	37140	TX90
112	9900	778	9000	22G2	TX100	3787	TX10	6031	TX9	37141	TX90
132	9600	782	9600	22G3	TX100	3768	TX9	6053	TX9	37340	TX10
133	9600	784	9600	2251	TX100	3769	TX9	6070	TX9	37341	TX10
134	9600	785	9600	2261	TX100	3780	TX9	6071	TX9	37350	TX9
142	9600	14C1	TX90	2323	TX100	3781	TX9	6076	TX9	37351	TX9
143	9600	14C2	TX90	2343	TX100	3785	TX10	6083	TX10	37360	TX9
144	9600	16A1	TX90	2353	TX100	3788	TX10	6093	TX9	37361	TX9
170	TX9	16A2	TX90	2422	TX100	3789	9600	6103	TX10	37370	TX10
171	TX9	16A3	TX9	2423	TX100	3790	TX9	6116	TX9	37600	TX9
190	TX9	1764	9600	2433	TX100	3791	TX10	6121	TX9	37650	TX10
202	9000	1765	9600	2452	TX100	3792	TX9	6144	TX10	37850	TX10
203	9600	1785	TX10	2453	TX100	3793	9600	6170	TX90	37953	TX10
204	9600	1791	9600	2463	TX100	3795	TX10	6171	TX90	37963	TX10
213	9600	1796	9600	26D1	TX100	3796	TX10	6175	TX90	C28*	9000
221	9000	1798	9600	26D2	TX100	51A2	TX100	6213	TX9	C30E*	9000
232	TX10	1799	9600	26D3	TX100	51A3	TX100	66B2	TX100	C43*	9600
233	TX10	20A1	TX100	3722	9000	51A4	TX100	66B3	TX100	1C26	9600
242	9600	20A2	TX100	3734	9600	51A5	TX100	6603	TX10	1C31	9600
243	9600	20C3	TX100	3736	9600	59B2	TX100	8154	9600	3C40E	9900
244	9600	20E1	TX90	3737	9600	59B3	TX100	37041	TX9	3C47E	9600
262	TX9	20E2	TX90	3740	9000	59B4	TX100	37060	TX10	MC01	TX90
271	TX9	20G1	TX100	3742	9000	59B5	TX100	37063	TX10	MC05	TX90
272	TX9	20G2	TX100	3743	9600	59H5	TX100	37081	TX9	S7971	TX100
273	TX9	20G3	TX100	3747	9600	5164	9600	37090	TX9	S7981	TX100
282	TX10	22B1	TX100	3755	TX9	6003	TX10	37093	TX9		
283	TX10	22B2	TX100	3757	9900	6004	TX10				
289	TX10	22B5	TX10	3758	9900	6012	TX10				

** With prefix 5, 7 or 8.*

East-West Modulator Circuits

Joe Cieszynski

For the last fifteen years or so east-west correction in colour TV receivers has generally been carried out using some form of diode modulator. In the following article we'll examine the operation of this type of circuit, list the common faults encountered and outline fault diagnosis routines.

In the design of deflection coils there has always been a degree of trade-off between spot quality and deflection geometry. Since spot quality cannot be improved by external means, correction for pincushion distortion has been a traditional requirement in TV sets. It was simple to achieve the necessary correction in a monochrome set by using permanent magnets. This can't be done in a colour set because the magnets would interfere with the colour purity. In the first generation of colour sets a transductor was used to provide pincushion correction, modulating the line scan at field frequency and the field scan at line frequency.

The introduction of in-line gun colour tubes, along with precision made scan coil assemblies, removed the need for north-south correction and virtually eliminated the need for convergence correction. The price however was an increased amount of east-west (EW) distortion. By the time that the 30AX tube had been introduced scan coil construction had advanced to the stage where self-convergence was possible, but the EW distortion had increased to about eight per cent. These new coils on the other hand had the desirable effect of providing optimum spot quality over the entire screen area in addition to self-convergence and NS correction. Further advances in tube/yoke design have meant that external EW correction is required only with 110° tubes.

Scan Current Modulation

It's appropriate indeed to use the term modulator to describe the circuit employed for EW correction in modern sets, since the circuit amplitude modulates the 15,625Hz line scan waveform with a parabolic 50Hz waveform – Fig. 1 gives an impression of this. Fig. 2 illustrates the need for this modulation: it shows a pincushion distorted raster of

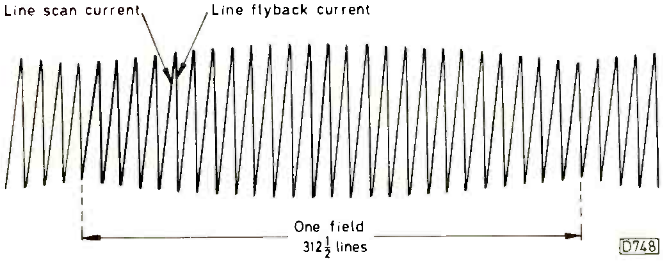


Fig. 1: Line scan current amplitude modulated by a field-frequency parabola.

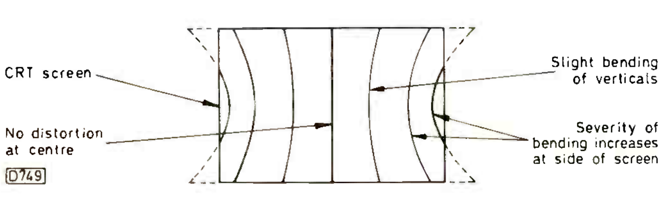


Fig. 2: Correct width raster with east-west (pincushion) distortion.

correct width in relation to the c.r.t.'s screen. From this diagram you can see that the requirement is to reduce the line scan current during the earlier and later parts of each field scan.

The modulator is driven by a circuit that incorporates components to shape the sample waveform obtained from the field output stage. It includes EW adjustment controls and a width control. Modulation itself occurs in the line output stage, where critically tuned *LC* circuits are switched by the modulator's power diodes. The idea is to vary the impedance of the line scan current path, but to do this only during the line scan period, not during the flyback. If the line flyback current were to be modulated, the line output stage tuning would be modulated with adverse effects on the e.h.t. (unless this is generated elsewhere).

Several versions of the diode modulator and driver have been used over the years, though the basic elements of the circuit have remained the same. We'll look at the three basic versions of the modulator in the order in which they appeared in TV sets.

Low-voltage Diode Modulator

A basic "low-voltage" two-diode modulator circuit is shown in Fig. 3. The two coils L1 and L2 on the line output transformer and the external coils L3 and L4 form a balanced bridge. It's because of this that L4 is known as the EW bridge coil. In a monochrome receiver the bottom end of L3 would be connected directly to chassis and the scan current would flow via L3, C2, L5 and L1. The inclusion of L4, with the varying potential across C4, has the effect of varying the impedance of the scan current path and hence the scan current itself.

The current that flows in a coil depends, amongst other things, on the voltage across the coil. In this case the voltage across L3 is the sum of the h.t. voltage and the voltage across C4. The latter has two components, a d.c. voltage A and a 50Hz parabola B, as shown in the diagram. Varying the d.c. voltage across C4 affects the overall line scan current and thus the width. So this d.c. voltage is the width control voltage. If it's increased the voltage across L3 and the width are reduced. As the voltage across C4 falls that across L3 is increased and so is the overall picture width.

It's easy to see how modulation takes place. At the start and end of each field scan the parabola is at its maximum amplitude, so the voltage across L3 is at minimum. The reverse is the case at the centre of the screen. Altering the peak amplitude of the parabola affects the degree of scan current modulation.

So far so good. One might at this point be forgiven for wondering why the diodes are necessary. Why not simply stick with altering the impedance of the scan current path as described? The fact is however that we don't want to modulate the e.h.t. and any other supplies derived from the line output transformer. So the action of the line flyback must be isolated from the modulator. This is where the diodes come in.

Detailed, in-depth analysis of the operation of this circuit can become quite an involved business. Basically however the action of the diodes is to steer the scan current

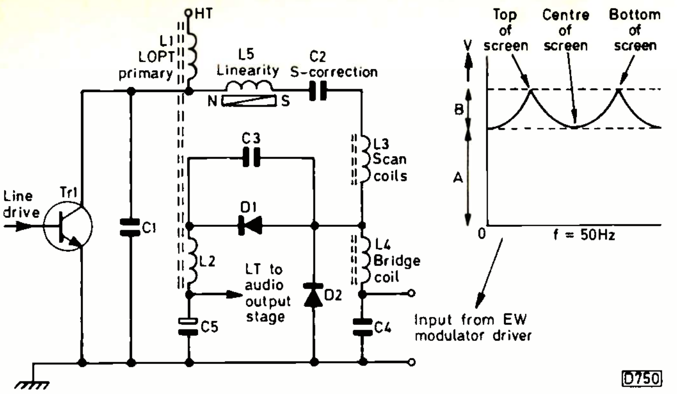


Fig. 3: Basic low-voltage, two-diode EW modulator circuit.

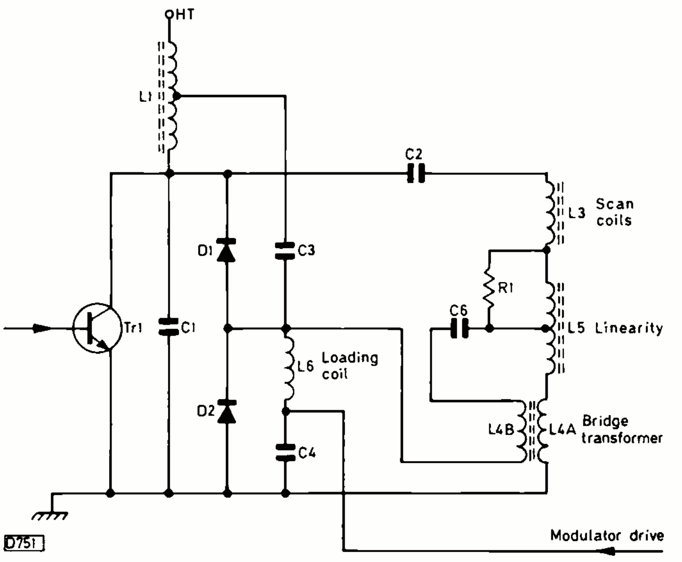


Fig. 4: Basic high-voltage, two-diode EW modulator circuit.

through either L4 or L2, depending on the width setting, and the flyback current through C1 and a combination of C3 and C5, again depending on the width. C1 and C3 have critical values, because their reactances relate to those of L1, L3 and L4. Suffice it to say that the steering action of the diodes not only ensures correct amplitude modulation of the line scan current but also prevents modulation of the flyback by ensuring that the reactance and tuning of the line output transformer remain constant. In a monochrome set C1 forms a resonant circuit with L1 and L3 to tune the line flyback. The EW modulation parabola can't be switched off during flyback, but the resonance conditions can be adjusted by the action of the diodes to maintain the tuning.

The l.t. voltage that's developed across C5 is more than just a by-product of the circuit action. C5 is responsible for balancing the bridge. The voltage across it is produced by the rectifying action of D1 and D2. Without a load, this voltage could build up to the point where the diodes would be permanently reverse biased: the circuit would then cease to work. A load resistor could be connected across C5 to provide a discharge path, but a more efficient approach is to use the voltage across C5 as a supply rail. In our example it's shown as being used to supply the audio output stage. This is simply because to maintain circuit operation the discharge current needs to be of the order of 1A.

The circuit shown in Fig. 3 is called a low-voltage diode modulator because the diodes operate at the scan voltages and are thus relatively low-voltage devices. An advantage of this circuit is that the damping effect of C5 removes any ringing, leaving a clear raster. In addition the tuning characteristics of the circuit are such that it lends itself to being driven by a switch-mode power supply operating at line frequency.

High-voltage Diode Modulator

Fig. 4 shows the basic "high voltage" two-diode modulator circuit. The term high-voltage relates to the fact that D1 acts as an efficiency diode across the line output transistor Tr1. Thus its voltage rating must be much higher than that of D2 and both diodes in Fig. 3.

The circuits shown in Fig. 3 and Fig. 4 are basically very similar: to aid comparison, where components perform the same task they have been given the same reference numbers. The drive applied across C4 is the same as that in the low-voltage circuit, and to all intents and purposes the circuit operation is the same.

The best way to analyse the high-voltage circuit is to look at each difference and examine why it has been made. The first thing to note is that C3 is no longer in parallel with D1 but is connected to a centre tap in the line output transformer's primary winding. This compensates for the transformer's stray capacitance, which would otherwise unbalance the bridge, causing modulation of the e.h.t. Tapping L1 replaces L2 (Fig. 3): each half of the primary winding forms one arm of the bridge. From the a.c. point of view, C3 is still effectively across D1.

Another improvement to the raster shape introduced with this circuit relates to the S-correction and the linearity control. The passive correction components C2 and L5 are fully effective only at the centre of the field scan. Because of the c.r.t. geometry, there's still slight distortion at the top and bottom of the screen. Adding C6 and tapping L5 provides modulated S-correction and linearity, giving the required correction. C6 and the lower section of L5 come into effect only at the start and the end of the field scan.

The bridge coil in Fig. 3 is replaced in Fig. 4 with the bridge transformer L4A/B. This change is necessary only when the line output stage is driven by a line-frequency switch-mode power supply. In this case the conduction of Tr1 cannot be easily controlled – the chopper transistor's conduction period takes priority. Because of this the switching of D2 may be delayed, giving rise to raster distortion. The bridge transformer L4 corrects for this. I should point out that this change would be necessary in the low-voltage circuit if it was driven from the power supply – also that circuit designers in general prefer to use a separate, conventional line drive circuit rather than taking the drive from the chopper circuit (the trend has been to use higher-frequency chopper circuits, which are of course more efficient).

Loading coil L6 is necessary to maintain the critical tuning of the balanced bridge circuit.

The main advantage of the high-voltage circuit over the low-voltage version is that there's no need for a high current drain (from C5). This means that the circuit is more efficient. Unfortunately the omission of C5 means that the circuit is prone to ringing, so the setmaker may have to add damping resistors.

Three-diode Circuit

Fig. 5 shows the basic three-diode high-voltage circuit, which combines the advantages of the two previous circuits, i.e. because of the action of C5/D1/D2 it's not prone to ringing, it provides modulated S-correction and

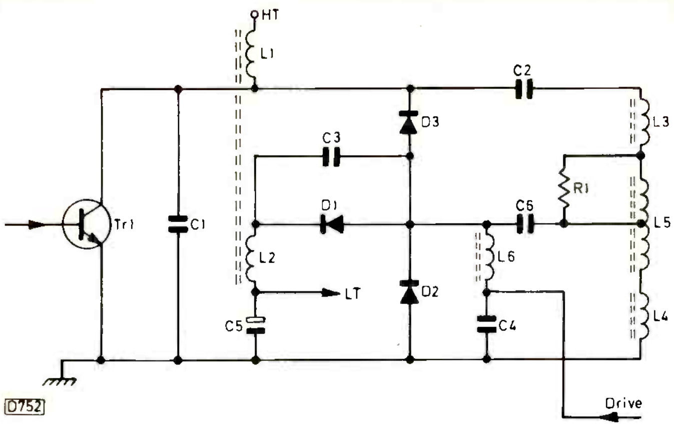


Fig. 5: Basic high-voltage, three-diode EW modulator.

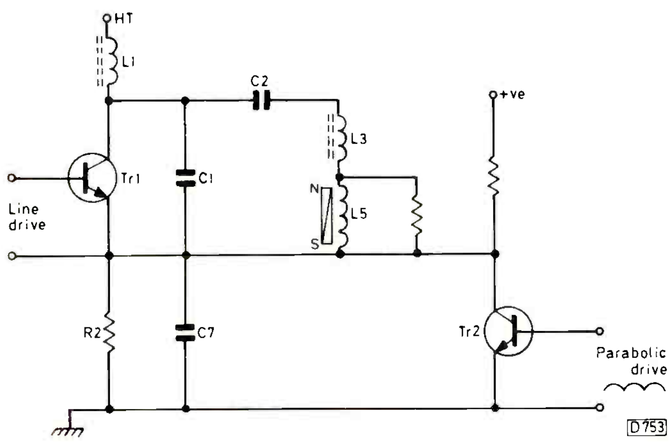


Fig. 6: Simple EW modulator circuit that can be used when the e.h.t. is not generated in the line output stage. C7 is a filter capacitor.

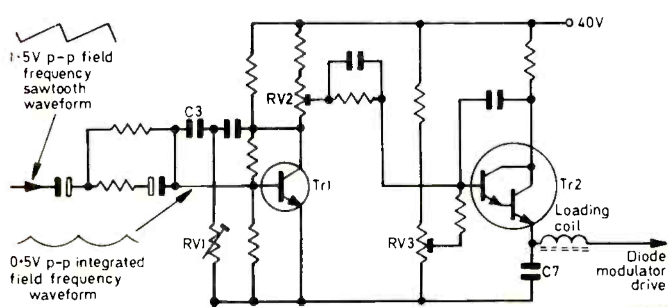


Fig. 7: Typical EW modulator control/driver circuit. C7 corresponds with C4 in Figs. 3-5.

linearity, and can if required be driven by a switch-mode power supply without the need for a complex bridge transformer (the three-diode arrangement overcomes the switching problems.) The main problem with the circuit shown in Fig. 3 was the large discharge current required from C5: the discharge rate is much less with the three-diode modulator.

Simple Modulator

In some chassis, such as the Ferguson TX10, the e.h.t. is generated in the switch-mode power supply. When this is done the line output stage simply provides scan drive. The provision of EW modulation is a much simpler matter since we no longer need to worry about the e.h.t. being modulated. Fig. 6 shows how EW modulation can be applied. The usual S-correction (C2), linearity coil and flyback tuning (C1) components are included. Scan current amplitude depends on the modulator transistor's collector voltage. Increasing the d.c. voltage at the base of Tr2 reduces its collector voltage. Thus Tr1 conducts more heavily and the width is increased. Superimposing a field parabola on the d.c. at the base of Tr2 modulates the scan (and flyback) current.

Driver Circuit

Fig. 7 shows a simple EW modulator control/driver circuit. Tr1 with the *CR* networks in its base circuit acts as a Miller integrator to convert the incoming field-frequency sawtooth waveform into a parabola suitable for EW correction. A field-frequency sawtooth waveform can be obtained from a low-value resistor connected in series with the field scan coils, on the earthy side. RV1 affects the phase shift introduced by C3/RV1, thus applying tilt to the parabola. The effect of this on the raster is to provide greater correction at one end of the field scan than at the other, compensating for c.r.t./yoke tolerances. RV1 is usually called the EW phase control. The amplitude of the parabola is determined by the EW amplitude control RV2.

Drive for the modulator is provided by the low-power amplifier Tr2 (not necessarily a Darlington transistor). The bias applied to this transistor by RV3 sets the width. Thus the output at Tr2's emitter is a parabola that sits on a d.c. potential. With the circuit shown in Fig. 6, where the driver is directly connected to the line output transistor, the output parabola would have to be inverted.

Common Fault Conditions

Perhaps the most common problem in EW modulator circuits is dry-joints. The transformers and coils used are of relatively large size. This, combined with the fact that the components run quite warm, often results in the joints cracking after three-four years. As soon as the smallest fracture occurs, the high voltages at the terminals produce arcing. At the very least this will result in a burnt PCB.

Once that arcing has done its work the modulator will normally cease to function. The result will be a narrow raster with pincushion distortion. Repairing damage of this sort is usually not difficult, but it's advisable to resolder all joints in the power area of the modulator – you generally uncover a number of potential dry-joints in the process.

When a burn-up has occurred at an inductor terminal it's advisable to inspect the component visually as in some instances the heat and back-e.m.f.s in the open-circuit winding can damage it. In most cases a damaged coil will be discoloured. When this is noticed the component should be replaced even though the raster can be set up correctly. Since the diode modulator is a critically tuned circuit, if a winding has gone partially short-circuit due to overheating the tuning will inevitably alter. Even though the circuit may appear to function, unwanted transients can occur, resulting in intermittent destruction of the driver transistor or modulator diodes.

In many cases the viewer continues to watch his set when a dry-joint has developed, even though the width has reduced and the picture is distorted. He may even ignore the smoke signals coming from the rear of the set! As one customer explained to me a few years ago, "well the smoke stopped after a few minutes, so we were able to watch the rest of the programme". In such an event it will be necessary to test the diodes and the driver transistor for shorts and leakage. In addition, examine the inductors and carry out a visual inspection of the carbon resistors, looking for black or non-existent ones.

Another common problem is failure of the driver transistor. The symptom will be either an excessively wide raster or a narrow one, depending on whether the transistor has gone short- or open-circuit respectively. In either case the raster will have pincushion distortion.

In most cases the transistor goes short-circuit between its collector and emitter. Unless the transistor is a peculiar Darlington type, there are usually several equivalents that can be used. In many cases the driver is a pnp transistor, something that should be borne in mind when faced with an unknown transistor and no service information.

Faulty Modulator Diodes

When a modulator diode goes short-circuit the symptoms will vary, depending on the type of modulator (low- or high-voltage) and which particular diode has failed. In general one of two things will happen: the power supply will go into the trip condition or the width will be at one of its two extremes.

If you have a set that's tripping or blowing fuses, check the modulator diodes not only for shorts but also for high-resistance reverse leakage. Also beware of the diode that breaks down only under load. Such a component may give perfectly good readings when checked with a test meter but will fail in operation, causing a power supply overload. If you decide to fit a substitute type diode, ensure that its ratings are high enough. Other characteristics may be important. Just because a certain type of diode is used in one chassis it doesn't follow that it will function for long in a different chassis – remember that there are low- and high-voltage modulators. As an example, the BYX71 was widely used in older receivers but its rating is such that it cannot replace something like a BY223, which looks identical, or the much smaller but higher rated BY228.

Defective Capacitors

The capacitors used in diode modulator circuits seldom give problems. If a capacitor does fail it's essential to use the correct type and value otherwise the critical tuning will be lost and the bridge will be unbalanced. Fitting the correct type often means ordering it from the manufacturer or his official distributor, as the capacitors can have obscure values and very high voltage ratings. Don't fit a near equivalent. I've come across a number of receivers in which this has been done: the result is regular failure of the driver transistor and in a few cases this continual failure leads to the associated inductor melting.

Should you encounter a receiver in which the driver transistor fails regularly for no apparent reason, and you've replaced the usual culprits such as the inductors and diodes, it's reasonable to suspect that the value of a capacitor has changed. Also be on the lookout for changed value resistors, though these are usually conspicuous as a result of their changed colour.

Fault Diagnosis

Where there's raster distortion but the width is at neither extreme, the cause of the fault may be in either the modulator itself or the driver circuit. As a general rule if the raster is affected when the pincushion and width controls are adjusted the cause of the fault is likely to be in the modulator. Faults in the wave-shaping section of the control circuit are rare as it's a low-power signal circuit.

Where the width is at one extreme and you're uncertain as to whether the cause of the fault lies in the driver or the modulator a simple test usually works.

If the width is excessive and the driver transistor is not short-circuit, remove the transistor and switch the set on. If the width comes in it means that the driver transistor is being turned on excessively by a fault in the drive circuit. If on the other hand the width remains at maximum, the cause of the fault is in the modulator and is more than likely to be a defective diode.

If the width is at minimum and the driver transistor is not open-circuit, switch off and place a shorting link across the transistor's collector and emitter. Switch on and observe the raster. If the width increases, the fault lies in the driver circuit. If it remains at minimum the fault is in the modulator.

TEST CASE

347

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.

Real Technician was not in a particularly good mood this nippy autumn morning. He'd used his holiday entitlement, the workload was building up steadily and Service Manager was becoming more testy and irritable by the day. TV and video faults seemed to be getting more complex and obscure, and the customers more demanding. Nor had the descriptions of faults, written at the counter, become any better. This one just said "running away"! RT looked at it closely. It stood quite still on the awaiting-repair rack. Resisting the urge to write "tested, didn't move, returned as received" in the work-done space he carried it off to his bench with a jaundiced air.

It was a Toshiba VCR, Model V81B. RT loaded his Walt Disney test tape without enthusiasm. Rabbits and wizards, chipmunks and wise owls rushed to and fro across the screen, screeching at each other in even more squeaky tones than they generally do in cartoons, their images broken up by mistracking bars. The tape spools were turning much faster than usual, as if the machine was in the forward-search mode. It wasn't though, because the sound wasn't muted. RT pressed the rewind key to put the machine into reverse search. The result was a still picture, broken by a mistracking bar, with the tape now stationary. Anticipating auto shut-down, RT pressed the stop key and went to find the service manual.

When a tape is running too fast the likelihood, it seemed to RT, is that the capstan is turning too quickly, a perfectly reasonable assumption on the face of it. So RT turned to the servo block diagram in the manual and studied it carefully. He discovered that the output from the capstan FG generator passes through an amplifier in IC502 before entering the main servo chip IC501. Knowing that lack of an FG feedback signal usually has the effect of increasing the motor speed, he started by examining the FG waveform. It was correct at the output from the preamplifier and at the input (pin 5) of IC501. Waveform 13, the capstan speed control signal from pin 15 of IC501, also looked like that shown in the block diagram.

RT had to turn to the circuit diagram to obtain information on the d.c. conditions in the servo. Here he discovered that the voltage applied to the motor, at the emitter of Q534, should be 6·79V. RT's little meter, hooked to this point, gave a reading of 6·85V. Could a capstan motor fail in such a way that it ran at twice the correct speed, or more, when the applied voltage was approximately right? It seemed unlikely, especially as this is no fancy direct-drive electronic motor – it's a cylindrically shaped brush type. Even if the motor wasn't running too fast because of an internal reason, why wasn't the servo reducing the supply voltage and current? RT was at a loss. Could it be that the control track pulses were not being read from the tape to control the motor? No, the motor drive voltage was normal. Could it be that... his eye reverted to the monitor screen, where two squirrels were chasing an owl – at normal speed! No noise bars, normal sound track pitch. The wretched machine had put itself right. RT measured the capstan motor voltage again: it was 6·82V, very little different from before, when the tape was whizzing through. What could have caused the original symptom then? See next month for the answer and another item in the test case series.

ANSWER TO TEST CASE 346
– page 898 last month –

It's a fact that chroma faults in VCRs are rare: the colour processing circuits run cool and lead a quiet life. Last month's story related to a Sony VHS machine with noisy, grainy colour in playback, though the luminance playback was fine.

If for any reason the playback chroma signal level is low the result is not colour desaturation: the a.g.c. system ensures that the colour burst amplitude, and with it the amplitude of the chroma signal itself, is held at the correct level over a wide variation in off-tape signal strength. High chrominance noise level usually indicates low signal level at the input to the colour processor chip. So the place to be with the oscilloscope probe is at the 627kHz low-pass filter which separates the luminance f.m. and the colour-under signals, at the output from the playback preamplifiers. Failure here would most likely be due to the filter itself, which of course is not used in the record mode.

The playback envelope signal from the heads was fine. A clear, sharp signal could be traced through the low-pass filter (L802). At the input (pin 5) to the processor chip IC801 however the signal was weak and noisy. The coupling capacitor C808 was virtually open-circuit. A replacement saved the day.

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TA7233P	£2.10
TA7240	£2.50
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TA7241AP	£3.00
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TA7271P	£3.25
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TA7280	£3.00
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TA7281	£2.75
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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
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TA7335P	£4.20
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TA7343	£1.75
TA7350	£2.10
TA7358	£1.50
TA7607	£3.50
TA7607AP	£2.40
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TA7614	£2.50
TA7628P	£2.40
TA7629	£4.00
TA7629P	£2.75
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TBA750Q	£4.20
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TDA1035T	£1.90
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TDA1057	£2.00
TDA1082	£3.50
TDA1083	£1.70
TDA1151	£1.50
TDA1154	£2.70
TDA1170S	£1.20
TDA1180	£1.80
TDA1180P	£3.00
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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
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TDA1908A	£1.75
TDA1940	£1.80
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TDA2530Q	£4.25
TDA2532	£3.00
TDA2532Q	£3.00
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TDA2560Q	£1.10
TDA2576A	£2.90
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TDA3653	£4.00
TDA3654	£2.80
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TDA4500	£3.80
TDA4501	£4.00
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UPC1363	£1.90
UPC1365	£3.50
UPC1377C	£2.20
UPC1378H	£2.00
UPC1379	£2.20
UPC1382	£1.50
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2SB965	£2.30
2SC1413A	£2.50
2SC1826	£1.80
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2SC1983	£1.30
2SC2003	£0.25
2SC2027	£4.50
2SC2230	£0.50
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2SC2335	£1.50
2SC2531	£0.26
2SC2564	£3.04
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2SC2621	£1.25
2SC2631	£0.30
2SC2632	£0.30
2SC2655	£0.60
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2SC2979	£3.00
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2SC3402	£0.40
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2SC3678	£1.25
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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
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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
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A. Z. ELECTRICS
SEE ADDRESS DETAILS ON NEXT PAGE

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SPECTRUM +2 COMPUTER Built in data recorder, 128K, psu and manuals £59.00 ref 59P4R
SPECTRUM +3 COMPUTER Built in disc drive, 128K, psu and manuals £79.00 ref 79P4R
AMSTRAD CPC464 COMPUTER No manuals but only £79.00 ref 79P5R (including monitor)
AMSTRAD CPC6128 COMPUTER Again no manuals but only £149.00 ref 149P4R
AMSTRAD GT65 Green screen monitor £49.00 ref 49P4R
HIGH POWER CAR SPEAKERS. Stereo pair output 100w each. 4ohm impedance and consisting of 6 1/2" woofer 2" mid range and 1" tweeter. Ideal to work with the amplifier described above. Price per pair £30.00 Order ref 30P7R.
2KV 500 WATT TRANSFORMERS Suitable for high voltage experiments or as a spare for a microwave oven etc. 250v AC input £10.00 ref 10P93R
MICROWAVE CONTROL PANEL. Mains operated, with touch switches. Complete with 4 digit display, digital clock, and 2 relay outputs one for power and one for pulsed power (programmable). Ideal for all sorts of precision timer applications etc. £6.00 ref 6P18R
FIBRE OPTIC CABLE. Stranded optical fibres sheathed in black PVC. Five metre length £7.00 ref 7P29R

12V SOLAR CELL. 200mA output ideal for trickle charging etc. 300 mm square. Our price £15.00 ref 15P42R
PASSIVE INFRA-RED MOTION SENSOR. Complete with daylight sensor, adjustable lights on timer (8 secs - 15 mins), 50' range with a 90 deg coverage. Manual override facility. Complete with wall brackets, bulb holders etc. Brand new and guaranteed. £25.00 ref 25P24R.
Pack of two PAR38 bulbs for above unit £12.00 ref 12P43R

VIDEO SENDER UNIT Transmit both audio and video signals from either a video camera, video recorder or computer to any standard TV set within a 100' range! (tune TV to a spare channel) 12v DC op. £15.00 ref 15P39R Suitable mains adaptor £5.00 ref 5P191R
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MINIATURE RADIO TRANSCEIVERS A pair of walkie talkies with a range of up to 2 kilometres. Units measure 22x52x155mm. Complete with cases. £30.00 ref 30P12R

FM CORDLESS MICROPHONE. Small hand held unit with a 500' range! 2 transmit power levels reqs PP3 battery. Tuneable to any FM receiver. Our price £15 ref 15P42AR
CAR STEREO AND FM RADIO Low cost stereo system giving 5 watts per channel. Signal to noise ratio better than 45db, wow and flutter less than .35%. Neg earth. £25.00 ref 25P21R.
LOW COST WALKIE TALKIES. Pair of battery operated units with a range of about 150'. Our price £8.00 a pair ref 8P50R

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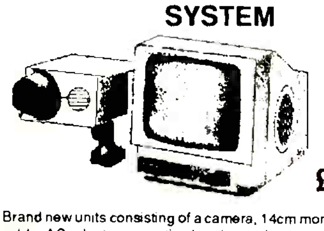
NICAD BATTERIES. Brand new top quality. 4 x AA's £4.00 ref 4P44R. 2 x C's £4.00 ref 4P73R, 4 x D's £9.00 ref 9P12R, 1 x PP3 £6.00 ref 6P35R
TOWERS INTERNATIONAL TRANSISTOR SELECTOR GUIDE. The ultimate equivalents book. Latest edition £20.00 ref 20P32R.
CABLE TIES. 142mm x 3.2mm white nylon pack of 100 £3.00 ref 3P104R. Bumper pack of 1,000 ties £14.00R

VIDEO AND AUDIO MONITORING SYSTEM



£99.00

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.

1991 CATALOGUE AVAILABLE NOW IF YOU DO NOT HAVE A COPY PLEASE REQUEST ONE WHEN ORDERING OR SEND US A 6"X9" SAE FOR A FREE COPY.

GEIGER COUNTER KIT. Complete with tube, PCB and all components to build a battery operated geiger counter. £39.00 ref 39P1R
FM BUG KIT. New design with PCB embedded coil. Transmits to any FM radio. 9v battery req'd. £5.00 ref 5P158R
FM BUG Built and tested superior 9v operation £14.00 ref 14P3R
COMPOSITE VIDEO KITS. These convert composite video into separate H sync, V sync and video. 12v DC. £8.00 ref 8P39R.
SINCLAIR C5 MOTORS 12v 29A (full load) 3300 rpm 6"x4" 1/4" O/P shaft. New. £20.00 ref 20P22R.
As above but with fitted 4 to 1 inline reduction box (800rpm) and toothed nylon belt drive cog £40.00 ref 40P8R
SINCLAIR C5 WHEELS 13" or 16" dia including treaded tyre and inner tube. Wheels are black, spoked one piece poly carbonate. 13" wheel £6.00 ref 6P20R, 16" wheel £6.00 ref 6P21R.
ELECTRONIC SPEED CONTROL KIT for c5 motor. PCB and all components to build a speed controller (0-95% of speed). Uses pulse width modulation. £17.00 ref 17P3R.
SOLAR POWERED NICAD CHARGER. Charges 4 AA nicads in 8 hours. Brand new and cased £6.00 ref 6P3R.

MOSFETS FOR POWER AMPLIFIERS ETC. 100 watt mosfet pair 2SJ99 and 2SK343 £4.00 a pair with pin out info ref 4P51R. Also available is a 2SK413 and a 2SJ118 at £4.00 ref 4P42R
12 VOLT BRUSHLESS FAN 4 1/2" square brand new ideal for boat, car, caravan etc. £5.00 ref 5P206R.
ACORN DATA RECORDER ALF503 Made for BBC computer but suitable for others. Includes mains adapter, leads and book. £15.00 ref 15P43R
VIDEO TAPES. Three hour superior quality tapes made under licence from the famous JVC company. Pack of 10 tapes £20.00 ref 20P20R.
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SOLDER 22SWG resin cored solder on a 1/2kg reel. Top quality. £4.00 a reel ref 4P70R
600 WATT HEATERS Ideal for air or liquid, will not corrode, lasts for years. coil type construction 3"x2" mounted on a 4" dia metal plate for easy fixing. £3.00 ea ref 3P78R or 4 for £10.00 ref 10P76R
TIME AND TEMPERATURE MODULE A clock, digital thermometer (Celcius and Farenheit (0-160 deg F) programmable too hot and too cold alarms. Runs for at least a year on one AA battery £9.00 ref 9P5R.
Remote temperature probe for above unit £3.00 ref 3P60R.
GEARBOX KITS Ideal for models etc. Contains 18 gears (2 of each size) 4x50mm axles and a powerful 9-12v motor. All the gears etc are push fit. £3.00 for complete kit ref 3P93R.
ELECTRONIC TICKET MACHINES These units contain a magnetic card reader, two matrix printers, motors, sensors and loads of electronic components etc. (12"x12"x7") Good value at £12.00 ref 12P28R.
JOYSTICKS Brand new with 2 fire buttons and suction feet these units can be modified for most computers by changing the connector etc. Price is 2 for £5.00 ref 5P174R.
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6V 10AH LEAD ACID sealed battery by yuasha ex equipment but in excellent condition now only 2 for £10.00 ref 10P95R
12 TO 220V INVERTER KIT As supplied it will handle up to about 15w at 220v but with a larger transformer it will handle 80 watts. Basic kit £12.00 ref 12P17R. Larger transformer £12.00 ref 12P41R.
VERO EASI WIRE PROTOTYPING SYSTEM Ideal for designing projects on etc. Complete with tools, wire and reusable board. Our price £6.00 ref 6P33R.
MICROWAVE TURNTABLE MOTORS. Ideal for window displays etc. £5.00 ref 5P165R
STC SWITCHED MODE POWER SUPPLY 220v or 110v input giving 5v at 2A, +24v at 0.3A, +12v at 0.15A and +90v at 0.4A £6.00 ref 6P59R
HIGH RESOLUTION 12" AMBER MONITOR 12v 1.5A Hercules compatible (TTL input) new and cased £22.00 ref 22P2R
VGA PAPER WHITE MONO monitors new and cased 240v AC. £59.00 ref 59P4R
25 WATT STEREO AMPLIFIER ic. STK043. With the addition of a handful of components you can build a 25 watt amplifier. £4.00 ref 4P69R (Circuit dia included).
MAINS FANS Snail type construction. Approx 4"x5" mounted on a metal plate for easy fixing. New £5.00 5P166R.
POWERFUL IONIZER KIT. Generates 10 times more ions than commercial units! Complete kit including case £18.00 ref 18P2R
MINI RADIO MODULE Only 2" square with ferrite aerial and tuner. Superhet. Req's PP3 battery. £1.00 ref BD716R.
HIGH RESOLUTION MONITOR. 9" black and white Phillips tube in chassis made for OPD computer but may be suitable for others. £20.00 ref 20P26R.
BARGAIN NICADS AAA SIZE 200MAH 1.2V PACK OF 10 £4.00 REF 4P92R, PACK OF 100 £30.00 REF 30P16R
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FLOPPY DISCS. Pack of 15 3 1/2" DSDD £10.00 ref 10P88. Pack of 10 5 1/4" DSDD £5.00 ref 5P168R.
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FRESNEL MAGNIFYING LENS 83 x 52mm £1.00 ref BD827R.
LCD DISPLAY. 4 1/2 digits supplied with connection data £3.00 ref 3P77R or 5 for £10.00 ref 10P78R.
ALARM TRANSMITTERS. No data available but nicely made complex transmitters 9v operation. £4.00 each ref 4P81
TRANSMITTER RECEIVER SYSTEM originally made for nurse call systems they consist of a pendant style transmitter and a receiver with telescopic aerial 12v. 80 different channels. £12.00 ref 12P26R
CLAP LIGHT. This device turns on a lamp at a finger 'snap' etc. nicely cased with built in battery operated light. Ideal bedside light etc £4.00 each ref 4P82R.
ELECTRONIC DIPSTICK KIT. Contains all you need to build an electronic device to give a 10 level liquid indicator. £5.00 (ex case) ref 5P194R.
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PC MODEMS 1200/75 baud modems designed to plug into a PC complete with manual but no software £18.00 ref 18P12R
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CAPACITOR PACK 1. 100 assorted non electrolytic capacitors £2.00 ref 2P286R.
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WASHING MACHINE PUMP. Mains operated new pump. Not self priming. £5.00 ref 5P18R
IBM PRINTER LEAD. (D25 to centronics plug) 2 metre parallel £5.00 ref 5P186R
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TV LOUDSPEAKERS. 5 watt magnetically screened 4 ohm 55 x 125mm. £3.00 a pair ref 3P109R.
SPEAKER GRILLS set of 3 matching grills of different diameters 2 packs for £2.00 (6 grills) ref 2P364R
50 METRES OF MAINS CABLE £3.00 2 core black precut in convenient 2 m lengths. Ideal for repairs and projects. ref 3P91R
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TWEETERS 2 1/4" DIA 8 ohm mounted on a smart metal plate for easy fixing £2.00 ref 2P366R
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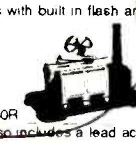

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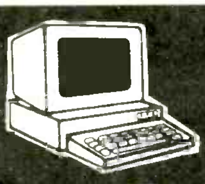

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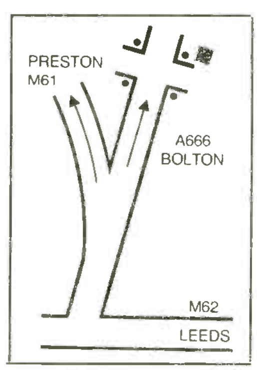

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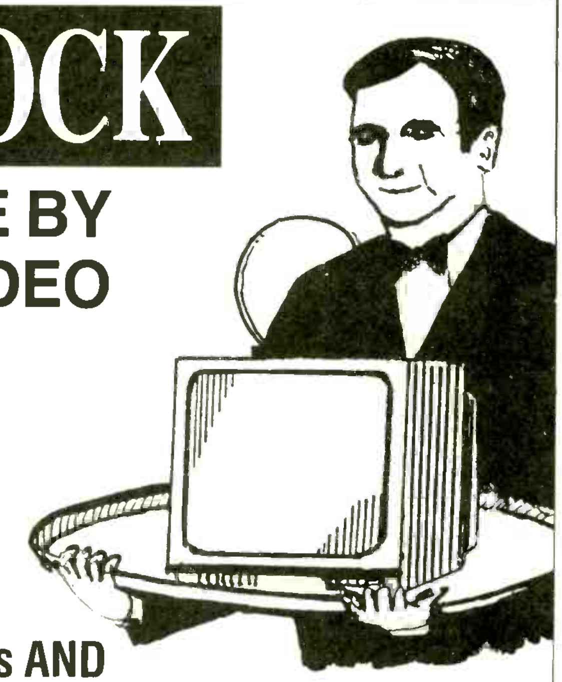

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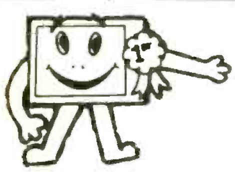

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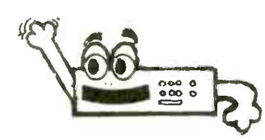

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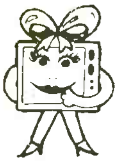

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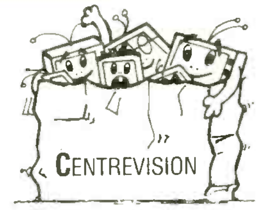

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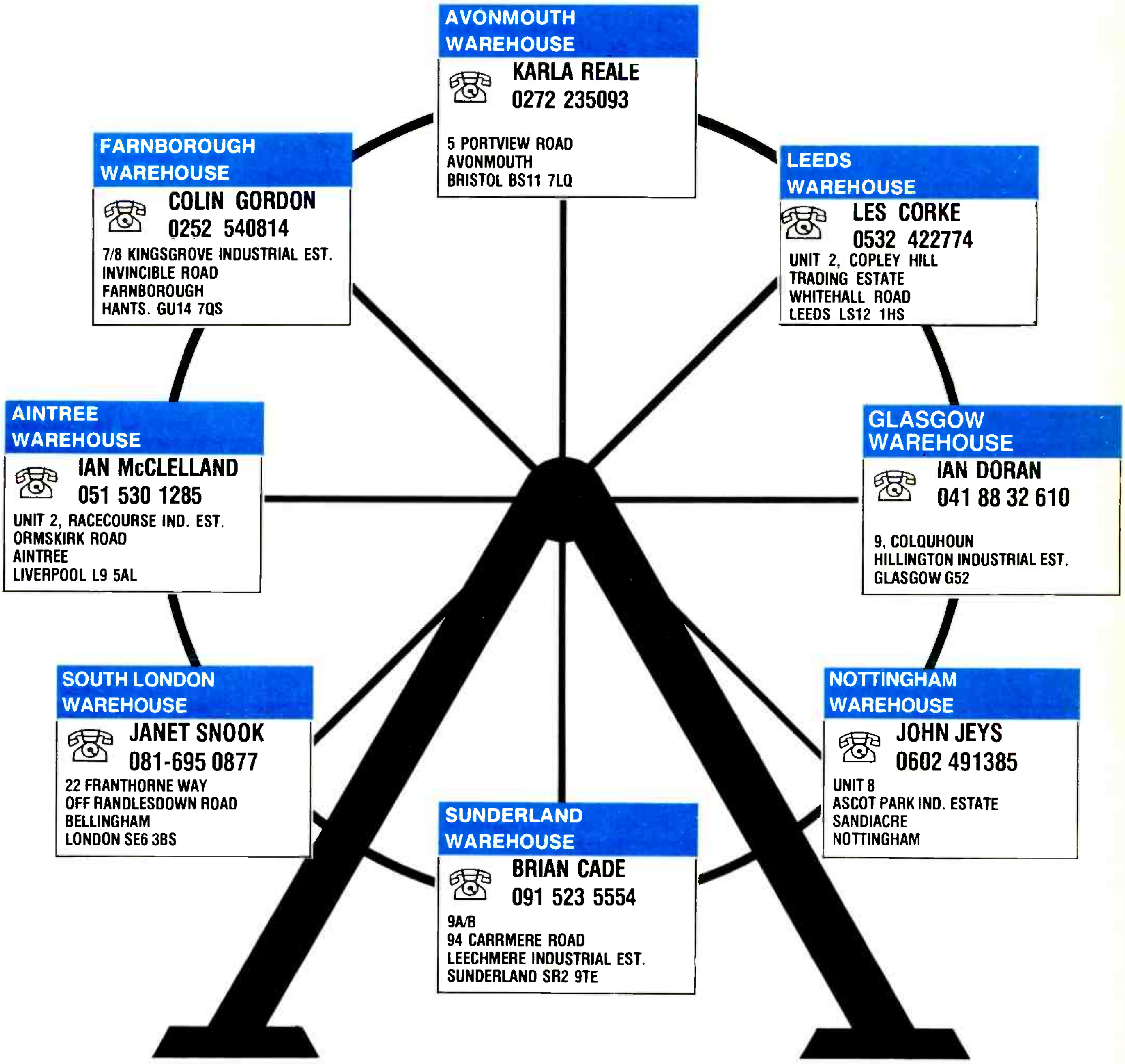

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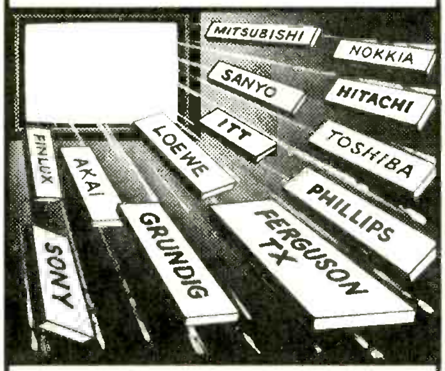

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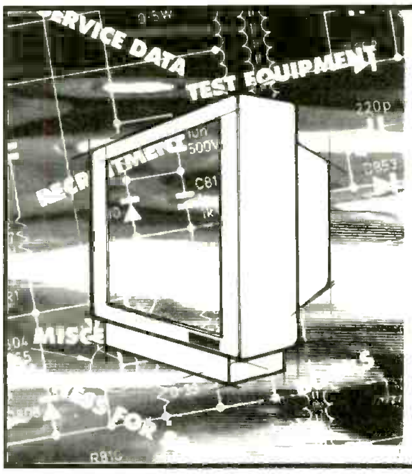
INDEX TO ADVERTISERS

TRAINING

NOTICE TO READERS

Whilst prices of goods shown in classified advertisements are correct at time of closing for press, readers are advised to check with the advertiser both prices and availability of goods before ordering from non-current issues of the magazine.

CLASSIFIED CLASSIFIED CLASSIFIED CLASSIFIED CLASSIFIED



TELEVISION CLASSIFIED

No other consumer magazine in the country can reach so effectively those readers who are wholly engaged in the television and affiliated electronic industries. They have a need to know of your products and services.

The prepaid rate for semi display setting is £10.35 per single column centimetre (minimum 3 cm). Classified advertisements 70p per word (minimum £12), box number £4.00 extra. All prices plus 17½% VAT. All cheques, postal orders etc., to be made payable to Reed Business Publishing Group. Advertisements, together with remittance, should be sent to the Television Classified Room L327, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

PHONE 081-661 8339 FAX 081-661 8931

LINEAGE

OCHRE MILL TECHNICAL SERVICES. Grundig TV spares for most models to 1985, fast, friendly, helpful, sensible prices. Gr Lype Farm, Charlton, Nr. Malmesbury, Wilts SN16 9DR. Tel. 0666 823228.

METERS RECONDITIONED £1.00, slot meters for TV Rental £5.95, 50p slot £2.95. Tel. AUDIOTECH 07903 245.

WANTED REGULAR SUPPLIES of large & small quantities television & VHS videos, best prices paid. Tel. (0934) 641742 (daytime), 516483 (evening).

TV/VIDEO/SATELLITE. Expanding business for sale. Large showroom. Sales service. Rentals, leasehold or freehold. South Devon. Box No. 261.

RADIO AND TELEVISION SERVICING. Newnes/McDonalds. 29 Volumes Vol. 1 Pre-1955 to Vol. 29 1982-83. Offers invited. Tel: 0742 740036.

AVO MULTIMETER Model 8 £40.00. 500 volt Megers £30.00 prices plus VAT. Send S.A.E. for lists of surplus instruments & scopes etc. A.C. ELECTRONICS, 17 Apleton Grove, Leeds LS9 9EN. Tel 0532 496048.

AMSTRAD SATELLITE OWNERS. Convert to tuneable audio, more stations £18. Free leaflets. EMO Ramsbottom, Lancashire BL0 9AG. Tel: 0706 823036.

PRIVATE RETAILER has excellent part exchange colour televisions to clear. Tel: 0494 814317.

BUSINESS FOR SALE, East Devon. TV video repairs, sales 50% gross profit. Rent £3,000 per annum. Owner emigrating. £16,800 WIWO. Tel: 0404 815 265.

VALVES, HUGE STOCKS, credit cards accepted. Full 45 page valve catalogue now available £2.00 post paid. VNC, 20a Cossham Street, Mangotsfield, Bristol BS17 3EN. Telephone: 0272 565472 (24 hours). Fax: 0272 575442 (24 hours).

METERS Reconditioned 10p/50p available from stock. Contact THE METER CO. (Poole) Ltd. (0202) 683498.

RADIO AND TELEVISION SERVICING 1970-1987 (17 volumes) £150. U-View Television Servicing, 87-88, 88-89 plus Video Service 87-88 £100. 0206 867790.

TRY BEFORE YOU BUY. TV, Video, HiFi sales, service business, south side of Glasgow. Cheap rented shop. Box No. 260.

WANTED EX RENTAL colour TV's. Cash on collection. Quick service. 0742 312832.

BUSINESS FOR SALE. TV/video sales/repairs with video library. Leasehold, lock-up shop. Further details on application. Tel: 071-274 8669.

SPARES & COMPONENTS

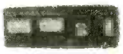
West Wales Wholesale TV

Working TVs from £18.
Videos from £60.
Discount for quantity.

**8 CILLEFWR IND. EST.
JOHNSTOWN CARMARTHEN
(0267) 222047**

RCS VARIABLE VOTAGE D.C. BENCH POWER SUPPLY

1 to 24 volts up to ½ amp. 1 to 20 volts up to 1 amp. 1 to 16 volts up to 1½ amps D.C. Fully stabilised. Twin panel meters for instant voltage and current reading. Overload protection.
Fully variable. Operates from 240V A.C. Compact Unit: size 9×5½×3ins.



£45 inc. VAT + Post & Ins. £4

NEW MODEL. Up to 38 volts DC at 6 amp. 10 amps peak. Fully variable. Twin panel meters. Size 14½"×11"×4½" **£96** inc VAT. Carr £6

RADIO COMPONENT SPECIALISTS

ACCESS — 337 WHITEHORSE ROAD, CROYDON SURREY, U.K. Tel: 081 684 1665 — VISA

List. Large S.A.E. Delivery 7 days Callers Welcome Closed Wednesday

ALLPARTS DISTRIBUTORS

SATELLITE SPARES

TV & VIDEO SPARES FOR THE TRADE AND PUBLIC
BELT KITS, TRANSISTORS, ICs, REMOTES, FERGUSON, PANASONIC, SHARP, GRUNDIG, SONY, KONIG, PHILEX, AMSTRAD

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051-260 4825

TELEVISION CLASSIFIED LINEAGE *advertisements can be submitted on this coupon with a cheque made payable to Reed Business Publishing Group. Television Classified Room L327, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. The charge per word is 70p plus 17½% (minimum £12.00 + VAT.)*

TV/11/91

For Issue Dated ....or next available. Total insertions ....Total of Cheque £.................................
Name ....Address.................................
.................................Post Code ....Tel Num ....Signature ....

Debit my Access/ Visa Card (delete)

Expiry Date .... VAT Reg. No. 238 8937 10

CLASSIFIED CLASSIFIED CLASSIFIED CLASSIFIED CLASSIFIED

TUBES

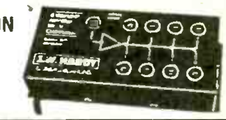
FOR SALE

J.W. HARDY
COMPARE THE VALUE

CONSULTANT IN SATELLITE TV & TV DISTRIBUTION NETWORK SYSTEMS.

NEW SALES WINNER! – X-10 POWERMID –
Uses existing remotes to control TV, VCR, stereo, CD or Cable Converter from anywhere in the house. Just plug in – no wires! Combines well with our 8-way amplifier or any other distribution network £39.95
D.T.I. approved

J.W. HARDY 8-WAY UHF AMPLIFIER FOR TV DISTRIBUTION



High quality – top value.
Frequency: 470-860MHz.
Gain: 2dB per outlet.
Power: 240v AC 4.8 Watts
Rugged, screened case. £18.95

NEW FROM PROMAX

MC 160

MC-312 – INSTANT STREAMLINED ACTION FOR THE PROFESSIONAL AERIAL INSTALLER & SYSTEMS ENGINEER

Optimizes tuning process with digital frequency meter. 39 programmable tuning memory. 60 dB attenuator. £545 + £8.00 pp.

MS 150

required satellite. Built-in sound indicator. £50 + £2.50 pp

FIELD STRENGTH METERS

MC-477B – TOP OF THE RANGE FOR THE PROGRESSIVE SYSTEMS ENGINEER

Spectrum analyser. Built-in monitor. Viewable dB frequency. 39 programmes can be pre-tuned. £1200 + £8.00 pp.

MC-160 – FOR THE DISCRIMINATING TV/AERIAL INSTALLER

Remarkable performance – capable of systems work. Built-in frequency meter. Easy to carry. Low cost. £344 + £8.00 pp.

SAT SIGNAL DETECTOR

MS-150 Permits a TV-Sat antenna to be optimally directed to

SAT SIGNAL LEVEL METERS

MS-450 Measures signal levels from –60 to –10 dBm. Accoustic signal level indication. Frequency digital display. £378 + £8.00 pp.

MS-850B Same features as MS-450 plus sound channel selector and video output. £938 + £8.00 pp.

All models (except MS-150) are complete with superb padded carrying case in highly resilient black nylon.

NEW REMOTE LEARNS UP TO 124 COMMANDS!
Universal Remote Control. Macro function – 4 commands in 1 button. Easy to use. Outmodes ordinary remotes. £21.00

MAXIMISE YOUR AERIAL PROFITS!
10-Element TV Aerials (indoor/outdoor) with pole mounting bracket
Box of 24 – ONLY £54.00 (ie £2.25 each!)
1-off sample – £6.00

ANNOUNCING
Pace 9200 IRD
90 channels, enhanced frequency scan mode. Plus access to all receiver features as well as favourite channels. £199.00 or less

Can we help you?

All the items below are provided with full technical assistance and service back up.
We shall be pleased to offer advice on suitability and fitting of any of our products.
Let us know how we can help you. We offer a planning, design and commissioning service.

TRADE ONLY | **MINIMUM TRADE ORDER £60.00** | *All prices quoted are plus carriage, plus VAT*

PRICES CORRECT AT TIME OF GOING TO PRESS

021-784 8478

VISA

J.W. HARDY, 231 Station Road, Stechford, Birmingham B33 8BB.

U.H.F. Aerials

Groups A, B, C/D & W

THE DIAMOND RANGE	
Diamond DC 10 Boxed	6.95
Diamond DC 18 Boxed	9.95
Diamond Colour Grid	16.95
Diamond Quad 8	16.60
THE TRIAX RANGE	
Unix 24	20.17
Unix 44	25.60
Unix 92	42.13
HB Grid	16.95
Yagi 10	8.38
Yagi 20	21.63

V.H.F. Aerials

THE TRIAX RANGE	
FM Omni	6.67
FM 2MT	9.07
FM 3MT	10.91
FM 4MT	12.26
FM 5MT	13.60
FM 5S	15.28
FM 8S	26.95
THE J.W. HARDY RANGE	
FM Dipole Heavy Duty	3.64
FM 2 Ele. Heavy Duty	4.80
FM 3 Ele. Heavy Duty	6.95

Masts

Alloy	
12" × 1" Loft Stand	1.00
24" × 1" with 90° Bend	1.35
5' × 1" 18g	1.63
6' × 1" 18g	1.93
10' × 1 1/2" 16g	6.95
13' × 1 1/2" 14g	9.05
16' × 2" 14g	20.18
20' × 2" 14g	26.00
20' × 2" 10g	40.00
20' × 2" 7g	P.O.A.
Steel	
10' × 1"	1.95
10' × 1 1/4"	3.00
13' × 1 1/2"	6.00
16' × 2"	8.00
18' × 2"	9.00
20' × 2"	10.80
4' × 1" × 1 1/2" dia 90° Bend Sat	4.00
9' × 1" × 1 1/2" dia 90° Bend Sat.	7.50
"S" Bend for Sat.	2.88

Chimney Lashing

Standard Repair Kit	1.28
5 Metre Wire Coil	0.80
Corner Plates	0.06
4 3/4" J Bolt & Nut 3/4	0.14
1 3/4" V Bolt & Nut M8	0.12
2 1/2" V Bolt & Nut 3/4	0.22
Chimney Brackets	
6" × 6" Pressed	0.68
6" × 6" Welded	0.98
6" × 9" Welded	1.48
7 1/2" × 7 1/2" Welded	2.15
13 1/2" Cradle Welded	2.85
Double Lashing Pair	2.85

Clamps

Aerial to Mast Clamps	
15mm to 2 1/2"	0.30
Cross Clamp	0.65
V Bolt & Nut M6	0.12
Amstrad Sat. to Mast	2.73
Mast to Mast Clamps	
1" to 2" Cross Clamp	0.75
1 1/2" to 2" Universal	1.60

Coaxial Cable

Priced in 100 metre lengths all Cables can be supplied in 100 or 250 Metre Lengths
Attenuation figures are approx at 900 MHz/100m

Volex Raydex	
C55B 21dB Brown	11.95
C55W 21dB White	11.95
C56B 17dB Black Sat.	11.95
C56W 17dB White Sat	11.95
CT100 19dB D.S. Sat.	20.00
CT125 PVC 15dB D.S. White	22.00
CT125 PVC 15dB D.S. Black	26.00
CT125 PE 15dB D.S.	52.95
CT16725 PE 11dB D.S.	68.00
CT167 RBS 11DB D.S.	92.00
J.W. Hardy	
DS75 26dB D.S.	21.00
DS100 19dB D.S.	19.95
DS165 PVC 11dB D.S.	58.00
DS165 PE 11dB D.S.	58.00
DS1002 19dB Coax & Twin Sat.	35.00
Altai	
RG6	13.95

Wall & Floor Brackets

Welded Wall Brackets	
6" × 6" Painted	0.97
6" × 6" Galv. or Polyester	1.97
6" × 9" Painted	1.48
9" × 9" All Angled, Painted	2.26
12" T & K Painted	3.75
12" T & K Black Polyester	5.27
18" T & K Painted	4.75
18" T & K Black Polyester	6.27
24" T & K Painted	5.35
24" T & K Black Polyester	7.85
Special Sat Brackets	
Patio Mount 1 1/2" Black Poly.	9.95
Patio Mount 1 1/2" 90° Bend	10.95
Saddle Bracket Pan Wall	4.50
Amstrad etc Sat to Mast	2.75
24" H.Duty Wall Black Poly.	POA
28" H.Duty Wall Black Poly.	POA
36" H.Duty Wall Black Poly.	POA
2" Ground/Wall Stand Poly.	POA
3" Ground/Wall Stand Poly.	POA

Fixings

Wallplugs & Bolts		
Hilti HRD-H 10/10S & Bolt		0.32
Mungo 10 × 50 & Bolt	each	0.19
Mungo 10 × 50 & Bolt	per 100	14.00
Cable Clips		
5, 6 & 7mm Uni Clip	per 100	0.78
9mm Uni Clip	per 100	0.95
11mm Uni Clip	per 100	1.05
13 × 7mm Uni Clip	per 100	1.25
6+mm Tower Clip	per 100	0.78
Adhesive Tape		
20M 3/4" PVC		0.32
10M × 19mm PIB Self Amalg.		3.70
10M × 25mm PIB Self Amalg.		3.75

Coax Connectors

Coax Plug Ally Screw on	each	0.30
Coax Plug Ally Screw on	per 50	12.95
Coax Plug Ally	each	0.20
Coax Plug Ally	per 100	12.95
Coax Coupler	per 50	5.95
Coax Coupler	each	0.20
"F" Screw for CT100	per 100	13.00
"F" Screw for CT100	each	0.20
"F" Screw for C56	per 100	13.00
"F" Screw for C56	each	0.20
"F" Crimp Bonded Ring	per 100	12.00
"F" Loose Ring	per 100	9.00
"F" Crimp Loose Ring	per 1000	60.00

Sat. Antenna

Dish with Polar Mount & Feed with Wall or Floor Stand. Spun Ally	
90cm 2"	105.00
90cm 3"	133.00
100cm 3"	143.00
125cm 3"	183.00
160cm 3"	273.00
180cm 3 1/2"	383.00
200cm 3 1/2"	410.00
Dish Spun Ally on Patio Ring	
90cm "F" Boss	75.00
90cm Feed Horn & Sealer	87.00
Dish Steel & Azel Mount	
60cm Mesh Concentric	22.00
80cm Mesh Concentric	45.00
60cm Mesh Marconi	35.00
120cm "F" Boss, Floor Stand	75.00
Lenson Heath – Alloy – Azelmount	
60cm Black Mesh, oval	28.00
60cm Light Grey, oval	28.00
55cm Black Mesh, square	28.00
80cm Black Mesh, oval	40.00
80cm Light Grey, oval	40.00

LNB, Feed, Polorota

LNB's with line 13/17V Polarity Switch		
Marconi Twin LNB		59.00
Marconi Blue Cap	1.8dB	35.00
Marconi Compact	1.6dB	40.00
M.T.I.	1.5dB	50.00
M.T.I. Dual V & H	1.5dB	86.50
Continental Microwave	1.2dB	40.00
S.T.C. 115000	1.2dB	40.00
LNB		
Sharp	1.1dB	60.00
Sharp Triple Band	1.5dB	149.95
Hempt White	1.2dB	35.00
Feed		
Marconi Horne		15.00
O.M.T. V-H		45.00
Polorota		
Racal		29.95
IRTE		29.95
Polorota/Feed		
Agin 100 Prime		29.95
Agin 101 Offset		29.95
Marconi Bullet		25.95
Polorota Interface		
IRTE		19.95
Racal		19.95
Chapal		24.95

Amplifiers

Telesat Mast Head		
Multi 4 incl. power	7274	19.95
Multi 3 incl. power	7273	19.95
UHF 15dB	7271	8.55
UHF 20dB	7076	9.55
UHF 20dB Cascade	7080	POA
U/V 26dB	7265	12.55
UHF 29dB Grouped	7268	12.55
Power Supply 23mA	7261	7.50
Power Supply 80mA	7262	12.50
Telesat Multi Outlet		
One Set	7291	12.95
Two Set	7292	13.75
Three Set	7293	16.95
Four Set	7294	23.95
6 + 1	7296	38.95
8 + 1	7298	42.95
Wolsey Multi Outlets		
Set Back 12dB		9.99
Two Set 7dB		9.99
Three Set 12 & 9dB		12.95
Four Set 12, 9 & 1dB		16.95
J.W. Hardy Multi Outlets		
4 Way 2dB		12.95
8 Way 2dB		18.95
Telesat M.A.T.V.		
20dB-41dBmV V-U	7263	29.79
28dB-45dBmV V-U	7264	38.31
32dB-51dBmV V-U	7281	58.10
32dB-51dBmV Diplex	7382	72.50
35dB-52dBmV Split V-U	7245	105.00
43dB-61dBmV Split V-U	7250	POA
43dB-61dBmV UHF	7255	POA
Wolsey M.A.T.V.		
Amethyst U 60dBmV		148.50
Amethyst W 60dBmV		181.50
Telesat Sat I.F. 950-1750 Mhz		
44dB-41dBmV	5100	176.00
11dB-Line amp	5110	18.70
4 Way 7dB	5104	25.19
8 Way 7dB	5108	38.50

Attenuators

3, 6, 9, 12, 18, 24 dB	1.25
"F" 3, 6, 12, 18 dB	1.40

Sat. System

Pace 9200 IRD	60cm	199.00
Amstrad SRD400	60cm	145.00
Palcom SL500	60cm	299.00

Global Sat. I.F.

Splitters to 2 Ghz	
2 Way 004-2Ghz	5.45
2 Way 9-2Ghz	6.76
4 Way 9-2Ghz Active	15.11
8 Way 9-2Ghz Active	27.32
8 Way 9-2Ghz	21.94
Taps to 2Gh:	
1-Tap 12dB 004-2Ghz	5.45
1-Tap 16dB 004-2Ghz	5.45
Switch to 2Gh:	
2 to 1 VH1 Pulse/DC	20.45
2 to 1 VH2 Pulse	20.45
2 to 1 VH3 13/17V Line	14.90
2 to 1 VH4 Xtal Adj	14.90
2 to 2 Magic 13/17V Line	18.18
2 to 4 Magic 13/17V Line	29.05
4 to 4 Magic Pulse DC	172.50
Interface to 2Gh:	
INT 1F 13-17V Line to 1 Pol	19.32
INT 2F 1 Pol to 13-17V Line	24.15
Frequency Converter	
1F-1F Pulse Control	69.00
1F-2F V Control	69.00
Power Supply	
Power Supply	19.04
DC Block & Power Insert	8.21
Line Amplifiers	
Flat 9-2Ghz	10.35
Slop 004-2Ghz	15.87
Slop 9-2Ghz	21.39

Filters, All Types POA

Decoders

Video Crypt S/VA1 Reconditioned	45.00
Video Crypt S/VA2 New	65.00
Fallan Mk II incl. lead	68.00
Fallan Mk III incl. lead	78.00
Fallan Inter Face	18.95
Fallan RTL4	52.00
Fallan Digital Sound	POA
Decoder Leads	4.50

Sat. Receivers

Pace 9000		120.00
Pace 9200 IRD		POA
Pace 9000 IRD	price guide	145.00
Amstrad SRD400		£95.00
Palcom SL500		179.00
Palcom SL3000		335.00
Pace 9000 Positioner		73.00

VIDEO AND HANDBOOK
TRAINING IN
SATELLITE TELEVISION

It's very very good!

A 55 minute video with a lavishly illustrated supporting 46 page A4 handbook aimed at the practical sales person and installer. All you need to know to become conversant with the subject. A brand new course written and produced by experts in the industry. Send for full details.

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Please send me further information on "SATELLITE TELEVISION SERVICING AND INSTALLATION"

Name..

Address..

....

............................Post Code.................

SATELLITE TV RECEPTION

DRAKE Receiver/Positioners from £299
RACAL Magnetic Polarisers from £29
60cm to 3m Antennas, polar mounts
11/12/4Ghz LNBs – feeds, accessories
SAE for Leaflets

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Main Street, Kesh, Co Fermanagh BT93 1TF
Tel. 03656 31449 Fax. 39250 Tlx 747412

EURO-SAT
SUPPLIERS TO H.M.F. – M.O.D.
MANUFACTURERS OF G.R.P. DISH ANTENNAS

1.0M *DIA*	£63.00	80cm *DIA*	£61.00
1.2M *DIA*	£85.00	2.0M *DIA*	£197.00
1.2m *off set*	£93.00	2.3m *(PETAL)*	£259.00
1.5M *OFF SET*	£119.00	3.0M *DIA*	P.O.A.
1.6M *DIA*	£119.00	FEED SUPPORT ASSEMBLY	£23.00
1.8M *(PETAL)*	£197.00		

PLEASE NOTE: We are dish manufacturers only and do not supply systems.

Please enclose S.A.E.
EURO-SAT, 107 CROSS ST., SALE, CHESHIRE M33 1JM, ENGLAND
TEL: 061-962 0542 – 061-881 4249

RECRUITMENT

REPAIRS

SERVICE SHEETS

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. & pats	£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

1A/1600V	10p
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 KBF408	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 204/4	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
Fish BY229 black	15p
BY 229 Red	20p
BY 229/400	30p
BY 229/60p Tag	30p
BY 237	3p
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	10p
F247	10p
GP20G	5p
GRP80G (TX10)	30p
XK 3102	50p
BYV 28/200	20p
Bridge TX10 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

G8 Lopt	£5.00
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
2 J/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
GEC 2110	£7.00
Mullard AT 2036	£1.50
Pye 169 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 G1OT2041	£3.00
GEC Portable G1OT2046	£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
11 TJT	£2.50
11 TGA	£2.00
ITT CVC 5-8-9	£3.50
Rank T25LE Tripler	£2.00
Rank 11TCP A823	£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
9600 Thorn	£4.00
2040 GEC	£3.50
GEC TVM25 Tripler	£2.00
Universal Tripler	£5.00
G8 Tripler	£5.00
CVC20-32	£5.00
Decca 80 100	£4.50
Grundig TVK 52	£2.50
11TBQ 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 focus PO7	
BG2087	£5.00
T/text ultrasonic rec'r panel	£14.00
12-14V. 20 for £5.00 200 for £25.00	
GEC 8 touch unit 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 Scan 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
K30 drawer 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
Pye. K30. GEC. etc. Pre-mains stand-by switch	£1.00
Decca 80/100 IF panel	£5.00
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
G11 8 touch button unit replaces old 6 P.B.U.	£24.00
Tube base + base unit for 820 Euro chassis	£4.00
GEC 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
CVC 40/45 IF panel	£5.00
40K Transducer	50p
PHILIPS NE511N	£1.20
LM337M Reg.	30p
20 GEC Black Spark Gaps	£1.00
KT3 Front Panel Control Assy.	£2.50
BTW 30/50	50p

Voltage Regulators

+5V/UA78PO5SC	30p
-8V/79M08c	£30p
+6V/78M06c	£30p
LM 317T	30p
LM 337	30p
LM 342/18	30p
LM 340T 5.0	50p
+12V/LM 340T12	50p
+18V/MC78M18	20p
+24V/78M24	£30p
MC 7724cp	40p
MC 7824	40p

Power Supply for Sinclair Spectrum +2	£5.00

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 71/350	20p
BYX 71/600	50p
BYX 72/300	20p
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
Transformer 240v/20v-500Ma	75p
Chassis type Transformer 240v/12 Volt - 500m/a	75p
CVC 20 tube base	£2.00
Tube Base Rank & G11	£1.20

BRIDGES

KBL 005	30p
KBL 02	30p
KBP 04	30p
W02	15p
W004	15p
W005	20p
800V Bridges 2½ Amp	30p

G11 Drawer ASS 3 pots Mans Switch and Lead	£2.00
K30 Drawer Ass with pots cable forme	£1.00
TX10 Drawer with 8 way pots. ass	£2.50
Hills 9 piece tool kit in case	£5.00
Philips Coaxial Cable Stripper SBC325	£7.50
Self adjusting cutter stripper	£5.00
10 mixed tube bars	£4.00
5000 Diodes-Resistors	£3.00 pack
*D P push mains switch	20p each
Mains lead & two pin socket for radio cassette	35p
T/V loop aerial	75p
Radio Telescopic Aerial	£1.00
Philips Silicon Grease	£1.50 each
Freeze Philips	£1.50 each
Foam Cleaner Philips	£1.50 each
Contact Cleaner Philips	£1.50 each
100 Coax Plugs	EACH 14p
De-solder pump + 2 nozzles Philips	£4.00
Flat Red LED and Green	5p
500gm 60/40 Solder reel	£6.00
Dual v/u meter -20 — +10db	£1.00
K30 Thermistor 232266298009	75p
De-solder Pump	£2.50
Portasol Flameless Gas Soldering Iron	££16.00
Green and Red LED pack mixed	100 for £1.00
Hill Meter Leads. S/Rubber and Probes	£4.00

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
Min 12 volt Relays	75p
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.

STR454	£2.00
STR6020	Kit £6.00
S 2000AF line o.p.	£1.00
2SC940	£1.00
BU 105/04	80p
BU 108	£1.00
BU 124	50p
BU 126	80p
BU 180a	£65p
BU 204	60p
BU 205	75p
BU 206	£1.00
BU 207	£1.00
BU 208	80p
BU 208A	75p
BU 208D	90p
BU 222	£1.00
BU 326	£1.00
BU 407	60p
BU 426A	45p
BU 500	£1.10
BU 500D	£1.00
BU 508A	90p
BU 508AF	£1.00
BU 508D	80p
BU 508V	£1.00
BU 705	£1.00
BU 806A	£1.00
BU 807	£1.00
BU 824	50p
BUX [illegible]	50p
BUT 13 600V-28A	£1.00
BUW 11	50p
BUW 84	60p
BYW 2048-9	£1.00
BYW 95	10p
BUX 39 25A-150V	£1.00
BUX 84	50p
BUX 85	50p
BUY 49	20p
TIC 106a	30p
TIC 116m	30p
TIC 116m 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	20p
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
HD1000 Digital	£20.00
HD1200 Low Cost Digital	£13.00
HD2500	£18.00
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HD5500 Digital	£29.00
HD6000 Digital	£32.00
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HD9500 Digital with capacity Temp Trans Volts Ohms and Amps ranges	£60.00

DVM's

Infra Red Hanset Tester

Works at 24 feet – Sound repeater. Works off 9 volt battery Fits in top pocket.	£8.00

Handset Tester with LED	£4.50

Repaired Handsets

Philips K4-K35. RC5350-RC5300. RC5370. RC5375. repaired same day	£10.00
RC4001 Full Remote KT3 K30 Teletext Handsets exchanged	£15.00
GEC Full Remote Infra-red. 1983 models	£15.00

TOSHIBA HAND SETS

CT9185 CT9176 CT9133 CT938
CT995 CT9144 CT9185 CT9193
CT9383 CT9384 £4.00 each

Rediffusion MK3	£5.00

TOSHIBA HAND SETS

24 Button CT938 Fullremote	£5.00
32 Button CT983 Videotex	£6.00

?

THORN

VCR Front Display Panel	£7.00
Large type ITT TV and V.C.R. Handset	£15.00
GEC Ultrasonic 8C11 Full Remote	£10.00
G11 Full Remote Ultrasonic	£10.00
G11 Ultrasonic Teletext Handset	£10.00
8 C.H. Ultrasonic GEC Full Remote C2014H/C2219H	£15.00
New Replacement for G11 Ultrasonic Full Remote	£12.00
Thorn 4000 insert with 7 buttons	£5.00
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 1826	£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	
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
GEC push pad handset button blobs	10p each
Pye & Philips handset KT3-K30 chassis. No RC5150-RC5176-RC5171-RC5177. **Special Price**	£13.00
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
Philips RC5	£15.00

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

RC5171	£12.00

K35-K4 HAND SET

Repaired for £5.00

International Rectifier EHT Diodes G770/HV34 6KV		3 for 8p
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TUNER UNITS

TX90-TX100 Tuners with AE socket	£5.00
Thorn TX Tuner V/Cap eqv. to ELC1043	£4.50
Min. UHF Tuner 40dB gain 2" x 1½" x 1½	£1.50
AMSTRAD Tuner	
Thorn TX10 Export V/Cap UHF, VHF	£3.00
V/Cap Rank UHF Z776T/Unit	£6.00
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NEW GS Tuner V/Cap	£3.50
1206 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
Mullor 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
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U.V. 411 Tuner	£8.00
U.V. 412	£8.00
U.V. 417	£5.00
U.V. 617	£6.00
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U743 Tuner	£7.00
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Small V/Cap Mitsumi UHF	£4.00
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Portable & rotary Tuners Sanyo & Mitsumi UHF	£5.00
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UL2-B31 Fidelity V/Cap T/Unit	£6.00
UHF-VHF V/Caps on panel	£3.00
HITACHI 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.I.R. system. Data supplied	£10.00
4 Button Rank Z18 Tuner	£4.00
TRS 250V AC mains filter 0.1 + (03x2) 11" leader & earth clip	25p
NEW U321 Mullard	£4.00

Astec 230V/.6A Switch Mode Power Supply	£5.00
Astec UM1623 VHF	£2.00
Astec UM1286	£4.00
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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	£8.00
UF745 BAV	
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Co-Ax Joint	15p
Co-Ax Belling Lee Plug	14p
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Infra Red Emitting Diode	20p
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Mullard 5 Watt Amps. LP1162 New	75p

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SW453	50P	SW154	50P
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SY2153	50P		

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BD807	20p
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BD933	30p
BD939	30p
BD948	30p
BDT31A	50p
BDX75	20p
BDV64B	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	30p
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BTT6218	£1.50
BTT8124	£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
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CD4510	30p
CD4555BE	30p
DM7492	50p
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HA1196	40p
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HA1377	£3.00
HA11223	40p
HA11423	£1.00
HA11440	50p
HA11484	£3.00
HA11485 Ant	£1.00
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LA3220	50p
LA4102	£1.00
LA4261	£1.00
LA7830	£2.00
LA7831	£2.00
LM1111N	£1.00
LM1017N	25p
LM8361	£3.00
PCF8571P	£5.00
M913	£2.00
M1024=SAA	£2.00
M1025=SAA	£2.00
M5840A-84RS	£3.00
MC476p	£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
ML238B	£4.00
ML239	£2.00

Thyristors

Philips Kits OT121	50p
TR106A	30p
BT151/500	30p
BT106 Plastic	20p
BT106 Metal	30p
BT119	£1.20
BT120	£1.00
BRC4443	£1.00
G11 Thyristor	75p
Decca 80-100	60p
2N4444	60p
MCR72-6	£1.00
OT112	25p
TF320M	£1.00
HC6441	£1.00
17052	£2.00
17088H	£2.00
17089R	£2.00
17053R	£2.00
SP2M	50p
RCA Thyristor	
CC0240H	£2.00
CC0240R	£2.00

Thermistors

PTHBG100M	75p
GS Degausing	35p
Philip type VA1104	70p
TT1P73/6312	15p
PTH451 AOR	15p
PT37P Fits Pye & PT34	20p
Degausing Thermistor (fits most sets)	20p
POS 109 Philips	50p
POS 110 Philips	50p

BF694	10p	2SC3795	30p	BC368	10p
BF758	30p	2SC3973B	30p	BC369	10p
BF760	30p	2SC7350	15p	BC384	10p
BFT34	15p	2SD180 TO3 80w/6A	15p	BC394	10p
BFT43	10p	2SD200	£2.00	BC413	10p
BFT84	8p	2SD401	£1.00	BC414	10p
BFW11	20p	2SD716	£1.00	BC416	10p
BFX29	30p	2SD787	30p	BC440	30p
BFX84	25p	2SD789	30p	BC454	10p
BFY50	15p	2SD820	£1.00	BC455	10p
BFY52	20p	2SD868	75p	BC456	10p
BFY90	25p	2SD880	30p	BC460	25p
BLY49	25p	2SD1264	£1.00	BC462	10p
BPW41	25p	2SD1266	£1.00	BC463	10p
BRC116	25p	2SD1415	£1.00	BC478	10p
BRX43	10p	2SD1427	£1.00	BC527	10p
BRX48X	10p	2SD1432	£1.00	BC532	10p
BRY56	30p	2SD1576	£1.00	BC546	10p
BSS68	10p	2SD1577	£2.00	BC547	10p
BSY79	10p	2SD1878	£1.00	BC548	10p
BSY95a	10p	2SK30A	10p	BC556	10p
BTY80	20p	BC107	10p	BC557	10p
BSX19	17p	BC108	10p	BC558	10p
BSX20	17p	BC109	5p	BC559	10p
FT3055	30p	BC113	10p	BC635	10p
TCE82	30p	BC114	10p	BC636	10p
TCE520	30p	BC115	10p	BCX31	25p
2N930	5p	BC116	10p	BCX32	25p
2N2221	8p	BC117	20p	BD116	30p
2N2222	8p	BC119	20p	BD124	30p
2N2906	10p	BC125	10p	BD124 (metal)	30p
2N3055	40p	BC126	10p	BD130Y	25p
2N3566	10p	BC139	10p	BD131	30p
2N3702	10p	BC140	30p	BD132/238	30p
2N3711	10p	BC141	25p	BD135	25p
2N3583	50p	BC143	25p	BD136	30p
2N3904	15p	BC147	10p	BD138	30p
2N4355	10p	BC148	10p	BD140	30p
2N4442	£1.00	BC149	10p	BD176	25p
2N4444	£1.00	BC153	10p	BD182	£1.00
2N5278	20p	BC154	10p	BD183	70p
2N5296	40p	BC157a	10p	BD202	30p
2N5983	30p	BC158	10p	BD204	30p
2N6099	40p	BC159	10p	BD207	60p
2N6109	40p	BC160/16	25p	BD221	30p
2N6130	50p	BC171	5p	BD222	20p
2N6133	20p	BC172	5p	BD228	30p
2N6348	20p	BC173	5p	BD226	30p
2N6399	10p	BC174	5p	BD233	30p
2SA437	20p	BC183	5p	BD234	25p
2SA673P	10p	BC184	5p	BD235	30p
2SA844P	10p	BC204	5p	BD238	30p
2SC643A	£1.00	BC207	5p	BD239	15p
2SA999	10p	BC212	5p	BD240	50p
2SB474	30p	BC213	5p	BD243c	40p
2SB566	10p	BC214	5p	BD244	50p
2SB686	75p	BC237	5p	BD250a	30p
2SC515A	£1.00	BC238	5p	BD252	20p
2SC772	20p	BC239	5p	BD253B	20p
2SC381	10p	BC250	5p	BD331	20p
2SC458	50p	BC251	5p	BD373b	20p
2SC491	50p	BC252	5p	BD416	25p
2SC732	10p	BC262	10p	BD433	25p
2SC733	10p	BC263b	20p	BD437	25p
2SC940	£1.00	BC294	30p	BD438	30p
2SC1030	£1.00	BC298	10p	BD139	30p
2SC1061	30p	BC300	30p	BD439	30p
2SC1162 C/18	30p	BC301	30p	BD544D	40p
2SC1514	30p	BC303	30p	BD650	30p
2SC1520	25p	BC307	7p	BD678	30p
2SC1546	20p	BC308	7p	BD681	30p
2SC1617	£1.00	BC309	10p	BD682	30p
2SC1725	20p	BC327	10p	BD507	30p
2SC1740	20p	BC328	10p	BD508	30p
2SC1756	50p	BC328/338 pair	15p	BD509	30p
2SC1942	£1.00	BC337	10p	BD517	30p
2SC2027	£1.00	BC338	10p	BD519	30p
2SC2068	20p	BC347	10p	BD534	30p
2SC2073	8p	BC349b	10p	BD535	30p
2SC2229	15p	BC350	10p	BD544D	30p
2SC2688	20p	BC365	10p	BD562	40p
				BD610	40p

THORN	
ML926	£1.00
MAB8400B-C	£2.00
MAB8440 P-D070	£2.00
MAB8441 PT001	£3.00
MAB8420PC035	£2.00
MAB8422P-Q005	£2.00
MAB8440P	£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
MM53108N	£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
SAA611	£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	£3.00
SAA3027P	£4.00
SAA5000A	£1.50
SAB3013	£2.00
SAB3037	£2.00
SAB3205	£3.00
SAB3210	£2.00
SAB4209	£2.00
TBO0124	£1.00
SAA3008P	£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
TBA396O	£1.00
TBA396	75p
TBA440P	£1.00
TBA1440C	£1.00
TBA480Q	£1.00
TBA520	£2.00
TBA530	£2.00
TBA540	£1.00
TBA560CO	£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
TBA780	£1.50
TBA800	50p
TBA810AP	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
UPX1365C	£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/02	40p
BT138/10A	70p
BT146	30p
TBA540Q	£1.50
TCA270	£1.00
TCA270Q	£1.00
TCA270S	£1.00
TCA270SQ	£1.00
TCA740	£1.00
TCA800	£1.50
TCA830	£1.00
TCA940	£1.00
TCEP100	£1.00
TCE120CO	£1.00
TCE520	30p
TD6306P	£3.00
TDEA440Q	50p
TDA1003A	£1.00
TDA1010	£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
TDA2545A	£1.00
TDA2600	£3.00
TDA2640	£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
TDA3561	£3.00
TDA3560	£4.00
TDA3561A	£3.00
TDA3662ZA	£3.00
TDA3566	£3.50
TDA3564	£4.00
TDA3565	£3.00
TDA3571A	£2.75
TDA3581	£3.00
TDA3590	£3.00
TDA3591	£1.00
TDA3592A	£3.00
TDA3650	£7.00
TDA3651	£3.00
TDA3651AO	£3.50
TDA3652	£3.50
TDA3653AO	£2.00
TDA3654	£2.00
TDA3654O	£2.00
TDA3710	£3.50
TDA3800	£4.00
TDA3180	£2.00
TDA4260	50p
TDA4500	£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
MJE51T	25p
MJE340	28p
MJE660	25p
MJE661	25p
MJE3055	£1.00
MJE2801	30p
MJE2955	50p
MJE13005	50p
Sanikron Diode	30p

Sells see p.17

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
AC169	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
		BF271	10p
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

DT207678	£10.00
90D34035-003	£10.00
90D4-106-003	£1.00
90D34038-001	£5.00
OT204130	£3.00

I.C.s

MA721PC	£1.00	UPD114LC-2	£1.00
M50430-8505P	£1.00	MN1250BJC	£1.00
TD6359P	£1.00	M50441-5505P	£1.00
M58657P	£1.00	M491BB1	£2.00
PCD8572	£1.00	HA513385	£1.00
HD74HC86P	£1.00		