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# TELEVISION

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A REED BUSINESS PUBLICATION

SOUTHLAND NEWSAGENCY  
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## FREE TV+VIDEO SPARES GUIDE

**TV Tuning and Memory Systems**

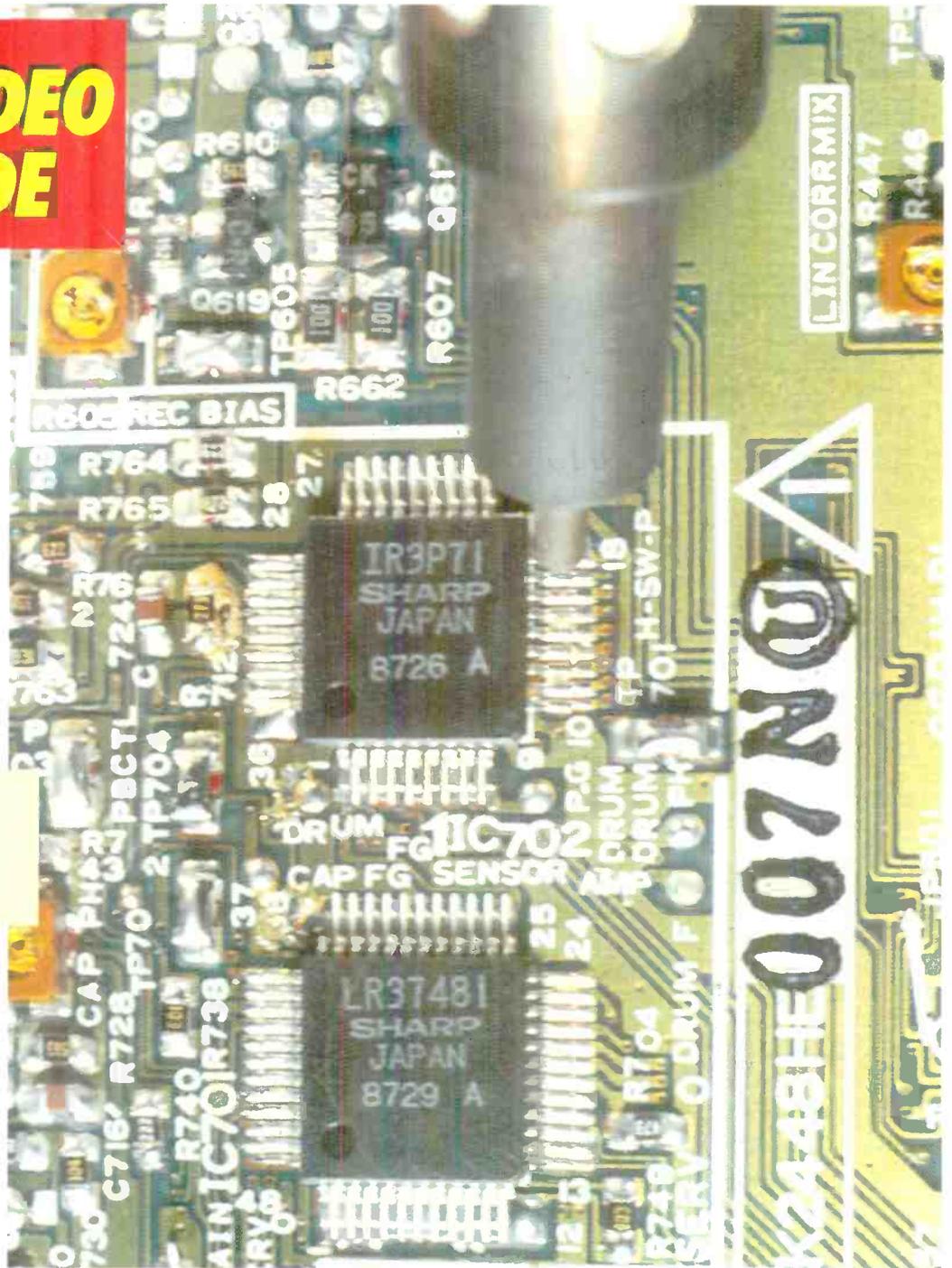
**VCR Clinic**

**Audio Tape Problems**

**Test Report: ServiceBase**

**Toshiba Service Notes**

**TV Fault Finding**



## REPLACING SM DEVICES



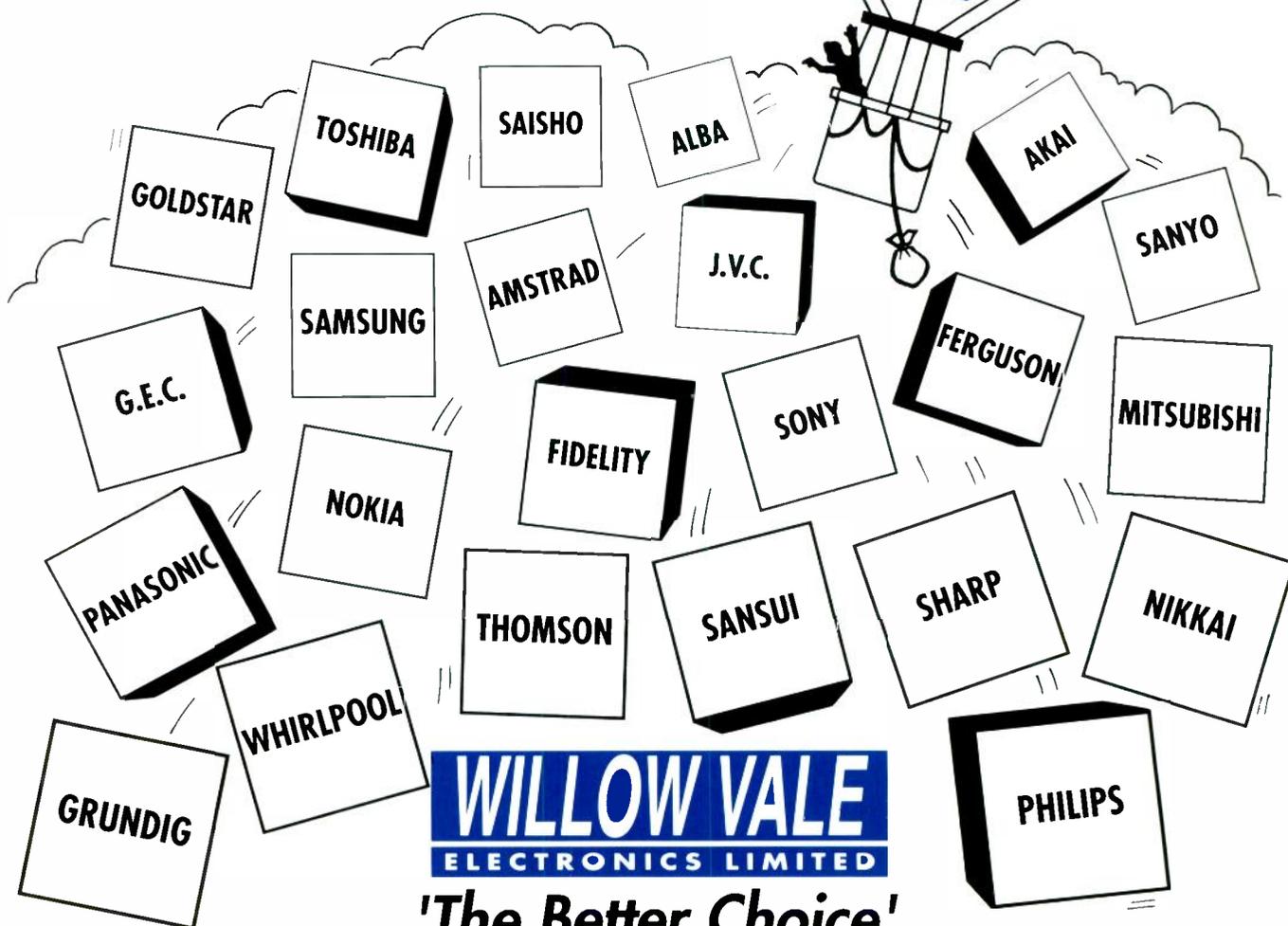
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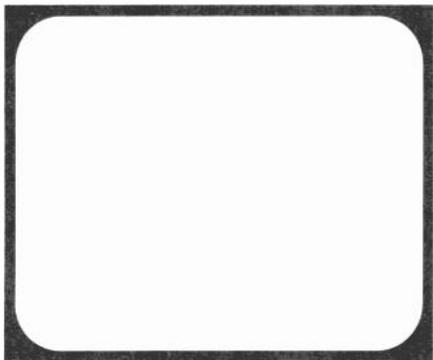
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# TELEVISION

April  
1994

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## 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 Department, Reed Business Publishing, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

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BC107	8p	BD897	50p	S2800M	72p	DIODES	PCL84	60p	AY3-8910	350p	LA4102	100p	SAA5030	350p	STK4793	800p	STR50441	350p	TD41013A	110p	TD4280	320p	
BC108	8p	BD899	50p	T2800M	52p		PCL85	80p	AY3-8912	400p	LA4110	120p	SAA5030	440p	STK4803	600p	STR50441	350p	TD41015	85p	TD4282	360p	
BC109	8p	BD901	40p	T2800M	72p	Rectifier	PCL805	80p	BA301	55p	LA4112	120p	SAA5040A	280p	STK4813	300p	STR56041	500p	TD41016	140p	TD4290	200p	
BC109C	10p	BD977	45p	PI230	15p	Diodes	PF200	110p	BA311	80p	LA4120	270p	SAA5040B	280p	STK4833	700p	STR58041	325p	TD41020	110p	TD4400	175p	
BC140	10p	BD922	100p	T292A	25p		PI212	8p	BA312	25p	LA4120	270p	SAB3013	200p	STK4833	700p	STR58041	325p	TD41020	110p	TD4400	175p	
BC141	20p	BDK33	60p	TP129C	25p	BY133	6p	PL83	6p	BA333	60p	LA4126	240p	SAB3013	200p	STK4853	730p	STR6001	525p	TD41023	130p	TD4420	120p
BC142	20p	BDK65	60p	TP130	25p	BY164	40p	PL84	80p	BA340	150p	LA4137	180p	SAB3035	600p	STK4863	700p	STR61001	525p	TD41024	150p	TD4430	300p
BC143	20p	BDW23	55p	TP130C	25p	BY179	35p	PL95	180p	BA401	60p	LA4140	60p	STA301A	200p	STK4873	850p	STR6105	550p	TD41025	320p	TD4426	170p
BC144	20p	BDW24	55p	TP130C	25p	BY184	35p	PL94	180p	BA405	60p	LA4140	60p	STA301A	200p	STK4873	850p	STR6105	550p	TD41025	320p	TD4426	170p
BC145	8p	BDW93	50p	TP131C	27p	BY196	20p	PL508	200p	BA511	145p	LA4180	300p	STA403A	270p	STK4913	300p	STR1806	400p	TD41029	200p	TD4447	200p
BC149	8p	BDW94	50p	TP132	24p	BY206	11p	PL518	430p	BA514	160p	LA4182	180p	STA404	290p	STK5314	475p	STR1816	400p	TD41035	110p	TD4450	300p
BC157	8p	BDY92	100p	TP132A	21p	BY207	3p	PY81	100p	BA516	150p	LA4190	300p	STA405A	280p	STK5315	500p	STR200D	52p	TD41037	190p	TD4451	150p
BC158	8p	BDY93	100p	TP132A	21p	BY208	3p	PY82	100p	BA517	150p	LA4190	300p	STA405A	280p	STK5315	500p	STR200D	52p	TD41037	190p	TD4451	150p
BC160	30p	BF167	30p	TP133	50p	BY225	120p	PY500A	190p	BA524	240p	LA4200	120p	STA432A	220p	STK5324	450p	TA7061	115p	TD41046	200p	TD4440	180p
BC171	10p	BF180	16p	TP133C	60p	BY227	19p			BA526	180p	LA4201	120p	STA432A	220p	STK5325	370p	TA7063	70p	TD41053	300p	TD4442	240p
BC172	10p	BF181	16p	TP134	50p	BY228	28p	LED's		BA527	27p	LA4220	120p	STA435A	270p	STK5331	300p	TA7066	120p	TD41054	180p	TD4445	220p
BC177	14p	BF183	20p	TP134C	60p	BY230	25p	3mm		BA532	12p	LA4260	230p	STA441C	220p	STK5332	180p	TA7078	200p	TD41060	140p	TD4452	200p
BC179	14p	BF195	7p	TP135C	65p	BY298	15p	RED	5p	BA534	220p	LA4261	300p	STA456C	240p	STK5333	500p	TA7119	150p	TD41062	180p	TD4448	280p
BC179	14p	BF199	8p	TP136C	65p	BY299	18p	YELLOW	8p	BA536	150p	LA4270	300p	STA471	210p	STK5335	350p	TA7120	55p	TD41072	150p	TD4500	300p
BC182	7p	BF200	16p	TP141A	20p	BYX10	15p	GREEN	8p	BA546	150p	LA4420	140p	STR901M	280p	STK5337	500p	TA7130	80p	TD41074	280p	TD4501	400p
BC182L	7p	BF225	16p	TP141C	22p	BYX55/50	30p	5mm		BA547	150p	LA4422	120p	STAB20	260p	STK5338	250p	TA7137	60p	TD41082	275p	TD4502	350p
BC183	7p	BF240	16p	TP142A	20p	BYX55/600	25p	RED	5p	BA556	110p	LA4430	130p	STK0025	270p	STK3031	400p	TA7140	100p	TD41083	100p	TD4503	300p
BC183L	7p	BF245	25p	TP142C	22p	BYX70/500	30p	YELLOW	5p	BA558	350p	LA4440	150p	STK0029	360p	STK5342	245p	TA7157	100p	TD41085	170p	TD4505	300p
BC184	7p	BF254	15p	TP147	40p	DA47	10p	GREEN	8p	BA584	400p	LA4445	150p	STK0039	500p	STK5361	375p	TA7176	200p	TD41097	475p	TD4510	270p
BC184L	7p	BF258	15p	TP147	40p	DA80	10p	GREEN	8p	BA585	400p	LA4460	120p	STK0040	520p	STK5372	260p	TA7183	320p	TD41151	40p	TD4515	400p
BC192	7p	BF256	16p	TP150	60p	DA91	3p	RECTANG.		BA1310	400p	LA4461	120p	STK0040	520p	STK5372	260p	TA7183	320p	TD41151	40p	TD4515	400p
BC212L	7p	BF257	16p	TP151	120p	DA200	10p	LED's		BA1320	120p	LA4500	200p	STK0050	440p	STK5421	450p	TA7205	80p	TD41170	85p	TD4556	370p
BC213	7p	BF258	16p	TP152	120p	DA202	10p			BA1330	120p	LA4505	220p	STK0059	620p	STK5422	375p	TA7207	150p	TD41180	270p	TD4560	300p
BC214	7p	BF259	16p	TP153	120p	IN 514	2p	5mm x 2.5mm		BA1360	160p	LA4507	360p	STK0060	820p	STK5431	550p	TA7208	125p	TD41190	80p	TD4600	140p
BC214L	7p	BF263	25p	TP105	65p	IN 4001	3p	RED	10p	BA1370	160p	LA4508	190p	STK0062	800p	STK5432	550p	TA7214	100p	TD41190	80p	TD4600	140p
BC237	7p	BF270	18p	TP106	65p	IN 4002	3p	YELLOW	5p	BA5101	350p	LA4510	100p	STK0080	580p	STK5436	500p	TA7217	145p	TD41220	75p	TD4600-2	160p
BC238	7p	BF273	18p	TP107	65p	IN 4003	3p	GREEN	8p	BA5102	350p	LA4520	170p	STK011	330p	STK5441	400p	TA7220	220p	TD41235	300p	TD4605	220p
BC300	20p	BF331	20p	TP111	40p	IN 4004	3p	LINEAR IC's		BA5204	200p	LA4550	200p	STK015	440p	STK5451	390p	TA7222	90p	TD41236	240p	TD4610	130p
BC301	20p	BF337	20p	TP112	40p	IN 4005	4p	AN203	210p	BA5406	180p	LA4570	130p	STK025	650p	STK5461	500p	TA7225	200p	TD41327	200p	TD4660	300p
BC302	20p	BF338	20p	TP115	40p	IN 4148	2p	AN210	165p	BA5408	180p	LA4512	200p	STK043	900p	STK5462	675p	TA7226	290p	TD41410	210p	TD4690	120p
BC303	20p	BF362	30p	TP116	40p	IN 5403	2p	AN210	165p	BA5408	180p	LA4512	200p	STK043	900p	STK5462	675p	TA7226	290p	TD41410	210p	TD4690	120p
BC304	25p	BF367	13p	TP117	40p	IN 5403	2p	AN210	165p	BA5408	180p	LA4512	200p	STK043	900p	STK5462	675p	TA7226	290p	TD41410	210p	TD4690	120p
BC327	7p	BF371	17p	TP120	37p	IN 5405	4p	AN252	150p	BA6304	120p	LA6324	200p	STK077G	520p	STK5473	480p	TA7232	95p	TD41514A	450p	TD4566P	250p
BC328	7p	BF400	25p	TP121	40p	IN 5403	8p	AN259	250p	BA6305	140p	LA7011	220p	STK078	580p	STK5476	500p	TA7233	120p	TD41515A	200p	TD4670	200p
BC330	7p	BF405	25p	TP122	40p	IN 5404	8p	AN259	250p	BA6305	140p	LA7011	220p	STK078	580p	STK5476	500p	TA7233	120p	TD41515A	200p	TD4670	200p
BC338	7p	BF491	90p	TP125	40p	IN 5405	11p	AN271	230p	BA6411	250p	LA7033	300p	STK082	600p	STK5479	300p	TA7324	400p	TD41570	45p	TD4579	450p
BC41	28p	BF473	30p	TP126	45p	IN 5406	12p	AN274	250p	BA6993	150p	LA7040	280p	STK084	600p	STK5481	420p	TA7240	160p	TD41520	25p	TD4580	600p
BC46	8p	BF429	20p	TP127	40p	IN 5407	12p	AN301	330p	BA7001	150p	LA7042	280p	STK085	600p	STK5482	285p	TA7241	165p	TD41521	25p	TD4580	370p
BC48	15p	BF438	30p	TP128	40p	IN 5408	12p	AN304	330p	BA7006	150p	LA7046	300p	STK086	600p	STK5483	440p	TA7242	150p	TD41522	110p	TD4580	175p
BC461	28p	BF485	20p	TP131	30p	RG151	30p	AN304	330p	BA7007	200p	LA7224	150p	STK420	500p	STK5484	240p	TA7243	150p	TD41523	110p	TD4580	175p
BC477	18p	BF487	15p	TP141	75p	RG130	16p	AN315	210p	BA7021	180p	LA7505	250p	STK430	500p	STK5490	450p	TA7245	225p	TD41540	420p	TD4700	170p
BC478	18p	BF488	15p	TP142	80p	SKE4F2706	60p	AN316	350p	BA7022	350p	LA7507	250p	STK433	400p	STK5490	450p	TA7245	225p	TD41540	420p	TD4700	170p
BC485	20p	BF496	60p	TP143	80p	SKE4F2706	60p	AN316	350p	BA7022	350p	LA7507	250p	STK433	400p	STK5490	450p	TA7245	225p	TD41540	420p	TD4700	170p
BC537	25p	BF517	100p	TP146	80p	SKE4F2710	100p	AN360	100p	BA7755	150p	LA7520	200p	STK435	375p	STK5730	450p	TA7269	260p	TD41596	200p	TD4705	200p
BC546	8p	BF518	100p	TP147	80p	SKE4F2710	100p	AN360	100p	BA7755	150p	LA7520	200p	STK435	375p	STK5730	450p	TA7269	260p	TD41596	200p	TD4705	200p
BC547	8p	BF520	100p	TP148	80p	SKE4F2710	100p	AN360	100p	BA7755	150p	LA7520	200p	STK435	375p	STK5730	450p	TA7269	260p	TD41596	200p	TD4705	200p
BC548	8p	BF521	100p	TP149	80p	SKE4F2710	100p	AN360	100p	BA7755	150p	LA7520	200p	STK435	375p	STK5730	450p	TA7269	260p	TD41596	200p	TD4705	200p
BC549	8p	BF522	100p	TP150	80p	SKE4F2710	100p	AN360	100p	BA7755	150p	LA7520	200p	STK435	375p	STK5730	450p	TA7269	260p	TD41596	200p	TD4705	200p
BC550	8p	BF523	100p	TP151	80p	SKE4F2710	100p	AN360	100p	BA7755	150p	LA7520	200p	STK435	375p	STK5730	450p	TA7269	260p	TD41596	200p	TD4705	200p
BC556	8p	BF564	25p	TP1305A	45p	14PIN	6p	AN3320K	800p	CX136	600p	LA7808	250p	STK457	470p	STK632	525p	TA7280	190p	TD41822A	270p	TD4725	500p
BC557	7																						

LINEAR ICs	25A1051	300p	25C536	20p	25C1675	150p	25C2329	480p	25C2938	25p	25C3521	120p	25D794	600p	25D1399	300p	25K197	140p	25K166	300p	8284	440p
Cont.	25A1052	40p	25C537	35p	25C1676	150p	25C2330	480p	25C2939	25p	25C3522	120p	25D795	600p	25D1400	300p	25K198	140p	25K167	300p	8285	440p
UIC1363	190p	25A1060	120p	25C563	120p	25C1677	15p	25C2331	200p	25C2940	300p	25D796	20p	25D1401	160p	25K199	200p	25K168	200p	COMPUTER C's	8286	650p
UIC1363C	300p	25A1069	150p	25C603	40p	25C1678	75p	25C2334	80p	25C2968	50p	25D798	30p	25D1404	125p	25K210	215p	25K169	150p	25K170	870p	900p
UIC1364	350p	25A1078	230p	25C605	100p	25C1679	100p	25C2335	75p	25C2969	60p	25D799	70p	25D1406	60p	25K211	400p	25K171	200p	25K172	870p	900p
UIC1365	350p	25A1081	300p	25C606	100p	25C1680	100p	25C2336	80p	25C2970	60p	25D800	70p	25D1408	60p	25K212	400p	25K173	200p	25K174	870p	900p
UIC1367	500p	25A1081	80p	25C641	80p	25C1681	100p	25C2347	60p	25C2979	160p	25D804	33p	25D1408	125p	25K217	50p	25K175	200p	25K176	870p	900p
UIC1370C	300p	25A1082	80p	25C643	500p	25C1682	15p	25C2353	120p	25C2987	250p	25D805	200p	25D1409	170p	25K218	350p	25K177	200p	25K178	870p	900p
UIC1373	85p	25A1084	100p	25C644	10p	25C1675	90p	25C2360	120p	25C2988	150p	25D811	450p	25D1412	75p	25K219	200p	25K179	200p	25K180	870p	900p
UIC1377C	200p	25A1085	300p	25C645	10p	25C1676	90p	25C2361	120p	25C2989	150p	25D812	450p	25D1413	75p	25K220	200p	25K181	200p	25K182	870p	900p
UIC1378	180p	25A1091	100p	25C681	250p	25C1683	100p	25C2362	50p	25C2989	50p	25D813	450p	25D1414	70p	25K221	200p	25K183	200p	25K184	870p	900p
UIC1382	110p	25A1093	300p	25C683	35p	25C1684	30p	25C2365	280p	25C3001	1400p	25D814	250p	25D1415	190p	25K222	120p	25K185	200p	25K186	870p	900p
UIC1384	425p	25A1094	80p	25C708	100p	25C1685	30p	25C3012	600p	25C3012	600p	25D815	290p	25D1417	125p	25K223	140p	25K187	200p	25K188	870p	900p
UIC1387C	200p	25A1095	100p	25C709	100p	25C1686	30p	25C3013	600p	25C3013	600p	25D816	290p	25D1418	125p	25K224	140p	25K189	200p	25K190	870p	900p
UIC1389	120p	25A1096	80p	25C711	15p	25C1730	10p	25C3021	1250p	25C3021	1250p	25D817	300p	25D1420	60p	25K225	140p	25K191	200p	25K192	870p	900p
UIC1397	350p	25A1102	130p	25C717	50p	25C1735	20p	25C3026	500p	25C3026	500p	25D818	300p	25D1421	60p	25K226	140p	25K193	200p	25K194	870p	900p
UIC1403A	450p	25A1103	130p	25C730	350p	25C1740	10p	25C3026	500p	25C3026	500p	25D819	300p	25D1422	200p	25K227	140p	25K195	200p	25K196	870p	900p
UIC1404	650p	25A1105	250p	25C733	15p	25C1752	35p	25C3030	300p	25C3030	300p	25D820	300p	25D1423	40p	25K228	140p	25K197	200p	25K198	870p	900p
UIC1420A	450p	25A1106	250p	25C735	40p	25C1755	40p	25C3038	125p	25C3038	125p	25D821	300p	25D1424	40p	25K229	140p	25K199	200p	25K200	870p	900p
UIC1421A	450p	25A1111	90p	25C738	15p	25C1756	35p	25C3039	80p	25C3039	80p	25D822	300p	25D1425	40p	25K230	140p	25K201	200p	25K202	870p	900p
UIC1423A	550p	25A1123	40p	25C762	150p	25C1775	10p	25C3042	300p	25C3042	300p	25D823	300p	25D1426	40p	25K231	140p	25K203	200p	25K204	870p	900p
UIC1470	200p	25A1124	60p	25C783	85p	25C1781	20p	25C3047	1000p	25C3047	1000p	25D824	300p	25D1427	180p	25K232	140p	25K205	200p	25K206	870p	900p
UIC1504C	400p	25A1127	50p	25C790	50p	25C1789	10p	25C3049	200p	25C3049	200p	25D825	300p	25D1428	180p	25K233	140p	25K207	200p	25K208	870p	900p
UIC1505C	400p	25A1115	50p	25C791	50p	25C1790	10p	25C3050	200p	25C3050	200p	25D826	300p	25D1429	180p	25K234	140p	25K209	200p	25K210	870p	900p
UIC1514C	200p	25A1142	100p	25C805A	250p	25C1815	10p	25C3061	1600p	25C3061	1600p	25D827	300p	25D1430	200p	25K235	140p	25K211	200p	25K212	870p	900p
UIC1516A	250p	25A1143	40p	25C828	20p	25C1818	70p	25C3062	60p	25C3062	60p	25D828	300p	25D1431	200p	25K236	140p	25K213	200p	25K214	870p	900p
UIC1520CA	250p	25A1152	150p	25C839	20p	25C1827	60p	25C3071	150p	25C3071	150p	25D829	300p	25D1432	200p	25K237	140p	25K215	200p	25K216	870p	900p
UIC1536C	550p	25A1156	90p	25C869	120p	25C1829	50p	25C3077	120p	25C3077	120p	25D830	300p	25D1433	200p	25K238	140p	25K217	200p	25K218	870p	900p
UIC1536C	550p	25A1162	30p	25C870	100p	25C1832	40p	25C3085	100p	25C3085	100p	25D831	300p	25D1434	200p	25K239	140p	25K219	200p	25K220	870p	900p
UIC1536C	550p	25A1163	30p	25C871	100p	25C1833	40p	25C3086	100p	25C3086	100p	25D832	300p	25D1435	200p	25K240	140p	25K221	200p	25K222	870p	900p
UIC1536C	550p	25A1170	100p	25C872	100p	25C1834	50p	25C3087	100p	25C3087	100p	25D833	300p	25D1436	200p	25K241	140p	25K223	200p	25K224	870p	900p
UIC1536C	550p	25A1175	100p	25C873	100p	25C1835	50p	25C3088	100p	25C3088	100p	25D834	300p	25D1437	200p	25K242	140p	25K225	200p	25K226	870p	900p
UIC1536C	550p	25A1182	30p	25C874	100p	25C1836	50p	25C3089	100p	25C3089	100p	25D835	300p	25D1438	200p	25K243	140p	25K227	200p	25K228	870p	900p
UIC1536C	550p	25A1183	30p	25C875	100p	25C1837	50p	25C3090	100p	25C3090	100p	25D836	300p	25D1439	200p	25K244	140p	25K229	200p	25K230	870p	900p
UIC1536C	550p	25A1184	120p	25C876	100p	25C1838	50p	25C3091	100p	25C3091	100p	25D837	300p	25D1440	200p	25K245	140p	25K231	200p	25K232	870p	900p
UIC1536C	550p	25A1185	120p	25C877	100p	25C1839	50p	25C3092	100p	25C3092	100p	25D838	300p	25D1441	200p	25K246	140p	25K233	200p	25K234	870p	900p
UIC1536C	550p	25A1186	120p	25C878	100p	25C1840	50p	25C3093	100p	25C3093	100p	25D839	300p	25D1442	200p	25K247	140p	25K235	200p	25K236	870p	900p
UIC1536C	550p	25A1187	120p	25C879	100p	25C1841	50p	25C3094	100p	25C3094	100p	25D840	300p	25D1443	200p	25K248	140p	25K237	200p	25K238	870p	900p
UIC1536C	550p	25A1188	120p	25C880	100p	25C1842	50p	25C3095	100p	25C3095	100p	25D841	300p	25D1444	200p	25K249	140p	25K239	200p	25K240	870p	900p
UIC1536C	550p	25A1189	120p	25C881	100p	25C1843	50p	25C3096	100p	25C3096	100p	25D842	300p	25D1445	200p	25K250	140p	25K241	200p	25K242	870p	900p
UIC1536C	550p	25A1190	120p	25C882	100p	25C1844	50p	25C3097	100p	25C3097	100p	25D843	300p	25D1446	200p	25K251	140p	25K243	200p	25K244	870p	900p
UIC1536C	550p	25A1191	120p	25C883	100p	25C1845	50p	25C3098	100p	25C3098	100p	25D844	300p	25D1447	200p	25K252	140p	25K245	200p	25K246	870p	900p
UIC1536C	550p	25A1192	120p	25C884	100p	25C1846	50p	25C3099	100p	25C3099	100p	25D845	300p	25D1448	200p	25K253	140p	25K247	200p	25K248	870p	900p
UIC1536C	550p	25A1193	120p	25C885	100p	25C1847	50p	25C3100	100p	25C3100	100p	25D846	300p	25D1449	200p	25K254	140p	25K249	200p	25K250	870p	900p
UIC1536C	550p	25A1194	120p	25C886	100p	25C1848	50p	25C3101	100p	25C3101	100p	25D847	300p	25D1450	200p	25K255	140p	25K251	200p	25K252	870p	900p
UIC1536C	550p	25A1195	120p	25C887	100p	25C1849	50p	25C3102	100p	25C3102	100p	25D848	300p	25D1451	200p	25K256	140p	25K253	200p	25K254	870p	900p
UIC1536C	550p	25A1196	120p	25C888	100p	25C1850	50p	25C3103	100p	25C3103	100p	25D849	300p	25D1452	200p							





**SONY FLYBACK TRANSFORMERS**

Part No.	Models	Price
1-439-216-00	KV-2002E, 2010E, 2200E, 2015, 1820E, 2010SE, KV-2012ME, 2016ME, 2015ME, 2010ME	£14.00
1-439-256-11	KV-2704EC, 2704UB, 2704ET, 2704E(A), 2704E	£35.00
1-439-286-21	KV-2215UB, 2217UB, 2215E1, 2215FE, 2212EX, 2215ET	£30.50
1-439-289-21	KV-2705F, 2705FE, 2705UB, 2705E, 2706UB, 2720EC	£40.00
1-439-303-00	KV-2064EC, 20P51, 2082ME7, 2056EC, 2060SA, KV-2062E(ESP)	£27.00
1-439-311-00	KV-1440AE2, 1440AS MK2, CPS-14CD3, CPV-14CD2, KTX-1350NF, KTX-1430UB	£20.00
1-439-332-21	KV-2756, 2730EC, 2730FE, 2764E, 2752UB, 2752F	£36.00
1-439-333-00	KV-1882EC, 1882UB, 1882F, 1882CH, 1882AE, 1882AM, KV-1882ME, 1882MK, 1882AK, 1882AS, 16TR1, 882C(P), 1770W	£20.00
1-439-363-21	KV-18HT1A, 1851UM1, 1852, 1826M7, 1826GE, ADM-16B, KV-2082UB, 2086UB	£22.00

**FLYBACK TRANSFORMERS**

Manufacturer	Part No.	Price
FERGUSON	00D-4208-001	£14.00
	00D-4-208-002	£14.00
	00D-4-225-002-01G	£14.00
	00D-4-247-001	£14.00
	00D-4-247-001 HT1	£14.00
	06D-3-083-001	£14.00
	(110) 06D-3-087-001	£14.00
	(110) 06D-3-084-001	£14.00
	06D-3-088-001	£14.00
	GRUNDIG	29201-019-05
29201-024-11	£14.00	
29201-024-04	£14.00	
PHILIPS	P5-140-17112	£14.00
	P5-140-10306	£11.50
	P5-140-10353	£14.00
	P5-140-10151	£15.00
	P5-140-10283	£15.00
	P5-140-10246	£13.00
	P5-140-10247	£14.00
	P5-140-10149	£9.00
	P5-140-10161	£9.00
	P5-140-17033	£14.00
P5-140-17089	£10.00	
P5-140-10328	£14.00	
ITT	CVC20	£11.50
	CVC25	£11.50
	CVC30	£11.50
HITACHI	2432981	£15.00
	2434274	£14.00
	OUTPUT TV MODULE	£5.50
	HM6232	£3.00

**IDLERS & PULLEYS REPLACEMENT**

Manufacturer	Part No.	Description	Price	
AKAI	V51-2, V54-5, V515	FF-REW IDLER	M1327773 £4.50	
	V53, 6, 12, 56, 58, 59	T-UP IDLER	BV327915 £6.00	
	V51-2, V54, V515	T-UP IDLER	M2366960J £16.00	
	V52, 38, 105, 112, 116, 205, 220	IDLER	BV321979 £6.00	
	V97100, V53300	IDLER ASSY	M4366960J £16.00	
	V59500, V53900	UNLOADING IDLER	PU46381 £4.00	
	V59100, V53900	UNLOADING IDLER	PU46381 £4.00	
	V97100, V53300	REW IDLER	PU46381 £4.00	
	V59500, V53900	REW IDLER	BV327815 £3.00	
	V977, V510	REEL IDLER	BV336067 £5.00	
	V98, V31, 3, 4, 9, 12	REEL TABLE	BR347731 £5.50	
	V515, 58	CLUTCH	ML373043 £13.00	
	V523, 35, 37, 53, 55	CLUTCH	BV321761 £3.20	
	V566, 75, V5A77	REW IDLER	W321762 £4.25	
	V59700	FF IDLER	BV321761 £3.20	
V59700	REW IDLER	W321762 £4.25		
AMSTRAD	VCR7000	IDLER	150280 £1.50	
	TVR1, VCR4500	CLUTCH	150873 £3.75	
	VCR4600, VCR5000, VCR9000	CLUTCH	151284 £3.50	
	TVR1, VCR4500	GEAR HOLDER	151284 £3.50	
	VCR4600, VCR5000, VCR9000	GEAR HOLDER	151284 £3.50	
	TVR1, VCR4500	REF. CLUTCH	153202 £3.80	
	VCR5000	CLUTCH	153202 £3.80	
	VCR6000, VCR6100	CLUTCH	153202 £3.80	
	VCR4500, VCR9000	CLUTCH	153202 £3.80	
	VCR4500, VCR4600	MOD KIT	(TAPE CREASING) £4.50	
	VCR4700	MOD KIT TAPE CREASING FOR AMSTRAD	(TAPE CREASING) £3.00	
	VCR4500, 4600, 4700	MOD KIT TAPE CREASING FOR AMSTRAD	(TAPE CREASING) £3.00	
	FERGUSON	3V00, 3V01, 3V16	T-UP IDLER	PU47752 £4.50
		3V22, 3292, 8900, 8901, 8904, 8906	T-UP IDLER	PU49280 £5.50
		3V16, 3V22	T-UP IDLER	PU49280 £5.50
8903, 8928, 8912, 8922		T-UP IDLER	PU49280 £5.50	
3V23, 3V29, 3V30		REEL IDLER	PU48967 £2.50	
3V31, 3V32, 3V35, 8923, 8924, 8929, 8930, 8931, 8940, 8941, 8942		T-UP IDLER	PU49042A £4.00	
3V23, 3V30, 3V31		T-UP IDLER	51402 £1.25	
3V32, 3V35, 3V36, 3V38, 3V39, 3V49, 8930, 8931, 8940, 8941, 8942		T-UP CLUTCH	PU51380 £2.25	
3V32, 8930, 8931, 8940, 8941, 8942		T-UP CLUTCH	PU51380 £2.25	
3V35, 3V36, 3V38		REEL IDLER	PU55374 £2.85	
3V39, 3V49, 8943, 8944		REEL IDLER	PU55374 £2.85	
3V35, 3V36, 3V38		T-UP CLUTCH	PU55373 £2.25	
3V39, 3V49, 8943, 8944		T-UP CLUTCH	PU55373 £2.25	
3V98, 3V99, 3V94		IDLER ARM	PU58645 £2.00	
3V65, FV10, FV11, FV12, FV13, FV14, FV20, FV21, FV22, FV26		CLUTCH ASSY	PU55822 £13.50	
FV30, FV32, FV33, 8950, VC1411	CLUTCH ASSY	PU55658 £11.50		
3V42, 3V43	CLUTCH ASSY	PU55822 £13.50		
3V43, 3V44, 3V45	SUPPORT CLUTCH	PU56044-1-5 £2.80		
3V48, 3V53, 3V54, 3V55, 3V57, 8947, 8948	SUPPORT CLUTCH	PU56044-1-5 £2.80		
3V42, 3V43, 3V44	T-UP CLUTCH	PU56043-1-4 £2.80		
3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8947, 8948	T-UP CLUTCH	PU56044-1-5 £2.80		
3V40, 3V01, 3V16	LOADING IDLER	PU43681 £4.00		
3V22, 3292, 8900, 8901, 8902, 8903, 8904, 8906, 8909	LOADING IDLER	PU43681 £4.00		
8912, 8922	LOADING IDLER	PU43681 £4.00		
3V00, 3V01, 3V16	REW IDLER	PU43680 £6.00		
3292, 8900, 8901, 8904, 8906	REW IDLER	PU49281 £1.70		
3V16, 3V22, 8902	IDLER	PU49283 £1.00		
8909, 8912, 8922	IDLER	PU49283 £1.00		

Manufacturer	Part No.	Description	Price	
FISHER	FVHP420, 520, 530	FF-REW PULLEY	H1638531 £1.00	
	FVHP615, 618, 620	COMP IDLER ASSY	F11430420400300 £3.30	
	FVHP622, 710, 711, FVHP720, 721, 722, FVHP725, 730, 830	GEAR IDLER ASSY	F11430490400900 £4.50	
	FVHP640, 905, 906, FVHP908, 910, 911, FVHP915, 916, 918	GEAR IDLER ASSY	F11430490400900 £4.50	
	FVHP622, 710, 711, FVHP720, 721, 722	GEAR IDLER ASSY	F11430410400900 £5.50	
	FVHP725, 730, 830, FVHP940	REEL T-UP ASSY	F11430410400900 £5.50	
	FVHP615, 618, 620	REEL T-UP ASSY	F11430410400900 £5.50	
	FVHP622, 710, 711, FVHP720, 721, 722	GEAR IDLER ASSY	F11430490402400 £4.00	
	FVHP905, 906, 908	GEAR IDLER ASSY	F11430490402400 £4.00	
	FVHP910, 911, 915, FVHP916, 918	GEAR IDLER ASSY	F11430420400700 £4.50	
	FVHP915, 916, 918	GEAR IDLER ASSY	F11430420400700 £4.50	
	FVHP995, 5000, 5005	GEAR IDLER ASSY	F11430420400700 £4.50	
	FVHP050, 5075, 5100	REEL DRIVE ROLER	F12430510404200 £3.00	
	FVHP40, 55, 140	REEL DRIVE ROLER	F12430510404200 £3.00	
	FVHP975, 980, 990	GEAR CLUTCH	F12430510404200 £3.00	
FVHP975, 980, 990	GEAR CLUTCH	F12430510404200 £3.00		
FVHP420, 520, 530	IDLER	F12430510404200 £3.00		
FVHP420, 520, 530	TAKE UP IDLER	F12430510404200 £3.00		
FVHP980	LOADING GEAR	F12430510404200 £3.00		
VBS3500	REEL DRIVE PULLEY	F12430510404200 £3.00		
VBS3500	IDLER	F12430510404200 £3.00		
VBS7000	REW IDLER	F12430510404200 £3.00		
GOLDSTAR	GHV1221, 1232, 1240	CLUTCH GEAR	435038A £2.50	
	GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000, GHV8200, 8210, 8215, GHV951, VCP1400, 4130	CLUTCH GEAR	435038A £2.50	
	GHV1221, 1232, 1240	IDLER	435038A £2.50	
	GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000, GHV8200, 8210, 8215, GHV951, VCP1400, 4130	CLUTCH GEAR	435038A £2.50	
	GHV1221, 1232, 1240	IDLER	435038A £2.50	
	GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000, GHV8200, 8210, 8215, GHV951, VCP1400, 4130	CLUTCH GEAR	435038A £2.50	
	GHV1221, 1232, 1240	IDLER	435038A £2.50	
	GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000, GHV8200, 8210, 8215, GHV951, VCP1400, 4130	CLUTCH GEAR	435038A £2.50	
	GHV1221, 1232, 1240	IDLER	435038A £2.50	
	GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000, GHV8200, 8210, 8215, GHV951, VCP1400, 4130	CLUTCH GEAR	435038A £2.50	
	GHV1221, 1232, 1240	IDLER	435038A £2.50	
	GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000, GHV8200, 8210, 8215, GHV951, VCP1400, 4130	CLUTCH GEAR	435038A £2.50	
	GHV1221, 1232, 1240	IDLER	435038A £2.50	
	GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000, GHV8200, 8210, 8215, GHV951, VCP1400, 4130	CLUTCH GEAR	435038A £2.50	
	GHV1221, 1232, 1240	IDLER	435038A £2.50	
HINARI	VXL3, VXL20	REEL IDLER	40000009 £1.50	
	VXL2	IDLER	40000009 £1.50	
	VXL4, VXL35	IDLER	40000009 £1.50	
	VXL4, VXL35	CLUTCH	40000009 £1.50	
	VXL4, VXL12, VXL25	LIMITER POST	40000009 £1.50	
	VXL30, VXL35, VTLV300	CLUTCH	40000009 £1.50	
	VXL5, VXL6	CLUTCH	40000009 £1.50	
	VXL7, VXL8, VXL9	CLUTCH	40000009 £1.50	
	HITACHI	VT11-33, VT63-64	CLUTCH ASSY	6879515 £7.50
		VT14, 17, 19, 38, 57, 86, 88, 34, 35, 39, 52, 61	CLUTCH ASSY	6879515 £7.50
		62, 65, 85, 330, 640, VT165	CLUTCH ASSY	6886972 £7.50
		VT120, 220, 100, 110	CLUTCH ASSY	6886972 £7.50
		111, 113, 115, 118, 200	CLUTCH ASSY	6886972 £7.50
		125, 128, 130, 135, 138, 145, 150, 175, 225, 250	CLUTCH ASSY	6886972 £7.50
		255, 258, 260, VTL30	CLUTCH ASSY	6886972 £7.50
VT8000-8300, 7000		FF-REW IDLER	6413663 £2.80	
VT8500-8700		FF-REW IDLER	6414221 £3.60	
VT8000-8300, 7000		PLAY IDLER	6414221 £3.60	
VT8500-8700		PLAY IDLER	6414221 £3.60	
VT8000-8300, 7000		FF-REW PULLEY	6383531 £0.80	
VT8500-8700		FF-REW PULLEY	6383531 £0.80	
VT9300-9500, 6500		FF-REW IDLER	6861471 £3.30	
VT680, 6800, 9700, 9900		PLAY IDLER	6861482 £3.20	
VT9300-9500, 6500	PLAY IDLER	6861482 £3.20		
VT980, 8900, 9700	IDLER	6861481 £3.00		
VT9300-9500, 9700	IDLER	681505 £3.00		
VT9300, 6500, 6800, 6900	IDLER	687043 £3.80		
VT113, 33, VT63-64	FF-REW IDLER	6885971 £1.50		
VT14, 16S, 17, 19, 34, VT35, 38, 39, 52, 61, 62	FF-REW IDLER	6885971 £1.50		
VT65, 85, 86, 88, 330, 640	FF-REW IDLER	6885971 £1.50		
VT100, 110, 111, 113	FF-REW ARM	6886792 £2.75		
VT115, 116, 119, 120, 125, 128, 130, 135, 138, 145, 150	FF-REW ARM	6886792 £2.75		
VT175, 220, 225, 250, 255, 258, 260, VTL30	FF-REW ARM	6886792 £2.75		
VT400, 405, 410, 413	FF-REW ARM	6887094 £1.30		
VT414, 415, 418, 420, 425, 426, 428, 430, 431, 435	FF-REW ARM	6887094 £1.30		
VT438, 450, 488, 510, 518, 520, 525, 526, 530, 535	FF-REW ARM	6887094 £1.30		
VT536, 540, 545, 546, 548, 570, 575, 576, 580, 585	FF-REW ARM	6887094 £1.30		
VT588, VTM625, 626, 630, 635, 636, 640, 645, 646, VTS80, 85	CLUTCH BASE	6886951 £3.25		
VT400, 405, 410, 413	CLUTCH BASE	6886951 £3.25		
VT414, 415, 418, 420, 425, 426, 428, 430, 431, 435	CLUTCH BASE	6886951 £3.25		
VT438, 450, 488, 510, 518, 520, 525, 526, 530, 535	CLUTCH BASE	6886951 £3.25		
VT536, 540, 545, 546, 548, 570, 575, 576, 580, 585	CLUTCH BASE	6886951 £3.25		
VT588, VTM625, 626, 630, 635, 636, 640, 645, 646, VTS80, 85	CLUTCH BASE	6886951 £3.25		
VT3600	T-UP IDLER (LARGE)	6861505 £4.50		
VT3000	REW IDLER	6861505 £6.00		
VT680, 6500, 6800	FS-BRAKE	6861505 £3.00		
VT9300, 9900	FS-BRAKE	6861505 £3.00		
HITACHI	OUTPUT MODULE HM 6251	OUTPUT MODULE HM 6251	£8.50	
	OUTPUT MODULE HM 6232	OUTPUT MODULE HM 6232	£8.50	
	JVC	HR330, 3660, 4100	T-UP IDLER SML	PU49280 £5.50
		HR7200, 7600, 7650	T-UP CLUTCH	PU53462A £2.25
		HR765, 7300, 7350, 7610	T-UP CLUTCH	PU48967 £2.50
		HR7200, 7300, 7350	REEL IDLER	PU48967 £2.50
		HR7600, 7610, 7650, 7655, 7700	REEL IDLER	PU49042A £4.00
		HR765, 7300, 7350, 7610	REEL IDLER	PU49042A £4.00

## VIDEO SERVICE KITS

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BELT SET PINCH ROLLER REEL IDLER VIDEO LAMP			
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HRD455/HRD725			
<i>Contents</i>			
BELT SET PINCH ROLLER CLUTCH MECHANISM TENSION BAND		<i>Economy Kit Contents</i>	
	<b>£17.50</b>	BELT SET PINCH ROLLER SUPPLY CLUTCH TAKE UP CLUTCH	<b>£9.50</b>
Order Code: SK37		Order Code: SK38	
3V58/59/64/65			
HRD170/180/210/230/300/320/370/400/430/500/700/750			
HR55000			
<i>Contents</i>			
BELT SET PINCH ROLLER IDLER ARM TENSION BAND			
Order Code: SK44	<b>£8.50</b>		
3V29/3V30			
HR7200/7300/7350			
<i>Contents</i>			
BELT SET PINCH ROLLER TENSION BAND IDLER TYRES			
Order Code: SK05	<b>£6.00</b>		
3V35/36/38/39/49			
HRD110/111/120/225			
<i>Contents</i>			
BELT SET PINCH ROLLER TENSION BAND IDLER TYRES			
Order Code: SK04	<b>£5.50</b>		
3V31/3V42			
HR7200/7610/7650/7655			
<i>Contents</i>			
BELT SET T.U. REEL TABLE TYRE PINCH ROLLER REEL IDLER T.U. CLUTCH T.U. IDLER TENSION BAND VIDEO LAMP	<b>£12.00</b>	<i>Economy Kit Contents</i>	
		BELT SET T.U. REEL TABLE TYRE PINCH ROLLER REEL IDLER TYRE T.U. IDLER TYRE T.U. CLUTCH	<b>£5.50</b>
Order Code: SK33		Order Code: SK34	
3V35/36/38/39/49			
HRD110/111/120/212/225			
<i>Contents</i>			
BELT SET T.U. REEL TABLE TYRE SUPPLY REEL TABLE TYRE PINCH ROLLER T.U. CLUTCH T.U. IDLER REEL IDLER TENSION BAND	<b>£10.50</b>	<i>Economy Kit Contents</i>	
		BELT SET T.U. REEL TABLE TYRE SUPPLY REEL TABLE TYRE PINCH ROLLER T.U. CLUTCH T.U. IDLER TYRE REEL IDLER TYRE	<b>£6.50</b>
Order Code: SK35		Order Code: SK36	
3V29/3V30			
HR7200/7300/7350			
<i>Contents</i>			
BELT SET T.U. REEL TABLE TYRE SUPPLY REEL TABLE TYRE PINCH ROLLER REEL IDLER T.U. CLUTCH T.U. IDLER TENSION BAND VIDEO LAMP	<b>£11.50</b>	<i>Economy Kit Contents</i>	
		BELT SET T.U. REEL IDLER TYRE SUPPLY REEL TABLE TYRE PINCH ROLLER REEL IDLER TYRE T.U. IDLER TYRE T.U. CLUTCH	<b>£5.60</b>
Order Code: SK31		Order Code: SK32	
3V44/45/48/53/54/55/57			
HRP50/HRD140/150/158/160			
HRD250/257/565/566/755			
<i>Contents</i>			
BELT SET PINCH ROLLER CLUTCH MECHANISM TENSION BAND	<b>£15.00</b>	<i>Economy Kit Contents</i>	
		BELT SET PINCH ROLLER	<b>£9.50</b>
Order Code: SK39		Order Code: SK40	
<b>FISHER</b>			
FVHP905/906/907/908/910/911/916/918			
<i>Contents</i>			
BELT SET PINCH ROLLER IDLER GEAR IDLER UNIT TENSION BAND	<b>£13.00</b>	<i>Economy Kit Contents</i>	
		BELT SET PINCH ROLLER IDLER TYRE	<b>£5.00</b>
Order Code: SK57		Order Code: SK58	
FVHP615/618/620/622/710/711/717/5716/720/721/722/725			
730/830/840			
<i>Contents</i>			
BELT SET PINCH ROLLER IDLER GEAR IDLER UNIT TENSION BAND	<b>£12.50</b>	<i>Economy Kit Contents</i>	
		BELT SET PINCH ROLLER IDLER TYRE	<b>£3.60</b>
Order Code: SK68		Order Code: SK69	
<b>HITACHI</b>			
VT11/VT33			
<i>Contents</i>			
BELT SET PINCH ROLLER TENSION BAND IDLER TYRES	<b>£6.00</b>		
Order Code: SK08			
VT11/VT33			
<i>Contents</i>			
BELT SET T.U. REEL TABLE TYRE SUPPLY REEL TABLE TYRE PINCH ROLLER FF/REW IDLER CLUTCH PLATE TENSION BAND	<b>£15.00</b>	<i>Economy Kit Contents</i>	
		BELT SET PINCH ROLLER FF/REW IDLER TYRE T.U. REEL TABLE TYRE SUPPLY REEL TABLE TYRE	<b>£4.50</b>
Order Code: SK45		Order Code: SK46	

## VIDEO SERVICE KITS (Cont.)

<b>HITACHI</b>			
VT52/61/62/63/64/65/85/86/640			
<i>Contents</i>			
BELT SET PINCH ROLLER FF/REW ARM CLUTCH PLATE TENSION BAND	<b>£14.00</b>	<i>Economy Kit Contents</i>	
		BELT SET PINCH ROLLER FF/REW IDLER	<b>£3.25</b>
Order Code: SK49		Order Code: SK50	
VT400/405/410/113/14/15/18/420/25/26/28/430/31/35/48/450/498			
510/520/25/26/530/35/36/540/545/46/48/570/75/576/580/85/88			
<i>Contents</i>			
TIMING BELT PINCH ROLLER FF/REW ARM CLUTCH BASE TENSION BAND			
Order Code: SK52	<b>£11.50</b>		
VT100/110/111/113/115/118/120/125/128/130/135/138/145/150			
175/220/225/250/255/258/260/VTL30			
<i>Contents</i>			
BELT SET PINCH ROLLER FF/REW ARM CLUTCH PLATE TENSION BAND			
Order Code: SK51	<b>£15.00</b>		
<b>PANASONIC</b>			
NV2000/NV2010			
<i>Contents</i>			
BELT SET PINCH ROLLER TENSION BAND IDLER TYRES	<b>£6.25</b>	<i>Economy Kit Contents</i>	
		NV7000/NV7200/NV7800	<b>£5.50</b>
Order Code: SK03		Order Code: SK02	
NV305/NV330/NV333/NV340/NV366			
<i>Contents</i>			
BELT SET PINCH ROLLER TENSION BAND IDLER TYRE			
Order Code: SK01	<b>£5.50</b>		
NV2000/NV2010			
<i>Contents</i>			
BELT SET PINCH ROLLER FF IDLER PLAY IDLER TENSION BAND VIDEO LAMP	<b>£9.50</b>	<i>Economy Kit Contents</i>	
		BELT SET PINCH ROLLER IDLER TYRE PULLEY TYRE	<b>£4.50</b>
Order Code: SK13		Order Code: SK14	
NV7000/NV7200/NV7800			
<i>Contents</i>			
BELT SET PINCH ROLLER IDLER UNIT PLAY IDLER TENSION BAND	<b>£10.00</b>	<i>Economy Kit Contents</i>	
		BELT SET PINCH ROLLER IDLER TYRE CLUTCH TYRE	<b>£4.20</b>
Order Code: SK11		Order Code: SK12	
NV300/NV330/NV333/NV340/NV366			
<i>Contents</i>			
BELT SET PINCH ROLLER IDLER UNIT PLAY IDLER TENSION BAND	<b>£8.00</b>	<i>Economy Kit Contents</i>	
		BELT SET PINCH ROLLER IDLER TYRE PLAY IDLER TYRE	<b>£4.00</b>
Order Code: SK15		Order Code: SK16	
NVG7/NVG9/NVG10/NVG11/NVG12/NVG14/NVG15/NVG16/NVG18/NVG30/NVG120/NVG130/NVG400/NVH65 (PXAC) AG1810 (P/K)			
<i>Contents</i>			
LOADING BELT CAPSTAN BELT PINCH ROLLER IDLER TENSION BAND	<b>£9.50</b>	<i>Economy Kit Contents</i>	
		LOADING BELT CAPSTAN BELT PINCH ROLLER IDLER TYRE	<b>£4.50</b>
Order Code: SK27		Order Code: SK28	
NV332			
<i>Contents</i>			
BELT SET PINCH ROLLER PLAY IDLER FF/REW IDLER TENSION BAND FF/REW TYRE	<b>£13.00</b>	<i>Economy Kit Contents</i>	
		BELT SET PINCH ROLLER PLAY IDLER TYRE FF/REW IDLER TYRE	<b>£5.10</b>
Order Code: SK29		Order Code: SK30	
NV230/250/260/280/430/450/460/470/650/810/890/AG1200PK/AG1500PK			
<i>Contents</i>			
BELT SET PINCH ROLLER IDLER TENSION BAND	<b>£7.00</b>	<i>Economy Kit Contents</i>	
		BELT SET PINCH ROLLER IDLER TYRE	<b>£3.50</b>
Order Code: SK23		Order Code: SK24	
NV600/NV688			
<i>Contents</i>			
BELT SET PINCH ROLLER PLAY IDLER FF/REW IDLER TENSION BAND	<b>£13.00</b>	<i>Economy Kit Contents</i>	
		BELT SET PINCH ROLLER PLAY IDLER TYRE FF/REW IDLER TYRE	<b>£6.50</b>
Order Code: SK25		Order Code: SK26	
NV730/NV770			
<i>Contents</i>			
SLOT IN BELT LOADING BELT PINCH ROLLER IDLER UNIT TENSION BAND	<b>£7.00</b>	<i>Economy Kit Contents</i>	
		SLOT IN BELT LOADING BELT PINCH ROLLER IDLER TYRE	<b>£4.30</b>
Order Code: SK19		Order Code: SK20	
NV370/NV380/480/630/780/830/850			
<i>Contents</i>			
BELT SET PINCH ROLLER IDLER TENSION BAND	<b>£7.00</b>	<i>Economy Kit Contents</i>	
		BELT SET PINCH ROLLER IDLER TYRE	<b>£3.50</b>
Order Code: SK21		Order Code: SK22	
NV777 NV788			
<i>Contents</i>			
BELT SET PINCH ROLLER IDLER UNIT TENSION BAND	<b>£7.50</b>	<i>Economy Kit Contents</i>	
		BELT SET PINCH ROLLER IDLER TYRE	<b>£4.00</b>
Order Code: SK17		Order Code: SK18	

## VIDEO SERVICE KITS (Cont.)

<b>SHARP</b>			
VC381			
<i>Contents</i>			
BELT SET PINCH ROLLER REEL IDLER TENSION BAND VIDEO LAMP	<b>£9.00</b>	<i>Economy Kit Contents</i>	
		BELT SET PINCH ROLLER REEL IDLER TYRE	<b>£5.00</b>
Order Code: SK47		Order Code: SK48	
VC500/VC571/VC581/VC582/VC583/VC584/VC5F3			
<i>Contents</i>			
BELT SET PINCH ROLLER REEL IDLER TENSION BAND	<b>£9.50</b>	<i>Economy Kit Contents</i>	
		BELT SET PINCH ROLLER REEL IDLER	<b>£6.50</b>
Order Code: SK60		Order Code: SK61	
VC781/VC7810/VC7822/VC785/VC786/VC793/VC800			
VCA100/VCA102/VCA104/VCA202			
<i>Contents</i>			
BELT SET PINCH ROLLER REEL DRIVE UNIT TENSION BAND	<b>£13.50</b>	<i>Economy Kit Contents</i>	
		BELT SET PINCH ROLLER REEL DRIVE UNIT TYRE BAND	<b>£6.25</b>
Order Code: SK64		Order Code: SK65	
VC681/VC682/VC684/VC685/VC693/VC699/VC6F3/VC700			
<i>Contents</i>			
BELT SET PINCH ROLLER REEL DRIVE UNIT TENSION BAND	<b>£13.50</b>	<i>Economy Kit Contents</i>	
		BELT SET PINCH ROLLER REEL DRIVE UNIT TYRE BAND	<b>£6.25</b>
Order Code: SK62		Order Code: SK63	

## THIS MONTH'S SPECIAL OFFERS

STK461	£6.00	STK7563F	£8.00
STK5332	£1.80	STK73410	£3.50
STK5333	£5.50	TA8205AH	£2.50
STK5422	£3.75	TA8210AH	£3.00
STK5476	£3.50	TA8215H	£3.00
STK7308	£3.50	TA8216H	£3.75
STK7348	£4.00	TIPL791A	£0.80
STK7358	£4.40		

## SONY FUNCTION SWITCH (2 LEG) SPECIAL PRICE £0.50

VIDEO REEL MOTOR PU51381V	<b>£15.00</b>
3v29, 3v30, 3v31, 3v32, 3v39, 8930, 8931, 8941, 8942, HR7200, HR7300, HR7600, HR7610, HR7650, HR7655	
HITACHI VIDEO HEAD	<b>£11.00</b>
VT11, VT14, 16, 30, 33, 34, 330, 340, 503, 640, 5030	
MITSUBISHI VIDEO HEAD	<b>£16.00</b>
HS303, 304, 320, 700	
HS306, 318, 710	<b>£18.00</b>
HS300, 301, 302, 310	<b>£17.00</b>
HS337, 347	<b>£17.00</b>
HITACHI TRANSFORMER 2434274	<b>£14.00</b>
OUTPUT TV MODULE HM6251	<b>£5.50</b>

## PHILIPS

CASSETTE LIFT ASSEMBLY 69120366	<b>£11.00</b>
DV186, 198, 286, 471, 562, 761, VR6180, 6182, 6185, VR6285, 6296, 6291, 6293, 6362, 6367, 6393, VR6467, 6468, 6470, 6561, 6670, 6760, 6761, 6870, 6970	
PRESSURE FOLLER ASSEMBLY	<b>£4.50</b>
DV186, DV190, DV286, DV486, DV471, DV582, DV571, DV761, VR6180, VR6182, VR6185, VR6285, VR6290, VR6291, VR6293, VR6362, VR6367, VR6390, VR6391, VR6393, VR6467, VR6468, VR6470, VR6561, VR6570, VR6581, VR6670, VR6676, VR6670, VR6761, VR6762, VR6870, VR6970, VR6975, VR88B1, 63SB7, 68SB4, 71SB4, 72SB8, 92SB31	

## I.C. PROTECTOR

ICPF10	ICPN5
ICPF15	ICPN10
ICPF20	ICPN15
ICPF25	ICPN20
ICPF38	ICPN25
ICPF50	ICPN38
ICPF75	ICPN50
	ICPN75

## IMPORTANT NOTICE

Attention all customers who purchased the WOODEN HANDLE SOLDERING IRONS. BRAND MITSUKO - MODEL MX-34 (30, 40 AND 60 WATTS) from us. Please DO NOT USE this tool. We would like you to return this item to us immediately and we will refund your money together with the postage. We apologise for any inconvenience caused.

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## VIDEO HEADS

<b>AKAI</b>	
VSF600, VSF650	3800P
VP7100, VP7200, VP77	1500P
VS155, VS165	2600P
VS20, VS22, VS24, VS25, VS26, VS27, VS422,	
VS425, VS426, VS427, VSF10, VSP8,	
VSP9	1700P
VS240, VSP82, VS202	1500P
VS33	2600P
VSR9	1700P
<b>AMSTRAD</b>	
VCR8800, VCR8804, VCR9340	2400P
DD8900, DD8904, TVR4, VCR6200, VCR8600,	
VCR8602, VR8700	1300P
VCR8603, VCR8604, VCR8704, VCR8714	1350P
<b>BAIRD</b>	
VC14L	3000P
VHS82	7000P
<b>BLAUPUNKT</b>	
CR1000, CR1200, CR1500	4650P
CR1800	4100P
RTV321, RTV322	1700P
RTV330	2300P
RTV333	1000P
RTV33B	2800P
RTV348	2700P
RTV404, RTV414	3000P
RTV635	3000P
RTV640	3000P
RTV750, RTV800, RTV900	3500P
RTV810	4400P
RTV910	4500P
<b>JVC</b>	
HRD330, HRD337, HRD440, HRD637, HRD641,	
HRD660, HRFC100	2200P
<b>JVC AND FERGUSON</b>	
8902/8903/8909/8912/8922	1000P
8923/8925/8929/8935	650P
8931/8933	750P
FV43H, HRD860	3800P
VC141L, HRD190, HRD610	3050P
FV44L	2200P
BR1600, HRD142, HRD156, HRD152	1550P
BR6200	720P
HRD154, HRD217, HRD321, HRD350, HRD521,	
HRD522, HRD525, HRD527, HRD550	1700P
HRD580, HRD620, HRD650	2900P
<b>FIDELITY</b>	
VR900, VR910	1600P
<b>FISHER</b>	
FVHD140, FVHD40, FVHP1, FVHP10, FVHP20	
FVHP40, FVHS10	1600P
FVHP200, FVHP210, FVHP300, FVHP310	2100P
FVHP500, FVHP5100, FVHP730, FVHP830	1200P
FVHP980	2500P
<b>FUNAI</b>	
E1100, VIP5000	1200P
VCR5840, VCR8007, VIP2500A, VIP3000A,	
VIP6000, VIP150	2200P
VCR4530, VCR6000, VCR6100	1600P
VCR8103, VCR600, VCR6100	1600P
VCR8103, VCR8107	2200P
VIP300A MKII	1900P
<b>GEC</b>	
V4005H	2000P
<b>GOLDSTAR</b>	
GHV1232, 1233, 1241, 1242, 1243, 1244, 1290,	
1291, 1295, 1296, 1891, VCP4130, 4300, 4301,	
4305, 4306, 4310, 4311, 4315, 4316, 4320, 4321,	
4326	1650P
<b>GRUNDIG</b>	
VS456	1700P
SE6110, SE9100, TVR4510, TVR5510, VS500,	
VS510, VS5180, VS6190, VS700, VS900	1800P
VS790, VS930, VS940	3800P
MVS660, SE6160, VERONA, VS660,	
VS6690	3500P
MVS710, MVS720, MVS910, SE9120, VS800,	
VS810, VS910, VS920, SE7120, VS710,	
VS720	1800P
VS160, VS740	4400P
VS170	4600P
VS680	4600P
<b>HINARI</b>	
VCR34H, VTV200, VXL90	1850P
<b>HITACHI</b>	
VT15, VTP10, VTP30	1100P
VT16B, VT260, VT498	2700P
VT570, VT575, VT576, VT580, VT585,	
VT588	3400P
VT5600	1200P
VT60	1500P
VT660E	2600P
VT6700, VT6800	1200P
VTL30	2100P

VT522, VTM620, VTM622, VTM720, VTM722,	
VTM822	2000P
VTM725, VTM726, VTM728	1600P
<b>ITT</b>	
VR3520, VR3701, VR3719, VR3720, VR3721,	
VR3759, VR9720	2000P
VR3730, VR3731, VR3749,	2700P
VR3907, VR3908	1600P
VR3918, VR3919, VR3938	1800P
VR3968	7000P
VR3984	2300P
VR3958, VR4993	650P
VR4913, VRP3833	650P
<b>LUXOR</b>	
9245, 9251, 9254	1225P
9255, 9256	2150P
9270, 9271, 9273	1800P
9272, 928217	2700P
9252	2500P
928017, 928077, 928097, 929107, 929117	1700P
9253	2500P
9281	2700P
9284, 9295, VR3701, VR3721, VR3731,	
VR3761	2100P
<b>MATSUI</b>	
VX600	1100P
VX750	1500P
VX990	1600P
<b>mitsubishi</b>	
HSE12, HSE22, MX1	2400P
HS411EZ, HS411GZ	2900P
HS273	1700P
HSB10, HSB20, HSE10, HSE20, HSE21,	
HSE41	2200P
HSB11, HSB21	2200P
HSB30	2400P
HSE31, HSB31, HSE32	2800P
HSE50	3300P
<b>NATIONAL</b>	
NV8050, NV8051	2800P
AG1000, AG1050, NV260	1650P
AG6010, AG6015	2500P
AG6840	2400P
NV200	850P
NVD80	5000P
NVF65, NVH75	3400P
NVF51	4200P
NVG19	2300P
NVJ33, NVL21, NVJ30	1800P
NVJ35	3000P
NVM1, NVM3, NVM5	4200P
AG2100, AG2200	700P
NVF65	3200P
<b>N.E.C.</b>	
DX2000	3400P
DS6000	3500P
DX1000, DX1600, N9040, N9053, N9055	2000P
DX4000, N9610, DX3000	3200P
N9052, N9530	3400P
N9110, N9120, N914C	2700P
VCP1	1700P
PVC2300, PVC240, PVC740, PVC744, PVC760,	
PVC764	1600P
<b>SAMSUNG</b>	
VM1560, VN1561	2200P
<b>SANYO</b>	
VHR7900	3600P
<b>SHARP</b>	
VC585, VC685	2300P
VC90ET	3900P
VFH815	2800P
<b>SONY</b>	
SLV373UB	3000P
<b>TOSHIBA</b>	
V660	2350P
V880MS	2600P
V700G	3700P
V500G, V509G	2500P
V9680	2900P
V300G, V301, V305, V309G	2550P
V61, V63	1700P
V110, V120, V130, V140, V210, V220	1800P

## TELEVISION ON/OFF MAINS SWITCHES

Baur, Normende, Nova, Pioneer, Quelle, Saba, Salora, TEC, Thomson & Vega 375P

## VIDEO MOTORS

<b>HITACHI</b>	
VT11, VT14, VT15, VT16, VT17, VT19, VT35,	
VT39, VT57, VT88 (capstan motor)	3100P
<b>BANG &amp; OLUFSEN</b>	
VHS65, VHS90 (capstan motor)	3100P

## LOADING MOTOR UNITS

<b>ITT</b>	
VR3605, VR3905, VR3955, VR3985	1500P
VP2826, VR3906, V43926, VR3976	1250P
VP3946, VR3906, VR3948, VR3986, VR3995,	
VR6948	1500P
<b>JVC</b>	
HRD110, HRD111, HRD120, HRD121,	
HRD225	1500P
HRD140, HRD150, HRD157M, HRD158MS,	
HRD160, HRD250, HRD257MS, HRD566,	
HRP50	1250P
HRD455, HRD725, N895	1500P
<b>SABA</b>	
VR6005, VR6014, VR7004, VR7011, VR8011,	
VR8014	1500P
VR6006, VR6007, VR608, VR6009, VR6018,	
VR7007, VR7018, VR9006	1250P
VR6016, VR6038, VR7016	1500P
<b>TELEFUNKEN</b>	
VR1925, VR1930, VR1940, VR1950, VR925,	
VR930, VR940, VR950	1500P
A920, VR2920, VR12970, VR7921, VR7926,	
VR7931, VR7971, VR975	1250P
VR1970, VR1980, VR7970, VR7980, VR970,	
VR980	1500P
<b>THOMSON</b>	
V320, V321, V323, V326, V4200, V4300	1500P
V342, V343, V352, V353, V360, V4210, V4230,	
V4260	1250P
V364, V368, V4400, V6000	1500P
<b>THORN-FERGUSON</b>	
3V35, 3V36, 3V38, 3V39, 3V49, 8943, 8944	1500P
3V44, 3V45, 3V48, 3V54, 3V55, 3V57, 8947,	
8947B, 8948	1250P
3V43, 9845	1500P
<b>TOSHIBA</b>	
V55, V57	1500P
V65, V66, V67	1250P
V61, V63	1500P

## CASSETTE HOUSING

<b>AKAI</b>	
VS35, VS53, VS55, VS56, VS75	2600P
<b>FERGUSON</b>	
FV31R	4300P
<b>JVC &amp; FERGUSON</b>	
HRD515, HRD520, HRD527, HRD540, HRD550,	
HRD580, HRD600, HRD610, HRD620, HRD660,	
HRD670, HRD830, HRD840, HRD850, HRD860,	
HRD4050, HRD6600 & FV37H	2400P
<b>IC TRANSISTORS</b>	
M491BB1	500P
SAAS243PE	800P
TIP112H	50P
UPC1488H	150P
STR4090A	650P

## IC AND TRANSISTORS

BU506DF	120P
BUZ11	200P
BUZ80	200P
M494B1	700P
SAAS231	300P
SAA1293	550P
S2000A3	175P
S2000AF	175P
S2055A	175P
S2000AF	200P
S2530A	100P
TEA201BA	200P
UC3844	100P
UPC1185H2	400P

## REMOTE CONTROLS

<b>AKAI</b>	
RC-V10A	RC 876 850p
RCV378	RC891 850p
V25A	RC 896 850p
<b>AMSTRAD</b>	
DD8900	R 65132 1400p
VCR4700	RC 2009 1400p
<b>BUSH</b>	
2020T, 2114T, 2321T, 2514T	RC 304 850p
2020, 2114, 2321, 2514	RC 313 900p
<b>DECCA</b>	
RC70	RC 894 850p
<b>FISHER</b>	
RC905B	RC 879 900p
<b>GRANADA/REDIFFUSION</b>	
UNIVERSAL, 79500C, 986700	RC 309 800p
SATELLITE	RC 550 850p
MK4 TEXT, 70115G, 70133G, 357E	RC 880 800p
MK4A TEXT, 70375C	RC 881 800p
95288E	RC 882 850p
944900	RC 884 850p

## REMOTE CONTROLS

Description	Order Code	Price
<b>GRUNDIG</b>		
TP160E	RC 107	900p
TP200, TP300	RC 380	800p
TP400	RC 401	800p
TP590-600	RC 600	850p
TP390, TP610	RC 610	850p
TP621	RC 621	850p
TP630, TP650	RC 650	850p
TP660	RC 660	850p
TP661	RC 661	850p
<b>HITACHI</b>		
CLE800-CLE830	RC 140M	850p
A617402/655602	RC 192	875p
A512120/230	RC 900	800p
A514790	RC 901	850p
A5088470	RC 902	800p
A518612	RC 903	900p
SCL002	RC 904	850p
C2096	RC 905	850p
A511940	RC 906	800p
655602H	RC 907	850p
<b>ITT</b>		
IFB13, 14, 15	RC 143	875p
FS4	RC 148	850p
RG305	RC 305	825p
RG306	RC 306	825p
FS9/1-10/1	RC 307	850p
V55 RUK	RC 308	825p
V54-1	RC 310	850p
MULTICONTROL (17C20)	RC 311	800p
<b>KORTING</b>		
18279, 18396, 18460, 18521 SE	RC 108	850p
40540 VTS	RC 108	900p
<b>LOEWE</b>		
DC11	RC 146	850p
<b>MATSUI</b>		
010270601	RC 889	850p
VX770	RC 892	850p
<b>METZ</b>		
JAVA COLOR (6890)	RC 166	850p
COLOR (7156)	RC 183	850p
JAVA (7180)	RC 184	850p
<b>MITSUBISHI</b>		
939P/03607, 939P/03609	RC 140M	850p
<b>NOKIA</b>		
SATELLITE	RC 550	850p
<b>NORDMENDE</b>		
TC2336	RC 351N	850p
CMC1, TC3519	RC 356	875p
<b>OCEANIC</b>		
390C9500	RC 339	900p
<b>ORION</b>		
RC53	RC 892	850p
<b>PANASONIC</b>		
EUR51200	RC 200	850p
TC2200	RC 201	850p
V500357/NV730	RC 202	875p
TN01621	RC 203	900p
<b>PHILCO</b>		
CARVEL, CONCORDE, MERCURY, TELESTAR	RC 108	850p
TC10	RC 152	900p
<b>PHILIPS</b>		
RC5002,5154	RC 134	850p
KT3 NON TEXT	RC 135	825p
69117032	RC 178	875p
69117194	RC 180	875p
RC5991-UNIV	RC 300	850p
RC38	RC 301	875p
KT3 TEXT	RC 5301	800p
RC5352	RC 5352	800p
RC5375	RC 5375	850p
RC5 STANDARD	RC 5534	850p
RC5901	RC 5901	850p
RC5903	RC 5903	800p
<b>SABA</b>		
T6772	RC 149	900p
TC319-320	RC 328	875p
TC356	RC 356	875p
TC358	RC 358	850p
TC360	RC 360	800p
TC365	RC 365	800p
<b>SALORA</b>		
SERIES L	RC 190	875p
86173	RC 882	850p
<b>SANYO</b>		
RC218, RC222, RC228, RC238	RC 140M	850p
JXGE	RC 878	850p
JXDE	RC 884	850p
VHR2300	RC 890	850p
RC628	RC 865	900p
<b>SHARP</b>		
GO121CESA, 123CESA, 204, 251	RC 140M	850p
<b>SIEMENS</b>		
FC616	RC 130	850p
FC631	RC 132	850p
FC742	RC 164	900p
<b>SONY</b>		
RM604, RM605, RM606	RC 140	850p
32 CHANNEL	RC 140M	850p
RM613	RC 141	850p
RM632, RM636	RC 160	850p
<b>TATUNG</b>		
FXA	RC 877	850p
RC70	RC 883	750p
FX70 FASTTEXT	RC 894	850p
<b>TELEFUNKEN</b>		
FB632	RC 632 ST	850p
FB639	RC 639 ST	850p
<b>THORN/FERGUSON</b>		
3V35-42	RC 342	850p
3V31-32	RC 344	850p
3V57-58	RC 628	900p
TX10 TEXT	RC 732	750p
TX10 STEREO TEXT	RC 738	750p
TX9-90-100	RC 740	750p
3V55, FV11	RC 783	900p

Description	Order Code	Price
TX100 FASTTEXT	RC 785	800p
TX100 STEREO FASTTEXT	RC 789	800p
PROFESSIONAL	RC 790	800p
<b>TOSHIBA</b>		
CT937	RC 950	850p
CT9117	RC 951	850p
201R4B	RC 952	850p
<b>UNIVERSAL PROGRAMMABLE REMOTE CONTROL</b>		
Controls up to 4 different devices which use infra red remote controls including TV, audio, VCR and satellite. (need original remote control TC program)		
Order code: IR100R		Price: 1950p

We stock Remote Controls for over 5000 different models. Ring for further details on 081-900-2329.

## BACKUP BATTERIES

Description	Price
<b>REPLACEMENT PHILIPS NI-CAD BACKUP BATTERIES</b>	
Replaces Philips Part No's: 138-10138, 138-10313. 1.2V - 90mAh	160P
Replaces Philips Part No's: 138-10229. 2.4V - 90mAh	240P
<b>REPLACEMENT FERGUSON NI-CAD BACKUP BATTERIES</b>	
Replaces Ferguson Part No: 00E6-067-001. 1.2V	
Used on: TX10	150P
Replaces Ferguson Part No's: 00E6-066-001. 2.4V	
Used on: 3V35, 3V56, 3V58, 3V65	280P

## LINE OUTPUT TRANSFORMERS

Description	Price	Order Code
HITACHI 2433752	1500P	LOT01
ORION 3714002	1500P	LOT02
FIDELITY ZX300	1500P	LOT03
FE TX100 90 DEG	1500P	LOT04
SABA 490007182	1500P	LOT05
FE TX90 WHITE	1650P	LOT06
ITT D307/37 EQ	1600P	LOT07
BLAUPUNKT 210	1600P	LOT08
GRUNDIG 2922010	1600P	LOT09
ITT CVC800/1/3	1500P	LOT10
ITTD218/37 EQ	1600P	LOT11
NORMENDE 5255	1600P	LOT12
SABA 81000 200	1600P	LOT13
SALORA T236 EQ	1650P	LOT14
SABA 811-50-24	1600P	LOT15
SABA 770223500	1600P	LOT16
TELEFUNKEN AT1	1450P	LOT17
TELEFUNKEN AT1	1400P	LOT18
SALORA FM0218B	1600P	LOT19
NORMENDE 5255	1600P	LOT20
ITT CVC 1150/1	1500P	LOT21
ITT COMPACT 80	1500P	LOT22
FE TX100 GREEN	1450P	LOT23
HINARI CT4/5 5113	1500P	LOT24
SELECO 6320410	1600P	LOT25
BLAUPUNKT 8667	1600P	LOT26
ITT COMPACT B1	1450P	LOT27
ITT CT3326 MUL	1500P	LOT28
ITT D066/37 EQ	1600P	LOT29
ITT 3546 EQ	1500P	LOT30
LUXOR 5810110	1600P	LOT31
SABA 849380920	1600P	LOT32
HITACHI 2434141 CP	1450P	LOT33
FE TX100 110 D	1700P	LOT34
HANTAREX 28021	1600P	LOT35
SHARP C3700 EQ	1600P	LOT36
HITACHI 2432981 CP	1500P	LOT37

We stock line output transformers for over 100 different models. Please ring 081-900 2329 for more information.

## REPLACEMENT LINE OUTPUT TRANSFORMERS

Description	Order Code	Price
FERGUSON 00D3-508-002	LOT 38	1650p
Fits Chassis TX99.41cm + 51cm. Used On: 51K2, 51J8, 51J7, 41H3, 41H3, 41H2, 51K3		
PANASONIC TLF14567F	LOT 39	1850p
Used On: TC2043, TC2243, TX300		
PANASONIC TLF14568F	LOT 40	1850p
Used On: TX2231, TX2244		
PANASONIC TLF14584F	LOT 41	2350p
Used On: TC2210, TC2160, TX1752, TX2112, TX2112, TX2162, TXC22		

## FAULT FINDING GUIDE BOOK

Vico Recorders Edition 3, 1994

Lists more than 4000 faults for 43 different brands

Price: £9 45p Only. No VAT  
Order Code: BOOK01

## Satellite Repair Manual Edition 2

A comprehensive guide to receiver reviewing, featuring stock faults and installation tips.

Price 1475p Only No VAT Postage 100p  
Order Code: BOOK03

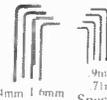
## VIDEO HEAD CLEANING STICKS



Order Code: SP14

Price: 17p Each  
15p Each Pack of 10pcs  
13p Each Pack of 25 pcs

## VIDEO MAINTENANCE TOOLS



Set of 8 Allen keys packed in a plastic wallet  
Order Code: TOOL9  
Price 125p

## FUSES

Value	TIME LAG (20mm)		QUICK BLOW (20mm)	
	Order Code	Price	Order Code	Price
160mA	FUSE01	75P	FUSE17	60P
250mA	FUSE02	75P	FUSE18	60P
315mA	FUSE03	75P	FUSE19	60P
400mA	FUSE04	75P	FUSE20	60P
500mA	FUSE05	75P	FUSE21	60P
630mA	FUSE06	75P	FUSE22	60P
800mA	FUSE07	60P	FUSE23	60P
1A	FUSE08	60P	FUSE24	60P
1.25A	FUSE09	60P	FUSE25	60P
1.6A	FUSE10	60P	FUSE26	60P
2A	FUSE11	50P	FUSE27	60P
2.5A	FUSE12	50P	FUSE28	60P
3.15A	FUSE13	55P	FUSE29	50P
4A	FUSE14	55P	FUSE30	50P
5A	FUSE15	60P	FUSE31	50P
6.3A	FUSE16	60P	FUSE32	50P

## CERAMIC PLUG TOP

3A	FUSE33	100P
5A	FUSE34	100P
13A	FUSE35	100P

ALL THE ABOVE PRICES ARE FOR PACKS OF 10 FUSES

Solder Mop 1.2mm x 10 metres	300P
Tubed Silicon Grease 50 gram	200P
Tubed Heat Sink Compound 25 gram	150P

**UNIVERSAL HEAD EXTRACTOR TOOL**  
Hand tool designed for extracting hard to remove heads without damage to either the head or the mounting assembly. Adjustable so as to suit various brand heads. PRICE - £7



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Over 200 models at very attractive prices.

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**VIDEO SPARES**

3V29 TAKE UP IDLER	£1.00
3V29 FF NEW IDLER	£2.00
3V595FF P1014 IDLER	£1.50
3V23 LOADING ROLLER BAR	£1.50
SHARP 0005 & 0006	£1.50
SHARP VCG61 ASSEMBLY	£6.99
VT11/14/17 IDLER	£1.50
VT11 CLUTCH ASSEMBLY	£6.99
VT100225260 IDLER	£2.75
NEC 9013 IDLER	£3.99
SANYO VHR3300 IDLER	£3.99
AKAI VS105/250 CLUTCH ASSEMBLY	£11.99
SAISHO VR380 CLUTCH	£2.75
MITSUBISHI H5337 FF IDLER	£2.75
ALBA SENTERA PULLEY	£1.25
MATSUI LIMITER STOP	£1.25
PANASONIC NV370 IDLER	£1.50
FISHER R615 IDLER	£1.50
FISHER GEAR ASSEMBLY	£4.50
AMSTRAD TRINCH WHEEL MOD KIT	£5.99
UNIVERSAL PINCH	£4.99
UNIVERSAL TRIPER WITH FOCUS	£7.99
HITACHI MODULE HM6251	£6.99
CUC2410 TRIPER	£16.99
TENSION BAND FOR MOST MOD FROM	£1.50
CIRCUIT PROTECTOR ICP	50p
TX10 FOCUS UNIT	£7.99
PHILIPS BACK-UP BATTERY	£1.50
ALBA BATTERY 1F 5.5V	£2.50
TV SWITCHES FOR MOST MOD FROM	£1.00
SONY FUNCTION SWITCH	£1.00

**LINE OUTPUT TRANSFORMERS**

DECCA 100	9.99
FERGUSON TX85	19.99
TX90	19.99
REDSHOT	19.99
WHITE SPOT	29.99
TX100	14.20
GREEN	14.20
SPOT	14.20
BLUE SPOT	14.20
YELLOW	14.20
SPOT	21.99
FST	21.99
ALBA VCR4000	1.50
AMSTRAD VCR4600	1.80
VCR6000	1.30
VCR7000	1.00
FERGUSON 3V22	1.80
3V29/30/33	2.00
3V42/65	0.85
HT45	16.99
HITACHI CPT1444	21.99
CPT1453	19.99
CPT1456	19.99
FYHP615/725	1.10
GRUNDIG CPT1473	29.99
CPT1474	19.99
CPT1476	19.99
CPT1492	19.99
CPT1493	19.99
CPT2028	21.99
CPT2078	19.99
CPT2174	19.99
CPT2176	19.99
CPT2178	19.99
CPT2234	19.99
CPT2248	19.99
CPT2274	19.99
CPT2278	19.99
CPT2508	39.99
CPT2808	24.00
CPT2478	25.00
ITT CVC20	13.99
CVC28/32	9.99
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KV2066	19.99
KV2217	19.99
KV2252	19.99
KV2704	19.99
KV2705	19.99
KV2752	19.99
PANASONIC TL14520F	29.99
TL14521F	29.99
3V65FV32 CASSETTE HOUSING	25.00
3V35/45 CASSETTE HOUSING	21.99
VT33/65 CASSETTE HOUSING	24.99
OSAKI VCR33 HOUSING	7.00
VT400/800 HOLDER CASSETTE	11.99
VR462 CASSETTE HOUSING	19.99
VR637 CASSETTE HOUSING	19.99
V335 CAPSTON MOTOR	19.99
V655 CAPSTON MOTOR	24.99
VT110/150 CAPSTON MOTOR	24.99
VT110/150 CAPSTON MOTOR	24.99
VT500 CAPSTON MOTOR	29.99
VR64700 CAPSTON MOTOR	29.99
MVG SERIES PINCH ASSEMBLY	8.50
MITSUBISHI ASSEMBLY	19.99
VR637 RINGWHEEL BACK	9.99
VR637 MODIFICATION KIT	8.99
VR637 CHARLIE LOADING GEAR	9.99
VIDEO HEAD PULLER	9.99
VCR CILIPS & SPRING KIT	5.50

**LINE OUTPUT TRANSFORMERS**

FX3548	19.99
SFK3489	19.99
STX3588	19.99
STX3767	19.99
TX3325	19.99
TX3437	19.99
TX35467	19.99
TX3835	19.99
MATSUI 1420	17.99
1480	17.99
MITSUBISHI CTX529	21.99
LOEWE OPTA CLASSICS	12
STUDIO T28	21.99
M124	30.00
PHILIPS BA6229	2.80
BA6238	1.99
BA6239	2.50
BA6304	1.00
BA6305	1.00
BA6259	2.99
BA10324	1.99
BA10358	1.80
BA15218	2.20
CNX65	4.99
CNX62A	2.99
CNX82	3.99
STK2029	9.99
STK457	6.50
STK2129	2.60
STK2250	1.99
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STK321	2.20
STK0040	5.50
STK0060	3.99
STK2029	9.99
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STK0060	3.99
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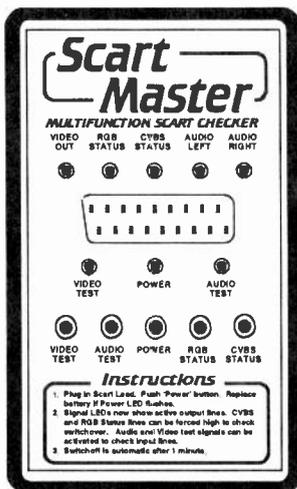
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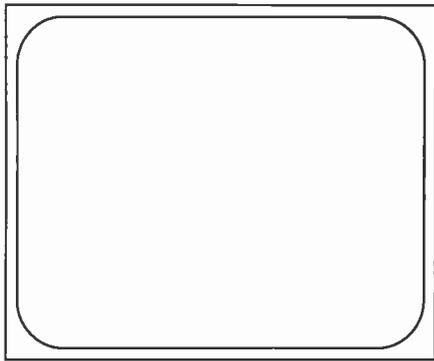


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# TELEVISION

## Corporate Fashions

Granada has succeeded in taking over London Weekend Television. Bell Atlantic and Tele-Communications, the largest US cable TV company, have called off a planned \$21.4bn merger that would have been the largest in the history of the US telecommunications industry. Viacom, another major US cable TV company, has successfully bid \$10bn to take over Paramount Communications, the aim being to create a "global media powerhouse of unparalleled proportions". Sony on the other hand appears to be seeking a partner to take a quarter stake (\$3bn) in its software subsidiary that owns, amongst other things, Columbia Pictures. One could be forgiven for wondering just what is going on? Are we witnessing an outbreak of "multimedia moguldom" – the *FT*'s phrase. What does it all mean in terms of a concentration of media power? Is it all just a matter of deal making that's got out of hand?

There are some straightforward points that can be made. First there is the growing trend to multimedia operations as the technology advances, making it all possible. You can pump out your programmes via cable networks of one sort or another, via satellite and in video form. It makes sense to link these methods of distribution; and if you own the lot, you're unlikely to have bet on the wrong one. Thus you might as well take a stake in them all. But once you've got that far you might feel vulnerable to a possible lack of material to pump out, or maybe exploitation by programme producers. So you go on to add programme-making capacity – and it had better be on a large scale. That's one rationale for being big in the media/broadcasting field. The reason why Sony bought Columbia and Matsushita bought MCA was similar but not quite the same. In this case the basic idea was to have available in house software to back hardware – to ensure that the launch of an AV system would be guaranteed adequate software support. One can see the point, but whether ownership of one type of activity by a firm that specialises in a quite different field is the best way to go about it is open to question. Sony and Matsushita announced at the outset that they would leave the day-to-day running of their software subsidiaries in the hands of the previous management. Another consideration is the vast financial outlay required to generate the programming that will keep a multimedia distribution system going. It might however be better to contract this out as far as possible.

The most extraordinary saga in this series of corporate moves is the takeover of Paramount Communications. The battle between Viacom and QVC Network lasted for five months. In the end Viacom had to pay substantially more than many informed observers consider Paramount to be worth – the company's profit performance has been poor for several years. There's a third leg to the Viacom/Paramount merger however: the video rental company Blockbuster is to be added. Once this lot has been merged, the combined enterprise will have annual revenues – assuming that all goes well – of \$26bn from businesses that extend from cable TV and film production to book publishing and video rentals. This is what the "global media powerhouse" is supposed to be about. In comparison the Granada/LWT merger is comparatively small beer. But one can see why management might feel it desirable to gain apparent protection from increased mass. The Bell/TCI merger was called off not on business grounds but because of fears about regulatory requirements. It could well be on again once these have been sorted out.

Throughout all this there runs what one might call 'corporate fashion'. Not small is beautiful, which was never of course the ideal for large corporations, but strength through sheer size. This can work very well in some industries: think of Unilever for example. Whether it works in the media industry depends amongst other things on the commitment that can be generated and sustained. Success may be achieved for a while and then fade. One feels that Sony and Matsushita are no longer all that enamoured with their software subsidiaries. In commenting on the Viacom/Paramount merger, the *Financial Times* posed some pointed questions. While selling the same product in as many different ways as possible makes sense, is a vertically integrated corporation the best means of doing this? Might not Viacom do better to pick the best programmes from a range or producers or Paramount do better to choose the best distributor for each market? Quite possibly yes. It's just that those moguls are calling the tunes right now. It may be a different matter once personalities and fashions have changed.

### EDITOR

John A. Reddihough

### PRODUCTION EDITOR

Tessa Winford

### EDITORIAL OFFICE

081 652 8120

Fax 081 652 8956

Note that we are unable to answer technical queries over the telephone and cannot provide information on spares other than that given in our Spares Guide.

### ADVERTISEMENT MANAGER

Carol Nobbs

081 652 8327

### SALES EXECUTIVE

Pat Bunce

081 652 8339

Fax 081 652 8931

### ADVERTISING PRODUCTION

Brian Chapman

081 652 8681

Fax 081 652 8917

### PUBLISHING DIRECTOR

Susan Downey

### SUBSCRIPTION ENQUIRIES

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### COVER PHOTO

This month's cover photograph shows work being done on a surface-mount PCB used in a Sharp camcorder. See article on pages 402-5.



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# Curing Audio Tape Damage Problems

*Geoff Davies*

Almost everyone has had audio tape damage in a cassette player at some time or another. The cause can be poor cassettes: with cheap ones there can be uneven winding on to the spools and hence damage. If take-up of the tape is prevented it will spill out and wrap around the capstan. The best cassettes to use are the 60 type or prerecorded ones with five or six tracks per side: the worst are cheap ones, the 120 type and prerecorded ones with ten or more tracks per side.

Matters are made worse when the tape wraps itself around the capstan to such an extent that the mound of tape won't go back through the hole in the cassette: the cassette is stuck there, unless the owner uses a crow-bar to remove it, in which case the capstan will often come out as well!

Before starting work it's always worthwhile, if you can, to remove the jammed cassette in one piece: try turning the flywheel backwards by hand to unroll the tape.

## **The Pinch Roller**

If a faulty or unsuitable cassette can be ruled out the most common cause of trouble is the pinch roller. Even one that looks perfect can cause trouble. If the roller looks worn – a tape-width bulge usually develops around the centre of the roller – it should definitely be replaced.

Where possible a manufacturer's original should be fitted. If you are stuck for a roller for an obscure brand and have a new one that looks right, fit it to the old arm. Purists may disapprove, but in practice this works very well. Don't be tempted to swap only the pinch-roller tyre: this never works because the new one doesn't run true. Why should this be? Because a pinch-roller tyre is profiled on to its plastic hub to coun-

teract any tendency in the latter to eccentricity.

Incidentally there's often great similarity between the decks used by different manufacturers. Make a careful note about this – it can lead you to the cheapest source of spares.

Having fitted the new roller press the play button (a cassette is not necessary for this) and check that there is some clearance between the pinch-roller arm and whatever pulls it off the capstan in the stop mode. Because set-ups vary so much it's impossible to illustrate this. A good test is to push the pinch-roller arm towards the capstan, using finger pressure. If the pinch roller appears to be compressed to allow for this movement all should be well. Insufficient or no clearance will cause tape-speed variations.

Matters are almost never improved by increasing pinch-roller spring pressure. Where the pressure is adjustable it shouldn't be necessary to alter it from the manufacturer's setting. Tape sometimes slips between the pinch roller and the capstan, the result being intermittent speed increases. Temporarily increasing the spring pressure might bring about an improvement, but the real cause of the trouble will usually be excessive clutch drag.

## **Take-up Clutches**

Take-up clutches are often incorporated in the turntable assembly (often referred to as the reel). Sometimes a separate clutch is used. Whatever the system, your first check should be to use a gauge to measure the take-up torque. If it's too low, look for slippage between rubber tyres and metal drive wheels or between pulleys and belts. As they age rubber parts often perish and become smooth and must therefore be replaced. When you are dealing with an older model bear in mind that the supplier will have had the rubber parts in stock for a long time: they may also be unsuitable! If you're completely stuck for a part, use wet-and-dry emery paper to clean the tyre while the mechanism is running. Although this is crude, it can work well for a year or more. Don't try fitting a new tyre to an old wheel: this doesn't work, for the same reason mentioned in connection with the pinch roller.

It's very rare for the clutch itself to be responsible for lack of take-up torque: if it is, fit a replacement.

It's quite common for the take-up torque to be too high. If the clutch isn't adjustable not much can be done about this – other than fitting a new one. Shortening a spring or fitting a softer one never works! When I've had this problem with an old deck for which spares are not longer available I've

sometimes spent hours swapping springs and felts and carefully lubricating where it's safe to do so – all to no avail.

Where a clutch is adjustable it can be wise, especially in a difficult case, to set the torque to the lowest figure recommended in the manual. This almost always results in better tape handling.

## **The Heads**

A loose head can cause tape damage. Because the head guide is a long way from its correct position it will force the tape to follow the wrong path through the capstan/pinch roller. This leads to tape chewing.

Obviously the thing to do is to secure the head then adjust it correctly. Excellent head alignment can be achieved, without the tape pressing significantly on the head guide, where both height and azimuth adjustment is provided. The pinch roller/capstan combination mainly determines the run of the tape: so adjust the head to the tape – don't use the head guide to force the tape where you think it should go.

To adjust the height screw – the one nearest the guide – use a cassette with the case cut away so that you can clearly see the tape passing through the head guide. Look with one eye covered: if the tape doesn't touch the guide you'll see a 'knife edge'. The cassette should be a newish one – when tape has been used a lot it tends to crease longitudinally, spoiling the knife-edge effect.

Once the height is about right, set the azimuth screw – using an azimuth tape. Check the height screw setting again, then finally set the azimuth. Lock the screws. Copydex adhesive is quite good for this as it's non-toxic and non-hardening. But keep it away from the electronics, especially when wet – it seems to be to some extent electrically conductive!

If no height adjustment is provided it's sometimes possible to fit a shim beneath the head to raise it if necessary. Nothing much can be done if it's too high. If it's a long way out however try a new head – the guide is sometimes welded on to the head in the wrong position.

## **Final Test**

It's always desirable to carry out a final test when you've completed the work you think is necessary. Although crude, a 90-type cassette in which the tape has been damaged close to the leader makes a good test cassette: if the deck will handle the leader then the damaged part, without damaging it further, the chances are that the customer will have little trouble when using good cassettes.

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# Letters

## CHIPS AND PINS

I was asked to repair a TV set and after collecting it came to the conclusion the the microcomputer chip (CCUFRG007) was the cause of the trouble. It's not cheap at £14 plus Mr. Major's bit. The set was returned with a bill for £45, which seemed reasonable.

The customer looked at it and asked what the "CCU thingy" was? Trying to keep things simple, I explained that it was a silicon chip. "In that case I'm certainly not paying £45" she replied. Asked what the problem was she told me that Tomorrow's World had said a few days previously that silicon chips are now only a few pence each!

Incidentally this particular device is fitted with a child lock and requires a four-figure PIN to enable the set to stay on when a channel is selected. If an incorrect entry is made the set switches itself off. Now I somehow managed to get an ICC5 set fitted with this chip into the child lock mode and didn't have the PIN. The customer didn't know it either. The chip supplier couldn't offer any information on overriding the lock, and I'd all but given up on the job and was ready to count my losses. Someone who has nothing to do with electronics then suggested that I try 0000. Lo and behold, it worked! When I asked him about this he said that when briefcases, suitcases, safes etc. fitted with combination locks are sold the combination is always set to zero to safeguard against exactly the situation I'd found myself in. Sorting the problem out if a customer had forgotten what he'd set the PIN to would be a totally different matter of course. I haven't tried it, but removing the memory chip might possibly help in such a case. Some just plug in.

*David C.J. Tilley,  
Tiverton, Devon.*

## CONNECTOR PROBLEMS AND PHOTOCOPIERS

Sometimes the causes of what seem to be the most complex faults turn out to be something very simple. Here are a couple of examples.

A Bull Geiger counter worked quite happily – but only after being given a smack. Thinking that there was a loose connection somewhere I resoldered no end of joints, including those to the battery, and treated the plugs/sockets with WD40. All to no avail. Avo checks on the power supply suggested that all was well. I eventually noticed however that touching the battery made the counter come on or go off. Further investigation revealed that the battery connector tags were fixed to the actual connecting pieces by means of a metal-to-metal contact relying on the pressure of folded metal. Soldering this instead cured the fault. As the appliance took current from the battery in short pulses the d.c. level looked o.k., but when a pulse occurred the battery path resistance went right up, starving the Geiger tube.

The second example was more serious. A Panasonic NVW1 VCR gave consistent trouble whose cause neither I nor a repair firm had been able to find. Each time something was done the machine worked all right for a while before the fault returned. The mode switch was changed several times, and its connections back to the control system were checked over. Eventually the control PCB was taken out and

it was noticed that a connector had a loose clamp. After fitting this properly the fault disappeared.

Now for something quite different. I recently changed my Sharp SF740 photocopier (A4/B4 paper only) for one able to print on A3 paper. As the old one was in perfect working order, I wanted to sell it. But before doing so I decided to check on whether toner was still available – and was told that it isn't. On making further enquiries I was told that toner is not available for some machines that are only five years old. One shop told me that they throw away three perfectly good machines a week because supplies are no longer available. Parts are not interchangeable, and the machines are simply thrown on the skip. Maybe electronics enthusiasts should visit their local copier shops and try to buy these for a few pounds for parts – they contain motors, switches, power supplies and even microprocessors, not to mention lenses, prisms and mirrors.

All copiers these days work on the electrostatic principle, using a black fusible toner. The image is transferred optically to a drum that attracts particles of charged toner in accordance with the density at each point. This is then transferred by pressure to the paper sheet, where heat is used to fuse the toner in place. Yet it seems that toner from one make of machine won't work in another. I wonder why not? Would it be possible to modify a machine to work with toner for another by altering the electrostatic charge on the wires? Alternatively an agency could possibly be set up to supply different toners for different obsolete machines.

It does seem absurd that perfectly good machines whose manufacture involves an environmental cost are discarded in this way. Maybe someone could suggest a remedy for this situation.

*John de Rivaz, B.Sc.(Eng.), AMIEE,  
West Towan House, Porthowan,  
Truro, Cornwall TR4 8AX.*

## NO TRICK-MODE LP COLOUR

We recently purchased from our wholesaler some high-specification Ferguson FV74LVX VCRs, featuring on-screen displays, Startext, PDC, 4-head LP and built-in VideoPlus. We bought them because they were on offer at a very low price – around £210 plus VAT. On test we found that there was no colour with LP cue and review and pause. A check with another local dealer revealed that his machines had no colour in the LP search mode. Someone at Ferguson said that this was only to be expected in the LP mode, though there's no mention of it in the instruction book. What do other readers think about this?

*Michael Dranfield,  
Buxton, Derbyshire.*

## WELL DONE TOSHIBA!

I would like to say how surprised and pleased I was with the help and advice I recently received from the technical help department at Toshiba, Surrey. It's nice to find a company that's willing to help us poor engineers. The gentleman will know who he is if he reads this. Well done Toshiba!

*Chris Place,  
Tele-Video-Services, Swansea.*

## WHAT A GAME

Life in the TV and video repair business is getting harder. Most companies don't give technical advice any more. Spares companies expect you to spend at least £30 – if you don't, you get surcharged. As the part you want may cost

AC188	0.79	2SA748	0.85	2SD2340	0.45	STK461	6.00
AD181	0.50	2SA777	0.35	2SD325	0.35	STK1050	7.25
AD162	0.50	2SA841	0.40	2SD355	0.45	STK2029	4.75
BC108	0.07	2SA893	0.50	2SD400	0.18	STK3042	4.20
BC141	0.30	2SA1101	1.35	2SD467	0.15	STK3042/2	4.75
BC142	0.20	2SA1102	1.60	2SD525	0.60	STK1915/5	18.50
BC307	0.08	2SA1123	0.49	2SD600	0.40	STK5325	4.45
BC337	0.07	2SA1175	0.40	2SD612	0.80	STK5332	1.80
BC546	0.07	2SA1282	0.80	2SD636	0.10	STK5333	2.40
BD131	0.30	2SA1307	1.50	2SD716	0.95	STK5422	4.20
BD132	0.30	2SB370	0.40	2SD725	0.50	STK5476	4.00
BD243	0.38	2SB541	1.90	2SD836	0.75	STK7348	3.15
BD246	0.65	2SB546	0.55	2SD856	0.55	STK73410	4.00
BDX33	0.50	2SB618	3.05	2SD1136	0.50	STK401	3.50
BDX54	0.50	2SB641	0.11	2SD1273	0.70	STK411	3.80
BF137	0.20	2SB649	0.38	2SD1275	0.58	STK441	2.50
BF259	0.70	2SB717	0.52	2SD1278	0.58	STK441	4.75
BF494	0.16	2SB861	1.50	2SD1398	1.40	STR451	13.95
BF681	0.30	2SB881	0.60	2SD1426	2.05	STR5412	4.40
BFY51	0.80	2SB1015	1.10	2SD1441	3.50	STR41090	5.90
BFY90	2.00	2SB1016	1.10	2SD1441	3.50	STR50103	2.65
BU124	1.35	2SC372	0.70	2SC372	0.70	STR59041	6.40
BU180	0.90	2SC377	0.68	2SC377	0.68	TA7157	1.20
BU206	1.85	2SC458	0.68	2SC458	0.68	TA7270	2.00
BU208	0.68	2SC581	3.20	2SC581	3.20	TA7280	2.25
BU208A	0.68	2SC741	3.00	2SC741	3.00	TA7604	2.35
BU208A	0.70	2SC867	3.00	2SC867	3.00	TA8705	2.90
BU208A	0.70	2SC941	0.12	2SC941	0.12	TA8705	2.90
BU208A	0.90	2SC941	0.12	2SC941	0.12	TA8705	2.90
BU325A	1.10	2SC998	3.05	2SC998	3.05	TA8705	2.90
BU407	0.65	2SC1008	0.20	2SC1008	0.20	TA8705	2.90
BU409	1.10	2SC1103	0.50	2SC1103	0.50	TA8705	2.90
BU426	1.50	2SC1123	0.45	2SC1123	0.45	TA8705	2.90
BU508A	0.85	2SC1222	0.11	2SC1222	0.11	TA8705	2.90
BU508B	1.35	2SC1327	0.78	2SC1327	0.78	TA8705	2.90
BU508B	1.35	2SC1382	0.38	2SC1382	0.38	TA8705	2.90
BU508B	1.10	2SC1429	0.58	2SC1429	0.58	TA8705	2.90
BU536	1.05	2SC1447	0.60	2SC1447	0.60	TA8705	2.90
BU626	1.45	2SC1447	0.60	2SC1447	0.60	TA8705	2.90
BU626	1.45	2SC1514	0.32	2SC1514	0.32	TA8705	2.90
BU626	1.45	2SC1619	0.25	2SC1619	0.25	TA8705	2.90
BU626	1.45	2SC1674	0.30	2SC1674	0.30	TA8705	2.90
BU626	1.45	2SC1674	0.30	2SC1674	0.30	TA8705	2.90
BU626	1.45	2SC1765	0.38	2SC1765	0.38	TA8705	2.90
BU626	1.45	2SC1815	0.18	2SC1815	0.18	TA8705	2.90
BU626	1.45	2SC1852	0.49	2SC1852	0.49	TA8705	2.90
BU626	1.45	2SC1874	0.15	2SC1874	0.15	TA8705	2.90
BU626	1.45	2SC1983	0.90	2SC1983	0.90	TA8705	2.90
BU626	1.45	2SC2002	0.22	2SC2002	0.22	TA8705	2.90
BU626	1.45	2SC2027	2.20	2SC2027	2.20	TA8705	2.90
BU626	1.45	2SC2076	1.10	2SC2076	1.10	TA8705	2.90
BU626	1.45	2SC2236	0.96	2SC2236	0.96	TA8705	2.90
BU626	1.45	2SC2278	1.30	2SC2278	1.30	TA8705	2.90
BU626	1.45	2SC2347	1.18	2SC2347	1.18	TA8705	2.90
BU626	1.45	2SC2500	0.25	2SC2500	0.25	TA8705	2.90
BU626	1.45	2SC2579	1.25	2SC2579	1.25	TA8705	2.90
BU626	1.45	2SC2603	0.12	2SC2603	0.12	TA8705	2.90
BU626	1.45	2SC2668	0.70	2SC2668	0.70	TA8705	2.90
BU626	1.45	2SC2688	0.30	2SC2688	0.30	TA8705	2.90
BU626	1.45	2SC2838	3.60	2SC2838	3.60	TA8705	2.90
BU626	1.45	2SC2979	2.00	2SC2979	2.00	TA8705	2.90
BU626	1.45	2SC3182	1.50	2SC3182	1.50	TA8705	2.90
BU626	1.45	2SC3262	3.60	2SC3262	3.60	TA8705	2.90
BU626	1.45	2SC3345	1.00	2SC3345	1.00	TA8705	2.90
BU626	1.45	2SC3506	3.40	2SC3506	3.40	TA8705	2.90
BU626	1.45	2SC3883	2.80	2SC3883	2.80	TA8705	2.90
BU626	1.45	2SC4242	1.40	2SC4242	1.40	TA8705	2.90
BU626	1.45	2SD198	1.60	2SD198	1.60	TA8705	2.90

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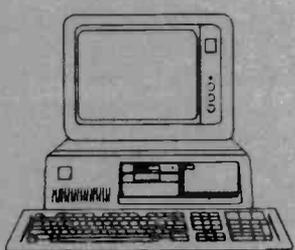
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only say £10 or £15, you tend to make up the order by asking for spare parts you don't at the time need. The result is money tied up uselessly in stocks.

When ordering an item, for example an i.c. priced at £23.04, you are often told that the price has increased to say £26.04. I wouldn't mind so much, but the catalogue I've just quoted is dated 1994!

It would be a great improvement if the larger spares companies that are made official agents had technical departments. When setmakers like Sony, Hitachi, Grundig etc. appoint sole agents they should give them access to technical help for dealers.

I warn my customers about companies that don't provide a technical back-up.

*Michael Cordner, M & M Video,  
West Norwood, London.*

## VOLTAGE REGULATION

K.J. Treeby (Letters, March) queries the series voltage regulator circuit shown in Eugene Trundle's article (Fig. 3, page

168, January). The resistor (R3) in parallel with the series regulator transistor Tr1 isn't necessary for regulation purposes. It's there to reduce the dissipation in the transistor, by bypassing about a third of the current, and to provide a start-up supply without which Tr1 would not conduct. The advantage of using a pnp series regulator transistor is the fact that it will work with less than a volt across it. This is essential if the output from a 12V battery is to provide an 11.6V regulated supply. The Darlington configuration suggested by J. LeJeune (May 1992) involves a voltage drop of at least 1.5V because of the two base-emitter voltage differences of say 0.7V for VT21 and VT23. It's standard practice in the 'low drop-out' voltage regulators used in automobile electronics to use a pnp device.

Incidentally Q4 is described in Steve Beeching's Auto Grey-scale Faults article (March, page 356) as providing a constant-current source. In Fig. 1 it's drawn as a constant-voltage source, with 2.8V at its emitter. Any comments on this?

*Ray Porter, M.Sc., C.Eng., MIEE,  
Stourbridge, West Midlands.*

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# Test Case 376

As Tatung products are favoured for rental by the shop side of the business, the Test Case workshop has had many dealings with them over the years. While Tatung manufactures its own TV sets, the company goes shopping for VCRs on the international market – its badge and logo have graced VCRs designed by JVC, Philips, Akai, Sharp and others. Some Tatung products have more than a passing resemblance to Amstrad models. . .

The complaint with a two-year old machine, Model TVR6122, that had been bought rather than rented was of a roaring noise during playback and record. It came from deep within the lower drum, where the most likely cause was the motor or a bearing. An estimate was prepared and passed to the customer who was, to say the least, not best pleased with what he saw. Even so he agreed to have the work done. So a lower drum assembly was ordered. When it arrived it was given to Roger to fit and align.

All went smoothly. The upper drum was transferred to the new assembly, great care being taken to ensure that it was correctly phased. After connecting the motor and video feeds the machine was run on test. It worked well enough mechanically but there were no playback pictures, just grain and snow being present on the monitor's screen. Maybe the

heads had become dirty during the repair work. They were thoroughly cleaned, but this didn't restore the pictures. When a finger or a screwdriver was placed close to the head leadout wires however the noise pattern on the monitor's screen livened up. This indicated that the video carrier preamplifier circuit was working. Could the heads have been damaged when they were changed over? The upper drum was removed and the head chips and windings were carefully examined. They appeared to be perfectly all right, and continuity checks on them and on both windings of the two rotary transformers showed that there were no breaks.

What else could have been wrong? The lower drum had come in the form of separate components. But they must have been put together properly as the motor was running and was noise free. The speed was correct too, confirmed by the strobe pattern visible on the upper drum in the fluorescent glow of the bench light. A double check proved that the head drum hadn't been turned through 180° during reassembly: Roger knew that this would have produced the present symptoms.

Finally a known good head drum was taken from another Tatung VCR of the same type and fitted to the recalcitrant machine. Once again the playback sound came through in full measure but there was nought but noise on the monitor's screen. In desperation the head drum from the faulty machine was tried in the good VCR: this proved that it could produce perfectly good playback pictures. Could it be that the tape's signals were being wiped out on their way to the drum? No: the sound was there, and anyway no pictures came through in reverse search.

At this point a sensible move would have been to make a recording and try to play it back via another machine. Had he done so Roger would have found that the machine could record signals, proving that the rotary transformer and its connections were o.k., but that playback would probably have been in black and white. But Roger didn't carry out this test: he once more dismantled the motor assembly at the bottom of the lower drum for inspection. Finding nothing visibly wrong he put it together once more. This time the machine worked correctly, needing only slight mechanical and electrical alignment to bring it fully up to standard.

It's worked perfectly from that day to this, and Roger still doesn't know what caused the problem. Can you work it out? There's a perfectly logical explanation which you'll find, if you need it, on page 436

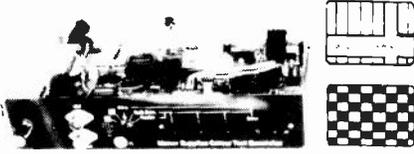
## BOOK NOTICE

The *TV and Video Engineer's Reference Book*, originally published by Butterworth-Heinemann in a hardback edition at £150, is now available in paperback form at just £40. This massive reference work, which was reviewed on page 267 of the February 1992 issue of *Television*, has 850 large pages and was written by sixty two specialist authors. It's 1.5in. thick and weighs almost 4lb. The new, cheap format brings the book within the reach of a much wider readership, representing excellent value for money. It can be obtained by post from Paul Richards Books, 28 Boscobel Road North, St. Leonards on Sea, East Sussex TN38 0NZ (telephone 0424 434 874) at £40 plus £3 for post and packing.

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BA6229	£3.80	SAF1039	£2.20	TBA1.005	£1.20	TDA2654	£5.70	IDA7052	£2.50
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# Teletopics

## DIGITAL TV

The Japanese Ministry of Posts and Telecommunications has announced that it favours the use of a digital system for HDTV broadcasting rather than the Hi-Vision analogue system at present in use. Hi-Vision was developed by the Japanese public broadcasting network NHK: over thirty years of work has gone into it. At present eight hours of Hi-Vision TV are being broadcast daily, though only around 20,000 receivers have been produced and few of these seem to have been bought by private households. Understandably, the Ministry's announcement has not gone down well with NHK and the Electronics Industry Association of Japan, which represents the setmakers: it was welcomed by representatives of the US and European electronics industries. Mr. Akimasa Egawa, director general of the Ministry's Broadcasting Administration Bureau, said that Japan should consider various possibilities in the context of a world-wide move towards the adoption of digital systems. The Ministry is to make a final decision in July.

Meanwhile the US Digital HDTV Grand Alliance which, following pressure from the Federal Communications Commission (FCC), was formed last May to establish a standard for HDTV broadcasting in the USA has made a final decision on the standard's technical features. Until now a decision on the transmission system had been deferred while practical tests were being carried out. Zenith technology, using a form of vestigial sideband transmission, has been selected in preference to QAM (quadrature amplitude modulation). The standard agreed upon by the alliance can transmit up to 43Mbits/sec, enabling cable TV operators to transmit two HDTV signals in a single 6MHz channel bandwidth. If the specification is approved by the FCC, there will be further testing late this year followed by final field testing in early 1995.

Europe's first digital cable system, using MPEG standards, is expected to be brought into operation early next year by Deutsche Bundespost Telekom.

Matsushita has developed a real-time MPEG-2 decoder chip. It uses 0.5µ triple metal CMOS technology and contains some 2.5 million transistor elements. Commercial samples should be available next year.

Carlton Television hopes to conduct experimental digital TV broadcasts in London later this year, using its standby transmitter at Croydon. The broadcasts would be transmitted in collaboration with NTL, which has been carrying out experiments in the west country for the ITC. These, using conventional transmitters and mainly test patterns, have proved that the technology works.

## BROADCASTING

The ITC is in favour of re-advertising the Channel 5 franchise – provided the government guarantees that the frequencies will be made available for a number of years. MAI, a consortium consisting of Meridian Broadcasting, Time Warner, Pearson and Thames Television, would like to bid and claims that it could start a service by the end of 1995. There is discussion however as to whether this would be compatible with a long-term strategy of moving to digital terrestrial broadcasting. Nigel Walmsley, chief executive of Carlton Television and chairman of the ITV engineering

policy group, feels that the frequencies should be used for digital terrestrial television. He is quoted as saying that "while the ITC has a duty to consider the case for Channel 5 the government needs to decide whether new developments in digital television should now take priority".

NTL has announced the schedule for completing the addition of Nicam digital stereo sound to the ITV, Channel 4 and S4C networks. This is as follows:

Second quarter 1994: Beacon Hill, Angus, Carmel and Fremont Point. Third quarter: Darvel and Moel-Y-Parc. Fourth quarter: Limavady, Ridge Hill and Bluebell Hill.

First quarter 1995: Rosemarkie, Midhurst and Huntshaw Cross. Second quarter: The Wrekin and Presely. Third quarter: Knock More and Rumster Forrest. Fourth quarter: Brougher Mountain and Llandona.

First quarter 1996: Blaen-Plwyf, Chatton and Keelylang Hill. Second quarter Eitshal (Lewis), third quarter Bressay, fourth quarter Torosay.

When these main stations have been equipped, their relays will also transmit Nicam. The exception to this is the Skriaig, Long Mountain and Kendal relays which with their dependents will become Nicam capable in the fourth quarter of 1996. Beacon Hill, Huntshaw Cross, Darvel and Torosay already have Channel 3 (ITV) Nicam.

Trials of a system that will provide improved teletext graphics are to begin in London during the next few months. The intention is to use video compression.

The BBC hopes to start digital audio broadcasting via satellite in 2007. A frequency has been allocated but cannot be used before the year 2007. Terrestrial DAB at 226MHz is currently undergoing trials: the service is expected to come into operation by the end of next year. Receivers will probably cost around £400.

## KONIG REMOTE CONTROL UNITS

The wall chart enclosed with this issue of *Television* presents a selection from the wide range of TV, video and satellite receiver remote control units available from Konig through a nationwide distribution network. Products supplied by Konig have gained an excellent reputation for quality and reliability. Information on Konig products can be obtained from the company's UK agent TW Electronics, Kennett Building, Woolton Hill, Newbury, Berks RG15 9UJ (phone no. 0635 253 706, fax no. 0635 254 038).

## SATELLITE TV

Maspro has signed an agreement with Northern Telecom to produce a low-noise (maximum noise figure 1dB) LNB with a 90° aperture. It's being designed for specific use with Maspro's BSK60 range of dishes. A 90° aperture enables the focal distance to be reduced without impairing performance, resulting in a more compact dish assembly. The Astra 1D compatible LNB is due for release shortly at around £28.

ElectroTech Distribution (Unit 6, Drury Way Industrial Estate, Laxton Close, Neasden, London NW10 0TG, phone no. 081 451 6766) has introduced a low-cost multi-satellite upgrade system from IRTE. It enables even basic Amstrad receivers to be used for multi-satellite viewing. Instead of a motorised dish system, the IRTE multi-satellite selector has a motorised arm that moves the LNB. Prices start at £129, rising to £179 for the universal model with 80cm dish.

Chaparral has introduced a new receiver, Model MC115,

that features its patent-pending Scan Tune system. This gives automatic selection and tuning of over 800 programmable favourite channels. Its memory card provides instantaneous, updated and transferable database information, making EPROM replacement obsolete. The Insta-Track feature (also patent pending) gives automatic satellite position calculation. Satellite position and channel data is then stored in the receiver's own non-volatile memory. Various features have been designed to make the receiver user-friendly.

## VIDEO NEWS

Panasonic plans to launch a low-cost, professional-standard camcorder using the DVC system (digital VCR – see Teletopics last September) in about a year's time. The company says that consumer DVC will be ready by January or February 1995. Professional and consumer equipment using the system will be compatible, the only difference being in the ruggedness of the hardware.

3DO plans to launch an interactive multimedia player in the USA and Europe this autumn. The DC-ROM based video games system will enable players at different locations to play a game, and at the same time talk, via a telephone line link. It will use AT&T's VoiceSpan technology which increases the capacity of a telephone line by employing it for two channels, one for audio and the other for high-speed data.

Xerox has developed, with Pentagon backing, an advanced high-resolution LCD panel. It has over 6.3 million pixels, about ten times the number that current computer LCD screens have. Further funding has been provided by the Pentagon to develop the manufacturing technology required.

Will we eventually have flexible, light-weight flat-screen TV displays? The possibility arises from the discovery in 1990 of plastics that emit light and can be used as LEDs. A problem at present is that the polymers degrade with use – current life is up to 700 hours. According to researchers even a rudimentary display device is some way from production, so the flexible TV screen is a distant prospect.

## BUSINESS NEWS

Hong Kong manufacturer Kong Wah's subsidiary Onwa Electronics has opened a TV plant in the UK. The company is anxious to maintain access to the European market. It produces sets for Akai, Alba, Amstrad, Bush and other firms and intends to start selling Onwa brand sets in the UK next year. Other brand names used by the company include Kawa, Konka and Greatwall. It produces a complete range of consumer electronic products and has demonstrated a widescreen LCD receiver – see Teletopics last month.

Glasgow-based multiple Clydesdale has been put into administrative receivership. The company continues to trade and it's understood that at least two prospective buyers have expressed an interest.

Sega has announced a 24 per cent drop in pre-tax profits for the current financial year, the first fall in twelve years. The company blames the strong yen and fierce price competition for the decline. A new 32-bit technology home multimedia game called Saturn, and an increase in its theme park activities, are expected to boost Sega's profits next year.

For an annual membership subscription of £15 The Bankruptcy Association of Great Britain and Ireland, which was started over ten years ago, offers debt counselling and advice to anyone in financial trouble. The Association has available at £7.95 (including post) a guide to bankruptcy. Details of the Association can be obtained by ringing its national inquiry telephone number 0482 658 701 or writing

to The Bankruptcy Association, Freepost, 4 Johnson Close, Lancaster LA1 1BR.

## WORKSHOP EQUIPMENT

A unique scart diagnostic tool, the ScartMaster, has been introduced by Intercomms, Box 434, Ascot, Berks SL5 0QY (034 420 234, fax 034 420 244). The pocket-sized tester verifies all scart/Euroconnector functions. Outputs and switching voltages are checked by LEDs – switching functions can also be checked by using push switches to force status lines high. Input lines are checked by means of a built-in pattern generator, with separate test tone generators for the left and right audio channels. Status lines are automatically switched high when using these inputs. Automatic switch-off ensures maximum life for the 1604A battery.

Welwyn Tool and its distributors have available a range of specialist equipment for SMD reworking. The company points out that fast, economical work calls for different soldering and desoldering techniques which can be carried out using the same basic tool, that to minimise the risk of component or board damage a contactless, i.e. hot-air, system is best, that the hot air must be closely controlled at the correct temperature, and that a light air flow is required for work on high-density boards. Welwyn's SMD rework systems are based on an electric hot-air tool, either the No. 1 hot-jet S or the more powerful No. 7A1 Labor. Both provide precise-temperature, electronically controlled heat with adjustable air flow. The same tool can be fitted with a small-diameter pipe nozzle for soldering and any of a wide range of nozzles for desoldering. The basic system with S tool costs from £243; a portable rework station is available for just under £500; while more powerful and sophisticated systems cost up to £1,300. For further information and literature write to the Welwyn Tool Co., Ltd., 4 South Mundells, Welwyn Garden City, Herts AL7 1EH, phone 0707 331 111.

The Health and Safety Executive (HSE) has published a leaflet, which is available free of charge, entitled *Five Steps to Risk Assessment*. It provides simple, practical guidance for employers on how to assess and control risks to health and safety in the workplace. The leaflet, reference IND(G)163L, is available from HSE Books, PO Box 1999, Sudbury, Suffolk IP10 6FS (phone no. 0787 881 165).

## RECYCLING ELECTRONICS

The government has asked the Industry Council for Electronic Equipment Recycling (ICER), which was set up about eighteen months ago, to draw up a nationwide plan for recycling electronic and electrical equipment and organise a pilot recycling project. The pilot collection and recycling scheme, involving domestic and light commercial equipment, will begin before the end of the year.

The ICER represents a broad range of interests including suppliers, manufacturers, retailers, recyclers, waste management companies and local authorities. A study into the environmental impact of equipment that has reached the end of its life is one project for the present year. Recent research suggests that some six million personal computers, photocopiers, TV sets, microwave ovens and other household and office equipment goes into landfill each year. A MORI survey commissioned by ICER to find out what householders do with their old TV sets revealed that only twelve per cent of them are thrown away: others are kept as a spare, given away or stored. This just postpones the eventual outcome of course. The ICER is committed to developing an industry-led solution to the problem of disposing of electronic equipment responsibly.

# Soldering and Desoldering Surface-mounted Components

Steve Beeching, T.Eng.

There are several different ways of removing a surface-mounted component from a PCB. The best method to use is, by general consensus, the one that suits you best – the one with which you are most comfortable.

## Removing Components from a Surface-mount PCB

When a passive surface-mounted component such as a resistor or a capacitor is to be removed, heat must be applied to both ends of the component simultaneously. If an attempt is made to lift such a component off after heating just one end the result is likely to be component and/or print damage. Two soldering irons can be used as shown in Fig. 1, but this is not really practical. Although both ends of the component are heated simultaneously, it's difficult to lift the component.

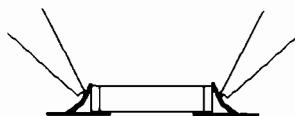


Fig. 1: Use of two soldering irons to remove a passive surface-mounted component: hardly a practical way of going about it.

Use of a special soldering-iron tip is a much better approach, see Fig. 2. The tip heats both ends of the component then, with a twist, the component can be lifted off. With some components the use of a pair of tweezers helps.

Slightly larger attachments are available for use with components, such as transistors, that have three legs. Some transistors, particularly power devices, have the collector connected to a tab that, together with the print area to which it is soldered, act as a heatsink. Greater care is required when removing such components as either insufficient or too much heat will cause print damage. With insufficient

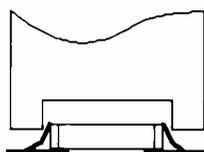


Fig. 2: A special tip simplifies matters.

heat the print will be dragged up when the component is pulled off: too much heat will also lift the print from the PCB, either because of expansion of the copper or blistering of the board material.

The Weller EC3100 and EC4100 series of temperature-controlled soldering irons are good examples of tools that are suitable for this type of work. They are rated at 20W and have a closed-loop temperature-control system, with electrostatic protection. This makes them suitable for precision soldering. They are available at around £170. The type EPH tips are conical and either straight or slightly bent. They are

available in the following sizes: 0.38, 0.8, 1.19, 1.5, 1.98 and 3.17mm.

For heavier use the EC2100 has a 45W heater and larger or longer tips. The type ET tips are longer with conical or screwdriver shaped ends. They are available in sizes from 0.4 to 5mm. An added bonus is the range of shaped, surface-



Fig. 3: Shaped tips available from Weller.

mount tips for use with the EC2100. These taper fit into an adaptor tip that's mounted on the iron. See Fig. 3.

## Soldering

Solder is a problem with smaller components. The smallest commercially available solder is the 26 s.w.g. type. Some setmakers however have available from their service departments smaller gauge solder. JVC for example has 0.3mm solder available under part no. YTU94038-51.

A small tip size can cause problems by overheating the solder and baking the rosin in it on to the tip, which thus becomes tarnished and won't tin properly. The result is messy soldered joints. It's helpful to use a tin of tip cleaner: dip the iron's tip into it frequently, following this action with a cleaning wipe on a cloth or damp sponge. This will maintain the tip's tinning efficiency. RS Components has available small tins of tip cleaner, with a useful sticky backing for placement, under part no. 561-533.

## Integrated Circuits

The removal of integrated circuits is a much greater problem. There are two approaches. The simplest one is to use force. The more sophisticated way is to desolder then remove the device.

Brute force is dangerous. Some engineers use a Stanley knife to cut the leads. This is not good practice because too much pressure has to be applied to the legs of the i.c. and the print. If the knife slips, it's bye, bye print.

A better method is to use very small cutters to clip each leg gently at the point where it meets the body of the i.c. Small cutters can be obtained from RS Components. They can be ground down a bit more to fit between i.c. legs. There's a compromise here between size and strength – and the cutters will cost you more than £40 before you do any grinding. Do this carefully and make sure that the metal doesn't overheat.

The cutters must be stable when the cut is made, so that the cut is central to the leg and the cutters don't jump away from the cut position. If they do jump away, strain is

imparted to the section of leg that remains soldered to the print. This can cause print damage.

The Linstrom Series 80 i.c. lead cutters (RS Components part no. 614-772, at £40.91) are suitable, also one of the cutters from a set contained in an SMT tool kit (RS Components part no. 663-049). The Linstrom cutters have more 'body' and can be ground down almost to a point. The bulk of the tip of these cutters makes it impossible to use them in very confined spaces where there are other, larger components adjacent to the chip. In this situation the cutters from the SMT tool kit are more useful.

Farnell Electronic Components has recently introduced the Swiss-made EREM precision cutters for surface-mounted components, in particular the removal of DIL and quad-pack chips. The tips are ground to a delta shape, with cutting edges on each side (see Fig. 4). This means that the i.c. leg being cut is approached from each side, the cut being made towards the centre where the cutting edges meet. With its delta shape the cutting tip is very small (about 2mm long): the contoured head provides strength. This shape is ideal for use with surface-mounted i.c.s: each leg can be quickly and carefully snipped in turn, then the body of the chip removed, leaving just a small cleaning up operation to remove the remaining leg debris. This can be done with solder wick or even a wetted iron tip. Farnell has put a lot of effort into locating this cost-effective cutting tool for i.c. removal. The cutters are available under part no. 290-087 at about £49.95 plus VAT.

Once its legs have been cut, an i.c. is dead. You can't refit it: the chip has been sacrificed to preserve the print and the PCB. It doesn't matter how much the i.c. may cost: you have to compare this with the cost of a new PCB and its fitting and alignment, or the risk of writing off someone's equipment. This makes one appreciate the real cost of SMD (surface-mounted device) repairs and reworking.

## Soldering Technology

We have all become used to the traditional multicore solder which, as it's heated, supplies flux to the joint. When it comes to SMDs we have to reconsider this technology. We have to learn how to apply flux separately, when and where to use it and the correct temperature to use.

Except for the previously mentioned 0.3mm type available from JVC, rosin-cored solder is generally too large for use where the spacing (pitch) of i.c. leads is less than 0.25mm. The main problem is that the solder bridges between adjacent legs and has to be cleaned up. The use of flux makes this job a lot easier, but care must be taken and learning how to do it takes time. Don't expect to achieve perfect results the first time you try. Or every time.

If all the surfaces to be soldered are coated with flux, the solder will run on to them as if attracted by magic: by this I mean solder that's held on the soldering iron's tip, using this as a reservoir, not solder that's applied to the joint in the traditional way, as a wire feed.

## Replacing Passive Components

First remove the component carefully, avoiding print damage at all costs. Then remove the solder left on the pads. Use an absorbent solder wick to do this. Chem-wick, which is available from CPC, is particularly good as it's available in very small sizes. It is important that the wick is kept inside its reel, away from fresh air, until used. This prevents tarnishing or drying up. The temperature of the iron used to heat the wick should be about 390°C, i.e. hot, but make sure that you don't overheat the PCB. Finally use a flux remover

such as Isopropanol cleaning solvent (RS Components part no. 567-884) to clean the print. Don't spray it everywhere: squirt it on to a cotton bud, which should be well soaked, to do the cleaning. Allow it to dry or mop it up. You should end up with a crisp, clean section of the PCB.

There are three ways of fitting the replacement component, as follows.

(1) This method uses very thin-cored solder. Apply some of it as a small – and I mean small – mound to one pad. Sit the component on the PCB, holding it with tweezers. Heat the solder so that the component is held, then solder it at the other end. Resolder the first end. The result should be as shown in Fig. 5. Remove excess solder with the desoldering wick.

(2) Coat the solder pads with liquid flux from a bottle with a brush in it: don't spray flux everywhere. As the flux dries, it becomes sticky. This property can be used (sometimes) to hold the component. When the component is sitting in the correct position, apply a little more flux to its ends. Then apply a small amount of solder to a very small, clean soldering iron tip: not too much – practice may be required

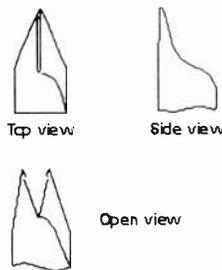


Fig. 4: The EREM cutter, available from Farnell.

to judge the amount. Apply the iron tip, with its small reservoir of solder, to one end of the component. Solder will flow off the tip and, because of the 'wetting' effect of the flux, it will go around and beneath the component. The result should, again look like Fig. 5.

(3) This method uses solder paste. There are two types of paste, those that contain rosin flux and those that don't or not enough. If the paste doesn't contain flux, use a brush to apply a thin coat of flux or apply sticky flux as a blob (contact Sanyo about sticky flux). Apply a small ball of solder paste to each print pad, place the component on the paste then heat with a hot-air pencil or pyropen.

## Fitting ICs

There are also three ways of soldering surface-mounted chips, as follows. The one to use is the one that suits you best: this may be decided by the equipment that's available.

(1) A small soldering iron bit, say 0.4mm, and fine solder with a diameter of 0.3mm may, as with passive components, be used. Whether this is possible depends of course on the i.c. and its leg spacing. Double-sided tape or blue tack could be used to stick down and position the chip temporarily before using the soldering iron to anchor its corner legs, but

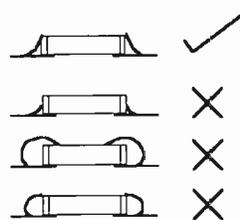


Fig. 5: Correct and incorrect SMD solder joints.

this is not good practice. Then solder each leg. Use the desoldering braid to remove any excess solder between the legs. A hot-air pencil is useful to give the solder a final reflow, producing a decent finish – otherwise the job looks a bit rough. When doing this take care not to overheat the i.c., otherwise it won't work.

(2) As it's sticky when it dries flux paint on the PCB will enable the i.c. to be stuck down temporarily while its corner legs are being soldered. Then coat all the legs with flux – don't soak them. As with passive components, reflow a reservoir of solder on the iron's tip on to the legs and print. You can experiment with larger bits that hold more solder: surprisingly, the solder will flow without running across the legs and joining them. With a quad-pack chip, flux and solder a row of legs at a time.

(3) The third method is to use solder paste. To help with the tinning process it's a good idea to apply flux to both the PCB and the chip, even though the solder paste may contain flux (check this before proceeding). Experience is required to determine exactly how much paste to use. Apply it in a thin line across the edge where the legs meet the print, so that the legs and PCB are bridged (see Fig. 6). Then heat the paste gently, using a hot-air pencil or blower at a temperature of about 300-350°C. The paste will first change colour then start to set just before it melts and flows. Ensure that the paste, as it forms tiny balls of solder, doesn't run beneath the chip. I've had problems where this has happened, shorting out bits of print around through-plated holes. If this does happen the i.c. will have to be removed and another one fitted.

Use of solder paste and a hot-air pencil can be very messy, with waves of flux and solder balls running everywhere. Maybe that's just me – I prefer a different method. The paste comes in a syringe with a fixed tip. Other tips that will fit the syringes are available – these are generally used

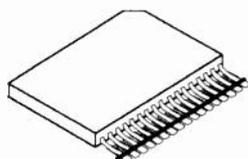


Fig. 6: Use of solder paste with an SMD chip.

for precision adhesive applications. RS Components solder paste (part no. 551-693) comes in a syringe that will take tips with an internal diameter of 0.027mm (part no. 552-286) or 0.033mm (part no. 552-270).

The method you decide to use depends on personal preference, skill and the equipment available.

## Pace

In my quest for suitable desoldering equipment I came across Pace. This US-based manufacturer's range of high-quality soldering and desoldering equipment, including cleaning materials and fume extraction arrangements, is vast. Systems consist of handpieces, a temperature control arrangement and a compression pump system.

The SensaTemp temperature management system provides heat control. It's a closed-loop system that senses the thermal load (heat drain) by monitoring the tip temperature, controlling the energy supplied by the power unit to the heating element to compensate for the load requirement. With work such as surface-mounted component replacement

the energy requirement is light, so power delivery is reduced to prevent overheating. With a heavy load, for example large components and large areas of print, there is substantial heat conduction away from the work: rapid power delivery is required to maintain tip temperature and ensure good solder reflow. The SensaTemp system's precise control enables work to be completed at a much lower temperature than with a basic soldering iron. With SensaTemp control, work that would normally be carried out at 380-420°C is done at 280-320°C. This is an obvious advantage for precision work: fine print on a PCB will not suffer damage because of overheating and is less likely to part from the board, while temperature-sensitive i.c.s also benefit from the lower soldering temperature. Some flatpack



Fig. 7: The Pace IR70 soldering iron.

microcontroller chips will fail when subjected to 'normal' soldering temperatures.

There are five types of handpiece: a basic soldering iron; a desoldering extractor; a hot-air pencil; an i.c. extractor; and a heated tweezer assembly. We'll look at these in turn.

**IR70 soldering iron:** This unit (see Fig. 7) enables a variety of tasks to be accomplished ranging from light soldering to through-hole work. Tip sizes are from 0.4mm conical to 4.8mm chisel shape, with over fifty options of various types. One of these is a wide-blade tip to provide heating along one side of a surface-mounted chip for insertion soldering. Double-sided U-shaped tips are available for use with dual-in-line (DIL) chips. There are tips for use with passive surface-mounted components, with sections cut out so that the tip reaches each side of the component. Rectangular tips cater for various shaped surface-mounted chips, though some of the other handpieces may be better for removing these. With the IR70 components can be inserted and removed at relatively low, controlled temperatures.

**SX70 solder extractor:** This handpiece (see Fig. 8) relies on the vacuum provided by the pump within the power unit. A small pushbutton on the handle controls the suction: you can therefore reflow the solder before applying suction. The long glass tube fitted in the handle has a large capacity and can be easily removed, by unhooking the rear grip, for cleaning. It's connected to the power unit via a Snaplock connector. The desoldering tips are heated by the SensaTemp system and

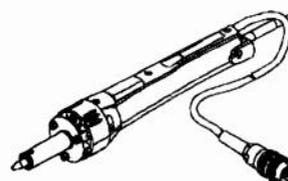


Fig. 8: The Pace SX70 solder extractor.

can be set to any temperature within the range allowed. Melted solder passes through a small-bore hole in the tip: as this hole is inside the heating element the solder is kept in its liquid state until it reaches the glass cylinder where it's rapidly cooled. Internal and external diameters are specified for the ends of the conical-shaped tips. Thus one can be selected to suit a particular job, the nominal size being

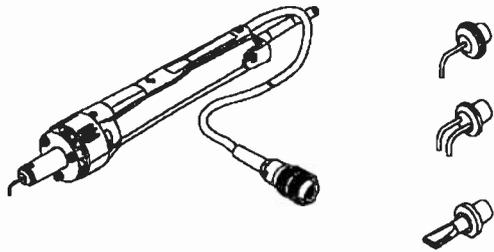


Fig. 9: The Pace TJ65 thermojet, with alternative tips.

1.78mm for the tip end with a 1.02mm hole. A finger-actuated switch controls the air flow, with further control on the power to set the flow rate. The SX70 provides continuous surface or through-hole desoldering and printed-circuit land cleaning. The temperature control is much easier on the print than the use of an overheated solder wick.

**TJ65 thermojet:** The thermojet handpiece (see Fig. 9) does the job of a pyro pencil, but here the similarity ends. With the thermojet you can control both the air flow and the temperature accurately. A small curved tip is supplied as standard, but a dual version (dual jet) is available for use with DIL chips. The slim-line, focused air flow, actuated by a finger switch on the handle, ensures safe installation of surface-mounted components: it enables solder paste to be reflowed rapidly and accurately without affecting adjacent components.

**TT65 thermotweezers:** This dual soldering iron (see Fig. 10) is rather like hot chopsticks! Both elements are temperature controlled. Tips for removing chips and other surface-mounted components come in pairs. Leadless chips that have their legs curled beneath them, as in the Grundig VS500 series of VCRs, are particularly easy to deal with using the thermotweezers. There are triangular tips for i.c.s, which you approach from each corner: clamp it, heat it then simply lift it off the PCB. Small tweezer-shaped tips can be used to heat and lift most small, flat surface-mounted components. Tips with flat, parallel blades can be used to heat and lift DIL i.c.s. It's easy to remove components single-handedly in tight situations without harming adjacent components. The use of hot air in such a situation would result in components going walkabouts.

**TP65 thermopick:** The thermopick handpiece (see Fig. 11) uses square- or rectangular-shaped tips that are similar to those used with the soldering iron: the difference with the thermopick is that the component can be lifted. It's one thing to be able to reflow the solder on the legs around a

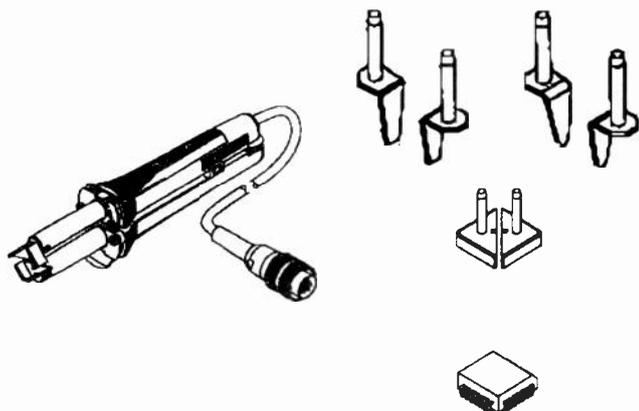


Fig. 10: The Pace TT65 thermotweezers with alternative tip arrangements.

flatpack i.c., quite another to be able to get underneath the i.c. at the same time in order to lift it off. The thermopick solves this problem by means of a self-adjusting, centre-mounted suction pad. Suction is provided by the power unit pump. Once you've reflowed the solder you operate the suction pad by means of a handle-mounted pushbutton and gently lift the i.c. off.

**Power units:** The range includes power units to drive one or more of the handpieces. The basic MBT101 powers one handpiece. It has a calibrated dial for temperature setting, using the SensaTemp system to keep the tip heat correct. There's a pressure port and a vacuum port, along with flow control. It comes with an SX70 desoldering handpiece: other handpieces can be obtained as accessories. A 'hot cubby' (stand) is supplied. This fits at the side of the power unit and has a wet sponge in its base for continual tool cleaning. Price of the MPT101E kit is £548 plus VAT.

The MBT201E double power unit kit costs £752 plus VAT and comes with two handpieces, an IR70 for soldering and an SR70 for desoldering. Two temperature setting dials enable each handpiece to be adjusted independently. Pressure and vacuum ports with Snaplock fittings for the SX70 are mounted on the right-hand side. There are two hot-cubby holders, one for each handpiece, that fit at either side.

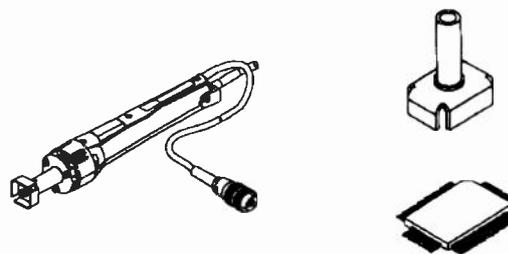


Fig. 11: The Pace TP65 thermopick with suction tip.

The top-of-the-range MBT250, a three-way power unit at £1,289 plus VAT, comes with four handpieces (IR70, SX70, TJ65 and TT65). It's the ultimate soldering station. The power unit runs three handpieces at a time with individual SensaTemp control for each of them – there are digital temperature readouts. Vacuum and pressure ports are fitted, with flow control at the pressure port. It's not advisable to use both ports at the same time as they interact. The MBT250 has a temperature offset control that works as follows. If a large tip is fitted to the handpiece, say a rectangular chip removal type, there will be a temperature drop along the body of the tip. The offset control provides compensation for this tip temperature loss, enabling the SensaTemp control system to maintain the tip temperature at the constant read-out value. There are two twin holders and a single holder for the various handpieces. Also provided are a tip maintenance station consisting of brushes and wet sponges, an operation manual and a tip offset chart (for use with the temperature offset control).

The only handpiece not supplied with the MBT250 is the thermopick which is available as an optional extra at £195 plus VAT.

### Next Month

In the concluding part of this article I'll provide a practical review of the Pace system and take a look at one or two other items of equipment for use with surface-mounted components.

# VCR Clinic

*Reports from Eugene Trundle,  
John C. Priest, John Coombes,  
Mike Leach, Mike Pritchard,  
John Pitt-Francis, Chris Watton  
and John Edwards*

## JVC HRD750

The trouble with this machine was intermittent failure of circuit protector CP802 in the motor 12V line. When failure had occurred the machine would perform no deck functions, switching itself off after eight seconds. The cause was an expensive one: an intermittent short-circuit within the capstan motor. **E.T.**

## Sony SLV353

If you get one of these machines with the complaint that it damages or snags the tape, often intermittently, during the eject operation feel the half-loading arm: it will probably be very stiff on its shaft, as a result of which it will be slow to retract. If it doesn't get there by the time the cassette moves up, it's bad news for the tape! The cure is to clean and lubricate the arm's shaft and bearing. **E.T.**

## Philips DMP Deck (VR6362 etc)

If the cassette sometimes gets caught and jammed on its way into the machine, don't change the carriage ('lift' in Philips' language) until you've checked for loss of strength in the tension spring associated with the lift-operating rack at the right of the deck – it's no. 275 in the exploded view of the deck shown in the manual. **E.T.**

## Sony SLV625

The spool-rotation sensors are a weak spot in this and similar Sony VCRs. This particular machine would play or record for about half an hour then shut down with the letter L displayed in the place where the hours digits normally live. Thereafter it would shut down as soon as any tape forward mode was selected, though it was quite happy to run in the reverse modes. The cure was to replace both the optocouplers, HP001 and HP002, under the deck. Type number is PS6002. **E.T.**

## Audio/Control Heads

Have you noticed the increased failure rate of AC heads in more modern machines? I have and know of several machines that are ten or more years old and still carry on operating reliably with their original AC heads which show little visible sign of wear. It is becoming necessary to replace AC heads in a growing number of newer machines however, because of wear to either the linear audio head or the sync head – or both.

If you have problems with intermittent loss of capstan sync or trouble with low or muffled sound, especially with playback of a machine's own recordings, take a good look at the face of the AC head. Visible wear, curvature of the surface of the polepieces etc., is enough to condemn the head. With some heads you find that the whole face shows a vertical bronze stripe where the original chromium surface has worn away.

The common denominator with these machines is that they nearly all feature index search. Consequently the tape remains fully laced during wind and rewind as well as during record, play and search. Thus during any

record/rewind/play sequence the amount of AC head wear is increased by fifty per cent: much use of the index search/shuttle features only adds to the problem. The incorporation of a half-load or reverse back-tension arm increases the wrap around the head and contributes to increased head wear.

When you remove a faulty head prior to replacement, examine the top and bottom polepieces to see if there's been uneven wear, i.e. the audio head is more worn than the sync head or vice versa. This indicates incorrect alignment of either the head's vertical setting or the half-load/reverse-tension arm. When fitting the replacement head/assembly it's essential to take extra care with the alignment. Note the manufacturer's recommended back-tension setting and the alignment of the AC head and half-load arm – as well as carrying out the usual checks on the entry and exit guides etc. The tape path arrangement during rewind or reverse search is particularly important. Tape tension in these modes can be measured accurately only by using a tentelometer – if you can afford one! The usual back-tension cassette works only in the forward play mode.

Another side effect of index-search machines being fully laced in all modes is increased lower drum assembly wear. This eventually imposes additional friction on tape movement, showing up first as poor tracking in reverse search and/or throwing loops of tape during extended periods in this mode. When the lower drum needs to be replaced it's usually best to replace the whole unit, including the upper drum. Check the condition of the soft-brake band and the back-tension arm at the same time. Give a realistic estimate for this sort of job as the customer, when faced with a bill for a full drum assembly together with AC head replacement, new soft brake, idlers, clutch, belts plus cleaning and lubrication etc. and all the work involved in such an extensive overhaul, will often decide to trade in the machine in favour of the latest model with Nicam sound and VideoPlus. **J.C.P.**

## Orion D4500A/GSC

A common fault with these machines and several other Orion VCRs that have a similar power supply module is no functions and no display. The machine will probably come in with a cassette loaded but will neither eject it or lace up, and no keyboard or remote control commands will operate. Check the switched 5V and 12V supplies (the manual calls them p.con 5V/12V) at pins 4 and 5 of CP502 on the power supply panel. If they are absent check for 13V at pin 6 of the STK5342 regulator chip. If this voltage is low or zero, before condemning the chip check R508 (10k $\Omega$ ). It will probably have gone high in value or open-circuit.

Other models that have a similar power supply module and suffer from the same fault are the D1000/D1100/D2000X/D5000/VXL12. Model VL is prone to the same fault but in this one the regulator is type STK5332 and the suspect resistor is R2508. **J.C.P.**

## Hitachi VT63

With a prerecorded tape the picture was unwatchable when the tracking control was in its centre position. If it was

moved to either end there was a stable, watchable picture. We found that the f.m. envelope varied and couldn't be corrected by operation of the tracking control. Replacing the audio/control head provided a complete cure. **J.C.**

### **Panasonic NVG21**

Intermittent tape take-up, or the tape being caught in the carriage during eject, can be caused by a faulty play arm. It can also be caused by a stiff mounting post. The remedy is to replace the play arm unit and lightly oil the play arm's mounting post. **J.C.**

### **Sharp VCA105HM**

If there's a jammed tape check for foreign bodies in the machine then check whether the tension arm assembly is bent, preventing the loading arms moving to the unloaded positions. If the latter is the cause of the problem, replace the tension arm assembly, band brake and spring. **J.C.**

### **Panasonic NVG45**

Failure to accept tapes is often caused by a faulty timing belt. In one case recently however the flywheel was at fault: the collar that provides the belt drive had become detached. Check the flywheel by replacement. **J.C.**

### **Toshiba DV80**

If F803 has gone open-circuit you will often find that the machine works normally for some time after fuse replacement. The cause however may well be dry-joints at the junction of diodes D801/2 (the earthy end). **J.C.**

### **Tashiko VVE921/GoldStar GHV12211**

Problems in the i.f. department are becoming all too common with these machines. This one was no exception. The E-E and recorded pictures were both very poor: tearing was evident at the top, and the luminance content was very low. The cause of the trouble turned out to be a leaky capacitor, C704. It's a 1 $\mu$ F, 50V type that's mounted close to the LA7530 i.f. chip. **M.L.**

### **Hitachi VT17**

As with all machines that have a few years of service behind them head wear is becoming a problem with this model. This particular machine's symptoms were poor playback with a lot of tracking noise evident with prerecorded tapes: reproduction of the machine's own recordings was poor, but not quite as bad as with prerecorded tapes. We tried fitting some second-hand heads from a scrap machine but the fault persisted. Replacement of the relay behind the head drum assembly also made no difference. The clue to sorting out the problem was the fact that the tracking control seemed to be loose while we couldn't find its centre position. The control turned out to be open-circuit, a replacement restoring normal results. **M.L.**

### **Amstrad VCR6100**

The complaint with this machine was of wow on sound. We replaced the take-up clutch and pinch wheel but the problem persisted. So we ordered an HIC401 hybrid servo chip from CPC. On inspecting the faulty chip we saw that C3 (33 $\mu$ F, 10V) was leaking and thus of low capacitance value. It's not

visible until the chip is removed from the PCB: next time a cheaper repair will be possible. **M.P.**

### **Saisho VR1200HQ/Matsui VX820**

In the play and record modes this machine would lace up and then run for only three seconds. Since the machine would start to operate normally we suspected a false end-of-tape message from the left-hand end sensor. For once we were right first time! **J.P-F.**

### **Toshiba V109B**

A cassette stuck in the machine and no loading motor life took us back to the power supply regulator, where we found that the 12V supply was missing. A temporary bypass, using a 78012 chip, proved the point. Replacing the STK7248 chip completed the repair. **J.P-F.**

### **Matsui VX880/Saisho VR1600/Hinari VXL4**

There was intermittent poor lift operation. It was sometimes dead, and appeared to overshoot the end stop during the eject cycle. Both leaf switches were tested and found to be o.k. Fortunately another similar machine came in – we tried its lift and got the same results. This led us to the mode control switch which, when checked with a component tester and scope, produced some very ragged on-to-off changeovers. A replacement put matters right. **C.W.**

### **Philips VR6462**

Lift problems said the card, and the tape wouldn't go in. We found that with a cassette inserted and then a key pressed it went down and everything worked correctly. The switch on the lift assembly has to be pressed and released before the lift will go down. If the cassette is put in and doesn't come out a little the lift will stand still. It all depends on the cassette being pushed out after being pushed in by the user. If you look at item 2421 on the lower side of the deck you'll see that there's an eccentric nut with a locking screw. Adjustment of this determines how far out the cassette is ejected after being inserted, and hence the action of switch 204 (lift switch tape in). The adjustment enables a small amount of mechanism wear to be taken up. **C.W.**

### **JVC HRD640**

This machine worked correctly until play was selected after pause or reverse search. It would then unlatch and enter the stop mode. The cause turned out to be the mode control switch. **J.E.**

### **Amstrad VCR4600**

When play was selected the machine went straight into forward picture search. Replacing IC302 (BA718) cured the problem. **J.E.**

### **Toshiba V93**

There was a normal tape playback picture but no front display and only snow in the E-E mode. The cause was traced to circuit protector 2L62 (ICP-N10) on the timer-2 PCB being open-circuit. A long soak test after fitting a replacement proved that all was well, with no other cause apparently being present to make the CP go open-circuit. **J.E.**

# What a Life!

**Donald Bullock**

Bringing son Steven into the business was a rare brain-wave on my part. I still can't understand how he's learnt so quickly what it took me forty years to learn. The bonus is that I no longer have to stay rooted to the workshop each and every day – there's nothing like a spell away from the bench. Another interesting thing is that Steven doesn't mind making field calls. I stopped that years ago, having reached the stage where my eyes would glaze over as soon as I was corralled and the usual prattle began.

## **Last Straw**

It was the Blakeways who finally made me give it up. I'd already called on Mrs. Pratt (no picture) to remake her aerial lead connection yet again, slyly catching her dog's face with my service case in the process. It was a huge, overfed dog that used to roll on the lead and pull it from the set. Though I explained the cause of the trouble twice a week for years, Mrs. Pratt always reacted as though it was something new.

"Oh Bonzo, you silly big softy! What's mummy going to do with you?"

Then, as she turned for her purse, I'd catch it under its snout and it would throw itself about and howl.

"Dear Bonzo" she'd say, "don't take it so. I didn't mean it!"

After my last visit I went on to the Blakeways, whose set lived in a corner amidst a maze of wires, old shoes and goodness knows what else.

"Never bin right since you last did it. . . Hums now. Never watches it meself. . . wife and children. . . Which is the best set anyway? Gets hot you know, never used to."

"My husband thinks it's the valve. . . or the condenser. . . Is renting a good idea? Irene next door had trouble galore then rented. . . No more trouble. . . Special sets y'know."

"Can't be the tube, 'cos the sound's all right. . . How can you tell when the tube's gone?" Then, pointing to the aerial lead, "that the tube then? We was watching, er, what was we watching Doll? ITV, I know. That one where they guesses things and there's the thin Irish chap with the mouth. . . or was it Eastend Neighbours? Like that Rosebud in May chap, don't you? Did you see the one. . . Reckon the colours really right? 'Ow long before we won't need no aerials? We were about to come and pay for what you did last year when it went again. . . Ain't gotta take it 'ave you? That all it was? 'Ow much for that little bit then? Tell you what, we'll see 'ow it settles down. . ."

## **Out in Spain**

My Amstrad PCW8512 wordprocessor failed during a recent visit to Spain. Field Collapse. I had a service manual, which had come surprisingly cheaply from Willow Vale, and it didn't take me long to establish that the LA1385 field timebase chip was the cause of the trouble. But where to get one? I telephoned JJ Components and received a couple within a few days. Jay and his wife Lata run this excellent little firm. They are two of the most

helpful and decent people you could wish to meet, and their latest catalogue is a gem.

## **Scrambled Signals**

The availability of 'alternative' Sky TV decoder cards was mentioned in an article in *Television* recently. Such cards are widely advertised in Spain, where dish television is popular amongst the thousands of British residents. Can't think why, but there we are. One firm offers Sky cards at £220, with D2-MAC cards at £150. Another offers a 'cardless decoder'. "Save hundreds of pounds" says the advert, "we have the solution and you buy it only once." There are also companies that provide all the decoded channels by cable for less than the price of a card. I don't know what would happen if the encoding changed.

Dish reception is quite good in Spain – provided a large dish is used, preferably 1.2m or more, plus a very low-noise LNB. Personally I wouldn't bother, having sampled the programmes. But it's a funny old world. Fancy people paying to watch commercial television, and paying twice to watch BBC television.

This encoding business got me thinking. Some channels display no chroma while others do. Some seem to suffer from degraded luminance bandwidth, and all mess about with the line scanning.

I looked up the VideoCrypt circuitry in a Pace manual. It's printed on pink paper overlaid with deep grey bars. This makes it tedious to read. So I copied it which is not, of course, impossible. Basically the video signal is converted to digital form and fed into a pair of line-duration memory chips. When told to do so a following latch switches the processed signal to a digital-to-analogue converter. Processing is controlled by the split output from a 28MHz master oscillator: the 14MHz outputs are divided again to produce 7MHz and 3.5MHz clock signals.

The smart card needs two supplies, one at 5V which is switch controlled and another that can be varied between 5V, 12.5V, 15V or 21V as commanded. For those who might be wondering how the on-screen messages remain clear and locked on the scrambled screen, well they simply pass straight across to the video output stage while the previously mentioned processing is going on.

What I find interesting is not the fact that a few have cracked the encoding, but why this hasn't been more widely cracked. I would have thought that almost any competent electronics technician, given the broadcast signal, a decoder-receiver, its circuit diagram and an oscilloscope would pretty quickly be able to see what's going on and what could be done about it.

## **Tuning Problem**

Like Greeneyes, some VCRs have extensive wardrobes. The Nikkai NVR100/500RC for example often appears as the Solavox NCVR1000/5000, the Sentra GX8000 and the Alba VCR3000/4000X, not to mention the Amstrad clones. One we had in recently wouldn't tune properly. Some channels couldn't be got at all. Others had crackling on sound and on E-E and video. In the end we found that the cause was in the converter box, a replacement providing a cure.

## **The Trews' Bush**

Mr. and Mrs. Trew called in the other day with a Bush colour portable, Model 2114. She placed her hand in the small of his back and he spoke.

"We think it wants adjusting, Mr. Butcher."

"Don't like that word" I replied, "but tell me more."

"When we turned it on last night it squealed and hissed, then smoked and burnt and went off. Would you need to keep it a while, Mr. Bullrush?"

"I sure will, if not longer."

As they left Steven came in. I handed him the set. "It squealed and hissed, smoked and burnt and went off" I said, "and it's all yours."

### Clarence's Video

As Steven settled to do it Mrs. Runner called in with her son Clarence. He was carrying a Samsung S11260 VCR.

"Tell Mr. Bullock what's wrong, Clarence" she said. Clarence opened his mouth but his mother spoke.

"It takes the tape in all right doesn't it, Clarence?" As Clarence breathed in to speak his mother continued.

"And it whirrs, doesn't it, Clarence - and what else is it?" Clarence shifted his stance and opened his mouth, but it was no good.

"Oh, and he can't get his tape out, can you, Clarence?" Then she smiled. "It's an educational tape, Mr. Bullock. He thinks the world of it. Likes to study, he does. Spends his life in his room with that recorder thing, you know."

When they'd gone I tried the machine. There was no E-E picture but the sound was there. When I tried to eject the tape the machine switched off.

I decided to make a few checks in the power supply and found that the 5V line was low. This brought me to a couple of diodes, D109 and D110, that were leaky. After replacing them I tried the machine again. It worked perfectly. Then, wondering what Clarence was studying so intensely, I inserted his tape and pressed play. Then I pressed stop as quickly as I could and took the tape out. Wherever had Clarence got it from? And hadn't there been more legs than arms? I boxed the machine up, put the tape on top of it and placed the lot to one side. Just then Steven called over.

### The 2114's Problem

"Got the Bush done!" he exclaimed. He had, too. The picture and sound were excellent. "Found that C806, a 1,000µF, 16V l.t. reservoir capacitor, was down to 300µF. It had also blown its top. R811, the 1Ω surge limiter in the h.t. supply, was open-circuit. C409 (220µF, 25V) which smooths the supply to the line driver stage was down at about 80µF and C818 (1µF, 50V) in the regulation network was faulty. It's a TDA4601 type power supply. I'm getting to know these sets quite well. Reckon that the Trews went on using theirs, even though they know that it had problems, until it blew up."

"One that came in the other day was squealing, would tune only to BBC-1 and had vertical tearing. C818 had gone low in value again. As a result the h.t. was low and spiky."

### Return Calls

Next day the Trews trudged back, him in front. "Have you adjusted the set, Mr. Buzzard?" he piped.

"You could say that, Mr. Twap" I beamed. "And if you've got your cheque book we can do the same to your bank balance."

Then Mrs. Runner came in with Clarence for the Samsung video and his tape.

"Thank Mr. Bullock for doing it so quickly, Clarence" she said. Clarence took a gulp of air. "He don't say much, Mr. Bullock. Heaven knows why. But he can get back to his studying now. He's brighter than he seems, you know. Knows what it's all about."

"Can't deny that, Mrs. Runner" I said.

# Next Month in TELEVISION

## SERVICING THE PHILIPS GR1-AX CHASSIS

The Philips GR1-AX chassis was designed to drive 90° tubes with screen sizes from 14 to 21in. Although it's been around for some time many engineers are still not familiar with it. The unusual power supply could be the reason for this - a series chopper circuit with a f.e.t. as the active element. It does in fact have some consequences for servicing. But you'll be at ease with the chassis after reading Steve Cannon on the subject.

## SATELLITE RX TUNING THE EASY WAY

With the ever increasing number of satellite channels available a quick and easy way of updating a receiver's preset tuning is helpful for installers. A simple, elegant method is to use an EEPROM for this purpose. Gordon McCrea describes how it can be done with the popular, upmarket Nokia Model SAT1700.

## THE VERSATILE LM317T

This adjustable output (1.2-37V) voltage regulator chip has been around for many years. It's a useful device to have in stock for repair purposes when an unusual regulated voltage is required, and comes cheaply. There are other uses to which it can be put. Gordon Haigh describes the device's capabilities.

## SERVICING FEATURES

In next month's packed issue we hope to include more notes on Toshiba fault finding, further information from Steve Beeching on dealing with surface-mounted devices, and another CD player servicing article from Les Austin.

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# Modern TV Receiver Techniques

## Part 16: Tuning and Memory Systems

Eugene Trundle

Back in Part 2 of this series (February 1993) we looked at the operation of a varicap TV tuner and saw how, by varying the positive bias voltage applied to the cathodes of its varicap diodes, it can be made to tune across the u.h.f. band – and, if necessary, the v.h.f. bands. As Fig. 1 shows, in modern tuners

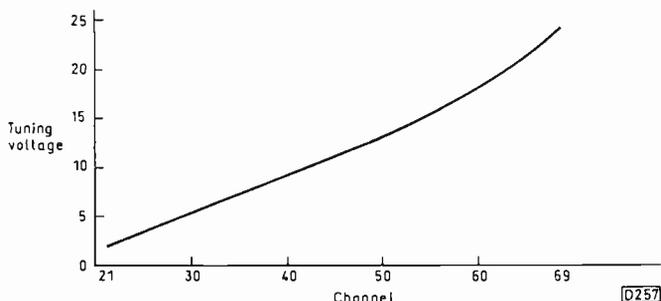


Fig. 1: Typical varicap tuner tuning voltage/frequency characteristic.

the relationship between the bias voltage and the tuning frequency is almost linear – with earlier types of tuner the voltage/tuning characteristic curve was more curved.

### Simple Tuning

The simplest way to arrange for tuning and channel selection is shown in Fig. 2. A stable voltage of about 32V is developed across a zener-like regulator and is fed to a number of potentiometers that are connected in parallel. Their sliders tap off preset voltages that correspond with the required local transmissions, channel selection being carried out by means of switches that may be mechanical, as shown here, or electronic. Touch pads, light-touch keys or a simple remote control system may be used to operate the switches. Minor tuning errors caused by drift in component characteristics with age or imprecise adjustment of the potentiometers are cancelled out by the action of the a.f.c. (automatic frequency control) circuit. This produces and feeds back an error-correction voltage obtained by sampling the i.f. signal. When this correction voltage is added to (or subtracted

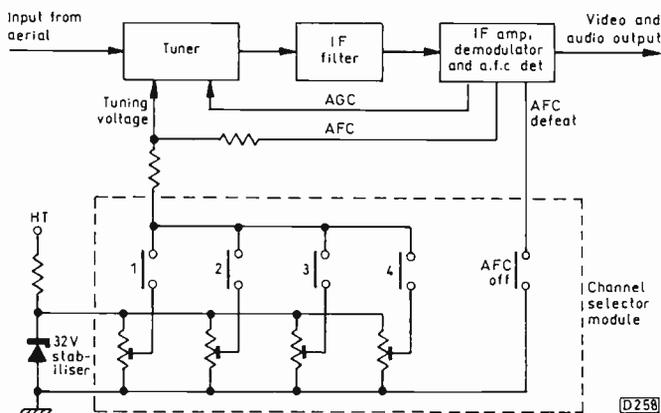


Fig. 2: Simple electromechanical system for obtaining the required tuning voltages. The a.f.c. loop is disabled during station tuning.

from) the voltage obtained from the potentiometer a closed-loop is created, keeping the tuning spot-on. The a.f.c. action can be switched off to avoid system hunting when a potentiometer is being adjusted.

This system served well for many years. It was eventually replaced, in all but the simplest sets, by more sophisticated electronic tuning arrangements that are more accurate and versatile. If required these can store scores of 'tuning points' which can be called up at the touch of a button; they provide tuning and channel memorising via a remote control handset; and some enable channels to be preset in the absence of a transmission by simply keying in carrier frequencies or channel numbers, with on-screen readout of the carrier frequency. There are two basic types of all-electronic tuning: voltage-synthesis (VS) and frequency synthesis (FS). They can be distinguished by the presence or absence of a prescaler, which provides direct feedback from the local oscillator in the tuner to the control circuit.

### Voltage-synthesis Tuning

Fig. 3 shows in block diagram form one type of VS tuning system. The microcomputer chip used for control purposes in the receiver contains a pulse-width modulator (PWM) capable of producing a precise squarewave output with a very wide range of on/off times, i.e. from very narrow pulses widely separated to relatively broad pulses that are close together. These are integrated to produce the

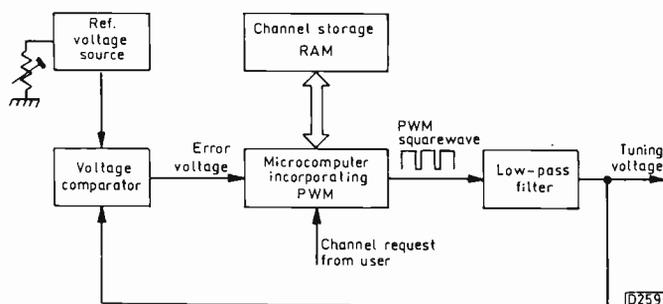


Fig. 3: Principle of voltage-synthesis tuning using a reference voltage obtained from a single manually adjusted preset potentiometer.

bias voltage, over the range 0-30V d.c., for application to the tuner unit's tuning-voltage pin. Integration is carried out by feeding the squarewave signal to a low-pass filter: the smoothed output from this varies with the on/off ratio of the squarewave – narrow, widely spaced pulses produce a small output voltage while broad pulses produce a high output.

To preset a channel, a single tuning potentiometer is used to supply a reference voltage to a voltage comparator whose other input is the output from the low-pass filter. The error voltage thus obtained is passed to the microcomputer chip which adjusts the on/off ratio (duty cycle) of the squarewave signal until the output from the voltage comparator indicates that its two inputs are the same, i.e. the preset reference and the tuning voltages are identical. This voltage is converted to a 13-bit binary word within the microcom-

puter chip. When the 'store' key is pressed, the 13-bit word is passed from the microcomputer chip to a non-volatile memory for storage – in location one for BBC-1, location two for BBC-2 and so on. If used to store only tuning data a 1Kbit RAM can memorise the tuning points for 76 channels. Use of a 13-bit word enables 8,192 tuning voltage levels to be defined: on a 0-30V basis, this represents progressive steps of 3.66mV, each of which will alter the tuning point in a tuner covering the u.h.f. band by about 46kHz. This gives 174 possible tuning points within each 8MHz TV channel (system I), which is more than enough for fine tuning.

When the user subsequently calls up one of the memorised channels, via a remote control unit or set-mounted keypad, a memory address is generated and fed to the memory chip which in turn supplies the required 13-bit

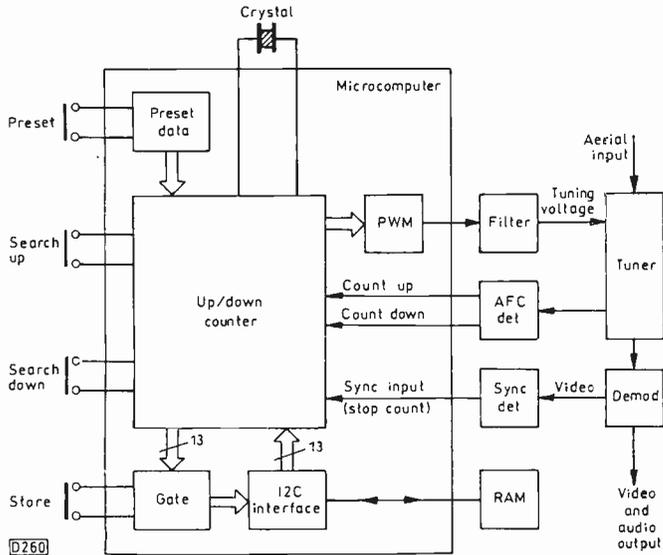


Fig. 4: Simplified block diagram of a key-controlled voltage-synthesis tuning system using a microcomputer chip.

word to the microcomputer chip, enabling it to adjust its pulse-width modulated output to produce the correct tuning voltage. We'll look at the arrangement and operation of memories later.

Fig. 4 shows an alternative and later form of VS tuning, using up/down search keys. When the preset key is pressed the microcomputer chip enters the tuning mode. The currently selected memory content is present in the up/down counter, which is incremented (count up) or decremented (count down) by the action of the search up and down keys respectively. As the count increases, the duty cycle of the output from the PWM increases likewise and as a result the tuner searches up the band. In some sets an on-screen line or dot display is generated as this is done. When a TV station has been found, feedback from the vision demodulator or line sync circuit (indicating that line sync pulses are present) to the microcomputer chip stops the count and holds the PWM output steady. At this point the new count is present as a 13-bit word in a register in the counter and there are three possibilities: further searching up or down; reversion to operation as before if nothing is done to the presetting keys; or, at a touch on the memory/store key, the new 13-bit data word is stored in the memory, overwriting anything previously present at the particular location. When the newly stored channel is subsequently selected, the previously described read-from-memory and voltage synthesis process (PWM output change and filtering) is carried out.

The a.f.c. action depends on a tuned circuit associated with the vision demodulator: it produces an output voltage that's

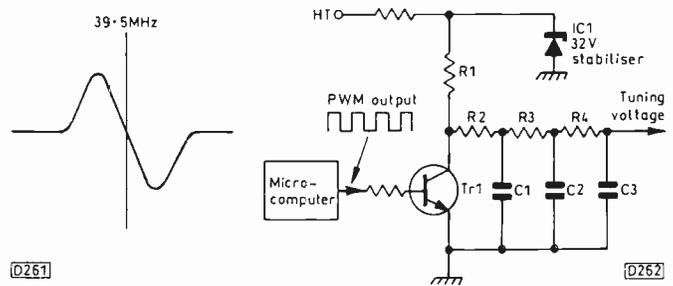


Fig. 5 (left): A typical a.f.c. detector response curve. When the tuning is spot on, 39.5MHz is at the half-way point on the downwards slope and the output is zero. As the tuning varies, the slope moves to the left or right and a correction voltage is produced.

Fig. 6 (right): How the tuning voltage is obtained using a variable duty-cycle pulse train. The charge developed across the filter capacitors C1/2/3 depends on the on/off times of the switching transistor Tr1.

proportional to any frequency variation from the correct vision i.f. of 39.5MHz (see Fig. 5). This correction voltage is used within the microcomputer chip to produce a limited change in the up/down count, pulling the tuner's local oscillator on to the correct frequency and holding it there.

### The Low-pass Filter

The tuning voltage fed to the tuner must be smooth, noise free and correspond exactly with the condition set by the PWM pulse train. In most circuits the pulses are of 5V peak-to-peak amplitude. They are used, as shown in Fig. 6, to switch on and off an npn transistor (Tr1) which alternately links an RC filter (R2, C1, R3, C2, R4, C3) to a 'soft' 32V supply (via R1, transistor off) and chassis (transistor on). With a 50:50 mark-space ratio squarewave the transistor will be conductive for exactly half of each duty cycle and exactly half the 32V will be present across C3 at the end of the filter. The action of the filter is to integrate the pulses present at the collector of Tr1.

### Frequency-synthesis Tuning

The two systems described so far employ a feedback loop that includes the local oscillator in the tuner, the loop being completed via the a.f.c. circuit. The effect of the feedback is limited to compensating for any drift away from a manually-set tuning point. In a frequency-synthesis tuning system the tuner's local oscillator frequency is under the control of a precision frequency reference, usually provided by a 4MHz quartz crystal. This makes it possible to pre-program the tuner without any reference to actual transmissions, so long as their frequency is accurately known. It also eliminates any drift or ageing effects in any part of the system unless the crystal itself is responsible, and crystals are not prone to that sort of thing.

FS tuning is vital in equipment such as communications transceivers and satellite receivers: in the latter case factory presetting of transponder channels and user-friendly channel selection is important. In theory there's no need for a.f.c. with an FS tuning system because it can't drift. In practice a.f.c. is usually provided, to cater for unstable signal sources such as those provided by computer games and VCRs – these use an LC oscillator, which is subject to frequency drift with time and temperature, to generate the carrier signal.

There are two basic forms of FS tuning, the phase-locked loop (PLL) and the counter system. Fig. 7 shows a PLL system in simplified, block diagram form. Within the tuner or, in older designs, adjacent to it a prescaler that's capable

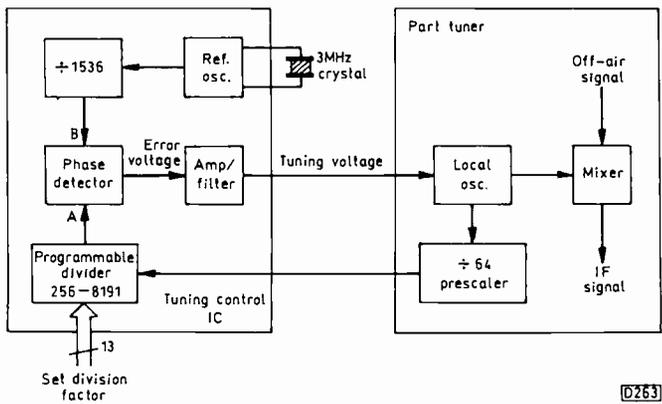


Fig. 7: Block diagram showing frequency-synthesis tuning by means of a phase-locked loop.

of handling frequencies up to about 1GHz divides the output from the local oscillator by 64. The counted-down frequency ( $f_{osc}/64$ ) is fed to a programmable divider within the tuning control chip. This, depending on the divide factor instruction fed to it, carries out a further count down to produce one input (A) to a phase detector. The detector's other input (B) is derived from a crystal-controlled 3MHz reference oscillator after a fixed division of 1,536 times. 3MHz divided by 1,536 produces a 1.953kHz signal. Whenever there's a frequency or phase difference between its A and B inputs the phase detector produces a d.c. error voltage whose polarity depends on the direction of the frequency difference, i.e. on whether input A is faster or slower than input B, and whose amplitude depends on the actual phase/frequency difference. This error voltage is used to control the varicap tuner's tuning voltage. When the tuner's local oscillator is at the correct frequency, the two inputs to the phase detector are identical, no error voltage is produced and the tuning voltage is stabilised at the correct level. The PLL thus locks the local oscillator to a multiple of the 3MHz reference frequency. The exact multiple is set by the division ratio of the programmable divider, which in this particular example can divide by anything from 256 to 8,191. Thus to change channel all that's necessary is to supply the divider with a coded instruction to alter its division ratio to correspond with another known, pre-programmed channel frequency. Let's see how this works.

We know that the local oscillator must run at 39.5MHz (the vision i.f.) above the incoming carrier frequency, and we know the standard CCIR vision carrier frequency for each TV channel. To take an example, the vision carrier frequency for channel 41 is 631.25MHz, so to tune in this frequency the local oscillator must run at  $631.25 + 39.5 = 670.75$ MHz. The output from the prescaler will then be 10.48MHz. To produce a 1.953kHz input for the phase detector the programmable divider's division ratio must be  $10.48/1.953 = 5,366$ . So this is the ratio for channel 41. It's one of say 100 ratios available to cover all the CCIR-standard TV channels in the four bands used for terrestrial TV transmissions. To change to another channel the division ratio is altered. As a result the inputs to the phase detector differ and an error voltage is produced. This in turn adjusts the tuning voltage. Once the inputs to the phase detector are the same there is no error voltage and the tuning voltage is stabilised at the new level. Should the local oscillator frequency vary, an error voltage will be produced and the system will pull the oscillator back on to the correct frequency.

Each channel instruction (for a specific division ratio) is held in a ROM in 13-bit form. For channel 41 the 5,366 division ratio is (in this particular design) produced by the 13-bit binary word 101001110001. A division ratio of 6,838 gives

us channel 64, the corresponding binary code being 1101010110001. Thus the ROM needs to have 100 memory addresses in this example each with the appropriate code to produce a specific channel.

When the user selects say channel 41 the contents of ROM address no. 41 will be read out and fed to the programmable divider's instruction register. It will then switch to the required division ratio. Fig. 8 shows the basic hardware required for this sort of system. Search and store facilities are provided.

Continuous tuning is not possible with an FS system, but small discrete steps can be made. In our example the reference frequency of 1.953kHz and the prescaler division factor of 64 gives a minimum step of  $1.953 \times 64 = 125$ kHz, so that there are 64 separate tuning points across an 8MHz wide channel. For finer (62kHz) steps a 4MHz crystal can be used with a fixed 512 divider, a local oscillator prescaler division

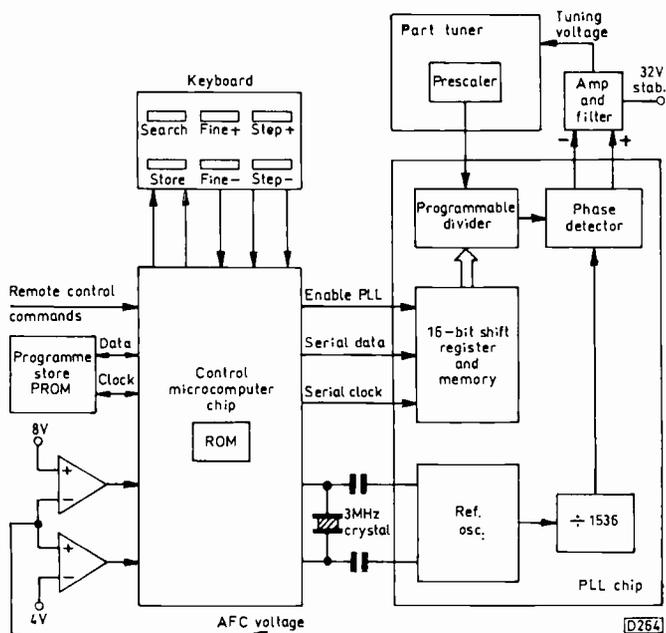


Fig. 8: Practical implementation of the system shown in Fig. 7. Three i.c.s are involved.

factor of 8 and a programmable divider ranging from  $\div 256$  to  $\div 16,383$ .

### Pulse-counting FST

An alternative and at present widely-used system differs from the phase-detector type just described in using a pulse-counting technique. Fig. 9 outlines the basic idea. The reference source here is a 4MHz crystal whose output is divided by 512 to produce a fixed 7.8125kHz squarewave with an on period of 64µsec. This is one input to an and gate whose other input is the tuner's local oscillator frequency divided by 256. During the 64µsec timing period, the 15-bit frequency counter clocks up the local-oscillator derived pulses. When the and gate shuts off at the end of a 64µsec stint, the contents of the counter are presented to a 15-bit comparator which has been loaded, by the system control microcomputer chip, with 15-bit channel tuning data – either from the microcomputer's ROM in the preset mode, from its up/down counter in the search mode or from the non-volatile station-memory PROM for routine channel selection. Any difference is fed to a digital-to-analogue converter which produces an error voltage to adjust the tuning. When the tuning is spot on, the data in the two halves of the comparator are exactly the same and no

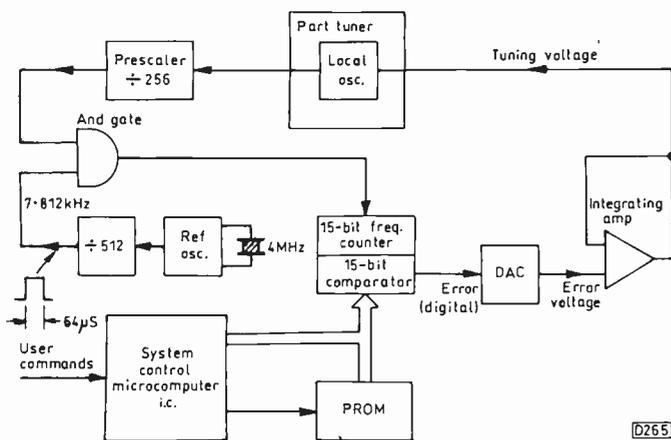


Fig. 9: Basics of a frequency-synthesis tuning loop using a pulse counter.

error output is produced. Once again the tuner's local oscillator is under the control of a crystal oscillator.

### Tuning and AFC

While modern tuning systems are based on one or other of the principles described above, there are differences in the software (microcomputer program) to give improved performance and better user friendliness. You find such features as auto-tuning lock, variable-speed band-search, tuning offset memorisation and a.f.c. window control. Typically the initial search process takes place in 1MHz steps until the microcomputer chip receives a stop signal from the vision demodulator circuit. The PLL count-down ratio is then changed as appropriate, the nearest CCIR channel is called up, tried and if necessary adjustment is carried out in 50kHz or 62.5kHz steps until the a.f.c. feedback is correct. Once correct tuning has been achieved the digital system becomes inoperative – so long as the tuning stays within a window whose width is programmable and within which the a.f.c. circuit has a free hand: if the tuning drifts outside this window, the digital system takes over again. This permits tracking of a carrier whose frequency wanders.

The trend is towards increased integration. In the latest TV and VCR models the entire synthesis circuit may well be within the tuner itself, which has I2C clock and data pins to enable channel changes to be requested. A chip such as the SDA3202 may be used, employing the principles previously described.

### Programme Memories

The non-volatile memory, an EEPROM (electrically erasable and programmable read-only memory), may be within the control chip or separate, with 1Kbits or 2Kbits of memory and a serial data input/output system. These data stores generally use floating-gate technology, see Fig. 10(a): an n-channel CMOS FET storage element has two gates, the one nearest the channel being completely 'buried' in silicon dioxide and thus fully insulated. To write data into this transistor memory cell a voltage of about 25V is applied to the outer gate. This forces electrons through the thin silicon dioxide layer to charge the floating gate, after which the transistor element becomes 'immune' to the normal operating voltage of around 5V. Thus a single bit of information has been locked in and will remain there for ten years or more. To reprogram the cell the 25V supply must again be applied, this time in reverse, to force the floating gate's charge into the drain.

In an EEPROM each memory cell consists of the storage transistor just described and, in series, a switching transistor,

see Fig. 10(b). To erase the cell, the switch and data lines are raised to 25V while the column line is earthed. To write into it the switch and column lines are raised to 25V while the data line is earthed. To read out the data the switch and data lines are raised to 5V and the column line is earthed: the read pulse switches a written into cell so that it sends a current pulse to the output via the column line but has no effect on an erased (uncharged) cell. Early EEPROM designs such as the SDA2216 require this separate 25V or 30V supply for erasure/writing, as just described: later ones use an on-board voltage multiplexer that works with the 5V VDD supply.

In addition to storing tuning data the memory in a control system is used to store data on analogue functions such as brightness, contrast, colour and volume levels. Where the service adjustments (picture geometry, line phase, decoder setting up etc.) are provided in software form the data for them is also stored in the EEPROM. Some sets have provision to program such things as the VCR time-constant and

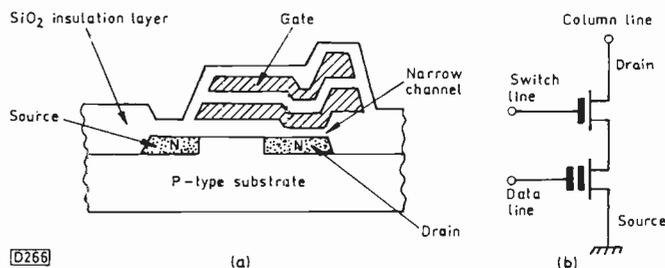


Fig. 10: Physical arrangement of a floating-gate CMOS storage FET element (a). Circuit of a switched cell that provides erase, write and read operations (b). A couple of thousand of these memory cells will be present in a typical non-volatile EEPROM chip.

tuning offset per channel: again this is all stored in the memory. It's fed in and out along the I2C lines (one clock and one data). Where a large memory is required, two EEPROM chips can be stacked: for use as a memory extension the second chip's A0 address line is connected to the VDD supply. The technique can be used to operate four EEPROMs by using the A0, A1 and A2 lines in this way.

### Satellite Programme Tuning

As we saw in Part 2, the local oscillator in the indoor tuner part of a satellite TV system operates in much the same way as a u.h.f. tuner's local oscillator. The principles and practice are the same, and sometimes the same chips are employed. Again a.f.c. is used, this time to compensate for possible LNB oscillator drift. In a satellite receiver for the general consumer market FS tuning is essential so that popular satellite transponders such as the Astra group can be factory pretuned and a track can be kept on the many transponders, radio channels etc. on offer, typically via an on-screen frequency readout. A built-in variable band-search speed facility eases tuning at s.h.f.

The non-volatile EEPROM section in a satellite tuner generally needs to be larger than that in an ordinary TV receiver: ability to store tuning data for 100-200 programmes is called for plus software-programmed instructions on LNB frequency offsets, polarisation, sound carrier selection, audio and video de-emphasis, Wegener switching and so on. In a multi-satellite system the memory must also hold data on dish positioning, decoder switching options, LNB selection and polarisation skew. Indeed in a modern satellite receiver the control systems, digital electronics and memory amount to much more than the actual receiver functions.

### NEXT MONTH: Remote control systems

# Equipment Servicing – Ugandan Style

Joe Cieszynski

If the title above seems a bit out of the ordinary it's because the work I have been doing in recent months has also been out of the ordinary. My family and I have only recently returned from Uganda having taken part in, amongst other things, relief and development work with a mission organisation known as Youth With A Mission – YWAM for short.

Before going out we'd been told that anyone with any skills at all would be more than welcome, not only in carrying out the main relief work – which is to do with making provision for the many orphans – but also in helping to maintain the base and its equipment. With this in mind I packed a small selection of hand tools, a soldering iron and a DMM while Linda packed for the rest of us. Then off we went.

## Tasks

Soon after our arrival we were briefed on our duties. Once it was discovered that I could service electronic equipment the task of bringing the base equipment up to scratch fell on me. I was to spend about two hours each day working through a list of items that had been left waiting for someone like myself to arrive.

Now under normal circumstances this wouldn't have been too difficult. But these were not normal circumstances, not for a western engineer anyway. The main problem is that there just aren't any spares – and I mean that. My first expeditions to Jinja to locate a supplier proved more than a culture shock. You can purchase new TV sets, VCRs and hi-fi systems in Uganda, but the prices are well out of the reach of most of the population and there is no service back-up. Wherever you go to ask for spares you get the same reply: "you must go to Kenya for those". The problem with this is that two thousand miles is a long way to go for a belt kit!

I did pass one shop window that looked promising. On display were a small Altai analogue meter, a solder pump, also various VHS tapes, editing leads etc. When I entered the shop however I thought I'd gone through the wrong door. I was surrounded by

piles and piles of new shirts, all wrapped up.

"Can I help you?" asked a beaming Ugandan.

"Er. . . do you sell audio heads or belts?" I asked, feeling rather stupid looking at all these shirts.

"Oh no, you must go to Kenya for those. I have only what you see in the window."

So he sold just soldering irons and shirts.

And so it was. Each morning I would spend about two hours in a small workshop I'd made up in the back room of the main base, repairing all types of equipment despite no spares and very limited test gear. During the few weeks I was there I was to find myself doing things that I would normally class as cowboy practices. Later I realised that this was the hardest thing to come to terms with. But on many occasions it was a question of either patching the item up to give its owner a few more months' use or throwing it away. Perhaps the fact that I wasn't charging for the service made it more bearable.

There were times when I encountered things that were outright lethal, like the mains extension with bare wires at the connectors and the power socket with a kettle lead trailing from it waiting to fall into a kitchen sink full of water. Cases such as this, where health and safety were an issue, were dealt with in a more appropriate manner. The majority of the problems I had were not so serious however, and with hindsight one can see the amusing side.

I decided to keep a diary of the items I 'serviced': there follows a selection of some of the more interesting experiences.

## Audio Equipment

The first items to come my way were two identical portable PA amplifiers with built-in speaker and cassette deck. When I opened the first one hope soon went out of the window. The preamplifier board, mounted piggy-back on the cassette deck, was rather burnt and perhaps most disturbing was the fact that two 100k $\Omega$ , 0.5W resistors were burnt to cinders. My conclusion was that with

some outside assistance 240V had found its way through the board. In addition the cassette mechanism was jammed and the record/play head was badly worn. I was later to discover that every cassette head I would encounter would be excessively worn. The locals got accustomed to the muffled tones that emanate from their equipment however, and have more pressing things than new heads to spend their limited resources on.

After this rather discouraging start I turned my attention to the second unit. This one at least worked after a fashion, though the sound was intermittent, the bass control had broken off and rewind was inoperative, to mention only the more significant faults. Resoldering the dry-joints on the treble control took care of the intermittent sound problem, and by using parts from the other unit I was able to restore full operation. Pity the head was worn out.

Now for a Sony radio/cassette player. Tapes were being chewed because the take-up torque was very low. The cause of the trouble was a worn nylon drive gear. I decided that turning the gear upside down might possibly solve the problem. It did. Only the tape now had a tendency to ride up the pinch roller and crease. What happens if I turn the pinch roller upside down? Well what do you know – it works! This turned out to be one of my better repairs, but I could do nothing about the rattling speaker and, of course, the worn head.

Perhaps one of the most bizarre things that I encountered was the mains cable on a large power amplifier. As in the UK, the Ugandan mains supplies are at 240V, 50Hz, and UK-type power sockets are used. On this particular piece of equipment the cable clamp had been broken, leaving the cable to exit the unit through the metal back plate without any protection. As a result the live core had cut right through and the bare wire was resting on the chassis plate. So why wasn't the unit blowing fuses? Because someone had sawn the earth pin off the round-pin plug used to allow it to fit, with some difficulty, a square-pin socket. This was not however the reason why the amplifier had been brought to me. The complaint was of intermittent sound.

I managed to fit the cable, complete with 13A square-pin plug and cable clamp, from the portable PA amplifier I'd previously had to write off. The intermittent sound was caused by dry-joints and a dirty volume control. I cleaned the control with some WD40 I'd found, much to my surprise, on the base.

There was an interesting problem with another a.m./f.m. radio/cassette player. It was brought along with the complaint that it was dead. Repairing a break in the PCB restored the radio section to life, but the cassette mechanism refused to move. When it was stripped down further the cause was revealed: three large, dead cockroaches had jammed it. Normal operation was restored when these had been removed. Pity about the corroded head: it was actually not too badly worn.

If the dead cockroaches made me shiver, this was nothing compared to what was in store for me a few days later. A power amplifier with two intermittent 0.25in. jack inputs came in. I removed the rear cover and put my hand inside to have a tap around. Strange, I thought, didn't know that they used TDA4500 chips in power amplifiers. It was only when this large black object resembling a VLSI chip began to run around that I realised what it was – the largest spider I had ever come across. My hand came out faster than if I'd just been caught napping by e.h.t.! That was perhaps a little too close.

### **An Early Call**

Once you are known for a particular skill at the base people soon begin to seek you out, sometimes at the most unexpected times – like 6:30 in the morning. It was still dark when I was woken by the cries of my youngest daughter Ruth who had just been sick – the result of taking the dreaded malaria tablets on an empty stomach. I am not at my best at that time, and while grovelling around in the kitchen looking for a cup of water, a bucket and a cloth there was a knock on the door. I opened it to see in the black of night two white eyes and a set of white teeth that outlined a beaming smile.

"Oh, hello Moses" I said.

"Hello, how are you?" Moses replied slowly. This was the customary greeting. In Uganda you never rush into discussing what you've actually come for. It's impolite. You first enquire about each others' entire families, which takes a time. While this was in progress Moses slowly brought his hand round

to reveal a small Sony radio/cassette player.

"I was wondering if you would look at my radio."

"What, now?" With the sleep in my eyes I could hardly see the radio, never mind look at it.

"When you have time."

When I did get to look at it I found that the fuse on the primary side of the mains transformer had blown. Further investigation revealed that the voltage selector was set for 120V. The mains transformer read all right with the meter however. Now there are no fuses in Uganda. So the best that I could do was to reset the selector and, wait for it, wire across the fuse with some 5A fuse wire I found in my limited tool kit. This was a culture shock for me. As a westerner used to Health and Safety, IEE and COSHH regulations it actually hurt me to have to do that. But it was either this or throw the unit away. A recent letter from Moses tells me that the set is still working.

### **VCRs**

The base leader was very pleased to hear that a VCR service engineer had arrived. He presented me with an Akai VS3 that looked for all the world like a dismantled Mechano set. Unfortunately someone else had had a go before me and did me no favours.

The cassette lift had been completely dismantled and all the gears were missing. Though I managed to persuade the microcontroller chip to operate the mechanism without a lift in place this revealed the desperate need for a service kit. It was then that I noticed the sorry state of the audio-control head. This was without doubt the most worn head I've ever seen in a VCR. I've seen worn heads, but never like this. It must be something in the air that causes all this head wear. The machine is still there on the shelf, waiting for the next poor unfortunate service engineer to turn up. . .

The Panasonic NVJ47 that arrived late one night in the middle of a tropical storm was not so difficult. Its owner had carried it for about a mile in the pitch dark in a plastic bag to keep the rain out.

"There are mosquitoes on the screen" was his complaint.

When I questioned him about this I soon realised that what we call snow Ugandans call mosquitoes. Well it's obvious, really: they never see snow!

A quick head clean with the isopropyl supplied by the owner restored normal operation. It was fortunate that he was able to supply

this as I had no idea where to obtain it.

"Do you know where you can get spares?" I ventured, hopefully.

"Yes, from Kenya."

Oh well!

### **A Bush in the Bush**

I had taken my camcorder with me to record our exploits, and wanted to get some panoramic shots of lake Victoria. The base administrator drove me to the top of a hill where a boys boarding school stood. We were met by the deputy head, who gave us permission to enter and film.

During the course of our conversation the deputy asked what I did. And that was it! He has a physics degree and likes to dabble with TV as a hobby. Please could I offer some advice on a set with which he was having difficulty? Well I could hardly refuse after he'd allowed us into his school.

When I arrived at his home I found a very sad looking Bush TV set, one fitted with the T26 chassis. Of all the sets to practice on I thought.

I took the back off and found that the tripler was encased in car body filler while the power supply wiring was highly suspect.

"It's dead" he told me. I'd have been more surprised had he suggested otherwise.

He then produced a circuit diagram that he'd obtained via a contact in the UK. So I circled every stock fault I could remember, which was difficult as it was some time since I'd worked on one of these sets, and explained how to get the power supply to operate with the line output stage disconnected.

I think he enjoyed our chat, but I don't think it will have been much help – unless he takes a trip to Kenya for some spares.

### **Running Repairs**

There were countless other repairs that I was asked to undertake, many of them outside my usual field. We were there not only to build and repair however but also to educate and train people who, because of the severe unrest that had gripped the country prior to about 1988, had been denied such opportunities.

It was a challenging but also a very rewarding experience. My children often talk of going again, though they want to take a supply of sweets with them next time. For myself, I would probably pack a few spares – including a mixed bag of audio heads.

# Service Briefs from Toshiba

*The following information was released by Toshiba during 1988, 1989, 1990 and late 1993. Previous information published in our October and November 1993 issues (pages 850-851 and 52-3) was released during 1991 to early 1993.*

## TELEVISION

### Models 140E4B/140R4B

**Set dead with R801 open-circuit:** If over-voltage protection diode D808 is short-circuit chopper chip IC801 has intermittently caused excessive h.t. voltage.

**Tuning drift:** Replace RA05 (33k $\Omega$ ).

**Permanent or intermittent field collapse:** C312 permanently or intermittently short-circuit. Check whether R333 is open-circuit as a result.

**Intermittent failure to start:** Check values of R811/R812.

**Low h.t., Model 140R4B:** Q803 leaky.

**Intermittent failure to start up from standby or comes on but no tuned stations:** RA42 (5.6k $\Omega$ ) open-circuit.

**Line jitter at top of picture:** R402 has gone high in value.

**Low, distorted sound:** C636 short-circuit.

### Models 145E7B/145R7B

**Tuning drift:** Replace RA05 (33k $\Omega$ ).

**Dead set (may sometimes start up):** R815 open-circuit. There will be some h.t. as the chopper chip acts as a series regulator: if this reaches 60V the set will operate.

**Dead set, h.t. o.k.:** R444 (1 $\Omega$ ) is open-circuit.

**Dead set:** Check whether RA25 is open-circuit (no 5V supply). Alternatively the infra-red receiver could be short-circuit, loading the 5V line.

**Repeated failure of over-voltage protection diode D808:** Replace C813 (47 $\mu$ F, 50V – part no. 24797470).

**Colour drop-out when set has warmed up:** Replace IC501 with new version available under original part number.

**Snowy raster/no tuning:** Replace QA05 (BC557A) in reset circuit.

### Model 150R6B

**Set tripping, no 112V h.t. supply:** Check whether the line output transformer is short-circuit between pins 1 and 5.

### Models 155R9B/155T9B

**Black band down right-hand side of the screen (line shift**

**fault):** Replace the 6.2V zener diode D403 (part no. 23115604) and the pulse feed resistor R402 (12k $\Omega$ , part no. 243661123).

### Models 159R4B/201E4B/201R4B/201T4B/ 221E4B/221R4B/221T4B

**Intermittent or permanent field collapse:** Replace C312 and check R333.

**Field foldover at top:** Replace C313.

**Text lines at top:** Replace D203 (leaky).

**Poor sync/low field scan:** Replace R402 which goes high in value.

**Lack of brightness (looks like low tube emission):** Check whether R203 is open-circuit.

**Intermittent colour – Hanover blinds when colour is present:** C509 is leaky.

### Models 175R9B/175T9B/210R6B/210T6B/ 215R8B/215T8B/255R7B/255T7B/256T9B/ 258R7B/258T7B/284T8B/285T8BU

**Problems with scan coil connector P570:** The soldered connections can crack after extended use. This can cause arcing (particularly the line connection) and permanent or intermittent loss of the picture. The joints should be resoldered whenever one of these sets is serviced. If resoldering is not possible because of the condition of the PCB pad, proceed as follows:

(1) Clean the socket pin and, using suitably insulated wire, wrap one end around the pin and solder it.

(2) Solder the other end of the wire to the nearest solder pad for the track concerned: keep the wire short and mount safely.

Toshiba can supply prepared links with fitting instructions under part no. 23305501.

If a damaged PCB is encountered, contact Technical Advice on 0276 694 555.

For improved reliability later models are fitted with eyelets in the connection holes.

### Models 210R6B/210T6B

**Dead set, no 112V h.t. supply (remote supply o.k.):** Check whether start-up resistor (for IC801) R811 (220k $\Omega$ , 1W) has gone high in value. Alternatively R814 (680 $\Omega$ ) could have gone high in value.

**Dead set, no 5V supply:** Replace R843 (15Ω fusible) if open-circuit.

**No video:** Check whether RV80 on the back terminal PCB is open-circuit. Alternatively CV03 (0.01μF) could be faulty.

**No luminance:** Replace diode D213 (1SS104, part no. A7150041) – when faulty the d.c. level at pin 3 of IC501 is incorrect.

**No colour/faulty text display/lack of brightness:** Replace R331.

**Flyback lines visible:** First ensure that the picture display adjustments are correctly set up. Then if necessary reduce the value of RV21 on the back terminal PCB from 1kΩ to 390Ω.

### **Models 211E4B/211T4B/212R4B/212T4B plus 213 and 214 versions**

**Faults listed under Models 159R4B/201E4B/221E4B etc. apply. In addition:**

**Won't come out of standby or low h.t.:** Optocoupler DR10 is faulty. With set on pin 8 of IC801 should be at 0V.

**Set won't go into standby, just snowy raster:** Optocoupler DR10 faulty.

**Field jitter, particularly with high video content:** D371 is leaky.

**Field bounce:** Replace R315 and R316.

**One audio channel noisy (Model 211T4B):** Check R637 and R640.

**When text is selected set stays in the TV mode but channels count down repetitively:** Replace zener diode DS10.

**Picture remains when text is selected, though in text mode (Model 212T4B):** TV/VID/RGB switch is in the RGB position.

**No text (low amplitude video input to teletext PCB):** Replace D204 (leaky).

**No colour/blank raster with teletext:** C319 is open-circuit.

**Cogging/hum/no field sync/poor line sync:** C303 is leaky.

**Intermittent shading on left-hand side of screen/no luminance/text o.k.:** R220 (1.5kΩ) is open-circuit.

**Impurity with early FST models:** Check d.c. resistance of the degaussing coils. If 7Ω replace with later 19Ω type available from Toshiba Spares.

**Complete loss of video with normal picture selected, sometimes intermittent (Models 211T4B/212T4B):** VIP chip IC02 on text PCB faulty.

**Low h.t. (85V):** R810 has gone slightly high in value.

**Text lines at top of picture:** Replace D203 (leaky).

**Snowy picture:** Replace C104 in the a.g.c. circuit.

**Incorrect background colour/one gun over-driven:** One of the clamp diodes DF01/2/3 is faulty (text models).

**Low, distorted sound:** Check whether D632 is short-circuit.

**Set doesn't stop in search/immediately enters search:** CA28/CA29 on Rem Sel PCB short-circuit.

**Pulsating picture with rapid changes in peak white:** D242 in the beam-limiter network is short-circuit.

### **Models 215T8B/255T7B/284T8B**

**No text, page number (which can be changed) only:** CF14 (0.01μF) leaky.

Fault could apply with other CCT/Fasttext models.

### **Model 255R7B**

**No on-screen display:** Replace D403 (leaky).

**Field jitter when cold:** Change R332 to 10kΩ (this modification was implemented in later production sets).

### **Model 255T7B**

**Intermittent loss of colour:** Subcarrier adjustment trimmer C551 faulty (gentle tap on trimmer should produce fault).

### **Model 258T7B**

**No tuning (snowy raster only) and no on-screen display:** Zener diode DB01 (5.1V) leaky.

**Flyback lines visible:** First ensure that the picture display adjustments are correctly set up. Then if necessary reduce the value of RV21 on the back terminal PCB from 1kΩ to 390Ω.

### **Model 261T4B**

Some fault notes listed under Models 201E4B, 211E4B etc. apply. Note that IC801 must be type TA7265AP: type TA7265P must not be used.

**Dead set:** First check whether R803 (6.2kΩ, 7W) in the start-up circuit is open. Check whether the line output transistor Q404 is short-circuit: if it fails repeatedly, check for dry-joints at the line driver transformer T401. If the transformer (T802) rattles and the h.t. is at 70V, R481 (2.4Ω, 1W) is open-circuit. If the chopper transistor Q804 is short-circuit, the following components must be checked: IC801 (TA7265AP), D805 (1N4148), R802 (0.47Ω, 2W), R818 (10Ω), R819 (510Ω), R820 (27Ω), R822 (15Ω) and R830 (82Ω).

### **Model 284T8B**

**Field bounce when the set is very hot:** Cause is poor thermal contact between the TDA8170 chip IC303 and the heatsink. Add heatsink compound.

**Distorted sound:** Replace the 6MHz filter Z602.

**TO BE CONTINUED**

# Long-distance Television

Roger Bunney

January was a poor month for DX-TV reception, though this is to be expected during mid-winter. The very limited Sporadic E activity reported occurred on the 3rd, 8th and 22nd, when unidentified programmes were received on ch. E4/IB. Very slight tropospheric activity on several occasions during the month produced Band III/u.h.f. signals, but again reception was fragmentary. The January Quadrantids meteor shower on the 1st-6th produced little if anything by way of signals. And that was it for January 1994. It can only get better!

Reports from Australia indicate that their SpE season has been excellent, with really long-haul reception, double-hop propagation on some occasions and much rejoicing in the outback. Band II f.m. radio signals from Western Australia have been received on the east coast: odd that when Band II signals were received at good levels there was only poor reception of Band I transmitters from the same sites. Unfortunately there seems to be no direct relationship between SpE conditions in Australia and those in this part of the globe six months later.

## Satellite Loggings

The drama of the loss of the Ariane V63 rocket was linked back to Europe, in Turkish, via Intelsat K at 21.5°W: an English version was watched by John Locker (Wirral) via Eutelsat I F5 at 21.5°E. Intelsat K also carried the drama of the Los Angeles earthquake on the 17th, when the Californian SNG system swung into action with many TV stations offering live coverage. John Locker again watched much of this, including an incredible shot from a helicopter of a police car that drove, presumably because the driver's attention was distracted, into a large crevice (they crawled out). Satellite reception is like that – often dramatic as events and dramas unfold.

John Major's 'Back to Basics 2' speech at Leeds on the 28th was carried live by Sky News. The SNG truck 'UKI 128 LEEDS' appeared that evening via Eutelsat I F1 (25.5°E) at 11.142GHz (horizontal): live hourly reports

were fed back to Sky News from the street outside. Reception from Eutelsat I F1 is rather variable as the satellite is in an inclined orbit.

John Womersley (Yorkshire) has sent in a log of his Eutelsat reception using an 80cm mesh dish with LNBS for the FSS and Telecom bands. He uses a windscreen-wiper motor to rotate his dish, feeding the output to a Trac converted Ferguson BSB receiver. Though reception is restricted to the arc 16°E-8°W, the results obtained with the relatively small dish are excellent. Apart from the usual programmes John receives Italian/ITV football via Eutelsat II F3 from 1300 onwards on most Sundays at 11.164GHz (horizontal – sound at 6.6MHz), varying between B-MAC and clear signals. He receives PAL signals from Telecom 1C (3°E), usually at 12.568GHzV, 12.606GHzV and 12.655GHzH.

K. Benyon (Cornwall) is using a 1.8m dish (lucky chap!) with LNBS for the FSS, Telecom and C bands, an Echo-sphere 5500 tuner and a multistandard Sony KV27XRTV (though he had problems with conversion to multistandard operation). He speaks highly of the receiver which provides excellent colour resolution of the NHK Tokyo NTSC feeds from PAS-1 at 45°W.

There's speculation that Telecom band signals picked up at about 53°W are not from Intelsat 513 (it doesn't have any Telecom band transponders) but from the old French Telecom 1A satellite – though why it's there is anyone's guess! Signals have been received from 513 but levels vary considerably over the day as the craft is in inclined orbit.

## News Items

**Lithuania:** SECAM colour transmissions are to be phased out by the year 2000, with PAL adopted instead.

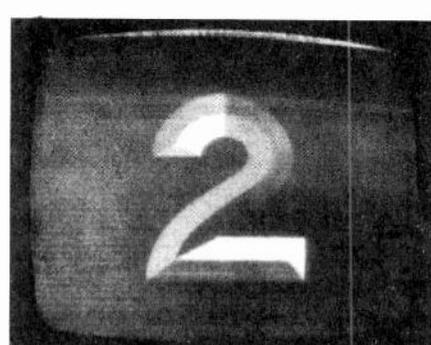
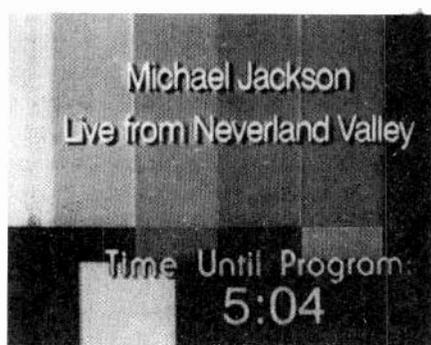
**Tanzania:** A locally-operated TV network should come on air by the end of the year.

**Nigeria:** Following deregulation, twenty five new companies have been offered franchise licences, eleven of them for terrestrial broadcasting and the rest for cable or satellite distribution.

**Zimbabwe:** ZBC has dropped plans to expand studio and broadcast operations. Instead, national coverage will rely on short-wave radio.

**Israel:** The TV2 network has applied to join the EBU. The Palestine Television Authority (PTA) is now transmitting TV programmes from Ramallah: stations in Jericho and the Gaza Strip should be on-air by June.

**India:** State broadcaster Doordarshan is to drop three of the five local TV channels that were started last August. There will be three improved services in the main cities and



Left: An unidentified Arabic ch. E3 signal received by Ryn Muntjewerff in Holland last summer, at 1705 CET, via SpE propagation. Centre: Satellite reception via Intelsat K at 21.5°W. Photograph from John Locker (Wirral). Right: The Norwegian TV2 network logo, received by Ryn Muntjewerff. The PM5544 test pattern is used.

regional-language programming is to be increased. **Digital Audio Broadcasting (DAB):** Independent DAB services should start next year in Germany. The 1.5GHz band is to be used, though the 50MHz band may be used initially for tests. Dutch tests are being carried out at 189-25MHz from a 1kW transmitter in Haarlem, also a 30W relay in Hilversum.

**Germany:** An independent station has opened at Ludwigshafen, Rheinland-Pfalz. Berlin-Schaferbert has been allocated two channels, E22 and E47, running at 25kW each. The latter is at present on air with a test pattern. IA Brandenburg now operates from Berlin on ch. E5 at 100kW e.r.p. (the former DDR-1 channel).

**Slovakia:** The first independent network should now be on air using former CT-2 transmitters and signing itself 'TV Nova'. The former CT-3 transmitters will take over the CT-2 network.

**Bulgaria:** CNNI is now being transmitted for seventeen hours daily from Sofia on ch. R41.

**50MHz Amateur Band:** A thousand transmission permits are to be issued in Germany for 1994, with 25W the maximum e.r.p. Experimental 50MHz operation is to continue in Belgium – though Antwerp ch. E2 is still on air! There are suggestions that the 50-51MHz band has been withdrawn from amateur use in New Zealand.

### Satellite News

New Intelsat slots will come into operation over the next couple of years. There will be orbital positions at 157°, 330.5°, 338° and 340°E while 63°E is to become 62° and 64°E. Intelsat 701 has just come into operation at 174°E serving the Pacific Ocean region. It has 26 C band and ten Ku band transponders. Unlike its predecessor 501 it has station-keeping facilities and doesn't operate in an inclined orbit position.

An Entertainment Television Broadcast service (CETB) operating for 24 hours a day is to be started by China via the Apstar-1 satellite.

RTL-TV via Telecom 2B may be scrambled by the time that this is read – there have been tests during the early mornings. It seems that a simple alternate line video inversion system will be used. TMC is also to be scrambled (Nagravision).

Thaicom 1 is now in orbit at 78.5°E. It has ten C band and two Ku band transponders, all booked. Alan Smith in Thailand tells us that Star TV via AsiaSat 1 has the same signal on the left and right audio subcarriers, i.e. there's no stereo. He feels that this may be to encourage subscriptions to the new Star Plus pay-TV service via AsiaSat 2.

The Swedish Space Corporation has bought the Marco Polo 1 satellite (originally operated by BSB) and is moving it to 5°E to replace Tele-X whose output has been falling in recent months.

Once a replacement for the satellite that was lost with the failed Ariane V63 launch has been obtained Turksat-1 will be put into orbit at 42°E. Another Ku band satellite, the Russian Coupon 1, is due to be put into orbit at 55°E.

### Mountain-edge Scatter

Refraction/bending of v.h.f. signals at the tops of mountains is something one would rarely expect to encounter in the UK, though this form of scatter propagation does occur in the more mountainous regions of Europe. It means that areas screened by a mountain range can receive signals from transmitters on the other side.

In an article published by the US World Wide TV-FM

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- ▷ NTSC playback on PAL TV
- ▷ Quick response system
- ▷ Quick start
- ▷ Quick index search
- ▷ Quick intro scan
- ▷ IMS
- ▷ DX 4 head
- ▷ Long play
- ▷ Remote handset
- ▷ On-screen programming
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DX Association (WTFDA) Frank Aden describes KER (knife-edge refraction, or mountain bending). Basically, signals incident upon the summit of a mountain or mountain range are refracted downwards as they skim the top, providing reception at reasonable levels on the far side. Rather than being deflected to cover a wide area, the signals tend to be concentrated in a limited area (or 'window' as Frank describes it). This area is at roughly the same distance from the mountain as the transmitter on the other side. It often has a crescent or half-moon shape. Propagation can be up to 500 miles, with the mountain as the mid-point, and the sharper the mountain peak the better for KER. Signals undergo a single refraction, a parallel mountain range blocking the signal path unless it reaches the valley between.

The refracting mountain need not be exactly half way between the transmitter and the reception site: if the transmitting mast is higher (above sea level) than the reception area, the latter will be at a greater distance from the mountain than the transmitter, and vice versa. It seems that KER occurs mainly with Band II (f.m.) and III signals: no Band I examples are quoted.

Frank recalls a bus trip through central Oregon (US Highway 26) during which, using a battery-powered TV set, he suddenly received local-strength signals from KEZI ch. A9 and KVAL ch. A13. They continued to be present for a distance of about fifteen miles, disappearing once the shadow of Mt. Jefferson had been passed.

Our thanks to Frank and the WTFDA for this information, which was reproduced in the January 1994 *BDXC Bulletin*. We would be interested to hear from any readers who have experienced this type of reception.

# ECONOMIC DEVICES 32 TEMPLE STREET, WOLVERHAMPTON, WV2 4AN

15/80H	3.83	ZSC1398	0.80	ZSD468C	0.00	BB105B	0.24	BO190	0.31	BF959	0.10	BYW56	0.46	M192B1	1.86	SG613	18.79	TA7176P	1.30	TD1190Z	4.08	TEA1009	1.61
15/85R	3.84	ZSC1413A	1.30	ZSD476	0.97	BC107B	0.20	BO201	0.40	BF960	0.27	BYX55600	0.20	W21C	1.85	SGSIF344	6.82	TA7193AP	3.36	TD1200	0.91	TEA1014	1.87
17052	3.85	ZSC1509	0.51	ZSD525	1.27	BC108	0.15	BO203	0.46	BF966	0.61	CA1310E	0.78	M293	14.33	SKE4F104	0.97	TA7193P	7.99	TD1210	1.79	TEA1039	2.15
17053	2.38	ZSC1520	0.54	ZSD551	5.81	BC109A	0.16	BO232	0.28	BF970	0.80	CA309A	3.06	M490	15.30	SKE4F210	0.87	TA7205AP	1.81	TD1472	0.77	TEA2018A	1.40
17088	2.38	ZSC1533	0.36	ZSD613	0.63	BC109B	0.15	BO234	0.25	BF939	0.34	CD4001	0.14	M491	7.94	SKE5F310	1.68	TA7207P	1.68	TD1506	4.59	TEA2164	2.68
17089	3.39	ZSC1533Q	0.26	ZSD636	0.14	BC117	0.14	BO237	0.30	BF841	0.44	CD4011	0.21	M50115AP	3.24	SL1430	1.41	TA7210P	1.50	TD1510	2.54	TEA2165	6.26
17127	1.77	ZSC1675	0.09	ZSD637	0.12	BC139	0.33	BO238	0.11	BF930	0.61	CD4013	0.34	M51102L	1.77	SL1431	1.76	TA7214P	3.74	TD1512	3.17	TC1060	0.85
1N4001	0.04	ZSC1685	0.17	ZSD663	0.26	BC140	0.21	BO239	0.29	BF930A	0.77	CD4016	0.14	M51231P	2.03	SL1432	2.10	TA7217AP	1.24	TD1515A	2.54	TC106M	0.75
1N4002	0.07	ZSC1740	0.12	ZSD669	0.63	BC141	0.34	BO241	0.41	BF931	0.43	CD4021	0.43	M51393AP	4.64	SL471	1.70	TA7222	1.24	TD1516Q	3.56	TC105	0.99
1N4003	0.05	ZSC1741	0.17	ZSD669A	0.63	BC147A	0.34	BO243	0.38	BF936	0.53	CD4052	0.29	M51515L	2.81	SL490	2.31	TA7222AP	1.24	TD1518Q	3.32	TI100	0.52
1N4004	0.07	ZSC1815	0.14	ZSD716	1.46	BC148	0.12	BO243A	0.43	BF932A	0.48	CD4053	0.20	M51521L	0.54	SN29764AN	1.99	TA7227P	2.29	TD1670A	2.81	TI110	0.36
1N4005	0.06	ZSC1826	0.72	ZSD718	1.45	BC148A	0.06	BO243C	0.44	BFX85	0.55	CD4066	0.30	M5218L	0.48	SN7474N	0.38	TA7230P	1.60	TD1701	4.86	TI112	0.00
1N4006	0.06	ZSC1827	1.00	ZSD734	0.24	BC148B	0.04	BO244A	0.34	BFY50	0.34	CD4069	0.17	M5231L	0.55	SN76013ND	7.97	TA7233P	1.95	TD1870	3.37	TI121H	0.88
1N4007	0.06	ZSC1845	0.20	ZSD762	1.51	BC149	0.04	BO244C	0.42	BFY51	0.34	CD4070	0.21	M52316P	1.48	SN76227N	1.09	TA7240P	2.46	TD1904	1.21	TI120	0.87
1N4148	0.04	ZSC1846	0.51	ZSD774	0.43	BC149C	0.04	BO245C	0.72	BR100	0.17	CN62A	2.95	M54543L	1.61	SN76666N	1.26	TA7241	2.30	TD1905	0.94	TI121	0.42
1N4448	0.06	ZSC1923	0.14	ZSD787E	0.36	BC157	0.13	BO246C	0.71	BR101	0.98	CR3CM	2.62	M54544L	1.87	SN76705AN	1.07	TA725C	4.03	TD1908A	1.14	TI126	0.48
1N5061	0.38	ZSC1942	3.33	ZSD837	0.90	BC159	0.06	BO278A	0.56	BR103	0.53	CR02AM	2.17	M54545L	3.29	ST3431M	2.54	TA7267P	2.62	TD1910A	2.77	TI132	0.46
1N5042	0.12	ZSC1959	0.11	ZSD841	1.34	BC161	0.27	BO317	0.87	BR303	1.22	CV12E	2.70	M54644BL	3.30	ST4401	2.46	TA7270	1.80	TD1950	1.86	TI137	0.48
1N5404	0.13	ZSC1969	2.46	ZSD856	0.94	BC167	0.42	BO318	1.10	BR444	1.82	CX109	7.05	M54648L	6.62	ST4441C	2.80	TA7270P	1.73	TD2002	0.85	TI2955	0.83
1N5406	0.12	ZSC1983	1.78	ZSD869	3.28	BC171B	0.14	BO380	1.34	BRV56	0.43	DTA124EF	0.13	M54898AP	20.45	STK0029	5.88	TA7271P	1.76	TD2004	1.27	TI29C	0.30
1N5408	0.12	ZSC2001	0.14	ZSD870	3.81	BC177	0.14	BO433	0.29	BSS38	0.23	DTA144EF	0.17	M54899P	5.95	STK0039	7.11	TA7273	3.21	TD2005	1.36	TI29E	0.46
1N914	0.04	ZSC2073	0.51	ZSD871	5.08	BC178	0.11	BO434	0.34	BT120	1.28	ER1400	2.15	M58730	2.38	STK0040	7.40	TA7274P	2.72	TD2006	1.06	TI3055	0.77
1S1555	0.22	ZSC2078	0.77	ZSD880	0.48	BC182L	0.06	BO435	0.38	BT129	3.26	HA11235	1.95	M5B3731	2.20	STK0059	9.75	TA7280	2.11	TD2009	2.29	TI30C	0.37
1S2076	0.29	ZSC2141	1.48	ZSD982	0.43	BC182LB	0.06	BO436	0.32	BT139600	1.14	HA11244	3.14	M5C1244	3.33	STK025	9.61	TA7299	2.34	TD2020	3.72	TI31A	0.12
2N2219A	0.27	ZSC2166	1.27	ZSD988B	4.23	BC184	0.09	BO437	0.32	BT151500R	1.10	HA1124A	1.21	M5C13002P	5.74	STK3042	6.98	TA7313AP	0.63	TD2030H	0.61	TI31B	0.30
2N2222	0.22	ZSC2168	0.85	ZSD904	5.95	BC184L	0.04	BO438	0.31	BT151800R	1.15	HA11243	2.82	M5C1310P	0.85	STK3062	8.88	TA7317P	0.92	TD2030V	1.05	TI31C	0.44
2N2905	0.21	ZSC2236	0.25	ZSD973	0.38	BC184LC	0.10	BO441	0.34	BZ205	1.07	HA11440	2.92	M5C1327AP	1.62	STK4131	7.79	TA7325P	0.45	TD2170	2.55	TI32A	0.39
2N2926G	0.37	ZSC2271	0.22	Z41500	0.21	BC204	0.14	BO442	0.29	BZ208A	1.16	HA1166X	3.43	M5C1330AP	1.26	STK4141	9.31	TA7343AP	0.72	TD2270	1.68	TI32C	0.38
2N3053	0.36	ZSC2274	0.22	Z805	0.28	BC207B	0.23	BO510	1.94	BZ208D	1.53	HA11713	1.24	M5C1350P	1.62	STK4142	8.21	TA7358P	0.78	TD2530	3.76	TI33A	0.82
2N3054	0.98	ZSC2274K	0.22	Z808	0.30	BC212B	0.06	BO529	1.37	BZ226A	1.36	HA11741	6.77	M5C1352P	1.45	STK4162M	9.51	TA7358P	0.68	TD2540	0.84	TI33C	0.86
2N3055	0.77	ZSC2314	0.33	Z812	0.30	BC212L	0.06	BO530	1.10	BU406	0.68	HA11745	5.08	M5C1358P	1.98	STK4171	10.50	TA7607AP	2.82	TD2541	0.72	TI34	0.00
2N3442	1.00	ZSC2335	1.43	Z815	0.30	BC213	0.11	BO535	0.43	BU406D	1.02	HA13001	1.72	M5C14528BCP	1.70	STK4181	12.85	TA7609P	1.95	TD2560	4.46	TI34C	0.00
2N3702	0.11	ZSC2458	0.12	Z818	0.41	BC214L	0.09	BO536	0.48	BU407	0.53	HA13108	3.56	MDA2062	2.21	STK4181A	12.46	TA7630P	0.97	TD2576A	5.95	TI41A	0.38
2N3704	0.14	ZSC2482	0.34	Z905	0.34	BC237	0.10	BO675	0.32	BU407D	0.53	HA13118	1.87	MJ2955	0.97	STK4332	5.54	TA7640AP	1.80	TD2577A	4.25	TI42C	0.37
2N3773	1.27	ZSC2547E	0.24	Z912	0.43	BC237B	0.05	BO677	0.52	BU426A	0.96	HA13119	2.03	MJ802	0.37	STK4352	1.70	TA7676P	4.25	TD2578A	5.55	TI42A	0.39
2N3819	0.34	ZSC2565	8.46	AA119	0.36	BC238	0.11	BO707	0.51	BU426E	2.13	HA13403	4.66	MJ13005	2.85	STK437	8.30	TA7680AP	3.81	TD2581	5.75	TI42C	0.37
2N3904	0.11	ZSC2570A	0.29	AA143	0.13	BC238B	0.05	BO839	0.51	BU500	1.32	HA1377	2.42	MJE2955	0.68	STK4392	5.92	TA7698AP	1.93	TD2581Q	10.15	TI47	0.51
2N4444	3.22	ZSC2577	1.46	AC127	0.11	BC239	0.04	BO901	0.51	BU508A	0.95	HA1388	2.63	MJE3055	0.51	STK441	11.81	TA7705P	5.68	TD2582	1.95	TI4791A	1.24
2N6292	0.62	ZSC2581	3.05	AC141K	0.46	BC252B	0.07	BO902	0.51	BU508AF	1.27	HA1389	2.52	MJE340	0.50	STK459	11.17	TA7769P	1.43	TD2591	1.15	TI43	0.86
2SA1015	0.10	ZSC2632	0.43	AC176K	0.30	BC300	0.48	BO911	0.65	BU508D	1.27	HA1392	1.61	ML923	14.26	STK461	10.49	TA8205	3.89	TD2593	0.75	TI110CP	1.36
2SA1016	0.17	ZSC2655	0.25	AC187	0.16	BC301	0.28	BO912	0.63	BU508DF	1.47	HA1397	2.63	MN1405XVF	11.08	STK4843	11.10	TA8210H	4.57	TD2594	2.21	TI701CP	0.38
2SA1020	0.43	ZSC2671	0.68	AC187K	0.33	BC302	0.36	BO958	1.16	BUV65B	1.63	HA1398	2.33	MN1435XVB	14.35	STK5211	15.78	TA8215	4.74	TD2595	2.41	TI94	1.61
2SA1020Y	0.43	ZSC2688	0.30	AC188	0.36	BC303	0.22	BDW84C	1.28	BU526	1.41	HA1452	4.86	MN1435XVB	10.66	STK5322	6.35	TA8691N	1.67	TD2600	3.04	TMPTC432AP	11.24
2SA1095	7.44	ZSC2785	0.12	AC198K	0.82	BC307	0.06	BDW93C	0.59	BU536	1.60	HM6232	10.36	MN450	2.50	STK5325	5.92	TA8626	1.85	TD2611A	8.88	TMPTC432AP-355	11.87
2SA1102	2.54	ZSC2791	5.44	AD149	0.52	BC307A	0.06	BDW94C	0.46	BU608	1.44	HM6251	0.82	MPS442	0.23	STK5326	6.20	TBA120	0.53	TD2611AQ	2.03	UC384A	1.78
2SA1143	0.17	ZSC3150	1.44	AD161	1.02	BC307B	0.06	BOX32	1.70	BU705	1.61	HM7103	14.87	MPS456	0.12	STK5331	3.82	TBA120AS	0.80	TD2640	4.13	UP481C	0.94

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BU208A x 5	3.99	TDA 3651 x 2	2.50
BU 426A x 5	3.75	TD1A 4611 x 2	2.55
BU 508A x 5	3.60	STR 54041 x 2	6.00
BU 508AF x 5	5.00	STANDARD VIDEO SENSOR AMP x 10	2.50
BUT 11AF x 5	3.25	STANDARD VIDEO SENSOR AMP	
TV FAULT FINDING GUIDE	9.99	PLUG x 10	4.00
VIDEO FAULT FINDING GUIDE	9.99	VIII ETC BELT KIT x 5	5.50
SATELLITE FAULT FINDING GUIDE	14.95	3V29 ETC BELT KIT x 5	4.50
CO AXIAL AERIAL PLUGS x 25	3.75	3V35 6 ETC BELT KIT x 5	4.25

2SA1175	0.25	ZSC3153	2.37	AD162	0.98	BC308	0.06	BOY20	2.13	BU806	0.82	ICH281	0.28	MPSA93	0.09	STK5332	2.74	TBA120S	0.89	TD2652	14.32	UPC1181H	6.90
2SA1186	3.73	ZSC3156	4.22	AF124	0.77	BC308A	0.09	BF115	0.41	BU806A	0.81	KA2101	0.83	MR854	0.14	STK5333	4.28	TBA120T	0.51	TD2653A	3.26	UPC1182H	5.05
2SA1208	0.34	ZSC3182	3.25	AF127	0.59	BC308C	0.06	BF179	0.31	BU807	0.50	KB080	0.47	MSM5840H	0.36	STK5372	3.40	TD120U	0.39	TD2680	5.16	UPC1185H	18.20
2SA1265	1.95	ZSC3225																					

# TELEVISION

## TV/VCR SPARES GUIDE 1994

**Aiwa** UK Ltd., Unit 5, Heathrow Summit Centre, Skyport Drive, West Drayton, Middx UB7 0LY.  
**081-897 2425**  
Fax 081-899 0055.  
See also Willow Vale.

**Akai** UK Ltd., Haslemere Heathrow Estate, 12 Silver Jubilee Way, Parkway, Hounslow, Middx TW4 6NF.  
**081-897 6388**  
Fax 081-759 6118.  
See also Willow Vale.

**Akura.** Spares available from Akura Components Ltd., 44, Deerdykes View, Westfield, Cumbernauld, Glasgow G68 9HP.  
**0236-457 022**  
Fax 0236-457 333.

**Alba** Radio Ltd., Harvard House, 14-16 Thames Road, Barking, Essex.  
**081-081 594 5533**  
Fax 081-591 0962.  
See also Willow Vale.

**Ambassador.** Brand name used by Sentra Electronics.

**Amstrad.** Spares available from CPC Ltd., Chas Hyde & Son Ltd. and Amstrad PLC, Brentwood House, 169 Kings Road, Brentwood, Essex CM14 4EF.  
**0277-228 888**  
Fax 0277-209 559.  
See also Willow Vale.

**ASA.** Spares can be ordered from NCS.

**Autovox.** See Comet Group plc.

**Benkson.** B. Benskert Ltd., Benkson House, 26 Thames Road, Barking, Essex IG11 0JA.  
**081-594 7532**  
Fax 081-594 9919. Trade only.

**Beovision/Beocord.** Bang and Olufsen UK Ltd., Eastbrook Road, Gloucester GL4 7DE.  
**0452-307 377**  
Fax 0452 303 859.  
Trade only.

**Binatone** International Ltd., Binatone House, 1 Beresford Avenue, Wembley, Middx HA0 1YX.  
**081-903 5211**  
Fax 081-903 5521.  
Trade only.

**Blaupunkt.** Merrivale Television Services, 1 Lockside,

Tatbank Road, Oldbury, Warley, W. Midlands.  
**021-544 6250**  
Fax 021-552 1503.  
Trade only.

**Bush** Radio Plc., Harvard House, 14-16 Thames Road, Barking, Essex IG11 OHX.  
**081-594 5533**  
Fax 081-591 0962.  
See also HRS, Willow Vale.

**Canon** UK Ltd., Unit 4, Brent Trading Centre, North Circular Road, London NW10.  
**081-459 1266**  
Fax 081-459 4202.

**Cathay.** Spares from MG Services, Return Centre, BSS House, Cheyney Manor, Swindon, SN2 2PJ.  
**0793-497 591**  
Fax 0793-431 687.

**Commodore.** Spares available from CPC.

**Comet** Group plc., Service Dept., Unit 5, City Park Ind. Estate, Gelderd Road, Leeds LS12 6DR.  
**0532-311 024**  
Fax 0532-311463.

**Connexions** UK plc., Unit 3, Travellers Close, Travellers Lane, Welham Green, Herts AL9 7LE.  
**0707-272 091**  
Fax 0707-269 444.

**Contec** CTVs sold by Dixons. Spares available from Mastercare Components.

**CPC** Ltd., Component House, Faraday Drive, Fulwood, Preston, Lancs PR2 4PP.  
**0772-654 455**  
Fax 0772-654 466.  
Official spares stockists for Alba/Bush, Amstrad, Commodore, Epsom, Ferguson, Fidelity, GEC, GoldStar, Hinari, Ingersoll, Logic, Matsui, Olympia, Olivetti, Orion, Pace, Philips, Pye, Saisho, Sinclair, Sony and Triumph. Other spares available.

**Crown.** Spares available from Datapart, Electron House, 100 Great Barr Street, Birmingham B94 BB.  
**021-766 5551**  
Fax 021-766 5819.

**Daewoo** Electronic Sales UK

Ltd., Unit 640, Winnersh Triangle, Wokingham, Berks RG11 5TP.

**0734-695 666**  
Fax 0734-699 922.

Note: Daewoo brand products only, not OEM products. For the latter, refer to the original distributor.  
See also Willow Vale.

**Dansai** TV and Video spares available from Nikkai. Audio spares available from Diamond Television, Return Centre, BSS House, Cheyney Manor, Swindon.  
**0793-497 591**  
Fax 0793-431 687.

**Decca.** See Tatung (UK) Ltd and Wizard Distributors. Spares for chassis up to and including the 110/115 series available from D&S Electronic Services, Building 15, Unit 4, Stanmore Industrial Estate, Bridgnorth, Salop WV15 5HR.  
**0746-766 641.**

**Definition.** Spares available from Wilts Grove Ltd.

**Denon.** Hayden Laboratories Ltd., Hayden House, Chiltern Hill, Chalfont St Peter, Gerrards Cross, Bucks SL9 9UG.  
**0753-888 447**  
Fax 0753-880 109.

**Doric.** Some spares available from UK Rental and Retail Ltd.

**Dynatron.** Pre 1981 sets see Philips Service, post 1981 sets spares from SEME.

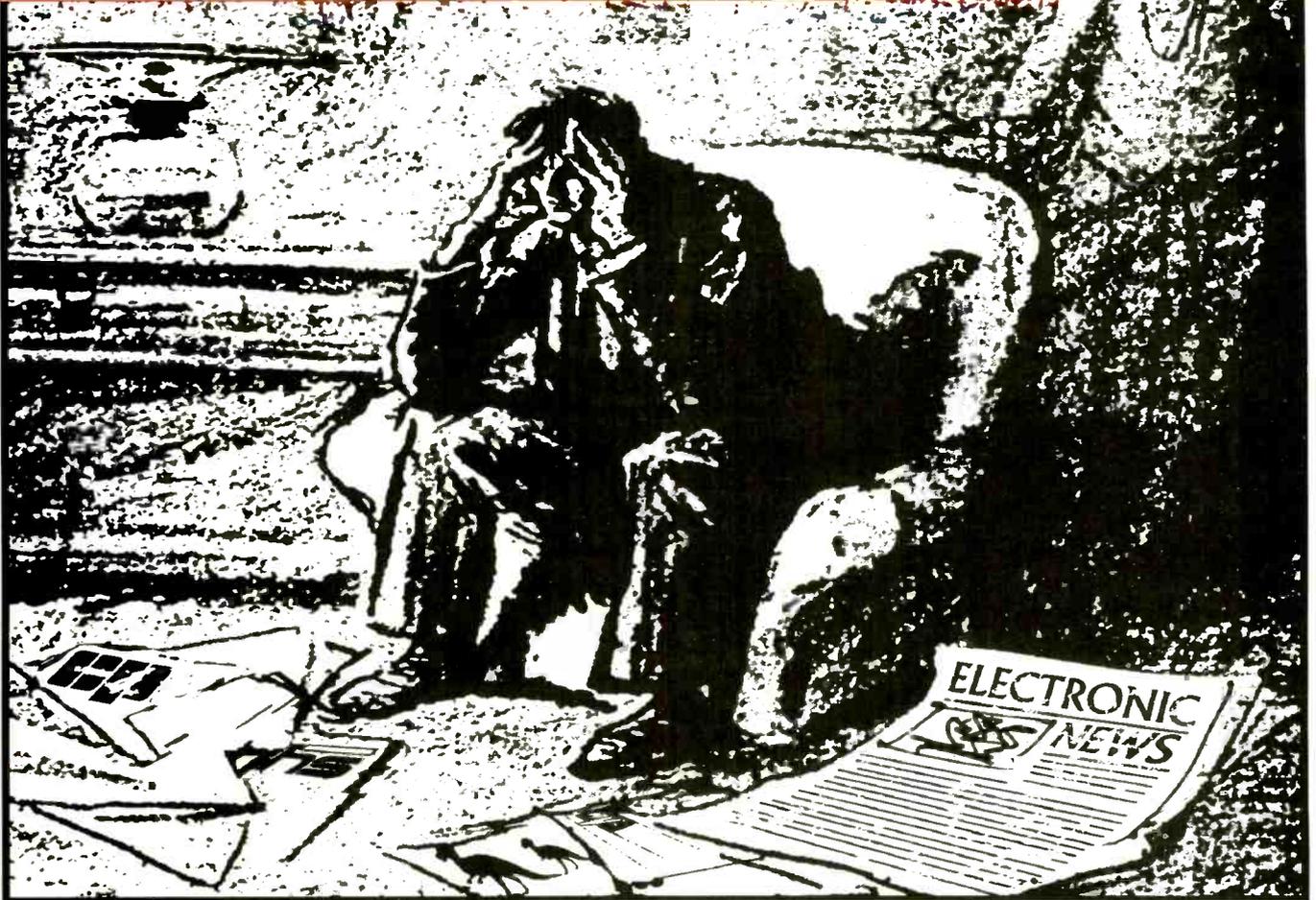
**Elftone** Electronics Ltd., 4 Beresford Avenue, Wembley, Middx HA0 1YZ  
**081-902 6222**  
Fax 081-903 5011.

**Etron.** Brand name used by Nikkai Imports Ltd.

**Expert.** Spares from Tatung, GEC, or Luxor depending on chassis.

**Ferguson** Ltd., Service Division, Crown Road, Enfield, Middx EN1 1DZ.  
**081-344 4412**  
Fax 081-344 4455. Trade only.  
See also CPC, HRS, Chas Hyde,

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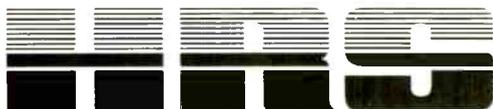
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**Fidelity.** Spares available from  
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Willow Vale.

**Finlux.** Spares available from  
NCS.

**Finlandia.** Spares available  
from UK Rental and Retail Ltd.

**Fisher.** Spares available from  
Sanyo UK Sales Ltd., Sanyo  
House, Otterspool Way, Watford,  
Herts.  
**0923-222 244**  
Fax 0923-818 251.

**Fujitsu General.** See Teleton  
Electro (UK) Co. Ltd. Spares  
available from HRS.

**GEC.** Spares available from  
CPC, HRS, Chas Hyde, SEME,  
Willow Vale and Wizard.

**General.** See Teleton Electro  
(UK) Ltd.

**GoldStar** UK Sales Ltd.,  
Goldstar House, 264 Bath Road,  
Slough SL1 4DT.  
**0753-691 888**  
Fax 0753-517 445.  
See also CPC.

**Goodmans** Industries Ltd., Tees  
Building, Unit 2-3, Mitchel Way,  
Portsmouth P03 5PR. **0705-673  
763**  
Fax 0705-673 671.

**Granada.** Spares available from  
UK Rental and Retail Ltd.

**Grundig** International Ltd., Mill  
Road, Rugby, Warwickshire  
CV21 1PR.  
**0788-577 155**  
Fax 0788-562 354. Account  
holders only supplied. See also  
Willow Vale.  
Spares for VCR4000 and  
SVR4004 ranges available only  
from Willow Vale.

**Harwood.** Spares available  
from HI Group, Express Way,  
Whitwood, Nr. Wakefield WF10  
5QJ.  
**0977-603 333.**

**Hinari.** Spares available from  
CPC, Chas Hyde, SEME.

**Hitachi** Sales (UK) Ltd., Hitachi  
House, Station Road, Hayes,  
Middx UB3 4DR.  
**081-569 1975.**  
Fax 081-569 1441.  
See also Chas Hyde, UK Rental  
and Retail Ltd., Willow Vale,  
Wizard.

**HMV.** Sets use Ferguson or  
Fidelity chassis.

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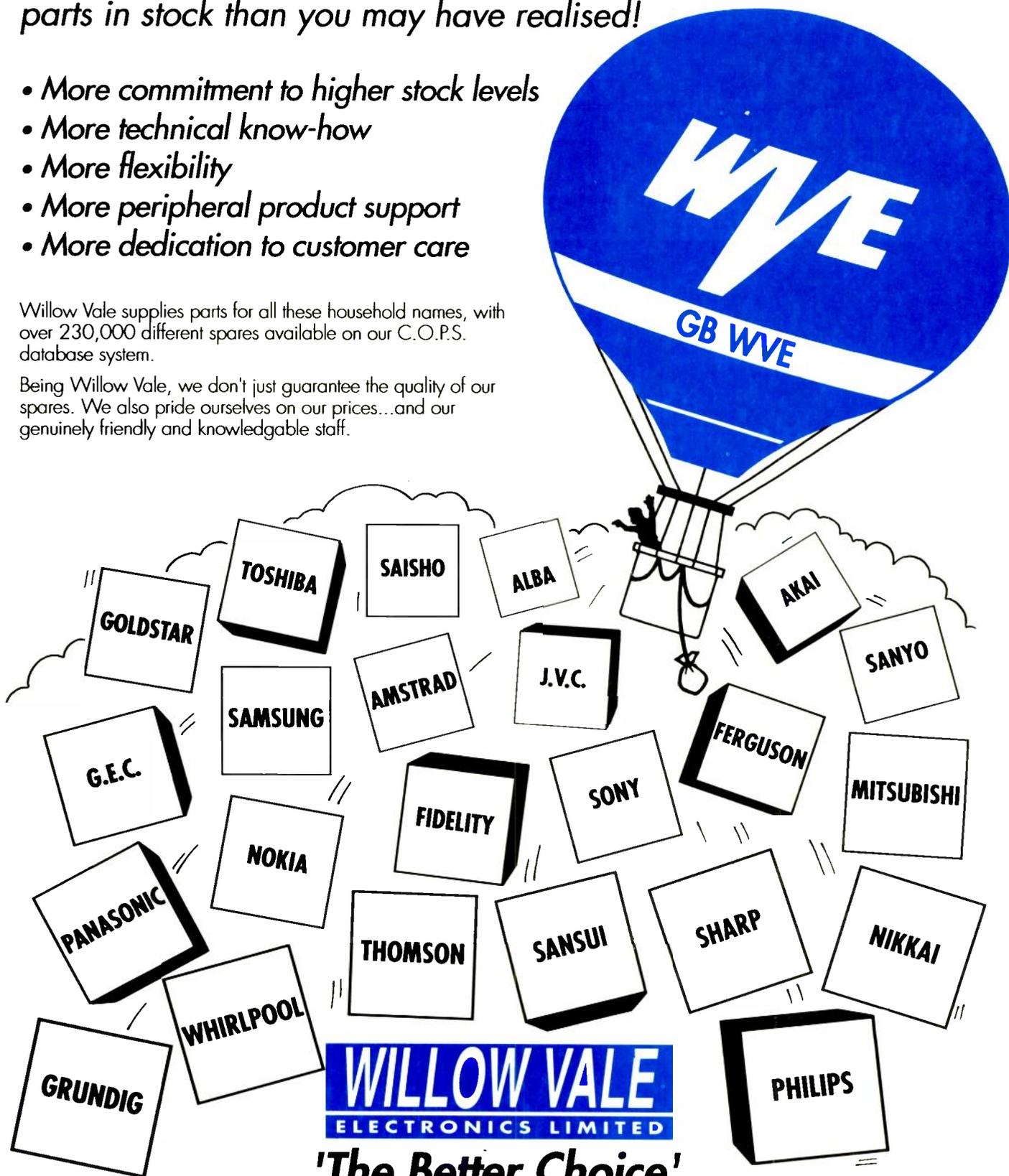
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**061-736 6333.**

**Economic Devices**, 32 Temple Street, Wolverhampton WV2 4AN.  
**0902-712 083**  
Fax 0902-29 052.

**East London Components**, 63 Plashet Grove, East Ham, London E6 1AD.  
**081-472 4871.**

**Electrovalue Ltd.**, 28 St Judes Road, Englefield Green, Egham, Surrey TW20 0HB.

**0784-434 757**  
Fax 0784-472407  
Northern branch 680

Burnage Lane, Manchester M19 1NA.  
**061-432 4945**  
Fax 061-432 4127.

**Express TV Supplies**, The Mill, Mill Lane, Rugeley, Staffs WS15 2JW.  
**0889-577 600.**

**GGL Components**, PO Box 72, Unit 7, South John Street, Carlisle, Cumbria CA2 5AL.  
**0228-39 693/20 358**  
Fax 0228-515 127.

**Grandata Ltd.**, KP House, Unit 15, Pop In Commercial Centre, Southway, Wembley, Middx HA9 0HB.  
**081-900 2329**  
Fax 081-903 6126.

**J.W. Hardy**, 231 Station Road, Stechford, Birmingham B33 8BB.  
**021-784 8478.**

**Harrison Electronics**, Century Way, March, Cambs PE15 8QW.  
**0354-51 289**  
Fax 0354-51 416.

**Irwin Electronics**, Unit 200, JC Albyn

Complex, Burton Road, Sheffield S3 8BX.  
**0742-739 622.**

**JJ Components**, 63 The Chase, Edgware, Middx HA8 5DN.  
**081-952 4641 also**  
**081-381 1700.**

**KSA Wholesale Components**, 582 Green Lane, Small Heath, Birmingham B9 5QG.  
**021-772 2834.**

**LRC (Spares)**, 3-5 Whitfield Street, London W1P 5RA.  
**071-323 2107.**

**Manor Supplies**, 172 West End Lane, London NW6 1SD.  
**071-794 8751/7346.**

**Marapet**, 1 Hornbeam Mews, Gloucester GL2 0UE.  
**0452-526 883.**

**Nikko Electronics**, Dalbani House, 257 Burlington Road, New Malden, Surrey KT3 4NE. **081-336 0566.**

**T. Powell**, 16 Paddington Green,

London W2 1LG.  
**071-723 9246.**

**PV Tubes**, 104 Abbey Street, Accrington, Lancs BB5 1EE.  
**0254-236 521/232 611**  
Fax 0254-395 361.

**Visions (GB) Ltd.**, Unit 4, Rainstar Industrial Estate, Eley Estate, Nobel Road, Edmonton, London N18 0AA.  
**081-807 7476/7579.**

**Vista Electronics**, Unit 1B, Wingate Grange Industrial Estate, Wingate, Co. Durham TS28 5AH. **0429-837 100.**

Part No.	Price	3-Y-57	Part No.	Price	3-Y-57
<b>ANVA</b>					
IR 46					
Video Head	VD 2546 £15.34	Video Head	VD 1817 £5.50		
Pinch Roller	VD 1755 £3.83	Pinch Roller	VD 1813 £3.15		
Belt Kit	VD 7519 £3.83	Belt Kit	VD 7540 £3.83		
Idler Replacement Set	VD 1001 £3.83	Clutch Mechanism	VD 1083 £13.98		
Idler	VD 1005 £2.12	Capstan Motor	VD 2158 £45.86		
Capstan Motor	VD 2150 £25.80	Loading Motor	VD 2167 £14.11		
Tension Band	VD 1423 £3.85	Front Loading Motor	VD 2168 £12.84		
Rear Tension Rubber Type	VD 1335 £1.18	Cassette LED	VD 1981 £1.53		
CTL Unit	VD 2637 £91.55	Tension Band	VD 7920 £21.85		
		Cassette Housing	VD 1315 £21.90		
<b>AV-77</b>		<b>FY-108</b>			
Video Head	VD 2546 £15.34	Video Head	VD 2580 £78.70		
Pinch Roller	VD 1755 £3.83	Pinch Roller	VD 1817 £5.50		
Belt Kit	VD 7525 £3.33	Belt Kit	VD 7564 £1.81		
Idler Replacement Set	VD 1008 £3.83	Idler Arm	VD 1091 £3.18		
FFW Limiter	VD 1002 £3.83	Rear Motor	VD 2153 £16.24		
Idler	VD 1004 £1.18	Capstan Motor	VD 1081 £13.18		
Take Up Idler	VD 1005 £3.27	Loading Motor	VD 2412 £8.37		
REW Idler	VD 1026 £5.71	Capstan Motor	VD 2412 £8.37		
FF Rubber Type	VD 1029 £0.85	Front Loading Motor	VD 1981 £1.53		
FF Rubber Type	VD 1030 £0.85	Cassette LED	VD 1386 £0.85		
Unloading Idler	VD 1207 £0.88	Repair Kit	VD 7921 £9.97		
Rubber Type	VD 2119 £25.34				
Capstan Motor	VD 2126 £20.20	<b>FY-12L</b>			
Cassette Lamp	VD 1943 £3.85	Video Head	VD 2581 £30.88		
Tension Band	VD 1391 £3.85	Pinch Roller	VD 1817 £5.50		
Repair Kit	VD 7511 £15.27	Belt Kit	VD 7516 £1.81		
Take Up Rubber Type	VD 1028 £0.54	Idler Arm	VD 2153 £16.24		
		Rear Motor	VD 2130 £24.72		
<b>ALBA</b>		Loading Motor	VD 2412 £8.37		
<b>VCR-4800</b>		Front Loading Motor	VD 2412 £8.37		
Video Head	VD 2713 £16.30	Cassette LED	VD 1981 £1.53		
Pinch Roller	VD 1787 £3.43	Tension Band	VD 1386 £0.85		
Belt Kit	VD 7596 £3.81	Repair Kit	VD 7921 £9.97		
Idler	VD 1045 £3.44				
Cassette LED	VD 1981 £1.53	<b>FIDELITY</b>			
Tension Band	VD 1395 £2.84	<b>VR-160</b>			
<b>AMSTRAD</b>		Video Head	VD 2582 £15.81		
<b>VCR-4640</b>		Pinch Roller	VD 1758 £3.15		
Video Head	VD 2676 £13.77	Belt Kit	VD 7593 £1.75		
Pinch Roller	VD 1758 £3.15	Clutch	VD 1226 £4.76		
Belt Kit	VD 7593 £1.75	Gear Holder	VD 1227 £13.14		
Clutch	VD 1226 £4.76	RF Clutch	VD 1231 £7.78		
Gear Holder	VD 1227 £13.14	Cassette LED	VD 1981 £1.53		
RF Clutch	VD 1231 £7.78				
Cassette LED	VD 1981 £1.53	<b>FINLUX</b>			
		<b>VR-1030</b>			
<b>VR-4680</b>		Video Head	VD 2558 £44.82		
Video Head	VD 2676 £13.77	Pinch Roller	VD 1813 £3.83		
Pinch Roller	VD 1758 £3.15	Idler	VD 1006 £3.46		
Belt Kit	VD 7593 £1.75	Tension Band	VD 1432 £5.87		
Clutch	VD 1226 £4.76	Remote Control	IR 3034 £14.52		
Gear Holder	VD 1227 £13.14	Repair Kit	VD 7930 £12.58		
RF Clutch	VD 1231 £7.78				
Cassette LED	VD 1981 £1.53	<b>VR-2010</b>			
		Video Head	VD 2578 £82.15		
<b>BANG &amp; OLUFSEN</b>		Pinch Roller	VD 1827 £5.70		
<b>WV-45</b>		Belt Kit	VD 7588 £1.88		
Video Head	VD 2506 £14.14	Idler	VD 1027 £3.14		
Pinch Roller	VD 1788 £3.15	Loading Gear	VD 1253 £7.23		
Belt Kit	VD 7538 £1.27	Modification Set	VD 1254 £10.81		
FFxREW Idler Arm	VD 1020 £1.78	Tension Band	VD 1431 £4.85		
Clutch Plate	VD 1211 £8.27	Remote Control	IR 3034 £14.52		
Capstan Motor	VD 2147 £23.15				
Cassette LED	VD 1981 £1.53	<b>FISHER</b>			
		<b>FM-PS20</b>			
<b>DECCA</b>		Video Head	VD 2500 £17.38		
<b>VR-4300</b>		Pinch Roller	VD 1810 £3.84		
Video Head	VD 2511 £10.74	Belt Kit	VD 7532 £1.25		
Pinch Roller	VD 1814 £3.15	Gear Idler	VD 1013 £4.51		
Belt Kit	VD 7512 £1.02	Idler	VD 1014 £3.06		
Rear Idler	VD 1036 £2.83	Loading Gear Set	VD 1230 £1.02		
Take Up Clutch	VD 1037 £2.44	Cassette LED	VD 1981 £1.53		
Take Up Idler	VD 1038 £1.29	Tension Band	VD 1235 £2.38		
Brake Pad	VD 1169 £5.58	Take Up Reel Table	VD 1295 £8.87		
Rear Motor	VD 2164 £23.86	Supply Reel Table	VD 1294 £5.55		
Capstan Motor	VD 2168 £12.84				
Loading Motor	VD 1947 £3.81	<b>FM-PS30</b>			
Cassette Lamp	VD 1389 £1.44	Video Head	VD 2500 £17.38		
Tension Band	VD 1389 £1.44	Pinch Roller	VD 1810 £3.84		
Repair Kit	VD 7913 £16.08	Belt Kit	VD 7532 £1.25		
Take Up Reel Table	VD 1080 £0.88	Gear Idler	VD 1013 £4.51		
Supply Reel Table	VD 1080 £0.88	Idler	VD 1014 £3.06		
Rubber Type	VD 1080 £0.88	Loading Gear Set	VD 1230 £1.02		
Rubber Type	VD 1080 £0.88	Cassette LED	VD 1981 £1.53		
		Tension Band	VD 1235 £2.38		
<b>3-Y-36</b>		Take Up Reel Table	VD 1295 £8.87		
Video Head	VD 2647 £9.18	Supply Reel Table	VD 1294 £5.55		
Pinch Roller	VD 1814 £3.15				
Belt Kit	VD 7812 £1.02	<b>FM-V722x121</b>			
Rear Idler	VD 1036 £2.83	Video Head	VD 2500 £17.38		
Take Up Clutch	VD 1037 £2.44	Pinch Roller	VD 1810 £3.84		
Take Up Idler	VD 1038 £1.29	Belt Kit	VD 7532 £1.25		
Brake Pad	VD 1161 £5.58	Gear Idler	VD 1013 £4.51		
Rear Motor	VD 2169 £23.86	Idler	VD 1014 £3.06		
Capstan Motor	VD 2168 £12.84	Loading Gear Set	VD 1230 £1.02		
Loading Motor	VD 2168 £12.84	Cassette LED	VD 1981 £1.53		
Front Loading Motor	VD 1981 £1.53	Tension Band	VD 1235 £2.38		
Cassette LED	VD 1981 £1.53	Take Up Reel Table	VD 1295 £8.87		
Tension Band	VD 1389 £1.44	Supply Reel Table	VD 1294 £5.55		
Remote Control	IR 9100 £11.01				
Repair Kit	VD 7918 £12.51	<b>FM-V722x125</b>			
Mains Transformer	VD 2223 £24.78	Video Head	VD 2501 £28.27		
Rubber Type	VD 1080 £0.88	Pinch Roller	VD 1810 £3.84		
Supply Reel Table	VD 1080 £0.88	Belt Kit	VD 7813 £1.19		
Rubber Type	VD 1080 £0.88	Gear Idler	VD 1013 £4.51		
Cassette Housing	VD 1099 £21.75	Idler	VD 1014 £3.06		
		Loading Gear Set	VD 1230 £1.02		
<b>3-Y-57</b>					
Video Head	VD 2573 £14.66				
Pinch Roller	VD 1813 £3.15				
Belt Kit	VD 7540 £3.83				
Clutch Mechanism	VD 1083 £15.00				
Capstan Motor	VD 2188 £45.86				
Loading Motor	VD 2167 £14.11				
Front Loading Motor	VD 2168 £12.84				
Cassette LED	VD 1981 £1.53				
Tension Band	VD 1388 £2.13				
Repair Kit	VD 7920 £21.85				
Cassette Housing	VD 1315 £21.90				

Part No.	Price	HITACHI	Part No.	Price	JVC	Part No.	Price	Part No.	Price	
VD 1981	£1.53	VT-11	VD 2504	£15.84	VR-1300	VD 2511	£10.74	Remote Control	IR 8547	£14.80
VD 1376	£2.38	Video Head	VD 1788	£3.15	Video Head	VD 1756	£3.23	Repair Kit	VD 7919	£17.52
VD 1295	£3.87	Pinch Roller			Pinch Roller			Cassette Housing	VD 1315	£21.90

# IMPORTANT NOTICE

The green video comparison sheet is now out of date. We will continue to supply this document because it remains an invaluable reference in the workshop. It has become impracticable to update it due to the greatly increased amount of information now available. The video comparison database now installed in our computer contains

## OVER 50,000 RECORDS

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Wolverhampton WV2 4AN  
Phone (0902) 773122 Fax (0902) 29052**

VD 2596	£15.75	Cassette Lamp	VD 1981	£1.53	Take Up Clutch	VD 1031	£2.26	<b>SALORA</b>		
VD 1757	£3.13	Tension Band	VD 1389	£3.44	Take Up Idler	VD 1038	£1.29	<b>SV-8620</b>		
VD 7567	£0.85	Repair Kit	VD 7913	£16.00	Reel Idler	VD 1039	£3.40	Pinch Roller	VD 1868	£3.15
VD 1052	£1.78	Take Up Reel Table			Brake Pad	VD 1361	£0.59	FFxREW Idler Arm	VD 7600	£3.31
VD 1222	£1.57	Rubber Type	VD 1080	£0.68	Capstan Motor	VD 2165	£25.16	FFxREW Idler Arm	VD 1233	£3.66
VD 1228	£2.29	Supply Reel Table			Loading Motor	VD 2168	£12.64	FFxREW Idler Arm	VD 1234	£3.51
VD 1440	£1.53	Rubber Type			Front Loading Motor	VD 2168	£12.64	Cassette LED	VD 1981	£1.53
VD 1981	£1.53	VR-3983			Tension Band	VD 1389	£1.44	Tension Band	VD 1394	£3.84
VD 1400	£2.38	Video Head	VD 2647	£9.18	Repair Kit	VD 7918	£12.51	Take Up Reel Table	VD 1308	£3.37
IR 8965	£20.78	Belt Kit	VD 7523	£1.27	Mains Transformer	VD 2223	£24.78	Supply Reel Table	VD 1305	£4.67
		Reel Drive Unit	VD 1037	£2.44	Take Up Reel Table	VD 1080	£0.68	<b>SAMSUNG</b>		
		Loading Gear B	VD 1038	£1.29	Rubber Type	VD 1080	£0.68	<b>W-510x520x611x621x621</b>		
		Capstan Motor	VD 1363	£4.67	Supply Reel Table	VD 1080	£0.68	Video Head	VD 2548	£17.88
		Cassette LED	VD 1037	£2.44	Rubber Type	VD 1080	£0.68	Pinch Roller	VD 1815	£3.15
		Tension Band	VD 1038	£1.29	Cassette Housing	VD 1099	£21.75	Belt Kit	VD 7598	£1.40
		Repair Kit	VD 1361	£0.59				Idler	VD 1232	£1.53
		VR-400	VD 2169	£28.97				Rear Motor	VD 2407	£15.75
		Video Head	VD 2187	£47.57				Capstan Motor	VD 2409	£29.29
		Pinch Roller	VD 1814	£3.15				Loading Motor	VD 2147	£16.70
		Brake Pad	VD 1361	£0.59				Cassette LED	VD 1981	£1.53
		Rear Motor	VD 2169	£28.97						
		Capstan Motor	VD 2187	£47.57				<b>SANYO</b>		
		Loading Motor	VD 2168	£12.84				<b>VR-1100 EX IIxEX-6</b>		
		Front Loading Motor	VD 2168	£12.84				Video Head	VD 2583	£22.58
		Cassette Lamp	VD 1946	£0.59				Pinch Roller	VD 1815	£3.15
		Tension Band	VD 1389	£1.44				Belt Kit	VD 7598	£1.40
		Repair Kit	VD 7914	£13.42				Rear Drive Roller	VD 1076	£8.18
		VR-30x35x4						Rear Motor	VD 2198	£15.87
		Video Head	VD 2518	£21.85				Cassette LED	VD 1981	£1.53
		Pinch Roller	VD 1815	£3.15				Tension Band	VD 1411	£2.72
		Belt Kit	VD 7566	£2.38						
		Clutch	VD 1316	£6.21				<b>VR-1500 EX-6</b>		

# TV Fault Finding

*Reports from Terry Lamoon, Mike Leach, Brian Storm, Bob McClenning, Alfred Damp, John Edwards, Chris Watton, Eugene Trundle, Michael Dranfield and Geoff Fardon*

## Matsui 1580

When this set was switched on it squealed and tripped off. A check on the h.t. voltage at TP44 after switching on showed that it was high (160V) and couldn't be reduced. We carried out a quick visual check on the power supply and saw that C818 (1 $\mu$ F, 50V) was very distressed – it sits too close to a high-wattage resistor. On fitting a replacement and adjusting the h.t. for 112V everything was fine. T.L.

## Tashiko 14F891 (Tatung 160 Series Chassis)

The cause of field collapse with this set was the fact that R301 (560k $\Omega$ ) had increased in value to over 2M $\Omega$ . It's in series between the field hold preset and pin 1 of the TDA4503 chip. J.E.

## Hitachi CPT2508 (G7P Mk II Chassis)

The cause of no life from this set was the fact that the main surge limiter resistor R901 (3.9 $\Omega$ , 7W) was open-circuit while C919 (4.7nF, 1kV) and C928 (2.2nF, 2kV) were both short-circuit. Both capacitors had split, burnt bodies. C919 is in the snubber network while C928 is connected across the chopper transistor. J.E.

## Alba CTV10

This set was dead though the standby indicator LED was on. Checks showed that diode D410 (FR605), which is in series with the h.t. feed to the line output transformer, was open-circuit. It had burnt out because the transformer had failed. Both items are available from CPC Ltd. J.E.

## Panasonic TX25W3 (Euro 1 Chassis)

There was an intermittent fault with the display produced by this set: maybe once a day the dark areas of the picture would become dotted, rather like a swarm of bees, in parts that were shadowy. Any approach to the set would banish the fault until next day. We had to proceed on the basis of guesswork and eventually found that the digital transient improvement chip IC1661, type DTI2223, was faulty. B.S.

## Panasonic TX21V2 (Alpha 4 Chassis)

When this set was switched on there was a slight splutter then the power supply shut down. A check on the h.t. at switch-on produced a reading of only 60V, after which it quickly faded out. As no obvious shorts could be measured in the line output stage we decided to fit a replacement line output transformer. This restored normal operation. B.S.

## Panasonic TX28W2 (Alpha 3 Chassis)

The type of intermittent fault I least like produces some obscure complaint and lasts for about two minutes every other day. So how about this one: the symptom consisted of diagonal black and white stripes that appeared maybe once a day?! Muttering some cynical comments I left the set to its own devices on the soak test bench. Hours later a colleague

drew my attention to diagonal bold black and white stripes across the screen. I quickly checked the text display, which was faultless, but by now my two minutes were up as the symptom receded. Many days later the cause of the fault was traced to an intermittently leaky zener diode, D329, which stabilises the supply to the TDA4670 transient improvement chip IC302: as the supply fell the lines appeared. The part number is MA4068. B.S.

## Panasonic TX28X1 (Alpha 4 Chassis)

After about half an hour the height would start to increase then twitch erratically. Checks in the field output stage didn't bring anything unusual to light so I moved back to the driver stage. As there was some instability in the ramp generator I decided to check the capacitors here. The culprit turned out to be C402 (0.33 $\mu$ F) which was leaky. This was surprising as it's a Mylar type. A replacement cured the fault however. B.S.

## Philips 2A Chassis

One of these sets with remote control came to us with a tripping power supply. We found that the cause was a short-circuit in the MAB8441 microcontroller chip on the front control panel. B.McC.

## Philips CP110 Chassis

This set would start up at switch on but just as the picture began to appear the set would flash on and off, quite violently but irregularly. The power supply and optocoupler chips were tried without success. We noticed that the fault became less frequent as the set warmed up. Tapping the power supply in the area of the degaussing posistor produced the fault, so a replacement was fitted. The set was then left to soak test. At switch on from cold next day it worked perfectly. A.D.

## Hitachi CPT2188

The trouble started as an intermittent failure to start fault. The owner overcame it by leaving the set in standby all the time. Eventually the set refused to start from standby, so he had to bring it in for repair. We traced the cause of the trouble to the fact that C604 (1,000 $\mu$ F, 25V) was open-circuit. A.D.

## Grundig 2401 Chassis

At switch on this set went straight into the trip mode. All the components we tried in the line output stage turned out to be innocent. Eventually we found that L519 had shorted turns. A.D.

## Hitachi CPT2218 (NP81CQ Chassis)

This set wouldn't come out of standby. All the legs of the chopper transformer T901 had hairline cracks at the solder

connections – they were visible only when a strong magnifying lens and lamp were used. **A.D.**

### Philips K40 Chassis

Two of these sets, with similar symptoms but different component failures, came into the workshop within days of each other. With the first set there was only a very faint raster. This set proved to be the easier one to fix: the TDA3561 colour decoder chip had failed, a replacement restoring the picture. There was no raster at all with the second set. We hoped that replacing the same chip would put matters right but weren't so lucky. Checks around the chip showed that the blanking waveform at pin 8 was low. Tracing this back to source brought us to the TDA3576B timebase generator chip which was the cause this time. **M.L.**

### Hitachi CPT2578

There was a blank raster and no sound. Checks showed that the 12V output from the 7812 regulator IC932 was low. The chip was all right however, the cause of the trouble being C933 which smooths its input. A new 2,200 $\mu$ F, 25V capacitor restored normal operation. **M.L.**

### Nikkai Tara 10

This 10in. portable's power supply refused to start up. The power supply circuit is rather complicated: fortunately the cause of the trouble was simply a dry-joint at L110 in the line output stage. You also tend to get dry-joints around the line driver transformer. Because of the circuit design, a fault in the line output stage often shuts down the power supply. **M.L.**

### Philips CTX Chassis

We had difficulty getting the chopper circuit to work in one of these sets. When you've changed just about everything in the power supply and it still won't start up, try replacing C2323 (220 $\mu$ F, 10V). It worked for me. **M.L.**

### Hitachi CPT2808 (G7P Mk 2 Chassis)

This 28in. set came in because there was no sound or picture: a raster was present, but there was only snow on the screen. Neither the remote nor the manual front controls worked. It seemed that a supply was missing, but checks showed that they were all present and correct. The next step was to check the voltages around the microcontroller chip IC101. Some were slightly high, others o.k. The simplest thing seemed to be to fit a replacement, but as so often this made not the slightest difference. So I had to investigate those incorrect voltages more carefully.

The voltage at pin 15 was significantly high. There should be field-frequency pulses here: these were missing, though the raster height was correct. Was there something wrong with the AN5521 field output chip IC601? Fortunately another of these sets was in the workshop at the time, because of a power supply fault, so I swapped over the field output chips. This proved that the chip was faulty, a replacement restoring the signals.

How technology has changed, eh? Twenty years ago one wouldn't have replaced a PCL85 for a snowy raster! **M.L.**

### Solavox 140/Nikkai TLG88

A blank raster was the complaint with this set. There was no snow, and it looked as if the set was stuck in the AV mode.

Checks around the TDA4505 chip IC101 suggested that it might be faulty, so a replacement was fitted. As this seemed to cure the problem the set was returned to the customer.

Within a month it was back with the same fault. This time I found that the area around IC101 was very sensitive to heat, producing all kinds of symptoms when either a hairdryer or freezer was pointed in its direction. I felt it unlikely that the new chip had failed, but a replacement had to be tried. No luck. Plying the panel eventually led me to the cause of the problem: after much soul searching and prodding around the chip I found that L105 in the video output feed was intermittent. A replacement salvaged from a scrap panel cured the fault. **M.L.**

### Hitachi CPT2488

At switch on the picture was blacked out except for a narrow strip at the top and bottom of the screen. As the set warmed up the blank area shrank, one line at a time, towards screen centre. Within twenty or thirty minutes the blank bar had disappeared, leaving a normal picture. All this was caused by C574 (100 $\mu$ F, 40V) in the field timebase area being low in value. **E.T.**

### Philips K40 Chassis

The power unit was whistling and the BU508 line output transistor was short-circuit. The set continued to scream when a new BU508 had been fitted. I found that the over-voltage thyristor was conducting because the CNX62 opto-coupler IC7120 was faulty. **C.W.**

### Grundig CUC95 Chassis

When this set was switched on e.h.t. could be felt on the screen and the tube's heaters glowed but there was no raster. As with so many sets nowadays a field output fault will remove the raster. My first check was to advance the setting of the first anode control. This produced a single line across the screen, i.e. field collapse. The cause of the fault was traced to R2754, a 1M $\Omega$  potentiometer, being open-circuit. **C.W.**

### Amstrad TVR1

This set always came on from cold. If it was switched on when warm however it would start all right but after only a very short time the picture would go off and the power transformer would whine. Replacing D1507 and C1511 (100 $\mu$ F, 160V) cured the fault. **C.W.**

### Fidelity LC169

This 14in. portable had neither sound nor sync. The cause was traced to R109E which is part of a chain of ten 5.6k $\Omega$  resistors that supply a sample line flyback pulse to pin 5 of the TDA4500 chip. One end of the chain is connected to the line output transistor's collector. **C.W.**

### Finlux 9000 Chassis

A common fault with these excellent receivers is lack of contrast at switch on. The level can be stored in the memory, but the switch-on level is only about seventy per cent at maximum. This isn't actually a fault: it's caused by the design of the circuit. When the normalise button on the set or the remote control unit is pressed the contrast will come up to the desired setting. The problem is that the tube

is losing emission: with a high contrast setting a good picture can be displayed. A variable d.c. voltage to the colour decoder chip sets the contrast level. Adjusting the values of the resistors in the potential divider network that produces the control voltage will provide a higher contrast level at switch on. It can then be adjusted in the normal way. After some experimentation I found that changing the value of Rb29 on the video panel from 56k $\Omega$  to 40.5k $\Omega$  produced the desired effect. With a lower value the contrast wouldn't turn down while a higher value had little effect. Two resistors in parallel were used to produce this value. The modification is not official. **C.W.**

### Rediffusion/Doric Mk 4 Chassis with Text

This set could be switched on normally but there were no signals until the remote control unit was used to select a channel. Once this had been done all stations were tuned and the set worked perfectly until it was switched off. Replacing the SAA1174 chip on the remote control panel cured the fault. **C.W.**

### Grundig CUC70KT Chassis

There was a raster but no picture, only weak snow. Voltage checks around the tuner/i.f. module showed that all the supplies were present and correct, while the varicap tuning voltage varied. So obviously the cause of the fault was in the can. While checking around the TUA2000 chip IC2110 I found that there was only 1V instead of about 7V at pin 3. R2127 (180 $\Omega$ ) was open-circuit. **C.W.**

### Fidelity ZX5000 Chassis

There was no green in the display unless the brightness was turned to minimum and loss of colour unless the brightness was turned up to 25 per cent of its range, when colour flooded the screen, looked plastic and wasn't registered with the luminance. Replacing the VCU2213A video codec chip restored a normal picture. **C.W.**

### Huanyu 37C-3

Intermittent sound is a fairly common fault with these sets. The loudspeaker is the cause: the flexible braid connection to the push-on connector is poorly soldered. Resoldering often provides a cure. **C.W.**

### Finlux 1000 Chassis

When this set was switched on the channel display lit but there was no sound or picture. Checks showed that the line drive was missing. This was in turn because of loss of the supply to the line oscillator. Transistor Ta2 (BC547), which is part of a voltage regulator circuit on the signals panel, had failed. **C.W.**

### Mitsubishi CT1905BM

If you find that the standby light is on and the power supply is running all right but the set is otherwise dead with no line drive to Q551, check whether R556 is very hot with only about 2V at one end. If it is, C501 (100 $\mu$ F, 25V) on the signals PCB is short-circuit. **M.Dr.**

### Toshiba C2020B

This set had two separate faults: a stringy sort of patterning

on the picture; and field crossover distortion when cold. The cause of the patterning was the fact that the mains bridge rectifier's reservoir capacitor C807 (120 $\mu$ F, 400V) was open-circuit. Now this capacitor has a 4-pin base, so most 2-pin types are unsuitable. A look through some old panels produced a capacitor with the same pin connections. This had been used in a Sony KV2020. Although the value was 250 $\mu$ F, it worked. For the field fault replace the linearity feedback capacitor C317 (2.2 $\mu$ F, 50V). We've had the problem before and use a 4.7 $\mu$ F capacitor in this position as the 2.2 $\mu$ F type can be unreliable when very cold. **M.Dr.**

### Tatung 161 Chassis/GEC C1410

There was no sound and no channel LED display on the front PCB. While checking the voltages around the LED display we found that the set came on when LL01, a small green choke, was touched. It had been poorly soldered from new. I don't know why this affected the sound – we didn't have the manual. **M.Dr.**

### Sony KV2096

This set had an odd intermittent fault. Sometimes it would be stuck on AV when switched on, with AV displayed on the screen. At other times the IR receiving diode would flash as if a remote control command had been received and the channel number would appear on the screen. The cause of the fault turned out to be dry-joints on the screening can around the main microcontroller chip. This can is also used to earth print lands around the chip. Also check the main PCB where the subpanel is plugged in. **M.Dr.**

### Ferguson TX90 Chassis

This set would trip intermittently on scene changes. We found that the h.t. voltage was high at 126V instead of 115V. The cause of the trouble was the fact that the two resistors on the chassis side of the set-h.t. control had gone high in value: R225 measured slightly high at 49k $\Omega$  instead of 47k $\Omega$  while R229 measured 49k $\Omega$  instead of 39k $\Omega$ . **M.Dr.**

### GEC 20AX Chassis/Granada C20VA1

A fault you sometimes get with these sets is flyback lines being visible at low brightness levels during dark scenes. The first thing to check is the value of the first anode supply feed resistor – it tends to go high. Then if necessary check R281 (82k $\Omega$ ) on the decoder panel and both zener diodes in this area (D212 and D218). **G.F.**

### Rediffusion Mk 3 Chassis

There was a blank display, i.e. a white screen, and the sound was intermittent. The 7.5V zener diode 2D15 on the colour decoder panel turned out to be faulty. **G.F.**

### Tatung 145 Chassis

Tuning drift with one of these sets was cured by replacing the M293AB1 tuning voltage synthesiser chip IR03. **G.F.**

### Tatung 140 Chassis

This set wouldn't start up. We found that there was a start-up voltage (9V) at pin 9 of the TDA4600 chopper control chip 1801 but no voltage at pin 5 as R805 (390k $\Omega$ ) had gone open-circuit. **G.F.**

# Camcorner

Reports from David C. Woodnott  
Nick Beer and Keith T. Keeton

## JVC GR45

Irrespective of the position of the on/off switch this camcorder's viewfinder produced a blank white raster whenever power was connected. In fact operating the on/off switch had no effect: a blank raster was still present, with no functions available. The cause of the problem was the fact that the switch's contacts were permanently made, thus inhibiting any function. **D.C.W.**

## Canon VME1E

There was no output from this camcorder's a.c. adaptor. The cause was C22 (2,200 $\mu$ F) being open-circuit. **D.C.W.**

## JVC GRAX10

The complaint was of an intermittent viewfinder picture. In fact in the record mode the camera section of this camcorder switched on and off at random. I suspected the d.c.-d.c. converter, which in fact proved to be the cause of the trouble. The unit is replaceable only as a complete assembly, but in this case a quick reflow session with the hot-air tool provided a complete cure. **D.C.W.**

## Canon E60E

The cause of white flashes and a generally flickering picture was traced to a noisy resistor (R1055) on the main camera PCB. It biases Q1007, a buffer stage in the signal path between the sample-and-hold and processing stages. Not a nice one to get at! **D.C.W.**

## Sony CCDV30E

The complaints with this old timer were that it occasionally chewed tapes and that it produced a rolling picture for the first half minute of a playback. When checked in the workshop it worked all right, with no fault showing up – until it had been left on the bench overnight. When play was selected the following day the rolling picture fault symptom was seen. After a short period the picture stabilised and efforts to instigate the fault were ineffective. The cause of the trouble was that because of contamination the back-tension guide pivot was sticking: it was o.k. when warm, but when cold it took several seconds to reach its correct working position. Once we'd removed the assembly and cleaned the pivot bearing we had no further problems. **D.C.W.**

## Sony CCDF330E

Loss of playback chroma was the complaint. The fault was intermittent with the camcorder's own recordings and seemed to be thermal, as indeed it was. Replacement of DL360 cleared the fault. **N.B.**

## Panasonic VWAM7B

This is the a.c. power supply/charger/AV unit for use with the NVM7B camcorder. The complaint was of no baseband or r.f. output, though the unit did power a camcorder admirably. Checks showed that there was no SW12V supply

at the terminal CBA, where it should appear via the yellow lead that's paired with a pink lead. Between the terminal CBA and the front switch CBA this pair of leads passes via an in-line plug and socket which is not shown in the circuit diagram. The cause of the fault was simply that the plug wasn't fully home – the unit had been dropped, and some case parts had to be replaced.

It's interesting that although the unit came from a state school where technicians look at equipment before it is sent to us the mains plug was in a lethal condition – a 13A fuse was fitted, there were long tails, the cord grip was faulty and undone and a piece of the plug body was missing, exposing the live fuseholder. **N.B.**

## Sony TR45

This machine is very similar to the TR55, for which servicing notes were published in a separate article in the March 1994 issue of *Television*. It suffers from similar faults: the following are ones that were not included in the TR55 article. Note that the front section of the lens on this unit sometimes falls off. This is not because of damage caused by the user but because the glue that was used was not strong enough. Simply reglue it back on, noting the correct position for accurate focusing.

(1) No E-E picture luminance, playback o.k.: Checks showed that there was an input at pin 2 of the low-pass filter FL181 but no output at pin 11. Pin 6 was open-circuit. Fault was cured by replacing FL181, part no. 123626611 (board VC84).

(2) No E-E picture, playback o.k. Checks showed that the V1 and V2 pulses to the CCD image sensor were low. Pulses V3 and V4 were o.k. Cause of the fault was a defective pin-through on board CD48P. Cure is to replace the board or hard wire.

(3) No E-E picture, black screen, intermittent noisy white lines may be seen. Oscillator X101 on board VC84 was not running at the correct frequency because C112 was faulty.

(4) No E-E luminance though titles and playback o.k. A scope check at pin 41 of IC301 (board VC84) restored the picture. C305 (0.01 $\mu$ F, part no. 116297411) was faulty.

(5) Recording produces a black screen: the E-E and playback pictures o.k. Scope checks brought us to filter FL503 on board VC60. We have on occasions found this filter to be either open-circuit or dry-jointed. Replace or resolder as necessary.

(6) When the door was closed with no cassette in, the mechanism loaded halfway, rewound for about three seconds then stopped. Cause was failure of the LED in the centre of the mechanism. Replace LED (GL453, part no. 871995103).

(7) Lines on playback picture (smeared picture). Heads didn't seem to lock because the PG pulse wasn't locking them. C515 (2.2 $\mu$ F, 10V) on board VS72P was open-circuit. **K.T.K.**

# Test Report: ServiceBase

David Botto

The ServiceBase software program developed by PC Control Systems is intended to make life for the long-suffering service engineer easier and less stressful.

In times past the service manager spent much of his time dealing with paperwork and the organisation of the workshop. Parts ordering, keeping track of work in progress, writing out bills and calculating the department's profitability had to be done the hard way. Often only about a third of the manager's working time could be spent on actual servicing. The workshop PC is rapidly changing things for the better.

PC Control Systems believes that ServiceBase will become the industry's standard program. Designed by service engineers for service engineers, ServiceBase is intended to help the industry standardise its business procedures. PC Control Systems plans to make new technical information and product enhancements available to users via a special quarterly update plan.

The ServiceBase program is designed to work with any IBM compatible PC. It comes in the form of two double-sided, high-density 1.44Mbyte 3.5in. discs that are packed in a neat plastic case. A comprehensive, clearly written user manual is supplied.

## What ServiceBase Does

A service department that repairs TV sets, VCRs and other electronic equipment needs to keep accurate records of such things as customers' names and addresses, dates when jobs are booked in, model/serial numbers, fault diagnosis, parts ordered, engineers' notes, warranty claims, method of payment and so on. These and other functions are rapidly performed by ServiceBase.

By using the Update Spares option it's easy to order spares by selecting a supplier from a look-up table. The Parts Ordering process searches through current jobs, selects suppliers and prints out purchase orders. You can print out invoices, job cards, customer receipts, field call receipts, supplier orders, standard reports and a whole lot more. Information on literally thousands of jobs can be stored and recalled instantly.

## Program Requirements

When it's loaded ServiceBase occupies about 5.8Mbytes of your PC's hard disc space. It requires at least 540Kbytes of free computer RAM. To achieve this it may be necessary to edit your autoexec.bat and config.sys files. Almost all modern DOS operating systems however contain a memory manager that can usually make ample space available. To check, type MEM when the C:>DOS prompt occurs. Your monitor will then show the amount of RAM that's available for use in your PC.

To install ServiceBase you start by inserting the Master Disc 1 into drive A. You then type A: Install and follow the simple on-screen instructions. If you want, ServiceBase's install program will automatically modify your autoexec.bat and config.sys start-up files. If you don't want the program to change these files, alter the files statement in your config.sys to FILES=99 otherwise the program won't run.

Software piracy is unfortunately on the increase. For this reason ServiceBase is protected by a clever encoding arrange-

ment. Master Disc 2 contains a file called CCMOVE. Should you want to reformat your hard disc or, for any reason, remove ServiceBase from it the CCMOVE file must be transferred back to Master Disc 2. Otherwise this secret file will be lost. This protection is designed to prevent the program being illegally copied or loaded into more than one PC.

## Running ServiceBase

To start ServiceBase you type CD\SERVICE at the C:\DOS prompt then press enter. Type the letters SB then again press enter. Alternatively use your PC's EDIT (editor) facility to write a simple batch file and store it on the hard disc. Here's one I named SB.BAT.

```
C:
cd service
SB
```

To use this batch file, type SB at the DOS prompt and the ServiceBase program loads. Help is available at any time throughout the program by pressing function key F1.

The first time you use ServiceBase the program requests information, including details of your business, your address and telephone number, VAT number, the password you'd like to use and the serial number of your copy of ServiceBase. Once this has been typed in the information is automatically included on your invoices, job cards, parts orders and customer receipts. You can change these details if you should ever want to do so. After entering this basic information you are asked, whenever you start the program, your name and password. You can then gain entry to the program files. I sure you choose a password you won't forget!

Once your name and password have been logged in, the opening screen appears. It lists the various functions that can be selected, as follows:

**Create new records:** workshop repairs; warranty claims; retail sales\*; rental contracts\*; maintenance contracts\*.

**Daily procedures:** field calls diary; reports sub menu; faults database\*; sales invoices\*; purchase invoices\*.

**Spares stock control:** update stock heading; add stock items; parts ordering; view spares orders.

**Search facilities:** by reference no.; by customer surname; by date order; by unit type and model; by trade accounts; by invoice numbers.

**File maintenance:** suppliers; manufacturers; unit models; trade accounts; contacts database; wants database.

**System management:** system administration; electronic mail; editor and mail merge; graphical analysis\*; quit system.

Items marked \* are not active to date, awaiting module releases.

To select a function you use the arrow keys to move the screen cursor to the required item then press enter. I did miss

using my mouse to do this: it would be helpful to have a mouse facility in a later version. We'll take a brief look at some of the menu options.

### **Create New Records**

This is used to create new job records. All jobs are entered into the system via a workshop repair booking form. You can do this while the customer is supplying you with information. According to PC Control Systems once you've used this facility a few times you'll find it faster, more accurate and a lot easier than any paper system.

Because the person who originally logged into the system may not be the one who is booking a service call, the system asks for user details. You then press the enter key to see a table of users or type in your initials. A job number next appears at the top of the screen. You are asked if the job is a warranty repair and whether it's retail or trade. Under job type you select either field call or workshop repair. An advantage of this job booking-in sheet is that little typing is required: you simply select entries from available headings.

The next thing to enter is the job status. A drop-down menu with several choices such as completed, estimate accepted, no fault found and so on appears. (The program has lots of drop-down menus.) You use the cursor arrows to highlight your choice, which is printed out on the booking form.

Another drop-down menu appears for you to select the source of repair from several headings such as yellow pages, existing customer, maintenance contract, etc.

You are now prompted to provide details of the actual item to be repaired. This can be entered directly or by means of a further drop-down menu which lists a large range of equipment including camcorder, computer, computer monitor, CTV, video cassette etc.

Under fault description you can use your own words or select the IRIS (Integrated Repair Information System) code that's now very widely used. Service engineers constantly have to learn new things: understanding and using IRIS codes is a definite must. Press function key F4 and another drop-down menu and a sub-menu appear, enabling you to select and enter the IRIS codes.

When a job record has been completed you press function key F7 and a customer receipt is printed – on the screen, by the printer or both. Press F8 and the job card is printed out.

### **Daily Procedures**

Within this menu there's a handy Field Calls Diary: it displays a neat calendar showing the month, year, time and full details of recent appointments. New appointments can be entered or existing ones modified. There's also a reports sub-menu.

### **The Other Options**

The Search Facilities menu enables you to find details of any job by order of its reference number, customer's surname, date, unit type/model, invoice number etc. Other pull-down menus lead to tables of manufacturers and trade suppliers. A handy feature is the Wants Database: this stores information on prospective customers for new or second-hand equipment not at present in stock. System Administration enables you, amongst other things, to obtain the correct printer output setting. By selecting Electronic Mail you can send information by telephone via a modem. The Editor and Mail Merge function enables you to send customised,

perfectly printed letters to an individual or a group of people.

### **Future Developments**

PC Control Systems has an ambitious new features programme. As these are released, it will be possible to add them to the basic program. The Fault Database for example will give access to over 24,000 fault details supplied by manufacturers. The idea is that by using the IRIS code system the service engineer will be given direct access to manufacturers' fault data.

The Rental Module will give quick access to customer information, updates, service history and accounts, while the Retail Module will help sales staff to produce invoices and purchase orders and maintain accurate stock control – it will also produce reports on business trends and staff performance.

The Warranty Module will enable the essential information to complete warranty/guarantee forms to be recorded. If you have a laser printer you'll be able to produce an exact facsimile of each manufacturer's warranty claim form. This can be posted to the manufacturer or, better still, sent by telephone via a modem (you won't then need a laser printer).

The Maintenance Module will enable contract dates, terms and agreed rates to be recorded. Together with other ServiceBase features this module will accurately track routine administration figures and data.

Finally (for 1994) the Accounts Module will provide an accounts package specially designed for the trade and acceptable to the tax authorities. There will also be an option to move information directly into the Sage Purchase and Ledger Accounts computer program.

### **Support Fee**

Service engineers will be able to benefit from a continual process of product improvement by paying an annual support fee. Manufacturers' fault data is to be organised by skilled technicians so that fast access to this information is available through the ServiceBase program. Other planned features are lists of manufacturers' technical modifications, model equivalents, component value data, a satellite channel frequency listing, a terrestrial transmitter listing and scart connection data.

### **Conclusion**

ServiceBase is an advanced program for the management of a busy service department. We've covered only its basic features in this article. Engineers will need to set aside time to work right through the manual and master the program. The time spent should however prove to be an investment that will pay off in increased trading profits. Also available are a half-day training program run by PC Control Systems and an effective telephone help line.

When all the promised modules have been released and have been installed the paperwork side of your workshop operation should be fully automated. You'll also know just how profitable the service department is and what needs to be done to boost profits by adjusting your costs and charges.

ServiceBase costs £399 for the single-user version, £599 for a ten-user network. The additional modules will cost from £99 each. The program is available from PC Control Systems Ltd., Hamilton House, 66 Palmerston Road, Northampton NN1 5EX, telephone 0604 601 677. Our thanks to Joe Berry for supplying the test program.

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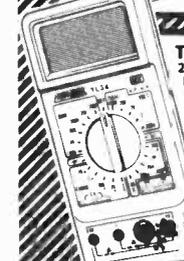
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AN714 £1.00	BA4514 £3.30	1A1430 £1.00	M51933 £1.75	SAAS052 £3.50	STK7358 £3.50	TA7680 £1.75	TD2032 £2.00	TEA3012P £2.00	25C2K32 £1.00	BC3275 £0.07	
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Series 6: Grundig VS300/310/320/340/380, Hitachi VL8/9/10 & Clones, Hitachi VT410 to VT450, Panasonic NV730/777/778/788, Sanyo VHR3100, VHR3800.

Series 7: Ferguson 3V58 to FV11/12, Goldstar GHV/GSE1290-1296, Panasonic later D-Deck, G/G1 Decks, Sharp VC381 to VC387.

(Please note: the above are not full listings, only the main models from each series, they actually contain more information) **Only £12.95 per series or £79.95 for all.**



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# The Panasonic Alpha 3 Chassis

## Part 2

Ray Meadows

Last time we looked at the general layout of the chassis and the circuitry used in the isolated and non-isolated sections of the power supply. We'll turn next to the signals circuitry, which is mainly contained on panels B and H. Basically panel B has the tuner, the i.f. amplifiers and demodulators and the Nicam decoder while panel H is concerned with AV switching and teletext. RGB switching takes place on main panel E.

### Tuner and IF

An Ecom u.h.f. tuner, usually type ENV87839G3, is fitted in models for the UK market. Continental models are fitted with a v.h.f./u.h.f. tuner from either Philips or Telefunken. Apart from the frequency coverage, the main difference is that the Ecom tuner provides an unbalanced output.

Fig. 1 shows a simplified circuit of the tuner and i.f. sections. The tuner's output is fed via emitter-follower Q105 to separate filters for the vision and sound signals. In each path there's a SAWF with a driver stage, Q104 and X101 in the vision path and Q2102/3 and X2101 in the sound path – this one caters for both the f.m. and the Nicam (QIF) signals. After the bandpass filtering these two sets of

signals are fed to the i.f. amplifier/demodulator chip IC101, at pins 7/8 and 13/14 respectively. This device, type M52020SP, was custom designed for the Alpha 3 chassis by Mitsubishi, which manufactures it, and Matsushita engineers. Its features include two-stage i.f. amplification, a mute detector and the option to demodulate positive-going video signals.

Two-stage amplification is useful, particularly where the signal strengths of the local channels differ, in providing high gain and good overload immunity. The mute detector stops the search tuning by producing a high output at pin 25 when a video signal has been detected. The positive-going video option, not used in UK models, enables French system L signals to be demodulated. For this option to be implemented a few additional external components are required. The chip also provides the usual features such as a.g.c. and a.f.c.

As IC101 is not connected to the I2C bus – Mitsubishi was not an I2C signatory when the chip was being developed – the a.f.c. output at pin 43 is buffered by Q102 and fed to the main microcontroller chip IC1213 on panel E. IC1213 then adjusts the tuner via the I2C bus.

The demodulated video appears at pin 52, which with pin 51 provides a convenient off-chip loop where video equalisation can be applied. The 6MHz sound trap is also fitted here. Further equalisation is provided by the feedback link between pins 49 and 50. The equalised video output at pin 49 is fed to panel E via the emitter-follower buffer transistor Q101. A video signal is fed back into IC101 at pin 26, where it's passed to a sync separator that provides the previously mentioned mute output (pin 25).

There are few adjustments – only LC102 (vision i.f. SAWF matching), L105 (vision demodulator) and L2105 (sound demodulator).

### FM Audio

The chip's sound outputs, f.m. and the Nicam QIF (quadrature-modulated i.f.), appear at pin 42. There are again two paths, to the 5MHz (f.m.) intercarrier sound chip

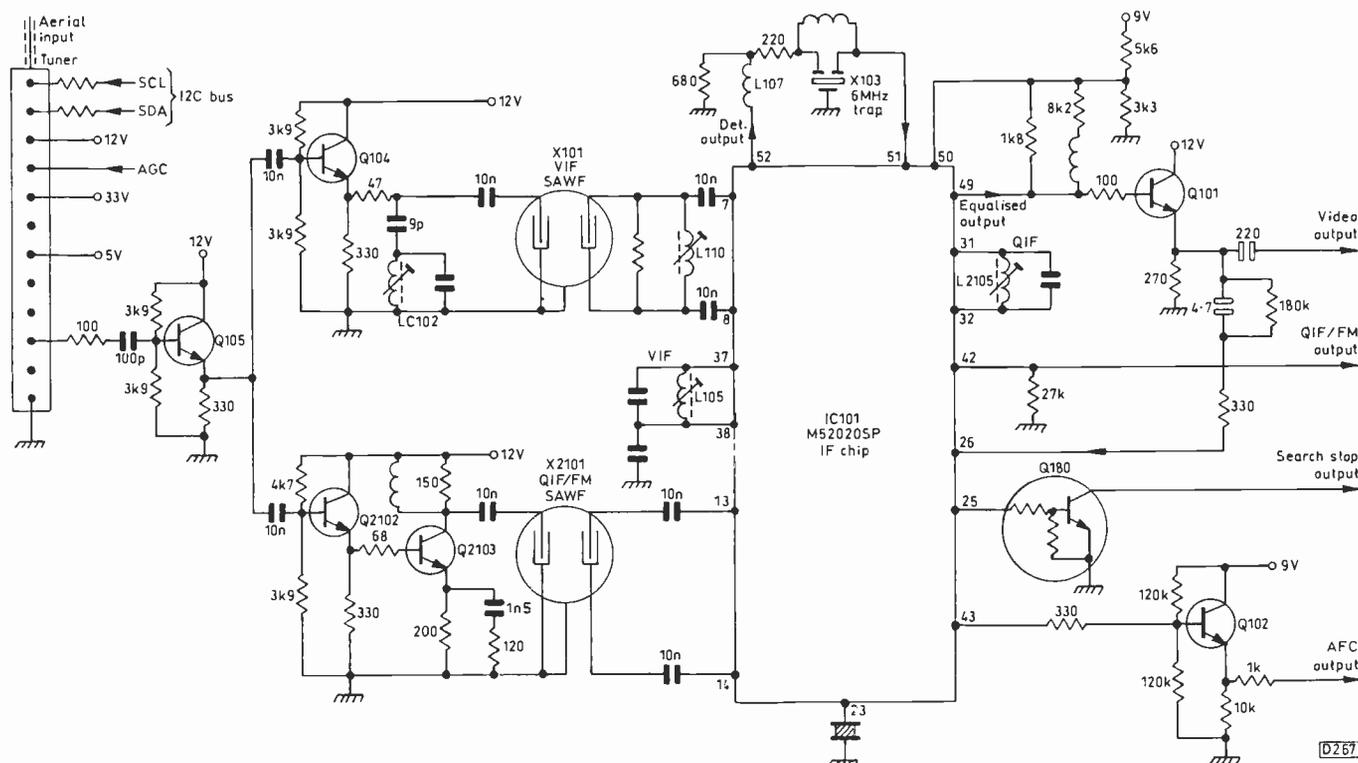


Fig. 1: The basic i.f. circuit, simplified.

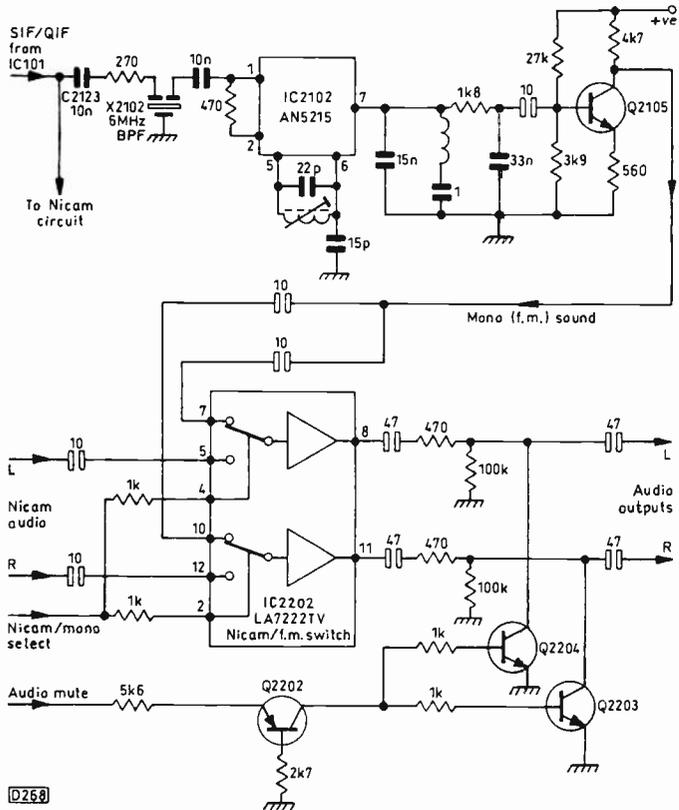


Fig. 2: The f.m. sound and audio switching circuitry, again simplified.

IC2102 and via Q2001 etc. (see below) to the Nicam demodulator chip IC2012.

Fig. 2 shows the f.m. sound demodulator circuit and the

subsequent audio switching between mono and stereo sound. The f.m. sound is fed via a 6MHz ceramic filter, X2102, to the Matsushita AN5215 chip IC2102 whose output, at pin 7, goes to the f.m./Nicam selector switch chip IC2202 via the buffer transistor Q2105. The output from IC2202 is passed to panel E.

Continental sets that can demodulate Zwitone stereo signals have two AN5215 chips with two input bandpass filters, one tuned to 5.5MHz and the other to 5.74MHz. A stereo/bilingual audio decoder chip then uses the pilot tone to select the correct mode. An a.m. sound detector can be added for system L operation, thus increasing the panel's flexibility.

### Nicam

Fig. 3 shows a simplified circuit of the Nicam demodulator/decoder part of the board. The output from pin 42 of IC101 is fed via Q2001 to the QPSK block filter T2001. This provides very high out-of-band attenuation: Q2001 is included to compensate for the loss introduced by the filter. C2060 couples the filter's output to pin 4 of the TA8662N Nicam demodulator chip IC2012. There are two clocks here. X2003 generates a 6.552MHz Nicam subcarrier frequency signal while X2001 provides a 5.824MHz Nicam data clock. Internal synchronous demodulators followed by data sampling circuitry produce the serial data and 728kHz clock signals required by the Philips SAA7280 Nicam decoder chip IC2001, the next chip in the chain.

IC2001 provides descrambling, de-interleaving, parity checking and ten-to-fourteen bit expansion of the Nicam data. It operates with a 17.472MHz clock provided by X2002, which is synchronised with the 728kHz clock

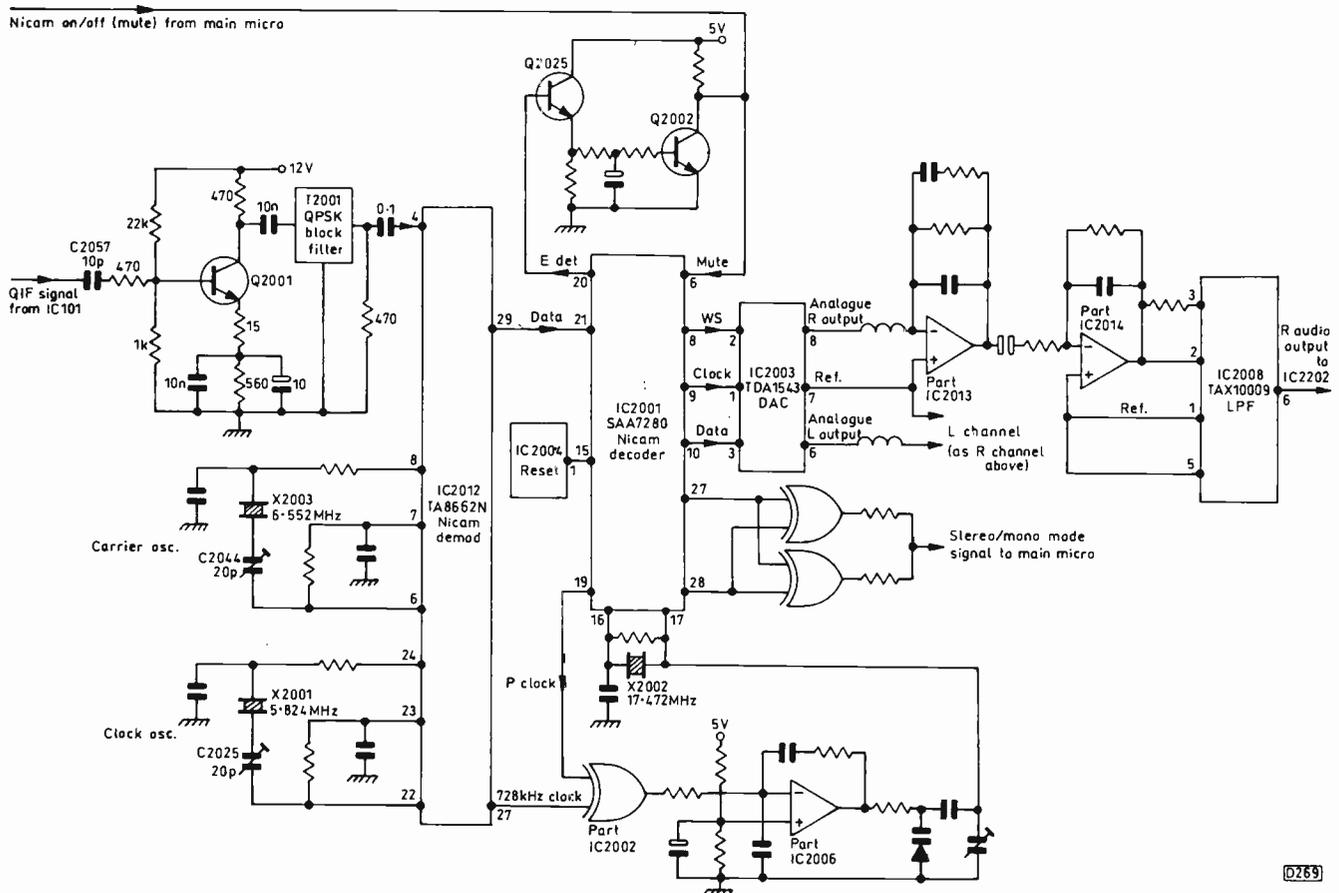


Fig. 3: Simplified Nicam decoder circuit.

signal via a gate in IC2002 and a comparator in IC2006. Other peripheral circuitry includes transistors Q2025 and Q2002 which take the error detect (EDET) output and feed it back to pin 6 as a mute signal should errors be detected. The mute input is also used to switch off the Nicam decoder when the main microcontroller chip selects the f.m. audio mode. The decoder chip is reset at switch on by IC2004, a Matsushita MN1280-R device.

The decoded serial digital audio output at pin 10 is passed to a Philips TDA1543 digital-to-analogue converter chip, IC2003, which generates separate left and right audio signals. These are filtered and level-matched to the f.m. signal by dual operational amplifiers in IC2013 and IC2014. Finally a pair TAX10009 low-pass filter chips, IC2008 and IC2009, remove clock noise and digital interference, the outputs being passed to the selector chip IC2202.

## B Panel Variations

There were a few modifications to panel B during the production life of the Alpha 3 chassis. In early sets the Nicam decoder, DAC and immediately associated chips were fitted in a screened can on a subpanel called panel BN. In later sets the screening is retained but the circuitry is incorporated on the main panel. The most recent models, such as the TX25A2X, use a new, lower-cost Toshiba Nicam decoder, also a new vision i.f. chip – the system is similar to that used in Alpha 2M models.

## AV Switching

Now that we know where the video and audio signals come from, let's see how they are switched and routed around the chassis. It's important to understand this, the route being quite complex. Various loss-of-signal faults can be caused by poor connections: a loose or unclipped B panel for example will mean loss of the tuner signals and thus a blank raster, while a loose H panel will remove the tuner signals and the AV inputs as well.

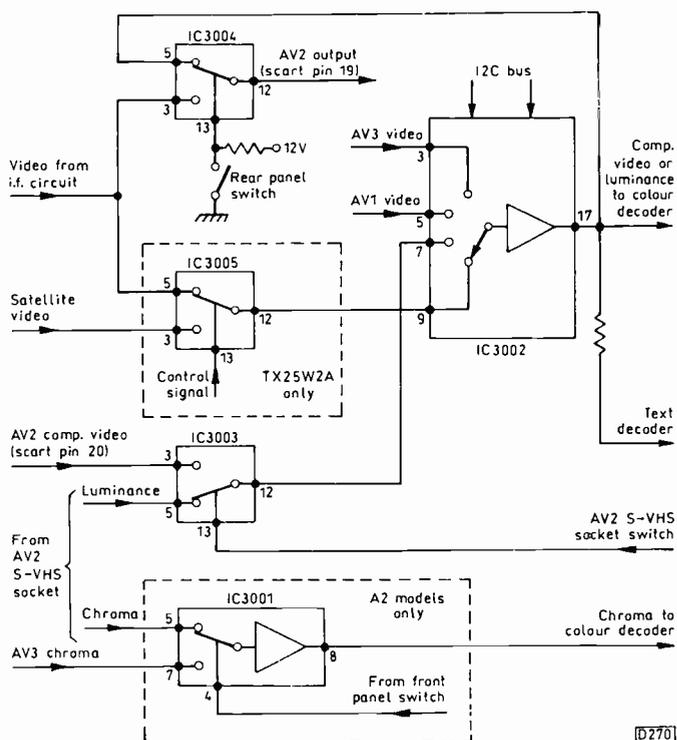


Fig. 4: Schematic diagram showing the AV switching arrangement on panel H (video path only shown).

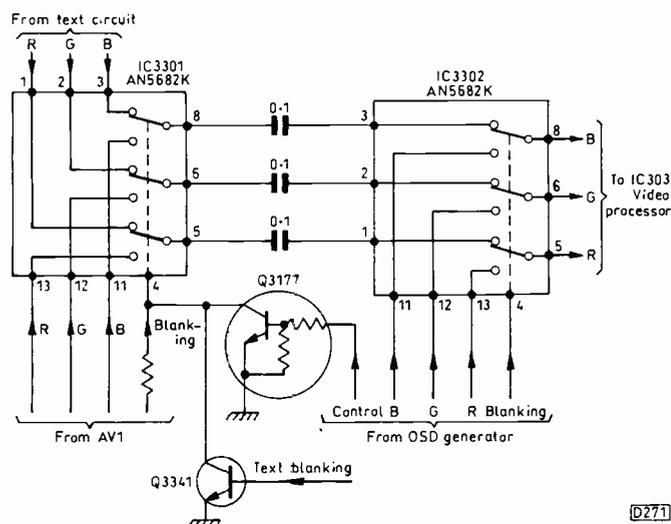


Fig. 5: The RGB source-selection switching on panel E.

Fig. 4 shows in simplified form the video path AV switching on panel H. The circuit enables a number of useful user functions to be included – these are guaranteed to confound the user and service engineer alike! As we've just seen, the tuner signals come from panel B: the AV1 signals come from panel E, the AV2 signals from panel H, the AV3 signals from, where fitted, panel L, while the satellite TV signals (Model TX25W2A only) come from the satellite pack. Except for the RGB inputs from the AV1 scart socket, all the inputs go to panel H for selection. The AV1 RGB inputs are mixed with the on-screen display graphics and teletext RGB outputs by IC3301 and IC3302, see Fig. 5.

Back to Fig. 4. To add to the confusion, there is provision for feeding in S-VHS signals via the AV2 and AV3 inputs. Now the rear-mounted AV2 bracket (see Fig. 1 last month) has a four-pin S socket in addition to the scart connector. If an S-VHS source is fed in via the scart connector, the front-panel AV2 mode switch (next to AV3) must be pushed in. This rearranges the AV2 scart connections so that pin 20 (normally composite video input) becomes the luminance input and pin 15 (normally R in) becomes the chroma input. A small switch is built into the four-pin AV2 S-VHS socket so that use of this input automatically overrides the scart input. Meanwhile AV3 (A2 models only) on the front panel has both an S connector and phono AV sockets. Composite video has priority until the S connector is plugged in. This is a constant source of misunderstanding for users and, probably, service personnel.

Main AV source selection is carried out by IC3002, a four-input, three-way (L/R audio and video) switch with an internal video amplifier. Prior to this the AV2 configuration (depending on whether the input is via the scart or the S connector) is pre-selected by IC3003. IC3001 selects the chroma source with an S-VHS input, the luminance signals passing along the same route as composite video in this mode. Model TX25W2A also has IC3005, which selects either the off-air (u.h.f. tuner) or satellite tuner signal.

One feature that's often overlooked is the selectable video output from the AV2 scart connector. IC3004 enables this to be set to obtain either an on-screen video monitor output, i.e. from IC3002, or a tuner output. A small switch on the rear panel beneath AV2 enables this choice to be made. The tuner video loop-through is useful in a TV dealer's showroom as the input from a single aerial can be used to provide pictures on many sets, using

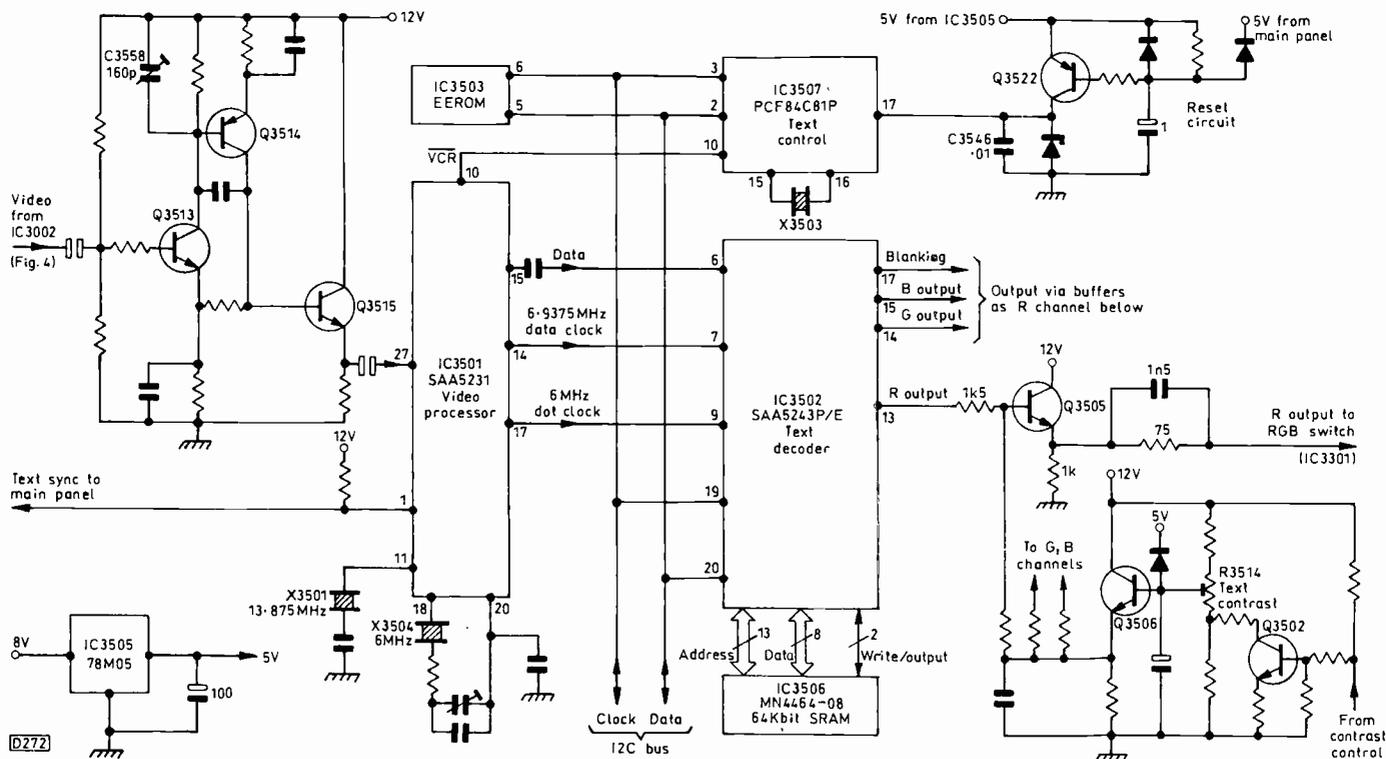


Fig. 6: Simplified teletext decoder circuit (there are variants – see text).

scart 'daisy chains'. For the user, the monitor output enables the selected video source to be dubbed or fed to an AV system.

The other function of the H panel is teletext decoding. Apart from the video input to the teletext decoder, the AV switching and teletext operations are completely separate. Three different types of H panel were used in UK models, depending on the number of AV/satellite inputs provided.

### Teletext

Fig. 6 shows a simplified circuit of the teletext decoder. A three-transistor circuit is used at the input to amplify and buffer the selected video signal, raising it to a suitable level for the text data slicer. The small trimmer C3558 is factory preset to adjust the amplifier's h.f. response for optimum text performance. The Philips ECCT text system is used: it consists of an SAA5231 video processor chip, an SAA5243P/E text decoder chip and a PCF84C81P text controller, with an MN4464-08 static RAM for page storage and an EEROM to provide four 'favourite-page number' memories for the first 25 channels. Two crystals are used for the teletext data (13.875MHz) and character generator (6MHz) clocks. The circuitry is very similar to that used by other setmakers, but there are one or two points worth mentioning.

The red, green, blue and blanking outputs generated by the text decoder chip IC3502 are buffered by Q3505/4/3/1 respectively before being sent to the previously mentioned RGB switches. In the normal text mode the blanking signal is active continuously, so that the text appears against a black background. In the mix mode it's inactive, so that the picture and text are seen. When a subtitle or newsflash appears, the blanking is active only while there's text on the screen. R3514 provides text contrast adjustment. Together with Q3506 it sets the drive level at the RGB output stages. Tracking with the main contrast control is provided via Q3502, which alters the control range at the base of Q3506.

Q3522 and the associated components reset the text control chip IC3507. This is necessary because the text circuit uses two separate 5V supplies: the reset action ensures that the circuit doesn't start to operate until both supplies are available. One fault I've had here was failure of the 10nF capacitor C3546. The result was permanent text blanking because the i.c. latched up during an unsuccessful power-on reset.

A 'funny' that might have been seen by some service engineers in recent months is twinkling or incorrect channel name displays (such as ABCDEFGHIJKLMNOPQRST) when changing channels. Programme providers insert a channel identification in packet 8/30 of the teletext signal: this is used to generate the channel change display. Recently however Channel 4 has started to use Startext, which uses packet 8/30/2 to provide automatic VCR timer switching. Unfortunately the ECCT teletext decoder can't differentiate between the packet 8/30 and packet 8/30/2 codes, relying on the broadcaster to follow the transmission rules to the letter. Channel 4 now appears to be doing so but, at the moment, its Welsh equivalent S4C isn't. If ITV or the BBC start to use Startext we could experience further problems. This isn't, by the way, intended as criticism of ECCT which normally provides excellent, user-friendly text.

### H Panel Variations

Later H panels have a simplified video amplifier at the input to the text circuit, with just one transistor and no trimmer capacitor. For TOP text territories there's a different text decoder that's compatible with the TOP table and German character set.

### Next Month

This completes our look at panels B and H. Next month we'll move on to the main microcontroller and the video processing on panel E.

## Pye CST428

The CD section of this midi equipment didn't work at all. When we removed the CD unit from the cabinet and inserted a disc it became plain that the turntable motor was being permanently braked. The laser assembly was at its outermost point, at the very outer part of the disc. Checks revealed that there was no -11V output from the power supply. The cause was traced to transistor T104 (BC338) which was leaky, a replacement restoring normal operation of the unit. **M.L.**

## Pioneer PD4300

After a period of time that varied the audio output would degenerate to noise – just like when a RAM fails. Giving the optical signal processor chip (r.f. amplifier) a dose of freezer cleared the problem. But the situation remained the same when the chip had been replaced. Oh dear! If you placed your fingers near the optical unit's flexible connector there was inordinate disturbance to the r.f. signal. It was the optical unit that was the cause of the trouble. **N.B.**

## Sony CDPM20S

This CD player is powered by a low a.c. supply. The problem was that the disc ran up at too high a speed, though it didn't run away. Thus the TOC wasn't read. The power supply is based around IC8 and produces split 8V outputs. There was no regulation however: the positive supply was too high and the negative supply too low. The cause of the trouble was a break in the print between pin 3 of IC8 and regulator transistor Q2, the noteworthy point being that if there's a fault in one half of a split supply both outputs will usually be affected, as in this case. **N.B.**

## Pioneer PDM435

This multiplayer was not happy: it was apparently dead but the spindle motor ran (makes a change!) and the disc and cartridge loading motors were running against their end stops. This all suggested loss of half of a split supply, which was indeed the case. The -5V supply was missing because circuit protector IC30 (ICP-N10) was open-circuit. It's quite common to get random failure of these ICP-N10s in Pioneer players generally. **N.B.**

## Ross RCD2000

This portable CD player had been dropped and would now read only the TOC. This is a classic sign of no traverse action, which was the case. Traverse drive comes from a brush motor via a couple of plastic gears to a rack on the laser unit. One of the plastic cogs was dislocated. All that was required was dismantling and retiming. **N.B.**

## Pioneer PDM550

This multiplayer was accused of playing one disc then refusing to play any more: in fact it would play some discs and not others. A check on the r.f. signal, using a test disc, showed that it was low at about 650mV. Lens cleaning improved this by only about 50mV, which is not enough. Increasing the laser power slightly brought up the r.f. signal, as you would expect,

and the unit then worked admirably. But the customer opted for the sensible solution – a new laser unit. **N.B.**

## Sony CDPM29S

This player wouldn't read the TOC with some discs: with others it wouldn't play beyond the TOC. A dirty lens meant that the amplitude of the r.f. signal was very low, but the symptoms were compounded by the usual fault with these players – a weak loading belt, which causes intermittent poor clamping. Attention to both these points restored the unit to good health. **N.B.**

## Sony CDX5080

This in-car radio-CD player would spin the disc very weakly, stop then produce ERS in the display. This indicates low output from the laser unit, which must be replaced. The focus and tracking were severely impaired. **N.B.**

## Pioneer PDX77M

This multiplayer lived in a restaurant. So it was no surprise when it came in because it wouldn't play discs and the spindle motor turned out to be faulty. A new PEA1233 motor cured the initial problem. The lens was visibly dirty, but before cleaning it we decided to check the laser unit and found that it wouldn't focus. Cleaning it got us running, but playability was poor at best and some discs couldn't be read at all. The r.f. signal was low at about 700mV (with a clean lens!). Increasing the laser power restored normal operation, but the correct course would have been to fit a new laser unit. The customer decided to have just the basic job done however. **N.B.**

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**Wanted:** Single-sideband adaptor for the Grundig radio Model SAT2100. Keith Smith, 4/6/8 Staddon Road, Anstey, Leics LE7 7AY. 0533 362 395.

**Wanted:** Circuit diagram or manual for the Cascade TV510 14in. CTV (or clone) and for the Cabel MC370M 14in. colour monitor. Also copies of *Television* from May 1990-August 1991. John Pitt-Francis, Otter Vision, 6 Mount View, Feniton, Honiton, Devon EX14 0EB. 0404 850 126.

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**Wanted:** Service manuals for the Sony SLC6UB Mk. 1 and Amstrad PCW9512. Also an LA4175 chip, an HC1023-85 chip for the Amstrad PS1 charger/power supply and a front panel for the Panasonic NV333. P. Redpath, 47 Corbett Road, Waterlooville, Hants PO7 5TA. 0705 253 595 (evenings).

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**Wanted:** Manual and working or non-working chassis for the Finlux 1000. J. Thornton, 6 Telston Lane, Otford, Sevenoaks, Kent TN14 5JX. 0959 524 085.

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**Wanted:** IF module for the Amstrad SRX100/200 satellite receiver – a scrap one would do. R. Baker, 17 Chapel Lane, Upwey, Weymouth, Dorset DT3 5NA. 0305 208 815.

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**Wanted:** Audio output transformer for the Decca SRG600 series radiogram, part no. 56449; service data for the teletext PCB type BS555 used with the Zanussi 22ZT509 CTV; manual or copy for the Amstrad TVR1. D. Hazell, 159 Queen Emma's Dyke, Witney, Oxon OX8 7EU. 0993 771 373.

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## Solution to Test Case 376

– see page 398 –

How can a perfectly good pair of heads, working with a perfectly good rotary transformer and preamplifier, fail to produce playback pictures from a known good videotape recording? That all these things were perfect had been proved by the fact that the head drum worked in another machine and that the VCR being repaired was capable, though this hadn't been tried, of making a recording.

The answer to this puzzle lies in something that was touched upon a couple of times during our description of the technician's attempts at diagnosing the cause of the problem. It was almost given away by our admission that a recording made by the 'faulty' machine would probably have produced a monochrome picture when played back by another VCR. Although Roger had taken great care to ensure that the upper drum was fitted the right way round on its turntable, he'd not done the same with the bottom shell (it's too light really to be called a flywheel) beneath the motor. As it carries the PG magnets, if it's screwed on 180° out of phase the head switching pulses will be inverted and the heads will become active as they leave the tape wrap for the half-revolutions during which they see just space! The same thing can happen of course if the upper drum itself is bolted down incorrectly.

In the record mode there's no head switching action (in standard models, not small-drum camcorders), both heads being driven all the time with recording current.

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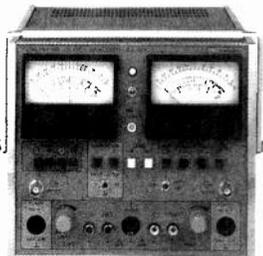
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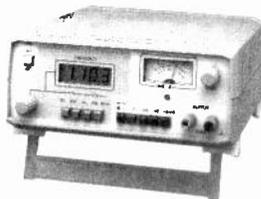
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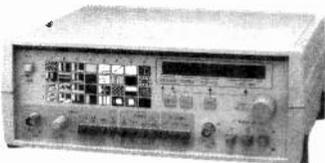
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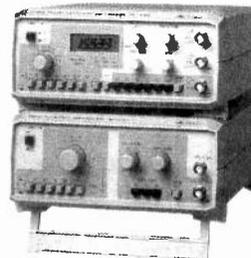
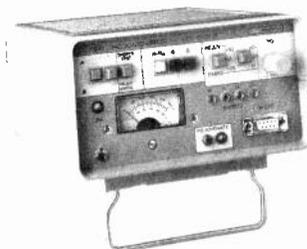
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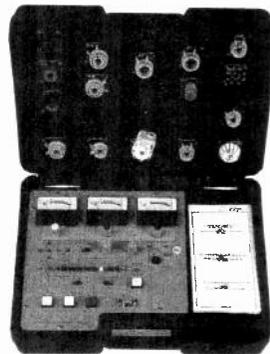
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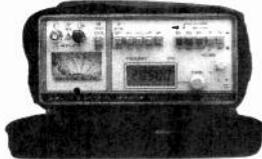
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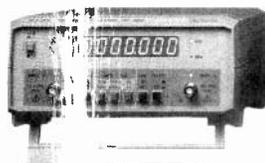
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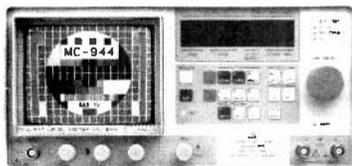
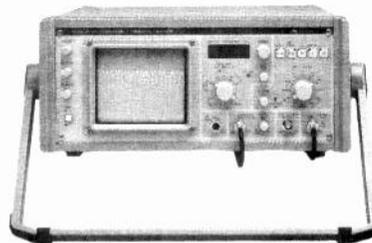
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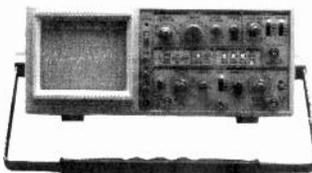
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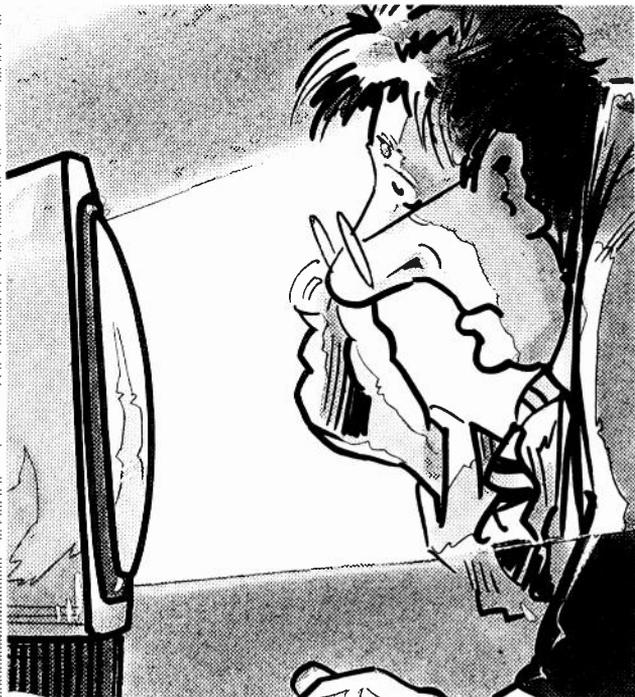
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2SB772/2	£0.40	2SD313	£0.52	BC368	£0.24	BF338	£0.40	BUT255	£0.13	MVS240	£0.58	STK7348	£6.80	TDA1015	£1.75	UC3844	£1.75	250mA 4 Amp	SLOW-BLOW	Aero Duster 100/2	£4.85
2SB793	£0.20	2SD350A	£1.70	BC369	£0.16	BF355	£0.46	BUT288	£0.13	NE5458	£3.10	STK7358	£5.55	TDA1020	£1.85	UPC181C	£0.82	500mA 8 A p	QUICK-BLOW	Spray Adhesive 120	£2.35
2SB879	£0.45	2SD361	£0.14	BC370	£0.45	BF356	£0.17	BUT289	£0.12	NE555	£0.28	STK7358	£5.40	TDA1035B	£4.10	UPC181H	£0.80	400mA 6.3mm	QUICK-BLOW	Anti-Static	£2.23
2SB881	£0.92	2SD3438	£0.32	BC376	£0.35	BF359	£0.16	BUT476A	£0.84	NE555N	£0.35	STR1096	£4.85	TDA1035T	£1.40	UPC182H	£0.80	500mA 8 A p	QUICK-BLOW	Foam Cleaner	£2.22
2SB891	£0.40	AD161	£0.88	BC547	£0.10	BF422	£0.18	BD141	£0.30	NE592	£1.80	STR40050	£8.70	TDA1037	£0.40	UPC185H	£18.00	630mA	QUICK-BLOW	Aero-Klene	£2.23
2SC1008	£0.16	AD152	£0.34	BC547A	£0.04	BF423	£0.13	BD133G	£0.87	NE648N	£2.80	STR496	£18.25	TDA1044	£1.40	UPC185S	£3.80	800mA	QUICK-BLOW	Foam Cleaner	£2.22
2SC1061	£0.80	AF124	£0.14	BC547B	£0.18	BF423	£0.13	BD133L	£0.87	NE648N	£1.75	STR496	£18.25	TDA1060	£1.55	UPC185C	£3.80	12.5 Amp	QUICK-BLOW	Glass Cleaner	£2.23
2SC1096	£0.48	AF127	£0.57	BC548A	£0.27	BF435	£1.82	BYV10-40	£2.10	OA47	£0.22	STR440	£8.25	TDA1082	£4.20	UPC128HA	£0.54	800mA	QUICK-BLOW	Label Remover 130	£2.30
2SC1114	£1.10	AF139	£0.27	BC548B	£0.17	BF458	£0.28	BYV95C	£0.42	OA80	£0.55	STR441	£6.25	TDA1083	£1.15	UPC129H	£2.70	200mm x 5mm	MICROWAVE FUSES	GoldKlene 110	£2.81
2SC1162	£0.40	AF239	£0.40	BC549C	£0.11	BF459	£0.28	BYV960	£0.25	OA91	£0.14	STR451	£14.85	TDA1151	£0.49	UPC129H	£2.65	6.3mA E0.28	200mm x 5mm	32mm x 6.3mm	£0.50
2SC1213	£0.13	AF279	£0.30	BC549	£0.06	BF469	£0.32	HM6232	£18.25	RP240	£2.85	STR50020	£8.80	TDA1170	£1.65	UPC1318	£2.95	8mA E0.20	6.3mA E0.28	8 Amp	£0.50
2SC124	£0.40	AL102	£5.00	BC556B	£0.06	BF470	£0.32	HM6251	£9.48	RP240X	£1.80	STR50103	£5.90	TDA1170N	£1.35	UPC135V	£1.80	10mA E0.20	10 Amp	12.5 Amp	£0.50
2SC1306	£1.14	AN3821K	£7.20	BC557	£0.06	BF480	£0.65	HM7103	£13.89	RP2M	£0.75	STR54041	£8.70	TDA1170S	£1.15	UPC1351C	£1.70	20 Amp	20 Amp		£2.22
2SC1318	£0.08	AN526S	£1.70	BC557B	£0.05	BF493S	£0.32	K42101	£0.80	RP315	£0.40	STR5412	£9.25	TDA2640	£4.10	UPC1353S	£1.30				£2.86
2SC1364	£0.27	AN543S	£1.40	BC557C	£0.10	BF597	£0.15	KA050	£8.45	RP350	£1.80	STR56041	£8.10	TDA2652	£14.20	UPC1353C	£1.05				£2.24
2SC1384	£0.30	AN5512	£2.10	BC558B	£0.05	BF757	£0.41	KSR1004	£0.08	R4051	£2.85	STR6020	£10.10	TDA2653A	£3.25	UPC1363CA	£2.10				£2.22
2SC1353	£2.32	AN5513	£2.30	BC560	£0.20	BF759	£0.33	L200CV	£1.10	RB156	£2.00	STR6020M17	£10.80	TDA2660	£1.85	UPC1363C	£1.85				£2.86
2SC1356	£4.20	AN5521	£2.10	BC560C	£0.20	BF759	£0.33	L1201	£0.55	RP315	£0.40	SL1430	£11.20	TDA3190	£1.25	UPC1378A	£1.15				£2.73
2SC1382	£3.20	AN5612	£2.82	BC563S	£0.18	BF860	£0.22	L1230	£1.82	RP315	£0.34	SL1430	£11.20	TDA3190	£1.25	UPC1378A	£1.15				£2.73
2SC1325	£0.48	AN5900	£1.22	BC637	£0.14	BF762	£0.27	L1385	£1.62	RP30M	£0.28	SL1431	£1.65	TDA3300B	£28.75	UPC1394	£1.90				£2.86
2SC379S	£1.90	AN6310	£4.85	BC639	£0.13	BF869	£0.23	L3161	£0.38	RM11C	£0.85	SL1432	£2.85	TDA3330	£10.75	UPC1420CA	£1.80				£2.53
2SC380	£0.10	AN6326	£3.58	BC640	£0.05	BF870	£0.21	LA1140	£0.35	S2005AF	£1.15	SL471	£1.80	TDA3541	£3.82	UPC1488H	£1.25				£2.85
2SC388A	£0.55	AN6341	£2.22	BC879	£0.25	BF808	£1.42	LA182	£1.70	S2054F	£1.80	SL490	£2.30	TDA3660	£3.82	UPC2002	£2.05				
2SC458	£0.10	AN6610	£0.80	BC880	£0.35	BF075S	£1.58	LA192	£1.12	S2530A	£1.95	ST3A31M	£2.50	TDA3661A	£3.30	UPC324C	£1.73				
2SC536	£0.09	AN6671K	£5.30	BC870	£0.06	BF808	£0.06	LA220	£1.25	SAA1004	£1.13	ST4A01	£2.40	TDA3662A	£0.48	UPC458C	£0.48				£2.65
2SC710	£0.11	AN71																			



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- ☞ Fault Description
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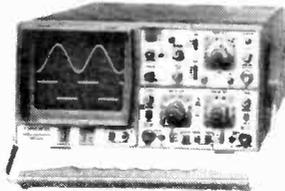
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**HM203-7 20MHz STANDARD**



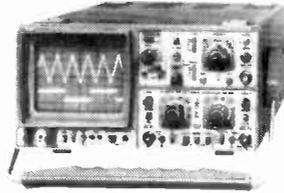
- SPECIFICATION**
- \* 2 Channels
  - \* Bandwidth: DC - 20MHz
  - \* Sens: Ch.1, Ch.2, 1mV/cm
  - \* Timebase: 0.1s - 20ns/cm
  - \* Triggering: DC - 40MHz
  - \* Active TV - Sync - Separator
  - \* Variable hold-off
  - \* Trigger LED indicator
  - \* Calibrator: 1KHz Square wave
  - \* Component tester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

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**SPECIFICATIONS**

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

**HM604 60MHz UNIVERSAL**



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**HM1005 100MHz UNIVERSAL**



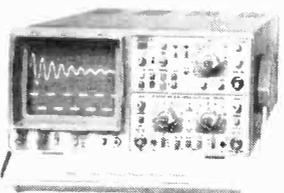
**3 CHANNELS - UP TO 6 TRACES**

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

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**HM205-3 20MHz DIGITAL STORAGE**

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

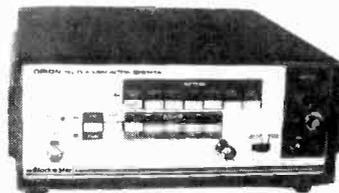


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PAL VHF/UHF - PAL VIDEO COMPOSITE - R.G.B.**

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- FEATURES**
- \* Colour bars, purity, greyscale, crosshatch, dots, locus, etc.
  - \* VHF/UHF Channels.
  - \* 5.5MHz, 6.0MHz, 6.5MHz Sound Carriers.
  - \* Internal/External Sound.
  - \* External Video Output.
  - \* Trigger Output.
  - \* PAL B,D,G,H,I,K.
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  - \* Mains powered 220/240V AC 50/60Hz.
  - \* Size: 98 x 219 x 240mm.



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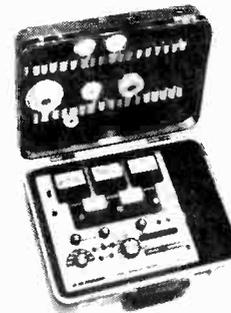


A very effective degaussing coil, ideal for degaussing TV tubes, computer monitors, oscilloscopes etc. Mains Power: 220/240 50/60Hz. Size: 355 x 355 x 24mm.

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The Sadelta Field Strength Meters have been designed to facilitate the dish alignment of satellite TV systems and aerial alignment of VHF/UHF television and radio systems. Signal levels can be accurately measured on the TC402-D, TC90 AND TC80, allowing the evaluation of signal conditions for satisfactory operation. All models have a clear LCD direct frequency readout, coupled to a multiturn tuning control enabling precise channel identification.

**TC402-D VHF & UHF**

**FEATURES**

- \* Three bands:
- Low VHF: 45-170MHz
- High VHF: 170-450MHz
- UHF : 450-862MHz
- \* Digital display for direct frequency readout.
- \* Built-in monitor loudspeaker AM/FM.
- \* Signal measurement from 20µV to 3V.
- \* Powered by eight 1.5V AA batteries.
- \* Fully portable with sturdy carrying case.



Price £289.00 + £50.57 V.A.T.

**TC90 VHF-UHF- SAT.**

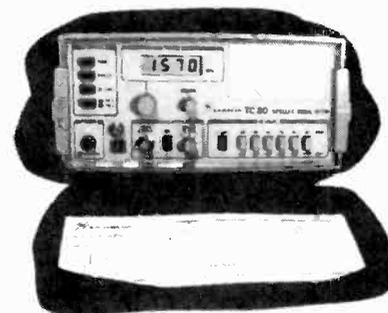


**FEATURES**

- \* Five bands:
- Low VHF : 45-110MHz
- High VHF : 110-300MHz
- Hyper VHF : 300-470MHz
- VHF : 470-862MHz
- Satellite : 950-1750MHz
- \* Digital display for direct frequency readout.
- \* Signal measurement VHF/UHF 20µV to 3V.
- \* Signal measurement satellite -70dBm to -10dBm.
- \* Audible indication of satellite signal level.
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- \* Audio demodulation with internal loudspeaker
- \* Video demodulation
- \* Rear SCART connector for A/V connection
- \* Oscilloscope/spectrum analyzer output
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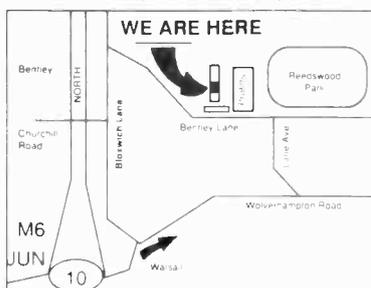
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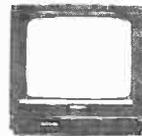
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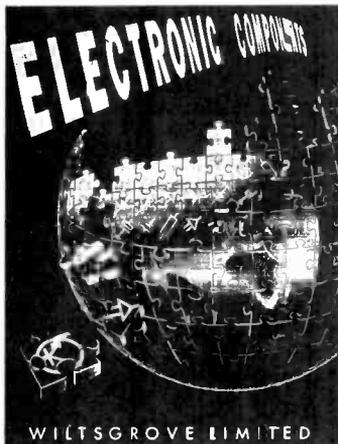
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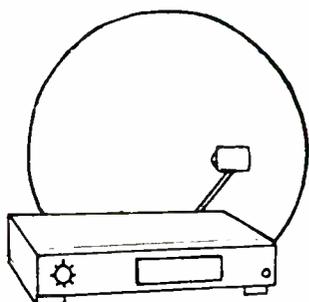
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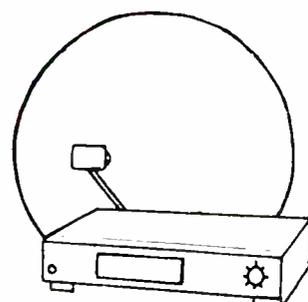
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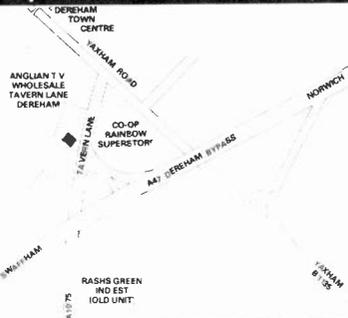
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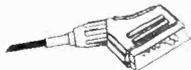
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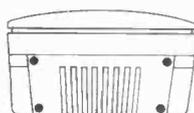
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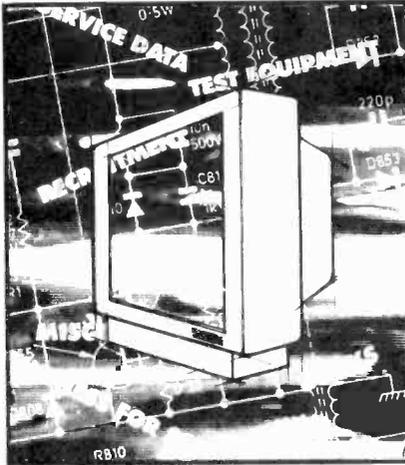
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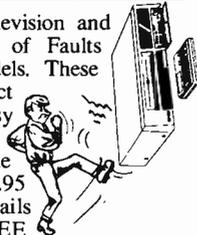
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PHILIPS Decoder SAA IC 5020-5030 5040B 5050	£8.00	PHILIPS IEX1-TYPE Replace Hand Set for Philips KT3-K30, K4 etc £12.50	THORN HAND SETS 9000 - 9600 - TX9 - TX10 - TX100 Text and Non-Text £10.00	FERGUSON PAY HAND SET 4 FOR £1
K40 Text Panel	£8.00	THORN HAND SETS 9000 - 9600 - TX9 - TX10 - TX100 Text and Non-Text £10.00	PHILIPS RCS171 (HAND SET) £12.00	TOSHIBA REMOTE CT9233 AND CT938 £3
ICC5 TUBE BASE ON PANEL ICC5 DECODER PANEL ICC5 TEXT PANEL	£5.00 £15.00 £15	PHILIPS K35-K4 HAND SET Repaired for £5.00	SANYO MAGMITRON Type 2M218H £10	TOSHIBA T/V TUNER. IF ENV 57836 G2F £3
K35 Decoder £8.00 K35 Sound OP £4.00 Thick Film Daughter Kit 3.33122-127-43891 £3.00		B.SKY.B VHF TO IF BLOCK CONVERTER £5	10 Panels Ferguson Mixed from TX9 to ICC5 £20	HITACHI STAND BY MAIN TRANS £10 2213881 AND L210049
12 CH. K30 Text Rec Front Panel with I.C. £5.00		10 Panels Ferguson Mixed from TX9 to ICC5 £20	TV Aerial Ring Type 40p	PHILIPS K35 ETC 12 WAY SWITCH WITH KNOBS 50p
Plug in K4 Focus Pot K40 £1.00		TV Aerial Ring Type 40p	TX100 Remote Hand Sets £6	60.40 SOLDER 500G £4
Fidelity Tube Base with transistor & focus pot £1.50		PHILIPS Video Remote Hand Set Works most sets. No L.C.D. Display £5	Phils Handset IC SAA3010P £3.00 MAB8461/WO63 £3.00	HIGH GAIN T/V ANTENNA UHF-VHF BUILT IN 32DB AMP 12V DC/220 AC £9.25
TX10 Tube Base on Panel £3.00		IIT-Nokia Tuner IF RF-IF Module 5829 02 58 £6	BG 2087 - 642 - 1005 Tripler Grundig £7	AMSTRAD VIDEO FRONTS WITH FLAP LONG CHASSIS ALL MODELS MADE IN 1991 TO 1992 AND DECCA PRO LINE £3
PHILIPS HAND SET K35-K4-K40, etc £10		SEL-IIT IF-Module 2 UK 5828-04-10 £6	Ferguson Hand Set for IK 2000 and IK 7000 £8	AMSTRAD VI VIDEO CASSETTE MECHANISM FITS 30 DIFFERENT MODELS - OSAKI - TATUNG - DECCA - AKAI ETC 1991 TO 1992 WITH SINGLE PLAY HEAD £20
Universal Tripler with small focus pot. Green type £7.00		01 M4-412-001-RU1 £3 8 Way Pre sets for TX10-TX100	01 V61-002 Text Panel ICC5 Ferguson £10	AMSTRAD 6000 HEAD WITH MOTOR LP £12
THORN CASSETTE HOUSING PAS26805U £18.00		01 V61-002 Text Panel ICC5 Ferguson £10	Sharp Tuner and IF 1810587 PAL1 UK £3 Tuner IF UE30-BO-3 Amstrad £3	AMSTRAD - LONG CHASSIS AND SHORT CHASSIS POWER SUPPLY £4 MODELS 1991 TO 1992
LITHIUM BATTERY BR-2/3 Voits 20p		01 V61-002 Text Panel ICC5 Ferguson £10	Sharp Tuner and IF 1810587 PAL1 UK £3 Tuner IF UE30-BO-3 Amstrad £3	AMSTRAD - DOUBLE DECKER SWITCH MODE £8 POWER SUPPLY
TUNER, SAT 2000 KHC £8		01 V61-002 Text Panel ICC5 Ferguson £10	Sharp Tuner and IF 1810587 PAL1 UK £3 Tuner IF UE30-BO-3 Amstrad £3	AMSTRAD - DOUBLE DECKER PANELS. DOUBLE DECKER FRONT £7
HITACHI, IC D1514C 036 £3 D1514C 046 £3 MN1250BJC A ST6393 B1/1Y A 11D6140815A90 C TM147C1637N H M50442-5535P H		01 V61-002 Text Panel ICC5 Ferguson £10	Sharp Tuner and IF 1810587 PAL1 UK £3 Tuner IF UE30-BO-3 Amstrad £3	AMSTRAD LONG CHASSIS DISPLAY PANEL 1992 TO 1993 £4
International Rectifier EFT Diodes G770HV/346KV3 for 8p 6A/60V Stud Diodes 20p BTW 92/800R £3.00 6A/1000V Stud Diodes 20p 24A473 PNP C/P 10p DL 711 Mullard £1		01 V61-002 Text Panel ICC5 Ferguson £10	Sharp Tuner and IF 1810587 PAL1 UK £3 Tuner IF UE30-BO-3 Amstrad £3	AMSTRAD TUNER UE33-B01 £3 IF £2

DIODES		Voltage Regulators		SENDZ COMPONENTS		ML926		TBA1440C		TDA3565	
Bridge KBT-08	40p	+5V/LA78P05SC	30p	2436792	£10.00	BD646	50p	TBA4800	£1.00	TDA2575A	£3.00
BY 126	10p	+SV/79M08C	30p	2436797	£10.00	BD933	30p	TBA520	£2.00	TDA2577A	£2.00
BY 133	10p	+6V/78M06C	30p	AT2078/25	£10.00	BD948	30p	TBA530	£2.00	TDA2578A	£2.00
BY 134	10p	LM 3171	30p	TFB4032B/D	£10.00	BD131A	30p	TBA560C	£2.00	TDA2581	£1.00
BY 176	25p	LM 337	30p	TFB4110E/D	£10.00	BDX75	20p	TBA570	£1.00	TDA2591	£2.00
BY 179	40p	LM 342.18	30p	R 1038	40p	BDX76	20p	TBA625	50p	TDA2593	£3.00
BY 184	20p	LM 3401 + 0	30p	R 1039	40p	BDX77	20p	TBA651	£2.00	TDA2596	50p
BY 187	40p	+12V LM 340T12	50p	R 2009	£1.00	BDX78	20p	TBA673	£1.00	TDA2596	£1.50
BY 190	40p	+18V MC79M18	20p	R 2010	£1.00	BF769	30p	TBA750C	£2.50	TDA2611A	£1.00
BY 196	30p	+24V 78M24	20p	R 2029	£1.00	BF788	30p	TBA800	£3.00	TDA2611A	£1.00
BY 198	40p	MC 7724-p	40p	R 2210	60p	BF789	30p	TBA810S	60p	TDA2653	£4.00
BY 204/4	8p	MC 7824	40p	R 2257	60p	BF858	30p	TBA820M	60p	TDA2593	£2.00
BY 206 - BY 407 Equv	8p			R 2305	50p	BF859	30p	TBA920	25p	TDA3047	£1.00
BY 208/800	8p			R 2306	30p	BF860	30p	TBA990C	£1.00	TDA3083	£2.00
BY 210/400	5p			R 2322 2323	pair 30p	BF871	30p	TMS100NL	£2.00	TDA3190	£1.00
BY 223	10p			R 2323	15p	BF872	30p	TMS1943N2L	50p	TDA3300B	£5.00
BY 226	15p			R 2396	50p	BF873	30p	(clockchip)	£1.00	TDA3301	£1.00
BY 227	15p			R 2461	10p	BF874	30p	TMS270K/G45	45p	TDA3506	£3.00
BY 228 1500V	20p			R 2462	10p	BF875	30p	TMS270J/G45	45p	TDA3561	£3.00
Flat BY 229 black	15p			R 2463	10p	BF876	30p	TMS270L/G45	45p	TDA3562	£3.00
BY 229 Red	20p			R 2464	10p	BF877	30p	TMS329	£1.00	TDA3563	£3.00
BY 229/400	30p			R 2465	10p	BF878	30p	TMS329A	£1.00	TDA3564	£4.00
BY 229/800	30p			R 2466	10p	BF879	30p	TMS329B	£1.00	TDA3565	£3.00
BY 237	5p			R 2467	10p	BF880	30p	TMS329C	£1.00	TDA3571A	£3.00
BY 254	30p			R 2468	10p	BF881	30p	TMS329D	£1.00	TDA3571A	£3.00
BY 255	30p			R 2469	10p	BF882	30p	TMS329E	£1.00	TDA3581	£2.75
BY 268	30p			R 2470	10p	BF883	30p	TMS329F	£1.00	TDA3590	£3.00
BY 269	30p			R 2471	10p	BF884	30p	TMS329G	£1.00	TDA3592A	£3.00
BY 406	8p			R 2472	10p	BF885	30p	TMS329H	£1.00	TDA3651	£3.00
BY 527	20p			R 2473	10p	BF886	30p	TMS329I	£1.00	TDA3652	£3.00
BY 407A	10p			R 2474	10p	BF887	30p	TMS329J	£1.00	TDA3653AQ	£2.00
BY 448	10p			R 2475	10p	BF888	30p	TMS329K	£1.00	TDA3654	£2.00
BY 502/200 - 5 amp	8p			R 2476	10p	BF889	30p	TMS329L	£1.00	TDA3655	£2.00
BY 527	10p			R 2477	10p	BF890	30p	TMS329M	£1.00	TDA3656	£2.00
BY 642	10p			R 2478	10p	BF891	30p	TMS329N	£1.00	TDA3657	£2.00
BYV 26C	10p			R 2479	10p	BF892	30p	TMS329O	£1.00	TDA3658	£2.00
GRP10G	5p			R 2480	10p	BF893	30p	TMS329P	£1.00	TDA3659	£2.00
GRP10G (TX10)	5p			R 2481	10p	BF894	30p	TMS329Q	£1.00	TDA3660	£2.00
KK 3102	5p			R 2482	10p	BF895	30p	TMS329R	£1.00	TDA3661	£2.00
BYV 28/200	20p			R 2483	10p	BF896	30p	TMS329S	£1.00	TDA3662	£2.00
Bridge TX10 800/3 amps	20p			R 2484	10p	BF897	30p	TMS329T	£1.00	TDA3663	£2.00
KBPC35-02 Bridge	£1.50			R 2485	10p	BF898	30p	TMS329U	£1.00	TDA3664	£2.00
Bridge Rect D35E10	£1.50			R 2486	10p	BF899	30p	TMS329V	£1.00	TDA3665	£2.00
BY171/800	12p			R 2487	10p	BF900	30p	TMS329W	£1.00	TDA3666	£2.00
				R 2488	10p	BF901	30p	TMS329X	£1.00	TDA3667	£2.00
				R 2489	10p	BF902	30p	TMS329Y	£1.00	TDA3668	£2.00
				R 2490	10p	BF903	30p	TMS329Z	£1.00	TDA3669	£2.00
				R 2491	10p	BF904	30p	TMS329AA	£1.00	TDA3670	£2.00
				R 2492	10p	BF905	30p	TMS329AB	£1.00	TDA3671	£2.00
				R 2493	10p	BF906	30p	TMS329AC	£1.00	TDA3672	£2.00
				R 2494	10p	BF907	30p	TMS329AD	£1.00	TDA3673	£2.00
				R 2495	10p	BF908	30p	TMS329AE	£1.00	TDA3674	£2.00
				R 2496	10p	BF909	30p	TMS329AF	£1.00	TDA3675	£2.00
				R 2497	10p	BF910	30p	TMS329AG	£1.00	TDA3676	£2.00
				R 2498	10p	BF911	30p	TMS329AH	£1.00	TDA3677	£2.00
				R 2499	10p	BF912	30p	TMS329AI	£1.00	TDA3678	£2.00
				R 2500	10p	BF913	30p	TMS329AJ	£1.00	TDA3679	£2.00
				R 2501	10p	BF914	30p	TMS329AK	£1.00	TDA3680	£2.00
				R 2502	10p	BF915	30p	TMS329AL	£1.00	TDA3681	£2.00
				R 2503	10p	BF916	30p	TMS329AM	£1.00	TDA3682	£2.00
				R 2504	10p	BF917	30p	TMS329AN	£1.00	TDA3683	£2.00
				R 2505	10p	BF918	30p	TMS329AO	£1.00	TDA3684	£2.00
				R 2506	10p	BF919	30p	TMS329AP	£1.00	TDA3685	£2.00
				R 2507	10p	BF920	30p	TMS329AQ	£1.00	TDA3686	£2.00
				R 2508	10p	BF921	30p	TMS329AR	£1.00	TDA3687	£2.00
				R 2509	10p	BF922	30p	TMS329AS	£1.00	TDA3688	£2.00
				R 2510	10p	BF923	30p	TMS329AT	£1.00	TDA3689	£2.00
				R 2511	10p	BF924	30p	TMS329AU	£1.00	TDA3690	£2.00
				R 2512	10p	BF925	30p	TMS329AV	£1.00	TDA3691	£2.00
				R 2513	10p	BF926	30p	TMS329AW	£1.00	TDA3692	£2.00
				R 2514	10p	BF927	30p	TMS329AX	£1.00	TDA3693	£2.00
				R 2515	10p	BF928	30p	TMS329AY	£1.00	TDA3694	£2.00
				R 2516	10p	BF929	30p	TMS329AZ	£1.00	TDA3695	£2.00
				R 2517	10p	BF930	30p	TMS329BA	£1.00	TDA3696	£2.00
				R 2518	10p	BF931	30p	TMS329BB	£1.00	TDA3697	£2.00
				R 2519	10p	BF932	30p	TMS329BC	£1.00	TDA3698	£2.00
				R 2520	10p	BF933	30p	TMS329BD	£1.00	TDA3699	£2.00
				R 2521	10p	BF934	30p	TMS329BE	£1.00	TDA3700	£2.00
				R 2522	10p	BF935	30p	TMS329BF	£1.00	TDA3701	£2.00
				R 2523	10p	BF936	30p	TMS329BG	£1.00	TDA3702	£2.00
				R 2524	10p	BF937	30p	TMS329BH	£1.00	TDA3703	£2.00
				R 2525	10p	BF938	30p	TMS329BI	£1.00	TDA3704	£2.00
				R 2526	10p	BF939	30p	TMS329BJ	£1.00	TDA3705	£2.00
				R 2527	10p	BF940	30p	TMS329BK	£1.00	TDA3706	£2.00
				R 2528	10p	BF941	30p	TMS329BL	£1.00	TDA3707	£2.00
				R 2529	10p	BF942	30p	TMS329BM	£1.00	TDA3708	£2.00
				R 2530	10p	BF943	30p	TMS329BN	£1.00	TDA3709	£2.00
				R 2531	10p	BF944	30p	TMS329BO	£1.00	TDA3710	£2.00
				R 2532	10p	BF945	30p	TMS329BP	£1.00	TDA3711	£2.00
				R 2533	10p	BF946	30p	TMS329BQ	£1.00	TDA3712	£2.00
				R 2534	10p	BF947	30p	TMS329BR	£1.00	TDA3713	£2.00
				R 2535	10p	BF948	30p	TMS329BS	£1.00	TDA3714	£2.00
				R 2536	10p	BF949	30p	TMS329BT	£1.00	TDA3715	£2.00
				R 2537	10p	BF950	30p	TMS329BU	£1.00	TDA3716	£2.00
				R 2538	10p	BF951	30p	TMS329BV	£1.00	TDA3717	£2.00
				R 2539	10p	BF952	30p	TMS329BW	£1.00	TDA3718	£2.00
				R 2540	10p	BF953	30p	TMS329BX	£1.00	TDA3719	£2.00
				R 2541	10p	BF954	30p	TMS329BY	£1.00	TDA3720	£2.00
				R 2542	10p	BF955	30p	TMS329BZ	£1.00	TDA3721	£2.00
				R 2543	10p	BF956	30p	TMS329CA	£1.00	TDA3722	£2.00
				R 2544	10p	BF957	30p	TMS329CB	£1.00	TDA3723	£2.00
				R 2545	10p	BF958	30p	TMS329CC	£1.00	TDA3724	£2.00
				R 2546	10p	BF959	30p	TMS329CD	£1.00	TDA3725	£2.00
				R 2547	10p	BF960	30p	TMS329CE	£1.00	TDA3726	£2.00
				R 2548	10p	BF961	30p	TMS329CF	£1.00	TDA3727	£2.00
				R 2549	10p	BF962	30p	TMS329CG	£1.00	TDA3728	£2.00
				R 2550	10p	BF963	30p	TMS329CH	£1.00	TDA3729	£2.00
				R 2551	10p	BF964	30p	TMS329CI	£1.00	TDA3730	£2.00
				R 2552	10p	BF965	30p	TMS329CJ	£1.00	TDA3731	£2.00
				R 2553	10p	BF966	30p	TMS329CK	£1.00	TDA3732	£2.00
				R 2554	10p	BF967	30p	TMS329CL	£1.00	TDA3733	£2.00
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