

# TELEVISION

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SERVICING·VIDEO·SATELLITE·DEVELOPMENTS

A REED BUSINESS PUBLICATION

## Servicing the Matsui 1455 Chassis

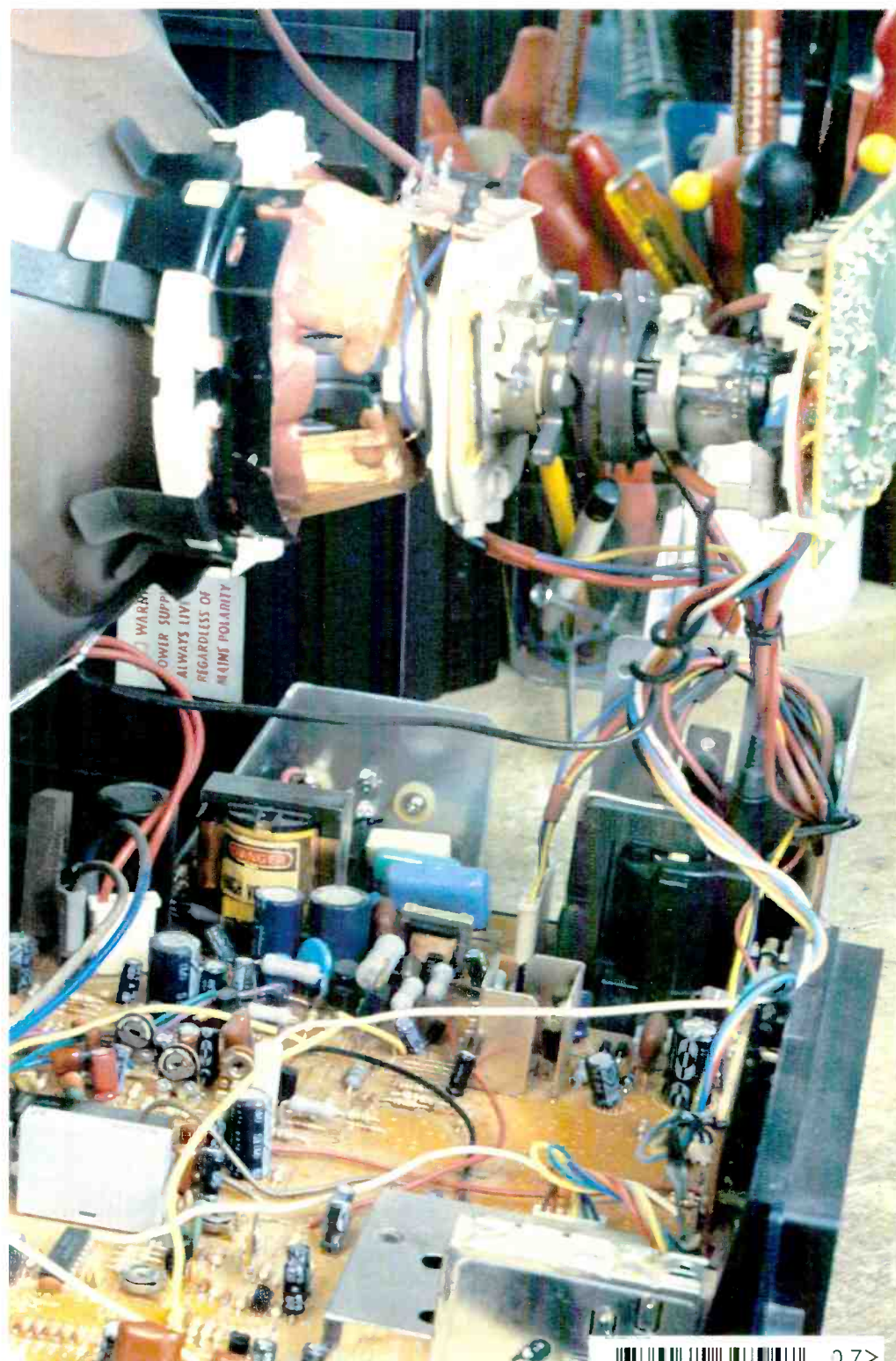
TV Fault Finding

VCR Clinic

Camcorder Battery Discharger

Satellite TV Servicing

Switch-Mode Power Supplies



Computer Communications & Modems



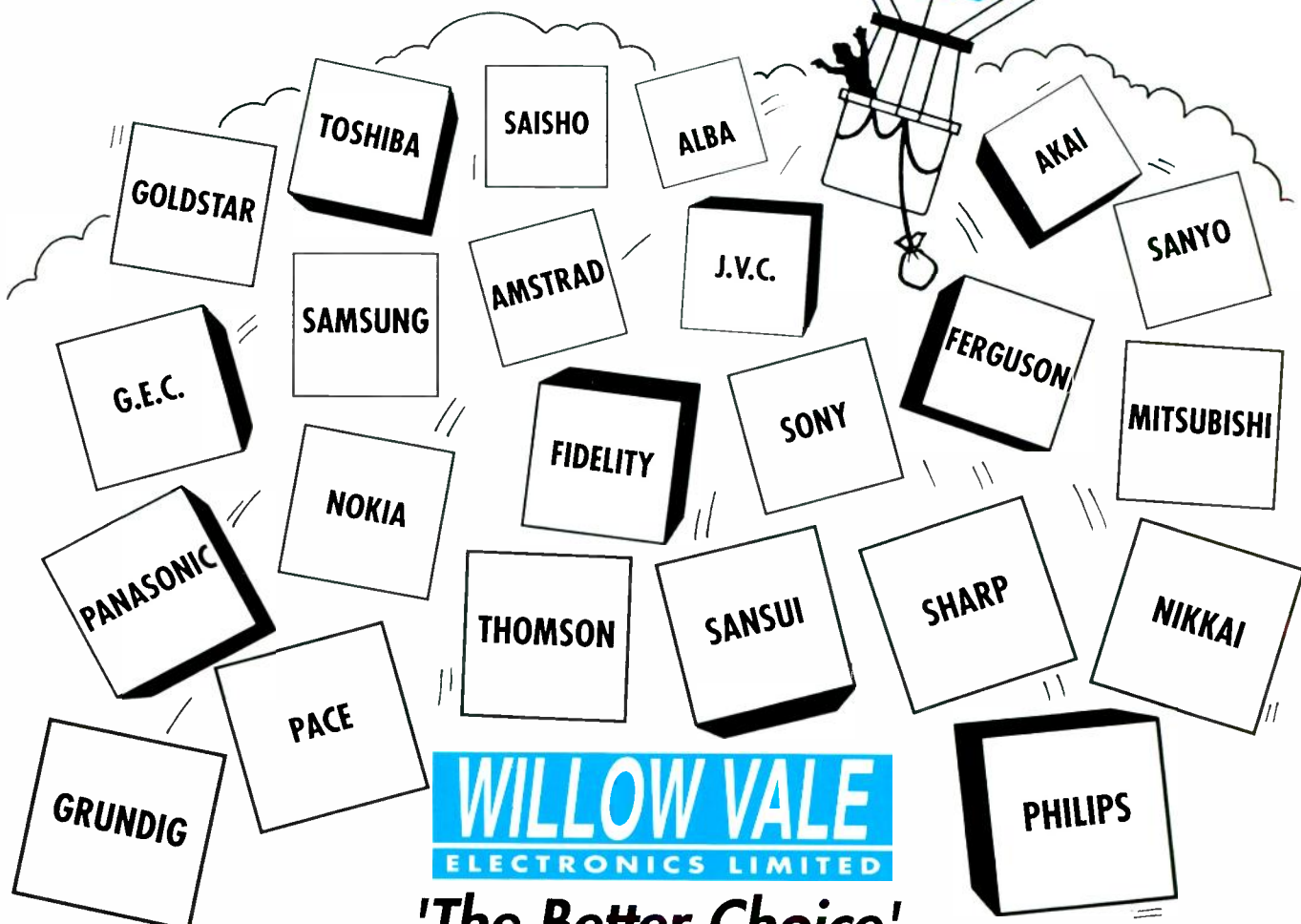
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# TELEVISION

JULY 1995

On sale

June 21st

Vol. 45, No. 9

Issue 537

## 622 *Satellite Notes*

Satellite receiver repairs and modifications.

## 624 *Servicing the Matsui 1455*

Tony Ashworth

The faults you could encounter with this popular colour portable and how to tackle them. Also a note on its non-remote cousin, Model 1422.

## 627 *Computer Communications and Modems*

Jon Lye

How computers communicate via modems and telephone lines, with notes on standards, setting up and software.

## 634 *Inside the Panasonic Alpha 4 Chassis, Part 2*

Ray Meadows

The tuner and i.f. sections, including Nicam sound and teletext, and the AV/off-air/OSD signal switching arrangements.

## 642 *Satellite Receiver Servicing – The Pace MSS Series*

Jack Armstrong

Guidance on the MSS200, MSS300, MSS500 and MSS1000.

## 654 *From the Model T Ford to the PC: an Intro to Switch-mode Power Supplies*

Andy Denham

The principle of the switch-mode power supply goes back to one of the earliest electrical devices, the buzzer. How the system evolved, how and why it came to be used in consumer electronic products and how to go about fault-finding, in particular in TV receivers.

## 660 *Tubes and Other Matters*

Les Austin

How a tube's grid bias can affect the readings obtained when carrying out emission checks with a meter. Other matters? –

cheaper laser units could mean more CD player estimates being accepted.

## 661 *A Simple Camcorder Battery Discharger*

John Cronk,

GW3MEO

Camcorders tend to stop working before the battery has been fully discharged. To overcome the 'memory' effect, a further discharge is necessary before recharging. This simple circuit for the purpose uses a 555 timer chip to minimise the cost.

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The August issue will be published on July 19th

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BC140	20p	BD437	36p	BU126	65p	MPSA94	20p	2N3442	85p	7905	25p	BR254	180p	8250	750p	BA511	145p	KA2912	125p
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BC142	20p	BD439	40p	BU184	100p	OC28	350p	2N3703	9p	7908	30p	BR256	200p	8253	150p	BA516	150p	LA1130	240p
BC143	20p	BD440	40p	BU204	65p	OC29	250p	2N3704	9p	7912	30p	25A600V	8257	8257	220p	BA521	100p	LA1150	150p
BC147	8p	BD441	40p	BU205	70p	OC35	350p	2N3705	9p	7915	30p	BR258	240p	8271	3400p	BA524	240p	LA1185	150p
BC149	8p	BD533	50p	BU206	100p	OC36	250p	2N3706	9p	7918	30p	25A800V	8279	8279	270p	BA526	180p	LA1201	75p
BC159	8p	BD535	38p	BU208	80p	OC45	50p	2N3707	9p	7924	30p	BR351	185p	8283	400p	BA527	95p	LA1210	140p
BC160	8p	BD535	38p	BU208A	80p	OC200	180p	2N3710	12p	7915	24p	35V200V	8284	8284	440p	BA532	130p	LA1222	80p
BC171	10p	BD536	38p	BU208AT	200p	R2008B	100p	2N3711	12p	78108	24p	BR352	200p	8287	240p	BA534	220p	LA1230	130p
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M50784	200p	STK1050	550p	STK5483	440p	STR505041	500p	TBA820M	35p	TDA1941	300p	TDA3771	460p	TDA8380	200p	UPC1298V	320p	2SA988	25p
M50786	500p	STK1060	700p	STK5486	450p	STR50541	550p	TBA820M	100p	TDA1950	175p	TDA3791	300p	TDA8390A	650p	UPC1318	300p	2SA992	30p
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M51381P	200p	STK2025	620p	STK5492	450p	STR60001	525p	TBA990	60p	TDA2004	150p	TDA3810	200p	TDA8417	550p	UPC1363	190p	2SA1006	90p
M51387P	800p	STK2028	500p	STK5525	450p	STR61001	550p	TC5020	200p	TDA2005	150p	TDA3825	225p	TDA8421	500p	UPC1363C	300p	2SA1008	125p
M51544	150p	STK2028	480p	STK5730	450p	STR61001	550p	TC5081A	80p	TDA2006	70p	TDA3840	200p	TDA8425	500p	UPC1364C	350p	2SA1009	200p
M51848	200p	STK2038	700p	STK5735	450p	STR61001	550p	TC9106	500p	TDA2007	120p	TDA3843	200p	TDA8432	550p	UPC1365	250p	2SA1010	225p
M54523P	200p	STK2048	950p	STK6324B	500p	STR61001	550p	TC9142	225p	TDA2008	100p	TDA3845	325p	TDA8433	600p	UPC1370C	300p	2SA1011	80p
M54563P	200p	STK2110	550p	STK6431	850p	STRD1206	600p	TC9142	225p	TDA2009	160p	TDA3856	400p	TDA8434	600p	UPC1373V	250p	2SA1012	85p
M54844	500p	STK2125	580p	STK6722	725p	STRD1806	400p	TC9143	300p	TDA2010	150p	TDA3857	350p	TDA8442	200p	UPC1377C	200p	2SA1013	100p
M51516	260p	STK2129	610p	STK6732	1000p	STRD1816	400p	TC9145	150p	TDA2020	120p	TDA3950	225p	TDA8443	350p	UPC1378	180p	2SA1015	15p
M51518	240p	STK2139	675p	STK6822	900p	STRD3035	300p	TC9148	200p	TDA2030	80p	TDA4050	150p	TDA8451	400p	UPC1382	110p	2SA1016	30p
MB3712	140p	STK2155	900p	STK6932	525p	STRD4412	400p	TC9149	225p	TDA2040	140p	TDA4092	350p	TDA8452	200p	UPC1384	425p	2SA1018	100p
MB3713	130p	STK2230	470p	STK6932	525p	STRD4512	400p	TC9150	425p	TDA2040	140p	TDA4100	225p	TDA8453	350p	UPC1387C	250p	2SA1020	30p
MB3714	270p	STK2240	740p	STK6962	275p	TA7054	190p	TC9152	425p	TDA2040	140p	TDA4100	225p	TDA8454	350p	UPC1393	350p	2SA1023	60p
MB3715	250p	STK2250	650p	STK6972	490p	TA7061	115p	TC9153	300p	TDA2040	140p	TDA4100	225p	TDA8455	350p	UPC1397	350p	2SA1026	90p
MB3722	280p	STK3041	370p	STK6981B	600p	TA7066	120p	TC9156	300p	TDA2040	140p	TDA4100	225p	TDA8456	350p	UPC1400A	450p	2SA1029	60p
MB3730	160p	STK3042	375p	STK6982	600p	TA7089	300p	TC9163	375p	TDA2040	140p	TDA4100	225p	TDA8457	350p	UPC1421CA	650p	2SA1036	60p
MB3731	160p	STK3044	375p	STK7216	400p	TA7119	150p	TC9164	400p	TDA2040	140p	TDA4100	225p	TDA8458	350p	UPC1423CA	550p	2SA1037	50p
MB3756	160p	STK3062	500p	STK7217	400p	TA7120	150p	TC9172P	300p	TDA2040	140p	TDA4100	225p	TDA8459	350p	UPC1423CA	550p	2SA1038	40p
MB3759	200p	STK3082	550p	STK7225	500p	TA7137	60p	TC9194	300p	TDA2040	140p	TDA4100	225p	TDA8460	350p	UPC1488H	150p	2SA1041	80p
MB8719	360p	STK3102II	530p	STK7226	600p	TA7140	100p	TC9194	300p	TDA2040	140p	TDA4100	225p	TDA8461	350p	UPC1505C	400p	2SA1051	30p
MC1455	45p	STK3152II	900p	STK7251	500p	TA7157	100p	TC9194	300p	TDA2040	140p	TDA4100	225p	TDA8462	350p	UPC1514CA	200p	2SA1060	120p
MC1496	85p	STK3156	500p	STK7308	350p	TA7193	320p	TC9194	300p	TDA2040	140p	TDA4100	225p	TDA8463	350p	UPC1515CA	250p	2SA1069	150p
MC3491	250p	STK4025	470p	STK7309	350p	TA7200	200p	TC9194	300p	TDA2040	140p	TDA4100	225p	TDA8464	350p	UPC1520CA	250p	2SA1076	230p
NE555	25p	STK4019	480p	STK7310	470p	TA7206	115p	TC9194	300p	TDA2040	140p	TDA4100	225p	TDA8465	350p	UPC1536C	550p	2SA1077	300p
NE556	40p	STK4021	380p	STK7348	400p	TA7207	150p	TC9194	300p	TDA2040	140p	TDA4100	225p	TDA8466	350p	ZN423	100p	2SA1081	80p
NE558	80p	STK4024II	550p	STK7356	425p	TA7208	125p	TC9194	300p	TDA2040	140p	TDA4100	225p	TDA8467	350p	TEA1019	280p	2SA1082	80p
NE565	110p	STK4025	530p	STK7358	440p	TA7214	220p	TC9194	300p	TDA2040	140p	TDA4100	225p	TDA8468	350p	TEA1024	150p	2SA1084	70p
NE567	115p	STK4026	480p	STK7402	560p	TA7217	145p	TC9194	300p	TDA2040	140p	TDA4100	225p	TDA8469	350p	TEA1045	300p	2SA1085	15p
NE571	200p	STK4028	480p	STK7403	400p	TA7220	220p	TC9194	300p	TDA2040	140p	TDA4100	225p	TDA8470	350p	TEA1060	225p	2SA1091	100p
NE592	85p	STK4032II	510p	STK7404	400p	TA7222	220p	TC9194	300p	TDA2040	140p	TDA4100	225p	TDA8471	350p	TEA1067	175p	2SA1094	190p
NE593P	140p	STK4036	470p	STK7406	675p	TA7223	210p	TC9194	300p	TDA2040	140p	TDA4100	225p	TDA8472	350p	TEA1080P	250p	2SA1097	300p
SA1006	300p	STK4038	680p	STK7410	900p	TA7225	300p	TC9194	300p	TDA2040	140p	TDA4100	225p	TDA8473	350p	TEA1087	400p	2SA1102	80p
SA1008	450p	STK4040II	650p	STK7554	600p	TA7226	290p	TC9194	300p	TDA2040	140p	TDA4100	225p	TDA8474	350p	TEA1101	425p	2SA1106	130p
SA1010	400p	STK4042II	800p	STK7561	650p	TA7227	170p	TC9194	300p	TDA2040	140p	TDA4100	225p	TDA8475	350p	TEA1101	425p	2SA1107	80p
SA1024	250p	STK4044	890p	STK7562	1000p	TA7230	100p	TC9194	300p	TDA2040	140p	TDA4100	225p	TDA8476	350p	TEA1101	425p	2SA1108	130p
SA1025	250p	STK4046	890p	STK7563	1000p	TA7232	95p	TC9194	300p	TDA2040	140p	TDA4100	225p	TDA8477	350p	TEA1101	425p	2SA1109	130p
SA1075	350p	STK4048	1280p	STK8050	750p	TA7233	120p	TC9194	300p	TDA2040	140p	TDA4100	225p	TDA8478	350p	TEA1101	425p	2SA1110	130p
SA1124	200p	STK4060	510p	STK8250	500p	TA7237	110p	TC9194	300p	TDA2040	140p	TDA4100	225p	TDA8479	350p	TEA1101	425p	2SA1111	130p
SA1250	280p	STK4065	650p	STK8260	1200p	TA7238	400p	TC9194	300p	TDA2040	140								

# JAPANESE TRANSISTORS

Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price		
2SA1371	100p	2SC1008	20p	2SC1730	10p	2SC2270	60p	2SC2750	300p	2SC3277	280p	2SC389C	225p	2SD836A	60p	2SD1279	600p	2SD1815	100p
2SA1380	75p	2SC1012	225p	2SC1735	70p	2SC2271	30p	2SC2751	270p	2SC3280	200p	2SC389E	400p	2SD837	55p	2SD1288	175p	2SD1825	60p
2SA1381	100p	2SC1010	75p	2SC1739	800p	2SC2274	15p	2SC2752	140p	2SC3281	200p	2SC3897	400p	2SD838	300p	2SD1289	250p	2SD1843	100p
2SA1382	120p	2SC1013	170p	2SC1740	10p	2SC2275	50p	2SC2757	300p	2SC3284	600p	2SC3907	250p	2SD841	110p	2SD1291	400p	2SD1846	350p
2SA1385	180p	2SC1014	140p	2SC1741	35p	2SC2278	70p	2SC2769	400p	2SC3293	85p	2SC3927	250p	2SD844	200p	2SD1292	60p	2SD1849	325p
2SA1386	400p	2SC1030	150p	2SC1755	90p	2SC2290	1800p	2SC2773	700p	2SC3298	50p	2SC3950	120p	2SD845	250p	2SD1297	300p	2SD1850	325p
2SA1423	30p	2SC1047	20p	2SC1756	35p	2SC2291	40p	2SC2774	500p	2SC3299	120p	2SC395C	60p	2SD850	170p	2SD1302	20p	2SD1858	40p
2SA1489	300p	2SC1050	280p	2SC1758	30p	2SC2295	60p	2SC2785	60p	2SC3300	400p	2SC397C	210p	2SD856	48p	2SD1308	80p	2SD1877	250p
2SA1491	300p	2SC1060	70p	2SC1775	10p	2SC2298	35p	2SC2786	20p	2SC3303	100p	2SC3987	220p	2SD858	25p	2SD1309	140p	2SD1878	230p
2SA1493	500p	2SC1061	85p	2SC1781	20p	2SC2307	300p	2SC2787	10p	2SC3306	130p	2SC399E	1200p	2SD863	23p	2SD1310	140p	2SD1879	275p
2SA1516	280p	2SC1070	65p	2SC1789	100p	2SC2308	10p	2SC2791	500p	2SC3307	600p	2SC400E	100p	2SD864	200p	2SD1313	1000p	2SD1884	300p
2SA1535	175p	2SC1096	40p	2SC1809	40p	2SC2312	300p	2SC2792	220p	2SC3309	150p	2SC402E	280p	2SD866	120p	2SD1326	200p	2SD1886	450p
2SB324	40p	2SC1098	120p	2SC1810	250p	2SC2314	70p	2SC2793	700p	2SC3316	280p	2SC4023	325p	2SD866A	140p	2SD1328	60p	2SD1887	450p
2SB546	45p	2SC1106	180p	2SC1815	10p	2SC2316	150p	2SC2808	40p	2SC3317	350p	2SC405E	350p	2SD868	260p	2SD1347	70p	2SD1910	280p
2SB560	25p	2SC1114	415p	2SC1819	70p	2SC2320	10p	2SC2810	360p	2SC3323	480p	2SC412A	200p	2SD870	190p	2SD1348	65p	2SD1911	300p
2SB561	50p	2SC1115	280p	2SC1826	60p	2SC2324	120p	2SC2812	40p	2SC3327	60p	2SC4123	450p	2SD871	300p	2SD1350	150p	2SD1913	50p
2SB562	25p	2SC1116	290p	2SC1827	60p	2SC2329	480p	2SC2814	40p	2SC3331	120p	2SC4129	250p	2SD879	60p	2SD1376	125p	2SD1929	60p
2SB566	50p	2SC1124	270p	2SC1829	500p	2SC2331	50p	2SC2824	75p	2SC3333	120p	2SC416A	60p	2SD880	100p	2SD1379	100p	2SD1939	75p
2SB595	55p	2SC1161	110p	2SC1833	40p	2SC2333	200p	2SC2825	900p	2SC3345	100p	2SC423B	550p	2SD882	25p	2SD1380	100p	2SD1941	500p
2SB596	50p	2SC1162	30p	2SC1834	50p	2SC2334	80p	2SC2826	200p	2SC3352	200p	2SC4237	650p	2SD892A	100p	2SD1384	50p	2SD1959	280p
2SB600	500p	2SC1165	750p	2SC1845	15p	2SC2335	75p	2SC2827	200p	2SC3353	280p	2SC4242	170p	2SD894	35p	2SD1390	350p	2SD1961	50p
2SB646	20p	2SC1166	100p	2SC1846	35p	2SC2344	150p	2SC2832	300p	2SC3355	50p	2SC4301	550p	2SD895	200p	2SD1391	250p	2SD1978	50p
2SB647	20p	2SC1170	180p	2SC1847	45p	2SC2347	60p	2SC2834	400p	2SC3356	120p	2SC4742	275p	2SD896	200p	2SD1392	150p	2SD1984	450p
2SB648	45p	2SC1172	150p	2SC1855	85p	2SC2353	120p	2SC2837	250p	2SC3358	50p	2SC476E	300p	2SD900	400p	2SD1395	150p	2SD2012	50p
2SB649	35p	2SC1173	40p	2SC1856	25p	2SC2360	120p	2SC2839	40p	2SC3361	50p	2SD198	140p	2SD905	450p	2SD1396	120p	2SD2125	225p
2SB688	90p	2SC1195	210p	2SC1865	700p	2SC2361	150p	2SC2853	70p	2SC3376	300p	2SD199	195p	2SD916	130p	2SD1397	120p	2SD2333	300p
2SB703	90p	2SC1212	35p	2SC1870	700p	2SC2362	50p	2SC2877	120p	2SC3377	50p	2SD200	180p	2SD917	300p	2SD1398	120p	2SD2348	425p
2SB705	200p	2SC1213	15p	2SC1875	220p	2SC2365	280p	2SC2878	20p	2SC3378	120p	2SD201	260p	2SD921	320p	2SD1399	300p	2SD2349	425p
2SB707	200p	2SC1214	15p	2SC1881	70p	2SC2369	100p	2SC2879	3200p	2SC3383	80p	2SD257	195p	2SD923	360p	2SD1400	280p	2SD2350	425p
2SB716	20p	2SC1216	25p	2SC1890	15p	2SC2371	25p	2SC2883	60p	2SC3387	550p	2SD313	25p	2SD946	120p	2SD1402	150p	2SD2356	700p
2SB718	60p	2SC1216	200p	2SC1904	125p	2SC2373	210p	2SC2898	200p	2SC3393	80p	2SD315	75p	2SD947	100p	2SD1406	60p	2SD2374	60p
2SB727	200p	2SC1222	15p	2SC1906	15p	2SC2383	50p	2SC2899	50p	2SC3399	50p	2SD325	30p	2SD950	300p	2SD1407	60p	2SD2375	280p
2SB754	80p	2SC1226	75p	2SC1907	20p	2SC2389	45p	2SC2909	60p	2SC3400	35p	2SD330	65p	2SD951	290p	2SD1408	125p	2SD2376	220p
2SB755	310p	2SC1252	850p	2SC1909	250p	2SC2407	110p	2SC2911	80p	2SC3401	50p	2SD338	30p	2SD957A	520p	2SD1409	170p	2SD2377	350p
2SB772	25p	2SC1278	110p	2SC1913	90p	2SC2408	120p	2SC2912	120p	2SC3402	40p	2SD357	40p	2SD958	60p	2SD1412	75p	2SD2379	225p
2SB774	50p	2SC1279	30p	2SC1921	15p	2SC2412K	50p	2SC2921	650p	2SC3409	400p	2SD358	40p	2SD965	35p	2SD1413	60p	2SD2383	75p
2SB775	100p	2SC1306	90p	2SC1923	10p	2SC2440	200p	2SC2922	480p	2SC3412	800p	2SD371	240p	2SD970	170p	2SD1415	190p	2SD2388	60p
2SB791	280p	2SC1308K	300p	2SC1929	180p	2SC2458	10p	2SC2928	550p	2SC3416	30p	2SD380	850p	2SD973	70p	2SD1417	125p	2SD2389	525p
2SB795	60p	2SC1312	40p	2SC1940	110p	2SC2459	50p	2SC2929	280p	2SC3417	90p	2SD381	50p	2SD973A	60p	2SD1425	260p	2SD2390	550p
2SB825	135p	2SC1317	15p	2SC1941	27p	2SC2470	65p	2SC2934	75p	2SC3419	120p	2SD388	150p	2SD985	120p	2SD1426	160p	2SD2391	700p
2SB861	110p	2SC1318	10p	2SC1942	350p	2SC2481	120p	2SC2937	250p	2SC3420	80p	2SD389	60p	2SD986	120p	2SD1427	180p	2SD2392	650p
2SB882	180p	2SC1325	400p	2SC1944	350p	2SC2482	20p	2SC2938	235p	2SC3422	75p	2SD400	14p	2SD1012	40p	2SD1428	220p	2SD2393	680p
2SB886	90p	2SC1327	15p	2SC1945	350p	2SC2483	120p	2SC2939	400p	2SC3423	60p	2SD401	50p	2SD1020	40p	2SD1429	410p	2SD2394	45p
2SB950	180p	2SC1328	20p	2SC1946	1500p	2SC2484	185p	2SC2944	300p	2SC3446	150p	2SD402	120p	2SD1021	120p	2SD1430	280p	2SD2395	50p
2SB951	190p	2SC1342	15p	2SC1947	450p	2SC2491	200p	2SC2958	50p	2SC3447	200p	2SD415	55p	2SD1022	400p	2SD1431	400p	2SD2396	50p
2SB1009	110p	2SC1345	15p	2SC1957	70p	2SC2495	1900p	2SC2962	800p	2SC3456	200p	2SD424	350p	2SD1024	130p	2SD1432	400p	2SD2397	100p
2SB1077	180p	2SC1346	100p	2SC1959	10p	2SC2498	50p	2SC2979	160p	2SC3457	125p	2SD426	150p	2SD1030	75p	2SD1433	750p	2SD2398	100p
2SB1109	100p	2SC1358	270p	2SC1967	1300p	2SC2500	25p	2SC2987	250p	2SC3459	180p	2SD427	350p	2SD1031	70p	2SD1438	140p	2SD2399	75p
2SC182	75p	2SC1359	15p	2SC1969	160p	2SC2502	200p	2SC2988	150p	2SC3460	180p	2SD438	35p	2SD1046	200p	2SD1439	165p	2SD2400	100p
2SC372	25p	2SC1360	70p	2SC1970	100p	2SC2519	60p	2SC2995	80p	2SC3461	350p	2SD467	15p	2SD1047	180p	2SD1441	280p	2SD2401	40p
2SC380	10p	2SC1364	25p	2SC1972	600p	2SC2527	30p	2SC2999	50p	2SC3466	225p	2SD468	15p	2SD1051	190p	2SD1445	200p	2SD2402	50p
2SC382	50p	2SC1383	25p	2SC1973	150p	2SC2534	150p	2SC3001	1400p	2SC3468	70p	2SD471	20p	2SD1060	130p	2SD1450	60p	2SD2403	100p
2SC388A	60p	2SC1384	20p	2SC1983	75p	2SC2535	30p	2SC3012	300p	2SC3481	300p	2SD525	50p	2SD1062	150p	2SD1451	260p	2SD2404	650p
2SC394	60p	2SC1393	20p	2SC1984	150p	2SC2538	100p	2SC3019	320p	2SC3482	275p	2SD526	70p	2SD1063	200p	2SD1452	350p	2SD2405	415p
2SC403	25p	2SC1394	15p	2SC1985	100p	2SC2540	1900p	2SC3025	500p	2SC3486	275p	2SD545	18p	2SD1064	250p	2SD1453	140p	2SD2406	415p
2SC454	15p	2SC1398	55p	2SC1986	100p	2SC2542	300p	2SC3026	550p	2SC3502	100p	2SD549	120p	2SD1065	160p	2SD1455	250p	2SD2407	160p
2SC458	10p	2SC1400	50p	2SC2001	15p	2SC2545	55p	2SC3030	300p	2SC3503	50p	2SD551	300p	2SD1069	150p	2SD1457	165p	2SD2408	150p
2SC460	10p	2SC1403	500p	2SC2002	15p	2SC2546	25p	2SC3037	125p	2SC3504	120p	2SD555	500p	2SD1071	450p	2SD1459	120p	2SD2409	40p
2SC461	15p	2SC1407	550p	2SC2003	20p	2SC2547	65p	2SC3038	125p	2SC3505	240p	2SD566	50p	2SD1073	350p	2SD1468	60p	2SD2410	40p
2SC495	45p	2SC1413	150p	2SC2004	20p	2SC2550	50p	2SC3039	80p	2SC3506	250p	2SD571	20p	2SD1088	150p	2SD1479	200p	2SD2411	800p
2SC496	25p	2SC1419	50p	2SC2004	20p	2SC2551	70p	2SC3040	260p	2SC3507	650p	2SD575	530p	2SD1094	520p	2SD1487	225p	2SD2412	45p
2SC497	85p	2SC1																	







# VCR BELT KITS / REPLACEMENT VIDEO LAMPS

Model	Price	Model	Price	Model	Price	Model	Price
HRD520, 600, 620, 637, 641, 660, 830 HRD540, 560, 580, 660, 860, 960, HR55800	95p 130p	VR6010, VR9010 VR6020, VR6022, VR6023, VR6028, VR7730 VR6024 VR6520, VR6540, VR6560 VR6710, VR6720, VR6735, VR6720 VR6720, VR6730, VR6760, VR6775, VR6780	70p 150p 75p 75p 90p 130p 160p	<b>Models &amp; Description</b>	<b>Order Code</b>	<b>Price</b>	
<b>KENWOOD</b> KV901 KV903	70p 90p	<b>SAISHO</b> VR2000, VHL3 VR3800	90p 75p	UNIVERSAL VIDEO LAMP 9V 80mV (310mm WIRES)	VL01	25p	
<b>LOEWE</b> OC11, OC40 OC410, OC420, OC440, OC460 OC50, OC55, OC60, OC65, OC70, OC75	95p 130p 120p	<b>SALORA</b> SV6500 SV6600 SV8100 SV8100 SV8100 SV8500, SV8520, SV9500 SV7400, SV8400, SV8420, SV8550 SV6700, SV8710, SV8750, SV9700 SV6800, 6900, 8810, 8820, 8870, 8910, 8920, 8970 SV8600, 8620, 8700, 8720, 8830, 9600, 9810	100p 150p 120p 60p 60p 150p 120p 120p 135p 90p 130p	PANASONIC VIDEO LAMPS	VL02	35p	
<b>LOGIK</b> VR955	180p	<b>SAMSUNG</b> SV716, 717, V1616, V1621, V1626, VX616, VX617, VX619, VX626, VX627, VX629 85p VX170, 790, 8220, 8225, VK8220, VPX31 627, 629, V1510, 520, 611, 616, 621, 626, VX510, 520 VB900, VB910, V1900, V1910 PX980, 981, 982, SE9001, SV9001, SVX307, 319, 322, VB770, 8220, 8225, VX170, 790, 8220, 8225, VK8220, VPX31 VX750, VV790, 8220, 8225 SVX301, 303, 305, SX7301, VB710, 971, V1730, 710, VX712, VX720, 730, 970, 971, 972 VX9880	100p 120p 60p 150p 120p 120p 135p 230p 110p	SHARP VIDEO LAMPS	VL02	35p	
<b>LUXOR</b> 9245, 9251 9252 9253 9254 9255 9256 9270, 9271, 9273, 9274 9272, 9280 9281, 9284, 9285, 9292, VR3701, 3721, 3731, 3761, 3781	130p 140p 140p 100p 130p 130p 115p 140p 95p	<b>MATSUI</b> VX850	75p	HITACHI 5381682 (VT63, VT64) VIDEO LAMPS	VL04	135p	
<b>MITSUBISHI</b> HS200 HS300, 301, 302, 307, 310, 337, 338, 347, 349, 411, 412, 421, HSB10, 20, 30, HSE10, 20, 30, 70 HS303, HS304, HS306, HS307, HS330, HS400, HS700 HS318, HS319, HS410	200p 150p 150p 130p	<b>N.E.C.</b> NB30, NB31, NB32, NB33 NB95 PVC2300, PVC2400 DX1000, 1600, 2000, 3000, N9012, 9013, 9014, 9016, 9033, 9034, 9053, 9054, 9055, 9066, 9110, 9120, 9510, 9520, 9530, 9610	100p 80p 180p 95p 95p	AKAI, AKAI, ALBA, AMSTRAD, BLAUPUNKT, FERGUSON, FIDELITY, FISHER, FUJITSU, FUNAI, G.E.C., GOLDSTAR, GRANADA, GRUNDIG, HINARI, HITACHI, ITT, JVC (HRD SERIES), MATSUI, MITSUBISHI, NEC, ORION, NATIONAL, PHILIPS, SAISHO, SALORA, SAMSUNG, SANYO, SHARP, SIEMEN, SONY, TELEFUNKEN, THOMSON, TOSHIBA	VL05	150p	
<b>NATIONAL PANASONIC</b> NV300, NV332, NV333, NV340, NV366 NV777, NV788 NV2000, NV2010, NV3000 NV7000, NV7200, NV7800 NV8600, NV8610, NV8620 NV230, 250, 280, 430, 431, 433, 450, 460, 465, 470, 730, 770, 810, 870, 890, AG1000, 1050 NV370, NV380, NV480, NV630, NV780 NV830, NV850 NV800, NV888, AG6010, AG6015 NVG7, 10, 12, 14, 15, 18, 30, 130, 400, NVH70	125p 100p 130p 95p 145p 100p 110p 70p	<b>SHARP</b> VC200, 384, 385, 386, 388, 390, 9300, 9500, 9700 VC7300, VC7700, VC7750, VC7800, VC7800 VC8300 VC300, 387, 471, 473, 481, 482, 483, 485, 488, 496, 8481 VC402, 500, 571, 573, 581, 582, 583, 584, 585, VCSF3 VC600, 5651, 662, 684, 685, 693, 783, VC6F3, VC6V3 VC772, 779, 781, 782, 785, 786, 793, 800, 7810, 7822, VCA100, VCA102, 104, 131, 140, 170, 202, 203, 234, 501, 602, 5011, VCD806, 810, 815, VCH80, 865, 910, VCS1000, VCT1310, 410, VCT1314, VCTS312	100p 100p 95p 220p 130p 90p 150p 110p 100p 150p 80p 80p 70 80p 115p	AKAI, GRANADA (VHSTJ2), HITACHI (VT3000), ITT (VR3912, VRP3833), JVC (HR2200, 3300, 3330, 3660), MITSUBISHI (HS200), TELEFUNKEN (VR510, 519, 610), THOMSON (VK300, 305, 306, 3301), FERGUSON (3V00, 16, 22, 24, 3292, 8900, 8901, 8902, 8903, 8909, 8912, 8922, 8925)	VL01	25p	
<b>NORDMENDE</b> V100, V140 V1000M, 1005M, 1205, 1215, 1235, 1245, 1305, 1403, 1405, V1500P, 1503, 1505K, 1805K, 2000D, 2405, 2500H, 3000H, V3405H, 3105, 4405H, 5000, 8005, 900, 905 V1001, 1005, 1015, 1025, 1035, 1041, 1055, 1065, 1105, 3005, 304, 5005, 502, 503 V101, V102, V103, V112, V141, V142, V301, V302 V110, V333 V1500T, V2000B, V2000P, V400H V250, V460, V9460, V20035542, V20035543 V300, V303, V380 V500	70p 80p 80p 110p 95p 130p 75p 75p	<b>SIEMENS</b> FM350, FM352, FM355 FM484, FM485 FM391, FM392, FM394, FM462 FM461, FM464, FM468, FM561 FM361, FM362, FM363, FM364	60p 55p 100p 150p 120p	BLAUPUNKT, ORION (VH1, 2A), NATIONAL (NV200, 2010, 3000, 7000, 8150, 8200, 8400, 8600, 8610, 8620), SHARP (VC2300, 6000, 6200, 6300, 7300, 7700, 8000, 8300)	VL02	40p	
<b>ORION</b> COMBI15000, 16000, NEVHM, TYP230RC, 900MVH1012, VH1030, 1040, 1060, 1070, 1100, 1120, 1440, 1500, 1660, 1800, 2150, 2308, 2400, 2500, 2600, 2700, 2960, 300, 358, 360, 392, 4010, 4015, 4016, 4020, 4300, 5010, 5015, 530, 535, 536, 630, 635, 640, 730, 735, VP220, 225, 245, VR1032, 2966, 2980, 821, 925, VXL25 NEVHL, VCP, VH1204, 2004, 2204, 3050, 3060, 4008, 400, 4012, 412, 512, 600, 666, 744, 774, 7905, 800, 820, 900, 974, VP200, VR4294, 2956, 2957, VXL20 VC150, 180, VH1000, 200, 201, 205, 212, 250, 254, 288, 300, 303, 3030, 312, 33, 3312, 404, 555, 700, 704, 708, 712, 770, 780, 844, 900, VHF2, VH3 VH1, VH2A	30p 80p 150p	<b>SONY</b> SLC5, SLJ10, SLT6ME SLC5, SLC7, SLJ7, SLJ9 SLC9, SLR000, SLR080, SLT50 SLR000E, SLR080E, SLR200, SLR8600 SLV255	140p 140p 165p 175p 95p	AKAI (VS10), GRANADA JVC (VHSXJ3), ITT (VR3993, 3994), JVC (HR2650, 7600, 7610, 7650, 7655), TELEFUNKEN (VR530, 535, 539, 550, 630, 650), THOMSON (V309, 316, 357, VK309, 411, TX8000), FERGUSON (3V31, 8941, 8942)	VL06	40p	
<b>PHILIPS</b> VR6460, VR6920 VR6540 DV186, 286, 291, 292, 468, 471, 562, 571, 761, VR201, 202, VR20DV1, 20DV2, 20RW7, 25801, 25802, 302, 303, 305, VR30DV2, 35802, 35803, 63587, 71584, 71585, 71588, VR86582, 91582, 92583, VR6180, 6185, 6285, 6290, 6291, 6293, 6367, 6390, 6391, 6393, 6467, 6468, 6470, 6561, 6570, 6581, 6670, 6676, 6760, VR68584, 96581, 92583 VR6442, VR6542 VR2025, VR2580 VR44589, BR4458920, VR4458922, BR6843 VR6548, VR6648, VR4958620, VR648695	170p 100p 100p 85p 100p 100p 100p 100p 110p	<b>TELEFUNKEN</b> VR400, VR410, VR440, VR448 VR450, VR500, VR549, VR640 VR520, VR529, VR620, VR920 VR530, VR535, VR539, VR550, VR630, VR650 A940, VR1925, 1930, 1940, 1950, 2960, 925, 930, 940, 950 A920, VR1970, 1980, 2920, 2925, 2930, 2970, 7921, 7926, 7931, 7970, 7971, 7980, 970, 7981, 975, 980 A1200, 930, 932, 935, 960, 980, 990, VR2931, 2935, 2941, 2971, 3935, 3945, 3950, 3965, 3975, 4935, 4940, 4942, 4945, 496, VR4970, 6000, 7932, 7959, 7979 VR1935 VR2915	70p 70p 70p 75p 90p 90p 65p 100p 90p	AUTHENTIC (NR50), DECCA (VR8300), GRANADA (VHSTJ3, WJ1, WJ3), ITT (VR3913, 3914, 3963), JVC (HT7200, 7300, 7350, 7700), TELEFUNKEN (VR450, 520, 529, 540, 549, 620, 640, 920, 1920), THOMSON (V4100, VK308, 309, 312, 410), FERGUSON (3V23, 29, 30, 8923, 8924, 8929, 8930, 8931, 8940)	VL07	40p	
<b>SABA</b> VR6420, 6435, 6440, 6460, 6480, 6620, 6770, 7200, 8420, 2A10, 70, 2B20, 3520, 4A10, 4B20, 6A10, 6A70, 6B20, 8B20 VR6004, 6005, 6011, 6014, 7004, 7011, 7014, 8011, 8014, BERLIN VR2000, VR6000, VR6012, VR7000, VR7720, VR8008 VR5005, VHR7000 VR6006, 6007, 6008, 6009, 6015, 9016, 9018, 6038, 7006, 7007, 7016, 7018, 9006	65p 90p 130p 135p 100p 100p 110p	<b>THOMSON</b> SV1000, V410, 430, 450, 510, 520, 530, 540, 620, 630, 640, 4240, 5V5540 TX8000, V309, V357, VK411 TX8500, V342, 343, 351, 352, 353, 360, 364, 365, 4210, 4230, 4260, 4400, 5500, 6000, 8564 V320, V321, V323, V326, V4200, V4300 V333 V340 V3100, VK308, VK309, VK410 VK300, VK301, VK302, VK303, VK305, VK3301 VK312	65p 75p 75p 90p 90p 90p 100p 120p 135p 65p	GRANADA (VHSAY3), SHARP (VC200, 381, 384, 385, 386, 388, 390, 393, 9300, 9500, 9700)	VL08	60p	
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3V42/43			
HRD455/HRD725			
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3V29/3V30			
HR7200/7300/7350			
<i>Contents</i>			
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3V35/36/38/39/49			
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BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES			
Order Code: SK04		£5.00	
3V31/3V42			
HR7600/7610/7650/7655			
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Order Code: SK33	£11.00	Order Code: SK34	£5.00
3V35/36/38/39/49			
HRD110/111/120/121/225			
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BELT SET, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, T/U CLUTCH, T/U IDLER, REEL IDLER, TENSION BAND		BELT SET, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, T/U CLUTCH, T/U IDLER TYRE, REEL IDLER TYRE	
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3V29/3V30			
HR7200/7300/7350			
<i>Contents</i>		<i>Economy Kit 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		BELT SET, T/U REEL IDLER TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, REEL IDLER TYRE, T/U IDLER TYRE, T/U CLUTCH	
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HRP50/HRD140/150/158/160			
HRD250/257/565/566/755			
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FVHP905/906/907/908/910/911/916/918			
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VT11/VT33			
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Order Code: SK49	£14.00	Order Code: SK50	£3.00
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<i>Contents</i>			
TIMING BELT, PINCH ROLLER, FF/REW ARM, CLUTCH BASE, TENSION BAND			
Order Code: SK52		£9.75	
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175/220/225/250/255/258/260/VTL30			
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<i>Contents</i>			
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRE			
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NV2000/NV2010			
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<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND		BELT SET, PINCH ROLLER, IDLER TYRE, CLUTCH TYRE	
Order Code: SK11	£8.50	Order Code: SK12	£3.25
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<i>Contents</i>		<i>Economy Kit Contents</i>	
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NVG7/NVG9/VNG10/NVG11/NVG12/NVG14/NVG15/NVG16			
NVG18/NVG30/NVG120/NVG130/NVG400/NVH65 (P/A/C)			
AG1810 (P/K)			
<i>Contents</i>		<i>Economy Kit Contents</i>	
LOADING BELT, CAPSTAN, BELT, PINCH ROLLER, IDLER, TENSION BAND		LOADING BELT, CAPSTAN, BELT, PINCH ROLLER, IDLER TYRE	
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NV332			
<i>Contents</i>		<i>Economy Kit Contents</i>	
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NV230/250/260/280/430/450/460/470/650/810/890			
AG1200PK/AG1500PK			
<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, IDLER, TENSION BAND		BELT SET, PINCH ROLLER, IDLER TYRE	
Order Code: SK23	£6.00	Order Code: SK24	£3.25
NV600/NV688			
<i>Contents</i>		<i>Economy Kit Contents</i>	
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<i>Contents</i>		<i>Economy Kit Contents</i>	
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Order Code: SK19	£5.00	Order Code: SK20	£3.00
NV370/NV380/480/630/780/830/850/AG2100PK/AG2200PK			
<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, IDLER, TENSION BAND		BELT SET, PINCH ROLLER, IDLER TYRE	
Order Code: SK21	£5.00	Order Code: SK22	£2.75
NV777/NV788			
<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, IDLER UNIT, TENSION BAND		BELT SET, PINCH ROLLER, IDLER TYRE	
Order Code: SK17	£6.00	Order Code: SK18	£4.00

## VIDEO SERVICE KITS (Cont.)

<b>SHARP</b>			
VC381			
<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, REEL IDLER, TENSION BAND, VIDEO LAMP		BELT SET, PINCH ROLLER, REEL IDLER TYRE	
Order Code: SK47	£8.00	Order Code: SK48	£3.25
VC500/VC571/VC581/VC582/VC583/VC584/VC5F3			
<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, REEL IDLER, TENSION BAND		BELT SET, PINCH ROLLER, REEL IDLER	
Order Code: SK60	£9.50	Order Code: SK61	£5.00
VC781/VC7810/VC7822/VC785/VC786/VC793/VC800/			
VCA100/VCA102/VCA104/VCA202			
<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND		BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE	
Order Code: SK64	£13.50	Order Code: SK65	£3.75
VC681/VC682/VC684/VC685/VC693/VC699/VC6F3/VC700			
<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND		BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE	
Order Code: SK62	£13.50	Order Code: SK63	£5.00

**FOR MORE DETAILS OF OVER 500  
TYPES OF SERVICE KITS...  
PLEASE RING US!**

## BACKUP BATTERIES

<b>REPLACEMENT PHILIPS NI-CAD BACKUP BATTERIES</b>		
Replaces Ferguson Part No: 00E6-067-001, used on TX10, L2V		
150p		
Replaces Philips Part No's:		
120p	138-10138, 138-10313, 1.2V - 90mAh	
Replaces Philips Part No's:		
180p	138-10229, 2.4V - 90mAh	
<b>REPLACEMENT FERGUSON NI-CAD BACKUP BATTERIES</b>		
Replaces Ferguson Part No's:		
200p	00E6-066-001, 2.4V	
Used on: 3V35, 3V56, 3V58, 3V65		

## REPLACEMENT 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 29222010	1600p	LOT09
ITT CVC 1150/1	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 EQ	1400p	LOT18
SALORA FM02188	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
JTT CT3326 MUL	1500p	LOT28
JTT 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
FERGUSON 00D3-508-002	1650p	LOT38
Fits Chassis TX99 41cm + 51cm		
Used On: 51K2, 51J8, 51J7, 41H3, 41H3, 41H2, 51K3		
PANASONIC TLF14567F	1850p	LOT39
Used On: TC2043, TC2243, TX300		
PANASONIC TLF14568F	1850p	LOT40
Used On: TX2231, TX2244		
PANASONIC TLF14584F	2350p	LOT41
Used On: TC2210, TC2160, TX1752, TX2112		
TX2112, TX2162, TXC22		
PANASONIC TLF14588F	2350p	LOT42
TC1651, TC2051, TC2061, TC2253, TC2263, TX5500		
HINARI	1600p	LOT43
Used On: CT15		
HITACHI 2434274	1250p	LOT44
CPT2174, CPT2176, CPT2178, 2434274		
We stock line output transformers for over 100 different models. Please ring 0181-900 2329 for more information.		

**IDLERS & PULLEYS REPLACEMENT**

<b>AKAI</b>					
VS1-2, VS4-5, VS15	FF-REW IDLER	M1327773	400p		
VS3, 6, 12, 36, 58, 59			500p		
VS1-2, VS4-5, VS15	T-UP IDLER	BV327815	500p		
VS3, 6, 12, 59, 59	IDLER	BV321979	600p		
VS125, 126, 155,	IDLER ASSY	M236966J2	900p		
VS5, 240, 244, 245, 247, 248, 250, 512, 515, 516					
VS22, 38, 105, 112, 115, 116, 205, 210					
VP7100, VS9300	T-UP IDLER	PU47752	£4.50		
VS9600, VS9800					
VP7100, VS9300	UNLOADING	PU46381	£4.00		
VS9600, VS9800	REW IDLER	PU46380	500p		
VP7100, VS9300	REW IDLER	BV321761	£5.00		
VS9600, VS9800		W321762	450p		
VP88	IDLER	BR347731	£4.50		
VS1, 3, 4, 9, 12	REEL TABLE	ML373043	1100p		
VS15, 58					
VS23, 35, 37, 53, 55	CLUTCH		£3.20		
VS66, 75, VSA77			£4.25		
VS9700	FF IDLER				
VS9700	REW IDLER				
<b>AMSTRAD</b>					
VCR7000	IDLER	150280	£1.50		
TVR1, VCR4500	CLUTCH	150873	£3.75		
VCR4600, VCS200, VCR9000					
TVR1, VCR4500	GEAR HOLDER	151284	£3.50		
VCR4600, VCR5200, VCR9000					
TVR1, VCR4600	REF CLUTCH		£3.50		
VCR5200					
VCR6000, VCR6100	CLUTCH	153202	£3.80		
VCR4500, VCR9000	CLUTCH		£4.00		
VCR4500, VCR4600	MOD KIT	(TAPE CREAMING)	300p		
VCR4700					
MOD KIT TAPE CREAMING FOR AMSTRAD			£3.00		
VCR4500, 4600, 4700					
<b>FERGUSON</b>					
3V00, 3V01, 3V16	T-UP IDLER	PU47752	£4.50		
3V22, 3Z32, 8900, 8901, 8904, 9606			£5.50		
3V16, 3V22	T-UP IDLER	PU49280			
8903, 8909, 8912, 8922					
3V23, 3V29, 3V30	REEL IDLER	PU48967	175p		
3V31, 3V32, 3V35, 8923, 8924, 8929, 8930, 8931, 8940, 8941, 8942					
3V23, 3V31	ROLLER ASSY	PU49042A	350p		
3V29, 3V30, 3V31	T-UP IDLER	51460	100p		
3V32, 3V35, 3V36, 3V38, 3V39, 3V49, 8930, 8931, 8940, 8941, 8942					
3V29, 3V30, 3V31	T-UP CLUTCH	PU51980	200p		
3V22, 8930, 8931, 8940, 8941, 8942					
3V35, 3V36, 3V38	REEL IDLER	PU55374	200p		
3V39, 3V49, 8943, 8944					
3V35, 3V36, 3V38	T-UP CLUTCH	PU55373	150p		
3V39, 3V49, 8943, 8944					
3V58, 3V59, 3V64	IDLER ARM	PU56645	£2.25		
3V65, FV10, FV11, FV12, FV13, FV14, FV20, FV21, FV22, FV26					
FV30, FV32, FV33, 8950, VC1411	CLUTCH ASSY	PU55822	1200p		
3V42, 3V43	SUPPORT CLUTCH	PU57858	1050p		
3V43, 3V44, 3V45	CLUTCH ASSY				
3V48, 3V53, 3V54, 3V55, 3V57, 8947, 8948					
3V42, 3V43, 3V44	T-UP CLUTCH	PU56043-1-4	240p		
3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8947, 8948					
3V42, 3V43, 3V44					
3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8947, 8948					
3V00, 3V01, 3V16	LOADING IDLER	PU43681	£6.00		
3V22, 3Z32, 8900, 8901, 8902, 8903, 8904, 8906, 8909					
8912, 8922					
3V00, 3V01, 3V16	REW IDLER	PU46380	500p		
3Z32, 8900, 8901, 8904, 8906					
3V16, 3V22, 8902	IDLER	PU49281	£1.70		
8909, 8912, 8922					
<b>FISHER</b>					
FVHP420, 520, 530	FF-REW PULLEY	H1638531	80p		
FVHP15, 618, 620	COMP IDLER ASSY	FH1430420400300	£220p		
FVHP522, 710, 711, FVHP720, 721, 722, FVHP725, 730, 830					
FVHP840, 905, 906, FVHP908, 910, 911, FVHP915, 916, 918					
FVHP615, 618, 620	GEAR IDLER ASSY	F1430490400900	380p		
FVHP522, 710, 711, FVHP720, 721, 722					
FVHP725, 730, 830, FVHP840					
FVHP615, 618, 620	REEL T-UP ASSY	F1430410400900	£5.50		
FVHP62, 710, 711, FVHP720, 721, 722					
FVHP725, 730, 830, FVHP840					
FVHP905, 906, 908	GEAR IDLER ASSY	F1430490402400	275p		
FVHP910, 911, 915, FVHP916, 917					
FVHP975, 980, 990	IDLER	F1430420400700	300p		
FVHP99, 5000, 5005					
FVHP5060, 5075, 5100					
FVHP40, 55, 140	REEL DRIVE ROLLER		£8.00		
FVHP1, 10, 20					
FVHP975, 980, 990	CLUTCH	F12430510404200	£9.50		
FVHP420, 520, 530	IDLER		£2.80		
FVHP420, 520, 530	TAKE UP IDLER		290p		
FVHP990	LOADING GEAR		90p		
VBS3500	REEL DRIVE PULLEY		£3.20		
VBS3500	IDLER		250p		
VBS5700	REW IDLER		95p		
<b>GOLDSTAR</b>					
GHV1221, 1232, 1240	CLUTCH GEAR	435038A	£2.50		
GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000, GHV2000, 8210, 8215, GHVPS1, VCPA100, 4130					
GHV1221, 1232, 1240	IDLER		110p		
GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000, GHV2000, 8210, 8215, GHVPS1, VCPA100, 4130					
<b>HINARI</b>					
VXL3, VXL20	REEL IDLER	40000009	110p		
VXL2	IDLER		110p		
VXL4, VXL35	IDLER		£2.75		
VXL4, VXL12, VXL25	CLUTCH		£8.50		
VXL30, VXL35, VTV300	LIMITER POST		£1.30		
VXL5, VXL6	CLUTCH		£3.75		
VXL5, VXL6	GEAR HOLDER		£3.50		
VXL7, VXL8, VXL9	CLUTCH		£3.80		
<b>HITACHI</b>					
VT11, 33, VT63, 64	CLUTCH ASSY	6879615	£7.50		
VT14, 17, 19, 38, 57, 86, 88, 89, 39, 52, 61, 62, 65, 85, 330, 640, VT16S					
VT120, 220, 100, 110	CLUTCH ASSY	6888824	£7.50		
111, 113, 115, 118, 200		6888972			
125, 128, 130, 135, 138, 145, 150, 175, 225, 250, 255, 258, 280, VT130					
VT8000, 8300, 7000	FF-REW IDLER	6413663	£2.80		
VT8500, 8700					
VT8000, 8300, 7000	PLAY IDLER	6414221	290p		
VT8500, 8700					
VT9300, 9500, 6500	FF-REW IDLER	6383531	80p		
VT8600, 6800, 9700, 9900					
VT9300, 9500, 6500	PLAY IDLER	6861482	230p		
VT8600, 6800, 9700		6861481			
VT9300, 9500, 9700	IDLER	681505	230p		
VT9900, 8500, 6800, 6800	IDLER	687043	£3.80		
VT11, 33, VT63, 64		6888971	125p		
VT14, 165, 17, 19, 34, VT35, 38, 39, 52, 61, 62, VT65, 85, 86, 88, 330, 640					
VT1000, 110, 111, 113	FF-REW ARM	6886792	240p		
VT115, 118, 119, 120, 125, 128, 130, 135, 138, 145, 150, VT175, 220, 225, 250, 255, 258, 280, VT130					
VT400, 405, 410, 413	FF-REW ARM	6897094	£1.30		
VT414, 415, 418, 420, 425, 426, 428, 430, 431, 435, VT438, 450, 498, 510, 518, 520, 525, 526, 530, 535, VT536, 540, 545, 546, 548, 570, 575, 576, 580, 585, VT588, VTM625, 620, 630, 635, 636, 640, 645, 646, VTS80, 85					
VT400, 405, 410, 413	CLUTCH GEAR	6898951	£3.25		
VT414, 415, 418, 420, 425, 426, 428, 430, 431, 435, VT438, 450, 498, 510, 518, 520, 525, 526, 530, 535, VT536, 540, 545, 546, 548, 570, 575, 576, 580, 585, VT588, VTM625, 626, 630, 635, 636, 640, 645, 646, VTS80, 85					
VT3000	T-UP IDLER (LARGE)		£4.50		
VT3000	REW IDLER		£5.00		

VT880, 6500, 6800	FS BRAKE	6861505	230p		
VT9700, 9900					
<b>HITACHI</b>					
OUTPUT MODULE HM 6251			£5.50		
OUTPUT MODULE HM 6232			£8		
<b>JVC</b>					
HR330, 3660, 4100	T-UP IDLER SML	PU49280	£5.50		
HR7200, 7600, 7650	T-UP CLUTCH	PU53462A	220p		
HR7655, 7300, 7360, 7610					
HR7200, 7300, 7600, 7650	REEL IDLER	PU48967	175p		
HR7600, 7610, 7650, 7655, 7700					
HR7600, 7610, 7650	ROLLER ASSY	PU49042A	350p		
HR7655, 7700					
HR3300, 3660, 4100	T-UP IDLER LRG	PU47752	£4.50		
HR7200, 7600, 7650		PU51402A	100p		
HR7655, HRD110, HRD111, HR7300, 7350, 7610, HRD120, 121, 125					
HRD110, HRD120, 121	T-UP CLUTCH	PU55373	150p		
HRD225, HRD111					
HRD110, HRD120, 121	IDLER ARM	PU55374-3-8	200p		
HRD120, 180, 210, 230	IDLER ARM	PU58465	£2.25		
HRD320, 370, 400, 430, 470, 530, 700, 750, 950, 9000					
HR55000, HR55000					
HRD456, HRD725	CLUTCH MECH	PU588822	1200p		
HRD140, 150, 157, 158	CLUTCH MECH	PU57658	1050p		
HRD160, 750, 257, 565, 566, 755, HPR50					
HR3300, HR3330	REW IDLER	PU46380	500p		
HR3660, HR4100					
HRD140, 150, 157, 158	TAKE UP CLUTCH	PU56043-1-4	240p		
HRD160, 750, 257, 455, 565, 566, 725, 755, HPR50					
HRD140, 150, 157, 158	T-UP CLUTCH	PU56044-1-5	160p		
HRD160, 250, 257, 455, 565, 566, 725, 755, HPR50					
<b>MATSUJI</b>					
VX730, 735, 750, 755	CLUTCH	850A00005	420p		
VX810, 820, 850, 880, 990					
VX730, 735, 750, 755	LIMITED POST LEVER ASSY		£1.30		
VX770, 800, 810, 880					
VX990					
VX800A, VX900	IDLER REEL		£1.50		
VX800A, VX820	REEL UNIT CLUTCH		280p		
<b>MITSUBISHI</b>					
HS336, 307, 318, 319	GEAR ASSY	522800201	£6.25		
HS400, 410, 710					
HS337, 338, 347, 349	IDLER	562801701	325p		
HS411, 412, 421, HS810, HS820, HS830, HSE10, HSE20, HSE30, HSE70					
HS570					
HS306, 307, 31					

# REMOTE CONTROLS

Description	Order Code	Price	Description	Order Code	Price
<b>GRUNDIG</b>			<b>PHILIPS (continued)</b>		
TP160E	RC 107	900p	RC38	RC 301	800p
TP200, TP300	RC 380	800p	KT3 TEXT	RC 5301	750p
TP400	RC 401	800p	RC5352	RC 5352	800p
TP590-600	RC 600	850p	RC5375	RC 5375	850p
TP390, TP610	RC 610	850p	RC5 STANDARD	RC 5534	850p
TP621	RC 621	850p	RC5901	RC 5901	850p
TP630, TP650	RC 650	850p	RC5903	RC 5903	800p
TP660	RC 660	850p	<b>SABA</b>		
TP661	RC 661	850p	T6772	RC 149	900p
<b>HITACHI</b>			TC319-320	RC 328	875p
CLE800-CLE830	RC 140M	850p	TC356	RC 356	875p
A617402/655602	RC 192	875p	TC358	RC 358	850p
A512120/230	RC 900	800p	TC360	RC 360	800p
A514790	RC 901	850p	TC365	RC 365	800p
A5088470	RC 902	800p	<b>SALORA</b>		
A518612	RC903	900p	SERIES L	RC 190	875p
SCL002	RC904	850p	86173	RC 882	850p
C2096	RC 905	850p	<b>SANYO</b>		
A511940	RC 906	800p	RC218, RC222, RC228, RC238	RC 140M	850p
655602H	RC 907	850p	JXGE	RC 878	850p
<b>ITT</b>			JXDE	RC 884	850p
IFB13, 14, 15	RC 143	875p	VHR2300	RC 890	850p
FS4	RC 148	850p	RC628	RC 865	900p
RG305	RC 305	825p	<b>SHARP</b>		
RG306	RC 306	825p	G0121CESA, 123CESA, 204, 251	RC 140M	850p
FS9/1-10/1	RC 307	850p	<b>SIEMENS</b>		
VS5 RUK	RC 308	825p	FC616	RC 130	850p
VS4-1	RC 310	850p	FC631	RC 132	850p
MULTICONTROL (17C20)	RC 311	800p	FC742	RC 164	900p
<b>KORTING</b>			<b>SONY</b>		
18279, 18396, 18460, 18521 SE	RC 108	850p	RM604, RM605, RM606	RC 140	850p
40540 VTS	RC 108	900p	32 CHANNEL	RC 140M	850p
<b>LOEWE</b>			RM613	RC 141	850p
DC11	RC 146	850p	RM632, RM636	RC 160	850p
<b>MATSUI</b>			<b>TATUNG</b>		
010270601	RC 889	850p	FXA	RC 877	850p
VX770	RC 892	850p	RC70	RC 883	750p
<b>METZ</b>			FX70 FASTTEXT	RC 894	850p
JAVA COLOR (6890)	RC 166	850p	<b>TELEFUNKEN</b>		
COLOR (7156)	RC 183	850p	FB632	RC 632 ST	850p
JAVA (7180)	RC 184	850p	FB639	RC 639 ST	850p
<b>MITSUBISHI</b>			<b>THORN/FERGUSON</b>		
939P/03607, 939P/03609	RC 140M	850p	3V35-42	RC 342	750p
<b>NOKIA</b>			3V31-32	RC 344	800p
SATELLITE	RC 550	850p	3V57-58	RC 628	800p
<b>NORDMENDE</b>			TX10 TEXT	RC 732	650p
TC2336	RC 351N	850p	TX10 STEREO TEXT	RC 738	650p
CMC1, TC3519	RC 356	875p	TX9-90-100	RC 740	700p
<b>OCEANIC</b>			3V55, FV11	RC 783	900p
390C9500	RC 339	900p	TX100 FASTTEXT	RC 785	700p
<b>ORION</b>			TX100 STEREO FASTTEXT	RC 789	700p
RC53	RC 892	850p	PROFESSIONAL	RC 790	700p
<b>PANASONIC</b>			<b>TOSHIBA</b>		
EUR51200	RC 200	800p	CT937	RC 950	850p
TC2200	RC 201	850p	CT9117	RC 951	800p
VSQ0357/NV730	RC 202	875p	201R4B	RC 952	800p
TNQ1621	RC 203	900p			
<b>PHILCO</b>			<b>UNIVERSAL PROGRAMMABLE REMOTE CONTROL</b>		
CARVEL, CONCORDE,	RC 108	850p	Controls up to 4 different devices which use infra red remote controls including TV, audio, VCR and satellite. (need original remote control TC program)		
MERCURY, TELESTAR			Order code: IR100R Price: 1950p		
TC10	RC 152	900p	<b>We stock Remote Controls for over 5000 different models. Ring for further details on 081-900-2329.</b>		
<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	700p			

### VCR ALIGNMENT KIT

CONTAINS:

- SET OF 7 HEAD & TAPE PATH ALIGNERS
- RCA TYPE AUDIO & CONTROL HEAD POSITIONING TOOL
- RCA ADJUSTMENT TOOL FOR TAPE GUIDE POSTS
- RCA TYPE BACK TENSION TOOL
- TENSION ADJUSTMENT TOOL FOR VARIOUS USES
- VCR ADJUSTMENT TOOL

SET OF 8 ALLEN KEYS

- 0.77mm
- 0.90mm
- 1.27mm
- 1.50mm
- 1.60mm
- 2.00mm
- 2.40mm
- 3.00mm

3 Reversible Screwdrivers  
Spring Hook

Circclip Pliers  
Micro Screwdriver

VCR Head Extractor

**Order Code: TOOL10 Price: 2900p**

### 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

### FUSES

CURRENT RATING	ORDER CODE	PRICE
<b>CERAMIC PLUG TOP</b>		
3A	FUSE33	100P
5A	FUSE34	100P
13A	FUSE35	100P
<b>20MM CERAMIC TIME LAG</b>		
3.15A	FUSE41	100P
4A	FUSE42	100P
5A	FUSE43	100P
6.3A	FUSE38	100P
8A	FUSE39	100P
10A	FUSE40	100P
<b>32MM CERAMIC SLOW BLOW</b>		
8A	FUSE44	210P
10A	FUSE45	210P
15A	FUSE46	210P
20A	FUSE47	210P
<b>38MM CERAMIC SLOW BLOW</b>		
10A	FUSE48	875P

ALL THE ABOVE PRICES ARE FOR PACKS OF 10 FUSES

### I.C. PROTECTOR

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

Price: Only 30p each

**AUDIO CONTROL HEAD**  
Amstrad Original No: 150751

Used on Amstrad TVR1 2.3, JCR4600, 4600MII, 4700  
Funai V2S, VCR4600, 4800, 520M, 5600, 6600, VIP3000, 5000  
Also fits: Fidelity, Funai, Hinari, Proline, Schneider, Towada, Ultravox

Order Code: AH01 Price: £13.50

**Amstrad Original No: 153154**

Used on Amstrad 008900, 8904, VCR2000, 6000, 8600, 8602, 8603, VCR8604, 8700, 8704, 8714, 8800, 9005, 9244

Also fits: Antitec, Boadstec, Casio, Crown, Fidelity, Goldhead, Granada, Hinari, Marguant, Omega, Protex, Schneider, SEG, Sentra, Shiptom, Tashiko, Tatung, Towada, Universum

Order Code: AH02 Price: £14.50

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PACE PRD800, PRD900	SATPSU1	650p
PACE SS9000, 9200, 9010, 9020, 9220	SATPSU2	650p
AMSTRAD SRD510, SRD520	SATPSU3	650p
AMSTRAD SRD500	SATPSU4	650p

## Replacement Video Heads

MAKE	MODELS	PRICE
HITACHI	VT570, VT575, VT576, VT580, VT585, VT588, VTF70	3100p
I.T.T.	VR3761	3100p
JVC & FERGUSON	HRD950, HRD960, HRD980, FV46	5000p
LUXOR	VR3761	3100p
MITSUBISHI	HSE51	3000p
NATIONAL PANASONIC	NVFS200, NVFS90, NVV8000	4600p
	NVHD100, NVHD101, NVHF100	3100p
	NVSD	1400p
	AG7330, AG7350, AG7355, AG7450	5000p
	NVFS100	5000p
N.E.C.	D5600	3500p
SANYO	TLS1000P, TLS1001P, TLS1100	3100p
	VHR7800, VHR7810, VHR8000SP, VHR8801SP, VHRD4800	3100p
SHARP	VCH80, VCH81, VFH815	2800p
	VCA33, VCA36, VCA43, VCA44, VCA46, VCA49	1500p
	VCA55, VCA63	2200p
SONY	SLV656, SLV715, SLV757, SLV777, SLV815, SLV825	4600p
	SLV353UB	3200p
	CCDF340E, CCDF500E, CCDV90E, CCDV95E, CCDS95E	4800p

## Original Video Heads

MAKE	MODELS	PRICE
NATIONAL PANASONIC	NVG20, NVG21, NVG22, NVG25, NVG25, NVG28, NVG200, NVD48 PART NO: VEH 0343	3000p
	NVG33, NVG45, NVG46, NVL23, NVL25, NVL28 PART NO: VEH 0417	2900p
	NVJ30, NVHJ33, NVL20, NVL21, NVG30, NVG31, NVG40, NVG130 PART NO: VEH 0416	2700p

## Audio Control Head

**AMSTRAD ORIGINAL NO: 150751**  
Used on: AMSTRAD TVR1, 2, 3, VCR4600, 4600MKII, 4700, FUNAI VS2, VCR4600, 4800, 5200, 5600, 6600, VIP3000, 5000  
Also fits: FIDELITY, FUNAI, HINARI, PROLINE, SCHNEIDER, TOWADA, UNIVERSUM ORDER CODE: AH01 PRICE: 1350p

**AMSTRAD ORIGINAL NO: 153134**  
Used on: AMSTRAD DDR8900, 8904, VCR2000, 6000, 6100, 8600, 8602, 8603, VCR8604, 8700, 8704, 8714, 8800, 9005, 8244  
Also fits: ANITECH, BONDSTEC, CASIO, CROWN, FIDELITY, GOLDHAND, GRANADA, HINARI, MARQUANT, OMEGA, PROFEX, SCHNEIDER, SEG, SENTRA, SHINTOM, TASHIKO, TATUNG, TOWADA, UNIVERSUM ORDER CODE: AH02 PRICE: 1450p

## Replacement Audio Control Video Sound Head for National Panasonic

PART NUMBER	MODELS	PRICE
VBR 0091	NVG7 etc	875p
VBR 0050	NV300, NV340 etc	875p
VBR 0061	NV777 etc	875p
VBR 0103A	NV250, NV450 etc	625p
VBR 0125		625p

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\* Stylish and easy to operate \* Replace broken or lost remotes  
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## Replacement Video Cassette Housings

MAKE	MODELS	CODE	PRICE
AKAI	VS35, VS53, VS55, VS56, VS75	CH18	2600p
GRANADA	VHSDP1	CH05	1100p
	VHSYJ2	CH01	2600p
GOLDSTAR	GHV1290P, 1291P, 1296P, 9400, 73401, GSE1295P, GSE1891P, 20001Q, 20051Q, VCP4200, 4300, 4301, 4305, VCP4306, 4311, 4315, 4316, 4320, 4321, 4325	CH25	2000p
	GHV51, 1221, 1232, 1240, 1241, 1242, 1244, 1246, 1248, GHV9000, 8200	CH26	2900p
FERGUSON & J.V.C.	3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, 3V49, HRD 110, 111, 120, 121, 225	CH01	2600p
	3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948, HRD140, 141, 150, 157, 158, 160, 250, HRD257, 455, 565, 566, 725, 755	CH02	2600p
	8948, 8950, FV10B, 12L, 13H, 14T, 20B, 21R, 22L, 26, 395, HRD230, 430, 530	CH03	2600p
	3V58, 3V59, 3V64, 3V65, FV11R, 8950, 8951, HRD170, HRD186, HRD370	CH04	2600p
	FV31R	CH19	4300p
	HRD515, 520, 527, 540, 550, 580, 600, 610, 620, 660, 670, HRD830, 840, 850, 860, 4050, 6600, FV37H	CH20	2400p
	HRD540, 580, 830, 860, 910, 960, HRD970, HRDX20, FERGUSON FV57H	CH27	2400p
I.T.T.	VR3605, VR3905	CH01	2600p
	VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH02	2600p
	VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH02	2600p
NATIONAL PANASONIC	NV730	CH06	4300p
N.E.C.	N830EG, N831EG, N832, N833EG	CH01	2600p
	N895	CH02	2600p
PHILIPS	CASSETTE LIFT ASSEMBLY (69120366) DV186, 190, 286, 471, 562, 761, VR6180, 6182, 6185, 6285, VR6290, 6291, 6293, 6362, 6367, 6393, 6467, 6468, 6470, VR6661, 6670, 6760, 6761, 6870, 6970	CH35	1100p
	VR6443	CH22	2900p
	VR6448	CH23	2500p
	495B6	CH24	2500p
SHARP	VCA100, VCH851, VCH852	CH22	2900p
	VCA103, 103GV, 106, 106GVM, 254GVM	CH23	2500p
	VCS211, 244, 5055, 605, VCB230, VCD806G, 810G, VCT212, 310, 410G, 610	CH24	2500p
TELEFUNKEN	VR2970	CH02	2600p
THOMSON	V320, 321, 323, 326, 4200, 4300	CH01	2600p
	V342, 343, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, V5560, 6000, 8540	CH02	2600p
TOSHIBA	V55, V57	CH01	2600p
	V65, V66	CH02	2600p

## Service Aids

DESCRIPTION	VOLUME	CODE	PRICE
VIDEO HEAD CLEANER	75ML	SP01	140p
SWITCH CLEANER	176ML	SP02	150p
SILICONE GREASE	200ML	SP03	170p
FREEZE IT	170ML	SP04	200p
FREEZE IT	400ML	SP16	350p
FOAM CLEANER	400ML	SP05	170p
ANTI-STATIC	150ML	SP06	170p
AEROKLEANE	135ML	SP07	140p
AERO DUSTER	150ML	SP08	200p
AERO DUSTER	400ML	SP17	425p
PLASTIC SEAL	200ML	SP09	200p
GLASS CLEANER	250ML	SP10	160p
COLDKLENE	250ML	SP13	160p
EXCEL POLISH 80	250ML	SP18	150p
ADHESIVE 120	400ML	SP19	190p
LABEL REMOVER 130	200ML	SP20	240p
REFURB 140	400ML	SP21	240p
TUBE SILICON GREASE	50 GRAMMES	SP11	200p
TUBE SILICON SEALANT WHITE	75ML	SP22	280p
TUBE SILICON SEALANT CLEAR	75ML	SP23	280p
TUBE HEAT SINK COMPOUND	25 GRAMMES	SP12	150p
DRIVE CLEANER	200ML	SP24	150p
SCREEN CLEANER	200ML	SP25	150p
COMPUTER CARE KIT		SP26	2100p

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SONY OPTICAL PICK UP  
PART NO: KSS21DA SONY CDPC 301M, CDPC 305M 2200p  
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## PART NO: KSS210B

USED ON MODELS:  
CFD100, 105L, 120, 309, 440, 454, 455, 50, 500, 55, 58, 60  
CFD68, 750, 755, 760, 765, 770, 775, 4405, W100, 1005 2200p

## Cassette DC Motors

MOTOR TYPE	PRICE
6V MOTOR	170p
9V MOTOR	170p
12V CW MOTOR	170p
12V CCW MOTOR	170p
13.2 CCW MOTOR	290p

## Cassette Tape Heads

HEAD TYPE	PRICE
MONO HEAD	90p
STEREO-HEAD	110p
MINI HEAD	150p
AUTO REVERSE HEAD	200p

## Soldering Accessories

DESCRIPTION	CODE	PRICE
<b>ANTEX SOLDERING IRONS</b>		
25 WATT 240 VAC (XS25W 240V)	S101	900p
15 WATT 240 VAC (XS15W 240V)	S102	900p
25 WATT SPARE ELEMENT	S103	450p
15 WATT SPARE ELEMENT	S104	450p
<b>SOLDERING STANDS &amp; SPONGES</b>		
SOLDERING STAND (MADE BY ANTEX)	S108	350p
SPARE SPONGE	S109	55p
<b>SOLDER</b>		
18 SWG 500 GRAMMES	S110	500p
20 SWG 500 GRAMMES	S111	650p
22 SWG 500 GRAMMES	S112	700p
<b>DESOLDERING AIDS</b>		
SOLDER MOP STANDARD GAUGE 1.2mm x 1.5M	S107	70p
SOLDER MOP 1.2mm x 10M	S113	400p
DESOLDERING PUMP	S105	320p
SPARE NOZZLE	S106	60p

## Transistors & ICS

BU 508A (PHIL)	80p	MJE 13009	100p	2SC 3885A	350p
BU 810	110p	MJE 18004	125p	2SD 633	70p
BUZ 90A	180p	STK 6982H	600p	2SD 1680	225p
CXA 1044P	550p	STK 7253	450p	2SK 793	400p
HA 1340B	350p	TEA 2030H	100p	2SK 956	1400p
IRFB40	400p	TEA 2019	200p	2SK 1023	550p
L272	200p	TMP 47C434N	1250p	2SK 1342	750p
L6210	250p	SAA 1300	200p	2SK 1358	600p
MC 3423P	100p	2SA 1540	55p	68000	500p
MJ 15015	250p	2SC 3788	60p	82S147	450p
MJ 15016	350p	2SC 3885	350p		

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# TELEVISION



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## A Hard World

It's a hard world out there amongst the TV media wheelers and dealers, no doubt about it. Not a bit like the cosy days of the old BBC/ITV duopoly, as it came to be known. Is this progress? Could it all be done in a better way? Hard to know, especially in a fast-moving field where new opportunities appear before anyone has had time to come to grips with and decide what to do about the last ones. In the English-speaking media world, the figure of Rupert Murdoch seems to be present whenever new deals are in the making.

Recently BSkyB thoroughly upset some of the UK cable companies, also the ITV companies and Channel 4, by insisting on 'non-competitive' clauses in new, long-term contracts to provide pay-TV programming. These prevent a company that signs such a contract from investing in or using material that competes directly with BSkyB-sourced programmes. Some companies, including two of the largest, signed up without demur. Others have protested and have lodged complaints with the Office of Fair Trading and the competition authorities in Brussels. The chairman of the ITV Association and the chief executive of Channel 4 have called on Michael Heseltine, the President of the Board of Trade, to refer the contracts to the Monopolies and Mergers Commission. On the face of it there does seem to be something decidedly heavy-handed about insisting on exclusive conditions of this type. BSkyB is now a

successful company. It shouldn't need to insist on restrictive contracts.

It's a different matter when Rupert Murdoch is paying the bill. He has described the cost of leasing a satellite transponder in Europe as "a scandal. They are at least four times the American charges". This would seem to be a simple matter of supply and demand. European satellite operators have been able to lease their transponders without difficulty. And there is competition in the medium-power satellite field now that the Eutelsat Hot Bird is there. Mr Murdoch maintains that he would be better off with his own satellite. Maybe. But there is the little matter of where to put it. Possibly one of the smaller countries with an orbit allocation would oblige. It will be interesting to see whether News Corporation takes the idea any further.

Certainly the company is in a strong position financially, especially after the alliance it recently reached with MCI, the second-largest US long-distance telecommunications carrier. The two companies have agreed on a joint venture to distribute information and entertainment to businesses and residential subscribers, first in the USA then worldwide. It will for the time being be known as WWJV (World Wide Joint Venture). MCI will invest up to \$2bn to give it a 13.5 per cent stake in News Corporation. Both companies will then contribute \$200m to the joint venture, though News Corporation's

contribution could be in the form of programme material rather than cash.

This is a rather interesting case of laying foundations for possible future developments. Rupert Murdoch has commented that "We don't know where technology is taking us in the delivery of content, but the deal opens all these options as the technology develops". A sort of open-ended arrangement if you like. He sees it as "a very big strategic step". Previously, "no one has put together the right building blocks – programming, network intelligence, distribution and merchandising – to offer new media services on a global scale". Maybe, but they undoubtedly will!

Rupert Murdoch seems to be showing both foresight and level-headedness in this. He has suggested that it will be many years before "the full impact of the multimedia revolution is felt". His opinion is that "the full information superhighway is fifteen-twenty years away in the USA and Europe and fifty years away in the rest of the world". A rather more down-to-earth view than that of the usual information technology/media hypster.

One just wonders how many tough deals, commercial rows and legal battles will accompany these eventual developments. It all seems a very long way from the old ideals of broadcasting, of Lord Reith's "nation speaking unto nation" and so on. Sad, but the comfy world of limited, publicly accountable broadcasting seems to be gone for good.

---

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### COVER PHOTO

This month's cover photograph shows the Matsui 1455 colour portable, from the inside with a nice bunch of screwdrivers to hand! See servicing article on pages 624-6.

# Camcorner

*Reports from Nick Beer and David Woodnott*

## **Panasonic NVS20B**

This camcorder refused to do very much in the deck mode, basically because there was no capstan rotation. Voltage checks in the driver circuit revealed the cause: when a load was applied the voltage on the CAP.SW. line fell severely. Moving back to the power supply we found that Q1007, a surface-mounted 2SB798 transistor, was short-circuit base-to-collector. It's the 'capstan power generator' – a switching transistor. **N.B.**

## **Panasonic NVR30B**

This slimcorder came back shortly after it had been sold, the complaint being that the zoom didn't work. There's only a power zoom in these modern units, which don't have a lens that you can manipulate. Although there was drive to the zoom motor section the lens didn't move because connector FP701 had been fitted incorrectly. **N.B.**

## **Canon E30E**

The list of fault symptoms made it sound as if this was going to be a rather expensive repair. There was no viewfinder picture, no playback picture, no zoom button operation and no clock/title function. Apart from this everything else was o.k.! Autofocusing worked, as did record, with E-E vision and sound via a monitor. We found that playback of a recording in another machine showed a colour flicker problem however. Where to start?

A collection of almost random symptoms like this can of course be due to liquid getting into the works, but in this case no tell-tale signs of spillage were visible. To reduce a long story to readable length, the cause of all this mayhem was once more a leaky electrolytic capacitor. Incredibly it was in this instance in the grip case section, which includes the viewfinder circuitry. The culprit was C2931, a 47 $\mu$ F, 16V electrolytic that had leaked and corroded the print running between its pins. This track carries the EVF ON line, which should normally be low. As it was at 6V, there was no viewfinder picture. In addition the EVF 5V regulated supply, which is used to power the zoom button control circuit, was turned off. The date and title functions are tied up with this supply, and because of the way in which the corrosion had occurred the other diverse symptoms were all related. **D.C.W.**

## **Sony CCDTR105E**

This handycam was with us for a long time. Not because of what it came in for, a stuck iris, but because of something that showed up only while it was on soak test.

Very occasionally in the playback mode, sometimes from cold and sometimes not, the machine would produce a picture with very bad dropouts and slight distortion – similar to the effect of an incorrectly terminated AV link. A scope check on the video signal in the fault condition showed a tendency to overshoot and sync pulse train distortion. Most of the time the unit played back perfectly however. When the fault was present, pressing the stop button then going back to play would sometimes clear the symptom. It tended to occur mostly with the case fitted.

Various heating and freezing sessions didn't help. Then

one day the fault occurred when the camcorder was out of its case. We transferred it to the bench with great care, and positioned it so that we could investigate the problem. The cause of the trouble was found to be an open-circuit capacitor, C088 (0.01 $\mu$ F) – not an electrolytic this time! It feeds the playback f.m. signal to pin 1 of IC005 on the syscon/servo/video PCB.

One of IC005's functions is to check for Hi8 tape in the playback mode. To aid detection, IC005 disables the DOC circuitry in the main playback signal path. With C088 open-circuit, the detection switching was random, with the results described. This was a nasty one! To add to the confusion, I didn't appreciate that although the CCDTR105 is not a Hi8 machine it does have the facility to play back Hi8 tapes. We live and learn! **D.C.W.**

## **Hitachi VMC1E**

This twist-and-shoot model came in because it was dead. We found that the two ceramic fusible links F971 and F972 were open-circuit. They are both rated at 2A and feed separate circuits. The fault was noticed after the unit had been dropped. But there was no sign of impact anywhere, either on the case or internally, so the reason for their failure is a mystery. A long soak test while monitoring the current flowing through the fuses didn't enlighten us either! We have however had the same symptom, some time ago, with at least one other of these units. There again fitting new fuses provided a complete cure. Does anyone know the reason for this fuse failure? **D.C.W.**

## **Panasonic NVG2B**

This machine produced a bright blue picture – very bright blue, with no other colour showing. The iris was also fully open at all times. The playback pictures were fine, also the audio.

A vectorscope display showed a distorted burst signal near the U axis, with no V (R – Y) signal present. Most of the YC signal processing is carried out by IC314 on the camera PCB. The signals around this chip suggested that it was faulty, further confirmation coming from the fact that it also incorporates the iris drive circuitry. But there's always the possibility these days that the cause of the fault might be wrong set-up levels being applied because of failure of a controlling EEPROM chip. In this case, fortunately, IC314 was the cause, a replacement restoring all the colours and normal iris operation. **D.C.W.**

## **Panasonic NVS1E**

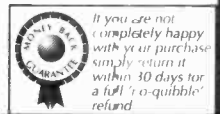
A "whirring" noise from within was the reported fault with this camcorder. In fact once it had been switched on the loading arms continuously moved in and out of position. With any attempt to power off, the fault would continue and all circuits remained on. We weren't told that the camcorder had been dropped. One of the results of this was that the eject switch was permanently on. Thus the machine continuously tried to eject with the outer cassette door closed. With any other camcorder the fault would have been obvious as the cassette lid would have opened! **D.C.W.**



# TELETEST

## Handheld TV and Video Test Equipment

# Two New Products!



### SPECIFICATIONS

FEATURE	TELETEST Quicktest	TELETEST	TELETEST PRO	DESCRIPTION
<b>SYNCHRONISATION</b>				
Synchronisation in accordance with the ITU (CCIR) 4.433619MHz PAL encoded specification, 625 lines, 50 Hz field rate fully interlaced, 15.625Hz line frequency with all the broadcast specified sync pulses and blanking intervals.				
<b>VIDEO PATTERNS</b>	✗	✗	✗	75% EBU bars 8 steps from black to white With castellation around edges
Colour Bars	✗	✗	✗	
Grey Scale	✗	✗	✗	
Crosshatch	✗	✗	✗	
Red Purity	✗	✗	✗	
Black Burst	✗	✗	✗	Sync and colour bursts 1.175MHz and 3.5MHz
Multi-Burst	✗	✗	✗	
Dots	✗	✗	✗	
White purity	✗	✗	✗	
<b>VIDEO OUTPUTS</b>	✗	✗	✗	75% 1Vp-p S-Video RF Video
Composite Video	✗	✗	✗	
S-Video	✗	✗	✗	
RF Video	✗	✗	✗	75% channels 32-39 (tunable)
<b>VIDEO CONNECTORS</b>	✗	✗	✗	Composite video Composite video RF (PAL I = Socket, PAL G = Plug) S-VHS, Hi-8 etc (S Connector)
Phono Socket	✗	✗	✗	
BNC Socket	✗	✗	✗	
Co-Axial Socket	✗	✗	✗	
4-pin Din Socket	✗	✗	✗	
<b>AUDIO SINE WAVES</b>	✗	✗	✗	1KHz 10KHz
1KHz	✗	✗	✗	
10KHz	✗	✗	✗	
<b>AUDIO OUTPUTS</b>	✗	✗	✗	1Kv 1Vp-p 600Ω Output (0.775V rms) (PAL I = 6MHz, PAL G = 5.5MHz)
Line Out	✗	✗	✗	
Balanced Line Out	✗	✗	✗	
RF Audio	✗	✗	✗	
<b>AUDIO CONNECTORS</b>	✗	✗	✗	Line out Balanced line out RF out
Phono Socket	✗	✗	✗	
XLR Socket	✗	✗	✗	
Co-Axial Socket	✗	✗	✗	
<b>POWER</b>	✗	✗	✗	9V PP3 Alkaline (not included) Audio only mode 2.1mm DC 3-pin UK, 2-pin Euro or Lead style
Battery Powered	✗	✗	✗	
Low Power Facility	✗	✗	✗	
External pwr socket	✗	✗	✗	
Mains Adapter	✗	✗	✗	
<b>SIZE</b>	✗	✗	✗	150x90x40mm 265g or less
Dimensions	✗	✗	✗	
Weight	✗	✗	✗	

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# Teletopics

## **Samsung Plans Digital Camcorder Launch**

Samsung has announced plans to launch a digital camcorder, which it expects to start marketing towards the end of next year. It will provide improved performance while being a third smaller and twenty per cent lighter than existing machines. An international SD (standards definition) specification for digital camcorders has been in existence since April 1994, and has been adopted by fifty companies including all the major consumer electronics manufacturers.

Digital recording and playback provide better definition – 500 lines compared to the 240 with current low-band tape formats – while the use of 16-bit PCM provides DAT-quality sound. Recording can be duplicated any number of times without loss of quality. The tape width is 6.35mm. Drum diameter is 21.7mm compared to 40mm with Video 8, the drum speed being 7,500 r.p.m. compared to 1,500 r.p.m. (both for 50Hz systems).

Samsung thinks that digital will replace analogue camcorders by the end of the decade, the smaller size increasing demand. No price suggestions have been made.

## **Discs, Discs and Yet More Discs**

The video disc system saga continues to unfold. The last development we mentioned (June issue) was an optical arrangement proposed by Matsushita to make the Toshiba DVD-SD and conventional CD systems compatible. Subsequently Matsushita proposed a change to the DVD-SD system: the two sections of the disc would be bonded together face-to-face, with a semi-reflective layer between, instead of back-to-back. This has two advantages: a label can be put on one side of the disc, which is read from one side so that it doesn't have to be turned over. The disc can store 9Gbytes of data, the same as the original Toshiba DVD-SD proposal.

More recently Matsushita has revealed a disc, known as the SD-RAM, which has been developed specifically for computer use. It's a two-sided, rewritable disc that can store 2.6Gbytes of data per side. Video information, short film sequences for example, can be held on the disc but Matsushita says that it is not suitable for feature films.

Philips and Sony are set to launch the CD Plus (CD+) or enhanced CD format, which has been developed with help from Microsoft and Apple Computer. In a similar manner to the Kodak Photo CD system, it uses a multi-session disc: the first data recording or session stores music data while the second stores CD-ROM data. An ordinary CD player can reproduce the music while ignoring the CD-ROM data. CD-ROM decks can read both the music and the extra data, which can consist of pictures, text etc. CD+ discs will work with most double-speed ROM drives, though some may require new driver software. The Echo record company is to launch the first CD+ discs later this month (June). Sony plans to introduce CD+ titles later this year.

OmniMedia has developed a variant of CD+ called Video CD Plus. It combines a linear MPEG-1 program with an interactive program. According to OmniMedia the Video CD Plus discs will use software-based MPEG-1 video, enabling a PC to play MPEG-1 clips without need for a special video card.

Philips has developed the Rainbow CD, so-called because the discs can be used with several CD formats (each standard is known by the colour of the specification book). The new discs are CD audio, CD-ROM and CDi compatible. The first title is due to appear this autumn.

News too on the hardware front. Samsung has developed a new CD laser system that promises to cut the cost of the optical unit by fifty per cent while providing enhanced performance. It has a vertical instead of an edge light-emitting laser, which is formed on the same semiconductor substrate as the diode detector array. A three-beam diffraction grating and a focusing hologram are incorporated in the same housing. The vertical-well laser requires about a tenth of the power of a conventional semiconductor laser – it produces 1.5mW of 780nm wavelength optical power with a sustaining current of 4mA at 1.9V. There is thus no need for a heatsink, and battery life in portable machines is increased. Volume production is expected to start next year.

## **Broadcasting Notes**

The ITV companies, in their plans for terrestrial digital TV presented to the national heritage department, have called for a flexible approach to the allocation of the available bandwidth. Instead of simply using an existing u.h.f. channel for four digital TV channels, the ITV Association recommends the use of compression and multiplexing technology to merge the information from four TV channels into a single digital stream, thus making optimum use of the available capacity. The Association points out that while a fast-moving sports programme with wide-screen presentation would require 8Mbits/sec, a discussion programme with little movement would need only 2Mbits/sec. The idea is to use the 20Mbits/sec available in different ways at different times.

The BBC has announced that it will add PDC (Programme Delivery Control) to both channels later this year: at present only Channel 4 transmits PDC codes nationally. The BBC's service will cater for late programme starts, but not when a programme is moved to another channel, for example when cricket or Wimbledon is moved from BBC-1 to BBC-2.

Since DAB (digital audio broadcasting) handles signals in digital form, it need not be restricted to sound. Why not pictures and data as well? Bosche GmbH has developed a DAB radio receiver that can also display pictures. The company is advocating the use of MPEG-4 compression video with DAB.

## **PCs**

According to market research figures published recently by the *Computer Industry Almanac*, the number of computers in use throughout the world is growing at an explosive rate – 350 per cent over the last decade. In the USA there are now 350 computers for every thousand of the population. These figures relate to all types of computers. Last year more PCs than TV sets were sold in the USA.

A simple, free Windows-based monitor test program is available from the Computer Graphics Suppliers Association which can be reached on 01905 613 236.

## **Satellite TV**

Eutelsat's Hot Bird 1, at 13°E, is now in commercial service. All sixteen transponders have been leased by TV broadcasters. First tests confirmed that direct-to-home reception with 70cm dishes is possible from Ireland in the west to

Ukraine in the east. Use of larger dishes makes reception possible as far as Moscow and the near Middle East.

The number of BSkyB paying subscribers rose above 4m during the first quarter of the year. Results for the first nine months of its financial year show turnover 47 per cent and profits 65 per cent ahead of the corresponding period in 1994. Despite that Rupert Murdoch is not happy. "The charges for transponders in Europe are a scandal" he said recently. "They are at least four times the American charges." So News Corporation is considering the purchase of its own TV satellite.

Digital TV is taking off: Pace Micro Technology has received orders from Australia and east Asia for over £200m worth of digital pay-TV receivers.

### **Extended Warranties**

A Code of Practice for Extended Warranties on Electrical Goods has been published by the British Retail Consortium. It was drawn up in response to the Office of Fair Trading's report on extended warranties in December 1994.

The main points of the code are that details of extended warranties on offer, with prices, terms and conditions, should be given point-of-sale display; that firms should implement a policy that prevents sales staff applying undue pressure when selling extended warranties to customers; that extended warranty contracts must be written in plain language and be easy to understand; and that compliance with the code will be monitored annually, with retail trade associations submitting an annual report to the OFT.

Copies of the Code are available from the BRC, Bedford House, 69/79 Fulham High Street, London SW6 3JW (0171 371 5185) at £1 each inclusive of postage.

### **Trade News**

BREMA figures for 1994 show that for the second year running there were record VCR deliveries, this time 2.5m. Camcorder business declined, with deliveries at 0.4m, a fall of 25.4 per cent. A feature of the CTV market was a strong demand for sets with Dolby Surround sound. There was a 21.4 per cent increase in deliveries of sets with Nicam sound.

Sales of widescreen sets in France and Germany advanced dramatically – Europe-wide deliveries increased from 92,000 to 167,000. UK CTV production increased by 700,000 to 4.9m, with exports accounting for 3.2m. UK production of VCRs increased by 700,000 to 2.5m.

Hyundai is the latest Korean manufacturer to enter the European consumer electronics market. It will do so as an OEM supplier rather than use its own name. Hyundai-made satellite receivers are scheduled to appear in the autumn. These will be followed by cable and telecoms units. Plans for more bread-and-butter lines are longer term.

CPC Ltd. has been bought by Farnell Electronics of Leeds for £30.5m. Work recently started on a 2,800 sq. m extension of CPC's warehouse and office facilities at Faraday Drive, Fulwood, Preston.

Granada UK Rental and Retail has bought Direct Vision Rentals, which conducts its business via advertising and leaflets and does not have showrooms. The DVR headquarters will remain at Dunstable.

### **Multimedia News**

Trials of Two Way TV's interactive service have started, via Central TV, in 250 Oxfordshire homes. A commercial launch is planned in Birmingham later this year, where the

aim will be to sign up 2,000 homes. This could be followed by a national launch across all channels. Granada and Radio Rentals are to distribute the set-top boxes required. The retail price of these, including four handsets, is likely to be about £180, though rental is expected to be most people's preference. The service will enable graphics and text to be added to TV programmes to provide viewers with extra information, background details and interactive options.

Whether such services will turn out to be economically successful is a very big question. It seems that one of the biggest trials, carried out by Time Warner in Florida, has not been a success to date.

3DO has unveiled its M2 64-bit upgrade, which uses an IBM PowerPC 602 RISC chip and has MPEG-1 decompression built in. It's expected to be available towards the end of the year. GoldStar has launched, at a suggested price of £400, a 3DO interactive multiplayer that can play audio CD, Photo CD and 3DO discs. Atari and Virtuality of the UK have announced plans to launch the Jaguar VR system for use with the 64-bit Jaguar games unit. It will have a head-mounted display and an optional track joy-stick. Suggested price is expected to be around £200.

### **Telephone Numbers**

Changes at Amstrad. The trade spares ordering telephone number is now 01277 236 111. The fax number is 01277 209 559, as before. A new general number for customer relations/enquiries is 01277 236 100.

A correction is required to Version 3 of the *Television Index* disc, which has the wrong fax number for Hitachi spares ordering. The number is 0181 569 1441, not 0181 561 1441. The error is present on only the first few discs to be issued, being corrected on later ones. Our printed spares guide (April) is correct in this respect.

### **Catalogues**

The 1995 issue of Cricklewood Electronics' catalogue is now available at £2.50, post paid. This seventeenth edition has 160 pages and includes extensive listings of video heads and belt kits and remote control units. A new section on computer equipment lists PCBs, enclosures, power supplies and testers. The catalogue is available from Cricklewood Electronics Ltd., 40-42 Cricklewood Broadway, London NW2 3ET. Telephone 0181 452 0161, fax 0181 208 1441.

Mauritron Technical Services, 8 Cherry Tree Road, Chinnor, Oxfordshire OX9 4QY (01844 351 694, fax 01844 352 554) has issued a new catalogue of technical books (edition 24). There are extensive sections on TV and video publications.

### **News from Willow Vale**

Willow Vale Electronics is distributing a 71-minute, full-colour video training tape that covers Akai AX-GX series VCRs, with the emphasis on repair and testing. The tape has been produced in conjunction with Visions Video Productions and is available, under WVE order code 18201TT, at £19.95.

Willow Vale has also been appointed distributor of the One For All range of remote control units. These pre-programmed handsets will replace the RC units that come with almost any TV set or VCR. The manufacturer operates a One For All hot-line to deal with any customer queries.

For further information apply to Willow Vale Electronics, 11 Arkwright Road, Reading, Berkshire RG2 0LU. Telephone 01734 876 444, fax 01734 867 188.

# Satellite Notes

Reports from Andrew Tebbutt, Hugh Allison, Philip Blundell, AMIEEIE and Chris Watton

## **Pace SS9200**

We've had interesting faults recently with a couple of these receivers. The owner of the first one complained that every so often she would lose the station on every available channel position and receive the control room! The problem would clear if the top of the unit was tapped. Obviously a dry-joint somewhere.

After some discussion and a bit of reasoning we figured that the control room bit was in fact the receiver tuning to the lowest available frequency, which just happened to be the Astra dealer demonstration channel. This also led us to think that the cause of the problem lay somewhere in the MOD 1 tuning supply circuit. We couldn't find any obvious dry-joints in the tuner area, but when we traced back to the source of the tuning supply we found a dry-joint at pin 14 of the chopper transformer. This is at the a.c. side of the rectifier diode that produces the 24V tuning supply.

At about the same time one of these units that had suffered from the usual exploding power supply syndrome came in. To get it going again we replaced the BUT11AF chopper transistor, the 1 $\mu$ F capacitor in its base circuit, the two fusible resistors R12 (0.22 $\Omega$ ) and R13 (4.7k $\Omega$ ) and of course the 1A fuse. But there was no "please wait" prompt from the decoder. We replaced the decoder plug and socket assembly which can cause trouble, but this made no difference. Close inspection of the print side of the decoder panel then revealed a rather large blob of solder across quite a few of the i.c.'s pins. After removing this all was well.

Incidentally we also looked at pin 14 of the chopper transformer in this unit and found that it was also becoming dry-jointed. So it looks as if this could be starting to become a common problem as these receivers age. A.T.

## **Pace PRD900**

This unit came to us dead following a power cut at the customer's home. After a power supply rebuild I found that it couldn't be tuned in anywhere in the u.h.f. spectrum and that it wouldn't enter the modulator tuning mode (F5 on the handset). By wiring via a scart lead and entering the menu I found that the menus were locked. I unlocked the menu, using code 0000, then entered the modulator tuning mode. This showed that the r.f. output was tuned to channel 20! Resetting to channel 38 restored normal operation.

I checked to see if the r.f. output could be changed back to channel 20. It couldn't. I can only conclude that as well as killing the power supply the power cut had locked out the micro. A.T.

## **Amstrad SRD510**

The owner said that the VideoCrypt decoding section of this receiver had been dodgy from the start. Although the receiver worked well with unscrambled channels, it was very much a matter of chance whether it would bother to decode. Since the situation had now been reached where it decoded less than half the times when asked, a repair was called for.

The card reader part of the VideoCrypt section is separate from the decoder itself – probably to minimise

patterning with terrestrial TV reception. One screw holds the card reader PCB in place. We found that C403, a disc ceramic capacitor that's mounted near the screw, was trapped beneath the screw head and had cracked. A replacement cured the fault. H.A.

## **Philips STU824/Pace PRD900**

This set wouldn't tune to MTV or Eurosport. Sky 1, Sky News and the Movie channels were o.k. Though the local oscillator and tuning menu settings were all correct, the receiver produced Sky Sports when Eurosport was expected (0.256MHz out). My thanks to the nice man at Philips Technical for suggesting that I try the Nicky i.c. first. He was correct. P.B.

## **Maspro SRE90S**

This receiver was brought in because it produced a rolling picture. After hours of soak testing the fault appeared. Its cause was traced to C407 (1,000 $\mu$ F, 35V) in the power supply section. It must be hot in the customer's house, as the complaint was that the fault occurred after a few minutes. It was on the third day of nine to six soak testing that it appeared for us. C.W.

## **Pace Modifications**

**Model MSS1000:** In speaker configuration no. 3 one of the two audio channels normally used for Surround sound is switched to carry the centre channel sound. This configuration is normally used where the TV set doesn't provide adequate audio performance. Switching chip U2 carries out the changeover. There have been a few instances where U2 has failed to switch over. To ensure positive switching, R83 on the Dolby Pro Logic board has been changed from 470k $\Omega$  to 100k $\Omega$ . Its full specification is 100k $\Omega$ , 0.1W, 5%, part no. 940-1040501.

**Enhanced PRD Series:** The following compatibility problem can occasionally occur between enhanced PRD800/900 receivers (with PCB part no. 182-0190203 only) and Pace dish positioners. When the positioner is connected to the receiver with a fully-wired scart lead (all pins connected) the two units operate together via a data link to give the correct satellite position for a selected channel. The data line is pin 12 in the decoder interface. With some enhanced PRD receivers the d.c. level of the data line is slightly low. If the Pace dish positioner occasionally displays a satellite position number that's incorrect or doubled in value, add a 2.2k $\Omega$ , 0.25W, 5% carbon film resistor between the end of coil L14 nearest to diode D98 and the cathode (banded end) of D98. The part no. for this resistor is 140-2222501.

**SS9200 and PRD/PSR/MRD950 series:** Customers can be confused when the wrong frequency is displayed in the tuning menu. This occurs if the receiver is set to the wrong frequency band, i.e. DBS or telecom instead of FSS (FSS A or FSS B with enhanced PRD series receivers). The FSS band is required for current Astra programmes. It's the LNB setting that has to be made.

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# Servicing the Matsui 1455

Tony Ashworth

The Matsui 1455 colour portable sold in large numbers during the period 1989-1991. Features include remote control and AV inputs. Provided care is taken over any repairs necessary, these sets will give good service.

Much of the information in this article also applies to the Matsui 1422, which was a budget, non-remote version. The power supply, timebase and signal processing circuitry are all similar. Its control and audio stages differ however, and the circuit reference numbers are different.

## Power Supply Operation

Fig. 1 shows the power supply circuit, which is of the Siemens discrete-component self-oscillating type. At switch-on chopper transistor Q604 is forward biased by R603 and R604. As a result, current flows through the primary winding of the chopper transformer T601, also through R616 and R605 which are in series with Q604. A negative-going sawtooth voltage is developed across R605. When this reaches a certain level, Q602 and Q603 will switch on, switching Q604 off via C607. With Q604 now off, the voltage across R605 disappears and Q602/3 turn off. The next cycle occurs once all the energy has been drained from T601 by the secondary loads. Feedback from winding 7-8 then switches Q604 on again.

D603 and C606 rectify the voltage developed across winding 9-10. This feedback voltage varies in accordance with the loading on the transformer's secondary windings. Error amplifier transistor Q601 detects these variations, in turn altering the bias applied to Q602/3 and thus the triggering point for these transistors. In this way the mark-space ratio of Q604's drive is varied to regulate the output voltages obtained from the circuit.

## Power Supply Faults

The first thing to do with a dead set is to check the voltage across the mains bridge rectifier's reservoir capacitor C604. If this is absent it's likely that the BA106 bridge rectifier BR601 is faulty. In this event the surge limiter resistor R601 usually fails. If some 300V is present across C604, check the voltage at the junction of R603 and R604. The reading should be around 150V. If not, check R603 and R604. Be sure to discharge C604 before making any cold checks in this area.

One component that can cause problems is C613 (4.7nF, 1kV), which forms part of a damping network across the h.t. rectifier diode D607. In extreme cases this capacitor spits apart. But it can just break down. The power supply then emits a high-pitched whine, though no obvious short-circuit

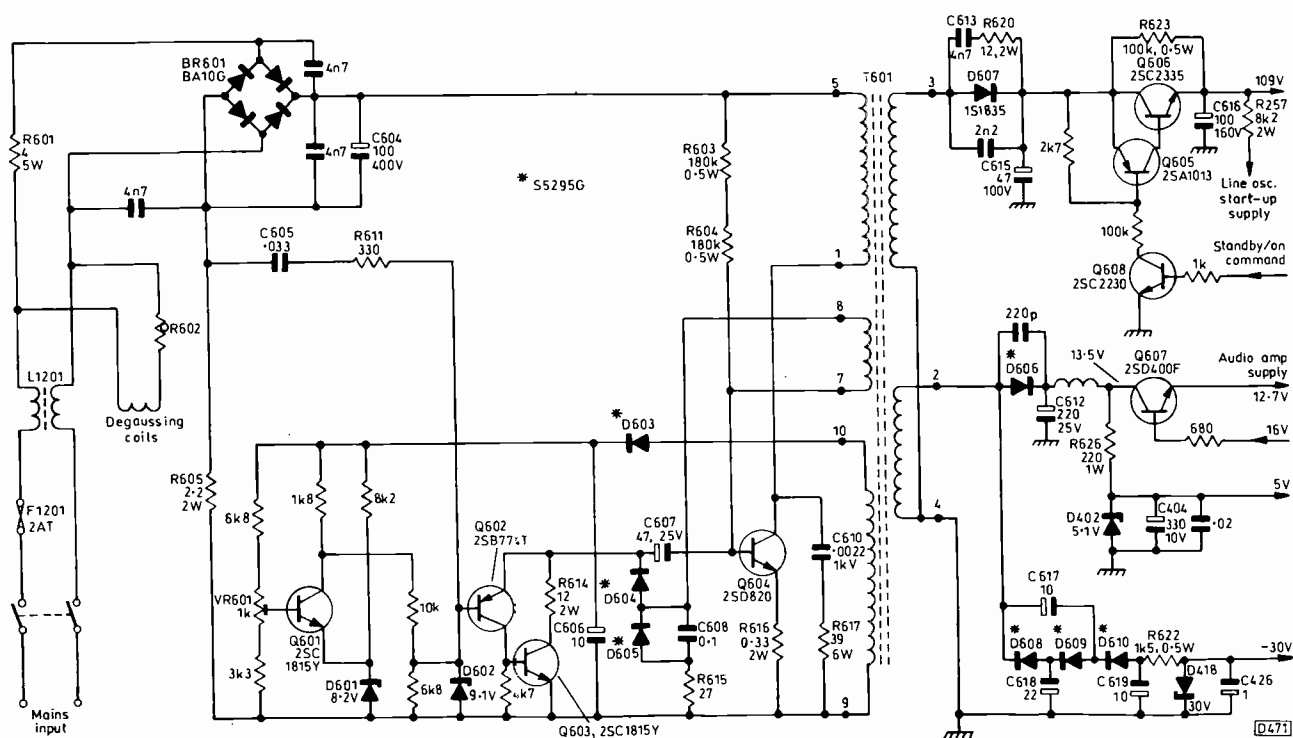


Fig. 1: The power supply circuitry used in the Matsui Model 1455. Q605/6/8 provide standby/on switching under the control of IC401. Q607 provides audio muting: it switches on when the line timebase comes into operation. The -30V supply is used by the memory chip IC404.

is present. This problem is very common with Model 1422, in which the relevant component reference number is C617.

Excessive h.t. is the most destructive fault that can afflict the set. The usual cause of this is C607 (47 $\mu$ F, 25V). Being mounted close to some hot-running resistors, it dries up. The h.t. can then be anything up to 180V at switch-on, slowly falling as the set warms up. For long-term reliability, C607 should be replaced with a high-temperature component. If the h.t. is very high (over 200V), check the components in the regulation circuit, particularly Q602 (2SB774T) and the 8.2V zener diode D601 which should be checked by replacement.

### Signals Circuitry

The vision and sound i.f. circuitry is incorporated within the TA7680AP chip IC101 which lives in a screened can next to the tuner. This chip can be responsible for instability when the set has warmed up – the symptom is flashing on the picture. It can also be responsible for loss of sound, but first check the volume control voltage at pin 1 (should be around 4V) as the cause of this fault may lie elsewhere. The audio driver and output stages are very simple, being based on transistors Q103-5 which are powered by the chopper-derived 13V supply. This supply is not present in standby, being switched off by the 2SD400F transistor Q607 in this mode. If the customer complains about strange noises when the set is in standby, check this transistor.

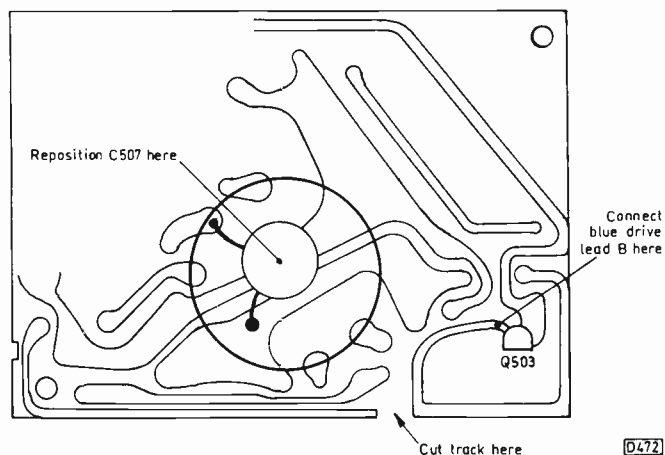
Most of the signal processing is carried out by the TA7698AP chip IC202, which contains the video processing, colour decoder and the timebase generator stages.

The video signal from IC101, via emitter-follower Q102, enters at pin 39, its amplitude being around 2V peak-to-peak. After inversion it appears at pin 40, where it's passed to the sync separator circuitry at pin 37 and, after filtering, to the chroma input at pin 5. The video signal also emerges at pin 42, after contrast control adjustment (pin 41), passing via the luminance delay line/filter DL202 to pin 3. Brightness control is applied here, based on the control voltage at pin 4 (4.3-4.6V depending on setting).

The contrast control voltage at pin 41 should be between 7.3-7.7V depending on the setting. If the voltage at pin 41 is less than 7.3V there will be no video output at pin 42. One fault that can cause this is failure of R314 (180k $\Omega$ ), which is the pull-up resistor for the beam limiter circuit. Should R314 go open-circuit the contrast control voltage will be reduced and there will be no picture. This fault is easy to miss when fault finding as the voltage drop at pin 41 is only very slight.

The luminance delay line DL202 can be responsible for intermittent video faults, going either open-circuit or short-circuit to chassis. The luminance signal finally emerges from IC202 at pin 23, passing to the base of the 2SA562TMY emitter-follower transistor Q202. This transistor drives the emitters of the RGB output transistors which are on the tube base panel. A white screen is the result when Q202 is leaky. Blanking is applied to the base of Q202, via diodes. A common cause of problems is failure of the 2SC1815Y on-screen display blanking transistor Q408, which can go open-circuit. Q202 is then cut off, blanking out the picture. As a quick check disconnect one end of D417: this will isolate the on-screen display blanking circuitry. Check whether D417 is short-circuit if the display characters leave a white streak to the right.

Colour faults are rare. The colour killer can be over-ridden for fault-finding purposes by connecting a 10k $\Omega$  resistor between pins 2 (12V supply) and 12 (colour-killer)



**Fig. 2: Modifications to the tube base panel (print side) to improve reliability.**

of IC202. For colour control the voltage at pin 7 is varied (between 4.1-7.4V). If the colour-killer is in operation the voltage at this pin will be held low.

### The CRT Base Panel

The circuitry on the tube base panel is straightforward. There are four transistors, all type 2SC2482. Q501-3 provide the RGB tube drives while Q504 drives the green cathode for the on-screen display. Q504 can become leaky, or a fault in the preceding circuitry can switch it hard on. The picture is then flooded with green. Disconnect one end of R514 to isolate the on-screen display circuitry.

If there's loss of a particular colour the 180pF capacitor between the base of the relevant RGB output transistor and chassis should be checked. These capacitors can become leaky, reducing the base voltage and thus cutting off the transistor. The capacitors are C501 in the red channel, C503 in the green channel and C505 in the blue channel. The transistors themselves also often fail. A dark, flaring picture can be caused by C507 becoming leaky. This 4,700pF, 1kV capacitor decouples the tube's first anode.

### Modification

A modification was introduced to improve the reliability of the tube base panel circuitry after it was found that leakage can occur between the track connected to the base of the blue output transistor Q503 and the track that carries the 180V supply. This leakage can damage Q503 and, in extreme cases, burn the PCB. To prevent this, connect the lead labelled B from the main PCB directly to the base of Q503 and remove a small section of the bottom track – see Fig. 2.

It is also recommended that C507 is repositioned, as shown, so that it's connected to the tube instead of the video earth. This is usually possible by soldering it to the back of the PCB. Apply a small blob of hot-melt glue to hold it in place.

### The Field Timebase

The most common cause of field collapse is absence of the relevant supply to IC202. This chip has two supplies: 8.5V at pin 33 for the line oscillator and 12V at pin 2 for the rest of the chip. The stabilising 12V zener diode D219 goes short-circuit and the 39 $\Omega$ , 1W feed resistor R256 open-circuit. If this has happened be sure to replace C607 in the power supply (see above) otherwise you will find that you

get a repeat performance.

Other causes of field collapse are as follows: R310 (10 $\Omega$ , 0.5W fusible) can go open-circuit, removing the supply to the field driver and output transistors; R304 (47k $\Omega$ , may be 56k $\Omega$ ) in the linearity feedback network can change value; and IC202 can fail, though this is rare.

For lack of height and bottom fold-over, check the value of R305 (24k $\Omega$ ).

For field hold problems check the value of R279 (240k $\Omega$ ).

### The Line Timebase

Apart from the output transformer the line output stage is generally reliable. The transformer's e.h.t. section tends to fail, resulting in a high voltage at pin 7. This causes damage in the beam limiter circuit, with R315 (10k $\Omega$ ) burning up.

The line output transformer is often blamed for repeated failure of the 2SD1426 output transistor Q305 though the usual cause is excessive h.t. voltage.

For loss of line hold check R274 (27k $\Omega$ ). This resistor is part of the pulse feedback network between pin 5 of the line output transformer and pin 35 of IC202.

### Control Circuitry

A common problem is that the set will not switch to standby because Q606 (2SC2335) or Q605 (2SA1013) is short-circuit. These transistors act as a switch in series with the h.t. supply. If the set goes to standby intermittently, check for dry-joints on wire link g that goes from pin 27 of

the microcontroller chip IC401 to the switching circuit. If the set won't come out of standby the 4MHz crystal X401 may be faulty or the reset pulse may be absent – this can happen if C403 (1,000pF) is leaky.

Loss of sound and failure to stop in the search mode can be caused by absence of sync pulses at pin 12 of IC401 because Q404 (2SC1815Y) is open-circuit.

No or intermittent remote control operation can be caused by dry-joints within the remote control receiver can.

IC404 is the memory chip. For loss of memory, check that the -30V supply is present at pin 2. If it's missing the 30V zener diode D418 could be short-circuit.

### Model 1422

As mentioned earlier, the 1455 has a cousin, Model 1422. Although this set does not have remote control it still uses a microcontroller chip for tuning and channel selection, and this is where most of the problems occur. The 5V supply to the microcontroller chip is fed via a fuse that's situated near the chopper transformer, soldered directly to the PCB. As anyone who has tried to solder wires to a fuse will know, this is very difficult to do without making the fuse go open-circuit in the process. What happens is that the fuse goes open-circuit when the set is warm, causing loss of signals and the channel display. For a reliable repair, use a Wickman fuse or a suitably-rated circuit protector instead.

The other problem that affects this model is a corrupt memory – IC402 (MDA2062). When this happens the channel numbers may be incorrect or search tune may not operate correctly.

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# Test Case

## 391

Luxor is a name we seldom come across nowadays. It was one of several northern European setmakers – others include NordMende, Tandberg and Salora – that produced stylish, good-quality sets. Some of them are still around, though spares for many of the brands can be hard to obtain.

This particular Luxor colour set was fitted with the SX9 chassis. Its owner, the retired boss of a now closed down rival shop in the town, brought it in. He said that it had been fizzing and flashing for a while. Then, finally, the picture had collapsed and disappeared and a funny smell had come from the back. Of all people, he should have known better than to run a fizzing and arcing TV set till it stopped altogether! The symptoms suggested that the transformer or some other vital and possibly difficult/impossible to obtain item in the line output stage had died. Told about this, Mr Wakefield departed with a long face.

As usual in early summer, half the workshop staff were away on holiday.

So this repair fell into the hands of Service Manager himself. Cussing freely, and interrupted every few minutes, he sat at Television Ted's bench with the set in front of him. It was soon apparent that the fault was line scan collapse. The cause was also quickly discovered: the line linearity correction coil was dry-jointed to the PCB – there were signs of severe arcing at the point of disconnection. The parallel 820 $\Omega$  damping resistor RH09 had also had a hard time. As the only path for the line scan current, it had been roasted to a turn.

Fortunately the damage to the PCB was repairable. Otherwise the set would have been a write-off. Service Manager removed the coil and the resistor. He cleaned up the coil's lead-out wire and treated it with emery cloth, then fluxed it and tinned it with solder. He treated the PCB land in the same way, then refitted the two-pin coil using plenty of high melting-point solder and a liberal application of flux. A new damping resistor was fitted.

After a check for dry-joints elsewhere in the line timebase and power supply sections of the receiver Service Manager applied mains power. Up came a picture. Not a bad one in terms of brightness and contrast, considering the set's age. SM hadn't lost his touch! There had always been some rivalry

between Test Case Repairs Ltd. and Mr Wakefield's now-defunct outfit. . .

As a final check before making out the bill, Service Manager tuned the Luxor set to the workshop test pattern – a proper one, with a centre circle, border castellations and all. Seldom did pride have such a speedy fall! The picture's geometry was terrible, the line linearity being way out. The circle was the shape of a potato: the grid squares to the left of the pattern were all stretched, while those to the right were cramped. What could have gone wrong?

Service Manager checked that he had not shorted out the coil with a splat of solder, and that the new damping resistor was of the correct value. Everything was o.k. He removed the resistor and tried again. There was no improvement in the horizontal linearity, but vertical striations were now present at the left-hand side of the picture. SM examined the linearity correction coil closely. Its winding did not appear to have been damaged, and there were no signs of overheating. Even so, it seemed that it had to be responsible for the fault. What else was there? The inductor is not an adjustable one. In fact the coil itself wasn't faulty, nor was anything else in the set. So what was the cause of the trouble? For the solution, turn to page 652.



# Computer Communications and Modems

Jon Lye

You seem to hear or read something about e-mail or the Internet almost every day. In fact the media seem to be obsessed with this aspect of computing, which is beginning to play a greater role in our own trade's day-to-day business. On-line ordering systems, whose use is sure to increase over the next few years, are making it an important subject. This short article has been written as an introduction to the modems and communications software required.

Modems are considered to be a bit of a black art in computing. Setting one up can be a daunting task, mainly because there are so many standards and variables. Modern communications software makes setting up easier, but to get the best results from a modem you need to have a little knowledge of how it works.

## Speed

The word modem is made up from modulator and demodulator. These are basically the functions it performs. As the telephone system was originally designed for voice communication, it doesn't have the bandwidth to be able to transmit digital signals. This problem is overcome by using a carrier. The digital signal modulates this, the resulting modulation being sent along the telephone line to a remote modem that demodulates it. The data can then be fed into a remote computer. This data is in serial form, i.e. it's transmitted one bit at a time.

It follows that the more bits per second that can be transmitted, the shorter the connection time and the lower the cost of the telephone call. Thus the all-important factor is the data transmission speed.

While the speed of older modems is expressed in bauds, newer modems are rated in bits per second. These are not the same thing. The baud rate is the number of times per second that the signal changes state. A 300 baud modem can change state 300 times a second. Several techniques can be used to modulate the carrier. If we use FSK (frequency shift keying), with each change representing a baud, the data rate is 300 bauds or 300 bits per second. We can however use a method of modulation where one change (baud) represents four bits. In this case the modem's speed is 300 bauds or 1,200 (300 x 4) bits per second.

Seven bits are required to transmit one ASCII character. But start, stop and parity bits have to be added. Thus ten bits per character have to be used. At 2,400 bits/sec, with ten bits per character, 240 characters a second can be transmitted. This is called the throughput.

## Modem Standards

With improvements in the technology, the transmission rate capability of modems has increased. This has led to the biggest problem, the large number of standards that a modem must be able to handle to maintain compatibility. The latest modems on the market have to be downwardly compatible with all older ones.

The international organisation that defines these stan-

dards is the ITI-T, which superseded the CCITT. It gives V numbers to the various data communications standards.

To gain competitive advantage, modem manufacturers have developed the technology to achieve faster data transmission rates, hoping that their standards will be accepted and ratified by the ITI-T. The ITI-T has not always obliged, and as a result there are a number of proprietary standards that not all modems can handle.

To assess the performance of different modems you have to compare their data throughput. This is the volume of user data transmitted per second and depends not only on the bits/second rate but on whether data compression is used. More on this later.

The following are common modem standards:

V23	1,200/75 bits/sec (Viewdata)
V22bis	2,400 bits/sec
V32	9,600/4,800 bits/sec
V32bis	14.4k/12k/9,600/7,200/4,800 bits/sec
V34	28.8k/26.4k/24k/21.6k/19.2k/16.8k/ 14.4k/12k/9,600 bits/sec.

## Types of Modem

There are two basic types of modem, internal and external. There is not much difference between the two, and each have advantages and disadvantages.

The biggest problem with the internal type is configuring the associated computer's hardware. All the devices in a computer system require an interrupt connection, which is used to tell the computer's central processor (CPU) that a device is calling for attention. Where there are a number of other items, such as a sound card or a scanner card, there can be a conflict should they share an interrupt line. Processors of the 386 and 486 variety have fifteen interrupt (IRQ) inputs. This can present problems, as a lot of them will be used for such things as a mouse and a printer port.

In my opinion external modems are easier to work with, but they are not without problems. Most computers use an 8250 UART (Universal Asynchronous Receiver/Transmitter) chip for the communications port. It may not be able to keep up with the latest V34 standard modems, whose advantage is then lost. A faster UART chip such as the 16550 can be used. It's pin compatible with the 8250, but there is little difference in cost between replacing the chip or the board – unless the communications port is on the mother board.

Because modems are serial devices they are, in computer terms, quite slow. The transmission rate may have to be reduced further if the telephone line is noisy, causing data loss. Error correction is used to protect the data from noise correction. This is done in several ways, from basic parity checking to the use of more complex algorithms.

## Smart Modems

A 'smart' modem can be used to improve the overall data throughput between computers. This type of modem can

talk to the computer and the modem at the other end of the telephone line at different rates. The communication rate between the modem and the local computer is known as the DTE (Data Terminal Equipment) rate while the communication rate between the local and the remote modem is known as the DCE (Data Communications Equipment) rate.

The smart modem sets the DTE rate at the highest the computer's communications port will accept. This could for example be 19,200 bits/sec. The communications port is then locked or fixed at this rate. Error correction and data compression are next carried out by the modem. These involve cyclic redundancy checking and data framing in blocks. The techniques are similar to those used by the well-known PKZIP compression software. All this requires a large amount of processing power in the modem.

At the remote end of the link the modem carries out error correction and data expansion before sending it to the computer. The two modems would, in our example, be connected together with their DTE rates locked at 19,200 bits/sec. If a compression standard such as V42 is being used the DCE rate may be only 2,400 bits/sec but the data throughput will exceed 100 per cent of this rate. Thus although the DTE and the DCE rates are different the overall rate, because of the use of data compression, is the DTE rate. This is the theory: in practice the rate will depend on such things as the noise on the line. But it does show the need for correct modem set-up.

## **Communications Software**

As the number of on-line services grows, so does the number of communications packages on offer. The first thing to decide is whether to go for a Windows- or a DOS-based package. If you are mainly a Windows user who never descends to the DOS prompt you will most likely go for the former. This is one area however where DOS can be more efficient, as it doesn't require the transmission of memory-hungry graphics. Whichever alternative you choose will have mostly the same features. We'll run over the more basic ones.

**Automated dialling directory:** This provides an on-screen list of all the services that can be dialled and logged on to automatically. Entries can be added or deleted. Such things as the service name, the telephone number and the setting of the different parameters for the service are included.

**Script language:** This is a simple programming language that enables you to carry out such tasks as dialling a telephone number, logging on to the system, entering the password etc. It can also be used to automate operations so that your computer can for example dial a system in the middle of the night at the cheap rate then retrieve your e-mail and download it on to your computer ready for you to read in the morning.

**Learn or record mode:** Most software packages now include this. All the activity between you and the system you are calling can be recorded. When you first call a system you can set the software to record: as you log on and enter your password etc. this is recorded in a script file so that when you next call that service the file will automate the logging-on process.

**Terminal emulation:** This part of the software enables the computer to act as a different type of terminal, in other words it sets the way in which the characters are displayed

on the monitor. The simplest is the old teleprinter type TTY. Today the most common types are VT52, VT100, IBM PC and ANSI. From the point of view of readers of this magazine probably the most important system is View-data/Prestel as this is used by all the on-line ordering services. These services are used mainly in the UK. If you are going to use them it's important that the software has Prestel emulation – not many US packages do.

**File transfer protocol:** This determines the way in which files are transferred. There are several protocols, the more common ones being Xmodem, Ymodem, Zmodem and Kermit – yes, it was named after the frog!

When a text file is being transferred, simple parity checks will detect transmission errors that could have produced wrong letters. When a program file is transferred one wrong bit could prevent it running, so more complex error control is required. Take Zmodem for example – this is now public domain software. It transmits data in variable-sized blocks. If a transmission error occurs, the block instead of the complete file is re-transmitted.

The computer software at the sending and receiving ends of the line must use the same data transmission protocol. File transfer protocols won't concern you if your only interest is in connection to on-line ordering services.

## **Talking to the Modem**

Now for some modem commands and tests. Most modems are referred to as Hayes compatible, which means that they use a simple language devised by, yes, Hayes. It uses one or two characters preceded by the letters AT.

A simple telephone number dialling instruction is ATD343224. The instructions must all start with AT, which the software sends to the modem to get it to perform its operations. Once you know the basic commands it's easy to use the language to deal with modem set-up problems. When a problem arises the first thing to do is to check that the computer and the modem are talking to each other. Set the communications software to 'terminal mode', type 'AT' at the keyboard and the modem should respond with 'OK'.

Other commands that are useful include the 'ATI' ones. A number of tests relate to the modem make and model. Typing in 'ATI4' for example may show all the current register settings in the modem.

## **What's Ahead?**

If you think that this is all rather over-complicated, help may be at hand. It's rumoured that Windows 95 will contain a system called TAPI (Telephone Application Programming Interface). The great interest in communications and the Internet has led to this.

TAPI is similar to the way in which a printer and a computer are interfaced using Windows. A TAPI compatible modem will tell the interface what it's capable of doing: the interface then sets the correct AT commands to optimise performance. It is surprising that no one thought of this before. How long it will be before we see TAPI-compatible modems remains to be seen.

## **What to Buy**

For those who are not already on-line, here are one or two pointers about buying equipment. It's likely that you will want to buy the equipment for on-line ordering. The basic on-line ordering systems in use date back to the old

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days of Prestel terminals. This is why your software must have Prestel emulation.

To give you the local call rate, access to most suppliers' ordering systems is via a common carrier such as Istel or Fastrack. Travel agents use the same system. As so many old Prestel terminals remain in use, the maximum data transmission speed is V23, i.e. 1,200/75 bits/sec. This is because the older terminals will drop the line if they have to wait for the modem to fall back to this slow standard. If your need is simply to connect to these systems you can pick up a second-hand V23 modem very cheaply.

Willow Vale has gone down another path however. Although you may have to call long distance and the connection rate is much higher, you gain in not having to wait for each screen of data to be transmitted.

The best solution seems to me to be an ordering system which enables the part number to be found off-line in a database, connection then being made to order the part. This would save on the phone cost and mean fewer people using the system at a time. In these days of computers with large hard discs it shouldn't be too much trouble for suppliers to provide a catalogue on disc - RS is now doing this with a CD-ROM.

Enough of that and back to the main subject. If you plan to transfer files you will need something faster. A 14,000 bits/sec modem with error correction should suffice, or you could invest in the latest V34 type which can operate at 28,000 bits/sec.

### Now Try it Out

Once you've got the equipment you will want to try it

out. I've set up a self-help bulletin board for TV engineers. Now that technical support from manufacturers is becoming harder and harder to get, we could try providing our own. We are all experts at pooling knowledge, and should be able to solve most problems.

The system works by having 'conferences' for different manufacturers, with access via private e-mail. When you log on, you select to join a conference and enter or read messages relevant to the manufacturer concerned. If someone has left a message about say a problem with a Toshiba set and you know the answer you can send them a message (if Chris Harding or Martin Edwards is reading this, yes Toshiba sets don't give us many problems!).

If you want to get on to the system you can do so for free. All you pay for are the phone charges. Set your software to 8n1 and the terminal emulation to ANSI. Enter the number 01275 879 005 in your dial directory. When you connect, just enter your name and a password and you are in. If it works too slowly, try selecting mono display when you log on. You can always change back to colour later.

If you are on Compuserve and have problems with logging on you can contact me by sending a message. My address is Jonathan Lye 100306,1241.

### SPARES GUIDE ON VIP DISC

Would users of the VIP Index Disc version 3 please note that the Hitachi fax number should be 0181 569 1441 and not 0181 561 1441 as stated on disc (early issues). Apologies for any inconvenience this error may have caused.

# VCR Clinic

*Reports from Eugene Trundle, Andrew Tebbutt, Nick Beer, David Belmont, Christopher Nunn, Bob McClenning, V.W. Cox, Graham Thompson, Ronnie Boag, Gerald Smith, Roger F. White and Terry Lamoon*

## JVC HRFC100

The real-time tape counter in this VHS/VHS-C compatible machine worked in the record and playback but not in the fast-forward and rewind modes. This was because the left-hand half-loading arm (item 25 in the exploded deck diagram in the manual) was bent, diverting the tape path past the control track head. **E.T.**

## Sanyo VHR3300

Very intermittent failure to accept a cassette has been the problem with an increasing number of these middle-aged machines. The tape goes in, half laces, half ejects, goes back down and is then fully ejected! The culprit is the mode switch, which is more accessible in this than in some Sanyo models. **E.T.**

## JVC HRFC100

Towards the end of rewind a VHS-C tape, but not an ordinary VHS one, would be cruelly chewed. When small cassettes are being fast rewound the tape guides are extended a little from the cassette shell. The tape was riding up and over the upper collar of the entry guide because it was loose and able to vibrate and lean backwards. We cured the problem by pushing home the entry guide's retaining stopper on the underside of the deck. It's item 11 in the exploded deck diagram on page 4-6 of the manual. **E.T.**

## Ferguson FV31

If you come across this type of machine with a no-go, no light-up condition, check the supply voltage at pin 32 of the microcontroller chip IK60. The chances are that you'll find little or no voltage here because the BC337 regulator transistor TK44 has failed. Also check its 1 $\Omega$ , fusible series feed resistor RK44, which is a safety component. **E.T.**

## JVC HRJ200

If the problem with one of these newish machines is no action and failure to eject the tape, check CP1 in the power supply. It's an N20 type, rated at 800mA, and often fails. You will probably find that the current through the replacement is normal, at about 550mA, but to prevent further failure earth the cassette cradle with a bracket, JVC part no. PQ46086. It seems that static discharges can produce current surges through the protector. **E.T.**

## Ferguson FV81LV

If one of these machines seems to be completely dead though the mains fuse is intact and the power supply is producing outputs that pulsate at low levels, take a look at CP008 (100 $\mu$ F, 50V) in the power supply. If it looks unhealthy, replace it and the machine should burst into life. **A.T.**

## Mitsubishi HSB11/32 and similar models

A common fault as these machines begin to age is no

rewind/fast forward/take-up. The cure is to replace unit gear idler part no. 522C077020, pulley gear part no. 641C789020 and thrust washer part no. 552C010040. If you still have the same or similar symptoms after replacing these items replace the loading motor as well. This will in most cases solve the problem. **A.T.**

## Sanyo VAR512 Battery charger/power pack

We've had two of these units in recently because they were completely dead. In both cases the cause was R5104 (0.33 $\Omega$ ) being open-circuit. **A.T.**

## GoldStar 203I

Be warned if one of these machines won't play back an LP tape recorded by another VCR. Although the LP indicator in the display lights up this is not an LP model! I wasted some time in a customer's house before I found this out. **A.T.**

## Panasonic NVFS200B

The complaint with this highly-specified S-VHS edit deck was that the front AV inputs (AV4) didn't work. There was no display though the audio was o.k. Tests showed that one of the scart sockets, AV2, was similarly afflicted. The address lines to the audio switching array were clearly o.k. They were similarly correct at the M52474P video switching chip IC3901, which was faulty. **N.B.**

## Panasonic NVHD90B

The playback pictures produced by this brand-new budget hi-fi machine were spoilt by a faint blue vertical bar about a third of the way in from the right-hand side. Scope checks while a black level was being played back showed that the noise appeared at pin 16 of IC301 in the CNR circuit. The cause of the trouble was that the chroma recursive adjustment VR801 was set incorrectly. Realignment as per the manual cleared the problem. **N.B.**

## Saisho VR805S

This machine would accept a tape but wouldn't accept any other tape command. A new cassette lamp put matters right. **D.B.**

## Matsui VX2700

This machine wouldn't give the customer his tape back. The cause of the fault was in the power supply, where the switched 5V feed was missing. A new STK5342 chip (IC501) restored the 5V supply and gave us back the tape. **D.B.**

## JVC HRFC100EK

This machine was dead, which is not uncommon. Replacing Q1 and Q2 usually cures the fault, but not this time. When Q1 and Q2 had been replaced the machine squealed. D15 was short-circuit. After replacing this diode and switching

on again the machine went bang. So Q1, Q2 and the photo-coupler PHS1 were replaced. This time the fuse didn't blow, but all the voltages were low – approximately half what they should have been. This was cured by replacing IC1. Then FR23 went up in smoke. D33 was short-circuit. Replacing D33 and R33 finally restored normal operation. **D.B.**

### **Panasonic NVF65B**

Very noisy rewind was the complaint with this machine. We found that the supply and take-up spindles were as dry as a bone. Lubrication silenced the noise. **D.B.**

### **Panasonic NVJ40**

This machine wouldn't eject tapes because the release spring had parted company with the release lever. Refitting the spring and retiming the mechanism cleared the fault. We fitted a new mode switch for good measure. **D.B.**

### **Mitsubishi HSM48V**

This machine wouldn't rewind or wind the tape fully and at speed. We found that the idler assembly had popped out of its locating clip. Refitting it cured the problem. **D.B.**

### **Hinari VXL8**

If the complaint with one of these machines is that the channel display goes to E, or pause or record lights up, or the machine jumps between the LP and SP modes, before carrying out any checks replace C509 (220µF, 10V) in the 5V supply. A scope check on his supply will probably show that a 50Hz ripple is present. These problems tend to be very intermittent. So give the machine a long test before returning it. **C.N.**

### **Sharp VCH81H**

This machine would try to load the cassette housing without a cassette being inserted. The IR emitter was short-circuit. **C.N.**

### **Ferguson FV50B**

The symptoms were sound muting and lines on recordings. Playback of a known good tape was o.k. The mute circuit was firing up and not only muting the E-E sound but also causing mistiming of the head amplifier flip-flops because of V pulse suppression and thus loss of sync. Replacing the BC548B transistor TN74 put the machine back in the pink. **B.McC.**

### **Samsung VI621**

There was no colour with timer recordings only. I thought we'd a really difficult one here but all it took to put matters right was to set up the colour lock adjustment. Why the problem occurred only with timer recordings is beyond me! **B.McC.**

### **Sharp VCA100**

On rare occasions this machine would refuse to play or record, with the capstan and drum both motionless though the machine had loaded and the display showed the play symbol. The cause of the fault turned out to be poor riveting on the print that connects pin 10 of IC801 to AE4 en route to the cam switch, which modulates the voltage supplied to IC801 and thus confirms the mode position. At least it

wasn't the mode switch again! The problem was cured by fitting a bridging wire over the defective print. **V.W.C.**

### **JVC HRD455**

If one of these machines comes in dead check for a dry-joint at CN1 in the power supply. **R.B.**

### **Sanyo VHR291**

Intermittent loss of colour in the record mode was the problem with one of these VCRs. The fault could be instigated by going to pause and changing channels. When checking around IC101 (LA7395) we found that all its inputs were correct but when changing channels in the record mode the colour killer would trip. A new LA7395 chip cured the problem. **G.S.**

### **JVC HRD960**

There were no functions, a tape was jammed inside and the display was very, very dull. After many checks I found that the machine wasn't coming out of standby. The power supply rails were o.k., the secondary side supplies coming up when the machine was first plugged in, only to return to standby shortly after. As I could find nothing actually wrong I phoned the customer who said that the display had been dull for some time. Looking at it closely I noticed a small bar lit up at the top. I kicked myself and went in hunt of a remote control unit so that I could bring the machine out of the child-lock mode. After pressing the remote control unit's power button for a couple of seconds the machine sprang to life and is now working normally – after replacing the display. **G.S.**

### **Panasonic NVG40**

Playback was o.k. but when the machine was asked to record the tape counter stopped after about seven seconds and neither sound nor the control pulses were recorded. IC2101 was faulty. **G.S.**

### **Toshiba V711**

This machine would sometimes go to standby when eject was selected. There was also intermittent failure to change mode, e.g. from play to stop, unless the power was switched off then back on again. The cause was a faulty mode state switch. **G.S.**

### **Sanyo VHR315**

This VCR was dead, with no clock and no functions and the power supply tripping. We found that IC511, a zener regulator on the secondary side of the power supply, was short-circuit. **G.S.**

### **Toshiba V110**

There was no play, fast forward, rewind etc. The machine would try to go into a mode then, after a few seconds, it would revert to standby. When hand-winding the loading block I found that it would jam. On stripping it down I discovered that the main cam was damaged. To put this right you have to replace the full loading block assembly. **G.S.**

### **Akura VX140**

There was no on-screen display. If the PCB was tapped,

OSD letters would jumble or flash. The problem was cured by resoldering ICC101 and LC01, the voltage feed coil to the OSD section. **G.S.**

### **JVC HRD830**

The playback picture would jump, and the sound would jump from hi-fi to linear. A check on the off-tape f.m. signal envelope showed that a slice was missing. To cure this the drum motor (available only as a lower drum assembly) had to be replaced. **G.S.**

### **Akura VX150**

Failure to accept a tape was the complaint with one of these machines. Everything was o.k. around the microcontroller chip, but there was no drive from pin 12 of IC702. R762 in the feed to pin 11 was open-circuit. **G.S.**

### **Mitsubishi HSB30**

A blue, muted screen in the E-E mode signified loss of the signal. Sure enough nothing discernible emerged from the M51496P i.f. chip IC101. The voltages around this chip were reasonable except for those at pins 1 and 2, where the expected 4.9V was much reduced because C104 (0.22 $\mu$ F, 50V) was leaky. It's of the much maligned tantalum variety. **S.L.**

### **Ferguson FV31R**

This machine was dead: no functions worked and there were no displays. Checks showed that the switched 5V supply was missing – all the unswitched supplies were present and correct. The culprit was TP73, which was open-circuit. It's on the timer/display board. **S.L.**

### **Hinari VXL8/Amstrad VCR6000 etc**

There have been several references to the no rewind/fast forward problem you get with these and similar machines. In the May issue (page 504) Gerald Smith mentioned that the rubber pad which causes the trouble is not available as a spare. He and others will be pleased to know that it's available from SEME under part no. VPAR6833 (rubber damper). **S.L.**

### **Ferguson FV71 (R3000 Chassis)**

Failure to erase the old sound track was the problem with this machine, the bias oscillator being responsible. Its circuit, consisting largely of surface-mounted components, is on the small PCB to the right of the deck. We found that the transistor, IT001, was short-circuit and its 18 $\Omega$  feed resistor RL02 was open-circuit. A bell began to ring about a modification in this area. Solder up the oscillator coil LL01, and change the value of C002 from 1nF to 2.7nF (part no. 20136340). This modification improves the oscillator's ability to start. We also soldered the erase head wires directly, as failure in this area is common with other machines we've had in. **S.L.**

### **Ferguson FV21**

There was an interesting fault with this machine: intermittently part of the playback picture, sometimes all of it, would be missing. The fault was different each time the machine was put into the playback mode. A scope check showed that during part of each field there was a complete absence of signal. When we looked at the FG signal from

the lower drum we found that FG was there but no PG. The cause of the fault was a 3.3 $\mu$ F capacitor on the lower drum PCB. **R.F.W.**

### **Samsung SI1240**

There were random functions, as if the end sensors were faulty. With a cassette loaded we found that the voltage at one end sensor was 0.6V and at the other 5V. R6203 (4.7k $\Omega$ ) on the deck joint PCB was open-circuit. This is the small board beside the loading motor. **R.F.W.**

### **Ferguson FV30**

After we'd replaced all the usual items that fail when the switch-mode power supply dies the voltages were pulsing and the machine was still dead. Replacing CP38 (470 $\mu$ F) cured the fault. **R.F.W.**

### **Akura VX160**

The loading motor drive chip IC601 was short-circuit. The chip had overheated to such an extent that the solder had melted and it had fallen off the PCB. The same thing had happened to the associated current-limiting resistor R601. This is becoming a common fault – we've had it on a number of occasions. A different chip, type BA6219B, is now being supplied by Akura. **G.T.**

### **Samsung SI1260**

There was no 15V supply to the loading motor drive chip in this machine. After a few checks we found that D212 was open-circuit. **G.T.**

### **Orion D1094**

We've had various faults, usually intermittent, with this model. Symptoms have been no audio playback or record, no control pulses, no erase etc. Check for dry-joints at the vertical PCB to the rear of the deck. It connects the deck to the main PCB. **G.T.**

### **Sony SLV280**

This machine was brought in because it wouldn't load a tape. When I tried to load a tape manually I found that the loading motor was very tight. A replacement loading motor restored normal operation. **T.L.**

### **Ferguson FV71**

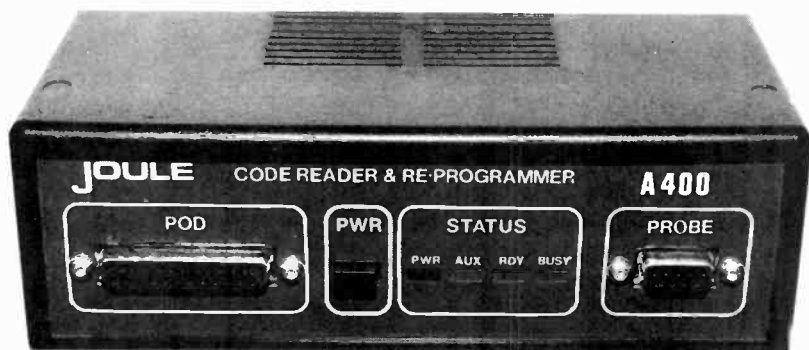
This is one to watch out for. Ferguson recommends changing the value of C002 from 1.4nF to 2.7nF if one of these machines fails to erase the previous sound. Part no. of the new capacitor is 20136340. The fault can be intermittent. **T.L.**

### **Matsui VP9401**

This machine came in dead. Once we'd opened it up we found that fuse F502 was open-circuit. A replacement got the machine working, but there were no mechanical functions and it went into the standby mode after three seconds. This is a mid-mount machine, so I took it all apart and removed the PCB from the casing. The loading motor chip IC1004 had obviously been getting very hot: on closer examination I noticed that there was a small eruption on its plastic encapsulation. A new i.c. cured the problem. **T.L.**

# JOULE A-400

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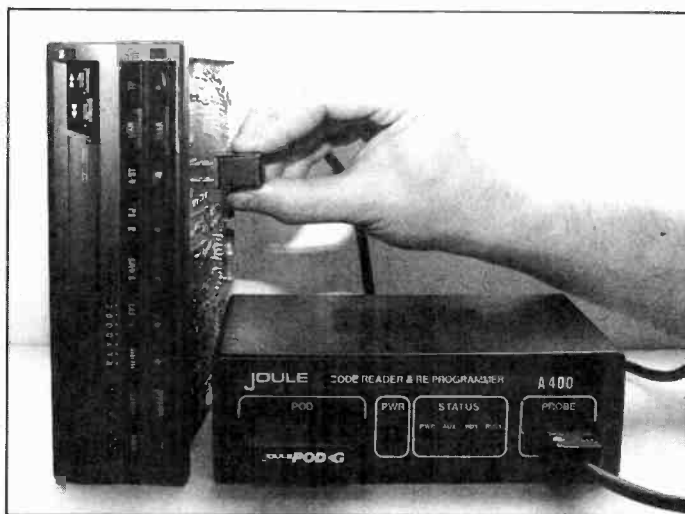
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# Inside the Panasonic Alpha 4 Chassis

Part 2

Ray Meadows

This month we'll take a look at the signals, AV selection and teletext sections of the chassis.

## Tuner and IF Circuitry

While the power supply circuitry we described last month is virtually the same as that in the Z4 chassis, the tuner and i.f. sections are similar to those in the Alpha 3 chassis. See Fig. 1.

An Ecom tuner, type ENV87865G3 in later models, selects the u.h.f. signals. This I2C bus driven tuner delivers an unbalanced i.f. output signal to Q105 and Q104. The latter drives the i.f. bandpass shaping SAW filter X101. In Nicam stereo models a signal feed is taken from the emitter of Q105 via Q2101 and Q2103 to a second SAW filter, X2101: this provides superior vision signal rejection and thus improved Nicam reception.

The outputs from both SAW filters are fed to a Mitsubishi M52301SP VIF/SIF/QIF chip, IC101. This device is very similar to the M52020SP chip used in the Alpha 3 chassis but has improved characteristics. It provides a demodulated video output, also intercarrier

f.m. sound (SIF) and Nicam sound i.f. (QIF) outputs.

Another output, at pin 43, provides automatic frequency control (a.f.c.). This output is buffered by Q102 and is then fed to pin 11 of the main microcontroller chip IC1213 on panel E. IC1213 carries out fine tuning adjustment, determined by the slope of the a.f.c. signal, controlling the tuner via the I2C bus.

Tuner automatic gain control is more direct: the a.g.c. output at pin 5 goes directly to the tuner. Preset R128 provides manual adjustment of the r.f. a.g.c. threshold.

There's an external loop for the video signal (out at pin 52, back in at pin 51) to enable a 6MHz trap (X103) to be incorporated in the signal path. In addition negative feedback, from pin 49 to pin 50 via an LCR network, provides equalisation over the video bandwidth. The output at pin 49 is fed to the TV/AV switching chip on panel H via buffer transistor Q101. The signal path is via panel E, to enable a feed to be taken to the AV1 scart socket.

IC101 also provides a mute output at pin 25. This appears when there is no sync signal. The situation is checked by an internal sync separator which receives a video feed at pin 26. Digital transistor Q180 inverts the

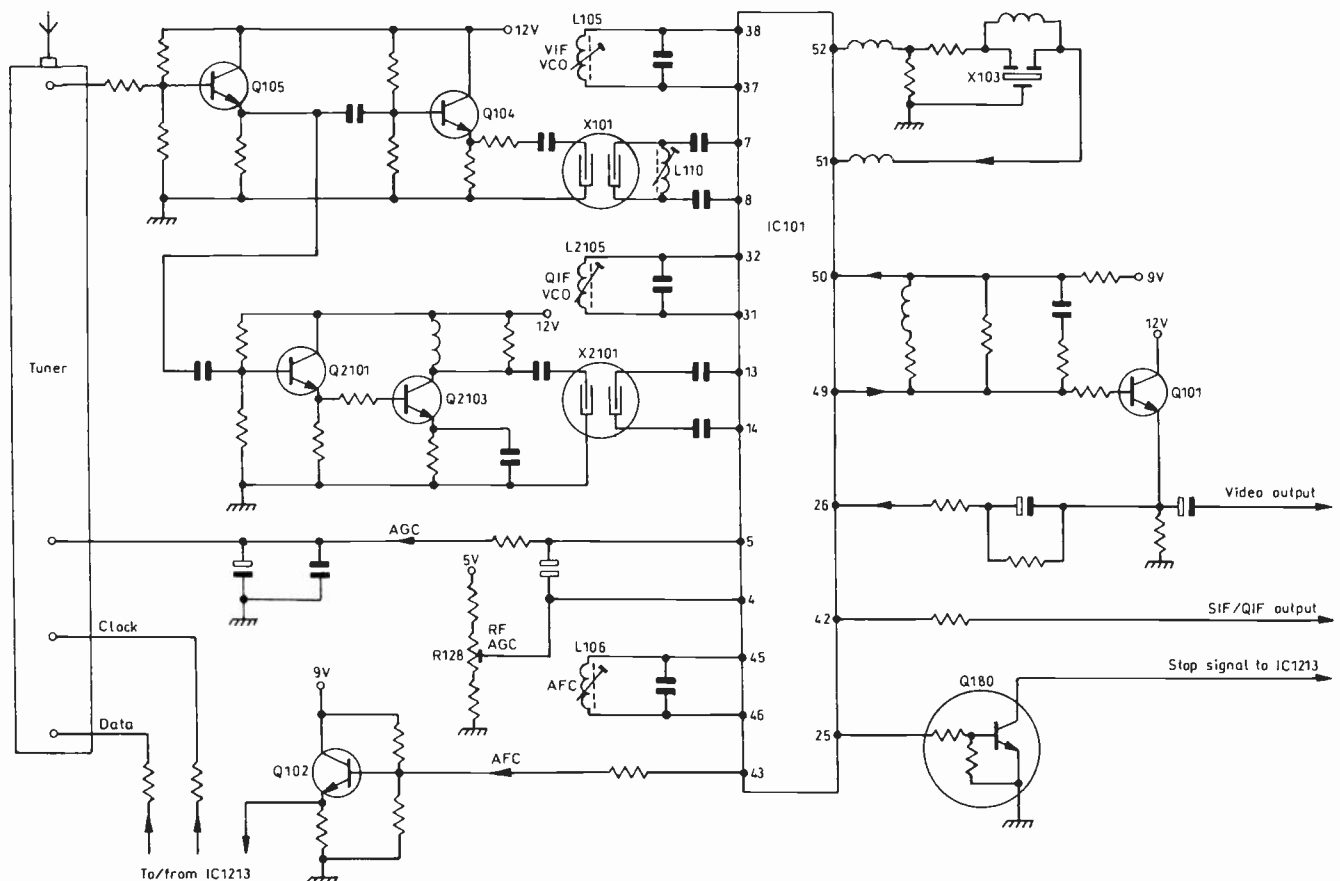
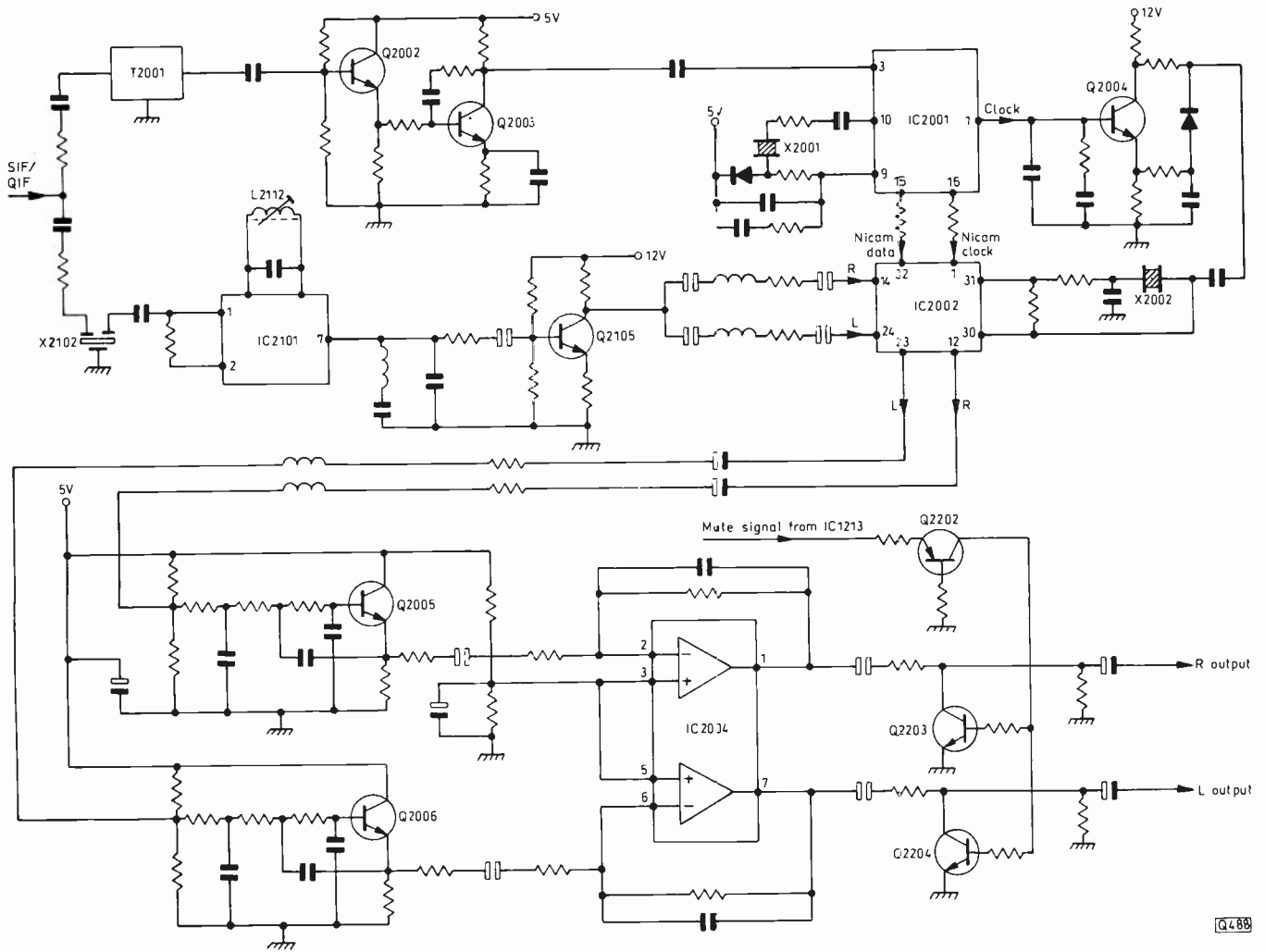


Fig. 1: Tuner and vision i.f. arrangement, shown simplified.





**Fig. 2: The f.m. and Nicam sound circuitry.**

output and feeds it to the main microcontroller chip, where it signals search stop during the tuning process.

The SIF and QIF outputs appear at pin 42. They are split (see Fig. 2) to feed the intercarrier f.m. sound chip IC2101 and the Nicam demodulator chip IC2001.

Factory alignment adjustments around IC101 consist of SAW filter matching (L110), VIF VCO (L105), QIF VCO (L2105) and a.f.c. (L106).

### FM Audio

The intercarrier f.m. sound signal (SIF) is passed via a 6MHz ceramic bandpass filter (X2102) to the Matsushita AN5215 demodulator chip IC2101. The output from this chip is split to provide 'mono left and right' inputs to an audio switching system in the Nicam decoder chip IC2002.

In Continental Alpha 4H chassis sets that are equipped to handle Zwitone stereo signals there are two SIF channels, fed by 5.5MHz and 5.74MHz filters, for the main and stereo difference signals respectively. Lower-cost, small-screen Alpha 4 Continental models such as the German TX21V2C use an M51362SP VIF/SIF chip (no QIF facility) and a separate AN5215 chip (IC2102). The former demodulates the 5.5MHz intercarrier sound signal while the latter demodulates the 5.74MHz stereo difference signal. A TDA8417 audio decoder/matrix chip is then used to select the audio mode required.

Secam L models have similar circuitry but use an a.m. sound demodulator in place of IC2101, with switchable

filters for the low and high Secam L and L' subcarriers.

### Nicam

Filter block T2001 extracts the Nicam QIF signal which is then passed via transistors Q2002 and Q2003 to the Philips TDA8732 demodulator chip IC2001. This device contains all the analogue Nicam circuitry and operates with a single 6.552MHz clock that's controlled by X2001. Its two synchronous demodulators produce 728kHz clock and serial data outputs which are passed to the Philips SAA7282ZP Nicam decoder chip IC2002.

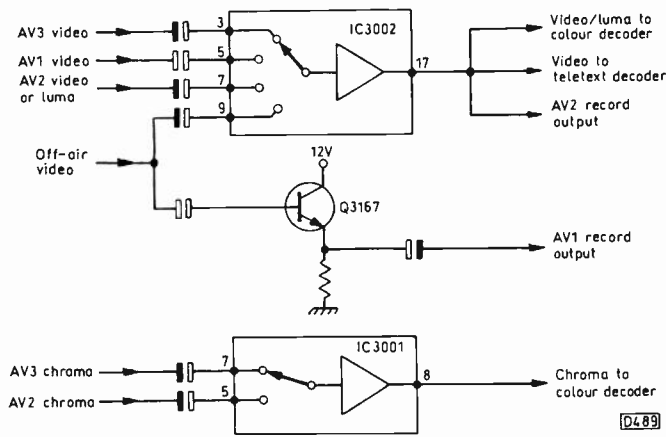
This chip performs all the digital Nicam operations, including descrambling, de-interleaving, parity checking and ten-to-fourteen bit data expansion. It also contains an analogue audio switch that selects the f.m. signal automatically when digital audio is not available. Its 17.472MHz clock is controlled by X2002 and is synchronised with IC2001's 6.552MHz clock by the circuitry around Q2004.

After data decoding and processing, IC2002 produces digital right and left audio outputs at pins 12 and 23 respectively. These are converted to analogue signals by Q2005/6 and their associated RC filtering networks. If analogue ex-f.m. sound has been selected it passes through this circuitry without being affected.

The operational amplifiers in IC2004 buffer the audio outputs and, by feedback action, produce a frequency-selective roll-off above the audio band, removing the digital clock elements of the signal.

Muting is provided by Q2202/3/4, under the control of

the main microcontroller chip. In the mute mode this circuit shorts the outputs from IC2004 to chassis. The idea



**Fig. 3: The TV/AV switching system.**

is to prevent any possible digital noise remnants reaching the audio amplifiers when audio modes or channels are changed.

To help prevent digital noise reaching other circuits in the receiver the VIF/SIF/QIF panel has its own on-board 5V and 12V regulators, IC178 and IC179 respectively. They are fed from the 16V supply. As far as possible the analogue and digital earth paths are kept separate, and isolation is provided between the supply feeds to the left and right channel digital processing circuits.

### AV Switching

As in all Panasonic chassis, the AV signal routing is quite complex. You need to understand it however if you

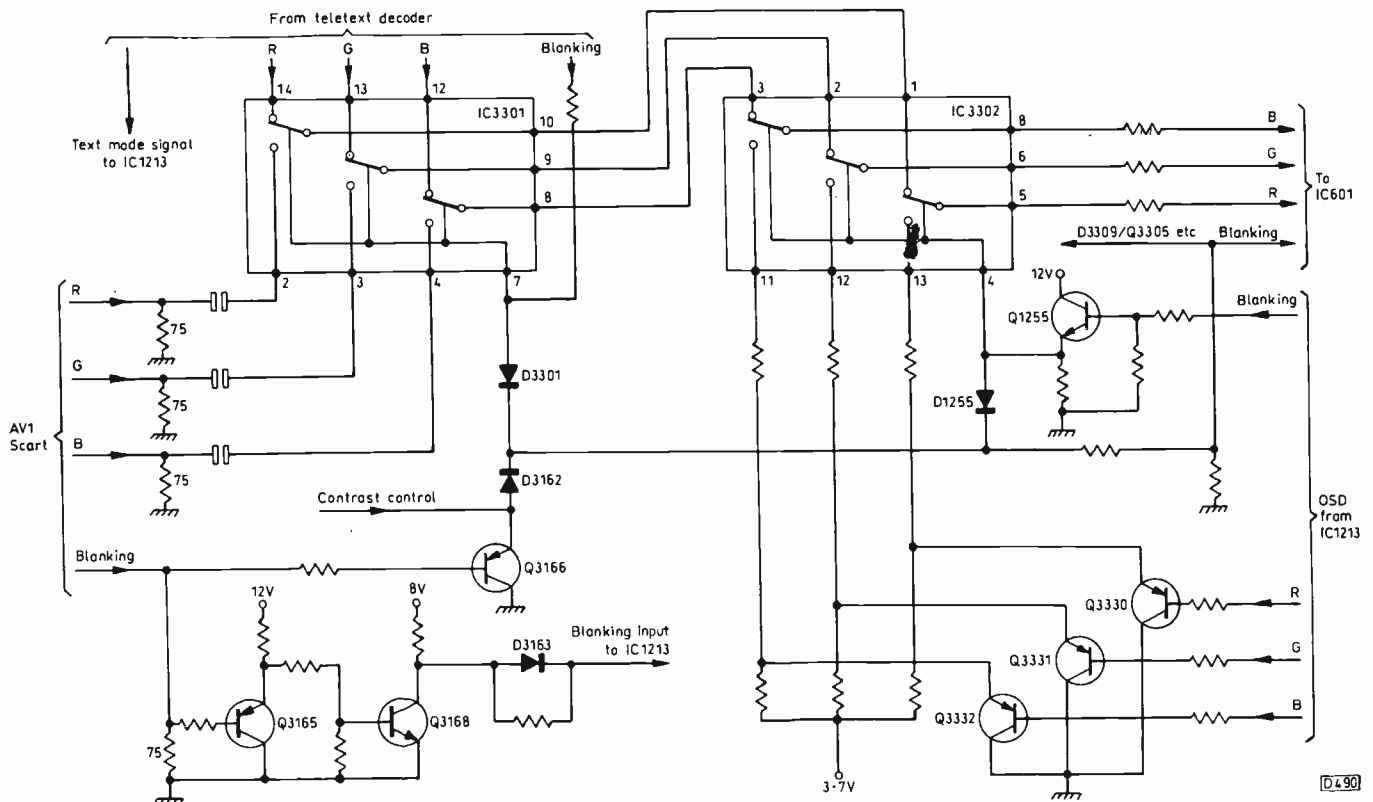
are involved in fault diagnosis. We'll consider non-Dolby models first. These employ similar circuitry to their Alpha 3 predecessors. The audio signal routing in Dolby Pro Logic models will be described in the final article.

The demodulated AV signals from the tuner are passed to panel E (our simplified block diagram, Fig. 2 last month, was not quite accurate in this respect, showing the signals passing direct to panel H). The purpose of routing the signals via panel E is to provide an off-air recording output. This is done by splitting the signals to provide feeds to scart socket AV1 – the video feed is buffered by Q3167. Socket AV1 also provides AV inputs. These and the demodulated signals are passed to panel H, where the AV2 scart inputs are present. These can be in composite or S video form – a small slide switch adjacent to the AV2 scart socket selects the mode. In addition, AV3 phono and S connector inputs from the front panel are brought in. After signal switching the selected audio and video signals are passed to panels E and C. There is also buffering to provide a 'monitor' recording output at AV2 and stereo phono connections for hi-fi systems.

IC3002 selects the audio and composite (or luminance) video source, off-air or from AV1-3, while IC3001 selects the chrominance signal from AV2 or AV3. Fig. 3 shows the video part of the circuitry involved, in simplified form.

### RGB Signals

Connector AV1 also accepts RGB inputs with fast blanking. They are fed (see Fig. 4) to the AN5860 switching chip IC3301 which selects either these inputs or the teletext RGB signals. The outputs go to a second switching chip, IC3302 (AN5862K), which enables buffered on-screen display RGB signals from the main



**Fig. 4: RGB switching.**

microcontroller chip to be selected. The outputs are passed to the TDA3504 video processing chip on panel C.

## Teletext

The Philips IVT two-chip decoder system is used for teletext reception. It consists of an SAA5246APEM6 decoder chip (IC3501) which operates with a microcon-

troller chip (IC3507) and an 8Kbyte SRAM chip (IC3506). This provides four pages of text memory. The circuit is straightforward and is almost identical to that used in the Z4 chassis. See Fig. 5.

The video input, from IC3002, is buffered by Q3515 then fed to pin 8 of IC3501. This device contains all the processing circuitry required to extract the text data from the composite video input and process it to provide RGB plus blanking outputs. Control is provided by a Philips MAB8461 series text controller chip, IC3507, which is linked to IC3501 by an I2C bus. This bus is also linked to the main microcontroller chip IC1213, but is isolated from it by the CMOS switch IC3508. The link is connected only when text is selected. IC1213 then produces a logic zero at pin 33. This switches Q3523 off with the result that switches in IC3508 close, connecting the I2C clock and data lines. Bus isolation reduces the risk of interfer-

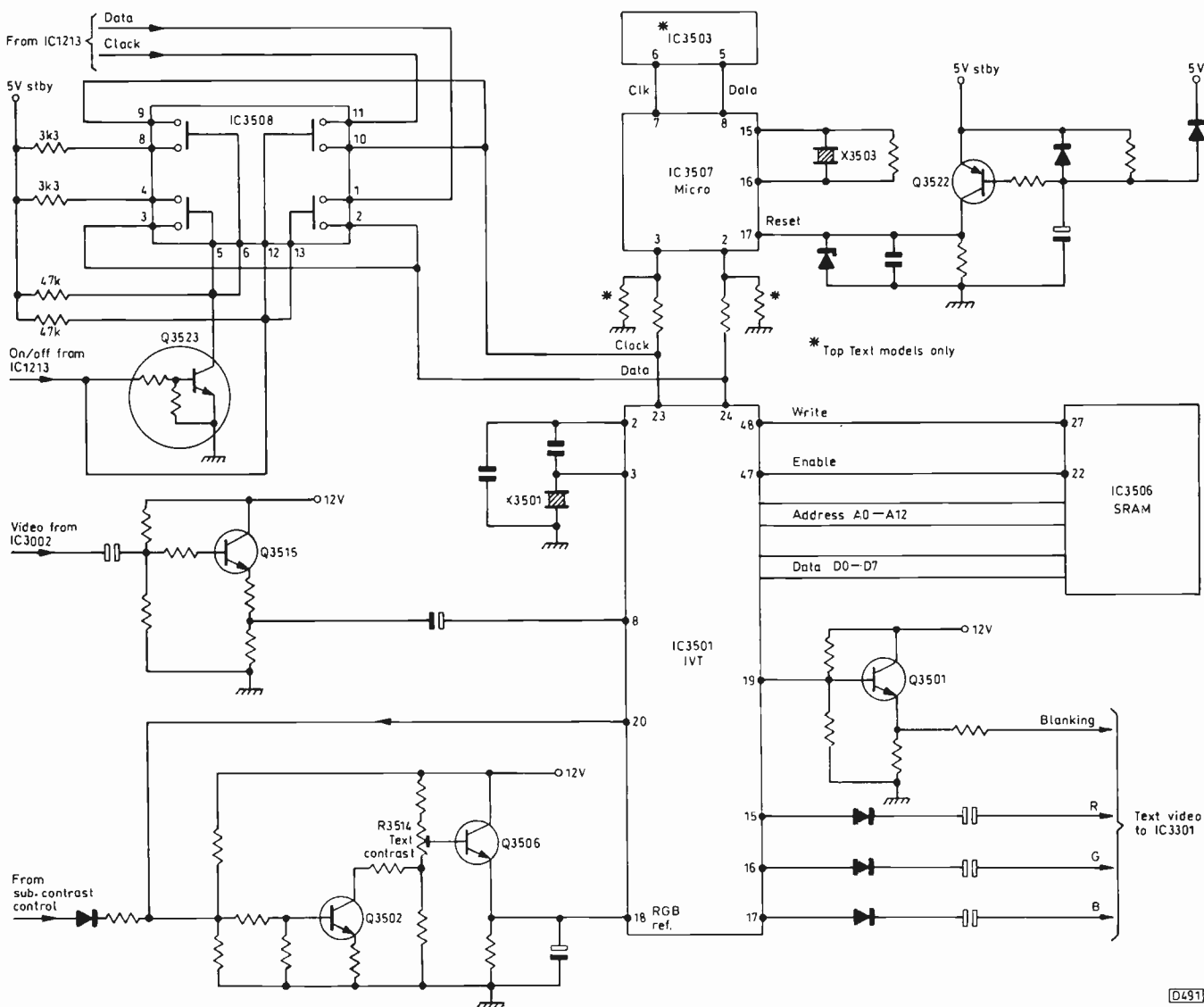


Fig. 5: The teletext decoder arrangement.

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ence being fed back to the main panel, where it could cause problems with sets that are fitted with a v.h.f. tuner.

text mix mode. The character ROM in IC3501 contains all the normal UK and Continental letters, figures and symbols, including the £ sign, the umlaut and the cedilla. It can thus be used in sets for the UK, German and Spanish markets. To enable Top Text to be implemented an extra device (IC3503) has to be fitted. This EEROM is used with a different microcontroller chip, type PCB83C-6544022. Virtually all the other components remain the same, the main change being that the I2C bus is connected to pins 2 and 3 of the Fasttext microcontroller chip and pins 7 and 8 of the Top Text microcontroller chip.

## Next Month

In Part 3 we will take a look at the main microcontroller and the video signal processing circuits.

# TV Fault Finding

*Reports from Russell J. Fletcher, John Pitt-Francis, Mike Leach, Terry Lamoon, Andrew Tebbutt, Mike Rathbone, Bob McClenning, V.W. Cox, Roger F. White, Ian Rees, Ed Rowland, Tony Ashworth and John Edwards*

## Grundig CUC2400/2401

This set had low but controllable sound. We found that the tuner was faulty. No other problems were evident. **R.J.F.**

## Panasonic TC1480 (Z3 Chassis)

This set bounced on us with a blown R2G zener diode (D816) just a week after we'd fitted a replacement. It's in the start-up/chopper bias network. A new STR50103 chopper chip restored reliable operation. **R.J.F.**

## ITT Digi 3 Chassis

There were intermittent, sometimes permanent, black bars and screen blanking in large chunks. The cause of the fault was the VCU2100A video codec chip IC650 on the digi board. **R.J.F.**

## Grundig CUC120 Chassis

The cause of lack of height was traced to R2761 which had risen in value to 39 $\Omega$ . Its correct value is 6.8 $\Omega$  – safety type. **J.P-F.**

## Hitachi CPT1456D (NP84CQ Chassis)

C245 (1 $\mu$ F, 160V) had leaked, bringing about the demise of the sound output pair (Q421/2). As replacements we fitted type 2SC2073, which seem more than adequate. **J.P-F.**

## Nikkai Baby 10

This little set was double trouble! It came in dead because IC402 had failed, so we carried out Chris Avis's excellent modification (*Television* March 1993). The set then sprang to life, but with full volume and the volume control inoperative using either the remote control unit or the front panel control. Mute and the other functions were o.k. The culprit was the MN1220 EEPROM chip IC601. We've also had the MN15425 chip IC602 faulty, the result being all functions inoperative. **J.P-F.**

## Samsung CI5322

Field faults are becoming common with these sets. The supply for the field output stage is derived from pin 4 of the line output transformer. In the event of field collapse you usually find that the surge limiter resistor R412 is open-circuit. It's advisable to replace the rectifier diode D401 (ERB4304) as well, also C307 (100 $\mu$ F, 50V) in the flyback generator circuit. This capacitor can cause various field scan problems. **M.L.**

## Ferguson TX90 Chassis

One of these sets had no field sync while the line scanning suffered from jitter at the top of the picture only. The problem

could be familiar to those who deal with Ferguson sets regularly, but was one we've never come across before. We carried out various checks around the TDA4500 i.f./timebase generator chip, and eventually replaced it and various other components that could have been relevant. But things still weren't right. When we up-ended the set something fell out of the cabinet on to the bench. It was the ferrite core from the line driver transformer. When the core was replaced in the hole it obviously came from normal operation was restored. An unlikely fault, but one that I'll remember. **M.L.**

## Hitachi C2565TN

It was reported that the set would shut down when the VCR was put into the search mode, and then only when the VCR was operating in the LP mode. We confirmed that this was the case, the set going completely dead when search was selected in the LP mode. The standby light would remain off. After a few minutes the set could be powered up again by using the on/off switch.

Though the symptom was strange, the cause of the trouble was simple: The h.t. was too high! When the set had warmed up, the h.t. rose from the correct 144V to 160V. The line output stage was unable to handle the LP mode tracking bars with this high h.t. Checks showed that R952 in the power supply had risen in value from 68k $\Omega$  to 74k $\Omega$ . **M.L.**

## Hitachi CPT2488 (Salora K Chassis)

The problem was no results. Checks showed that the crucial 8.5V at pin 8 of the LF0059 hybrid power supply control chip HB600 was low at approximately 5V. We checked several things, including the BR100 start-up diac and its associated 22nF capacitor, but the fault persisted. The cause of the low voltage reading was eventually traced to the BC557 transistor TB541, which provides a start-up feed for pin 16 of the TDA2579 timebase generator chip ICB500. TB541 was leaky, a replacement restoring normal operation. **M.L.**

## Matsui 209

One of these sets came in suffering from field foldover and flyback lines on the display. It's becoming quite a common fault. The cure is to replace C303 (4.7 $\mu$ F, 160V), which is mounted very close to some hot components and tends to dry out. **T.L.**

## Toshiba 258T7B

There was nothing at all from this set as the power supply was inoperative. We found that Q802 (2SA1012Y) in the chopper control circuit was shorted collector-to-emitter while R808 (0-47 $\Omega$ ), which is in series with the base of the chopper transistor, was open-circuit – it's a safety resistor. When these two items had been replaced there was still

nothing, but at least the power supply seemed to be o.k. When I disconnected the load across the h.t. output the voltage rose to the correct level. Cold checks then showed that both the line output transistor and transformer were short-circuit. Replacements brought the set back to life, but it was an expensive repair. T.L.

### **Matsui 1422**

There was no sound. The cause proved to be C150 which was short-circuit. It's at the input to the audio output chip. T.L.

### **Bush 2020T**

When this set was switched on it started to trip, with the h.t. low at 55V. I couldn't find any shorts, but when the feed to the line output stage was disconnected the h.t. rose. Replacing the line output transformer brought the set back to life. An uncommon fault with this chassis, but probably not the last time we'll come across it. T.L.

### **Matsui 1422**

There was no power in this set. On inspection I found that C617 had burnt out, something that's quite common with this chassis. I replaced it and switched on, but the set was still dead. Unusually, Q604 was short-circuit. The set was restored to life when a replacement had been fitted. T.L.

### **GoldStar 20A80**

If one of these sets comes in with no picture, check FR406 which is in the 26V supply to the field output stage. It seems to go open-circuit for no apparent reason. As with most modern sets, in this event the blanking circuitry will prevent the tell-tale white line appearing on the screen. A.T.

### **Panasonic TC2636 (U4 Chassis)**

This set came to me after receiving attention from another engineer who had replaced a short-circuit line output transistor. Because of the following symptoms he had then diagnosed a faulty line output transformer: at switch-on the tube's heaters would light up brightly for a few seconds, then die down to nothing. He'd also checked the series resistor in the heater supply.

As a new transformer came with the set I fitted it, only to find that the symptoms remained the same. Time to get the meter out. When checking around the tube base I found that the first anode voltage seemed to be quite low and swung about from 180V to 340V. After much puzzling I started to suspect an internal short in the tube and, as I'm sure many of you reading this would have done too, disconnected the Aquadag lead from the tube base to see what happened. Lo and behold there was a loud (but not that loud) crack and the set began to work. My relief was short-lived however. When it was returned to its owner, with the Aquadag reconnected of course, the set worked until it was switched off and left overnight, whereupon the fault returned.

While checking around the line output transformer I noticed that the heater winding is connected to a small transformer in the power supply as well as to the series resistor. When this transformer was disconnected the set worked, but the h.t. was very low. The purpose of this transformer is to feed pulses back to the power supply to synchronise its operation with that of the line timebase. Very near the transformer there was a rather sorry looking electrolytic, C808 (47µF, 16V). When this was replaced the set sprang to life at

every press of the on/off button. C808 is the reservoir capacitor in the feedback supply to the error amplifier stage in the chopper control circuit. That swinging first anode voltage should have led me to the power supply earlier. A.T.

### **Panasonic 25A3 (Euro 1 Chassis)**

This set produced a negative, monochrome picture with unstable sync. We assumed that the cause was in the digital section, so we decided to check around the AD converter chip IC1601 – well, we had to start somewhere! The video signal was present and correct at the input. When we moved to the output we found that there were nice, square waveforms at all except pin 38, where the waveform was of low amplitude and more like a sawtooth. To our relief a replacement SAD2140 chip produced a normal picture. M.R.

### **Panasonic TC1485 (Z3 Chassis)**

This set wouldn't start up. On checking at pin 15 (X-ray protection) of IC101 we found that a positive voltage was present. The set worked normally when this pin was shorted to chassis. Some people might have applied a blob of solder and ridden off. But that's not *Television* style, is it? Pin 15 is controlled by transistor Q502, which receives feeds from all points of the compass. So each had to be checked in turn. We eventually found that R506, which is connected to the 150V RGB output stage supply, was open-circuit. A replacement (270kΩ) restored normal operation. M.R.

### **Panasonic Alpha 2 Chassis**

One of these sets displayed a picture with bowed-in sides. Checks in the EW diode modulator circuit failed to reveal anything amiss. We had to go a little farther back, to the control circuit, where we found that C754 (180pF) had developed a slight leak. Replacing this capacitor restored the picture's straight edges. M.R.

### **Hitachi CPT1626 (NP82CQ Chassis)**

There was field foldover at the top of the screen along with flyback lines. Not your usual capacitors this time: R614 (150kΩ) in the field linearity feedback circuit had gone high in value. B.McC.

### **Sharp CV2123H (7P-SR1 Chassis)**

If one of these sets trips out at switch on, first check for dry-joints in the chopper power supply. Then bring the mains input up to 40 per cent via your variac. The set should switch on. If not, the STR41090 chopper chip is probably faulty (in the over-voltage mode). Replacing it should enable the set to work happily with the full mains supply restored. B.McC.

### **Philips G90AE Chassis**

The problem with one of these sets was intermittent sound. Even the slightest attempt to move the chassis would cure the problem for months at a time. We eventually traced the cause to D6272 (BAS32), a surface-mounted diode that's in series (along with another similar diode) with the 20V supply to the TDA8191 sound chip IC7220. V.W.C.

### **Panasonic TX24T (Alpha 2 Chassis)**

The line output transistor was leaky but when it was

replaced we had intermittent line output stage operation. The cause of this was traced to dry-joints at the pins of the line driver transformer. It was very difficult to see the cracks, even with a magnifying glass. **R.F.W.**

### **Matsui 1420A/1440A**

Dark to light shading across the picture improved slightly as the set warmed up. We found that C431 (4.7 $\mu$ F) in the supply to the RGB output stages was faulty. **R.F.W.**

### **Toshiba 219T9**

The STR54041 chip in the power supply was short-circuit and the fuse had blown. When a new STR54051 chip was fitted it went short-circuit as soon as power was applied. Eventually, after a call to the nice people at Toshiba, I discovered that Q802 was open-circuit base-to-emitter. As there is an 0.33 $\Omega$  resistor across this junction the transistor can only be checked out of circuit. **R.F.W.**

### **Ferguson TX99 Chassis**

After repairing the power supply we found that the h.t. voltage was low. The reservoir capacitor C103 (47 $\mu$ F, 160V) was to blame, though it measured o.k. when checked with a capacitance meter. **R.F.W.**

### **Nikkai Tara 10**

Although the 11V supply came up there were still no results. The cause was traced to dry-joints at the line driver transformer EM103. They were invisible without the use of a magnifying glass. **R.F.W.**

### **Solavox 142TT**

There was flashing teletext and the on-screen graphics were missing. IC303 (SAA5243P/E) in the teletext circuit had failed. This set is similar to the **Nikkai TLG100T**. **I.R.**

### **Sanyo CTP7132 (80P Chassis)**

At switch on the power supply tripped slowly. If the set was left on the fault would correct itself. Replacing C312 (10 $\mu$ F) restored normal operation. **I.R.**

### **Philips CTX-E Chassis**

We've had two of these sets in recently. The first one was tripping because the h.t. rectifier D6583 was short-circuit. The problem with the second set was jagged verticals. This was caused by a faulty e.h.t. lead. **I.R.**

### **Logik 4298 (Ferguson TX100 Chassis)**

This set came in dead. We found that the BY299 h.t. rectifier diode D15 was short-circuit. **I.R.**

### **KB ATX6424**

In the text mode the screen was covered with # symbols. The cause of this was the HCF4001 chip on the text PCB. **I.R.**

### **Philips 14CT3205 (KT3 Chasis)**

Intermittent loss of signals, leaving a noise-free raster, was the problem with this portable. We suspected the tuner and

as we had one on the shelf we fitted it. This failed to provide a cure, so we unplugged the i.f. module and did a blanket soldering job on it. Although there had been no visible dry-joints, when it was replaced the set worked perfectly. **E.R.**

### **GoldStar 2190 (PC-04A Chassis)**

The owner of this set said that a dotted line had appeared at the top of the screen then, after about ten minutes, the picture had collapsed to a horizontal line before the screen went black. When we turned up the first anode control we got a horizontal line. confirming field collapse. The TDA1170N field timebase chip IC301 had failed. Replacing it is no easy task in this model. When we'd done so a normal raster was obtained and the set was left on soak test.

After about five minutes the picture suddenly distorted at the top and the dotted line described by the customer appeared. Use of freezer revealed that the culprit was C311 (100 $\mu$ F, 35V). Finding this out wasn't as simple as it might sound, as C311 is concealed by the chip's heatsink and access is difficult. Its replacement cured the problem. **E.R.**

### **Boots 1412R**

This colour portable came in dead. Checks in the power supply showed that R803 (15k $\Omega$ ) had gone open-circuit. Replacing it restored normal operation. **E.R.**

### **Matsui 1436**

The fault with one of these sets was line tearing when the set had warmed up. Heating and freezing IC301 made the fault come and go. A new TA7698AP chip cured the trouble. **T.A.**

### **Mitsubishi CT21M3TX**

The h.t. voltage was low. We traced the cause to the JC501Q error amplifier transistor Q953. Part number is 260P543050. **T.A.**

### **Mitsubishi CT29B3STX**

The cause of the picture blanking out intermittently was traced to the JC501 transistor Q7705. It's mounted on the text PCB. **T.A.**

### **Philips CP110 Chassis**

As the set warmed up the picture would flash cyan every few seconds. Heating the TDA3566 colour decoder chip IC7260 would clear the fault, but a replacement failed to cure the problem. When we fitted the tube PCB into another set we got a picture that flashed green, suggesting a fault in the auto grey-scale circuitry. Voltage checks showed that the base of transistor Tr7413 was at 4V instead of 5V. The culprit turned out to be its bias resistor R3415 (470k $\Omega$ ) which is connected to the 200V rail. **T.A.**

### **Hitachi C2164TN**

Spurious operation of the over-voltage trip was caused by zener diode ZD701. The part no. is 2339251M. **T.A.**

### **Mitsubishi CT29B3STX**

The owner of this set complained that there was no sound from his VCR or satellite receiver. Because the memory

chip IC702 had become corrupted, the f.m. sound wasn't working. Mitsubishi recommends that to prevent a repeat performance the chip is replaced instead of being reprogrammed. The part no. is 263P434020. T.A.

### GoldStar CIT2162X

The job card said intermittent low gain but in fact the picture disappeared completely, leaving just snow. Each time this occurred the tuning voltage increased to 31V. The cause of the trouble was an intermittent open-circuit in the lead from the prescaler in the tuner to the tuning PCB. T.A.

### Panasonic Euro 1 Chassis

This set produced a weak monochrome picture with poor sync. When checks were made around the SAD2410 video AD converter chip IC1601 we found that while good video was present at the input some of the data outputs appeared to be of low amplitude. Replacing this chip cured the fault. T.A.

### Sanyo CBP2572 (ED1 Chassis)

If the set comes on with a blank raster, no sound and no on-screen displays it's likely that the two non-volatile memory chips on the signals PCB have become corrupted. They can be replaced or reprogrammed, as the set has a built-in facility for reprogramming corrupt memories. To gain access to this, press the service button and the volume plus button simultaneously – the service button is accessible through a small hole in the front panel. Care should be exercised when using this feature, as all the previously stored data will be lost. It's quite time-consuming to re-enter this. T.A.

### Toshiba 2505DB/2805DB

The display consisted of a horizontal line across the centre of the screen and about five widely-spaced lines above it. The cause of this turned out to be the TA8739P chip IC371 which takes the field drive from the jungle chip and processes it in order to provide adjustment in the service mode. The part number is B0383680. T.A.

### Ferguson ICC7 Chassis

One of these sets suffered from i.f. instability when it was first switched on. The symptoms were either a negative picture with poor sync or a display that consisted of just short, white streaks. Tapping the i.f. unit made the fault come and go. The cause of the trouble was C525 (1µF) which was dry-jointed. T.A.

### Sony KV2704

Originally it would require several attempts to switch this set on. It now remained dead, though a noticeable fast ticking noise came from the chopper transformer T5. This was struggling to provide a 135V h.t. supply but managed only 39V. The h.t. reservoir capacitor C623 (33µF, 250V) was open-circuit, a replacement restoring normal operation. J.E.

### Ferguson 51L5 (ICC5 Chassis)

When this set was switched on it tripped three times then shut down. Disconnecting the supply to the line output stage made no difference, but when the 36V supply was disconnected the set sprang to life. This supply feeds the two TDA2030 audio output chips, one of which was short-circuit. J.E.

# Next Month in TELEVISION

## SERVICING THE HITACHI G6P CHASSIS

This chassis was used in a number of models that feature on-screen displays and FS tubes. Model numbers are CPT2174, CPT2176, CPT2178, CPT2476 and CPT2478. Though the sets are now a few years old, they are still capable of giving good performance provided the tube is o.k. Glyn Dickinson provides a detailed guide to fault-finding and renovation.

## EUTELSAT'S HOT BIRD

To date BSkyB transmissions via Astra have monopolised UK satellite TV viewing, since the many other satellites in orbit have relatively little appeal for the ordinary viewer. Eutelsat's Hot Bird 1 at 13°E has changed this situation, being a relatively high-power satellite that provides much programming of general interest. The problem, for the installer, is how to go about providing reception – since most viewers will not want to miss out on BSkyB. Eugene Trundle describes practical approaches to reception.

## TOSHIBA SERVICE BRIEFS

The latest service know-how from Toshiba on the company's CTV and video products.

## TEST REPORT: TEKTRONIC'S TEKMETER

Tektronic's new Tekmeter combines the power of a true r.m.s. digital multimeter, an auto-ranging dual-beam scope and a whole lot more in a simple hand-held instrument. David Botto reports on its performance and use in practical servicing.

## JACK'S SATELLITE WORKSHOP

Satellite TV, presenting its own problems, has become something of a specialist business. Starting next month, Jack's Workshop will provide insight on this part of the TV servicing scene.

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# Satellite Receiver Servicing: The Pace MSS Series

Jack Armstrong

We haven't seen many MSS series receivers in the workshop since Pace introduced its free collection, 48-hour warranty repair service. A few fault conditions have come to our attention however. The following notes cover these.

## Intermittent Decoder Operation

Pace rather overdid the number of contrast settings – there are eight in the menu. Unfortunately the selection of a low contrast setting along with a combination of component tolerances and poor signals from the dish can result in the decoder dropping out. The solution is simply to select a higher contrast setting from the receiver's 'picture' menu.

## Dim Displays

Models that use a vacuum fluorescent display can produce dim or non-existent results. The cure depends on the model. With the MSS500 and MSS1000 the fault is caused by failure of C2 (22 $\mu$ F) on the front panel. It carries the full a.c. for the display and, sitting between two transistors, becomes rather warm. The solution is to replace it with a 1 $\mu$ F, 50V multilayer ceramic capacitor (Pace part no. 155-1055751).

Occasional, intermittent failure of the display occurs with Model MSS300, especially when the receiver is very warm. The cause of the problem is a combination of component tolerances and heat. It can be cured by adding a 1N4148 diode on the front panel, see Fig. 1. The cathode goes to the end of the 10k $\Omega$  resistor marked 103, next to a through-board hole, while the anode goes to the junction of a capacitor and the 12k $\Omega$  resistor marked 123. Pace also recommend deleting the BAS16 surface-mounted diode marked D1.

Intermittent problems occur with the LED display segments in Model MSS200. In most cases the cause is dry-joints at the display's wire legs.

## Blue Screen

You occasionally get one of these receivers with the blue-screen fault symptom. There are various things to check. If there's no LNB supply at the F connector, make sure that an incorrect selection hasn't been made (wrong input in the channel menu, or LNB voltage 'none' in the installation

menu). Another cause is a broken connection inside the tuner module: if the F connector nut in a Pace-designed tuner wasn't fully tightened during manufacture the centre pin can fracture its solder joint. If necessary check for dry-joints at the tuner pins, and the connections to L18 and L19 (if 'f store' removes the blue screen and produces a grey picture that floats sideways).

## Fault Summary: Models MSS200/MSS300

These models share a common PCB: the following faults can occur with both of them.

**Stuck in standby:** Check R452 and R108. Don't confuse this with a blank display.

**Stuck in standby, zeros on display:** Daughter board is not making contact with its socket.

**Rolling monochrome picture:** U4 can cause this. Alternatively check for a dry-joint at L18 or L19.

**No r.f. output:** Check for dry-joints at U2 or alternatively a break in the track from D15 to the transformer pin.

**No audio:** U14 has probably failed.

**Won't tune right down to 700MHz:** Replace tuner type A5 with later type A6. This is not generally a problem as standard LNBS are not designed to work at this low a frequency.

**Early MSS200 receivers may supply insufficient current for certain LNBS and devices like the Global Mini Magic:** The solution is to solder a 2.2 $\Omega$  resistor between link LK110 and the positive leg of C143. This should not be necessary with receivers that have a date code (the first three digits of the serial number) higher than 433.

## Fault Summary: Models MSS500/MSS1000

These models also share a common PCB. At switch on the microcontroller chip looks for a Dolby Surround sound board. If it doesn't find one it assumes that the receiver is an MSS500 and omits the Pro Logic and Surround sound features from the menus. Unfortunately the same thing happens if the connections to the audio board in the MSS1000 become loose!

**Power supply ticks but won't light up or function:** Disconnect the Pro Logic board power supply plug. If this

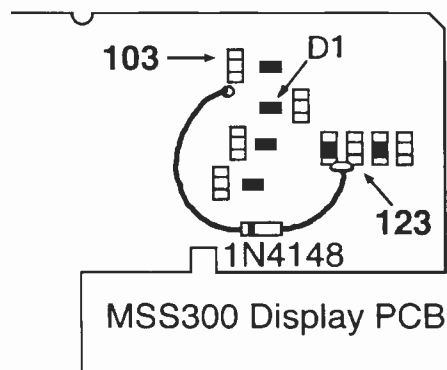


Fig. 1: Modification to cure occasional, intermittent display failure with Model MSS300.



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## REPRINTS

Reprints of articles from *TELEVISION* back to 1986 are also available: ordering information is provided with the index, or can be obtained from the address below. Hard copy indexes of *TELEVISION* are available for Volumes 38 to 44 at £3.50 each.

All the above prices include UK postage and VAT where applicable. Add an extra £1 postage for overseas EC orders, or £5 for non-EC overseas orders. Cheques should be made payable to Video Interface Products. Allow 28 days for delivery (UK).

Video Interface Products Ltd., 1 Vineries Close, Cheltenham GL53 0NU, UK.

cures the fault, replace the audio output chips on the Pro Logic board.

**No audio, Model MSS1000:** Try disconnection from the mains supply for two minutes. If this doesn't clear the fault replace U22 and U18.

**'Insert card' command with card inserted:** Ribbon cables Rib7 and CA1 may be loose or faulty.

**Every channel suffers from lines 1cm apart:** Tuner could be faulty. Otherwise send to Pace for the video tilt modification.

**Clock gains more than thirty seconds per week:** Replace C6 (39pF) with a 47pF, 5 per cent ceramic capacitor (part no. 150-4705551).

**Sound is muted when returning from a MAC programme:** Fit a later-masked version of the microcontroller chip.

**VideoCrypt messages off-centre or distorted:** Replace

R75 (910Ω surface-mounted) with a 1.2kΩ, 5 per cent resistor (part no. 940-1220501).

**Will not work with a D2MAC decoder:** Use a very short (less than 2ft) 9-wire scart lead. Select MAC in menu.

**No centre sound in config. no. 3 (Model MSS1000):** Replace R83 with a 100kΩ resistor (part no. 940-1040501).

**Surround sound comes on when video recording, or mute symbol appears on recordings:** Fit later software contained in EPROM part no. 805-1000108. This software is already included in receivers with serial numbers that begin "PALAE. . . (or letters later in the alphabet).

## In Conclusion

Some surface-mounted components mentioned above will be almost impossible to locate without the relevant Pace service manual. These can be obtained from Pace approved suppliers or from Davenham Satellite Systems, 1 Firths Fields, Davenham, Northwich CW9 8JB (telephone 01606 49 085).



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# Long-distance Television

Roger Bunney

There was a small increase in short-duration Sporadic E activity in April. Unfortunately there were no reports of a mid-month opening – an SpE opening in mid-April usually means that the main season from mid-May onwards will be an active one. In view of our position in the current solar cycle, some improvement over 1994's fizzle and splutter season can be expected. As I write this in early May settled, warm conditions have developed over the UK, with high pressure and north/south isobars. Hopefully this will develop into a full tropospheric opening.

## Satellite Sightings

I had an interesting sighting on April 19th, via Eutelsat I F4 at 25.5°E, during a Channel 4 racing feed from Pontefract. At about the time of the first race a 'Reuters London' caption appeared. I waited for a news item to unfold, but the Reuters caption was replaced by 'Arena, Newman Street' then back to Channel 4 racing though in 16:9 format.

Several reports of the APNA TV opening on Gorizont at 11°W have been received. A check showed this to be at 11.523GHz, with right-hand circular polarisation and the sound at 7.45MHz. Odd that the signals from this Gorizont satellite seem to be more stable now that APNA has arrived on the scene. APNA is a new global Asian-language channel that uses Rimsat and Gorizont satellites. Programme content seems to be films, teleplays etc.

A new broadcaster, MED TV, appeared via Eutelsat II F2 at 10°E in mid-April. The transponder frequency is 11.574GHz with vertical polarisation. Programme input is via Orion Atlantic at 37.5°W. The language seems to be Turkish, the audio being at 6.6/7.4MHz.

Ian Waller (Lincoln Satellite) has been given permission to retain a 3.4m dish in his garden for C band use. He had been in dispute with the local council over the dish.

Julian Redwood (Christchurch) is also active in C band. He reports changes via the Gorizont/Express satellites at 11/14°W. On the former Moscow 1 is very strong at 3.675GHz while at 3.812GHz there's a very weak Russian test card. At 14°W there are Russian test cards at 3.672 and

3.822GHz, Moscow 1 is very strong at 3.967GHz, RTP International is strong at 4.022GHz, there's a strong test card at 4.078GHz and OITV Moscow 1 is weak at 4.122GHz. Bob French (Warks) also reports stronger C band signals at 14°W, with Sri Lankan/Muslim TV new at 3.825GHz (RHC).

Ray Carmen (Reigate) points out that in addition to digital signals Orion at 37.5°W carries many analogue signals during the day. It is well worth checking the FSS and Telecom bands for east-bound feeds from the USA and European back links. Various UK broadcasters, including Sky, use the satellite. WWF Wrestling usually makes its way to Europe via the 11.464GHz horizontal transponder, and Carlton TV has been seen receiving a golf feed from France at 12.605GHz.

Sky Sports seems to use various satellites. A new one to me – I'd not looked before! – is Hispasat at 30°W. Ray has seen American football arriving in Europe via this satellite, at 12.671GHz vertical. 625-line PAL was being used instead of the more usual 525-line NTSC. Another reader noted Sky Golf from Morocco via Hispasat, at 12.595GHz.

John Locker (Wirral) noticed an EBU switching glitch while watching Eutelsat I F4 at 25.5°E. As a result, the Kuala Lumpur identification appeared. AsiaVision often carries the Kuala Lumpur test card prior to the morning news exchange. Satellite viewing is making for a very small world.

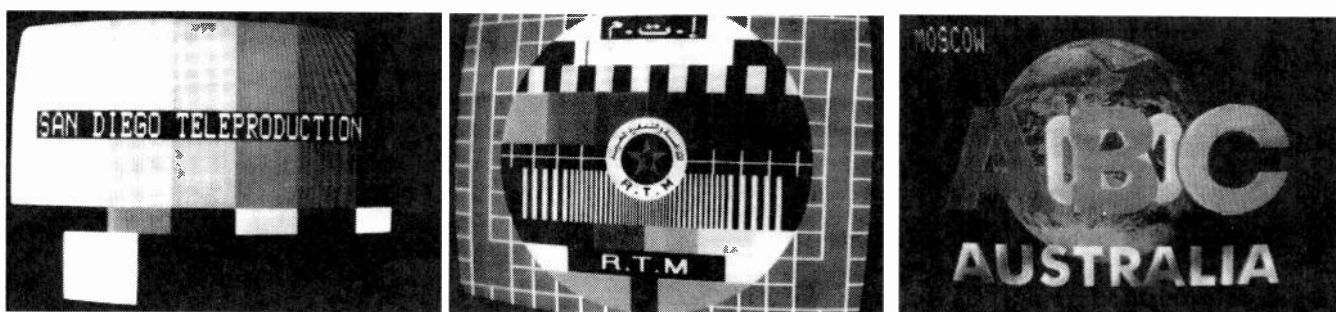
## Terrestrial News

**Solar cycle:** We are now at the start of solar cycle 23. The sunspot maximum is expected to occur in the autumn of 1999/spring 2000, with a smoothed monthly count just below 200.

**Amateur TV:** Proposed changes are as follows. The 50-52MHz band to be allocated to amateur TV on a primary service basis (i.e. not shared with other users). Additional beacon allocations to be at 40-68MHz and about 60MHz. The 430-440MHz band to be reduced to 432-438MHz on a primary basis, and possibly moved to an allocation above 1GHz.

**French radio links:** According to *Six News* nine French local radio stations are using frequencies within Band I for studio-OB communications. The duplex-operation allocations are as follows, low (L) being OB/mobile, high (H) the studio: ch. 1 47.025MHz L, 50.025MHz H; ch. 2 47.050MHz L, 50.050MHz H; ch. 3 47.075MHz L, 50.075MHz H; ch. 4 47.1MHz L, 50.1MHz H. Ch. 1 is used by Belfort, Cherbourg and La Rochelle, ch. 2 by Orleans and Strasbourg, ch. 3 by Nancy and Perpignan, ch. 4 by Bordeaux and Lille.

**Eastern Europe:** All Polish networks now use PAL. Some thirty new local and regional TV and 376 radio channels are being offered for franchise operation. TIPP TV, Tallinn, Estonia is also using PAL and expects to achieve national coverage during the next three years. The local LTV service



**Left:** Orion Atlantic at 37.5°W provides access to US stations farther to the west than previously available. **Centre:** The Moroccan test pattern was once a rare DX catch. It can now be received via a 90cm dish in the back garden. **Right:** This impressive ABC Australia logo was received, unusually, from Gorizont at 11°W via the Moscow bureau.

at Vilnius, Lithuania has moved from ch. R4 to ch. R2 (vertical).

The new Premiera TV Czech commercial service is now transmitting from the following sites: Praha City ch. R24 (100kW); Plzen ch. R51 (1.2kW); Zlin ch. R53 (1kW); Svitavy ch. R58 (1kW); Jihlava ch. R59 (600kW); Valasske Klobouky ch. R59 (100kW); As ch. R60 (100kW); Liberec ch. R60 (100kW). Poprad ch. R5 in Slovakia is to close in early 1997, moving to ch. R47. There is at present dual operation.

**French TV:** TDF has started digital TV test transmissions from Orleans in ch. E33 (120kW). Stereo sound is making slow progress with French TV: check France 2 teletext to find which programmes have Nicam stereo sound.

**In brief:** Bangladesh TV has opened a 10kW transmitter and studio centre at Rajshashi. . . Skycom Oy is a new local TV service in Finland, in operation at Tampere on ch. E6. . . ABNQ in Cairns, Australia has moved from ch. 4 to ch. 45. . . A group called Stay Tuned has been established for the preservation of test cards. The address is Lustkandlagasse 21-1, A-1090 Vienna, Austria.

### The D100 DX-TV Receiver System

We have received from HS Publications details of the latest versions of the company's D100 DX-TV receiving system. They supersede earlier versions, incorporating improvements to enhance the performance. There are two versions, the Super-2 and Super-X. Both cover the basic bands 43-86MHz, 160-230MHz and 470-870MHz, but the Super-X features an 'extend' mode in which the ranges are increased: Band III becomes 120-300MHz for example. It has two u.h.f. ranges, low which covers chs. 21-46 and high (extend) which reaches up to ch. E72. This gives more accurate channel calibration and introduces logarithmic tuning, so that lower channel spacings are expanded instead of being cramped.

Variable i.f. selectivity is essential in a successful DXing system. The D100 has a unique circuit that reduces the bandwidth with a weak signal, progressively widening it as the signal level increases. The signal-to-noise ratio and picture quality are thus optimised. Use of a standard f.m. radio enables the various possible sound carriers with a received channel to be resolved - 4.5, 5.5 and 6MHz, plus 'odd' carriers up to 10MHz. Bandscan and French system L reception are other features.

A detailed leaflet is available from HS Publications, 7 Epping Close, Mackworth Estate, Derby DE3 4HR - send a stamped, addressed envelope. Alternatively phone 01332 381 699. Current UK prices are £129.95 for the Super-2 and £138.95 for the Super-X. These prices include an external flat-pin power supply and postage. Versions supplied to Continental EC countries cost £124.95 and £133.95 respectively, plus £10 for postage, and do not include a power supply.

### MMDS

Following a mention of terrestrial microwave TV distribution in the March column I received interesting information from Brent R. Maurer of Murton Industrial Controls, South Africa. Brent's company has introduced an advanced integrated downconverter/aerial system to compete in a market previously dominated by equipment from the Far East. The Murton system provides a gain of 30dB with a noise figure of less than 1dB, interchangeable bandpass filters at the input selecting either 2.3-2.5GHz or 2.5-2.7GHz.

Brent tells us that MMDS is an expanding market across Africa, being used in the Republic, Madagascar, Morocco and Zimbabwe. Most residential areas in South Africa have at least two MMDS services. Further product information is available

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Nicholas Earley, Victoria, Australia reports excellent



The latest version of the HS Publications D100 DX-TV receiver/converter.

MMDS reception at fifteen miles from the local transmitter. A wide variety of TV channels are available there. His decoder/receiver has an in-built seven-day timer which can be locked to a VCR for four programme recordings. Oddly it provides only a mono audio output, despite an MMDS music channel being available.

### An LNB Supply/Polariser Control Unit

Satellite LNBs are normally powered from the receiver via the coaxial download. It's also conventional to apply power to the LNB even when the receiver itself is switched off. This does not present any problems when a single receiver is used. But some of us use several receivers. My own installation for example has four receivers with an active four-way splitter. This presents several options for switching a triple-band

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switch to each receiver's rear panel, leave the switches in the off position and provide an external control voltage.

I decided to modify a Maplin XM20W CB power supply (13.8V, 3A) for the purpose, see Fig. 1. The internal stabilising circuitry was all removed, leaving just a bridge rectifier to provide 22V d.c. This is fed to an LM317T variable voltage stabiliser, which can run at over 1A. Two resistors in series with the adjustment pin provide, with switch SW1, selection of either 14V or 18V at the output. The LM317T was bolted to the rear metal case via a heatsink spacer, with heatsink compound, and a large metal heatsink was bolted on externally. The stability in the open-circuit condition and with different loadings was checked and was found to remain accurate at 14V or 18V. Output to the LNB coaxial system/active splitter is via two parallel F sockets, for either a direct feed to the active splitter and then the LNB or direct LNB powering as with a masthead amplifier.

A reader who prefers to remain anonymous kindly provided a simple circuit to operate a ferrite (magnetic) polariser. It's powered by an L7808CP chassis-mounting 8V stabiliser which is connected to the LM317T's output. In the original circuit a 2N2222A transistor was used (Tr1). I found that this ran rather warm and use a BFY50/BFY51 instead. It runs only slightly warm to the touch. The 5kΩ linear skew potentiometer can be adjusted for vertical to horizontal polarisation over 90° of rotation without need to operate the two-way switch (SW2). Practice will establish the best settings for vertical-horizontal polarisation. The output to the polariser is taken via an isolated (from chassis) phono socket – gold-plated, from Maplin (JZ05F or JZ06G).

The unit has been found to work well and there is the advantage that the consumption of the receivers is considerably reduced. If a CB-type power supply is to hand, the cost of building the unit is very modest.

LNB/polariser. Unfortunately a receiver that is switched off will supply 18V to the LNB, selecting the Telecom band via the switching diodes even though the FSS band is required. So an unwanted receiver had to be switched on simply to provide 14/18V control. The answer is to fit an LNB power on/off

## Satellite News

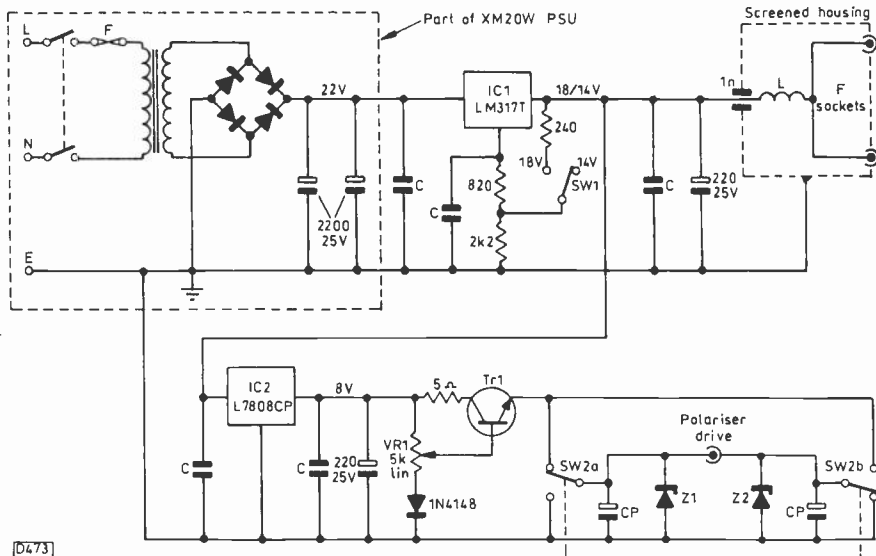
PanAmSat is to offer a 120-channel digital TV service covering India and neighbouring countries from the PAS-4 satellite, which is due for launch this summer. Several major media groups have booked space.

ETI (Greece) has moved from Eutelsat II F4 (7°E) to Eutelsat II F2 (10°E). Frequency is 11.596GHz, with horizontal polarisation. RTS has moved to the 7°E slot vacated by ETI (11.180GHz horizontal).

It seems that Express 2, an improved Russian satellite, is to be positioned at 14°W. Gorizont 26 remains at 11°W though the mega-strength Moscow TV1 3.675GHz Eurobeam has been switched off.

## Obituary

It is with deep regret that I have to report the death on Good Friday morning of Andrew Sykes. Andrew was a true enthusiast who was deeply involved in satellite reception. He had only recently moved to King's Lynn, Norfolk, where he had installed an upmarket satellite system for his hobby. A warm character, he made you immediately at ease – as if you'd known him for years. He provided many excellent photographs and much information that appeared in this column. Andrew, a character and a friend to many, is now at peace.



**Fig. 1: Circuit diagram of the LNB supply/polariser control unit. Filter coil L consists of four 1/8th in. diameter close-spaced turns. Zener diodes Z1 and Z2 are 6.8V, 1W. Capacitors marked C are 1nF, CP 10μF, 25V. The 5Ω resistor in series with Tr1's collector can consist of two 10Ω resistors connected in parallel. Note that the BFY50/51's collector is connected to its case.**

# Letters

## PRERECORDED TAPE PROBLEM

We have recently had a spate of what can probably best be described as incompatibility problems between prerecorded tapes (the ones that are sold rather than rented) and our customers' video and TV equipment.

For example with hi-fi machines it has become quite common to experience a sort of purring sound, especially at the start of speech. It does not occur with older hi-fi machines such as the Ferguson 3V48. It does occur with the JVC HRD530 and later machines. Some manufacturers recognise that there is a problem and blame it on the tapes. Others maintain that there is no problem.

Another symptom is colour drop-out. It seems to affect Disney films in particular.

The cause of all this appears to be the anti-copying signals that some software firms include on their tapes. These signals can affect either the VCR or the TV set used for playback. We sent a sample tape, and the customer's VCR, to one manufacturer for testing. A modification that helps with most but not all tapes was subsequently suggested.

Our difficulties are compounded by the fact that the customer can often play an offending tape on another machine without any problems. As a result the equipment is blamed instead of the tape.

It would be interesting to have the views of manufacturers and other dealers. Hopefully some suggestions on how to deal with the problem, and convince the customer that it lies with the software rather than the hardware, will be forthcoming.

*Michael Maurice,  
Wembley, Middx.*

## WHITE COMET SPOTS

Here's a point that can easily be overlooked with VCRs. White comet spots across the screen, in either the SP or LP mode, is a common complaint. The cause is generally bad head or drum earthing. Initial checks may suggest that everything is o.k., but before you go on to remove the head amplifier etc. check where the PCB from the head amplifier enters the drum. Clean the small board that connects with the drum, using isopropyl alcohol and a proper head cleaning stick.

What happens is that oxide flakes off as the tape moves across the head. Many machines nowadays don't have covers over the heads: the head spinning and the heat produced by the machine draw in dust that settles on the boards. If some of this dust carries conductive material such as oxide, a resistive path can be created across soldered parts of the board above.

*Monty Alter,  
London N15.*

## SURFACE-MOUNTED DEVICES

Much has appeared in these pages on the problems experienced when surface-mounted (postage stamp) chips have to be replaced.

Some different problems occur with two-legged surface-mounted components. Because they are fragile, they can crack when a PCB is flexed. If you have an intermittent fault that is brought on or cured by flexing a panel with conventional through-lead components, the cause is likely to be a print crack or a dry-joint. But where surface-mounted compo-

nents are involved the cause is often a cracked capacitor, resistor or diode. Cracked components can also be open-circuit.

Inspection with a magnifying glass will reveal most cracked components. If you desolder one end of a suspect – this is not recommended by manufacturers – you will get definite proof as the broken half of the component will come away.

Some firms are inclined to route tracks beneath surface-mounted components. Philips and Grundig seem to be fond of doing so. This can cause problems where a solder bridge beneath a component makes intermittent contact with the track.

*Philip Blundell, AMIEEIE,  
Birmingham.*

## TECHNICAL ADVICE

In a letter in the May issue Paul Goldring, General Service Manager of Grundig Satellite Communications Ltd., asks for views on how much an annual fee for having access to technical advice by fax might be, and whether automatic mailing of service data should be included. My views, as someone involved with satellite TV equipment repair, are as follows.

Pace, Nokia, Cambridge, Amstrad and others already provide telephone and fax help lines. They provide regular service bulletins and, in the case of Pace, factory change notes are automatically mailed to major distributors. These services are provided free. In addition, these companies carry out free under-warranty repairs. It is unlikely that dealers who buy receivers from these sources will be happy about paying for technical back-up from other manufacturers.

Paul Goldring also suggests that, for consumer safety reasons, small businesses should provide manufacturers with details of their qualifications. I sympathise with this view but feel that it is impractical, because most dealers cannot afford to train technicians. The alternative is that manufacturers should run product training courses – Pace do so, again free of charge.

Unfortunately the present situation with satellite receivers is that the public tends to take them to back-street shops for cheap repair. Because of this, safety critical components are often replaced with whatever the technicians involved can obtain. Power supply repair kits for Amstrad and Pace receivers, containing approved components, are available from several suppliers. This helps. You can't prevent the public seeking low-cost repairs, but you can take steps to see that the correct parts are used – by making them cheap and easy to obtain. Instructions that cover safety requirements can be included.

*Martin Pickering, B.Eng.,  
Sandbach, Cheshire.*

In reply to Paul Goldring's questions on charging for the provision of technical advice, I would prefer a pay-as-you-use-it scheme. A small enrolment fee, say £5, could be charged to set up an account with an identification number. Credit card details, qualifications etc. could all be held on a data base. Technical enquiries could then be faxed in, a charge of say £5 being made for any technical assistance provided. Technical bulletins could be mailed quarterly, at a nominal charge to cover postage and printing costs.

In my business an annual fee of say £25 might prove to be too expensive, especially if (we can but dream) all manufacturers decided to establish similar schemes. One could then be faced with charges running to hundreds of pounds a

year just for access to information that might not be required.  
*Bob Longhurst,*  
*East Grinstead, West Sussex.*

## BACK TO COWBOYS

The May issue certainly provided me with lots to think about. I agree entirely with Michael Dranfield's comments in his letter. Much good gear undoubtedly ends up on skips because cowboys have either failed to get it working and declared it to be beyond repair or provided an extortionate estimate because they didn't want to get involved. I have picked up numerous items myself, and repaired others that people have brought along. Many VCRs have needed only a belt kit and/or an idler. A GEC/Hitachi TV set that required only a field module and a couple of capacitors was brought along from a skip. It was in immaculate condition, was complete with its remote control unit, and produced a fantastic picture when repaired. I obtained a Tatung set that required only a posistor. After repair I got £70 for it and haven't seen it since. I don't believe for a minute that these items had simply been thrown away indiscriminately.

J. LeJeune's article on u.h.f. interference caused by satellite TV equipment also brought various experiences to mind. I get lots of calls to sort out interference and poor performance problems. The equipment has usually been installed by the same local rigger, and the problems I encounter come up time after time. Incorrectly fitted coaxial plugs for example, often those stupid plastic ones; LNBs that sit at an angle of 45°; and poor quality u.h.f. coaxial cable used for the connection to the dish. His speciality however is a method supplying satellite pictures to every set in the house.

He cuts the fly lead supplied with the receiver, then strips back the two ends. Next he gets as many lengths of coaxial cable (the poor stuff) as he requires and strips them back. He finally twists all these pieces together. Hey presto, satellite TV in all rooms – complete with all sorts of noise and patterns.

I have spent many an hour realigning dishes and LNBs, replacing cables and adding amplifiers (there are many poor signal areas in this town). He has usually told the customer that better performance can't be expected from satellite equipment. One of his tricks is to stick a small screwdriver into the recesses on the underside of Amstrad receivers, where the lid retaining screws are situated, and then 'adjust' the receiver. "No, it's fully adjusted, you can't get it any better than that" he'll declare. The customers who really annoy me are the ones who put up with these pictures until the TV set breaks down, then tell you that the picture was perfect before.

One the subject of technical help, I would certainly be happy to pay for information by using a premium (0898) phone line. Manufacturers take note! This is the best idea I've seen for a long time.

*Name and address supplied.*

## SONY KV-X2972U

There was reference in the April TV Fault Finding column (page 408) to random on-screen display characters with this model. The following additional information is required when dealing with this fault.

Two types of M board have been used in these sets, one designated M1 and the other M2. In both cases the fault is caused by the Megatext chip IC2002, but with M1 boards the correct part no. is 8-759-273-61 while with M2 boards it is 8-759-262-58. The correct type must be fitted.

With M2 boards only, Sony advise that R007 is changed

to 47kΩ (part no. 1-216-089-91) and that C006 (part no. 1-164-005-91) is added. These are both surface-mounted components.

*Nigel Burton,*  
*Glenfield, Leicester.*

## APPROACHES TO BUSINESS

I feel that I must reply to Michael Dranfield's letter (May). As a qualified engineer, with over ten years' experience behind me, I advertise free estimates, no call-out charge and tackle any make of equipment that comes my way. With the increasing reliability of brown goods products and the drop in prices at the lower end of the market, putting some equipment almost into the throw-away category, I feel that it would be unwise for someone like myself to limit my income potential by sticking to only a few brands. It provides good experience to tackle anything, and helps me to further my knowledge of today's wide and ever-changing market.

I have accounts with a number of suppliers, and have never had difficulty in obtaining spares and information provided these are available. On the odd occasion when a service manual has to be obtained, the customer is told and the manual is paid for either by myself or the customer who can then retain it. For engineers who have reservations about this there's the alternative, after paying a modest joining fee, of borrowing one from a library such as Harvey Electronics, which advertises in this magazine regularly and provides a friendly, helpful service.

While I agree that there are cowboys in this trade, they are not all to be found amongst the small ads sections of the local newspapers. Recently for example I had for repair a Bush Model 2520T. The customer had taken it to a local shop which had quoted £60-£70 to carry out the repair – after charging for an estimate. On investigation I found that the BU508A chopper transistor and the TDA4601 chopper control chip were short-circuit. After replacing them the set worked perfectly, though for good measure I replaced the associated power supply electrolytics that I've found, in the past, give trouble. Cost of the job? – £26.

Another example is provided by a Mitsubishi VCR that came to me after being taken to a well-known, respected shop. The customer was told that parts were no longer available, but still had to part with his hard-earned cash for the 'estimate'. I had a look and discovered that one of the loading gears was damaged. The mode switch was the basic cause of the trouble. The mechanism had slipped out of alignment, damaging the gear in the process. After replacing these two items and realigning the mechanism everything worked perfectly. The cost of the repair was less than £30, which the customer was very happy to pay after being told that his machine was in effect a write-off.

A short while after that episode I had a call from the owner of an Amstrad VCR6100. Yet another local shop had told him that spares were no longer available – after taking four months to do so and previously claiming that the parts were on back order. On test I found that there was no output from the head amplifier. The cause of this was not the heads, as the customer had been told, but the lower drum assembly. After replacing this I found that the picture was extremely poor. Could the heads be faulty after all? When checks with the manual and an oscilloscope had been carried out it was clear that all the presets had been twiddled, including dark clip, white clip, the envelope settings etc. There was a good picture when everything had been realigned, though every now and again noise bars would appear on the screen and the sound would vary. Could there be a capstan servo fault? Were the FG pulses from the capstan motor correct? It transpired that



the control pulses from the deck were of insufficient amplitude because the audio/control head was worn. Replacing this restored stability.

I could go on and on. But the point I am trying to make is that having a nice, respectable-looking shop front and charging for estimates does not mean that the engineer behind the counter is any better or worse at his job than someone who works from home – which I had been doing until recently, when I took on an industrial unit nearby.

The cowboy problem is not caused by any particular engineer classification. It is widespread throughout the trade. It's a pity that something positive can't be done to eradicate this element.

*K. Docwra, DTV Service,  
Thanet, Kent.*

### BETTER CUSTOMERS

During the twenty three years I've been in this business I've read many letters/articles by others on the problems raised by customers' attitudes and expectations. The job has become increasingly more difficult and frustrating in recent years, much of this being caused by the manufacturing side of the industry, what with the multitude of makes and models, sets with ridiculously complicated controls, surface-mounted components and the pricing of consumer electronic equipment. These are problems over which we in the service side have little or no control. But we do have some control over the type of customers our businesses attract.

When I started in the repair business I joined the others who advertised in the local press and the yellow pages, offering free estimates, free call-outs, speedy service etc. But I found that this attracted a high percentage of people who were happy to waste my time and resources, expecting to have their old bangers repaired yesterday for next to nothing. As my advertisements had suggested that I was desperate for work, the average punter's attitude was largely 'do what I ask or I'll go elsewhere'.

I gave the matter some thought. It occurred to me that whenever I needed some work done, say a roof repair, my first consideration was to find someone who would do a thorough, effective job. Such a person wouldn't be able to do it yesterday, as his services would be in demand. On completion of the job, I'd be prepared to pay a fair price for the work done. It also occurred to me that I wasn't attracted by tradesmen who advertised free estimates, free call-outs and speedy service. Perhaps others thought like me!

So I altered my advertisements, aiming them at like-minded people who's prime concern isn't cost and speed. The type of customers I attracted in this way were much better. Although the overall number of telephone enquiries dropped slightly, the percentage received from time wasters was greatly reduced, as was the drain on my resources.

Our customers' approach is to some extent shaped by the way in which we in the trade present ourselves. If customers have a difficult attitude, with unreasonable expectations, it could be that we are contributing to the problem. In my experience the free estimate, free call-out operators are, by inviting abuse, doing nothing to further their own cause. They are certainly not helping the trade's image.

*T. Catchpole,  
West Yorkshire.*

### MAKING SERVICE PAY

Like many others who own a small electrical retail business I am finding it increasingly more difficult to compete and make any worthwhile profit from sales alone. Margins continue to

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shrink as retail prices tumble. It's a great pity that our high-tech products have become so devalued. The public is becoming accustomed to pay less for its goods – and also for the cost of repairing them. But I don't feel that the services we provide should be devalued in the same way, typically by offering freebies on estimates etc. as a ploy to make people think they are getting something for nothing. It only undermines what used to be regarded as a highly respected profession. We shouldn't be giving it away – I can think of many other professions that do very nicely, thank you!

Some time ago I made the decision to avoid time wasters and the "have a quick look" brigade. Too much of my time was being spent at no cost other than to myself. Nobody can work for nothing. So I came up with the following idea. I placed a poetically written notice, headed 'Good Service', in a prominent position to catch the eye. A service fee of £15 is requested in advance to cover the initial costs of inspection etc. The wording, for anyone who wants to follow up the idea, is as follows:

#### **Good Service**

A £15.00 engineering inspection fee is requested on all repairs as an advance payment.

*We ask for this when you bring a repair,  
Our service is good so never despair.  
We fix it quick, and get it right,  
Our charges are fair, won't give you a fright.  
Before your cash goes into the till,  
That £15 has been knocked off your bill.  
We can't work for nothing, you must agree,  
That's why an estimate can never be free!  
Under £45 we will get on with the job,*

*Value our customers, not cause them to sob.  
Should it cost more to mend,  
An estimate we'll send.  
Doesn't matter where it's been,  
You'll get it back shiny and clean.  
The bonus comes last, you'll have no need to worry,  
We've checked that it's safe, no need to be sorry.  
Just remember this, we'll not rob you blind,  
And that service like this is hard to find.*

*If you don't think it's worth it after reading this rhyme,  
Kindly don't leave it and you'll not waste our time.*

The £15 fee is deducted on completion of the repair, and helps cover the cost of a written estimate. I no longer lose out, and when the customer comes to collect his repair he has less money to find. In many cases, where faults have not shown up, the customer asks whether there's anything more to pay!

This way of working has proved very successful for me. Customers find the notice acceptable and humorous. I share their smile when they hand over the fee!

Those who, like me, rely very much on service as a major part of the business income should seriously consider the use of a similar idea – and keep at it. The public has to be made aware that the repair of electronic gear, irrespective of its original cost, calls for trained and highly skilled engineers. Such service cannot be provided on the cheap.

*Mervyn Deeley,  
Wolverhampton.*

### TECHNICAL SUPPORT

I appreciate the efforts of Willow Vale and recognise that engineers' time has to be paid for, but nevertheless feel that the manufacturers should be the ones to provide technical support. After all they design, make and sell the things, presumably to make a profit. They should build into their costings provision for an adequate service department, something that always seems to be starved of funds.

I can appreciate the point that appointed dealers should be protected from cowboy outfits that live off the skills of manufacturers' engineers and steal their customers. But in my experience such cowboys don't get as far as ringing the manufacturers, and wouldn't know what to ask for anyway.

We may be a bit naive, but if a customer to whom we have sold something moves to another area and goes to someone else to have a repair carried out, if that firm should ring us for help or advice we would provide every assistance we could. Although our customer has gone, there would probably be relations left, and every good word about us is worth twenty £10 advertisements. So we retain some sort of customer loyalty, with no fear that people will recommend against buying from us. I feel that this applies to manufacturers as well. Sales are likely to dip once a bad reputation has been generated in the service trade.

Many service departments continue to give excellent advice however. For example when I phoned Alba Radio and asked an engineer the value of a component he readily went and found a manual, told me the value and type, and went on to suggest various other components to check and replace. This is the sort of response we want. No "have you an account number", "have you ordered a manual yet" – just straightforward, good service.

The symbol Nick Beer saw with the Finlux VR5250 (page 423, April) is actually the lock symbol. To unlock the machine, depress the remote control unit's standby button for five-six seconds. Maybe Nick had tried his, but the point wasn't made. I assume that replacing the microcontroller chip would bring the machine on, requiring the install sequence. This would

release the lock. Before replacing an i.c., try the unlock process first. If this was the case, Nick has my sympathy. I've also changed a chip or two when a machine has been locked or told not to do something. If only we could get clear information from the user about what he/she was doing when the machine went wrong!

*Chris Watton,  
Boston. Lincs.*

### PRICE OF SPARES

I was interested to read Andrew Churchley's letter about trying to obtain a spare part from Sony. Sony has always insisted that there's something magical about its spares – even the humble on/off switch! This does Sony no favours, or us either.

Good, reliable pattern spares have improved the situation in the trade greatly in recent times. It's amazing how manufacturers' prices for say a line output transformer plummet when pattern parts become available. It confirms my suspicions about the prices that some manufacturers charge.

But enough cynicism for now. There are encouraging things as well: equipment continues to fail and need repair, and there are still some friendly, helpful manufacturers. We should publish a top ten!

*Steve Hague, Trans Vision,  
Redruth, Cornwall.*

### VELCRO TO THE AID

All those in the rental TV business will be aware of the problem of having to search for the remote control units for TV sets held in storage. We've hit on a solution that works well for us: sticky Velcro, an inch square with the soft side on the remote control unit and the other side on the back of the set. Maybe this tip will help other readers.

*Cathal McHugh,  
Ballybofey, Co. Donegal.*

## Answer to Test Case 391

– see page 626 –

Line linearity correction coils are used to compensate for the inherent resistance in the line scan coils. If these were purely inductive, the scan would be perfectly linear and correction would be unnecessary. The linearity coil's field embraces a ferrite-based permanent magnet. As the deflection current rises, the winding begins to saturate. Because the coil's inductance decreases with increasing current flow, the scan linearity can be optimised. Many linearity correction coils can be adjusted by rotating the magnet. But not this one. Even if it had been, adjustment would not have made it possible to achieve correct linearity following the repair.

What had happened was that Service Manager had replaced the coil in the PCB the wrong way round – a forgivable mistake with a two-pin device that had no obvious polarity markings. As a result, the permanent magnet's field was reversed with respect to the scan current. The diminution of the coil's inductance was thus occurring at the wrong end of the line scan. This was discovered only when a junior technician had removed the coil for testing and happened to refit it the correct way round! Oh well, Sage, Ted and the rest of the crew will soon be back.

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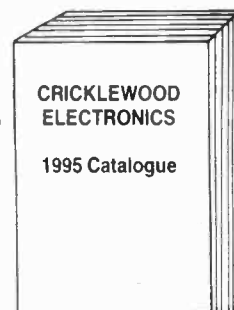
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# From the Model T Ford to the PC: an intro to the switch-mode power supply

Andy Denham

Young Kevin was busily probing around in the latest offering from the land of the rising yen. He stopped and looked in the direction of the Workshop Sage, who was carefully reaming out his pipe with a blunt drill bit.

"Why do they use these damned switch-mode supplies?" he asked. "Wouldn't it be easier to use a transformer and regulator?"

Disturbed in his pipe reaming, WS sighed and leaned on the edge of the bench. "I know your game, Kevin. You think I'll spend all afternoon telling you some old yarn. But I'll try to explain."

"First, they are not as new as you think. Switch modes have been around as long as electricity. It's just that we began to see them in consumer electronic equipment only a few years back. And oldsters like myself were scared stiff.

"It all started when motor engineers wanted to use a spark to make their engines go. Till then they had only a few choices: an open flame, or what was called an l.t. magneto. But Henry Ford used electricity in his cars. He was probably the first commercial switch-mode power supply user.

## The Trembler Coil

"What he did was to use a trembler coil. This was like a buzzer, and operated like one. Look." He drew something like Fig. 1 on a bit of paper.

"When the push switch is operated and the points are closed, current flows in the coils. The armature – that bit of metal – moves towards the electromagnet formed by the coils and the soft iron core. Thus the points open, breaking the circuit. The magnetic field then collapses and the armature springs back. With the points once more closed, the current flow is resumed. The operation starts all over again.

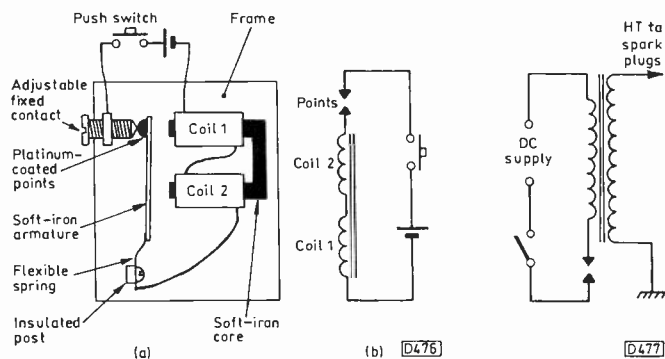


Fig. 1: Basic buzzer arrangement (a), circuit (b).

Fig. 2 (right): Trembler coil circuit.

What Ford did – see Fig. 2 – was to add another winding over the buzzer coils. When the magnetic field produced by

the buzzer coils collapses, a high voltage is induced in the extra winding – call it an induction coil. He used this voltage for the spark plugs in his engines.

"This trembler coil arrangement was not very efficient. The points wore away, and the thing made lots of what we now call r.f.i. – it acted like Hertz's transmitter. The switching action was also rather variable. But in essence the system acted in exactly the same way as the power supply in that Japanese wonder you were fiddling with just now. Throw away the points and put a transistor there instead and you get Fig. 3 – assuming that the arrangement is mains operated.

## Transistor Switching

"When the transistor is switched on, the d.c. supply produced by D1 and C1 is instantly connected across the coil. But the current that flows through the coil as a result of Tr1 becoming conductive takes a time to build up. This is because of the coil's magnetic reluctance – also that of the core.

"The current increases linearly for a time that depends on the coil's inductance and its d.c. resistance. It will eventually start to increase very rapidly. This is because saturation has occurred. To explain, above a certain level of magnetic field strength the coil's reluctance drops and the only things

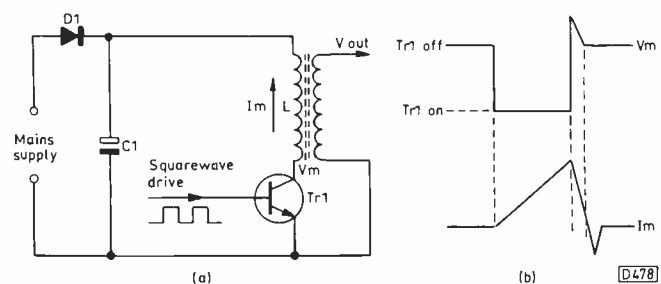


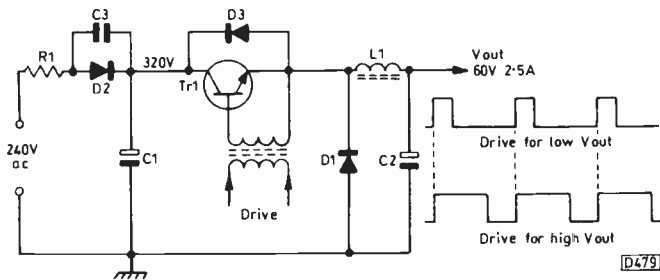
Fig. 3: Use of a transistor to provide the switching action. (a) Basic circuit assuming mains operation, (b) voltage and current waveforms.

that limit the current flow are the winding's d.c. resistance, which is usually only a few ohms, and the source impedance of the supply. At this point the transistor would form a dead short and the rectifier (D1) in the d.c. supply would go bang. In comes a dead set! Unless, of course, the current flow is switched off before saturation occurs.

"Suppose that 2A is flowing in coil L. If we turn the transistor off in say 1msec, the current falls at a rate of 2kA per second. Mr Lenz's law states that  $V = -L \times di/dt$ . Thus with an inductance of 20mH we'd get a voltage of 400V. Only for the 1msec of course, but with a transformer it's a way of getting some e.h.t. In fact that's how the line output stage works. They've been switch-mode power supplies since

mains-derived e.h.t. bit the dust.

"You don't always want lots of volts of course. Maybe you've just designed the latest in TV technology. It has lots of digital circuits that operate at 5V, some on all the time and others only when the set is switched on. It also requires h.t. supplies for the video and line output stages, and some-

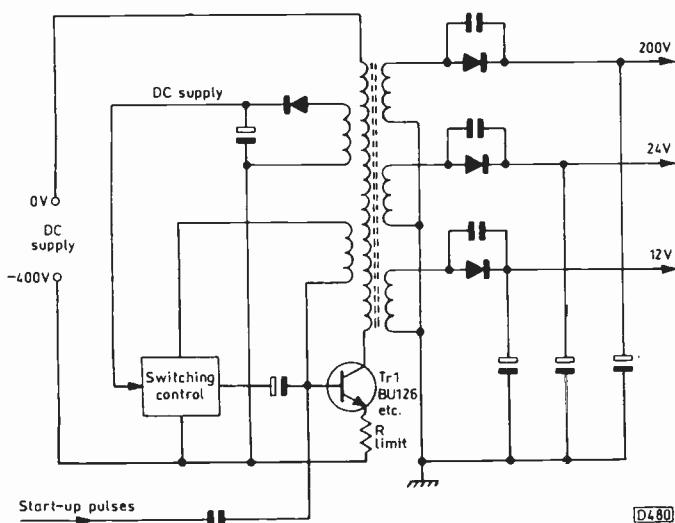


**Fig. 4: The buck-regulator switch-mode power supply arrangement used in the Thorn 3000 chassis. The output voltage is determined, and stabilised, by varying the mark-space ratio of the drive to the chopper transistor Tr1 and thus its on time during each cycle of operation.**

thing like 20-30V each for the field and audio output stages. Do you go and buy a thundering great transformer, which will play havoc with the purity and scan circuits? It would be well over-rated most of the time, and very expensive. I think not!

### The Buck Regulator

"When Thorn developed the 3000 chassis, way before your time, a form of switch-mode power supply was adopted." WS drew Fig. 4 on the back of a job sheet. "They decided to use a line output stage that required about 60V at 2.5A. A dropper resistor for this purpose would have acted



**Fig. 5: Basic arrangement used in the Siemens self-oscillating switch-mode power supply.**

as a room heater. Rectify the mains supply and you'll get around 300V d.c. Lose 240V of this at 2.5A and you'll dissipate 600W. All that power wasted!

"So the Thorn men used a little-known - at that time - idea called a 'buck regulator'. The rectified mains supply is smoothed, then chopped at line rate. This produces a pulse output which can again be smoothed to produce a d.c. output. Vary the chopping on/off time and you can get the

output voltage you require - and stabilise it. The chopper circuit's reservoir is coil L1, with C2 to provide smoothing. D1, an essential part of the circuit, acts as an efficiency diode. It's really a flywheel diode that conducts for part of the chopping cycle - the part when the transistor is off. This gave Thorn the required 60V at 2.5A, with negligible dissipation. It also gave us some headaches!

### The Siemens Circuit

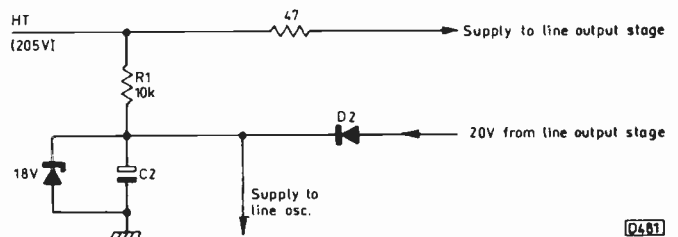
"We'd just got used to that when along came a glut of imported sets, Skantic and things like that, which used the Siemens self-oscillating power supply. This is more like the sort of circuit you get today. It's a way of providing mains isolation for one thing. For some strange reason the primary side of the circuit was operated at -400V. Fig. 5 shows the idea. Another oddity was that the circuit doesn't self start: it has to be kicked into operation, say by feeding it some pulses derived from the mains a.c. side of the circuit.

### Changes

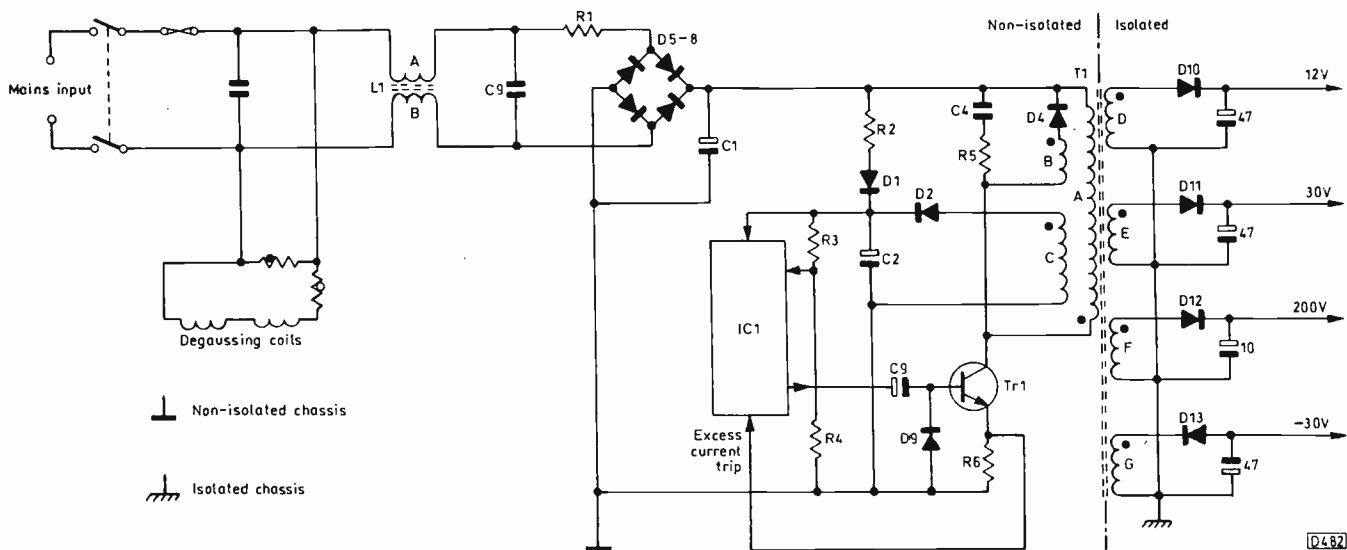
"There were a lot of changes over the years. By about 1976 some manufacturers were actually giving thought to the problems of those who had to repair the circuits. Then the Far Eastern invasion came and reliability improved as well. I remember in my young days taking a colour TV course - it was in about 1969. We were told that for the foreseeable future sets would be dual-standard types that used valves in the power stages. There might also be some simple PAL sets. This was a penny-pinching approach that omitted the chroma delay line in the colour decoder. Very few of those ever appeared - a few from Teleton and that was about it. The course was also wrong about dual-standard operation and valves. The valves had dissipated 60-70W via their heaters alone. The line bottles were huge, wasting about 30-40W. Efficiency wasn't a major consideration then.

"At about this time there were quite a few truly portable monochrome sets about, operating at 12V. This brought home that you could get more from the line output transformer than just the e.h.t. and focus supplies. You could get say 12V, 30V and 200V by adding extra windings. As the frequency is high, smoothing is easy. And the line output transistor doesn't seem to mind the extra load.

"The Philips G8 CTV chassis was quite successful in using this approach. Its line output transformer produced all the h.t. supplies, including that for the line oscillator. The problem with this was that the line oscillator couldn't, without something else being done, start up! The nice men at Philips adopted a simple dodge, see Fig. 6. They took a feed from the chopper circuit via a high-value resistor (R1). Once the line output stage got going, it developed a 20V supply which is fed to the line oscillator via D2. R1 dissipation



**Fig. 6: Method of powering the line oscillator in the Philips G8 chassis. When the set is running normally the oscillator's supply is obtained from the line output stage. A start-up feed is thus required. It's provided by R1.**



**Fig. 7: Basic elements of a common type of switch-mode power supply that provides mains isolation.**

pates power only during the start-up phase. You'll nearly always find something like this is a modern set.

"The name of the game is efficiency you see. The initial Philips G6 colour chassis had a power consumption figure of about 350W. With the G8 this was brought down to about 150W. Nowadays no self-respecting setmaker would produce a 24in. set that consumed more than about 100W.

### Servicing

"There's a price to pay: the old servicing techniques just don't apply with switch-mode power supply circuits. For one thing, nearly all current sets use the chopper transformer to provide mains isolation. This means that to work on the power supply you have to know where to connect your meter and scope. Take a look at Fig. 7.

"Mains potential is present in the non-isolated part. If you want to look at the drive waveform at the base of the chopper transistor Tr1 you will have to use the negative end of reservoir capacitor C1 as the reference for the scope. It would be a waste of time clipping your earth probe to the isolated chassis. All you would see would be mains hum. The same applies to your meter. To look for h.t. at say D4 you have to use the same reference point as with the scope. Note that if there's no bleed resistor across the reservoir capacitor C1 it will hold its 300V charge after switching off the set – the 300V waits there for the unwary!

"The way to start is to use your eyes and ears. When you are sure that it is safe to switch on, listen! Does the e.h.t. crackle a bit as it comes up? Alternatively, do the hairs on the back of your hand stand up in front of the screen? This indicates the presence of e.h.t. Can you hear any line whistle? If you can, the power supply is working up to a point. Do the c.r.t.'s heaters light up? Since these are usually powered by the line output transformer, you've established whether or not the line output stage is operational. All this without getting out your meter.

"If none of these things happen, did you hear the degaussing coils twang at switch on? If not, the mains supply is probably not getting there. So check the fuse, switch and plug. Still no meter!

"Can you hear a squeal or low-pitched whistle from the chopper transformer, or is there a kind of pulsing noise for a few seconds after switch on? If so the chopper circuit is overloaded or shutting down because of the operation of a protection circuit.

"Three major things have been checked without resort to any test equipment. If all else fails, you have to start fault finding. We'll start at the beginning.

### Fault Finding

L1A/B form part of an input filter for r.f.i. suppression. Unless one of the pins is dry-jointed, this is a very reliable item. R1 is the surge limiter resistor which can go open-circuit, usually because one of the bridge rectifier diodes has gone short-circuit. The fuse may be open-circuit as well. You do not just put a new fuse in and hope for the best. When these items go, all too often the chopper transistor Tr1 is short-circuit. The surge produced by a new set of diodes and fuse can kill other things should Tr1 have failed.

"You must check Tr1 and R6 at least, because they can both suffer. Almost certainly IC1 will die if the current sensing resistor R6 is open-circuit. 300V across the innards of an i.c. designed to operate at about 40V will do it no good at all. Even if Tr1 is in good shape, check all the diodes in the supply. With some designs the fuse will blow if one of these has failed, though the protection circuit associated with R6 will usually shut things down. That's what causes the pumping noise, generally at about one-second intervals.

"What should happen is that if the current passed by Tr1 rises above a certain level the i.c. will cease to produce the chopper drive, so that the circuit closes down. Or, if it's the old TDA4600 type of thing, it will lower the frequency of the output drive until the load is low enough for the chip to try a restart. These i.c.s run at about 25kHz on load and about 70kHz off load. Under a fault condition the output is reduced to about 2kHz – which is very noticeable!

"Because the load in a TV receiver or VCR can vary quite a lot in normal use, the chopper circuit is usually of the flyback type. This stores magnetic energy in the transformer's core while the transistor is on, then releases it to the load when the transistor is switched off. This provides the best compromise in performance and efficiency when there are several outputs and the load varies – from standby to full on, with the volume low or high.

"The regulation with this type of circuit is not fantastic. Look at the bit associated with transformer winding TIC. R2 and D1 provide a start-up feed. Once the circuit has started up, D2 rectifies the waveform developed across TIC so that the charge on C2 is increased, switching off D1. The

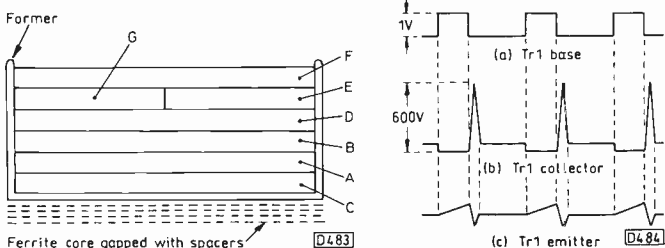
circuit now provides its own power for IC1. There is also feedback, for regulation purposes, from the junction of R3 and R4. The voltage here varies with the load, so the circuit can compensate for such a change. But the transformer's windings cannot all be equally well coupled.

"Primary winding A usually sits in the middle – look at Fig. 8. Now the best coupling is between adjacent windings. So C will produce good regulation: that's why it's used for the feedback. The worst regulation will be produced by winding F, which produces the 200V h.t. supply. While the variation associated with C may be kept within two per cent, that associated with F may be twenty per cent or more. When better regulation is required for low-voltage lines you may find that one or more linear regulators are added – 7805s, 7812s and things like that.

"By using a variable regulator such as the LM317 you can switch off the line oscillator in the standby mode. This removes the tube's e.h.t. and heater supplies and thus the picture. Feed the sound and field output stages from the line output transformer and you have standby from one chip.

"Once you have established that the diodes are o.k. and that Tr1 is probably healthy, take a look at C4. This forms part of a dissipative snubber circuit. Tr1 switches off quite fast, producing a healthy voltage spike at its collector when it does. Winding B and D4 clamp this pulse voltage at twice the supply voltage, but C4 has to take the edge off the pulse. If R5, which has a fairly high wattage rating, is open-circuit you'll be fitting a new chopper transistor very quickly, and probably new bridge rectifier diodes as well.

"Talking about diodes, even h.t. rectifiers are becoming quite exotic these days. 1N4007s are no longer suitable. The newer diodes are fast, soft-recovery types. This means that they can switch on and off quickly, but from a reverse bias they tend to come on more gradually. This reduces the switching spikes produced and, along with L1, reduces r.f.i.



**Fig. 8: Section of half of transformer T1 in Fig. 7.**

**Fig. 9 (right): Waveforms associated with chopper transistor Tr1 in Fig. 7.**

emission. The diodes on the output side of the circuit have to be fast types. Don't try to use 1N400X types here. Even at 1kHz they won't rectify properly.

### Switching On

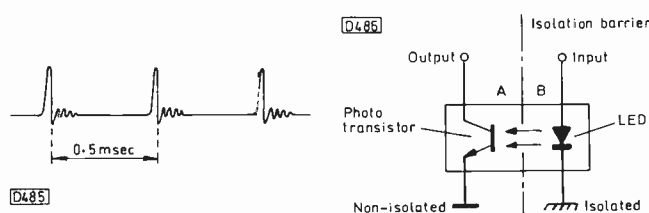
"Now you can switch on, warily. Look and listen – remember what I said earlier. If you are lucky everything will be all right. More likely you'll have to go deeper. Look for the start-up supply at D1. R2 could be open-circuit or high in value, preventing the start up. If this is o.k., get out your scope. Clip its earth lead to the negative side of C1 and take a look at Tr1's base drive waveform. It should look something like Fig. 9(a). There'll be thumping great spikes at the collector if Tr1 is working. About 600V peak-to-peak is the going rate. Make sure that you check at both sides of the base drive coupling capacitor C9. With the base drive

current required, this capacitor leads a hard life. It can dry up, removing the drive.

### Tripping

"If Tr1's collector waveform looks like Fig. 10, especially if the power supply is squawking at you, the thing is tripping. It could be that R6 has gone high in value, but more likely the cause is an overload. If all the diodes and reservoir capacitors on the output side of the circuit are o.k., you will have to start looking elsewhere. Favourites are the line and field output stages, but any short will cause this sort of problem.

"Don't just disconnect the feeds. If you take out the h.t. rectifier diode D12 for example the voltages on the other rails may rise by fifty per cent and you'll be replacing bits and pieces for a long time to come. Load the circuit with a bulb or something. About 50 or 60W will do for the h.t. line. If the power supply starts up with the h.t. line loaded in this



**Fig. 10: Tr1's collector voltage waveform in the trip mode.**

**Fig. 11 (right): How an optocoupler works.**

way, check whatever this rail feeds – usually the line output stage, maybe the driver stage as well. Don't forget that when you start to carry out voltage checks on the secondary, isolated side of the circuit you have to move your meter earth connection to that side as well.

### Optocouplers

"Something else you might come across in a switch-mode power supply that provides mains isolation is an optocoupler. It may be used where the feedback for regulation is derived from the secondary (isolated) side of the circuit, where pulses are fed back from the secondary side to synchronise the operation of the chopper circuit with that of the line timebase, or where standby control from a micro-controller chip on the secondary side is applied to circuitry on the primary side.

"The idea is shown in Fig. 11. Side A of the device is flash tested to prove isolation from side B, at 2kV or whatever. Current through the light-emitting diode on the secondary side controls the conduction of the phototransistor on the primary side.

### In Conclusion

"That summarises most of what you need to know about these circuits. You'll just have to learn to live with them. They are everywhere nowadays. Apart from TV and video equipment, you find them in fluorescent lighting systems, computers, camera flash guns, strobe lights, microwave ovens – even car radios.

"Now try to crack the one you've got there on the bench. Then you can have a go at Miss Unwin's iron. You don't find switch-mode power supplies in them – at least not so far!"

# What a Life!

**Donald Bullock**

"Now that we spend more of our time here in Spain" commented Greeneyes the other day, "why can't you start to get things right? There's that dripping tap for example. And why not fill in some of your time and earn us a little pocket money by doing the odd repair?"

"Because", I said "to start with I'm not a plumber, and once you get into repairs they never finish. Look how it's been all the years I worked from the house. On how many days was I able to sit down to dinner without the phone going or somebody tapping on the door?"

"I would have thought you could manage one or two. Ivor asked you to stop the tape spilling from his video and you put him off. He went to Graspero's and they kept it a month then charged him fifty quid. You could have done it for a tenner, and with that we could have had a good meal out."

Her logic was impeccable. It always is. So when Albert, our local plumber, asked me to look at his video recorder I agreed. It was only a greasy idler, so I did it for free. In return he fitted a new tap for us. "You see" she said.

## **Life In the Sun**

A busy main road runs down the entire Spanish Mediterranean coast. Towns and villages are strung along it. Most of them manage to support a crop of dealers, who are often British. They make a living by providing satellite systems, mainly to UK expatriates. Because Spain is on the edge of the main European satellite footprints the signals are weak. So receiving systems that use an 0.8dB LNB and a 1m or larger dish are common.

When I first came over I bought an 80cm dish and an LNB with a noise figure of 1.2dB, because I didn't know better. Reception was awful. So I upgraded to a 2m dish and a better, 1dB LNB. These produce perfect pictures, but when I see the programmes I wonder why I bothered.

Pirate Sky decoders are common here. Whilst browsing in a satellite shop recently I overheard a conversa-

tion between a dealer and a fellow engineer. The dealer was showing him the decoder he sells for £25. It consists of a simple 2 x 4in. glass-fibre PCB with eight switch contacts that are connected to three surface-mounted i.c.s – a pair of PIC16C84s and a tiny 24C65/CM. It seems that the decoder gets all the programmes and works perfectly.

"We tell the customer to bring it back if it stops working" the dealer said. He jerked his thumb heavenwards. "When the switching is changed up there the boys here crack it again and send over the new code on an EEPROM. This goes into the machine and when the decoder is popped in the new code is written into its chips."

That coastal road takes you to Alicante, though not very quickly. It runs through a very long tunnel which is lit by a series of closely-spaced orange lights to the top at each side. For a long time it's been my impression that as the lights flash past in the car they become redder – a sort of frequency-shift or a visual Doppler effect. But since I'm known for noticing odd effects (and people) I thought no more about it. Until the other day, when some passengers in our car mentioned it. Since I wasn't travelling at the speed of light – I don't, these days – I am wondering whether the mains frequency strobos with the car's speed or something. There must be someone out there who can come up with an answer.

I've built a small workshop and equipped myself with some tools and a Band III aerial. Incidentally there are numerous huge Band I aerials here, larger than anything I ever saw in the UK in the pre-u.h.f. days.

## **Satellite Solutions**

Then I required a satellite signal. I tried splitting, then James and Rebecca wanted signals as well. So it was time to consider a proper installation. The correct approach is to fit a dual-polarisation LNB, run its outputs to a magic box and feed the outputs from this to separate receiver/decoders. But it all seemed rather costly.

Satellite Solutions of Northampton came up with the right answers, and I'm very grateful to their John G. Jones who went to the trouble of faxing and telephoning me with advice and arranging for the delivery of the equipment to Spain. It arrived within two days.

I wound up with some Maspro ST8 receiver/decoders at less than £80

each, a dual-output Continental LNB and a Global magic box, plus the necessary cable and accessories.

## **Pedro's Video**

Pedro runs a local restaurant here. The other day he came around with a Japanese video. "I've half mended it" he smiled, "but it only half works." It was then that I noticed Pedro's hands. Like Popeye's. So I hastily got rid of him and tried the machine out. It accepted a tape and tried to load it, then died. I found a cotton bud sticking into a cracked-open microswitch on the cassette mechanism. As it was unlike anything I had here I made a pair of spring contacts and glued them on with Araldite. To my surprise it worked.

## **His Sister's Samsung TV**

Pedro subsequently recommended me to his sister Carmen, who brought along a Samsung TV set. When I plugged it in a cramped raster that kept shimmering yellow came up. Then the raster died though the sound remained. I took a look at the chassis – I didn't have the circuit – and noticed that some components in the line and power sections were covered with a tacky goo, among them a 2SD288 transistor (Q802) and some electrolytics. The transistor was cooking and proved to be short-circuit. After removing the goeey stuff I checked the capacitors. C821 (100µF, 100V) and C829 (330µF, 25V) were very low in value, while C415 (1µF, 250V) was open-circuit. Replacing them cured the trouble.

## **A Sony KV1612**

Then a fax arrived from Steven. He had a Sony KV1612 on the bench, its problem being vertical striations that were strongest at the left-hand side of the screen, fading towards the right-hand side. What did I think could cause this?

"Easy" I replied, "something's modulating each line, producing a ringing effect that falls off as the line scan progresses. But don't ask me what!"

He came back a bit later. A 22µF, 250V electrolytic, C801, had been the cause. It's the reservoir capacitor for the line output stage derived 200V RGB output transistor supply.

## **Flashes and Bangs**

By now the sky was leaden and all



was still. Thunder came rumbling round the mountains, then lightning flashes came. Within minutes there was a storm, and we seemed to be at its centre. I disconnected the fax and plugged in the cheap telephone, bought from Rogoes market stall.

Suddenly there was a deafening thunder clap, and a whisp of smoke came from the telephone junction box as our lights went out.

I reset the mains trip and the lights came on again. The phone was as dead as mutton, the junction box reduced to soot.

When the rain eased, Ivor appeared.

He was carrying his Pace PRD900 satellite receiver/decoder. "Struck" he announced.

The telephone line was fixed next day, and we added 'cheapjack phone' to Greeneyes' shopping list. A little later I opened up Ivor's PRD900. Some print on the primary side of the power supply had melted and C6, a 1,000 $\mu$ F, 16V electrolytic, had arced across. The mains fuse was a tube of soot, and the TEA2018A chopper driver chip was blackened, as was the MJE18004 chopper transistor Q1.

I checked the circuit thoroughly before writing out the spares list, but

the only other item that was faulty was C5 (22 $\mu$ F, 16V). It was leaking like a Whitehall secret.

The spares arrived a few days later. Having fitted them, I gingerly wound up the supply to the receiver via the variac. At about 180V it chirped happily and slipped into standby. On test it worked excellently.

## Apology

Our apologies to Jay and Lata Popat for the spelling mistake in last month's column. The editorial department blames a fax which was none too clear.

# Help Wanted

*The Help Wanted column is intended to assist readers who require a part, circuit etc. that's not generally available. Requests are published at the discretion of the editor. Send them to the editorial department - do not write to or phone the advertisement department about this feature.*

**Wanted:** Circuit diagram for the Tandon TF1202 colour monitor. P.M. Rae, 79 Coleshill Street, Sutton Coldfield, Birmingham B72 1SH. 0121 354 5444.

**Wanted:** Fisher FV700 series deck mechanism or complete scrap machine. Peter M. Heeley, 40 St. Leonards Road, St. Annes, Lancs FY8 2HD. 01253 721 918.

**Wanted:** Service manual/circuit diagrams (photocopy will do) for the Nokia 2110 handsfree unit (car mount). Johan Svensson, Tunnländsg 20, 421 38 V.F, Gothenburg, Sweden. Tel. 0046 31 899218 or 0046 707 144037.

**Wanted:** 11SP22 or 11WP22 c.r.t. for the Granada C11GZ1 Colourette/Kuba Portacolor. Also any Bang and Olufsen hybrid CTV set. Keith Parker, 20 Herbert Road, Bounds Green, London N11 2QN. 0181 889 3779.

**Wanted:** Anyone know of a source of circuit diagrams for domestic cordless phones, especially the BT Freeway etc.? N. Childs, 30 Chobham Road, Knaphill, Woking, Surrey GU21 2SX. 01483 472 011.

**Wanted:** Operating instructions for the Grundig VS500 VCR (a photocopy would do). Doug Carson, 89

Holborn Hill, Millom, Cumbria LA18 5BL. 01229 774 749.

**Wanted:** Baird Model 8759 colour TV set - it's a schools' TV set with wooden lock-up cabinet. Also a Thorn 2000 chassis dual-standard 25in. colour set. S. Nicholson, 77 Deerlands Avenue, Parson Cross, Sheffield S5 7WS.

**Wanted:** One or if possible two new audio/control heads for the Panasonic NV730 VCR. Part no. VEH0259. V.W. Cox, 40 Porter Road, Long Stratton, Norwich, Norfolk NR15 2TY. 01508 530 386.

**Wanted:** Instruction manual for the Telequipment S51B oscilloscope. Michael Zwierzanski, 92 Locks Crescent, Portslade, East Sussex BN41 2HH. 01273 702 016.

**Wanted:** A copy of *Radio and Television Servicing 1981-82*. Also a service manual (photocopy would do) for the Sanyo VHR1300E VCR. Stephen Lawlor, 11 Findern Green, Cardale Road, Nottingham NG3 7BU.

**Wanted:** Working teletext panel for the Philips CP90 chassis. R. Benka, 29 Union Street, Montrose. Tayside DD10 8PZ. 01674 671 384.

**Wanted:** Second-hand lens assembly for the Sanyo VMD6P camcorder, or scrap camcorder with good lens. Also details of how to tune stations with the ITT Digi 3 chassis. Peter Nutkins, Higher Spence, Wootton Fitzpaine, Charmouth, Dorset DT6 6DF. 01297 560 556.

**Wanted:** An instruction book and remote control handset for the Osaki VCR33. John Reynolds, 29 Southdale Road, Birkenhead, Merseyside L42 3XN. 0151 647 8764.

**Wanted:** A DD cylinder unbit, part no. VEG0449, for the Panasonic NVG18B VCR. A.J. Martin, Brook End, Essen Lane, Kilsby, Nr. Rugby CV23 8XQ. 01788 823 789.

**Wanted:** Lower drum for the Akai VS105HQ VCR and a remote control

unit for the Matsui VX755A VCR. J. Sampson, 59 Kenwyn Street, Truro, Cornwall TR1 3DB. 01872 42 404.

**Wanted:** Channel selector assembly for the Grundig CUC120 chassis. Wayne Haverson, 139 Victoria Road, Emsworth, Hants PO10 7LX. 01243 377 746.

**Wanted:** Circuit diagrams or any other information for the Apricot XEN PC, made about 1985-6. The machine I have has a non-standard QWERTY keyboard with an integral LCD strip screen. David Bolt, 2 Park Cottages, Berners Lane, Woolverstone, Suffolk IP9 1HR. 01473 780 833.

**Wanted:** LOPT for the Network NWC1439 (1402 or 1410 chassis). S. Raistrick, 135 Lister Avenue, East Bowling, Bradford BD4 7QU. 01274 735 047.

**Wanted:** LOPT for the Huanyu 37C3 or details of a supplier. Andie Wilkes, 34 Tideswell Road, Great Barr, Birmingham B42 2DT. 01926 404 935 (day), 0121 605 0702 (evenings).

**Wanted:** Tripler, part no. 9502 9643, for the Bush BC6125 (alternatively the BC6004 or BC6124). Paul Hardy, 43 Sheridan Ave., Caversham, Reading, Berks RG4 7QB. 01734 475 869.

**Wanted:** Valves for the Fairchild 660 limiter/amplifier as follows: four 6386s (or equivalent 2C51, 6CC42); one 5651 (OA3, KD21, QS1205, VR75/30, CV2573 or CV3798); one 6BL7 (6BX7, 6DN7 or CV5039). Eddie Cox, 86 St. John's Road, Hedge End, Southampton SO3 4DF. 01703 333 262 (day), 01489 782 885 (evenings).

**Wanted:** CCU-VES-01 (IC1501) and MDA2062 (IC1502 and IC1503) chips for the Saisho FST2130TX (or Matsui 2190) digital CTV. Alternatively a scrap panel or scrap set. Also servicing/set-up information (photocopies will do). M. Drummey, 2 Howell Drive, Rhyl, Clwyd. 01492 535 912 (after 6 p.m.).

# Tubes and Other Matters

Les Austin

Not as much as I'd hoped this time on tubes, as I've been rather busy in the workshop lately, but here goes. In the May issue I discussed tube basics and touched on the subject of instrument-based tube testing. It's important to appreciate that a meter reading from a tester will never reveal information about such things as purity problems caused by a loose shadowmask. There's no substitute for a TV set itself when it comes to purity and convergence assessment, also problems with blockages of or damage to a shadowmask. I plan to look at these matters in a later article.

## Grid Bias

I ended last time by mentioning the importance of the grid voltage used by a tester. The explanation for this is as follows. Picture brightness is controlled (increased or reduced) by varying the tube's negative grid bias. In practice the cathode voltage is made more positive with respect to the fixed grid voltage to reduce the brightness and less positive to increase it; that is, the grid is made more negative or positive with respect to the cathode – it depends on how you look at it.

Because the grid opening in a c.r.t. consists of a small hole, the area of the cathode from which electrons can be emitted to form the beam is restricted to a small central portion. If the cathode in this area is 'poisoned', the visual result will show as a low-emission tube. If a test instrument which applies a positive voltage to the grid is used however, it will measure the electron flow from the total cathode surface instead of the small central portion, giving a misleading high-emission reading. This is the reason why some testers occasionally give a good reading when the picture tells a different tale. It also explains why my own tester uses a fairly high first anode voltage and a relatively high negative grid voltage.

I first encountered this peculiarity some fifteen years ago. When I used a Video Circuits Model V31A to test the tube in a Grundig Model 5010 colour set I obtained readings of about 220 $\mu$ A per gun. These impressive readings didn't tie up with blurred, flaring appearance of the picture. Puzzled by this, I decided to boost the tube – and

was rewarded with a much improved picture. But I didn't at the time understand the apparently wayward readings I had obtained. I can now confirm that the V31A uses a small positive grid bias to carry out its emission test. Nevertheless most of the tests I have made with it correspond with the picture performance of the set concerned.

Two other Video Circuits' testers, the V33 and V35, were progressively simplified and 'improved' versions. In my opinion they were progressively less effective, but such is progress! I devised some modifications for the V31A, and will return to these another time.

## Cathode Poisoning

What is meant by 'cathode poisoning'? As a result of bombardment by positive ions a coating builds up on the cathode, whose surface work function is thus reduced. The effect was well-known in the days of valve radio, and was expected if an unused valve section was left without its electrodes being tied to specific voltages – grids and cathodes should not be left floating when they are not required in a particular circuit.

Another factor that contributes to cathode poisoning and consequential loss of emission is operation at a low heater supply voltage. If the cathode temperature is too low, contaminants are not 'boiled off' as they ought to be: remember that temperature is the enemy of adsorption.

## Another Conundrum

This brings me to another little conundrum. The Grundig Model 6010 was the remote-control version of the previously mentioned 5010. In the standby mode its heater supply voltage fell from 6.3V to about 4V. Yet there were no cathode poisoning problems associated with this model despite the fact that some sets were left in standby for most of the time, with only occasional periods of full operation. A study of the circuit diagram provides the answer.

In standby the mains input is switched from the bridge rectifier to a single diode that produces a negative output of about -200V. This supplies

the standby dot in the nixie display, maintains the excitation neon lamp illumination for the memory modules and, more importantly, puts a negative voltage at the output of the colour-difference amplifiers (as in many early colour sets, these used colour-difference rather than RGB tube drive). The colour-difference amplifiers were a.c. coupled to the grids, with a common positive d.c. bias added to set the black level. In standby the positive bias was removed, its place being taken by the negative supply. At a level of -200V, the conditions in the tube are such that any marauding positive ions collect at the grids, with no opportunity to accumulate on the cathodes. Thus with these sets prolonged standby does not, contrary to expectations, result in cathode poisoning.

## Laser Prices Revisited

In my first article on CD player servicing, last year, I commented on the high cost of replacement laser units, in particular the Sony KSS210. I didn't mention that laser prices in the Far East were at that time in the range \$5-8, say around £5 in our money. We now have a few small movements in that direction.

The last official Sony price I paid was £27, though a chap at SES told me that they had gone up recently. If you scan the advertisements in *Television* however you'll have seen that Grandata has them listed at £22. We ordered one, and it was the genuine article.

SEME has reduced the price from £38 to £20. For the same price SEME can supply a Samsung mechanism complete with laser, sled and spindle motors, and a complete PCB for one model. CPC has reduced the price to just over £14. Not for a compatible laser unit but for a genuine KSS210.

Perhaps at these lower prices some of those refused estimates may become acceptances. I don't expect to see a reduction in the prices of all the dozens of different types of laser, but we may see the price of some of the more common ones, such as the Sanyo SF89, fall.

Incidentally, what do you do if a compatible type is offered? Most manufacturers list the optical unit as a safety component.

# A Simple Camcorder Battery Discharger

John Cronk, GW3MEO

Camcorders tend to reject batteries before they are discharged to the correct level for recharging. To maintain the capacity of a NiCad cell, it should be discharged to 0.9V before being recharged. The usual 6V battery has five cells. Thus at 0.9V per cell, it should be discharged to 4.5V. A 1Ah battery (NP55) requires a 100mA discharge at the ten hour rate.

## Chip Selection

After several false starts, the circuit shown in Fig. 1 was adopted for the purpose. It's based on the well-known 555 timer chip which has two comparators, a flip-flop and an output stage that can pass up to 200mA. Although there are

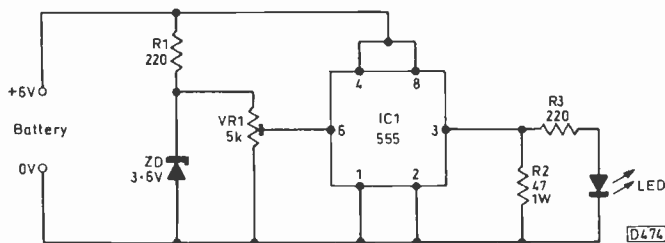


Fig. 1: The discharger circuit.

chips that are specifically designed for the control of NiCad chargers/dischargers, the U2400B for example, the 555 is much cheaper and more readily available.

## Circuit Description

The circuit will discharge a battery, at almost 100mA, until the voltage across its terminals falls to 4.5V. The LED will then go out and the current will drop abruptly to about 7mA.

A reference voltage is applied to pin 6, the threshold pin. This is the non-inverting input of one of the comparators. Its inverting input is connected to an internal potential divider across the supply – the potential divider values are such that this input is at two thirds of the supply voltage. When the comparator's two inputs are roughly the same it operates the flip-flop, which abruptly switches on the totem-pole output transistors. The load (47Ω) and the LED then cease to conduct.

## Construction

The circuit was built on a piece of single-sided PCB a

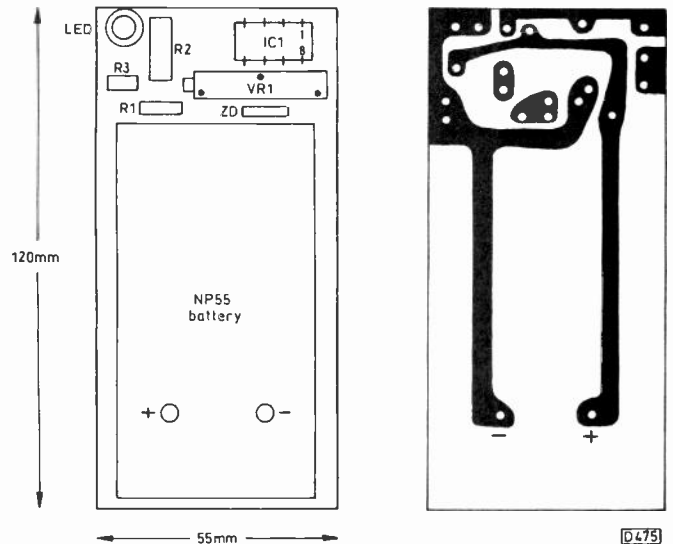


Fig. 2: Suggested layout.

couple of centimetres longer than the battery. Two small lengths of thick copper wire are used to make raised contacts for the battery, which can be held in place with an elastic band. The exact trip voltage is set by the 5kΩ potentiometer VR1. This is a multi-turn preset.

## Alternative Components

Low-voltage zener diodes are not always held in stock. As an alternative, the forward voltage drop across five or six silicon diodes connected in series could be used.

I found that 555 timer chips from different manufacturers have slightly different characteristics when used at low voltage. The use of an 8-pin DIL socket is thus recommended.

## Setting Up

Use an adjustable power supply to simulate the battery. Adjust VR1 so that the LED goes out when the output from the power supply is reduced to 4.5V. You will need to increase the output from the supply to about 5V before the LED comes on again. This hysteresis prevents circuit oscillation.

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**24v AC 96WATT** Cased power supply. New. £13.99 ref APR14.

**MILITARY SPECGEIGER COUNTERS** Unused unstraight from Her majesty's forces. £50 ref MAG 50P3.

**OUTDOOR SOLAR PATH LIGHT** Captures sunlight during the day and automatically switches on a built in lamp at dusk. Complete with sealed lead acid battery etc. £19.99 ref MAR20P1.

**ALARM VERSION** Of above unit comes with built in alarm and pi to deter intruders. Good value at just £24.99 ref MAR25P4.

**CARETAKER VOLUMETRIC Alarm**, will cover the whole of the ground floor against forced entry. Includes mains power supply and integral battery backup. Powerful internal sounder, will take external bell if req'd. Retail £150+, ours? £49.99 ref MAR50P1.

**TELEPHONE CABLE** White 6 core 100m reel complete with a pack of 100 clips. Ideal phone extras etc. £7.99 ref MAR8P3.

**MICRODRIVE STRIPPERS** Small cased tape drives ideal for stripping, lots of useful goodies including a smart case, and lots of components. £2 each ref JUN2P3. Box of 10 just £9.99 ref EF207.

**SOLAR POWER LAB SPECIAL** You get TWO 6"x6" 6v 130mA solar cells, 4 LED's, wire, buzzer, switch plus 1 relay or motor. Superb value kit just £5.99 REF: MAG6P8

**BUGGING TAPE RECORDER** Small voice activated recorder, uses micro cassette complete with headphones. £28.99 ref MAR29P1

**ULTRAMINI BUBBLE MIC** 6mm x 3.5mm made by AKG. 5.12v electret condenser. Cost £12 ea. Ours? just four for £9.99 REF MAG10P2

**RGB/CGA/EGA/TTL COLOUR MONITORS** 12" in good condition. Back ordered metal case. £79 each REF JUN79

**ANSWER PHONES** Returns with 2 faults, we give you the bits for 1 fault, you have to find the other yourself. BT Response 200's £18 ea REF MAG18P1. PSU £5 ref MAG5P12.

**SWITCHED MODE PSU** ex equip, 60w +5v @5A, -5v @.5A, +12V @2A, -12V @.5A 120/220v cased 245x88x55mm IEC input socket £6.99 REF MAG7P1

**PLUG IN PSU 9V** 200mA DC £2.99 each REF MAG3P9

**PLUG IN ACORN PSU** 19v AC 14w. £2.99 REF MAG3P10

**POWER SUPPLY** fully cased with mains and o/p leads. 7v DC 900mA output. Bargain price £5.99 ref MAG6P9

**ACORN ARCHMEDES PSU** +5v @ 4.4A, on/off sw uncased, selectable mains input, 145x100x45mm £7 REF MAG7P2

**9v DC POWER SUPPLY** Standard plug in type 150mA 9v DC with lead and DC power plug. price for two is £2.99 ref AUG3P4.

**AA NICAD PACK** encapsulated pack of 8 AA nicad batteries (tagged) ex equip, 55x32x32mm. £3 a pack. REF MAG3P11

**13.8V 1.9A** psu cased with leads. Just £9.99 REF MAG10P3

**PPC MODEM CARDS**. These are high spec plug in cards made for the Amstrad laptop computers. 2400 baud dial up unit complete with leads. Clearance price is £5 REF: MAG5P1

**INFRA RED REMOTE CONTROLLERS** Originally made for hi spec satellite equipment but perfect for all sorts of remote control projects. Our clearance price is just £2 REF: MAG2

**200 WATT INVERTER** Converts 10-15v DC into either 110v or 240v AC. Fully cased 115x36x156mm, complete with heavy duty power lead, cigar plug, AC outlet socket. Auto overload shutdown, auto short circuit shut down, auto input over voltage shutdown, auto input under voltage shut down (with audible alarm), auto temp control, unit shuts down if overheated and sounds audible alarm. Fused reversed polarity protected. output frequency within 2%, voltage within 10%. A well built unit at a keen price. Just £64.99 ref AUG65

**UNIVERSAL SPEED CONTROLLER KIT** Designed by us for the C5 motor but ok for any 12v motor up to 30A. Complete with PCB etc. A heat sink may be required. £17.00 REF: MAG17

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**BOOMERANG** High tech, patented poly propylene, 34cm wing span. Get out and get some exercise for £4.99 ref EF83

**AIR RIFLES**. 22 As used by the Chinese army for training purposes, so there is a lot about! £39.95 Ref EF78. 500 pellets £4.50 ref EF80.

**PLUG IN POWER SUPPLYS** Plug in to 13A socket with output lead. three types available, 9vdc 150mA £2 ref EF58, 9vdc 200mA £2.50 ref EF59, 6.5vdc 500mA £3 ref EF61

**VIDEO SENDER UNIT**. Transmits both audio and video signals from either a videocamera, videorecorder, TV or Computer etc to any standard TV set in a 100' range! (tune TV to a spare channel) 12v DC

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**LOW COST WALKIE TALKIES** Pair of battery operated units with a range of about 200'. Ideal for garden use or as an educational toy. Price is £8 a pair REF: MAG 8P1 2 x PP3 req'd

**\*MINATURE RADIO TRANSCIVERS** A pair of walkie talkies with a range up to 2 km open country. Units measure 22x52x155mm. Including cases and ear pieces. 2xPP3 req'd. £30.00 pr. REF: MAG30

**COMPOSITE VIDEO KIT**. Converts composite video into separate H sync, V sync, and video. 12v DC. £8.00 REF: MAG8P2.

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**\*FM BUG KIT** New design with PCB embedded coil for extra stability. Works to any FM radio. 9v battery req'd. £5 REF: MAG5P5

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**ROCK LIGHTS** Unusual things these, two pieces of rock that glow when rubbed together believed to cause rain! £3 a pair Ref EF29.

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**Ferguson/JVC**  
Universal 2 Head many models ..... £7.50  
8950, 8951, 3V64, 3V65, FV10, 11, 20, 21, 22, 26, 30 etc ..... £14.50  
FV31, 14, HRD210, 211, 520, 540, 550 etc ..... £17.50

**Hitachi**  
VT130, 135, 250, 420, 425, 430, 530, 630 etc ..... £22.00  
VTVT100, 110, 120, 220, 400 etc ..... £19.00  
VT52, 60, 61, 63, 640 etc ..... £16.00  
VT11, 33, 6500, 8000, 9300 etc ..... £14.00

**Matsui/Saisho**  
VX730, 750, 735, 755, 990, VR2000, 3200, 3300, 3500, 3600 ..... £18.00

**Panasonic**  
Universal 2 Head many models ..... £7.50  
NVG130, 30, 40, NVJ30, NVL20 etc ..... £17.50  
NVG33, NVJ35, NVL25 ..... £22.50

**Sharp**  
VC9300, 381, 481, 500, 571, 600, 682, 772, VCA100, 105, 106, 202, VCD801, VCM73, T72 ..... £14.50

**Not all models are shown for each make. A vast range of other makes & models i.e. Akai, Alba, Anwa, Fidelity, Fisher, Funai, GEC, Goldstar, Granada, Grundig, Hitachi, Onon, Philips, Sanyo, Sentra, Proline, Salora, Sony, Samsung, Toshiba & Mitsubishi are available**

### IDLER ASSEMBLIES

**Akai**  
FF/Rew Idler VS1, 2, 4, 5, 6, 9, 15 ..... £3.45  
Take up Idler VS1, 2, 4, 5, 6, 9, 15 ..... £4.45  
Clutch Assemb. VS112, 105, 125, 165, 205 ..... £10.00  
Cassette Housing Repair Kit VS 22, 23 ..... £10.50

**Amstrad**  
Tape Creasing Kit VCR4500, 4600, TVR1 ..... £5.00

**Ferguson**  
Take up Idler 3V29, 30, 35 etc ..... £1.20  
Reel Idler 3V29, 30, 31, 32, 35, 36, 38, 39 ..... £3.00  
Take up Clutch 3V29, 30, 35, 36, 38, 39 ..... £2.85  
Idler Arm 3V58, 59, 65, FV10, 11, 13 etc ..... £2.25  
Cam Control Gear FV37, 43, 44, 46 ..... £2.75

Cap Motor Cog Repair Kit FV37 etc ..... £3.50

**Fisher**  
Idler Assembly FVHP615, 715, 905 etc ..... £5.00  
Gear Idler Assembly for above models ..... £4.50

**Hitachi**  
FF/Rew Idler VT11, 14, 33, 64, 88 etc ..... £2.50  
Clutch Assembly VT11, 14, 33, 64, 88 etc ..... £8.50  
Idlers for earlier models in stock also

**Panasonic**  
Idler Arm Unit NV370, 430, 830, G7, 10 ..... £3.50  
Idler Unit NV332, 777, 780 ..... £3.00

Ali G Mechanism Parts & Kits available  
G Mechanism Training Tape ..... £15.00

**Sanyo**  
Idler VHR1100, 1300, 1500, 2100, 2500 ..... £5.50

**Sharp**  
Idler Assembly VC9300, 381, 481, 581 ..... £3.50  
Idler Assembly VC651, 751, 781 etc ..... £6.50  
Master Cam VC651, 772, VCA100 etc ..... £1.50

**MISCELLANEOUS MAKES**  
ALBA - MOTOR PULLEY 4000 ..... £1.20  
Idler VCR5000, 6000 ..... £3.50  
Goldstar - Idler GHV51, 1221, VCP4000 ..... £3.00  
NEC - Idler N9013, 9033, 9053, 9066 ..... £6.65  
Philips - Idler Mod. - VR6462, 6463 ..... £4.50  
Samsung - Idler V1510, 520, 620, 626 ..... £1.50  
Idler Assemb. VB710, 790 ..... £9.75

**Not all the models are given under each make. Please ask for models & makes not listed**

### VIDEO MOTORS

**Ferguson**  
Capstan Motors 3V35, 36, 38, 39, 49 ..... £24.00  
FV14, 26, 29 ..... £33.00

**Hitachi**  
Capstan Motors - VT11, 14, 17, 38, 39 ..... £30.00  
VT33, 34 ..... £32.00  
VT62, 63, 64, 640, 65 ..... £22.75  
VT100, 110, 220, 225 ..... £22.00

**Sharp**  
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Akai - Power Board VS22, 23 etc ..... £29.00  
Amstrad - PSU Kit PRD500, 510 Satellite ..... £7.00  
Ferguson - PSU Kit Video ..... £7.00  
ITT - Pico 1/1A Chassis ..... £11.00

Philips - PSU Kit Anubis "A" Kit ..... £8.50  
PSU Kit G110 Chassis ..... £12.00  
PSU Kit G90AE/G90B Chassis ..... £11.00  
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Panasonic - G Deck genuine kits in stock

Sharp - Cassette Housing Kit VCA113 Series ..... £6.50

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Hinari - CT4/5, TVA1 ..... £17.50

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Matsui - 1440, 420 ..... £19.00

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Hitachi - Lopt1471/72/73 ..... POA  
Sony - 27XRT4 Lopt ..... POA  
Ask for models not listed

Panasonic - Originals ..... From £15.50  
Sony - Please quote Sony part No for price  
Other makes & models in stock. Please ask.

### BACK UP BATTERIES

Philips 1.2V Back Up Battery ..... £1.75  
Philips 2.4V Back Up Battery ..... £2.80  
Ferguson TX10 1.2V ..... £2.10  
Ferguson TX10 2.4V ..... £3.85  
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IC Circuit Protectors Most Values ..... £0.60  
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1994 Video Fault Guide ..... £9.00  
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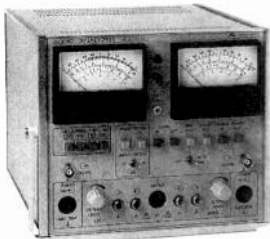
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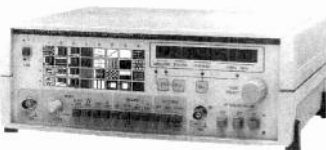
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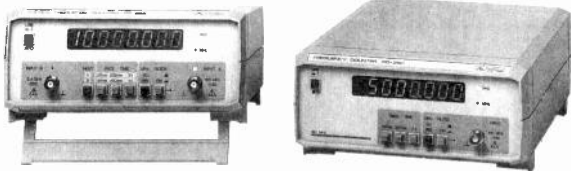
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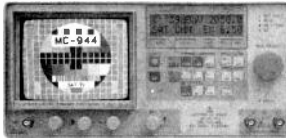
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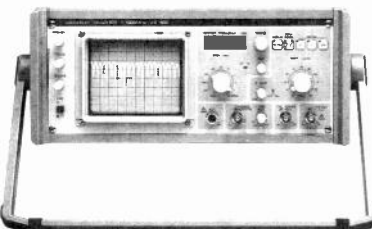
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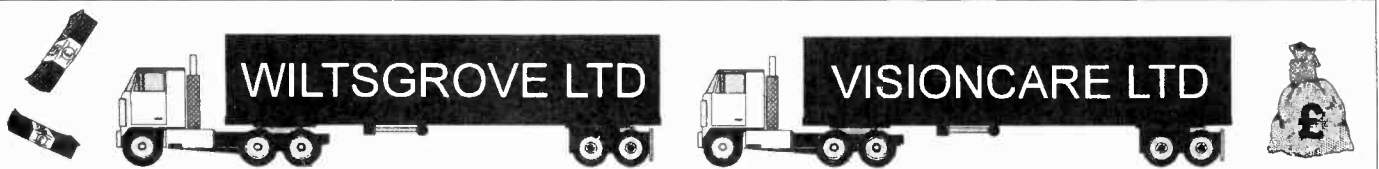
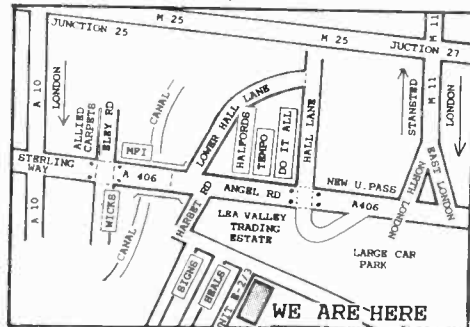
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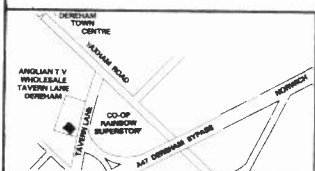
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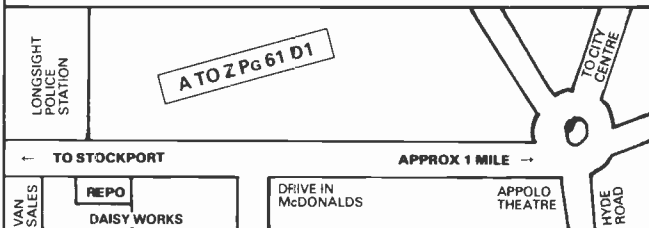
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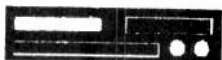


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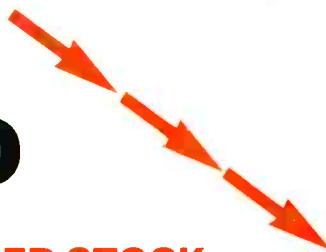
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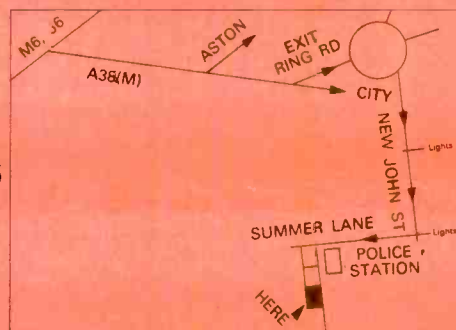
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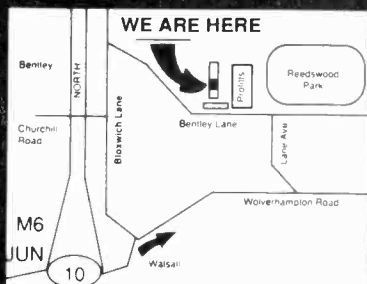
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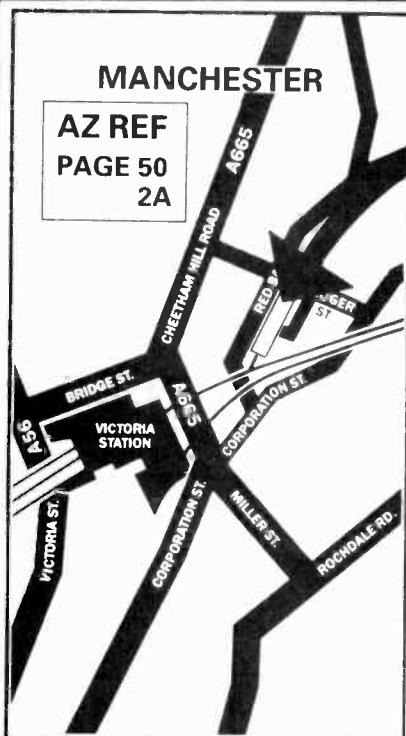
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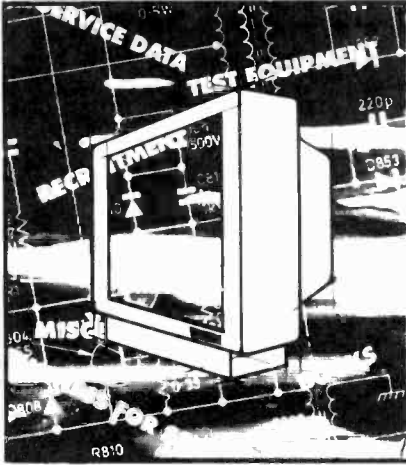
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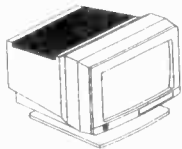
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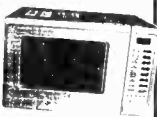
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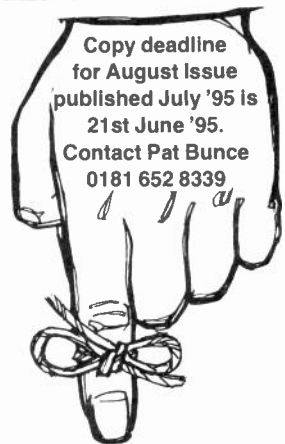
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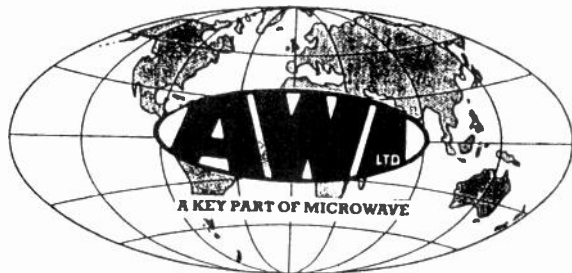
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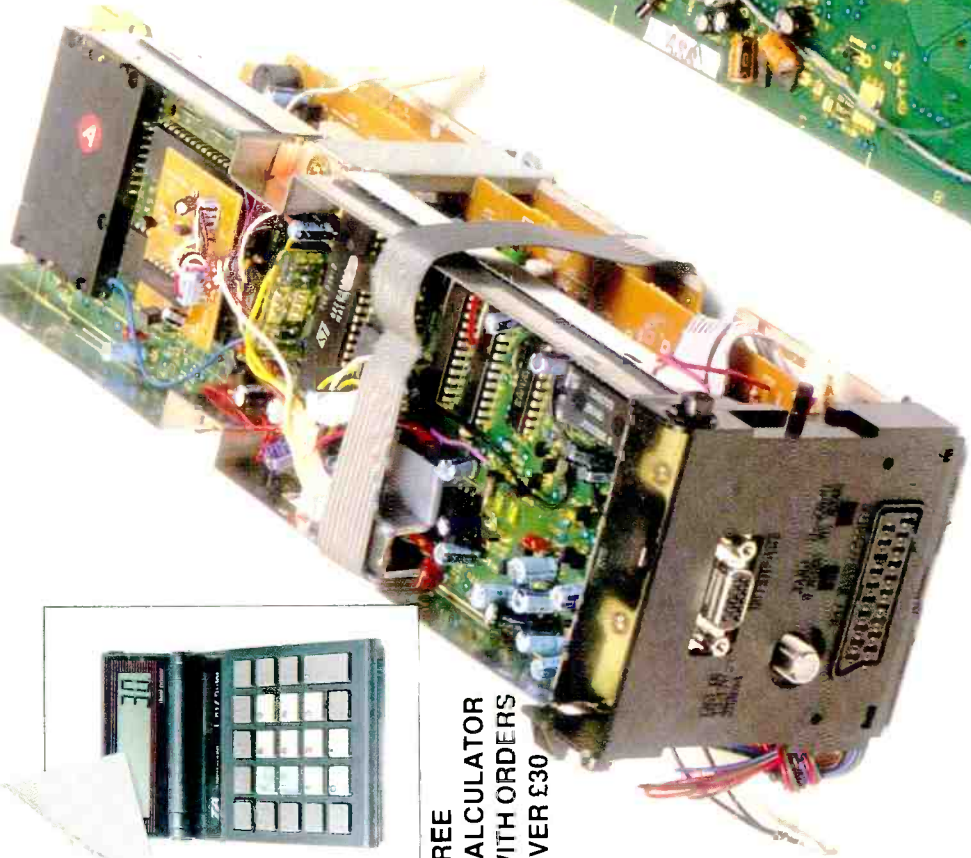
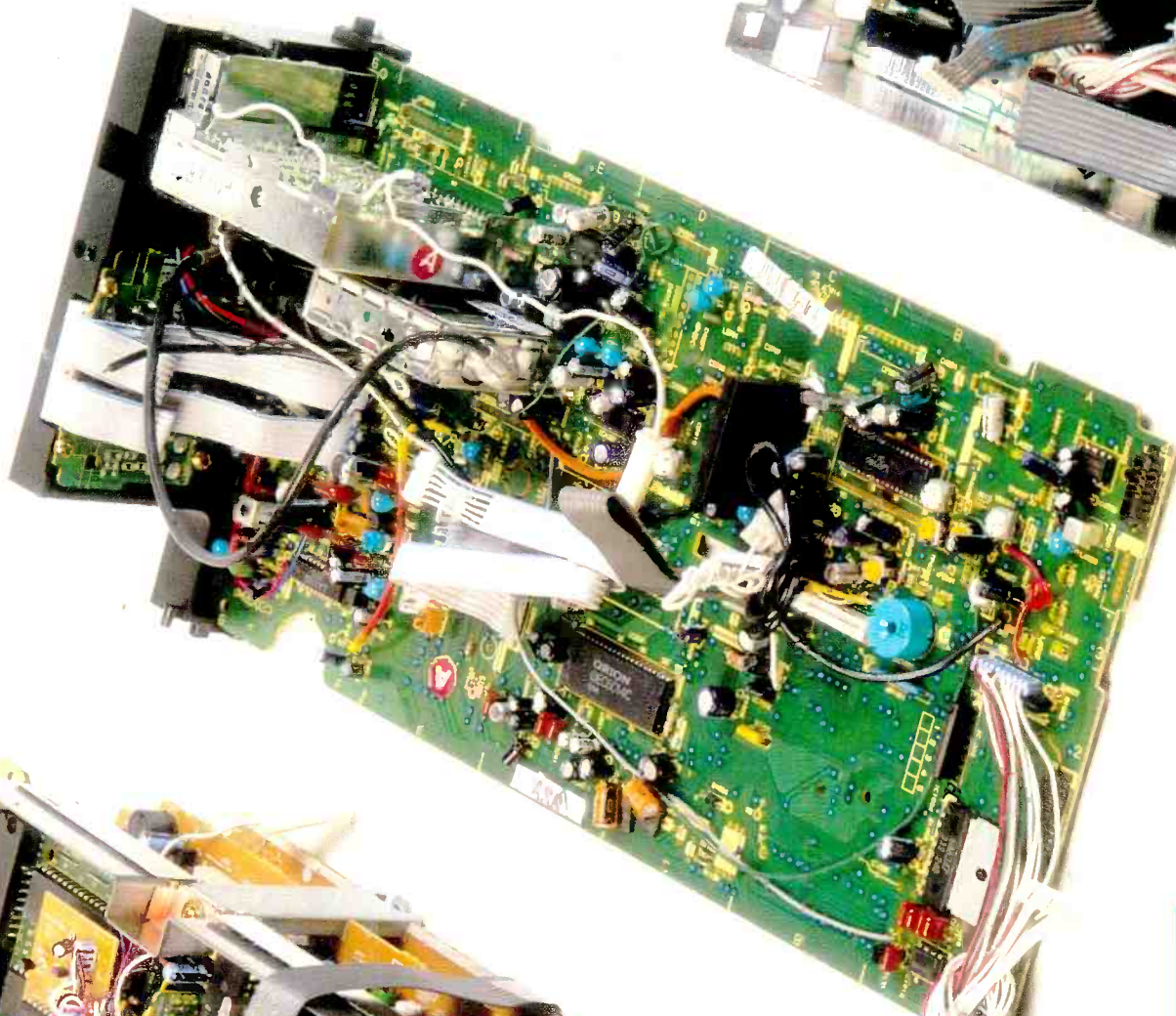
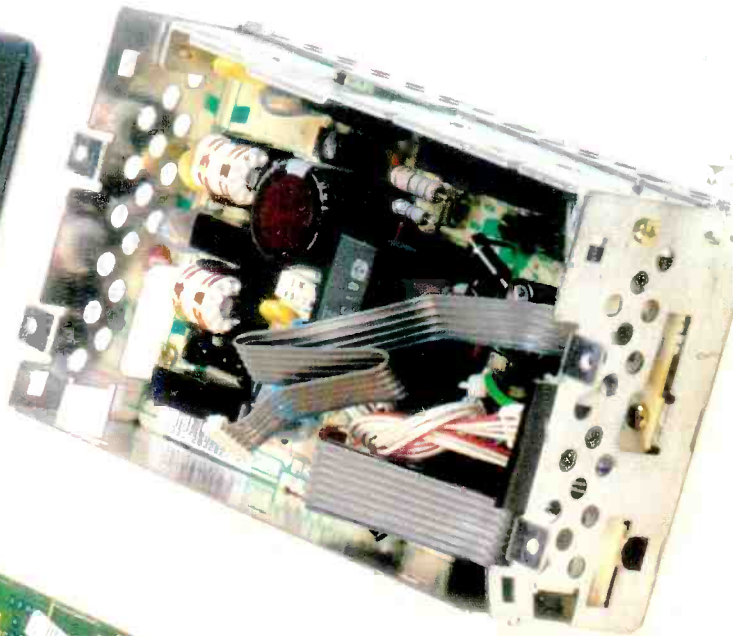
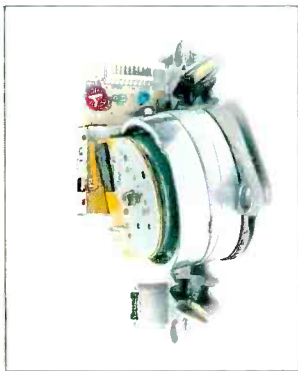
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