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SERVICING·VIDEO·SATELLITE·DEVELOPMENTS

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SERVICING THE ITT COMPACT 80R CHASSIS

The IRIS System

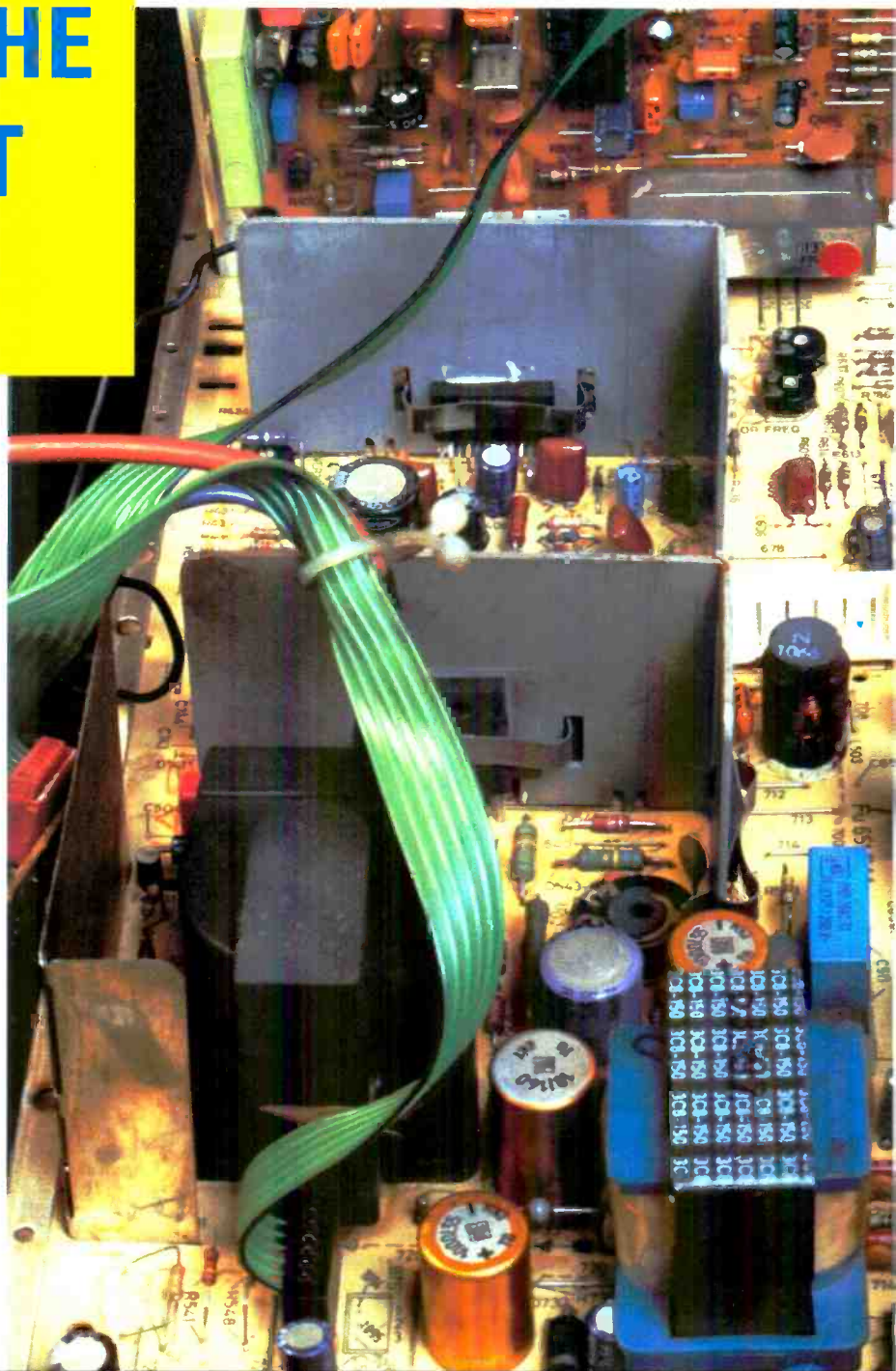
**Test Tapes and
Cassettes – Use
and DIY Recording**

Long-distance TV

**Income from Loss
Adjustment**

TV Fault Finding

VCR Clinic



CD Player Servicing



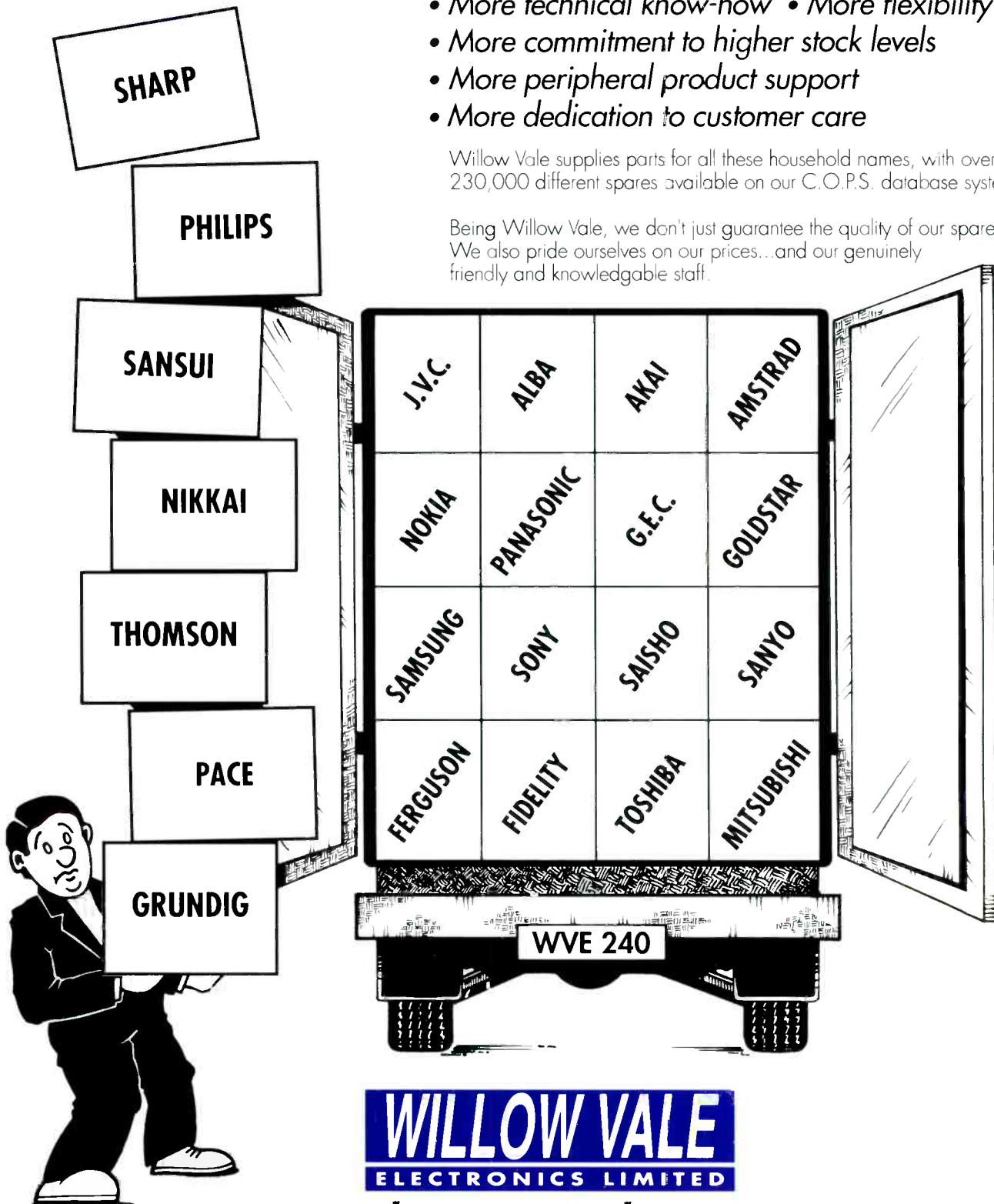
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TELEVISION

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January 18th

Vol. 45, No. 4

Issue 532

242 Quick Projects

John Pitt-Francis

How to obtain RGB analogue signals from a BSB satellite receiver to test most functions in older monitors, and a means of obtaining continuous VCR playback.

244 Test Tapes and Cassettes

Eugene Trundle

Use of the various types of test cassettes available and how to make DIY test tapes to save using, and possible damage to, expensive factory-standard alignment tapes.

255 Rechargeable Batteries

Pete Roberts

How NiCad cells work and how to reactivate them; the new NiMH (nickel metal hydride) technology; the different types of memory back-up button cells and their operation.

261 Servicing the ITT Compact 80R Chassis

Chris Watton

Start of a three-part series of articles on ITT colour TV chassis from the 1984-88 period.

263 Future of Audio?

NEC has developed a portable record/playback system that uses flash memory chips on a plastic card to store the signals.

270 Income from Loss Adjustment

Robert Blair

Providing a brown goods loss adjustment service for insurance companies can provide a useful source of extra income for service engineers.

278 The IRIS Code

David Botto

IRIS stands for Integrated Repair Information System. The code is used by many manufacturers to standardise documentation, process warranty claims and collect data

on stock faults. It also simplifies billing and record keeping in the workshop.

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The March issue will be published on February 15th

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

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MB8719	360p	STK3102II	530p	STK7226	600p	TA7140	100p	TCEP100	100p	TD42501	400p	TD44421	300p
MC1455	45p	STK3152II	900p	STK7251	500p	TA7157	100p	TD62308AP	200p	TD42503	200p	TD44426	170p
MC1496	65p	STK3156	500p	STK7308	350p	TA7193	320p	TD62382	200p	TD42504	200p	TD44427	200p
MC3401	45p	STK4017	400p	STK7309	400p	TA7200	200p	TD62506	200p	TD42505	200p	TD44430	200p
NE555	45p	STK4019	400p	STK7348	400p	TA7207	150p	TD62506	200p	TD42506	500p	TD44437	300p
NE556	40p	STK4021	380p	STK7348	400p	TA7207	150p	TD6304AP	300p	TD42510	450p	TD44439	220p
NE558	80p	STK4024II	550p	STK7356	425p	TA7208	125p	TD6306P	350p	TD42514A	500p	TD44440	180p
NE565	110p	STK4025	530p	STK7358	440p	TA7214	220p	TD6306P	350p	TD42515	450p	TD44442	240p
NE567	115p	STK4028	480p	STK7402	560p	TA7217	145p	TD6359P	300p	TD42530	450p	TD44445	250p
NE571	290p	STK4028	550p	STK7404	400p	TA7220	220p	TD6359P	300p	TD42532	120p	TD44445	250p
NE592	140p	STK4031	510p	STK7404	400p	TA7222	220p	TD6359P	300p	TD42532	120p	TD44450	225p
NE593P	140p	STK4036	470p	STK7408	675p	TA7223	210p	TD6359P	300p	TD42541	120p	TD44452	250p
SAA1006	300p	STK4038	680p	STK7410	900p	TA7225	300p	TD6359P	300p	TD42542	110p	TD44453	275p
SAA1008	450p	STK4040II	650p	STK7554	600p	TA7226	290p	TD6359P	300p	TD42543	210p	TD44480	280p
SAA1010	400p	STK4042II	600p	STK7561	650p	TA7227	170p	TD6359P	300p	TD42543	210p	TD44482	350p
SAA1024	250p	STK4044	800p	STK7562	1000p	TA7230	120p	TD6359P	300p	TD42546	200p	TD44482	350p
SAA1025	140p	STK4046	800p	STK7623	950p	TA7231	95p	TD6359P	300p	TD42547	100p	TD44482	350p
SAA1025	350p	STK4048	1280p	STK8050	750p	TA7233	120p	TD6359P	300p	TD42548	300p	TD44482	350p
SAA1124	200p	STK4060	510p	STK8250	500p	TA7237	300p	TD6359P	300p	TD42555	175p	TD44482	350p
SAA1250	280p	STK4065	650p	STK8260	1200p	TA7238	400p	TD6359P	300p	TD42556	230p	TD44482	350p
SAA1251	380p	STK4101	500p	STK8280	1850p	TA7240	160p	TD6359P	300p	TD42558	500p	TD44482	350p
SAA1274	280p	STK4111	500p	STK73410	350p	TA7241	165p	TD6359P	300p	TD42575A	100p	TD44482	350p
SAA1293	550p	STK4112	500p	STK73410II	350p	TA7242	190p	TD6359P	300p	TD42575B	100p	TD44482	350p
SAA3004	410p	STK4121	600p	STK7360S	375p	TA7243	320p	TD6359P	300p	TD42575C	100p	TD44482	350p
SAA5000	200p	STK4122	500p	STR370	300p	TA7245	225p	TD6359P	300p	TD42578A	200p	TD44482	350p
SAA5010	220p	STK4131	600p	STR371	400p	TA7267	220p	TD6359P	300p	TD42579A	250p	TD44482	350p
SAA5012	400p	STK4132II	600p	STR380	350p	TA7269	260p	TD6359P	300p	TD42582	130p	TD44482	350p
SAA5020	350p	STK4141	420p	STR381	390p	TA7270	170p	TD6359P	300p	TD42590	170p	TD44482	350p
SAA5030	440p	STK4151	680p	STR382	450p	TA7271	170p	TD6359P	300p	TD42591	110p	TD44482	350p
SAA5040A	400p	STK4152	620p	STR383	450p	TA7272	260p	TD6359P	300p	TD42592	110p	TD44482	350p
SAA5040B	400p	STK4162	650p	STR440	700p	TA7273	300p	TD6359P	300p	TD42593	250p	TD44482	350p
SAA5050	650p	STK4161	650p	STR450	520p	TA7274	210p	TD6359P	300p	TD42600	250p	TD44482	350p
SAA5231	300p	STK4162	550p	STR451	600p	TA7280	190p	TD6359P	300p	TD42611A	100p	TD44482	350p
SAA5231PE	800p	STK4171	750p	STR452	600p	TA7281	200p	TD6359P	300p	TD42630	300p	TD44482	350p
SAB301A	200p	STK4172II	800p	STR453	600p	TA7282	160p	TD6359P	300p	TD42640	220p	TD44482	350p
SAB303S	600p	STK4181	680p	STR454	400p	TA7283	200p	TD6359P	300p	TD42641	220p	TD44482	350p
SA301A	220p	STK4182II	750p	STR455	500p	TA7288	220p	TD6359P	300p	TD42654	200p	TD44482	350p
SA401A	220p	STK4191	700p	STR456	470p	TA7299	200p	TD6359P	300p	TD42670	150p	TD44482	350p
SA403A	270p	STK4192	700p	STR457	600p	TA7310	100p	TD6359P	300p	TD42732	280p	TD44482	350p
SA405A	280p	STK4231II	600p	STR470	400p	TA7312	120p	TD6359P	300p	TD42760	400p	TD44482	350p
SA41A	210p	STK4332	365p	STR471	400p	TA7313	120p	TD6359P	300p	TD42770	250p	TD44482	350p
SA432A	220p	STK4241V	1250p	STR1195	500p	TA7314	175p	TD6359P	300p	TD42791	275p	TD44482	350p
SA443A	270p	STK4272</											

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	2SC3893	225p	2SD836A	60p	2SD1279	600p	2SD1815	100p
2SA1380	75p	2SC1010	225p	2SC1735	70p	2SC2271	30p	2SC2751	270p	2SC3280	200p	2SC3895	400p	2SD837	55p	2SD1288	175p	2SD1825	60p
2SA1381	100p	2SC1012	75p	2SC1739	800p	2SC2274	15p	2SC2752	140p	2SC3281	200p	2SC3897	650p	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	2SC2759	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	2SC3953	60p	2SD850	170p	2SD1302	20p	2SD1858	40p
2SA1489	300p	2SC1050	280p	2SC1758	30p	2SC2295	60p	2SC2785	60p	2SC3300	400p	2SC3973	210p	2SD856	48p	2SD1308	80p	2SD1877	250p
2SA1491	300p	2SC1060	70p	2SC1775	10p	2SC2298	35p	2SC2786	20p	2SC3303	100p	2SC3987	220p	2SD858	250p	2SD1309	140p	2SD1878	230p
2SA1493	500p	2SC1061	85p	2SC1781	20p	2SC2307	500p	2SC2787	10p	2SC3306	130p	2SC3996	1200p	2SD863	23p	2SD1310	140p	2SD1879	275p
2SA1516	280p	2SC1070	65p	2SC1789	100p	2SC2308	10p	2SC2791	50p	2SC3307	600p	2SC4006	100p	2SD864	200p	2SD1313	1000p	2SD1884	300p
2SA1535	175p	2SC1096	40p	2SC1809	40p	2SC2312	300p	2SC2792	220p	2SC3309	150p	2SC4020	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	2SC4056	350p	2SD868	260p	2SD1347	70p	2SD1910	280p
2SB560	25p	2SC1114	415p	2SC1819	70p	2SC2320	10p	2SC2810	360p	2SC3323	480p	2SC4106	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	25p	2SC4124	250p	2SD879	60p	2SD1376	125p	2SD1929	60p
2SB566	50p	2SC1124	270p	2SC1829	500p	2SC2331	50p	2SC2824	75p	2SC3333	120p	2SC4169	60p	2SD880	40p	2SD1379	100p	2SD1939	75p
2SB595	55p	2SC1161	110p	2SC1833	40p	2SC2333	200p	2SC2825	900p	2SC3345	100p	2SC4236	550p	2SD882	25p	2SD1380	100p	2SD1941	500p
2SB596	50p	2SC1162	30p	2SC1834	50p	2SC2334	50p	2SC2826	200p	2SC3352	200p	2SC4237	650p	2SD882A	100p	2SD1384	50p	2SD1959	280p
2SB598	30p	2SC1164	600p	2SC1845	15p	2SC2335	75p	2SC2827	200p	2SC3353	280p	2SC4242	170p	2SD884	35p	2SD1390	350p	2SD1961	50p
2SB600	500p	2SC1166	750p	2SC1846	35p	2SC2344	150p	2SC2832	300p	2SC3355	50p	2SC4301	550p	2SD885	200p	2SD1391	250p	2SD1978	50p
2SB646	40p	2SC1166	750p	2SC1846	35p	2SC2344	150p	2SC2832	300p	2SC3355	50p	2SC4301	550p	2SD885	200p	2SD1392	150p	2SD1984	450p
2SB647	20p	2SC1170	180p	2SC1847	45p	2SC2347	60p	2SC2834	400p	2SC3356	120p	2SC4742	275p	2SD896	200p	2SD1395	150p	2SD2012	50p
2SB648	45p	2SC1172	150p	2SC1855	85p	2SC2353	120p	2SC2837	250p	2SC3358	50p	2SC4769	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
2SB888	90p	2SC1195	210p	2SC1955	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	120p	2SD200	180p	2SD917	300p	2SD1398	120p	2SD2333	300p
2SB705	200p	2SC1213	15p	2SC1875	220p	2SC2365	280p	2SC2878	20p	2SC3378	120p	2SD201	260p	2SD921	320p	2SD1399	300p	2SD2333	300p
2SB707	200p	2SC1214	15p	2SC1881	70p	2SC2369	100p	2SC2879	3200p	2SC3383	80p	2SD202	195p	2SD923	360p	2SD1400	280p	2SD2333	300p
2SB716	20p	2SC1215	25p	2SC1890	15p	2SC2371	25p	2SC2883	60p	2SC3387	550p	2SD203	25p	2SD946	120p	2SD1402	150p	2SD2333	300p
2SB718	60p	2SC1216	200p	2SC1904	125p	2SC2373	210p	2SC2888	200p	2SC3393	80p	2SD204	75p	2SD947	100p	2SD1406	60p	2SD2333	300p
2SB727	200p	2SC1222	15p	2SC1906	15p	2SC2383	50p	2SC2889	50p	2SC3399	50p	2SD205	30p	2SD950	300p	2SD1407	60p	2SD2333	300p
2SB754	80p	2SC1226	75p	2SC1907	20p	2SC2389	45p	2SC2909	60p	2SC3400	35p	2SD206	65p	2SD951	290p	2SD1408	125p	2SD2333	300p
2SB755	310p	2SC1252	850p	2SC1909	250p	2SC2407	110p	2SC2911	80p	2SC3401	50p	2SD207	300p	2SD957A	520p	2SD1409	170p	2SD2333	300p
2SB772	25p	2SC1278	110p	2SC1913	90p	2SC2408	120p	2SC2912	120p	2SC3402	40p	2SD208	40p	2SD958	60p	2SD1412	75p	2SD2333	300p
2SB774	50p	2SC1279	30p	2SC1921	15p	2SC2412K	50p	2SC2921	650p	2SC3403	400p	2SD209	350p	2SD965	35p	2SD1413	60p	2SD2333	300p
2SB775	100p	2SC1306	90p	2SC1923	10p	2SC2440	200p	2SC2922	480p	2SC3412	800p	2SD210	240p	2SD965	35p	2SD1415	190p	2SD2333	300p
2SB791	280p	2SC1308K	350p	2SC1929	180p	2SC2458	110p	2SC2928	550p	2SC3416	30p	2SD211	650p	2SD973	60p	2SD1417	125p	2SD2333	300p
2SB795	60p	2SC1312	40p	2SC1940	110p	2SC2459	50p	2SC2929	280p	2SC3417	90p	2SD212	380p	2SD973A	70p	2SD1425	260p	2SD2333	300p
2SB825	135p	2SC1317	15p	2SC1941	27p	2SC2481	350p	2SC2934	75p	2SC3419	120p	2SD213	150p	2SD985	120p	2SD1426	160p	2SD2333	300p
2SB861	110p	2SC1318	10p	2SC1942	350p	2SC2482	20p	2SC2938	235p	2SC3422	75p	2SD214	140p	2SD985	120p	2SD1428	220p	2SD2333	300p
2SB882	180p	2SC1325	400p	2SC1944	350p	2SC2483	120p	2SC2939	400p	2SC3423	60p	2SD215	50p	2SD986	120p	2SD1429	410p	2SD2333	300p
2SB886	90p	2SC1327	20p	2SC1945	350p	2SC2484	185p	2SC2944	300p	2SC3446	150p	2SD216	120p	2SD986	120p	2SD1430	280p	2SD2333	300p
2SB890	180p	2SC1328	15p	2SC1946	1500p	2SC2491	200p	2SC2958	50p	2SC3447	200p	2SD217	55p	2SD986	120p	2SD1431	400p	2SD2333	300p
2SB951	190p	2SC1342	15p	2SC1947	450p	2SC2495	1900p	2SC2962	800p	2SC3456	200p	2SD218	350p	2SD986	120p	2SD1432	400p	2SD2333	300p
2SB1009	110p	2SC1345	15p	2SC1957	70p	2SC2498	50p	2SC2979	160p	2SC3457	125p	2SD219	150p	2SD986	120p	2SD1433	750p	2SD2333	300p
2SB1077	180p	2SC1358	270p	2SC1969	160p	2SC2500	25p	2SC2987	250p	2SC3459	180p	2SD220	350p	2SD986	120p	2SD1434	140p	2SD2333	300p
2SC182	75p	2SC1359	15p	2SC1970	100p	2SC2502	200p	2SC2988	150p	2SC3460	180p	2SD221	350p	2SD986	120p	2SD1435	165p	2SD2333	300p
2SC372	25p	2SC1360	70p	2SC1971	400p	2SC2519	60p	2SC2995	60p	2SC3461	350p	2SD222	15p	2SD986	120p	2SD1441	280p	2SD2333	300p
2SC380	10p	2SC1364	25p	2SC1972	600p	2SC2527	300p	2SC2999	50p	2SC3466	225p	2SD223	15p	2SD986	120p	2SD1445	200p	2SD2333	300p
2SC382	50p	2SC1383	25p	2SC1973	150p	2SC2534	150p	2SC3001	1400p	2SC3468	70p	2SD224	20p	2SD986	120p	2SD1450	80p	2SD2333	300p
2SC388A	60p	2SC1384	20p	2SC1973	150p	2SC2535	300p	2SC3012	300p	2SC3481	300p	2SD225	50p	2SD986	120p	2SD1451	260p	2SD2333	300p
2SC394	60p	2SC1393	20p	2SC1983	150p	2SC2538	100p	2SC3019	320p	2SC3482	275p	2SD226	70p	2SD986	120p	2SD1452	350p	2SD2333	300p
2SC403	25p	2SC1394	15p	2SC1984	150p	2SC2540	1900p	2SC3025	500p	2SC3486	275p	2SD227	18p	2SD986	120p	2SD1453	140p	2SD2333	300p
2SC454	15p	2SC1398	55p	2SC1985	100p	2SC2542	300p	2SC3026	550p	2SC3502	100p	2SD228	120p	2SD986	120p	2SD1455	250p	2SD2333	300p
2SC458	10p	2SC1400	50p	2SC1986	100p	2SC2545	55p	2SC3030	300p	2SC3503	50p	2SD229	300p	2SD986	120p	2SD1457	165p	2SD2333	300p
2SC460	10p	2SC1403	500p	2SC2001	150p	2SC2546	25p	2SC3037	125p	2SC3504	120p	2SD230	500p	2SD986	120p	2SD1459	125p	2SD2333	300p
2SC461	15p	2SC1407	550p	2SC2002	150p	2SC2547	65p	2SC3038	125p	2SC3505	240p	2SD231	50p	2SD986	120p	2SD1468	60p	2SD2333	300p
2SC495	45p	2SC1413	150p	2SC2003	20p	2SC2550	50p	2SC3039	80p	2SC3506	200p	2SD232	20p	2SD986	120p	2SD1479	200p	2SD2333	300p
2SC496	25p	2SC1419	50p	2SC2004	20p	2SC2551	70p	2SC3040	260p	2SC3507	650p	2SD233	530p	2SD986	120p	2SD1487	225p	2SD2333	300p
2SC497	85p																		

VIDEO SERVICE KITS

AMSTRAD			
VCR700			
<i>Contents</i>			
BELT SET, PINCH ROLLER, REEL IDLER, VIDEO LAMP		£5.50	
Order Code: SK41			
FERGUSON & JVC			
3V243			
HRD455/HRD725			
<i>Contents</i>			
BELT SET, PINCH ROLLER	<i>Economy Kit Contents</i>		
CLUTCH MECHANISM, TENSION BAND	BELT SET, PINCH ROLLER, SUPPLY CLUTCH, TAKE UP CLUTCH	£17.50	£9.50
Order Code: SK37	Order Code: SK38		
3V58/59/64/65			
HRD170/180/210/230/300/320/370/400/430/530/700/750			
HRSS5000			
<i>Contents</i>			
BELT SET, PINCH ROLLER, IDLER ARM, TENSION BAND		£8.50	
Order Code: SK44			
3V29/3V30			
HR7200/7300/7350			
<i>Contents</i>			
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES		£6.00	
Order Code: SK05			
3V35/36/38/39/49			
HRD110/111/120/225			
<i>Contents</i>			
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES		£5.50	
Order Code: SK04			
3V31/3V42			
HR7600/7610/7650/7655			
<i>Contents</i>			
BELT SET, T/U REEL TABLE TYRE, PINCH ROLLER, REEL IDLER, T/U CLUTCH, T/U IDLER TENSION BAND, VIDEO LAMP	<i>Economy Kit Contents</i>	£12.00	£5.50
Order Code: SK33	Order Code: SK34		
3V35/36/38/39/49			
HRD110/111/120/121/225			
<i>Contents</i>			
BELT SET, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, T/U CLUTCH, T/U IDLER, REEL IDLER, TENSION BAND	<i>Economy Kit Contents</i>	£10.50	£5.80
Order Code: SK35	Order Code: SK36		
3V29/3V30			
HR7200/7300/7350			
<i>Contents</i>			
BELT SET, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, REEL IDLER, T/U CLUTCH, T/U IDLER, TENSION BAND, VIDEO LAMP	<i>Economy Kit Contents</i>	£11.00	£5.10
Order Code: SK31	Order Code: SK32		
3V44/45/48/53/54/55/57			
HRP50/HRD140/150/158/160			
HRD250/257/565/566/755			
<i>Contents</i>			
BELT SET, PINCH ROLLER, CLUTCH MECHANISM, TENSION BAND		£15.00	£9.50
Order Code: SK39			
FISHER			
FVHP905/906/907/908/910/911/916/918			
<i>Contents</i>			
BELT SET, PINCH ROLLER, IDLER, GEAR, IDLER UNIT, TENSION BAND	<i>Economy Kit Contents</i>	£13.00	£5.00
Order Code: SK57	Order Code: SK58		
FVHP615/618/620/622/710/711/715/716/720/721/722/725/730/830/840			
<i>Contents</i>			
BELT SET, PINCH ROLLER, IDLER, GEAR, IDLER UNIT, TENSION BAND	<i>Economy Kit Contents</i>	£12.50	£3.60
Order Code: SK68	Order Code: SK69		
HITACHI			
VT11/VT33			
<i>Contents</i>			
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES		£6.00	
Order Code: SK08			

UNIVERSAL TRIPLER Price: £4.00 each

AMSTRAD MODE KIT Price: £3.00 each

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VIDEO SERVICE KITS (Cont.)

VT11/VT33			
<i>Contents</i>			
BELT SET, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, FF/REW IDLER, CLUTCH PLATE, TENSION BAND		£14.00	
Order Code: SK45			
<i>Economy Kit Contents</i>			
BELT SET, PINCH ROLLER, FF/REW IDLER TYRE, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE		£4.50	
Order Code: SK46			
VT52/61/62/63/64/65/85/86/640			
<i>Contents</i>			
BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE, TENSION BAND		£14.00	
Order Code: SK49			
<i>Economy Kit Contents</i>			
BELT SET, PINCH ROLLER, FF/REW IDLER		£3.25	
Order Code: SK50			
VT400/405/410/13/14/15/18/420/25/26/28/430/31/35/48/450/498/510/520/25/26/530/35/36/540/545/46/48/570/75/576/580/85/88			
<i>Contents</i>			
TIMING BELT, PINCH ROLLER, FF/REW ARM, CLUTCH BASE, TENSION BAND		£11.50	
Order Code: SK52			
VT100/110/111/113/115/118/120/125/128/130/135/138/145/150/175/220/225/250/255/258/260/VTL30			
<i>Contents</i>			
BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE, TENSION BAND		£14.00	
Order Code: SK51			
PANASONIC			
NV2000/NV2010			
<i>Contents</i>			
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES		£6.25	
Order Code: SK03			
<i>Economy Kit Contents</i>			
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES		£5.50	
Order Code: SK02			
NV300/NV330/NV333/NV340/NV366			
<i>Contents</i>			
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRE		£5.50	
Order Code: SK01			
NV2000/NV2010			
<i>Contents</i>			
BELT SET, PINCH ROLLER, FF IDLER, PLAY IDLER, TENSION BAND, VIDEO LAMP		£8.00	
Order Code: SK13			
<i>Economy Kit Contents</i>			
BELT SET, PINCH ROLLER, IDLER TYRE, PULLEY TYRE		£4.50	
Order Code: SK14			
NV7000/NV7200/NV7800			
<i>Contents</i>			
BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND		£8.50	
Order Code: SK11			
<i>Economy Kit Contents</i>			
BELT SET, PINCH ROLLER, IDLER TYRE, CLUTCH TYRE		£4.20	
Order Code: SK12			
NV300/NV330/NV333/NV340/NV366			
<i>Contents</i>			
BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND		£7.50	
Order Code: SK15			
<i>Economy Kit Contents</i>			
BELT SET, PINCH ROLLER, IDLER TYRE, PLAY IDLER TYRE		£4.00	
Order Code: SK16			
NVG7/NVG9/NVG10/NVG11/NVG12/NVG14/NVG15/NVG16/NVG18/NVG30/NVG120/NVG130/NVG400/NVH65 (PX/AC)/AG1810 (P/K)			
<i>Contents</i>			
LOADING BELT, CAPSTAN, BELT, PINCH ROLLER, IDLER, TENSION BAND		£8.00	
Order Code: SK27			
<i>Economy Kit Contents</i>			
LOADING BELT, CAPSTAN, BELT, PINCH ROLLER, IDLER TYRE		£4.00	
Order Code: SK28			
NV332			
<i>Contents</i>			
BELT SET, PINCH ROLLER, PLAY IDLER, FF/REW IDLER, TENSION BAND, FF/REW TYRE		£12.00	
Order Code: SK29			
<i>Economy Kit Contents</i>			
BELT SET, PINCH ROLLER, IDLER TYRE		£5.10	
Order Code: SK30			
NV230/250/260/280/430/450/460/470/650/810/890/AG1200PK/AG1500PK			
<i>Contents</i>			
BELT SET, PINCH ROLLER, IDLER, TENSION BAND		£6.00	
Order Code: SK23			
<i>Economy Kit Contents</i>			
BELT SET, PINCH ROLLER, IDLER TYRE		£3.50	
Order Code: SK24			
NV600/NV688			
<i>Contents</i>			
BELT SET, PINCH ROLLER, PLAY IDLER, FF/REW IDLER, TENSION BAND		£12.00	
Order Code: SK25			
<i>Economy Kit Contents</i>			
BELT SET, PINCH ROLLER, PLAY IDLER TYRE, FF/REW IDLER TYRE		£6.00	
Order Code: SK26			
NV730/NV770			
<i>Contents</i>			
SLOT IN BELT, LOADING BELT, PINCH ROLLER, IDLER UNIT, TENSION BAND		£6.50	
Order Code: SK19			
<i>Economy Kit Contents</i>			
SLOT IN BELT, LOADING BELT, PINCH ROLLER, IDLER TYRE		£4.00	
Order Code: SK20			
NV370/NV380/480/630/780/830/850/AG2100PK/AG2200PK			
<i>Contents</i>			
BELT SET, PINCH ROLLER, IDLER, TENSION BAND		£6.00	
Order Code: SK21			
<i>Economy Kit Contents</i>			
BELT SET, PINCH ROLLER, IDLER TYRE		£3.00	
Order Code: SK22			
NV777/NV788			
<i>Contents</i>			
BELT SET, PINCH ROLLER, IDLER UNIT, TENSION BAND		£7.00	
Order Code: SK17			
<i>Economy Kit Contents</i>			
BELT SET, PINCH ROLLER, IDLER TYRE		£4.00	
Order Code: SK18			

VIDEO SERVICE KITS (Cont.)

SHARP			
VC381			
<i>Contents</i>			
BELT SET, PINCH ROLLER, REEL IDLER, TENSION BAND, VIDEO LAMP		£9.00	
Order Code: SK47			
<i>Economy Kit Contents</i>			
BELT SET, PINCH ROLLER, REEL IDLER TYRE		£4.75	
Order Code: SK48			
VC500/VC571/VC581/VC582/VC583/VC584/VC5F3			
<i>Contents</i>			
BELT SET, PINCH ROLLER, REEL IDLER, TENSION BAND		£9.50	
Order Code: SK60			
<i>Economy Kit Contents</i>			
BELT SET, PINCH ROLLER, REEL IDLER		£6.50	
Order Code: SK61			
VC781/VC7810/VC7822/VC785/VC786/VC793/VC800/ VCA100/VCA102/VCA104/VCA202			
<i>Contents</i>			
BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND		£13.50	
Order Code: SK64			
<i>Economy Kit Contents</i>			
BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE		£6.25	
Order Code: SK65			
VC681/VC682/VC684/VC685/VC693/VC699/VC6F3/VC700			
<i>Contents</i>			
BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND		£13.50	
Order Code: SK62			
<i>Economy Kit Contents</i>			
BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE		£6.00	
Order Code: SK63			

**FOR MORE DETAILS OF OVER 500
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BACKUP BATTERIES

REPLACEMENT PHILIPS NI-CAD BACKUP BATTERIES		
Replaces Ferguson Part No:		
00E6-067-001, used on TX10, L2V		150p
Replaces Philips Part No's:		
138-10138, 138-10313, 1.2V - 90mAh		120p
Replaces Philips Part No's:		
138-10229, 2.4V - 90mAh		200p

REPLACEMENT FERGUSON NI-CAD BACKUP BATTERIES		
Replaces Ferguson Part Nos:		
00E6-066-001, 2.4V		200p
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 2922010	1600p	LOT09
ITT CV800/173	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 E7	1400p	LOT18
SALORA FM0218B	1600p	LOT19
NORMENDE 5255	1600p	LOT20
ITT CVC 1150/1	1500p	LOT21
ITT COMPACT 80	1500p	LOT22
FE TX100 GREEN	1450p	LOT23
HINARI CT4/5 5113	1500p	LOT24
SELECO 6320410	1600p	LOT25
BLAUPUNKT 8667	1600p	LOT26
ITT COMPACT B1	1450p	LOT27
ITT CT3326 MUL	1500p	LOT28
ITT D066/37 EQ	1600p	LOT29
ITT 3546 EQ	1500p	LOT30
LUXOR 5810110	1600p	LOT31
SABA 849380920	1600p	LOT32
HITACHI 2434141 CP	1450p	LOT33
FE TX100 110 D	1700p	LOT34
HANTAREX 28021	1600p	LOT35
SHARP C3700 EQ	1600p	LOT36
HITACHI 2432981 CP	1500p	LOT37
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, TX1762, TX2112		
TX2112, TX2162, TXC22		
PANASONIC TLF14586F	2350p	LOT42
TC1651, TC2051, TC2061, TC2253, TC2263, TX5500		
HINARI	1600p	LOT43
Used On: CT15		
HITACHI 2434274	1400p	LOT44
CPT2174, CPT2176, CPT2178, 2434274		
We stock line output transformers for over 100 different models. Please ring 081-900 2329 for more information.		

IDLERS & PULLEYS REPLACEMENT

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VS1-2, VS4-5, VS15	FF-REW IDLER	M1327773	400p		
VS3, 6, 12, 50, 58, 59	T-UP IDLER	BV327815	500p		
VS1-2, VS4-5, VS15			600p		
VS3, 6, 12, 58, 59	IDLER	BV321979	900p		
VS125, 126, 156	IDLER ASSY	M2366960J2			
VS165, 240, 244, 245, 247, 248, 250, 512, 515, 516					
VS22, 38, 106, 112, 115, 116, 205, 220	T-UP IDLER	PU47752	£4.50		
VS600, VS900	UNLOADING IDLER	PU46381	£4.00		
VS600, VS900	REW IDLER	PU46380	£4.00		
VS600, VS900	IDLER	BV336067	£5.00		
VS1, 3, 4, 9, 12	REEL TABLE	BR347731	450p		
VS15, 58	CLUTCH	ML373043	1100p		
VS23, 35, 37, 53, 55	FF IDLER	BL321761	£3.20		
VS66, 75, VSA77	REW IDLER	W321762	£4.25		
VS700					
VS9700					
AMSTRAD					
VCR7000	IDLER	150280	£1.50		
TVR1, VCR4500	CLUTCH	150873	£3.75		
VCR4600, VCR5000, 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	MOUD KIT	(TAPE CREASING)	£3.00		
VCR4700					
MOUD KIT TAPE CREASING FOR AMSTRAD					
VCR4500, 4600, 4700			£3.00		
FERGUSON					
3V00, 3V01, 3V16	T-UP IDLER	PU47752	£4.50		
3V22, 3V22, 8900, 8901, 8904, 8906	T-UP IDLER	PU49280	£5.50		
3V16, 3V22					
8903, 8909, 8912, 8922					
3V23, 3V23, 3V30	REEL IDLER	PU49897	175p		
3V31, 3V32, 3V35, 8923, 8924, 8929, 8930, 8931, 8940, 8941, 8942					
3V23, 3V31	ROLLER ASSY	PU49042A	150p		
3V29, 3V30, 3V31	T-UP IDLER	51402	300p		
3V32, 3V35, 3V36, 3V38, 3V38, 3V43, 8930, 8931, 8940, 8941, 8942	T-UP CLUTCH	PU51390	200p		
3V29, 3V30, 3V31					
3V32, 8930, 8931, 8940, 8941, 8942	REEL IDLER	PU55374	200p		
3V35, 3V36, 3V38					
3V39, 3V49, 8943, 8944	T-UP CLUTCH	PU55373	150p		
3V35, 3V36, 3V38					
3V39, 3V49, 8943, 8944	IDLER ARM	PU58645	£2.25		
3V58, 3V59, 3V64					
3V65, 3V10, 3V11, 3V12, 3V13, 3V14, 3V20, 3V21, 3V22, 3V26	CLUTCH ASSY	PU58622	1200p		
3V30, 3V32, 3V33, 8950, VCT141			1050p		
3V42, 3V43	CLUTCH ASSY	PU58622	1200p		
3V43, 3V44, 3V45	CLUTCH ASSY	PU57658	1050p		
3V48, 3V53, 3V54, 3V55, 3V57, 8947, 8948	T-UP CLUTCH	PU56043-1-4	240p		
3V42, 3V43, 3V44	SUPPORT CLUTCH	PU56044-1-5	160p		
3V45, 3V46, 3V53, 3V54, 3V55, 3V56, 3V57, 8947, 8948	LOADING IDLER	PU43681	£4.00		
3V00, 3V01, 3V16	REW IDLER	PU46380	500p		
3V22, 3V22, 8900, 8901, 8902, 8903, 8904, 8906, 8909, 8912, 8922	IDLER	PU49281	£1.70		
HSHER					
FVHP420, 520, 530	FF-REW PULLEY	H1638531	80p		
FVHP615, 618, 620	COMP IDLER ASSY	F1430420400300	£220p		
FVHP622, 710, 711, FVHP720, 721, 722, FVHP725, 730, 830					
FVHP840, 805, 906, FVHP906, 910, 911, FVHP915, 916, 918	GEAR IDLER ASSY	F1430490400900	380p		
FVHP615, 618, 620					
FVHP622, 710, 711, FVHP720, 721, 722					
FVHP725, 730, 830, FVHP840					
FVHP615, 618, 620	REEL T-UP ASSY	F1430410400900	£5.50		
FVHP682, 710, 711, FVHP720, 721, 722					
FVHP725, 730, 830, FVHP840					
FVHP905, 906, 908	GEAR IDLER ASSY	F1430490402400	275p		
FVHP910, 911, 915, FVHP916, 918					
FVHP975, 980, 990	IDLER	F1430420400700	300p		
FVHP990, 5000, 5005					
FVHP990, 5075, 5100	REEL DRIVE ROLLER		£9.50		
FVHD40, 55, 140					
FVHP1, 10, 20	CLUTCH	F12430510404200	£9.50		
FVHP975, 980, 990	CLUTCH		£2.80		
FVHP420, 520, 530	TAKE UP IDLER		290p		
FVHP420, 520, 530	LOADING GEAR		90p		
FVHP990	REEL DRIVE PULLEY		£3.20		
VBS3500	IDLER		250p		
VBS7000	REW IDLER		90p		
GOLDSTAR					
GHV1221, 1232, 1240	CLUTCH GEAR	435038A	£2.50		
GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000, GHV2200, 8210, 8215, GHVPS1, VCP4100, 4130					
GHV1221, 1232, 1240	IDLER		110p		
GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000, GHV2200, 8210, 8215, GHVPS1, VCP4100, 4130					
HINARI					
VXL3, VXL20	REEL IDLER	40000009	110p		
VXL2	IDLER		110p		
VXL4, VXL35	IDLER		£2.75		
VXL4, VXL35	CLUTCH		£6.50		
VXL4, VXL12, VXL25	LIMITER POST		£1.30		
VXL30, VXL25, VTV300					
VXL5, VXL6	CLUTCH		£3.75		
VXL5, VXL6	GEAR HOLDER		£3.50		
VXL7, VXL8, VXL9	CLUTCH		£3.80		
HITACHI					
VT11-33, VT63-64		6879515	£7.50		
VT14, 17, 19, 38, 57, 86, 88, 34, 35, 39, 52, 61, 62, 65, 85, 330, 640, VT16S					
VT120-220, 100, 110	CLUTCH ASSY	6888624	£7.50		
111, 113, 115, 118, 200		6886972			
125, 128, 130, 135, 138, 145, 150, 175, 225, 250, 255, 258, 260, VTL30					
VT8000-8300, 7000	FF-REW IDLER	6413663	£2.80		
VT8500-8700					
VT8000-8300, 7000	PLAY IDLER	6414221	290p		
VT8500-8700					
VT8000-8300, 7000	FF-REW PULLEY	6383321	80p		
VT8500-8700					
VT9300-9500, 6500	FF-REW IDLER	6861471	250p		
VT680, 6800, 9700, 9900					
VT9300-9500, 6500	PLAY IDLER	6861482	230p		
VT680, 6800, 9700		6861481			
VT 9900					
VT9300-9500, 9700	IDLER	681505	£3.80		
VT9900, 6500, 680, 6800	IDLER	687043	£3.80		
VT11-33, VT63-64	FF-REW IDLER	6888971	125p		
VT14, 165, 17, 19, 34, VT35, 38, 39, 52, 61, 62, VT65, 85, 96, 98, 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, 260, VTL30					
VT400, 405, 410, 413	CLUTCH BASE	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, 626, 630, 635, 636, 640, 645, 646, VTS80, 85					
VT400, 405, 410, 413	CLUTCH GEAR	6896951	£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		£6.00		

VT680, 6500, 6800	FS BRAKE	6861505	230p		
VT9700, 9800					
HITACHI					
OUTPUT MODULE HM 6251		£5.50			
OUTPUT MODULE HM 6252		£8			
JVC					
HR300, 3660, 4100	T-UP IDLER SML	PU49280	£5.50		
HR7200, 7000, 7650	T-UP CLUTCH	PU53462A	220p		
HR7650, 7300, 7360, 7610					
HR7200, 7300, 7360	REEL IDLER	PU49267	175p		
HR7600, 7610, 7650, 7655, 7700					
HR7600, 7610, 7650	ROLLER ASSY	PU49042A	350p		
HR7655, 7700					
HR300, 3660, 4100	T-UP IDLER LRG	PU47752	£4.50		
HR7200, 7600, 7650	T-UP IDLER	PU51402A	100p		
HR7655, HRD110, HRD111, HR7300, 7350, 7610, HRD120-121, 225	T-UP CLUTCH	PU56373	150p		
HRD225, HRD111					
HRD110, HRD120-121, IDLER ARM		PU55374-3-8	200p		
HRD225, HRD111					
HRD170, 180, 210, 230	IDLER ARM	PU58465	£2.25		
HRD320, 370, 400, 430, 470, 530, 700, 750, 950, 3000					
HR55000, HR55500	CLUTCH MECH	PU56822	1200p		
HR0456, HR0725	CLUTCH MECH	PU57658	1050p		
HRD160, 150, 157, 158	CLUTCH MECH				
HR300, HR330	REW IDLER	PU46380	500p		
HR3660, HR4100					
HRD160, 150, 157, 158	TAKE UP CLUTCH	PU56043-1-4	240p		
HRD180, 150, 257, 495, 565, 566, 725, 755, HRP50					
HRD160, 150, 157, 158	TAKE UP CLUTCH	PU56044-1-5	160p		
HRD120, 150, 257, 495, 565, 566, 725, 755, HRP50					
MATSUJI					
VX730, 735, 750, 755, VX920, 850, 880, 890, 930	CLUTCH	850A00005	420p		
VX730, 735, 750, 755	LIMITED POST LEVER		£1.30		
VX770, 800, 810, 880	ASSY				
VX900					
VX800A, VX900	IDLER REEL		£1.50		
VX800A, VX820	REEL UNIT CLUTCH		280p		
MTSUBISHI					
HS326, 307, 318, 319, HS400, 410, 710	GEAR ASSY	522800201	£6.25		
HS337, 338, 347, 349	IDLER	552801701	325p		
HS411, 412, 421, HS810, HS820, HS830, HSE10, HSE20, HSE30, HSE30					
HSE70					
HS306, 307, 318, 319	IDLER	641C34301	£2.00		
HS400, 410, 710					
HS347, 349, 412	IDLER	522902002	£3.00		
HS810, HS820, HS830, HSE10, HSE20, HSE30, HSE70					
HS337, 338, 411, 421</					

REMOTE CONTROLS

Description	Order Code	Price	Description	Order Code	Price
GRUNDIG			PHILIPS (continued)		
TP160E	RC 107	900p	RC38	RC 301	875p
TP200, TP300	RC 380	800p	KT3 TEXT	RC 5301	800p
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	SABA		
TP661	RC 661	850p	T6772	RC 149	900p
HITACHI			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	SALORA		
A518612	RC903	900p	SERIES L	RC 190	875p
SCL002	RC904	850p	86173	RC 882	850p
C2096	RC 905	850p	SANYO		
A511940	RC 906	800p	RC218, RC222, RC228, RC238	RC 140M	850p
655602H	RC 907	850p	JXGE	RC 878	850p
ITT			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	SHARP		
RG306	RC 306	825p	G0121CESA, 123CESA, 204, 251	RC 140M	850p
FS9/1-10/1	RC 307	850p	SIEMENS		
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
KORTING			SONY		
18279, 18396, 18460, 18521 SE	RC 108	850p	RM604, RM605, RM606	RC 140	850p
40540 VTS	RC 108	900p	32 CHANNEL	RC 140M	850p
LOEWE			RM613	RC 141	850p
DC11	RC 146	850p	RM632, RM636	RC 160	850p
MATSUI			TATUNG		
010270601	RC 889	850p	FXA	RC 877	850p
VX770	RC 892	850p	RC70	RC 883	750p
METZ			FX70 FASTTEXT	RC 894	850p
JAVA COLOR (6890)	RC 166	850p	TELEFUNKEN		
COLOR (7156)	RC 183	850p	FB632	RC 632 ST	850p
JAVA (7180)	RC 184	850p	FB639	RC 639 ST	850p
MITSUBISHI			THORN/FERGUSON		
939P/03607, 939P/03609	RC 140M	850p	3V35-42	RC 342	850p
NOKIA			3V31-32	RC 344	850p
SATELLITE	RC 550	850p	3V57-58	RC 628	900p
NORDMENDE			TX10 TEXT	RC 732	750p
TC2336	RC 351N	850p	TX10 STEREO TEXT	RC 738	750p
CMC1, TC3519	RC 356	875p	TX9-90-100	RC 740	750p
OCEANIC			3V55, FV11	RC 783	900p
390C9500	RC 339	900p	TX100 FASTTEXT	RC 785	800p
ORION			TX100 STEREO FASTTEXT	RC 789	800p
RC53	RC 892	850p	PROFESSIONAL	RC 790	800p
PANASONIC			TOSHIBA		
EUR51200	RC 200	850p	CT937	RC 950	850p
TC2200	RC 201	850p	CT9117	RC 951	850p
VSQ0357/NV730	RC 202	875p	201R4B	RC 952	850p
TNQ1621	RC 203	900p	UNIVERSAL PROGRAMMABLE REMOTE CONTROL		
PHILCO			Controls up to 4 different devices which use infra red remote controls including TV, audio, VCR and satellite. (need original remote control TC program)		
CARVEL, CONCORDE, MERCURY, TELESTAR	RC 108	850p	Order code: IR100R Price: 1950p		
TC10	RC 152	900p	We stock Remote Controls for over 5000 different models. Ring for further details on 081-900-2329.		
PHILIPS					
RC5002,5154	RC 134	850p			
KT3 NON TEXT	RC 135	825p			
69117032	RC 178	875p			
69117194	RC 180	875p			
RC5991-UNIV	RC 300	850p			

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: 3000p

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
CERAMIC PLUG TOP		
3A	FUSE33	100P
5A	FUSE34	100P
13A	FUSE35	100P
20MM CERAMIC TIME LAG		
3.15A	FUSE41	100P
4A	FUSE42	100P
5A	FUSE43	100P
6.3A	FUSE38	100P
8A	FUSE39	100P
10A	FUSE40	100P
32MM CERAMIC SLOW BLOW		
8A	FUSE44	210P
10A	FUSE45	210P
15A	FUSE46	210P
20A	FUSE47	210P
38MM CERAMIC SLOW BLOW		
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, VCR4600, 4600MII, 4700
Funai V2S, VCR4600, 4800, 5200, 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, Sniptom, Tashiko, Tatung, Towada, Unversum
Order Code: AH02 Price: £14.50

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Satellite PSU Repair Kits

Experience shows that 50% of all receiver power supplies 'bounce' unless the correct precautionary measures are taken when being serviced. A kit of all the recommended parts is supplied for the 4 most popular models, which when fitted should overcome this.

MAKE & MODEL	ORDER CODE	PRICE
PACE PRD800, PRD900	SATPSU1	670p
PACE SS9000, 9200, 9010, 9020, 9220	SATPSU2	670p
AMSTRAD SRD510, SRD520	SATPSU3	670p
AMSTRAD SRD500	SATPSU4	670p

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, TV46	5000p
LUXOR	VR3761	3100p
MITSUBISHI	HSE51	3000p
NATIONAL	NVFS200, NVFS90, NVV8000	4600p
PANASONIC	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	SLV856, SLV715, SLV757, SLV777, SLV815, SLV825	4600p
	SLV353UB	3200p
	CCDF340E, CCDF500E, CCDV90E, CCDV95E, CCDSPE5E	4800p

Original Video Heads

MAKE	MODELS	PRICE
NATIONAL PANASONIC	NVG20, NVG21, NVG22, NVG25, NVG25, NVG28, NVG200, NVDA48 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 DD8900, 8904, VCR2000, 6000, 6100, 8600, 8602, 8603, VCR8604, 8700, 8704, 8714, 8800, 9005, 8244
Also fits: ANITECH, BONDS TEC, CASIO, CROWN, FIDELITY, GOLDHAND, GRANADA, HINARI, MARQUANT, OMEGA, PROFEX, SCHNEIDER, SEG, SENTRA, SHINTOM, TASHIKO, TATUNG, TOWADA, UNIVERSUM ORDER CODE: AH32 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	825p
VBR 0125		625p

4 way Preprogrammed Universal Remote Control

A single remote control to operate Televisions, Videos and Satellite Receivers. Plus Auxiliary Options!!

- Controls up to 8 remotes with one • Simple 4 digit setup routine
- Controls 1000s of models • Teletext functions with Fastext
- Clear (large key) layout • Code Search Facility
- Stylish and easy to operate • Replace broken or lost remotes
- Original Remote not required

Order Code: RCBW0200 Price 1500p + VAT

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, 1295P, 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, GHV8000, 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, 4945, 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, 39S, HRD230, 430, 530	CH03	2600p
	3V58, 3V59, 3V64, 3V65, FV11R, 8950, 8951, HRD170, HRD180, 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, VR6561, 6670, 6760, 6761, 6870, 6970	CH05	1100p
	VR6443	CH22	2900p
	VR6448	CH23	2500p
	49S86	CH24	2500p
SHARP	VCA100, VCH851, VCH852	CH22	2900p
	VCA103, 103GV, 106, 106GVM, 254GVM	CH23	2500p
	VCS211, 244, 5055, 605, VCB230, VCD806G, 810G, VCT2, 2, 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, V5500, 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	178ML	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
AEROKLEAVE	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

All the above items are manufactured by Servisol
If you purchase more than one Servisol Product, postage & package will be charged as follows:
300p for 5 cans 450p for more than 5 cans

CD Pick Ups

SONY OPTICAL PICK UP
PART NO. KSS210A SON Y CDPC 301M, CDPC 305M 2200p
Fits most Sony, Akai & J.V.C. Portable Hi-Fi and Midi Systems

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USED ON MODELS:
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CFD68, 750, 755, 760, 765, 770, 775, 440S, W100, 100S 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
ANTEX SOLDERING IRONS		
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
SOLDERING STAND & SPONGES		
SOLDERING STAND (MADE BY ANTEX)	S108	350p
SPARE SPONGE	S109	55p
SOLDER		
18 SWG 50g GRAMMES	S110	500p
20 SWG 50g GRAMMES	S111	650p
22 SWG 50g GRAMMES	S112	700p
DESOLDERING AIDS		
SOLDER MOP STANDARD GAUGE 1.2mm x 1.5M	S107	70p
SOLDER MOP 1.2mm x 10M	S113	300p
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 13408	350p	TDA 2030H	100p	2SK 956	1400p
IRFBC40	400p	TEA 2019	200p	2SK 1023	550p
L272	200p	TMP 47C434N	1250p	2SK 1342	750p
16210	250p	SAA 1300	200p	2SK 1358	600p
MC 3423P	100p	2SA 1540	55p	6800Q	500p
MJ 15015	250p	2SC 3788	60p	82S147	450p
MJ 15016	350p	2SC 3885	350p		

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SHARP 0005 & 0006	£1.99p
SHARP VC651 ASSEMBLY	£6.99p
VT11/14/17 IDLER	£1.95p
VT11 CLUTCH ASSEMBLY	£6.99p
VT1022/25/260 IDLER	£2.75p
NEC 9013 IDLER	£4.99p
SANYO VHR3300 IDLER	£3.99p
AKAI VS105/250 CLUTCH ASSEMBLY	£11.99p
SAISHO VR380 CLUTCH	£6.99p
MITSUBISHI H5337 F.F. IDLER	£2.70p
ALMA SENTRA PULLEY	£1.25p
MATSUI LUMITER POST	£1.35p
PANASONIC NV370 IDLER	£1.95p
FISHER 615 IDLER	£3.50p
FISHER GEAR ASSEMBLY	£4.50p
AMSTRAD PINCH WHEEL MOD KIT	£3.99p
UNIVERSAL TRIPLER	£4.99p
UNIVERSAL TRIPLER WITH FOCUS	£7.99p
HITACHI MODULE HM6251	£6.99p
CU2410 TRIPLER	£16.99p
TENSION BAND FOR MOST MOD FROM	£1.99p
CIRCUIT PROTECTOR ICP	50p
TX10 FOCUS UNIT	£7.99p
PHILIPS BACK UP BATTERY	£1.30p
ALBA BATTERY 1F 5.5V	£2.50p
TV SWITCHES FOR MOST MOD. FROM	£1.99p
SONY FUNCTION SWITCH	0.85p

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AKAI	MATSUI			
CT2570E	19.99	19.99		
CT2870	19.99	14.00		
ALBA	14.50	16.99		
CTV14RS	19.99	14.65		
AMSTRAD	14.00	16.99		
CTV2200	14.99	14.99		
CTV2210	14.99	14.99		
VT1R/24	16.99	16.99		
V522/35	20.00	20.00		
V5105/250	1.50	27.14		
FIDELITY	KT3	13.99		
TX2000	14.50	KT4	16.99	
ZX3000	16.99	TX90	16.99	
FERGUSON	KT40	16.99	REDS/PDT	16.99
VR4600	1.80	2A	16.99	
VCR6000	1.30	3A	16.99	
VCR7000	1.00	CTX E/S	16.99	
FERGUSON	WHITE	CF1	16.99	
3V29	SP259	NCR	16.99	
TX98	19.99	GR1 AX	16.99	
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3V5965 FV1014 IDLER	£1.50p	TX90	16.99	
3V23 LOADING ROLLER BAR	£3.99p	REDS/PDT	16.99	
SHARP 0005 & 0006	£1.99p	WHITE	14.99	
SHARP VC651 ASSEMBLY	£6.99p	3V29	1.80	
VT11/14/17 IDLER	£1.95p	3V29 F.F. REW IDLER	£2.50p	
VT11 CLUTCH ASSEMBLY	£6.99p	3V5965 FV1014 IDLER	£1.50p	
VT1022/25/260 IDLER	£2.75p	3V23 LOADING ROLLER BAR	£3.99p	
NEC 9013 IDLER	£4.99p	SHARP 0005 & 0006	£1.99p	
SANYO VHR3300 IDLER	£3.99p	SHARP VC651 ASSEMBLY	£6.99p	
AKAI VS105/250 CLUTCH ASSEMBLY	£11.99p	VT11/14/17 IDLER	£1.95p	
SAISHO VR380 CLUTCH	£6.99p	VT11 CLUTCH ASSEMBLY	£6.99p	
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ALMA SENTRA PULLEY	£1.25p	NEC 9013 IDLER	£4.99p	
MATSUI LUMITER POST	£1.35p	SANYO VHR3300 IDLER	£3.99p	
PANASONIC NV370 IDLER	£1.95p	AKAI VS105/250 CLUTCH ASSEMBLY	£11.99p	
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AN5435	2.50	M4908B1	8.50	STK7216	5.00	TDA1516	4.00	UPC1420	5.25	Z8B86	1.80
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AN7178	2.60	M54544L	2.99	STK73410	6.99	TDA1701	4.25	SG13 THY	11.00	Z8C29	0.25
BA3402	3.99	M54549L	4.50	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C32	3.75
BA5402	2.50	M54644L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C38	0.25
BA6109	1.80	M54644L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C39	0.25
BA6121	2.99	M54644L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C42	0.25
BA6122	2.99	M54649L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C43	0.25
BA6209	1.50	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C44	0.25
BA6219	2.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C45	0.25
BA6229	2.80	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C46	0.25
BA6238	1.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C47	0.25
BA6304	1.90	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C48	0.25
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BA10324	1.29	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C51	0.25
BA10358	1.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C52	0.25
BA15218	2.20	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C53	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C54	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C55	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C56	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C57	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C58	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C59	0.25
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CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C62	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C63	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C64	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C65	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C66	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C67	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C68	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C69	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C70	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C71	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C72	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C73	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C74	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C75	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C76	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C77	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C78	0.25
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CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C81	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C82	0.25
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CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C84	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C85	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C86	0.25
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CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C90	0.25
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CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C92	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C93	0.25
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CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C97	0.25
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CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C99	0.25
CN765	4.99	M54693L	3.99	STK73410	6.99	TDA1701	4.25	TRANSISTORS	0.90	Z8C100	0.25

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How Much Viewing?

"The problem with television is that people must sit and keep their eyes glued to the screen; the average American family hasn't time for it." That's what the *New York Times* thought in 1939 at the time when, to coincide with the opening day (April 30th) of the 1939 New York World's Fair, RCA announced that it would start the first regular TV service in the USA (as far as the FCC was concerned this 441-line service was experimental – regular commercial 525-line transmissions didn't start until July 1st 1941). Spectacularly wrong though the *New York Times* turned out to be, one can't help sympathising with its view. It seemed to suppose that American citizens were active people with plenty to occupy their time, failing to foresee the ability of the small screen to catch and hold attention.

There is nevertheless a limit to the amount of TV that people are prepared to watch. According to a recent report (*Cultural Trends 1994, No. 21*) published by the Policy Studies Institute, average viewing in the UK last year was three and a half hours a day. This average daily viewing time hasn't increased for at least ten years. In fact there was a slight decrease in 1994, from 3.6 hours in 1993. According to the report there is little scope for growth in TV viewing. The arrival of satellite TV and increased provision of cable TV services have not increased average viewing time:

viewers have either ignored the extra channels or split their viewing between a greater number of channels. The report sums this up as follows: "It is a zero-sum marketing game played at the margins, in which success or failure is measured in terms of bitterly contested yet sometimes imperceptibly small shifts in market share." The ITC's latest report on TV viewing in homes with cable TV available seems to confirm this: terrestrial TV channels accounted for 61.4 per cent of such viewing in October 1992, 57.9 per cent in October 1993 and 65.1 per cent in October 1994.

There is a marked difference between the cable and satellite TV audiences and those for the off-air terrestrial TV channels. The former are younger: about 20 per cent (quoting again from the PSI report) are children aged four to fifteen, and over 50 per cent are under 34 (this compares with 35 per cent for BBC-1). Whether this means that cable and satellite TV viewing shares will tend to increase remains to be seen. What does not seem to be in doubt is the limited overall number of hours spent viewing. This should cause no surprise except amongst TV company hysteresis. There are only so many hours in the day, and many other demands upon them. Those thinking of or planning to provide hundreds of channels should proceed with care: profitability will be difficult, if not

impossible, for most of them to achieve.

The one thing that could possibly increase TV viewing is interactive TV. Basic television as a medium has its disadvantages. The presentation is usually drearily slow, and you can't move back and forth as your interest changes, or as you may need to in order to check on facts, in the way that you can with printed matter and recordings. By bringing to TV the advantages of the forwards/backwards programme movement possible with recorded material, plus access to a greatly increased amount of programme material, interactive TV could boost overall viewing times. There is also the prospect of linking computer and TV viewing via interactive TV services, so that it may be difficult to ascertain exactly what viewers are doing. Will interactive TV viewers make extensive use of the facilities available to them? Not if the trials carried out by AT&T in the USA (mentioned in Teletopics last month) are anything to go by: these proved that entertainment was the main interest, with viewers spending most of their interactive TV time playing games. And there will remain that finite limit to what one can choose to spend one's time doing. Interactive TV could simply reduce the time spent watching conventional programming, though we could be as wrong as the man who wrote that leader in the *New York Times*.

EDITOR

John A. Reddihough

PRODUCTION EDITOR

Tessa Winford

EDITORIAL OFFICE

0181 652 8120

Fax 0181 652 8956

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COVER PHOTO

This month's cover photograph shows the ITT Compact 80R chassis. See article on pages 261-3.

Quick Projects

John Pitt-Francis

Here are a couple of simple modifications which will provide you with services that could be helpful.

RGB Analogue Test Signal Source

The following minor conversion (see Fig. 1) will enable those who have a BSB satellite receiver converted to D2 MAC and don't repair enough monitors to justify the price (£500+) of the official test gear to check most of the functions of older monitors up to the Philips CM11342 and its clones. The satellite receiver will give you at least three channels in the clear from 19°W: you may sometimes get the bonus of a test card/pattern during working hours. If you don't have such a receiver, look for a squarial and make the owner an offer! The chances are that you'll pick up the whole kit for around £10. Sendz Components can supply an EPROM to convert the Ferguson SRB1 to D2 MAC.

I've simply made use of the fact that convenient RGB outputs are available direct from the codec. They go to the MC1377P PAL encoder chip and are also wired to pins 7, 11 and 15 of the scart socket. So all you require is a composite sync signal, which can be obtained from another input to the encoder chip. It simply needs to be inverted and impedance matched.

My conversion was done with a Philips STU902 receiver, but an identical arrangement is used with the Ferguson SRB1 and Tatung TRX2801 – they all use the MC1377P encoder chip, which has composite sync at pin 2. Feed the sync signal, after inversion, to the unused pin 20 of the scart socket.

Only two other connections are required, a chassis return at pin 21 and a 12V supply which can be obtained from C2012 in the STU902. It's near the MC1377P's supply pin 14. The equivalent capacitor with the SRB1 is CV56. Make a fly lead to provide the RGB, composite sync and two sound channel outputs.

From Ken Taylor's article in last August's issue it will be clear that what has been provided in this way will be limited to use with those monitors that accept an analogue RGB input with a 50Hz field rate and normal 15,625Hz line rate. It's nevertheless a useful item. The same signals fed to a TTL interface produce, as one would expect, a display consisting of

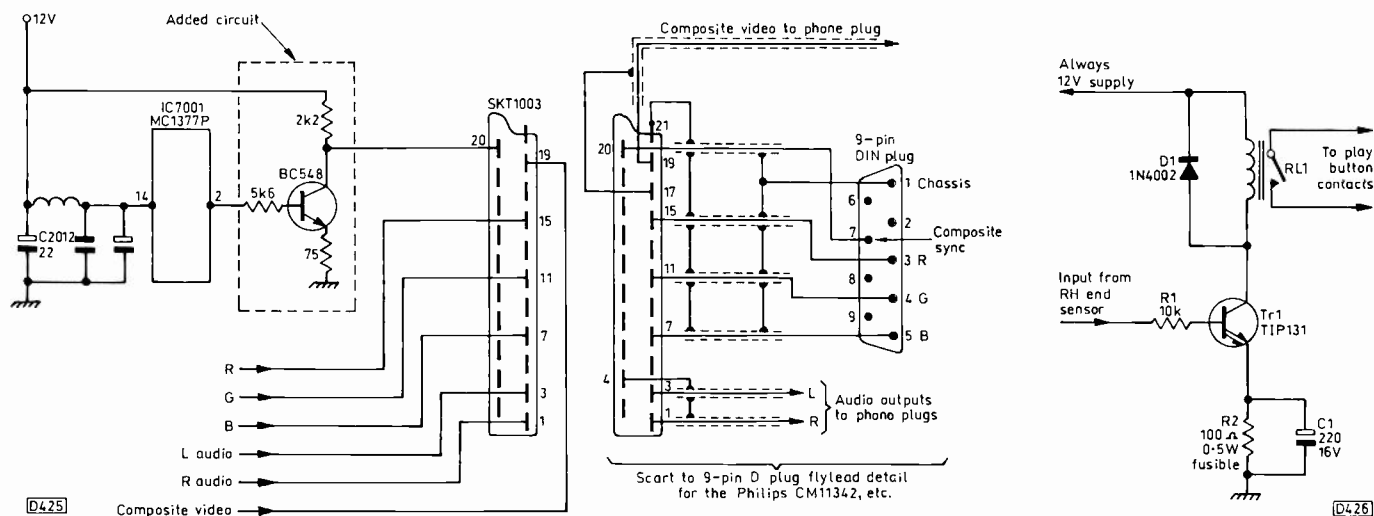


Fig. 1 (left): Obtaining an analogue RGB signal from a MAC receiver to check older monitors.
Fig. 2 (right): Circuit to provide continuous VCR playback.

discrete colour chunks well off the correct hue. But this can be used to check picture geometry etc.

The only fly in the ointment is how much longer we'll have unscrambled D2 MAC. Let's hope for a few more years.

Continuous VCR Playback

Some of our business is with the holiday/tourist market, where there's a requirement to be able to show information video tapes on an automatic, continuous basis. Some older VCRs, such as the Hitachi VT9500E, had a secret switch mounted behind the operation keyboard to provide for this need. But these VCRs are getting a bit long in the tooth and this feature is not included with the popular VCRs we stock.

So the circuit shown in Fig. 2 was devised in an attempt to come up with a modification likely to work with the majority of VCRs in which a simple logic one signal (around 2V) comes from the right-hand end sensor as an end-tape message after auto rewind. Direct transistor feedback could be used instead of a relay, but eject is then not possible without first disconnecting the circuit and there are circumstances where the system control chip won't reset without resorting to interruption of the mains supply. This circuit operates only at the end of auto rewind (the standard method gives a continuous auto-play instruction): it can be used in the normal way by operating the stop command after rewind.

The output from the RH end sensor is normally logic zero (about 0.1V). Thus the Darlington switch transistor Tr1 is non-conductive. At the end of rewind the RH end sensor output goes to logic one (around 2V) and Tr1 switches on, providing a once only play output to the command interface. R2 and C1 have been included to limit the current should a fault condition be present.

As the circuit runs cold, if elegance is not important the components can be mounted on the relay pins directly and the whole assembly can be mounted on a suitable support with a tie wrap and glue anywhere in the VCR's case – but well away, including the additional wires, from the power supply and moving parts.

I've used the circuit in the Logic VR955 (Samsung VI710) and the Sanyo VHR2300, using for RL1 the sub-miniature relays found in early Sharp VCRs (similar to the Omron type G2VN-287P-47) – the type used in the Ferguson TX100 chassis should work just as well. Sendz Components can supply this type together with the TIP131 for a few pence!

Note that this circuit will not work with Panasonic VCRs that use the 'lighthouse circuit', e.g. the Panasonic NV430 etc.

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FLY LEAD	70		CP7226/2278	14.85	Sony RM632/635	9.70	BEAR KIT	F/R REW IDLER (GEN)	2.50	REEL DRIVE ROLLER	4.85	30B BOOY MOUNT
VIDEO LEAD	70	IC's	CP72476/2478	16.25	RM70/672/674	9.70	GET ASSEMBLY	PINCH ROLLER	2.95	PINCH ROLLER	2.95	30R GLASS MOUNT
4-WAY DISTRIB. AMP	18.50	SAAL1293-02	CITCOMPACT 80R/110	14.50	Tatung RC40/45	9.25	MODIFICATION KIT	CLUTCH ASSEMBLY	7.75	CLUTCH ASSEMBLY	7.75	Motrola 8500/14 WVE
8-WAY DISTRIB. AMP	20.25	SAAL1293-03	CVC1200	17.50	RC70	9.25	PINCH ROLLER	CAPSTAN MOTOR VT11E	27.50	CAPSTAN MOTOR VT13E	27.50	8800X
BATTERIES		SAAL1293A-93	Watusu 1410/20/40	16.95	RC70	11.85	YCR6000	REEL MOTOR (GEN)	2.95	F/R REW IDLER (GEN)	2.50	9800X
Philips MEMORY 1V2	1.70	STK5332	Panasonic TLF14567F	19.25	TOPLET WITH FST	24.95	BELT KIT	BELT KIT	1.85	F/R REW IDLER (GEN)	2.50	Nokia 101
MEMORY 2V4	2.50	STK5422	TLF14568F	19.25	NON FST	17.95	PINCH ROLLER	BELT KIT	2.95	REEL MOTOR (GEN)	3.95	14.95
CAPACITOR		STK5481	Philips CP90	18.50	VIDEO HEADS		CLUTCH	REEL MOTOR (GEN)	2.95	REEL MOTOR (GEN)	3.95	
63V		STK5482	2A	18.50	Alfa 4000/5000X	16.95	FERUSDN VIDEO SPARES	CLUTCH ASSEMBLY	7.75	REEL MOTOR (GEN)	3.95	BATTERIES
47uf at 63V	18	STK7308	SWITCHES		Amstrad 4500/7000	14.70	JY29/30	CAPSTAN MOTOR	27.50	REEL MOTOR (GEN)	2.95	Ericson HOTLINE
100uf at 63V	22	STK7348	FIDELITY CRV140	1.50	4600/4700	13.75	BELT KIT	VT120/130E	1.80	REEL MOTOR (GEN)	1.85	Mitsubishi MT5
220uf at 63V	35	STK7411	GRUNDIG CUC731	3.50	6000/6100	15.25	CASSETTE LAMP	VT120/130E	1.80	PINCH ROLLER	2.50	M77 700MA
250V		STR5412	KTA/CTX SW-REMOTE	1.50	7000	14.95	LOAD BELTS (PK-5)	VC81/502	1.85	PINCH ROLLER	2.50	Motrola 8500/1000MA
1uf at 250V	20	STR5010A	PHILIPS UNIVERSAL	4.25	Ferguson 3V00/39	8.50	REEL IDLER	VC81/502	1.85	PINCH ROLLER	2.50	8500/1500MA
4.7uf at 250V	25	STR54041	SONY UNIVERSAL	4.25	3V4/755	17.25	PINCH ROLLER	VC81/502	1.85	PINCH ROLLER	2.50	8800/1000MA
10uf at 250V	25	STR58041	TX910 STANDARD	1.00	3V59/PV12	27.85	REEL IDLER	VC81/502	1.85	PINCH ROLLER	2.50	9800/700MA
22uf at 250V	40	TD11705	TX910 REMOTE	1.50	3V65/FV11R	16.50	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	NEC P3 700MAH
47uf at 250V	40	TD12270	TX910/10 REMOTE	1.75	3V75/32L	27.95	REEL IDLER	VC81/502	1.85	PINCH ROLLER	2.50	Nokia 101 700MAH
100uf at 250V	1.25	TD2575A	TRANSISTORS		FV31	25.95	3V35/35	REEL IDLER	1.95	PINCH ROLLER	2.50	Panasonic F1 700MAH
400V		TD2577A	BC639	20	BC640	33.95	BELT KIT	VC81/502	1.85	PINCH ROLLER	2.50	Sony CMH333
1uf at 400V	23	TD2579	BC640	20	BC640	33.95	CAPSTAN MOTOR	VC81/502	1.85	PINCH ROLLER	2.50	Telephone TP3
4.7uf at 400V	35	TD2581	BU5080	1.25	BU5080	1.25	LOAD BELTS (PK-5)	VC81/502	1.85	PINCH ROLLER	2.50	TP405 700MAH
10uf at 400V	75	TD2582	BU5080A	1.20	BU5080A	1.20	REEL IDLER	VC81/502	1.85	PINCH ROLLER	2.50	
22uf at 400V	85	TD26253AQ	BUS058AF	4.65	BUS058AF	4.65	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
EMT TRAYS		TD3552A1TFK	BUS058D	1.50	BUS058D	1.50	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
CONTINENTAL 30AX	0.95	TD3552A1TFK	BUS058F	1.65	BUS058F	1.65	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
GRUNDIG CUC2400/2410	13.70	TD3552A1TFK	BUS058G	1.20	BUS058G	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
PHILIPS KTS	7.85	TD3552A1TFK	BUS058H	1.20	BUS058H	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
UNIVERSAL (S-LEAD)	5.95	TD3552A1TFK	BUS058J	1.20	BUS058J	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
FUSES		TD3552A1TFK	BUS058K	1.20	BUS058K	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
20mm A/S (10 PER PK)	1.00	TD3552A1TFK	BUS058L	1.20	BUS058L	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
500MA/630MA/800MA/1A/1.6A	1.00	TD3552A1TFK	BUS058M	1.20	BUS058M	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
2A/2.5A/3.15A/5A	1.00	TD3552A1TFK	BUS058N	1.20	BUS058N	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
20mm Q/B (10 PER PK)	1.00	TD3552A1TFK	BUS058P	1.20	BUS058P	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
500MA/800MA/1A/2A/2.5A	80	TD3552A1TFK	BUS058Q	1.20	BUS058Q	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
SERVICE MANUALS		TD3552A1TFK	BUS058R	1.20	BUS058R	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
Amstrad 4600	9.95	TD3552A1TFK	BUS058S	1.20	BUS058S	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
6000	9.95	TD3552A1TFK	BUS058T	1.20	BUS058T	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
Ferguson TX85	8.50	TD3552A1TFK	BUS058U	1.20	BUS058U	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
3V59	13.50	TD3552A1TFK	BUS058V	1.20	BUS058V	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
3V65	13.50	TD3552A1TFK	BUS058W	1.20	BUS058W	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
FV11	13.50	TD3552A1TFK	BUS058X	1.20	BUS058X	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
FV37	17.25	TD3552A1TFK	BUS058Y	1.20	BUS058Y	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
SERVICE AIDS		TD3552A1TFK	BUS058Z	1.20	BUS058Z	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
CLEAR TEST TAPE	7.95	TD3552A1TFK	BUS058AA	1.20	BUS058AA	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
FIBRE PEN	3.50	TD3552A1TFK	BUS058AB	1.20	BUS058AB	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
HEATSHINK COMP	1.55	TD3552A1TFK	BUS058AC	1.20	BUS058AC	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
SILICON GREASE	1.85	TD3552A1TFK	BUS058AD	1.20	BUS058AD	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
SOLDER MOUNT	7.95	TD3552A1TFK	BUS058AE	1.20	BUS058AE	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
TOLDO 5KG/18SWG	7.95	TD3552A1TFK	BUS058AF	1.20	BUS058AF	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
WELLER GUN TIPS (2)	1.85	TD3552A1TFK	BUS058AG	1.20	BUS058AG	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
DIODES		TD3552A1TFK	BUS058AH	1.20	BUS058AH	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
R2M	05	TD3552A1TFK	BUS058AI	1.20	BUS058AI	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
BY133	09	TD3552A1TFK	BUS058AJ	1.20	BUS058AJ	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	
BY227	20	TD3552A1TFK	BUS058AK	1.20	BUS058AK	1.20	TAKE UP CLUTCH	VC81/502	1.85	PINCH ROLLER	2.50	

VR6467	11.50	Amstrad 4500/7000	14.70	VR6467	11.50	Amstrad 4500/7000	14.70
Sony 1100/1200	13.25	4600/4700	13.75	Sony 1100/1200	13.25	4600/4700	13.75
Sony RM632/635	9.70	6000/6100	15.25	Sony RM632/635	9.70	6000/6100	15.25
RM70/672/674	9.70	7000	14.95	RM70/672/674	9.70	7000	14.95
Tatung RC40/45	9.25	Ferguson 3V00/39	8.50	Tatung RC40/45	9.25	Ferguson 3V00/39	8.50
RC70	9.25	3V4/755	17.25	RC70	9.25	3V4/755	17.25
TOPLET WITH FST	24.95	3V59/PV12	27.85	TOPLET WITH FST	24.95	3V59/PV12	27.85
NON FST	17.95	3V65/FV11R	16.50	NON FST	17.95	3V65/FV11R	16.50
VIDEO HEADS		3V75/32L	27.95	VIDEO HEADS		3V75/32L	27.95
Alfa 4000/5000X	16.95	FV31	25.95	Alfa 4000/5000X	16.95	FV31	25.95
Amstrad 4500/7000	14.70	FV31	25.95	Amstrad 4500/7000	14.70	FV31	25.95
4600/4700	13.75	FV31	25.95	4600/4700	13.75	FV31	25.95
6000/6100	15.25	FV31	25.95	6000/6100	15.25	FV31	25.95
7000	14.95	FV31	25.95	7000	14.95	FV31	25.95
Ferguson 3V00/39	8.50	FV31	25.95	Ferguson 3V00/39	8.50	FV31	25.95
3V4/755	17.25	FV31	25.95	3V4/755	17.25	FV31	25.95
3V59/PV12	27.85	FV31	25.95	3V59/PV12	27.85	FV31	25.95
3V65/FV11R	16.50	FV31	25.95	3V65/FV11R	16.50	FV31	25.95
3V75/32L	27.95	FV31	25.95	3V75/32L	27.95	FV31	25.95
FV31	25.95	FV31	25.95	FV31	25.95	FV31	25.95
Fisher FV615/910	15.95	FV31	25.95	Fisher FV615/910	15.95	FV31	25.95
FV906/916	15.95	FV31	25.95	FV906/916	15.95	FV31	25.95
Hitachi 8000/9700	13.50	FV31	25.95	Hitachi 8000/9700	13.50	FV31	25.95
VT11/33E	14.30	FV31	25.95	VT11/33E	14.30	FV31	25.95
63/64E	19.25	FV31	25.95	63/64E	19.25	FV31	25.95
VT65E	28.50	FV31	25.95	VT65E	28.50	FV31	25.95
VT100/120	29.50	FV31	25.95	VT100/120	29.50	FV31	25.95
VT130E	25.30	FV31	25.95	VT130E	25.30	FV31	25.95
VT150E	36.50	FV31	25.95	VT150E	36.50	FV31	25.95
Matzui VX735A	18.80	FV31	25.95	Matzui VX735A	18.80	FV31	25.95
NEC 9034/9053	19.75	FV31	25.95	NEC 9034/9053	19.75	FV31	25.95
Panasonic NV333	8.50	FV31	25.95	Panasonic NV333	8.50	FV31	25.95
PN366	19.50	FV31	25.95	PN366	19.50	FV31	25.95
NV370	9.50	FV31	25.95	NV370	9.50	FV31	25.95
NV370	13.95	FV31	25.95	NV370	13.95	FV31	

Test Tapes and Cassettes

Eugene Trundle

There's an alignment tape for each domestic video format: it's a factory-standard reference for use when setting up and aligning the mechanics and electronics of a VCR or camcorder. Alignment tapes are an essential part of any self-respecting workshop's equipment. But they are expensive: the standard VHS alignment tape currently costs between £100 and £200. So it's best kept in the cupboard and brought out as seldom as possible! The same applies to the alignment tapes for the S-VHS, Hi-Fi sound and Video 8 formats. More on this later.

Tape-tension Cassettes

Other test cassettes, used mainly for checks on the mechanics of a deck, are less expensive. First comes the tape-tension gauge, in which one or both spools incorporate a spring-loaded clutch and a pointer and scale which is calibrated in g.cm. Tape-tension gauges work well and are very useful, but many modern VCRs don't seem to be in sympathy with them mechanically. As a result the tape tends to get chewed. This can usually be prevented by winding up any slack tape manually, between the stop and eject functions, but this may not be possible with some machines that eject from the fully-laced position.

If the tape in a back-tension gauge does become crumpled and chewed, it can be replaced with a few minutes' worth of good tape from an ordinary cassette. Dismantle the cassette carefully, splice the new tape to the leaders then reassemble. Ensure that the tape is the right way round, with the shiny side facing outwards so that it is in contact with the head drum.

Dummy Cassettes

The third and certainly the cheapest type of test cassette is the dummy one with no spools or tape inside. It's used to test and inspect the deck mechanics and control system by fooling the end sensors and cassette-down switch into thinking that a normal cassette has been inserted. Most

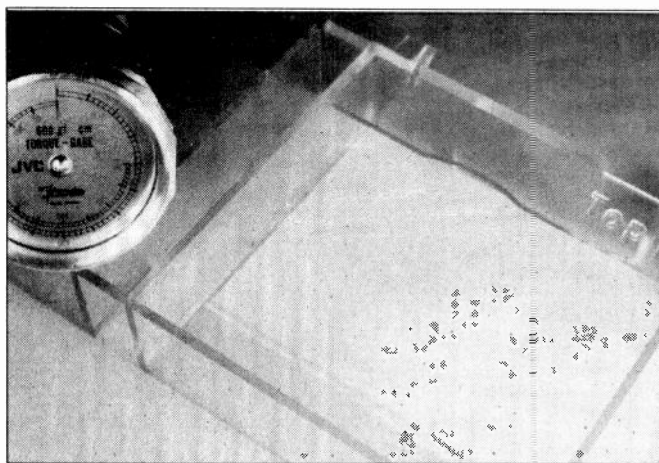


Fig. 1: A clear plastic dummy cassette with filed indentation (to the left of the moulded word 'top') to admit the type of torque gauge shown on the left.

machines will work perfectly well in the play and fast-forward modes with this type of cassette installed. But because of lack of take-up spool rotation, which is invariably monitored by the syscon, they won't work in the

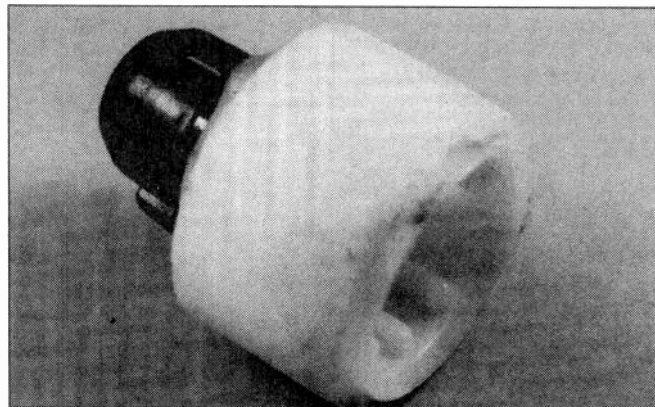


Fig. 2: DIY extension piece for use with a torque gauge in certain 'awkward' cassette cradle designs.

reverse modes (review, rewind): unless the take-up spool carrier is rotated by hand, the deck will shut down after a few seconds.

The clear plastic type of dummy cassette that's available from component distributors for about five pounds is excellent for its purpose, enabling you to see what's going on beneath the cassette – at least in those machines in which the bottom tray of the cradle doesn't totally obscure the view!

This type of dummy cassette has two drawbacks. First it won't admit the standard hand-held type of take-up torque gauge (the cylindrical type with a dial on top). Secondly some VCRs object to the lack of a flap and solid front, the result being that they jam up during the cassette-loading process.

It's easy to solve the first problem – see Fig. 1 – by filing a large round indentation in the plastic body's upper cross rib, adjacent to the position of the take-up spool. For use with machines that require a full-fronted cassette shell you can take a damaged or discarded cassette of everyday type, remove the top cover and spools and enlarge the bottom holes.

The construction of the top part of the cassette cradle in some VCRs prevents a take-up torque meter being plugged on to the take-up spool carrier even if the dummy cassette admits it. The solution to this problem is to make an extension piece by combining part of a discarded tape spool with part of a carrier from a scrap VCR: the other two requirements are butchery and epoxy-resin adhesive – few technicians that I know are strangers to these! The end result is shown in Fig. 2. It's crude but effective.

In a Flap

Another problem that can be solved by butchery of an ordinary cassette is difficulty in being able to see the operation of the capstan-pinch roller interface, and the path of the

tape past the audio/control head, in machines that don't have a half-loading facility or have an unconventional tape wrap. The Philips DMP (Charlie) series decks provide an

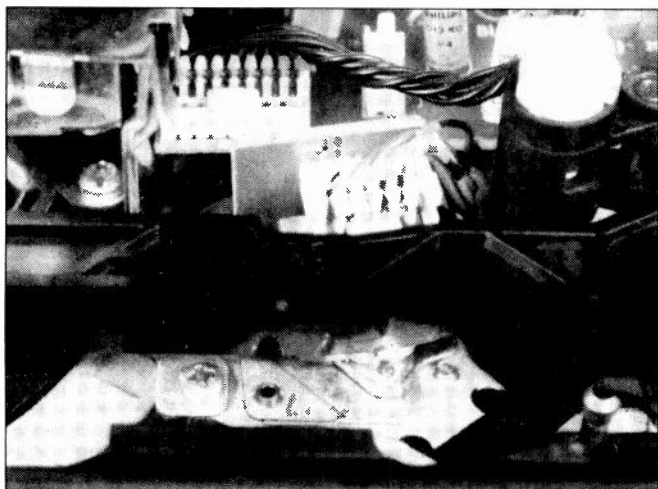


Fig. 3: Observing the tape path in a Philips DMP series deck: the test cassette's front flap has been removed to provide a view of the lie of the tape across the audio/control head (centre of the picture).

example: the upturned cassette flap conceals these things completely – and with this deck, especially the early versions, they require more attention than with most decks.

To get round this it's simple to remove the front flap (beware of losing the spring inside!) from an ordinary cassette. This will permit easy observation of the tape path and behaviour, see Fig. 3, with a bright bench lamp and a dental mirror as aids where necessary. If you are intending to get a dental mirror, go for a good quality type with a glass mirror and a fully insulated body. Avoid the cheap types that are optically poor and/or have a metal body that can cause short-circuits. RS markets suitable mirrors. You won't regret the extra cost.

Tape Gobblers

The mangled, creased tapes that we save after repairing VCRs with tape chewing faults also come, perhaps loosely, under the general description of test tapes. You can use them without having to worry about further damage, though any section that presents a threat to the rotating heads should be cut out and the loose ends spliced together. Never insert an alignment or a prepared test tape in a machine whose mechanics are the slightest bit doubtful.

DIY Test Tapes

If possible, confine the use expensive alignment tapes to checking rather than adjustment. The 'work tapes' described below will suffice for all mechanical adjustments, leaving the real McCoy to settle disputes and arguments and for those rare occasions when it's required for electrical adjustments in the playback electronics – rare because video head resonance and damping adjustments are not required or provided nowadays, and because sound playback levels can usually be set using other prepared tapes.

Blank tape is cheap. A four-pack of good-quality E180 tapes that costs perhaps £8 net can provide a useful range of test signals provided care is taken when recording them. You'll need a brand-new, high-quality VCR of the relevant type, typically with HQ and Hi-Fi sound. Confirm that the machine plays the alignment tape spot on, with no need to

adjust the tracking control. Very slight tweaking of the guides or the lateral position of the audio-control head may be required. My experience has been that JVC and Panasonic VCRs have the best factory alignment. Connect the input signals via the AV socket(s) – usually scart or S plus phono – rather than via the aerial socket at r.f., and clean all the heads before you start and between recording sessions.

If you can borrow an alignment tape you can use it to check the condition of your 'master' recording machine before making your test tapes. But my own feeling is that the workshop should have an alignment tape as a reference for every format handled, even if it seldom or never sees the light of day. This is, I admit, a heavy financial burden for small workshops and one-man outfits.

What to Record

The most useful general-purpose test tape you can make is one with a grey-scale step-wedge and a 6kHz sinewave audio track throughout. The absence of colour means that the off-head playback r.f. envelope will be smooth, which helps with guide adjustment during playback, while the 6kHz sound track is ideal for azimuth alignment of audio-control head stacks. The recorded audio signal will have to come from a separate audio generator at the input level specified for the machine – generally about 1.5V peak-to-peak. It should emerge at exactly the same level when played back – make a note of this on the cassette label. This recording simulates the most useful and used section of the JVC MH-2 standard VHS alignment tape. It's not necessary to try to record a sweep signal: this is difficult to do successfully, and it's very seldom required.

Another very useful test tape for general fault-finding is one recorded throughout with the standard colour bars and a 1kHz sinewave audio test tone. The video signal is helpful for checking through the chrominance and luminance sections of a VCR: if you've got three hours' continuous playback you don't have to stop and rewind at regular intervals when, for example, tracking down the cause of no-colour faults.

The 1kHz tone, which should be recorded on both linear and Hi-Fi tracks, can be used for setting playback levels, adjusting the audio-control head height and tilt-out, looking for the causes of waveform distortion and checking on audio edge-track playback level fluctuations. For this latter application the oscilloscope's sweep speed can be set to just above the point where the screen flickers, displaying an audio envelope waveform in which dropouts and amplitude variations, typically caused by a worn audio head or a tape-tension fault, can be clearly seen.

A very useful test tape I have consists of three hours of silence and a totally blank screen, recorded from a test pattern generator that produces colour bursts, sync pulses and a black level, with the audio inputs shorted out. You could make such a recording using a camera or camcorder with the lens cap on or the iris closed. Use it for checking playback hum, crackle and sound buzz faults and for setting the Hi-Fi head switching point. The blank screen shows up any patterning, interference or other effects, while the colour bursts will open the colour-killer in both the VCR and the TV set/monitor to show the effects of noise, patterning or what have you in the chroma channel. During playback of this tape the gain controls (contrast, colour and volume in the TV set/monitor, Y gain in the scope) can be turned way up to magnify the symptom or effect you're looking for.

This tape is also useful, played via any VCR, for soak testing TV sets that have vision and, especially, sound

faults: how many workshops have one or more TV sets blaring away all day, every day just because the customer has complained about an intermittent crackle? I'm wandering off the point however!

Two other video signals provide useful test tape recordings. One is a test pattern or similar signal from a pattern generator. It should have lots of fine detail, i.e. a multiburst or frequency gratings, and a picture with sharp vertical black-white and white-black transitions. This will show up the worms 'n' dots and streaking effects produced by worn heads and playback amplifier faults.

The second, less useful signal is a plain peak-white level raster. Amongst other things this can be used to check, strangely enough, the setting of the sound carrier oscillator in the VCR's r.f. modulator. With some VCRs a coarse vision buzz will be produced by the TV set unless the 6MHz setting (UK system I) is spot on.

Versions

The above test signals should cover virtually every requirement. Record the tapes in both low-band and high-band VHS and Video 8 versions as required, also on a C-type VHS cassette for camcorder testing. For three good reasons I've never felt the need to make test tapes that contain LP recordings. First, tapes are never offered for sale or rental in the LP format; secondly LP tapes are almost always recorded and played back by the same

machine; and thirdly when the SP alignment is spot on the LP alignment must also be right – unless there's something very strange about the video heads!

Sacrificial Tape

The strangest test tape I ever made was part of a project to evaluate proprietary head-cleaning tapes. The guinea-pig cassette's flap was opened to expose the tape, which was then cruelly scratched and churned, using a fibre pencil to plough up the oxide surface. As a result it promptly blocked the heads of any machine in which it was inserted, and the efficacy of the cleaning tapes being tested was quickly established by trying them in turn!

Aftercare

Finally a few words on labelling and storage. Remove the safety tabs of the test tapes you've recorded and note on the label the format, the date of recording and the video/sound contents, also the sound level where relevant. Keep the cassettes flap-forwards in their cartons, stacked upright (reels vertical) in a dry cupboard or drawer at room temperature away from sources of magnetic radiation, steam, dust, damp and dirt. If in doubt about dampness, enclose the cassettes in a seal-easy polythene bag with a sachet or tablet of silica gel – you can get this from a photographic dealer or chemist.

Test Case 386

TV sound, which was once a matter of a six-inch speaker and a single audio chip, has in recent times become a very big deal indeed, with stereo, Nicam, hi-fi and Surround sound all on offer. In the hands of some customers this can present problems for the service department, as we discovered with Mr Sutton in Test Case 382 (October).

Real Technician's first call on this chilly Monday morning was to Mr Mark, a young executive who had just invested in a new 25in. TV set with built-in Surround sound. As the sound "wasn't right", he'd requested a service call free of charge under the guarantee. Don't tell anyone, but RT had never encountered Surround sound before and wasn't sure whether he would know whether it was right.

The sound, which came from a satellite receiver via a stereo VCR, certainly sounded different from ordinary TV sound – even stereo sound, which RT *had* heard. It echoed around the room when the wick was turned up, enhanced by the fact that Mr Mark had fixed himself up with a pair of external speakers for the left and right front channels. Though small, they were very high-quality Bang and Olufsen units from a 'separates' hi-fi system that Mr Mark had discarded some years ago in favour of a stacker. He swore by them.

RT was told that the sound had presence all right but no body. Listening, he had to agree. The bass notes seemed to lack 'oomph', and human speech – even from a mono source, and with only the two front speakers programmed in – sounded strange and disembodied. It seemed that the sound came from nowhere in particular, even though it was quickly established that the two rear effects speakers were, for the moment, silent. The sound was somewhat reminis-

cent of the effect produced when a stereo TV set is switched to the spatial or ambience mode.

Based on this similarity, and after he'd listened once more to the effect of two-speaker (left and right front) reproduction of a mono soundtrack, a light dawned in RT's eye. Once he'd done something very simple he was rewarded with excellent, full-bodied mono, stereo and Surround sound: the bass was good and strong, the speech direction clearly defined and the Surround effects realistic. What had he done? It had nothing to do with the satellite box or the VCR. . .

Well pleased with this, Mr Mark led the hapless RT to his VCR, a four-year-old machine with Nicam and hi-fi stereo. Assuring RT that the fault could only be a minor one, he explained the problem. Until the wonder TV with Surround sound had arrived, he'd had no interest in buying or renting cassettes, using the machine purely for time-shifting and archiving programmes (all these buzz words!) from terrestrial and satellite broadcasts. He'd now bought *Snow White* for the children, *Robocop* and *Striking Distance* for himself, and had rented several more tapes from the local branch of Ritz Video. With most of these tapes a raucous buzz or crackle accompanied the reproduced sound. Sometimes the machine would default to the lo-fi mono sound track. In some cases the problem could be alleviated by use of the tracking control, but in others tracking adjustment simply made matters worse. And the pictures weren't as good or free of noise as those he recorded himself.

RT was treated to a two-minute extract from *Robocop*, then a go at a recording made from VH-1, Sky's yester-year rock channel. One crackled and dropped out, the other didn't. This was no little job riding on the back of a virtually non-existent under-guarantee one reflected RT. He left the house with the VCR under his arm and a bunch of Mr Mark's fivers in his pocket by way of an initial payment towards transport and repair. So what was wrong with the machine? For the solution, turn to page 260.

TV & VIDEO SPARES

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BA6239	£3.80	SN76226DN	£1.80	TCA900A	£6.80	TDA2680	£3.80	TDAR180K1	£7.50
CCURFG07	£14.40	SN76705	£9.80	TD6316AP	£4.80	TDA2690	£3.80	TDAR190	£3.80
CXN62	£4.00	STK3222	£21.80	TDA1035T	£2.40	TDA2780	£6.80	TDAR305	£9.90
HA11211	£2.80	STK3225	£6.80	TDA1037	£1.90	TDA3190	£4.20	TDAR341	£4.20
HA11423	£3.80	STK3232	£6.80	TDA1044	£2.90	TDA3301	£6.80	TDAR372A	£8.40
HA51385P	£21.50	STK3322	£4.80	TDA1060	£3.80	TDA3303	£19.80	TDAR380	£3.20
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LA4270	£4.95	STK3337	£4.80	TDA11705	£1.80	TDA3500	£6.80	TDAR403	£3.80
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Sharp VLC780

The reported fault was that when going from the record to the play or stop mode E012 would occasionally appear in the viewfinder with loss of functions. The fault occurred only at this particular point in the loading sequence, and not every time. We found that there was a partially broken tooth on the loading drive gear that meshes with the loading worm gear. If the broken tooth was positioned at a different point the gears didn't stick. A replacement assembly cured the problem. **D.C.W.**

Ferguson F801

Loss of this 8mm camcorder's functions was caused by failure of fuse link F052 (1.6A). We've had the same fault with similar **Hitachi** machines, yet despite long soak tests no definite cause of the fuse failure has been found. An ammeter in circuit showed that the current was well within the CP's working range. So far we've not had any of these machines returned because of subsequent fuse failure. Has anyone found a definite reason for the fuse to fail? **D.C.W.**

Akai PVC20E

There were no functions with this VHS-C machine. Power up was followed by immediate power down. The cause was simply that connectors P608 on the power PCB and J308 on the camera PCB had been unduly stressed, no doubt because of some unmentioned impact! Once the soldering had been made good all was well. These connectors are at the lower, rear end of the camcorder and are often damaged because of impact. Similarly positioned connectors in other ranges, e.g. some Sharp and Mitsubishi models, can suffer the same fate when the camcorder is dropped. **D.C.W.**

Panasonic NVM7

There were no functions and we soon found that the circuit protector for the 9V supply was open-circuit. A check showed that there was a dead short across the supply – but where? The supply goes all over the place! The 9V regulator transistor Q331 (camera process CBA) on the camera head was found to be burnt up, indicating a major short-circuit in this area. The culprit was the 1H/2H chroma delay chip IC308, whose supply pin (11) was dead short internally. It sounds easy, but as usual with this type of fault diagnosis is very time consuming. **D.C.W.**

Sony CCDF375E

A fault that's often encountered with models in the F and V ranges is intermittent operation of the functions, for example when going from the play to the stop mode etc. The cause is usually poor contact in the camera/player switch. **D.C.W.**

Sharp VLC780H

There were no signs of life with this camcorder but the customer did do us the favour of mentioning that he thought it had failed while he was trying to transfer recordings to a

full-size VHS machine. This made us think of the problems we sometimes encounter, under similar circumstances, with certain JVC camcorders. The cause is usually either a faulty AV lead that has shorted the r.f. unit's supply to earth, or the fact that with some VCRs or TV sets the relevant scart socket pin is earthed. The r.f. unit's 8V supply should be present at pin 3 of the eight-pin mini AV socket: it was missing.

In this model the missing supply is used internally as a start-up feed for the main power d.c.-d.c. converter circuitry. There should initially be around 9V at the supply pin of the converter's drive chip IC901: this was the missing voltage, without which the converter can't function. The cause of the trouble was failure of the UN2111 9V supply switch Q803, which is controlled by the syscon chip's power-up command.

Sometimes the customer does make a comment that's worth listening to and which, if noted, can save us time and him money! **D.C.W.**

Sanyo VMEX20P

This camcorder made new recordings in black-and-white: the camera E-E pictures and playback of previous good recordings were o.k. We found that L3313 in the record chroma to head amplifier section was open-circuit. **D.C.W.**

Sony CCDF330E

This camcorder was brought in because the auto-focus action was poor. The fault was easily corrected by removing sand from the lens assembly. But the customer also mentioned, casually, that the clock wouldn't hold its time after removal of the main battery, and that the clock battery had been changed. He was right: the clock could be set, and would run all right until the main battery was removed. Yes, CR2025 was o.k. Connector CN191 on the camera operation PCB should house the plug that links the 3V lithium battery supply to the clock circuitry. It didn't – the plug was missing.

The lithium battery is housed at the rear end of the camcorder's case. Instead of being connected to CN191, the leads that carry the back-up supply had been parked in a spare socket, CN201, on the VC48 camera PCB. Fortunately this socket is unused, so no damage had been done. When asked how long the clock fault had been present the customer said he thought it was shortly after the camcorder had last been serviced! **D.C.W.**

Sanyo VMRZ1P

This fairly recent 8mm camcorder wouldn't accept a tape. It would load a cassette partially then return it. If you didn't present a tape to the machine the cassette mechanism would close normally. While we were carrying out these checks we noticed that the head drum revolved backwards at high speed, whirring madly. Yes, the drum FG pulses went missing somewhere along the line. The cause of the fault was a dry-joint at pin 8 of the pulse shaping etc. chip IC381. As a result the pulses didn't reach the syscon chip. **D.C.W.**



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CD DEVELOPMENTS

Philips and Sony have released further details of their proposal for a high-density multimedia CD (HDCD). The 12cm diameter discs (same size as the present audio CD) will be able to store around 3.7Gbytes of data, five times the capacity of existing CDs – giving 135 minutes of video, enough for most feature films. This is made possible by using a red (wavelength 635nm) instead of an infra-red (780nm) laser, by reducing the pit size and track pitch (0.84 microns instead of the 1.6 microns with current CDs), and by using improved error-correction and modulation techniques. Production costs would be kept down because the new discs can be produced using current manufacturing techniques.

There are other proposals however. Toshiba has, in conjunction with the Time Warner entertainment group, developed a disc that stores data on both sides, giving up to 270 minutes of video with, it is claimed, better visual images than the the Philips/Sony proposal. Prototypes are due for early demonstration.

There are plans to develop, with 3M, a dual-layer disc with a capacity of 7.4Mbytes. A group of computer companies including Apple, Compaq, IBM and Microsoft is discussing plans for an HD CD-ROM.

Philips, Sony and several US record companies are, with the Recording Industry Association of America, studying a new type of CD that's currently known as CD Plus. It combines normal CD audio data with CD-ROM data. Owners of audio CD players hear the music normally: those with CD-ROM drives also see text, graphics and video clips.

EXTENDED WARRANTIES CRITICISED

Reports from the Office of Fair Trading (OFT) and the Consumers' Association have criticised the way in which extended warranties are at present sold. Over five million warranties a year are sold at a cost to consumers of £400m. The OFT criticises in particular the lack of information given to shoppers and the profit margins (as high as 70 per cent) made by retailers. As an example of the wide disparity with extended warranty costs the OFT quotes the Sony KVX2572 colour receiver: the John Lewis group provides a free five-year warranty while other retailers charge between £57.99 (Argos) and £150 (Dixons/Currys). The OFT also compared the cost of warranties with the average cost of repairs: with one camcorder the warranty cost was £199 while repairs averaged £40.

The OFT calls for early moves towards the provision of full point-of-sale information and backs the Consumers' Association's proposed code of conduct. Sir Bryan Carsberg, director-general of fair trading, is prepared to consider a Monopolies and Mergers Commission reference if retailers fail to implement the OFT's recommendations without delay.

SATELLITE TV

BSkyB is to intensify its legal battle against suppliers of pirate access cards following a significant High Court ruling in its favour. The company has obtained a permanent injunction against David Lyons, a leading supplier of pirate devices.

Eutelsat has placed an order for Hot Bird 3, which will join Eutelsat II F1, Hot Bird 1 and Hot Bird 2 at 13°E. Hot Bird 3 will have, like Hot Bird 2, twenty high-power TV transponders that will operate in the DBS band, with a high degree of flexibility to meet broadcasters' requirements. Widebeam coverage will reach homes throughout Europe and as far as central Asia and the Gulf States: Superbeam coverage will focus on central and western Europe, being particularly well suited to digital TV reception using less than 45cm dishes.

General Instrument has signed a licensing agreement with SGS-Thomson Microelectronics enabling the latter to develop dual-mode decoder chips that can process both DigiCipher II and MPEG-2 video signals.

Satellite Solutions is holding seminars throughout the UK covering topics that include the new Astra 1D services, the new Astra digital radio system (ADR), 22kHz tone switching and 'universal' LNBs. The one-day seminars are being run in conjunction with Astra, Pace, Amstrad, Teleste and BSKyB. Tickets cost £19.60, which includes lunch. To reserve a place, phone Kathryn Darbon at Satellite Solutions on 01604 787 888.

Global Communications (UK) Ltd., Winterdale Manor, Southminster Road, Althorne, Essex CM3 6BX (0621 743 440) has introduced a frequency converter unit, the ADXplus, to enable older satellite receivers to tune in the Astra 1D signals – provided the LNB will respond to them. Price is £24.95.

INTERACTIVE TV

Digital Equipment Corporation has announced an alliance programme aimed at ensuring that its media server (used for video-on-demand services) is compatible with third-party set-top boxes. The alliance includes Apple Computer, Compression Labs, General Instrument, GoldStar, Mitsubishi, Online Media, Philips, Samsung, Scientific Atlanta, Stellar One Corporation and Zenith. Digital is making the server's application programming interface (API) open and available to all set-top box manufacturers.

In a step towards the provision of multimedia services Canal Plus has placed orders with five manufacturers – Philips, Pioneer, Sony, Thomson-TCE and Eurodec – for digital satellite TV decoders. In addition to use with TV and video inputs the decoders, which should be available from June, will be compatible with PCs and telephone lines. Canal Plus' Digital Project, offering interactive services, is due to start late this year. Games and video-on-demand are expected to be amongst the services offered. The use of multiplexing will allow a variety of programmes and services to be made available via the same channel. Transponders aboard Astra 1E and 1F have been reserved for the services.

Hewlett-Packard's interactive TV set-top box, called the Kayak, will use a Motorola 68000 microprocessor to provide control of interactive TV services. Two major US cable firms, TCI and Comcast, have placed orders for Kayaks to be used in interactive TV trials due to start in the first half of this year. It will be HP's first product to be used for home entertainment purposes. A series of related products are planned.

BROADCASTING

Philips Digital Video Communication Systems has supplied Channel 4 with fourteen PALplus encoders. They comply with the PALplus 3.0 specification and their outputs can be carried by all existing distribution networks and infrastructures, including terrestrial TV, telecom systems and satellite networks, without any interference. Channel 4 has been trans-

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Flat nose plier, side cutter, round nose plier |
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mitting PALplus broadcasts since September 1994 and plans to offer nationwide coverage early this year. Nineteen European broadcasters are preparing to provide PALplus transmissions. Philips and Sony are expected to launch PALplus sets in the UK later this year.

Philips is also planning to sell ghost-cancelling set-top units in the UK by the middle of next year (see Ghost Cancelling System in last month's Teletopics column, page 172). The retail price is expected to be around £200. Philips sets incorporating the circuitry should be available in 1997 at a premium of £25-£50 on the basic set price. Five-ten million people in the UK are affected by minor TV ghosting problems: half a million suffer from severe ghosting. While Philips is believed to be ahead in this field in Europe, it's expected that the major Japanese manufacturers will have sets available shortly after.

The BBC has confirmed that it will launch a digital audio broadcast (DAB) service this September, carrying Radio 1-4 in stereo and Radio 5 in mono as well as extended parliamentary and sports coverage. It will be the world's first broadcaster to launch a DAB service. DAB is being promoted in the UK by the National DAB Forum, organised by the DTI. Members include Philips, Panasonic, Hitachi, Sharp, Pioneer and Quad.

BUSINESS/TRADE NEWS

RS Components has opened a trade counter for North London at Colonial Way, Watford WD2 4WW. It's just two minutes from Junction 5 off the M1. Telephone number is 01923 210 050, fax 01923 211 177. In addition to fast counter service technical support is provided. Other RS trade counters are located at Birmingham, Corby, Glasgow, West London, East

London, Manchester, Newcastle and Nottingham.

Matsushita is buying Nokia's picture tube factory at Esslington, Germany. It will become Matsushita's fourth c.r.t. plant outside Japan, the others being in the USA, Malaysia and China. Matsushita will be refurbishing the plant, which will have a production capacity of 2m tubes a year.

JVC is to increase TV receiver production at its East Kilbride plant. At present the plant produces small- and medium-sized TV sets and monitors. The £9.2m investment will enable higher added-value large-screen sets to be added to the range. Over 150 new jobs will be created over the next four years.

Grundig is to extend its product portfolio with the introduction of a new range of colour receivers based on the G1000 chassis manufactured by Gooding Consumer Electronics at the company's factory in Creutzwald, France. In view of the confusion that has arisen with two sales forces selling Grundig brand products a new joint sales and distribution strategy has been adopted. Grundig International, based at Rugby, will be responsible for the sale of satellite products and the new range of G1000 chassis TV sets to independent dealers, satellite specialists, buying groups and distributors and will continue to offer the full range of existing Grundig products to all UK customers. Grundig Satellite Communications, based at Llantrisant, South Wales, will be responsible for the sale of satellite products and the new G1000 chassis CTV range to multiple retailers and major store groups.

The dates for CETS 95, the Consumer Electronics Trade Show launched by our sister journal *Electrical and Radio Retailing (ERT)*, are April 2nd-4th. Venue is Olympia 2, West London. The aim is to provide an under-one-roof alternative to the traditional trudge around London hotel trade shows.

VCR Clinic

Reports from Keith Evans, Nick Beer, Gerald White, Chris Watton, Gerald Smith, David Belmont, Eugene Trundle, Brian Storm, Colin McCormick, Derek Bracknell, John Edwards and Mike Leach

Samsung VI8220

When this rarely seen VCR appeared in the workshop with the complaint that it chewed tapes we were not surprised to find that the reel idler tyre was cracked and worn. Alas a search through our tyre stock failed to produce a suitable replacement, so we were forced to fit a new idler assembly. Unfortunately this wasn't the end of the story.

When either fast forward or rewind was selected the cassette would be immediately ejected. All other functions, including the search modes, were fine. With many other makes and models a faulty mode select switch causes this type of fault, so we reluctantly decided to fit a replacement. I say reluctantly because the mode switch is buried in the works: to gain access you have to lift the deck assembly and dismantle the operating plate mechanism. To avoid timing problems after reassembly it's worth noting the relative positions of the two cam gears and their associated components. The new switch provided a complete cure. **K.E.**

Sony SLV615

The symptoms were loss of the playback picture, only a blue mute screen but the hi-fi sound o.k.! When pause was selected a very poor-quality still-frame picture appeared. This suggested that the video heads were badly worn. In view of the age of the machine, its infrequent use and the good-quality hi-fi sound however we resisted the temptation to replace the very expensive upper drum.

An interesting display was obtained when the scope was connected to the head amplifier chip's output. The waveform didn't look quite right and appeared to have something superimposed on it. All was revealed when the head rotation was momentarily interrupted and the waveform remained. It transpired that one of the four head amplifiers was producing a 12MHz signal. A new HA118019NT head amplifier chip put things right. **K.E.**

GoldStar RQ2001

If one of these machines is stuck in the LP mode with a function wrong, e.g. fast forward search, switch off at the mains supply, short-circuit the 5.5V back-up capacitor C503, remove the short then switch on again. **G.W.**

JVC HRD610

With a timed recording this machine would record only one event. Manual recordings were fine, as were single-event timer recordings. But if more than one event was programmed in the mechanism would jam when the second event occurred. The machine would then switch off, and the second set of information was lost. The cause of the trouble turned out to be the mode switch: when the deck tried to start from the fully loaded position it locked up. A new mode switch put matters right. **C.W.**

Amstrad VCR6000

Remote control operation of these machines has always been a problem: the batteries last for only a few weeks, making RC operation very expensive. When the battery

voltage drops to 5.7V the handset's programming section becomes inoperative: if you try to transfer information to the recorder the display clears and nothing is sent.

A scope check on the battery connections with new batteries fitted produced a d.c. reading of 6.4V. The voltage bounced when one of the keys was pressed, the lowest point being 6V. With the old batteries fitted the same checks produced readings of 5.9V and 4.9V respectively. Although the handset still transmitted instructions such as play with the old batteries fitted, the programming information held in the chip was lost when the voltage fell below 5.1V. The simple solution was to connect a 1,000µF capacitor across the battery terminals, soldered to the print in a position where it didn't foul the case moulding.

I then tried the handset for twenty consecutive programmes, held the play key down for one minute and finally programmed again, using batteries that would previously have been discarded. As a matter of curiosity, to see how low the battery voltage could go without the unit failing to transmit a programme, I tried it with only three of the new batteries, the other position being linked across. The handset still worked. **C.W.**

GoldStar GHV4400I

There was intermittent jumping with playback and recordings. The cause of this was intermittent loss of back tension. A new mode control switch cured the problem. **G.S.**

Sanyo VHR3300

Intermittent tape damage was the complaint with this machine. If you pressed stop during fast forward near the start of a tape the tape would spill out into the mechanism. The cure was to replace a spring in the brake trigger area. **G.S.**

Panasonic NVSD40

This brand new machine kept on ejecting tapes when they were inserted. On investigation I found that the capstan had seized: because 'thrust screw UMT' was loose, the capstan flywheel was rubbing against the motor PCB. The problem was cured by adjusting this screw (it's the large white plastic screw on top of the capstan spindle). **G.S.**

Sony EVS600

The lacing with this PCM home deck was intermittently very clattery. Removing, cleaning and lubricating the pinion of the no. 10 gear put matters right. Note the alignment requirements of this gear on reassembly – you can't just pop it back in! **N.B.**

Panasonic NVG12B

A pair of these machines produced no E-E signals or red on LED display. The first fault was a formality: the STK5331 multiregulator IC1001 was defective. This device is not as unreliable in the G12 as it is in some models, but when the

second faulty machine came along and voltage checks seemed to point to the same cause we again condemned IC1001. The replacement didn't restore normal operation however. We then found that the 10k Ω pull-up resistor R1003 was open-circuit. The new chip was left in to be on the safe side. **N.B.**

Ferguson FV61LV

This machine's mechanism produced a very loud hum or drone. The cause was sticky dirt in the capstan motor bearing. It was generating so much friction that there was burning – the capstan was discoloured at this point. Stripping the motor, cleaning and lubricating provided a complete cure. **N.B.**

Panasonic NVSD40B

There was no through r.f. gain. The cause of the fault was in the power section – there was no always 12V supply. In this machine the 12V supply is derived from the 13V line via two diodes, D1114 and D1115. The former was open-circuit. We replaced them both for good measure. **D.B.**

JVC HRD140

The servos did anything but run at the right speed. We found that the cause was lack of the FSc signal to the servo section. The cure was to replace the chroma sub-panel, part no. PU22046A. **D.B.**

Matsui VX2500

The switched voltages from the power supply failed to come up. Checks showed that Q07 was open-circuit. **D.B.**

Sanyo VHR291E

There was no E-E sound or vision. There was also no sync detection because T6901 on the sync detector sub-panel was dry-jointed. **D.B.**

Panasonic NVF55B

This machine was dead. We found that IC1102, part no. S13120C, was short-circuit internally. **D.B.**

Saisho VR3400

There was intermittent loss of the luminance record signal. We eventually found that R52 on the YC board was going open-circuit intermittently. **D.B.**

JVC HRD750

The playback pictures flickered because there were no PG pulses from the head drum. We had to replace the lower drum assembly. **D.B.**

Sony SLVE8

The fault with this new video was intermittent failure to eject a cassette. We found that most of IC201's pins were dry-jointed. **D.B.**

Philips VR323

The mechanism was jammed. When this had been rectified

we found that the machine still wouldn't work because IC40 (SAA1310) was short-circuit internally. **D.B.**

Aiwa VXT1010

There was a fault with the tape section of this combined TV/VCR. When a tape was inserted it went into rewind. The cause was IC502, which acts as a buffer between the sensors and the microcontroller chip. **D.B.**

Philips VR203

As the capstan flywheel and bearing were badly worn there was severe wow and flutter. We obtained a replacement flywheel, which comes complete with housing, bearing and a service kit. Fitting this cured the fault. **D.B.**

Philips VR6760

While disposing a few wrecks at the local dump my eye was caught by a forlorn looking Philips VR6760 hi-fi stereo machine. I paid a small sum for it and when I got it back I found that someone had tried to fix the DMP deck and got themselves into an awful mess. When I tipped out all the bits it was virtually complete: a service kit then got the machine working nicely. The only thing I would like to add to the excellent article on the deck in the March 1992 issue is to be sure that the record-tab sensor switch is fully down on the chassis before inserting a tape. It can collide with the bottom of the tape with the result that your carefully rebuilt deck jams.

I also had a problem when I came to fit the cassette flap, which was missing. The one I ordered came with much larger square supports at the top than the round holes in the machine would accept. Willow Vale told me that the type with the small supports is no longer available and that I should open out the holes in the machine. Since there would have been nothing left of one of them I instead filed down the new and expensive flap I'd just bought. I was reluctant to do this, but it worked. **C.McC.**

Tatung TVR6111

This machine has much in common with Amstrad VCRs produced during the same period. If the symptom is intermittent or permanent no go, with the display panel black and no mechanical functions, it may well be that the power supply is working all right but crystal X801 is dry-jointed at one or both legs. It's mounted to the right of the FDP on the front panel. **E.T.**

JVC HRD750

Failure to function, sometimes on an intermittent basis, and perhaps accompanied by failure of mains fuse F1, can be caused by sparking between the chopper chip's heatsink tab and the adjacent PC land which goes off to R1. I deal with this by cutting away and scraping off some of the PCB foil to the side of the heatsink tab. **E.T.**

Sanyo VHR3100/VHR3300

Intermittent failure to wind or rewind, because the reel brakes fail to come off, is an increasingly common problem with these models. If you encounter it, turn the machine upside down and examine the brake activator pin that passes through the deck plate at the front left-hand side. You'll probably find that it rides down, as you view it from the

underside, beneath the slide bar. The cause is movement of the slide bar's retaining pin. Push it back through and fit a spacer and circlip on the top side. Top, that is, when you've turned the machine back upright! **E.T.**

Akai VS55

Both the playback and E-E pictures had noise bars across them. In addition the machine would sometimes fail to play, record, eject or fast wind in either direction. I suspected the power supply for the noise bars but also felt that the capstan motor might be faulty as it sometimes refused to start to rotate. The various power supply outputs seemed to be o.k., though the 6V output had a small amount of ripple on it (the voltage was correct).

Following advice on similar Akai models given in previous issues of *Television*, I checked all the small electrolytics in the power supply. Capacitance meter tests showed that a number of them were low in value. Fitting replacements failed to cure the problems however. What did eventually clear the faults was replacement of C15 (220 μ F, 16V) which sits on the output side of the 6V supply. This cleared the ripple. Incidentally C15 tested o.k. for value and leakage with the capacitance meter, so I've no idea why it failed to work when in circuit. **D.Br.**

Panasonic NVSD30

This machine would accept a tape then immediately eject it. Loss of capstan drive is the usual cause of this situation, but not on this occasion – the capstan motor rotated as the tape was being ejected. The capstan stator (part no. VEK4097) was eventually found to be the cause. Presumably the FGs or PGs were confusing the systems control chip. **B.S.**

Panasonic NVV8000

This impressive looking machine produced a less than impressive picture. The playback and E-E pictures were distorted and rolling, with both S-VHS and normal VHS operation. With this model and its lower specified relatives the NVFS100 and NVFS90 you tend to get capacitor trouble in the small pack that houses the CCD delay line. The CCD delay pack is on the YC separation board in the NVV8000. An excellent picture was obtained when C3506/7/8 had been replaced. They are all 3.3 μ F capacitors rated at 16V. **B.S.**

Panasonic NVJ35

This machine had a nasty capstan fault, with bad wow on sound and tracking bars that jerked down the screen spasmodically. The capstan drive chip and stator are prime suspects when you get symptoms like these. On this occasion they were both innocent however. We next changed the servo and system control chip, as the capstan drive seemed to be abnormally high, but again the verdict was not guilty.

As things were now looking desperate the oscilloscope was wheeled into action. We were surprised to find that a check on the capstan error voltage produced a very corrupted digital waveform, even when the machine was in the stop mode.

In this machine the capstan FG signals are amplified before being fed to the servo and systems chip IC2001. We found that there was a large spiked waveform sitting on the input at pin 15, which supplies the digital speed control circuit. Two operational amplifiers feed this pin, from the capstan FG2 buffer amplifier: this is where the additional waveform was being added. High-frequency noise was

being picked up and amplified. Where was it being generated? The power supply of course. C1118 had gone low in value, leaving a small high-frequency ripple on the 5V line. A new 330 μ F, 10V capacitor put matters right. C1122 (100 μ F, 50V) in the 45V supply had also fallen in value. While we were in there we also replaced C1109 (1 μ F, 400V) and C1114 (47 μ F, 16V) on the primary side of the supply as they can also give trouble. **B.S.**

Saisho VR1200HQ/Matsui VX820/Hinari VXL35

The job card said "reluctant to accept a tape". When I tried to insert a tape I found that it had to be pressed in quite hard for a few seconds before the loading motor took over and dragged the tape in. The cause of this was immediately apparent when the top cover had been removed: the tape-in leaf switch mounted on top of the carriage was loose in its mounting because one of its plastic lugs was broken. A new switch put matters right. **J.E.**

Ferguson 3V29

The E-E sound was o.k. but there was no picture. C243 (220 μ F) which is connected to pin 8 of the HA11738 chip IC201 was open-circuit. **J.E.**

Panasonic NV333

The playback sound and picture were normal but there were no E-E signals and no channel indications. One end of the 3.9 Ω resistor R7020 in the power supply was found to be dry-jointed. **J.E.**

Logic VR950/Samsung VI611

This machine would stop in play or record, usually after about an hour. Up to the shut-down point the head and the take-up spool rotated normally. Suspecting a reel pulse problem, I connected the scope to the collector of Q610. The waveform consisted of four healthy squarewave pulses, but of only 2V p-p instead of 5V p-p amplitude, followed by very noisy and even lower-amplitude pulses. When the spool carrier was removed and the ten silver-plated reel pulse reflectors were examined they appeared to be clean. But I then noticed that there were three ring spacers on the shaft. So the spool carrier was sitting too high! Removing two of them and refitting the carrier produced ten healthy 5V p-p squarewaves.

Why the shut-down delay? As the take-up spool fills with tape it rotates more slowly. Thus the 'poor' portion of reel pulses remained for longer. As a result the system control thought that there was no tape drive. **J.E.**

JVC HRD560

No play the customer had said. On test the drum didn't rotate and the machine shut off. A look at the circuit diagram led me to CP401, which protects the 13V motor supply. It was open-circuit, a replacement restoring the supply to the drum which then rotated at the correct speed. This wasn't the end of the matter however. The capstan seemed to be running as though there were no control pulses, which turned out to be the case – the control amplifier had failed. It's incorporated in the HD49733NT servo chip IC401. Replacing this finally restored normal operation. **M.L.**

Rechargeable Batteries

Pete Roberts

One particularly expensive item associated with camcorders is the rechargeable battery pack. NiCad cells are also replacing disposable batteries in ever increasing numbers. Because of the way in which they are used however, NiCad cells often lose their efficiency and appear to be in need of replacement long before the end of their theoretical lifespan. This article will explain how NiCad cells work, how to reactivate tired batteries and will also give an insight into the new nickel metal hydride (NiMH) technology.

History

Sealed NiCads are derived from the wet nickel-cadmium batteries developed between the Wars for use in arduous industrial or climatic conditions. They first appeared on the scene, as large round button cells, in the early Fifties. They were commonly known as Deacs, after the original manufacturer DEAC (now Varta) Batteries. Similar types, now usually known as mass-plate cells, are used as a memory back-up in TV sets, VCRs and computers. We'll take a look at them later.

Unlike primary (single use) cells, the chemical systems in secondary (rechargeable) types are designed to be reversible, with efficient recovery of the active materials. Some familiar rechargeable systems are the lead-acid (car) battery, the nickel-iron (NIFE) batteries used to power milk floats, and nickel-cadmium (NiCad) types. Strictly speaking it's correct to refer to a single 'battery' as a cell, a battery being an assembly of two or more interconnected cells. NiCad chemistry is fairly complex, but we'll try to give as simple an explanation of the internal goings-on as possible.

NiCad Basics

To start with there are two foil electrodes, one of nickel (negative) and the other of cadmium (positive). The negative electrode's active material is nickel hydroxide while the positive electrode starts off as metallic cadmium. The active layers are made by fusing powdered active materials on to the foil substrate,

using a combination of heat and pressure – the process is known as sintering. This results in a granular, porous structure which maximises the surface area of the electrodes. The greater the effective electrode surface area, the higher the cell capacity for a given cell size – it's basically the same idea as that of the etched foils used in electrolytic capacitors.

Between the foils there's a thick, fibrous plastic separator that's soaked with the electrolyte – a strong solution of potassium hydroxide (caustic potash or KOH). The lot is rolled up and stuffed into hefty steel cans which are sold as replacements for disposable batteries, or made up into cased battery packs for use with camcorders and suchlike.

Charge and Discharge

During discharge of a cell the cadmium positive plate is converted to cadmium hydroxide while the negative plate is changed from nickel(III) hydroxide to another form, nickel(II) hydroxide. When a cell is being charged these reactions are, hopefully, completely reversed.

Under overcharge conditions free oxygen is liberated. As overcharging is quite common, means have to be taken to reabsorb it. The oxygen comes from the water in the electrolyte: if its liberation was allowed to continue unchecked the cell would dry out and become useless. The solution to the problem is to make the nickel negative foil larger than the positive one. This extra, free negative material, known as the charge reserve, combines with any free oxygen then, via a succession of chemical reactions, returns it to the electrolyte.

This gas reabsorption system is fairly slow and can cope with only limited abuse. If severe overcharging, accidental shorting or overheating occurs a dangerously high internal pressure will develop: it could result in an explosion. To prevent this, sealed NiCads have some form of resealable safety valve. It's usually situated under the positive pip and must never be sealed up or otherwise obstructed. The valve

opens when the internal pressure reaches typically 200 p.s.i., resealing when the pressure falls below about 140 p.s.i. Venting should be avoided at all costs however since, as mentioned earlier, it will dry out the electrolyte. Always heed the warnings about puncturing or otherwise mutilating cell casings – the internal pressure can expel liquid electrolyte, and a faceful of liquid electrolyte is not exactly good for the complexion.

Pollution

While nickel is fairly innocuous, cadmium is a highly toxic heavy metal. It presents a severe environmental pollution risk when NiCads are disposed of in landfill operations. Battery manufacturers are tackling the problem in two ways.

First, the return of dead NiCads is being encouraged to recover the nickel and cadmium, which are both high-value materials. But unfortunately the response from the trade and the public has been rather apathetic. If you sell rechargeable batteries, you would do everyone a great favour by taking your customers old ones and returning them to the manufacturers via your wholesaler or a metal recovery service (the posh name for the local scrappy).

The second approach is the development of the Nickel Metal Hydride (sometimes called just Nickel Hydride) system. This is just becoming available in the popular AA size cylindrical cell and also in camcorder and mobile phone battery packs.

NiMH Technology

The internals of an NiMH cell are similar to those of its NiCad cousins. There's a nickel foil negative electrode coated with nickel hydroxide, and the electrolyte is still an aqueous solution of potassium hydroxide. Here the similarity ends: the positive element is quite different, the active material being hydrogen.

Although hydrogen is a gas at normal temperatures and pressure, it can behave as a metal and in fact occupies Group 1 of the Periodic

Table, in company with potassium, sodium and the other alkaline metals. Under the extremes of pressure and low temperature on other planets hydrogen is believed to exist as a form of metal. As such conditions can't be replicated here however the hydrogen has to be 'metalified' in some other way.

Hydrogen has the ability to combine with metals very loosely to form hydrides, compounds that are somewhere between a true chemical compound and a sort of alloy. Hydrogen so combined is readily available to take part in chemical reactions without the risk of leakage and explosion that's associated with gaseous hydrogen.

The positive electrode of an NiMH cell is made from foamed nickel alloyed with small amounts of titanium, vanadium, zirconium and chromium and can hold about two per cent of hydrogen by weight.

Unfortunately NiMH chemistry seems to be something of a trade secret at present. The reactions at the negative electrode are similar to those in a NiCad however, while at the positive electrode hydrogen is oxidised during discharge to form water. During subsequent recharging this water is split up, releasing hydrogen to regenerate the hydride.

While the main drive behind the development of nickel hydride technology was the elimination of cadmium, there are a few other advantages over NiCad technology. The metal-foam positive electrode has an enormous surface area for its size, resulting in a vastly increased energy density. In fact NiMH cells and batteries can have between two and three times the capacity of a NiCad for a given size.

Cadmium is quite a heavy metal, whereas nickel is very light. So the omission of cadmium results in a much lighter battery, which is very important where several battery packs may need to be carried.

An NiMH battery can be charged via a standard NiCad charger: the only point to remember is that because of the greater capacity a longer charging period is required.

The Memory Effect

A major cause of complaint from camcorder users is a battery pack that appears to be fully charged but runs for only a fraction of the time it should before giving up – the same problem often occurs with mobile phone batteries. This reduced capacity

is a result of the so-called 'memory effect'.

Unless a NiCad battery is fully discharged every so often it loses its ability to accept and subsequently deliver its rated amount of electrical energy. This is caused by a change in the active materials from a rough, granular form to a smooth coating with a greatly reduced effective surface area. Any remedial action must reverse this change.

The problem arises because both camcorder and mobile phone users tend to switch off, due to low voltage, well before the battery is completely flat.

The Cure

The cure involves fully discharging the battery pack before recharging it, and may require several charge/discharge cycles before the full capacity is restored. Controlled fast (and preferably pulsed) charging gives the best results. Special battery dischargers are available to fit camcorder and phone packs, but they can be expensive and often fit only one type of battery.

All that's needed however is a bulb of appropriate voltage (6V or 12V auto bulbs rated at about 6W are ideal). Solder wires to the bulb's terminals and connect them to the battery's output terminals. Never solder directly to the battery, as this will damage it and prevent proper contact being made in use. It's usually fairly easy to fix up something to hold the lamp leads on to the battery terminals. Where many similar batteries may need treatment – for example when camcorders are rented out – a custom-built holder can be made up. The battery must be discharged until the bulb goes out, then fully recharged. Repeat the cycle until no further improvement is obtained.

Guidance

If a battery doesn't respond to this treatment its failure is probably due to some other cause and replacement is the only option. The usual causes are drying out and dendrites. These are stalactite-like growths on the cell's electrodes: they grow and eventually puncture the separator, causing an internal short.

You won't have to go through this palaver with nickel hydride batteries, as they don't suffer from the memory effect. This is one very good reason to change over to NiMH despite the

initially higher cost.

Never try to flatten a battery by shorting it across. A rechargeable battery can pass enough current to start a fire, and such abuse can result in the battery exploding.

Both NiCad and NiMH batteries need to be charged by a tightly-controlled constant current. Use only pukka NiCad and NiMH chargers, and don't ever think of using a domestic car battery charger. Incorrect charging will ruin your – or your customer's – batteries, and could also cause your own personal Big Bang!

Mass-plate Button NiCads

The mass-plate button NiCads used for memory back-up usually last for years before they need replacement. The term 'mass plate' refers to the construction of the electrodes: powdered active materials are pressed into tablets that are a bit like large aspirins.

Unlike the high-current, sintered foil NiCads previously described, they have a very low self-discharge rate and are kept on a trickle charge of a few mA whenever the host equipment is switched on. Any attempt at rapidly charging or drawing a heavy current from this type of battery will lead to its demise.

Whenever back-up battery failure is suspected it's important to check that the battery is being charged. The charging circuit usually consists of a highish value resistor with a diode in series, fed from one of the higher low-voltage supplies, and you're looking for a charging current of anything between 1mA and 10mA. The resistor can go high in value or open-circuit, or the diode may fail to conduct. Make sure that what you are dealing with is actually a NiCad and not a large-value Supercap capacitor or a lithium battery.

Button cells also have a pressure-release system. This is the + mark on the positive side: it ruptures should the internal pressure become dangerously high. If you come across a cell that has ruptured, check the charging current before fitting a replacement. Always take great care to fit PCB mounting cells and batteries the right way round.

Types of Button Cells

Lithium cells appear to be taking over from NiCads in many back-up applications. They must never be fitted in place of a NiCad cell: if it's subjected to even a tiny charging

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current a lithium cell will explode nastily. In addition the voltage is wrong: a NiCad or NiMH cell delivers around 1.2V while a lithium coin cell provides 3V.

When they get on a bit button NiCads sometimes leak. This is revealed by a white deposit around the seal. Any cell or battery in this state should be replaced, as leaking chemicals can make quite a mess of the copper tracks on a PCB.

Incidentally nickel hydride back-up batteries are made by Varta in two-cell (2.4V) and three-cell (3.6V) versions. These should make a more reliable replacement for NiCads provided they will physically fit.

They are available from Farnell. Nickel hydride AA cells with a capacity of 1,200mAh are available from CPC: the catalogue lists them under general-purpose NiCads – the type is AA-1200, made by GPI.

In Conclusion

If you run a camcorder rental operation a change over to nickel hydride battery packs should save you money and reduce complaints. Likewise persuading customers to replace tired old battery packs with nickel-hydride ones should generate useful sales as well as reducing the "this battery is only six months old but runs for just ten

minutes" type of complaint – as long as you impress on the customer that NiMH batteries have a higher capacity and need a longer charging time.

Don't forget to ask your wholesaler whether he will return dead NiCads to the manufacturer for recycling. If not, still ask your customers for their old ones: you should get a good contribution to the tea fund from the local scrapyard provided you take along a reasonably large boxful. Most metal merchants are also happy to relieve you of old transformers and deflection coils – in realistic quantities of course.

Finally I would like to thank Varta Batteries for the use of their technical data in the preparation of this article.

Long-distance Television

Roger Bunney

November lived up to its reputation of being a quiet month for DX reception. The Leonids meteor shower didn't produce much excitement, though reasonable MS signal pings from the east and Scandinavia were seen on the 18th. There was a lively but short-lived tropospheric opening on the 29/30th, with signals present mainly on an east-west path. This produced Irish signals from the west and signals from Germany, the Benelux countries and Denmark (just) from the east. There was reception in both Band III and the u.h.f. bands, with several strong, long-duration signals being received from Germany. Reasonable-strength Sporadic E signals were received from TVE (Spain) on the 11th, in channels E2 and E3. Weak SpE signals from the south east were present on the 20th, in channels E3, E4 and R2.

Our thanks to Peter Schubert (Rainham), Garry Smith (Derby) and Brian Williams (Penarth) for supplementing my own meagre log.

Peter Schubert mentions seeing the PM5544 test pattern on two occasions on BBC-2, during programme times, with the sound cutting to Radio 2. On one occasion the identification 'BBC-2' was included, on the other 'BTN' – can anyone explain the meaning of the latter ident?

A few months back I mentioned a 'Channel 2' programme listed in a local Dubai TV guide. It's an Arabic channel transmitted via the Arabsat craft at 31°W and is not available terrestrially. Sorry about that.

George Gaskin (Gibraltar) has seen my name in end captions on a Ruth Rendell mystery – from my pre-redundancy TVS days! It was being broadcast by TV station 'R340' which transmits from Marbella. The town sits on the Costa del Sol main road no. R340, hence the station name!

There are rumours that a new Greek commercial station that broadcasts in ch. E3 is calling itself Sky. Finally, the EBU reports that the Psunj, Croatia ch. E4 transmitter (1kW) has closed.

Satellite Sightings

John Locker (Liverpool) first sighted Astra 1D in a test slot at 14.5°E on the 21st, with carrier tests in the FSS and DBS bands. It has since moved across to 19.4°E. John has also received reasonable-quality signals – Cine 5 (11.130GHz) and Show TV (11.170GHz) – from Turksat at 42°E, using the Echosphere full threshold setting level. Good going for signals in the Turkish spot beam.

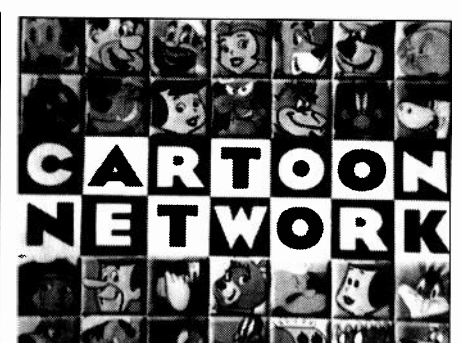
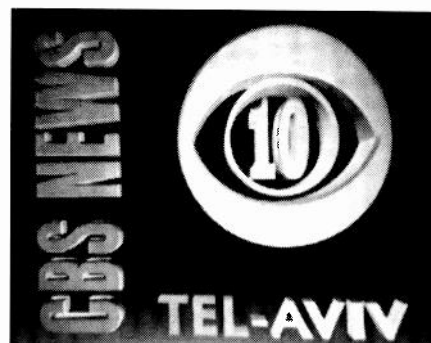
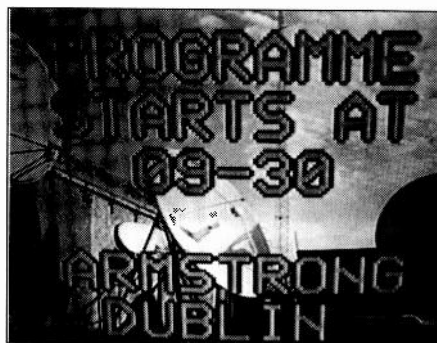
A BBC Lottery programme line feed has been carried by Eutelsat II F4 (7°E), with sound in syncs (SIS). Interesting that the programme production talkback has been carried in the clear on the downlink – check at 6.6MHz on the (variable) EBU lease transponder. An unusual programme seen from 7°E (at 11.050GHz) for several hours on the 15th consisted of a New York street scene with an occasional shot of several people in discussion. As with all EBU feeds SIS is the order of the day: the pictures just shook – in silence! This was obviously a secondary European distribution feed, the primary transatlantic signal probably being sent via Intelsat 601 at 27.5°E, now with digital compression and thus invisible to us mortals.

The ITV *Family Service* on the 27th came from Plymouth and was, I thought, oddly network linked via Eutelsat I F4 (25.5°E). It was near the sea front and could have easily been single-hop linked into the local BT network system a couple of miles distant.

Bob French (near Rugby) reports that many of the African feeds have disappeared from Intelsat 512 now that the satellite has moved from 1°W to 21.3°W, leaving only Nile TV (4.1353GHz, LHC polarisation) with greatly reduced power. David Thorpe (*Transponder Bulletin*) feels that some of 512's old Ku band transponders may come back into use, so keep a look out. There is currently a Sky News feed via 512 southwards bound for Africa, at 4.001GHz with LHC polarisation.

Brian Williams (South Africa) reports that PAS-4 will start transmitting on May 31st at either 69 or 72°E, with 60W spot beams directed at Africa. M-Net and CNNI will be carried – M-Net is expected to use MPEG-2 compression.

Because of Eutelsat I F4's (25.5°E) inclined orbit and transponder failure problems ITN has now taken a lease



Left: An identification logo seen by John Locker (Wirral) via Eutelsat II F2 at 10°E, part of a feed to Poland. Centre: A CBS New York NTSC news feed from Israel via Eutelsat II F1 at 13°E, received by Andrew Sykes. John Locker and Andrew Sykes both use 90cm dishes. Right: The TNT Cartoon network received by Alan Smith in Thailand via Palapa B2P. The signal is clear from Palapa but encrypted from Apstar 1.

on I F5 (21.5°E) – check at 11.140GHz and 11.180GHz (horizontal) for UK and European location to studio feeds. With increased trouble in Bosnia, I've seen little recently of the EBU Sarajevo feeds that were carried by Intelsat 603 at 34.5°W. Downlinks from that region have been seen via Eutelsat II F1 and F3 in the FSS and Telecom bands respectively.

Gorizont 20 at 14°W fired up recently with live video from the MIR space station. Audio was also present – check at 6.56 and 7.38MHz.

Hispasat 1 and 2 at 30°W often carry OB sports feeds. The Grand Premio Nacional (akin to the Grand National) was present at 11.670GHz (vertical) though with poor quality audio while the race was running, suggesting that the feed was intended for a bookies' shop chain. An ITV-bound feed with Manchester United playing Barcelona was seen via the 11.538GHz transponder.

A month with something for everyone!

News Items

Norway: Two new networks are to begin transmissions this year. TV+, a commercial station offering general entertainment, is to start in April while NRK will be introducing a second channel that should provide a service akin to BBC-2.

Austria: There are to be two ORF networks, ORF-1 a commercial operation and ORF-2 licence funded. The change is due to take place in March.

Czech Republic: A new commercial service, TV Premiera, has started transmissions from Prague on ch. R24. It's to be extended with transmitters at Plezn (ch. R51), Zlin (R58) and Liberec/Jested (R60) – all powers 2kW.

Latvia: The capital, Riga, now has a commercial station – RBS-TV.

Bulgaria: The first commercial TV licence has been awarded to a station called Tempo TV.

Meteor Shower Dates for 1995

Meteor shower/scatter propagation offers the possibility of daily DX-TV reception throughout the year, though the signals are of brief duration and often weak. The early morning is perhaps the best time to try for this type of reception. Signal pings occur in Bands I and II (f.m. radio): you can also get fleeting signal glimpses in Band III. Chs. E2 and R1 are the most likely to produce such signals, though most Band I channels will produce them if you stay tuned for long enough.

Since the signals last for a few seconds – up to 15-20 seconds with a 'super ping' – the receiver used must be capable of rapid line and field locking. The meteor ionisation usually occurs at E layer height (about seventy miles above the earth's surface), so signal reflection distances will be the same as you get with summer SpE reception.

In addition to random MS propagation there are several periods throughout the year when meteor showers regularly occur, increasing the reception prospects. At such times the TV-DXer should stay tuned to clear Band I channels. Our thanks to the British Astronomical Association for the following list of meteor shower dates for 1995:

Lyrids: April 19-25th peaking on the 22nd.

TELEVISION FEBRUARY 1995

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May (Eta) Aquarids: April 24th-May 20th, peaking on May 5th.

Cetids: May 7th-June 9th, peaking on May 14-25th.

Delta Aquarids: July 15th-August 20th peaking on July 29th and August 6th.

Perseids: From July 25th-August 20th, peaking on August 12th.

Orionids: October 16-27th, peaking on the 20-22nd.

Taurids: October 20th-December 1st, peaking on November 1-7th.

Leonids: November 15-20th, peaking on the 18th.

Geminids: December 7-15th, peaking on the 14th.

The Quadrantids occurred in early January.

The Leonids shower could be a substantial one this year, ahead of possible storms in 1998/9. For visual effects ('shooting stars') the Quadrantids, Perseids and Geminids are the most noteworthy showers.

Airborne TV

The airborne TV Marti transmissions to Cuba continue, from an aerostat balloon tethered at about 10,000ft above Cudjoe Key in the Florida Keys. Ch. A13 is used, with the main signal beam now shifted to Cojimar, east of Havana, following jamming in the capital. Programme hours have been increased to 0730-1300 GMT. The programmes originate in Washington, being linked to Florida via transponder 14 on Intelsat 601 at 27.5°W (C band).

Some time back I mentioned the USAAF Blue Eagle flight that transmitted Band III TV signals into Vietnam during the war of the late Sixties, using a Super Constella-

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tion which circled in a figure of eight pattern to give wide coverage. An article in the September 1994 issue of *Monitoring Times* describes this and earlier US government TV activity. In late 1962 a modified naval DC6 loaded with TV apparatus and flying at 12,000ft was used during the Cuban crisis to override Cuban TV channels. In May 1965 the aircraft was used to fill the temporarily off-air Ch. A4 during a political crisis in the Dominican Republic. On January 9th in the following year the Blue Eagle craft was back in Washington to carry out tests and within weeks the flight had left for Vietnam.

This time three Super Constellations were used, flying at 20,000ft, for both radio and TV broadcasts. Two of them were equipped for two-channel TV transmissions. RCA

supplied most of the equipment, each aircraft having telecine, VTR playback, a small presentation studio and 2kW transmitters operating in Band III.

Currently two EC130E Pysops aircraft (modified Hercules) are equipped for radio transmission. They saw service during the Desert Storm Iraqi war and more recently, flying from the Roosevelt Roads naval air base in Puerto Rico, during the Haiti invasion.

As a footnote, Ronan O'Railly of Radio Caroline fame proposed the use of an aircraft flying over the North Sea for pirate TV in the late Sixties. This never came to fruition, so Europe has never experienced this unique method of TV transmission.

Satellite TV

The TMC and RTL transmissions from Telecom 2B at 8°W are now encrypted for much of the time, using Smartcrypt and Nagravision respectively. M6 and the LCI news channel are also expected to be encrypted within the next few months. An RTL decoder is on sale in French TV shops at FFfr690; the subscription is FFfr10 monthly.

The US Ku band satellite Orion 1 should be in operation at 327.5°W by the time that this is read, offering West European access to US corporate/VSAT video feeds and other circuits. Starbird Satellite Service of the UK has taken a full-time lease on the satellite for transatlantic SNG services, initially analogue but with a proposed move to digital operation at a later date. Intelsat Washington is offering broadcasters the free use of uplink equipment to assess digital SNG hardware using the new compression techniques.

The Franco/German cultural channel Arte is likely to move from the ailing Kopernikus satellite to the Eutelsat Hot Bird at 13°E when this becomes operational.

Teleport London International has leased several transponders aboard the C band TDDRS satellite at 41°W to provide links between Europe and five US cities. Intelsat is considering the launch of a series of Ku band satellites, already denoted Intelsat KX, into mid-Atlantic slots to rival PanAmSat in providing links between the USA on one side and Europe and Africa on the other. Later this year Intelsat 707 is to replace 505 at 18°W while 708 will be slotted in at 40.5°W.

London based International Network Television is to start a new Russian TV channel, TV3, via the Express 1 satellite at 14°W. The Express series satellites will have higher outputs than the earlier Horizons, allowing direct dish reception in Russia. The channel is also to be reradiated locally as a terrestrial signal.

Answer to Test Case 386

— see page 246 —

So many under-guarantee jobs turn out to be not real jobs at all but simply a matter of pilot error, incorrect hook-up, lack of understanding of the gear or troubles with peripheral equipment.

So it was with Mr Mark's sound fault. He'd wired up a couple of external speakers for the main stereo channels, left and right. They were screwed to the wall and wired to the TV set's external speaker connections, but with no regard to polarity. Because of this they were working out of phase, with the cone of one moving forwards as that of its companion went backwards. To put this right RT simply reversed the connections to one of the speakers, restoring the system's good reproduction.

The cause of the problem with the VCR was obvious to RT at the outset,

as was the fact that this was a workshop job. The hi-fi audio tracks are recorded and played back by their own pair of rotary heads. For good signal continuity it's essential that the same path across the tape is followed in the record and playback modes. This was happening with playback of the machine's own recordings, but not with playback of recordings made elsewhere: the tape path was out of alignment, preventing correct head tracking along the paths laid down by another machine. The workshop cure was a deck service, including guide-pole adjustment.

Servicing the ITT Compact 80R Chassis

Chris Watton

This is the first part of a series of articles that will deal with the ITT Compact 80R, the Monoprint B and Digivision 3 chassis.

The Compact 80R was a development from the CVC1200/CVC1210 series chassis with which it has much in common. The main differences are that in the Compact 80R chassis the line output transistor is driven by a winding on the chopper transformer instead of a separate line driver stage and a slightly different sync separator/line generator chip is used (TDA1941 instead of TDA1940F). The colour decoder, RGB output stages, the field timebase and the r.f./i.f. module are all much the same: the primary side of the chopper circuit is virtually identical.

These sets are quite reliable and should display a good picture provided the tube is sound. With a little routine service work they should continue to provide good service.

The HF Module

The CMR800 and CMR803 r.f./i.f. modules used in these sets differ in that the former is for use with manual control

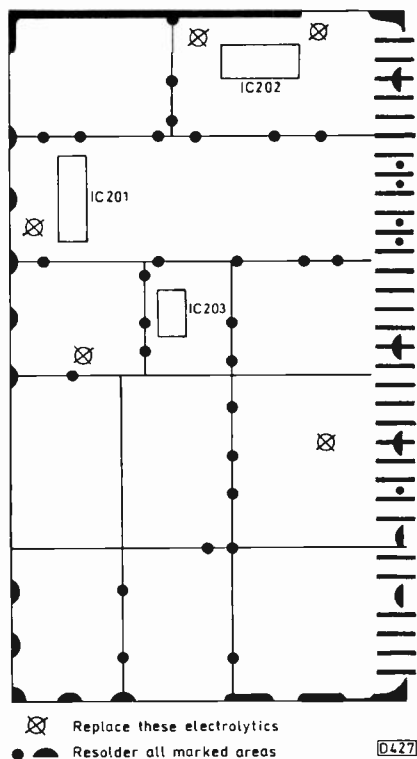


Fig. 1: Trouble spots in the CMR800/803 h.f. module (viewed from the print side). All marked areas may need attention: the joints often look o.k. but are not good at h.f. Faulty electrolytics can cause sound faults, a.f.c. drift and loss of picture. Replace the ones indicated here.

while the latter is for use with frequency-synthesis tuning. They are fully integrated units that contain a varicap tuner

and the i.f./detector circuitry, providing outputs for the audio and video/chroma stages. D.C. volume control is also incorporated.

It is not uncommon to get faults with these units. Most can be repaired fairly easily, but it's tricky to say the least to try to repair the module in situ. Here are some faults you may encounter:

(1) Dry-joints in the module are the usual cause of tuner drift or picture disturbance. The dry-joints occur mainly around the edges, where the PCB meets the metal frame, and also where the numerous shield plates are connected to PCB earth points. Resoldering these will cure a high percentage of faults. It's advisable to resolder these points (see Fig. 1) even if they look good. A solder joint may appear to be o.k. but will, if at all dodgy, give trouble where h.f. is involved.

(2) The a.f.c. can pull the set off tune. Readjustment of L205 may cure this trouble but C214 may have to be replaced.

(3) Replacement of C228, C229 and IC202 should cure low/distorted sound. If the sound is still low after replacing these items readjust L209.

(4) Replace C209 and C212 if there is loss of field sync or the picture rolls on scene changes.

(5) Replace IC201 for a.g.c. problems (the set often being all right with weak signals).

(6) Check the SAWF driver chip IC203 if the gain is low (looks as if the tuner's r.f. stage is no good).

To summarise, make sure that you have a reliable h.f. module. It's advisable to change all the electrolytics and resolder all the framework. The following list of pin connections should be useful in determining whether the cause of a fault lies in the module or elsewhere in the set:

- Pin 6 12.5V supply.
- Pin 7 Tuning voltage supply. Should be variable from 0-31V.
- Pin 10 Line pulse.
- Pin 11 12V supply.
- Pin 14 12.5V supply.
- Pin 17 8V supply – manual tuners only.
- Pin 23 Composite video output.
- Pin 25 Line pulse.
- Pin 26 D.C. volume control voltage.
- Pin 27 A.F.C. switch.
- Pin 29 Audio muting (high for mute).
- Pin 34 Audio output.

Some engineers may be happy to service these modules but if an alignment or r.f. fault occurs it may be advisable to

send the unit to MCES (15 Lostock Road, Davyhulme, Manchester M31 1SU, telephone 0161 746 8037/8). This firm will repair and align the module for a reasonable charge.

Video and Colour Decoder

The composite video signal from pin 23 of the h.f. module is fed to two emitter-follower transistors, T603 and T860. T603 passes the signal to the sync circuitry while T860 passes it to the colour decoder circuitry. The luminance feed is from the emitter of T860 via the luminance delay line to pin 10 of the TDA3561 colour decoder chip (IC870); the chrominance feed is via a high-pass filter to pin 3. We will now consider the various decoder chip pins.

A variable d.c. voltage is fed to pin 11 to control the brightness. The black-level clamp capacitors are connected to pins 18, 19 and 20. Pin 7 is used to apply a variable d.c. for contrast control. The beam limiter circuit also controls the voltage at this pin. Pin 5 of the line output transformer, the earthy end of the e.h.t. section, is the beam current sensing point. The feed to pin 7 of IC870 is via transistor T900: as the beam current increases, the voltage at pin 5 of the LOPT swings negatively and T900 switches on (note that it's an npn device, not a pnp transistor as shown on the circuit diagram).

The RGB outputs appear at pins 12, 14 and 16 respectively. They are passed to the class AB RGB output stages on the c.r.t. base panel. There are five presets here, two for blue and green drive and three for black-level adjustment.

After entering the chip at pin 3 the chroma signal is subject to a.c.c. and user saturation control (the d.c. voltage at pin 6). Gating is carried out by the sandcastle pulses fed to pin 8. The chroma signal emerges at pin 28 to go to the delay line circuit, the separated B - Y and R - Y signals returning to pins 21 and 22 respectively. After this the signals pass to the chroma detectors, thence to the matrix circuit and output stages, and also to the burst detector which phase locks the reference oscillator to the bursts. The reference oscillator's frequency is under the control of the 8.86MHz crystal X875 which is connected, in series with trimmer C875, to pins 25 and 26.

There are data inputs for text versions at pins 13, 15 and 17. Pin 9 is the switching pin: a high level here switches over to the data inputs.

The sandcastle input comes from pin 4 of the TDA1941 sync/line generator chip IC601.

The Timebases

The composite video signal from the h.f. module is, as previously mentioned, fed via T603 to pin 11 of the TDA1941 sync/line generator chip IC601 (in text versions there's also a feed to the decoder module). The chip produces a field sync output at pin 9. This is fed to pin 2 of the TDA2653A field timebase chip IC401 which at pin 6 produces an output to drive the scan coils. The scan current path is via the coils, the coupling capacitor C415 (1,000 μ F) and R433 (1.2 Ω) to chassis. Sample waveforms are taken from the earthy side of the coils back to the chip for linearity correction and to the EW correction circuit. There are height (R432), linearity (R423) and hold (R402) controls. The chip is powered by a 26V supply (III) that's derived from 11 of the line output transformer. The main components here are the series safety resistor R522 (0.1 Ω), rectifier diode D523 (BA158) and its reservoir capacitor C527 (1,000 μ F), with further smoothing by L401, C405 (47 μ F) and C416 (0.1 μ F) before application to pin 9.

A short-circuit field timebase chip may result in the electronic fuse in the power supply operating, as it will represent a heavy load on the line output stage. Field collapse is usually caused by dry-joints around IC401 or failure of the chip itself, though poor capacitors in the supply are a possibility - it's worth replacing them.

Transistor T401 feeds a field-frequency waveform to pin 18 of IC601 to generate the field-frequency component of the sandcastle waveform that emerges at pin 4 of this chip. Pin 5 of IC601 is used for VCR time-constant switching. The voltage here is set by the customer control unit (how this is achieved depends on the version - manual or remote) and is low for off-air reception, high for VCR use. Pin 7 provides an audio muting output - high when there is a synchronised signal, low when no signal is detected. There are presets for line oscillator frequency and phase control, R611 and R608 respectively. The chip is powered by a 12.6V supply which is applied to pin 14 via D604, with C614 (100 μ F) to provide smoothing. This supply is derived from the line output transformer.

Pin 2 of IC601 provides a line-frequency pulse which is fed to the control amplifier in chopper circuit. The latter operates at line frequency, a secondary winding on the transformer providing the drive for the base of the line output transistor.

The drive for the base of the line output transistor is taken from a separate winding (o-n) on the chopper transformer via R741 and L741. Tr501 is the line output transformer and T501 (BU208A) the line output transistor. The circuitry in this area follows conventional practice. 110° sets incorporate an EW diode modulator circuit which is driven by T563 (BD135) with T561 and T562 (both type BC308C) being the active devices in the control circuit. There are width (R556) and pincushion correction (R565) adjustments here.

The line output transformer provides various voltages. An e.h.t. of 24kV is produced by the diode split section. The 6.8kV focus voltage is tapped from this circuit, the focus preset being on the c.r.t. base panel. A separate rectifier circuit fed from pin 8 produces the first anode voltage (UG2), the preset here (R545) being on the main panel. The following pins feed rectifier circuits that provide the outputs listed: pin 7 220V; pin 9 24V (this is linked via R520 to the 24V output from the chopper circuit) then 12.5V via the μ A7812 regulator IC521; pin 11 26V; pin 1 8V. Pins 3, 12 and 10 are associated with the c.r.t. heater supply. A further supply, 90V, is obtained from the h.t. line via an RC circuit.

The 145V h.t. is fed via L541 to pin 4 of the transformer, the primary winding being connected between pins 4 and 8. Pin 8 is connected to the deflection coils, the EW diode modulator and, via L501, the line output transistor. There are two pulse outputs from the transformer. Pin 6 produces 70V pulses which are used by the teletext decoder. Pin 9 produces 140V pulses which are processed and applied to the c.r.t.'s control grid, the i.f. section and, in sets with remote control, the operating unit.

Pin 5, at the earthy end of the e.h.t. section, is connected to the 12.5V line via R536 and R535/537 and is decoupled to chassis by C542. This point is used for various purposes. It's connected to the beam limiter circuit and also, to provide breathing compensation, to the EW modulator control circuit, the field timebase and the voltage sensing section of the chopper drive circuit.

The Power Supply

The chopper circuit, which provides mains isolation, is driven at line frequency by pulses from pin 2 of the

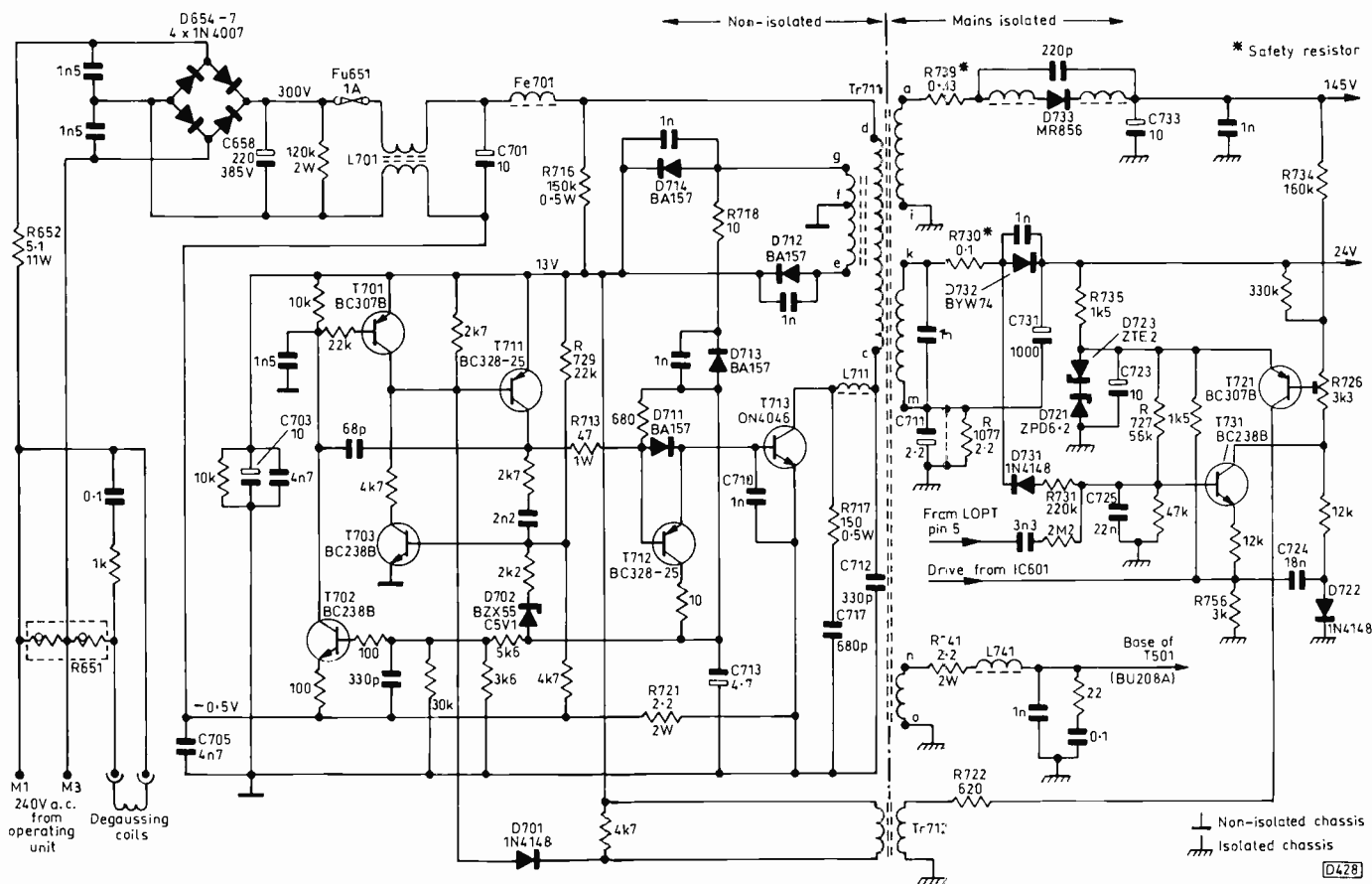


Fig. 2: The chopper power supply circuit used in the ITT Compact 80R chassis.

TDA1941 sync/line generator chip IC601. Fig. 2 shows the circuit, whose operation is not too clear at first sight. T713 is the chopper transistor, T711 the driver transistor while T721 on the secondary side of the circuit is a pulse-width modulator. The pulses from IC601 are coupled to the base of T721 by C724. The point at which this transistor switches on is determined by the d.c. conditions at its base. The link via R734 to the h.t. line senses the load while T731 is used to provide compensation for variations in the mains supply. This works as follows. The voltage swing at tag k of the chopper transformer is mains dependent. D731 and C725 rectify the negative-going swings to produce a voltage that counters the bias via R727. Thus the conduction of T731 alters with mains voltage variations, in turn adjusting the voltage at the base of T721. When T721 switches on it produces an output pulse which is coupled to the base of T711 via the isolating pulse transformer Tr712 and D701.

When T711 switches on it provides T713 with base drive current via R713 and D711. T712 is then reverse biased. When T711 switches off, T712 switches on, linking the base of T713 to the negative supply provided by D713 and C713 to ensure a rapid switch off.

A start-up system is required to get everything going. At switch on C703 charges via R716, producing a sawtooth which is coupled to the base of T703 via R729. T703 thus switches on, in turn switching on T711 and T713. At this point the circuit becomes self-oscillating. Because of the inductive load at its collector, the current through T713 rises linearly. This produces a sawtooth voltage across R721, negative with respect of chassis. This negative-going waveform at the emitter of T702 switches it on. T701 in turn conducts, shorting the base and emitter of T711 which then switches off. In the absence of drive from IC601 the chopper circuit free runs at approximately 20kHz. Since there's no regulation in the free-running condition, the

output voltages must be limited. This feature is provided by zener diode D702 in T703's base circuit.

T701 and T702 also act as a trip under excess current conditions.

A faults list will be included later in this series. While we're on the subject of the power supply however it's worth noting that the electrolytic capacitors can, as you would expect, cause various troubles. The smoothing capacitor C701 in the mains-derived 300V supply tends to go short-circuit, blowing the fuse. C703, the reservoir capacitor for the 13V supply on the primary side of the circuit, can cause various problems such as tripping, switching to standby and loss of voltage control. It's not always clear what the defect is.

FUTURE OF AUDIO?

NEC of Japan has developed a portable record/playback audio system that stores the signal in digital form in flash memory chips incorporated in a piece of plastic the size of a credit card. Audio quality is up to CD standard. One advantage of the player, called Silicon Audio, is that it has no moving parts. In prototype form the player operates with a 32Mbyte memory card that contains sixteen 16Mbit flash chips, providing 24 minutes of audio material. It uses MPEG audio processing chips developed by NEC. A 64Mbyte memory would hold 96 minutes of audio, a 256Mbyte memory 192 minutes. Don't expect the system to appear as a consumer product for some time however. At present the cost of 32Mbytes of flash chips alone is around £2,000, while the prototype player can run for only four and a half hours on its four NiCad batteries.

There are prospects for multimedia use in the future: a larger memory would enable the card to provide moving video images.

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15/80H	3.83	ZSC2314	0.38	ZSD088B	7.78	BC337L	0.22	BFR91	0.60	CD4060R	0.76	M104B1	5.30	SAB3035	6.35	TA7280P	2.69	TDA2030V	1.05	TEA2031A	3.40
1N4001	0.04	ZSC2335	1.56	ZSD0965	0.67	BC338	0.06	BFR91A	0.82	CD4066	0.30	M192B1	1.86	SG264A	13.59	TA7281P	2.98	TDA2040H	2.11	TEA2164	2.96
1N4002	0.07	ZSC2458	0.14	ZSD0973	0.38	BC368	0.25	BRF96	0.55	CD4070	0.21	M293	20.65	SG5F344	7.28	TA7288P	2.04	TDA2170	5.40	TEA2165	4.27
1N4003	0.05	ZSC2482	0.35	ZSD1115	6.41	BC369	0.17	BFY51	0.39	CD4081	0.15	M493	7.94	SL1430	1.53	TA7299P	2.65	TDA2270	3.03	TEA2165A	9.58
1N4004	0.07	ZSC2570A	0.30	ZSK1117	3.06	BC372	0.62	BR100	0.21	CD4093	0.32	M494B1	5.65	SL1431	1.70	TA7317P	0.93	TDA2540	1.12	TEA5101A	3.95
1N4006	0.06	ZSC2581	3.08	ZSK192A	0.36	BC461	0.31	BR103	0.53	CD4093	0.36	M51387P	10.68	SL1432	1.53	TA7609P	4.92	TA2511	1.80	TEA5115	3.25
1N4007	0.06	ZSC2603	0.25	ZSK197A	6.41	BC517	0.14	BR303	1.02	CN62A	3.83	M51393AP	4.64	SL1433	1.70	TA7680AP	5.57	TA25176A	4.95	TIC1060	0.82
1N4148	0.02	ZSC2655	0.21	ZSK888	1.54	BC546A	0.07	BRX44	1.22	CN82A	3.23	M5218L	1.59	SN76705AN	1.70	TA7698AP	4.97	TA2577A	5.25	TIC106M	0.75
1NS061	0.39	ZSC2705	0.32	ZL745247	0.62	BC547	0.09	BRX49	0.49	CN83A	2.65	M5231	2.36	STA341M	3.35	TA7769P	3.01	TA2578A	2.91	TIC225M	1.02
1NS401	0.14	ZSC2724	0.19	7805	0.78	BC547A	0.11	BRX55	1.20	CRO2AM	3.16	M54519P	1.37	ST4441C	4.51	TA7784P	3.25	TA2579A	3.06	TIC2260	1.68
1NS402	0.12	ZSC2979	2.74	7806	0.60	BC547A	0.04	BRX56	0.43	DTA114ES	0.24	M54543L	1.97	ST44122H	6.70	TAB201	3.93	TA2581	7.52	TIC225M	0.62
1NS403	0.13	ZSC3117	0.60	7808	0.72	BC547B	0.11	BRX57	0.75	DTA124EF	0.13	M54544L	2.41	ST44132H	8.89	TAB205	3.93	TA2581Q	4.96	TL111	2.54
1NS406	0.12	ZSC3153	2.40	7809	0.69	BC548	0.11	BSS38	0.11	DTA144EF	0.43	M54548L	4.95	ST44141H	12.46	TAB205AH	2.10	TA2582	2.35	TL110	0.36
1NS408	0.12	ZSC3156	6.61	7812	0.72	BC548B	0.18	BT139600	1.87	DTA144EF	0.18	M54548L	6.87	ST44141V	11.03	TAB207	4.74	TA2593	0.76	TL112H	0.71
1N914	0.04	ZSC3179	0.82	7815	0.82	BC548C	0.12	BT151500R	1.44	DTA144EF	0.18	M58655P	4.96	ST44142H	10.40	TAB210H	4.79	TA2594	2.21	TL121	0.42
2N2222	0.22	ZSC3182	2.49	78105	0.26	BC549	0.11	DTC144ES	1.15	DTA124EF	0.13	M54544L	2.85	ST44152H	10.68	TAB215H	4.79	TA2595	3.19	TL127	0.47
2N2222A	0.23	ZSC3198	0.43	78M05	0.17	BC550	0.15	BU104	1.43	HA11423	2.84	MB3732	14.89	ST44171H	13.20	TAB216H	8.06	TA2600	0.83	TL132	0.65
2N369A	0.34	ZSC3225	0.50	7905	0.35	BC550C	0.05	BW205	1.07	HA13001	1.89	MC13002P	7.69	ST44192H	15.79	TAB220H	7.01	TA2611A	0.64	TL137	0.48
2N9207	0.20	ZSC3242	1.19	7915	0.63	BC556A	0.06	BW208A	0.06	HA13108	3.59	MC1310P	0.85	ST44392	6.49	TAB221L	7.19	TA2611AQ	3.25	TL137C	0.68
2N3053	0.38	ZSC3310	2.12	AA119	0.36	BC556B	0.18	BW208AT	1.25	HA13117	2.58	MC1377P	7.51	ST4663	15.69	TAB221L	7.01	TA2653A	2.57	TL139C	0.83
2N3055	0.86	ZSC3311	0.29	AA143	0.13	BC557	0.09	BW280	0.08	HA13118	3.32	MC1391P	2.02	ST5211	16.12	TAB210K	4.27	TA2655B	14.61	TL192E	0.47
2N3440	0.77	ZSC3330	0.26	AC127	0.11	BC557A	0.16	BW326A	1.36	HA13119	2.05	MC14426P	1.71	ST5331	2.87	TAB691N	7.01	TA2659A	1.27	TL1905	0.94
2N3442	1.00	ZSC3355	0.96	AC151	0.52	BC557B	0.08	BW406	0.68	HA13403	5.98	MC3357P	2.14	ST5332	2.99	TAA550B	0.24	TA3301B	9.40	TL30C	0.33
2N3707	1.12	ZSC3358	0.69	AC153K	0.40	BC558	0.06	BW406G	1.02	HA1377	2.62	MDA2062	3.89	ST5333	10.47	TAA550C	0.30	TA3330	12.29	TL31A	0.17
2N3713	0.22	ZSC3420	0.55	AC187K	0.34	BC560C	0.06	BW407	0.53	HAS13385P	7.69	MJ15003	3.91	ST5338	4.99	TBA120	0.53	TA3355	4.87	TL31C	0.77
2N3819	0.55	ZSC3423	0.60	AC188	0.40	BC635	0.19	BW4070	1.00	HM6232	10.46	MJ15004	5.08	ST5342	5.00	TBA120C	0.65	TA3501	0.98	TL32A	0.41
2N3904	0.22	ZSC3502	0.45	AC188K	0.62	BC636	0.14	BW426A	1.03	HM6251	9.57	MJ2955	0.98	ST5372	3.51	TBA120S	0.89	TA3560	2.96	TL32C	0.40
2N4123	0.30	ZSC3656	0.18	AD149	0.82	BC637	0.15	BW500	2.00	KCJ206	1.32	MJ3001	1.56	ST5372H	6.84	TBA120T	0.51	TA3561A	4.79	TL32C	???
2N5296	0.69	ZSC3679	3.59	AF124	1.75	BC639	0.18	BW505DF	1.35	KC2223	0.60	MJ4502	1.84	ST5421	2.62	TBA120U	0.40	TA3562A	5.16	TL32C	???
ZSA1013	0.52	ZSC3788	0.77	AF125	0.57	BC640	0.06	BW505DF	1.68	KC2625	0.55	MJ4802	2.40	ST5466	5.66	TBA800	0.50	TA3562ATF	4.93	TL32C	???
ZSA1015	0.11	ZSC3795	1.97	AF126	1.12	BC679	0.40	BW508A	0.95	KAR301	1.46	MJ13005	0.86	ST5471	4.87	TBA820M	0.69	TA3565	2.95	TL32C	???
ZSA1015GR	0.11	ZSC3795B	3.88	AF127	0.77	BC7Y1	0.27	BW508AF	1.37	KB108	1.27	MJ18004	1.80	ST5473	3.51	TBA920	0.79	TA3566	3.40	TL32C	???
ZSA1016	0.26	ZSC3807	0.84	AF139	0.29	BC131	0.34	BW508AP	1.99	KIAB211H	6.15	MJ2955	0.68	ST5476	5.03	TBA950	1.68	TA3567A	9.88	TL32C	???
ZSA1020	0.44	ZSC3883	5.92	ANS265	1.76	BU1032	0.21	BW5080	1.29	KSR1001	1.12	MJ2955T	0.68	ST5481	6.53	TCA270S	0.75	TA3640	5.92	TL3791A	1.58
ZSA1029	0.27	ZSC392A	4.74	ANS435	1.46	BU1077	0.??	BW5080F	1.88	KSR1004	0.14	MJ3055	0.52	ST5482	6.41	TCA800Q	1.65	TA3650	9.91	TL3791B	1.58
ZSA1048	0.16	ZSC3953	0.72	ANS512	1.83	BU1036	0.??	BW5080F	1.88	KSR2001	1.85	MJ3055T	0.74	ST5483	7.69	TCA800Q	1.65	TA3650	9.91	TL3791C	1.58
ZSA1048	0.16	ZSC3953	0.72	ANS512	1.83	BU1036	0.??	BW5080F	1.88	KSR2001	1.85	MJ3055T	0.74	ST5483	7.69	TCA800Q	1.65	TA3650	9.91	TL3791D	1.58
ZSA1286	0.55	ZSC4106	2.05	ANS515	2.79	BU1037	0.46	BW526	1.65	KSR2004	0.14	MJ3055T	0.74	ST5484	6.20	TCA800Q	1.65	TA3650	9.91	TL3791E	1.58
ZSA1370	0.43	ZSC4242	2.29	ANS521	2.16	BU1039	0.41	BW536	1.61	LM200CV	2.19	MN650	3.23	STK7226	8.14	TDA1013A	1.27	TA3653	1.77	TL3791F	1.58
ZSA1489	2.40	ZSC4517	1.70	AN610	0.94	BU1040	0.24	BW608	1.46	LA1230	1.95	MPSA06	0.35	STK7253	5.30	TDA1015	1.37	TA3654	1.89	TL3791G	1.58
ZSA1706	0.52	ZSC4517A	2.52	AN7161N	3.85	BU203	0.47	BW801	1.37	LA1503	1.29	MPSA42	0.23	STK7308	5.98	TDA1035T	4.14	TA3654Q	2.81	TL3791H	1.58
ZSA562	0.17	ZSC458	0.12	AN7171K	4.68	BU232	0.45	BW806	0.82	LA4261	2.29	MPSA43	0.15	STK7340H	6.41	TDA1044	1.43	TA44420	1.29	TL3791I	0.43
ZSA564	0.33	ZSC4742	0.70	BA154	0.68	BU233	0.31	BW807	0.51	LA4427	2.73	MPSA45	0.26	STK7348	4.91	TDA1060	1.73	TA44427A	0.80	TL3791J	0.40
ZSA608	0.24	ZSC4536	0.14	BA157	0.09	BU234	0.34	BW826A	2.40	LA4482	3.59	MPSA56	0.12	STK7356	8.31	TDA1082	2.27	TA4500	4.66	TL3791K	10.30
ZSA673	0.12	ZSC639	0.56	BA158	0.07	BU237	0.30	BW908	1.17	LA4422	1.36	MPSA92	0.18	STK7358	5.81	TDA1085C	4.29	TA4501	5.95	TL3791L	12.05
ZSA684	0.60	ZSC710	0.12	BA159	0.15	BU238	0.24	BW944	2.40	LA4444	2.40	MR854	0.65	STR4090	8.71	TDA1170	2.14	TA4501H	2.57	TL3791M	0.28
ZSA733	0.17	ZSC828	0.29	BA5406	2.12	BU239	0.29	BW944	2.40	LA4445	2.01	MR856	0.21	STR4211	10.53	TDA1170N	2.05	TA4502A	7.62	TL3791N	3.81
ZSA769	1.29	ZSC867A	7.13	BA5410	2.57	BU243	0.39	BW944	2.40	LA4460	1.49	NE5458	3.20	STR441	15.95	TDA1170S	1.35	TA4503	3.40	TL3791O	0.28
ZSA844	0.26	ZSC945	0.12	BA5412	2.48	BU243C	0.44	BU11	1.20	LA4461	1.49	NE555N	0.37	STR451	29.90	TDA1180Z	1.69	TA4505E	4.87	TL3791P	1.58
ZSA872	0.35	ZSD1071	4.31	BA6109	1.85	BU244A	0.42	BU11A	1.05	LA4475	3.09	NE556	0.43	STR50020	9.02	TDA1270	1.79	TA4505M	8.97	TL3791Q	1.58
ZSA872A	0.35	ZSD1128	1.02	BA6209	1.46	BU244C	0.34	BU11AF	0.86	LA4476	2.79	NE556	0.43	STR50103	6.92	TDA1420	3.04	TA4508	10.05	TL3791R	1.58
ZSA916	1.14	ZSD1191	1.49	BA6209N	1.27	BU245C	0.92	BU11Z	1.13	LA4508	2.13	NE646N	4.45	STR54041	6.99	TA4510	3.40	TA46600	2.29	TL3791S	1.12
ZSA933	1.00	ZSD1207	0.35	BA6219	2.46	BU246C	0.97	BU112AF	1.39	LA4507	0.47	OZ200	0.22	STR5412	5.15	TA4515A	2.57	TA46600/2/3	2.72	TL3791T	5.08
ZSA940	0.82	ZSD1246	0.30	BA6219B	1.46	BU243	0.29	BU118AF	1.37	LA6358S	0.62	OZ90	0.64	STR58041	9.30	TA4516Q	3.59	TA46600/2D	2.82	TL3791U	3.95
ZSA950	0.18	ZSD1265	1.08	BA6222	3.16	BU243A	0.34	BU156A	1.19	LA6530A	2.94	OCT1	1.03	STR59041	9.68	TA4518Q	3.59	TA46600/3	1.80	TL3791V	2.82
ZSA965	0.52	ZSD1266	0.68	BA6247	1.95	BU243S	0.38	BU156AT	2.78	LA7520	2.77	P600A	0.33	STR6020	10.25	TA4519	4.23	TA46600/4	2.02	TL3791W	1.87
ZSA966	0.54	ZSD1275	1.23	BA718	1.08	BU2436	0.32	BU146A	0.84	LA7800	1.46	PC814	1.27	STR7???	???	TA4519A	2.74	TA46605	3.03	TL3791X	2.66
ZSA970	0.36</																				

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BU508A	X5	£1.60	BU426A	X5	£3.75	3V35/36 etc. Belt kit	X5	£4.25
BU488AF	X5	£5.00	TDA4601	X2	£2.55	VT11E etc. Belt kit	X5	£2.50
BUT11A	X5	£2.25	TDA3654	X2	£2.50	Standard video camera lens	X10	£2.50
Philips type 1.2 volt Back up battery				X5	£4.50	Standard video camera lens	X10	£4.00
Philips type 2.4 v r k Back up battery				X5	£8.75	Thorn TX9/40 Remote control		£7.99
Scart - Scart lead 1.5m Fully wired				X2	£2.90	Thorn TX10 Green remote control		£3.99

.....and now ask for a full price list.
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Satellite PSU Repair/Refurb kits

Experience in one of the largest repair centres has shown that all repairs to Power supply units require special treatment with not only the obviously faulty parts being replaced but a number of others also changed to ensure a satisfactory repair. Experience shows that up to 50% of all power supply repairs 'bounce' unless the correct procedure and the correct precautionary changes to certain components are made.

At last 4 repair kits are available to cover the majority of all Amstrad and Pace receivers each with a simple to understand instruction sheet to guide you through the correct way of repairing and refurbishing satellite receiver power supply units.

	MANUFACTURERS	MACHINE NO.	PRICE
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SATKIT2	PACE	SS9000 SS9200	£6.95
		SS9010 SS9210	
		SS9020 SS9220	
SATKIT3	AMSTRAD	SRD510 SRD520	£6.95
SATKIT4	AMSTRAD	SRD500	£6.95

all + £1.00 handling and + VAT

IMPORTANT ANNOUNCEMENT

ALL SATELLITE RECEIVERS purchased before MAY 1994

It is almost certain that if you purchased your satellite receiver before May 1994 you will be unable to receive all the projected channels when they become available on ASTRA 1D neither will you be able to receive the lower two channels on ASTRA 1C. The lower two channels on ASTRA 1D are Filmnet Movies (H - 10.921) and RTL-5 (V - 10.934). These are broadcasting now. If you wish to receive these two channels now and the projected possible 16 channels on ASTRA 1D when it is launched later this year, you will need to purchase extra equipment. The SUPER 'D' CONVERTOR is a clever, low cost frequency converter which can be purchased now. Millions of satellite receivers will need converting in Europe so it is good advice to buy now while stocks are readily available.

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ASTRA 1D
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Method 1

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 - 2) Purchase an LNB with a conversion frequency of 9.75 GHz
 - 3) Book an engineer to install the equipment
- TOTAL COST AROUND £200

Method 2

- 1) Purchase a SUPER 'D' convertor
 - 2) Install the SUPER 'D' convertor - All by yourself.
- TOTAL COST EXACTLY £29.95

What is a SUPER 'D' convertor ?

The super 'D' convertor is a small box (110mm x 60mm x 50mm) which is inserted into the down lead from the satellite dish at the rear of the receiver (no power supply is required). A suitable connecting lead is supplied together with end user simple instructions. At the flick of a switch or in most cases a touch on the remote control, channels on ASTRA 1D can be tuned in when available. The bottom 2 channels on ASTRA 1C which up to now you may not have been able to tune in, will be immediately available.

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Letters

NO HELP FOR UK INDUSTRY

I read your December issue editorial with interest since it refers to matters on which I have long held strong views. You rightly bemoan the demise of the home-grown consumer electronics industry in the UK. In contrast, foreign companies wishing to set up production facilities here are given government aid.

Not so many years ago the UK had a good number of indigenous TV receiver manufacturers. Now we have only those whose parent companies are in the far east. It seems to me that the cause of this has been at least in part the fact that successive governments regarded home-grown companies as money cows to be milked at every budget while offering no food in the form of financial assistance. I wonder how many UK setmakers were ever offered £58m, as Samsung has been, to help them set up new plants? Recent governments have been keen to attract competitors into this country, have offered huge financial inducements not available to indigenous producers, have eased planning applications for green field sites and so on. This has been accompanied by criticism of British companies' management, who had no hope of being able to compete against the newcomers and finally gave up.

Now there were undoubtedly UK managements that failed to invest and were inefficient. But I wonder how much assistance I'd get from the Japanese government if I were to try to set up in competition, locally, with their industries? The Japanese have long maintained an extremely protectionist policy, and I don't think you'd get a single yen of help to set up production facilities there.

UK governments have bragged about foreign investment in the UK but seem to have overlooked the fact that while there are welcome benefits in terms of new jobs there has been a loss of employment from the closure of our own companies. And where do you think the newcomers' profits will end up? – back in Japan and Korea. Their owners must be laughing all the way to the bank.

I'm not against competition and progress, but cannot understand why there has been no challenge to the policy of assisting those who aim to kill off our own indigenous manufacturing capacity. How many jobs could have been created by one of our own companies given a present of £58m? Sadly we shall never know, since they have all gone. Maybe someone out there can explain the logic behind all this? I suspect that there isn't any.

*L.J. Pitts, B.Sc. (Hons), FIAP, GRSC,
South Brent, Devon.*

TECHNICAL ADVICE

Much has been printed over the past couple of years about the dearth of technical advice in the trade and the number of manufacturers who now restrict such advice as is available to holders of their service accounts. Meanwhile the onrushing technology juggernaut brings with it an accelerating growth in development, resulting in ever-widening product ranges with enhanced performance and facilities often within microscopic dimensions. In the natural scheme of things these products eventually percolate through the various layers of the domestic electronics trade, eventually ending up on the benches of smaller service organisations

and individual service engineers who may not have access to the technical data required.

While service manuals may be available from various wholesalers and specialist traders, they rarely contain the circuit descriptions common a few years ago and lack information on the full functions of the various faceless chips. As a result servicing time may be quadrupled by the need to spend a long time puzzling over an unfamiliar circuit/device. There is an inevitable time lag in the publication of the printed and software fault information, which so often doesn't provide the details you want. This problem can often be eased by a few minutes' chat with an engineer familiar with the unit concerned. This is especially the case with many modern problems caused by software set-up.

Market forces have compelled most manufacturers to reduce expenditure on their service organisations. There are now fewer TLOs or none at all and smaller service departments, while much of the spares supply commitment is off-loaded on to various national wholesalers with a consequent reduction in the range of items available and an increase in the time taken to obtain anything required to special order.

Lack of technical advice means that many service departments have to turn away work, with loss of goodwill for both the service department and the manufacturer of the goods concerned as the prospective customer will frequently decide to purchase a different brand in future and go elsewhere for his repairs.

To get around the problem I'd like to suggest that manufacturers' service departments set up 0891/0898 telephone numbers for non-dealer's technical queries. As these would be in use during normal working hours, at a premium rate, the income generated should make such services self-financing. This would provide important technical support for the trade and help improve the reputation of electronics products generally. The cost to the dealer, say around £5 for an average call, could be passed on to the customer with little increase in the overall charge and a great reduction in the amount of time taken by the technician to sort out problems. It may also be possible for those manufacturers who operate a viewdata service to offer restricted access to the technical advice and part number search sectors of their databases via similar income-generating telephone numbers.

The numbers could be circulated within the trade via wholesalers or trade orientated publications so that enthusiastic amateurs don't get their inexperienced fingers in the pie.

*John C. Priest,
Blackpool.*

ENTERING THE TRADE

I am in total agreement with the engineer who wrote the letter headed 'enter the trade? – don't' in the December issue. I've been in the trade since 1967 and have been self-employed for the past twelve years. During this time I have lived and carried out servicing in two totally different areas, moving from a large city to a semi-rural district. The conclusion I've come to is that servicing is becoming harder and harder, both with respect to repairs and getting work. I did once have job satisfaction, but that has long gone. The worst thing is the amount of money customers are prepared to pay for repairs. They frequently won't pay, on the grounds that new equipment is relatively cheap to buy.

I firmly believe that most of the problems have been caused by technology, the manufacturers and this present head-in-the-clouds government. It seems to me that most small businesses and self-employed service engineers are going to be in for hard times in the months and years ahead.

Many will give up and change direction. I wish them luck: I've been attempting to change direction for three years now without success!

*Paul Byrne,
Ruthin, Clwyd.*

TOO INTROVERT?

As a 47-year old engineer who has been in business for twelve years I would like to shake by the hand the writer of that letter 'enter the trade? - don't' in the December issue. Very well said - you've quoted me word perfect!

But we musn't be too introvert. Many of the problems in business today are caused by the fact that we have been forced to become a nation of skinflints. The only thing that appears to matter is price: quality is a word which I fear may soon be removed from the English language.

Manufacturers now base their products on cost alone. As a result we purchase equipment from areas of the world where bridges collapse into rivers and the front may fall off a ship. But if it's cheap (for the survivors) it's o.k.

In his book *Making it Happen* Sir John Harvey-Jones refers to the skill base as being of value beyond its cost. But Joe Public is no way prepared to pay for skill directly. If something can't be stood on a shelf and seen the public feels that there's nothing there to pay for. If the TV set becomes a disposable item in ten years' time, more will be sold but the losers will be the public. There may well be no job satisfaction now, but it pays the bills - and you may well be able to afford to enjoy electronics as a hobby again!

*J. Lewis,
Shoebury, Essex.*

ADVICE AND SAFETY

We recently had in for repair a Sony Model KV21XMU (AE1 chassis). On investigation we found that R614 (220Ω, 10W) in the snubber network was sitting in a circle of charcoal, having arced for some time before blowing the chopper transistor Q602. Although there is no technical advice for us lowly 'non-account' customers, I nevertheless felt that this matter was a question of safety and was irritated to find that I still couldn't speak to anyone at Sony or SES about it. Surely this must be wrong?

It looks as if Sony originally designed the board for two 110Ω, 5W resistors in series instead of the type fitted. If this is so, the design boys were right in the first place. The only option left to me was to clean away all the charred print, fit a link across the original site of the problem, remove the link from the second position and fit a new 10W resistor here. Q602 (2SD1548LB) had to be replaced of course, and IC601 (TEA2164) was replaced for good measure. So was this safe Sony? And what do I do if the same thing happens in twelve months' time?

*John Pitt-Francis,
Honiton, Devon.*

NOISY LOPTs

Nicholas Arnold (letters, December) asks whether Superglue can be used to silence loose windings on LOPTs. I've checked on the dielectric strength, which according to Loctite is 25kV/mm. An epoxy suitable for potting coils has a dielectric strength of 10kV/mm, so Superglue seems to be better in this respect. But I can't say whether the solvent in Superglue will attack copper wire enamel, which would be undesirable.

Another problem that can occur is when a glue dries to a

very hard residue. Temperature change in the windings causes stress in the copper, with the result that open-circuits can occur. It's better to use a slightly flexible adhesive to avoid mechanical stress.

The other point with Superglue is that it is anerotic, i.e. it sets only when air is excluded. In practice this means a gap of say 0.1mm. So the gaps between bobbins and cores might not be small enough to allow the glue to set, especially with just one application.

The volume resistivity, permittivity and dissipation factor of Superglue are all similar to that of epoxy, so other circuit characteristics shouldn't change. But I feel that we need some field experience to see if it really does the job.

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

ADHESIVES

Care needs to be taken over the choice of an adhesive to silence noisy line output transformers (letters, December).

PVA wood glue (polyvinyl acetate) is particularly corrosive towards copper. So is standard silicone rubber, which releases acetic acid during cure - hence its familiar vinegar smell! Neither of these materials should be used anywhere near copper windings. Cyanoacrylate adhesives (Superglue) are available in several grades, but the stuff sold for domestic use is not really suitable for repairs to coils - I've even known certain brands to attack the enamel insulation of winding wire. Loctite makes a special grade, Tak-Pak 382, that's specifically designed to secure coil windings or stick down lifted PCB track.

Epoxy resins also come in several grades, and again the types sold for domestic use are not the best for winding repairs. The ideal resin mix is free flowing, fast setting and filled with an inert material to impart fire resistance. Such materials are used by coil and transformer manufacturers, but don't seem to be readily available in workshop-size quantities even from specialist suppliers.

Acrylic adhesives are very good for repairing LOPT or other ferrite cores - they have enormous strength, even when used with difficult materials such as metals and ferrites. One of the ferrite cores in the thyristor line output stage in my own set had broken in three places. I repaired it successfully with acrylic adhesive. The repair was completed by securing the loosened windings with the special non-corrosive silicone rubber specially made for encapsulating electronic assemblies. Bear in mind that even the thinnest crack in a magnetic core adds considerable reluctance, which could theoretically upset its characteristics.

Fortunately most of the inductors in TV use have a gap in the core to help prevent saturation, so the extra added by a repaired crack is usually of little consequence. In fact it's the core gap that can be responsible for excessive noise, especially in older non-encapsulated LOPTs. Even a tightly clamped LOPT or mains transformer core will still produce some noise however because of magnetostriction, a property displayed to some extent by all ferromagnetic materials. It means that the physical size of a piece of the material changes slightly in step with the strength of the magnetising force. Fortunately most chopper transformers operate at frequencies that are too high for humans to hear - though the bats in the roof or the family dog may not be so lucky!

Finally, don't forget hot-melt glue. This material is great for sticking loose wiring in place and is used by some manufacturers for securing deflection coil windings. It must be used with care on or near warm-running components.

*P.E. Roberts,
Runcorn, Cheshire.*

CD Player Servicing

Les Austin

Lens Cleaning

While discussing the subject of laser power adjustment in the July issue I included some advice on cleaning the objective lens. I thought I was quoting Sony correctly when I said that it recommended the use of isopropyl alcohol. But Sony's David Meyer, in a letter in the September issue, vehemently denied this. I now notice that, for example in the manual for the Sony Model CDPM43, the recommendation is to use a neutral detergent solution. I suppose that this could simply be one drop of Teepol in a cupful of water, but I won't stick my neck out again – please ignore that. In a service bulletin dated 19-05-92 Sony specifies the method and materials to be used: in the same bulletin the use of ethyl alcohol (though not isopropyl alcohol) is specifically forbidden. I should in fairness point out that Sony is not alone in giving clear advice on this subject: Panasonic/Tech-nics has its own cleaning kit, part no. SZZP1038C, which contains a blower, cotton rods and a cleaning fluid. Philips recommends the use of an air brush. So there is plenty to back up David Meyer's case. Yet I think he protests too much.

In the May 1989 issue (page 521) Joe Cieszynski recommended the use of a cotton swab moistened with isopropyl alcohol for lens cleaning. So do others. I recently had a Sanyo DCX1000MD in for service. The lens was dirty, a common condition that Sanyo has written about in a bulletin. Clearly the first move was to clean the lens. The service manual tells us to use isopropyl alcohol. Now guess which laser unit is used in this machine: the Sony KSS210! After cleaning the lens Sanyo recommends fitting a plate, part no. 614-256-2888, to prevent recurrence of the problem.

Surface-mounted Chips

One of the problems with servicing CD players, one that's not unknown to other disciplines, concerns those small, postage-stamp sized black plastic things with almost as many legs as a centipede. I refer to the surface-mounted chip of course. Failure of an eighty-legged servoprocessor chip is not uncommon – the mere thirty legs attached to a CXA1081M r.f. chip begin to seem trivial. What if you don't have all that expensive soldering and desoldering equipment?

A Samsung SCM6000 sat on my bench. It was the first version, with the Sony chips. It was also a manufacturer's return, and it wouldn't cooperate. There was a difference with this one however. From the address labels on its box it seemed to have spent some time in the Emerald Isle. I reasoned that the little people had played a trick with it, so I kept looking at it until I spotted what they had done. Instead of facing me, the CXA1082 chip had its back towards me. When I'd refitted the chip the correct way round I switched the machine on and was pleased to find that it happily played any disc I fed in.

When I showed Master he was as amazed as I was pleased. How did I go about it? I didn't like the idea of amputating all those legs, as suggested by one manufacturer's service engineer, nor the idea of using a garotte threaded under the legs, as recommended by Master. I'll tell you my method. The faint-hearted are advised not to read on

but to turn over a couple of pages. What you require are a big Weller gun, some Philips desoldering braid (SBC306), a fine-tipped iron, some ordinary but good-quality solder and a leg-lifter made to the following design.

Find a well-stocked craft store and buy a packet of Millwards No. 12 beading needles. These are very thin, straight needles, about two inches long, and can be used to produce two leg lifters each. Take a needle and bend it at the centre, around a very small radius, through an angle of just over 360°. Heat is required to do this. A fine burner will probably be suitable. I had a length of nichrome wire, of about 0.060in. diameter, which I connected across my Cytringham electric welder set to its lowest current. A pal switched it on and off as required while I used two pairs of long-nosed pliers to bend the needle around the hot wire. When the needle had quickly cooled I nipped it carefully in the middle of the bend to create two miniature walking sticks. I then pressed the straight end into a thin piece of wooden dowel, pulled it out again, applied a drop of superglue and pushed it back into the dowel. Viola – a leg lifter!

Now its use. First catch your suspect chip. Then, with your Weller gun good and hot, use the Philips desoldering braid to remove all accessible solder from the chip's legs. Next use the fine iron and leg lifter to lift each leg, one at a time, clear of the board: provided the leg lifter has been made to the shape indicated, it can be easily slid between two legs and rotated through 90° to give an unencumbered purchase on the leg. Once all the legs have been released, simply lift the chip off. Gently wipe away any residual solder, using the big gun and desoldering braid, to give a clear space. Remove any traces of flux with a cotton-wool bud and some lens cleaner – oops, sorry, isopropyl alcohol!

Line up the replacement chip, using the fine iron and a little solder to stop it walking off. Next use the big gun to apply solder liberally to all sides of the chip. Don't panic at the sight of hundredweights of solder everywhere – this is all part of the plan. Position the board vertically. Use the hot Weller to stroke each leg of the bottom row downwards, until the tinned bit has been 'filled' with solder. Flick the solder into your bin, or on to the floor if your aim is poor. Repeat the process along the bottom row of legs until no surplus solder is left. Rotate the board through 90° to bring the next row of legs to the bottom, then once more remove the surplus solder. Do the same with the two remaining sides, and expect to find the replacement chip fitted better than the original one.

If you lack my confidence, practice on a dead board before you tackle your most difficult customer's prized equipment, but you will be pleased with the results. I can remove and replace an eighty-leg chip in ten minutes. As you may have deduced from my story above about the Samsung player, it's quite reasonable to expect to be able to transfer a good chip to a different board with the certainty that it will work. After my first attempts, I've never had a failure. For me, one other essential piece of equipment I forgot to mention above is a large illuminating Ledu.

The Demonstration

While I'm in a smug mood, let me tell you a funny story. Master had a phone call from a rep who said that Sony had

given our name to his firm as it expected all its service agents to have the proper gear for servicing equipment that uses surface-mounted components. Could he come and give us a demonstration of his firm's products? Master agreed and told me to see the chap on the appointed day.

Prior to his arrival I prepared a board with an empty space suitable for a CXA1082 chip with its 48 legs, and a second board with such a chip still in place. My request when he arrived was that he removed the chip from the board on which it was mounted and then installed it on the other board. He removed the chip easily and successfully, but his first attempt at refitting it left about a dozen legs dry. He put a different nozzle on his machine – a hot-air type – and tried to complete the task. He then bladdered the board. We didn't spend the £1,200 or so suggested as appropriate for our needs.

I have no doubt that with practice and care the equipment will work well, but so far I've not needed it. The rep was able to desolder the J-type legs that hide beneath the chip – I can't get at these – but to date I've not yet come across a chip of this type on a board I've had to work on.

The Ferguson CD07 and CD08

The Ferguson CD07 and CD08 CD players are fairly regular visitors to our service bench. While the CD07 is manually operated the CD08 has remote control. There are two versions. The earlier one has a latching on-off switch while the later version has a non-latching switch. The service sheets are not all that helpful, with no spares information – in fact little more than the circuit and a PCB layout. Fortunately the machines are quite reliable, with only a few common faults.

The sled motor is the most common cause of problems: it may prevent TOC reading or may play for a short while then jump back about half a minute and repeat this until you either switch off or throw it into the bin. All versions use the same motor – part no. 00X6.644.116 should identify it. It's a small diameter motor that looks very similar to the ones used in a number of Akai players such as the CDM640. These are similarly prone to failure. The Hinari DSK2 has a similar sled motor which is also unreliable.

Be sure to replace the drawer belt, part no. 00X6.644.118, when you replace the sled motor in these Ferguson players – otherwise the job will surely bounce.

You sometimes find that there are dry-joints around the mains transformer. While in this area, it's as well to check the connections to the regulators.

A recurring problem is failure of the small plastic shaft that carries the drawer driving gear. As it shears off, a complete new plastic moulding is required. When stocks ran out Ferguson did a repair, but his was discontinued a couple of years ago. All is not lost however. Cut a length of rod, about an inch long with a diameter of 4mm. Drill carefully through the site of the original shaft, push in the new length of rod, and secure in place underneath with Araldite. A suitable piece of rod can be cut from a scavenged Hinari DSK3 sled support shaft if you have one in your parts department (scrap bin).

Apart from these few faults and the disgusting grunting noise the players make while thinking about playing, or after you press stop, they seem to be quite good machines and are generally worth repairing.

A Fisher AD822

Low output was the complaint with a Fisher AD822 player that appeared on my bench recently. This is a fairly

old machine, and I was told that it was to be repaired only if the expense would not amount to much. Instructions like this are increasingly common. I think the best response would be to send the customer elsewhere, but since the boss had accepted the job I had at least to give the machine a try. As sound was present I felt it unlikely that any of those expensive-looking Yamaha chips in the complicated areas would be faulty.

I took the cover off, connected the player up and popped a disc in. The TOC was read, and when play was pressed there was sound from the speakers with no obvious problem. If it hadn't been for the note saying low sound I would probably not have been aware that there was a fault.

There are a couple of operational amplifier chips in the output stage, an LM833 and an NJM4558. They operate with dual supplies, 12V and -12V, that are common to them both. The feeds are to pins 8 and 4 respectively. A check showed that the positive supply was missing at pin 8 of the chips. The cause was quickly traced to C127 (470µF) which was short-circuit. When a replacement had been fitted the sound was noticeably louder and a bill that was acceptable to the customer was written out. I was surprised that there had not been a severe distortion problem with one supply missing.

.....

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Income from Loss Adjustment

Robert Blair

The big problem for service engineers thinking about trying to earn extra money in some other field is that their skills are very much focused on what they do for a living. They find that their knowledge cannot be applied to other areas. In recent times however there's been a greatly increased demand from insurance companies for the services of television engineers in the field of loss adjustment in connection with claims relating to brown goods.

As most of you will appreciate from reading newspaper reports, the reason for this is an upsurge in the number of fraudulent claims being made by householders on their home contents insurance policies. A large proportion of these claims relate to TV sets, hi-fi equipment and VCRs.

An Example

As an example, the following is a true case relating to a client of one of the larger insurance companies, the claim being concerned with lightning damage to equipment at his home. The claim was for more than £1,500 and involved a music centre, a VCR and two TV receivers. I was asked by the insurers to call on the gentleman to verify the damage.

The music centre, one of the older types, lit up but produced no sound. Its owner said that his wife (who, conveniently, was not around to contradict him) had been listening to her favourite programme on the evening of the storm, during which lightning had struck and the whole thing had

gone dead. To prove the point he switched the unit on: sure enough the dial lights lit up but the speakers produced no sound. Imagine his consternation when I leaned forward and casually pressed the 'speakers on/off' button and the air was suddenly filled with the strains of Frank Sinatra singing *My Way*. That promptly removed about £400 from his claim.

I next looked at the VCR. This had definitely been struck and, having lost large sections of print, was without doubt a write-off. The television set that partnered it was o.k. however. It gave the impression of having failed because there were no loop-through signals from the VCR: when the aerial was plugged in directly the set worked perfectly. Thus the total amount involved in the claim had by now been reduced to about £700.

The final item, a Philips TV set fitted with the KT3 chassis, was also a victim of the storm. So this too was written off. The claimant was obviously none too happy about the way in which things had turned out, but the insurance company most certainly was! The amount they were going to have to pay out was less than half of the original sum claimed.

Getting Started

Although loss-adjustment work is interesting and pays reasonably well, it tends to be infrequent and is therefore useful only as a means of adding a few extra pounds to one's

**The Claims Controller,
Chainmail Insurance Company,
Bloggington, Bucks.**

Date

Dear Sir or Madam,

I am currently contacting insurance companies in this area with an offer in which you might be interested, namely a loss-adjustment service with respect to claims involving electrical brown goods (television receivers, video recorders, music centres etc.). As you will be aware, there has been a tremendous increase in the number of such claims in recent years, often involving large sums. It is often possible for me to be able to reduce these amounts by as much as fifty per cent, a figure not to be taken lightly when claims are frequently in excess of £1,000.

The service offered covers the area within a 30-mile radius of Bloggington. The cost to companies is £XX for distances up to 15 miles and £XX for journeys in excess of this, plus the cost of any repairs to claimants' equipment. Each visit to a claimant is followed by a written report advising the insurer of the situation regarding the claim. There is no commitment on the part of companies involved and the service can be used as and when the need arises.

Should you at any time in the future consider that this type of service would be of benefit to your company, please contact me by letter or telephone. I shall be only too pleased to help.

Yours faithfully,

Fig. 1: Letter offering a loss-adjustment service.

**The Claims Controller,
Chainmail Insurance Company, etc.**

Date

Dear Mr XXXXX,

Your Insured, Mr A Nicely-Browne

I have visited the home of the above and examined the Pye portable colour television receiver which is the subject of his claim. My conclusions are as follows:

The set has been accidentally dropped and as a result the neck of the cathode-ray tube has been fractured. In addition, the cabinet has been damaged.

In my opinion the combined cost of replacing these items renders the unit beyond sensible repair.

The cost of replacing this receiver with a similar model would be approximately £210.

Yours sincerely,

Fig. 2: Typical post-visit report.

income. If you are interested in getting involved, the first thing to do is to look in your *Yellow Pages* or your *Thomson Local Directory* to discover the whereabouts of insurance company branches. Compose a typewritten outline of the service you intend to offer and send it off to them. Address all correspondence to The Claims Controller. Fig. 1 shows a sample of the type of letter I send out.

Typical Report

A typical post-visit report, which should be written on business stationery, is outlined in Fig. 2. To avoid delay, quote the claimant's case number in all correspondence. This will normally be supplied to you along with the details of the claim when the insurance company gets in touch with you, usually by phone.

An invoice can be submitted as soon as the claim has been

settled, which will usually be two to three weeks after your visit. It can take the form shown in Fig. 3.

The companies I deal with normally send a cheque within a few days of being invoiced, but this may not be the case with all companies.

Charges

It's difficult to recommend a scale of charges, and I leave this up to the individual. I would suggest a scale starting at a minimum of £15 for a local visit: this can always be increased once you've got your foot in the door so to speak and have proved that you can save money for your clients.

You certainly won't become rich on insurance assessing at this level, but I personally find it an interesting way of supplementing my income from servicing.

**The Claims Controller,
Chainmail Insurance Company, etc.**

Date

Dear Mr XXXXX,

INVOICE

To visiting the home of your insured, Mr A. Nicely-Browne, 11 The Cloisters, Bloggington, Bucks to assess the extent of damage to a Pye colour television receiver:

Total cost

£XX.

Yours sincerely,

Fig. 3: Typical invoice.

What a Life!

Donald Bullock

After a lifetime in this trade I'm well used to the nonsense and trouble we get from the owners of the equipment that's brought to us for repair. The other day, while on holiday in Spain, I got into discussion with a retired dealer, Richard Pollock, who used to trade as R.W. Pollock and Co. in Bradford. We got around to the various things that people have been saying to us over the years, in every case with the shining-eyed look of someone who's just thought of something quite new. Things like:

My husband says it's the condenser.
It can't be much, my sister had a baby last week.
My husband would do it – but he's lost his screwdriver.
These aerials won't be needed soon, will they?
It's only a loose wire.
It can't be the tube. It was new when we bought it.
My husband writes all the cheques.
We'll see how it settles down first.
It's only the switch.
I'm in agony with my brother.
My husband thinks it's a valve.
It's only 'cos the children touched the buttons.
I've Hoovered the chassis thing.
It can't be much – we hardly watches it.
It can't be the tube, the sound's all right.
I've tightened up all the screw things in the cans.
Pop him on the bench and I'll show you. . .
We were coming in to pay, but it went again.
Why is it all liney now you've fixed it?
It can't be much. It was perfect until it exploded.
It never used to flicker like that.
Now what were we watching when it went. . .
It's never been right since you done it.
We'll let you do it if it's cheap.
Have you been mending these long?

And, of course, we don't want to spend much because only the kids watch it/it only cost us a tenner/a new one's only eighty quid/it's all these satellites now/we'll rent one/there's nothing to 'em now/we're old-age pensioners.

Not to mention the chap who papered his walls with kitchen foil to avoid buying a licence; the man who tapped mains wire into his neighbour's aerial lead, reducing the latter's picture to a ghost show; and the woman whose set produced only a sound output and used binoculars to watch her neighbour's picture across the street.

Then there was the ten-year old lad who, disappointed at losing his cartoons when we switched the mains supply off to rewire a dicky socket, switched it back on just as I was across the mains. I don't care what his mother said. He would have heard the same sort of language sooner or later in his life, and got the same sort of hammering. Sometimes it's all too much.

Old Technology

Forty years of it. What a sentence! We then got to talking about some of the valves that used to turn our hair grey. Would those newer to the trade ever believe the old,

expensive and short-lived U801s? Four rectifiers in an envelope that got almost red hot. How many remember the clusters of surge limiters that used to festoon the undersides of old Ultra sets? On the signals side there were those skirted 10F1 and 6F1 valves that lived for self-oscillation. Not to mention the Hunts 0.001 μ F condensers, in the days before they became capacitors or course. The PL81 looked so neat and clean when you plugged it in, but looked like a cinder within a few hours. The stocky PCL83 used to sizzle – and talk about microphony!

There was an even worse one, the UCL83 that also worked as a heater and a crystal microphone. I reckon that one took the biscuit. A UCL83, a rapid-action BSR turntable whose motor was used as the heater ballast, about four resistors and a 1V output ceramic cartridge and you practically had a record player. For a while, at any rate.

In all an interesting chat. Pity we couldn't lace our clouds with any silver linings – apart from the keen sense of humour we survivors developed and honed on each other.

Incidentally whenever I write about the frame output stage in a television set your editor (and mine) changes it to field, but because I'm so steeped in the old ways I mentally read 'frame' whenever I see 'field' written. This has its drawbacks, particularly when I read any of my pieces in the country magazines – I turn corn fields into corn frames. . .

But enough of this. Time to get down to recent servicing experiences.

The Sharp C3720 Colour Portable

We recently had a dead Sharp C3720 14in. colour portable on the bench. There didn't seem to be anything obviously amiss – there seldom is nowadays – and we didn't have the circuit diagram. So, as increasingly happens these days, we stood there transfixed. Should we delve in and spend an hour hoping to stumble on the cause of the trouble? Or should we put the set aside and send for a circuit? If we did, how many pounds would it cost? Would we be able to read it? Sure to, being a Sharp set, but what about, sorry, Philips and Bang and Olufsen say?

If we did lash out for a circuit, would we be able to tack its cost on to the repair bill? Not if there was much wrong. Folks won't spend much any more. Talk about a gamble. I wonder whether we'd do better to get out of this trade and take up horse racing? Or spend what money we have on lottery tickets?

Anyway, we decided to spend a while on the set. When it was switched on the LED changed from red to green as the e.h.t. came up, then it changed back to red as the e.h.t. decayed. All this took about a second. We managed to work out that the set uses a fault-sensing transistor switching arrangement, so to home in on the cause of the fault we removed Q603. This enabled us to work on an uninhibited set. Up came the e.h.t., and this time it stayed with us. What we got was field collapse and very low, distorted sound. We decided to try even cleverer dodges, trying the set with Q603 back in position and the field output chip IC501 removed. We needn't have bothered. The set refused to spring to life.

Our razer-sharp intellect told us that the field and sound troubles were associated: that there was a common fault. But we didn't have much to go on. So I phoned Alan Dyson, the genial brain that nestles within Willow Vale. He gave us the good news that they charge only a fiver for Sharp service manuals. We ordered one and, by way of

thanks, he faxed us the C3720's line-derived power supply circuitry.

What with this information and our super brains there was no stopping us. We saw that a 24V supply is derived from pin 3 of the line output transformer, and decided that this could be where the trouble lay. A check showed that the 24V supply was indeed low, down 1V in fact. R521, the 3-9Ω surge limiter resistor in this supply, was virtually open-circuit. A replacement restored the set to normal operation, which was excellent.

Incidentally Alan also told us that two other resistors in this set cause trouble, R623 (1.2MΩ) and R632 (12kΩ). Our thanks, Alan.

Trouble with Ivor

As I boxed the set up a strange bundle of bedlam came loping into our drive. It was Ivor and his mother. He's keen to learn the trade and his mother thinks he's wonderful, but. . .

"Mr Boathook" she cried, "Good news! Ivor's got a week off his youth training thing. So you can have him. Show him what's what. He won't want much pay – say five or ten pounds a day."

Ivor grinned, and I pulled a Bush 2514T on to the bench. The complaint was that the screen went bright red intermittently. I decided to study the tube base, looking for dry-joints or cracks in the red gun drive circuitry. Just as I brought my magnifier to the tube base Ivor poked my elbow and I gave the tube's neck a smack.

"What shall I do, Mr Bullock?" I looked around and saw that the old Saisho CT141X that we use as a VCR monitor produced a low, flipping field scan.

"Open that set" I said, "and don't poke my arm again. We don't want to see necks flying off tubes, do we?"

He soon had the Saisho unboxed. After clouting the field circuitry to no avail I checked its supply voltage, which was all right. "Take out these electrolytics and check each one on the bridge" I said, "and put them back the right way round."

As the joints on the Bush 2514T's tube base panel all seemed to be sound I started to tap the tube's neck.

"Why are you hitting that tube?" asked Ivor.

"I'm not hitting it, I'm tapping it" I replied, "because I think that the red gun is being switched on hard now and again when a bit of swarf on its warmed grid sags against the cathode."

A bit of further tapping produced a red raster. I gave the tube a long, dirty look, and after a word with the customer I removed the base panel, charged a 200μF wire-ended electrolytic capacitor and then discharged it across the appropriate tube pins. The gun gasped then fell quiet. When I tried the set again the picture was good. Just to be sure, I gave the neck another good hammering with a screwdriver handle. As the tube passed the violence test I boxed up the set and put it on soak test.

"Ah" cried Ivor, "I've found a dud electrolytic in this Saisho set. C422 measures only 10μF instead of 1,000μF."

He fitted a replacement and tried the set again. The field scanning was back to normal. He then picked up my screwdriver and started hammering at the tube's neck.

"Ivor!" I cried, "Ivor!!" But it was too late. There was no ring with his final tap, just a dull clunk and the soft tip-tap of glass fragments on to the bench, followed by a long, thin hiss.

"Those taps didn't do any harm, did they, Mr Bullock?" Ivan asked, eyeing the way to the door.

"No, no Ivor" I said – but he'd gone.

Next Month in TELEVISION

FREE BOOK!

Next month's issue comes with a free cover-mounted special edition of Newnes Radio and Electronics Engineer's Pocket Book. This extract of basic electronics information has been compiled by the author, Keith Brindley.

INTRO TO THE FERGUSON ICC9 CHASSIS

The ICC9 is the most recent Thomson chassis to appear in the UK under the Ferguson banner. The basic design is international, being customised to suit individual markets. There are many novel features and some new chips. These include the TEA5101A RGB output chip which has mosfets as the output devices. Comprehensive safety systems are incorporated, and the line driver stage is one of the strangest we've seen – six transistors are involved in one way or another! Despite the elaborate circuitry, the component count has been reduced in comparison with the Thomson chassis it's currently replacing. Extensive use is made of minimef and surface-mounted chip devices.

SATELLITE RECEIVER SERVICING

Jack Armstrong on how to tackle common faults experienced with the Pace SS9000 and Amstrad SRD510 receivers.

COMMUNICATION BY FAX

We tend to take fax communication for granted, and little technical information on it is available generally. There's quite a lot to the technology, as Geoff Lewis explains.

SERVICING ITT CHASSIS

Chris Watton takes a look at the Monoprint B chassis in the second article in his current series.

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TV Fault Finding

Reports from Philip Blundell, AMIEEIE, John C. Priest, Andrew Tebbutt, J. LeJeune, John Pitt-Francis, John Hepworth, Mike Leach, David Belmont, Chris Watton, John Edwards and Michael Dranfield

Philips GR2 Chassis

I've now had a couple of cases of intermittent power supply shutdown. In each case the problem has been resolved by replacing the CNR50 chip. **P.B.**

Philips G90 Chassis

This set worked well apart from the fact that there was no teletext and F7 was displayed on-screen. Checks around IC7800 showed that its reset pulse was missing. This comes from a separate 5V regulator/reset pulse generator circuit (transistor Tr7846 etc.) which checked out all right. Its input voltage was 1V low at 7.3V however. C2843 (220µF) had dried up. A replacement brought the voltage at the collector of Tr7846 back to 8.3V and restored the teletext. **P.B.**

Toshiba 214T7B

If the set is dead – the standby light goes off when the remote control unit is operated but the set fails to come on – check whether C815 (0.039µF) is open-circuit. **P.B.**

Philips G110 Chassis with Nicam

AV switching problems are becoming more common as customers increasingly use the baseband circuits. When the scart socket was used as an input with this set the sound from the external source was heard but the off-air picture was displayed. Voltage checks around the micro-controller chip IC7720 showed that pin 14 went low when a video signal was being played back via the scart socket but pin 38 failed to go high to switch over to the video signal. A new TMP47C634-2676 chip was required. As the sound is switched by the I2C bus it wasn't affected by the fault. **P.B.**

Ferguson IKC2 Chassis

This set wouldn't come out of standby. When the field scan coil plug was temporarily removed the set came back on, indicating that the protection circuit was sensing a field fault. We carried out some d.c. checks in the field output stage and found that DF16 (BY398) was short-circuit. **P.B.**

Philips CTX-E Chassis

This set was dead, with no 125V output from the power supply. The TDA2577 chopper control chip was producing a squarewave drive output at pin 11 but this didn't reach the chopper transistor. The BF422 driver transistor Tr7353 was open-circuit between its base and its collector. **P.B.**

Philips G110 Chassis with Nicam

If the set is dead but the power supply works all right when tested with a dummy load, remove and inspect capacitors C2546 (8.2nF) and C2550 (390nF) in the line output stage.

Replace them if their wires are loose or there are signs that the capacitors are overheating internally. **P.B.**

GoldStar CIT2168

If one of these sets fails to start at switch on, with nothing blown (the fuse and the wirewound surge limiter resistor R812P in the mains bridge rectifier circuit being o.k.), check R811P (22kΩ, 3W) and D805P (R10J) in the start-up supply to the TDA4601 chopper control chip IC801. Look for 6V plus at pin 9 of IC801. If these items are o.k. replace C805P (100µF, 16V) which couples the drive to the base of the chopper transistor Q801P. This component can also be responsible for sluggish turn on. **J.C.P.**

Mitsubishi CT33C1STX

Check the teletext subpanel in this and similar Mitsubishi chassis when the fault is intermittent loss of sync. It's the daughter board that stands vertically on the main PCB, with three plug-in connectors with latches. Check the plugs and sockets first, and the soldering of the socket pins into the main PCB. Then check the following items on the teletext panel itself: the video input buffer transistor Q7706, the sync buffer Q7707, and C7718 (22µF, 50V) which couples the sync output from pin 1 of the SAA5231 chip IC705 to the base of Q7707. All these components have been found to give trouble, but Q7706 (type JC501R) is the usual cause of the problem. **J.C.P.**

TDA4601 Power Supplies

We had similar faults recently in sets from two different manufacturers, both using this type of power supply. The first set was a **Perdio** CT2005 (**Indiana** 100 chassis) which was dead. When we looked inside we found that C820 (1µF, 25V) had blown apart while R812 (47Ω, 0.5W) was open-circuit. These items are in the voltage regulation feedback circuit. Replacing them restored normal operation.

The second set was fitted with the **Decca/Tatung** 170 chassis. The mains fuse was blackened, the chopper transistor was short-circuit and there was quite a lot of scorching in the power supply area. My first move was to check the resistors connected to pin 4 of the chip. They were both innocent however – there are two, 120kΩ and 150kΩ in series. As in the previous case, the cause of the trouble lay in the voltage regulation part of the circuit, where R817 and R819 (both 220Ω, 0.5W) were open-circuit because the rectifier D807 (BA157) was short-circuit. Unfortunately we were not so lucky with this set as we also had to replace the TDA4601 chopper drive chip, the S2000AF chopper transistor (Q801), the bridge rectifier diodes D801-4, the surge limiter resistor R802 (3.3Ω, 4W) and, for good measure, the chopper transistor's base drive coupling capacitor C807 (100µF, 25V).

Was this just coincidence, or do these two cases suggest

that a new fault pattern is developing with this type of power supply as the sets age? A.T.

Cascade TV510

Half the difficulty with this set lay in obtaining information – no one in my circle of contacts seemed to know it, and it didn't look to be a clone of any other chassis. Even a plea in the Help Wanted column produced only one reply, which suggested that the set may have been distributed by GUS. This turned out to be good information however. I was able to discover that Cascade Electronics has been taken over by Ross Consumer Products of Emlyn Street, Farnworth, Bolton BL4 7EB who can supply spares (for the present).

The problem was that the set kept blowing its line output transistor, either at or shortly after switch-on from cold. A check showed that the 112V supply to the line output stage was about 30 per cent high to start with, falling to the correct level after about five minutes. Surprisingly we traced the cause of this to VR901 rather than the two zener diodes ZD901 and ZD902. Q901 was also changed for good measure. J.P.F.

Sharp DV1512 (Euro DS1 Chassis)

If you find that the chopper transistor in this chassis has gone short-circuit, order the official Sharp repair kit from Willow Vale (part no. 27510PK). It's tedious having to fit the dozen or so small components that would either have been weakened by the short-circuit or be of modified value, but is the only way to achieve a reliable repair. J.P.F.

Loewe Profi S28 (C8001 Chassis)

The line output stage was not working though the switch-mode power supply was fully operational. Checks brought us to the BD137 line driver transistor T534 which was short-circuit base-to-emitter. In addition the PCB had been discoloured by overheating. A replacement ran pretty hot so we upgraded it to a TIP41C to ensure a lasting repair. J.P.F.

Toshiba C2020B1

During the initial warm-up period this set produced sound but only a blank raster. This pointed firmly to the first or second video amplifier stage, nowhere else. The first video amplifier transistor Q201 proved to be faulty. A textbook fault that's rare these days. J.P.F.

Sanyo CTP7132 (80P Chassis)

This set was dead with a short-circuit line output transistor. While fitting the replacement I resoldered the heatsink plate connection to the main PCB as this is often the cause of line output transistor failure in this chassis. Two weeks later the same fault occurred. The set worked normally when another BU208D transistor had been fitted, but after ten minutes the line output transformer started flashing. Assuming that the trouble was insulation breakdown, I replaced the transformer. Yes, you guessed right, the set came back a week later.

This time I was in luck. While checking the power supply, with its 110V output disconnected and a 100W bulb as a dummy load across C321, I was called away to the phone. When I returned twenty minutes later the bulb was noticeably brighter than before. The h.t. had risen to 160V. The cause of the power supply instability was traced to zener diode D305 in the error detector circuit. From time to

time the voltage across it was as low as 5V instead of 7.6V. Its replacement restored normality to both the set and myself! J.P.F.

Osume CTV1484R/Harwood HTV9014R

The symptom was not unusual: when the set was switched on it tripped. A lot of time was wasted because I assumed that the chopper power supply was tripping due to an overload. After drawing a blank in the 120V department and then a check on the 12V supply, it finally dawned on me that there was no standby voltage at C128. In this circuit the result is a cyclic on/off effect. The cause of the trouble was the standby transformer EM112 which was open-circuit. Point to note: all tripping is not the same! J.P.F.

Matsui 1810

If you have one of these sets that's suffering from Nicam breakthrough on the sound, remove the ceramic filter CF301 and throw it in the bin. J.H.

Grundig CUC220 Chassis

The fault with this set was field collapse. After checking everything two or three times I discovered that R2779 (18k Ω) was open-circuit – but you have to check it out of circuit. J.H.

Bush 2214

This set had been to another 'repairer' who had given up. It didn't take long to find that the line output transistor was leaky and that there was a dry-joint at R756 which is connected to its base. J.H.

ITT Digi 3 Chassis

There was crackling on sound when Hyposound was selected. The cause of the trouble was the APU2400E chip IC670 on the digiboard J.H.

Rediffusion Mk 4 Chassis

I can't praise these sets highly enough: they were masterpieces. But here's a fault that can catch you out. If there is little h.t. but the voltage comes up when the feed to the line output stage is disconnected don't go hunting around for an overload, because you won't find one. What you will find is that 4R5 (68k Ω) on the power supply panel is open-circuit. You must test it when out of circuit. J.H.

Ferguson TX90 Chassis

This set came in dead with fuse FS102 blown. Checks showed that the line output transformer was short-circuit between the primary winding (pins 3, 5, 10) and chassis – it's the first time we've had a dud line output transformer in one of these sets. When a new transformer had been fitted a slightly undersized picture with a ripple was produced. The electrolytics were all o.k., the cause of this fault being the BD839 regulator transistor TR107 which was open-circuit base-to-emitter. J.H.

Ferguson C51F (ICC6 Chassis)

The problem with this set was low i.f. amplifier gain. The cause was traced to CS25, a small, green 1 μ F capacitor

that's connected to pin 13 of the LA7550 chip IS10 within the i.f. module casing. **J.LeJ.**

Bush 2057NTX

The standby light was on but nothing else happened. Checks showed that the 12V supply was missing because zener diode ZD402 was short-circuit and R423 (0.68Ω safety) open-circuit. When these items had been replaced the set worked but couldn't be switched into standby. The fairly hefty 2SC2335 transistor Q907 in the standby switching circuit was found to be leaky. A replacement restored correct operation. **M.L.**

Hitachi C14-P216 (G7P Mk 2 Chassis)

Low sound with buzzing was the complaint with this 14in. portable. I wrongly assumed that the cause would be the TA8691 chip, which is usually responsible for buzzing and sound problems with these sets. On this occasion however the culprit turned out to be C410 (0.01μF) which is connected between crystal MF402 and chassis. It was leaky. **M.L.**

Tatung 170 Series Chassis

The line output stage in one of these normally reliable sets wouldn't start up. The channel indicator on the front worked, and the set could be switched into standby. We decided to replace the two transistors (Q401/2) in the line driver stage. This made no difference. There was a line drive waveform at the base of Q401, but it was a little cramped and low in amplitude. This seemed to point to capacitor trouble, but the few capacitors involved were all o.k. What we eventually found was that R426 (1kΩ), which is connected between the base of Q401 and chassis, had gone high in value. Q402's base is also connected to chassis via a 1kΩ resistor (R427). After replacing both of these resistors the line drive had been restored and the set worked normally. **M.L.**

Matsui 1422

There was no picture, just a blank raster. L108 in the i.f. strip had gone open-circuit. **D.B.**

Decca/Tatung 140 Chassis

The complaint with this set was that the picture went red intermittently. We traced the cause to the 1kΩ preset R224 in the red output stage. Replacement and setting up produced a good picture. **D.B.**

JVC C21TX1EK

The customer's complaint was of a fuzzy picture, the technical diagnosis being no sync. The sync signal is routed through the text module in this chassis. We found that the 6MHz crystal X002 in this module was faulty (no oscillation). A new crystal cured the fault. Note that the text chips for some models are not available from JVC – you have to obtain a complete module. This isn't cheap. **D.B.**

Hitachi C2514T

There was no picture and no sound, just a blank raster. I then discovered that the picture controls were all at 0 and the set wasn't tuned in. So I tuned the receiver in and set up the picture controls, but attempts to store them set every-

thing back to 0. There was obviously a memory fault. While checking in this area I discovered that one end of R068 had never been soldered. Putting this right brought the picture back on all four channels. **D.B.**

JVC C14A1EK

When standby was selected the picture dimmed to a faint raster but the set wouldn't switch off. Q1901 was short-circuit. You'll usually find that it was dry-jointed prior to its failure. **D.B.**

Loewe MS56 (C8001 Chassis)

The dead set symptom with this set was caused by a short in the line output transformer. When a replacement had been fitted and the h.t. had been set up (142V) there was an EW fault. This was cleared by replacing R583 (22Ω) and the TDA4950 EW drive chip IC1581. **C.W.**

Osaki 3214S

This set would search tune but wouldn't stop searching: it passed every channel it came to. The sync detection pulse was present at the tuning chip and the a.f.c. detect pin went high, but not high enough. Replacing Q133 (2SC945) restored correct tuning. **C.W.**

Matsui 2190

There was a starting problem with this set. It would trip when it tried to start. If you held down one of the keys on the remote control unit for a few seconds the power supply would begin to motorboat. After holding the handset button down for some time the set would start up.

A check on the standby 5V line showed that it dipped to only 4V when the set tried to start up. The 8.5V supply from the chopper transformer also dipped, from 12V in the standby mode to 5V, as start up was tried. There are two 2,200μF electrolytics for this supply. Both were low in value, replacements restoring normal operation.

These sets are not made to come on from the standby condition by operation of the mains switch. I find it annoying having to find the handset to switch on. The mains switch is the remote-control type however and the simple addition of a diode (1N4148 or similar) in position D1511 will provide starting via the mains switch. **C.W.**

Dansai CTV1406

If the set goes dead intermittently with the power supply ping-pong, resolder all four pins of the line driver transformer T751 – even though they look all right. **M.Dr.**

Samsung CI6230WN

The TDA4601 power supply was pulsing away in the trip mode. After disconnecting many things we found the culprit on the tube base panel. C560 (2.2μF, 250V) in the RGB output stage power supply had a bulge on top and was short-circuit. I would recommend replacing C590 at the same time, both with 450V types. A quick check is to unplug the connection to the tube base panel at the plug near the line output transformer. **M.Dr.**

Tatung 170 Chassis

Every time we have an electrical storm we get these sets in

for repair. My tip is to replace IR02 (PCD8572) and I001 (SAB3035) as a pair before getting too deeply involved in investigating the causes of obscure faults. In ninety per cent of cases replacement of these two chips will be all that's required.

M.Dr.

Hitachi C25-P228 (G8Q Chassis)

The chap who brought this set in had already replaced an endless list of components including the line output transformer and the TDA2579 timebase generator chip IC701. It was dead with the line driver transistor Q701 turned fully on as there was no line output from IC701. Now IC701 is switched on and off at pin 16 for standby switching. This clue led us to the control panel, where the LED display was not lit in the way it should be if the set was stuck in standby.

Scope checks around the SAA1293H control chip IC1502 showed a general lack of activity, as if its clock had stopped. In fact it had, replacement of the 4MHz crystal X1501 bringing the set back to life. All that now had to be done was to set up the focus and first anode supplies from the new LOPT.

M.Dr.

Hitachi CPT2508 (G7P Mk II Chassis)

No results with only 33V at the collector of the line output transistor was found to be the result of the mains rectifier's 150µF, 400V reservoir capacitor C909 being open-circuit.

J.E.

Panasonic TX24T1 (Alpha 2W Chassis)

There was normal sound but only a poor washed-out picture, i.e. no contrast. The picture could sometimes hardly be seen, consisting of just a slight movement of shaded greys on the raster. Or the screen might be completely blanked out so that the first anode control had to be turned up to see the effect. The symptoms were caused by C626 (10nF) which decouples the TDA3505 video control chip's contrast pin (19). I've had the symptoms on three occasions, so it looks like the start of a stock fault.

J.E.

Ferguson TX90 Chassis

The fuse on the secondary side of the mains transformer was open-circuit. As the rectifier diodes were all o.k. I fitted a new fuse and switched on. This produced an uncontrollable hum from the speaker. The cause was quickly traced to the line output transistor, which was short-circuit base-to-collector, and the line output transformer's chassis pin (6) which was badly dry-jointed. The set worked normally after fitting a new line output transistor and resoldering all the pins of the transformer, but the customer was disappointed about the continuous buzz that could be heard even with the set switched off. I explained that this was because of the design, with the mains transformer on the live side of the on/off switch, but the customer was not impressed. To tell the truth, neither am I.

J.E.

Sony KVX25TU

No sound was the complaint with this set. When I removed the LA4280 audio output chip IC251 it fell in half! Fortunately a replacement produced good-quality sound without further ado. The customer confessed to having connected two external speakers to the set without using proper plugs. Instead he'd pushed the bare leads into the speaker sockets, using drawing pins to hold them in place. Say no more!

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The IRIS Code

David Botto

Pete sat at the keyboard of his PC, tapped in a few numbers and letters then pressed 'print'. The PC coughed and the printer ejected a fully itemised and priced bill for Mr Brown's repaired VCR. Not so long ago it would have been necessary for Pete to have laboriously typed or written out the bill, wasting valuable time searching for the correct words to use. Instead he now uses the IRIS code stored within his workshop PC program. It does most of the work for him.

The IRIS code is easy to learn and, once mastered, saves you much work, tension and frustration. Mountains of tedious paper work disappear, and the day-to-day running of the service department is simplified. Sony defines the IRIS code, which it devised in 1986, as a means of translating the customer-stated fault, the service

engineer's description of it and the repair undertaken into a series of coded digits. These digits, in conjunction with a good PC workshop management program, can help the engineer by standardisation of the terms and phrases used.

PC programs that incorporate the IRIS code include ServiceBase, F4 and Workshop Manager Plus. All three were reviewed in this magazine last year (see the March, April and July 1994 issues). Installing one of them in your PC will represent a sound investment. Make sure that you purchase the latest version, to ensure that the IRIS codes have been fully updated.

An advantage of IRIS coding is that it enables you to make claims on a manufacturer's guarantee easily, simply and accurately. When Sony receives a claims report the IRIS code enables it to note recurrent failures and stock

Table 1: Condition codes

1 Constantly: Symptom is always present, under any condition.

2 Intermittent: Symptom appears and disappears at regular or irregular intervals.

3 After a time: No symptom at switch on. Fault occurs a certain time after activating the equipment.

4 Hot environment: Symptom appears when ambient temperature is high but within normal specified operating level.

5 Cold environment: Symptom appears when ambient temperature is low but within normal specified operating level.

6 When switching: Symptom appears when the user activates a function of the equipment.

7 With vibration: Symptom occurs when the equipment is subjected to mechanical shocks or vibration.

8 Wet environment: Symptom occurs when the relative air humidity is very high but within the specified conditions for normal operation.

9 Dry environment: Symptom occurs when the relative air humidity is very low but within the specified conditions.

A Dropped: Symptom occurred after the equipment had been subjected to a heavy shock.

B After lightning strike: Equipment damaged by lightning.

C Only certain stations(s)/mode/software:

Symptom appears only when equipment is tuned to certain channels or frequencies, is using a specific operating mode (e.g. edit mode, digital effect on, RDS activated etc.), or is playing or recording specific software.

D Only on certain standards: Applies with multistandard equipment when symptom appears when using a specific standard, e.g. PAL, system L etc.

E Only on one channel: Symptom is present on only one channel of a stereo pair.

F Only with certain input(s): Symptom appears on only one (or more) of a series of different inputs.

G Only with certain output(s): Symptom appears with only one (or more) of a series of different outputs.

H In standby/off mode: Symptom appears only when the equipment is switched off or in the standby mode.

J At edit point: Symptom appears at a point where an edit is or has been carried out.

K When interconnected: Symptom appears only when the set is connected to another piece of equipment.

L Liquid contamination: Set was submerged in liquid or a liquid infiltrated it, causing the problem.

X No symptom/problem found: Even after a complete investigation the technician could not confirm the symptom complained about.

Table 2: Symptom codes – main headings only

110 Power problem	460 Poor colour recording
120 Charging problem	470 Special colour picture function problem
130 Display function problem	510 No audio
140 Abnormal noise	520 Audio level problem
150 Remote control problem	530 Audio quality problem
160 Physical damage	540 Noisy audio
170 General function problem	550 Unstable audio
180 Special requirements	560 Poor audio recording
210 No reception	570 Poor special audio function
220 Poor reception	580 Stereo/multi mode operation problem
230 Transmission problem	610 No mechanical operation
240 Noisy reception	620 Irregular mechanical operation
250 Unstable reception/transmission	630 Speed problem
260 Tuning problem	640 Mechanical noise
270 Special communication problem	660 Damage to software
280 Special reception problem	670 Mechanical operation problem
310 No picture	680 Lens problem
320 Picture level problem	710 No data processing operation
330 Picture quality problem	720 Faulty data processing operation
340 Picture noise	730 Data display problem
350 Unstable picture	760 Data read/write problem
360 Poor picture recording	770 Special data function problem
370 Special picture function problem	810 No printer operation
380 Picture display/pickup problem	820 Faulty printer operation
410 No colour	830 Poor print quality
420 Colour level problem	840 Noisy printing
430 Poor colour quality	850 Unstable printer operation
440 Noisy colour	860 Ribbon/paper problems
450 Unstable colour	880 Faulty font/character functions

faults. The main benefit to Sony is that the information it receives is in a standardised form – a main requirement for electronic data information transfer of claims. The code originated in Japan, but has been used successfully in Europe for several years. For Sony it proved to be the ideal system for conveying repair data throughout the company. Sony revised and expanded the code in 1989 to provide the more detailed information required by the latest technology. It can now be used worldwide.

IRIS is an acronym for Integrated Repair Information System. It has been accepted as the industry standard repair code for Europe and is now used by most electronics and TV manufacturers in addition to Sony.

How IRIS Works

IRIS consists of letter and number codes. Each code represents information that might otherwise be lengthy to type or write out in full and possibly difficult to describe accurately. Fault data is conveyed precisely, without ambiguity. Large amounts of information can be recorded and recalled easily.

There are, in the IRIS code system, condition codes, symptom codes, section codes, repair codes, defect codes and rejected claim reasons. Part numbers, circuit reference numbers and PCB numbers form an important part of the code. Tables 1-6 list the basic codes. To make matters clear we'll give some examples of their use.

Condition Codes

It's important to be aware that the condition and symp-

toms codes on the Sony Guarantee claim form are the customer's description of the fault, not the service engineer's findings. The coding can accommodate the service engineer's condition and symptom for each part number entered, but this is optional.

The condition code (Table 1) is the first one entered on the job sheet or the manufacturer's claim form. Figure 1 for example indicates that the symptom is always present under any condition. If a TV set had a permanent sound fault you'd enter 1. If the sound went off and on intermittently 2 would be entered. A set that's completely and permanently dead gets a 1 entry. A dropped TV is coded A. L stands for liquid contamination. Note that not all codes are valid for guarantee claims: this applies with liquid spillage for example. If no fault can be found with the equipment the code entered is X.

Symptom Codes

Next to be entered is the symptom code (Table 2). The idea here is to choose the code that accurately describes the problem as it can be observed with the five senses. It's important to enter the symptom code before carrying out any technical checks or measurements on the equipment.

Table 2 is a shortened listing showing only the main headings. In the full code list each symptom is subdivided into more specific conditions. For example entering 110 specifies a power problem while entering 111 indicates that there is no power on a.c., i.e. when the equipment is connected directly to the mains supply. 430 means poor colour quality while 431 means some or all colours missing. We haven't the space here to include the full list.

Table 3: Section codes

ANT Antenna section	MIC Microphone section
APR Signal processing	PDS Control panel display section
ARM Arm mechanism	PFM Paper feed mechanism
BCH Battery charge	PIN Pinch roller/lever
CHA Chassis	PRG Programming section
CLK Clock/timer section	PRI Print block
CTR Control panel	PSU Power supply
DFL Deflection circuit	PUD Pickup device
DOM Disc drive mechanism	REM Remote control section
DPR Signal processing (digital)	RFM Ribbon feed mechanism
EXC External connector	RFU Booster/r.f. unit
FDD Floppy disc drive	RHD Rotary heads
FLX Flexible PCB	SFT Software (tape, disc etc.)
FMW Firmware	SHD Stationary heads
HCM Head carriage mechanism	SLD Sled mechanism
HDD Hard disc drive	SNS Sensor unit
HFS High-frequency section	SPK Loudspeaker
HOL Cassette holder	SRS Supply reel section
IMG Image display unit	STA Static block
INC Internal connector	SVO Servo section
INP Signal input section	SYS System control section
KBO Keyboard	TDM Tape-drive mechanism
LDG Loading mechanism	TIM Timer section
LNM Lens mechanism	TNR Tension regulator
OUT Signal output section	TPT Tape path
MEM Memory circuit	TRS Take-up reel section
	TUN Tuning section
	TXR Text processing
	VWF Viewfinder
	WIR Lead wire
	XXX Cabinet/cosmetic parts

A full copy of the IRIS code is issued with each Sony warranty pad and a free copy can be obtained from Sony (UK) Ltd., Warranty Department, National Operations Centre, Pipers Way, Thatcham, Newbury, Berkshire RG13 4LZ.

Section Codes

The section codes, Table 3, pinpoint the area or section of the equipment in which the fault lies. If the clock/timer section of a VCR is faulty for example the section code to enter is CLK. If the cassette loading mechanism is defective the code is LGD. Other examples are TUN for a fault in the tuner section, HDD for a PC with a faulty hard disc drive mechanism, VWF for a camcorder viewfinder fault and SPK for a faulty loudspeaker.

Repair Codes

The repair codes are listed in Table 4. When parts are replaced the repair code is A. Resolder a dry-joint and the code is D. Code F indicates that all or part of a mechanism has been lubricated. If the equipment is returned without a repair having been carried out the code is Y. A repair esti-

mate that has been refused is coded V. Not all these repair codes are valid for under-guarantee claims: to make things easier for the engineer, the Sony warranty pad omits all non-valid codes.

Defect Codes and Rejected Claims

Table 5 lists the repair codes. They are divided into two sections, mechanical and electrical. If a mechanical part has worn out the code is A, if it has snapped off the code is F while lack of lubrication is code L. An electrical short-circuit is code Q, a cracked PCB code V, a missing component code Z while defect code 1 indicates a PC software bug.

Table 6 shows the codes used to specify why a claim under guarantee has been rejected. If a set has been dropped on a concrete floor for example the code would not be valid for warranty purposes. O/W indicates that the set is out of its guarantee period while DOP indicates that the date of purchase needs to be checked.

Reference and Part Numbers

Component circuit reference and part numbers are

Table 4: Repair codes

- A Replacement
- B Mechanical alignment
- C Electrical alignment
- D Resoldering
- E Cleaning
- F Lubrication
- G Repair electrical parts
- I S/B modification
- J Components removed
- K Components added
- L Functional check
- M Specification measurement
- N Maintenance
- O Refurbishing
- U Explanation added
- V Estimation refused
- W Estimation with parts
- X Estimation without parts
- Z Set exchange

Table 5: Defect codes

Mechanical

- A Worn out
- B Dirty, clogged
- C Misaligned
- D Cut, broken
- E Deformed
- F Snapped
- G Scratched
- H Cracked, peeled, corroded
- I Loose
- J Shaky, unstable
- K Leaking
- L Dry (no lubricant)
- M Foreign object

Electrical

- N Exhausted, low emission
- O Burnt, arcing, missing pixels
- P Misaligned
- Q Short-circuit
- R Open-circuit
- S Leaky
- T Bad contact/connection
- U Open pattern
- V Cracked PCB
- W Cold or no soldering
- X Bridged soldering
- Y Wrong component fitted
- Z Missing component
- I Software bug

Table 6: Codes for rejected claims

- C Customer's name and address required
- DOP Check date of purchase
- F Fault symptom required
- M Model number incorrect
- N/C Not eligible (e.g. cleaning etc.)
- OM Old model – customer's sales receipt or delivery note to dealer required
- O/W Out of warranty
- P Part number required or incorrect
- S Serial number required
- MI Missing/incorrect information

important pieces of information that must be entered – obtain them from the relevant service manual.

Under Guarantee Claims and Bills

Most workshop PC programs will display and print the under guarantee claim forms used by Sony and other manufacturers. These programs automatically enter such details as your name, address, telephone number, your Sony account and VAT numbers. The forms include boxes in which the appropriate IRIS symbols should be inserted. On receipt of the claim the manufacturer will know immediately all the details of the repair.

If the repair is chargeable to the customer, enter into your PC workshop program the IRIS codes and the other necessary details. It will then compute and print out the completed bill, with part, labour and the total charge plus VAT, for presentation to your customer. The system can also be used with maintenance contracts. However you use it, the system will provide repair information for your service records.

In Conclusion

An important way in which the IRIS code benefits both Sony and its dealers is through product quality feedback to the factories. Information on faults is required by the factories to achieve high reliability standards. The IRIS coded data can be interpreted to analyse accurately the facts behind the basic figures.

To cope successfully with modern technology service engineers regularly have to learn new things. IRIS is one such thing you need to know. Fortunately the codes are easy to understand. They have proved to be a valuable addition to engineers' skills.

Acknowledgement

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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 diagrams (photocopy would do) for the Hitachi VT220E, Solavox NCVR5000 and Contec KT8135, also a remote control unit for the Akai VSF600. Paul Thomas, 5 Lingfield Green, Darlington, Co. Durham DL1 1DD.

Wanted: Thorn/Ferguson TA127A 12-12V d.c. battery converter for the TX90 chassis. Eric Thelan, The Cottage, Holtwhites Hill, Enfield EN2 8BY. 081 367 3101.

Wanted: Circuit diagram for the Saisho CX780 car radio comb. Photocopy will do. R.E. Norgan, 24 Hankinson Road, Bournemouth BH9 1HJ. 0202 529 181.

Wanted: Service manual for the Sony SLF20/30 VCR. Also a dud machine for spares. Pete Hills, 50 St. Augustine's Avenue, Wembley, Middx HA9 7NX. 081 904 5955.

Wanted: Circuit diagram for the Hung Chang 3502 20MHz oscilloscope. Wayne Townsend, 23 Garden Court, Brackla, Bridgend, Mid. Glamorgan CF31 4UJ.

Wanted: Remote control handset, working or not, for the Bang and Olufsen CTV3119. L.E. Swain, 53 Park Road, Buckden, Huntingdon PE18 9SL. 0480 811 058.

Wanted: Teletext board for the Loewe Profi M10; circuit diagram for the Toshiba C400BB; LOPT (MSHIFCB04) for

the Sharp C1410; PCB/chips for the Toshiba 145R7B; TDA1104SP or TDA1106SP chip (Panasonic). D. Benyon, Marshland View, St Annes Hill, Bude, Cornwall EX23 0LT. 0288 353 373.

Wanted: Panasonic NV8600 VCR (top loader, piano keys). A bonus if in working order. Will collect anywhere promptly. Robert Anderson, 12 Fairy Dell, Marton, Middlesborough, Cleveland TS7 8LF. 0642 314 385.

Wanted: 1986 and 1987 copies of *Television*. Have 1981 to mid-1985 to swap/sell. Also *Radio and Television Servicing* 1960 and 1965-68. G.D. Stocks, 62 Ridge Park Avenue, Mutley, Plymouth, Devon PL4 6QA. 0752 668 015.

Wanted: Source of service information for the Memorex TV Model 1400R. A. Robertson, Enterprise TV, 261 Warrington Road, Abram, Wigan WN2 5RQ. 0942 865 621.

Wanted: X0064CE i.f. chip for the Rediffusion/Doric colour portable. Jim Mudford, 9 Greenhill Place, Midsomer Norton, Avon BA3 2TF. 0761 416 245.

Wanted: Atari 1050 disc drive plastic case parts. P.A. Solomon, 43 Amberley Road, Macclesfield, Cheshire SK11 8LX. 0625 420 782 or 515 331.

Wanted: New or used mains transformer for the Telequipment D43 oscilloscope. Ron White, 29 Nunnery Sreet, Castle Hedingham, Essex CO9 3ND. 0787 462 106.

Wanted: Sanyo VHR5240/Granada VHS GS5 VCR for spares. Working/non-working o.k. P.K. Osborne, 29 Shirecroft Road, Westham, Weymouth, Dorset D74 0NH. 0305 770 591.

Wanted: Service sheet (photocopy o.k.) for the Ferguson Model 34634 music centre. Also an AF21 transistor or information on an equivalent. A. Watson, 2 Masefield Avenue, Padiham, Lancs BB12 8SY. 0282 774 114.

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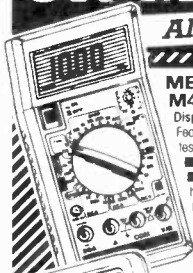
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TEKTRONIX CFG250 Func Gen 0.2Hz-2MHz Sine/Sq/Tri/TTL	£180
TEKTRONIX CDM250 Digital Multimeter 3 1/2 digit Led	£180

SPECTRUM ANALYSERS

H.P. 853 with 8559A 0.01-21GHz	£4500
H.P. 3180A Led 5Hz-6MHz	£1000
ANRITSU MS62B with Trac Gen 10KHz-1700MHz	£1500
POLARAD 6411 100MHz-18GHz	£1500
ANIDO ACB281 with ACB211 100MHz	£1500
H.P. 82 with 8558 100kHz-500MHz	£1500
H.P. 141T with 8558 & 8552B 500KHz-1250MHz	£1200
H.P. 141T with 8553B & 8552A 1KHz-110MHz	£800
MARCONI TF2370 30Hz-110MHz	£1000
H.P. 8443 Tracking Generator, Available from	£100
H.P. 141T Main Frames only Good Tubes	£225

BLACK STAR EQUIPMENT (P&P all units £5)

APOLLO 10 100MHz Counter Timer Ratio/Period/Time interval etc	£222
APOLLO 100 - 100MHz (As above with more functions)	£225
METEOR 100 FREQUENCY COUNTER 100MHz	£119
METEOR 600 FREQUENCY COUNTER 600MHz	£145
METEOR 1000 FREQUENCY COUNTER 1 GHz	£189
JUPITOR 500 FUNCTION GEN 0.1Hz-500kHz Sine/Sq/Tri	£219
ORION COLOUR BAR GENERATOR Part TV Video	£229

All other Black Star Equipment available

OSCILLOSCOPE PROBES

Switchable x1 x10 (P&P £5)	£12
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Used Equipment - Guaranteed Manuals supplied if possible.
This is a VERY SMALL SAMPLE OF STOCK SAE or Telephone for list. Please check availability before ordering.
CARRIAGE all units £16 - VAT to be added to Total of Goods and Carriage

STEWART of READING
110 WYKEHAM ROAD, READING, BERKS RG6 1PL
Telephone: 0734 268041 Fax: (0734) 351696
Callers Welcome 9am-5.30pm Mon-Fri (until 8pm Thurs)

ELECTRONIC TEST EQUIPMENT

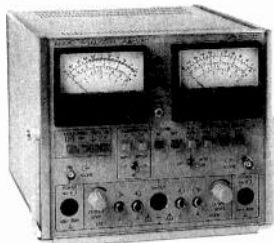
Audio - Video - Television - Satellite TV - Telecommunications

The manufacturer who cares about quality & features rather than being lowest in price !



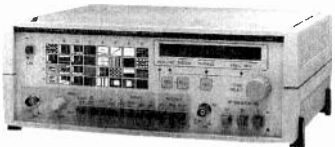
Audio Analyser
Model AA-930

Multi-function meter. Measures distortion, wow & flutter, stereo power, signal levels in & out; generates audio test signals. Features include large clearly marked analogue meters. Performs the work of many individual instruments. £ 490




Television Pattern Generator
Model GV-698/11

32 patterns, 32 internal memories. PAL/NTSC/SECAM standards, with I, B, G, H, M, M, N, D & K, NICAM, teletext all in one instrument. Optional on screen logotype. (Other pattern generators available from £ 210). £ 1428




Television Pattern Generator
Model GV-298

Compact high performance generator, RF and video outputs. Frequency range same as GV-698/11, 37 to 865 MHz. Circle pattern included. £ 433



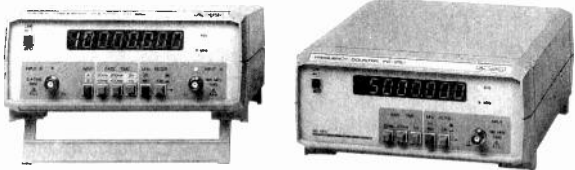
TV & Satellite Level Meter
Model MC-360

Ideal instrument for the professional installer of FM/TV aerials and satellite TV dishes. Covers 48 to 856 MHz and 950 to 2050 MHz. Lightweight, compact and rechargeable battery operated. £ 654



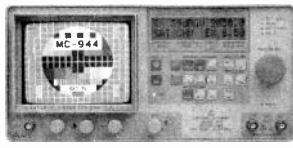
Frequency counters Models FD-250 & FD-252

FD-250 covers 20 Hz to 160 MHz and FD-252 covers same plus, 100 MHz to 2.4 GHz. Large L.E.D. display. Wide performance at low cost. £ 153 & £ 206




TV & Satellite Level Meter
Model MC-944

This meter has everything for the top flight installer of aerials, dishes, CCTV, MATV, SMATV and others systems. Features include TV monitor, spectrum analyser, sync pulse, teletext, printer output, 99 memories, tuneable audio subcarriers, etc. Full autocorrection for superb, unequalled accuracy! RS-232 as standard. £ 1895




Low Distortion Low Frequency Generator
Model GB-212

20 Hz to 200 kHz, harmonic distortion 0.02 % maximum over audio band. Frequency counter resolution as high as 0.1 Hz. 600 ohms impedance. Output level attenuation range 60 dB, with analogue meter for setting accuracy. Excellent output level flatness. £ 219



Functions Generators
Models GF-230 & GF-232

Two versions available: 0.1 z to 1 MHz and 0.2 Hz to 2 MHz. Producing sine, triangular and square waveforms, with variable symmetry. Excellent performance. £ 153 & £ 206




CRT Rejuvenator
Model TA-903

Similar to TA-901, but has three meters to monitor cathode current. Special technique allows repeated rejuvenation of CRT. Supplied in attaché style case, for easy field and workshop use. £ 498




CRT Rejuvenator
Model TA-901

An essential tool for every TV workshop. Promax have made many thousands. Supplied complete with a set of base adaptors. £ 235



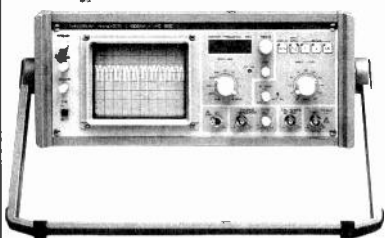
TV/FM Level Meter
Model MC-160B

The aerial installers best friend. Calibrated for accurate signal level measurements. Digital frequency display ensures correct signal selection and identification. Built-in demodulator for easy station ident, and audible tone foreay positioning. This meter is light in weight, but has outstanding technical features. £ 354



R.F. Spectrum Analyser
Model AE-566

1 to 1000 MHz, with 950 MHz to 1750 MHz option. Built-in tracking generator. Offers spanwidths from 1 MHz to 1000 MHz. Includes normalizer. This analyser is ideal for production and educational applications, as well as R+D. £ 2800




The company has been producing test equipment in Spain for over thirty years, earning a strong reputation for excellent engineering, quality performance at budget prices. The equipment is supported by Alban Electronics from their St Albans facility. These products are suitable for only professional and educational applications.



Prices shown exclude VAT, but includes UK delivery. Most items available for immediate despatch.



ALBAN ELECTRONIC LIMITED
4 - St Albans Enterprises Centre - Long Spring
Porters Wood - St Albans - Hertfordshire - AL3 6EN
Tel: 0727 832266 - Fax: 0727 810546

A4 DTP MONITORS Brand new, 300 DPI. Complete with diagram but no interface details. (so you will have to work it out!) Bargain at just £12.99 each!!!!

OPD MONITORS 9" mono monitor, fully cased complete with rasterboard, switched mode psu etc. CGA/TTL input (15way D), IEC mains. £15.99 ref DEC23. Price including kit to convert to composite monitor for CCTV use etc is £21.99 ref DEC24

LOW COST LASER NIGHT SIGHT just £79!!!
Cheaper version of our £245 Cyclops model, works ok in low light levels or in complete darkness with the built in laser. ref 95/79 (please allow about 1 month delivery for these due to import difficulties)

PC CONTROLLED 4 CHANNEL TIMER Control (on/off times etc) up to 4 items (8A 240v each) with this kit. Complete with Software, relays, PCB etc. £25.99 Ref 95/25

LOW COST RADAR DETECTOR Built and tested pocket radar detector, ideal for picking up speed traps etc. Why pay £70 or more? ours is just £24.99 ref 95/25

COMPLETE PC 300 WATT UPS SYSTEM Top of the range UPS system providing protection for your computer system and valuable software against mains power fluctuations and cuts. New and boxed, UK made Provides up to 5 mins running time in the event of complete power failure to allow you to run your system down correctly. SALE PRICE just £119.00.

RACAL MODEM BONANZA! 1 Racal MPS1223 1200/75 modem, telephone lead, mains lead, manual and cased software, the cheapest way on the net! all this for just £13 ref DEC13

HOW LOW ARE YOUR FLOPPIES? 3.5" (1.44) unbranded. We have sold 100,000+ so ok! Pack of 50 £24.99 ref DEC16

BRITISH TELECOM MULTIMETERS SA9083 These are 'returns' so they may have faults but look ok. Complete with new leads and leather case. Price for two meters & 1 case is £10 ref DEC89.

6mw LASER POINTER. Supplied in kit form, complete with power adjuster, 1.5mw, and beam divergence adjuster. Runs on 2AAA batteries. Produces thin red beam ideal for levels, gun sights, experiments etc. Cheapest in the UK! just £39.95 ref DEC49

SHOP WOBBLE! Small assemblies designed to take D size batteries and 'wobble' cardboard model signs about in shop windows! £3.99 Ref SEP42.

RADIO PAGERS Brand new, UK made pocket pagers clearance price is just £4.99 each 100x40x15mm packed with bits! Ref SEP5

BULL TENS UNIT Fully built and tested TENS (Transcutaneous Electrical Nerve Stimulation) unit, complete with electrodes and full instructions. TENS is used for the relief of pain etc in up to 70% of sufferers. Drug free pain relief, safe and easy to use, can be used in conjunction with analgesics etc. £49 Ref TEN/1

STEREO MICROSCOPE 155X195MM, up to 600mm high, so items up to 10" will fit under lens. Rack and pinion focusing, 6 interchangeable rotating objective lenses, interchangeable eye pieces, & scaled eyepiece for accurate measuring etc. Powerful low voltage illumination system with green filter and variable intensity, 100mm black/white + ground glass stage plate, 70mm swivel mirror, adjustable eyepieces (both focus and width). Magnification range 4.6-100.8, field of view 39-2.4mm. Price is £299 for complete setup Ref 95/300

3D 35MM CAMERA SYSTEM Complete kit to convert a standard 35mm camera into a 3D version, enable you to take 3D colour slides with your own camera! Kit contains a prism assembly for the front of your existing lens, a sample 3D slide, a 3D slide viewer and 2 different lens mounts 49mm and 52mm, (other sizes available from photo shops at about £3 ea) all you need is standard slide film. Price for the complete kit is £29.99 ref 95/30.

COMPUTER RS232 TERMINALS. (LIBERTY) Excellent quality modem units, (like wyse 50, s) 2XRS232, 20 function keys, 50 thro to 38,400 baud, menu driven port, screen, cursor, and keyboard setup menus (18 menus) £29 Ref NOV4

OMRON TEMPERATURE CONTROLLERS (E5C2). Brand new controllers, adjustable from -30 deg C to +1,200 deg C using graduated dial, 2% accuracy, thermocouple input, long life relay output, 3A 240v o/p contacts. Perfect for exactly controlling a temperature. Normal trade £50+, ours £15. Ref E5C2.

ELECTRIC MOTOR BONANZA! 110x60mm. Brand new precision, cap start (or spin to start), virtually silent and features a moving outer case that acts as a fly wheel. Because of their unusual design we think that 2 of these in a tube with some homemade fan blades could form the basis for a wind tunnel etc. Clearance price is just £4.99 FOR A PAIR! (note these will have to be wired in series for 240v operation Ref NOV1.

MOTOR NO 2 BARGAIN 110x90mm. Similar to the above motor but more suitable for mounting vertically (ie turntable etc). Again you will have to wire 2 in series for 240v use. Bargain price is just £4.99 FOR A PAIR!! Ref NOV3.

OMRON ELECTRONIC INTERVAL TIMER.
Miniature adjustable timers, 4 pole c/o output 3A 240v, HY1230S, 12VDC adjustable from 0-30 secs. £9.99
HY1210M, 12VDC adjustable from 0-10 mins. £9.99
HY1260M, 12VDC adjustable from 0-60 mins. £9.99
HY2460M, 24VAC adjustable from 0-60 mins. £5.99
HY241S, 24VAC adjustable from 0-1 secs. £5.99
HY2460S, 24VAC adjustable from 0-60 secs. £5.99
HY243H, 24VAC adjustable from 0-3 hours. £8.99
HY2401S, 240v adjustable from 0-1 secs. £9.99
HY2405S, 240v adjustable from 0-5 secs. £9.99
HY24060M, 240v adjustable from 0-60 mins. £12.99

PC PAL VGA TO TV CONVERTER Converts a colour TV into a basic VGA screen. Complete with built in psu, lead and software £49.95. Ideal for laptops or a cheap upgrade.

EMERGENCY LIGHTING UNIT Complete unit with 2 double bulb floodlights, built in charger and auto switch. Fully cased, 6v8AH lead acid req'd. (secondhand) £4 ref MAG4P11

GUIDED MISSILE WIRE. 4,200 metre reel of ultra thin 4 core insulated cable, 28lbs breaking strain, less than 1mm thick! Ideal alarms, intercoms, fishing, dolls house etc. £14.99 ref MAG15P5

300v PANEL METER 70X60X50MM. AC, 90 degree scale. Good quality meter. £5.99 ref MAG 6P14. Ideal for monitoring mains etc.

ASTEC SWITCHED MODE PSU BM41012 Gives +5 @ 3.75A, +12 @ 1.5A, -12 @ .4A, 230/110, cased, BM41012. £5.99 ref AUG6P3.

TORRODIAL TX 30-0-30 480VA. Perfect for Mosfet amplifiers etc. 120mm dia 55mm thick. £18.99 ref APR19.

AUTO SUNCHARGER 155X300mm solar panel with diode and 3 metre lead fitted with a dgar plug. 12v 2watt. £9.99 ea ref AUG10P3

FLOPPY DISCS DSDD Top quality 5.25" discs, these have been written to once and are unused. Pack of 20 is £4 ref AUG4P1.

ECLATRON FLASH TUBE As used in police car flashing lights etc, full spec supplied, 60-100 flashes a min. £9.99 ref APR10P5.

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

MILITARY SPEC GEIGER COUNTER Unused straight from Her Majesty's forces. £50 ref MAG 50P3

STETHOSCOPE Fully functioning stethoscope, ideal for listening to hearts, pipes, motors etc. £6 ref MAR6P6.

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 pir 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 dips. Ideal phone extns etc. £7.99 ref MAR8P3.

MICRODRIVE STRIPPER Small cased tape drives ideal for stripping, lots of useful goodies including a smart case, and lots of components. £2 each ref JUN2P3

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

SOLID STATE RELAYS Will switch 25A mains. Input 3.5-26V DC 57x43x21mm with terminal screws £3.99 REF MAG4P10

300DPI A4 DTP MONITOR Brand new but shop soiled so hence bargain price! TTL/ECL inputs, 15" landscape, 1200x1664 pixel complete with circuit diag to help you interface with your projects. JUST £14.99 REF JUN15P2.

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

ULTRAMINI BUGHMIC 6mmx3.5mm made by AKG, 5-12v electret condenser. Cost £12 ea, Ours? just four for £9.99 REF MAG10P2.

RGB/CGA/EGATTL COLOUR MONITORS 12" in good condition. Back anodised 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 17v DC 900mA output. Bargain price £5.99 ref MAG6P9

ACORN ARCHIMEDES PSU +5 @ 4A c/n off sw uncased, selectable mains input, 145x100x45mm £7 REF MAG7P2

GEIGER COUNTER KIT Low cost professional twin tube, complete with PCB and components. Now only £19 REF AUG19

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%. Extremely well built unit at an excellent 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

MAINS CABLE Precut black 2 core 2 metre lengths ideal for repairs, projects etc. 50 metres for £1.99 ref AUG2P7

COMPUTER COMMUNICATIONS PACK Kit contains 100m of 6 core cable, 100 cable clips, 2 line drivers with RS232 interfaces and all connectors etc. Ideal low cost method of communicating between PCs over a long distance. Complete kit £8.99.

MINICYCLOPS PIR 52x62x40mm runs on PP3 battery complete with shrill sounder. Cheap protection at only £5.99 ref MAR6P4

ELECTRIC MOTOR KIT Comprehensive educational kit includes all you need to build an electric motor. £9.99 ref MAR10P4.

VIDEO SENDER UNIT. Transmits both audio and video signals from either a video camera, video recorder, TV or Computer etc to any standard TV set in a 100' range! (tune TV to a spare channel! 12v DC op. Price is £15 REF: MAG15 (12v psu is £5 extra REF: MAG5P2

***FM CORDLESS MICROPHONE** Small hand held unit with a 500' range! 2 transmit power levels. Reqs PP3 9v battery. Tuneable to any FM receiver. Price is £15 REF: MAG15P1

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 £3 a pair. REF: MAG 8P1 2 x PP3 req'd

***MINIATURE RADIO TRANSCIVERS** A pair of walkie talkies with a range of up to 2km in 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.

LQ3600 PRINTER ASSEMBLIES Made by Amstrad they are entire mechanical printer assemblies including printhead, stepper motors etc etc in fact everything bar the case and electronics, a good stripper £5 REF: MAG5P3 or 2 for £8 REF: MAG8P3

LED PACK of 100 standard red 5mm leds £5 REF MAG5P4

UNIVERSAL PC POWER SUPPLY complete with flyleads, switch, fan etc. Two types available 150w at £15 REF MAG15P2 (23x23x23mm) and 200w at £20 REF: MAG20P3 (23x23x23mm)

***FM TRANSMITTER** housed in a standard working 13A adapter! the bug runs directly off the mains so lasts forever! why pay £700? or price is £26 REF: MAG26 Transmits to any FM radio

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

***FM BUG BUILT AND TESTED** superior design to kit. Supplied to detective agencies. 9v battery req'd. £14 REF: MAG14

TALKING COINBOX STRIPPER originally made to retail at £79 each, these units are designed to convert an ordinary phone into a payphone. The units have the locks missing and sometimes broken hinges. However they can be adapted for their original use or used for something else?? Price is just £3 REF: MAG3P1

TOP QUALITY SPEAKERS Made for Hi Fi televisions these are 10 watt 4R Jap made 4" round with large shielded magnets. Good quality £2 each REF: MAG2P4 or 4 for £6 REF: MAG6P2

TWEETERS 2" diameter good quality tweeter 140R (ok with the above speaker) 2 for £2 REF: MAG2P5 or 4 for £3 REF: MAG3P4

4 KEYBOARDS Made by Apricot the quality keyboards need just a small mod to run on any AT, they work perfectly but you will have to put up with 1 or 2 foreign keycaps! Price £6 REF: MAG6P3

HEADPHONES Ex Virgin Atlantic 8 pairs for £2 REF: MAG2P8

DOS PACKS Microsoft version 3.3 or higher complete with all manuals or price just £5 REF: MAG5P8 Worth it just for the very comprehensive manual 5.25" only

DOS PACK Microsoft version 5 Original software but no manuals hence only £5.99 3.5" only

PIR DETECTOR Made by famous UK alarm manufacturer these are hi spec, long range internal units. 12v operation: Slight marks on case and unboxed (although brand new) £8 REF: MAG8P5

MOBILE CAR PHONE £6.99 Well almost complete in car phone excluding the box of electronics normally hidden under seat. Can be made to illuminate with 12v also has built in light sensor so display only illuminates when dark. Totally convincing! REF: MAG6P6

ALARM BEACONS Zenon strobe made to mount on an external bell box but could be used for caravans etc. 12v operation. Just connect up and it flashes regularly! £5 REF: MAG5P11

6"x12" AMORPHOUS SOLAR PANEL 12v 155x310mm 130mA Bargain price just £5.99 ea REF MAG6P12

FIBRE OPTIC CABLE BUMPER PACK 10 metres for £4.99 ref MAG6P13 ideal for experimenters! 30m for £12.99 ref MAG13P1

HEATSINKS (finned) TO220, designed to mount vertically on a pcb 50x40x25mm you can have a pack of 4 for £1 ref JUN1P11

INFRARED LASER NIGHT SCOPES
Image intensifier complete with hand grip attachment with built in adjustable laser lamp for zero light conditions. Supplied with Pentax 42mm camera mount and normal eyepiece. 16kg. uses 1xPP3, 3xAAA's. Please allow us about 1 month for delivery on this product due to import problems! £245+Vat

NEW HIGH POWER LASERS
15mW, Helium neon, 3 switchable wavelengths 63um, 1.15um 3.39um (2 of them are infrared) 500 mW power built in so good for holography. Supplied complete with mains power supply. 790x65mm. Use with EXTREME CAUTION AND QUALIFIED GUIDANCE. £349+Vat

WE BUY SURPLUS STOCK FOR CASH
1995 100 PAGE CATALOGUE NOW AVAILABLE, 45P STAMP OR FREE WITH ORDER.
3FT X 1FT 10WATT SOLAR PANELS
14.5v/700mA
£44.95
(PLUS £2.00 SPECIAL PACKAGING CHARGE)

TOP QUALITY AMORPHOUS SILICON CELLS HAVE ALMOST A TIMELESS LIFESPAN WITH AN INFINITE NUMBER OF POSSIBLE APPLICATIONS, SOME OF WHICH MAY BE CAR BATTERY CHARGING, FOR USE ON BOATS OR CARAVANS, OR ANYWHERE A PORTABLE 12V SUPPLY IS REQUIRED.

SOME OF OUR PRODUCTS MAY BE UNLICENSABLE IN THE UK

BULL ELECTRICAL
250 PORTLAND ROAD HOVE SUSSEX
BN3 5QT (ESTABLISHED 50 YEARS)
MAIL ORDER TERMS: CASH PO OR CHEQUE
WITH ORDER PLUS £3.00 POST PLUS VAT.
PLEASE ALLOW 7 - 10 DAYS FOR DELIVERY
TELEPHONE ORDERS WELCOME
TEL: 01273 203500
FAX: 01273 323077



PORTABLE RADIATION DETECTOR
WITH NEW COMPUTER INTERFACE.
£59.00
A Hand held personal Gamma and X Ray detector. This unit contains two Geiger Tubes, has a 4 digit LCD display with a Piezo speaker, giving an audio visual indication. The unit detects high energy electromagnetic quanta with an energy from 30K eV to over 1.2M eV and a measuring range of 5-9999 UR/h or 10-99990 Nr/h. Supplied complete with handbook. Ref. NOV18.

FOUR-IN-ONE INSTRUMENT MODEL MX-9000



All in one bench test instrument with frequency counter, autoranging digital multimeter, 3 D.C. power supplies (2 fixed & 1 variable) and function generator, integrated into one compact and lightweight unit with full overload protection. Ideal for use in laboratories, education, production lines or research and development environments with its simple and easy operation.

FREQUENCY COUNTER

Range: 1Hz - 100MHz
Display: 8 Digit LED

FUNCTION GENERATOR

Output Waveforms:
Square, Pulse, Triangle,
Skewed Pulse, Sine,
TTL Level Square
Frequency: 0.02Hz - 2MHz
Output: 0.1Vpp - 20Vpp

Please Note:- It is not possible to list all of this instrument's functions and specifications above. A detailed leaflet is available on request.

Price:
£353.00 + £61.78 V.A.T.

DIGITAL MULTIMETER

3 1/2 Digit LCD Display
Auto Manual Ranging
Measurement:
DC V: 1000V Max
AC V: 750V Max
DC A: 10A Max
AC A: 10A Max
Resistance: 2M Ohm Max

POWER SUPPLY

3 1/2 Digit LCD Display
Triple Output:
0 - 50V Variable, 0.5A Max
15V, 1A (Fixed)
5V, 2A (Fixed)

Full Over Current Protection

Multifunction Meter PC Compatible, Metex M3850



The Metex M3850 is excellent value for money and is packed with so many features that only a few can be included here. The M3850 is an autoranging DMM, but also includes a frequency counter, thermometer, capacitance meter, logic probe, diode check and transistor hFE. Also, the M3850 can communicate with a PC using the software and leads provided. The M3850 is supplied complete with a carry case, test leads and a manual.

DC Volts 0 - 1000V
AC Volts 0 - 750V
DC Current 0 - 20A
AC Current 0 - 20A
Resistance 0 - 40M
Capacitance 0 - 400uF
Frequency 5Hz - 40MHz
Temperature -40 - +1200 C

Price:
£99.00
+ £17.33
V.A.T.

OTHER HAND HELDS

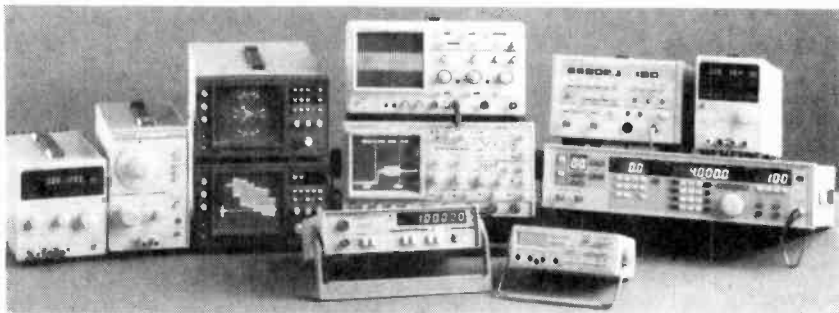
CAPACITANCE METER DM9023
9 Ranges 0pF (with set zero) to 20,000uF * Large, 3.5 Digit, 16mm LCD Display
Price: £57.90 - £10.13 V.A.T.

LCR METER LCR195
3.5 Digit LCD Display * 7 Capacitance Ranges 0 - 200uF
* 6 Inductance Ranges 0 - 200H * 7 Resistance Ranges 0 - 200M Ohm
Price: £57.90 - £10.13 V.A.T.

FREQUENCY COUNTER (SAGE) SC130
5Hz - 130Hz * 8 Digit LCD * High Sensitivity
* Freq. Period-Count-RPM-Min-Max-Average-Difference
* Data Hold * High Accuracy
Price: £109.00 - £19.08 V.A.T.

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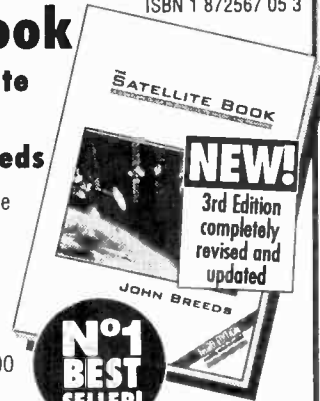
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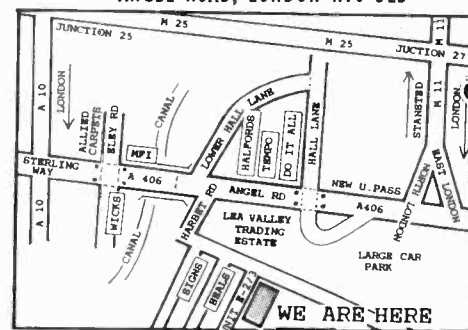
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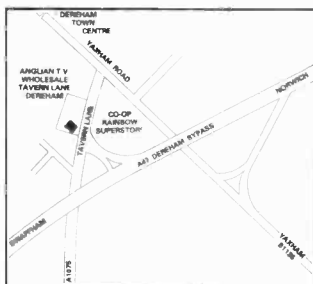
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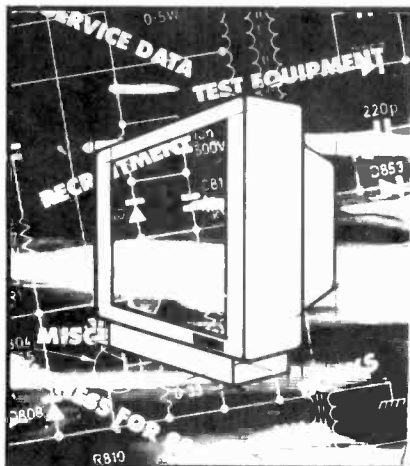
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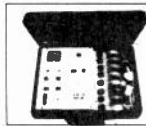
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TX100 REMOTE PANEL No.56413IC M293B/and SAA5012 £10 etc		144MHz Changed Over Relay Aerial 50p		PHILIPS UNIVERSAL BATTERY TESTER SBC 1695 £3.00		NEW DETECTOR £10.00 PHONE HOME TO CHECK WHETHER YOU HAVE AN INTRUDER SEND FOR DATA WITH TELEPHONE £11.00		TX100 SWITCH MODE TRANS 5157/48 £5 AND 00D4252001 06D3082001			
TX100 REMOTE PANEL IC £10		6251 FRAME O/P THICK FILM HITACHI GEC £9.00 THICK FILM HITACHI HM9205A £4.00		REGULATED PWR. SUP. 500MA/1.5V 12V DC switched + & - £5.00		MADE BY PLESSEY — MADE IN ENGLAND New public telephone exchange original price cost £299.00 Network exchange line (at home or in a small business) has two telephones and cables and NS5107 control unit SPECIAL PRICE £40 Send for data		STEREO SOLAR RADIO VHF AND MW £10.00			
NICAM UNIT — Ferguson made for ICCS Chassis — home market and export — has circuit diagram and can be converted to most sets — £15. TOSHIBA Nicam panel & IF export only has the Toshiba chip set £7.00		TX10 REMOTE PANEL £5		TX9-TX100 FRONT PANEL £5 WITH REMOTE £10 NON REMOTE 8 push button £10		G11 470 MFD 250v £1.35		3V33 HAND SET £10			
LARGE Foacs pots. Fits Pyc. GEC. ITT. Decca 75p		TX9-TX100 FRONT PANEL £5 WITH REMOTE £10 NON REMOTE 8 push button £10		PHILIPS NEW TYPE U/V HANDSET £10		G11 OPT Panel £4.00 G11 Top Switch £20.00 G11 IF Panel £3.00 G8 Push Button Unit £2.00 G8 Con Panel New Back Type £4.00		12 Volt Relays 20p with D/P changeover			
BSB SAT/REC NEW. CHASSIS, TUNER AND MOD £5 + Post £3		MIXED TOSHIBA HAND SETS FIVE FOR £12		Have you got Acid Rain in your garden? PH METER £5.00		DECODER C-CAM PHILIPS MADE FOR K40 CHASSIS IC No. TDA 3590 £5.00		PHONO T/O LEADS 3 Metres..... 30p LEAD SCART TO D PLUG..... 50p			
LATEST VIDEO For Latest Philips, GEC, Pyc and Hitachi. Front panel with memory chip and push button and pots and LED's £6.00 NEW		TX100 FRONT PANEL £5 8 Button		PULSE CAPACITOR 20 for a £1 mixed (1500V to 2KV) 56420A 20A/600V THYRISTOR £1.75		TERE 7-008A — 115-B-2010 ECC-2885PLE TEEF 1-030A UHF, VHF TUNER — SMALL TYPE £4 EACH		BRIDGES RECTIFIER Mixed BR-31 to 34 2 Amp to 5 Amp..... 8 for £1.00			
FERGUSON YELLOW SPOT TX100 NEW CHASSIS £12 £5 Post		SALORA SAT RECEIVER CONVERSION KIT For models 24M60, 25M90, 28M90, SB1206E, SB1365 £15		ITF BG2032-642A TRIPLER £5.00		BRIDGE RECTIFIERS — MIXED 10 FOR £1		1 METRE SCART LEAD £1.00			
LNC 11GHZ NOKIA — 1NB FOR OFFSET DISH £13.00 ELC/TROMAGNETIC POLARIZER 10.95 12.75 GHZ £9.00 11GHZ LOW NOISE BLOCK DOWN CONVERTER SCE 975 MADE BY MASPRO £14.00 5 Mixed AMSTRAD VIDEO MOTORS £5.00		TX90 TO TX100 8 BUTTON UNIT £4.00		ITT/KOKIA HF IF MODULE 24K No 5828-04-10 £15.00		BURGLAR ALARM USE INFRA RED DETECTOR WIDE AND SHORT ANGLE WALL MOUNT 8 WITH RELAY		TUNER U/V 616..... £10			
SATELLITE TUNER UNIT 2427611 with Base Band, Video Out £8.00		TX85 2435701 £10 2434393 £10 2435016 £10 2435014 £10 2436797 £10 2434494 £15 2435065 £15		TUNER UNITS Small V/Cap Mitsumi UHF £4.00 VHF £3.00 Portable & Rotary Tuners Sanyo & Mitsumi UHF £5.00 Mitsui UHF/VHF (new type) £8.00 UHF-VHF V/Caps on panel £3.00 HITACHI 20 Turn Pot 40p £6.00 U321 Ca panel U/V 615 £10.00 U/V 616 £10.00		POWER SUPPLY KIT 0.28 volts 1.2 amps with 2 meters..... £12 Printed circuit board and components		MODULATOR KIT..... £5 5v to 12v for all cameras etc			
TX10 8 way button unit £8.00 24v 0 24v 3Amp MAINS TRANSFORMER £3.00		TRV3 Amstrad Cassette Mechanisms. New with 2 motors and sound head. £15 £5. Amstrad Television Tuner UHF. Small, Fits most Amstrads. £6.		INFRA RED DETECTOR (for outside use) with Time Control & Distance Control £12 Sensitivity Adjustment Control High Adjustment Time Delay Adjustment		FERGUSON SAT HAND SET SR D1 SR D2 £2 SR D3 SR D4		SHARP MSH1FCE09 £10 EACH FIT MOST SETS New Thorn Hand Set Type u/v (£10) 0004-235 002-01			
2433752 £20 2432964 2432871 2432301 2435016 2433952 2434393 2432211 T9848A DST85H243 TFB3069D K41 O.P.T K40 2433452 2432904 2434451 £14		SPLIT-DIODE 2433752 £15 TX100 Green Spot £15.00 TX100 Yellow Spot 1 O.P.T £10.00 TX90 White Spot 1 O.P.T £15.00 Split Diode 110 £12.50 Orion 65-3M GEC 85-9793-6 TX9 Thorn 2432101 2 £5 2434141 £10 2434492 2434493 £10		DST 81N243 TFB4023AD £10.00 MSH11PPT131 £12.00 MSH11B827 £12.00 DST186N243 £10.00 3221029 £10.00 TOSHIBA DST 186N243 £10 TFB 4023AD £10 CP91 Philips Split Diode £10.00 2435141 £15 2432491 £10 2435065 £15		TRANSFORMERS 2435701 £10 2435012 £10 FERGUSON 47003481 £10 AMSTRAD TVR3 LPTS £10 TFB3069D EQU TFB4009AN		AT2076/01 AT2076/55 AT2068/11 AT2076/11 AT2055 RCOST CT3325 AT2076/35 OT2041 AT2076/38 FB1658A Orion 3076/51 AT2076/51 2432461 2433151 CVC 800 CVC 801		VIDEO MOTOR for VT568 type VC62DD8 £8.00 AMP TUNER HF for VT568 Hitachi & GEC £9.00 U/V 6, DIODE TRIPLERS £2.00 4600 TO 8600 AMSTRAD VIDEO HAND SET WITH LCD £10	
SATELLITE TUNER 950MHz-1750MHz £5.00		BURGLAR ALARM £2.00 with siren 9 VOLT		FERGUSON SAT HAND SET		FERGUSON ICCS STEREO O.P. PANEL IC'S TDA8405 TDA8421 TBA1204 £10		NICAM MKII KIT MODULE £20.00 with data			
TTT PANEL CMC 301 CMC 113 CMC 302 CMC 115 CMC £5.00 303 CMC 964		25 Way Plug and Socket with Case £1.50		SENDZ COMPONENTS 0702 338894 (To order see back page)		Burglar Alarm Has time delay to set £2 Mains Transformer 240v to 110v to 120v out 1 amp post £3					
BRIDGE RECTIFIERS 10 FOR £1.00 4 Amp for Video Power Supply											
SEL ITT IFB254F2 Front Panel £15.00											
DECCA — GEC — ITT 6 push button £5.00											