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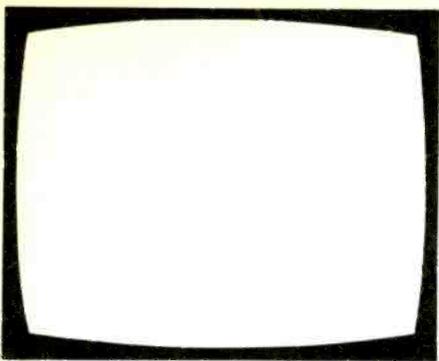
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PHILIPS



TELEVISION

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QUERIES

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

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- 174 Letters**
- 182 Satellite TV Video Amplifier/Filter** *C.W. Murray*
Use of a single chip to provide the gain makes this an easy design to adopt. It incorporates de-emphasis and dispersal signal filters.
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- 184 Teletopics**
- 186 Fifty Years in Radio and TV, Part 1** *Harold Peters*
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- 191 Test Case 337**
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- 193 The MCES LNB Repair Service** *Steve Beeching, T.Eng.*
MCES has set up a high-technology test jig to enable LNBs to be assessed and brought up to specification.
- 194 Servicing Salora CTV Receivers** *Nick Beer and Ian Bowden*
Enabling procedures with the K and L chassis.
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- 202 Dealing with Surface-mounted Components** *Eugene Trundle*
An introduction to surface-mounted component technology and the problems it presents to the service engineer.
- 203 Test Report: SolderQuick Tape** *Nick Beer*
A useful aid for fitting multipin S-M devices.
- 204 Test Report: The Weller Pyropen** *Eugene Trundle*
This device seems to solve most of the problems that S-M technology has brought to servicing.
- 206 A Life Beset with Problems** *Donald Bullock*
The service engineer's problems don't stop with the equipment that comes his way.
- 208 Copying and Editing VHS-C Tapes** *Ivor Nathan*
Use of an r.f. unit and aerial amplifier makes copying and editing a simple matter.
- 209 The Problem of Video Head Clogging** *Nick Beer*
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OUR NEXT ISSUE DATED FEBRUARY WILL
BE PUBLISHED ON JANUARY 16

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TEA-1002	650p	25A-979	85p	25C-1114	415p	25C-2228A	60p	25C-3179	160p	25D-789	80p	25D-1608	210p	25D-1941	500p
TLO-61	40p	25A-984	50p	25C-1115	280p	25C-2229	25p	25C-3181	240p	25D-792	40p	25D-1609	100p	25D-1984	150p
TLO-64	80p	25A-1006	120p	25C-1116	290p	25C-2230	80p	25C-3209	120p	25D-794	100p	25D-1632	500p	25D-1985	425p
TLO-71	38p	25A-1007	120p	25C-1117	110p	25C-2231	100p	25C-3212	510p	25D-795A	140p	25D-1649	260p	25D-1986	45p
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ULN-2002	90p	25A-1018	100p	25C-1214	40p	25C-2271	60p	25C-3273	80p	25D-830	100p	25D-1683	250p	25D-1993	160p
ULN-2003	69p	25A-1060	150p	25C-1215	60p	25C-2274	40p	25C-3280	600p	25D-837	80p	25D-1685	100p	25D-1994	150p
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ULN-2088	170p	25A-1076	280p	25C-1226	75p	25C-2278	120p	25C-3293	85p	25D-841	160p	25D-1687	100p	25D-1996	140p
ULN-2803	230p	25A-1085	75p	25C-1278	110p	25C-2290	1800p	25C-3298	120p	25D-844	200p	25D-1688	350p	25D-1997	750p
ULN-2804	170p	25A-1091	100p	25C-1279	90p	25C-2291	125p	25C-3299	120p	25D-846	250p	25D-1689	300p	25D-1998	130p
UPC-162	160p	25A-1094	190p	25C-1306	90p	25C-2295	120p	25C-3303	170p	25D-850	260p	25D-1690	280p	25D-1999	70p
UPC-20C	220p	25A-1102	180p	25C-1308K	350p	25C-2298	120p	25C-3306	200p	25D-856	80p	25D-1691	200p		
UPC-554	130p	25A-1103	200p	25C-1312	40p	25C-2307	500p	25C-3316	280p	25D-858	250p	25D-1692	200p		
UPC-555	60p	25A-1104	200p	25C-1317	25p	25C-2308	40p	25C-3327	60p	25D-863	60p	25D-1693	200p		
UPC-566H	60p	25A-1106	180p	25C-1318	25p	25C-2312	300p	25C-3331	40p	25D-864	200p	25D-1694	200p		
UPC-571	220p	25A-1111	120p	25C-1325	40p	25C-2314	70p	25C-3333	120p	25D-866	120p	25D-1695	200p		
UPC-574	60p	25A-1112	150p	25C-1326	20p	25C-2315	40p	25C-3335	140p	25D-868A	140p	25D-1696	200p		
UPC-575C2	90p	25A-1113	150p	25C-1328	40p	25C-2324	120p	25C-3336	120p	25D-869	450p	25D-1697	200p		
UPC-576	200p	25A-1123	70p	25C-1342	120p	25C-2329	480p	25C-3358	80p	25D-870	400p	25D-1698	200p		
UPC-577	64p	25A-1127	50p	25C-1345	60p	25C-2331	150p	25C-3378	120p	25D-871	450p	25D-1699	200p		
UPC-580	300p	25A-1133	200p	25C-1358	350p	25C-2334	240p	25C-3383	80p	25D-879	60p	25D-1700	200p		
UPC-592	95p	25A-1141	350p	25C-1359	60p	25C-2335	120p	25C-3400	40p	25D-880	40p	25D-1701	200p		
UPC-595	190p	25A-1144	350p	25C-1383	35p	25C-2344	150p	25C-3402	50p	25D-882	80p	25D-1702	200p		
UPC-596	190p	25A-1152	150p	25C-1387	240p	25C-2346	60p	25C-3406	120p	25D-882A	100p	25D-1703	200p		
UPC-100	220p	25A-1156	150p	25C-1390	55p	25C-2347	60p	25C-3412	90p	25D-884	120p	25D-1704	200p		
UPC-1018	170p	25A-1180	500p	25C-1393	80p	25C-2360	120p	25C-3419	120p	25D-895	200p	25D-1705	200p		
UPC-1020	200p	25A-1190	500p	25C-1398	70p	25C-2361	150p	25C-3420	120p	25D-896	200p	25D-1706	200p		
UPC-1023	60p	25A-1198	40p	25C-1398	70p	25C-2362	50p	25C-3430	150p	25D-896	400p	25D-1707	200p		
UPC-1025	230p	25A-1206	100p	25C-1403	500p	25C-2369	50p	25C-3450	120p	25D-898	200p	25D-1708	200p		
UPC-1026	95p	25A-1208	70p	25C-1407	550p	25C-2371	45p	25C-3457	200p	25D-916	130p	25D-1709	200p		
UPC-1028	90p	25A-1209	100p	25C-1413	240p	25C-2372	210p	25C-3459	250p	25D-917	300p	25D-1710	200p		
UPC-1031H2	70p	25A-1210	120p	25C-1419	150p	25C-2389	45p	25C-3461	100p	25D-921	320p	25D-1711	200p		
UPC-1032	60p	25A-1217	100p	25C-1424	450p	25C-2391	45p	25C-3461	100p	25D-921	320p	25D-1712	200p		
UPC-1158H2	70p	25A-1220	120p	25C-1446	100p	25C-2408	120p	25C-3466	350p	25D-946	120p	25D-1713	200p		
UPC-1167CL	170p	25A-1263	280p	25C-1448	100p	25C-2412K	50p	25C-3467	70p	25D-947	100p	25D-1714	200p		
UPC-1181	110p	25A-1264	280p	25C-1449	120p	25C-2413	50p	25C-3472	70p	25D-950	300p	25D-1715	200p		
UPC-1182	110p	25A-1265	280p	25C-1450	200p	25C-2413	50p	25C-3482	300p	25D-951	300p	25D-1716	200p		
UPC-1183	200p	25A-1290	150p	25C-1452	200p	25C-2459	50p	25C-3502	120p	25D-957A	520p	25D-1717	200p		
UPC-1185H2	230p	25A-1291	150p	25C-1472	40p	25C-2470	65p	25C-3503	90p	25D-958	60p	25D-1718	200p		
UPC-1186	80p	25A-1295	500p	25C-1473	70p	25C-2481	120p	25C-3547	120p	25D-965	100p	25D-1719	200p		
UPC-1187	150p	25A-1301	350p	25C-1474	125p	25C-2483	120p	25C-3568	120p	25D-973	60p	25D-1720	200p		
UPC-1188H	400p	25A-1302	400p	25C-1475	80p	25C-2484	240p	25C-3583	170p	25D-973A	70p	25D-1721	200p		
UPC-1189H	400p	25A-1307	400p	25C-1505	80p	25C-2500	80p	25C-3595	220p	25D-985	120p	25D-1722	200p		
UPC-1191	140p	25A-1317	30p	25C-1507	140p	25C-2509	200p	25C-3605	60p	25D-986	120p	25D-1723	200p		
UPC-1200	325p	25A-1318	30p	25C-1509	45p	25C-2527	300p	25C-3631	130p	25D-1012	40p	25D-1724	200p		
UPC-1222	130p	25A-1329	200p	25C-1514	65p	25C-2545	55p	25C-3636	280p	25D-1021	120p	25D-1725	200p		
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UPC-1238	120p	25A-1352	100p	25C-1520	120p	25C-2550	70p	25C-3675	160p	25D-1024	130p	25D-1727	200p		
UPC-1242	230p	25A-1353	100p	25C-1541	110p	25C-2552	150p	25C-3678	280p	25D-1026	200p	25D-1728	200p		
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UPC-1350	110p	25A-1381	100p	25C-1570	40p	25C-2564	230p	25C-3719	150p	25D-1071	450p	25D-1732	200p		
UPC-1353	160p	25A-1423	30p	25C-1583	30p	25C-2565	260p	25C-3746	120p	25D-1073	350p	25D-1733	200p		
UPC-1363	320p	25A-1443	250p	25C-1586	540p	25C-2568	120p	25C-3747	120p	25D-1094	620p	25D-1734	200p		
UPC-1368H	420p	25A-1489	300p	25C-1617	340p	25C-2577	125p	25C-3789	120p	25D-1117	60p	25D-1735	200p		
UPC-1373	85p	25A-1516	380p	25C-1625	150p	25C-2578	220p	25C-3790	120p	25D-1128	200p	25D-1736	200p		
UPC-1378	210p	25B-324	55p	25C-1626	130p	25C-2578	220p	25C-3795	200p	25D-1135	150p	25D-1737	200p		
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 VS201, VS301, VS303, VS304, VS603, VS606, VS607, VP68-P82 280p
 VS125, VS155, VS165, VS220, VS240, VS250, VS512, VSX9 280p

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 VCR7000 320p

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 VT5000, VT8000, VT9300, VT9500 250p

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NATIONAL
 NV100, NV180, NV300, NV333, NV340, NV366, NV600, NV688, NV777, NV788 280p
 NV230, NV370, NV430, NV460, NV730, NV810, NV830, NV850, NV870, NV890, NV2000, NV2010, NV3000, NV7000, NV7200, NV7800, NV8600, NV8610, NV8620, NVG14 250p
 NVG7, NVG19, NVG12, NVG18 320p
 NVG21, NVG25, NVH65 320p

PHILIPS
 VR6460 280p
 VR2020, VR2021, VR2022, VR2023, VR2024 320p

SANYO
 VHR1100, VHR1300, VHR1500, VHR2300 320p
 VTC5000, VTC5150, VTC5500, VTC9300, VTCM10, VTCM20 280p

SHARP
 VC381, VC386, VC2300, VC3300, VC7300, VC7700, VC8300, VC9100, VC9300, VC9500, VC9700 320p
 VC387, VC481, VC482, VC483, VC486, VC496, VC581, VC582, VC583, VC585 320p
 VC651, VC681, VC685, VC750, VC780, VC781, VC785, VC787, VC793, VC722 320p

SONY
 SLC5, SLC6, SLC7 320p
 SLC9, SLC20, SLC24, SLC30, SLC33, SLC44, SLHF100, SLF1, SLF11, SLF75, SLF30, SLF60, SLF100 320p

VCR BELT KITS

AKAI
 VP-7100 160p
 VS-1 150p
 VS-2EG 100p
 VS-4 120p
 VS-5EG 100p
 VS-9300 160p
 VS-9500 155p
 VS-9700 160p
 VS-9800 155p

AMSTRAD
 TVR-1-2-3 210p
 VCR-4600 & MK2 210p
 VCR-4700 210p
 VCR-5200 210p
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FERGUSON

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 3V23 65p
 3V29/30 120p
 3V31/32 85p
 3V35/36 80p
 3V38-39 80p
 3V42/43 65p
 3V44/45 65p
 3V34/54 65p
 3V55 65p
 3V58-59, 3V64-65, 8950-8951, FV10-11, FV12-13, FV14 140p

FISHER

VBS-7000 245p
 VBS-9000 120p
 FVHP520, FVHP530 80p
 FVHP710, FVHP716, 722 120p
 FVHP905, FVHP906, 907, 910 130p
 FVHP615, 715, 725, 830 120p

GEC

4005 150p

HITACHI

VT-11, VT-33 100p
 VT-5000 120p
 VT-5500 130p
 VT-8000 60p
 VT-8500 60p
 VT-9300 50p
 VT-9500 50p
 VT-9700 60p
 VT-14-17-19-VT35, 38-88 120p
 VT52-62, VT64-65-86 150p

ITT

VR3605, 3905, 3935, 3985 100p
 VR3913, VR3914 100p

JVC

HR-3300, HR-3330, HR-3360, HR-3660 160p
 HR-4100 180p
 HR-7200 70p
 HR-7600 80p
 HR-7610 95p
 HR-7650 75p
 HR-7655 90p
 HR-7700 77p
 HRD-110, HRD-111, HRD-120, HRD-225 100p
 HRD-250, HRD-455, HRD-565, HRD-566, HRD-725, HRD-755 100p
 HRD-170, HRD-180, HRD-230, HRD-370, HRD-430, HRD-530 130p

MITSUBISHI

HS-200 200p

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NV-300 160p
 NV-333 135p
 NV-777 100p
 NV-2000 150p
 NV-3000 160p
 NV-7000 95p
 NV-7200 90p
 NV-8600 160p
 NV-7500, NV-7800 110p
 NV-340, NV-366 140p
 NV-600, NV-788 120p
 NV-230, 250, 280, 370, 380, 430, 450, 460, 465, 600, 630, 730, 810, 830, 850, 870, 890 135p

PHILIPS

VR-6460 170p

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VTC-5000 75p
 VTC-5300 100p
 VTC-5500 95p
 VTC-9300 220p
 VHR-1100, 1300, 1500 100p

SHARP

VC-381/383/386 125p
 VC-6300 150p
 VC-7300/7700/7500 150p
 VC-8300 150p
 VC-8381, VC-9100 125p
 VC-9300, VC-9500 135p

SONY

SL-C5, SL-C6 140p
 SC-C7 140p
 SC-C9 165p
 SL-8000, SL-8080 200p

TOSHIBA

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 V-5250/5280 230p
 V-5480 210p
 V-5475 160p
 V-7540 160p
 V-8600 150p
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STK 4019	600p	34p	7405	35p	74LS126	42p	8272	1200p	75492	55p	
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STK 4132 II	750p	40p	7408	36p	74LS136	61p	8283	400p			
STK 4172 II	1050p	21p	7409	25p	74LS138	74LS139	8284	440p			
STK 4182 II	1100p	13p	7410	20p	74LS145	38p	8287	380p			
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STK 5333	750p	18p	7414	32p	74LS154	36p	AY3-1015	290p			
STK 5335	500p	40p	7415	32p	74LS155	46p	SP0256AL2	500p	4N25	50p	
STK 5337	850p	40p	7416	22p	74LS156	48p	Z80ACPU	150p	4N26	50p	
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STK 5339	700p	33p	7418	28p	74LS158	20p	Z80ADMA	500p	4N28	50p	
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STK 5467	500p	25p	7422	22p	74LS166	61p	Z80BPCTC	320p	4N32	100p	
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STK 5479	400p	18p	7424	30p	74LS169	60p	Z80AS10.1	580p	4N36	58p	
STK 5725	600p	29p	7425	35p	74LS170	68p	Z80BP10.2	580p	4N37	58p	
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STK 5732	1500p	40p	7427	45p	74LS175	65p	74S289	180p			
STK 7226	800p	17p	7428	90p	74LS180	90p	74S387	200p			
STR 3212	330p	40p	7429	52p	74LS181	43p	75107	65p	LED DISPLAYS		
STR 7310	650p	60p	7430	28p	74LS193	110p	75110	75p			
STR 7561	800p	76p	7431	28p	74LS194	110p	75113	100p			
STR 8280 II	1950p	42p	7432	28p	74LS195	90p	75122	110p	MAN.72	115p	
STM 1240	600p	180p	7433	45p	74LS198	120p	75150	95p	MAN.74	115p	
STR 1195	450p	75p	7434	48p	74LS201	100p	75154	100p	MAN.4640	180p	
STR 1229	550p	46p	7435	80p	74LS202	75p	75162	700p	MAN.8910	230p	
STR 3113	330p	180p	7436	80p	74LS203	80p	75183	95p	DL.747	160p	
STR 3135	330p	30p	7437	45p	74LS204	75p					
STR 3132	330p	20p	7438	45p	74LS205	75p					
STR 3214	330p	18p	7439	45p	74LS206	34p					
STR 3215	330p	20p	7440	45p	74LS207	40p					
STR 3315	330p	38p	7441	45p	74LS208	38p					
STR 4142	650p	35p	7442	45p	74LS209	38p					
STR 4512	500p	40p	7443	45p	74LS210	38p					
STR 5214	650p	52p	7444	45p	74LS211	38p					
STR 5314	650p	20p	7445	45p	74LS212	38p					
STR 20005	550p	40p	7446	45p	74LS213	38p					
STR 20013	550p	40p	7447	45p	74LS214	38p					
STR 30110	330p	40p	7448	45p	74LS215	38p					
STR 30112	330p	40p	7449	45p	74LS216	38p					
STR 30118	330p	40p	7450	45p	74LS217	38p					
STR 30120	330p	40p	7451	45p	74LS218	38p					
STR 30125	550p	40p	7452	45p	74LS219	38p					
STR 30134	330p	40p	7453	45p	74LS220	38p					
STR 50020	650p	40p	7454	45p	74LS221	38p					
STR 50213	650p	40p	7455	45p	74LS222	38p					
STR 56041	650p	40p	7456	45p	74LS223	38p					
STR 58401	600p	40p	7457	45p	74LS224	38p					
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		40p	7461	45p	74LS228	38p					
		40p	7462	45p	74LS229	38p					
		40p	7463	45p	74LS230	38p					
		40p	7464	45p	74LS231	38p					
		40p	7465	45p	74LS232	38p					
		40p	7466	45p	74LS233	38p					
		40p	7467	45p	74LS234	38p					
		40p	7468	45p	74LS235	38p					
		40p	7469	45p	74LS236	38p					
		40p	7470	45p	74LS237	38p					
		40p	7471	45p	74LS238	38p					
		40p	7472	45p	74LS239	38p					
		40p	7473	45p	74LS240	38p					
		40p	7474	45p	74LS241	38p					
		40p	7475	45p	74LS242	38p					
		40p	7476	45p	74LS243	38p					
		40p	7477	45p	74LS244	38p					
		40p	7478	45p	74LS245	38p					
		40p	7479	45p	74LS246	38p					
		40p	7480	45p	74LS247	38p					
		40p	7481	45p	74LS248	38p					
		40p	7482	45p	74LS249	38p					
		40p	7483	45p	74LS250	38p					
		40p	7484	45p	74LS251	38p					
		40p	7485	45p	74LS252	38p					
		40p	7486	45p	74LS253	38p					
		40p	7487	45p	74LS254	38p					
		40p	7488	45p	74LS255	38p					
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		40p	7490	45p	74LS257	38p					
		40p	7491	45p	74LS258	38p					
		40p	7492	45p	74LS259	38p					
		40p	7493	45p	74LS260	38p					
		40p	7494	45p	74LS261	38p					
		40p	7495	45p	74LS262	38p					
		40p	7496	45p	74LS263	38p					
		40p	7497	45p	74LS264	38p					
		40p	7498	45p	74LS265	38p					
		40p	7499	45p	74LS266	38p					
		40p	7500	45p	74LS267	38p					
		40p	7501	45p	74LS268	38p					
		40p	7502	45p	74LS269	38p					
		40p	7503	45p	74LS270	38p					
		40p	7504	45p	74LS271	38p					
		40p	7505	45p	74LS272	38p					
		40p	7506	45p	74LS273	38p					
		40p	7507	45p	74LS274	38p					
		40p	7508	45p	74LS275	38p					
		40p	7509	45p	74LS276	38p					
		40p	7510	45p	74LS277	38p					
		40p	7511	45p	74LS278	38p					
		40p	7512	45p	74LS279	38p					
		40p	7513	45p	74LS280	38p					
		40p	7514	45p	74LS281	38p					
		40p	7515	45p	74LS282	38p					
		40p	7516	45p	74LS283	38p					
		40p	7517	45p	74LS284	38p					
		40p	7518	45p	74LS285	38p					
		40p	7519	45p	74LS286	38p					
		40p	7520	45p	74LS287	38p					
		40p	7521	45p	74LS288	38p					
		40p	7522	45p	74LS289	38p					
		40p	7523	45p	74LS290	38p					
		40p	7524	45p	74LS291	38p					
		40p	7525	45p	74LS292	38p					
		40p	7526	45p	74LS293	38p					
		40p	7527	45p	74LS294	38p					
		40p	7528	45p	74LS295	38p					
		40p	7529	45p	74LS296	38p					
		40p	7530	45p	74LS297	38p					
		40p	7531	45p	74LS298	38p					
		40p	7532	45p	74LS299	38p					
		40p	7533	45p	74LS300	38p					
		40p	7534	45p	74LS301	38p					
		40p	7535	45p	74LS302	38p					
		40p	7536	45p	74LS303	38p					
		40p	7537	45p	74LS304	38p					
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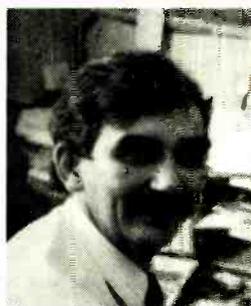
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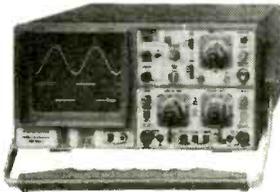
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 - * Triggering: DC - 40MHz
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 - * Variable hold-off
 - * Trigger LED Indicator
 - * Calibrator: 1KHz Square wave
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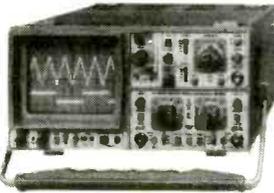
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- * Timebase: 2.5s - 5ns/cm
- * Triggering: DC - 80MHz
- * Active TV - Sync - Separator
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- * Sweep delay
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- * Trigger LED Indicator
- * Calibrator: 1KHz & 1MHz Sq. Wave
- * Component tester

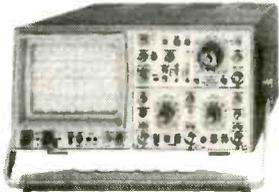
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HM604 60MHz UNIVERSAL



HM1005 100MHz UNIVERSAL

3 CHANNELS - UP TO 6 TRACES



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

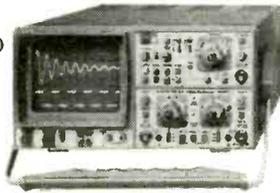
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- * Sens: Ch.1, Ch.2, 1mV/cm
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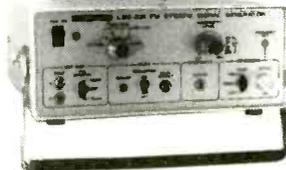
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TC402-C VHF & UHF

FEATURES

- * Three bands:
- Low VHF: 45-110MHz
- High VHF: 110-300MHz
- UHF: 470-862MHz.
- * Digital display for direct frequency readout.
- * Built-in monitor loudspeaker AM/FM.
- * Signal measurement from 20µV to 3V.
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FEATURES

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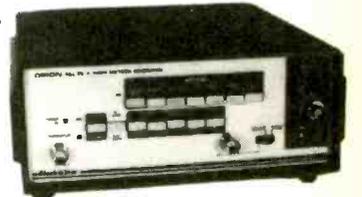
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AV66	£12.92	3V43	£31.96	VCP-4310	£17.01	VT-M646	£17.01	HS-200	£26.50	NV-230	£14.27	SV-8750	£18.35	VC-681	£14.27
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V51	£13.61	3V53	£31.96	VCP-4325	£17.01	ITT		HS-306	£24.45	NV-340	£6.50	SV-9700	£17.01	VC-699	£14.27
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V55	£13.61	3V57	£16.32	GRANADA		VR-3905	£6.50	HS-318	£24.45	NV-430	£14.27	SV-9900	£17.01	VC-782	£14.27
V510	£13.61	3V58	£22.25	VHS-EH2	£22.45	VR-3906	£16.32	HS-319	£17.01	NV-450	£17.01	SV-9900	£17.01	VC-783	£14.27
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V5112	£14.97	3V62	£17.01	VHS-EH4	£18.35	VR-3908	£17.01	HS-330	£17.01	NV-465	£17.01	SV-9900	£17.01	VC-786	£30.87
V5115	£14.97	3V63	£14.27	VHS-EH5	£14.27	VR-3912	£6.50	HS-337	£17.01	NV-600	£17.01	SV-9900	£17.01	VC-A100	£14.27
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V5220	£14.97	3V73	£27.21	VXL-2	£13.61	VR-3918	£18.35	HS-411	£17.01	NV-770	£19.06	SV-9900	£17.01	VC-A203	£14.27
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V5301	£14.97	3V75	£17.01			VR-3922	£16.32	HS-421	£17.01	NV-780	£30.61	SV-9900	£17.01	VC-A310	£41.07
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VCR5000	£12.26	3V99	£17.01			VR-3999	£6.50	HS-445	£17.01	NV-8620	£6.50	SV-9900	£17.01	VC-9800	£14.27
VCR6000	£12.26	3V99	£17.01			VR-3999	£6.50	HS-446	£17.01	NV-8620	£6.50	SV-9900	£17.01	VC-9800	£14.27
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8901	£6.50	3V99	£17.01			VR-3999	£6.50	HS-449	£17.01	NV-8620	£6.50	SV-9900	£17.01	VC-9800	£14.27
8902	£6.50	3V99	£17.01			VR-3999	£6.50	HS-450	£17.01	NV-8620	£6.50	SV-9900	£17.01	VC-9800	£14.27
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8912	£6.50	3V99	£17.01			VR-3999	£6.50	HS-455	£17.01	NV-8620	£6.50	SV-9900	£17.01	VC-9800	£14.27
8916	£6.50	3V99	£17.01			VR-3999	£6.50	HS-456	£17.01	NV-8620	£6.50	SV-9900	£17.01	VC-9800	£14.27
8922	£6.50	3V99	£17.01			VR-3999	£6.50	HS-457	£17.01	NV-8620	£6.50	SV-9900	£17.01	VC-9800	£14.27
8923	£6.50	3V99	£17.01			VR-3999	£6.50	HS-458	£17.01	NV-8620	£6.50	SV-9900	£17.01	VC-9800	£14.27
8924	£6.50	3V99	£17.01			VR-3999	£6.50	HS-459	£17.01	NV-8620	£6.50	SV-9900	£17.01	VC-9800	£14.27
8925	£6.50	3V99	£17.01			VR-3999	£6.50	HS-460	£17.01	NV-8620	£6.50	SV-9900	£17.01	VC-9800	£14.27
8928	£6.50	3V99	£17.01			VR-3999	£6.50	HS-461	£17.01	NV-8620	£6.50	SV-9900	£17.01	VC-9800	£14.27
8929	£6.50	3V99	£17.01			VR-3999	£6.50	HS-462	£17.01	NV-8620	£6.50	SV-9900	£17.01	VC-9800	£14.27
8930	£6.50	3V99	£17.01			VR-3999	£6.50	HS-463	£17.01	NV-8620	£6.50	SV-9900	£17.01	VC-9800	£14.27
8931	£6.50	3V99	£17.01			VR-3999	£6.50	HS-464	£17.01	NV-8620	£6.50	SV-9900	£17.01	VC-9800	£14.27
8933	£6.50	3V99	£17.01			VR-3999	£6.50	HS-465	£17.01	NV-8620	£6.50	SV-9900	£17.01	VC-9800	£14.27
8935	£6.50	3V99	£17.01			VR-3999	£6.50	HS-466	£17.01	NV-8620	£6.50	SV-9900	£17.01	VC-9800	£14.27
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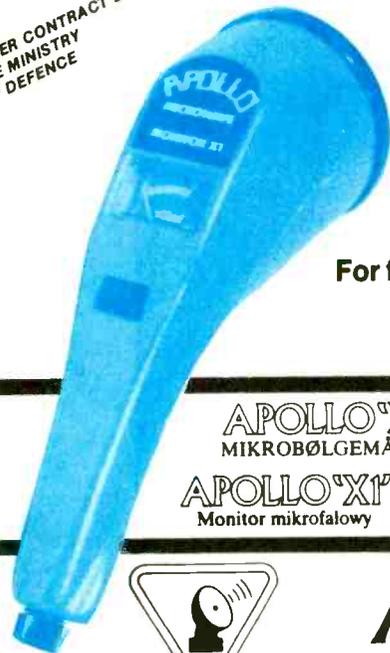
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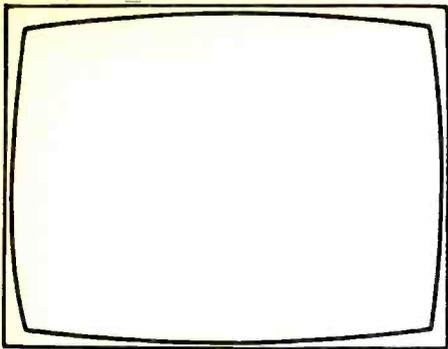
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John A. Reddihough

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COVER PHOTO

This month's cover photograph shows part of a surface-mounted component board used in a Sony V8 camcorder. Articles on servicing S-M component assemblies appear on pages 202-6.

Japanese Moves

The way in which the leaders of the Japanese consumer electronics industry manage to grow ever larger is remarkable. In 1989 Sony decided to go into the software side of the video business by taking over Columbia Pictures for \$3.4bn. Now Matsushita has agreed terms to takeover Music Corporation of America for \$6.6bn. MCA owns Universal Pictures, the MCA and Geffen record labels and various publishing, theme park and property interests. The idea, according to Matsushita, is an "ideal integration of software and hardware". No doubt Matsushita will make it work. There don't seem to have been any great problems with the Sony/Columbia operation. But doesn't a little bell ring in the back of one's mind? Weren't there two UK companies that followed this course, with some success, in the pre- and post-war period? We refer to EMI (HMV etc.) and Decca. In those days of course it was gramophone records and the equipment with which to play them. But both companies expanded into radio and TV, following precisely the same sort of strategy that Sony and Matsushita are now adopting. One wonders what went wrong. The times were different of course, but the basic idea should have worked out better than it did. It's particularly interesting that EMI sold its consumer electronics interests to Thorn who some decades later took over EMI, with its vast entertainment interests, and flogged its consumer electronics side to Thomson.

Looking back to the Thirties and Forties, EMI and Decca ran quite a cosy duopoly. During the depression years the two companies between them took over most of the rest of the industry. It was possibly not so much that EMI and Decca were particularly good at running record companies as that in those hard times recording artists had nowhere else to go. Teenage bands didn't make fortunes in those days. The whole thing started to fall apart in the Fifties and Sixties when strong competition developed. This competition proved that EMI and Decca weren't particularly good at running either entertainment or consumer electronics operations.

Sony and Matsushita look as though they are going to avoid the problems that sank the old Decca and EMI by leaving their entertainment subsidiaries to run their own affairs. They probably have little option in this. There's a major cultural problem for Sony and Matsushita. It seems unlikely that they could make a success out of running entertainment businesses directly: selling discs and tapes to Western consumers is not the same as selling them TVs and VCRs. So what's the advantage to Sony and Matsushita?

There is of course the underlying fact that when it comes to launching new consumer electronics hardware it's essential to have available the software to go with it. The Philips V2000 system's brief life bears witness to this. Now that Sony and Matsushita both own vast libraries of film and recorded material along with major studios they are safe from being squeezed out of the market when they introduce future hardware systems. One that springs to mind of course is HD-TV. Sony has just started to market the first high-definition TV sets to be offered to the public, in Japan, and Matsushita is understood to be about to enter the market. In due course there will be HD-TV videos, discs and so on.

One hopes that Sony and Matsushita, whose intense rivalry stretches back for several decades, have not gone into the entertainment industry for such cynical reasons alone. Both companies seem to be able to generate vast quantities of cash whatever the economic climate. There always comes a time when a cash rich company has to decide what to do with the money. One can just sit on it, as GEC did. Perhaps the Japanese companies consider their entertainment subsidiaries to be worthwhile investments in their own right. It's hard to be sure about this however: the price Sony paid for Columbia represented a price-earnings ratio of 350. Hardly a bargain however you look at it. Matsushita has done considerably better, but then the deal is being done at a more advantageous time. Sony and Matsushita could of course feel that a considerable improvement to the profitability of their subsidiaries will be achieved by applying more rigorous business methods, something at which Japanese firms seem to excel. Western entertainment companies hardly have a reputation for businesslike methods! We shall have to see. For the moment, having a foot in the entertainment field to guarantee the marketability of future hardware seems to be the more plausible explanation. Matsushita's president Akio Tanii was probably dissembling somewhat when he explained the move with the comment that the software and hardware sides of the entertainment industry "are like the wheels of the same car".

It still seems a pity that EMI and Decca failed to pull it off. Though the technology then was relatively primitive the rationale was the same. But of course our own industries have never put the sort of effort into making and selling that the Japanese have. According to a recent report in the *Financial Times* Sony launched 1,500 new products in 1989, an astonishing average of over four a day. The Japanese seem to operate at a frenetic pace in their own domestic market - many Japanese products never see the light of day elsewhere, and have a very short life in Japan itself. You could say that this represents poor marketing. But the endless gadgetry that's offered to Japanese consumers is only a superficial manifestation of the commitment of Japanese manufacturers to develop technology and products and seek out markets. The latest move seems to be to set up quite different product ranges and approaches in different world markets. Such effort and dedication: it's no wonder that Japanese firms grow and grow.

Letters

HORRIBLE TV SOUND

It's ironic that your articles on the admirable Nicam stereo system came at a time when the quality of TV sound must have fallen to an all-time low. For example the amount of distortion now tolerated with film sound tracks would have raised a storm of protest from viewers thirty years ago, while the appalling sound produced by ENG automatic recorders makes one wish for the good old days of the Arriflex and Nagra. What causes the distortion is the widespread and indiscriminate use of automatic noise-cancelling devices that produce the same effect as a speech coil rubbing on a polepiece – and for exactly the same reason.

With a fouling speech coil unwanted background noise is beautifully suppressed – a low input cannot unstick the coil. Much higher inputs produce a harsh but tolerable output. Its at the levels between these two that the intolerable distortion occurs. Similarly, noise-suppression systems operate on the principle of cleaning off unwanted noise below a certain arbitrary level. Speech, film dialogue for example, that rises above the set level breaks through in “packets” over an unnatural silence, with whole syllables clipped at the top and bottom. At each breakthrough there's an unpleasant “tizz” due to distortion products at the threshold. Quieter speech passages – women's voices in particular – often fail to clear the threshold properly and are thus distorted to the point of being unintelligible.

Quite apart from this the baby is also being thrown away with the bathwater – all the efforts of talented sound men to add atmosphere and ambience by mixing in multi-track wild sound are cleaned off. An eerie silence prevails, whether the scene consists of a quiet study, a crowded courtroom or a surfing beach.

The obsession with noise-cancelling is a deplorable and unnecessary trend. The human ear-brain system spends its natural life distinguishing between “wanted” and “unwanted” sounds. It does this effortlessly, finding the dialogue on an early talkie, mush and all, quite intelligible. Apply noise-suppression to such a sound track, producing gross distortion, weird silences and missing syllables, and the viewer's ear is offended. He doesn't realise how or why of course, so he blames the film or his set for the rotten sound. This may be good for trade now that Nicam sets are readily available. But selling sets capable of high-quality stereo sound reproduction reveals the shortcomings of the present transmissions. With Nicam, as with computers, garbage in means garbage out.

The broadcasting authorities have always considered the domestic receiver as being the weak link in the sound chain. They may have felt that they were casting pearls in providing high-quality sound. So their executives have succumbed to the noise-suppression salesmen and accepted the inevitable distortion – it gives savings in sound-proofing and operational costs. Accountants, shown the wonders of all-automatic cameras etc., are easily persuaded that sound recordings can also be left to the electronics. Unfortunately the electrons, being deaf, can't tell unwanted from wanted or distorted from undistorted sound.

Maybe the public is the same. But it now has the opportunity to pay more for receivers capable of producing

high-quality sound. Those who make such sets, those who sell them and those who repair them should insist that the broadcasters get their act together and stop introducing distortion at their end.

*J.G. White,
Norwich, Norfolk.*

A RIP OFF?

Amstrad is not known for cheap spares. The spares are usually quite expensive – and take a time to come – but occasionally there's something worthwhile at a good price. This was the case with the AMS40351 chip, which could be used in the older SRX100/200 Astra receivers to upgrade them to 48-channel reception. This i.c., along with the 16-channel version and the 48-channel SRD400 chip, all with similar part numbers, had a similar price of around £4. Imagine my surprise and horror when my latest delivery of AMS40351s arrived with a charge of over £88 per chip. A quick call to CPC confirmed what I suspected – Amstrad has spotted that people have been using this chip as an upgrade. So the price has been increased accordingly. I returned the chips as there's no way in which I am going to line Alan Sugar's pockets with a clear £84 profit on a £4 chip – a profit margin of over 2,000 per cent.

This move has in effect stopped people offering upgrades at a reasonable price, which is probably what Amstrad wants. When services from the Astra 1B satellite start I suspect that we'll see an upgrade offer to 16-channel receiver owners. Trade in SRX100/200s and, for an extra £200 or so, get an SRD400 receiver. If this happens Amstrad will deserve the bad publicity it will undoubtedly get.

*D. Lane
Grays, Essex.*

SERVICING MICROWAVE OVENS

In connection with Nick Beer's article on servicing microwave ovens in the November 1990 issue of *Television*, it should be pointed out that a majority of manufacturers will supply microwave spares only to their appointed service agents who have successfully completed their recognised microwave oven training courses. The article may well provide a “short introduction to the delights of servicing microwave ovens” but is likely to aggravate the problem of units being accepted for repair by non-appointed organisations who, finding that manufacturers' spare parts cannot be obtained, use substitute or worse incorrect parts. Some examples I've seen can be classified as dangerous.

Apart from that general observation I'd like to comment on some of the points within the article.

The leakage test omits to mention that the water load required and the distance of measurement must be in accordance with BS5175. The maximum permissible leakage is 5mW/cm², measured at a distance of 5cm with a water load of 275ml. Sharp specifies the maximum permissible leakage for its ovens as being 2.5mW/cm². In practice it's normal with a modern oven for there to be no measurable leakage.

The power output test omits to say that the average temperature rise must be measured in the two beakers then worked out from the formula

$$[(t_1 + t_2)/2] \times 70$$

where t1 is the temperature rise in beaker one and t2 the temperature rise in beaker two. The temperature measurement should be done as accurately as possible as any error will be multiplied by 70, e.g. 0.5°C × 70 = 35W.

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Cooking times, water loads etc. do vary so the correct service information should be consulted first.

This test gives results to within 10 per cent. I understand that a new power output test which will be accepted by all manufacturers is to be introduced by the International Electrotechnical Committee (IEC). Ovens tested by this method will be identified by the specific power on the rating label followed by IEC.

The oven circuit shown in the article has all the switches and the fuse on the neutral side of the supply. If an earth fault occurred on the neutral side of the power transformer the oven could possibly cook all the time. The shorting switch circuit shown is used by Panasonic (with the mains connections reversed) and is to say the least brutal. If a fault occurs and this shorting circuit has operated it's essential to check every switch, including the timer, and replace as necessary.

Some manufacturers include a resistor in series with the shorting switch to limit the current under a fault condition. A word of warning about this. Some of the resistors look like 1½in. fuses and fit in fuseholders. I've seen fuses fitted in this position. Needless to say this error could prove nasty.

In conclusion, for health and safety reasons microwave oven repairs must be undertaken with the greatest care by trained personnel. In the worst case an incorrectly repaired unit would be lethal. Recognised manufacturers' spares must always be used. *Television* should keep its articles within the scope that its name implies.

Brian Francis, AMIEIE, Bob Francis and Sons, Plympton, Plymouth.

Editorial comment: We were careful to stress the safety aspects of microwave oven servicing and hope that no one without adequate knowledge will tackle such work. Most "television engineers" do more than just TVs – audio and video equipment for example. Many nowadays have had training in microwave oven servicing. For dealers who sell microwave ovens as well as TV/video and other consumer electronics products it would rarely be worthwhile to employ an engineer just for microwave oven work.

The circuit shown in the article was taken from an official Panasonic service manual. There should be no difference between the neutral and live side of the equipment so far as earthing safety is concerned. Panasonic would have ensured that the precautions built into the device are adequate.

The power output equation given in the original article was simplified in the editing. Measurement should be carried out as described by Mr. Francis. Some sources give the multiplication factor as 50, others as 70. 50 applies with a heating time of 87 seconds, 70 with a heating time of two minutes.

SEQUENTIAL vs INTERLACED SCANNING

I must thank David Looser for his detailed response to my letter on this subject. His point about the camera spot overlapping adjacent lines is important, so I decided to investigate further. I assumed that the overlap would apply to adjacent lines defined in numerical sequence, i.e. that line 3 overlaps lines 2 and 4. If the overlap is small however there will still be an unscanned area if lines 2 and 4 are eliminated by the removal of interlacing.

A TV picture's spectrum contains energy peaks at the line and field scanning frequencies. If the odd and even fields differ from each other, a further energy peak occurs at frame rate, i.e. 25Hz. If odd and even fields are the

same, or interlacing isn't used, there is no energy peak at 25Hz.

As I have access to sophisticated spectrum analysers I set up an experiment to view the l.f. (0-100Hz) end of the video spectrum, taken from an off-air broadcast via a monochrome portable receiver. The results are shown in the two photographs, Figs. 1 and 2. Each reveals a peak at 25Hz, confirming that information carried by odd and even fields differs. The cross marks in Fig. 1 show the 25Hz peak associated with a typical picture. The large peak occurs at the field scan rate (approximately 50Hz). Fig. 2, showing a larger 25Hz peak with some sidebands, belongs to a picture with superimposed graphics, as described by David Looser. I also noted that during a short blank screen period, where odd and even fields were of course the same, the 25Hz peak disappeared.

What can we conclude from this? I believe that the apparent incompatibility, which prompted my earlier letter, in David Looser's statements is still fundamentally true but not as significant as I at first thought. Certainly the theory behind interlacing is not disproved. One of the most succinct descriptions of the interlacing technique is provided by G.H. Hutson in his book *Television Receiver Theory*, as follows:

"The interlaced system much reduces flicker, since the screen is being covered at twice the rate. Of course, the result is not the same as if 50 complete pictures per second

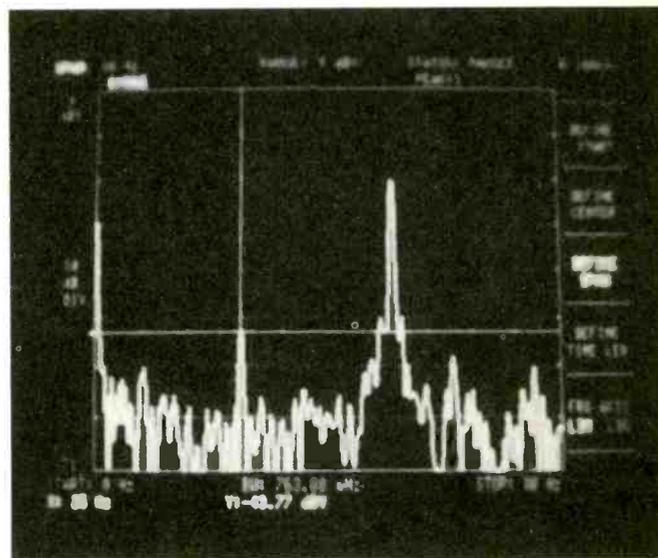


Fig. 1: Video spectrum from 0-80Hz with a normal picture.

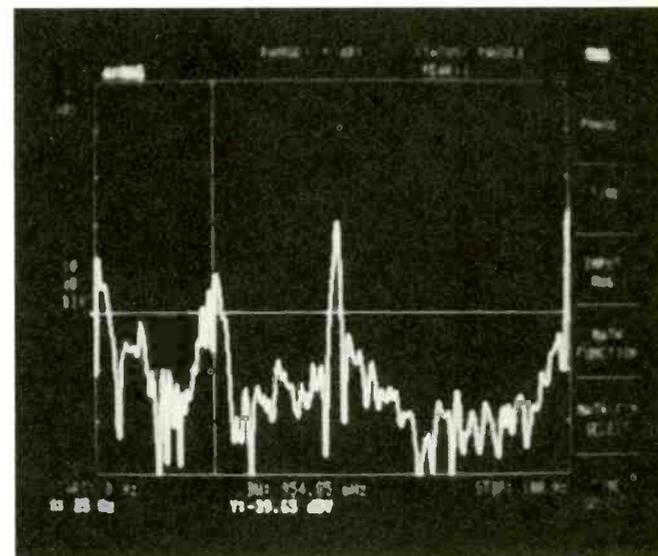


Fig. 2: Video spectrum from 0-100Hz, picture with graphics.

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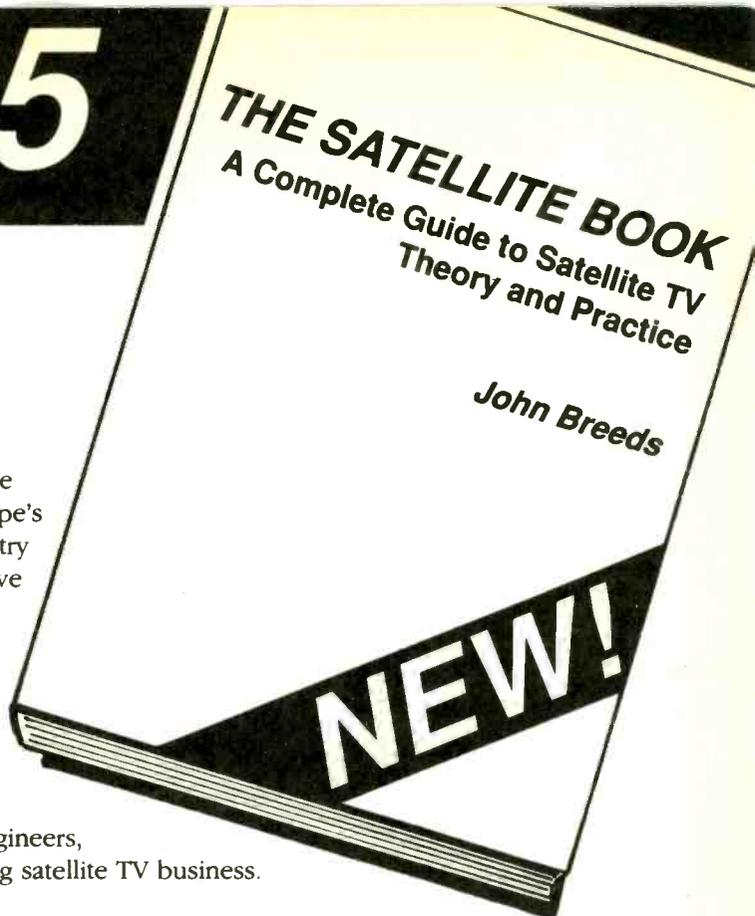
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were shown, because each individual line still appears at the rate of 25 times per second. Close examination shows that line flicker is visible, but this is tolerable and the overall effect of doubling the speed of vertical movement of the spot is a great improvement and approximates to the ideal 50 complete pictures per second arrangement."

To expand on this, I believe that the EMI team's conception of interlaced scanning didn't consider a reduction in vertical resolution. All television system parameter calculations normally provide for equal vertical and horizontal resolution.

If future techniques could eliminate the need for interlacing I would be as pleased as David Looser to see its demise – my primary objection concerns the spatial break-up between odd and even fields during fast panning shots etc. Nevertheless I feel that the technique has proved its usefulness over the years. As HD-TV approaches it would certainly be best if we could both dispense with interlacing and increase the picture repetition rate. Even increasing the field rate from 50 to 60 per second (as used in the North American system M) makes a significant difference to the flicker seen. I observed no flicker, even with a wall of very bright pictures, in a New York shop recently.

So, if we are all agreed that the more lines the better so far as picture resolution is concerned, and are moving toward pictures of in excess of 1,000 lines, has interlaced scanning been such a bad thing?

*Keith Cummins,
Holbury, Hants*

POOR SERVICE DATA

When consulting recent circuit diagrams there are times when the lines and symbols mean very little to me. This is strange. I was taught that the purpose of a circuit diagram was to enable me to recognise the type of circuit I'm dealing with quickly and painlessly, time being money and best spent on fault tracing rather than deciphering an obscure diagram. Over the last few years I've noticed that most of the manuals I require contain a circuit, some layout diagrams and some scope waveforms, only some of which have time and voltage details. Voltage tables are slowly disappearing. No explanation of circuit operation is given – with power supplies this can make all the difference between a painless repair or possibly no repair. There was a time when you could recognise an amplifier, an oscillator and a power supply in a circuit diagram because of its characteristic layout. There's no reason why similar layouts can't be used for modern sets – or is the use of a computer CAD program the reason for poor/bad layouts?

For various reasons – small size of company, distance and time, particularly if you operate alone – many of us cannot attend manufacturers' training sessions where I suspect information on circuit operation is supplied. Low-grade service manuals make it difficult to maintain high standards. All too often when one asks for help by phoning or writing to a manufacturer the reply is "if you don't hold an account we won't tell you". This is no way to help maintain sets to the correct standard, nor does it help a manufacturer's reputation with the public. The technical sections of some companies do give help willingly, and I thank them. I'm aware that if possible a main agent is the best place to go, but there are many places on mainland Britain where this is not possible but a competent, well-trained local engineer or small repair concern can undertake any repairs required. No small repairer can hold agencies for all manufacturers.

Stock faults now tend to be small in number and as sets become more reliable fewer engineers are going to know about them. Therefore a bank of faults similar to that listed in *Television* is required. What we need are well laid out manuals at a reasonable cost and fault clinics such as *Television's*.

*Ray Crockett,
Thrumster, Wick, Caithness.*

HEARTENING EXPERIENCE

In these days of ever advancing technology, which along with improved reliability and falling prices is threatening to put me out of a job, I had a most heartening experience the other day. A customer phoned to ask if I'd look at an amplifier that belonged to a local pop group. Remembering my last excursion into one of these some years ago, with all d.c.-coupled stages and a fault in one affecting the voltages everywhere else, I was somewhat reluctant to do so. I agreed however and on placing the amplifier on the bench and removing the rear cover guess what? – valves! Four of what looked like EL34s and several ECC83s. At last I thought something I understand!

It didn't take many minutes to locate the cause of the problem, a noisy ECC83. I had a quick rummage in my old TV valve box and found one. Having cured the fault I asked about the age of the amplifier. "It's new" I was told. Flabbergasted I made further enquiries and found that all the best hi-fi amplifiers now use valves! I worked on this type of amplifier when I started in the TV trade in the Fifties. There's hope for me yet!

Radio interference has been mentioned recently in letters. For about six months here there was a severe arcing noise that completely obliterated the 80 m Amateur band and also affected the m.w. broadcast band. After many hours of detective work the cause was eventually traced to a fault with an 11kV overhead cable pole about a mile away! When notified the SWEB corrected the fault within hours as it was potentially dangerous.

*Peter Nutkins, GOHET,
Charmouth, Dorset.*

TOO OLD?

Having been self-employed for ten years I have every sympathy with Mr. Byrne (Letters, December). At 44 it seems that I'm far too old for the TV servicing trade. My qualifications – final C and G with colour endorsement in 1968 – are also considered to be out of date.

Since I sold my business three years ago I've not been able to secure a position with any TV company. My twenty nine years in the trade doesn't seem to make one iota of difference. It's not experience that companies want nowadays but fresh young lads with up-to-date qualifications.

Mr. Byrne is right. Firms seem to judge a candidate on the application form. I've never got to the interview stage. Perhaps a home could be opened for unwanted TV engineers.

*V. Holt, 115 Lyndhurst Road,
Worthing, Sussex BN11 2DE.*

With reference to Paul Byrne's letter (December) the trouble with most employers today is that they want you to work for them and help build up their life styles at your expense. I used to work for a large company with a

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MANOR SUPPLIES

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workshop here in Blackpool. As I was single, I would work during the bank holidays. When my personal circumstances changed I wanted a bank holiday off but found only hostility when I asked for this. Following this disagreement I could no longer work for the company. That was six years ago. I became too old at 29. So chin up, you're not alone.

G. Knowles, 16 Kirkham Avenue,
Marton, Blackpool FY1 6RJ.

COMPUTER TIP

I fitted an uninterruptible power supply (UPS) to a computer only to find that it worked fine until the mains power came back on when the surge crashed the computer. After messing about with capacitors and filters to no avail I finally hit on the low-technology solution of fitting a three-pole changeover mains-operated relay, see Fig. 3. When the mains supply is off the input to the UPS floats, with the live, neutral and earth terminals connected together. When the mains supply is restored the relay is energised, connecting the live, neutral and earth mains terminals to the UPS. The switching delay is sufficient to allow sharp transients to settle, so the computer doesn't crash.

John de Rivaz, B.Sc. (Eng.),
Truro, Cornwall.

HORIZONTAL SHAKE

The advice given in Service Bureau, October (page 935) in connection with horizontal shake from cold experienced with a Grundig CUC220 chassis receiver was logical but the cause is more likely to be in the tuner/i.f. can. Check for dry-joints here, then see if any of the electrolytics are sensitive to freezer. You'll often find that the shake is worse on some channels than others.

Philip Blundell, AMIEIE,
Birmingham.

WORKSHOP TIPS

I always find the other man's workshop tips of interest. Here are some of mine.

The plastic pen can be used for several purposes. Secure a neon bulb at the end as shown in Fig. 4, using a rubber sleeve, and the operation of the line output transformer can be checked from a safe distance. A LED fitted at the top as shown in Fig. 5, wired through a resistor to a prod at the other end with the earth lead taken through the side of the pen to a crocodile clip, enables live i.c. pins to be found.

Old plastic 6mm knitting needles avoid mishaps when one needs to prod around in a live set. A stiff toothbrush is good for cleaning PCBs after carrying out repairs.

Murphy's Law dictates that the faulty plastic transistor is lurking in the most inaccessible spot. For TO92 types, the most common, shape a small piece of metal to the contour of the curved side and loosely bolt or rivet it to one arm of a pair of tweezers. The transistor can now be held securely. Fig. 6 illustrates the idea.

Keep bits and pieces in glass jars so that the contents are visible. When speaker units are scrapped retrieve the magnets and keep them on the workbench: if screws, nuts etc. are placed on them when a piece of equipment is dismantled they don't drop on the floor.

If you deal with audio you must have test speakers. Terminate them with a four-way socket and wire mating plugs to leads with the various loudspeaker plugs

encountered at the other end – DIL, phono, etc. This saves lots of time. It's a wise precaution to fit 1,000µF capacitors in the leads to the test speakers. Many amplifiers have non-isolated outputs and if a d.c. offset occurs your speaker coils are away in a puff of smoke – I know this from experience!

Finally a relic of old times. Use a 2V RS heater transformer to check loudspeakers for rattles etc.

Bill Harrison
Windsor.

HELP WANTED

Can anyone supply a circuit diagram/information on an Hitachi HV625K monochrome CCTV camera? Another point: can anyone explain why TDA3650s blow on Pye K4 sets?

Eddie Duncan-Dunlop, Highland Electrix TV,
1 Danylan-Penyfai Road, Aberkenfig,
Bridgend, Mid-Glamorgan CF32 9AB.

Can anyone supply or give me a source for the Philips AT2077/80 line output transformer used in the Boots CTV14 portable colour receiver/monitor? Philips seem to be unable to help without a chassis number.

Colin McCormick, 23 Shapleys Gardens,
Staddiscombe, Plymouth, Devon PL9 9TY.
Telephone 0752 405 201.

Could anyone help with spares and service information for the following two colour sets, both of recent manufacture? The Dansai TA1 2101 (21in.) and Phase PHZ-0567. I'm

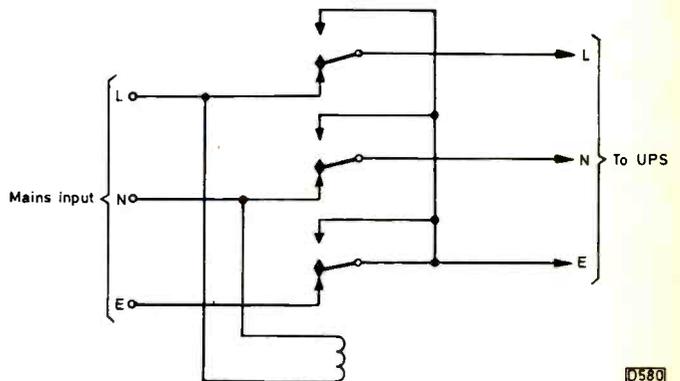


Fig. 3: Use of a changeover relay with a UPS.



Fig. 4: Plastic pen with neon.

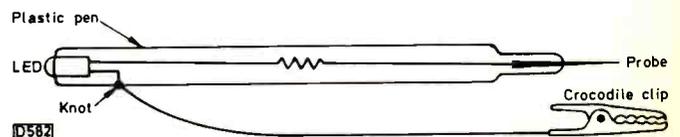


Fig. 5: Live chip pin tester.

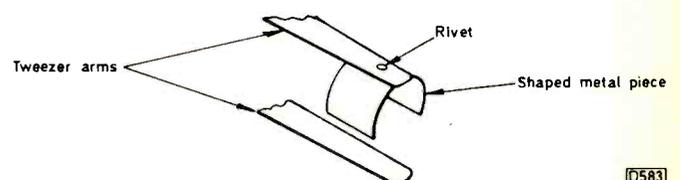


Fig. 6: Tweezers for holding TO92 transistors.

particularly interested in obtaining RC units for use with them.

David Rout, Two Akers, Wrabness Road, Ramsey, Harwich. Telephone 0255 880 672.

Can anyone explain how to remove the cabinet of a Telehifi Model ACN8109 TV monitor?
W. Causer GIZTK, 47 Sandringham Road, Wombourne, Wolverhampton WV5 8EF.

Can anyone tell me where Siliconix E421s are available? I need at least two for repairs to an oscilloscope.
E.E. Matthews, 63 The Oval, Otley, West Yorkshire LS21 2EE.

Can anyone supply a service manual or circuit diagram for the Fortel CCD-HP-PAL timebase corrector? I cannot obtain a reply from this American firm.
John Alcock, 4 Leyburn Grove, Hartburn, Stockton-on-Tees, Cleveland TS18 5NH. Telephone 0642 583 075.

SPECIALIST SERVICE CONSULTANCIES

Steve Beeching has commented recently on the problems of high-technology servicing. While what he says about the technology is perfectly true, it's unlikely that the average service department will change dramatically in the foreseeable future. Service departments haven't changed much in the last twenty years despite the progress of technology. Except for camcorders, repairs to most consumer electronic products are carried out with the same equipment, albeit improved, plus a digital multimeter, a

frequency counter, a double-beam oscilloscope and a few gadgets to set up VCRs.

The average engineer is not highly qualified, and in fact such qualifications are not essential for day-to-day repairs. Consumers will continue to look for a local engineer who will undertake repairs at a sensible price and it's no good if a high-technology department is miles away. Independent service departments are in business to make money. If the latest technology is beyond the average engineer the logical answer is replacement boards despite huge prices. It will be better to refuse high-cost jobs and concentrate on others that bring the money in.

It would be an idea for the sort of specialised service departments advocated by Steve to act as consultants to the trade in addition to carrying out their own servicing. Consultancies seem to be cropping up everywhere, offering all sorts of services. This is the marketing of information. The Aswo Videotext Information System is one that can be done, though it's rather expensive for the average service department to use, and impersonal to. Independent consultants are what will be required as manufacturers close their technical departments.

Operating a consultancy could be lucrative without the need for a heavy outlay. Consultancies could charge a registration fee plus a charge for each enquiry. Reasonable charges would be acceptable to the average busy service department that lacks the ability to tackle more specialised equipment. There must be a lot of wasted time in this industry as hundreds of engineers struggle to find the cause of the same or a similar fault. It need be done only once and the answer sold to others.

C. Deus, King's Lynn, Norfolk.

AN236	£2.30	LM1438	£2.32	STR1006	£3.80	IDA3653	£1.50	BU426	£1.70	ZSC783	£1.00	VIDEO BELT	£1.00	LEADING MEET	£1.00	PANASONIC NVG30 NVG130	£22.15	ELECTROLYTIC CAPACITORS	£1.20
AN245	£2.90	LM3915	£2.40	STR11006	£3.80	IDA4100	£3.95	BU500	£1.05	ZSC828	£2.20	JVC FER3V29	£0.30	JVC FER3V35	£0.35	SHARP VC811651652	£15.45	100UF 63V	£0.24
AN351	£1.40	LM3405	£2.40	STR40093	£2.85	IDA4003	£3.00	BU508A	£0.75	ZSC840	£3.15	HITACHI VT9300	£0.38	HITACHI VT9300	£0.38	SHARP VC81195009000	£15.75	220UF 63V	£0.09
AN3310K	£2.85	LM1416	£1.50	STR50103A	£3.50	IDA4505	£3.00	BU5080	£0.85	ZSC901A	£3.50	AKAI	£0.05	AKAI	£0.05	SONY C2024-40F1	£15.99	470UF 50V	£0.34
AN5010	£2.95	M5106P	£1.80	STR50113	£4.89	IDA4510	£3.10	BU526	£1.10	ZSC998	£1.80	V51ASV25S	£0.90	PINCHROLLERS	£1.75	SONY ON/OFF SWITCH WITH REMOTE	£2.35	100UF 63V	£0.40
AN5011	£2.95	M5152L	£1.50	STR54041	£3.50	IDA4600	£1.90	BU536	£1.05	ZSC1030	£1.80	V59300	£1.45	VCR7000	£2.70	IC 4116 (MIN 10 PCS)	£15.00	220UF 250V	£0.26
AN5071	£1.20	M5218L	£1.90	STR58041	£3.00	IDA4600.2	£1.75	BU5908F	£1.25	ZSC1106	£1.00	AMSTRAD	£2.00	3V29HR7200	£2.70	IDA 1044 (MIN 10 PCS)	£15.00	10K 250V	£0.34
AN5150	£2.85	M50115	£2.00	TA7070	£1.15	IDA4600.3	£1.75	BU5908F	£1.10	ZSC1115	£2.60	VCR7000	£1.45	HRD110-3V35	£2.70	SHARP REEL IDLER (56 ORIGINAL)	£6.22	47UF 250V	£0.65
AN5256	£2.20	M50120	£2.00	TA7130	£0.70	IDA4610	£1.95	BU111A	£0.70	ZSC1170	£2.45	AKAI	£1.90	VS12/24/45	£2.70	JVC FER VIDEO LAMPS (MIN 10 PCS)	£2.00	47UF 250V	£1.28
AN5510	£2.85	M51164	£2.00	TA7205	£0.80	IDA4630	£1.26	BU112	£0.85	ZSC1185	£3.00	VS3000/9500	£2.70	VS3000/9500	£2.70	IC 4116 (MIN 10 PCS)	£15.00	100UF 16V	£0.70
AN5521	£2.20	M5172	£2.40	TA7282	£2.45	IDA4650	£2.45	TP128	£1.05	ZSC1207	£1.10	VS3000/9500	£2.70	VS3000/9500	£2.70	SHARP REEL IDLER (56 ORIGINAL)	£6.22	10UF 400V	£0.24
AN5700	£1.10	M5425L	£2.85	TA7604	£2.35	IDA4680	£3.20	TP131	£0.20	ZSC1213	£2.30	AMSTRAD	£1.12	3V42/43	£0.85	SCART KIT	£4.62	47UF 400V	£0.30
AN5722	£1.60	M54886	£4.20	TBA1205	£0.40	IDA4731	£4.15	TP131A	£0.22	ZSC1229	£1.35	Mod Kit	£5.00	ATENUATOR ANY VALUE	£4.62	ATTENUATOR ANY VALUE	£4.62	22UF 400V	£0.69
AN6135	£1.40	TA7401	£0.40	TBA1209	£0.40	IDA4740	£2.90	TP132	£0.50	ZSC1245	£3.05	Hitachi	£1.90	VS12/24/45	£2.70	IC 4116 (MIN 10 PCS)	£15.00	47UF 400V	£0.22
AN6248	£2.00	TA7441	£2.25	TBA1209	£0.40	IDA4750	£1.05	TP132A	£0.22	ZSC1262	£1.00	AMSTRAD	£1.12	VS3000/9500	£2.70	SHARP REEL IDLER (56 ORIGINAL)	£6.22	2UF 400V	£0.70
AN6306	£2.00	STK0029	£4.00	TBA1209	£0.40	IDA4815	£4.80	TP141	£0.20	ZSC1278	£1.12	Hitachi	£1.45	VS3000/9500	£2.70	SCART KIT	£4.62	10UF 400V	£0.30
AN6360	£2.60	STK0040	£3.40	TBA250	£1.00	IDA4817	£3.00	TP141A	£0.20	ZSC1282	£1.12	Hitachi	£1.45	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
AN6673	£2.25	STK0049	£3.40	TBA250	£1.00	IDA4818	£3.00	TP141A	£0.20	ZSC1282	£1.12	Hitachi	£1.45	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
AN6876	£1.50	STK0050	£4.50	TCA650	£2.85	IDA4819	£2.80	TP142	£0.20	ZSC1285	£2.50	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	10UF 400V	£0.30
AN7120	£1.25	STK0060	£4.00	TCA900	£1.00	IDA4916	£3.70	TP142	£0.20	ZSC1285	£2.50	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	22UF 400V	£0.69
AN7140	£4.00	STK0080	£6.00	TCA900	£1.00	IDA49045	£3.10	TP142C	£0.23	ZSC1281	£2.50	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
AN7143	£2.45	STK043	£9.00	TA4440	£1.85	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
AN7158	£2.50	STK050	£6.20	TA1002	£1.85	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
AN7200	£2.85	STK092	£3.10	TA1011	£1.85	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
AN7300	£0.90	STK084	£7.00	TA1012	£1.05	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
AN7320	£1.60	STK086	£9.00	TA1010A	£1.05	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
AN7417	£2.38	STK425	£4.15	TA1015	£0.48	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
BA308	£1.30	STK437	£3.50	TA1028	£2.08	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
BA315	£3.15	STK439	£3.50	TA1029	£2.08	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
BA322	£1.30	STK441	£7.29	TA1035T	£2.20	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
BA358	£3.60	STK457	£3.40	TA1042	£2.20	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
BA1355	£2.85	STK459	£3.35	TA1044	£2.20	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
BA3506	£2.10	STK461	£6.50	TA1047	£1.80	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
BA3707	£2.00	STK465	£7.85	TA1054M	£1.82	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
BA5102	£2.30	STK463	£4.15	TA1059	£1.80	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
BA5402	£2.00	STK1070	£7.10	TA1060	£1.75	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
BA5408	£2.00	STK2025	£7.30	TA1072	£2.10	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
BA6109	£1.75	STK2028	£5.85	TA1085	£0.80	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
BA6124	£2.45	STK2145	£3.10	TA1170	£0.48	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
BA6209	£2.80	STK233	£3.15	TA1190	£0.90	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
HA1124	£1.45	STK2240	£9.00	TA1270	£1.80	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
HA1137	£1.50	STK250	£0.80	TA1410	£2.00	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
HA1196	£1.50	STK305	£5.00	TA1515A	£2.35	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
HA1377	£1.80	STK3042	£3.10	TA1908	£0.90	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
HA1392	£2.25	STK4024(2)	£7.85	TA1412	£0.90	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
HA11225	£2.00	STK4026	£6.00	TA2002	£0.75	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
HA11225	£1.60	STK412(2)	£7.00	TA2004	£0.90	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
HA11235	£1.55	STK421	£3.50	TA2005	£0.90	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
HA11423	£2.00	STK4773	£9.60	TA2006	£0.70	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
HA11714	£3.80	STK4803	£0.80	TA2009	£1.85	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
HA11715	£2.10	STK4833	£3.10	TA2030	£0.85	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
LA12017	£1.75	STK4843	£3.10	TA2031	£0.85	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	£0.69
LA13002	£1.85	STK4853	£3.25	TA2270	£2.65	IDA49503	£2.21	TP110	£0.25	ZSC1293	£1.85	Hitachi	£1.90	VS3000/9500	£2.70	ATTENUATOR ANY VALUE	£4.62	47UF 400V	

Satellite TV Video Amplifier/Filter

C.W. Murray

Denis Mott's satellite TV band scanner unit (November 1990) was most interesting. While its design was well thought out in general I feel that the video amplifier circuit it uses is over complex. It's also a fact that video amplifiers of this type can be tricky unless properly laid out on a PCB. Having designed and built my own satellite TV receiver I'd like to suggest as an alternative the video amplifier design I used. Fig. 1 shows the circuit while Figs. 2 and 3 provide a PCB layout.

Circuit Description

The baseband signal from the i.f. block passes first to a de-emphasis filter that's designed to meet CCIR Rec. 405-1. R1 and R2 match the i.f. unit's output impedance to the 75Ω input impedance of the filter. The values of these resistors need to be scaled to the output impedance of the i.f. unit used. The filter's output is then passed to an NE592 differential video amplifier. R8 and C3 form a low-pass filter whose output is fed to the video amplifier's inverting input. This has the effect of cancelling the 25Hz dispersal ripple. VR1 sets the video gain. Positive- and negative-going outputs are available at pins 8 and 7 respectively.

Amplifier Use

The circuit has been set up for use with the i.f. block employed in the Amstrad SRX100 satellite TV receiver.

This has an open-emitter (emitter-follower without the load resistor) output with negative-going video. If the i.f. block used has a positive-going video output, simply swap between outputs 1 and 2 from the video amplifier. I use an emitter-follower with a d.c. clamp after the video amplifier to drive an Astec UM1286 u.h.f. modulator. This arrangement gives very good results.

Construction

The board layout shown in Figs. 2 and 3 is untested. Its design is based on the circuitry used in my receiver. Modification may be needed to meet specific requirements. It's best to use double-sided board, with the component side copper acting as a ground plane (connect it

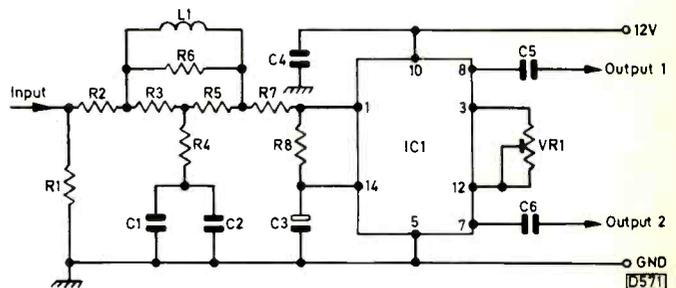


Fig. 1: Circuit diagram of the satellite TV amplifier/filter. The input is taken via a de-emphasis filter to IC1 which provides the gain. R8/C3 filter out the dispersal signal.

BOLTON COMMUNICATIONS PROJECT SATELLITE TELEVISION RECEPTION TRAINING COURSES

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One day definitive course on behalf of City & Guilds and the CAI

Thursday 14th February 1991

Cost (including materials & lunch) £95.00

City & Guilds and the CAI

Practical Assessment & Examination

Thursday 14th February 1991 1.30-5.00 p.m.

Cost (including materials) £50.

The above courses take place at The Smithills Coaching House, Bolton

Starting January Part-time 3 days a week

City & Guilds 279 – Television & Video Production

For further information please contact: Steven Goodman

Bolton Metropolitan College,
Manchester Road, Bolton BL2 1ER
Telephone: (0204) 31411 Ext. 3371

Component details

Resistors:

R1	100Ω	5%
R2	62Ω	1%
R3	75Ω	1%
R4	18Ω	5%
R5	75Ω	1%
R6	300Ω	1%
R7	75Ω	1%
R8	75Ω	1%
All 0.25W		
VR1	47k	linear

Capacitors:

C1	2,700pF	polystyrene
C2	2,700pF	polystyrene
C3	Less than 47μF	electrolytic
C4	0.1μF	met. polyester (or d.c.)
C5	1μF	met. polyester
C6	1μF	met. polyester
C5,6	Farnell 149-846	

Others:

L1	33μH	e.g. Maplin WH38R
IC1	NE592	(RS 301-583)

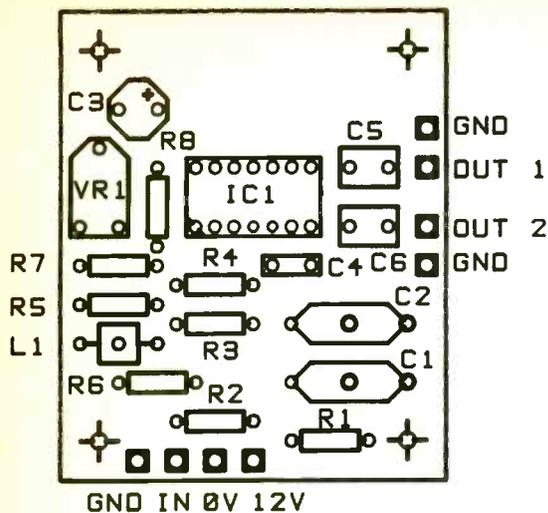


Fig. 2 (left): Layout of the suggested PCB, viewed from the component side. It's best to use a double-sided board with the copper on the component side acting as a ground plane – use a small bit to make clearance cuts for the non-earthed component leads.

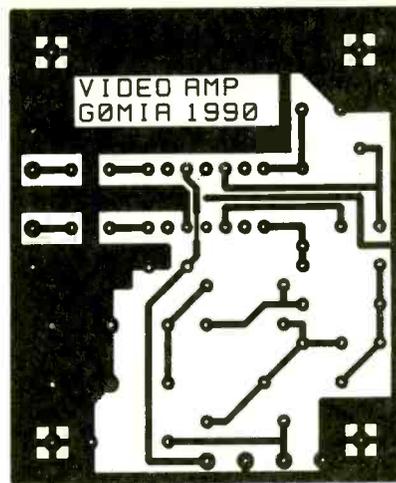


Fig. 3 (right): PCB layout seen from the copper track side. Scale 1:1.

to earth). Use a small drill bit to make clearance cuts in the ground plane for non-earthed component leads. The i.c. can be fitted in a socket.

To remove the dispersal flicker completely it may in some cases be necessary to reduce the value to $C3$ to $6.8\mu\text{F}$.

CD Player Casebook

Reports from Mike Leach and Joe Cieszynski

Aiwa DX-M77

The ticket said no results. When I switched the player on only the top right-hand corner of the fluorescent display lit up. No other functions worked. After getting a photocopy of the circuit from my friend Microwave Roy I checked the power supply system and found that the 5V ever supply was missing. The cause of this was a crack in the print around the 78L05 series regulator IC3 – there was in fact no 10V input at pin 1. When the print had been linked up the 5V supply was restored but the fault symptoms remained the same, with only part of the fluorescent display lit. I next moved over to the microcomputer chip IC51, where d.c. checks showed that there was no 5V supply at pin 15. This was again caused by cracked print. After a few blobs of solder the machine worked normally.

M.L.

Saisho CDX200

I thought there'd be a Philips machine inside this one, but there wasn't. In fact it was something I'd never seen before. The machine played all right but there was no sound, due to a fault in the audio section. Fortunately I noticed a slightly discoloured 470Ω resistor on the audio/mains board – yes, that's right, audio and mains on the same subpanel! The 470Ω resistor, R923, was in the 9V feed to a BA4558 chip. Basically the cause of the trouble was no 9V supply at pin 8 of this chip. I decided to replace the resistor, the chip (IC901) and the $220\mu\text{F}$ capacitor C922. After doing this the machine produced good sound. Be sure to disconnect these machines from the mains supply before attempting to remove the nasty audio board – it can bite!

M.L.

Matsui Midi 75CD

The play function was o.k., the fluorescent display did all that it should but there was no sound. When a disc was being played you could hear a faint hum through the speakers. I'd no circuit diagram so I dived in and trod carefully. It didn't take long to find that there was no 5V

supply to the LC7880 DAC chip IC7007. It comes via a 100Ω resistor R038 which had a voltage at one side and nothing at the other. While I was making these checks the supply returned and the sound reappeared. There were no signs of dry-joints in the area so I replaced the resistor and, just in case something strange was going on, the chip. The machine then worked perfectly.

M.L.

Dirty Lenses

In the November CD Player Casebook Mike Leach pointed out that some models are more susceptible than others to having a dirty objective lens and asked for comments. One factor that seems to be significant is the seal on the disc drawer when in the closed position. Many players have a loose-fitting drawer with large air gaps. This allows smoke, cooking fumes etc. to get inside with the result that the objective lens becomes fogged over. Think of the way in which the tube face of a TV set that operates in a smoky or dirty environment soon acquires a dark film over its surface. Consider the effect on laser output when such a film builds up on the objective lens.

A build up of dirt and grease on the sled mechanism also has a significant effect on CD player operation. For those more familiar with VCRs I should point out that in comparison the amount of grease needed to upset a CD player is quite small, because of the much finer mechanical operation. In addition a video mechanism's tape guides and heads are cleaned to some extent by the wiping action of the tape. There is of course no such cleaning action for the objective lens.

I also wonder whether the materials used in manufacture of the objective lens have a bearing on the build up of dirt. In most cases the lens is coated with a form of plastic. As we all know, some plastics are inclined to build up a static charge that attracts dust. This is a pure hypothesis on my part however and it would be very difficult to prove the point without the assistance of laser assembly manufacturers.

J.C.

Teletopics

MATSUSHITA'S TAKEOVER OFFER

After two months of negotiations an agreed price has been reached for the takeover of Music Corporation of America (MCA), which owns Universal Pictures, major record labels and other entertainment interests, by Matsushita. The Japanese company is to pay \$66 a share plus separate shares worth about \$5 for MCA's WWOR-TV station, valuing the Hollywood company at \$6.6bn. Matsushita sees the move as "the ideal integration of software and hardware", i.e. consumer electronics products and entertainment material, and has pledged to maintain MCA's present management and its "creative independence".

SATELLITE TV

The IBA/ITC has issued a statement on its view of the merger between BSB and Sky Television to form BSkyB. It points out that the legal relationship between the IBA and BSB takes the form of a programme contract entered into under the provisions of the Broadcasting Act 1981 and the Cable and Broadcasting Act 1984. The fact that the IBA's consent to the merger was neither obtained nor sought represents a serious breach of BSB's programme contract, as a result of which the IBA is entitled to terminate BSB's contract. It intends to do so. Since immediate termination would not be in viewers' interests however the IBA, now the ITC, intends to hold further discussions with BSB on transitional arrangements before issuing a notice of termination. What this amounts to is that those with BSB receiving equipment will continue to receive a service for the time being. When BSB's programme contract has been terminated the ITC intends to invite interested parties to put forward proposals for the use of the DBS frequencies.

The IBA/ITC further points out that the television services currently being provided by Sky will require a non-domestic satellite services licence under the Broadcasting Act 1990. BSkyB intends to apply for such a licence.

Owners and manufacturers of BSB equipment and dealers have so far been left to their own devices. Philips has become the first manufacturer to issue a writ against BSB, claiming £50m of lost business. Damages are being sought against BSB for broken agreements and action is being taken against Sky for "wrongful interference with such agreements".

There are understood to be around 250,000 MAC receivers in the distribution pipeline. It's expected that owners of BSB equipment will be given some sort of trade-in offer, but at the time we go to press there is no definite information on this. RETRA has demanded that BSkyB should reimburse retailers at full trade value for all stocks held, that BSB customers should be offered replacement Astra equipment of similar value and with a full guarantee or a full refund at retail price, and that replacement work should be carried out by the original retailer at the normal rate for the job.

Syntronix Systems, St. Matthews House, Brick Row, Darley Abbey, Derby DE3 1DQ (0332 553 024) has announced that it will be offering a DMAC to D2MAC modification for BSB receivers, giving owners the ability to receive a number of D2MAC transmissions from other

satellites. The option would involve motorising the dish system. For those unwilling to go to this expense the dish could be turned towards the Olympus satellite, giving access to the BBC's experimental Enterprise Channel.

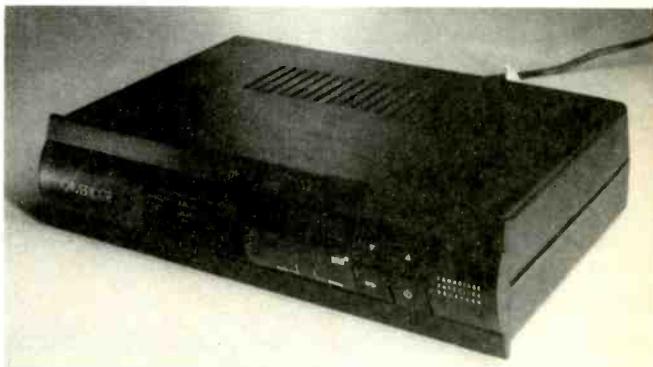
Just prior to the announcement of the merger the Department of the Environment issued details of new rules for satellite dish installations. Two dishes can be installed provided neither exceeds 60cm in diameter and neither projects above the highest part of the roof. Dishes should be sited so that their visual effect is minimised. A new code of practice is to be published shortly, giving guidance to installers and wider powers to planning authorities. Those who already have a 90cm dish would not have to remove it as the new regulations will apply to new installations. There are additional restrictions in conservation areas etc.

Ferguson has launched four Astra IRD (integrated receiver/decoder) systems, the SAP4/5/6/7, giving viewers a choice of two receivers and either a 60cm mesh dish or an 80cm steel dish. The higher specified receiver/decoder with the SAP4/5 systems features stereo sound, Panda Wegener noise reduction, 60 programmes tuned for Astra 1A and 1B, pretuned audio channels for stereo radio broadcasts, a 4-event/14-day timer for use with a VCR to give recording of more than one satellite channel, child lock, an on-screen graphics menu, and three scart sockets plus r.f. and audio phono sockets. With the SAP6/7 you get stereo sound, 62-channel capacity, and the following socket arrangement: scart, r.f. and both audio and composite video phono. Prices range from £359.99 to £419.99.

Cambridge Computer has announced an Astra receiver, Model R1317, capable of receiving all Astra channels – the 32 transmitted by the 1A and 1B satellites and the further 16 that will be added when 1C becomes operational in late 1991. The R1317 provides stereo reception with dynamic noise reduction and compatibility with industry standard 13/17V LNBS to allow use with a wide range of dish assemblies. There's full remote control and a socket is included for connection to a VideoCrypt decoder. The usual input/output sockets are provided.

TV RECEIVER NEWS

We understand that Sony is the first firm to launch on the market, in Japan, an HD-TV receiver. The set has a 38in. tube and, with the HD decoder, a price that's equivalent to over £16,000. At present NHK broadcasts an hour a day of HD-TV programmes via satellite. Full-scale HD-TV programming is due to start this autumn. Line doubling with interpolation is apparently used to provide a high-quality picture with conventional transmissions. The set incorporates the digital features you'd expect, such as picture-in-picture.



The Cambridge Computer R1317 Astra receiver has 48 channel capability and provides high-quality stereo reception.

Two large-screen sets have recently been launched in the UK by Philips. The 33in. Model 2080 is probably the first to incorporate the D2B domestic digital bus system for linking and control between various items in an AV system. A contour booster that improves soft outlines and a digital transient improvement circuit that boosts sharpness contribute to picture quality. Features include Nicam, picture-in-picture displays, parental lock, NTSC and SECAM video playback capability and Fasttext with two enhancements – eight-page and twenty-page-number memories. Socketry includes two scarts, S-video input and output, L/R audio and the D2B connector. Suggested retail price is £2,000. A four-amplifier, five-speaker home cinema sound system, Model AV1340, developed jointly with Boss, is available as an optional extra for £600. It produces 120W r.m.s. and can accommodate a VCR and a satellite receiver.

Philips' other offering is a 41in. projection set, the Superscreen Model 8841. The claim for this set is that it provides over twice the viewing area of a conventional 28in. set while taking up the same floor space. Three liquid-cooled 7in. monochromatic tubes are used, giving good brightness, with a four-element aspheric lens system to correct the video image curvature. The black matrix screen has miniature Fresnel lenses beneath the surface to improve picture quality. Features include a Nicam decoder, three speakers, Fasttext, picture-in-picture, an on-screen display and plenty of sockets. Suggested price is £2,200.

The advantages of power MOS field-effect transistors over bipolar types are said to include fast switching and an inherent immunity to thermal runaway. A few TV chassis now use one as the chopper transistor. Toshiba is developing an n-channel type with a breakdown voltage of 1.5kV. Use as the line output device is one of the main applications envisaged. Key electrical characteristics include a high forward transfer admittance, low leakage current and a drain-source resistance of 3.5Ω in the on condition.

BBC SELECT

The BBC is to use PAL with VideoCrypt scrambling for its night-time subscription service, called BBC Select, which is due to start this September. There will be 15 different services, transmitted via the BBC-1 and BBC-2 transmitters, including music, sport and motoring in addition to more specialised subjects. Details of the subscription charges have not so far been announced. The decoder provided will scan the two channels and start a VCR whenever a selected programme has been found.

VIDEO NEWS

Akai has introduced a VCR that can record teletext subtitles in full colour. The VS-F33EK was designed with help from the Royal National Institute for the Blind – the RNID says that around 700,000 severely deaf people rely on subtitles. An integrated teletext decoder enables the user to record subtitles while viewing or via timer-set recordings. Normal or double-height text can be selected. Other features include a multi-language interactive monitor system, VPT (video programming by teletext), VISS, variable speed play, a blank search system, twin digital audio tracks etc. All for a suggested price of £399.

Akai has also introduced two camcorders with a novel horizontal design. The PVS-C100E and PVS-CS500E have a wide body for two-handed operation, which gives improved picture stability. The cassette slot is at the top. Both models have a 420,000-pixel image sensor that works

down to 5 lux, four fast shutter speeds and a built-in character generator with 32 preset titles. The PVS-C100E is a VHS-C machine priced at £800 while the PVS-CS500E S-VHS-C machine has a suggested price of £1,000.

Sharp has introduced the first UK camcorder to have a colour LCD viewfinder. Model VL-C7950 has a × 12 zoom and a quick zoom that magnifies an image by a factor of 1.5 in just 0.2 sec. A "cat's-eye" system enables it to work at light levels down to 3 lux. The suggested price is £899.

Sony's mid-range EV-S550 Video-8 VCR features hi-fi stereo sound, a Nicam decoder and a LANC connector system for dual operation with compatible camcorders and VCRs. The suggested price is £550.

NICAM

The BBC's full stereo TV sound service will start this autumn from ten main transmitters and their 402 relays, giving coverage of about 73 per cent of the population. The main transmitter list is as follows: Belmont, Black Hill, Crystal Palace, Emley Moor, Mendip, Pontop Pike, Sandy Heath, Sutton Coldfield, Wenvoe and Winter Hill. Crystal Palace and its relays are already broadcasting test transmissions and the other transmitters will start testing during the summer. About 100 TV models and 30 VCRs at present on the market incorporate Nicam decoders.

Low-cost Nicam equipped VCRs are featured in several ranges including Matsui, Amstrad, Tatung, Deccacolour and Sharp. Suggested retail prices start from £299.99.

FOR ENTHUSIASTS

With the publication of issue eight of its magazine *405 Alive* the 405 Line Group has reached the end of its second year. The group now has nearly 150 members who enjoy collecting and renovating old receivers, cameras and so on. Displays of old equipment are from time to time put on at exhibitions. In addition old TV programmes, commercials etc. are collected. For further information on the group, its activities and its magazine apply to Andrew Emmerson, 405 Alive, 71 Falcutt Way, Northampton NN2 8PH.

The Test Card Circle has recently been formed. Its primary interest is the "seemingly lost forever TV art form of trade test transmissions". For details write to Paul Sawtell, 20 Seymour Road, Stourbridge, West Midlands DY9 8TB. We are told that it's more of a social club than a haven for technical experts, though quite a few members are in the trade or professionally involved.

ONE-FOR-ALL MK II

The original Celtel One-for-All remote control unit was reviewed in these pages a couple of years ago. Elimination of some of the less often used facilities of the Mk. I has enabled the price of the Mk. II to be reduced by about half, to £40. The new version is easier to use, with a redesigned layout and keys specifically for Fasttext. For many people this will be a more attractive proposition. The setting-up procedure is the same. Enquiries to Celtel Ltd., PO Box 135, Basingstoke, Hants RG25 2HZ (0256 64 324).

MICROWAVE OVEN SERVICING

If you are going into this line of business you might like to make a note of Express Components Ltd., 2 Holyoake Street, Wellington, Somerset TA21 8LD (0823 667 525) who specialise in express delivery of major microwave oven components including magnetrons, capacitors and transformers. ECL is also distributor for the Bussman-Cooper range of electronic fuses. The company claims to

be the first UK supplier of a range of fuse-selection boxes for microwave, electronics and electrical engineers. Each box contains up to 180 fuses suitable for each field. During the current year ECL intends to start manufacturing and selling a microwave leakage detection monitor which should be available at a very competitive price: a recalibration service will be available.

IN BRIEF

Harry Todd wishes us to make clear that in reaching a settlement with Radio Rentals over his case for compensation for back injury (see Teletopics October

1990) he did not, in writing or otherwise, agree to a no-liability settlement . . . The 1991 Greenweld catalogue of components and equipment, with 132 pages, is now available for £1.50 (free to education and industry) from Greenweld Electronics Ltd., 275 Park Road, Southampton SO1 3TB (0703 236 363) . . . The 1991 Youth Skills Olympics – a search is on to find the two best young (under 22) electronic technicians that the UK can enter for this event in Amsterdam. For details apply to Peter Bennett, Examination officer, The Electronics Examination Board, Savoy Hill House, Savoy Hill, London WC2R 0BS (071 836 3357), extension 201.

Fifty Years in Radio and TV

Part 1: The Thirties

Harold Peters

It was an eerie feeling standing on a spot where I stood fifty five years ago, looking out over SE London and seeing almost the same panorama. But fifty five years ago I would have been clutching my parents hands, waiting for the sun to set over the Crystal Palace behind us and for the fireworks – the celebrated Brocks Benefit – to begin.

It was to have been the last one however as the Palace burnt down the following year, on November 30th, 1936. Richard Dimpleby made reporting history with a live commentary. I watched it all from home, never to set foot inside the grounds again until now.

The terrace, with its marble steps down to where the fountains were, is still there, along with some of the original statues that haunt its balustrade. I even found the odd globule of molten glass on its gravel paving. Where the Palace once rose the Caravan Club now has its London site. To the north, set into the hillside, there's the BBC's transmitter building. It feeds megawatts of TV up a tower that overlooks all London, and which takes flashlight pictures of it every 1.5 seconds.

If you look away from this modern purveyor of Nicam etc., referred to by a former member of staff as being "a bit too near Head Office for comfort", you catch a glimpse to the south of some of the original Paxton buildings, preserved by being used, that could possibly have been part of the South Tower premises occupied by Baird himself.

In such a setting I hope you'll forgive me for looking back over a fifty year period spent at the pliers and screwdriver end of the business, starting back in those very early days.

Little has Changed

I never saw 30-line TV but I heard plenty of it because one of the London Regional medium-wave transmitters took the vision channel at certain times in place of the regular programmes. It sounded much like caption buzz on a current TV set that's misaligned. Little in fact has changed.

We had a high-speed train, the Silver Jubilee, that kept time on a daily four-hour run from London to Newcastle and back; we had personalised number plates; comedian Harry Tate drove around in a T8; and we had a better Broadcasting Standards Committee than we are ever likely to get today – it was called Sir John Reith. He was responsible for putting the BBC on to an internationally acclaimed pedestal that's only now beginning to crumble. Technically, anyone who mastered superhet theory at the

time was on a par with those who nowadays understand all about D-MAC and duobinary coding. Capacitors were condensers, Hertz were cycles per second and valves were the size of Coca Cola bottles. You could test an electrolytic by shaking it close to your ear. If fluid slopped around inside it was sure to be satisfactory – "o.k." was frowned upon then.

Entertainment

Visual entertainment was provided by three chains of cinemas – the Gaumont, Odeon and ABC. They all regarded the upstart television, which was being demonstrated at Radiolympia, with contempt. That was the place to go to see all the latest on offer from the trade. None of your trailing round hotels on a survival diet of sherry and cashew nuts. It was all there under one roof, with one of the two BBC television OB units providing continuous closed-circuit TV entertainment when Alexandra Palace was off the air. TV had two pretty hostesses – you would say presenters today unless you are over 35 years old when you would say announcers. There was Jasmine Bligh, a blonde descendant of the captain of the Bounty, and Elizabeth Cowell – my brunette pin-up. She actually spoke to me. "Excuse me" she said with cultivated asperity as she tried to get through the onlookers into the glass-walled studio where the Radiolympia morning began with "Come and be Televised".

It surprises me how "received English", the Reithian standard of the spoken work, has changed over the years. Listening to "clips" from those early broadcasts confirms that none of today's voices would have qualified for the job. Neither would the early ones survive today. You could tell just by listening that they faced the microphone in full evening dress!

Technical Advances

As war approached the technology strode ahead. Five-inch vision-only table models brought TV closer to the man in the street – the sound accompaniment was provided by a jumper lead into your radio receiver's pick-up socket. These sets retailed at around £30, about twice the price of a wireless set. Wages were around £4 a week. The radiogram was a heavy two-man lift with a superbly finished walnut cabinet and an automatic record player that dropped the stack of shellac records one at a time by thin steel fingers which moved in opposition. Heaven help you if a record with an enlarged centre hole or a thick rim was included in

the load. The mechanism, relentless as a modern dustcart, would reduce the disc to fragments. It would then get out of step, ruining some of the others. This was very distressing to lovers of classical music – a symphony would occupy up to five 12in. discs and albums were pressed as “automatic couplings”, arranged in sequence so that all you had to do was to turn the stack over and reload it at the end of the second movement. Fine until you broke the one in the middle and tried to obtain a replacement.

Ekco and Murphy introduced radio receivers with push-button armchair control of station selection and Bush had its famous “Bush Button” tuning (hands up those who remember those awful silver mica valves and Christopher Stone staring at you over a stylised spruce!).

Octal based valves reduced chassis dimensions and made multiple types, like triode-pentodes, a practicality. Mazda did its own thing by producing an incompatible octal base. Both series had an economy range for use with a dry-cell, 1.5V l.t. supply. As a result battery portables that no longer left you with one arm longer than the other after a hundred-yard hike to the beach were introduced. The valve “pinch” – the place where the wires left the glass – limited the h.f. performance of sets. As glass-metal seals were still not practical the pins were not taken straight through the glass, reducing inter-electrode capacity – the solution adopted instead was to make the control-grid connection via a top cap. So it was a struggle to maintain consistent performance up to 45MHz (Mc/s), the Ally Pally vision carrier frequency. This meant that there were not many fringe TV models around.

Beginning of Hi Fi

Television brought with it the beginnings of hi-fi. The BBC's music lines were engineered to be able to handle frequencies over 10kHz. But this good response was severely clobbered at the m.w. transmitter by band limiting and bass compression. There was no such restriction on TV sound, even though a.m. was used, so the Ally Pally sound transmitter was often used for symphony concerts and the like after viewing hours. You couldn't do it today, with line timebase derived supplies and intercarrier sound, but the pre-war TV sets with their huge mains-derived e.h.t. power supplies didn't seem to mind. Oddly enough most listeners concentrated on improving the bass rather than the treble performance. This wasn't easy since most speakers were mains energised, their magnetism being produced by a coil in the main h.t. supply. It doubled as a smoothing choke – an early example of cost-effective engineering.

The problem of getting better base from such an arrangement was solved by the “hum-bucking” coil. This consisted of a few turns of wire in series with the speech coil but mounted close to the smoothing choke winding and phased to neutralise any remanent 100Hz ripple. The astute amongst you will already have deduced that full-wave rectification was common practice.

Saturday Boy

How did I, a mere schoolboy, get to find all this out? I should have been concentrating on my school certificate exams. Although I aspired to a job in broadcasting I knew in advance that this was not to be, due to Reith's insistence on university degrees. Instead I ran my own radio station from the garden shed, inflicting my alternative programme on a captive family audience, and worked as a Saturday boy for a local dealer.

I picked up phrases such as “superhet theory” from the men there, adding them to my vocabulary with the predictable outcome that I was assumed to know more than I really did and was therefore given more interesting work. Trainees have done it on me in recent times, so nothing changes. I kept asking questions like “why 6.3V, 78 r.p.m. and 4ft 8½in.?” but never found out about the basic electronic parameters. The standard railway gauge was easier: it happens to be the width apart of Roman chariot wheels! So be of good heart any legionnaires stuck on Hadrian's Wall, hankering after leave in Londinium. Just straddle your wagon across the west coast main line and push: it's all downhill from Shap.

Stamps were a good revenue earner. Every record had one on it – as did all receipts over £2.

Outbreak of War

One day they tested the air raid sirens and we knew that “pre-war” was drawing to a close. It happened abruptly at 11 a.m. on Sunday September 3rd, 1939. Television had already pulled the plug – on a Disney cartoon – and all radio was amalgamated into a single Home Service, on a common wavelength to defeat attempts at direction finding. The contents of the *Radio Times* were halved and its price rose from 1d to 2d. Yours truly cashed in on the shortage of torch batteries for use in the blackout by splitting up grid-bias batteries into single cells and, while waiting to be called up, transferred his Saturday boy activities to the local Odeon projection room. I'm constantly reminded of this when I see children sitting on the floor watching TV from inches away. That's where the worst seats in the cinema were. Nothing changes much.

Service Bureau

SONY SLC6 Mk. 1

Every thirty seconds or so during playback there may be picture interference – like a tracking problem – but the sound isn't affected. Adjusting the tracking control doesn't remove the interference. Sometimes the fault is present when the machine is switched on and you can't get rid of it. At other times the fault doesn't occur.

This is quite a common problem with these machines. Find TP5 on board SS9 and connect a d.c.-coupled scope or a digital voltmeter to it. Then adjust the “cap free” preset for 5.5V d.c. while recording a broadcast signal.

HITACHI VT17

This machine has an intermittent clock fault. Despite the mains supply not being interrupted the clock reverts to 12.00 and flashes three or four times a day. This occurs both in the house and the workshop. The back-up batteries and the RC1795 10V back-up generator module have been replaced, but when the mains supply is interrupted the 10V back-up supply is not generated.

In this model the clock back-up is operational only when the timer switch is on, and then lasts for about five minutes. Your problem is usually caused by Q1795 overheating and going open-circuit. Replace it with a 2SD468 or 2SD882 supplied by Hitachi. Also replace the wire link marked K1788 (at pin 5 of module RC1795) with a 1N4148 diode, anode to pin 5, and fit an 0.022µF capacitor between pins 4 and 5 of RC1795.

VCR Clinic

Reports from Philip Blundell, AMIEE,
Eugene Trundle, Ed Rowland, Mick Dutton,
Hafidh Mahmood and Nick Beer

Philips VR6548

Over the past couple of months I've had two of these machines in with the same fault – failure to accept a cassette. The cassette lift is operated from the main deck via a complicated clutch arrangement and the locking lever appears to jam. Philips now supply a modification kit, part number 4822 214 32583. This seems to cure the problem.

P.B.

Blaupunkt RTV740

This machine was dead – at switch on just a click came from the power supply. Resistance checks across the power supply outputs showed that there was a short-circuit across the 45V line. Q1006 (2SC1384) was found to be short-circuit. When this was replaced the machine worked but the display, which should have been blanked, showed dimly. Zener diode D7503 (MA4068) on the timer board was short-circuit.

P.B.

Grundig VS340

Early versions of this model tend to produce black spaghetti after white when playing prerecorded tapes. The cure is to get an exchange panel from Grundig. It will have the following changes: C1406 220pF; L1406 will have two green and one blue paint spot; R1501 100k Ω ; a 560 Ω resistor will be added in series with C1420.

If you modify an early module the DOK control will need to be reset. Make a recording then play it back. Connect your scope to pin 16 of IC1430 and set the Y amplitude so that the waveform takes up six vertical divisions. Then adjust the DOK control so that the waveform occupies eight vertical divisions.

P.B.

Hitachi VT150

The problem with this machine was intermittent severe overloading in the record and E-E modes, with the picture crushed into white. As with the best intermittent faults it would lie dormant for long periods, fooling you into thinking that either you'd cured it or that it had gone away. At length we found that although the signal entering the HT4757A hybrid chip IC203 on the YC panel was o.k. in the fault condition it was much too large at pins 8 and 27. The chip itself was defective, with intermittent failure of the internal a.g.c. system.

E.T.

Mitsubishi HS347

Here's a new one for you – chewed tape due to failure of a crystal! From time to time crystal X6A0, the chroma reference crystal on the YC panel, would go open-circuit, deleting the colour and with it most of the urge of the drum and capstan motors – the crystal is also used as a servo reference. When the crystal stopped the head drum slowed, the capstan motor pulsed and, since the capstan motor powers the reel drive, a loop of crushed tape was left hanging from the front of the ejected cassette.

E.T.

Sharp VC9500/Rediffusion 620

Tape chewing is probably the most common offence committed by this range of models. The usual cause is the

reel idler. A less common cause is the reel drive motor. To our dismay replacement of both these items failed to cure the drive problem with this particular machine. Very little torque, insufficient to turn the take-up spool at all during play in fact, was the cause this time. It's very unusual for these machines to develop electronic faults, but failure of the 2SD882 reel motor load switching transistor Q7754 was the root cause of the problem. It had an open-circuit base-emitter junction.

E.T.

JVC HRD150

There was no response when the operate key was depressed though the clock display was present. The main power supply section was o.k. but the microcomputer chip IC601 had no 5V supply. This comes from the unswitched stabiliser transistor Q602 which in this case had zero voltage at its base and emitter. We expected the fault to be in zener diode D604 but in fact the parallel 22nF capacitor C605 was short-circuit.

E.T.

Philips VR6367/Tatung VHR8495 etc

The no-go symptom with this much-cloned range of models can be misleading. There's a little chopper power supply on panel 009, based on a BD436 switching transistor Tr7001 with catching diode D6006 and choke L5002. If there's no drive from pin 7 of the 7051-2A operational amplifier chip you might suspect this item. But change the BD436 first. This usually cures the problem.

E.T.

Samsung SI8220

This fairly new machine would sometimes fail to record the sound. The fact that it also failed to erase the sound when making new recordings indicated that the fault was in the bias oscillator circuit. Visual inspection around Q501 showed that one of its legs was dry-jointed. Resoldering cleared the fault.

E.R.

Sharp VC482H

"Not playing, damages tapes" said the ticket attached to this machine. So we changed the idler, loaded a cassette and pressed play. The tape threaded but there was no capstan rotation and the machine promptly switched off. We then discovered that the capstan had seized solid on its bearing. Good working order was restored by removing and cleaning the capstan and applying a tiny spot of oil.

E.R.

Toshiba V71B

In the play mode this machine would function normally for about half an hour from cold. It would then stop and unthread. Fast forward would fail shortly after this and the tape would be randomly ejected. The only mode then still working was rewind. Experience of this problem with other machines suggested that the carriage end sensors were probably faulty. We replaced them but the fault remained: so much for experience! As we didn't have a service manual our next step was to freeze the

TMP47465759 microcomputer chip IC601 while the machine was in the fault state. Immediately all functions reverted to normal. When a new chip had been obtained from Toshiba and fitted we'd yet another satisfied customer!
E.R.

Panasonic NV250/450

Cassette ejects instantly after being inserted is generally due to a worn out front loading motor belt. With one of these machines we then found that although the function display gave the appropriate indications there was no tape movement when functions other than play were selected. When play was selected the tape laced up but with no tape take-up the supply sensor triggered the syscon chip and the stop mode was entered. On occasions the machine worked perfectly. The cause of all this trouble was dry-joints on the AN3821K capstan drive chip. We've had this on several of these machines.
H.M.

Hitachi VT5000E

Here are a couple of faults we've had with these machines. The problem with the first one was that the playback mode picture was as if the machine was in the search mode (cue), with Mickey Mouse sound. Q505 was open-circuit collector-to-base. With the second machine the tape threaded but there was no take-up, after which it went into the stop mode. We noticed that the capstan motor didn't rotate after tape threading. D525 was open-circuit.
H.M.

Samsung SI7220

This fault was a little disconcerting. When a good recording was played back the picture was in black and white with severe distortion in the form of horizontal pulling – like hum. The fault cleared when the YC panel was lifted to make measurements, and I soon found that messing about with connector CN3201 could provoke and clear the symptom. The cause of the trouble was a high-resistance connection to pin 5, via which the playback f.m. from the head amplifier passes to the YC processing section. A cure was achieved by soldering the lead to the board. This step was necessary because Samsung tell us that they don't stock as spares any leads/looms/connectors, and this one couldn't be repaired successfully. We've had similar problems with other Samsung models, but nothing that can be noted as a stock fault.
N.B.

Ferguson FV31R

I'm not impressed by the mechanism in these machines. Extensive use is made of plastic components and this can lead to trouble. The initial problem with this one was that a cassette had stuck in it. It was the owner's fault – he'd stuck stickers all over the cassette rather than in only the specified positions. Our field engineer managed to extract the tape but then found that the mechanism was out of sync, something that afflicts these machines. Because of the design, in the event of even a small snarl-up there's a chain reaction of breakage in the rest of the mechanism. This machine required a new pair of loading rings and retiming.
N.B.

B and O VHS80

The mechanism and most of the electronics in this machine are the same as the Hitachi VT11. This one had come to us about eighteen months previously when it required the

usual belts and idler. It had also needed a new front flap escutcheon as the record button had disappeared inside. The controls are robust enough, so we thought it was a one-off failure. But here it was back again with the complaints that the button had once again broken and that it intermittently failed to lace. The customer admitted that the broken buttons were due to ham-fistedness, and having been in the trade he was able to give us a very accurate description of the lacing problem. This was just as well, as the fault wouldn't show up for us initially.

As the machine had obviously seen a lot of use I suspected that the loading belts were worn. When the fault did finally show up replacing them was the obvious course of action. One thing to remember is to get the similarly sized belts the right way round. I once spent ages looking for this intermittent fault only to find that another engineer had fitted the belts the wrong way round.

After we'd replaced the belts the machine performed faultlessly on soak test for several days. Then it started to play up again. The motor or mode switch were the next suspects. Voltage checks in the syscon circuit ruled out the mode switch, so a motor was ordered. Fitting this cured the fault – now all that remains is to replace that control flap again.
N.B.

Sony SLC9

Cassette lift problems with this machine are usually guaranteed to give me nightmares. This one was no exception. The customer had tried to remove a jammed cassette and in doing so had put everything out of sequence. I got the lift working after replacing the broken cogs, then the fun started. When I switched the machine on the rewind motor started to run then the eject light flashed. If a cassette was loaded manually it would thread and play, but when eject was pressed it would unthread but not unload. A cold check on the operation of all the switches failed to reveal anything amiss, but after a lot of searching the cause of the problem turned out to be the unthreading switch which had gone high-resistance. It's mounted alongside the loading rings.
M.D.

Sanyo VHR3100

The cassette lift would load half way then come part of the way back out again. After this the machine would shut down. If the tape was put into the stop position by hand, rewind and fast forward worked normally. But when play was selected the tape would load, the capstan would start to run very fast, then the tape would unlace and the machine would shut down. The voltages all seemed to be o.k. We then checked the mode switch by substitution. Next we suspected the system control microcomputer chip, but the fault was still present when a replacement had been fitted. In the end the cause of the fault turned out to be the LC7412 digital servo chip IC4001
M.D.

Mitsubishi HS306

The problem with this machine was very intermittent tuning drift. It would run all right for days with the top cover off. Heat and freezer had no effect. So we left a meter connected to the stabilised 30V line and covered the machine with a blanket. When the fault appeared the voltage dropped. Careful inspection of the 30V regulator on the main panel showed that there was some brown, foreign matter at the connections to D913 and D914. The problem didn't recur when this had been removed.
M.D.

R503 and R504 (both 150k Ω) and R516 (1.5 Ω , 1W). On very rare occasions you may find that the primary winding of transformer T101 has gone open-circuit. A further possibility is breaks in the print around the line output transformer.

Other Symptoms

Common causes of total loss of field scan are failure of C462 (0.068 μ F) or the UPC1378H field output chip IC402, or a badly soldered contact on the scan-coil assembly. A faulty chopper chip IC501 can cause cramping at the top of the picture – the only cure is to fit a replacement.

If the problem is intermittent or no colour, check for dry-joints at the 4.433619MHz crystal X601.

TEST CASE

337

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

TechnoCrat is not the happiest of souls. Indeed the rest of the workshop think of him as being the original MOS device, the initials standing for miserable old sod . . . Amongst the many things that make TC cantankerous is cold weather – and rarely can the workshop be brought up to 70° by the time he arrives at 8:30 a.m. So it was that, rubbing his legs and blowing into his hands, he settled down to the first job of the day, a Deccacolour set fitted with the 120 chassis. The problem was quite simple – it didn't work. So hopefully it wouldn't give him much trouble.

At switch-on the degaussing system buzzed and the power supply section appeared to be working. But there was no voltage at the collector of the BU500 line output transistor. It was soon discovered that the fusible resistor R430 in the h.t. feed to the line output stage had gone open-circuit – trouble in the line output stage then. TC clipped one lead of his ohmmeter to chassis and the other to the BU500's collector. There was no direct short-circuit, but the reading was lower than it should have been – especially with the power supply isolated as R430 was still open-circuit. Sure enough the BU500 was leaky.

TechnoCrat fitted a new transistor and restored R430. When he switched the set on however he was dismayed to find that it still didn't work. Clicks and ticking noises indicated that there was some form of life in the line output stage, but there was no e.h.t. and the c.r.t.'s heaters didn't glow. As he advanced a voltmeter probe to the collector of the newly fitted transistor TC found that his investigations were cut short by the failure once more of R430. He switched off and felt it. He wasn't cheered by its heat. Indeed with a burnt finger he was even more demoralised.

Real Technician commented that tripler failure was a common cause of this sort of thing. To prove the point, just disconnect it from the line output transformer. TC did so and attended to the now cool R430. But still no joy: the situation was much the same as before, and the anticipated corona discharge failed to appear at the line output transformer's tripler connection. All this suggested that the

The plugs that connect the teletext panel to the main PCB can work loose. The result of this is a mixed jumble of unsynchronised colour on the screen.

The 2SC4217 RGB output transistors Q801/2/3 are mounted on the c.r.t. base panel. They can become leaky, causing grey-scale drift.

Summary

Apart from their appetite for chopper chips these sets have proved to be fairly reliable. As most of them are now out of their guarantee period the prospects are that you'll see more of them. Hopefully you'll find the comments in this article of help, especially if you are not too familiar with these sets.

line output transformer was at fault, though TC took the precaution of checking the new BU500 – it had obviously taken a pounding during its short life to date. Tests showed that it had stood up to the situation so far, though R430 was getting tired. Between them, TC and RT decided that the best thing to do was to replace R430 and the line output transformer. When tested on TC's wonder-machine the latter brought on a red LED, thus confirming its guilt. It looked a bit faded and weary as well.

Did we have a 120 line output transformer and the right sort of fusible resistor in the stores? There was a new transformer, but the safety resistor had to be obtained from a scrap chassis of the same type – found lying in the basement graveyard. After installing them and reconnecting the tripler TC was all ready to go. But the set wasn't. There was still life in its line output stage and the new R430 was beginning to heat up – more than could be said for TechnoCrat, especially after his chilly visit to the scrap sets down below.

The cause of the trouble wasn't far away from the scene of TC's tests to date. Any ideas? See next month for the answer.

ANSWER TO TEST CASE 336 – page 128 last month –

What could cause poor carrier-to-noise ratio in a satellite TV system when the dish is correctly aligned and the LNB, the cable and the receiver have all been checked by substitution? This was the sixty-four thousand dollar question that confronted us last month.

The cause of the problem, discovered by looking at the profile of the dish from below, was that it was bent! In transit or during installation the aluminium parabola had become distorted. This had been unnoticed – except of course for its effect on the pictures. The effect of the distortion was to scatter the reflected signals to some degree instead of focusing and concentrating them all in phase at the LNB feedhorn. Hence the low signal strength. When a replacement dish had been fitted Mr. Judge at last got the picture quality he'd paid for, using the original LNB and receiver.

What to do with the warped dish? The manufacturer would certainly not entertain a claim, especially in view of the more than adequate transit packaging provided in this case. What we did was to make a wooden cross with which to check the truth of the plane of the dish's periphery. This showed the angle and amount of warp that had occurred. With the aid of this strange plywood alignment jig we heaved on the dish and got it straightened up. Subsequent comparison tests showed that full again has been restored! We can't sell the compromised dish as new, but it'll find a use.

CD-I Update

George Cole

There have been a number of developments since I last reported on the Compact Disc Interactive (CD-I) format in the August 1990 issue. CD-I is a multimedia version of the familiar compact disc, the CD-I discs storing a mix of sound, video, text, data and graphics. CD-I discs are interactive, allowing the user to control what he sees and hears. Domestic CD-I players are due to be released in the USA and Japan in 1991 and in Europe the following year.

I recently had the opportunity to visit the studio complex of Philips Interactive Media System (PIMS) in Dorking to see CD-I in action. The studio commenced operation last summer and is involved in all aspects of optical publishing, including CD-ROM (compact disc read-only memory), CD-ROM-XA (with extended architecture) and interactive Laserdiscs. Although the Laserdisc format has been withdrawn as a domestic system it's used by a number of educational establishments and businesses.

PIMS is putting most of its efforts into CD-I. The studio offers a complete CD-I production service – from the initial back-of-an-envelope idea to the finished disc as one PIMS employee put it.

Sixty people work at the complex at present, fifteen of whom are CD-I programmers. PIMS plans to increase the number of programmers to 21 shortly. Each programmer has a Sun Sparcstation computer and a CD-I authoring system. Around 15-16 Gbytes of data flow around the studio, so elaborate back-up systems are used. For archiving all data is saved on Video-8 cassettes, each one storing about 2Gbytes of data. A giant Chloride EDP400 battery is kept in the computer room: in the event of a power failure it can keep the whole system running for fifteen minutes – if most of the system is shut down the battery will keep the main computers going for about an hour and a half.

Since CD-I is a digital system most of the information has to be processed. Nearly all the graphics and video information is prepared in the production room, which has facilities for creating complex graphics and digitising still photographs and moving images. The complex also has a comprehensive sound studio to prepare the audio tracks. A Yamaha CD-R system can be used to make test pressings and for low-volume production runs – the Dorking studio isn't involved in large-scale disc manufacture.

Two new professional players have recently been introduced to supersede the previous three-module system. The CDI601 and CDI602 provide digital video and audio processing, with the video in RGB, Y/C or composite form for PAL or NTSC receivers. The 602 incorporates a 3.5in floppy disc drive.

Full-screen Action

Another development is full-screen, full-motion video (FSFMV), which is an extension of the original CD-I standard known as the Green Book. Domestic CD-I players will contain FSFMV chips which are being produced by Motorola. The discs will be able to store around 72 minutes of digitally-compressed moving video. An FSFMV chip set consists of a digital signal processing (DSP) chip to expand the video and 0.5Mbytes of extra

memory reserved for FSFMV. The chips work in conjunction with the main video-audio processor in the CD-I player. PIMS claims that this arrangement makes it very easy to incorporate FSFMV because a CD-I display is composed of four separate planes, the back one currently being unused. This is where the FSFMV will go. The video will be displayed as a normal full-sized picture or viewed through screen cut-outs known as windows. PIMS hopes that sample chip sets will be available in early 1991. Although the FSFMV chips will increase player production costs PIMS says that the increase will not be passed on to consumers.

Extra Recordings

Another interesting development is a CD-I format modification that enables additional recordings to be made on write-once discs – these are blank compact discs on which data can be written. Before the modification recording could be done only once because all compact discs must contain a table of contents (TOC) that gives the player time and track information. The TOC can't be rewritten, so any additional data would not be listed and would be ignored by the CD-I player. The modification came about as a result of the Kodak Photo-CD system which is based on the CD-I format and allows users to store up to a hundred photographs on a compact disc.

One of the features of the Photo-CD system is that additional photographs can be stored on a partly-filled disc. This is possible because Photo-CD and CD-I players contain new control software to enable them to look for tracks not listed in the TOC. A normal CD player reads the TOC and plays tracks listed in it as requested. A CD-I player will read the TOC then look beyond the last track to see if any extra tracks have been added. The modification is known as an extension of the CD-ROM-XA Mode 2 standard, and will be added to the Orange Book standard that covers recordable disc systems.

New Audio Mode

The Cambridge computer company Next Technology has developed a new CD-I audio mode that may become part of the CD-I standard. At present CD-I has four audio modes that range from PCM, which uses a 44.1kHz sampling rate and gives an hour of CD-quality sound, to ADPCM C which uses a sampling rate of 18.9kHz and gives over nineteen hours of a.m. quality sound. The ADPCM D mode proposed by Next has a sampling rate of 2.5kHz, giving forty hours of speech-quality sound. I've heard it and found the sound acceptable.

PIMS' reaction to ADPCM D has been one of interest rather than excitement however. Their feeling is that CD-I's current maximum playing time of nineteen hours is probably long enough for most applications and that if all you want is forty hours of audio it would be cheaper to use two discs. The main objection to ADPCM D is that it would not be part of the CD-I standard and would therefore be incompatible with current CD-I decks. As CD-I is not due to be launched for another year however there may still be time to incorporate ADPCM D in consumer players. The CDI601 and CDI602 professional players are retrofitable for FSFMV and presumably the same could be done for ADPCM D.

PIMS has high hopes for the CD-I system. If Philips' marketing people can match the enthusiasm and commitment I saw at Dorking CD-I should be a major success.

The MCES LNB Repair Service

Steve Beeching, T.Eng.

During a visit to MCES I was interested to see their LNB test jig. It has been set up at a cost of a hundred and fifty thousand pounds to enable MCES to provide an LNB repair and alignment service.

The LNB Test Jig

Fig. 1 shows a block diagram of the test jig. The main item is a Hewlett-Packard programmable microwave sweep generator – programmable refers to its ability to store up to ten preset sweeps, each with up to five marker frequencies. The minimum sweep start frequency is 2GHz, the maximum being 20GHz. A typical sweep programme for a satellite TV LNB would cover 10.95-11.5GHz with markers at the Astra transponder frequencies of 11.214GHz (Screensport), 11.318GHz (Sky-1) and 11.436GHz (Sky Movies). A second programme may cover the same sweep range but with markers at different transponder frequencies.

For alignment, the generator produces a single, precise spot frequency. If the spot frequency is 11GHz and the LNB's local oscillator frequency is 10GHz, the down-converted output should be 1GHz. This can be checked using a frequency counter, enabling the local oscillator to be set to 10GHz precisely.

The output from the microwave sweep generator, in either of the two forms mentioned above, can be routed to either of two waveguides via a special microwave relay. One waveguide ends in a flange that matches the standard LNB supplied by Grundig, Micro-X or Maspro, the other one ending with a flange that matches the Amstrad/Marconi type LNB. An ingenious device called a handle rotates the whole waveguide to enable the polarity of the signal to be altered by 90° for vertical/horizontal switching: this has to be seen to be believed!

The LNB's output is routed via a detector circuit to the input of the sweep generator's display: this display is similar to that provided by a slow-scan storage oscilloscope – it displays the sweep until the next scan, which is several seconds later.

In Use

In use the microwave sweep output level can be varied between 7dBm and -75dBm. A level of -60dBm has been found to be suitable for feeding to LNBs via the waveguides. If the level is increased to -55dBm there's a tendency for gain compression and saturation.

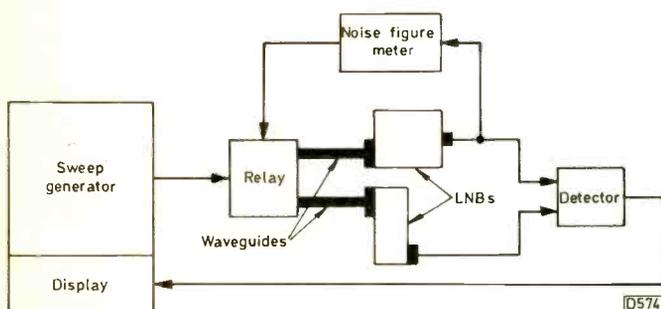


Fig. 1: Block diagram of the MCES LNB test jig.

A dual RS/Thurlby power unit provides a variable supply to suit various types of LNB, also catering for the polarity switching requirements – either voltage level for the Marconi type or separate current drives for ferrite types.

Measuring Noise Figure

The test jig also incorporates a noise figure meter. This generates a known standard noise reference signal which is fed to the LNB under test via the relay and waveguide. The LNB's i.f. output is routed back to the meter's input. By subtracting the original known noise reference level from the LNB's output the noise contributed by the LNB can be determined and displayed. The noise figure meter's output can also be programmed as a spot frequency. This enables the meter's triple digital display to show the i.f. output, gain and noise figure. Typical figures might be 1.436GHz i.f., 55.88dB gain and 1.39dB noise figure. Add the local oscillator frequency to the i.f. and you get the spot frequency, e.g. 11.436GHz.

A high degree of accuracy is achieved by monitoring the temperature of the waveguides and entering the result into the noise figure metre to provide a compensated readout.

Wideband Operation

The sweep I saw showed that LNBs, particularly the lower-cost ones, are wideband devices. This makes me wonder whether there may be co-channel problems when further Astra satellites come into operation, providing 48 channels from the same orbital position. I suppose that it will all depend on the design of the receiver circuitry – how wideband the cheaper ones are.

Gain Variation

Another thing I noted was that the gain variation of my Grundig LNB over the passband could be 3-4dB. Other types of LNB had similar characteristics. I'm not sure whether an LNB with a nominal gain of 55dB would be regarded as being within specification if it produced a dip of 5dB at a transponder frequency. For example, a gain of 50dB on say Eurosport compared to 55dB on Sky Movies would surely reduce the Eurosport rain margin below an acceptable level with a small dish – or even a larger one in Devon or Scotland. This is a personal view. Others may have similar suspicions.

MCES Details

The Hewlett-Packard test equipment used by MCES is to military specification. The company has gone to the same trouble that it did with its video head alignment jigs to ensure that precise results are obtained.

MCES is at 15 Lostock Road, Davyhulme, Manchester M31 1SU, telephone 061 746 8037. At the present time MCES specialises in LNBs of Marconi manufacture, with a throughput of 500 a week. A double sealing system is employed and only Marconi supplied spares are used. Other LNBs cannot at present be accepted.

Servicing Salora CTV Receivers

Nick Beer and Ian Bowden

In an earlier article (February 1990) we described the circuit arrangements used in the Salora K and L chassis and the Ipsalo-3 chopper/line output circuit. The present article deals with enabling.

Introduction

The purpose of enabling is to set up a receiver's features and capabilities. You start by dialling a password from the remote control handset. The sequence is P, *, 0, # followed within 1.5 seconds by →M. Depending on the chassis (K30 series, K70 series, small-screen L series and large-screen L series) you will then get a service mode display in the channel LED window. With basic models the left-hand of the two LED displays shows "0" for the option mode. With others that have more than one option byte the left-hand digit shows the option byte number in bars while the right-hand digit shows the status of the eight bits comprising the byte. These bits are displayed by using the seven segments of the LED and the dot at the side. Each bit is a one if lit, a zero if not lit. To switch them on or off you simply press the handset number key that corresponds to the bit you wish to toggle. To store settings you press →M and, with the 15L30/7, you switch to standby.

Should the customer enter the password and start to muck about he could really come a cropper! We've had a lot of K series sets with memory failure, where the enabling and tuning memory are lost, producing some weird effects. With the time restriction on pressing the password it's unlikely that a customer will stumble upon the service mode – in fact some engineers have difficulty getting the password in quickly enough. If P is pressed and you don't complete the sequence in time the set reverts to the tuning mode.

Large-screen L Series

We'll start with large-screen L series sets. There are several option bits to be set. After entering the password, check the information with reference to the bit list below. Fig. 1 shows the bit numbering. Each bit can be on or off, represented by the relevant segment being lit (on) or not lit (off). Alter the bits by pressing the appropriate number button on the remote control handset. When this is completed memorise by pressing →M.

Option bit 0 (the full stop): Set to 1 for customer use.

Option bit 1: This is for operating an NTSC module. Set to 0 for UK use.

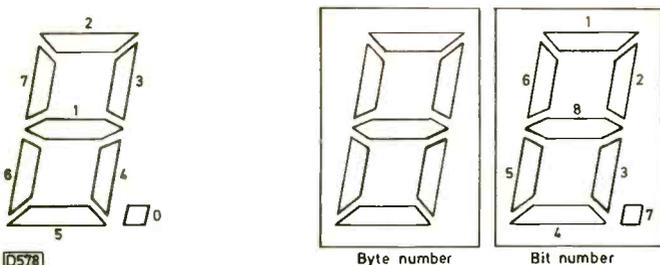


Fig. 1 (left): Option display, large-screen L chassis.

Fig. 2 (right): Small-screen L chassis enabling display.

Option bit 2: For operating system I. Set to 0 for UK use.

Option bit 3: Stereo on/off. Set to 1 with stereo sets, otherwise set to 0.

Option bit 4: Receivable bands. Set to 1 for UK use.

Option bit 5: VCR control. Set to 0 for Sanyo machines, to 1 for Hitachi or Mitsubishi machines.

Option bit 6: Receivable bands – with a CATV tuner set to 1, otherwise to 0.

Option bit 7: Type of teletext decoder. Set to 1 for Mullard, 0 for ITT.

Small-screen L Series

To enter the service mode with remote-control small-screen L series sets you temporarily short-circuit pins 15 and 23 of the SAA1250 remote control transmitter chip as the required code cannot normally be generated by the handset. The set's display will then show CH in the LED windows. Short-circuit pins 15 and 23 twice and the display will be OP. This is the mode for reprogramming after chip replacement. Short-circuit pins 15 and 23 three times and you are in the option select mode. There are four bytes and you start at byte one, as will be shown to the left of the display. This byte determines the receiver's features, the right-hand display showing the bits within each byte. Fig. 2 shows the numbering. We'll take the bytes in turn, starting with byte one.

Option bit 1: Standards selection. Set to 1 for UK use.

Option bit 2: Standards selection. Set to 0 for UK use.

Option bit 3: 29 or 39 memory locations. Set to 0 for UK use.

Option bit 4: Programme number stepping. Set to 0 (no stepping) for UK use.

Option bit 5: Not defined. Set to 0.

Option bit 6: Not defined. Set to 0.

Option bit 7: Teletext interface on/off. Set to 1 for teletext, to 0 for no text.

Option bit 8: A/V input use. Set to 1.

Short-circuiting pins 15 and 23 of the SAA1250 chip once more moves us to byte two, indicated in the left-hand display.

Option bit 1: Volume normalisation on/off. Set to 0 for UK use.

Option bit 2: Normalised or previous analogue settings after switching from standby. Set to 1 (previous settings) for UK use.

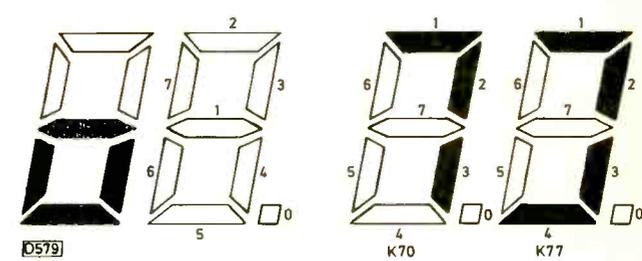


Fig. 3 (left): Enable word display, K30/37 chassis.

Fig. 4 (right): K70/77 series enable word displays.

- Option bit 3: Does bandswitch key display and switch bands? Set to 1 for UK use.
- Option bit 4: Muting after channel change. Set to 0 for UK use.
- Option bit 5: Only muting on channel change. Set to 0 for UK use.
- Option bit 6: As bit 5 – set to 0 for UK.
- Option bit 7: VCR output state. Set to 0 (high) for UK use.
- Option bit 8: Meaning of dot in right-hand display. Set to 0 (teletext mode) for UK use.

Short-circuit pins 15 and 23 of the SAA1250 chip again for byte three which is concerned with tuning.

- Option bit 1: V.H.F./U.H.F. tuning. Set to 1 for UK use.
- Option bit 2: As bit 1 but set to 0 for UK use.
- Option bit 3: Storing sequence. Set to 0 for UK use.
- Option bit 4: Handset search fast/slow. Set to 0 for UK use.
- Option bit 5: One- or three-band reception. Set to 0 for UK.
- Option bit 6: A.F.C. on/off during search. Set to 0 for UK use.
- Option bit 7: Undefined. Set to 0.
- Option bit 8: Undefined. Set to 0.

Applying the short-circuit again gives byte four which defines the functions of the various keys.

- Option bit 1: Key version A or B. Set to 0 for UK use.
- Option bits 2-4: Undefined. Set to 0.
- Option bit 5: Text commands version A or B. Set to 0 for UK use.
- Option bits 6-8: Undefined. Set to 0.

If any of the enabling is incorrect the set won't function properly and various odd faults can occur. Store all information by pressing →M and switching to standby.

L1 Series

The later L1 series chassis has a different microcomputer chip and the enabling is different.

K30/37 Series

The K30/37 series has only one option byte. After pressing P, *, 0, # and →M the display is as shown in Fig. 3. The zero on the left indicates the option mode while the right-hand digit shows the condition of the option bits. They should all be set to 0.

K70/77 Series

The correct enable words for the K70/77 series chassis are shown in Fig. 4. Carry out enabling in the same way as with the earlier J chassis. For details refer to page 104 of the December 1989 issue.

Summary

In all sets re-enabling is necessary when a microcomputer or memory chip is replaced.

A summary of various faults experienced with the K and L chassis will follow in a further article (see also page 275, February 1990) after which we will be providing some notes on the M series chassis.

next month in

TELEVISION

● TOSHIBA'S VHS MACHINES

After its Beta period Toshiba released a lengthy series of VHS machines that sold well. Next month John Coombes provides a quick guide to common faults, and one or two less common ones, experienced with the V55, V57, V65, V66, V71, V73, V81 and V83.

● THE DAT FORMAT

The service engineer needs to be familiar with an ever increasing number of formats and systems. A major one now gaining ground is digital audio tape (DAT), which is based on the rotating-head technology originally devised for VCR use. Although primarily an audio format DAT does have video applications. For example DAT has been designed to store high-quality still video images with sound, a digital still video format has been developed and Aiwa plans to market an analogue-to-digital converter to enable its DAT recorder to store still images from various video sources including TV broadcasts. George Cole describes the principles and provides a detailed guide to the format's specification.

● RC HANDSET CHECKER

Complaints about remote control failure are common. The problem is that the cause could be in the handset or the TV set/VCR it controls. A handset checker soon gives you the answer. Colin Birch provides a cheap and simple design that can be built from bits and pieces in the "odd bits" box.

● THE SALORA K AND L CHASSIS

Following this month's article on the enabling systems used in these chassis Nick Beer and Ian Bowden provide a detailed faults guide.

● FIFTY YEARS IN RADIO/TV

In the next instalment of his series Harold Peters describes war-time developments – much that was done had relevance to TV technology – and that strange early post-war period when TV was so slow to catch on. There was much to learn and to do, as service engineers were more involved in aligning and modifying sets than they are today.

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Long-distance Television

Roger Bunney

Long-distance reception remained surprisingly good despite the arrival of the dark November evenings. As usual the maximum usable frequency started to rise in October, and we've had reports of F2 layer reception in the lower part of Band I from stations in the Gulf and in distant parts of the USSR. Sporadic E propagation has been better than usual for the time of year and a sprinkling of tropospheric reception added to the cheer.

There were two tropospheric openings during October. A minor lift over the 10-13th produced signals from West Germany, Denmark and the Benelux countries in much of central and south east England, mainly at u.h.f. The second event on the 22nd extending into the 23rd was much more intense, giving Band III and u.h.f. reception across much of the UK from Poland (ch. R30), East and West Germany, Denmark and Scandinavia. Many French and Benelux stations were also received.

The SpE log for the month is as follows:

- 3/10/90 TVE (Spain) ch. E3.
- 4/10/90 RAI (Italy) IB.
- 6/10/90 TVE E2, 3, 4; RAI IA.
- 10/10/90 +PTT (Switzerland) E2, 3.
- 11/10/90 RAI IA; TVA (Italian private station) IA; +PTT E2, 3; TVE E2, 3, 4.
- 13/10/90 TVE E2, 3.
- 14/10/90 TSS (USSR) R1; YLE (Finland) E3.
- 16/10/90 JRT (Yugoslavia/HTV) E3; TSS R1.
- 17/10/90 TSS R1; RAI IB.
- 20/10/90 RTE (Eire) ch. B; TVE E2, 3, 4; NRK E2; TSS R1, 2.
- 22/10/90 TVE E2, 4.
- 28/10/90 JRT E3; RAI IA; TDF (France) L2; +PTT E4; TVE E3.
- 29/10/90 TVE E2, 3; DR (Denmark) E3; TDF L3.
- 30/10/90 RAI IA.
- 31/10/90 RAI IA, B; JRT E3, 4; CST (Czechoslovakia) R1; TDF L2; DR E3; MTV (Hungary) R1; +PTT E2; ARD (West Germany) E2; YLE E3; SVT (Sweden) E2; RUV (Iceland) E4; TSS R1, 2.

The F2 situation looks less promising than last year though there could well be some excitement. As the peak of Solar Cycle 22 has passed, activity will be more sustained instead of rising to a rapid peak. The maximum occurred in July 1989, though increased activity is expected

next April. The rise from minimum to maximum was the fastest ever recorded. Here's the F2 log:

- 17/10/90 The m.u.f. (monitored on a scanner) reached 46.2MHz. Weak R1 vision was just visible from the east.
- 20/10/90 Iran ch. E2 FUBK test pattern plus unidentified programme.
- 23/10/90 Iran E2; Dubai E2 with teletext; possibly ZTV (Zimbabwe) E2.
- 24/10/90 Iran E2; Dubai E2 colour bars plus programme, very strong at 1300; ZTV E2.
- 26/10/90 Weak Dubai E2 test pattern.
- 27/10/90 Weak Australian ch. A0 received by Simon Hamer at 0740 GMT; unidentified weak E2 and R1 signals a.m.; E2, 3 programmes at 1200.
- 30/10/90 Very weak E2 signals a.m.

Overall it was an active month considering the time of year. Look for F2 signals from the east from about 0800 to lunchtime, from the Gulf from about 1000 and from the south from noon. Transequatorial skip signals will be received most evenings: monitor ch. E2 towards the south from 1800 – check ch. E3 if E2 signals are present.

1991 Meteor Shower dates will be listed next month. Look out for the Quadrantids shower from January 1-6th, peaking on the 4th at 0300 GMT.

Finally, an unusual point from Robert Copeman in Australia. A Melbourne estate agent is using a system called "talking houses"! Low-power 99.9MHz transmitters operate in houses for sale, giving details that can be received by clients within range on a personal radio.

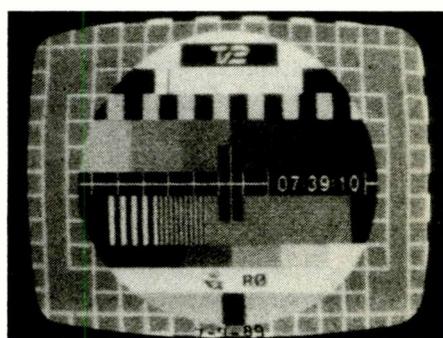
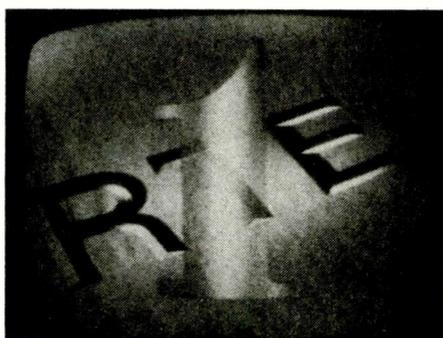
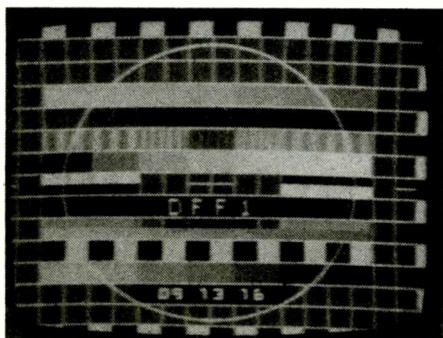
A correction: Ale Italia Canal Otto Video, which was seen frequently during the past SpE season, operates on ch. IB, not IA.

My thanks to the following for sending in reception reports: Simon Hamer (Powys), Roger Fussell (Torpoint), Bill Cotterill (Tipton), Tim Anderson (St. Leonards), Cyril Willis (King's Lynn), David Glenday (Arbroath) and Iain Menzies (Aberdeen).

News Items

Czechoslovakia: A third network financed by advertising is being established. Foreign investors will be able to own up to 49 per cent. Some of the transmitters formerly used to relay TSS-1 to Russian troops are being used. The first network is national and the second network is a split between services for the Czech and Slovak regions. Test pattern identifications are now F1 (first programme), CTV (second programme) and OK3 (third programme).

Channel Islands: The new UK Broadcasting Bill enables Jersey and Guernsey to establish commercial f.m. radio stations. Frequency allocations have been applied for by the States.



Left: Soon to be a collectors' item, the East German pattern received by Garry Smith in Derby via tropospheric propagation on ch. E12. Centre: RTE-1 (Eire) identification received from Sligo by Ryn Muntjewerff in Holland on ch. 1G. Right: Denmark TV2 (Bornholm) PM5534 test pattern received by Ryn Muntjewerff in Holland.

Portugal: Two nationwide commercial networks are to be established. A decision on bids will be made by March.

Thailand: The Bangkok Entertainment Company, which runs the channel 3 system, is to establish a nationwide network with nine further transmitters, making 32 in all. A mystery "3" logo was once received in the UK and was thought to have originated from Thailand.

Spain: TVE is testing Nicam via its Madrid and Barcelona transmitters. An additional carrier is being used to provide up to four languages or Spanish dialects in all.

Nicam: An increasing number of Swedish Kanal 1 and TV2 transmitters are using Nicam. The Belgian Schoten (E62) and Egen (E46) transmitters are also using Nicam. All Danish transmitters are to be equipped for Nicam.

Switzerland: Jean-Louis Dubler writes that he has been viewing the HD-MAC (1,250 lines, 16:9 aspect ratio) test transmissions of the German DBP via the TV-SAT 2 and TDF-1 satellites.

Chile: The first commercial TV station (channel 9) has gone on air in Santiago. Coverage is to be extended nationwide.

Gibraltar: George Gaskin reports that Algeciras TV continues to operate from an unknown location. The station's director hopes to gain a licence by 1992.

Satellite TV

ARD, Tele 5, CNN, Disney, Discovery, Super Channel and a Sky arts channel have booked transponders on the Astra 1B satellite which is expected to be in operation this February following a December launch.

In the USA CNN is expanding its SNG (satellite news gathering) coverage with a further three Ku band transponders on the Gstar IV craft. This is in addition to the three Gstar II transponders used.

The Eutelsat II F1 craft at 13° east is now fully operational. Up to 23 TV channels can be handled, the high-power Wideband and Superbeam footprints covering much of Europe. High-quality reception is possible with 80cm dishes. Eutelsat I F4 has moved to 7° east, relieving I F2 which is being moved to a new slot at 4° east.

Intelsat VI F4 is now in operation at 27.5° west, providing improved signal levels across Europe. The EBU news feed via the 11.47GHz vertical transponder is now a consistent signal with reduced sparklies.

1991 World Satellite Almanac

The annual *World Satellite Almanac* is well-known in satellite circles for its accurate information. Mark Long has once again provided an updated reference source. Don't pulp your previous almanacs though - these annual publications are designed to complement one another. The 1991 volume seems to be more massive than ever, with 600 7½ by 9½in. pages in a soft card cover format.

This year the various sections are printed on different coloured paper to make access to specific information easier. Sections include detailed information on Intelsat/Eutelsat, covering present and future plans; details of all satellites currently in or projected for synchronous orbit, their transponder/footprint/EIRP data etc.; who is using what, when and for which purpose; encryption standards; the present European situation; the future of C Band in the USA; space launchers; SNG operation; and extensive indexing. Each satellite operational in the three ITU regions is fully covered. The final section includes a "loading" profile that specifies each satellite, what it carries and transponder use. Though prepared in the USA this is a truly international publication. I have this and the earlier editions and consider them essential reading and

AERIAL TECHNIQUES



THOMSON/NORDMENDE GALAXY 25

- 10" Picture tube with 78° deflection and smoked screen filter.
- F10 Chassis with PAL/SECAM compatibility, together with 5.5, 6.0 and 6.5 MHz auto sound switching, enables this set to be used in FRANCE, UK and all of Western Europe.
- 12/24V or 240/220V operation from mains or battery.
- 39 Programme storage tuning.
- Full function remote control.
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TV Fault Finding

Reports from Philip Blundell, AMIEE,
John C. Priest, Ed Rowland, Ian Bowden,
Stephen Leatherbarrow, Steve Cannon,
John Hopkins and Mike Leach

Philips CTX-E Chassis

This one had no sound or vision, although the e.h.t. was present. A flat memory battery was the first suspect but it wasn't the cause this time. When the first anode control on the tube base panel was turned up a small raster appeared. A check showed that the supply to the line output stage was low. When the set h.t. control was turned past the half way point the voltage fell! R3327 (120k Ω) was open-circuit. **P.B.**

Pye 25KX1201/05R

Intermittent field collapse was the trouble with this set. Open-circuits in the earth lines are a common problem with this chassis. But when the fault was present there was no voltage difference between the field earth and the power supply earth, so an open-circuit here wasn't responsible. When the fault next appeared I'd time to check the voltages at most of the pins of the field output chip. The voltage at pin 20 had disappeared because C582 (0.01 μ F) was going short-circuit intermittently. **P.B.**

Philips 2A Chassis

This set was dead with no h.t. from the power supply. There appeared to be no starting voltage at the base of the BUT11AF chopper transistor. All the components in the feed checked out o.k. however and nothing seemed to be holding the voltage down. No shorts could be found across the power supply outputs. Luckily I checked the standby thyristor 6727 which was short-circuit. A new BT151 brought the set to life but I refitted the faulty one in order to be sure that I wasn't being fooled – it shouldn't have shut down the power supply completely. It does though! Mark your circuit diagram accordingly. **P.B.**

Philips K30 Chassis

Intermittent tripping is a common problem with these sets – it's often due to a loose Aquadag c.r.t. earthing braid because the plastic retaining clips have broken. I usually fit the braid back in place using a tie-wrap. **P.B.**

Decca/Tatung 190/195 Chassis

One of the most common problems with sets that use these chassis, the Decca 8955 for example, is the membrane switch on the RC90 remote control handset and the front control panel. Come back ZX81, all is forgiven: even Uncle Clive would disown these!

Various problems occur with the remote control unit – no output, continuous output (until the batteries run down), loss of some functions, etc. Apart from occasional total failure due to the 455kHz ceramic resonator XL790 all the faults we've had have been caused by a defective switch membrane. It's easy to remove by peeling up from one corner. Fit the replacement by sticking it down – it has a self-adhesive backing. The PCB has a strip connector into which the tail of the membrane is plugged. The battery cover latches also break off with depressing regularity.

If a customer complains that the set always reverts to a particular channel at switch on (usually channel 8 for some

reason) and cannot be shifted the remote control unit is probably transmitting permanently. Remove the batteries to prove the point. If this doesn't cure the problem turn your attention to the set's front control panel. Unplug it from the main board (ribbon cable to SK701). This should restore normal operation via the remote control unit. If so, replace the panel's membrane switch in a similar manner to the remote control unit switch. The section of the front moulding (carrier membrane) that holds the switch can be removed by taking out two screws from inside the cabinet front panel and releasing two plastic catches. This makes it quite easy to peel off the old switch and withdraw the end of the printed connector through the slot provided. Remember to note which way round the ribbon connector fits on the end – reversing it when fitting the new switch is easy to do and gives no operation.

Removing a faulty front control membrane and disconnecting it from the panel restores operation of the set via the remote control unit but doesn't restore those functions that operate only from the front panel – tuning, memory store, analogue settings, etc. If it's necessary to leave the customer with a working set while a new switch membrane is obtained, tuning and analogue settings can be made by linking appropriate pairs of pins on the chassis plug SK701 to obtain the correct levels. Table 1 shows how this is done. For example, linking pins 2 and 3 tunes up through the u.h.f. band while linking pins 2 and 5 stores the tuning point in the memory.

Part numbers are as follows:

Front panel membrane switch	83-3010-7/40110
Remote control membrane switch	83-2813-7/40110
Ceramic resonator XL790	15-7630-3
Battery cover	83-2810-0/29800
Alternative front panel switch used on earlier models	83-2807-2/40110

J.C.P.

Logik 4298 (Ferguson TX100 Chassis)

We had two of these sets in on the same day, both with the same fault. In each case D15 (BY299) in the power supply had gone short-circuit, giving the dead set symptom. The first repair was straightforward, but after we'd replaced the faulty diode in the second set we switched on to find that the field scan was badly distorted. The TDA3651 field output chip had to be replaced. **E.R.**

ITT CP332 (CVC40 Chassis)

This set would come on initially but would then shut down intermittently. After wasting quite a lot of time checking for dry-joints we eventually traced the cause of the trouble

Table 1: SK701 links, Tatung 190/195 chassis.

Pin	2	3	4	5	6	7
1	Vol+	Con+	Con-	Col+	Vol-	Co
2	-	Tun+	Bri+	Mem	Ch 4	Ch 7
3	-	-	Ch 2	Tun-	Ch 0	Ch 9
4	-	-	-	Ch 1	Ch 6	Bri-
5	-	-	-	-	Ch 5	Ch 8
6	-	-	-	-	-	Ch 3

to a loose bolt on the BU208A line output transistor. This bolt is used as a means of supplying h.t. to the collector, and was occasionally losing contact.

The problem with another of these portables was field collapse. The 1k Ω field hold control R2003 had gone open-circuit. **E.R.**

Panasonic TC2201

The trouble with this set was intermittent field collapse. Resoldering the legs of transistors 454 and 455 provided a complete cure. **E.R.**

Ferguson SRA1S

This receiver had an intermittent fault that produced two white horizontal noise bars. They drifted through the picture vertically, but were present on the horizontally polarised channels only. A scope check on the LNB's 18V supply showed that there were 3V dips. The d.c. output from the bridge rectifier BR3 was then found to be very ripply. When the PCB was removed from the case we discovered that there was a tiny crack in the print between the 2,200 μ F reservoir capacitor and the bridge rectifier. Normal operation was restored when this had been repaired. **I.B.**

Sony KV21XRTU

The customer complained of a poor picture that sometimes reverted to monochrome. We ran the set for several days in the workshop before the fault appeared. As the tuning had shifted slightly there was a ringing picture. We discovered that switching the a.f.c. on made no difference and that when the sweep tuning was started it didn't stop when a channel was found. So checks were made around the a.f.c. detector chip IC102 on the i.f. panel. A dry-joint was spotted at one end of the detector coil L105: when this had been resoldered the set worked perfectly. **I.B.**

Nikkai/Contec Portable CTVs

These sets usually employ a thyristor in their power supply. Several of them have come in recently with R812 (150k Ω) open-circuit. The result is a dead set. **S.L.**

Ferguson 14L2 (TX85 Chassis)

This set was dead, a not uncommon occurrence with this chassis. The main h.t. supply was present, also the 13V supply. This latter voltage did not reach the 12V regulator however. The basic fault was dry-joints on TR901 which is on the remote control panel – it produces the 9V rail for the TMS1000DN2LL microcomputer chip IC901. **S.L.**

Salora 1H6

This was an unusual fault: after a couple of minutes the picture and sound went completely off tune, the set couldn't be tuned in and the Band 1 LED lit. It was obviously a heat-related fault and we soon traced it to ICC9 on the tuning panel. This chip is a CMOS 4011 nand gate which supplies the band switching voltage for ICC1. **S.C.**

Hitachi C21 P228

It's difficult to describe the symptoms here: the picture looked off-tune, and there was a silver, shimmering outline around everything on the screen. We suspected an a.g.c. or i.f. fault, so as a start IC201 on the i.f. panel was replaced.

The gods must have been on our side as this provided a complete cure. **S.C.**

Panasonic TC1631 (U4 Chassis)

We've had several of these sets with the following fault: when you try to tune in, the set will search for only a few seconds. The cause can be either the microcomputer chip or IC1204. It's best to change the smaller chip first as it is usually the culprit. **S.C.**

Solavox NR20

This set was manufactured for Comet in Hong Kong. I suspected the worst, never being very happy when they spell colour without the u. The complaint was "it's my son's set and it just went up in smoke, so I removed the back and had a look". In between the usual components there lurked a lot of strange objects that turned out to be dust-covered budgie droppings. My heart sank, and I reached for the Hoover. Beneath all the dirt there was quite an ordinary TV set with a small subpanel near the on/off switch. This had a 1.5 Ω , 7W resistor mounted too close to the PTC degaussing thermistor, both of which had burnt up. **J.H.**

Sharp C1420H

The problem with this 14in. colour portable was no sound, no channel change and no tuning. With this model and a few others of the same generation the tuning, channel change and volume control commands all enter a microcomputer chip that was immediately suspected. After checking all the wrong things however the fault turned out to be due to the channel change button, which had fallen to pieces. A new switch soon had everything back to normal. **J.H.**

Hitachi CPT2478 (G6P Chassis)

The problem with this text set was no graphics. Teletext operation was o.k. Now it's worth pointing out that transistors Q858 (green-on-screen) and Q857 (red-on-screen) on the c.r.t. base panel do give trouble. But not this time. The character generator chip IC1104 was o.k., but D1113 and D1114 were both leaky. Replacing them restored the on-screen graphics but a week later the same fault occurred again. We replaced the two diodes and left the set soak testing. After a couple of days the e.h.t. arced over: so this was the cause of the diodes' downfall! We cleaned the final anode cap and so far (three weeks later) the diodes are still o.k. **M.L.**

Mitsubishi CT2125TX

There was a sound problem with this new Mitsubishi set. Sound was still present at minimum volume, though the on-screen graphics indicated that the volume was at minimum. The sound also remained when the handset was used to select mute. I scoped the waveform at pin 1 of the M50439-563SP microcomputer chip IC701. This is the volume up/down pulse output to the audio chip IC361. The waveform's mark-space ratio was present and correct – at minimum volume it disappeared. So IC701 was obviously doing its job all right. At minimum volume the d.c. voltage at pin 4 of the AN5265 audio chip IC361 was high at 2.3V instead of 0.3V however. This pin is linked to the 12V supply via R366 and the 1N4148 diode D361. The diode turned out to be leaky. **M.L.**

ECONOMIC DEVICES PO BOX 5, WOVVERHAMPTON, WV24AZ

1590H	3.72	25C1678	1.98	AN2140	2.40	BC207	0.19	BDX54B	0.33	BU126	1.10	H41196	7.43	MC1330P	5.42	STR1096	11.20	TBA970	3.50	TD4431	2.77		
1595A	3.72	25C1741	1.25	AN234	5.09	BC212B	0.10	BDX63A	2.09	BU137	6.53	H41300	1.56	MC1350P	1.56	SAS707	5.42	STR4900	6.43	TBA990	1.98	TD4440	1.56
17052	4.58	25C1810	1.70	AN236	3.33	BC213B	0.10	BDX63A	1.96	BU137	1.53	H41306	2.76	MC1351P	1.25	SAS705	1.95	STR440	6.18	TCA2705	2.15	TD4442	5.14
17053	5.61	25C1815	0.20	AN240P	0.99	BC225	0.10	BDY20	1.21	BU206	1.27	H41340	7.06	MC1352P	1.40	SAS890	2.85	STR451	5.77	TCA2705Q	1.06	TD4450	4.75
17074	1.07	25C1826	0.87	AN241	1.71	BC225	0.40	BDY11	1.18	BU206	1.65	H41342	2.85	MC1357P	2.15	SAS660	1.33	STR453	6.16	TCA290A	2.39	TD4460-2	1.75
17089	3.45	25C1826	2.25	AN245	5.48	BC225	0.10	BDY11	1.12	H41355	4.82	MC1358P	1.42	MC1358P	2.15	SCS640	1.95	TR454	5.82	TCA2420	2.16	TD4460	5.99
17127	2.50	25C1875	4.50	AN253	1.80	BC238	0.10	BF117	0.66	BU208	2.35	H41366W	2.88	MC14493P	5.50	SAS670	1.33	STR6020	1.33	TCA2420	1.10	TD4460	1.20
17376	1.58	25C1893	3.82	AN260	3.85	BC239B	0.25	BF118	0.67	BU208A	1.12	H41367	2.75	MC14494P	2.15	SAS670	1.33	TR629V	7.98	TCAS30	2.24	TD4500	1.40
1N4001	0.04	25C1906	0.88	AN272	7.92	BC251A	0.31	BF121	0.25	BU208D	1.41	H41368P	1.95	MC14497	7.10	SAS6710	2.21	TG635V	0.73	TCAG40	2.25	TD4500	2.75
1N4002	0.06	25C1921	1.37	AN295	7.83	BC259A	0.39	BF123	0.13	BU209	1.73	H41368	2.66	MC145108AL	6.80	SBA750	1.61	TG636V	0.67	TCAG50	3.05	TD4720S	1.60
1N4003	0.04	25C1923	0.80	AN301	2.45	BC260	0.13	BF122	0.131	BU226	2.55	H41370	3.71	MC145118CP	1.10	SDA203	19.35	TG637	0.91	TCAG60H	2.60	TD48190	4.30
1N4004	0.05	25C1929	2.75	AN302	3.00	BC260	0.34	BF137	0.30	BU226A	0.99	H41374	4.82	MC14528CP	3.88	SDA206	17.16	TG645	2.17	TCAG730	2.75	TD4830	3.70
1N4005	0.05	25C1942	2.50	AN305	8.88	BC302	0.53	BF153	0.58	BU406	1.26	H41117	0.89	MC1712	0.26	SDA2006	1.33	TG645	1.33	TCAG80	2.25	TD4830	1.58
1N4006	0.08	25C1959	1.20	AN315	2.46	BC303A	0.48	BF154	0.26	BU406D	1.24	H41377	1.95	MC1592	19.50	SDA21122	11.77	TG649	1.45	TCAG800	5.95	TD49513	3.15
1N4007	0.07	25C1957	0.95	AN316	4.95	BC303A	0.11	BF157	0.33	BU407	0.54	H41389P	2.05	MC1724CP	3.49	SG264A	5.26	TG652V	0.87	TCAG805	2.38	TD61033	2.60
1N4148	0.03	25C1963	1.93	AN318	7.16	BC309	0.17	BF158	0.18	BU412	1.59	H41389	2.39	MC1706-56	1.56	SG613	10.70	TG658	4.95	TCAG80	5.44	TD61081	7.24
1N4448	0.85	25C1962	1.93	AN320	5.47	BC317A	0.13	BF159	0.18	BU426A	1.67	H41392	2.22	MC1706-20	1.25	SG629	10.70	TG659	4.22	TCAG90	2.04	TD61082	4.93
1N5401	0.11	25C1969	1.79	AN321	2.25	BC327	0.06	BF160	0.31	BU500	1.53	H41394	2.86	MC1711	0.75	SG653	9.00	TG664V	1.25	TCAG10	1.65	TD61089	1.65
1N5402	0.13	25C1983	1.32	AN322	7.62	BC328	0.11	BF167	0.38	BU508A	1.50	H41397	3.75	ME1002	0.26	SH125H	7.95	TG665V	2.38	TCAG40	8.85	TD61094	4.30
1N5403	0.18	25C1985	0.60	AN337	5.37	BC337	0.09	BF173	0.34	BU536	1.55	H41398	2.06	ME1010	0.28	SH163H	20.62	TG611V	1.40	TCAG40E	1.40	TD61095P	3.00
1N5404	0.10	25C2009	0.34	AN340P	1.53	BC338	0.12	BF177	0.55	BU608	1.95	H41406	2.85	ME1001	0.34	SK2E121A	1.25	TG613V	4.95	TD3F900H	6.51	TD61096	0.61
1N5408	0.16	25C2029	2.33	AN355	1.65	BC400	0.69	BF178	0.40	BU705	2.67	H41452	0.80	ME1011	0.75	SK2E304A	0.73	TG614V	2.42	TD3F900R	6.51	TD61098	0.65
1N9114	0.04	25C2028	2.11	AN362	1.50	BC421	0.36	BF180	0.36	BU800	1.98	HD1433	2.07	MA2501	3.30	SK4E41F06	0.30	TG616	1.02	TD61018	2.31	TD61098	0.72
15555	0.18	25C2033	1.88	AN363	0.46	BC460	0.46	BF180	0.46	BF180	0.46	BF180	0.46	SK4E42F06	1.32	TG616H	1.34	TD61018A	1.54	TD61098	1.47	TD61098	0.86
1544	0.10	25C2078	3.39	AN5111	3.43	BC454	0.46	BF181	0.32	BU825A	1.55	HD38750A53	7.75	MJ481	1.53	SK4E42F06	0.80	TG616V	1.34	TD61018A	1.47	TD61098	0.72
15921	0.10	25C2073	2.73	AN5120M	4.50	BC461	0.47	BF182	0.34	BUW84	0.66	HD38750A7	7.25	MJE2955	1.03	SK4E42F10	1.36	TG616V	1.40	TD61018A	1.70	TD61120	1.55
2N2219A	0.29	25C2085	1.65	AN5132	4.42	BC462	0.51	BF183	0.39	BUX84	0.50	HD38800A50	14.09	MJE3055	1.15	SK4E42G02	0.96	TG616V	1.87	TD61018E	4.26	TD61120	0.30
2N3053	0.35	25C2091	1.30	AN520	4.40	BC463	0.30	BF184	0.43	BUX85	0.68	HD44001A25	10.47	MJE3404	0.49	SK5E5710	1.36	TG616V	5.98	TD61011	1.14	TD61121	0.49
2N3054	0.99	25C2141	2.44	AN5610	0.38	BC478	0.19	BF185	0.39	BUY126	0.13	H15H1010	14.60	MJE520	0.49	SK5F1370	2.15	TG616V	3.44	TD61011	1.10	TD61121	0.95
2N3055	0.67	25C2166	1.80	AN5612	4.73	BC479	0.40	BF194	0.40	BUY20	0.14	H19420	1.27	MJE932	0.95	SK4E42F06	0.77	TG616V	0.48	TD61011A	1.54	TD61121	0.86
2N3442	1.16	25C2216	0.89	AN5613	4.20	BC532	0.28	BF195	0.14	BY133	0.15	H15H1002	12.54	MJ2328	3.01	SL1430T	2.31	TG616V	0.45	TD61011A	1.54	TD61121	0.38
2N3702	0.14	25C2233	1.20	AN5630	3.95	BC546	0.28	BF196	0.17	BY164	0.64	HM6231	9.20	MJ2328	1.95	SL414	3.69	TG616V	0.48	TD610134B	2.42	TD61121	0.99
2N3703	0.10	25C2236	1.69	AN5701M	1.66	BC548	0.28	BF197	0.24	BY176	0.93	HM6232	7.20	MJ2328	5.65	SL432A	2.32	TG616V	1.74	TD610135S	2.95	TD61121	0.96
2N3705	0.15	25C2278	1.14	AN6250	1.75	BC549	0.10	BF198	0.17	BY179	1.42	HM6251	5.69	MJ2923	3.10	SL439	2.48	TG616V	1.74	TD610135T	1.70	TD61121	0.84
2N3706	0.14	25C2314	0.67	AN6300	4.40	BC550	0.19	BF199	0.19	BY198	1.05	HM7103	4.85	MJ926	3.58	SL471	4.45	TG616V	2.55	TD610137	2.75	TD61121	0.95
2N3707	0.11	25C2314 + K1	0.67	AN6300	4.40	BC550	0.19	BF199	0.19	BY198	1.05	HM7103	4.85	MJ926	3.58	SL471	4.45	TG616V	2.55	TD610137D	2.75	TD61121	0.95
2N3711	0.15	25C2551	1.76	AN6340	5.82	BC557	0.08	BF218	0.36	BY189	1.76	HM9012	3.22	MMS161N	5.50	SL490	2.37	TG616V	0.48	TD610137A	2.18	TD61121	0.86
2N3717	1.56	25C2565	4.66	AN6341	2.22	BC558	0.10	BF224	0.17	BY198	1.62	HM9015	3.24	MMS181N	3.11	SL918	8.32	TG616V	3.13	TD610147	4.25	TD61121	0.40
2N3772	1.55	25C2570	0.46	AN6363	16.00	BC559	0.10	BF237	0.65	BY207	0.17	HT4207	13.25	MMS369N	2.01	SL918A	9.07	TG616V	1.83	TD610156H	8.80	TD61121	0.75
2N3773	1.61	25C2577	1.34	AN6331	1.95	BC563	0.14	BF240	0.19	BY208	1.86	HT4208	20.65	MMS381AN	6.20	SL1686-10A	6.20	TG616V	2.57	TD610154M	1.21	TD61121	0.66
2N3719	0.40	25C2578	6.75	AN6551	0.95	BC636	0.20	BF241	0.17	BY210-400	1.18	KAZ191	1.00	MMS441AN	6.93	SL1686-2AN	2.98	TG616V	1.98	TD610160	2.50	TD61121	0.41
2N38021	0.99	25C2579	1.40	AN6552	0.95	BC636	0.20	BF241	0.17	BY245	0.60	KB200	1.35	MM1400L	13.65	SL1686-4AN	7.27	TG616V	0.98	TD610160	2.50	TD61121	0.41
2N3904	0.62	25C288A	1.85	AN6610	1.15	BC637	0.24	BF245	0.49	BY210-800	1.10	K5C82C	4.85	MM1405	12.92	SL1686-7AN	7.09	TG616V	1.50	TD610162	3.25	TD61121	0.40
2N3908	0.50	25C3153	6.50	AN7111	1.25	BC640	0.24	BF246A	2.52	BY223	1.25	LK200	1.69	MM1435VX	9.32	SN29716N	3.66	TG616V	0.94	TD611190	1.27	TD61121	0.38
2N4101	2.33	25C372	1.40	AN7115	2.52	BC834	0.55	BF255	0.20	BY224-600	2.63	LA1201	1.75	MP1192	5.07	SN29715N	6.04	TG616V	3.99	TD611190Z	4.48	TD61121	0.39
2N4240	1.60	25C373	1.16	AN7145	2.17	BD014	0.36	BF256	0.15	BY226	0.15	LA1210	1.56	MP2794	4.00	SN297212	11.95	TG616V	5.08	TD61200	1.51	TD61121	0.35
2N4444	1.66	25C383	1.33	AN7146	9.90	BD121	1.31	BF257	0.34	BY227	0.20	LA1230	1.18	MP2812	5.07	SN29723AN	6.77	TG616V	1.61	TD611235	3.88	TD61121	0.38
2N5293	0.50	25C388	0.29	AN7151	0.42	BD124	1.31	BF258	0.41	BY228	0.80	LA1320	2.87	MP2812	1.32	SN29726AN	2.80	TG616V	1.71	TD611236	3.03	TD61121	0.28
2N5294	0.50	25C394V	0.67	AN7156	3.37	BD131	0.42	BF259	0.34	BY229-1000	1.12	LA1357N	1.06	MP2812	5.13	SN29727P	6.80	TG616V	1.87	TD611237B	3.03	TD61121	0.28
2N5296	0.50	25C403C	0.60	AN7158	2.67	BD132	0.42	BF262	0.57	BY229-600	1.20	LA1363	1.05	MP2812	6.00	SN297208N	4.17	TG616V	2.34	TD61127A	6.83	TD61121	1.02
2N5297	0.50	25C458	0.34	AN7218	0.80	BD135	0.36	BF263	0.57	BY255	0.13	LA1364	3.02	MP2560	0.48	SN297270N	5.75	TG616V	1.90	TD611412	1.08	TD61121	0.95
2N5298	0.61	25C495	0.92	AN7223	4.55																		

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Dealing with Surface-mounted Components

Eugene Trundle

If you go back to the earliest days there were screw terminals to connect components together. These were succeeded by solder and tags. Printed circuit boards came to be used in consumer electronic products during the Fifties. Pye was one of the first companies to introduce this method of construction in TV sets. GEC then blessed us with double-sided print, which many engineers will have cause to remember! So far as most of us in this trade are concerned our first experience of surface-mounted components was with u.h.f. tuners and JVC cameras and camcorders – the GRC1 is over five years old now.

For miniaturisation and h.f. operation surface-mounting technology offers the designer and manufacturer (but not the serviceman!) several advantages. It accounts for the tiny, stable and reliable u.h.f. tuners we now have and such portable wonders as camcorders, Walkmans and CD players. The technology has progressed to the point where the consistency and reliability of surface-mounted assemblies make them a good choice even where miniaturisation and high-speed operation are not primary considerations. As a result they are now appearing in VCRs and TV sets. This is a trend that's bound to increase.

While surface-mounted assemblies can be mass-produced with relative ease, servicing is another matter altogether. The service engineer generally has to be able to take his diagnosis down to component level then replace individual, often pinhead-sized, components. These processes call for high levels of skill and care.

All components, both active and passive, are now available in surface-mounting versions. Variable passive components tend to be less reliable than conventional types and as a result are being replaced by software-programmed and stored analogue values in the latest equipment.

Passive Components

Passive components, mainly resistors and capacitors, are available in two versions, MELF and chip types. Metal-ended leadless frame (MELF) types are cylindrical like conventional components: they are colour coded but have no connection leads. Thomson/Ferguson are very fond of them – take a look at the photograph of the ICC5 chassis shown on our July 1989 cover. Chip resistors are rectangular and come in two main sizes, 3216 ($3.2 \times 1.6 \times 0.5$ mm, rated at 0.125W) and 2125 ($2 \times 1.25 \times 0.4$ mm, rated at 0.1W), with values from zero to 10M Ω and a voltage rating of 200V. Ceramic capacitors, with values from 1pF to 0.047 μ F and voltage ratings of 25V and 50V, are similar in top surface size but are generally thicker at about 0.8mm. Tantalum electrolytic chip capacitors are altogether larger, the size depending on capacitance value which ranges from 0.01 μ F to 100 μ F at d.c. working voltages from 4-35V. In practice these are the least reliable of surface-mounting components – they seem to be especially prone to intermittent troubles. Chip inductors, even in variable form, are available but are seldom used.

Identification

Some passive components have no identification marks. This makes it essential to keep them in their marked transit packs until they come to be used. Those that are marked

may be coded using either of two systems in general use. Both give resistor values in ohms and capacitor values in picofarads. The simplest is the three-symbol method, where the first two digits give the base figure and the third is the multiplier: thus 472 is 4.7k Ω or 4,700pF; 103 is 10k Ω or 0.01 μ F (10,000pF); and 4R7 is 4.7 Ω . The alternative is the two-symbol code consisting of a letter and a multiplier number, see Table 1. Here A1 indicates 10 Ω /10pF, N3 3.3k Ω /3,300pF etc.

Active Devices

Small active components (transistors and diodes) may also have truncated codes, often consisting of two letters, which can be cross-referenced for each manufacturer to the type number. In this case the thing is to change like for like. Surface-mounted integrated circuits generally have the full type number printed on them. Ensure that pin 1, which is not always obviously identifiable, is connected to the correct land on the PCB and, in the case of microcomputer i.c.s, that the replacement carries the right suffix in its type number – either the same as the one it replaces or representing a relevant modification or update. This suffix indicates the software implanted by the manufacturer.

Physical Problems

Very high component packing density is possible with surface-mounted assemblies. This can present problems for the service engineer. The components are tiny and the print patterns and through-board links minuscule. As a result PCBs are vulnerable to damage during repair and servicing – and are virtually impossible to repair satisfactorily once this happens. Complete PC assemblies are generally not available as spares (though manufacturers' in-house repair depots seem to be able to get them without trouble!) and are expensive. In addition it may be necessary to align and set-up presets on the replacement board.

For these reasons the first and foremost rule when servicing SM assemblies is not to damage the board. This is the reason why the use of a knife to remove i.c.s is risky – it could slip! The main risk however is that of lifting or breaking the print when removing components – the cause is more often insufficient heat than too much. Be gentle, careful and unhurried, and make sure that you are properly equipped to do the job.

Tools and Techniques

For work with surface-mounted devices there are several tool and facility requirements over and above the normal ones. Here's a list: a soldering iron rated at 15-20W, running at 250-330°C and fitted with a small (1mm) bit; fine gauge (22 or 26 s.w.g.) solder; desoldering braid, preferably used with a high-wattage, larger-bit iron; magnifying glasses of two types, a $\times 8$ watchmaker's type and a large, illuminated bench type; good, bright lighting; tweezers, ideally straight and bent types – keep them in protective sleeves when not in use; an antistatic workstation with a conductive wrist-strap; a pot of suitable

Table 1: Two-character SMC for resistors and capacitors.

A = 1	M = 3	Y = 8.2	0 = $\times 1$
B = 1.1	N = 3.3	Z = 9.1	1 = $\times 10$
C = 1.2	P = 3.6	a = 2.5	2 = $\times 100$
D = 1.3	Q = 3.9	b = 3.5	3 = $\times 10^3$
E = 1.5	R = 4.3	d = 4	4 = $\times 10^4$
F = 1.6	S = 4.7	e = 4.5	5 = $\times 10^5$
G = 1.8	T = 5.1	f = 5	6 = $\times 10^6$
H = 2	U = 5.6	m = 6	7 = $\times 10^7$
J = 2.2	V = 6.2	n = 7	8 = $\times 10^8$
K = 2.4	W = 6.8	t = 8	9 = $\div 10$
L = 2.7	X = 7.5	y = 9	

(non-corrosive) flux; solvent cleaner; a blob of Blu-Tack or similar inert adhesive. Several manufacturers, for example JVC, can supply special jigs and tools to help with surface-mounted device removal – they are usually listed in camcorder service manuals.

Here are some general dos and don'ts when working with SMD assemblies: (1) Limit the dwell-time of a hot iron at any one point to four seconds. (2) Don't burn all the flux out of the solder by leaving it on the bit – apply fresh solder at the moment of soldering. (3) Don't rub component terminals or the solder bit to and fro across the print surface. (4) Never use force when removing a component. (5) Don't reuse surface-mounted devices – discard them once removed from the board. (6) Before applying power, examine every joint closely under the magnifier.

Recently in a modern factory I watched hundreds of SMD PCBs come flooding off the production lines and swarming along a conveyor belt. It made me wonder why we go to so much time, trouble and expense when servicing them, especially with intermittent or hard-to-diagnose faults. No doubt there are good reasons, though they may be difficult to appreciate during a long, money-losing and possibly fruitless workshop session with a recalcitrant camcorder.

Test Report: SolderQuick Tape

Nick Beer

SolderQuick tape was originally developed by Raychem Corporation in the USA and is marketed in the UK by Raychem Ltd. It's described as a precision solder delivery and component lead alignment tape, the main aim being to simplify the soldering of fine-pitch, multi-lead surface-mounted components such as i.c.s, edge connectors etc.

How it Works

The tape has two main elements, a ribbon of solder that's laid across the pads to which the component is to be soldered and an adhesive-backed plastic film with precut fingers that lie between the leads of the component. Fig. 1 illustrates the system. When the soldering device is applied, the plastic fingers divide the molten solder evenly between adjacent leads and prevent bridges. Fig. 2 illustrates the result immediately after the application of the soldering device. The fingers have the additional

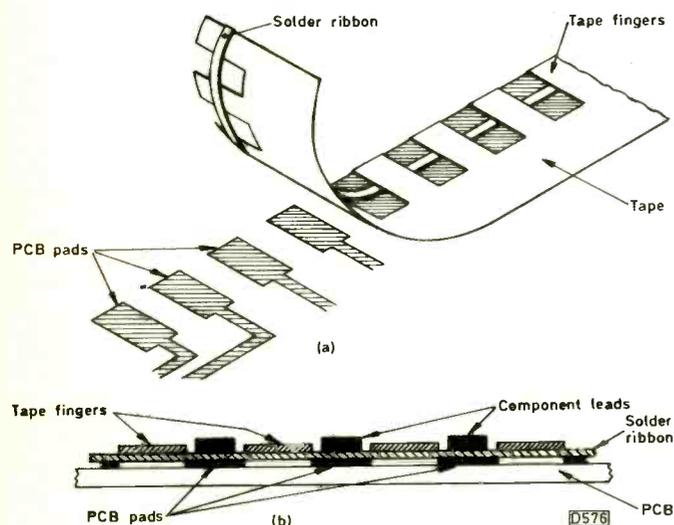


Fig. 1: (a) How the tape is positioned with respect to the PCB pads – the tape fingers rest between them. (b) Cross-sectional view before the application of heat.

advantage of making it easier to align the component's leads accurately with the PCB pads.

I've been testing SolderQuick for some months to assess its usefulness for consumer electronics servicing. In use the first step is to clean the board in the usual way, removing all the old solder from the PCB pads. You then stick the tape to the PCB and place the component on top, with its leads between the tape fingers. The leads are then heated and the solder amalgamates with each pin. The tape between the pins acts as a barrier, preventing inter-pin shorts and helping to ensure that each joint receives an equal proportion of solder. As the amount of solder provided is just right for a good joint, the possibility of dry-joints or short-circuits is virtually eliminated. Once the soldering has been completed the tape, now devoid of solder, is peeled off and disposed of.

The tape is available with different pitch sizes, the largest of which would be the correct one for most of the SMDs in the type of equipment TV/video service engineers handle. Those of us working on camcorders and the more complex VCRs would need to use the finer pitch tape as well. The tape is supplied on reels. Other uses include those flat flexi printed circuits that are becoming ever more common, especially in audio equipment.

On Test

After a couple of goes I found that SolderQuick is easy to use. Raychem also manufacture hot-bar soldering equipment but, like most of those in the servicing industry

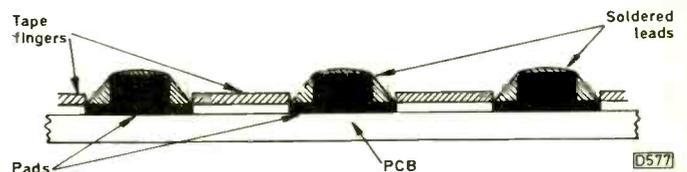


Fig. 2: Cross-sectional view after the application of heat, showing how the solder amalgamates with the PCB pads while the tape fingers leave the areas in between clear.

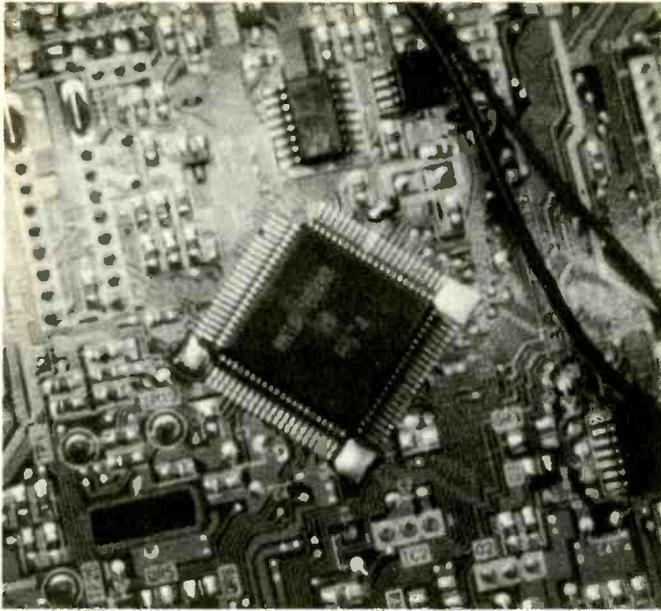


Fig. 3: Section of board with a multipin surface-mounted component that was replaced by the author using SolderQuick tape. Very successful, as you can see!

I suspect, I had to rely on my standard bench iron. The only consequence was that it was occasionally necessary to touch up a couple of joints slightly after removing the tape.

It's unlikely that problems will arise but I can think of a couple of possibilities. There are occasions where there's insufficient space adjacent to the pads to stick the tape: it needs only a couple of millimetres, but some units with double-sided print, where through-the-board components are also used, can cause difficulties. The other possibility is of the tape not sticking due to nasty stuff on the board – anything from dust to flux spillage. The simple answer to this is to wipe over the area with a cotton bud and cleaner first.

Conclusion

Cost depends on quantities etc. Enquiries should be directed first to Raychem Ltd., Edison Road, Dorcan, Swindon SN3 5JA – telephone 0793 528 171. Depending on the order Raychem may supply direct or refer you to a local source.

In conclusion, I would recommend SolderQuick as a very worthwhile aid in workshops where a fair amount of work has to be done on surface-mounted assemblies.

Test Report: The Weller Pyropen

Eugene Trundle

Miniaturised electronic equipment, especially camcorders, uses very small PCBs with surface-mounted components, some of which are of pin-head size. Over the last year or so there has been an increasing tendency for surface-mounted components to be used in larger equipment, such as TV sets and VCRs, as well. While the reliability of SM assemblies is very high, they can be very difficult to deal with and repair when things go wrong.

Working with SM Assemblies

Once a diagnosis has been made, right or wrong, the suspect component must be removed and replaced. So long as care is taken this is not too difficult when the component has just two or three connection points on the PCB. But components with many connections can be very hard to remove and fit because they won't move a millimetre until they have been freed completely. Foremost in this category are integrated circuits, which may have eighty or more leadout pins. The biggest risk of course is that of damage to the PCB, which may cost a fortune to replace if it's available at all as a spare part.

Methods of removing surface-mounted components include the use of strangely-shaped and all-embracing solder bits; the use of miniature shepherd's crooks to flip up i.c. pins one at a time; and a cheese-wire technique that I've favoured up to now, though it falls down when the component is hemmed in by others. None of these and various other techniques is entirely successful in all circumstances. Some, like the knife, can spell instant destruction of part of the PCB with one slip.

Once the device has been successfully removed the replacement has to be fitted: again there is plenty that can go wrong. Even with very thin solder it can be difficult to steer a course between open-circuit joints and solder blobs between pins when a conventional soldering iron is used, no matter how tiny its tip.

I've found that the Weller Pyropen removes virtually all these problems at a stroke.

Description of the Pyropen

There are several products in the Weller range, varying in size, capacity and facilities. The most suitable one for work with surface-mounted devices is Model WSTA4 which is 265mm/10.5in. long and weighs 126g/4.4oz. It has two basic modes of operation: as a cordless soldering iron, for which a wide range of bits is available; and as a hot-air blower, our main interest here. The Pyropen runs on ordinary butane gas. You fill it from a dispenser intended for cigarette lighters, available at tobacconists. It uses a catalytic burner and runs for up to four hours on a 28cc fill of fuel. Bit temperatures of 250-500°C (482-932°F) can be attained for soldering while the hot-blow air temperature is 650°C/1,202°F. The instrument comes with one 3mm soldering bit, a 5.7mm hot-air nozzle, a heat-shrink attachment, wrench, accessory spanner, protective cap and instruction book.

A push-button piezo ignitor is incorporated in the WSTA4, making the whole operation one-handed. Very useful this. There are also a heat control, on/off valve and a



Fig. 1: The Weller WSTA4 Pyropen (bottom) shown with a Multicore Solders' solder-paste dispenser (top).

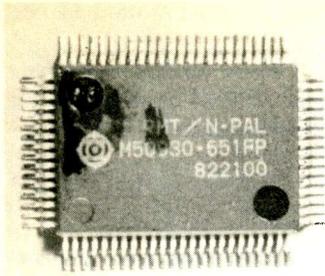


Fig. 2: This 80-pin SM i.c. has just been removed from a PCB – with not a hair out of place.

window to check the level of the fuel in the reservoir – this is in the handle. In addition to soldering in the absence of electrical power the Pyropen can be used on heat-shrink sleeving and for similar jobs. The hot-air nozzle supplied is too large for use with SMDs, so you need to get the 2.5mm WHC50 nozzle which is available as an optional extra. The other aid required is solder cream – we'll come back to this later.

SMD Removal

For an SMD to be removed cleanly from the PCB the Pyropen needs to be at a moderately high setting on the 1-5 scale: the more connections the device has, the higher the setting required. Secure the PCB firmly then run the hot-air tip to and fro over all the connection points while applying light pressure to the body of the SMD. The soldered joints will soon be simultaneously molten and the SMD can then be flipped off the board. Use the same technique with SM i.c.s, with a quick to-and-fro or circular movement of the nozzle around all the pins, keeping it two or three millimetres above the leadouts. When a chip has eightly or more leadout pins it may be necessary to desolder it in two stages: gently lever at one corner while heating the adjacent row(s) of pins until they lift off, then repeat for the other half. It's easy to see when the solder has melted and the device is ready to move.

It may at first seem a little frightening to use this blow-lamp technique on delicate components and PCBs, but the boards and SMD bodies are designed to withstand considerable heat – after all they are floated along a bath of molten solder at the factory. The Pyropen's hot-air stream is of very small diameter, and I've not had an SMD or board failure to date when using it. Components come off the board completely intact and virtually indistinguishable from the new replacement waiting to be fitted. While I wouldn't advise recycling SMDs that are removed in error, I have proved that this can be done. The remote control chip I used as a test still works after being fitted and removed three times. Get rid of residual solder on the PCB's lands after removing a component, preferably with braid and a conventional iron, so that the copper surfaces are completely flat. Now to fitting the replacement.

Fitting SMDs

Conventional multicore wire solder is not appropriate for use with SMDs. A cream or paste containing a flux is the thing to use: Multicore SN62 oxide-free solder is ideal – it comes in a 25g pump-action dispenser tube with a nozzle. For transistors and other small SM devices you need a small blob on each PCB land. For a multi-legged component such as an i.c. the technique to use is to trail a single streak of paste, about 1mm in diameter, across the line of the pads, at right-angles (see Fig. 3). A smaller nozzle on the solder cream dispenser would make the application easier.

Next place the replacement component on the board, with all its pins centred exactly on the appropriate copper lands – this is vitally important. Since the solder paste has virtually no stickyness it's often necessary to anchor the SM device using a pinpoint of inert adhesive – Blu-Tack works – under its centre. Make sure that each connection point or pin is in contact with solder cream, then use the Pyropen to heat the joints. Again a to-and-fro or round-and-round motion is required. When the cream's melting point is reached it liquifies and migrates to the PCB land, drawing into perfect solder blobs with no residues between tracks. The result looks exactly like the factory-produced original: very impressive!

Getting Practice

The Pyropen is very easy to use and is certainly the best heat source for use with SMDs. Even so it's best to get some practice with it before you flail about inside a £1,200 camcorder! Find a scrap PCB which uses SMDs and gain experience with the instrument. Many modern remote control handguns use SMDs and are sometimes scrapped because of damage or non-availability of spares. Using a dead remote control PCB I experimented to see how far I could go before damaging anything. If the heat is concentrated in one place for several seconds, i.e. long after the solder has melted, the print starts to lift and the upper layer of the PCB laminate bubbles up. With care there's no danger of this happening in normal use with the nozzle kept on the move.

The other thing that requires practice is dispensation of the solder cream on the PCB lands before the soldering-in process. Too little and there's a risk of the joint not making: too much and the joints come out fat and bloated with solder. You soon get to know what's needed. When it's right the solder flows to distribute itself evenly and correctly as it melts. You can practice removal and replacement many times over with just one multi-pin SM i.c., gaining skill and confidence as you go. With experience the whole operation becomes as easy as conventional soldering. Correct judgement of when the solder melts and runs, knowledge of the appearance of the blobs at various stages and a feel for the job are soon acquired.

Conclusion

This tool is essential if you deal with surface-mounted components or are likely to do so in the future – which means virtually everybody in the electronics repair business! It became indispensable to me the moment I tried it, and has greatly increased the confidence of everyone here in dealing with SMDs. Indeed I feel that manufacturers should make this tool mandatory for all dealers and service centres that repair their products, as a

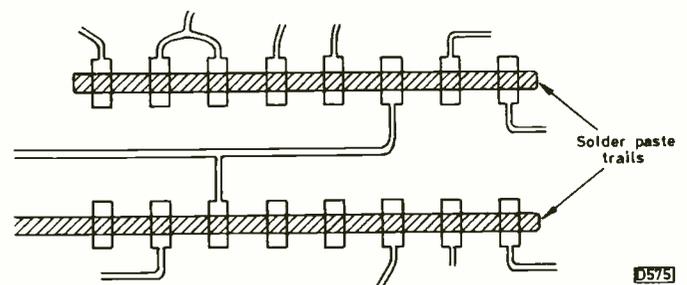


Fig. 3: How to apply solder paste to the PCB lands before positioning the new i.c. in place ready for soldering.

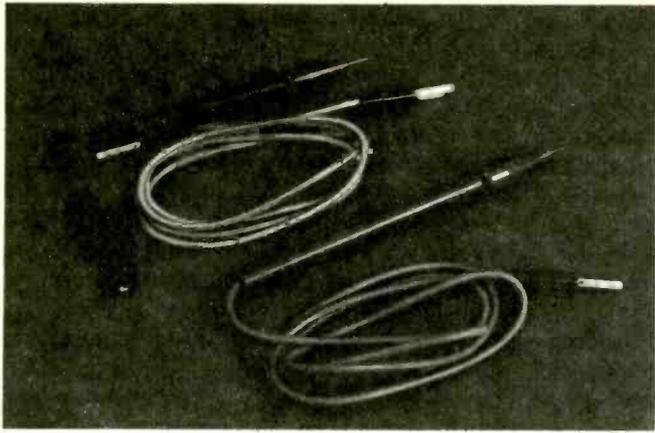


Fig. 4: The LMB Electronics probe set.

precaution against damaged boards and components. It's not a question of whether you need the Pyropen, more of whether you dare work without one.

The Pyropen Model WSTA4 costs about £48 plus VAT. It's available from large distributors or, as stock number 660-416, from RS Components/Electromail. Nozzle WHC50 at around £9 plus VAT is RS stock no. 660-977:

the solder cream, stock no. 551-693, costs around £7 plus VAT.

Sony stocks the Pyropen outfit for its dealers and service centres: account holder enquiries should be made to the central spares department at Newbury, Berks.

Test Probes

While we're on the subject of working with surface-mounted devices and other components with tiny and closely-spaced leadouts it's worth mentioning the difficulty one has in connecting to i.c. pins, PCB lands and so on in order to make tests. To overcome this problem LMB Electronics (301 Mawney Road, Romford, Essex RM7 8DR - telephone 0708 748836) has introduced an ultra-sharp meter probe set. The slender steel tips are needle sharp and easily penetrate flux, solder resist and PVC insulation. I've tried them and found them to be very effective, especially with a little sleeving on each prod to reduce the risk of inter-pin shorts. The leads are one metre long, extra flexible and silicone-insulated in black and red. A sheathed crocodile clip to replace the black probe tip when required is also supplied. The probe set is very useful when dealing with miniature assemblies and is good value at £10-74 including post and packing.

A Life Beset with Problems

Donald Bullock

There's nothing quite like a birthday to get you down. Not when you're regarded, by the more polite people anyway, as mature. Even aged-in-the-wood. There was a time when the approaching prospect sparked weeks of blissful, patient anticipation. Each day hung still. It was fun looking forward to the joyous day. But all this is no more.

Nowadays if you're in my boat you simply wake up one day to find that Father Time has jabbed you yet again with his trident thing. It makes you think. You know you're older, so you feel older. Your salad days have long since passed. You've enjoyed a spell on the flat: now dottage looms ahead over the next fence - if you can clear it!

And if you're a self-employed TV engineer, as kindly folks have described me over the years, extra confirmations of the ageing process are liable to occur almost hourly.

Mr Prattle's Hitachi

I now know that I should have slipped out the back way when I saw Mr. Prattle struggling from his car under the weight of a large, square-screened monster I didn't recognise. He kicked open the door, plonked the set down, belched and stifled a yawn. I yawned too, but more successfully.

"Went off like a gun" he announced. "I 'spect a valve's gone. Or a condenser!"

"I poised my pen over the pad. "Let's have your phone number" I said. "I'll look at it and phone you later." With that he went.

The set turned out to be an Hitachi CPT2178 - the G6P chassis. I gradually realised that the panel suspended in space to the right of the tube housed the power supply and quickly discovered that the mains fuse had blown. So I accused the nearby mains bridge rectifier of its downfall. But it cried honour bright and sure enough was o.k. Then I

noticed that a nearby resistor, R906, had also failed. Time to look at the circuit diagram. This showed that R906 is 68Ω and is part of the feedback network connected to the base of the self-oscillating chopper transistor. With great presence of mind I checked the associated 2.2μF electrolytic capacitor C911. Sure enough it punished the meter. So out it went and a nice new one was fitted. I checked around for anything else amiss but everything, including the nearby ceramic module that does the regulating bit, seemed to be o.k.

Time to switch on. The set cut the air with an anguished gasp and a little puff of blue smoke curled along the bench. As soon as the yellow lights cleared from my vision I noticed a black hole in the module, where there'd previously been a printed transistor. CP901 said the service sheet, so I ordered one from Wizard.

When it arrived I noticed that the printed transistor had been modified in favour of something more bulky, soldered on. Good thing too I thought. I fitted the module, switched on and the transistor blew asunder.

At this I decided that it was time to try logical thought, as instilled in me at Gloucester technical college some forty years ago. I checked the chopper transistor Q901, a big, silent rogue strapped to the chassis by the module. It had expired. Spurred on, I checked the line output transistor. This was also in an unhappy condition. At last I'd got to the bottom of the problem. The strain was beginning to tell, so I lurched out of the workshop towards the house. Perhaps there'd be a cup of tea.

I ran straight into Mr. Prattle. "Got 'im done, 'ave yuh?" he cried. "Nothing much wrong, was there?"

Faces

I was never much good at remembering faces. Nowadays I'm even worse. This explains why newly made

friendships sometimes have a short life when someone who meets me a while later receives the old fish-eye in response to their greeting of familiarity. It happened again this afternoon. Mr. Beamer poked his head around the workshop door and winked.

"Did you manage it, Mr. Bullock?"

"Er . . . manage what?"

"The little matter we discussed yesterday. Remember?"

I modulated my troubled brow and pressed my knuckle under my nose. Was this the chap who'd pestered me to advertise on the football fixtures poster, or was it the specialist I'd met and discussed an old trouble? "Er . . ." was about all I could manage.

Beamer's features faltered. Then, his grin hovering on the brink of recovery, he squared up to me and spoke with emphasis – as though I was not only deaf but slow on the uptake.

"You know. My folks lived next door to yours during the war. My sister had one brown eye and one blue! Married that podgy Yank GI and found that his Ohio ranch was a bedsitter over a condemned pork butcher's shop in the Bronx. Remember?"

I snapped into life and beamed. "Of course! With you now. Let's see – which of these is yours?" I turned to the shelf of repaired videos and surveyed them as though I knew which was his.

"It was the telly, Mr. Bullock. That one on the floor there, with all the videos on top, I think. Wasn't much, was it?"

Timers and Search Tuners

Then there's the problem of not being able to set up VCR timers or TV set search tuners. I usually put the job on one side until after school and get my ten-year old lad to do it. Takes him about fifteen seconds usually. The other day he came home late with a capful of apples, having torn his jacket in the process. Boasted he'd got them from the vicar's garden. As I was about to remonstrate the phone rang. It was Mr. Quick. Said he'd be round in ten minutes to collect his Pye TV set into which I'd soldered a memory battery. I'd no choice but to give up any idea of chastisement and enlist the boy's help in order to get the Pye tuned and set up. So much for parental dignity.

A 1500 Chassis

Three months ago I virtually gave a second-hand HMV 2809 – one of the 1500 chassis models – to Mr. and Mrs. Trew. They're a parsimonious couple who say they've no interest in colour. However that might be here it was back again.

"The picture's gone unsteady" said Mr. Trew. "My wife's afraid it'll cost us money. Only we're pensioners, see." With that they went off.

I plugged the set in and reached for a 47kΩ resistor – R44 in the sync separator's screen grid circuit used to be a stock fault with these sets. But it wasn't that. The picture was largely absent, flashing on now and then. I tapped the tube's neck and the picture danced on and off in sympathy. How was I going to get out of this one?

Then I spotted the light blue plastic spigot cover that peeps through the tube base and recalled how these become dry and brittle with age. As a result the built-in wire ring spark-gap arrangement earths some of the pins. Quick as a flash I hooked it off, replaced the tube base and switched on. Up came a surprisingly good and stable

picture that remained on despite the punishment I had given the tube's neck. Another successful repair! I'm getting pretty good I thought.

Where are the Knobs?

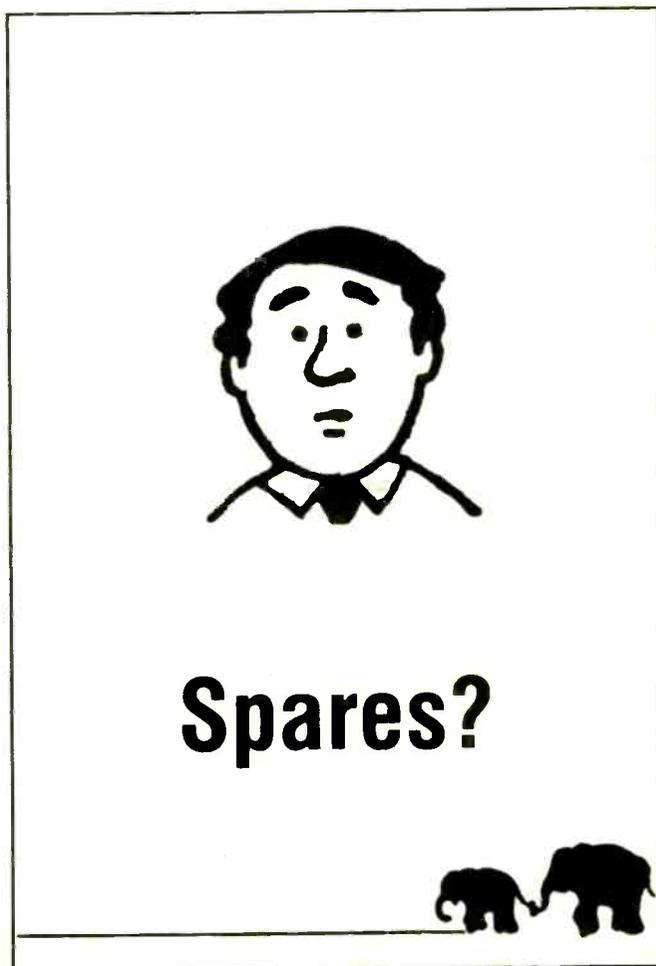
But I'm out of my depth with the modern sets and videos that have been coming in lately – the ones without knobs, accompanied by aeroplane cockpit type consoles. And because I'm becoming increasingly cantankerous and impatient with "progress" I get nasty.

One of these sets came in the other day. I put it on the bench and raised my hand towards the top right-hand part of the screen, extending my index finger in search of the usual well-disguised, flush on/off button. There wasn't one. Then I picked and pressed at the horizontal strips underneath in search of the vital control, all to no avail.

Some comedians amongst the design boys hide the control under the front underside of the cabinet to make viewing more fun, so I ran my fingers along here. No luck. It was then that I noticed an enormous collection of buttons in a nasty plastic slot behind the set. I surveyed it with increasing incomprehension. Who on earth would know what the huge variety of symbols meant? I smacked it back and yanked the set off the bench.

"You said you wouldn't use that word again!" It was Greeneyes poised in the doorway with a mug of tea. "It's no good your getting angry. That won't get the set mended, will it? I'm off to my Spanish lessons for an hour. Is it any good asking you to turn on the microwave grill at four and set the dish washer? Then there's that letter to fax and the new central heating timer to programme."

I looked at her blankly . . .



Copying and Editing VHS-C Tapes

Ivor Nathan

Most camcorders work either from the mains supply, via an a.c. power adaptor/battery charger, or from a high-capacity (equivalent to approximately 50 minutes' recording time) nickel-cadmium battery pack. In some cases there's instant playback of the recorded cassette via the camcorder's viewfinder, which has a tiny (approximately 0.6in.) monochrome screen. A separate LCD television set can be used adjacently for colour viewing. In-built colour screens are now being introduced, replacing the monochrome viewfinders.

Some camcorders are record-only machines. In this case the compact cassette must be placed in a cassette adaptor for playback via a full-sized VHS VCR. If the camcorder has both record/playback facilities the compact cassette can be played back either via an adaptor or directly from the camcorder by feeding the camcorder's AV output to an optional r.f. unit connected to a TV set – see Fig. 1. The r.f. unit is usually powered by the camcorder via a suitable AV connection lead and is nominally tuned to Channel 36. A switch on the r.f. unit enables the TV set to be connected either to the camcorder's AV output or to the TV aerial for reception of off-air programmes.

The recorded compact cassette (EC30 for half an hour, EC45 for three-quarters of an hour) can be kept as a master tape and used to provide an edited copy on a full-sized VHS cassette. This is useful for friends who want a copy but have only a standard VHS machine. Fig. 2 shows a complete system for copying and editing compact tapes on to full-sized cassettes.

Copying via an RF Unit

When copying a videotape best results are obtained by using the separate audio and video signals rather than an r.f. output signal. Satisfactory results can however be obtained from a good original by using the method described here if the r.f. unit is followed by a TV aerial signal booster that amplifies the signal by a factor of about three. As shown in Fig. 2, connect the booster's output to the VCR's aerial input socket, using a coaxial cable and connectors. Tune one of the spare channels in the VCR's

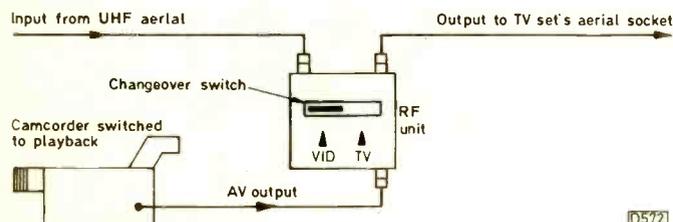


Fig. 1: Tape playback using an r.f. unit.

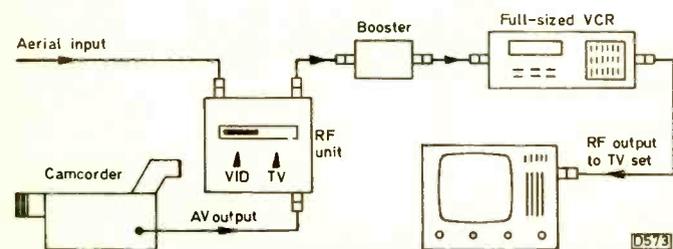


Fig. 2: The complete system.

receiver section to the amplified output from the r.f. unit, nominally on ch. 36. The camcorder's AV output modulates the r.f. unit whose output is amplified to provide a relatively high-level, noise-free signal at the VCR's aerial input socket.

Copies made by the VCR on a full-sized VHS tape using this method are superior in quality to those usually obtained when working with r.f. signals. In most cases they are perfectly satisfactory and avoid the need for special, optional AV dubbing cables and connectors. Precise tuning of the VCR's receiver can, as shown, be monitored by a colour receiver. When the camcorder is not in use and has been disconnected the set-up shown can be left in place permanently so that with the r.f. unit switched to TV the aerial signal is amplified and fed via the VCR to the TV set for viewing broadcast programmes. Use of the booster may even help by making it possible to receive distant stations not previously available.

Editing

Precise use of the pause controls on the camcorder and VCR enables editing to be done while producing copies. It's logical to copy all material from compact on to full-sized cassettes so that the compact tapes can be used again for fresh recordings.

Camcorder as a Camera

The system can be taken a stage further so that the output from the camcorder can be directly recorded on to a full-size cassette, using a standard domestic VCR, rather than making the recording on the compact cassette in the camcorder – provided of course the recording is done at home. Most camcorders can be used as cameras when switched to pause. The arrangement shown in Fig. 2 can again be used, but with no compact cassette in the camcorder. Instead of using the monochrome electronic viewfinder the TV set can be used to monitor in colour recordings being made directly on to the full-sized cassette in the VCR. Thus a first-generation recording can be made on a standard VHS tape. Sequences that are held on tape can be edited in from the camcorder, switched to playback, as required.

Sound

If the VCR has a microphone socket and an audio-dub facility a further refinement is to override the camcorder's microphone with its somewhat limited capability, using instead a separate high-quality microphone connected to the VCR. While some camcorders have an input socket for an external microphone, overriding the built-in microphone, the system described here avoids the nuisance of having a microphone cable trailing from the camcorder.

Summary

Thus the system shown can be used for editing, for dubbing compact cassettes to full-sized ones and for recording directly on to full-size cassettes – all without the use of special dubbing cables.

The Problem of Video Head Clogging

Nick Beer

Because the problem of video head clogging and its implications are not always fully understood a lot of time and money can be wasted. Many engineers still don't seem to appreciate the various circumstances that can cause head clogging. This can lead to many possible problems. Take the following example.

A VCR might require repair either in the house or in the workshop, the complaint being of poor or no picture and/or sound. Not surprisingly, the usual cause is dirty or clogged heads. The simple cure is to clean them. As far as many engineers are concerned this is the end of the story. Unfortunately however in an increasingly large number of cases it isn't. Very often you'll soon be seeing the inside of the same machine again. The usual reason for repeated head clogging is a defective tape.

I've little doubt that most engineers will have had to clean the heads in a machine that was playing a hire film from a library or a twentieth-generation blue film the previous night. Our own experience is that cases of faulty tapes have increased in recent times and furthermore that the faulty tapes are more often customer's own recordings than hired ones.

What often happens is that a different engineer sees the machine each time so that it's not until the customer complains about the same fault for the umpteenth time that attention is drawn to the real cause.

A Growing Problem

Why has the problem got worse? Quite apart from the ever increasing number of video tape hirers, from specialist outlets to newsagents and garages, there are in my opinion a number of relevant factors. These include:

- (1) The larger number of VCR users, the increased number of VCRs per household and the larger number of tapes owned per machine.
- (2) The increased use made of VCRs, especially for time-shift recording of satellite TV and all-night broadcasting.
- (3) A proliferation of cassettes of unknown or dubious quality and/or make. I strongly recommend that only the manufacturers' own branded cassettes and those from reputable tape firms such as TDK, whose tapes I've found to be more than satisfactory over the years, are stocked and sold.
- (4) Some modern and/or cheap VCR mechanisms give rise to heavy tape wear. Others are particularly susceptible to clogging when poor tapes are used.
- (5) A change in the attitude of VCR users. As with many new products VCRs, due to the high cost of early machines and their complexity in comparison with other domestic equipment, were initially treated with great respect. As the price has come down however and the majority of households have at least one machine so VCRs are more and more being abused, either directly or indirectly when the cassettes are mistreated. We seem to be getting an alarming number of VCRs in the workshop with extraneous matter across the tape path, the reason being that a tape which has been soiled by coffee, fruit juices etc. has been played in the machine.
- (6) The use of old tapes. On many occasions we've found that customers have been using tapes supplied with their first VCR some ten years ago. Now, three machines later,

these tapes are causing head clogs.

A combination of several of these factors makes matters worse of course. A point to bear in mind is that the problem can become awkward when the customer uses a faulty tape in a loan VCR or a rental or maintenance one. Strictly speaking the customer is nearly always liable for any resultant damage – so it's wise to try to sort out the problem as soon as possible.

What to Do

So what's to be done? The first thing to do when the fault is reported, whether over the phone or at the shop, is to ask the customer which tape was in the machine when the fault developed. Now as we all know customers can be vague at the best of times, but often they can remember and this can save much time.

A check on the inside of the machine, particularly around the capstan and guides as well as the heads, may reveal deposits of tape oxide, indicating that a worn or damaged tape has been used. Don't confuse tape wear with the various types of tape damage that can occur – see Eugene Trundle's article on video tape chewing in the September 1989 issue. It's easy to blame tapes when the problem lies in the machine's mechanism.

If you have a suspicion that the head clog is caused by more than normal wear and tear you need to inspect the customer's tapes. This can be very time consuming,

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making a head clean an uneconomic repair, but handled correctly this need not be so. The average customer may have 15-20 cassettes. Some have only three or four however: this can be a good indication that there are tape problems, since it means that the machine isn't used very much except for playing hired tapes or, more likely, that the user keeps re-recording on the same few tapes. I've often found that a customer with only three or four cassettes has a film or wedding on one, something they haven't managed to get around to watching on the second one, and that the third one is used for constant time-shifting. There's the other sort of customer who has loads of tapes, and in this case you may think that the chances of finding any faulty ones are pretty slim. If you ask the customer however you may well find that the majority are rarely used, which limits the search.

What to Look for

The next problem is what to look for. Engineers will probably have their own ideas about what a worn tape looks like. Eugene Trundle's article referred to above discussed marks on tapes. But in addition to a knowledge of this sort of thing one also needs to know the machine in question. Some have no problems with border-line tapes that instantly clog the heads of other machines. The following is the method I use for checking tapes.

Take each cassette in turn, open the blinder flap, and examine the tape at the point to which it has been wound. Despite the advice to rewind all tapes after use most customers leave the tape at the point where they finished using it. Rewind the tape to the beginning and check again. As you will know this is the point where the tape wears first and wears most heavily, providing a good indication of its condition. If it looks good at the beginning it's likely to be o.k., from the wear point of view, right through to the end. Again exact diagnosis will rely on your experience of tape and the machine in question. Without luck or an impossibly thorough check it will be difficult to pinpoint a particular tape that has only one tiny area where oxide is being shed. If your checks are inconclusive, advise the customer that the problem may well occur again and ask him in this event to make a note of the tape being used and the point at which trouble arose during its playing time.

Disregarding obviously damaged tapes, which should be discarded automatically, what are the signs of tape wear? Near the start there will be dull, thickish lines that run across the tape - these marks are made by the pinch roller when it takes up against the capstan. Unless these marks are present in large numbers or are obviously accompanied by oxide shedding they do not normally contribute to head clogging.

As long as the machine has been proved to work all right with new tapes, helical marks indicate a worn tape. They can result in further removal of oxide by the heads. Linear, horizontal lines are another sign of tape wear. These usually contribute to dirty audio/control heads. Once again it should be proved that these marks are not caused by a faulty machine.

The most obvious sign of wear, and cause of head

clogging, is a speckled tape. For an engineer who's searching for the cause of repeated head clogging this is a delight to see! You will often notice that the tape has turned a shade or two lighter brown than its normal very dark colour, and little bumps can be seen on the surface. In such circumstances another sign is that the normal sheen has been lost.

When you've carried out a tape check it's advisable to demonstrate to the customer the difference between a worn/faulty tape and a new one. Show them how to check tapes themselves, and tell them that tapes don't last for ever. Also advise against the use of inferior tapes.

If the problem persists, for example if a customer won't throw away faulty tapes because he doesn't accept your diagnosis, lend him a new one and suggest that he uses only this one for a period of time. If the problem doesn't recur, you've then got further proof.

Headclog Detectors

Certain manufacturers have devised circuits that give head-clog detection. So far they have been limited to camcorder use. The principle is quite simple. In the case of Panasonic, when the machine is put into record pause it performs a 1.5 second play backspace during which, if it detects an off-tape f.m. level of less than 20mV peak-to-peak twice or more in the course of an eight head switching sequence, it warns the user via a symbol in the electronic viewfinder.

Such detectors can and do work when worn or faulty tapes are used. If you receive for repair a unit in which the detector keeps operating for no apparent reason, look at the tapes!

Conclusions

Some of these problems can be difficult to assess. It's even more difficult to decide whether the cause of the problem is simply tape wear or VCR inflicted damage to the tape. Experience is the best guide. Never overlook the possibility of a faulty head clogging itself, or of machine faults causing tape marking.

Some video heads clean themselves fairly effectively when they run over a good length of tape after a clog. This applies to more modern heads, and is also related to the fact that tapes contain head-cleaning fluids. Even so it's essential to clean the heads thoroughly by hand in the event of clogging.

As camcorders are becoming more popular the problems of faulty/worn tapes are increasing. A recent case we had involved a C-format machine that failed to record a wedding. Watching the first few seconds of the recording revealed all. The heads could be seen to clog one after the other. The picture was then lost, followed shortly after by the sound. Use of head-clog detectors should enable this sort of thing to be avoided, though they do have their limitations.

Anyone who has to deal with tape problems will find the previously referred to article by Eugene Trundle, in the September 1989 issue, an invaluable reference source.

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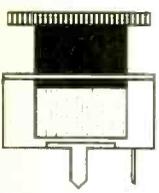
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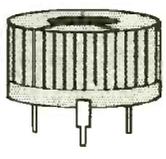
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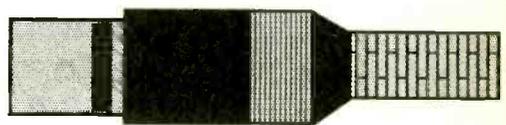
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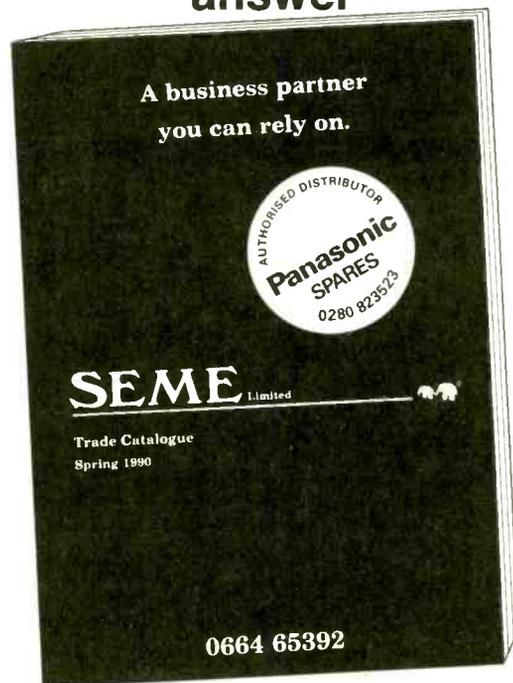
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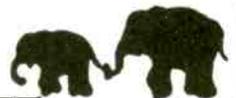
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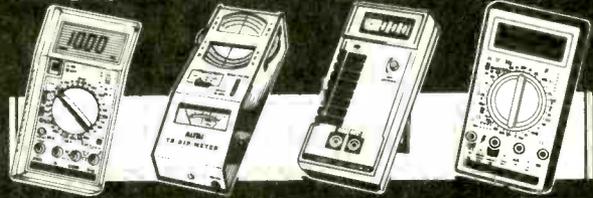
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AN3821K £6.75	BA5102 £2.45	L7912 £0.80	M4908B1 £12.50	MPD4098 £1.10	STK461 £10.50	TA7271P £3.25	TD1044U £1.50	TD2653B £2.00	U4A1008DP £2.00	ZSC3153 £3.40
AN3822 £7.50	BA5204 £2.75	L7915 £0.80	M4918B81 £11.50	MPD45148C £5.00	STK463 £14.50	TA7274 £2.60	TD1082 £3.50	TD2654 £3.00	U4C3845 £5.00	ZSC3402 £0.40
AN5015 £3.30	BA524 £3.00	L7918 £0.80	M50127AP £6.00	MSL5521066 £11.00	STK465 £12.00	TA7280 £3.00	TD1083 £1.70	TD2655 £2.50	U4C3845 £5.00	ZSC3519 £4.60
AN5033 £5.00	BA5402 £2.40	L7924 £0.80	M50431-1015P £6.00	MSL9378RS £3.50	STK5315 £6.50	TA7280P £3.00	TD1151 £1.50	TD2656 £2.50	U4C125H £2.50	ZSC3678 £1.25
AN5132 £3.95	BA5406 £2.50	LA180 £2.60	M50453-012P £6.20	MSM5840H-8ARS £14.50	STK5322 £6.50	TA7281 £2.75	TD1154 £2.70	TD2657 £2.50	U4C125H £2.50	ZSC3715 £4.80
AN5265 £1.35	BA6104 £2.50	LA185 £2.60	M50453-012P £6.20	MSM5840H-8ARS £14.50	STK5325 £3.50	TA7281P £2.75	TD1170S £1.20	TD2658 £2.50	U4C125H £2.50	ZSC458 £0.20
AN5510 £4.50	BA6109 £1.80	LA1201 £0.95	M50560-01P £2.70	SA1106 £2.50	STK5327 £3.50	TA7299P £3.00	TD1170S £1.20	TD2659 £2.50	U4C125H £2.50	ZSC458 £0.20
AN5512 £1.95	BA6124 £2.75	LA1235 £2.50	M5101AL £1.95	SA11025 £3.50	STK5332 £3.50	TA7302 £1.30	TD1180P £1.80	TD2660 £2.50	U4C125H £2.50	ZSC458 £0.20
AN5521 £5.50	BA6154 £2.50	LA1260 £1.75	M51164 £1.40	SA11226 £3.95	STK5333 £10.00	TA7303 £1.10	TD1190 £1.90	TD2661 £2.50	U4C125H £2.50	ZSC458 £0.20
AN5730 £3.20	BA6208 £2.75	LA1403 £3.75	M51356P £5.00	SA11174 £6.50	STK5338 £6.00	TA7310 £1.75	TD1270M £4.10	TD2662 £2.50	U4C125H £2.50	ZSC458 £0.20
AN5750 £2.50	BA6209 £3.20	LA1460 £1.90	M51381P £1.50	SA11250 £2.60	STK5361 £6.25	TA7312 £1.75	TD1270M £4.10	TD2663 £2.50	U4C125H £2.50	ZSC458 £0.20
AN5760 £2.00	BA6219 £1.95	LA3210 £1.90	M51393 £4.25	SA1251 £6.50	STK5421 £6.50	TA7313 £0.90	TD1412 £1.00	TD2664 £2.50	U4C125H £2.50	ZSC458 £0.20
AN5900 £1.50	BA6222 £3.10	LA3220 £1.00	M51513 £10.00	SA1276 £4.50	STK5422 £5.00	TA7313AP £1.40	TD1417 £0.90	TD2665 £2.50	U4C125H £2.50	ZSC458 £0.20
AN6326 £4.00	BA6229 £1.85	LA3350 £1.50	M51516L £1.50	SA11290-02 £10.70	STK5434 £5.50	TA7314 £2.00	TD1501A £3.20	TD2666 £2.50	U4C125H £2.50	ZSC458 £0.20
AN6332 £4.40	BA6236 £1.95	LA3361 £1.50	M51516 £4.00	SA11293-02 £7.75	STK5451 £5.30	TA7323 £3.25	TD1506 £3.50	TD2667 £2.50	U4C125H £2.50	ZSC458 £0.20
AN6341 £2.75	BA6239 £3.75	LA3600 £3.50	M51903L £3.00	SA1293-02 £7.00	STK5471 £5.25	TA7325 £2.00	TD1510 £3.20	TD2668 £2.50	U4C125H £2.50	ZSC458 £0.20
AN6344 £6.50	BA6259 £3.00	LA3700 £2.50	M5213L £3.10	SA3027 £6.00	STK5476 £6.00	TA7325P £1.50	TD1510A £3.20	TD2669 £2.50	U4C125H £2.50	ZSC458 £0.20
AN6346 £4.50	BA6301 £2.00	LA4100 £1.00	M52184 £1.00	SAAS000 £3.00	STK5481 £5.00	TA7326 £2.00	TD1512 £1.00	TD2670 £2.50	U4C125H £2.50	ZSC458 £0.20
AN6346 £4.50	BA6302A £1.80	LA4102 £1.20	M52314 £1.10	SAAS010 £5.80	STK5482 £5.20	TA7335 £1.50	TD1515A £2.50	TD2671 £2.50	U4C125H £2.50	ZSC458 £0.20
AN6359 £3.50	BA6304 £1.70	LA4125 £2.90	M54519P £1.00	SAAS012 £6.60	STK5720 £7.00	TA7335P £4.20	TD1515A £2.50	TD2672 £2.50	U4C125H £2.50	ZSC458 £0.20
AN6360 £2.75	BA6305 £1.75	LA4140 £0.70	M54543 £1.75	SAAS020 £5.80	STK5730 £5.25	TA7342 £2.10	TD1670A £2.60	TD2673 £2.50	U4C125H £2.50	ZSC458 £0.20
AN6362 £4.25	BA681 £0.90	LA4160 £1.25	M54544L £1.85	SAAS030 £9.00	STK6962 £2.20	TA7343 £1.75	TD1701 £3.00	TD2674 £2.50	U4C125H £2.50	ZSC458 £0.20
AN6387 £5.50	BA7001 £1.90	LA4182 £2.10	M54548L £4.50	SAAS040A £5.00	STK6972 £6.00	TA7350 £2.10	TD1770A £3.00	TD2675 £2.50	U4C125H £2.50	ZSC458 £0.20
AN6612 £2.20	BA718 £1.80	LA4183 £2.75	M54878P £4.75	SAAS040B £9.90	STK7126 £6.10	TA7358 £1.50	TD1870A £2.60	TD2676 £2.50	U4C125H £2.50	ZSC458 £0.20
AN6651 £0.60	BA728 £1.10	LA4192 £1.70	M56655P £6.50	SAAS041 £9.50	STK7308 £3.75	TA7607 £3.50	TD1905 £1.40	TD2677 £2.50	U4C125H £2.50	ZSC458 £0.20
AN6671K £5.50	BA7675 £15.00	LA4422 £1.30	M56839 £8.00	SAAS050 £14.00	STK7309 £7.00	TA7607AP £2.40	TD1908A £1.75	TD2678 £2.50	U4C125H £2.50	ZSC458 £0.20
AN6677 £5.25	BT16018 £3.50	LA4440 £2.70	M708 £5.50	SAAS231 £3.00	STK7348 £5.00	TA7609P £2.70	TD1940 £1.80	TD2679 £2.50	U4C125H £2.50	ZSC458 £0.20
AN6884 £2.75	HAI1215A £3.50	LA4445 £3.50	M709 £4.75	SAB301 £4.50	STK7356 £5.50	TA7614 £2.50	TD1950 £2.50	TD2680 £2.50	U4C125H £2.50	ZSC458 £0.20
AN6912 £2.00	HAI1223 £3.75	LA4460 £1.70	MA150-E £2.20	SAB303P £11.00	STK7358 £6.50	TA7628P £2.40	TD2002 £1.40	TD2681 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7111 £1.50	HAI1225 £2.10	LA4461 £1.00	MB3156 £1.00	SAB303P £11.00	STK7728 £4.75	TA7629 £4.00	TD2003 £1.30	TD2682 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7112 £3.00	HAI1226 £3.75	LA4500 £2.70	MB3730 £2.75	SAB303P £11.00	STR1096 £3.60	TA7629P £2.75	TD2004 £1.70	TD2683 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7116 £1.20	HAI1235 £3.10	LA4507 £2.70	MB3731 £3.25	SAB560 £3.50	STR1325 £5.50	TA7630P £2.00	TD2005 £1.70	TD2684 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7143 £1.65	HAI124A £1.75	LA4570 £2.20	MC13002P £5.00	SAS570 £3.00	STR0090 £3.00	TA7640 £2.00	TD2006 £1.95	TD2685 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7148 £1.70	HAI1414 £2.50	LA4572 £2.20	MC14497P £5.50	SAS80 £2.50	STR4211 £9.95	TA7642 £2.00	TD2006V £1.95	TD2686 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7158 £4.00	HAI1701 £3.10	LA5527 £1.95	MC1330P £2.95	SAS90 £3.50	STR440 £5.00	TA7658 £2.00	TD2020 £3.50	TD2687 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7160 £3.00	HAI1713 £3.90	LA6358 £5.00	MC14001BCP £1.10	SL1430 £2.80	STR441 £5.00	TA7660 £4.80	TD2030 £1.10	TD2688 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7169 £3.50	HAI1714 £3.50	LA7016 £2.50	MC14093B £1.50	SL1431 £2.80	STR451 £4.95	TA7681AP £5.75	TD2030H £2.00	TD2689 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7171K £1.00	HAI1715 £3.20	LA7096 £4.00	MC14426P £2.20	SL1432 £1.10	STR454 £4.85	TA7687 £2.00	TD2030V £1.75	TD2690 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7205 £1.95	HAI1747A £12.75	LA7210 £3.10	MC14429P £2.20	SL1471DP £2.20	STR50020 £7.90	TA7698A £6.85	TD2035 £2.00	TD2691 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7213 £1.10	HAI1749 £7.00	LA7305 £6.90	MC14497P £5.50	SL480 £3.30	STR50103A £5.50	TA7699P £7.50	TD2151 £3.00	TD2692 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7218 £1.20	HAI1750 £5.10	LA7309 £3.75	MC14511BCP £2.00	SL490 £3.00	STR5412 £5.95	TA7705P £1.50	TD2161 £1.75	TD2693 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7220 £1.60	HAI2005 £3.80	LA7507 £4.00	MC14516BCP £2.00	SL901B £3.00	STR58041 £6.75	TA7709 £2.50	TD2170 £3.00	TD2694 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7222 £2.10	HAI2017 £2.00	LA7520 £3.25	MC1458UPC1458 £1.95	SL9178 £2.50	STR6020 £4.95	TA7738 £2.50	TD2190 £10.00	TD2695 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7223 £7.60	HAI2026 £2.00	LA7800 £1.50	MC2359 £1.00	SN76670N £1.25	STR8050 £14.10	TA781010P £1.75	TD2270 £2.20	TD2696 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7274 £1.40	HA2413 £1.20	LA7801 £1.25	MC2359 £1.00	SSA1075 £5.90	SWM993C £2.00	TA8101N £4.25	TD2320 £0.90	TD2697 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7275 £1.90	HAI3001 £1.80	LA7820 £1.90	MC24061 £1.70	SSA1250 £3.50	TA4180 £3.00	TA8102P £4.25	TD2320 £0.90	TD2698 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7273 £2.00	HAI3402 £3.20	LA7830 £2.50	MDA2061 £1.00	ST082 £12.00	TA4193 £5.00	TA8255 £5.50	TD2513 £3.75	TD2699 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7310 £1.10	HAI3403 £4.00	LA7913 £1.30	MDA2062 £3.50	ST1195 £5.50	TA4194 £5.50	TA8310A £2.00	TD25220 £10.75	TD2700 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7311 £1.75	HAI350 £9.00	LM1011N £3.00	MDA2050 £4.60	STA401A £3.75	TA4301 £4.50	TA8550 £2.10	TD2530 £4.75	TD2701 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7315 £1.75	HAI368R £2.55	LM1017/M1921B £2.30	ME2901 £3.00	STAA41C £3.00	TA4345 £3.40	TA8120S £0.50	TD2530 £4.75	TD2702 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7324 £4.50	HAI374 £5.00	LM1035 £2.30	MH27316 £3.00	STK0029 £4.30	TA4350 £6.00	TA850 £1.00	TD2532 £3.00	TD2703 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7410 £2.10	HAI377 £2.00	LM1036N £3.70	ML232B £4.50	STK043 £10.00	TA7120 £1.25	TA8560 £1.00	TD2532 £3.00	TD2704 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7415 £1.40	HAI388 £4.00	LM1112CN £3.30	ML237 (BT6618) £2.50	STK082 £12.00	TA7137 £1.25	TA8750 £2.00	TD2540 £2.75	TD2705 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7420 £3.20	HAI392 £3.00	LM1112CN £3.30	ML237 (BT6618) £2.50	STK2029 £8.50	TA7176 £2.50	TA8800 £0.85	TD2541 £2.00	TD2706 £2.50	U4C125H £2.50	ZSC458 £0.20
AN7818F £1.60	HAI394 £4.00	LM1360N £5.00	ML238B £7.50	STK2125 £12.00	TA7176AP £2.40	TA8920M £0.45	TD2543 £5.25	TD2707 £2.50	U4C125H £2.50	ZSC458 £0.20
B1403 £1.00	HAI397 £5.40	LM1866N £1.50	M293 £4.00	STK2250 £9.20	TA7193AP £4.00	TA9205 £1.00	TD2560 £3.75	TD2708 £2.50	U4C125H £2.50	ZSC458 £0.20
BA1320 £1.50	HAI406 £3.50	LM1894N £5.75	M293 £4.00	STK3041 £5.70	TA7193P £6.00	TA9205 £1.00	TD2560 £3.75	TD2709 £2.50	U4C125H £2.50	ZSC458 £0.20
BA1332 £1.00	HAI436 £2.00	LM3177 £1.80	ML923DP £4.50	STK4090 £8.00	TA7205 £1.75	TA9650 £3.95	TD2560 £3.75	TD2710 £2.50	U4C125H £2.50	ZSC458 £0.20
BA3018 £1.50	HAI457 £2.10	LM324 £0.80	ML926 £4.20	STK4121 II £7.75	TA7205AP £1.25	TA9650 £3.95	TD2577 £2.80	TD2711 £2.50	U4C125H £2.50	ZSC458 £0.20
BA318 £2.50	HA4219 £2.70	LM339 £0.80	MM5314APL £1.25	STK4141 II £6.50	TA7222 £2.25	TD1005 £2.50	TD2578 £3.00	TD2712 £2.50	U4C125H £2.50	ZSC458 £0.20
BA328 £1.10	HD14081 £0.25	LM339N £0.75	MM53108N £1.25	STK4142 II £10.00	TA7223 £2.50	TD1010A £1.10	TD2578A £2.80	TD2713 £2.50	U4C125H £2.50	

A.Z. ELECTRICS

Stock items despatched by return

TRANSISTORS			
BC184	£0.09	BD244	£0.30
BC212	£0.09	BD244C	£0.30
BC213	£0.09	BD278A	£0.80
BC214A	£0.07	BD434	£0.90
BC214B	£0.07	BD508	£0.90
BC214L	£0.09	BF195	£0.07
BC237	£0.07	BF196	£0.15
BC238	£0.07	BF197	£0.15
BC307	£0.12	BF198	£0.07
BC308B	£0.07	BF199	£0.14
BC327-25	£0.07	BF244	£0.40
BC328-40	£0.05	BF259	£0.22
BC337	£0.07	BF422	£0.15
BC372	£0.95	BF458	£0.22
BC392	£1.50	BF459	£0.22
BC441	£0.25	BF469/BF471	£0.25
BC461	£0.25	BF471	£0.25
BC548	£0.07	BF472	£0.25
BC549	£0.07	BF870/BF472	£0.25
BC557	£0.30	BU108	£0.75
BC559B	£0.07	BU126	£0.70
BC639	£0.18	BU208	£1.00
BC640	£0.30	BU208A	£1.00
BD131	£0.50	BU208D	£1.00
BDDB132	£0.40	BU208T	£1.00
BD137	£0.35	BU208T	£1.00
BD237	£0.22	BU208T	£1.00
BD238	£0.22	(TOSHIBA)	
BD243B	£0.30	BU326A	£1.00
BD243C	£0.40		

DIODES AND THYRISTORS					
BA157	£0.07	BY206 (BY996)	0A91	£0.20	
BR100	£0.20		OT112	£2.20	
BR101	£1.40	BY210/800/BY996	RGF15G	£0.45	
BR103	£0.75		RGF15J	£0.45	
BR303	£1.50	BY227	£0.20	RGF15K	£0.35
BR556	£0.75	BY228	£0.50	RGF30K	£0.70
BT116	£2.50	BY229	£1.15	RH1	£1.30
BT128P	£4.50	BY299	£0.50	RM11C	£0.45
BT129P	£4.50	BY960	£0.30	SG26A	£8.50
BT151-800R	£1.75	BY965	£0.55	SKB/02	£0.60
		BY966	£0.50	SKB/08	£1.20
BY126	£0.20	BYW6E	£0.50	SKB/02	£0.90
BY127	£0.08	BYX10	£0.50	SKB/08	£1.10
BY133	£0.20	BYX55-600	£0.55	SKF1/02	£0.60
BY164	£0.90	FB2506	£1.50	SKF1M15	£0.65
BY164/SKB2/02	£0.90	IN4001	£0.10	SKZC2/02	£0.75
		IN4002	£0.06	SKZC3/04	£1.30
BY179	£1.10	IN4004	£0.10	SKF4F1/04	£0.45
BY179/SK2/08	£1.10	IN4005	£0.10	SKF4F1/06	£0.45
		IN4006	£0.08	SKF5F3/10	£0.75
BY184	£0.65	IN4007	£0.08	SR2M	£0.75
BY189	£2.00	IN4148	£0.10	T9053V	£1.40
BY190	£2.00	IN5408	£0.25		
BY223	£2.00	KBL08	£1.95		

ASK FOR SEMICONDUCTORS NOT LISTED

VIDEO HEADS

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

FERGUSON	
3HSSV-2 Head universal	£9.95
3HSSVA-3V42,44,45,46 etc.	£20.00
3HSS4VB-3V32/HR7655	£25.00
3HSS4VC-3V48/HRD565	£26.00
3V48,58,59,65,FV10,11,12,13,14,20,21,26	
And most other Fergusons	POA

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

PANASONIC	
3HSSN-2 Head universal	£9.95
3HSSU1N-NV100,370,380/Philips VR6460	£11.00
3HSSU2N-NV230,470,480,G9,10,11,15PX	£21.00
3HSSU3N-NV430,460	£16.00
3HSS3N-NV777,330	£18.50
3HSS4NB-NV730	£26.00
3HSS4NA-NV366	£24.00
NVG30,33,40,45,46,130, & most other Panasonics	POA

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

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

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

ASK FOR VIDEO HEADS NOT LISTED

The above heads are new and replacements.

BELT KITS

AKAI	
VS1,2,5	1.20
VS4,6,9,15	1.10
VS9300,9500,9800	1.60

AMSTRAD	
7000	1.00
VCR4600,5200	1.90
VCR4500,9000	2.00

FERGUSON/JVC	
3V00/16/22 Mechanical Models	1.60
3V23	1.00
3V29/30	1.20
3V29/30 Loading Belt	0.35
3V31/32	1.10
3V35/36/38/39	1.00
3V42/43/44/45/48/54/55	1.00
3V58/59/64/65/8950/51/FV10/11/12/13/14	1.60

FISHER	
FVHP520/530	1.70
FVHP615/710/715/716/722/725/830	1.00
FVHP905/906/907/908/910/911/915/916	1.20

HITACHI	
VT11/14/17/19/33/34/35/38/39/88	1.30
VT52/61/62/63/64/65/85/86	2.10
VT100/110/111/113/115/118/120/125/130/135/145/150/175	2.50
VT8000/8500	1.70
VT9300/9500/9700	1.50

PANASONIC	
NV230/250/280/370/380/430/450/460/465/485/630/810/830/850/870/890	1.90
NV300/333/340/366	1.60
NV600/777/788	1.50
NV2000/3000	1.50
NV7000/7200/7500/7800	1.40
NV8600	2.20
NV730	0.60

PHILIPS	
VR63676467/6561/6751/6760/68SB4	2.00
VR6460/6920/6520	2.40
VR6580/6581	2.50
VR6362/6367/6470/6467	2.25
VR6542/6843	2.00

SANYO	
VTC5000/6500	0.65
VTC5300/5350	1.00
VHR1100/1300/1500	1.00
VHR2300/2500/2700	2.90

SHARP	
VCF3/VC402/500/571/581/582/583/584/585	1.10
VC6F3/6V3/VC600/651/681/682/683/684/685/693/700/7832.10	2.10
VC200/381/384/385/386/390/9300/9500/9700	1.95
VC300/387/388/481/483/486/488/496	1.20
VC7300/7700/7750	1.95
VC8000/8300	1.95

TOSHIBA

V8600/8700/9600	1.05
V55/57	1.10
V66/67	2.80
V31/33	2.30
V73/81/83/85	2.30

Belt kits for Funai, GEC, Goldstar, Grundig, Hinari, ITT, Mitsubishi, NEC, Orion, Saisho, Samsung, Schneider, Sony and Tensai also available.

LINE OUTPUT TRANSFORMERS

Decca 100	9.50
ITT CVC20	12.50
ITT CVC25/30/32	9.50
ITT Compact 80 Series 110	16.75
ITT Compact 80 Series 90	19.75
ITT CVC45	18.00
ITT 1109F	14.00
ITT CVC1204	11.50
ITT CVC800/1/3	21.50
ITT CVC1100	16.50
ITT CVC1150/1175	20.00
ITT 6325	18.50
ITT 3546	18.50
ITT 1200/1	20.00

Other ITT transformers available

Fidelity all models up to 20' ZX3000	10.50
Fidelity Panel for ZX2000	1.00
Fidelity 22' ZX3000	24.50
Hinari CT4/5 & TVA1	22.00
Philips KT3	12.95
Rank Bush T20A	11.50
Thorn 1615	8.00
Thorn TX100 Green Spot 110	17.25
Thorn TX90 Mains Trans	18.85
Ferguson TX90 LOPT	19.50
Ferguson 3V35/36 Mains Transformer	23.00
Ferguson 3V44/4445 Mains Transformer	18.85
Sony - Please state model for price	
Universal Tripler	4.75
Universal Tripler with focus unit	9.50
Decca 120/130 series tripler	8.50
Thorn TX100 Focus Unit Kit	9.00

VIDEO MOTORS

REEL MOTORS	
Ferguson 3V29/30	£20.00
Ferguson 3V58,59,65	
FV10,11,12,13,14,20,21,22	£17.25
Ferguson FV11 Original	£14.50
Hitachi 8000,8300,8500	£8.50
Sanyo VTC5000,5150,5400,5300,6500	£7.50
Sharp VC9300,9500 etc, Original	£15.90
Panasonic NV333,366 Original	£13.20
All other Panasonics	POA

DRUM MOTORS	
Ferguson/JVC (Mechanical models)	£23.00
Sharp 7000 series Original	£24.63
All Panasonic Original	POA

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

MODE CONTROL MOTORS	
Ferguson 3V42,43,44,45,48,49,52,53	£6.00
Ferguson 3V58,59,65	
FV10,11,12,13,14,20,21,22,26	£4.50

IDLER ASSEMBLIES

FERGUSON	
Take up Clutch (Mechanical models)	£5.00
3V29/30 Take up Idler	£2.00
3V29/30 Take up Clutch	£2.85
3V29/30 Reel Idler	£3.00
3V35 Reel Idler	£3.00
3V35,36,38,39 Take up Clutch	£2.85
3V58,59,64,65,FV10,11,12,13,14 Idler Arm	£1.80
Clutch Assembly	
3V44,45,48,49,52,53,54,55	£14.00
Clutch Assembly 3V42,43	£14.00

VT9300,9500 etc. F/F Idler	£2.95
VT8000,9500 etc. Idler	£2.95
VT8000,8500 etc. F/F Rew Idler	£2.95
VT8000,8500 etc. Play Idler Assembly	£3.00
VT8000,8500 etc. FF-Rew Pulley	£0.70
VT11,33 etc. Clutch Assembly	£8.00

PHILIPS	
VR6460,6920 Idler Arm (original)	£3.00
DV464,6462,6463,650 etc. Idler Mod. Kit	£4.50
VR6542,6843 Reel Idler	£6.50
VR6542 Reel Drive Pulley	£7.75
VR6843 Reel Drive Pulley	£8.50

PANASONIC (All Original)	
NV370 Idler Arm Unit VXP0521 Gen	£3.00
NV8600,8610 Play Idler VXP0243	£0.95
NV332,777,788 Idler Unit VXP0463	£3.00
Reel Drive Pulley Unit VTC5000,5150,6500	£3.00
NV333,366 Idler Arm 2 Unit VXL0997	£10.50
NV8400,8600,8610 etc. VXP0245	£0.95
NV333,366 etc. Idler VXP0401-NV700,7200	7800
Idler VXP0344	£0.90
NV2000,3000 Play Idler VXP0331-NV2000,3000	Idler Unit VXP0329
Back Tension Bands	From £1.50
All Panasonic Maintenance Kits	POA

QUOTE PANASONIC PART No FOR PARTS NOT LISTED	
SANYO	
Idler VHR1100,1300,1500	£5.50
Idler VHR2100,2300,2500,2700	£5.50
Reel Drive Pulley Unit VTC5000,5150,6500	£5.00
Idler Roller Assembly VTC5000,5150,6500	£2.25

SHARP	
Idler VC9300,9500 etc.	£1.75
Idler VC481,581 etc.	£1.95
Idler (original) VC9300,481,581 etc.	£3.50
Idler Assembly (original) VC651,681,685	£6.50
Idler Assembly (original)	
VC780,781,785,787,793,VCT72	£6.50

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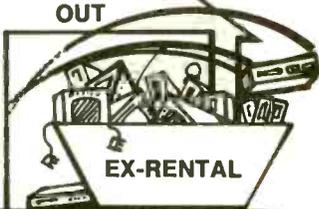
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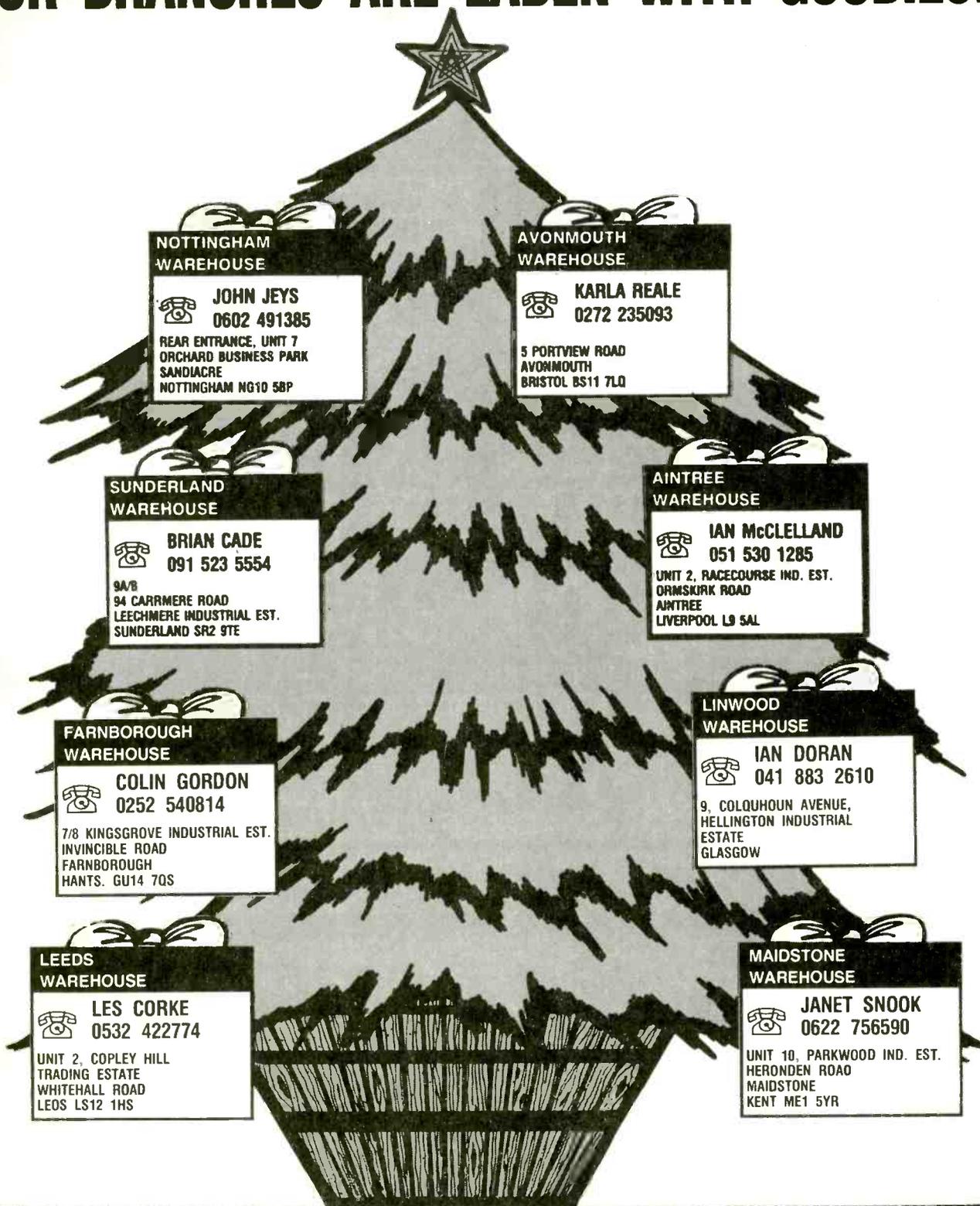
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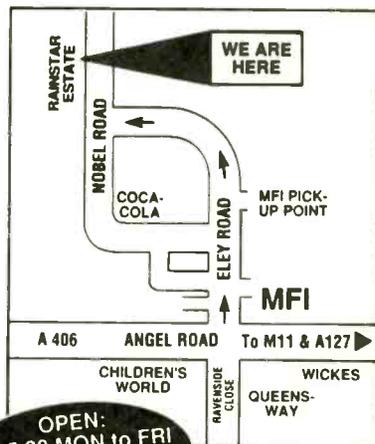
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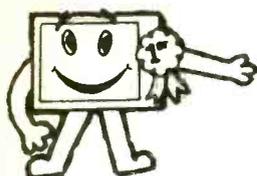
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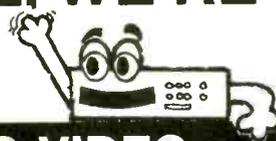


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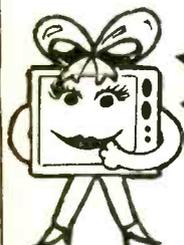
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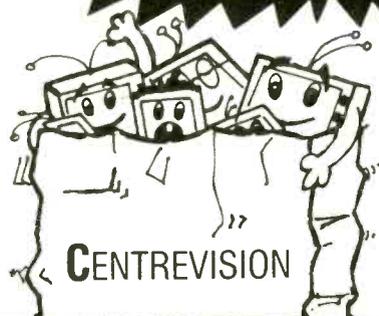
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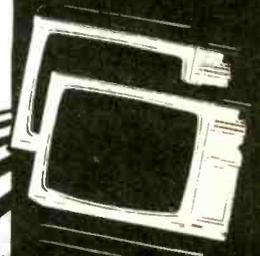
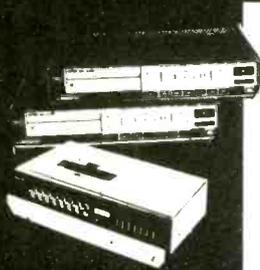
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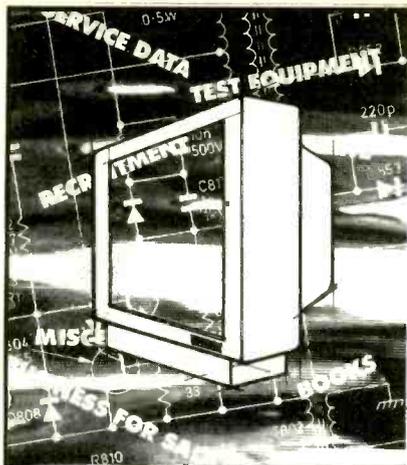
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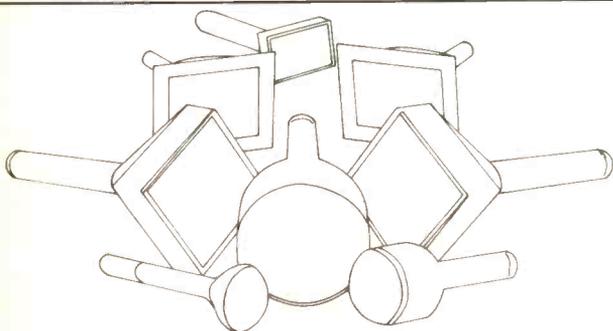
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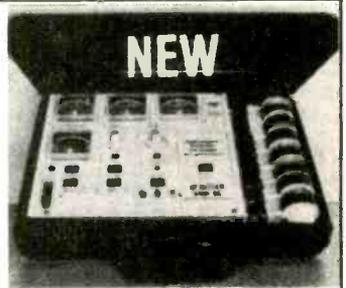
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CT75 21dB DS	30.40
CT100 19dB DS	30.40
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Antiference OX4 29.95

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FM 3 Ele. Heavy Duty	6.95
FM 4 Ele. Heavy Duty	7.95
FM 6 Ele. Heavy Duty	12.95

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24" x 12" with 90° Bend	1.25

Cable Accessories

Cable Clips

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11mm Black	per 100	1.05

Adhesive Tape

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Coax Plug Alloy each	0.17
Coax Cuppler per 50	5.95
Coax Cuppler each	0.17
F Screw On 1mm	0.20

Attenuators

3, 6, 12, 18 & 24 dB	1.25
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Fly Leads

2M Plug to Plug	0.60
2M Plug to Socket	0.66

Masts

Alloy

6" x 1/2" 18g	1.95
10" x 1/2" 16g	6.95
10" x 7/8" 16g	16.95
12" x 1/2" 16g	9.05
20" x 2" 18g	40.00

Chimney Lashing

Standard Repair Kit	1.28
5 meter wire Coil	0.80
Corner Plates	0.06
4 3/4" J Bolt & Nut	0.14
1 3/4" V Bolt & Nut	0.12
2 1/2" V Bolt & Nut	0.22

Chimney Brackets

6" x 6" Pressed	0.68
6" x 6" Welded	0.98
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Wolsley Electronics

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Die-Cast Splitters	7.14-11.52
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Line Terminator 75ohm	0.42
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Mini T Units 2 Way	4.25

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2 Way Inductive	2.65
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Diplexer UHF/VHF	2.65
Diplexer A/E	2.65
Diplexer K, CD	2.65

Wall Fixings

Welded Wall Brackets

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6 1/2" x 9" Painted	1.48
9" x 9" Painted	2.26
12" T&K Painted	3.75
18" T&K Painted	4.75
18" T&K Galvanised	7.45
24" T&K Painted	5.35
16" Tripped Galvanised	12.95
Drills, Plugs, Screws	POA

Clamps

Universal to Mast Clamps

15mm L	0.30
Cross Clamp	0.65
V Bolt & Nut 1/2"	0.12

Mast to Mast Clamps

1 1/2" to 2" Cross Clamp	0.75
1 1/2" to 2" Universal	1.60

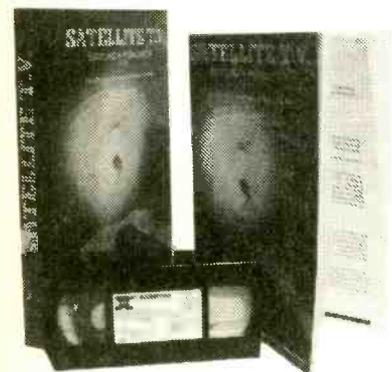
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Alan Surface Socket	0.48
Alan Surface Twin	0.75
Alan Flush Wall Socket	0.65
Alan Flush Twin	0.95
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CA3290	£1.00
CA3291	£1.00
CA3292	£1.00
CA3293	£1.00
CA3294	£1.00
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TDA3590	£1.00
TDA3591	£1.00
TDA3592A	£3.00
TDA3650	£3.50
TDA3651	£3.00
TDA3651A Q	£3.50
TDA3652	£3.50
TDA3653A Q	£2.00
TDA3653	£3.00
TDA3654	£2.00
TDA3654 Q	£2.00
TDA3710	£3.50
TDA3800	£4.00
TDA3180	£2.00
TDA4260	£3.00
TDA4261	£3.00
TDA4505N4	£4.00
TDA4420	£1.00
TDA4600/2D Di	£2.00
TDA4600/2 Flat	£3.00
TDA4601	£2.00
TDA8190	£3.00
TDA9813	£3.00
TDA9513	£3.00
TDB2033	£1.00
TDD1610S	50p
TDD3600	£2.00
TDA1010	£3.00
TDA1015	£3.00
TEA1019	£2.00
TEA1030	£2.00
TEA2017	£2.00
TEA5114	£1.00
TDA3300B	£6.00
SN7662AN	£1.00
SN7415 25K	50p
SN7415 50K	50p
SN1662AN	£1.00
SN1696AN	£1.00
SN2916AN	£1.00
UA730P	40p
UA730	40p
MP543A	25p
MJ1300S	30p
MJE31T	25p
MJE32	25p
MJE60	25p
MJE61	25p
MJE305S	£1.00
MJE2801	£1.00
MJE295S	50p
MJE1304S	50p
Sanikon Diode	30p

BT404	10p
BT405	10p
BT406	10p
BT407	10p
BT408	10p
BT409	10p
BT410	10p
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BC368	10p
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BC466	10