THE LEADING UK CONSUMER ELECTRONICS TECHNOLOGY MAGAZINE

TELEVISION

SERVICING · VIDEO · SATELLITE · DEVELOPMENTS

DECEMBER 1995 £2.35

A REED BUSINESS PUBLICATION

Servicing the Philips G110 chassis

Digital camcorder format

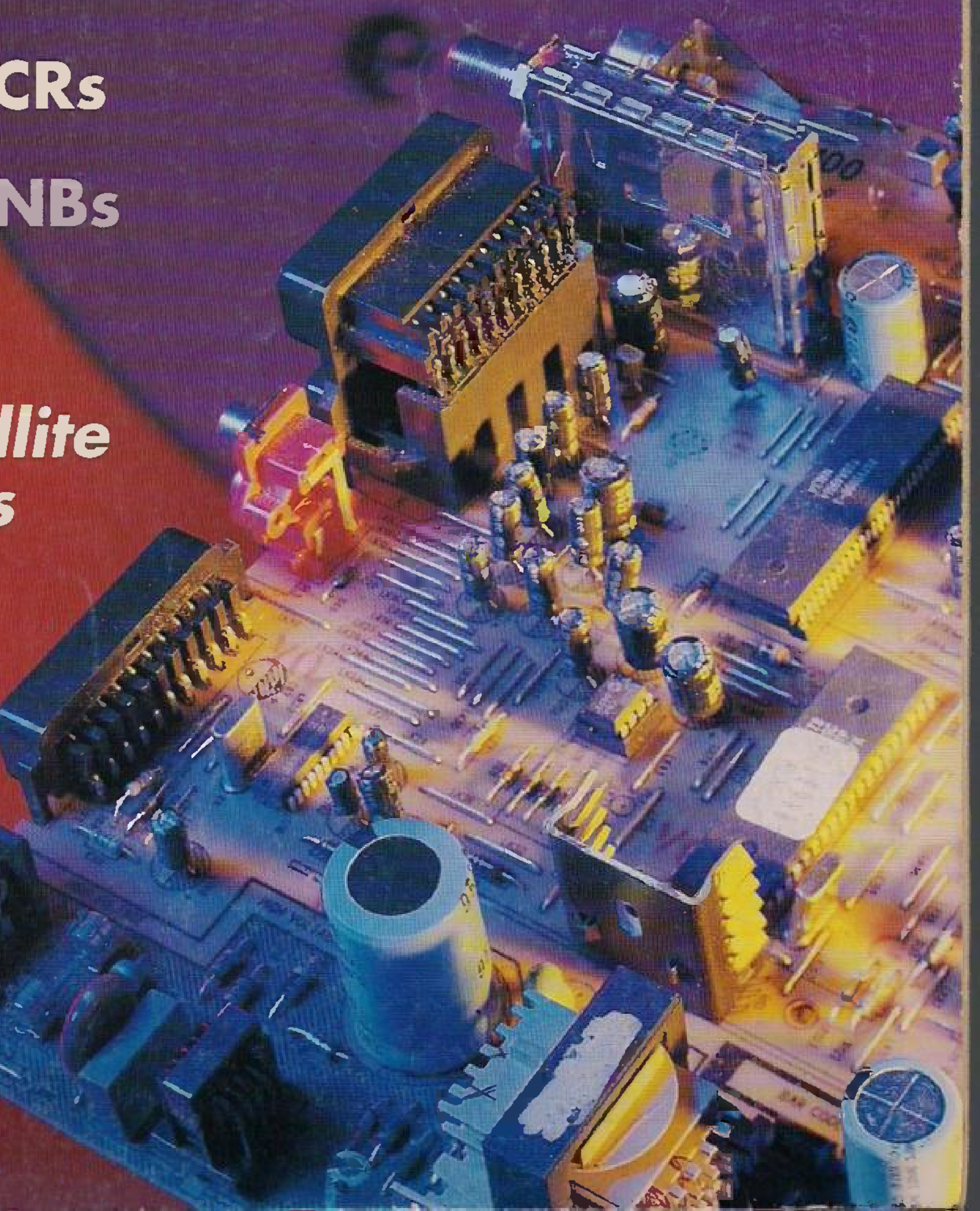
Luma signal processing in VCRs

Repairing MTI LNBs

Fault reports

TVs, VCRs, satellite and camcorders

Confessions of a TLO



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TELEVISION

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ACY19	40p
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AF139	30p
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BC107	8p
BC108	8p
BC109	8p
BC109C	10p
BC140	20p
BC141	20p
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BC639	20p
BC640	20p
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BD238	24p
BD239	30p
BD240	40p
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BD243A	50p
BD244	50p
BD245	50p

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BD265	45p
BD267	45p
BD269	45p
BD278	50p
BD311	100p
BD314	100p
BD315	150p
BD317	150p
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BD332	40p
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BD362	60p
BD370	30p
BD371	30p
BD410	50p
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BD839	55p
BD897	50p
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BD977	50p
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BDW93	50p
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BF760	40p
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BF961	35p
BF964	38p
BFR90	85p
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BFY51	14p
BFY52	14p
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BT119	100p
BT146	99p
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BUZ11	200p
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BUZ80	200p
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IRF630	150p
J174	38p
J300	50p
MJ900	200p
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MJ3000	100p
MJ3001	100p
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MJE30A	30p
MJE340	25p
MJE350	80p
MJE520	30p
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MPSA06	15p
MPSA13	15p
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MPSA42	15p
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MR856	36p
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OC45	50p
OC200	180p
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R2010B	100p
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S2055AF	200p
S2530A	100p
S2800M	72p
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TIP29E	40p
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TIP115	30p
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TIP3055	50p
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TIPL791A	80p
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TIS90	15p
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VK1010	88p
VN10KM	60p
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ZTX108	11p
ZTX109	12p
ZTX212	20p
ZTX300	10p
ZTX301	16p
ZTX302	10p
ZTX303	20p
ZTX304	10p
ZTX320	20p
ZTX501	13p
ZTX502	10p
ZTX503	18p
ZTX504	25p
2N696	26p
2N697	22p
2N698	40p
2N78	22p
2N914	28p
2N930	18p
2N1131	28p
2N1132	28p

Part	Price
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2N1711	24p
2N1893	30p
2N2102	50p
2N2218A	24p
2N2219	24p
2N2221	23p
2N2222	23p
2N2369	15p
2N2484	15p
2N2646	40p
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2N2905	20p
2N2906	18p
2N2907	18p
2N3019	28p
2N3053	18p
2N3054	40p
2N3055	38p
2N3055H	50p
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2N3702	9p
2N3703	9p
2N3704	9p
2N3705	9p
2N3706	9p
2N3707	9p
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2N3819	29p
2N3903	11p
2N3906	11p
2N4031	25p
2N4401	12p
2N4403	12p
2N5061	20p
2N5088	20p
2N5192	50p
2N5241	500p
2N5245	45p
2N5294	30p
2N5296	30p
2N5448	12p
2N6107	40p
2N6292	40p
2N6385	120p
2N6403	160p
RECTIFIER DIODES	
BY127	8p
BY133	8p
BY164	40p
BY179	35p
BY184	32p
BY206	11p
BY207	9p
BY227	19p
BY228	28p
BY298	15p
BY299	18p
BY448	20p
BYX10	15p
BYX55/600	25p
BYX70/500	32p
OA47	10p
OA91	10p
OA202	10p
IN4001	3p
IN4002	3p
IN4003	3p
IN4004	3p
IN4005	3p
IN4006	3p
IN4007	4p
IN4148	2p
IN5400	9p
IN5401	8p
IN5402	8p
IN5403	8p
IN5404	8p
IN5405	11p
IN5406	12p
IN5407	12p
IN5408	12p
RGP15	25p
RGP30	16p
SKE4F2/06	60p
SKE4F2/08	80p
SKE4F2/10	100p
5R2M	60p
I.C. SOCKETS	
8 PIN	5p
14PIN	6p
16PIN	7p
18PIN	10p
20PIN	12p
22PIN	13p
24PIN	14p
28PIN	16p
40PIN	18p
ZENERS	
400 mWatts	
2V7 to 39V	5p
1.3 Watts	
2V7 to 39V	9p
CRYSTALS	
Freq in MHz	
2.4576	180p

Part	Price
3.276	115p
4.0	110p
5.0	130p
10.0	140p
11.0	250p
12.0	120p
14.756	200p
15.0	160p
24.0	250p
VOLTAGE REGULATORS	
7805	25p
7806	25p
7808	25p
7812	25p
7815	25p
7818	25p
7824	25p
7905	25p
7906	30p
7908	30p
7912	30p
7915	30p
7918	30p
7924	30p
78L05	24p
78L08	24p
78L12	24p
78L15	24p
78L18	24p
78L24	24p
79L05	35p
79L08	35p
79L12	35p
79L15	35p
LM309K	100p
LM317T	100p
LM323K	350p
78H08KC	800p
79H12KC	700p
79HGKC	800p
VALVES	
DAF96	100p
DY87	80p
EBF80	60p
ECC84	80p
ECH84	90p
ECL84	100p
EF183	75p
EF184	85p
EL500	100p
EY86	70p
EY87	70p
EY88	80p
PC97	100p
PCC85	60p
PCF80	100p
PCF801	110p
PCF806	115p
PCH200	100p
PCL81	65p
PCL82	80p
PCL84	60p
PFL200	110p
PL36	120p
PL83	60p
PL84	80p
PL95	180p
PY81	100p
PY500A	190p
LEDs	
3mm	
RED	5p
YELLOW	8p
GREEN	8p
5mm	
RED	5p
YELLOW	8p
GREEN	8p
RECTANGULAR LEDs	
5mm × 2.5mm	
RED	5p
YELLOW	8p
GREEN	8p
OPTO COUPLERS	
4N37	48p
4N38	68p
AN203	210p
BRIDGE RECTIFIERS	
W005	16p
1A/50V	
W01	18p
1A/100V	
W02	19p
1A/200V	
W04	21p
1A/400V	
W06	23p
1A/600V	
W08	28p
1A/800V	
BR81D	33p
2A/100V	
BR82D	33p
2A/200V	

Part	Price
BR84D	37p
2A/400V	
BR86D	43p
2A/600V	
BR88D	43p
2A/800V	
BR32	43p
2A/200V	
BR34	43p
2A/400V	
BR36	44p
2A/600V	
BR62	80p
6A/200V	
BR64	72p
6A/400V	
BR251	150p
25A/100V	
BR252	165p
25A/200V	
BR254	185p
25A/400V	
BR256	200p
25A/600V	
BR258	240p
25A/800V	
BR351	185p
35V/100V	
BR352	200p
35V/200V	
BR354	220p
35V/400V	
BR356	230p
35V/600V	
BR358	260p
35V/800V	
BY164 1.5A/ 100V	40p
BY176 1.5A/ 800V	40p
TRIACS	
TIC206D	60p
4A/400V	
TIC225D	69p
6A/400V	
TIC226D	68p
8A/400V	
TIC236D	85p
12A/400V	
TIC246D	105p
16A/400V	
TIC253D	190p
20A/400V	
TIC263D	205p
25A/400V	
THYRISTORS	
2N5061	20p
0.8A/60V	
TIC116C	59p
8A/300V	
TIC116D	70p
8A/400V	
TIC126D	75p
12A/400V	
TIC126M	90p
12A/600V	
C106D	28p
4A/400V	
BR103	37p
BR303	85p
BT106	180p
BT119	100p
17088	200p
17089	200p
17127	200p
15/80H	230p
15/85R	230p
SG264	800p
SG613	1600p
COMPUTER ICs	
Z80ACPU	100p
Z80ADMA	200p
Z80ACTC	140p
Z80ASIO-1	210p
Z80ASIO-2	210p
75107	65p
75110	75p
75113	100p
75122	110p
75154	100p
75162	700p
76182	95p
75183	95p
75195	185p
2114	150p
2532	200p
2716	100p
2732	200p
2732A	220p
2764	150p
27C64	200p
27128	150p
27256-25	150p
27512	300p
4116	40p
4164-15	80p
4164-12	90p
41256-15	80p
41256-12	100p
41256-10	110p
41464-12	150p
6116	80p
6264-10	210p
62256-12	300p

Part	Price
6502A	380p
65C02	930p
6522	280p
6800	210p
6802	220p
680	500p
36808	500p
6809	500p
6810	150p
6818	380p
6821	130p
6840	290p
6845	200p
6850	90p
8085A	300p
8086	500p
8088	480p
8156	300p
8224	240p
8226	240p
8250	750p
8251	200p
8253	160p
8257	220p
8271	3400p
8279	270p
8283	400p
8284	440p
8287	260p
8288	650p
8748	700p
8755	800p
8T26	95p
8T28	110p
LINEAR ICs	
AN203	210p
AN210	165p
AN214Q	170p
AN228	280p
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AN360	100p
AN362	140p
AN366	150p
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AN3822K	600p
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AN5132	250p
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AN7115	110p
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AN7146	210p
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Part	Price
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AN7254	150p
AN7256	250p
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AN7311	90p
AN7410	150p
AY3-1015	290p
AY3-1270	800p
AY3-1350	450p
AY3-8910	360p
AY3-8912	400p
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BA311	80p
BA313	60p
BA333	80p
BA401	60p
BA402	50p
BA511	145p
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LM339	35p
LM348	50p
LM358	45p
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LM382	130p
LM386	60p
LM387	100p
LM393	45p

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LM1889	300p
LM2540N	200p
LM3900	40p
LM3909	100p
LM3914	150p
LM3915	160p
LM3916	270p
L200	200p
M491BB1	500p
M54481	700p
M50115P	320p
M50117P	500p
M50119P	525p
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MC1496	65p
MC3401	45p
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NE567	115p
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Part	Price
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JAPANESE TRANSISTORS

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Part	Price
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JAPANESE TRANSISTORS

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2SB647	20p
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Part	Price
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2SC2792	220p
2SC2793	700p
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Part	Price
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2SJ119	700p
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2SJ162	680p
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2SK55	100p
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2SK118	50p
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2SK557	400p
2SK566	475p
2SK695	550p
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2SK725	600p
2SK727	800p
2SK735	600p
2SK758	300p
2SK787	900p
2SK794	500p
2SK872	650p
2SK903	500p
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2SK1058	800p
2SK1117	250p
2SK1118	225p
3SK45	100p
3SK51	100p
3SK59	100p
3SK74	50p
3SK77	60p
3SK81	50p
3SK85	160p
3SK88	70p
3SK121	150p

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REPLACEMENT VIDEO HEADS

Model	Price
AIWA	
AV66/AV77	1200p
G700	1100p
G900	1500p
AKAI	
VS105, 112, 115, 116, 125, 128, 201, 202, 205, 220, 240, 244, 245, 247, 248, 250, 301, 302, 304, VSP6, VSP82	1200p
VP7100, VS8300, VS8500, VS5800	650p
VP77, VP98, VP7100, VP7200, VS9700, VS9800	1200p
VS1, VS2, VS3, VS4, VS5, VS10, VSP1	1350p
VS33, VS35, VS37, VS38, VS53, VS55, VS56, VS765, VS767, VS768	2100p
VS612, VS615, VS616	2800p
VS425	2300p
VS11, VS12	1200p
VS6, VS8, VS9	2400p
VSXG	2250p
VSF300, VSF650	3600p
VS155, VS165	2300p
VS20, 22, 24, 25, 26, 27, 422, 426, 427, VSF10, VSP9	1250p
VSR3	1300p
VS109, VS603, VS606, VS607	2500p
VS75	2500p
ALBA	
VCR4000, VCR5000, VCR6000	1650p
AMSTRAD	
VCR4500, VCR5200, VCR9000, TVR1	900p
VCR7000	1000p
VCR6000, 6100, 6200, 8600, 8602, 8700, DD8900, 8904, TVR4	1100p
TVR2, TVR3, VCR4600, VCR4600 MKII, VCR4700	1100p
AUTHENTIC	
N850	800p
AWA	
ATVI	800p
BAIRD	
8900, 8901, 8902, 8903, 8906, 8922, 8928	650p
8904, 8923, 8924, 8925, 8929, 8935, 8943, 8544	650p
8909, 8912	800p
8930, 8931, 8933, 8940	800p
8942	2300p
8945	2000p
8947, 8948	1600p
8950	1700p
VC141L	3000p
VH582	7000p
BLAUPUNKT	
RTV100, 200, 202, 211, 214, 222, 224, RTX100, 200	800p
RTV301, RTX250, RTV333	800p
RTV306, 307, 309, 311, 315, 316, 520, 707	1850p
RTV310, 311A, 312, 317, 319, 320	1100p
RTV324, RTV325	1550p
RTV328	1850p
RTV424	3500p
RTV434, RTV444	3900p
RTX260, RTX720, RTV330	2300p
RTV454, RTV740	5000p
RTV478	3700p
RTV520, RTV530	1800p
RTV535, RTV560, RTV570	2000p
RTV635, RTV660, RTV670, RTV730	3000p
CR1000, CR1200, CR1500	4650p
CR1800	4100p
RTV321, RTV322	1700p
RTV338	2800p
RTV348	2700p
RTV404, RTV414	3000p
RTV640	3000p
RTV750, RTV800, RTV900	3500p
RTV810	4400p
RTV910	4500p
BOSCH BAUER	
VRH50	1000p
VRP20	1000p
VRP25	1000p
VRP30	3350p
CANON	
VR10	1000p
VR30A, VR30B, VR30E, VR40A	3350p
DAEWOOD	
912, VCR12, VCR30, VCR32, VCR50, VCR52	1800p
VCP11 RAF	1800p
DECCA	
8300	1000p
8400, 8500	650p
DUAL	
EVR101	2300p
VR70, VR71, VR74, VR81, VR90, VR91	650p
VR85, VR96	2300p
VR97	3300p
VR80, VR92	650p
VR93	2450p
EDISON	
VC2130, 2133, 2135, 2140, 2830, 2930, 2932, 2934, 3122	650p
VK2132, VK2512	2300p
VK2436, VK2340	650p
VK2530, VK2532, VK2631, VK2541	1600p
VK2632	1700p
VK2637	3050p
VK2545	2450p
VKG2639, VKH2439	3300p
FUNAI	
ET1, 1100, VIP1000, 1400, 3000, 5000, VCR4000, 4500, 4800, 5200, VCR5600, 6400, 6800, V1, V25	1100p
VCR4800, VCR5400, VCR5800	1200p
VCR5480, 5843, 8007, VIP2500A, 3000A, 5000, 150	2000p
VCR4530, VCR6000, VCR6100, VCR6800, VCR6803	1300p
VCR8103, VCR8107	2200p
VIP300A MKII	1900p
FISHER	
FVHP420, 510, 520, 530, 615, 618, 620, 622, 710, 711, 715, 720, 721, 722, 730, 830, 905, 906, 908, 910, 911, 915, 916, 918, 5000, 5001, 5005, 5050, 5075	1100p
VBS3500, 7100, 7500, 7600, 9900, VBR330	1800p
VBS7000, VBS7100, VBS9000	2000p
FVHP500, 711, 715, 721, 722, 730, 830, 5100, FVHD720	1100p
FVHP725, 830, 980	2500p
FVHP990	2700p
FVHP975	2400p
FVHD40, FVHD140, FVHP1, FVHP10, FVHP20	1150p
FIDELITY	
HQS200, VCR600, VCR6100, VR900, VR9100	1500p
VCR100	1100p
VTR1000	1100p
GOLDSTAR	
8000 3HSSDB	1900p
GVH51, GVH122, VCP4000, VCP4100, VCP4200	1100p
GHV1232, 1233, 1241, 1242, 1243, 1244, 1245, 1246, 1290, 1291, 1295, 1296, 1891, 8210, 8215, GVHP1240, 1241, 1247, 1248, VCP400, VCP4130, 4300, 4301, 4305, 4306, 4310, 4311, 4315, 4316, 4320, 4321, 4326	1100p
G.E.C.	
4000H, 4001H, 4002H	1200p
V4001H, V4004	1200p
V4005H	1500p
GRANADA	
CS1, DS2	1600p
VHSAH1	1100p
VHSAH3	2400p
VHSAN3	800p
VHSAY3	1200p
VHSBH1, VHSCH1	2100p
VHSBP1	850p
VHSBY3	2600p
VHSD52	1600p
VHSEH2	1600p
VHSEY1, VHSEY2	1400p
VHSFG2, VHSFG4	1300p
VHFS1, VHSFS2	1300p
VHSTJ1, VHSTJ2, VHSTJ3, VHSWJ3, VHSYJ2	700p
VHSVH4, VHSWH1, VHSXH1, VHSYH2	1600p
VHSWJ1, VHSXJ3	700p
GRAETZ	
4312, 4605, 4905, 4912, 4913, P4833, TR4605, TR4812, TR4905, TR4912, TR4913, TR4914, TR4943	650p
4935, 4943, 4963, 4985, 4993, TR4833, TR4935, TR4985, TR4993	650p
4920, 4927, 4930	1700p
4946, TR4906, TR4916	1600p
TR4994	2300p
TR4995	3300p
GRUNDIG	
VS410, 450, 460, 500, 505, 510, 520, 521, 530, 546	1600p
BARCELONA, MVS400, 440, 500, 600, SE5100, 6100, 6110, 9100, TVR4500, 4510, 5510, VS400, 440, 500, 505, 510, 518, 600, 610, 5180, VS6190, 700, 900	1400p
MADRID, SE5140, VS540, VS5480	3000p
MVS550, 620, VS550, 620, 630, 640, 790, 930, 940	2400p
VS120	2300p
VS680	4600p
VS160, VS740	4400p
VS170	4800p
MVS660, SE6160, VERONA, VS660, VS6690	3500p
MVS710, 720, 910, SE7120, 9120, VS710, 720, 800, 810, 910, 920	1700p
HINARI	
VXL2, 3, 4, 20, 35	1000p
VXL5, V20H	1050p
VXL6	1200p
VXL7	1300p
VXL8, 9, 10, 11, 90, VCR34H, VTV200	1100p
HITACHI	
VT11, 14, 15, 16, 30, 33, 34, 330, 340, 503, 640, 5030, VTP10, 30	1000p
VT7, VT17, VT18, VT19	2200p
VT35, VT38, VT39	2400p
VT100, 110, 111, 112, 113, 115, 118, 120, 125, 128, 220, 225, 400, 405, 410, 413, 414, 415, 418, 510, 518, 520, 525, 526, VTM625, 626, 725, 726, 728	1400p
VT3000	650p
VT4000, 4200, 5000, 5500, 5600	1100p
VT77, 680, 6500, 6700, 6800, 7000, 8000, 8030, 8040, 8100, 8300, 8500, 8700, 9000, 9300, 9500, 9700, 9900	1000p
VT8, 9, 56, 57, 570, 575, 576, 580, 585, 588	3200p
VT65	2400p
VT130, 135, 138, 145, 250, 255, 258, 420, 425, 426, 428, 430, 431, 435, 438, 535, 536, VTL30, 301, VTM630, 635, 636	1900p
VT52, VT60, VT61E, VT62E, VT63, VT64, VT640	1200p
VT168, VT150, VT260, VT498 (4 HEAD)	2300p
VT530	2050p
VT522, VTM620, VTM622, VTM720, VTM722, VTM822	1650p
VT660E	2600p
H.M.V.	
HV1000, HV2000, HV3000, HV4000, HV7000, HV8000p	650p
I.T.T.	
VR3605, 3905, 3935, 3943, 3954, 3958, 3985, 3993, 4993	650p
VR3833, 3912, 3913, 3914, 3963, 3975, 4913, VRP3833	650p
VR3986	2000p
VP3826, 3906, 3916, 3926, 3946, 3948	1550p
VR3927	1400p
VR3976	2300p
VR3977	2700p
VR3984, VR3994	2300p
VR3995, 3997	1800p
VR3917	1400p
VR3730, VR3731, VR3749	2500p
VR3918, VR3919, VR3938	1500p
VR3520, 3701, 3719, 3720, 3721, 3769, 9720	2000p
VR3907, VR3908	1600p
VR3968	700p
J.V.C. & FERGUSON	
HR2200, 3300, 3320, 3330, 3350, 3360, 3660, 3750, 3860, 4100, 3292, 8900, 8901, 8902, 8903, 8906, 8922, 8928, 3V01, 3V06, 3V22	600p
HR3660, 7600, 7610, 7650, 7700, HRD110, 111, 120, 121, 220, 225, HRS100, 8904, 8923, 8924, 8925, 8929, 8935, 8941, 8943, 8944, 3V16, 3V23, 3V24, 3V31, 3V35, 3V36, 3V38, 3V39, 3V49	625p
BR1600, HRD140, 141, 142, 143, 150, 152, 156, 157, 158, 160, 5101, HRS10, 8947, 8948, 3V42, 3V44, 3V45, 3V46, 3V47, 3V52, 3V54, 3V55, 3V56, 3V57	1150p
HRD154, 170, 171, 210, 211, 217, 320, 321, 350, 521, 522, 525, 526, 527, 550, 8950, 8951, 3V64, 3V65, FV10, FV11, FV20, FV21, FV26	1300p
HRD565, HRD566, 3V48	2200p
HRD725, HRD755, 3V43, 3V53	2950p
8930, 8931, 8933, 8940, 3V29, 3V30	700p
8945	2400p
3V00, 8902, 8903, 8909, 8912, 8922	1000p
FV31	1500p
FV37, FV43H, HRD860	3500p
BR7000E, BR7000S	2600p
HR7200, 7300, 7350, 2650, BR6200	700p
HRD455	2000p
HRD520	1400p
HRD300, 400, 580, 600, 620, 650	2300p
HR4100	1000p
HRD750, HRD830	3300p
HRD250, HRD257	2500p
3V32, 8942, HR7655	2200p
HRD180, 190, 230, 610, 3V59, FV12L, FV20B, 26, 30, 32, 33, VC141L	2250p
HRD370, HRD430, HRD470, 3V58, FV13H	2300p
HRD530, HRD700, FV14T	3100p
GRC1, GRC2, 3V41	2800p
HRD330, 337, 440, 637, 641, 660, HRFC100, FV44L	2100p
KENWOOD	
KV901, KV903, KV905	650p
KV917	2450p
LOGIK	
VR960	1500p
VR950	1400p
LOEWE	
OC410, OC420, OC440	2400p
OC50, OC55, OC60, OC65	1500p
LUXOR	
9225, 9256	1800p
9245, 9251, 9254	1225p
9270, 9271, 9273	1800p
9272, 928217	2700p
9252	2500p
928017, 928077, 928097, 929107, 928117	1700p
9253	2500p
9281	2700p
9284, 9295, VR3701, VR3721, VR3731, VR3761	2100p
MATSUI	
VX600E, 800A, 810A, 820, 80A, 770B, 773B	1200p
VCRL3, VX730, VX750	1450p
VX735, VX755, VX990	1500p
VX735A, VX765, VX850	1750p
VX600	1100p
MITSUBISHI	
HS303, HS304, HS320, HS700	1500p
HS306, HS318, HS710	1500p
HS307	2300p
HS319	2300p
HS330	2400p
HS400	2250p
HS349, HSE31, HSE32, HSB31	2250p
HS411	2900p
HSE30, HSB30	2100p
HS338	2200p
HSE10, HSE11, HSE20, HSE21, HSE41, HSB10, HSB20	2100p
HS300, HS301, HS302, HS310, HS273	1450p
HS200	650p
HS337, HS347	1400p
HSE12, HSE22, MX1	2100p
HS411EZ, HS411GZ	2900p
HSB11, HSB21	2100p
HSE50	3300p
NATIONAL PANASONIC	
NV300, 322, 333, 390, 2000, 2010, 3000, 7000, 7500, 7800, 7850, 8170, 8200, 8400, 8600, 8610, 8620	625p
NV777, NV330	1500p
NV8050, NV8051	2800p
AG1000, AG1050, NV260, NV280, NV460, NV470, NV480	1600p
AG6010, AG6015	2500p
AG6640	2400p
NV100, NV200, NV370, NV380, NV630	725p
NVD80, NVH65	3400p
NVF65, NVH75	3200p
NVF51	4200p
NVG19	2300p
NVJ30, NVHJ33, NVL20, NVL21, NVG30, 31, 40, 130	1600p
NVJ35, NVG46	2100p
NVM1, NVM3, NVM5	4200p
AG2100, AG2200	700p
NV430	1000p
NV730, NV770 4 HEAD	1580p
NV366	1850p
NV180, NVD48	2300p
NV788	2800p
NV810, NV830	2400p
NV850, NV950	2750p
NV870, NV890, NV970	3600p
NVG33, NVG46, NVL23, NVL25, NVL28	1800p
NVG10, 11, 12, 14, 16, 120, NV250, 280, 450, 465	1500p
NVG18	1800p
NVG20, 21, 22, 25, 28, 200, NVD48	1800p
NVG50, NVG300	2650p
NVG45	1800p
NVH70	3800p
NV688	2400p
NV600	1600p
AG6800, AH6810	2600p
AG6100, AG6200, AG6300	2600p
NVG7, NVG9, NV230	1050p
NV780	2400p
NVG15, NVG400	2600p
NVM7, NVMC20	3800p
NVF70	5200p
N.E.C.	
N9011, 9012, 9013E, 9014E, 9014G, 9015, 9016, 901A, 902A, 9033, 9034, 9040, 9053, 9054, 9055, 9063, 9065, 9066, 906, DX1000, 1600	1200p
N911A, 914C, 915A, 916A, 917, 9110, 9120	2400p
PVC600, 740, 744, 754, 763E, 764, PV2300, 2400, 760, 794, 770, 774	1650p
N380, N381, N830, N831, N832, N833, N834, N835, N836	700p
8261, AH1 (for model DX3000), DX4000, N9610	3000p
N896	3150p
N9052, N9530, DX2000	3400p
VCP1	1700p
PVC2300, 2400, 740, 744, 760, 764	1400p
DS6000	3500p
NORDMENDE	
460, 9-460, V100, 140, 200, 250, 304, 341, 450, 550	700p
V1001, 1005, 1015, 1025, 1035, 1041, 1055, 1065, 1105, 2005	1250p
V110, V333	2000p
V101, 102, 103, 112, 141, 142, 200, 300, 301, 302, 350, 500, 3005	700p
V1205, V1215, V1235, V1245	1400p
V1305	2450p
V380	2300p
V502, V503, V5005	3150p
ORION	
VH3, VH555, VH600, VH700, VH844, VH900, VH1000 (ALL MODELS)	1100p
VH1, VH2A	700p
PHILIPS	
VR6460, VR6520, 64VR60, VR6420	725p
VR6711 4 HEAD	1800p
6920, VR6440	2500p
VR6441, VR6540, VR6541, VR6640, VR6642	1300p
RANK	
BV6900AS	1800p
N830EA, RV300, RV310, RV320, RV330, RV340, RV350, RV380	700p
REDSON	
MR100	1700p
SABA	
2A10, 2A70, 2B20	1400p
4A10, 4B20	2450p
6A10, 6A70	2300p
8A10, VR6038	3150p
CVR6083, VR600, 66007, 6008, 6009, 7006, 7007	1250p
PVR6068, 6070, 8070, VR2000, 6000, 6010, 6012, 7000, 9010	800p
VHR7000, VR5005	1500p
VR6004, 6005, 6011, 6013, 6014, 6020, 6022, 6023, 6024, 7004, 7011, 7014, 7720, 7730, 8011, 8014	700p
VR6018, VR7018	2450p
VR6028	2300p
VR7016	2000p
SAISHO	
VR100, 605, 705, 805, 905, 1000, 1100, 1200, 1600	1200p
VR3300X, VR3600X, VR3850, VR3800	1400p
VR3200, VR3500	1400p
VR2000, VR3300, VR3600	1400p
SALORA	
6500, 6600	1600p
SV7300, SV8200, SV8300, SV9200	1500p
SV7400, 8400	1600p
SV8100	1200p
SAMSUNG	
SVX301, VB900, 910, VVT510, VT320, 5600, VX510, 511, 520, 616, 626, 627, 717, 614, 619, 629, 710, 712, 720, 730, 970, 971, 972, SV716, 717, SVX303, 305, VB510, 520, 610, 616, 617, 619, 620, 626, 627, 629, 710, 971, V1520, 616, 621, 626, 900, 910	1200p
VB770, V1730, V1770, VK8220, VX750, VK770, VK8225	1900p
VM1560, VN1561	2200p
SANYO	
VTC5000, 5400, 6000, 6500, VPR5000, VTC1500, VTCM10, 11, 20, 21, 25, VTC2000, 5100, 5150, 5300, 5400, 5350, 5370, VTCNX10, VTCNX15, 20, 30, VPR5800	1800p
VTC5500, 6550, 9100, 9300, 9350, 9355, 9455, 9500	1900p
VHR1110, VHR1150, VHR1300, VHR1700, VHR2300	1200p
VHR3200, 3270, 3100, 3150, 3300, 3400, 3310, VHRD500	1500p
VHR1100, VHR1200	1500p
VHR1500, VHR2500	2100p
VHR2700	2450p
VHR7900	3000p
SHARP	
VC390, VC393, VC496	2750p
VC488	4200p
VC779	1800p
VC789, VC790	2900p
VC200, 220, 300, 381, 383, 384, 385, 386, 387, 388, 471, 477, 481, 482, 483, 486, 3300, 8381, 9100, 9300, 9400, 9500, 9600, 9700	1100p
VC582, 583, 651, 681, 750, 780, 781, 683, 684, 402, 500, 571, 573, 580, 584, 600, 682, 693, 700, 772, 7810, 782, 7822, 783, 8481	1100p
VC8000, 6200, 6300, 7300, 7700, 7750, 8000, 8300	1800p
VC793	3000p
VC473, 785, 786	2200p
VC699, VCA501, VCA802	2800p
VC585, VC685	2000p
VC90ET	3900p
VFH815	2800p
SIEMENS	
FM350, FM352, FM355, FM361, FM362, FM363	1300p
FM364	1350p
FM391, FM392, FM461	1800p
FM394, FM464	2800p
FM462, FM561	1600p
FM468	2450p
FM484, FM485, FM602, FM604, FM622, FM624	1800p
FM585	1425p
FM600	1900p
SONY	
DSR-19R (FOR SL-T 9ME)	3100p
DSR-21R (FOR SLC 8-C9)	2600p
DSR-35R (FOR C20, C30, C40, SLF1UB, SLF1E) 2 PIN SLC24PS, SLC33E, SLC44PS, SLF30PF, SLF60PS, SLK85, SLT20ME, SLT30ME	1500p
DSR-43R (FOR SLC7 RANGE, SL5000, SL5100, SL3000) 1 PIN SLC6E, SL36ES, SL37E	1300p
SL3000, 8000, 8080, SLC5E, SLT7ME	1600p
SLV201, 202	2000p
SLK95, SLT50ME	2900p
SLV373VB	2800p
TOSHIBA	
V63	1500p
V9680	3400p
V8600, V8700	3000p
V21, V31, V33, V50, V51, V53, V9600	1450p
V55, V57	700p
V71, V73, V74, V75, V77, V80, V81, V82, V83, V84, V85, V86, V87	1200p
V80, V93	1450p
V5470, V5480	1300p
V600	2350p
V880MS	2800p
V700G	3700p
V500G, V509G	2500p
V9680	2900p
V300G, V301, V305, V309G	2550p
V61, V63	1700p
V110, V120, V130, V140, V210, V220	1500p
TRIUMPH	
VR9500, VR9501, VR9525	1100p
TELEFUNKEN	
A890	2700p
A920, VR1970, 2920, 2926, 2930, 410, 7921, 7926, 7931, 7970, 970	1250p
VR400, 410, 450, 510, 519, 520, 529, 540, 610, 620, 640, 920, 1920	700p
A930, 932, 935, VR2931, 2935, 2941, 3935, 4935, 4940, 4942, 4945, 5935, 7932	1400p
A935, VR3945, VR3950, VR7959	2450p
A940, VR1925, 1930, 1940, 1950, 2960, 440, 449, 530, 535, 539, 549, 550, 630, 650, 925, 930, 940, 950	700p
VR1980, VR7980, VR980	3150p
VR2915	1100p
VR2970, VR7971, VR975	2450p
VR7979	2300p
THOMSON	
TX8000, V309, 316, 320, 321, 323, 326, 4100, 4200, 4300, VX305T, 306T, 309BL, 3301, 312T, 410T, 411T	650p
TX8500, V318, 342, 343, 351, 352, 353, 4210, 4230, 4260	1250p
V333	1100p
V340	1100p
V357, VK309LP	2300p
V360, V5500	2450p
V364, V4400	2000p
V368, V6000, V8540	3150p
V410, 510, 610, 630, 715, 4240	1400p
V430, 530, 4340	2450p
V450	2300p
VK300T, VK301T, VK302T, VK303T, VK308P	650p
VM10, VM20	2700p

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PINCH ROLLERS / VCR BELT KITS

Model	Price
AKAI	
VS10, VS9300, VS9500, VS9700, VS9800, VP7100, VP77	165p
VS1, VS2, VS3, VS4, VS5, VS6, VS8, VS9	166p
VS105, 112, 115, 116, 126, 205, 220, 240, 244, 245, 247, 248, 250, 512, 515, 516, VSX9	165p
VS201, VS301, VS303, VS304, VS603, VS606, VS607, VP58-P82	165p
VS125, VS155, VS165, VS220, VS240, VS250, VS512	166p
VS22, 23, 25, 35, 37, 38, 53, 66, 75, 422, 425, 426, 427, 452, 465, 467, 485, 965, 967, VSA77	165p
VSF260, 261, 262, 265, 270, 274, 280, 290, 410, 440, 400, 455, 480, 490, 497, 560, 599	165p
AMSTRAD	
VCR4000, 4600, 4700, 5200, 6000, 6100, 8600, 8602, 8603, 8604, 8700, 8704, 8714, 8800, 8804, 9000, 9340, DD8904, TVR1, 2, 3, 4	165p
VCR7000	165p
AIWA	
AV66, AV77	165p
G700, G900	165p
ALBA	
VCR3000X, VCR4000	165p
VCR5000, VCR6000	165p
AUTHENTIC	
N850	165p
BLAUPUNKT	
RVT100, 200, 202, 222, 224, 301, 306, 307, 309, 311, 312, 315, 316, 317, 319, 320, 328, 404, 414, 434, 444, 478, 707, RTX100	165p
RTV211, 214, 321, 322, 348, RTX250, 260	165p
RTV324, 325	165p
RTV330, 454, 520, 530, 535, 560, 660, 670, 720, 730, 740, 800, 810, 900, 910, 920	165p
DAEWOOD	
VCR12, VCR32, VCR52	165p
VCR30, VCR500	165p
DECCA	
VR8300	165p
VRH8495DK (Pressure Roller Assembly) PS403-40205	350p
FERGUSON	
3V00, 3V01, 3V16, 3V22, 3V23, 3V24, 3292, 8900, 8901, 8902, 8903, 8904, 8906, 8909, 8912, 8922, 8923, 8924, 8925, 8929	165p
3V29, 3V30, 3V31, 3V32, 3V52, 8930, 8931, 8933, 8940, 8941, 8942	165p
3V35, 3V36, 3V38, 3V39, 3V42, 3V43, 3V44, 3V45, 3V48, 3V49, 3V53, 3V54, 3V55, 3V56, 3V57, 3V58, 3V59, 3V65, FV10, FV11, FV12, FV14, 8943, 8944, 8945, 8947, 8948	165p
3V52	165p
8950, 8951, FV10B, 11R, 13H, 14T, 20B, 21R, 26D, 31R, 32L, 41R, FV42L, 50B, 51R, 52L, VC141L	165p
FV44L, FV46T, FV43H	165p
FISHER	
FVHP420, 520, 530	165p
FVHP615, 618, 620, 622, 710, 711, 715, 716, 720, 721, 722, 725, 730, 830, 840	165p
FVHP905, 906, 908, 910, 911, 915, 916, 918, 970, 975, 980, 990, 5000, 5005, 5050, 5075, 5100	165p
VBR330, VBS3500, 7000, 7500, 7600, 9000, 9900	165p
FVHD250, 270, 370, 2000D, FVHP3, 210, 250, 300, 310, FVSD2095	166p
FIDELITY	
HQS200, VCR100, 600, 6100	165p
VTR100	165p
FUJITSU	
HS760, VX715, VX720D	166p
FUNAI	
V1, V2, VCR4000, 4000, 4530, 4540, 4600, 4800, 5200, 5400, 5600, 5800, 5840, 5843, 6000, 6400, 6600, 6800, 6803, 8007, 8103, VIP150, 3000, 5000, 6000	166p
VIP1000, VIP1400	165p
G.E.C.	
V4004	165p
GRANADA	
VHSAH1, 3, VHSVH4, VHSWH1, VHSXH1, VHSYH2	165p
VHSAN3, VHS8P1, VHSVN1, VHSVN2	165p
VHSAY3, VHSX42	165p
VHSBH1, VHSCH1, VHSFS1, VHSFS2, VHSEH2, VHSEH3	165p
VHSBY3, VHSCC1	166p
VHSDS2, VHSXN2	165p
VHSDP1, VHSFP2 (Pressure Roller Assembly) PS403-40205	350p
VHSEY1, VHSEY2, VHSFY2	165p
VHSFG2, VHSFG3, VHSFG4, VHSFH6	165p
VHSFJ2, VHSFJ4	165p
VHSF83, VBXAS1	165p
VHSTJ1, VHSTJ2, VHSTJ3	165p
VHSWJ1, VHSWJ3, VHSXJ3	165p
VBXYB3	165p
VHSEH3, VHSES2	165p
VHSF34	165p
VHSFP2	165p
GRUNDIG	
BARCELONA, MADRID, MVS500, 510, 600, 620, 660, 710, 720, 910, 9105, SE5110, 6140, 6100, 6110, 7120, 9100, 9120, TVR4000, 4510, 5510, VERONA, VS500, 505, 510, 520, 530, 540, 550, 600, 610, 620, 630, 640, VS650, 660, 680, 700, 710, 720, 740, 790, 800, 810, 900, 910, 920, 930, VS940, 5180, 5480, 6190, 6690	165p
MVS400, 440, 400, 410, 440, 441, 400, 456, 460	165p
VS120	165p
VS150	165p
VS180, 200, 220, 226, 262, 265, 267, 300, 310, 315, 320, 326, 345, 380	166p
GOLDSTAR	
GHV51, 1221, 1232, 1240, 1241, 1242, 1243, 1244, 1245, 1246, 8000, 8200, 8210, 8215, GHVP1240, 1241, 1247, 1248, 1290, 1291, 1295, 1296, VCP4000, 4100, 4130, 4200, 4300, 4301, 4305, 4306, 4310, 4311, 4315, 4316, 4320, 4321, 4325, 4326	180p
HINARI	
V20H, VXL5, VXL6, VXL7, VXL8, VXL9, VXL10, VXL11, VXL19	165p
VXL2, VXL3	165p
VXL4, VXL20, VXL35	165p
HITACHI	
VT7, 11, 14, 16, 17, 19, 33, 34, 35, 38, 39, 88, 330, 680, 6500, 6800, 5000, 5500, 7000, 8000, 8300, 8500, 9300, 9500, 9700, 9900	165p
VT8, 52, 57, 61, 62, 63, 64, 65, 85, 86, 88, 100, 110, 111, 113, 115, 118, 120, 122, 125, 130, 135, 138, 145, 150, 168, 176, 220, 225, 250, 255, 258, 260, 400, 405, 410, 413, 414, 415, 418, 420, 425, 426, 428, 430, 431, 435, 438, 400, 498, 510, 518, 520, 525, 526, 576, 580, 585, 588, 640, VTD660, 665, VTF770, 775, VTL30, VTLC50, VTM620V, TM625, 626, 630, 635, 636, 640, 645, 646, 720, 722, 725, 726, 728, VTM730, 731, 735, 738, 740, 745, 746, VTS80, 85	166p
VT3000	165p
I.T.T.	
VR3605, 3826, 3905, 3906, 3916, 3926, 3935, 3946, 3948, 3976, 3985, 3986, 3995, 3997, 6348	180p
VR3913, 3914, 3943, 3964, 3984, 3993, 3994	165p
VR3907	165p
VR3908	165p
VR3912, VR3963, VRP3833	165p
VR3917, VR3833	165p
VR3927, 3929, 3968 (PRESSURE ROLLER ASSEMBLY) PS403-40205	400p
SVR3799, VR3520, 3701, 3719, 3720, 3721, 3730, 3731, 3749, 3759, VR3761, 3781	165p
VR3918, 3919, 3958, 3998	165p
VR670, VR680, VR681	165p
VR3927, VR3977	165p
VR482, VR580, VR581, VR582	165p
VR9720	165p
J.V.C.	
HR2200, 3300, 3330, 3360, 3660, 4100, 7700	165p
HR2650, 7200, 7300, 7350, 7600, 7610, 7650, 7655	165p
HRD110, 111, 120, 121, 140, 150, 157, 158, 160, 226, 257, 455, 565, 566, 725, 755, HRP50	165p
HRD520, 540, 550, 580, 600, 620, 637, 641, 650, 660, 830, 860, 960, HRS5800	165p
HRD170, 180, 210, 230, 300, 320, 321, 330, 337, 350, 370, 400, 430, 440, 441, 470, 500, 530, 700, 750, 950, HRS5000, 5500, 9000	166p
HRS10	165p
LOGIK	
VR955	180p
LUXOR	
9245, 9251	165p
8252, 8253, 8256, 8285	165p
9254	165p
9255	165p
9270, 9271, 9273, 9274	165p
9272, 928017, 928077, 928097, 928217, 929017, 929117, 929317	165p
9281, 9283, 9284, 9292, 9296, VR3701, 3721, 3731, 3761, 3781	165p
MATSUI	
VX850	165p
MITSUBISHI	
HS200, HS300, HS301, HS302, HS303, HS304, HS310, HS320, HS330, HS700	165p
HS306, HS307, HS318, HS319, HS337, HS338, HS347, HS349, HS400, HS410, HS411, HS412, HS421, HS710, HSB10, 20, 30, HSE10, 20, 30, 70	165p
HSE11, HSE12, HSE21, HSE22, HSE31, HSE32, HSE41, HSE61, HSE62	165p
NATIONAL PANASONIC	
NV100, 180, 300, 332, 333, 340, 366, 600, 688, 777, 788, 3321, AG6010, 6015, 6100, 6200, 6400, 6800	180p
NV230, 250, 260, 280, 370, 380, 430, 431, 433, 400, 460, 465, 470, 480, 630, 650, 730, 770, 780, 810, 830, 850, 870, 890, 2000, 2010, 3000, 7000, 7200, 7800, 8050, 8150, 8200, 8300, 8400, 8600, 8610, 8620, NVG14, NVG7, 10, 12, 15, 18, 30, 130, 400, AG1000, 1050, 1200, 1500, 2100, 2200, 6810, NVH70	165p
NVG9, NVG120	165p
AG6840, NVH65, 75, NVJ30, NVL20, 23, 25, 28, NVG300, NVF65, NVF70, NVFS1, NVFS100, NVG19, 20, 26, 33, 40, 50	165p
NVD48, NVD80, NVG21, NVG45	166p
N.E.C.	
N830, 831, 832, 833, 895	165p
PVC2300, 2400, 740, 744, 746, 760, 764, 766	165p
DX1000, 1600, 2000, 3000, N9012, 9013, 9014, 9016, 9033, 9034, N9053, 9054, 9055, 9066, 9110, 9120, 9510, 9520, 9530, 9610	165p
ORION	
VH1, VH2	165p
VC150, 180, VH3, 33, 200, 201, 205, 212, 250, 254, 288, 300, 303, 312, VTR404, 555, 700, 704, 712, 770, 780, 844, 900, 1000, 2948, 3030, 3312, VHF2A, VP2948	165p
COMBI15000, 16000, HV03, LVH50, NEVH, NEVHM, NEVHML, TVP230RC, VCP, VH04, 30, 103, 300, 358, 360, 362, 400, 416, 512, VH530, 532, 535, 536, 600, 630, 635, 640, 666, 730, 735, 744, 774, 790, 800, 820, 850, 888, 893, 900, 930, 940, 942, 974, 1012, 1040, 1050, 1060, 1070, 1100, 1120, 1204, 1440, 1500, 1660, 1800, 2004, 2151, 2308, 2204, 2400, 2500, 2600, 2700, 2960, 2970, 3050, 3060, 4000, 4008, 4010, 4012, 4015, 4020, 4300, 5020, VP10, 200, 220, 225, 245, VR821, 925, 1032, 2949, 2959, 2957, 2966, 2979, 2980, VTV300, VXL20, 25, 30	165p
PHILIPS	
VR6460, VR6820	166p
VR2020, VR2021, VR2022, VR2023, VR2024	165p
VR6711	165p
VR6540	165p
DV866, 686, VR702, 703, 6486, 6589, 6785, 6880, 6948	165p
VR445, VR6442, VR6542, VR6843, VR6943	166p
DV464, VR2220, 2300, 2324, 2330, 2334, 2340, 2350, 2414, 2480, VR2485, 2486, 2489, 2490, 2498, 2840, 6462, 6463, 6464, 6560, 6660, 6860, 6861, 6862, 6863	165p
N-1700, VR2870	165p
VR2025, VR6580	165p
VR6548, VR6648	165p
PRESSURE ROLLER ASSEMBLY PS403-40205, DV186, 190, 286, 291, 292, 486, 471, 562, 582, 571, 761, VR201, 202, 203, 302, 303, 305, 6180, 6182, 6185, 6285, 6290, 6291, 6293, 6362, 6367, 6390, 6391, 6393, 6467, 6468, 6470, 6561, 6570, 6581, 6670, 6676, 6760, 6761, 6762, 6870, 6970, 6975, 86B1, 63S87, 68SB4, 71SB4, 72SB8, 92SB31	350p
SANYO	
VHR1100, 1150, 1200, 1300, 1500, 2100, 2300, 2500, 2700	165p
VTC5000, 5150, 5300, 5350, 5400, 5500, 6000, 6500, 9100, 9300, VTCM10, 20, 11, 21, 31, 50, VPR5800	165p
VHR3100, 3300, 3310, 3400, 3700, 3800, VHRD500, 700	165p
VTC3000	165p
VHR4100, 4150, 4200, 4300, 4350, 4770, 5100, 5200, 5300, 5350, 5700, 7100, 7200, 7500, 7530, 7540, 7800, 8100, 8200, 8250, 8500, VHRD4400, 4410, 4400, 4600, 4610, 4710, 4890, 8700, VHRS700	165p
VCR100	165p
SHARP	
VC200, 381, 384, 385, 386, 388, 390, 393, 800, 2300, 3300, 6000, 6200, 7300, 7700, 7750, 8300, 9100, 9300, 9500	180p
VC300, 387, 402, 471, 473, 477, 481, 482, 483, 486, 488, 498, 500, 571, 573, 581, 582, 583, 584, 585, 8481, VC5F3, VC5W20E, VCA1031	165p
VC600, 651, 681, 682, 684, 685, 693, 699, 700, 772, 750, 779, 780, 781, 782, VC782MK2, 783, 785, 786, 787, 793, 800, 7810, 7822, VCT72, VC6F3, VC6V3, VCA100, 102, 104, 131, 140, 170, 202, 203, 211, 234, VCA303, 501, 602, 5011, VCD801, 802, 851, 852, 881, 882, VCM73, VCT73	165p
VC220	165p
VCA10, 30G, 60, 103, 105, 106, 211, 244, 505, 605, 615, 1031, VCD806, 810, 815, VCH80, 865, 910, VCS1000, VCT310, 410, 610, VCT1314, 5313	165p
SAISHO	
VHL3, VR1000, VR2000, VR2500, VR3800	166p
SALORA	
SV6500, SC6600	166p
SV7300, SV8200, SV8300, SV9200, SC9300	165p
SV7400, 8400, 8420, 8500, 8520, 8550, 8600, 8620, 8700, 8710, 8720, 8800, 8830, 9500, 9600, 9810	165p
SV8000, SV8100	165p
SV801, SV800, SV900, SV901, SV8910, SV9800, SV9900	165p
SV6700, SV8710, SV8750, SV9700	165p
SV6800, 6900, 8820, 8850, 8870, 8910, 8920, 8970	165p
SAMSUNG	
SV716, 717, VB510, 520, 610, 616, 617, 619, 620, 626, 627, 629, 900, SV910, VI510, 520, 611, 616, 621, 626, 900, 910, VX510, 520, 616, 617, 619, 626, 627, 629	165p
SVX301, 303, 305, 307, 319, 322, VB710, 770, 971, 8220, 8225, V1730, 1790, 18220, 18225, VX710, 712, 720, 730, 750, 770, 790, 825, 970, 971, 972, 8220	165p
SANSUI	
SVR5030	165p
SVR7010	165p
SIEMEN	
FM350, FM352, FM355	166p
FM361, FM362, FM363, FM364	165p
FM391, FM392, FM394, FM461, FM462, FM464, FM468, FM561	165p
FM484, FM485	165p
FM585, FM602, FM604, FM622, FM624, FM627	165p
FM600	166p
FM204, 303, 304, 314, 325, 328, 374, 375, 376, 384, 386, 388, 404, 424, 428, 429, 488, 489	165p
FM556, FM558, FM560, FM562, FM564, FM574, FM578	165p
FM601, 603, 605, 607, 608, 617, 619, 620, 621, 623, 625, 626, 628, 630, 632, 634, 636, 638, 639	165p
SOLAVOX	
NCVR1000, NCVR5000	165p
SONY	
SLC5, 6, 7, SL3000, 8000, 8080, 8200, SLJ10, SLT6ME, SLT7ME	165p
SLC9, 20, 24, 30, 33, 44, SLHF100, SLF1, 11, 20, 26, 30, 60, 100, 200, SLF60PS, SLF90E, SLHF150, 850, SLK88, 95, SLT20ME, SLT30ME, SLT50ME	165p
BMC100, BMC200, BMC500	165p
SLV201, 202, 301, 302, 401, 402, 801, 802	165p
SLV210, 270, 273, 275, 300, 353, 373, 410, 415, 474, 656, 715, SLV757, 777	165p
SLV255	165p
TELEFUNKEN	
A920, 930, 932, 935, 940, 960, 980, 990, 1200, VR925, 930, 940, 950, 971, 975, 980, 1920, 1925, 1930, 1940, 1950, 2920, 2925, 2930, 2931, 2935, 2941, 2960, 2970, 2671, 3935, 3945, 3950, 3965, 3975, 4935, 4940, 4942, 4945, 4970, 6000, 7921, 7926, 7929, 7931, 7932, 7970, 7971, 7979, 7980	166p
VR1935, VR2915	165p
VR1970, VR1980	165p
VR400, 410, 440, 449, 400, 510, 519, 540, 549, 610, 640	165p
VR520, 529, 530, 535, 539, 550, 620, 630, 650, 920	165p
THOMSON	
SV1000, TX8500, V320, 321, 323, 326, 342, 343, 351, 352, 353, 360, 364, 368, 410, 430, 400, 510, 520, 530, 540, 620, 630, 640, 4200, 4210, 4230, 4240, 4260, 4300, 4340, 4400, 5500, 5540, 6000, 8540	165p
TX8000, V309, 316, 357, 309, 410, 411, 3801, 4100	165p
V333, V340	166p
VX300, 301, 302, 305, 306, 312, 3301	165p
TOSHIBA	
DV55, 57, 61, 63, 65, 66, 67, 71, 73, 74, 75, 77, 81, 83, 85, 86, 93, 94, 80, 90, 96, 97, 200, 202, 205, 207, 300, 309, 500, 509, 700	165p
V5470, V5480	165p
V108, V109, V199, V209, V609	165p
PRESSURE ROLLER ASSEMBLY – PS403-40205, V91, V95	350p

VCR BELT KITS

Model	Price
AKAI	
VP7100, VS9300, VS9500, V9700, VS9800	120p
VS1, VS2, VS4, VS5	100p
VS10	65p
VSX9, V5105, 112, 115, 116, 205, 220, 24, 244, 245, 247, 248, VS250, 512, 515, 516	300p
VS22, VS23, VS25, VS35, VS37, VS38, VS53, VS55, VS66	80p
VS4, VS6	120p
VSA77	140p
AIWA	
AV66	125p
AV77	140p
G700	160p
G900	180p
ALBA	
VCR40000	130p
VCR5000, VCR6000	105p
AMSTRAD	
TVR123, VCR4600, VCR4700, VCR5200	120p
VCR7000	80p
VCR6000, 6100, 8600, 8602, 8603, 8604, 8700, 8704, 8714, 8800, 8804, 9000, 9340, DD8900, DD8904, TVR4	120p
AUTHENTIC	
N850	120p
BLAUPUNKT	
RTV100	200p
RTV200, RTV222, RTV224	90p
RTV202, RTX200	160p
RTV322, RTV248	100p
RTV306, 307, 309, 310, 311, 312, 328, 414, 434, 444, 707	135p
RTV211, RTV214	140p
RTV324, RTV325	65p
RTV315, RTV316, RTV319, RTV320, RTV317	50p
RTV301, RTV333, RTV338, RTV404, RTV424	85p
BONDSTEC	
BT100	110p
BT300, BT310	170p
BT350	140p
BT50	150p
BOSCH-BAUER	
VRH50	100p
VRH60	140p
VRP20	180p
DAEWOOD	
VCR12, VCR32, VCR52	110p
VCR30DAP	150p
VCR30DBD, VCR500BD, VCR50DFD, VCR50DFP	170p
DECCA	
VR8300	90p
VRH8945DK	80p
DUAL	
VR4430	90p
VR91, VR93, VR97	75p
VR70, VR71, VR74, VR81, VR90	85p
VR80	90p
VR96	85p
FERGUSON	
3292, 3V00, 3V01, 3V16, 3V22, 8900, 8901, 8904, 8906	120p
3V23, 8923, 8924, 8929	65p
3V29, 3V30, 8930, 8931, 8933, 8940	75p
3V31, 3V32, 8941, 8942	75p
3V35, 3V36, 3V38, 3V39, 3V49, 8943, 8944	75p
3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948	60p
3V43, 3V44, 3V58, 3V65, 8950, 8951, FV10, FV11, FV12, FV13, FV14, FV20, FV21, FV22, FV26, FV32, CV141L	65p
FV31R	110p
FIDELITY	
HQS200, VCR600, VCR6100	180p
VCR100	160p
VTR1000	100p
FINLUX	
VR2005, VR2010, VR2020, VR2025, VR2040	105p
VR2006	160p
VR3009	140p
FISHER	
VBS7000	245p
VBS9000	120p
FVHP520, FVHP530, FVHP420	60p
FVHP615, 618, 620, 622, 710, 711, 720, 721, 722, 725, 730, 840	80p
FVHP905, 906, 908, 910, 911, 915, 916, 918	80p
VBR330, VBS7500, VBS7600, VBS9900	100p
VBS3500	75p
FUJITSU	
HS760, HS750, VGX715, VGX720D	160p
FUNAI	
V1, V25, VCR4600, 4800, 5200, 5400, 5600, 6400, 6600, VIP3000, VIP5000	160p
VCR4530, 5840, 5843, 6800, 6803, 8007, 8103, VIP150, 6000	160p
G.E.C.	
4005	100p
V4004	100p
GOLDSTAR	
GHV1221, 1232, 1241, 1242, 1243, 1244, 1245, 1246, 1247, 1248, 8210, 8215, VCP4100, VCP4130	80p
GHV1290, 1291, 1295, 1296, VCP4000, 4200, 4300, 4301, 4305, 4306, 4310, 4311, 4315, 4320, 4321, 4325, 4326	120p
GRANADA	
VHSAH1, VHSAH3	100p
VHSVH4, VHSWH1, VHSXH1	60p
VHSYH2	50p
VHSBH1, VHSCH1	150p
VHS8P1	135p
VHSAN3	110p
VHSDS2	125p
VHSAY3	125p
VHSBY3	100p
VHSEY1, VHSEY2	70p
VHSCC1	100p
VHSDP1, VHSFV2	80p
VHFTJ1, VHSTJ2	160p
VHSTJ3	85p
VHSWJ1, VHSWJ2	120p
VHSXJ3	85p
VHSFJ2	140p
VHSFS1, VHSFS2	130p
VHSFG1, VHSFG4, VHSF63	180p
GRUNDIG	
MVS400, MVS440, VS400, 410, 440, 441, 400, 456, 460	55p
VS180, 200, 220, 226, 262, 265, 267, 2X40800, 0850, 0880, 1600, 2000, 2080, 2200, 2280, MVS200RC	90p
VS150	160p
VS310, VS315, VS320, VS326, VS340, VS345, VS380	85p
HINARI	
VXL2	80p
VXL7, VXL8, VXL9, VXL10	180p
VXL4, VXL35	70p
VXL5, VXL6	160p
VXL3, VXL20	90p
HITACHI	
VT11, 14, 17, 19, 33, 34, 35, 38, 39, 88, 165, 330	90p
VT5000, VT5500	120p
VT7000, VT8000, VT8300, VT8500	60p
VT680, VT6500, VT6800, VT9300, VT9500, VT9700, VT9900	75p
VT52, VT57, VT61, VT62, VT63, VT64, VT65, VT85, VT86, VT640	105p
VT3000	120p
VT100, 110, 111, 113, 115, 118, 120, 125, 128, 130, 135, 138, 145, 150, 168, 175, 220, 225, 250, 255, 258, 260, VTL30	110p
I.T.T.	
VR3605, VR3905, VR3935, VR3954, VR3985	90p
VR3913, VR3914	70p
VP3826, VR3906, VR3916, VR3926, VR3946, VR3948, VR3976, VR3986, VR3995, VR3997, VR6948	65p
VR3927, VR3977	65p
VR3993, VR3994	75p
VR3963	65p
VR3912	130p
VR3917	150p
VR3929, VR3968	85p
VR3907	100p
SVR3799, VR3520, 3701, 3719, 3720, 3721, 3730, 3731, 3749, 3759, 3761, 3781	90p
VR3908	180p
VR3918, VR3919, VR3958, VR3998	115p
J.V.C.	
HR3300, HR3330 HR3360, HR3660, HR4100	130p
HR7200, HR7300	70p
HR7350, HR7600, HR7610, HR7650, HR7655	75p
HR7700	75p
HRD110, HRD111, HRD120, HRD121, HRD225	90p
HRD140, 150, 157, 158, 180, 250, 267, 455, 565, 566, 725, 756, HRP50	85p
HRD170, 180, 210, 230, 300, 320, 321, 330, 337, 350, 370, 400, 430, 440, 441, 530, 700, 750, 950, HRS5000, 5500, 9000	60p

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AMSTRAD
VCR700
Contents
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FERGUSON & JVC
3V42/43
HRD455/HRD725
Contents: BELT SET. PINCH ROLLER. CLUTCH MECHANISM. TENSION BAND — **Order Code: SK37** £16.00
Economy Kit Contents: BELT SET. PINCH ROLLER. SUPPLY CLUTCH. TAKE UP CLUTCH — **Order Code: SK38** £9.00

3V58/59/64/65
HRD170/180/210/230/300/320/370/400/430/530/700/750
HRS5000
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3V29/3V30
HR7200/7300/7350
Contents
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3V35/36.38/39/49
HRD110/111/120/225
Contents
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES
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3V31/3V42
HR7600/7610/7650/7655
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Economy Kit Contents: BELT SET. T/U REEL TABLE TYRE. PINCH ROLLER. REEL IDLER TYRE. T/U IDERL TYRE. T/U CLUTCH — **Order Code: SK34** £5.00

3V35/36/38/39/49
HRD110/111/120/121/225
Contents: BELT SET. T/U REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. T/U CLUTCH. T/U IDLER. REEL IDLER. TENSION BAND — **Order Code: SK35** £10.00
Economy Kit Contents: BELT SET. T/U REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. T/U CLUTCH. T/U IDLER TYRE. REEL IDLER TYRE — **Order Code: SK36** £5.50

3V29/3V30
HR7200/7300/7350
Contents: BELT SET. T/U REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. REEL IDLER. T/U CLUTCH. T/U IDLER. TENSION BAND. VIDEO LAMP — **Order Code: SK31** £10.00
Economy Kit Contents: BELT SET. T/U REEL IDLER TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. REEL IDLE TYRE. T/U IDLER TYRE. T/U CLUTCH — **Order Code: SK32** £5.00

3V44/45/48/53/54/55/57
HRP50/HRD140/150/158/160
HRD250/257/565/566/755
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Economy Kit Contents: BELT SET. PINCH ROLLER — **Order Code: SK40** £9.50

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Contents: BELT SET. PINCH ROLLER. IDLER. GEAR IDLER UNIT. TENSION BAND — **Order Code: SK57** £13.00
Economy Kit Contents: BELT SET. PINCH ROLLER. IDLER TYRE — **Order Code: SK58** £5.00

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Economy Kit Contents: BELT SET. PINCH ROLLER. FF/REW IDLER — **Order Code: SK50** £3.00

VT400/405/410/13/14/15/18/420/25/26/28/430/31/35/48/450/498/510/520/25/26/530/35/36/540/545/46/48/570/75/576/580/85/88
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VT100/110/111/113/115/118/120/125/128/130/135/138/145/150/175/220/225/250/255/258/260/VTL30
Contents
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PANASONIC
NV2000/NV2010
Contents: BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES — **Order Code: SK03** £5.00

NV7000/NV7200/NV7800
Contents: BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES — **Order Code: SK02** £5.00

NV300/NV330/NV333/NV340/NV366
Contents
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRE
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NV2000/NV2010
Contents: BELT SET. PINCH ROLLER. FF IDLER. PLAY IDLER. TENSION BAND. VIDEO LAMP — **Order Code: SK13** £6.00
Economy Kit Contents: BELT SET. PINCH ROLLER. IDLER TYRE. PULLEY TYRE — **Order Code: SK14** £3.50

NV7000/NV7200/NV7800
Contents: BELT SET. PINCH ROLLER. IDLER UNIT. PLAY IDLER. TENSION BAND — **Order Code: SK11** £8.50
Economy Kit Contents: BELT SET. PINCH ROLLER. IDLER TYRE. CLUTCH TYRE — **Order Code: SK12** £3.25

NV300/NV330/NV333/NV340/NV366
Contents: BELT SET. PINCH ROLLER. IDLER UNIT. PLAY IDLER. TENSION BAND — **Order Code: SK15** £7.00
Economy Kit Contents: BELT SET. PINCH ROLLER. IDLER TYRE. PLAY IDLER TYRE — **Order Code: SK16** £3.25

NVG7/NVG9/NVG10/NVG11/NVG12/NVG14/NVG15/NVG16/NVG18/NVG30/NVG120/NVG130/NVG400/NVH65 (PX/AC)/AG1810 (P/K)
Contents: LOADING BELT. CAPSTAN BELT. PINCH ROLLER. IDLER. TENSION BAND — **Order Code: SK27** £6.00
Economy Kit Contents: LOADING BELT. CAPSTAN BELT. PINCH ROLLER. IDLER TYRE — **Order Code: SK28** £3.00

NV332
Contents: BELT SET. PINCH ROLLER. PLAY IDLER. FF/REW IDLER. TENSION BAND. FF/REW TYRE — **Order Code: SK29** £12.00
Economy Kit Contents: BELT SET. PINCH ROLLER. PLAY IDLER TYRE. FF/REW IDLER TYRE — **Order Code: SK30** £5.10

NV230/250/260/280/430/450/460/470/650/810/890/AG1200PK/AG1500PK
Contents: BELT SET. PINCH ROLLER. IDLER. TENSION BAND — **Order Code: SK23** £6.00
Economy Kit Contents: BELT SET. PINCH ROLLER. IDLER TYRE — **Order Code: SK24** £3.25

NV600/NV688
Contents: BELT SET. PINCH ROLLER. PLAY IDLER. FF/REW IDLER. TENSION BAND — **Order Code: SK25** £12.00
Economy Kit Contents: BELT SET. PINCH ROLLER. PLAY IDLER TYRE. FF/REW IDLER TYRE — **Order Code: SK26** £6.00

NV730/NV770
Contents: SLOT IN BELT. LOADING BELT. PINCH ROLLER. IDLER UNIT. TENSION BAND — **Order Code: SK19** £5.00
Economy Kit Contents: SLOT IN BELT. LOADING BELT. PINCH ROLLER. IDLER TYRE — **Order Code: SK20** £3.00

NV370/NV380/460/630/780/830/850/AG2100PK/AG2200PK
Contents: BELT SET. PINCH ROLLER. IDLER. TENSION BAND — **Order Code: SK21** £5.00
Economy Kit Contents: BELT SET. PINCH ROLLER. IDLER TYRE — **Order Code: SK22** £2.75

NV777/NV788
Contents: BELT SET. PINCH ROLLER. IDLER UNIT. TENSION BAND — **Order Code: SK17** £6.00
Economy Kit Contents: BELT SET. PINCH ROLLER. IDLER TYRE — **Order Code: SK18** £4.00

VIDEO SERVICE KITS *(Cont.)*

SHARP
VC381
Contents: BELT SET. PINCH ROLLER. REEL IDLER. TENSION BAND. VIDEO LAMP — **Order Code: SK47** £8.00
Economy Kit Contents: BELT SET. PINCH ROLLER. REEL IDLER TYRE — **Order Code: SK48** £3.25

VC500/VC571/VC581/VC582/VC583/VC584/VC5F3
Contents: BELT SET. PINCH ROLLER. REEL IDLER. TENSION BAND — **Order Code: SK60** £9.50
Economy Kit Contents: BELT SET. PINCH ROLLER. REEL IDLER — **Order Code: SK61** £5.00

VC781/VC7810/VC7822/VC785/VC786/VC793/VC800/VCA100/VCA102/VCA104/VCA202
Contents: BELT SET. PINCH ROLLER. REEL DRIVE UNIT. TENSION BAND — **Order Code: SK64** £13.50
Economy Kit Contents: BELT SET. PINCH ROLLER. REEL DRIVE UNIT TYRE — **Order Code: SK65** £3.75

VC681/VC682/VC684/VC685/VC693/VC699/VC6F3/VC700
Contents: BELT SET. PINCH ROLLER. REEL DRIVE UNIT. TENSION BAND — **Order Code: SK62** £13.50
Economy Kit Contents: BELT SET. PINCH ROLLER. REEL DRIVE UNIT TYRE — **Order Code: SK63** £5.00

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BACKUP BATTERIES

REPLACEMENT PHILIPS NI-CAD BACKUP BATTERIES

Replaces Ferguson Part No: 00E6-067-001, used on TX10, L2V — 150P
Replaces Philips Part No's: 138-10138, 138-10313. 1.2V – 90mAh — 100p
Replaces Philips Part No's: 138-10229. 2.4V – 90mAh — 180p

REPLACEMENT FERGUSON NI-CAD BACKUP BATTERIES

Replaces Ferguson Part Nos: 00E6-066-001, 2.4V
Used on: 3V35, 3V56, 3V58, 3V65 — 200p

REPLACEMENT LINE OUTPUT TRANSFORMERS

Description	Price	Order Code
HITACHI 2433752	1500p	LOT01
ORION 3714002	1500p	LOT02
FIDELITY ZX300	1500p	LOT03
FE TX100 90 DEG	1500p	LOT04
SABA 490007182	1500p	LOT05
FE TX90 WHITE	1650p	LOT06
ITT D307/37 EQ	1600p	LOT07
BLAUPUNKT 210	1600p	LOT08
GRUNDIG 2922010	1600p	LOT09
ITT CVC800/1/3	1500p	LOT10
ITTD218/37 EQ	1600p	LOT11
NORMENDE 5255	1600p	LOT12
SABA 81000 200	1600p	LOT13
SALORA T236 EQ	1650p	LOT14
SABA 811-50-24	1600p	LOT15
SABA 770223500	1600p	LOT16
TELEFUNKEN AT1	1450p	LOT17
TELEFUNKEN EQ	1400p	LOT18
SALORA FM0218B	1600p	LOT19
NORMENDE 5255	1600p	LOT20
ITT CVC 1160/1	1500p	LOT21
ITT COMPACT 80	1500p	LOT22
FE TX100 GREEN	1450p	LOT23
HINARI CT4/5 5113	1500p	LOT24
SELECO 6320410	1600p	LOT25
BLAUPUNKT 8667	1600p	LOT26
ITT COMPACT 81	1450p	LOT27
ITT CT3326 MUL	1500p	LOT28
ITT D066/37 EQ	1600p	LOT29
ITT 3546 EQ	1500p	LOT30
LUXOR 5810110	1600p	LOT31
SABA 849380920	1600p	LOT32
HITACHI 2434141 CP	1450p	LOT33
FE TX100 110 D	1700p	LOT34
HANTAREX 28021	1600p	LOT35
SHARP C3700 EQ	1600p	LOT36
HITACHI 2432981 CP	1500p	LOT37
FERGUSON 00D3-508-002 Fits Chassis TX99 41cm + 51cm Used On: 51K2, 51J8, 51J7, 41H3, 41H3, 41H2, 51K3	1650p	LOT38
PANASONIC TLF14567F Used On: TC2043, TC2243, TX300	1850p	LOT39
PANASONIC TLF14566F Used On: TX2231, TX2244	1850p	LOT40
PANASONIC TLF14584F Used On: TC2210, TC2160, TX1752, TX2112 TX2112, TX2162, TXC22	2350p	LOT41
PANASONIC TLF14586F TC1651, TC2051, TC2061, TC2253, TC2263, TX5500	2350p	LOT42
HINARI Used On: CT15	1600p	LOT43
HITCHI 2434274 CPT2174, CPT2176, CPT2178, 2434274	1250p	LOT44

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IDLERS & PULLEYS REPLACEMENT

AKAI			
VS1-2, VS4-6, VS15	FF-REW IDLER	M1327773	400p
VS3, 6, 12, 56, 58, 59			
VS1-2, VS4-6, VS15	T-UP IDLER	BV327815	500p
VS3, 6, 12, 56, 59			
VS700	IDLER	BV321979	600p
VS125, 126, 155,	IDLER ASSY	MZ366980J2	800p
VS166, 240, 244, 245, 247, 248, 250, 512, 515, 516			
VS22, 36, 105, 112, 115, 116, 206, 220			
VS7300, VS9300	T-UP IDLER	PU47752	£4.50
VS8500, VS9800			
VS7300, VS9300	UNLOADING	PU46381	£4.00
VS8500, VS9800	IDLER		
VS7300, VS9300	REW IDLER	PU46380	500p
VS8500, VS9800			
VS98	IDLER	BV336067	£5.00
VS1, 3, 4, 9, 12	REEL TABLE	BR347731	450p
VS25, 58			
VS23, 35, 37, 53, 55	CLUTCH	ML373043	1100p
VS86, 75, VSA77			
VS8700	FF IDLER	BV321761	£3.20
VS8700	REW IDLER	W321762	£4.25
AMSTRAD			
VCR7000	IDLER	150280	£1.50
VCR4500	CLUTCH	150873	£3.75
VCR4600, VC5200, VCR9000			
VCR4500	GEAR HOLDER	151284	£3.50
VCR4600, VCR5200, VCR9000			
VCR4600	REF CLUTCH		£3.50
VCR5200			
VCR6000, VCR6100	CLUTCH	153202	£3.80
VCR4500, VCR9000	CLUTCH		£4.00
VCR4500, VCR4600	MOD KIT	(TAPE CREASING)	300p
VCR4700			
MOD KIT TAPE CREASING FOR AMSTRAD			
VCR4500, 4600, 4700			£3.00
FERGUSON			
3V00, 3V01, 3V16	T-UP IDLER	PU47752	£4.50
3V22, 3292, 8900, 8901, 8904, 9806			
3V16, 3V22	T-UP IDLER	PU49280	£5.50
8903, 8909, 8912, 8922			
3V22, 3V29 3V30,	REEL IDLER	PU48967	175p
3V31, 3V32, 3V35, 8923, 8924, 8929, 8930, 8931, 8940, 8941, 8942			
3V23, 3V31	ROLLER ASSY	PU49042A	350p
3V25, 3V30, 3V31	T-UP IDLER	51402	100p
3V32, 3V35, 3V36, 3V38, 3V39, 3V49, 8930, 8931, 8940, 8941, 8942			
3V29, 3V30, 3V31	T-UP CLUTCH	PU51380	200p
3V32, 8930, 8931, 8940, 8941, 8942			
3V35, 3V36, 3V38	REEL IDLER	PU55374	200p
3V39, 3V49, 8943, 8944			
3V35, 3V36, 3V38	T-UP CLUTCH	PU55373	150p
3V39, 3V49, 8943, 8944			
3V58, 3V59, 3V64	IDLER ARM	PU58645	£2.25
3V65, FV10, FV11, FV12 FV13, FV14, FV20, FV21, FV22, FV26			
FV30, FV32, FV33, 8950, VC141L			
3V42, 3V43	CLUTCH ASSY	PU55822	1200p
3V43, 3V44, 3V45	CLUTCH ASSY	PU57658	1050p
3V48, 3V53, 3V54, 3V55, 3V57, 8947, 8948			
3V42, 3V43, 3V44	T-UP CLUTCH	PU56043-1-4	240p
3V46, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8947, 8948			
3V42, 3V43, 3V44	SUPPORT CLUTCH	PU56044-1-5	160p
3V46, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8947, 8948			
3V00, 3V01, 3V16	LOADING IDLER	PU43681	£4.00
3V22, 3292, 8900, 8901, 8902, 8903, 8904, 8906, 8909			
8912, 8922			
3V00, 3V01, 3V16	REW IDLER	PU46380	500p
3292, 9900, 8901, 8904, 8906			
3V16, 3V22, 8902	IDLER	PU49281	£1.70
8909, 8912, 8922			
FISHER			
FVHP420, 520, 530	FF-REW PULLEY	H8638531	80p
FVHP515, 618, 820	COMP. IDLER ASSY	F1430420400300	£220p
FVHP622, 710, 711, FVHP720, 721, 722, FVHP725, 730, 830			
FVHP840,905, 906, FVHP908, 910, 911, FVHP915, 916, 918			
FVHP616, 618, 620	GEAR IDLER ASSY	F1430490400900	380p
FVHP622, 710, 711, FVHP720, 721, 722			
FVHP725, 730, 830, FVHP840			
FVHP515, 618, 620	REEL T-UP ASSY	F1430410400900	£5.50
FVHP622, 710, 711, FVHP720, 721, 722			
FVHP725, 730, 830, FVHP840			
FVHP905, 906, 908,	GEAR IDLER ASSY	F1430490402400	275p
FVHP910, 911, 915, FVHP916, 918			
FVHP975, 980, 990,	IDLER	F1430420400700	300p
FVHP990, 5000, 5005			
FVHP5050, 5075, 5100			
FVHD40, 55, 140	REEL DRIVE ROLLER		£6.00
FVHP1, 10, 20			
FVHP975, 980, 990	CLUTCH	F12430510404200	£9.50
FVHP420, 520, 530	IDLER		£2.80
FVHP420, 520, 530	TAKE UP IDLER		290p
FVHP990	LOADING GEAR		90p
VBS3500	REEL DRIVE PULLEY		£3.20
VBS3500	IDLER		750p
VBS7000	REW IDLER		95p
GOLDSTAR			
GHV1221, 1232, 1240	CLUTCH GEAR	435038A	£2.50
GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000,			
GHV8200, 8210, 8215, GHVP51, VCP4100, 4130			
GHV1221, 1232, 1240	IDLER		110p
GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000,			
GHV8200, 8210, 8215, GHVP51, VCP4100, 4130			
HINARI			
VXL3, VXL20	REEL IDLER	40000009	110p
VXL2	IDLER		110p
VXL4, VXL35	IDLER		£2.75
VXL4, VXL35	CLUTCH		£6.50
VXL4, VXL12, VXL25	LIMITER POST		£1.30
VXL30, VXL35, VTV300			
VXL5, VXL6	CLUTCH		£3.75
VXL5, VXL6	GEAR HOLDER		£3.50
VXL7, VXL8, VXL9	CLUTCH		£3.80
HITACHI			
VT11-33, VT63-64	CLUTCH ASSY	6879515	£7.50
VT14, 17, 19, 38, 57, 86, 88, 34, 35, 39, 52, 61			
62, 65, 85, 330, 640, VT16S			
VT120-220, 100, 110	CLUTCH ASSY	6886824 6888972	£7.50
113, 115, 118, 200			
128, 130, 135, 138, 145, 150, 175, 225, 250,			
258, 280, VTL30			
-8300, 7000	FF-REW IDLER	6413663	£2.80
-8700			
-8300, 7000	PLAY IDLER	6414221	290p
-8700			
-8300, 7000	FF-REW PULLEY	6383531	80p
-8700			
-8500, 6500	FF-REW IDLER	6881471	250p
6800, 9700, 9900			
-8500, 6500	PLAY IDLER	8861482 6861481	230p
6800, 9700			
9900			
-8500, 9700	IDLER	681505	230p
6500, 680, 6800	IDLER	687043	£3.80
33, VT63-64	FF-REW IDLER	6886971	125p
15, 17, 19, 34, VT35, 38, 39, 52, 61, 62			
65, 86, 88, 330, 640			
110, 111, 113	FF-REW ARM	6886792	240p
118, 119, 120, 125, 126, 128, 130, 135, 138, 145, 150			
220, 225, 250, 255, 258, 260, VTL30			
405, 410, 413	FF-REW ARM	6897094	£1.30
418, 420, 425, 426, 428, 430, 431, 435			
456, 458, 510, 518, 520, 525, 526, 530, 535			
545, 546, 548, 570, 575, 576, 580, 585			
VT8825, 626, 630, 635, 636, 640, 645, 646, VTS80, 85			
405, 410, 413	CLUTCH BASE	6896951	£3.25
415, 418, 420, 425, 426, 428, 430, 431, 435			
450, 456, 458, 510, 518, 520, 525, 526, 530, 535			
545, 546, 548, 570, 575, 576, 580, 585			
VT8825, 626, 630, 635, 636, 640, 645, 646, VTS80, 85			
	T-UP IDLER (LARGE)		£4.50
	REW IDLER		£6.00
VT680, 6500, 6800	FS-BRAKE	6861505	230p
VT9700, 9900			
HITACHI TV			
OUTPUT MUDULE HM 6261			£5.50
OUTPUT MODULE HM 6232			£8
JVC			
HR330, 3660, 4100	T-UP IDLER SML	PU49280	£5.50
HR7200, 7600, 7650	T-UP CLUTCH	PU53462A	220p
HR7655, 7300, 7350, 7610			
HR7200, 7300, 7350	REEL IDLER	PU48967	175p
HR7600, 7610, 7650, 7655, 7700			
HR7600, 7610, 7650	ROLLER ASSY	PU49042A	350p
HR7655, 7700			
HR3300, 3660, 4100	T-UP IDLER LRG	PU47752	£4.50
HR7200, 7600, 7650	T-UP IDLER	PU51402A	100p
HR7655, HRD110, HRD111, HR7300, 7350, 7610, HRD120-121, 225			
HRD110, HRD120-121,	T-UP CLUTCH	PU55373	150p
HRD225, HRD111,			
HRD110, HRD120-121,	IDLER ARM	PU55374-3-8	200p
HRD225, HRD111			
HRD170, 180, 210, 230	IDLER ARM	PU58465	£2.25
HRD320, 370, 400, 430, 470, 530, 700, 750, 950, 3000			
HRS5000, HRS5500			
HRD455, HRD725	CLUTCH MECH	PU558822	1200p
HRD140, 150, 157, 158	CLUTCH MECH	PU57658	1050p
HRD160, 250, 257, 565, 566, 755, HRP50			
HR3300, HR3330	REW IDLER	PU46380	500p
HR3660, HR4100			
HRD140, 150, 157, 158	TAKE UP CLUTCH	PU56043-1-4	240p
HRD160, 250, 257, 455, 565, 566, 725, 755, HRP50			
HRD140, 150, 157, 158	TAKE UP CLUTCH	PU56044-1-5	160p
HRD160, 250, 257, 455, 565, 566, 725, 755, HPR50			
MATSUI			
VX730, 735, 750, 755,	CLUTCH	850A00005	420p
VX810, 820, 850, 880, 990			
VX730, 735, 750, 755	LIMITED POST LEVER		£1.30
VX770, 800, 810, 880	ASSY		
VX990			
VX800A, VX900	IDLER REEL		£1.50
VX800A, VX820	REEL UNIT CLUTCH		280p
MITSUBISHI			
HS306, 307, 318, 319,	GEAR ASSY	522B00201	£6.25
HS400, 410, 710			
HS337, 338, 347, 349	IDLER	552B01701	325p
HS411, 412, 421, HSB10, HSB20, HSB30, HSE10, HSE20, HSE20, HSE30,			
HSE70			
HS306, 307, 318, 319	IDLER	641C34301	£2.00
HS400, 410, 710			
HS347, 349, 412	IDLER	522902002	£3.00
HS810, HS820, HS830, HSE10, HSE20, HSE30, HSE70			
HS337, 338, 411, 421	IDLER	552B01801	320p
HS200	TAKE UP IDLER (LARGE)		£4.50
HS200	UNLOADING IDLER		£4.00
HS200	REWIND IDLER		£8.00
HS306, 307, 318, 319	SUPPLY REEL	522A00101	£3.20
HS400, 410, 710	DISK		
HS306, 307, 318, 319	TAKE UP REEL	522A00102	£3.20
HS400, 410, 710	DISK		
HS320	REEL DISK	522C06301	£3.00
HS337, 338, 411, 421	REEL DISK	522P00601	£5.00
HS300, 301, 302, 310	PULLEY	522C05201	£2.25
HS306, 307, 318, 319	GEAR WHEEL	641D71101	£1.50
HS400, 410, 710			
HS306, 307, 318, 319	GEAR WHEEL	641D71001	£1.50
HS400, 410, 710			
NEC			
N830, N831, N832, N833	TAKE UP CLUTCH		150p
N830, N831, N832, N833	TAKE UP IDLER		100p
N830, N831, N832, N833	REEL IDLER		200p
N895	TAKE UP IDLER SMALL		550p
N911, N915, N916, N917	REEL DRIVE PULLEY		350p
N9012, 9013, 9014, 9016, 9033, 9034, 9054, 9055, 9086, 9110			
N9510, 9520, 9530, 9610			
NATIONAL			
NV322, NV600, NV688,	IDLER UNIT	VXP0453	£2.75
NV777, NV788, NV332, AG6100, 6200, 6800, 6810			
NV300, NV333, NV340	IDLER ARM	VXL0997	£3.60
NV366			
NV300, NV330, NV333	IDLER UNIT	VXP0401	60p
NV340, NV366			
NV300, NV330, NV333	PLAY IDLER	VXP0433	£2.75
NV340, NV366, NV8620			
NV300, NV332, NV333	ACTION GEAR	VDG0016	£0.60
NV340, NV366, NV600, NV777, NV788, NV2000, NV2010, 3000, 7000			
AG6010, AG6015			
NV333, NV688, NV2000	LOADING GEAR	VXP0325	£2.00
NV3000, NV7800			
NV300, NV332, NV333	INTERMEDIATE GEAR	VXG0017	£0.65
NV340, NV366, NV600, NV777, NV788, NV2000, NV2010, 3000, 7000			
AG6010, AG6016			
NV330, NV333, NV340	CAM GEAR	VXG0158	£1.00
NV366, NV777, NV788			
NV230, NV250, NV260	IDLER ARM	VXP0521	110p
NV280, NV370, NV380, NV430, NV450, NV460, NV465, NV470, NV480			
NV630, NV650, NV730, NV780, NV810, NV830, NV850, NV870			
NVG7, NVG9, NVG10, NVG11, NVG12, NVG 14, NVG16, NVG18, VG18			
NVG30, NVG400, AG1000, AG1200, 1500, 1810, 2100.			
AG2200, NVH65, NVH70			
NV370, NV430, NV870,	CAM GEAR	VDG0200	£1.20
NV730, NV830, NV850, NVG10, NVG12, NVG18			
NV730, NV770	IDLER UNIT	VXP0581	£2.50
NV2000, 2010 3000	IDLER UNIT	VXP0331	80p
NV2000, 2010, 3000	IDLER UNIT	VXP0329	80p
NV2000, NV3000	CAM GEAR	VDG0069	£1.00
NV7000, 7200, 7800	IDLER UNIT	VXP0344	75p
NV7000, 7200, 7800	CLUTCH	VXP0343	300p
NV8160, 8200, 8300,	IDLER UNIT	VXP0245	80p
NV8400, 8600, 8610, 8620			
NV8200, 8400, 8600	PLAY IDLER	VXP0243	80p
NV8610, 8620			
NV8620	CLUTCH	VXP0343	250p
NV332, NV600, NV688	IDLER	VXP0488	300p
NVG20, NVG21, NGV25	PULLEY UNIT	VXP0767	400p
NVG40, NVG46			
NV230, NV250, NV280	WORM WHEEL	VXP0604	180p
NV430, NV450, NV460, NV465, NV650, NV730, NV770, NV810			
NV870, NV890, AG1000			
NV370, NV380, NV630	IDLER	VXP0523	300p
NV760, NV830			
NV370	CLUTCH GEAR	VXP0595	£1.00
NVG7, NVG11, NVG12	WORM WHEEL	VXP0691	£1.50
NVG14, NVG15, NVG18, NVG30, NVG120, NVG130, NVG400, NVH70			
NV2000, 2010, 3000	LOADING GEAR	VDG0035	£0.60
NV7000, 7200, 7800, 8050			
NV230, NV250, NV370	LOADING GEAR	VXP0520	£1.50
NV430, NV450, NV460, NV630, NV730, NV770, NV780, NV810			
NV830, NV890, NVG7, NVG10, NVG12, NVG15, NVG30, NVG120			
NGV130, NVG400, NVH70, AG1000			
NV230, NV250, NV260	CLUTCH GEAR		£2.50
NV280, NV430, NV450, NV730, NV770, NV810, NV870, NV890			
NVG7, NVG10, NVG11, NVG12, NVG14, NVG15, NVG18, NVG30			
NCG120, NVG130, NVG400, NVH70, AG1000			
NV230, NV250, NV260	LIMITER ROLLER		£1.50
NV280, NV300, NV333, NV340, NV366, NV370, NV430, NV450, NV460			
NV465, NV630, NV650, NV777, NV780, NV788, NV810, NV830, NV850,			
NV870, NV890, NV2000, NV2010, 7200, 7800, NVG7, NVG10, NVG12,			
NVG14, NVG15, NVG18, NVG30, NVG120, NVG130, NVG400, NVH70,			
AG1000			
SAISHO			
VR605, VR800, VR900	CLUTCH	850A20000	420p
VR1100, 1200, 1600, 2500, 3200, 3300			
VR3500, 3600, 3800	LIMITER POST		£1.30
VR1100, 1200, 1600, 2500, 3200, 3300, 3500, 3600, 3700			
VR605, VR800, VR900	IDLER		280p
VR2500, 3200, 3300, 3600, 3600, 3800			
VR705, VR805, VR905	IDLER		110p
SANYO			
VHR1110, 1150, 1200	IDLER	143-0-662T-14730	£5.00
VHR1300, 1500			
VTC5000, 5150, 6000	FF-REW IDLER	143-0-741T-20001	250p
VTC6500, VTCM10, M11, M20, M21, M30, M31, M50			
VTC9100, VTC9300	IDLER	143-0-551T-01400	95p
VTC9300	FF ROLLER ASSY	143-0-547T-00200	200p
VTCM10, M11, M20, M21	REEL DRIVE PULLEY	143-0-662T-10350	£5.00
VTCM30, M31, M50			
VHR2100, 2300, 2500	IDLER	6130374899	300p
VHR2700			
VTC5000, 6150, 6000	PULLEY	143-0-662T-01201	£5.20
VTC6500			
VTCM10, M11, M20, M21	PULLEY	143-0-662T-10350	£5.50
VTCM30, M31, M50			
VHR3100, 3300, 3310	REEL DRIVE	143-0-662T-15621	350p
VHR3400, 3700, 3800	ROLLER		
VHRD500, VHRD700			
VPR5800, VTC5300	LOADING ROLLER	143-0-661T-03800	80p
VTC5400			
VTC3000	FWD LIMITER		£3.50
VTC3000	IDLER		750p
SHARP			
	IDLER ASSY	NIDL0005GEZZ	110p
	IDLER	NIDL0006GEZZ	110p
VC800, 651, 681, 682	IDLER ASSY	NPLYV0107GEZZ	£6.15
VC684, 685, 693, 698, 700, 783, VC6FR, VC8V3			
VC7300, VC7700, 7750	PLAY IDLER KIT	NPLYV0041 + NDA1V1007	£7.50

FAULT FINDING GUIDE BOOKS

Satellite Fault Finding Guide Issue 1. Listing about 1,000 faults for over a range of 24 different brands. Order Code: BOOK05.
Price £8.50 – No VAT.

Video Recorders Edition 2
List more than 4000 faults for 43 different brands
Price £9 45p Only. No VAT. Order Code: BOOK01

TELEVISION Edition 5

Lists more than 6,000 faults with 306 pages covering 58 different brands
Price: 1450p only - no VAT. Order Code: BOOK02

Satellite Repair Manual Edition 3

A comprehensive guide to receiver reviewing, featuring stock faults and installation tips.
Price 1400p Only No VAT Postage 100p
Order Code: BOOK03

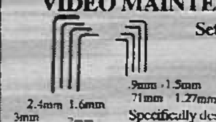
SEMICONDUCTOR COMPARISONS 1995

Listing more than 29,000 Semiconductors with suitable alternative complete with descriptions and base information.
Price: £13.25 – No VAT. Order Code: BOOK04

VIDEO HEAD CLEANING STICKS

Order Code: SP14
Price 17p each 15P each pack of 10pcs
13P each pack of 25pcs

VIDEO MAINTENANCE TOOLS



Set of 8 Allen keys packed in a plastic wallet
Order Code: TOOL9
Price 125p
Specifically designed for video maintenance

Solder Mop 1.2mm×10metres	400P
Tubed Silicon Grease 50 gram	200P
Tubed Heat Sink Compound 25 gram	150P

UNIVERSAL HEAD EXTRACTOR TOOL

Hand tool designed for extracting hard to remove heads without damage to either the head or the mounting assembly. Adjustable so as to suit various brand heads.
PRICE – £6.50

GRANDATA LTD
Tel: 0181-900 2329
Fax: 0181-903 6126

REMOTE CONTROLS

Description	Order Code	Price
GRUNDIG		
TP160E	RC 107	900p
TP200, TP300	RC 380	800p
TP400	RC 401	675p
TP590-600	RC 600	850p
TP390,TP610	RC 610	850p
TP621	RC 621	850p
TP630, TP650	RC 650	850p
TP660	RC 660	850p
TP661	RC 661	850p
HITACHI		
CLE800-CLE830	RC 140M	700p
A617402/655602	RC 192	875p
A512120/230	RC 900	800p
A514790	RC 901	800p
A5088470	RC 902	800p
A518612	RC903	900p
SCL002	RC904	850p
C2096	RC 905	850p
A511940	RC 906	750p
655602H	RC 907	800p
ITT		
IFB13, 14, 15	RC 143	875p
FS4	RC 148	850p
RG305	RC 305	675p
RG306	RC 306	825p
FS9/1-10/1	RC 307	850p
VS5 RUK	RC 308	825p
VS4-1	RC 310	850p
MULTICONTROL (17C20)	RC 311	800p
KORTING		
18279, 18396, 18460, 18521 SE	RC 108	850p
40540 VTS	RC 108	900p
LOEWE		
DC11	RC 146	850p
MATSUI		
010270601	RC 889	850p
VX770	RC 892	850p
METZ		
JAVA COLOR (6890)	RC 166	850p
COLOR (7156)	RC 183	850p
JAVA (7180)	RC 184	850p
MITSUBISHI		
939P/03607, 939P/03609	RC 140M	850p
NOKIA		
SATELLITE	RC 550	850p
NORDMENDE		
TC2336	RC 351N	850p
CMC1, TC3519	RC 356	875p
OCEANIC		
390C9500	RC 339	900p
ORION		
RC53	RC 892	850p
PANASONIC		
EUR51200	RC 200	800p
TC2200	RC 201	850p
VSQ0357/NV730	RC 202	875p
TNQ1621	RC 203	900p
PHILCO		
CARVEL, CONCORDE, MERCURY, TELESTAR	RC 108	850p
TC10	RC 152	900p
PHILIPS		
RC5002,5154	RC 134	850p
KT3 NON TEXT	RC 135	825p
69117032	RC 178	875p
69117194	RC 180	875p
RC5991-UNIV	RC 300	580p
PHILIPS (continued)		
RC38	RC 301	750p
KT3 TEXT	RC 5301	750p
RC5352	RC 5352	800p
RC5375	RC 5375	850p
RC5 STANDARD	RC 5534	850p
RC5901	RC 5901	850p
RC5903	RC 5903	700p
SABA		
T6772	RC 149	900p
TC319-320	RC 328	875p
TC356	RC 356	875p
TC358	RC 358	850p
TC360	RC 360	800p
TC365	RC 365	800p
SALORA		
SERIES L	RC 190	875p
86173	RC 882	850p
SANYO		
RC218, RC222, RC228, RC238	RC 140M	700p
JXGE	RC 878	850p
JXDE	RC 884	850p
VHR2300	RC 890	850p
RC628	RC 865	900p
SHARP		
G0121CESA, 123CESA, 204, 251	RC 140M	850p
SIEMENS		
FC616	RC 130	850p
FC631	RC 132	850p
FC742	RC 164	900p
SONY		
RM604, RM605, RM606	RC 140	700p
32 CHANNEL	RC 140M	700p
RM613	RC 141	750p
RM632, RM636	RC 160	675p
TATUNG		
FXA	RC 877	850p
RC70	RC 883	750p
FX70 FASTTEXT	RC 894	850p
TELEFUNKEN		
FB632	RC 632 ST	850p
FB639	RC 639 ST	850p
THORN/FERGUSON		
3V35-42	RC 342	650p
3V31-32	RC 344	800p
3V57-58	RC 628	800p
TX10 TEXT	RC 732	575p
TX10 STEREO TEXT	RC 738	575p
TX9-90-100	RC 740	675p
3V55, FV11	RC 783	800p
TX100 FASTTEXT	RC 785	650p
TX100 STEREO FASTTEXT	RC 789	650p
PROFESSIONAL	RC 790	650p
TOSHIBA		
CT937	RC 950	850p
CT9117	RC 951	800p
201R4B	RC 952	800p

UNIVERSAL PROGRAMMABLE REMOTE CONTROL
Controls up to 4 different devices which use infra red remote controls including TV, audio, VCR and satellite.
(need original remote control TC program)
Order code: IR100R   Price: 1950p

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

VCR ALIGNMENT KIT

CONTAINS:

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

SET OF 8 ALLEN KEYS
- 0.77mm
- 0.90mm
- 1.27mm
- 1.50mm
- 1.60mm
- 2.00mm
- 2.40mm
- 3.00mm

3 Reversible Screwdrivers, Circlip Pliers, Spring Hook, Micro Screwdriver, VCR Head Extractor

Order Code: TOOL10   Price: 2900p

FUSES

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

FUSES

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

ALL THE ABOVE PRICES ARE FOR PACKS OF 10 FUSES

I.C. PROTECTOR

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

Price: Only 30p each

AUDIO CONTROL HEAD

Amstrad Original No: 150751
Used on Amstrad TVR1.2.3, VCR4600, 4600MII, 4700
Funai V2S, VCR4600, 4800, 5200, 5600, 6600, VIP3000, 5000
Also fits: Fidelity, Funai, Hinari, Proline, Schneider, Towada. Ultravox
Order Code: AH01   Price: £13.50

Amstrad Original No: 153154
Used on Amstrad 008900, 8904, VCR2000, 6000, 8600, 8602, 8603, VCR8604, 8700, 8704, 8714, 8800, 9005, 9244
Also fits: Antitech, Boadstec, Casio, Crown, Fidelity. Goldhead, Granada, Hinari, Marguant, Omega, Protex, Schneider, SEG, Sentra, Shiptom, Tashiko, Tatung, Towada, Universum
Order Code: AH02   Price: £14.50

GRANDATA LTD

K.P. HOUSE, UNIT 15, POP IN COMMERCIAL CENTRE, SOUTHWAY, WEMBLEY, MIDDLESEX, ENGLAND HA9 0HB
Telephone: 0181-900 2329   Fax: 0181-903 6126

OPEN Monday to Saturday. Times: Mon-Fri 9.00-5.30 Sat 9.00-2.00

JUST ARRIVED!!! NEW ITEMS

Satellite PSU Repair Kits

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

MAKE & MODEL	ORDER CODE	PRICE
PACE PRD800, PRD900	SATPSU1	650p
PACE SS9000, 9200, 9010, 9020, 9220	SATPSU2	650p
AMSTRAD SRD510, SRD520	SATPSU3	850p
AMSTRAD SRD500	SATPSU4	650p

Replacement Video Heads

MAKE	MODELS	PRICE
HITACHI	VT570, VT575, VT576, VT580, VT585 VT588, VTF70	3100p
I.T.T.	VR3761	3100p
JVC & FERGUSSON	HRD950, HRD960, HRD980, FV46	5000p
LUXOR	VR3761	3100p
MITSUBISHI	HSE51	3000p
NATIONAL PANASONIC	NVFS200, NVFS90, NVV8000	4600p
	NVHD100, NVHD101, NVHF100	3100p
	NVSD	1400p
	AG7330, AG7350, AG7355, AG7450	5000p
	NVFS100	5000p
N.E.C.	D5600	3500p
SANYO	TLS1000P, TLS1001P, TLS1100	3100p
	VHR7800, VHR7810, VHR8000SP, VHR8801SP, VHRD4800	3100p
SHARP	VCH80, VCH81, VFH815	2800p
	VCA33, VCA36, VCA43, VCA44, VCA46, VCA49	1500p
	VCA55, VCA63	2200p
SONY	SLV656, SLV715, SLV757, SLV777, SLV815, SLV825	4600p
	SLV353UB	3200p
	CCDF340E, CCDF500E, CCDV90E, CCDV95E, CCDSP5E	4800p

Original Video Heads

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

Audio Control Head

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

AMSTRAD ORIGINAL NO: 153134
Used on: AMSTRAD DD8900, 8904, VCR2000, 6000, 6100, 8600, 8602, 8603, VCR8604, 8700, 8704, 8714, 8800, 9005, 8244
Also fits: ANITECH, BONDSTEC, CASIO, CROWN, FIDELITY, GOLDHAND, GRANADA, HINARI, MARQUANT, OMEGE, PROFEX, SCHNEDIER, SEG, SENTRA, SHINTOM, TASHIKO, TATUNG, TOWADA, UNIVERSUM ORDER CODE: AH02 PRICE: 1450p

Replacement Audio Control Video Sound Head for National Panasonic

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

8 way Preprogrammed Universal Remote Control

A single remote control to operate Televisions, Videos and Satellite Receivers. Plus Auxilliary Options!!
* Replaces up to 8 remotes with one * Simple 4 digit setup routine
* Controls 1000s of models * Teletext functions with Fastext
* Clear (large key) layout * Code Search Facility
* Stylish and easy to operate * Replace broken or lost remotes
* Original Remote not required

Order Code: 8 WAY Price 1450p + VAT

Replacement Video Cassette Housings

MAKE	MODELS	CODE	PRICE
AKAI	VS35, VS53, VS55, VS56, VS75	CH18	2600p
GRANADA	VHSDP1	CH05	1100p
	VHSYJ2	CH01	2600p
GOLDSTAR	GHV1290P, 1291P, 1295P, 9400, 73401, GSE1295P, GSE1891P, 20001Q, 20051Q, VCP4200, 4300, 4301, 4305, VCP4306, 4311, 4315, 4316, 4320, 4321, 4325	CH25	2000p
	GHV51, 1221, 1232, 1240, 1241, 1242, 1244, 1246, 1248, GHV8000, 8200	CH26	2900p
FERGUSON & J.V.C.	3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, 3V49, HRD 110, 111, 120, 121, 225	CH01	2600p
	3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948, HRD140, 141, 150, 157, 158, 160, 250, HRD257, 455, 565, 566, 725, 755	CH02	2600p
	8948, 8950, FV10B, 12L, 13H, 14T, 20B, 21R, 22L, 26, 395, HRD230, 430, 530	CH03	2600p
	3V58, 3V59, 3V64, 3V65, FV11R, 8950, 8951, HRD170, HRD180, HRD370	CH04	2800p
	FV31R	CH19	4300p
	HRD515, 520, 527, 540, 550, 580, 600, 610, 620, 660, 670, HRD830, 840, 850, 860, 4050, 6600, FV37H	CH20	2400p
	HRD540, 580, 830, 860, 910, 960, HRD970, HRDX20, FERGUSON FV57H	CH27	2400p
I.T.T.	VR3605, VR3905	CH01	2600p
	VR3918, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH02	2600p
	VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH02	2600p
NATIONAL PANASONIC	NV730	CH06	4300p
N.E.C.	N830EG, N831EG, N832, N833EG	CH01	2600p
	N895	CH02	2600p
PHILIPS	CASSETTE LIFT ASSEMBLY (69120366) DV186, 190, 286, 471, 562, 761, VR6180, 6182, 6185, 6285, VR6290, 6291, 6293, 6362, 6367, 6393, 6467, 6468, 6470, VR6561, 6670, 6760, 6761, 6870, 6970	CH05	1100p
	VR6443	CH22	2900p
	VR6448	CH23	2500p
	49SB6	CH24	2500p
SHARP	VCA100, VCH851, VCH852	CH22	2900p
	VCA103, 103GV, 106, 106GVM, 254GVM	CH23	2500p
	VCS211, 244, 5055, 605, VCB230, VCD806G, 810G, VCT212, 310, 410G, 610	CH24	2500p
TELEFUNKEN	VR2970	CH02	2600p
THOMSON	V320, 321, 323, 326, 4200, 4300	CH01	2600p
	V342, 343, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, V5500, 6000, 8540	CH02	2600p
TOSHIBA	V55, V57	CH01	2600p
	V65, V66	CH02	2600p

Service Aids

DESCRIPTION	VOLUME	CODE	PRICE
VIDEO HEAD CLEANER	75ML	SP01	140p
SWITCH CLEANER	176ML	SP02	150p
SILICONE GREASE	200ML	SP03	170p
FREEZE IT	170ML	SP04	220p
FREEZE IT	400ML	SP16	350p
FOAM CLEANER	400ML	SP05	170p
ANTI STATIC	150ML	SP06	170p
AEROKLEANE	135ML	SP07	200p
AERO DUSTER	150ML	SP08	220p
AERO DUSTER	400ML	SP17	425p
PLASTIC SEAL	200ML	SP09	200p
GLASS CLEANER	250ML	SP10	160p
COLDKLENE	250ML	SP13	200p
EXCEL POLISH 80	250ML	SP18	150p
ADHESIVE 120	400ML	SP19	190p
LABEL REMOVER 130	200ML	SP20	240p
REFURB 140	400ML	SP21	240p
TUBE SILICON GREASE	50 GRAMMES	SP11	200p
TUBE SILICON SEALANT WHITE	75ML	SP22	280p
TUBE SILICON SEALANT CLEAR	75ML	SP23	280p
TUBE HEAT SINK COMPOUND	25 GRAMMES	SP12	150p
DRIVE CLEANER	200ML	SP24	150p
SCREEN CLEANER	200ML	SP25	150p
COMPUTER CARE KIT	—	SP26	2100p

All the above items are manufactured by Servisol

If you purchase more than one Servisol Product, postage & package will be charged as follows:
300p for 5 cans **450p** for more than 5 cans

CD Pick Ups

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

PART NO: KSS210B
USED ON MODELS:
CFD100, 105L, 120, 300, 440, 454, 455, 50, 500, 55, 58, 60
CFD68, 750, 755, 760, 765, 770, 775, 440S, W100, 100S 2200p

Cassette DC Motors

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

Cassette Tape Heads

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

Soldering Accessories

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

Transistors & ICS

BU 508A (PHIL)	80p	MJE 13009	100p	2SC 3885A	350p
BU 810	110p	MJE 18004	125p	2SD 633	70p
BUZ 90A	180p	STK 6982H	600p	2SD 1680	225p
CXA 1044P	550p	STK 7253	450p	2SK 793	400p
HA 13408	350p	TDA 2030H	100p	2SK 956	1400p
IRFBC40	400p	TEA 2019	200p	2SK 1023	550p
L272	200p	TMP 47C434N	1250p	2SK 1342	750p
L6210	250p	SAA 1300	200p	2SK 1358	600p
MC 3423P	100p	2SA 1540	55p	68000	500p
MJ 15015	250p	2SC 3788	60p	82S147	450p
MJ 15016	350p	2SC 3885	350p		

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TELEVISION

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BUSINESS
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Whose Baby?

It doesn't seem often nowadays that an individual receives acknowledgement, let alone a substantial award, for research in the TV field. So the news that Larry Hornbeck has been awarded the Eduard Rhein Foundation's Technology Award for inventing the Texas Instruments' digital micromirror device (DMD) is welcome. The award is made for basic research into, or development in, the fields of radio, television and information technology and has a cash value of DM167,000 (about £75,000).

For those who haven't been following digital light processing, which was mentioned in George Cole's report from Berlin last month and has received several mentions in teletopics, the DMD is a highly sophisticated chip which carries on its back an array of tiny micromirrors. There are at present two versions, one with 848 x 600 mirrors (each mirror produces one displayed pixel) and the other with 1,280 x 1,024 mirrors. These mirrors are each mounted on an electronically-controlled tilt mechanism within the chip. What they do is to modulate an incident light source. The chip is complex electronically as well as mechanically, since it has to convert the incoming interlaced TV fields to produce the digital signals that control the micromirror array. Movement and other forms of image compensation are incorporated to remove picture distortion, also extrapolation between scan lines.

The names of Cambell Swinton, Baird, Zworykin and those in the EMI team that developed the 405-line system in the early Thirties are well enough known, as are those of many others who contributed to television in the early days. Many from the early days of radio and electronics are remembered from circuits that still bear their name – the Eccles-Jordan counting circuit, the Hartley, Colpitts and Miller oscillators, the Wheatstone bridge and the Schmitt trigger for example. Then there's Professor Yagi of the aerial. But who led the team that developed the shadowmask tube (the idea initially came from the Hazeltine Corporation, being taken up by RCA when it required a display device for its colour system)? Who devised teletext? Which names do you associate with satellite and digital TV technology? In truth, very few.

We all know that Bardeen and Brattain first discovered the transistor effect, while Shockley devised the junction transistor. Thereafter there are few names that come to mind in the semiconductor field. Clarence Zener, Schottky and Darlington – after that I, personally, draw a blank!

Could the relative lack of well-known names from more recent times be to do with the fact that research today, being infinitely more complex, depends on larger teams of scientists and engineers? Yet the EMI TV system development was very much a team effort, and the members of that team became well known. But teams today are probably much larger, while ideas tend to get thrown about and developed by different firms let alone teams. Research in the semiconductor memory field has become so expensive and complex that major electronics manufacturers worldwide have to collaborate.

The award to Larry Hornbeck at least brings recognition to one current man in TV research. This is welcome but unusual: one doesn't expect to get to know many of the names behind such current advances as digital TV, tape and disc systems and the various forms of flat-screen display. Probably recognition for technical achievement has always been a rather hit or miss affair, with hundreds of unacknowledged contributors to our technology.

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COVER PHOTO
This month's cover photograph shows part of the Pace **MSS100**, a recently introduced entry-level satellite receiver-decoder with a revolutionary profile. Our thanks to Pace for the loan of the receiver.

Letters

AN UNHELPFUL APPROACH

Problems with manufacturers who are reluctant to offer technical advice to any but their top account holders have been aired in these pages from time to time. Clarion has gone a step farther.

We needed a cassette motor for a relatively new model. On contacting Clarion we were told that as we didn't have an account we would be transferred to the Customer Services department. This turned out to be rather difficult. When we did eventually get through we were told that spares couldn't be supplied direct. We would have to get in touch with the local repair shop, which is some thirty miles away.

A call to this company didn't really help. They told us that they couldn't supply spares to third parties, and had previously got into trouble for doing so. They were sympathetic and tried to suggest alternatives, unfortunately to no avail.

Clarion suggested that we open an account if we needed spares on a regular monthly basis. This seemed to be a waste of time, as we rarely need any specialist Clarion parts – and an account would have taken time to set up.

We had a similar experience recently when we needed an instruction manual for a Toshiba fax machine. Various phone contacts around the country were given to us, but all came up with the same type of reply – "sorry, we don't supply parts or information to third parties." Just one phone call did the trick a few days later when we required an instruction manual for a Samsung fax machine. We were given the price immediately and the manual arrived by return of post.

It seems that while some companies go out of their way to be helpful, others just put obstacles in your way. You can guess whose products we will be recommending to our customers in future.

Radio and Electronics Engineer, Cambridgeshire.
(Name and address supplied.)

ELECTRONIC SET-UP PROBLEM

This is a plea to manufacturers to give thought to us poor chaps on the ground who have to grapple with innovations that, however well intended, often simply make our jobs more difficult. For example I was recently called to a Panasonic TX25W3 TV set (Euro 1 chassis) whose colour subcarrier oscillator required adjustment – the customer's complaint was that the picture went into coloured bars when the set was warm.

Now with this chassis all adjustments are made electronically, using the remote control unit to gain access to the set's service mode. Sounds marvellous – no need to remove the back cover! But I was not in possession of the necessary information, and guessed that the likelihood of my hitting on the correct sequence by chance was about the same as winning the Lottery. So the set was hauled into the workshop and the technical people at Panasonic were contacted. I was told that to enter the service mode you turn the bass to maximum, the treble to minimum and then press the button marked reset while at the same time pressing the volume down button on the TV receiver. Obvious really, when you think about it!

Once the set is in the service mode the various adjustments can be selected and made using the remote control unit's Fastext buttons. I selected 'colour VCO' and found that the setting was +37, way off the recommended –002. Carrying out this adjustment cured the problem and the set was then returned.

Fortunately Panasonic provide technical information to non-dealers, so I escaped without having to buy a service manual. With many other manufacturers the manual would have had to be obtained, turning a simple adjustment into an involved and relatively expensive job.

Manufacturers should realise that many of us engineers have to deal with a wide range of different models, most of which now have unique control set-ups. We can't be familiar with them all! So come on you manufacturers, use a bit of common sense. It shouldn't be necessary to have to obtain a service manual to carry out simple adjustments. Information on gaining access to these hidden functions could easily be printed on a label and stuck to the inside of the cabinet.

Colin Hartley,
West Yorkshire.

NEWSGROUP

If anyone is interested in me forming a newsgroup for the TV trade, like the ham radio one, please e-mail me on "stephen@hardrock.zynet.co.uk". I envisage tips, queries, items for sale and general topics as the main subject matter for the group, but other things would probably be acceptable. Please let me know.

S. Woodbridge-Smith,
Argyle TV and Video, Plymouth.

PRODUCT QUALITY

The quality of the electronic equipment being sold to the public seems to be declining remorselessly. There are VCRs with plastic mechanics that fail if you try to insert a cassette the wrong way round, TV cabinets that crack at the drop of a hat, and products that crack when you try to repair them because they have no service position. All, it seems, in the name of cost cutting. Here are some examples:

(1) Try removing the back mechanism PCB from a mid-mount Matsui VCR. It's easy to break the PCB as you remove it, or crack the main PCB.

(2) Ferguson and Toshiba VCRs have a small plastic gear that drives the carriage. It can break if the customer tries to put in a cassette the wrong way round. They also have the drum motor stator (coils) mounted on the main PCB with the rotor being part of the mechanism. So you can't separate and test them.

(3) In the Panasonic K mechanism arm P5 (part of a long, thin strip of metal) bends. On the G deck it was a cast gear arm.

(4) There are JVC control cam gears, plate assemblies and load gears that sheer, or the plastic twists.

There are countless more examples, too numerous to mention. Why are we obsessed with making things smaller, service unfriendly and very cheap? I bet that if VCRs cost £500 for the most basic models the public would still buy them.

Today's products should be idiot proof. You can't watch small children all the time, and it's easy to insert a cassette the wrong way round. Doing this shouldn't result in the machine going into the self-destruct mode! Equipment needs to be moved, and it needs to be serviced.

Whatever happened to the plastic covers one used to find on the primary side of switch-mode power supplies? With some VCRs the live mains supply is on the same PCB as the low-voltage electronics. One small mistake and you can end up with a nasty shock. You find this unsafe practice in Amstrad, Sony, Ferguson and Toshiba VCRs – I'm sure there are many more. Have these products been passed for safety?

Name and address supplied.

AKAI VS-F200

John Edwards' fault note on this model (September, page 793) was correct as far as it went. There can however be a problem with damaged eject gear teeth with this VCR and earlier machines that use the same mechanical design. The cause is poor meshing between the eject gear and the eject slider, because the black plastic lug that retains the slider provides insufficient support should excessive stress be placed on the mechanism. A technical note (AV 10014) on this problem was issued at the time, outlining a remedy (fit new type arm shutter, add new spacer, replace eject gear if teeth are damaged, apply grease to specified points). Later mechanisms of this design were upgraded, with a double-width lug that gives good support.

The purpose of the arm damper and spring combination is so that when a cassette is inserted it drops down into position smoothly, and subsequently ejects smoothly. If the combination is not fitted, the cassette will drop into position and flip back up too quickly – a toaster effect.

When a cassette is inserted, a lug that's part of the cassette load block runs along the moulded groove in the chassis. It pushes the arm damper down, under spring tension, as the cassette moves into position. Otherwise there is a big drop for the cassette as it turns the 90° bend to go down. The heavier the cassette, the more apparent the effect. This is why it's called an arm damper – it cushions the drop, and works the same in reverse (eject).

Alan Murphy, Technical Liaison Officer,
Akai (UK) Limited,
Hounslow, Middlesex.

HINARI VXL8/9, AMSTRAD VCR6000 ETC

John Pitt-Francis's advice on these machines (November, page 44) is not entirely correct. He is right to say that the cause of no rewind and fast forward is unreliable trigger lever action, but not in recommending edge cutting, increased spring tension and light greasing as a cure.

We see a fair number of these decks in various low-budget VCRs, and used to advocate the filing and greasing method. When the units began to bounce however we looked more closely at the root cause of the fault. The reason the trigger lever (item 260) is left proud is that the brake plate (item 261) which carries it doesn't travel far enough to the right. The cause is wear on the rubber block, which the brake plate pushes against, on the chassis. All that's required for a lasting cure is to replace this rubber pad (item 41, Amstrad part number 153091), which is available from Amstrad or CPC.

Rob Younger, Darton Electronics Services,
Barnsley, Yorkshire.

Teletopics

Projection TV Systems

Texas Instruments recently gave a demonstration, with a number of its customers, of projection TV systems using its digital light processing (DLP) technology. The Brussels demonstration signified the official launch of DLP systems in Europe. The basis of DLP technology is TI's digital micromirror device (DMD) chip, which uses an array of digitally-controlled micromirrors to produce a picture by modulating the light from one or more light sources. An optical system, including a colour filter wheel, projects the modulated light on to a screen. TI has announced that it will not be selling the DMD chip separately: OEM customers must buy the whole light modulation and optical system, which TI can tailor to meet particular requirements.

For example a Nokia back-projection system using two DMDs, one for red and one for green and blue, produced a 50in. (diagonal) display. The reason for the two DMDs is that the light source used in this application emits more blue and green than red light, enabling these colours to be time-multiplexed by a single chip. nView demonstrated a single DMD projector aimed at the office presentation market, while Rank Brimar demonstrated a high-power (more than 1kW) projector that uses three DMDs, designed to produce displays on screens of about 5m (diagonal). The light source makes a big difference to cost, ranging from $1,000 to several thousand dollars.

The quality of the pictures has been widely acclaimed. But problems remain, in particular the fact that the DMD chip yield is not high. Failure mechanisms are also still being studied, something that takes time with new technology.

Samsung has developed a 30in., widescreen 3D projection TV system. It uses two projectors and head-tracking technology that moves the image as the viewer's eyes move. The system is due to be launched late next year. Samsung has also developed a 22in. TFT LCD screen that cost some £15m to develop over four years. The screen is less than 25mm thick and has an energy consumption of less than 15W.

JVC is about to launch in Japan two new LCD projectors for PC and HDTV applications.

Satellite TV

The fifth Astra satellite, 1E, has been successfully launched into orbit at 19·2°E. It's the first of a planned series of satellites that are dedicated to digital TV transmissions. In all there will be 56 transponders, each able to provide around ten TV channels. A number of leading European broadcasting organisations, including CLT and Canal Plus, are already planning to offer services.

According to Astra's parent company SES, over five million households in the UK can now receive Astra services, three and a half million via individual dishes and distrihution systems and one and a half via cable systems.

Developments in LNB technology have enabled Sky to offer a new, smaller dish. The 48cm diameter makes it 37 per cent smaller than the 60cm size previously regarded as being the minimum acceptable. The dish is intended for use in the area to the south and east of a line from Southampton to Hull.

Pocket-sized Video

NEC engineers have developed a pocket-sized video playback device, called Silicon View. to play back MPEG-1 video and audio stored on a credit-card sized memory board. The prototype, which has been produced primarily to prove the system, has a 40Mbyte memory card that provides a playing time of just four minutes. The device, which has no moving parts, is unlikely to become available until much larger storage capacity memory chips have been developed. It weighs 295g, the dimensions being 14·6 x 7·6 x 3·7cm with a 5 x 3·9cm screen size.

TV and the Internet

Intel, the world's largest manufacturer of microprocessors, has developed technology to enable domestic PCs to receive television programmes and related information simulataneously from the Internet. The company sees its Intercast technology as an alternative to digital transmissions and broadband cable networks as a way of supplying news, entertainment and information services to domestic PCs. PCs equipped with the technology would receive TV signals with related information as embedded signals. This could include point-and-click links giving access to pages of information on the Internet.

Philips has developed a television-based method of using the Internet. Its Internet connection system is designed around the use of a CDi player. The Philips Internet connection kit consists of a modem that plugs into a CDi player, a telephone cable, a telephone adaptor and the CD-Online disc. According to Philips this approach should appeal to the mass market. The price of the CDi player and kit, at around £500, is far less than the cost of gaining access to the Internet via a PC.

Servicing News

Hitachi is appointing service agents and closing its Middlesex-based service operation. Techsure in Greenford is being closed down, though Hitachi will keep a specialist camcorder repair team at Hayes. It will also deal with "non-routine service matters". The authorised agents will be service specialists, not retailers. There is no change to the spares ordering system.

VCR Clinic

Reports from Brian Storm, Mike Leach, Terry Lamoon, David Belmont, Paul J. Charlton, Robert Marshall, Stephen Leatherbarrow, Ray Porter and Michael Maurice

Panasonic NVG21

The symptoms were badly distorted sound and diagonal lines across the picture. Anyone optimistic enough to try to play a tape would see that the drum and capstan speeds were incorrect. In a machine of this age the initial checks should be carried out in the switch-mode power supply. We found that C1019 (1,000μF, 25V) had died of old age. **B.S.**

Panasonic NVG10

An intermittent mechanical fit was the complaint with this machine – the mechanism would shuffle around, the machine then powering down. Selecting rewind or fast forward would sometimes produce a quick shuffle, then the command would be ignored. A machine of this age is usually in dire need of maintenance kit VUD4103KIT, but the part needed to cure the symptoms just mentioned, the mode switch, is not included. Its part number is VSS0135. **B.S.**

Panasonic NVJ40

The machines in this range and subsequent ones incorporate an internal fault diagnosis system. Pressing eject, fast forward and rewind puts the machine in the fault diagnosis mode (with shuttle search machines press eject and hold shuttle forward). The VCR will then recall from its memory the last registered fault – unless it has been unplugged from the mains supply since the last fault occurred.

The fault with this machine was intermittent stopping. Unfortunately it occurred once every two weeks. But the machine said E2, which according to the manual means reel stop problems. So we turfed out the two ON2170 reel sensors and cleaned the reflector surfaces. Our sincere thanks to the diagnostic system – the machine hasn't darkened our doorway since! **B.S.**

Akai VS765

This machine wouldn't respond to any function requests. There was also no clock display. A start was made in the power supply, to see whether there was anything obvious amiss, but the voltages at plug WP201 were all correct. Attention was next turned to the microcontroller chip IC403 and the front control panel. We found that the 5V supply to the chip and the panel were o.k., but the 5V reset voltage to the clock microcontroller chip was very slow in coming up while there was no reset voltage at all at the microcontroller chip on the main board.

The reset pulse is derived from the BU5V supply, which was very low. It comes from TR205 on the main panel. This transistor should receive a 23V input, but the voltage had fallen to only 5-6V. The cause was the 15Ω safety resistor R221, which had gone high in value. A replacement produced normal operation. **M.L.**

Akura VX90

The customer said that this machine would shut down when play or record was selected. Fast forward and rewind were o.k. Once the top cover had been removed I saw that there was no drum rotation. Although I didn't have the circuit diagram, I decided to strip out the main PCB and investigate. Unfortunately first-line checks proved to be inconclusive. As no resistors or safety components had failed, I felt that a manual would be required.

While I was trying to relocate the top board however my hand brushed against the r.f. booster/modulator. It was very warm. I then noticed that the r.f. channel output adjustment was chewed and possibly damaged. When the modulator was disconnected from the PCB the drum rotated and playback was achieved. A new modulator put matters right. The job might have been easier had there been a few more safety components. **M.L.**

Samsung VIK320

Watch out for this one: if the machine starts to do weird things by itself, e.g. trying to load with no cassette inserted, or the cassette flap 'flapping' with no tape in, check for dry-joints at the lighthouse. **M.L.**

Matsui VP9401

This machine wouldn't load. As there was no drive to the loading motor I pulled the machine apart to gain access to the loading drive chip. This was very hot and its casing was damaged. The machine worked when a replacement chip had been fitted, but the chip was still overheating. A new loading motor put that right. The machine then worked fine. **T.L.**

Matsui VX1100 etc

Intermittent mechanism faults are now common with this range of machines, e.g. failure to eject, not playing, etc. If you get this problem you can clear it by cleaning the mode switch. For a permanent cure however replace the switch with the improved type. **T.L.**

Matsui VP9401, VP9501

For problems with sound recording or playback, or any other intermittent deck problems, check the jump connection board at the rear of the mechanism. You will probably find dry-joints. Resolder all connections and give the machine a good test. **T.L.**

Sony SLVE40

This machine wouldn't eject tapes. The mechanics didn't jam: the mechanism would go to the point where it was ready to eject, then just sit there. The culprit was the mode switch, a replacement restoring normal operation. The mechanism bears an uncanny resemblance to the deck used in the Amstrad double-deckers, budget Aiwa machines, etc. **D.B.**

Hitachi VT65

Intermittent failure to record the picture was the complaint with this machine. When a sample tape provided by the customer was tried we found that no f.m. had been recorded. When the fault eventually put in an appearance in the workshop we found that little f.m. came from the modulator chip. A replacement thick-film unit cured the trouble. **D.B.**

Panasonic NVF65

This machine was dead with just a squeal from the power supply. When the main PCB was disconnected the power supply worked perfectly. So it was time to start disconnecting the loads to find out which one was imposing the excessive load. The 45V line turned out to be the culprit. Now there's a rather unusual shunt stabiliser across this rail, based around transistor Q6021 which was being turned on hard. A fault in its base drive circuit was therfore suspected. But checks here proved fruitless. The cause of the problem was the fuse on the main PCB. It was dry-jointed. Resoldering it cured the problem. **D.B.**

Sanyo VHR7700

This machine was dead, with only the clock display showing. There was no switched 5V supply because Q5402 was open-circuit. **D.B.**

Amstrad UF20

There was buzz on the E-E sound and tuner signal recordings: recordings via the scart socket were fine. In this and later Amstrad models the tuner, i.f. section and r.f. converter are housed in one can, part no. 254873. A replacement cured the fault. **D.B.**

Ferguson FV31R

This machine would jam intermittently then turn itself off. It uses optocouplers as mode switches. A sub-panel mounted on the power supply/servo PCB feeds the pull-up resistors associated with these optocouplers. The cause of the fault was a dry-joint on this panel. **D.B.**

Matsui VX800/Saisho VR1000

This machine's mechanics failed to complete the loading cycle in either play or record. On inspection we found that the cam gear was bone dry. A replacement together with some grease restored normal operation. **D.B.**

Panasonic NVFS90

This machine's playback picture was certainly below par. We suspected the heads but the drum is very expensive. So some checks were carried out. We found that the source of the trouble was on the delay PCB, which sits on its own at the bottom of the machine, being connected to the main PCB via various cables. A clean signal arrived at this board, but a very poor signal left it. On further investigation we found that capacitors C3501 and C3506 had dried out. Replacing them restored the excellent pictures that this superb SVHS machine produces. **D.B.**

JVC HRD660

The pulley ring on the capstan motor in these machines tends to split, the result being either cyclic interference to playback accompanied by a ticking noise or complete failure if the pulley and belt actually come off. The pulley is a toothed gear. JVC can supply a replacement, part number PTU96031-678C, to eliminate the need to replace the capstan motor. **P.J.C.**

Amstrad DD8900 Twin Deck

The problem with this machine was no fluorescent display. R29 (15Ω, fusible) in the power supply was open-circuit. Replace D29 (BA157) as well, or the repair will probably bounce. It's wise to mount these two components off the board to increase the air circulation around them. **P.J.C.**

Mitsubishi HSM34

This machine had a cassette stuck inside it. We found that the eject sequence couldn't be carried out because the main reel belt was off its pulley at the capstan motor. The pulley ring was off the capstan too – a split had appeared in the pulley. This would normally call for replacement of the capstan motor. We've had success however by simply fixing the split pulley back on its shaft. The small split doesn't impair performance. **P.J.C.**

Akai VSF30EK

Fluorescent display failure is common with these machines. A kit is available from Akai, part number BX744015J. It consists of replacements for C446/7 and D416/7 together with details of a small modification to extend tube life. **P.J.C.**

Mitsubishi HSM54 and Variants

This machine seemed to load the cassette correctly until either play or record was selected. It would then cut off, after approximately three seconds. The cause of the fault was the cam pinch lever (L016) which had become misshapen where it contacts the pinch cam, preventing completion of the loading sequence. I've also known this part to break completely, the symptom then being either failure to accept a cassette or tape damage on load/eject. **P.J.C.**

Hitachi VTM830

This machine didn't record sound and there was no E-E sound whilst recording. When the record button was pressed there was a noise as if the sound was being strangled: sad, really! The sound feed to the modulator and the scart socket is from pin 30 of the LA7297 record/playback processor chip IC401, which also switches on the 9V supply to the bias oscillator. The bias oscillator transistor Q401 had died. **R.M.**

Goodmans TX1101 etc

The deck used in this machine is the same as that in the **Amstrad VCR6000** and many other, often obscure, models. There are many similarities in the electrical/electronic systems as well. The following fault, which has become common, applies to them all.

The usual symptom is switching from the LP to the SP mode without being asked. Ripple on the 'mcoμ +5V' supply is the usual cause – it's at the rightmost power supply plug pin. The component that's responsible is either the bridge rectifier or C509 (220μF, 25V). We replace them both, also the pinch roller, then set up the control head. There have been no comebacks after doing this.

It's also common to find that the audio/control head tilt adjustment was incorrect from new (as it was with the Amstrad machines), to the extent that there is insufficient tension at the top edge of the tape. This produces rippling at the top edge and thus poor tape/head contact.

C509 can deteriorate further. As a result the 5V supply is so poor that the microcontroller chip fails to reset. The deck continues to carry out its initial shuffle however. **S.L.**

Samsung VI711

Intermittent play was the customer's complaint. I assumed to start with that the cause was of the usual idler or belt kit variety. Not so. Another symptom I noticed was patterning on the E-E pictures. So I checked for hum on the supply rails. This was in fact the cause of the trouble: C102 (3,300μF, 35V) had fallen to a very low value. **S.L.**

Sharp VC390H

After carrying out a deck service I did a full function check and was suprised to find that there was a no record fault. Playback was o.k., but the machine would neither record pictures and sound nor erase previously recorded material. The Rec12V line seemed to be an obvious thing to check. Bingo – the voltage was missing. It comes from the 2SA950 transistor Q807 on the bottom 'servo' board. As we didn't have a 2SA950 a BC640 was tried instead. It provided a complete cure. **S.L.**

Matsui VX735A/Saisho VR3300

The customer complained that the aerial socket was too hot to touch! When we tested the machine we found that the r.f. modulator's metal case was indeed extremely hot. A check on its supplies showed that one read 18V while the other was correct at 12V. These voltages were measured at CP501. Further checks in the power supply revealed that Q502 (2SD1207) was short-circuit all ways round. **S.L.**

Orion D4500

No playback was the customer's complaint. In fact the machine's r.f. output lacked video modulation because of an intermittent dry-joint on the wire link next to R4203, which is near the LA7282 chip and the r.f. modulator can.

The innards of this machine bear a close resemblance to the Matsui **VX1000/2000**. **R.P.**

Fisher FVH5100

Failure to play was the original symptom, with auto-ejection of the cassette. A new idler assembly cured that. But there was occasional colour dropout when playing a known good tape, leaving a white-spotted monochrome picture. Scope checks showed that one head's f.m. signal was missing at the output from the BA7253S three-head amplifier and switching chip. By the time the head-switching signal at pin 1 could be measured, the fault had cleared and didn't return for a month – in the customer's home, of course. Replacing the upper drum assembly cured the fault.

The original head assembly appeared to be in perfect condition. There must have been an intermittent break in a head winding or head ferrite, possibly caused by the tape brought along by the customer – it had been spliced using Sellotape. **R.P.**

Matsui VX800A/Saisho VR1200

This machine had been in several times because of the same fault: intermittent switching off. I changed the mode switch, but this made no difference. Then, quite by chance, I discovered that the spring action of the play and stop switches had been lost. As a result they were not making when required. New switches cleared the trouble, but two weeks later the machine was back. This time the cam had seized. After replacing this item we'd finally seen the back of the machine. **M.M.**

Ferguson FV62L

Capstan wobble was the trouble with this machine – the picture broke up in both rewind and forward search. The culprit was IT25. After replacing it the machine behaved normally. **M.M.**

Matsui VX1100

There was no LP playback colour with this machine, though recording was normal. The cause was eventually traced to C4316. One of its legs was dry-jointed. **M.M.**

Telefunken VR4940

This machine is similar to the **Ferguson FV32**. The one we had would load up, start to play, then stop. I suspected the reel sensors, but replacing them made no difference. Replacing the mode switch put matters right. **M.M.**

Matsui VX2700

Intermittently reverting to standby, after long periods of varying duration, was the complaint with this machine. Resoldering a number of dry-joints around the microcontroller chip IC1101 cured the trouble. **M.M.**

Philips VR727

This machine's threading motor had seized and its drive chip had burnt out. Unfortunately the chip is not listed separately in the manual: you have to replace the capstan drive board. Replacing this and the motor restored normal operation. **M.M.**

Ferguson FV62L

The customer described the symptom as "a vibration on verticals when a tape is being played". The fault was intermittent as well. A call to Ferguson Technical produced the suggestion that IT25 was responsible. Replacing it cleared the trouble. **M.M.**

Hitachi VT430

This machine wouldn't eject tapes. The cause was simply a slack reel drive belt – in the eject mode the belt drives the carriage. A new belt put matters right. **M.M.**

Satellite Workshop

Jack Armstrong

A lot of our business nowadays seems to start with a telephone call. The results can be quite mixed.

Bright Star

One of our local shops had sold an Amstrad satellite receiver system to a customer from Baslow, which is a rather posh sort of place. A few weeks later he returned to the shop to ask about buying another dish and LNB. He was naturally sold these items, and away he went. The next bit is where I became involved. He had rung the shop with a question and they had put him on to me!

I quizzed him for a while to get his story. He told me that he has a holiday cottage in France and that he had bought the original system for use there. It had been such a success that he'd decided to buy another dish for UK use, taking the receiver itself back and forth with him on his visits.

Now that I knew the background, I asked what the problem was. He wanted to know how to set up the dish. Being the sort of person I am, I enquired how he'd aligned his French dish.

Apparently he was able to "see the satellite" at his cottage in France. He had only to point the dish at it therefore.

Intrigued, I asked him what the satellite looked like. He replied that it was "a bright light in the sky"... Unfortunately he couldn't see it when in England.

At this point I mentioned its distance from earth and added that it doesn't have headlights.

Obviously a job for a local installer, but how lucky can you be – just pick a star at random and point the dish at it!

Funny Pictures

I had a call this morning from a lady in distress. She couldn't receive satellite pictures at all, neither would her video. Her TV set had been "playing up" or, to be more precise, "giving funny pictures". She'd tried swapping over with her portable but, as she couldn't figure out how to tune the channels, she'd swapped back.

When I arrived I found that the coaxial lead from the aerial was connected directly to the back of the TV set, and two r.f. leads connected the VCR to the satellite receiver. A quick lead swap restored the satellite TV pictures. The TV set itself was an ITT Model CT1611/2. When tapped, it would produce maximum volume and lose field hold. I assume that the cause was a dry-joint which I'll no doubt find in the workshop later. For the moment I've left the portable connected.

Technisat Kundendienst wir Bedanken uns bei Ihnen!

On Wednesday evening three weeks ago I received a call-out while I was listening to Eric Wiltsher's Satellite Workshop (Astra radio, frequency 7·56MHz on the JSTV transponder, at 8.10 p.m. for those interested). I was a little annoyed, because I couldn't very well listen in the car!

The problem was a 'dead' Technisat 4000ST receiver, which I brought back to the workshop for investigation. It didn't take long to find that the mains transformer's primary winding was open-circuit. As there's no longer a Technisat subsidiary in the UK, I dusted off my English-German dictionary and phoned the factory at Daun. The girl who answered said that the transformer for that model was obsolete but, if I faxed an enquiry, she thought that a replacement might be available. At least I think that's what she said!

So I faxed the information in my best schoolboy German and waited for a reply that didn't arrive. A week later however my toes were crushed by a battered jiffy bag that came through the letter box. It was a transformer, free of charge, with the compliments of Technisat! Impressed by this service, I faxed back a letter of thanks (if you're puzzled by the heading above, it should translate as Technisat Customer Service we thank you!). A note inside the jiffy bag explained that J.D. Electronics in Sudbury, Suffolk, is now the Technisat UK agent. I rang Joe at J.D. (01787 880 328): he confirmed that the transformer is a stock item, and mentioned that the firm also supplies Echostar spares. Useful to know.

No Connexions

A gentleman who phoned last week was happy to let me take away his Connexions CX95A receiver for repair: I made the mistake of assuming that he would be happy to pay for it! After ordering and fitting a new decoder board I telephoned to give him the good news – only £75 plus VAT. He became quite stroppy, and insisted that it shouldn't have gone wrong "after only two years".

Without an extended warranty there was little I could do about this: it was well outside the twelve-month warranty, and I'd been lucky to get a brand new Thomson decoder board so cheaply. Call me stupid but, to try to reduce the cost, I decided to see if I could fix the original decoder.

The fault symptom was display of the 'card invalid' message each time a valid card was inserted. A check on the 5V supply to the card reader showed that the voltage appeared briefly as the card was inserted, then dropped to zero. This suggested to me that the supply itself was o.k., the fault being in the card reader. It took an hour however to track down the culprit, a leaky 5·6V zener diode next to the card holder.

I compromised and suggested a £45 repair charge – expensive for a zener diode, but it helps with my petrol costs and the fact that I now have a new, unwanted Thomson decoder board in stock (it fits most Echostar and Palcom models...).

When I returned the receiver the customer asked me to install it back in the cabinet, on top of his VCR! I compromised by squeezing them side-by-side on the shelf. This arrangement still looked tidy, and provided far better ventilation. He paid me without a murmur, and seemed grateful.

Decorators

Loss of the satellite TV picture following a visit from the decorators was the complaint. When I called to inspect the installation I found that the Amstrad SRD400 receiver had popped its 630mA fuse. This suggested a possible short-circuit in the LNB or the cable. A replacement fuse melted instantly, so the diagnosis seemed to be correct.

The terrestrial pictures were also very poor however, bringing a suspicion to my mind. I traced the aerial and LNB cables through the wall and went outside. They'd been swapped over! The decorators had removed the sockets so that the cables could be pulled into the wall, allowing the new wallpaper to lie flat. They'd made a superb job of refitting the sockets – on the wrong cables!

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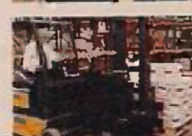

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The Digital Video

George Cole

Digital video recording systems have been used for many years in professional broadcasting studios, where there is a need for multiple dubbing and editing with little or no loss of picture quality. The consumer market is now to be offered a digital video format – the Digital Video Cassette

Electronics companies have been working on consumer digital video formats since the mid-Eighties. In 1990 Sony, Philips, Thomson and Matsushita (Panasonic) entered into discussions on a single, standard format, with the aim of avoiding the format wars that caused so much trouble in the consumer VCR market. In 1993 these four companies, plus six others, formed the High Definition Digital VCR conference. By April 1994 the total number of firms involved, from the electronics, computer, film and video industries, had grown to fifty two. They include Apple, IBM, Kodak, Texas Instruments, Samsung, BASF and TDK.

At a time when disc-based formats look as if they might replace tape the idea of launching a new tape system, albeit one that offers digital recording, may seem strange. But tape offers a higher recording capacity than disc, and is cheaper.

The DVC Format

There are four main standards within the DVC format. These are:

(1) SD (Standard Definition), designed for PAL and NTSC TV systems and camcorders.

(2) HD (High Definition), for higher picture quality.

(3) ATV, for use with the US Advanced TV System, which will offer high-definition digital TV.

(4) DVB, for the European Digital Video Broadcasting standard, which uses MPEG-2 video.

While the SD and HD standards were agreed in April 1994, the ATV and DVB standards are still under development. A system known as DVC PRO is designed for the semi-professional and professional markets. It's supported by several companies including Matsushita. The equipment due to be released in the consumer electronics markets during the next year will use the SD standard.

There are two types of DVC cassette. The full-sized version (125 x 78 x 14·6mm) is designed for VCR use. It stores up to four and a half hours of video. The mini cassette (66 x 48 x 12·2mm) is intended for camcorder use, storing up to an hour of video. DVC decks can use either type of cassette without the need for an adaptor. The tape width is 6·35mm.

Basic features of the SD system are as follows: two-head helical scanning; luminance horizontal resolution about 500 lines, with a sampling frequency of 13·5MHz and 8-bit quantisation; colour signals recorded in digital component (separate R – Y and B – Y) form, with a sampling frequency of 6·75MHz, 8-bit quantisation and a chroma bandwidth of about 3MHz; video transfer rate 25Mbits/sec (after compression); compression system DCT (Discrete Cosine Transform), giving a ratio of about 5:1; audio recorded in PCM form, in either a 12- or a 16-bit mode. Note that the chroma bandwidth and sampling frequency quoted above apply with the PAL version, the specification being different with the NTSC version.

The drum is the same in both camcorders and VCRs. Its diameter is 21·7mm and it rotates at 9,000 r.p.m., giving a writing speed of 9·9m/sec. For the sake of comparison, the Video 8 drum has a diameter of 40mm, rotating at 1,500 r.p.m. to give a writing speed of 3·12m/sec, while for VHS the figures are 62mm and 4·86m/sec.

Recording System

Fig. 1 shows in basic outline the recording system. The analogue luminance signal is fed to an analogue-to-digital converter which samples it at 13·5MHz, converting the samples to 8-bit digital form. The analogue colour signal is first separated into its R – Y and B – Y components. These are then sampled at 6·75MHz and are also converted to 8-bit form. Recording the colour signal in component form means that the DVC colour bandwidth is much wider than with other domestic video formats: because more signal information is recorded, colour blur is minimised and a degree of compatibility is provided for HD operation.

The digitisation process produces a vast amount of data, far more than could be recorded on the tape. Data compression is therefore required. Two systems are involved, discrete cosine transform (DCT) and variable-length coding. The compression process works in the following way.

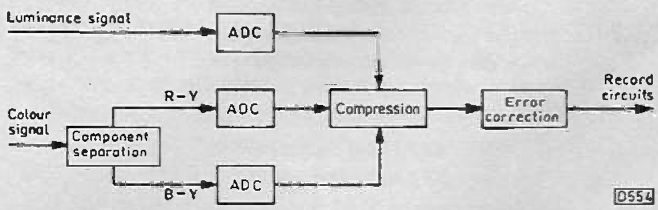


Fig. 1: Block diagram of the basic recording system.

First only the visible portion of the picture is coded – with conventional TV systems there's a certain amount of screen over-scanning. This reduces the data from 162Mbits/sec to 127Mbits/sec (NTSC figures this time). Each frame is then analysed, only the changes between successive frames being coded. This reduces the data rate to 25Mbits/sec, achieving a compression ratio of around 5:1. This is a lower ratio than with MPEG-2, which compresses the image data by a factor of around 20:1. It means that DVC images contain more

Cassette Format

detail, and are more suitable for still-picture display, editing and frame-advance viewing.

Error correction is applied before recording.

Despite the digital compression, the DVC picture quality is good, SD standard pictures having a horizontal resolution of around 500 lines. This is better than with existing high-band analogue video formats such as S-VHS and Hi-8.

Track Pattern

One frame of PAL signal (converted to digital form then compressed) occupies twelve successive helical tracks. The track pitch is ten microns. Fig. 2 shows the basic composition of a track. The video data is recorded towards the centre, preceded by the audio section.

There are two possible DVC audio modes: 16-bit PCM with alternative sampling rates (32kHz, 44·1kHz or 48kHz, i.e. CD quality sound can be recorded); or 12-bit PCM with a sampling frequency of 32kHz and non-linear quantisation. Since the audio and video data are recorded separately, features such as audio- and video-only insert editing are possible.

Other data is recorded, including auxiliary information such as the recording date and time, the picture mode (e.g. wide) and the signal source (e.g. channel number). This is carried in the sub-code section. There's also room for optional camcorder information. This data can be displayed on the TV screen if required.

The ITI section of the track stores three pilot tracking signals.

DVC also stores, in the sub-code section, time-code information which is useful for accurate editing, index marking information (cue signal) which helps to find the start of a scene, and PP-ID data which is used for still picture recording and playback.

Tape and Cassette

As previously mentioned, there are two types of DVC cassette. The mini cassette looks like a smaller version of the DAT cassette, complete with protective lid and hub lock to prevent tape slack. A small, sliding tab at the bottom of the cassette can be used to prevent accidental recording. It holds up to an hour of video.

The standard (full-sized) cassette is a little larger than the 8mm type and stores up to four and a half hours of video.

There's a simple DVC coding system: for example, DV270 indicates a standard 270-minute cassette while DV M60 indicates a miniature cassette with a sixty-minute recording time. The playing times are the same with both PAL and NTSC signals.

DV cassettes can incorporate an optional 4Kbit chip to store data such as the type of tape and a table of contents. The basic data structure is standard, but manufacturers can decide what information they want to store in the chip. If the cassette doesn't contain a memory chip the data can be stored in the machine itself.

The 6·35mm tape (quarter of an inch for those who prefer Imperial measurements!) has a double evaporated-metal layer with high coercivity (500mT/5,000Gauss). This enables a wider bandwidth to be recorded. There's a hard carbon coating to improve durability. See Fig. 3.

Compatibility and Connectivity

There is no compatibility between DVC tapes and analogue formats. DVC camcorders and VCRs can be connected to both analogue and digital VCRs however, and to standard TV sets for playback.

A single cable is used for transferring the digital data. It carries both audio and video information and is bi-directional.

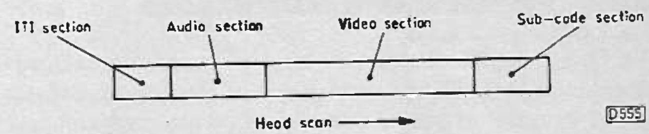


Fig. 2: Way in which the data is arranged along a track. The ITI section contains tracking signals etc. This is followed by the audio and video sections then, finally, the sub-code sector.

Prerecorded DVC tapes will have an anti-copying system – not least because any copies would look as good as the original!

Prospects

Panasonic, Sony and other companies are planning to launch DVC camcorders in Europe this autumn. They will, not surprisingly, be expensive. The cheapest will probably carry a price tag of over £2,000, though prices should fall as production builds up.

The DVC format is likely to establish itself in the camcorder market first, where enthusiasts may be prepared to pay extra for a machine that gives excellent picture quality and good copies. DVC will face a harder task if it seeks to replace VHS in the VCR market. Most VCR users don't seem to be all that bothered about picture quality – as the poor sales of S-VHS decks shows.

A point to watch is that JVC plans to launch D-VHS, a digital version of VHS that can play and record on standard VHS tapes. According to JVC, D-VHS is not designed to compete with DVC, instead being intended as a giant domestic data storage system.

Whether DVC or D-VHS can replace the VHS box that sits under hundreds of millions of TV sets around the world remains to be seen.

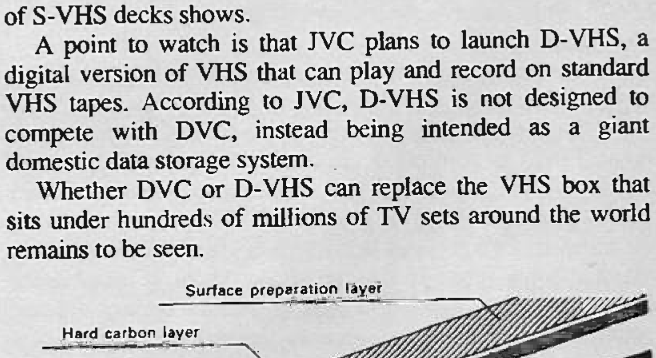


Fig. 3: Digital video tape composition.

Servicing the Philips G110 Chassis

Richard Newman

The Philips G110 chassis was used in models introduced during the years 1989-91. It was one of the first of several chassis to make extensive use of surface-mounted components. The result was a very compact, high-specification chassis with no component crowding. Nicam and Fastext are standard features. S video connection was an option with some sets, and there was also a 41in. projection version.

Mainly because of the number of surface-mounted components used in the power supply, these sets have not exactly been favourites in the servicing trade. In this article we'll describe how to tackle repairs and also take a look at the optics used in the projection version.

The Power Supply

The power supply circuit is shown in Fig. 1. It's of the familiar Philips self-oscillating (SOPS) type, but the component count is fairly high. There are basically three sections. First the BUT18AF chopper transistor T7625, which is connected as a blocking oscillator. Secondly a switch-off circuit based on transistors T7615 and T7616. This is used to ensure that the chopper transistor is switched off at the correct point during its on/off cycle. And thirdly a regulation control circuit, based around transistors T7637, T7652 and T7654 on the secondary side of the chopper transformer L5625. This controls the switch-off circuit via the optocoupler T7614.

As most power supply problems seem to relate to start-up and standby, we'll take a look at how it all works.

During normal operation the base of the chopper transistor T7625 is controlled via diode D6621 by the voltage across winding 3-4 on the transformer. When T7625 switches on, a voltage of around 280V is connected across the transformer's primary winding 5-6/7 and a linearly rising current flows through this winding. There is no current output from h.t. winding 17-16 on the secondary side of circuit during this period because the voltage at pin 16 is negative. Magnetic flux therefore builds up in the transformer. When the transformer becomes saturated, the voltage across winding 3-4 will fall and T7625 will switch off. As a result, the voltage across winding 5-6/7 will reverse its polarity and C2625 will charge. The maximum voltage developed across this capacitor is around 680V. At a certain point in the cycle the voltage across winding 17-16 will reverse and D6630 will charge the h.t. reservoir capacitor C2630, producing the 148V supply for the line output stage.

When the current flowing in winding 17-16 falls to zero, C2625 will form a resonant circuit with the winding 5-6/7. The polarity of the voltage across winding 3-4 will then reverse, providing the chopper transistor T7625 with base current drive. The cycle is then repeated.

To start the power supply at switch on, a 100Hz pulse is obtained from the mains supply via R3624/26. This is fed via R3618 and R3619 to the base of T7625 which is thus switched on.

The Turn-off Circuit

When the chopper transistor T7625 is conductive, the voltage across winding 3-4 is rectified by D6622. This produces a negative voltage, clamped by zener diode D6617, across C2617. When the regulation control circuit on the secondary side of the circuit produces a pulse, this is linked via the optocoupler T7614 to the base of T7615. Transistors T7615 and T7616 then switch on, linking the base of T7625 to the negative voltage across C2617. T7625 switches off very quickly, and C2617 is partly discharged. When T7615 and T7616 switch off, T7625 could start to conduct again. This is prevented for a short time by the blocking transistor T7612. In addition D6618 prevents T7625 starting spuriously. Diodes D6613 and D6614 with C2614 prevent spurious pulses triggering the turn-off circuit.

The Blocking Circuit

T7612 and its associated components prevent T7625 switching on before all the energy stored in the transformer has been dissipated. When T7625 is non-conductive, a positive voltage is present across winding 2-1. As a result T7612 is conductive, and any current that might drive the base of T7625 is shunted away. When the energy stored in the transformer has been removed, the voltage across winding 2-1 falls to zero. C2611 and R3611 provide an extra delay for T7612's turn off. Once T7612 has switched off, base current can be fed to T7625 to switch it on. This extra delay means that T7625 is switched on at precisely the correct time.

Voltage Regulation

The regulation control circuit consists of voltage comparator transistor T7637 and the pulse-width modulator T7652, T7654 and their associated components. The pulses

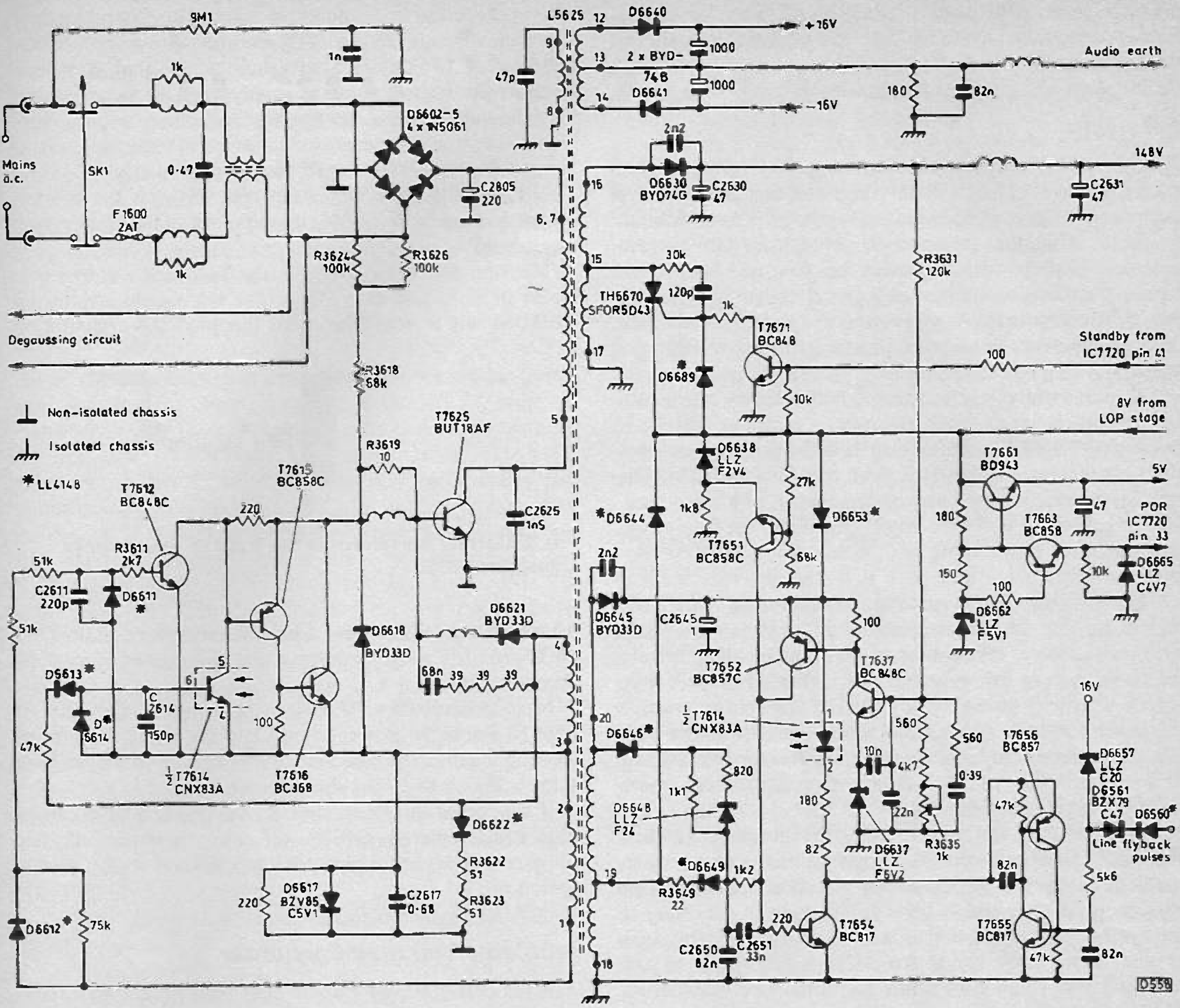


Fig. 1: Circuit diagram of the switch-mode power supply.

produced by the modulator are passed to the switch-off circuit on the primary side of the transformer by the optocoupler T7614.

When T7625 is off, C2650 is charged negatively via R3649 and D6649 from winding 18-19. T7654 is held cut off by this negative voltage, so no current flows through the optocoupler. When T7625 switches on, a positive voltage appears at pin 20 of the transformer. D6646 now conducts, and C2650 receives a positive charge. T7654 starts to conduct, current flowing through the optocoupler. This operates the chopper switch-off circuit.

Comparator transistor T7637 compares a sample of the h.t. voltage at its base with the constant reference voltage at its emitter provided by zener diode D6637. It sets the voltage at the base of T7652, which in turn controls the d.c. conditions at the base of T7654. In this way the timing of the switch-off pulse produced by the circuit is varied, adjusting the on/off period of T7625 and thus regulating the h.t. R3635 enables the h.t. to be adjusted.

Overvoltage Protection

In the event of the h.t. voltage rising above the correct figure, the current flowing in the line output stage will increase. The pulses developed in the EW diode modulator circuit are sensed via zener diode D6561 and D6560. Should the pulse amplitude exceed about 48V, D6561 will conduct, switching on the thyristor-connected transistors T7655/7656. The current through the optocoupler is thus increased, switching off the chopper transistor T7625.

T7655/7656 also receive information from the beam limiter circuit, the audio output stage and the 16V line (via D6657). In a good working receiver the input to T7655/7656 should be zero or slightly negative, ensuring that the transistors remain cut off.

The 5V Supply and Stand-by Operation

The series regulator circuit T7661, T7663 and zener diode D6662 provide the 5V supply. In normal operation this circuit receives an 8V input obtained from the line output stage.

For standby, pin 41 of the microcontroller chip IC7720 goes low and T7671 switches off. This enables thyristor TH6670 to switch on. It acts as a rectifier. The voltage at its cathode rises to about 10·5V, forward biasing D6653 which now provides the supply for the optocoupler. T7651 also switches on, increasing the current through the optocoupler via T7654. This turns off the chopper transistor for much longer periods, with the result that all the output voltages (except for the 5V supply) are reduced. The 5V supply remains constant, enabling the microcontroller chip to operate.

Servicing

When power supply repairs are required, Philips provide a kit (part no. 4822 310 20489) that contains around thirty components. There is good reason for this. It's very difficult to check individual components when they are surface mounted. Experience has proved that it is far cheaper too carry out a block component change rather than try to locate the faulty component. As you cannot reuse surface-mounted components, there is no point in trying to remove them for test.

When one of these sets comes in with a blown mains fuse and a short-circuit chopper transistor, a common mistake is to check T7615/7616 quickly in situ then, if they are not short-circuit, replace the BUT18AF transistor (T7625). The set may work, but the chances are that it won't for long. More likely there will be a bright flash from the fuse as the new transistor fails, taking with it numerous other components.

There is only one way to go about repair. Order the correct kit and fit the components it contains. Once you have done a few it takes about an hour and a half to rebuild the power supply properly and test it. Initially it will take longer. This may sound like a daunting task, but in practice it is much easier than you might think. Each kit comes with full instructions, and I always mark off the components as I fit them. This way you won't waste time finding out where you were if you get distracted.

The first thing to do is to clear the bench area. Then unclip the chassis and remove as many plugs as necessary to enable you to lay the panel on the bench as flatly as possible, print side up. A good bright light is necessary. I use eye magnifiers rather than a hand-held magnifying lens as this leaves both hands free. Use a hot (30W or so) soldering iron fitted with a fine bit, some fine desoldering braid and non-magnetic tweezers.

Component Replacement

I find that the easiest way of removing individual chip diodes and transistors is first to desolder the tags, using the fine braid, then gently grip the old component with the tweezers and apply just enough heat to free it from the board. Extreme care is required. Otherwise the PCB print pads will be damaged.

When fitting the replacement component, position it as accurately as possible on the pads, hold it in place with the tweezers and use fine solder on each pad to secure the device. The solder connections should be made as quickly as possible. With practice, you'll achieve very professional results. Some may frown upon this method, but I've found that it works well and have never had any problems.

Testing

When every part in the kit has been fitted, spend a little time going over your work. Diode polarity (A and K) is marked on the PCB, but because of the close proximity of some of them it's possible to misread the markings. Also note that D6622 has been replaced by a conventional type diode and that R3622 and R3623 (both 51Ω) have been replaced with a single, conventional 100Ω resistor.

When you are certain that everything is o.k., reconnect the plugs you removed, with the exception of plug 15G which provides the connection to the line output stage. Connect a scope set to 100V/div and 2msec/div to the collector of T7625 and a 60W bulb across the 148V line. Connect the set to the mains supply via a variac. If any of the following tests fail, see the next section.

Switch on and increase the mains input voltage slowly to about 90V. The power supply should start up at around 60V. This is proved by a waveform appearing on the scope's screen and the bulb glowing as the mains input is increased towards 90V.

Measure the voltage across the bulb and increase the mains input to just over 100V. The h.t. should stabilise at 148V. Slowly increase the mains input to 220V, monitoring

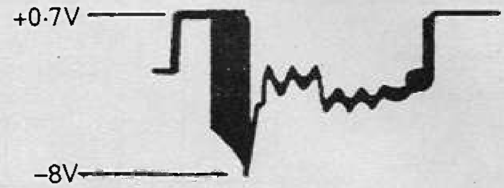


Fig. 2: Correct waveform at the base of the chopper transistor T7625.

the h.t. voltage all the time. Check the waveform at the base of T7625. It's most important that this should appear as shown in Fig. 2.

Next measure the 8V rail voltage (at the collector of T7661). Force the power supply into the standby mode by shorting together the base and emitter of T7671. The voltage at the collector of T7661 should rise to around 11V.

If the above checks are all o.k., the power supply can be considered repaired. Switch off and disconnect all test equipment. Reconnect plug 15G and test the set for normal operation.

Problems You may Encounter

If the power supply fails to start with plug 15G disconnected and a dummy load connected, reduce the mains input to around 70V. Check that the voltage at the collector of T7625 is about 100V d.c. If so, short together pins 1 and 2 of the optocoupler. If the power supply now starts, the cause of the problem may lie in the protection circuit. Check the voltage at the base transistor T7655. The reading should be 0V or slightly negative. If the voltage is greater than 0·5V, the protection circuit is operating. The only likely culprit with plug 15G disconnected is zener diode D6657. I've come across failure of this 20V chip zener diode on several occasions – it monitors the 16V supply.

If the supply fails to start after shorting pins 1 and 2 of the optocoupler, check around the standby thyristor. If all is well here, disconnect pins 12-14 of the chopper transformer. If the power supply now works, there's a fault in the audio output stage. If the power supply remains lifeless, check the start-up circuit. Don't forget to remove the short across pins 1 and 2 of the optocoupler before testing.

If the power supply fails to stabilise, check the circuitry around the optocoupler. Reduce the mains input to around 70V, then short together pins 4 and 5 of the optocoupler. The power supply should switch off. If not, recheck the components in the switch-off and switch-on delay circuits.

Final Touches

Once the power supply is working I like to clean the board with proper PCB cleaner to remove any untidy-looking flux. I then finish off with a coating of clear protective lacquer. It's not essential to do this, but the repaired board tends to look more professional, with an almost as-new appearance.

Success in repairing these power supplies is in direct proportion to the amount of care taken during the rebuild. There is no point in trying to rush, or in deciding not to replace certain components because they measure o.k. It will take you a couple of hours to do the job properly, especially if a third party has been there before. If the set comes in as a normal breakdown with no previous third-party attention, success is almost certain first time.

Other Circuits

The signals circuitry is fairly standard. There's a U944 tuner followed by filtering then a TDA2549 i.f. chip. A TDA2545 is used for the sound i.f. section. After an emitter-follower, the video signal is passed to a TDA8452 chroma/luminance filter chip which also incorporates the luminance delay. This chip provides three outputs. The chroma signal at pin 5 is fed to the TDA8390 PAL decoder chip; delayed CVBS at pin 4 is fed to the teletext decoder panel and the sync chip; the luminance signal at pin 3 is fed to the TDA4565 CTI chip. The two chroma outputs from the TDA8390 PAL decoder chip are fed to a TDA8451 chroma delay chip whose outputs are passed to the CTI chip. The colour-difference signal and luminance outputs from the CTI chip pass to the TDA8390 matrixing chip whose outputs finally go the the TEA5101 RGB output chip on the tube's base panel.

The sync/timebase generator chip is a TDA2579. The sound i.f. chip's output goes to the Nicam decoder – this panel also contains the f.m. sound demodulator and the tone control chip. Stereo audio outputs are provided by a TDA1521 chip.

The line output stage is conventional, using a BU508AF output transistor.

The microcontroller is a TMP47C634N with the program code 2415. As in some previous chassis, this type of chip can suffer from the effects of static. Replacement chips come with a metal shield that overcomes the problem. Tuning and personal preference settings are stored in a PCD8582 EEPROM chip.

Projection Sets

The projection model does not in essence differ much from the standard chassis. The signals stages, the main power supply and the line and field output stages are mostly identical. The power supply can be repaired using the same kit as with the standard version. The main differences are in the line output stage, where an e.h.t. splitter is used to feed 25kV to the three tubes. There is also an elaborate protection circuit and a convergence board.

The three tubes, one for each primary colour, are mounted in the base unit, facing upwards. They have powerful lenses in front of them, containing a liquid coolant. The images from the tubes are reflected via a front-silvered mirror at the back of the cabinet on to a special screen at the front. A properly adjusted projection set produces a very good quality picture.

The size of these sets means that dealers don't like to get involved with them. Owners tend to live in large, out-of-town houses however and are often prepared to pay more for repairs, so it's worth taking them on. There are also the pubs and clubs that have them in the bar showing Sky Sports all day long. The cost of repairs tends to be less of a problem in these circumstances. Once you've done a couple you may find yourself earning some welcome extra income as other owners get to hear of you.

It's essential to have the service information, Philips part number 4822 727 16947, for the projection version.

Transport

If you are called to one of these units and decide that it has to be a workshop job, the problem of transportation can be solved very easily. The top half, containing the screen and mirror, can be removed complete. It's held to the base unit by six screws (usually torx), one at each side towards the front and four along the back. Once they have been removed you can tilt the screen backwards and lift it. This is a two-man job: the screen is not very heavy but is rather awkward, being too wide to get your arms around it.

The golden rule with the base unit is never to tip it on its side. You'll see why later. Casters are fitted, so it can be rolled across carpet or smooth flooring. Once you have it in the van, make sure that it cannot roll about. The screen should be covered with a blanket and made secure. Extreme care is required with the screen, which can easily be scratched or marked: the trade price is about £250!

General Servicing Notes

The rear cover of the base unit can be removed, while the front speaker grille must be removed to gain access to the tube assemblies and the convergence board. This is done by removing the two screws at the front, just below the grille. After removing the two securing screws the control panel can then be swung down.

The most common problem seems to be associated with the RGB drives. The symptom is that the set shuts down just as the raster appears, rather bright and predominantly of one colour. You can usually get the set to work by removing the relevant tube base. Usually the cause of the trouble is the TEA5101A RGB drive chip on the green tube's base. If on the other hand all the tubes turn on hard (a white raster) before the shutdown, check the 200V supply on the red tube's base (R3392). The feed to this comes from pin 1 of the line output transformer.

Another very common problem that can usually be tackled in the field is a very wide picture with severe convergence errors. The cause is nothing more than dried out electrolytics in the EW correction circuit. Replace C2549 (10µF) and C2533 (1µF).

The Optics

For some reason the blue tube seems to fail – I've had to replace three to date. They are expensive, at around £200 trade. Provided care is taken, a tube can be replaced without

CORRECTIONS

There was a typographical error in the article on Designing for Reliability (September). In the penultimate paragraph, under the heading 'Multilayer Ceramic Capacitors' on page 778, "for the fault to occur the 5V supply had to be providing at least 8mA" should have read 80mA, not 8mA.

TV Fault Finding: Ferguson D51ND (ICC9 chassis), page 889, October. "Line output transformer was short-circuit" should have read "Line output *transistor* was short-circuit".

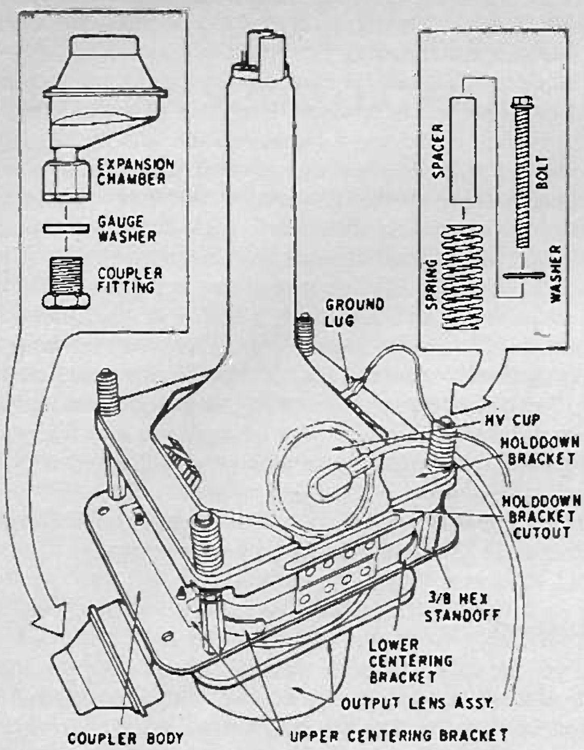


Fig. 3: Projection tube assembly.

loss of the coolant fluid. Fig. 3 shows the assembly and Fig. 4 the individual components. The tube must be removed from the base unit first. Full instructions are given in the service manual.

The e.h.t. cable is silicone cemented to the tube. Remove the cable at the e.h.t. splitter end then, using a sharp knife, cut away the cement from the e.h.t. connection cap. If you are replacing only the cable, all traces of the old cement must be removed from the tube. Apply new silicone cement (Philips part number 4822 390 40087) to the rubber cap. Fit the cap, making sure that the cable is in the correct position. Allow the cement to harden, preferably for 48 hours, before powering the set.

The Cooling Fluid

Because of the high brightness level at which they are run, the three tubes generate a lot of heat. Cooling fluid is used to reduce the heat in the lenses. It's very much like antifreeze, consisting of glycerine and ethylene glycol with some additives to inhibit corrosion. It's therefore poisonous, so extreme care must be taken.

A kit for replacing the fluid is available under part number 4822 390 80152 – this is sufficient for one tube assembly. New gaskets are included, and full instructions. Fluid loss usually occurs only if there has been a leak or, because of natural evaporation, after extensive use. If the fluid level is low, the symptoms will appear as gross purity, focus and convergence errors at the bottom of the picture. Why the bottom? Remember that a lens inverts the image.

The lenses can be cleaned with a solution of two drops of washing-up liquid to a cup of water. Use a soft cotton cloth.

Tipping the base unit on its side will also result in a low fluid level – the fluid runs out of the lens assembly into the expansion chamber. If this has happened, leave the set to stand for a while, allowing the fluid to drain back. Tapping the chamber will help to disperse any air bubbles.

All traces of coolant must be cleaned off the drip tray when a leak has occurred. Check the main and the convergence panel thoroughly for damage. I had one set in which coolant had dripped over the convergence panel plugs. Because of the highly conductive nature of the fluid, this resulted in a burn up.

The Screen and Mirror

The screen and mirror are very delicate. It's best not to touch them unless this is absolutely essential. As the dust seals are extremely good, it's unlikely that the mirror will be dirty. The screen should be cleaned with a camel-hair brush, in a downwards direction following the fine grooves. If the mirror is soiled a very dilute solution of washing-up liquid, as used for the tube lenses, can be used with a mineral wool.

Final Adjustments and Checks

Setting up is necessary after any major repairs to the optics. This is not too bad, as only one tube will usually have required attention. It's reasonable to conclude that the convergence and focus of the remaining two tubes are pretty well o.k.

Mechanical and electrical focusing have to be carried out, using a crosshatch pattern. The static and dynamic convergence must then be adjusted. I find that the controls on the convergence board all do what they are supposed to do, so there should be no major difficulties. It's sometimes necessary to go over the adjustments more than once. Full instructions are contained in the manual.

Check that there are no leaks, and finally make sure that all leads are clipped up correctly. Extreme care is required over the positioning of the e.h.t. cables.

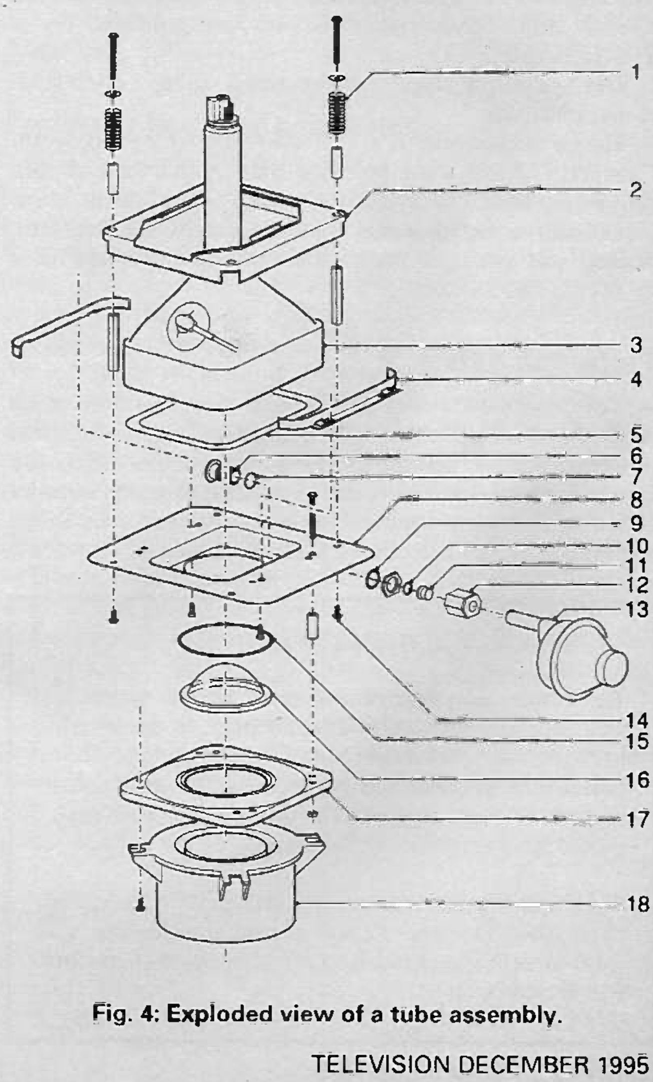
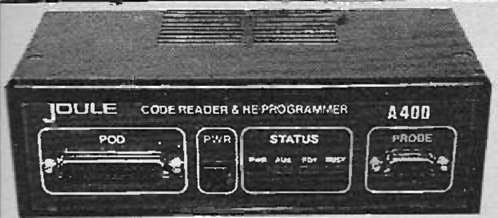


Fig. 4: Exploded view of a tube assembly.



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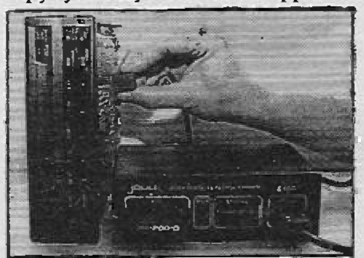

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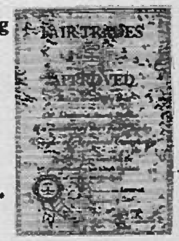

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VCR Signal Processing

Part 2

Joe Cieszynski

In Part 1 last month we explained why, before the analogue luminance signal is recorded on the tape, its bandwidth has to be reduced from 0-5·5MHz to 0-3MHz after which it is used to frequency modulate a 3·8MHz carrier.

During playback the f.m. signal is demodulated to recover the analogue luminance information. In addition to the luminance signal's reduced bandwidth (in comparison with a broadcast transmission), its signal-to-noise ratio is poor (because of the low – 0·3 – modulation index) and it sufferes from dropouts caused by inconsistent tape coating density and mechanical jitter. The luminance record and playback processing is designed to compensate for these factors and, where possible, enhance the picture quality.

We'll next take an overall look of the luminance record/playback processes, following up with a more detailed investigation of the various operations involved.

Luminance Record Block Diagram

Fig. 1 shows in block diagram form a typical VCR luminance record system. The input consists of a 1V peak-to-peak composite video signal, from either the tuner/i.f. section of the machine or an external video source. This signal is fed to the luminance, the chroma, the E-E and sync separator circuits. The term 'E-E' refers to the electronic-to-electronic mode, which provides the TV receiver with a signal during the record or stop modes. The E-E output is 1V peak-to-peak, with negative-going sync pulses. The output from the sync separator is used to provide a signal (at 25Hz) for the control track, to lock the drum servo and to operate phase-shifting circuits in the chroma signal section of the machine.

It's essential that none of the chroma frequencies reach the f.m. modulator. So the luminance section starts with a 0-3MHz low-pass filter that removes the 4·43MHz chroma signal. This filter also serves to restrict the luminance signal bandwidth to 0-3MHz.

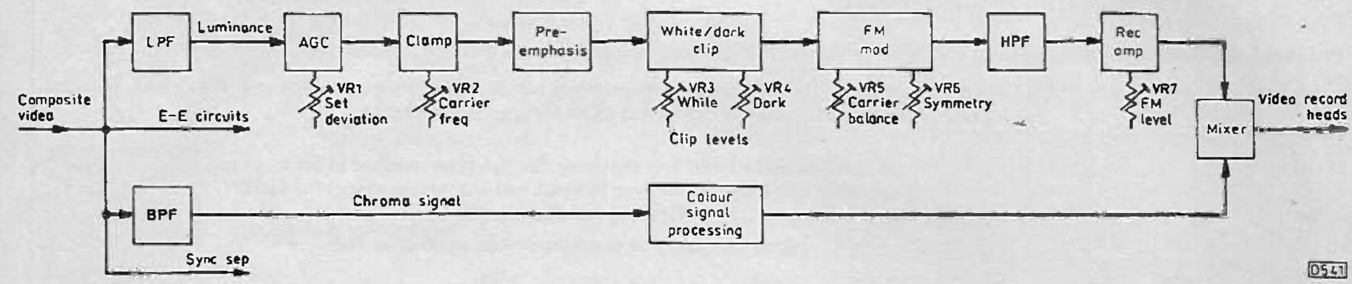


Fig. 1: Block diagram of a typical VHS luminance record channel.

The following a.g.c. and clamp circuits are standard arrangements. They are included to ensure that the luminance signal and its d.c. level remain constant. This, as we shall see later, is essential when recording. Pre-emphasis is then applied to the h.f. components of the signal to improve the signal-to-noise ratio which, because of the low modulation index figure, is very poor. Pre-emphasis also serves to sharpen the rise time of the h.f. luminance signal components – the effect of low-pass filtering is to slow the rise time. The white- and dark-clips prevent over-modulation of the carrier because of excessive pre-emphasis overshoot.

The output from the f.m. modulator contains a number of unwanted sideband components, in particular in the 0-1·2MHz region where the chroma signal is recorded. A high-pass filter is included to remove such components. The modulator may be followed by a limiter to remove a.m. (a product of the modulation process) from the f.m. signal. Any a.m. would interfere with the chroma signal later on.

The video f.m. passes through an amplifier before being fed to the record heads. An f.m. record current level control is often included here to set the f.m. voltage level at the heads at typically something between 1·5-3V peak-to-peak. The setting required depends on the head characteristics: consult the service manual before making any adjustments.

With audio recording the signal must be superimposed on an a.c. bias signal to prevent crossover distortion caused by the *BH* characteristic of the magnetic tape. In a VCR the f.m. demodulator acts on the peaks of the f.m. video signal, so any low-level crossover distortion is ignored. There is thus no need to bias the luminance f.m. signal. The much smaller a.m. chroma signal does require bias however: this is provided by the luminance f.m. signal – the chroma signal sits on the edges of the f.m. luminance signal. This occurs in

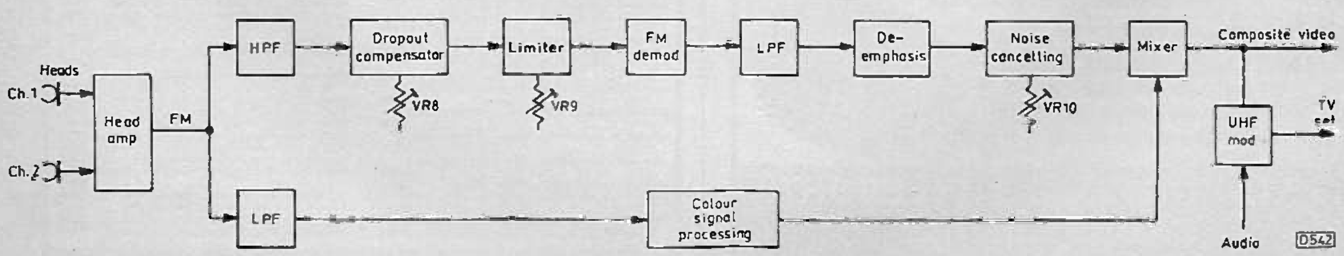


Fig. 2: Block diagram of a typical VHS luminance playback channel.

the mixer stage, where the f.m. luminance and 627kHz down-converted chroma signals are combined for feeding to the heads.

Luminance Playback Block Diagram

Fig. 2 shows in block diagram form a typical VCR luminance playback channel. The signals from the heads pass first to the head amplifier, where equalisation is also applied. The 25Hz drum flip-flop signal provides switching between the two heads (ch. 1 and ch. 2) as they rotate and scan successive tracks. A low-pass filter then separates the feed to the chroma circuits while the luminance channel has a high-pass filter to remove the chroma signal and the hi-fi sound carriers if these are present.

Deficiencies in the tape or the heads can cause small, random f.m. signal loss which would show up as random white specks on the playback picture if the dropout compensator was not present. This detects such signal dropouts and, to mask them, inserts stored f.m. from the previous line.

The limiter removes any a.m., which would otherwise produce an effect that's often referred to as black-to-white inversion. This would show up as horizontal black streaks to the right of light areas of the picture content, e.g. captions, clothing etc. There are several causes of black-to-white inversion, the most common being head wear. The other causes will be mentioned when we look at the luminance signal processing in more detail.

The output from the f.m. demodulator contains large components at the carrier frequency. These are removed by the following low-pass filter. De-emphasis then reverses the action of the pre-emphasis circuit in the record signal channel, improving the signal-to-noise ratio: when an oscilloscope is used to view the effect on the waveform you can see that the overshoot spikes are removed.

Noise-cancelling circuits vary quite a bit from one type of VCR to another, but all machines have some form of noise cancellation to clean up the picture. Some of these circuits can be very complex, and effective. Others may consist of nothing more than a simple soft/sharp control that alters the definition of all picture detail, including the noise!

The following mixer combines the luminance signal with the up-converted 4·43MHz chroma signal to get back to composite video – this is not the case with S-VHS, where the Y and C signals are kept separate to prevent Y/C beat patterning. The composite video is at 1V peak-to-peak, and is available at the machine's BNC or scart outputs. It's also fed, along with the audio signal, to the r.f. modulator which produces a u.h.f. output somewhere in the range of channels 33-39 for feeding to a TV set's aerial socket.

In addition to the items shown in Fig. 2, the machine may incorporate a luminance delay line for improved Y/C correlation. Some form of tuning bar generator will provide an input to the r.f. modulator: while early machines produced a simple black and white bar display, many modern machines produce a colour display with on-screen graphics such as the manufacturer's name.

The E-E Mode

In broadcast equipment the E-E signal is that which, in the stop mode, has passed through the record and playback processing sections of the machine. It gives the operator an immediate indication, on the monitor, of any misadjustments or faults in the equipment (other than the heads). Such an elaborate check is not necessary with a domestic machine, where the E-E signal is usually taken off somewhere soon after the output from the i.f. strip, or looped from another direct video source input, and passed to the TV receiver either via the r.f. modulator or a scart socket. It serves purely as a monitoring signal.

Many machines have adjustments for the E-E vision and sound levels. The sound level is perhaps not so critical, but if the vision level is set too high the monitoring TV set may produce intercarrier sound buzz. If the vision level is set too low the result will be insufficient contrast. These adjustments do not usually affect the recording levels.

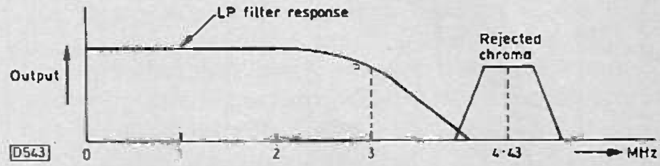


Fig. 3: Luminance record channel low-pass filter response with a standard VHS machine.

Summary

That completes our overview of the luminance record/playback arrangements. We will now take a closer look at each section, following the order outlined in the two block diagrams, Figs. 1 and 2.

Record Low-pass Filter

The response of the low-pass filter in the luminance record channel of a standard VHS machine is shown in Fig. 3. It fulfils two purposes, first rejection of the chroma signal centred on 4·43MHz and secondly limitation of the luminance signal to 0-3MHz (with a standard VHS machine).

AGC

A.G.C. is included in the early stages to ensure that a constant luminance signal amplitude is maintained. You may wonder why the luminance signal level should vary when any fluctuations should have been dealt with by the a.g.c. circuits in the tuner and the i.f. strip. Remember however that the recording source may be via the scart or other direct input socket, where a constant signal level cannot be guaranteed.

The a.g.c. circuit is a convenient point at which to control the deviation of the f.m. modulator, and many machines take advantage of this. VR1 in Fig. 1 represents the set-deviation control. Remember that in the basic VHS system the deviation limits are 3·8MHz (sync tip) to 4·8MHz (peak white): the deviation control adjusts the amplitude of the luminance signal to the level at which peak white deviates the modulator's output to 4·8MHz. Thus VR1 functions in the same way as the contrast control in a TV set. We'll return to this in a monent, when we consider the set carrier frequency control in the clamp circuit.

Because the majority of machines use the field blanking period as a record a.g.c. reference level, manufacturers of prerecorded tapes often add a simple anti-copying signal in this part of the waveform. It takes the form of a burst of constantly-varying amplitude. In theory this has no effect when the original cassette is being played back. When an attempt is made to copy the tape however, using a domestic machine, the record a.g.c. circuit will be confused by the apparently shifting signal level during the field blanking period, the result being a constantly changing contrast level during playback.

It's worth mentioning that there have been complaints about vertical jitter when hired tapes are played back. On occasions the cause has been traced to the anti-copying signal interfering with the TV set's field sync circuit. It is not the tape but the integrating circuit in the receiver that's

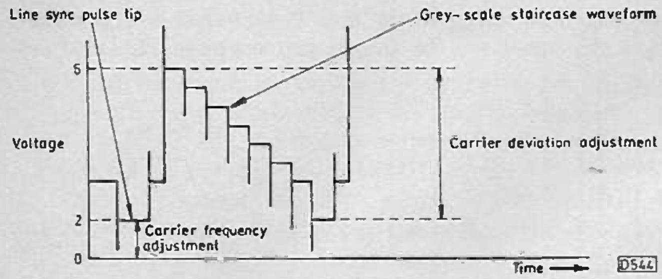


Fig. 4: Effects of the carrier deviation and frequency controls on the luminance signal. The voltages shown are typical. The carrier frequency control moves the signal's d.c. level while the deviation control adjusts the peak-to-peak voltage.

to blame for this. Some manufacturers have issued modifications for specific chassis to overcome the problem.

The Clamp

It is important that the sync tip remains at a constant d.c. level as it passes through the recording channel. If a luminance signal with a 'floating' d.c. level is fed to the f.m. modulator there can be a number of problems. Apart from the obvious contrast level variation, patterning effects can occur as a result of the modulator being driven outside its deviation limits. This will generate sidebands in the chroma region, or folded sidebands should the signal bandwidth extend below 0Hz. Signal clipping can also occur, depending on the design of the modulator.

The clamp circuit sets the sync tip at a predetermined d.c. level. In some machines this level is adjustable, enabling the f.m. carrier frequency to be set.

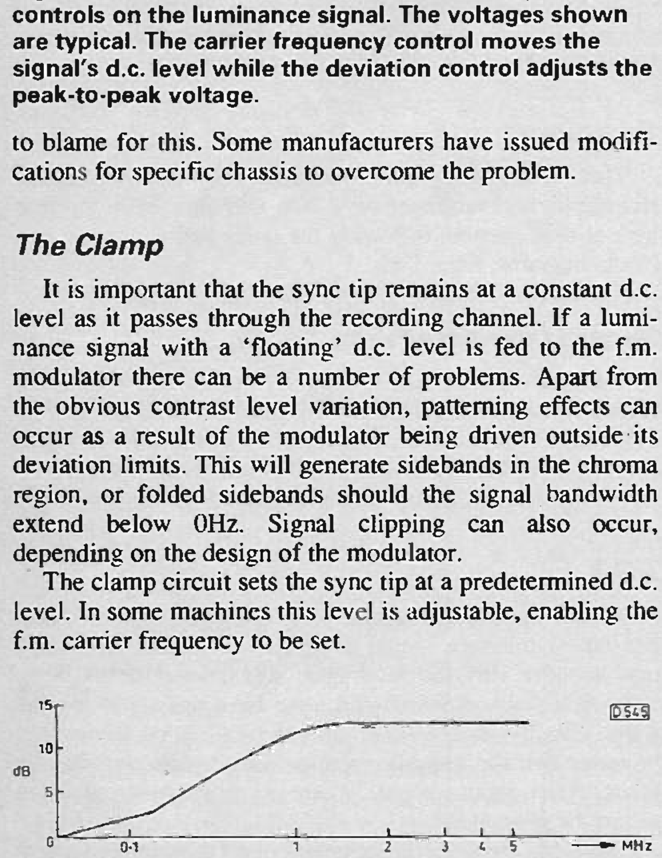


Fig. 5: Standard VHS pre-emphasis response (from BS6482). There is little change in gain up to 100kHz. Between 100kHz and 1MHz the gain rises dramatically. It flattens off above 1MHz.

VR2 in Fig. 1 represents the set carrier frequency control, whose effect is shown in Fig. 4. The clamp fixes the sync tip's d.c. level. This can be adjusted by VR2 to the point at which, when this voltage is fed to the f.m. modulator, the output will be at 3·8MHz. Fig. 4 also illustrates the effect of the set-deviation control in the a.g.c. circuit. You can now see that once the sync tip is fixed at 3·8MHz the peak luminance signal amplitude (peak white) will govern the amount of carrier deviation.

Pre-emphasis

With any f.m. system the signal-to-noise ratio falls as the modulating signal frequency rises. It is thus standard practice to use pre-emphasis and subsequent de-emphasis of the higher modulating frequencies in f.m. systems. It was therefore natural for this technique to be adopted in VCRs.

There are several types of pre-emphasis. The two used in VCRs are linear frequency pre-emphasis and non-linear frequency pre-emphasis. The former is part of the original VHS specification. We'll look at it first.

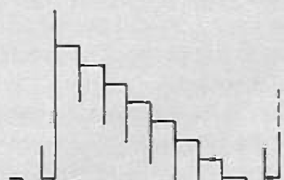
With a video signal, high-frequency noise will be most noticeable in areas of the picture with fine detail, or at sharp vertical black/white transitions or edges. Linear pre-emphasis, by boosting the h.f. signal components, improves the h.f. signal-to-noise ratio, enhancing fine detail and sharp edges in the picture.

To apply pre-emphasis, the luminance signal is fed to an amplifier which has a frequency response of the form shown in Fig. 5. The luminance signal staircase waveform (grey-scale bar signal, see Fig. 4) consists of vertical (h.f.) components and horizontal (d.c./l.f.) components. The effect of amplifying the h.f. components more than the l.f. components is to create large overshoots on the staircase waveform. When viewed on an oscilloscope these appear as shown in Fig. 6.

As well as improving the signal-to-noise ratio, pre-emphasis enhances the sharpness of the picture. Removal of the 3-5·5MHz section of the standard luminance signal by filtering it out means that during playback the rise time of the signal's higher frequencies is increased. The result is slight smearing of sharp edges in the picture. As Fig. 7 shows, the addition of an overshoot increases the rise time with a picture transition (edge). This gives the impression that the h.f. components of the signal have been restored, which is not true of course: although the edge is sharper than it would otherwise be, its phase has shifted slightly. When this phase shift is examined on the TV set's screen, a dark outline effect is seen around picture content edges.

The amount of pre-emphasis applied governs the degree of edge correction achieved. If the overshoot depicted in Fig. 7(c) is doubled, the rise time will be faster and the edge sharper. Formats other than standard VHS take advantage of this by using much greater amounts of pre-emphasis. For example while the peak white overshoot (after clipping, which we'll consider in a moment) with standard VHS is 80 per cent of the peak-to-peak luminance signal voltage, with the 8mm format the figure is increased to 200 per cent, achieving a much faster rise time.

Non-linear pre-emphasis was adopted with some later VHS machines to provide further picture quality improve-



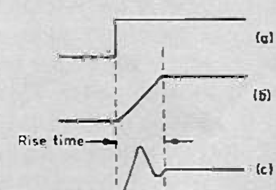


Fig. 6: (left) Effect of linear pre-emphasis on one line of a luminance staircase signal waveform.

Fig. 7: (right) Rise time with a step (h.f.) signal. (a) Luminance step signal rise time when the bandwidth is 0-5·5MHz. (b) When the bandwidth is reduced to 0-3MHz the rise time is increased (shown exaggerated here). (c) Use of pre-emphasis produces an overshoot and reduces the rise time, but note that the edge is subjected to a phase shift. (d) After de-emphasis during playback the overshoot is removed, leaving an enhanced but phase-shifted signal.

ment. In some models it may be used in addition to linear pre-emphasis.

Subjective tests show that h.f. noise is more noticeable in darker areas of the picture. With non-linear pre-emphasis only the h.f. signal components that sit at low brightness (and thus low d.c.) levels are affected. Non-linear pre-

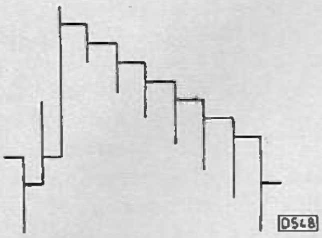


Fig. 8: Effect of adding non-linear pre-emphasis to a luminance staircase waveform.

emphasis doesn't affect h.f. signal components at higher brightness levels. This additional boost (and later cut – de-emphasis) in the level of low-brightness signals considerably improves the playback picture. The effect of non-linear pre-emphasis on a staircase luminance signal waveform is shown in Fig. 8.

White and Dark Clips

As we have seen from Fig. 7, introducing a large overshoot on the h.f. signal components reduces their rise time, giving an improvement in horizontal definition. Excessive overshoots could result in over modulation of the f.m.

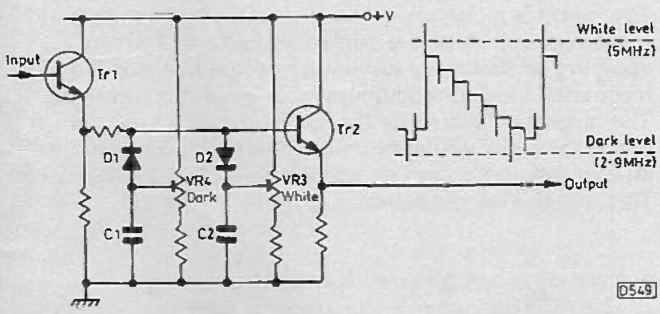


Fig. 9: Basic white- and dark-clip circuits.

carrier however. To prevent this, the level of the overshoots has to be kept within an acceptable level which is specified for a given system. The circuits that reduce the overshoots are known as the white- and dark-clip circuits.

The clip circuits are contained within the luminance processing chip. Their principle of operation is shown in Fig. 9 however. The conduction points of diodes D1 and D2 are set by VR4 and VR3 (the reference numbers match those in Fig. 1). When the line sync tip is present at Tr1's emitter, the voltage will be low and D1 will conduct. The low reactance of C1 will then attenuate the h.f. components of the signal. At peak white the voltage at the emitter of Tr1 will be high and D2 will conduct. This time C2 attenuates the h.f. signal components. The voltage thresholds at which D1 and D2 conduct are set by VR4 and VR3. Thus by adjusting these controls we can set the level of the overshoots at the clip circuit output.

All early VHS machines had white and dark clip adjustments. As production techniques have improved however the need for this amount of adjustment has decreased. More

Next Month in TELEVISION

TOSHIBA'S V3 VCR RANGE

The designers of the current Toshiba range of VCRs set out to make them easier to use, with features that are really wanted by consumers and improved performance. The mechanism has a faster winding speed and a third fewer parts than the previous range. Next month Philip Blundell takes a look at the technology used in these machines.

LNB TEST SIGNAL SOURCE

It's inconvenient having to instal an LNB on an outside dish in order to test it. Instead, a workshop source of signals is much handier. You can obtain signals by modifying a spare LNB to act as an up-converter instead of a down-converter. Hugh Cocks describes such a conversion.

THE JAPAN ELECTRONICS SHOW

George Colė has been over to Japan to see the latest offerings at the Electronics Show there. They included three types of flat-screen technology; widescreen TVs; digital camcorders; the digital video disc; HDTV receivers, VCRs and video disc systems; the MiniDisc photo system; Wide Clear Vision (Japan's NTSC version of PALplus); and sets designed to link with PCs.

THE TATUNG 120 CHASSIS

John Coombes provides a servicing update on this popular TV chassis.

CHINESE JUNK

More adventures in CD land, from Les Austin. The main problems this time relate to players of Chinese manufacture.

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recent models dispense with either one or both adjustments, though the need for clip circuits remains.

Adjustment of the clip controls is critical. Insufficient clipping leaves large overshoots that usually produce black-to-white inversion. Conversely if too much clipping is applied the sync tips and peak whites can be affected, the result being poor field sync and loss of peak white – some machines will not permit such an amount of clipping. A typical adjustment method is shown in Fig. 10. Refer to the service manual however for the correct settings.

It will be seen from Fig. 10 that there is significant overshoot after setting up the clip controls. We have seen that for VHS the f.m. modulator deviation limits are 3·8-4·8MHz. So what effect do these overshoots have on the modulator and the frequency spectrum it produces? In practice there are, for two reasons, no problems. First, because of tolerances and problems with drifting, the modulator has a permitted deviation error of ±100kHz at each of its limits. These limits accommodate the overshoots. Secondly the overshoots represent a brief, low-energy modulating signal that wouldn't produce sidebands or harmonic components of significant value.

The FM Modulator

One might expect the f.m. modulator to use a sinewave oscillator circuit. Such an arrangement requires accurate tuned circuits that cannot be incorporated within an i.c. however. Furthermore a sinewave oscillator doesn't perform well as a frequency modulator at the low frequencies used in VCRs. For these reasons the f.m. modulator usually consists of an astable multivibrator which, of course, produces a squarewave output. This output must be filtered to obtain the fundamental sinusoidal signal.

Fig. 11 shows a simple astable multivibrator modulator circuit: in practice the circuit is contained within a signal processing chip.

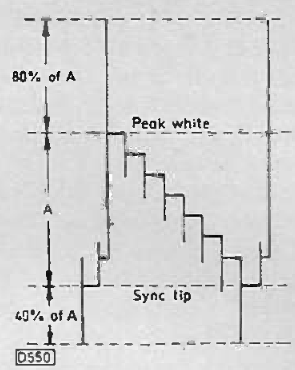
One point of major concern to designers is that the astable multivibrator modulator should produce an output with a 1:1 mark-space ratio. Different transistor characteristics and component tolerances can however result in a squarewave output at the correct modulating frequency but with an unequal mark-space ratio. Then. after filtering, the sinewave will suffer from serious harmonic distortion. As these harmonics cannot be filtered out during playback demodulation, they will give rise to patterning in areas of fine detail – an effect that's commonly known as carrier leak. When viewed on an oscilloscope, f.m. with carrier leak appears to have a 'woolly' outline. For this reason VR5 and VR6 are provided to ensure correct output symmetry.

The set carrier leak control VR5 ensures that the luminance signal voltage applied to point A, and thus the voltages at the bases of the two transistors, results in equal conduction of the transistors at all levels from the sync tip to peak white, the result being a 1:1 ratio from 3·8MHz to 4·8MHz. VR6 (set symmetry) may be included to ensure that the oscillator's output is symmetrical before modulation is applied, i.e. at 3·8MHz.

Some chips include a limiter after the modulator and filter. This is used to remove any a.m. on the f.m. signal caused by *LC* reactance changes. If the a.m. is not removed, sideband components may enter the playback chroma circuits, the result being colour patterning.

The FM Record Amplifier and Mixer

The modulator's output goes to a final amplifier before being applied to the record heads. This amplifier's response is designed to compensate for record head losses.



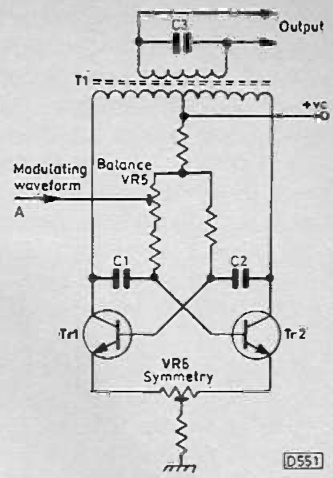


Fig. 10: (left) Method of determining the clip levels. Using a standard grey-scale bar signal as the input, with the machine set to the record (or sometimes E-E) mode, measure the amplitude of the luminance signal from the line sync tip to peak white. This is shown as value A above. The white clip level is then set so that the amount of overshoot above peak white is 80 per cent of value A. The dark clip is set so that the undershoot below the line sync tip is 40 per cent of value A.

Note that the original standard VHS white clip specification was 60 per cent: it was subsequently increased to 80 per cent.

Fig. 11: (right) An astable multivibrator frequency modulator circuit. Although the frequency is determined by the time-constants of the RC coupling networks in the base circuits of the two transistors, it is also governed by the voltage at point A. When this voltage is varied, the charging times of C1 and C2 alter. The result is a change in the frequency but not the mark-space ratio of the output waveform. Thus by applying an analogue luminance signal to point A a frequency-modulated squarewave output is obtained. The output is filtered by the tuned circuit T1/C3, which produces a sinusoidal f.m. output. The high-pass filter shown following the f.m. modulator in Fig. 1 consists of T1/C3 in the circuit above.

The 627kHz colour under signal is then mixed with the luminance f.m. signal. The final result is an f.m. carrier with the a.m. chroma superimposed. This 'composite' signal is fed to both heads simultaneously. Note however that simultaneous application of the f.m. to the heads in a VHS camcorder that has a miniature drum (41mm instead of the standard 62mm diameter) is not possible. This is because the miniature drum has four heads that act as two A and two B heads. So the heads have to be switched during record as well as playback, otherwise they would over-record on each other's tracks.

When scoped at the output of the record head amplifier, the amplitude of the f.m. signal is typically 2-3V peak-to-peak. This can be adjusted by using the f.m. record current control VR7. If the f.m. record level is set too low, the playback pictures will be grainy. If the level is set too high, there is the possibility of black-to-white inversion. In practice the record level rarely requires adjustment as the circuits are all contained within a specific chip and are thus unlikely to drift in tolerance.

Next Month

In Part 3 we'll look at the luminance playback circuitry.

What a Life!

Donald Bullock

It's amazing how the news has got about in this small corner of Spain that my life affliction has been in the TV/video trade. It comes up all too often in fatuous conversations in bars, while people keep showing up at the door with sets I can't work and don't understand.

I was relaxing with Greeneyes in Paco's bar the other night, watching his TV set doing its best with hardly any field sync, when this huge roughneck came and sat at our table. We soon learnt that after losing all his money running a bar he'd decided to take a postal careers course. "I'm now a physiotherapist" he said. "You mends tellies doncha?"

Using the skills of a lifetime, I changed the subject. But it was no good.

"Which is the best set?" he said, "and do you reckon they'll ever get the colours right? I only watches the sport meself." After that I got a potted history of his set, those of his friends and neighbours, and of all the rogue dealers from whom they'd suffered. Then he noticed the missing sync on Paco's set. "Hey Paco" he bawled, "this man's a telly mechanic."

Fortunately Paco doesn't understand any English. I'd entered Paco's with a spring in my step. I left it thoroughly choked.

VCR Troubles

Harry was at the gate, sitting on an up-ended video, when I got back from the village the other day. "It ain't much" he said, setting me up to work for nothing. The machine was a Sony SLV270 which, when I tested it, was lifeless except for a faint whining noise. I quickly developed the same trouble. Then I recalled that I'd had the fault before, and made for the power pack. C1326 (16µF, 25V) was open-circuit. A replacement put everything right.

As I was boxing it up a lady called in with her Samsung SI7220 VCR, which is identical to the Goodmans VCR2550. "I can't get a tape into it" she said, "not even with my foot."

On test the clock lit up but there was no on LED illumination and no loading motor operation. I soon found out why she couldn't get a tape into it: there was one jammed in there already. When I dismantled the machine and took it out I found that it was shredded and broken. My experience has always been that the motor in this model is a bit sluggish, but this one was worse than usual. There was less than a volt across it. As the windings checked out all right I made for the STK5333 regulator chip IC101 on the power panel. It was the cause of the trouble. I don't know whether it comes in different qualities, but the prices quoted vary enormously.

Edgar's CD Player

Shortly after that Greeneyes clopped round with Handsome Edgar, whom I don't like. "Edgar's got a Sony CD player" she announced. "We've all got our troubles" I replied nastily, "what's up with it?"

"Doesn't plaih" said Edgar, smiling like a dish of treacle. Then he disappeared up the garden path with Greeneyes.

It was an M35, minus the amplifier and speakers. It accepted a disc, read the TOC, then played the disc without skipping or jumping. In fact it behaved perfectly. I peered through the window, trusting that Edgar was doing likewise.

Then I noticed that the disc was vintage Sinatra. So I connected an amplifier and some speakers. There was no sound. On opening the player I found an identical dry-joint on both output sockets – where they connect to the board. Resoldering them brought excellent results.

A Grundig T55-340/90A Telly

"Jumps about and flickers when cold" was Maisie's complaint about her Grundig set, which was fitted with the CUC3490 chassis. I opened it up and looked around for dry-joints – I've worked on Grundigs before. Sure enough the chopper transistor was dry-jointed. Once again a bit of resoldering put matters right.

More VCRs

Old Mrs Sorrel struggled in with her Pye DV291. She was widowed a month after settling here and now devotes her life to raising funds for her favourite charity. The DV291 is the same as the Philips VR6290, but whatever clothes it comes in the machine frightens me to death. This one had died during a recent lightning storm. I was worried about being able to fix it, but fortunately the damage was confined to the primary side of the power supply. The BUT11AF chopper transistor had suffered, and safety resistor SR3 had failed. When both had been replaced the machine came autocratically to life.

I've had mode switch trouble with several Amstrad VCRs of late. Often the machine is a VCR9500 (Goodmans TX3650). The symptoms are misfunctioning. When a cassette is inserted you may find that the machine selects rewind and the heads spin. Sometimes the only symptom is failure to eject the tape. I now have a routine procedure for dealing with this situation.

I remove the fascia and the bottom cover by taking out the two screws near the front. Then I remove the clamp and screw at the centre, rear of the deck. This leaves the deck retained by two block connectors at the rear. After disconnecting these the deck can be lifted out. The mode switch is beneath the deck, to the right at the rear. I remove and examine it. If it's simply dirty, I clean and lubricate it. If there's wear I replace it.

A word of warning. It's easy to damage one or both of the two sensors at either side of the PCB. Another point. Fluorescent lights in the workshop will activate the sensors when the machine's cover is removed. No amount of striving will 'cure' this. To test the machine, turn the lights out or refit the cover.

After doing a couple of these recently I picked up a Sharp VCA63HM which was also suffering from mode switch trouble. It was about two years old. While it had updated panels, the deck was the one I'm used to, with the same troublesome mode switch and motor assembly. The symptoms were failure to eject, then lacing and unlacing when the stop button was pressed. Repairing or replacing the switch usually takes only ten minutes, so it's not too bad.

After putting this one back together I decided that it was time for a break. So we made off for the local open market in the next village. Several stalls were selling a wide variety of electronic equipment, much of it quite sophisticated. A stall that appeared to be devoted to Panasonic items was doing particularly good trade. Only there was something odd about the Panasonic trade mark. It was spelt Panasoanic!

Satellite Notes

Hugh Cocks

Tuning for Sky Movies Gold

Several of our customers were in a state of panic when Sky Movies Gold changed from Astra transponder 26 (11·597GHz) to 60 (10·877GHz). If the installation of a converter is impractical the following course does work, though it involves receiver retuning and Superchannel on the lowest 1D frequency can't be reached.

Most 10GHz LNB oscillators have sufficient adjustment range to enable transponder 60 to appear at an i.f. of 950MHz. CNN then appears 75-80MHz higher than before, at 1,700MHz (previously 1,622MHz). The Amstrad SAT510 will just get this in, as its i.f. bandwidth is only 950–1,700MHz (not –1,750MHz as with some other receivers).

With the Continental Microwave (CMW) LNB the oscillator adjustment is the large Allen screw near the F socket. Unscrewing it by about three turns is sufficient (this is in fact the maximum low setting). The oscillator frequency will be reduced by about 80MHz. If you have access to a signal source such as a satellite i.f. up-converter, you'll find that the LNB's output moves by about four and a half Astra channels. Thus if Sky News was originally at 1,377MHz (receiver displaying 11377 in the tuning mode) it should, with the new oscillator setting, be midway between Sky 1 and Sat 1.

If the oscillator range is not quite enough, check that the receiver's LNB offset is at its lowest setting. Adjust transponder 60 to come in at 950MHz.

Unfortunately this method means that all channels have to be retuned upwards by around 80MHz. It's the major disadvantage of this course of action, but may be an advantage to the customer, rather than having to press TV/SAT on the receiver's remote control unit to obtain Sky Gold.

If the customer subsequently decides to get a new receiver the non-standard LNB i.f. doesn't really matter, certainly not with Pace MSS series receivers, as a non-standard oscillator frequency can be entered – in this case the figure will be approximately 9·92GHz. This will produce correct frequency readouts with the new receiver.

Some early receivers tune below 900MHz – I encountered an Alba receiver recently that tuned down as far as Zee TV with an old Marconi blue cap LNB. The customer was very keen to have Superchannel on Astra. The receiver's tuner also went quite high, well beyond the top Astra 1B frequencies (CNN etc.). When I'd removed the Marconi LNB's rivets and its outer cover, the local oscillator screw was easily found. Unscrewing it by about four turns produced a good Superchannel at the bottom end of the tuner's range – CNN at the top end was also fine.

Cambridge IRDs

This receiver-decoder came in as the JVC Model AD1000. The customer's complaint was of poor, jumping pictures that had got worse over the course of a few days. Connection was at r.f., as the TV set being used had no scart connector.

When we checked the receiver in the workshop we found that the pictures obtained via the scart socket were very good, though the results with the r.f. output were indeed dreadful. A look around with the scope was called for.

The video input to the modulator was fine. But it was being modified by a small, blue 1μF, 50V electrolytic that's mounted just above the BB modulator video input pin. It's not difficult to find this capacitor, as there are no other electrolytics in the area. Fitting a replacement cured the problem.

We don't get many Cambridge receivers in for repair, though many a happy hour has been spent tuning them in for people who bought systems from local installers who have since disappeared. It has always seemed strange that when in the 'favourite' menu you can't just go round and round the favourites. Above F20 the receiver goes into the 'normal' channel mode via the up/down buttons.

Pace PRD800

The customer wanted to use this receiver with both a MAC D2 and a Dutch RTL Luxcrypt decoder. Unfortunately the RTL decoder requires an unclamped PAL input. Using the output from the video or TV scart socket produced a very poor picture, with streaking and general liney effects. Somehow, we had to find an unclamped output.

In the end we connected a 1μF capacitor across the clamp diode D70. This worked well. By disabling/reducing the efficiency of the video clamp in the receiver, good pictures were obtained via the RTL decoder which provided clamping for all the PAL signals.

The on-screen graphics became a little jittery, but the customer wasn't at all concerned about this. Quite possibly reducing the value of the added capacitor would have decreased the jitter and still given good results with Luxcript signals. An alternative would have been to add a switch to the receiver to enable/disable the clamp circuit as required. Even better would have been to break the link between the unclamped video and the clamp circuit within the receiver and connect the Luxcrypt decoder, giving an unclamped output, between these points. Since time is always at a premium, we were unable to look into this possibility.

The Uniden UST7007

Quite a number of these receivers remain in use here in the Algarve, along with the matching UST771 positioner box. They were made in the late Eighties/early Nineties and are well built, though they are prone to dry-joints on the power board.

It's quite common to find that the memory in both the receiver and the positioner unit is lost after disconnecting the power for more than a few minutes. Both units have a 3V lithium disc battery that's linked to the PCB. After a few years the batteries fail. Replacement is straightforward.

With original installations you usually find a magnetic polariser and an interface unit. The latter is used because the receiver produces an output to drive the mechanical type of polariser. A standard 13/17V V/H LNB can be used however. The magnetic polariser tends to go open-circuit, and we are reluctant to replace it. One reason for this is that skew is difficult to adjust at the extreme ends of the Astra band when an interface unit is used, particularly where the feed to the polariser is via a thin cable – the voltage drop limits the polariser current.

When an LNB with voltage-controlled polarisation selection is used, slide the switch at the back, near the F socket, from 18V to 'Cont'. Selection is then achieved by pressing DBS or ECS on the front panel. DBS gives the higher voltage. Tuning seems to be a little coarser in the

DBS mode: it's often best to get the frequency right in the ECS mode, then change to DBS for the channel with horizontal polarisation.

Reception of the German ZDF channel is difficult in the DBS mode, being right at the bottom of the Astra 1C band. If this channel is a customer requirement, turn the LNB through 90° and invert the DBS/ECS settings (UK Living, the next channel up, is o.k. with either setting). The other solution is to tune in ZDF in the DBS mode – lots of white sparklies will be present. Then remove the tuner from the chassis. You'll see the i.f. bandpass filter in three solid-looking cans (no SAWFs here!). There's a red, air-spaced coil adjacent to them. Spread its turns and ZDF will become clear as the tuning frequency is reduced a little.

We've encountered one or two cases of poor contact between the tuner's F socket and the PCB when the nut that holds the socket has been over-tightened after replacing the tuner.

A Decoder Problem

A Dutchman with a Grundig GRD150 gave us a call. He'd previously used a very early, manually tuned Astra receiver and was looking forward to the luxury of changing from RTL4 to RTL5 by remote control. This is where the problem arose. He wanted his RTL4/5 decoder connected, but this receiver has no decoder socket – though there appears to be provision on the PCB, presumably for other receivers in the range.

From experience we know that RTL decoders like an unclamped, de-emphasised video signal. They don't like being presented with clamped video, usually producing streaks/lines, particularly on the many subtitled programmes.

We come across a variety of decoders here in the Algarve, mostly pirate types that are openly on sale in the Netherlands. RTL have kept to the same coding system for years, and seem to intend to continue doing so.

We wired up a decoder and routed the signal via the scart socket on the customer's VCR (the VCR being on AV to watch/record coded channels). Clamped video was taken from the Grundig receiver's TV scart socket – we had to begin somewhere, though we had no great confidence about the outcome. And the Dutch channels are never coded when you want them to be! – the transmissions are coded only when programmes originating from outside the Netherlands are being shown, otherwise they are in the clear.

The results were surprisingly good, with no streaking on subtitles. But the decoder would drop out from time to time, especially with bright scenes. Adjusting the decoder's internal presets didn't help. As the customer wasn't interested in VideoCrypt reception, we decided to remove the VideoCrypt decoder PCB and look for unclamped video from the main PCB – though this meant taking the Grundig GRD150 and the decoder back to the workshop.

When I switched on with the VideoCrypt decoder PCB removed the RTL decoder worked well, with no sign of drop-outs. The only problem was that the on-screen graphics had disappeared – the customer decided that he could live with this. So everything was reassembled and no further investigation was carried out. I can only assume that unclamped video appears at the scart connectors when the VideoCrypt decoder is removed. We rarely see these receivers here, so maybe someone else could investigate further.

Test Case 396

Except for some occasional co-channel interference during the summer months, old Mrs Simes had enjoyed good TV reception for twenty five years at her village High Street cottage. Now, suddenly, her pictures were being torn to shreds every few minutes by some form of interference. Regardless of which channel she was watching, the picture would be obliterated by wavy patterns and black bars, while raucous rasping and grunting noises would take the place of the programme sound. It was no coincidence that this had all started when Beeline Taxis (motto: Where You Come First) had taken the premises next door and erected a mighty guyed pole with a v.h.f. whip aerial at the top. Mrs S confronted Mr Beeline, who agreed to finance a solution if one was possible.

Now Mr Beeline is no fool. He consulted his radio-telephone licence, which told him that his transmit frequency was about 176MHz. He discovered that terrestrial TV broadcasts are transmitted in the 470-860MHz band. So he couldn't see why there should be a problem. Admittedly his aerial was close to Mrs Simes's TV one, which was also mounted on a pole because of the poor local TV signal strength. Living in one of the few poor reception areas left around here, she had to use a masthead amplifier – a rare beast these days. No doubt the weak TV signals made her installation more susceptible to the 25W signals that Mr B used to guide his taxi fleet. Anyway, the upshot was that Mr B consulted the pages of his copy of the *Evening Echo*, and settled on Sick-em-Up Aerials to sort out the problem.

When Stick-em-Up was called in, its Tex Rogers gave his opinion. Drawing his breath through his front teeth and shaking his head, he pronounced (probably for the fourth time that day) "this is going to cost you, squire". Tex talked knowingly about special filters, braid-breakers and so on. They would have to be specially ordered – maybe specially made. Having obtained details of Beeline's v.h.f. transmit frequency, he drove off in his battered van, still shaking his head and drawing in air through his teeth. Our taxi mogul, seeing no other solution, duly sanctioned the work.

Stick-em-Up Aerials returned to Mrs Simes's cottage a couple of weeks later, this time with a rectangular metal box which had coaxial connections at each end, a couple of trimming holes and "–52dB, 176MHz" scrawled on it. This was the wonder filter that had been ordered from a specialist firm.

Tex inserted it in the feed between the aerial socket mounted on Mrs Simes's skirting board and her TV set, then phoned Mr Beeline next door. Mr B keyed his RT microphone, and the TV picture went to pieces – just as before. Consternation! Tex twiddled the trimmers, instantly destroying the precision factory alignment of the notch filter. Still the picture was obliterated whenever Mr B was on air. Tex vented his opinion of Fleetway Filters Ltd. as he removed their gadget and substituted an ordinary CB filter in the coaxial feed. The TV picture and sound still went haywire whenever the v.h.f. radio-telephone came on.

The harassed aerial man tried braid-breakers, ferrite rings, earthing the coaxial feeder's braid and every other possible remedy he could think of. All to no avail. A couple of hours later he retired defeated, with no chance that he could see of getting paid for his trouble. There was a solution though, if only he had had a full understanding of what was happening in this r.f. wipe-out situation. Do you know what the root cause of the problem was, and why the filter had virtually no effect? If not, turn to page 136 for the solution.

Day of the Show:
More Confessions of a TLO

Mark Paul

"Ach! I know he's a pain in the proverbial, but he's also a very big accoont." This was the National Accounts Sales Manager, addressing me in his broad Glasgow accent. "So when he arrives, you tak him oot fur lunch, and I'll take him oot for dinner. OK?"

It was an order of course, not a question. He then glided away across the thick pile carpet that covered the floor of the large room, heading for another very dear, ever-so-long-standing friend of a dealer who had just arrived. That well-rehersed welcoming smile was again dominating his face.

It was 10 a.m. on the first day of the annual Trade Show, and the atmosphere in the spacious hotel suite was dry and already heavily scented with a mixture of Old Spice, Chanel, cigars, cigarettes and Polos. A reflective mood came over me as I stood with my fourth cup of coffee, viewing the early show excitement. It seemed to me that on an ego scale of 1-10 the company sales personnel all scored 11. Such a concentration of poseurs in one place and at one time seemed strangely unnatural.

Angelique and Roj

"I say, are you the TLO?" A rather high-pitched, sibilant voice broke into my reflections. I turned to see Angelique Matthew-Henry, who worked in the ultimate department at the ultimate centre of the known universe – Marketing. She wouldn't, of course, recognise someone like me, even though we had in the past dealt, over the phone, with certain customer problems.

"Good" she continued. "Come with me. We're giving a pre-show presentation of the new model line-up to the press and need someone technical to make sure that everything works and answer any questions. You know the sort of thing. All right? Good. Let's go."

Before I could reply, she was off. I gulped the remains of my coffee, put the cup down and hastily followed to the special pre-view area. Roger St John Stevas-Brown, head of marketing, was presiding here.

"Roj! This is our TLO" Anjy said looking up into the face of the Marketing Manager. He turned slowly to look at me, his smile showing an amount of ivory seldom seen outside a game reserve.

"How splendid" he replied to Anjy. "You're so clever being able to get one so quick."

"Listen" he said to me in a low voice as he grasped my arm and took me aside. "Anjy has probably already told you what we need. The Trade Press is coming to see the new range and give us some good copy. At least I hope so."

"Now you know what these journalists and editors are like. There's the long-haired, smart-ass freelance journalist who always asks the highly technical questions. Simply an ego tripper. Then there's the pipe-smoking, been-there-seen-this-done-that editor with leather patches on his tired Harris Tweed jacket. Here's really here for the beer. And then there are the women. They are the worst, focusing on trivial detail and full of buzz words and phrases. They tend to get themselves all tangled up technically – this is where I need you." Then he went on to tell me a long story about a couple of female jounralists and their faux pas at the last show. Finally he paused, with a glazed look in his eyes.

I have a theory that the milieu of these events creates this sort of effect. A kind of mental eclipse is brought on by nervous energy drain and the effects of caffeine poisioning and breathing recycled air. Anyone who has experienced these shows will know what I mean. It makes the whole event seem somehow surrealistic.

I felt I had to break the spell. But it was a measure of the crazy situation that I came out with the words a mature TLO should never utter – especially to someone in marketing!

"So what do you want me to do?"

He turned, looked at me, smiled and said gently "just play it by ear". The ultimate cop out! With that he left me to my own devices. I decided to check that all was well with the presentation models.

The Presentation

The turn-out was good. Everyone who was anybody in the consumer electronics press was there. It was now almost mid-day, and for the last half hour the visitors had been lubricated with several glasses of good vintage Chablis. This produced excited chatter, and it seemed that the guests were now well set up for the model presentation.

This was to be done in a small auditorium. I worked my way forwards and sat at the end of the front row. While I was scanning the press release, someone came and sat in the next seat. It was that well-known, sometimes troublesome technical writer Barry Badger. Before he had time to notice, I'd unclipped my lapel name tag and stuffed it into my pocket. Then I tried to give the impression of being deeply immersed in the handout.

A loud crash of drums introduced some rock and roll music. Modulated, multi-coloured lighting wizzed around the room, highlighting the various models on display. Five go-go dancers appeared from nowhere and started to girate violently in time with the beat. All this was meant to emphasise the with-it theme of the new range, which had been created at great expense by that well-known designer Pinstripe Stork – the handout described the theme as "colour and movement". Oh well.

Just as suddenly the lights dimmed to dark, the music stopped, the dancers disappeared and a small rostrum, to the side of the front row not far from where I was sitting, was highlighted. Behind it stood Roj.

The audio-visuals on the large back-projection unit behind Roj were as good as his slick presentation. He worked his way through the sales and marketing strategy for the coming year, while describing the model line-up.

After the formal part of the presentation was over senior company staff from sales and marketing, plus yours truly, clambered on to a small stage in front of the back-projection screen. The meeting was opened for questions from the floor. Most of them were, as one would expect, aimed at my colleagues. Many of those present had either succumbed to the wine or were engaged in 'power napping'.

As it turned out I had only one question to answer. Predictably, it came from Barry Badger. He wanted more information on the design innovations in the new, super-fast teletext module with its Constant Repeatable Access Programme – CRAP for short.

"With the move away from SDRAM architecture towards FPMDRAM, and EPROM being dropped in favour of a combination of FLASH and EEPROM, giving increased densities and faster access speeds, does this mean that the SRAMs will be replaced with SSRAMs, and if so will the pipe-lined approach be replaced by the non-pipeline flow-through version?"

I sensed a hush fall over the meeting. All eyes were on me. I told myself that the question was easy enough to deal with. After all the company had recently sent me on a self-assertion course. So I took a deep breath, sighed audibly whilst looking at the ceiling, and then slowly returned my gaze to the questioner.

"Yes" I answered positively.

Barry Badger blinked. He pushed back his glasses and began to scribble furiously in his notebook. Another scoop in the making.

The moment of tension had passed. Roj rose to close the meeting. He thanked everyone for attending, and told them where lunch was being served.

I slipped away quietly to the main display area, where my lunch appointment was waiting. He was talking to the National Accounts Manager, who called me over.

"Here he is Jimmy" he said, referring to me and talking to the dealer. "He'll tak you oot for a bite tay eet an I'll see you later. OK?"

I smiled and we headed for the place where they served the standard chicken dish. For want of anything else to start up the conversation, I asked my guest "do you know anything about SDRAMs, FPMDRAMs, SRAMs or SSRAMs?"

He blinked and looked at me blankly. Then, fingering the neon screwdriver clipped to his top pocket, he replied "are they a kind oh mains dropper then?"

I had to smile to myself when I realised that this was still only the first day of the show.

Inside the Ferguson TX90E Chassis

Part 3

Mark Paul

In this concluding instalment we'll take a brief look at the remaining circuitry used in the chassis – the timebases, the RGB output stages, the audio amplifier and the microcontroller chip.

The Line Timebase

The line timebase is conventional. The line sync and oscillator circuits are in the TDA8218 chip IL01, which produces a line drive output at pin 17. This is passed via a driver stage to the base of the S2055AF line output transistor TL01. The line output stage is very simple, there being no need for EW correction.

Fig. 12 shows the line generator section of IL01, which also contains the field oscillator and output stages. Composite video is fed to the internal sync separator at pin 20. RL45 and CL13 form a low-pass filter at the input to suppress h.f. harmonics or noise that could cause picture jitter.

The separated line sync pulses are fed to a phase detector whose other input is derived from pulses tapped from the heater winding on the line output transformer. These are integrated by RL34 and CL21 to form a sawtooth waveform which is applied to pin 13. PL04 provides horizontal shift adjustment, by varying the phase of the sawtooth feedback waveform. The phase detector compares the timing of the line sync pulses and the sawtooth, producing a positive- or negative-going output at pin 12 to pull the line oscillator into lock.

The free-running oscillator frequency is set by PL02, RL02 and CL03, in conjunction with the internal resistor chain connected to pin 1. RL05 and CL05 integrate the current output from the phase detector, producing a d.c. error correction voltage which, via RL04, adjusts the charge/discharge timing of the oscillator tuning capacitor CL03, thus locking the line oscillator frequency to the line sync pulses. CL04 stabilises the phase-locked loop, ensuring a fast response time. RL05 and CL05 set the basic loop time-constant.

The sawtooth output produced by the oscillator, at the collector of internal transistor Tr, is fed to a comparator whose other input is a 4·8V reference voltage. Its output is a constant pulse-width squarewave signal which drives the chip's open-collector output transistors (open collector means that the load resistor is external to the i.c.). The line-frequency squarewave signal thus generated at pin 17 of the chip is capacitively coupled, with d.c. restoration, to the following driver stage.

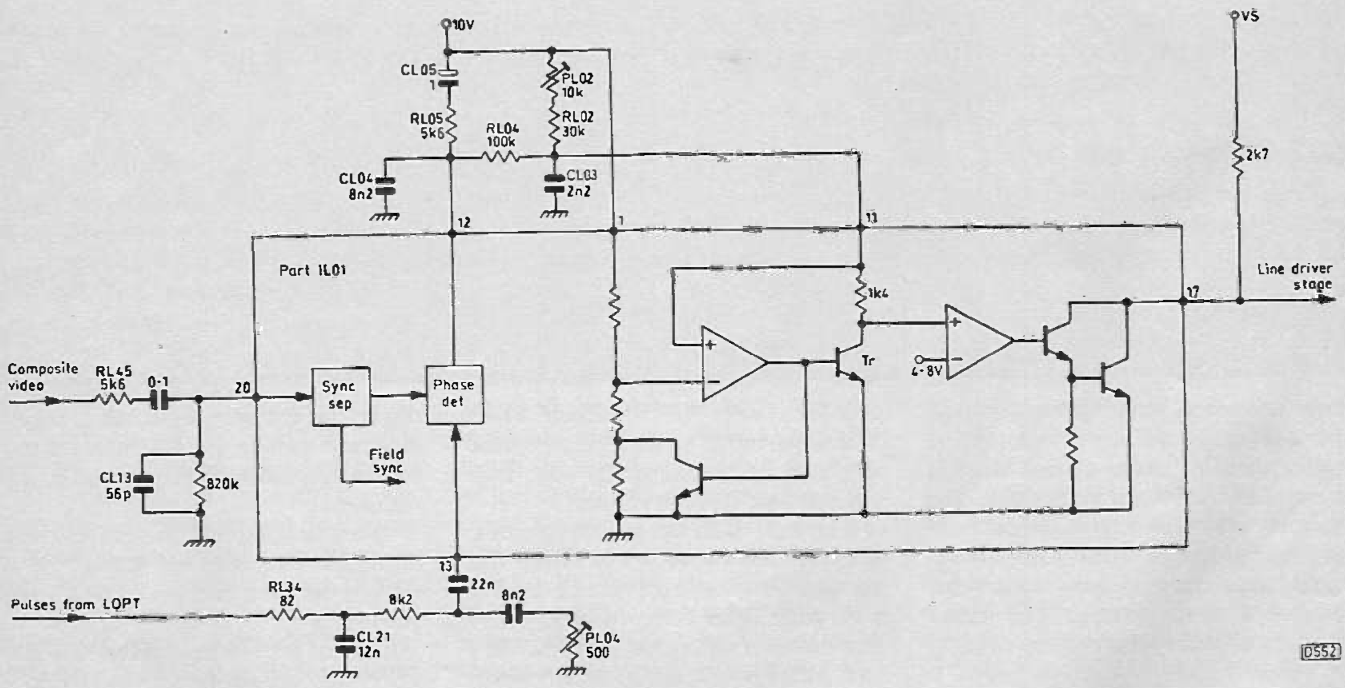


Fig. 12: The line sync/generator arrangement.

The Field Timebase

The TDA8218 chip drives the field scan coils directly from pin 10. The field timebase circuit follows conventional practice, with the usual flyback voltage generator arrangement. The oscillator is similar to that used in the line timebase section of the chip, though the separated field sync pulses are applied to the internal resistor chain directly instead of via a detector in a phase-locked loop.

There is a.c. and d.c. feedback from the scan coil circuit to pin 7 of IL01. The height control PL03 varies the slope of the feedback waveform at pin 7, thus adjusting the slope of the scan coil current drive waveform at pin 10.

A 25Hz signal from the teletext module is applied to the junction of the field scan coils and the scan coupling capacitor CL07 (1,000μF). This alters the scanning to non-interlaced in the teletext mode to prevent jitter.

Super Sandcastle Pulses

IL01 also provides super sandcastle pulses at pin 19, with three levels as follows:

(1) Field blanking level, typically 2·5V.

(2) Line blanking level, typically 4·5V.

(3) Burst gating level, typically 9V.

The field blanking generator is a monostable multivibrator with an external *RC* timing network connected to pin 8. The start of the blanking pulse is triggered by the falling edge of the field sawtooth waveform. The line blanking section of the super sandcastle pulse is produced by a comparator whose inputs are line flyback pulses and an internal reference voltage. The position of the burst gate section of the super sandcastle pulse is fixed by an external *RC* network connected to pin 14, with reference to the middle of the line flyback period. Close-tolerance components are used in these external *RC* networks.

RGB Output Stages

There are only very minor differences between the RGB output stages, so only one will be described. Fig. 13 shows the red output stage circuit.

The red output signal at pin 25 of the video processing chip IV01 is fed to base of the voltage amplifier transistor TT52, whose load resistor is RT52 (10kΩ, 2W). This high value is used to achieve high gain with low dissipation. The following pnp transistor TT51 serves two purposes. It acts as an emitter-follower: when TT52 is brought into conduction by a positive signal at its base, its collector voltage falls and TT51 conducts, providing a path for the tube's cathode current. The path, from chassis, is via pin 33 of IV01, RV17, RV18, PT50, TT51 and the flashover protection resistor RT54.

TT51 also provides current sensing for the automatic grey-scale correction circuit described last month. The voltage developed across PT50 and RT50 is directly related to the cathode current. This voltage is fed to pin 34 of IV01, operating in the manner previously described. Diodes DT55 and DT95 are included to prevent TT51's collector voltage rising above about 21V. Otherwise TT51 could saturate, with loss of beam current limiting. PT50 and the corresponding potentiometer in the blue output stage enable tinting at peak white to be removed – a fixed resistor is used in the green output stage.

In addition to supplying a stable 3·8V bias voltage for the RGB output transistors TT81 provides switch-off spot suppression. At switch off the 13V supply, which is obtained from the line output stage, collapses quickly. CT81 is very rapidly discharged, reducing TT81's base voltage to zero. As a result it switches to full conduction, removing the emitter bias voltage from the RGB output transistors. These also switch to full conduction, discharging the e.h.t.via the tube's cathodes.

Audio Circuit

The audio output stage is conventional, using a TDA2006 chip. The only point to note is that the input is via either

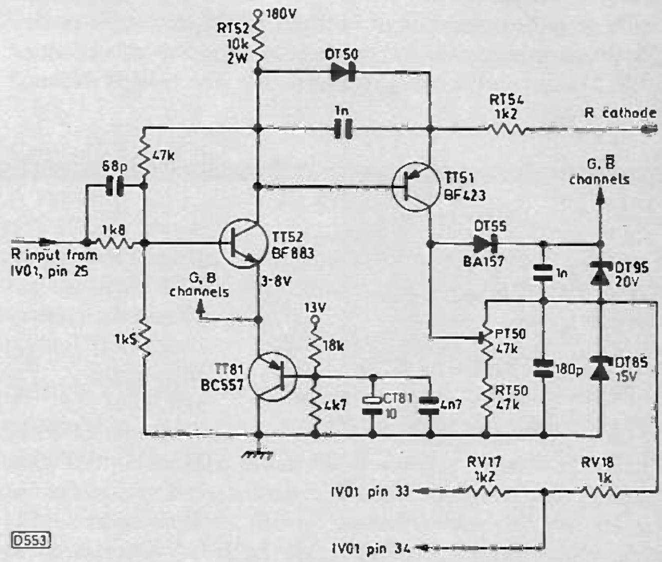


Fig. 13: The red output stage circuit.

transistor TS02 or TS03. In the TV mode TS03 is switched on while TS02 is switched off. This situation is reversed in the radio mode.

The Microcontroller Chip

The ST6399B1/KU microcontroller chip IR01 operates with an 8MHz clock, crystal QR01 being connected between pins 31 and 32.

The on-screen display (OSD) functions are built into it. OSD blanking is used to produce the black fringe background around the OSD characters. Timing of the OSD functions is controlled by the super sandcastle pulses. A separate OSD oscillator is connected to pins 28 and 29, running at approximately 5·5MHz. Adjustment of LR03, which is connected between these pins, varies the width of the characters.

There are different bus arrangements for video and teletext/tuner control. In both cases the data output is at pin 40. The video clock and enable lines connected to pins 38 and 39 are used for brightness, colour and contrast control via IV01. This Thomson bus is unidirectional. Pins 40 (data) and 41 (clock) carry commands to the tuner and teletext modules. This I2C bus is bidirectional, enabling the tuner or teletext module to carry out a 'handshake' with the microcontroller chip. These lines are normally high, going low to transmit commands.

The 62·5kHz output at pin 5 is used by the colour decoder chip IC01 for PAL/SECAM switching.

Pin 7 detects the presence of an AV signal at the scart socket while pin 17 switches the receiver to the AV mode.

The resistor connected 6 determines the TV standard, with pin 34 providing an output to the i.f. module to select the video and sound systems.

An associated muting signal generator circuit senses the presence of a video signal. Its output is also fed to pin 36 of

IR01 as a station detect input in the auto-search mode.

The keyboard has four key scan output and four key scan input lines. When no key is pressed the output lines are low. When a key is pressed the low from the output appears on one of the input lines. Once this is detected, the output lines begin to scan sequentially to enable the microcontroller chip to decide which key is being pressed.

Resistors connected to pins 18 and 19 tell the chip whether a simple clock or a radio/clock module is incorporated. These pins are also used for alarm input and f.m. power on/off control.

The remote control input is at pin 35. There's a 5V peak-to-peak square waveform with pulse-position modulation when a command is being received. The line is high with no signal input.

The standby/on output at pin 20 goes high for standby.

Pin 4 produces a pulse-width modulated output for volume control.

The reset circuit, centred on transistors TR76/7, generates a reset pulse for pin 33 of the microcontroller chip when a.c. is first applied to the receiver or after a power supply interruption. The reset line is held low initially, rising to 5V after about 20msec.

The power interrupt (power failure detect) input at pin 37 provides the microcontroller chip with a warning that the a.c. input is about to be lost. It's low when a.c. is applied, going high as soon as the mains input is disconnected. The 5V supply to the microcontroller chip is designed to maintain itself for at least 150msec, so that the chip can store the receiver's current status in the EEPROM.

Help Wanted

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

For disposal: *Television* magazines January 1971-December 1979; *ERT* service sheets/manuals from early Sixties-late Seventies as a lot; a 20in. CM51 Barco RGB monitor with spare tube, both unused; a Thorn TX100 chassis with panels. Contact Brian, Maidstone. 01622 730 504.

For disposal: *Practical Television /Television* magazines from 1970 (Vol. 20) to date. Also *Radio and Television Servicing* books 1977/78, 1978/79 and 1979/80. Stuart Higgins, 1 Strathmore Drive, Charvil, Reading RG10 9QT. 01734 340 736.

Wanted: MAB8051C21D1 microcontroller chip, used on board P607 in the Philips Model VR6467 and clones. D. Jannece, 54 Wyatts Green Lane, Brentwood, Essex. 01277 822 380.

Wanted: Circuit diagram (photocopy would do) for the Video Circuits tube tester Model V33 and any relevant information on it. B.R. McLeod, 8 Cunningham Road, Horndean, Portsmouth PO8 9LT.

Wanted: Mechanical layout of the CR-W77 cassette section of a Fisher Hi-Fi separates assembly (other units are MT55 and FM55). Also a circuit diagram for the Boots-Thomson T3614P1 colour portable. Photocopies would do. P. Travers, 6 Woodfield Road, Bebington, Wirral, Cheshire L63 3DX.

Wanted: Service manual/circuit diagram (photocopy would do) for the following: Panasonic NV2000 (Granada VHSNV1/VHSVN1); Granada VHSYH2 (GEC V4001/2 or Hitachi VT9300/9500). Also any information or circuit diagrams for the Commodore 1541 Mk II disk drive. W. Keenan, 86 Tyne Gardens, Ryton, Tyne and Wear NE40 3DR. 0191 413 6192.

Wanted: Betamax VCR in good working order, with camera socket. Paul Thompson, 58 Ella Road, West Bridgford, Nottingham NG2 5GW. 0115 981 3587.

Wanted: Service manual/circuit for the Questar Laser 1900 mono TV/a.m./f.m. radio/tape deck/digital alarm clock. Also source of SN96517BN and TDA1070 chips for Hoover washing machine motor modules. R.H. Hespley, 3 Cotsdale Road, Penn Common, Wolverhampton WV4 5LF.

Wanted: Circuit diagram and instructions for the Philips PM5504 pattern generator. Also scrap Philips music centre with good Philips FT260 micro and a movement for a TMK500 multimeter. Jim Littler, 363 Atherton Road, Hindley Green, Wigan, Lancs WN2 3XD. 01942 258 794.

Wanted: Laser assembly/main board ribbon connector for the Pioneer PD6010 CD player. Faulty unit with ribbon intact would do! David Upton, 85 Clyne Court, Sketty, Swansea SA2 8JA. 01792 207 697.

Wanted: Any service information for the Ayr Model T1 Viewdata/teletext adaptor. J.M. Parry, 4 Courtland Drive, Aston Park, Queensferry, Deeside, Clwyd CH5 1UQ. 01244 819 728.

Wanted: Service manual/circuit diagram for the Barco 3200 series CTV and any information on spares etc. Any circuits/manuals for older TV sets, audio equipment, VCRs, test equipment would be welcome for a new entrant to the business. Ken Darville, Avia, Station Road, Yeoford, Exeter EX17 5HU. 01383 84 017.

Wanted: S2800 or equivalent thyristor for the Ferguson Model 3787 (NordMende chassis), circuit reference number DU04. Have for disposal over 200 *Practical Television* magazines. Offers please! Stan Jesney, 56 Barnacle Lane, Bulkington, Nuneaton CV12 9RQ. 01203 315 788.

Wanted: LOPT for the Ferguson Model 51J7, also an automatic programming button unit assembly for the Sony Model KV2217UB. J.R. Walker, 45 Woodside, Barnard Castle, Co. Durham DL12 8DZ. 01833 690 557.

Wanted: French (SECAM) TV set required for test purposes – cabinet, tube condition not important. L.P. Watkinson, Telesonic Services, Regent House, Week St. Mary, Holsworthy, Devon EX22 6UJ. 01288 341 254.

Wanted: Remote control handset for the Fidelity AV2000 AV system, or a supplier's address. Also a circuit diagram (photocopy would do) for the Tandy Portavision-2 monochrome portable. G. Cannon, 16 St Cuthbert's Road, Holy Cross, Wallsend, Tyne and Wear NE28 7JF. 0191 262 0172.

Wanted: Circuit diagram plus any other information including a parts stockist for the Emelcold Super General 20in. TV/VCR Model DVT-9254D – it was bought in Cyprus. P.J. Rowe, 7 Trevol Place, Torpoint, Cornwall PL11 2NZ. 01752 815 392.

For sale: *Television* 1980-90 complete. £90 plus carriage, or collect for cash. F.S. Yarham, 18 Ivel View, Sandy, Beds SG19 1AU. 01767 680 154.

Camcorner

Reports from Brian Storm, Gerald Smith Simon Bodgett and David C. Woodnott

Panasonic NVM40

Tape playback was marred by a noise bar across the picture, as if the tape path was misadjusted. So this was the first thing we checked, only to find that it was all right. We next found that the PG adjustments had no effect on the head switching point. The cause of this was eventually traced to C6219 (0·027µF), which is connected across the PG adjustment control VR6201. It had gone open-circuit. A replacement capacitor closed the gap in the f.m. waveform. **B.S.**

Panasonic NVMS50

This oldish S-VHS machine would intermittently power down by itself, usually after working for hours on the soak test bench. The only thing we could do was to carry out a blanket replacement of the TL1453CNS power supply control chip (IC1001) and the 2SB956 transistors Q1001/2/6/7. After doing this we gave the machine a long soak test and declared it fit for return to service. **B.S.**

JVC AA-V3EK

This is the power supply for the GRAX5. It wouldn't charge, the power LED display being dull and pulsing. On investigation I found that D2 on the primary side of the supply was open-circuit. **G.S.**

JVC GRS70

This one wouldn't record colour. It's a not uncommon fault, caused by the failure of capacitors in the a.p.c. loop on the hybrid chip. You have to replace the chip. **S.B.**

JVC GR303

"Playback picture interference, see tape" it said. Yippee! With this one we got a sample tape. We had to clean the clogged flying erase head. **S.B.**

Sony CCDF340E

The E-E pictures were o.k. but there were no mechanical functions. Failure of the drum to rotate was the basic cause. Investigation brought us to an open-circuit lead-through between the sides of board SS86, specifically between Q053 (drum drive inverter) and Q052 (PWM amplifier).

When we'd restored the drum motor drive another problem showed up: playback was marred by coloured lines that flickered across the screen. The cause of this was C456 (22µF, 16V) which was open-circuit. It decouples pin 1 of IC363 (jog chroma processing) on board VA41. This fault has been reported previously but is now becoming quite common. **D.C.W.**

Mitsubishi CX1B

When we received this VHS-C camcorder a cassette was stuck in the mechanism and a "no tape" message showed in the viewfinder! No functions worked. Once you've removed the forty or so screws, access to the mechanism is quite good. We then removed the tape by using the Sony mode box to power the loading motor.

The cause of the trouble was damaged parts around the back-tension lever. Compared with some decks, this part of the mechanism is actually quite complex. The parts that had to be replaced were: spring push 2: set arm S; and lever tension off.

An excellent training tape from Akai covers all you need to know about aligning the mechanism, which is used in the **Akai Model PVC20.** **D.C.W.**

Sony CCDV800E

A knocking noise was being recorded on the tape. The cause was a faulty capstan motor bearing. Unfortunately the bearings are not available separately, so a new motor is required. We've had the same problem with other camcorders that use the same mechanism (U and U'), e.g. Canon, Sanyo etc. models. **D.C.W.**

Sanyo VMD9P

Noise bars on the playback picture is quite a common problem with this model. The effect is of no a.f.t. control. The fault sometimes affects the recorded picture as well, but more often it affects only playback. There seems to have been a batch problem with IC361: a replacement invariably cures the symptom. **D.C.W.**

JVC GRAX2

The E-E picture was o.k. but there were no mechanical functions. A quick check showed that CP1 (N38) was open-circuit. When this had been replaced the problem appeared to have been cured, with all functions restored, but on test the symptom returned when we pressed the record button. With this model there is a high current demand when the drum motor starts up and is then slowed as the tape wrap occurs. Even when the machine is working normally some 2A (total current) can be measured if the drum is slowed slightly in the record mode. The cause of the trouble turned out to be Q13 (2SB1302-SB) which was leaky. It acts as a switch-mode regulator for the drum 5V MDA supply. **D.C.W.**

Sanyo VMD3P

Three more capacitors to add to the list of those that should be replaced in this model. First C2009 (33µF) which is connected to pin 9 of the audio chip IC2001. It's in the audio level control circuit, and when faulty the result is continuous maximum audio sensitivity in the record mode. The other two capacitors are C1098 and C1124, which can leak producing a symptom that's identical to failure of one head in playback. The electrolyte leakage causes loss of the drum FF pulses to the head amplifier chip, hence the 'one head only working' symptom. **D.C.W.**

Canon E200E

The problem was lack of playback audio – the E-E and recorded sound were both o.k. Only a rough, rasping sound could be heard during playback. The culprit turned out to be the LA7454W a.f.m. demodulator etc. chip IC802, which is on the A-V out sub PCB. After fitting a replacement the relevant controls (deviation etc.) have to be set up as laid down in the manual. **D.C.W.**

Repairs to MTI LNBs

Hugh Cocks

The MTI (Microelectronics Technology Inc.) LNB is readily identifiable, being a large, round cylindrical unit with a flat part near the F socket. There are two common versions, the black UP3 and another that comes in various colours and has a silver or gold label stuck to the case. The body of this latter type, though looking similar to the UP3, is slightly larger.

Standard 13/17V voltage switching is used for polarisation selection. Because of the large diameter body however these LNBs are not compatible with a Marconi type feed bracket. Both versions use a 10GHz local oscillator, though models were available for the telecom/DBS bands. There's a later 9·75GHz type with a slightly shorter body, but we have no experience of this version.

We sold quite a lot of these LNBs, as part of satellite TV systems, up to a couple of years ago. Their performance is very good, especially the gold-label type, though there is one annoying feature: when the summer temperatures arrive here in the Algarve the LNB very often just stops working! A colleague in the UK tells me that this is much less common there.

I got fed up with sending these LNBs back and, at the time, other makes didn't seem to work so well here, partly because of the weaker signals -- especially from Astra 1A. So I decided to open up and see whether anything could be done.

Dismantling the LNB

Gaining access to the innards is fairly easy. Unscrew the front ring that holds the Teflon cover in place (the warranty sticker will break in the process!). This reveals a substantial scalar ring type feed, which in all probability was the reason for its performance edge over its contemporaries. Undo the nut on the F socket at the back, and push the socket into the case. The assembly then comes out. Make sure that you remove the front O ring on the feed at this point – otherwise it can fall off and disappear. The second, larger O ring just behind the first normally stays put.

The low-noise amplifier (LNA) and mixer are under a cover at one side. The i.f. amplifier and voltage regulator PCB is mounted at 90° to the LNA/mixer. The local oscillator assembly, which is easy to identify by its small cover with a large screw that sets the frequency, is on the opposite side.

The Problem Area

The local oscillator is the problem area. For some reason the oscillator stops oscillating, though the gallium arsenide FET (GaAsFET) continues to draw power as usual. An indication that the oscillator is about to stop is sometimes provided by the fact that there is a small 'jump' of about half an Astra channel – usually just about resettable using the receiver's offset menu. Replace the transistor and all is well.

A couple of years ago MTI were very helpful and sent me some complimentary oscillator transistors. The type of GaAsFET used doesn't appear to be very critical. The original type had just a blue mark on it – the replacements supplied by MTI had the identification J on the case. It may be an idea to buy a Sendz Components ex-rental LNB and plunder it for spares. Maplin listed a GaAsFET (type 2SK571, order code UH65V) in the 1993 catalogue but there is no such listing in the 1995 catalogue.

Some experience with handling GaAsFETs, and familiarity with the innards of LNBs, is an advantage. A signal source is helpful. A subsequent article will describe a microwave i.f. upconverter which will provide a good reference signal.

Oscillator Circuit

The oscillator circuit is quite simple – see Fig. 1. The transistor's drain is linked to a 5V supply via some thin PCB track that acts as an r.f. choke. Its gate is earthed via a length of stripline and a 51Ω chip resistor, its source being connected to earth via some more stripline and an 18Ω resistor. The d.c. voltage at the transistor's source is therefore positive with respect to its earthed gate.

A dielectric resonator mounted on a small, ceramic stand-off pillar sits on the Teflon PCB between the drain and gate striplines. The result is a stable, very high Q tuned circuit – to function properly the cover needs to be fitted. The oscillator's frequency is determined by the distance between the large screw in the cover and the resonator. If you want, you can think of this simply as a 10GHz crystal connected between the transistor's gate and drain!

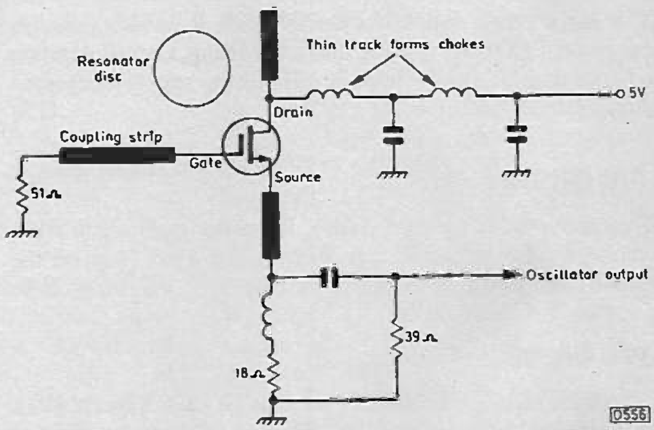


Fig. 1: The local oscillator circuit in the MTI LNB.

GaAsFET Replacement

Removing a no-go transistor from the PCB is the easy part. Fitting the replacement is not so easy: GaAsFETs don't like static! Take the normal precautions when handling the replacement device. When soldering it, ensure that the bit is linked to the LNB's body and that everything is earthed.

Use as little heat as possible if you remove a transistor from an old LNB to transfer it to the MTI one. Remember which way round the connections go – the gate and drain are 180° apart with the two, thicker source leads (only one of them is used here) in between. See Fig. 2. If you use a new device you will find that the gate lead is cut off at an angle or identified by a dot.

Once the transistor has been installed, apply power but be prepared to switch off quickly. There should be 5V at the drain and a small positive voltage at the source. The gate voltage should be zero – the meter may produce a small reading if the device is oscillating correctly. If the gate voltage varies around

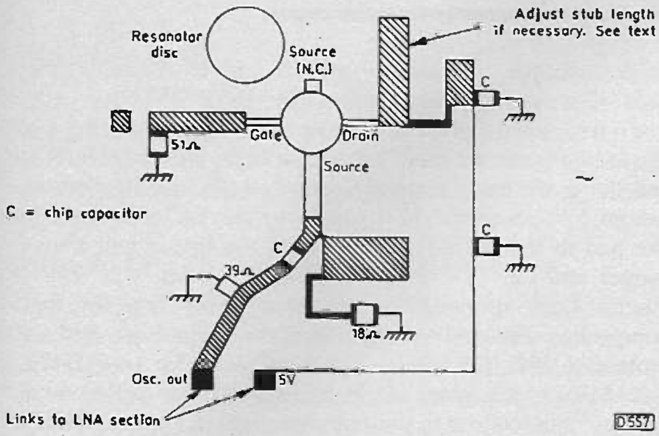


Fig. 2: Physical layout of the oscillator circuit. Note that chip capacitor and resistor earth connections are via through-plated points on the PCB. The chip capacitor values are not known.

zero when a finger is brought near the transistor, at least this shows that the circuit is oscillating.

If the voltage at the gate and/or source is 5V, disconnect the power to save the chip resistors. The GaAsFET has unfortunately died. Check your static precautions and have another go. If the FET has been obtained from an old LNB don't be too surprised if it dies in the transfer process. A new transistor shouldn't die however. If it does and your earthing arrangements are o.k., check that the transistor is the right way round: death is rapid if the gate and drain connections are reversed.

Test with signals and adjust the large screw for 10GHz (compare the pictures with those produced by a known good 10GHz LNB). Power up the MTI LNB a few times. If the oscillator is sometimes reluctant to start up (no picture), adjust the length of the drain stub slightly. Cut it back by 1-2mm and see if this helps – use a sharp, fine knife to cut through the track. If the results are now worse, the length of the drain stub needs to be made a little longer instead. Solder a very small piece of tinplate or similar material to the end of the stub. The results obtained should then be o.k.

Astra 1D Modification

If all has gone according to plan and you are feeling pleased with yourself, it might be worth considering modification for Astra 1D reception by changing the oscillator's frequency to 9·75GHz. The MTI LNB performs well at the 1D frequencies.

As things stand, the adjustment screw won't have enough range to tune down. With the screw fully out of the case, you will be lucky to have reduced the frequency by 60MHz or so. Proceed as follows. Remove the resonator and ceramic pillar from the PCB. There's actually a cut-out in the PCB, the pillar being glued to the metal underneath. A little force is required, but make sure you don't break anything! Remove the pillar from the resonator. This calls for some care, as the resonator can fall on the floor and be lost. Fine cutters and a small vice may be the best way to carry out the removal – the resonator and pillar are glued together very well.

Another pillar is required from an old LNB. Cut it down to approximately the same size as the original one. This is quite fiddly, but can be managed with a little care. When this has been done, stick the replacement pillar on its own into the oscillator cavity. Wait for the glue to dry (the type of adhesive used doesn't seem to be critical).

The original resonator now needs to be stuck on to the new pillar. Before you do this, if possible balance the resonator on the pillar, put the cover back on and see if anything appears on the screen (using the signal source – doing this at the dish is well nigh impossible!). All being well, you'll see something in the way of a new channel. All we're doing at this point is to check that the oscillator is working. Now glue the resonator on to the pillar and wait for the glue to dry. There may be no oscillation at all until the glue is completely dry, so patience is necessary.

Once the glue has dried, adjust the oscillator's adjustment screw for Galavision where Sky News was with the oscillator at 10GHz. Reassemble and test at the dish. Astra 1D reception should be good, with CNN appearing near 1,900MHz. The stability of the retuned oscillator is in no way impaired.

In Conclusion

You may have replaced some of these LNBs during the hot summer weather. I hope you didn't throw any of them away – never throw away old LNBs! These MTI LNBs are very well built. How they were made for the price at which they were sold is a mystery. The LNA section has rarely given me any trouble. Why the oscillator GaAsFET should stop is strange. Occasionally they have lasted out the hot weather only to die when the cold weather arrives!

Temperature change seems to be the problem. We've had MTI LNBs operating for over three years after replacing the oscillator transistor, with no subsequent trouble. Any suggestions as to how and why this problem occurs would be welcome! – write in via the magazine.

TV Fault Finding

Reports from Philip Blundell, AMIEEIE, Michael Dranfield, Stephen Leatherbarrow, Chris Watton, John Pitt-Francis, Nick Beer and John Edwards

Ferguson 20H3 (TX100 Chassis)

This set wouldn't change channels when cold. The channel display went off when the button was pressed, and the a.f.c. could be seen to switch off, but there was no channel change. Application of heat and freezer narrowed the search to the stand-up PC1668 module on the PC1223 TACS board. C261 (1μF) on the module had dried up. **P.B.**

Philips 14PT156A (Anubis A-AB Chassis)

There was no teletext, with E3 displayed on the screen. All other functions were o.k. The teletext decoder in on a subpanel in this model. When it was removed we could see from the soldering that someone had already replaced the SAA5246 chip. Scope checks here showed that the clock oscillator wasn't working. A new crystal (1701) restored the teletext. **P.B.**

Philips GR1-AX Chassis

This set came in with no picture. When the tube's first anode voltage was turned up a blank, unmodulated raster appeared. After much searching we discovered that a small, brown disc ceramic capacitor, C2045 (22nF), was leaky. It's in the a.g.c. circuit, connected to pin 10 of the TDA8305 jungle chip IC7020. The readings we obtained were 3kΩ both ways. A replacement restored the picture. **M.Dr.**

Ferguson TX99 Chassis

The complaint with this set was loss of the sound after an hour. A soak bench test confirmed that this was so. After checking the loudspeaker we turned our attention to the audio amplifier, but touching R72 at its input with a finger produced a healthy buzz from the speaker. Our next check was at the volume control pin (11) of the TDA4505 jungle chip IC2. As the voltage here didn't change when the volume control button was pressed we moved to the M494F chip IC241 on the remote control board. But surprise, surprise pin 34 and the output from the emitter-follower TR246 ramped up and down.

The only components between the emitter of TR246 and pin 11 of the TDA4504 chip are C66 and R12, which were both o.k., and the red LED D5. This was the culprit, going open-circuit when hot. It's easy to find, being mounted just behind the tuner. When working, its brightness intensifies as the volume is increased. In fact you can see it through the cabinet back. Remember the green LED in the TX10 chassis? Ferguson seems to like using LEDs! **M.Dr.**

Matsui 1455

High h.t. is a common fault with this set. The cause is C607 (47μF) in the power supply drying out, the result being weak chopper transistor turn-off drive. Usually the 2SD1426 line output transistor is damaged.

So we quoted a price and began work. After replacing the above two items we were left with a string of other faults – and the profit margin rapidly dwindled. Field collapse was caused by loss of the 12V supply to the TA7698AP chip. We had to replace R310 (10Ω) near the line output transformer and the 12V zener diode D219 which was short-circuit. Look around the luminance delay line for this component. For loss of the luminance signal we had to replace Q202 (2SA562), Q408 (2SC1815) and D417 (1N4148) which were all leaky. Finally the colour was wrong. This took us to the tube base where presets VR503 (10kΩ) and VR504 (500Ω) were burnt up, R510 (1·5kΩ) and R511 (4·7kΩ) were open-circuit and C505 (180pF) was short-circuit. **M.Dr.**

Grundig CUC52KT Chassis

There was a snowy raster with no signals. When we removed the tuner/i.f. can for inspection we saw that someone else had been looking for a dry-joint – the soldering was a right mess, and several pins of the tuner control chip (TVA2000) were shorted together. After desoldering and cleaning up, the tuner still failed to work. The cause was traced to a burnt-up resistor that supplies 7·5V to pin 3 of the TVA2000 chip. A new 56Ω resistor restored good pictures and sound.

When we tried the set next day it would receive channel 31 but only snow was present when the other local channels (21, 24 and 27) were tried. The channels reappeared when the set had warmed up. Use of freezer failed to get us to the cause of the fault, but we found that tapping the can would instigate it. We then found that the voltage at pin 10 of the TVA2000 chip varied. As the 12V supply at pin 12 of the main PCB connector was stable, the cause of the fault lay within the tuner/i.f. can. There was a dry-joint at pin 12 of the socket connector inside the can. This is not visible by just removing the bottom: pins 11 and 12 are beneath the small screening can that covers the prescaler. So you have to remove this can to get at them. After resoldering these pins the set was given a long soak test and declared fit. **M.Dr.**

Philips K35 Chassis

Intermittent low gain was the complaint with one of these sets. A tap on the tuner instigated the fault, so a new tuner was fitted. This seemed to cure the trouble, but the set bounced back three weeks later with the same complaint. As before, a tap on the tuner produced the fault. But so did tapping the PCB. We eventually found that the r.f. a.g.c. potentiometer R414 was intermittent. A replacement – not a squirt of Servisol – cured the fault. **M.Dr.**

Ferguson A51F (IKC2 Chassis)

This set was tripping. We found that TV01 (BC558C) in the electronic trip circuit was leaky. When we'd replaced this item the set still tripped, but at a slower rate. The cause was excessive current being drawn by the thyristor field output stage. To cure the trouble we had to replace the TL082 field oscillator/driver chip IF01. For a quick check, just remove it. In this particular set it was providing excessive drive. **M.Dr.**

Matsui 1481B

If the trouble is weak red, most noticeable with colour bars and teletext, replace C964 (1μF, 50V). It's part of the red cut-off network connected to pin 29 of the TA8807N chip on the tube base and tends to go open-circuit. **M.Dr.**

Hitachi CPT2578 (G8Q Chassis)

The complaint with this set was no sound. Its audio section was o.k., and pin 34 of the SAA1293H chip ramped up and down as the volume control was operated. But the voltage at pin 12 of the d.c. volume/tone control chip didn't. Replacing this chip made no difference however. The TDA2579 timebase generator chip is linked to the chip via D701 (1N4148), presumably to mute the sound on channel change. D701 was found to be leaky, measuring about 200Ω. We had to replace the TDA2579 chip as well as D701. **M.Dr.**

Grundig CUC70 Chassis

The display had very badly corrugated verticals for about the first two minutes. We carried out all sorts of freezer and hairdryer tests without success, then brought out the scope. A check on the 12V rail showed that C662 (600μF, 63V) in the power supply wasn't at home until it had warmed up – like a lot of us! **C.W.**

Ferguson 3787 (NordMende chassis)

We sold hundreds of these sets second-hand a few years ago. As some of them are now approaching seventeen years old, they are still working very well. This one had a fault we'd not seen before. The picture appeared at switch on, but there was a large blanked out area in the top half of the raster – it looked like a map of India. After a while it changed to South America! The culprit turned out to be CM21 (22μF, 35V) on the field output panel. **C.W.**

Doric Mk 4 Chassis

Tripping when cold is a very common fault with these sets. You can be misled, as disconnecting the load enables the power supply to run. So if the set is tripping and this stops when you disconnect the tripler, but a new tripler makes no difference, go back to the power supply and check 4R5 (68kΩ). If it's all right, change it anyway, along with the 1N4148 diodes 4D7, 4D10 and 4D11. This will stop the tripping. **C.W.**

Hitachi CPT2650 (Salora J Chassis)

This set was dead. A scope check at the collector of TB701, the lower chopper transistor in the Ipsalo circuit, showed that the normal pulse was present. This led us to check the voltages at pins 1, 2 and 3 of the hybrid LF0041 chopper control chip HB1. Pin 1 was at 20V but pins 2 and 3 were at zero. We decided that HB1 had failed and fitted a replacement. This restored normal operation. Out of curiosity we took a look at the LF0041 circuit and found that between pins 1, 2 and 3 there is a stabiliser circuit that consists of two transistors and a zener diode. Resistance tests showed that the zener diode was short-circuit. So we removed the hybrid chip and fitted a BZX61-8V2 zener diode, basically between pins 2 and 6. This restored operation of the device! **C.W.**

Philips CF1 Chassis

There was no colour, with the voltage at the wiper of the customer colour control very low. When the control was set to maximum the picture darkened slightly. This suggested a short across the control line. Disconnecting the feed to the TDA3560/N3 colour decoder chip (pin 6) restored the control voltage, which could now be varied from about 1V to 3V. With a new chip fitted the colour was back, though I was then told that the symptom will occur if the reference oscillator is off frequency. The old chip had hit the bin before I heard this – why do people always tell you these things after you've chucked the bit away?! **C.W.**

Hitachi C2118T

No signals was the complaint here. The tuning display could be called up, and the bar moved across the screen when search tuning was started. But there was no variable voltage at pin TU of the tuner. A wet finger test between the 12V supply and the tuning voltage input proved that the tuner was working, as some sort of picture appeared - albeit with hum from the finger. When we traced back to the source of the tuning voltage we found that R044 (12kΩ), which provides the link to the h.t. line, was open-circuit. **C.W.**

Dansai TAI1051

When this set was switched on using the standby button, the voltage at the collector of the power regulator transistor Q131 rose to 10·9V. It then dropped to zero, after about a second. Q131's output is fed to the line output transformer via D107, also to the line driver stage. The print goes around the edge of the panel, to a wire link between the transformer and the line output transistor's heatsink. This link hadn't been fitted correctly – it hadn't been pushed through the panel before being soldered. Fitting the link correctly restored normal operation. **C.W.**

JVC 7170GB

This ancient portable had poor sync, with the picture rolling on scene changes and the colour dropping out on some channels. Checks in the sync section revealed that R216 (470Ω) had gone high to almost twice its correct value. A replacement restored solidly locked pictures, the set working perfectly despite its age. They don't make 'em like that any more! **C.W.**

Philips 17CE1230 (CP90 Chassis)

This portable's remote control range was very poor. The cause turned out to be the TDA3047 RC receiver chip. After replacing it the range was excellent. **J.P-F.**

Bush 2321T

The symptoms produced by this set were most peculiar. Sometimes it would come on normally and stay on; sometimes it would come on, trip off and go totally dead; usually it would start up then, after just a couple of seconds and often before the picture put in an appearance, it would trip to standby with faint thumps from the loudspeaker. In fact there were two faults competing for our attention! The mains input plug to the mother board was badly crimped. And C802 (100µF, 16V), which couples the drive to the base of the chopper transistor, had gone low in value. **J.P-F.**

Binatone 01/9014

There was no life in the power supply. The cause was traced to R622 which supplies the start-up voltage. **J.P-F.**

Akura CX10 (Nikkai Baby 10)

There was normal sound but the line output transistor Q403 was overheating and there was no raster. The cause of the trouble was traced to D411 (FR155), which produces the 160V supply for the RGB output stages. It was very leaky. **J.P-F.**

Ferguson D14R (TX805 Chassis)

This was far too new a set for us to be familiar with the chassis, and we didn't have the manual in stock. The problem was that the set was stuck in the standby mode, with no voltages on the secondary side of the chopper power supply. Checks brought us to RP85 (270Ω) which was open-circuit. There was no apparent cause for its early failure. **S.L.**

Goodmans CTV20XRT

There was very little contrast. The on-screen display gave a normal indication, but the voltage at pin 6 of the TDA3562A colour decoder chip IC800 was low, at 1·3V, and didn't vary. After looking at the relevant circuit diagram we checked back to the beam limiter section where R414 (33kΩ) was found to be open-circuit. When this had been replaced the contrast control voltage could be varied between 2·95V (full) and 1·9V (zero). **S.L.**

Panasonic Alpha 2 Chassis

There was no picture because the tube's heater supply was missing. Inspection around the line output transformer revealed a crack in the PCB, though this didn't affect the heater supply – what did was the fact that the winding between pins 7 and 10 was open-circuit, presumably caused by the impact that had damaged the board. As a test I wound a small coil of wire around the transformer's core to provide a heater supply. **N.B.**

Grundig TVR5504

The TV section of this combined unit was in trouble. It would either come on with an over-bright raster and flyback lines then return to standby, or would come on with no raster. The cause of the fault was a dry-joint at the cathode of D617. **N.B.**

Mitsubishi CT2206BX

This set was dead with the 2A fuse F901 black and Q991 (2SC1114) short-circuit. There was a very low resistance reading across the h.t. line. The cause was traced to the MB1F EW modulator diode D579, which was very leaky, and the 2SC2073 EW modulator driver transistor Q491, which was short-circuit collector-to-emitter. **N.B.**

Salora 20L37

This set was arcing, the symptoms being a line across the screen and an audible addition to the sound. The cause of the trouble was dry-joints at one end of both C512 and R606. This arcing had led to the destruction of the MDA2062 memory chip, which couldn't recall anything. **N.B.**

Saisho CT14R

This set wouldn't tune in any stations. We soon found that the tuner's 12V supply was missing because of open-circuit print beneath the tuner. It had been eaten away by the fixative used to hold an 0·47µF electrolytic to the back of the board. Normal operation was restored by cleaning up this glue, repairing the print and replacing the capacitor – it's fitted across the tuning supply voltage. **N.B.**

Tashiko 16E891 (Tatung 160 Chassis)

There were teletext lines over the top half of the screen (slow field flyback). The cause was dry-joints on most legs of the field output chip, which is mounted on the rear chassis rail. You get the same problem with some Sony chassis. **N.B.**

Bang and Olufsen 5102 (7XXX Chassis)

This set had been to another dealer for a teletext fault, but there was still no teletext operation. When text was selected all you got was S100 in the top left corner and the page header about a third of the way up the screen. The number could be entered, but there was no clock. When I examined the text board I saw that at least two of the chips looked very new, as did most of the solder. Unfortunately it hadn't reached pin 13 of 65IC3, which was dry-jointed. **N.B.**

Logik 4298 (Ferguson TX100 Chassis, 110° Version)

This set was dead. For a change there was no short-circuit reading across the h.t. line. We found that D28 (BY299), which is in series with the h.t. feed to the line output transformer was short-circuit. When this was replaced there was a concave raster. R711 (2·7Ω, fusible) on the EW correction PCB had failed. It's in series with the emitter of the Darlington driver transistor TR73. **N.B.**

Ferguson TX85 Chassis

The complaint with this set was that it would come out of standby of its own accord. Noise from the SL486 IR preamplifier chip was found to be the cause of the trouble. **N.B.**

Ferguson TX9 Chassis (TDA4600 Version)

This set was fitted with the final version of the chassis, which has a TDA4600-based chopper power supply. Very occasionally the set would either fail to start up or go off at random. It would work normally for hours, days or even weeks. To cut a very long story short, the cause of the trouble was at pin 8 of the chopper transformer T1. It wasn't the usual dry-joint at the connection to the PCB: the actual winding termination to the pin itself was poorly jointed. The cure was to remove the transformer then scrape and resolder the connections. J.E.

Hitachi CPT2226 (NP81CQ Chassis)

Sound was present and there was a picture, but the chopper power supply transformer was screaming and there was severe line tearing across the centre portion of the raster. The mains bridge rectifier's reservoir capacitor C906 (220µF, 400V) was open-circuit. J.E.

Tandberg CTV3 Chassis

This set was dead. Fuse F725 had blown apart because the BU126 chopper transistor Q735 was short-circuit. Further checks showed that the BU208A line output transistor had also died. After renewing the above items we switched the set on. The sound came up but there was no raster and the e.h.t. tripler was very hot to touch. A new tripler finally got the set working. J.E.

Granada C59GZ5 (Salora K Chassis)

When this set had been on for about five seconds the picture would fluctuate rapidly in and out, followed by shut-down. Sometimes it wouldn't bother to produce a display, just tripping and going into standby. The Salora chassis in this set uses the Ipsalo-3 power supply, which is well known for failure of the S2000AF chopper transistor TB701 and the 22Ω, 5W filter resistor RB703. We repaired many suspect joints in the power supply and the line output section but this made no difference. The LF0059 hybrid chopper control chip HB600 then fell under suspicion. Fortunately, replacing it with one from a scrap set provided a cure. J.E.

Sanyo CTP3131

There was a blank raster with flyback lines. The first anode and focus controls worked normally but R464 (100Ω) was open-circuit. It's in the 85V supply to the RGB output stages. J.E.

Hitachi CPT2028 (NP83CQ Chassis)

There was no sound or picture though the power supply and the line output stage were working. R716 (2Ω) in the line output stage derived 12V supply was open-circuit. J.E.

Sanyo CTP3131

There was severe raster distortion at the sides, also fast vertical rolling. Because the mains bridge rectifier's reservoir capacitor C308 (100µF, 400V) was completely open-circuit there was a 400V peak-to-peak square waveform across it. A replacement produced a nice picture and the correct 1V peak-to-peak sawtooth ripple. J.E.

Long-distance Television

Roger Bunney

Autumn has brought little distant terrestrial TV reception, either via Sporadic E propagation or the traditional autumn tropospheric uplift. The only glimmer of TV-DX was reported by Peter Schubert, who received an SpE signal of unknown origin in Band I on September 16th.

There's more cheerful news from the other side of the globe. Todd Emslie, who lives near Sydney, Australia, reports remarkable results during their winter period, both with Band II f.m. radio reception and Band I TV reception. His Band II radio log includes Radio Djiido Montdo, New Calidonia, at 95·2MHz; 4IFO radio, a tourist information feed from Whitsunday Islands, at 88MHz, 10W; KSBS American Samoa at 92·1MHz, 3kW, a distance of 2,700 miles; VL2NI Norfolk Islands at 93·9MHz; and two Fijian transmitters at a distance of some 2,000 miles. The Band I listing includes numerous Malaysian, Philippine and Chinese transmitters, also American Samoa and possibly KGMV-TV ch. A3 (61·249MHz vision carrier) from Wailuku, Hawaii. Todd uses a National TV receiver which he has modified by including Philips G8 chassis selectivity modules and a Toshiba EG522F tuner.

Satellite Sightings

In early July I logged what I took to be an Italian prison riot at the Questra goal, Brescia, the feed being to Rome via SNG unit ITA 30. Maltese reader Charlot Zahra tells me that it was not a prison riot but an interrogation of a former anti-corruption magistrate at Brescia police HQ in northern Italy. The 'Questra', seen in the ITA 30 caption, was a misspelling in place of 'Questura', meaning police HQ.

On September 26th, during the late evening, Eutelsat II F4 (7°E) carried news for ABC, New York from Palermo. The coverage was of mafia trials with background information – some of the material showed extreme violence and was unlikely to have hit UK screens.

A refreshing change from the usual coverage from the Yugoslav area consisted of football inserts following the caption 'SKOPJE 28-9-95 DEWE TELEVISION u1', again via Eutelsat II F4, on the 28th. The carrier switched off at 2300, preceded by 'INTRAX HOL-9'. A conventional analogue signal provided the sound with the sports coverage, a welcome change from the sound-in-syncs you usually get with this satellite. A pan-European Quorum sales conference via this satellite (at 11·08GHz vertical) a few nights earlier also had conventional audio (at 6·6/7·4MHz).

John Dickaty is using, at his Bromborough, Wirral location, an Echostar 7700 receiver, a tracking 90cm dish, a Chaparral 0·7dB noise figure LNB and Lenco D2MAC decoder. The results, which I've seen on a video, are truly excellent. John can track from Turksat-1 at 42°E to PAS-1 at 45°W.

A mystery weather report by 'NTV' was seen at 1400 on September 23rd via the France Telecom transponder on Eutelsat II F1 at 13°E. It featured all the Russian regions from the Pacific across to Europe. The tape was then rewound and repeated. After a blank carrier, the transmission came to an end. Can anyone identify NTV and suggest the intended destination of the feed?

The Chris Eubank v. Steve Collins fight in mid-September was carried by Orion 1 at 45°W for Sky Sports, in the clear. The following afternoon (Sunday) I checked Hispasat at 30°W and found numerous sports programmes. At the same time the US Tennis Open was seen via Orion, the feed being to Hong Kong, presumably with onwards uplinking via Intelsat at 57°E. International sports fans will of course not overlook the various offerings via Intelsat K at 21·5W.

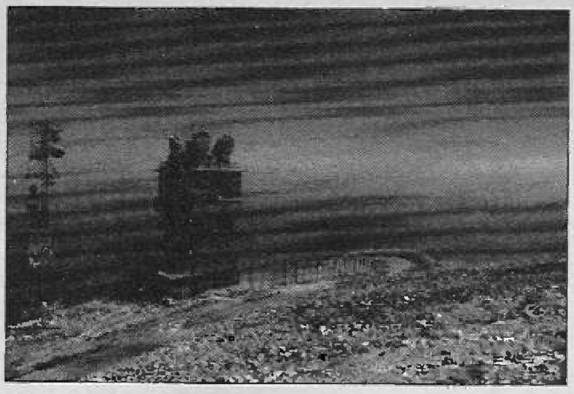
Bandula Gunasekera (Sri Lanka) reports strong C band reception from the PAS-4 satellite, with ESPN and the new Sony entertainment channel. He mentions that the Discovery Channel is being downlinked via Intelsat 704 at 66°E – the Goonhilly test pattern was previously carried. This is another strong signal. Other recently logged signals via 704 are the Indian channels YES and EETV. Insat 2B at 93·5°E is now transmitting CNNI across India at 4·17GHz (transponder C12).

News Items

Africa: South Africa's Independent Broadcasting Authority has recommended that SABC's third channel, NNTV, should become a commercial service. The Ugandan Minister of Information has arranged with South Africa for future satellite distribution of radio and TV services across the country.

Middle East: The existing MMDS network in Bahrain is to carry at least ten more channels. Over thirty channels will be available when the network is complete.

Left: A live TV feed from California to the UK via Intelsat K at 21·5°E. Centre: A TV reporter glances at his uplink SNG dish at a site in former Yugoslavia – picture received via Eutelsat II F3 at 16°E. Right: An expected news feed from Rome via Eutelsat II F1 at 13°E fails to appear!



A French Air Force radar station (right) and microwave relay tower with local relay TV aerial (left) at the dusty top of Mount Mentaux, Provence, France – height 1,909m. Photo from Bob Sibbald, Southampton.

India: The new DD3 terrestrial TV service is now available in the main population areas – Bombay, Calcutta, Madras and Delhi.

Digital TV: Latvia, Estonia and Lithuania plan to start digital broadcasting services using five or six frequency blocks. Latvia plans to make a start in 1997. The states are in talks with the European Union to establish a common single-decoder (apart from the smart card) digital broadcasting standard for Europe.

DAB has started in the UK, from five transmitters around London. The present plan is to extend services to the West Midlands in March 1996; the centre south/Oxford in August 1996; Liverpool, Manchester, Yorkshire and North Wales in March 1997; the North East in August 1997; South Wales and the Bristol Channel in November 1997; Central Scotland in January 1998; and Northern Ireland in February, 1998.

Singapore: A fourth terrestrial service, 'Premiere 12', is now in operation.

Sunspots: We are now in the declining section of solar cycle 22. Recent sightings of a sunspot cluster in the 'right' part suggest that cycle 23 may start sooner than expected.

Transmitters

The Kiel ch. E44 allocation has been transferred to Hamburg.

There are now fourteen Canal Plus Polska transmitters in operation. Apart from Opole ch. E10 all the transmitters operate at u.h.f., with 1kW e.r.p. or less. Polsat is now available via fourteen u.h.f. transmitters between chs. R35 (Warszawa) and R60 (Tarnow).

New local transmitters include NTV ch. E38 in Norway and TVS KANAL-1 chs. E51 and E58 in Denmark.

The Dutch Nederland 2 transmitters all now use the modified 16:9 PM5544 test pattern, with the identifications 'Nozema Ned 2' at the top and 'PALplus 16:9' below. The Belgian BRTRN TV1 and TV2 services have also adopted the 16:9 PM5544 pattern.

EBU TV Station List No 40

The official European Broadcasting Union *List of Television Stations No. 40* will be available in March 1996. It's a massive book that provides details of all transmitters in Europe, from milliwatt to megawatt powers. Orders are now being accepted by EBU Publications, Case Postale 67, CH-1218 Grand-Saconnex GE, Switzerland. The publication is priced at 70 Swiss francs in either book form or on an IBM compatible diskette – a user guide for the diskette costs an extra 15 Swiss francs. The prices include postage.

Echosphere SR50 Repairs

The Echosphere SR50 receiver is extremely popular with satellite enthusiasts. Although it's no longer in production, many are available second-hand. I use two myself, and have had the same fault with both of them.

Flashing on picture, tuning drift and/or abrupt loss of programme seems to be a common problem. Tapping the tuning control knob will provide a clue. The cause is that the tuning potentiometer's slider is making intermittent contact. A quick squirt of Ambersil or other cleaner will provide a temporary cure, but the flashing intermittency will return. It's best to replace the miniature potentiometer with a standard (larger) control of the same value – 10kΩ linear. Though this may sound simple, there are several problems to overcome. I hope the following notes will help.

Remove the main cover by unscrewing four cross-headed screws, two at each side of the receiver. Lift the cover gently, withdrawing it towards the rear and upwards. The front panel escutcheon fits over all the knobs and switches: the controls themselves are bolted to the receiver's chassis. To remove the plastic escutcheon, unscrew the three countersunk cross-headed screws along the top side (revealed when the outside cover has been taken off) and the matching three screws along the bottom side. The plastic face can then be pulled forwards – but wait. Three LEDs and the signal-strength meter are attached to the face plate. It's a simple task to trace out the wire connections and unsolder them. Take care not to overheat the small diode between two of the meter's pins – and make a drawing of the connections before you unsolder them.

The potentiometer can now be replaced. Remove the main tuning knob by pulling forwards gently until it is released. Make a note of the connections, then unsolder them and unbolt the potentiometer. As the original miniature control has a smaller spindle than the standard type, a cone-cutter is required to widen the hole. Do this slowly, so that you don't make the hole too wide and that there's central fixing between the tuning knob and the plastic face plate, with no friction between them. Compare the spindle lengths of the original and the replacement potentiometers. Match and cut to size. Throw the old control away, then fit and solder in the new one. Refit the plastic faceplate, screw it to the chassis then resolder the wiring.

The tuning knob's spindle hole now needs to be enlarged. You can do this by hand – turn a twist-drill bit of the correct diameter in the relatively soft plastic, then ream out just sufficiently to accommodate the new spindle length. Push the knob on, aligning the calibration mark with the dotted scale. Repair completed.

Thinking that the small bulb in the signal meter would eventually blow, I decided to fit two 12V bright LEDs in series across the respective meter connection pins. Dismantle the meter when the front panel is free – it's stuck on with double-sided tape. Carefully prize off the cover, unsolder the bulb and fit the two LEDS in series, ensuring that they don't impede the meter movement/needle. Get them the right way round! The scale will not be as brightly lit – just a green glow – but this is sufficient and avoids future bulb failure. The 12V LEDs have integral surge resistors.

In over three years' use these are the only things I've had to do with the SR50. Should you get a noisy potentiometer problem with the later RR50 similar steps can be taken, but note that the front panel component mounting differs.

Satellite TV

Good news for Dutch people living outside the country: from next year NOS is to provide a satellite service with a footprint that covers Europe. The 'best of Dutch' programme will have a format similar to TV5/Deutche Welle.

Associated Press and NTL are now using MPEG-2 digital compression for AP-TV's world coverage. The feed is still via Eutelsat II F3 at 13°, but is invisible without a digital decoder.

TLI London International has commissioned a dedicated earth station for use with the Orion-1 satellite at 37·5°W. It's offering up and down links across North America and Europe.

Finally some news in brief. Deutsche Welle has booked a ten-year lease aboard Intelsat 702 for radio/TV transmissions to Africa. German broadcaster Pro 7 has booked three transponders on Astra 1E, F and G for future digital broadcasting. The EU is seeking agreement on a single-box encryption standard. Arianespace is to launch the Swedish Sirius-2 satellite at 5°E in the summer of 1997: its 32 transponders will be used for TV (direct-to-home and cable) and data communications across Northern Europe. NHK Tokyo is to use PanAmSat's PAS-4 satellite at 68·5°E for news gathering and programme distribution. Australian Pay-TV operator Galaxy has started MPEG-2 test transmissions for its DTH subscription service via the Optus-B3 satellite: it assumes that 65cm dishes will be used in the well-populated eastern regions of the country, with up to 1·5m dishes in more remote areas. The recently launched JSAT-3 craft, at 128°E with twelve C-band and 28 Ku-band transponders, is likely to become a powerful force in East Asia and Australasia. It is another in the growing list of satellite downlink providers such as PAS, Rimsat. Palapa, AsiaSat, Insat, Measat and Chinasat, along with Intelsat and the various Gorizont craft.

Answer to Test Case 396

– see page 119 –

The sort of interference breakthrough described on page 119 is not unusual, though very often a CB rig rather than an RT set is the source of the trouble. Despite the very different frequencies of the v.h.f. transmitter and the u.h.f. TV channels to which the victim tuned, if the interfering r.f. field is strong enough some of it will find its way, by sheer brute force, to the receiver's front-end, where it will drive the r.f. amplifier transistor way beyond its normal operating point. The resultant non-linear operation jangles and mixes up all the carriers present. completely destroying signal reception.

Even so, the use of a blocking filter of the 'notch' or 'brick-wall' type tried by Stick-em-Up usually works, by reducing the interference signal to a level at which it is too low to cause mischief. It would have done so for Mrs Simes's installation had Tex Rogers realised that the cross-modulation was occurring within the masthead amplifier, up-stream from the position he'd selected for the wonder filter which was thus unable to provide any significant benefit.

The solution of course was to weatherproof the filter and fit it between the output from the u.h.f. aerial and the mast-head amplifier's input. Once this had been done, using an ugly but effective wrapping of thick plastic sheeting to make the filter weatherproof, Mrs Simes's picture had become a little snowier but was now immune from the calls to pick up in the High Street and drop the party at the station.

Stick-em-Up got its money – in the end.

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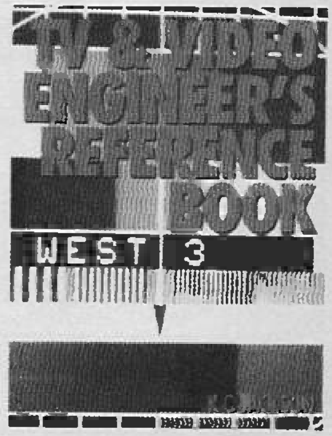

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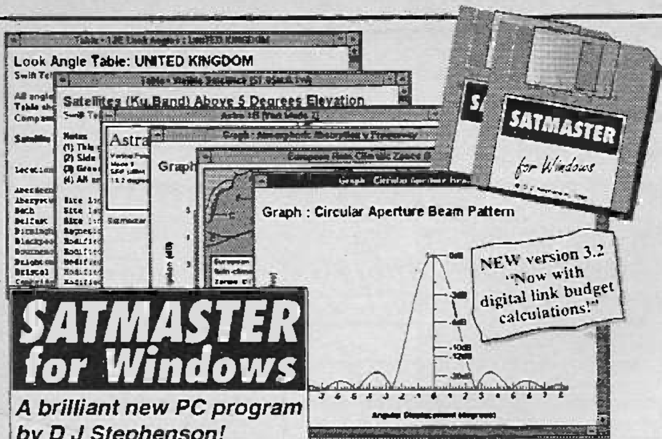

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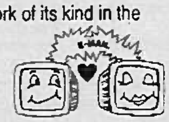

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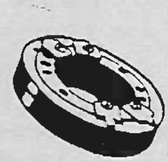

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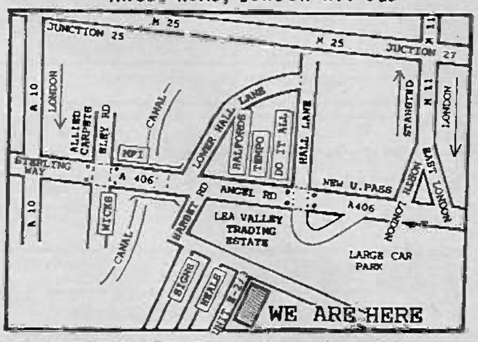

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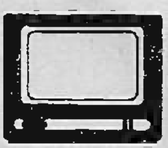

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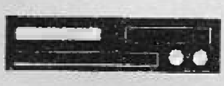

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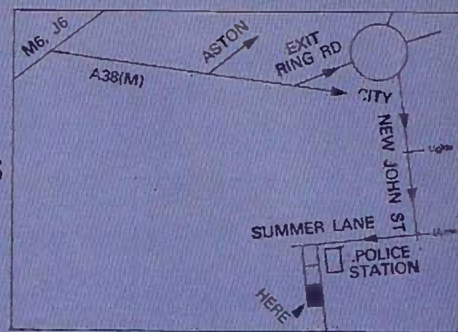

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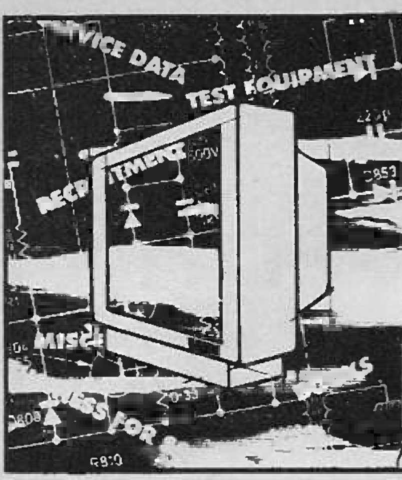

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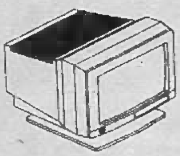

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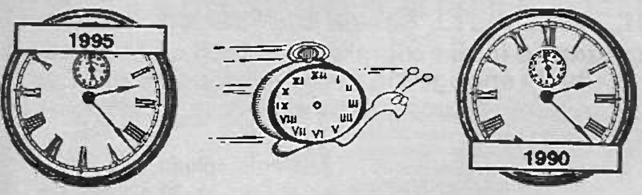

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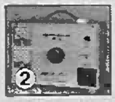

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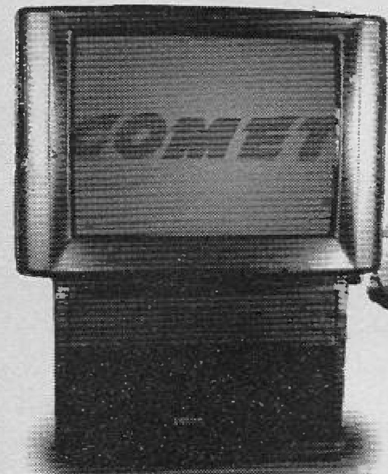

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AMSTRAD Nicam head and drum £12.00

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