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TELEVISION

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JANUARY 1996 £2.35

A REED BUSINESS PUBLICATION

Toshiba's V3 VCRs

Tatung 120 chassis servicing

Luminance playback techniques

Test source for LNBs

Japan's Electronics Show report

Television reader offer DMM for just £14. 95

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NEXT MONTH

Digital Radio from Space Digital sound came to us in 1982, with the compact disc. Since then the domestic uses of digital audio have burgeoned, and now we have radio services from satellite transmitters. Eugene Trundle takes a look at the technology involved. **Servicing PC Monitors** Some introductory comments on this relatively new line for TV service engineers, along with some feedback on faults encountered with various monitors. **VCR Signal Processing** Next month's installment in this series deals with chroma signal processing in the record mode. **Amstrad SRD510 1D Conversion** A simple modification to enable these receivers to provide reception from the Astra 1D satellite. **Servicing the Tatung 190/195 Series Chassis** How to tackle fault experienced with these popular receivers, which feature an FET chopper power supply. **A Visit to Sharp** George Cole takes a look at the latest technology from Sharp, the world's largest LCD manufacturer.

Our February issue will be published on January 17th

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TRANSISTORS / LINEAR ICs

Part	Price
AAY32	9p
AC107	40p
AC125	30p
AC126	30p
AC127	30p
AC128K	40p
AC141K	45p
AC176	22p
ACY18	48p
ACY19	48p
AD149	60p
AF125	50p
AF139	30p
AF239	30p
BB105B	18p
BB205B	24p
BC107	8p
BC108	8p
BC109	8p
BC109C	10p
BC140	20p
BC141	20p
BC142	20p
BC143	20p
BC147	8p
BC149	8p
BC159	8p
BC160	30p
BC171	10p
BC172	10p
BC177	14p
BC178	14p
BC179	14p
BC182	7p
BC182L	7p
BC183	7p
BC183L	7p
BC184	7p
BC184L	7p
BC212	7p
BC212L	7p
BC213	7p
BC213L	7p
BC214	7p
BC214L	7p
BC237	7p
BC238	7p
BC239	7p
BC300	20p
BC301	20p
BC302	20p
BC303	20p
BC304	25p
BC327	7p
BC328	7p
BC337	7p
BC338	7p
BC441	28p
BC446	8p
BC477	18p
BC516	22p
BC537	25p
BC546	8p
BC547	8p
BC548	8p
BC549	8p
BC550	8p
BC556	8p
BC557	7p
BC558	8p
BC559	8p
BC560	8p
BC637	20p
BC639	20p
BC640	20p
BCY33	200p
BCY34	200p
BCY70	16p
BCY71	16p
BCY72	16p
BD115	30p
BD124P	50p
BD131	25p
BD132	25p
BD133	50p
BD135	20p
BD136	20p
BD137	20p
BD138	20p
BD139	20p
BD140	20p
BD144	90p
BD157	38p
BD166	30p
BD175	30p
BD177	30p
BD179	32p
BD181	45p
BD182	60p
BD184	60p
BD187	30p
BD201	33p
BD202	38p
BD203	42p
BD204	42p
BD222	31p
BD225	31p
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BD233	30p
BD234	32p
BD235	28p
BD236	30p
BD237	21p
BD238	24p
BD239	30p
BD240	40p
BD241A	50p
BD243A	50p
BD244	50p
BD245	50p

Part	Price
BD246A	50p
BD265	45p
BD267	45p
BD269	45p
BD278	50p
BD311	100p
BD314	100p
BD315	150p
BD317	150p
BD331	40p
BD332	40p
BD361	60p
BD362	60p
BD370	30p
BD371	30p
BD410	50p
BD433	28p
BD434	30p
BD435	31p
BD436	30p
BD437	28p
BD438	36p
BD439	40p
BD440	40p
BD441	40p
BD533	50p
BD534	38p
BD535	38p
BD536	38p
BD537	40p
BD538	40p
BD643	50p
BD645	50p
BD647	50p
BD649	50p
BD675	40p
BD676	40p
BD677	38p
BD678	40p
BD679	40p
BD680	40p
BD681	45p
BD682	45p
BD705	50p
BD707	50p
BD709	50p
BD711	50p
BD736	50p
BD826	50p
BD828	50p
BD839	55p
BD897	50p
BD899	50p
BD977	50p
BDX33	60p
BDX65	80p
BDW24	55p
BDW93	50p
BDW94	50p
BDY92	100p
BF137	35p
BF167	30p
BF181	18p
BF183	20p
BF195	7p
BF199	8p
BF200	16p
BF225	30p
BF240	16p
BF245	25p
BF254	15p
BF255	12p
BF256	18p
BF257	18p
BF259	18p
BF262	25p
BF270	18p
BF273	15p
BF311	21p
BF336	20p
BF337	20p
BF338	20p
BF362	30p
BF367	13p
BF371	17p
BF421	18p
BF422	21p
BF423	25p
BF455	12p
BF458	19p
BF462	25p
BF471	28p
BF472	28p
BF479	30p
BF494	16p
BF495	16p
BF596	16p
BF615	30p
BF617	30p
BF760	40p
BF763	40p
BF870	22p
BF871	22p
BF960	30p
BF961	35p
BF964	38p
BFR90	85p
BFR91	99p
BFT43	30p
BFX29	20p
BFX84	20p
BFX85	20p
BFX87	15p
BFX88	15p
BFX89	60p
BFY50	14p
BFY51	14p
BFY52	14p
BFY56	25p

Part	Price
BFY64	25p
BFY90	45p
BLY48	85p
BR100	14p
BR103	37p
BR303	85p
BSS74	33p
BSX20	15p
BT100A	70p
BT106	180p
BT109	90p
BT119	100p
BT146	99p
BTY79	140p
BU105	80p
BU108	100p
BU109	80p
BU110	90p
BU111	100p
BU124	60p
BU126	65p
BU180	100p
BU184	100p
BU204	65p
BU205	70p
BU206	100p
BU208	70p
BU208A	75p
BU208AT	200p
BU208D	130p
BU209	90p
BU225	120p
BU226	120p
BU312	90p
BU325	55p
BU326A	75p
BU406	60p
BU406D	85p
BU407	55p
BU407D	75p
BU408	60p
BU408D	75p
BU409	85p
BU426A	70p
BU500	100p
BU505	90p
BU505D	90p
BU505DF	90p
BU506	100p
BU506D	70p
BU506DF	120p
BU508A	70p
BU508AF	95p
BU508D	90p
BU508DF	115p
BU508V	110p
BU508VF	100p
BU526	75p
BU536	100p
BU546	125p
BU608	120p
BU626	120p
BU705	130p
BU706DF	175p
BU706F	150p
BU801	70p
BU806	70p
BU807	60p
BU902	110p
BU903	110p
BU920	100p
BU922	110p
BU930	130p
BU2508A	130p
BU2508AF	130p
BU2508D	130p
BU2508DF	150p
BU2520AF	225p
BU2520DF	225p
BU2525AF	325p
BUH515	200p
BUT11AF	55p
BUT12	80p
BUT56A	100p
BU18	80p
BU18AF	80p
BUX10	150p
BUX11	200p
BUX12	150p
BUX20	350p
BUX21	450p
BUX22	450p
BUX37	220p
BUX40	210p
BUX41	200p
BUX42	200p
BUX47A	220p
BUX48A	150p
BUX80	180p
BUX84	50p
BUX85	50p
BUX86	30p
BUX87	50p
BUX98A	350p
BU69A	200p
BUY71	250p
BUZ11	200p
BUZ71	75p
BUZ80	200p
BY448	20p
BYT11	25p
C106D	28p
IRF630	150p
J174	38p
J300	50p
MJ900	200p
MJ1000	200p
MJ1001	200p
MJ10012	300p
MJ15003	250p

Part	Price
MJ15004	300p
MJ2501	100p
MJ2955	55p
MJ3000	100p
MJ3001	100p
MJE29A	30p
MJE30A	30p
MJE340	25p
MJE350	80p
MJE520	30p
MP8112	45p
MPSA05	15p
MPSA06	15p
MPSA13	15p
MPSA20	15p
MPSA42	15p
MPSA43	15p
MPSA70	15p
MPSA92	20p
MPSA93	20p
MR510	35p
MR856	36p
OC28	350p
OC29	250p
OC35	350p
OC36	250p
OC45	50p
OC200	180p
R2008B	100p
R2010B	100p
S2000A3	175p
S2000AF	175p
S2055A	175p
S2055AF	200p
S2530A	100p
S2800M	72p
TIP29	15p
TIP29A	22p
TIP29C	25p
TIP29E	40p
TIP30	25p
TIP30C	25p
TIP31A	22p
TIP31C	27p
TIP32	24p
TIP32A	21p
TIP32C	28p
TIP33	50p
TIP33C	60p
TIP34	50p
TIP34C	60p
TIP35C	65p
TIP36C	65p
TIP41A	20p
TIP41C	22p
TIP42A	20p
TIP42C	22p
TIP47	40p
TIP48	40p
TIP50	60p
TIP51	80p
TIP52	80p
TIP54	85p
TIP105	65p
TIP106	65p
TIP107	65p
TIP110	40p
TIP111	40p
TIP112	35p
TIP112H	50p
TIP115	30p
TIP116	30p
TIP117	30p
TIP120	37p
TIP121	35p
TIP122	30p
TIP125	30p
TIP126	40p
TIP127	35p
TIP130	30p
TIP131	30p
TIP132	30p
TIP141	65p
TIP142	75p
TIP145	50p
TIP146	70p
TIP147	80p
TIP150	90p
TIP151	60p
TIP2955	50p
TIP3055	50p
TIPL763A	200p
TIPL791A	80p
TIS61	15p
TIS90	15p
TIS93	20p
VK1010	88p
VN10KM	60p
ZTX107	11p
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
2N1613	24p
2N1711	24p
2N1893	30p
2N2102	50p
2N2218A	24p
2N2219	24p
2N2221	23p
2N2222	23p
2N2369	15p
2N2484	15p
2N2646	40p
2N2904	20p
2N2905	20p
2N2906	18p
2N2907	18p
2N3019	28p
2N3053	18p
2N3054	40p
2N3055	38p
2N3055H	50p
2N3442	85p
2N3702	9p
2N3703	9p
2N3704	9p
2N3705	9p
2N3706	9p
2N3707	9p
2N3710	12p
2N3711	12p
2N3771	85p
2N3772	90p
2N3773	100p
2N3799	18p
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

Part	Price
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
SR2M	60p

I.C. SOCKETS

Part	Price
8 PIN	5p
14PIN	6p
16PIN	7p
18PIN	10p
20PIN	12p
22PIN	13p
24PIN	14p
28PIN	16p
40PIN	18p

ZENERS

Part	Price
400 mWatts	
2V7 to 39V	5p
1.3 Watts	
2V7 to 39V	9p

CRYSTALS

Part	Price
Freq in MHz	
2.4576	180p
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

Part	Price
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

Part	Price
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

Part	Price
3mm	
RED	5p
YELLOW	8p
GREEN	8p
5mm	
RED	5p
YELLOW	8p
GREEN	8p

RECTANGULAR LEDs

Part	Price
5mm × 2.5mm	
RED	5p
YELLOW	8p
GREEN	8p

OPTO COUPLERS

Part	Price
4N37	48p
4N38	68p
AN203	210p

BRIDGE RECTIFIERS

Part	Price
W005 1A/50V	16p
W01 1A/100V	18p
W02 1A/200V	19p
W04 1A/400V	21p
W06 1A/600V	23p
W08 1A/800V	28p
BR81D 2A/100V	33p
BR82D 2A/200V	33p
BR84D 2A/400V	37p
BR86D 2A/600V	43p
BR88D 2A/800V	43p
BR32 2A/200V	43p
BR34 2A/400V	43p
BR36 2A/600V	44p
BR62 6A/200V	80p
BR64 6A/400V	72p
BR251 25A/100V	150p
BR252 25A/200V	165p
BR254 25A/400V	185p
BR256 25A/600V	200p
BR258 25A/800V	240p
BR351 35V/100V	185p
BR352 35V/200V	200p
BR354 35V/400V	220p
BR356 35V/600V	230p
BR358 35V/800V	260p
BY164 1.5A/ 100V	40p
BY176 1.5A/ 800V	40p

TRIACS

Part	Price
TIC206D 4A/400V	60p
TIC225D 6A/400V	69p
TIC226D 8A/400V	68p
TIC236D 12A/400V	85p
TIC246D 16A/400V	105p
TIC253D 20A/400V	190p
TIC263D 25A/400V	205p

THYRISTORS

Part	Price
2N5061 0.8A/60V	20p
TIC116C 8A/300V	59p
TIC116D 8A/400V	70p
TIC126D 12A/400V	75p
TIC126M 12A/600V	90p
C106D 4A/400V	28p
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

Part	Price
Z80ACPU	100p
Z80ADMA	200p
Z80ACTC	140p
Z80ASIO-1	210p
Z80ASIO-2	210p
75107	65p
75110	75p
75113	100p
75122	110p
75154	100p
75162	700p
75182	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
6502A	360p
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

Part	Price
AN203	210p
AN210	165p
AN214Q	170p
AN228	280p
AN252	150p
AN259	250p
AN262	140p
AN271	230p
AN274	250p
AN301	330p
AN303	250p
AN304	360p
AN315	210p
AN316	350p
AN360	100p
AN362	140p
AN366	150p
AN610	160p
AN3312	350p
AN3821K	600p
AN3822K	600p
AN3990K	300p
AN3991K	400p
AN5025	250p
AN5033	400p
AN5132	250p
AN5150	400p
AN5151	600p
AN5215	100p
AN5256	150p
AN5262	175p
AN5265	80p
AN5352	600p
AN5411	450p
AN5421	150p
AN5429	420p
AN5512	100p
AN5515	160p
AN5520	550p
AN5521	100p
AN5612	200p
AN5613	200p
AN5615	300p
AN5620	250p
AN5622	275p
AN5625	400p
AN5712	180p
AN5722	140p
AN5730	160p
AN5732	120p
AN5753	130p
AN5763	450p
AN5790	240p
AN5791	225p
AN5836	450p
AN5900	130p
AN6135	120p
AN6247	200p
AN6270	400p
AN6300	600p
AN6306	380p
AN6320	180p
AN6332	320p
AN6341	200p
AN6344	440p
AN6350	610p
AN6359	500p
AN6360	320p
AN6362	400p
AN6371	350p
AN6387	480p
AN6884	200p
AN7105	170p
AN7110	75p
AN7114	120p
AN7115	110p
AN7116	90p
AN7120	100p
AN7130	75p
AN7140	170p
AN7145	195p
AN7146	210p
AN7154	180p

Part	Price
AN7156	240p
AN7168	200p
AN7178	180p
AN7222	75p
AN7254	150p
AN7256	250p
AN7310	60p
AN7311	90p
AN7410	150p
AY3-1015	290p
AY3-1270	800p
AY3-1350	450p
AY3-8910	360p
AY3-8912	400p
BA301	55p
BA311	80p
BA313	60p
BA333	80p
BA401	60p
BA402	50p
BA511	145p
BA514	160p
BA516	150p
BA521	100p
BA524	240p
BA526	180p
BA527	95p
BA532	100p
BA534	220p
BA536	150p
BA546	160p
BA612	120p
BA656	110p
BA658	350p
BA684	400p
BA685	400p
BA1310	160p
BA1320	75p
BA1330	120p
BA1360	160p
BA4403	220p
BA5101	350p
BA5102	140p
BA5204	200p
BA5402	180p
BA5406	180p
BA5408	180p
BA6104	250p
BA6208	175p
BA6209	85p
BA6304	120p
BA6305	140p
BA6410	220p
BA6411	250p
BA6993	150p
BA7001	150p
BA7004	200p
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BA7755	150p
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CA3189E	230p
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CA3260E	170p
CA3290E	150p
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CX150B	325p
CX175	325p
CX187	825p
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CX868	525p
CX877	300p
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HA11724	650p
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Part	Price
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HA13412	600p
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HA17524	250p
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ICL7660	240p
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LM335Z	120p
LM339	35p
LM348	50p
LM358	45p
LM380	80p
LM381	150p
LM382	130p
LM386	60p
LM387	100p
LM393	45p

JAPANESE TRANSISTORS

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Part	Price
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Part	Price
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2SD774	30p
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2SD788	30p
2SD789	20p
2SD792	400p
2SD794	33p
2SD795A	140p
2SD811	450p
2SD819	200p
2SD820	250p
2SD821	550p
2SD822	290p
2SD826	30p
2SD836	60p

Part	Price
2SD836A	60p
2SD837	55p
2SD838	300p
2SD841	110p
2SD844	200p
2SD845	250p
2SD850	170p
2SD856	48p
2SD858	250p
2SD863	23p
2SD864	200p
2SD866	120p
2SD866A	140p
2SD868	260p
2SD870	190p
2SD871	300p
2SD879	60p
2SD880	40p
2SD882	25p
2SD892A	100p
2SD894	35p
2SD895	200p
2SD896	200p
2SD900	400p
2SD905	450p
2SD916	130p
2SD917	300p
2SD921	320p
2SD923	360p
2SD946	120p
2SD947	100p
2SD950	300p
2SD951	290p
2SD957A	520p
2SD958	60p
2SD965	35p
2SD970	170p
2SD973	60p
2SD973A	70p
2SD985	120p
2SD986	120p
2SD1012	40p
2SD1020	40p
2SD1021	120p
2SD1022	400p
2SD1024	130p
2SD1030	75p
2SD1031	70p
2SD1046	200p
2SD1047	180p
2SD1051	130p
2SD1060	130p
2SD1062	150p
2SD1063	200p
2SD1064	250p
2SD1065	160p
2SD1069	150p
2SD1071	450p
2SD1073	350p
2SD1088	150p
2SD1094	520p
2SD1110	225p
2SD1111	20p
2SD1113	225p
2SD1128	200p
2SD1133	100p
2SD1135	75p
2SD1138	50p
2SD1140	40p
2SD1142	350p
2SD1148	175p
2SD1159	90p
2SD1160	150p
2SD1163A	220p
2SD1164	75p
2SD1168	270p
2SD1169	280p
2SD1173	350p
2SD1185	400p
2SD1186	400p
2SD1187	250p
2SD1189	55p
2SD1190	150p
2SD1191	120p
2SD1192	90p
2SD1196	150p
2SD1197	150p
2SD1207	40p
2SD1210	280p
2SD1211	120p
2SD1218	75p
2SD1223	75p
2SD1225	120p
2SD1227	40p
2SD1229	250p
2SD1237	300p
2SD1246	20p
2SD1247	40p
2SD1248	270p
2SD1251	180p
2SD1263	90p
2SD1264	55p
2SD1265	75p
2SD1266	180p
2SD1267	55p
2SD1271	55p
2SD1271A	225p
2SD1272	200p
2SD1273	50p
2SD1275	50p
2SD1276	60p
2SD1277	190p

Part	Price
2SD1279	600p
2SD1288	175p
2SD1289	250p
2SD1291	400p
2SD1292	60p
2SD1297	300p
2SD1302	20p
2SD1308	80p
2SD1309	140p
2SD1310	140p
2SD1313	1000p
2SD1326	200p
2SD1328	60p
2SD1347	70p
2SD1348	65p
2SD1350	150p
2SD1376	125p
2SD1379	100p
2SD1380	100p
2SD1384	50p
2SD1390	350p
2SD1391	250p
2SD1392	150p
2SD1395	150p
2SD1396	120p
2SD1397	120p
2SD1398	120p
2SD1399	300p
2SD1400	280p
2SD1402	150p
2SD1406	60p
2SD1407	60p
2SD1408	125p
2SD1409	170p
2SD1412	75p
2SD1413	60p
2SD1415	190p
2SD1417	125p
2SD1425	260p
2SD1426	160p
2SD1427	180p
2SD1428	220p
2SD1429	410p
2SD1430	280p
2SD1431	400p
2SD1432	400p
2SD1433	750p
2SD1438	140p
2SD1439	165p
2SD1441	280p
2SD1445	200p
2SD1450	60p
2SD1451	260p
2SD1452	350p
2SD1453	140p
2SD1455	250p
2SD1457	165p
2SD1459	120p
2SD1468	60p
2SD1479	200p
2SD1487	225p
2SD1491	100p
2SD1494	300p
2SD1496	350p
2SD1497	230p
2SD1497-02	350p
2SD1505	120p
2SD1507	60p
2SD1509	100p
2SD1511	100p
2SD1519	250p
2SD1521	70p
2SD1541	350p
2SD1548	450p
2SD1554	170p
2SD1555	170p
2SD1556	400p
2SD1564	100p
2SD1565	75p
2SD1571	170p
2SD1572	100p
2SD1576	250p
2SD1577	250p
2SD1579	120p
2SD1589	60p
2SD1590	100p
2SD1591	310p
2SD1593	125p
2SD1595	160p
2SD1608	210p
2SD1609	70p
2SD1632	500p
2SD1637	50p
2SD1647	40p
2SD1649	260p
2SD1650	180p
2SD1651	150p
2SD1663	450p
2SD1666	90p
2SD1667	120p
2SD1668	120p
2SD1677	300p
2SD1730	350p
2SD1732	400p
2SD1739	275p
2SD1740	125p
2SD1748	90p
2SD1760	80p
2SD1762	50p
2SD1773	160p
2SD1783	100p
2SD1796	180p

Part	Price
2SD1815	100p
2SD1825	60p
2SD1843	100p
2SD1846	350p
2SD1849	325p
2SD1850	325p
2SD1858	40p
2SD1877	250p
2SD1878	230p
2SD1879	275p
2SD1884	300p
2SD1886	450p
2SD1887	450p
2SD1910	280p
2SD1911	300p
2SD1913	50p
2SD1929	60p
2SD1939	75p
2SD1941	500p
2SD1959	280p
2SD1961	50p
2SD1978	50p
2SD1984	450p
2SD2012	50p
2SD2125	225p
2SD2333	300p
2SJ48	425p
2SJ49	425p
2SJ50	425p
2SJ56	700p
2SJ74	60p
2SJ75	280p
2SJ76	220p
2SJ77	350p
2SJ79	225p
2SJ103	75p
2SJ108	60p
2SJ115	525p
2SJ117	550p
2SJ119	700p
2SJ161	650p
2SJ162	680p
2SK19	45p
2SK40	50p
2SK49	50p
2SK55	100p
2SK68	100p
2SK73	75p
2SK106	40p
2SK107	40p
2SK118	50p
2SK125	100p
2SK133	650p
2SK134	415p
2SK135	415p
2SK147	160p
2SK150	150p
2SK163	40p
2SK168	40p
2SK176	800p
2SK192	45p
2SK195	150p
2SK197	140p
2SK214	170p
2SK216	200p
2SK218	400p
2SK240	140p
2SK312	750p
2SK315	70p
2SK320	120p
2SK323	130p
2SK386	600p
2SK405	450p
2SK413	500p
2SK415	500p
2SK429	180p
2SK511	450p
2SK513	325p
2SK531	350p
2SK534	700p
2SK537	900p
2SK538	350p
2SK539	1100p
2SK555	400p
2SK556	500p
2SK557	400p
2SK566	475p
2SK695	550p
2SK719	300p
2SK724	600p
2SK725	600p
2SK727	800p
2SK735	600p
2SK758	300p
2SK787	900p
2SK794	500p
2SK872	650p
2SK903	500p
2SK1057	600p
2SK1058	800p
2SK1117	250p
2SK1118	225p
3SK45	100p
3SK51	100p
3SK59	100p
3SK74	50p
3SK77	50p
3SK81	50p
3SK85	160p
3SK88	70p
3SK121	150p

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REPLACEMENT VIDEO HEADS

AIWA

Model	Price
AV66/AV77	1200p
G700	1100p
G900	1500p

AKAI

Model	Price
VS105, 112, 115, 116, 125, 126, 201, 202, 205, 220, 240, 244, 245, 247, 248, 250, 301, 303, 304, VSP8, VSP82	1200p
VP7100, VS9300, VS9500, VS9800	650p
VP77, VP88, VP7100, VP7200, VS9700, VS9800	1200p
VS1, VS2, VS3, VS4, VS5, VS10, VSP1	1350p
VS33, VS35, VS37, VS38, VS53, VS55, VS66, VS765, VS767, VS768	2100p
VS512, VS515, VS516	2800p
VS465	2300p
VS11, VS12	1200p
VS6, VS8, VS9	2400p
VSX9	2250p
VSF600, VSF650	3600p
VS155, VS165	2300p
VS20, 22, 24, 25, 26, 27, 422, 426, 427, VSF10, VSP9	1250p
VSR9	1300p
VS109, VS603, VS606, VS607	2500p
VS75	2500p

ALBA

Model	Price
VCR4000, VCR5000, VCR6000	1650p

AMSTRAD

Model	Price
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

Model	Price
N850	800p

AWA

Model	Price
ATVI	800p

BAIRD

Model	Price
8900, 8901, 8902, 8903, 8906, 8922, 8928	650p
8904, 8923, 8924, 8925, 8929, 8935, 8943, 8944	650p
8909, 8912	800p
8930, 8931, 8933, 8940	800p
8942	2300p
8945	2000p
8947, 8948	1600p
8950	1700p
VC141L	3000p
VH582	7000p

BLAUPUNKT

Model	Price
RTV100, 200, 202, 211, 214, 222, 224, RTX100, 200	800p
RTV301, RTX250, RTV333	800p
RTV306, 307, 309, 311, 315, 316, 520, 707	1650p
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

Model	Price
VRH50	1000p
VRP20	1000p
VRP25	1000p
VRP30	3350p

CANON

Model	Price
VR10	1000p
VR30A, VR30B, VR30E, VR40A	3350p

DAEWOO

Model	Price
912, VCR12, VCR30, VCR32, VCR50, VCR52	1800p
VCP11 RAF	1800p

DECCA

Model	Price
8300	1000p
8400, 8500	650p

DUAL

Model	Price
EVR101	2300p
VR70, VR71, VR74, VR81, VR90, VR91	650p
VR85, VR96	2300p
VR97	3300p
VR80, VR92	650p
VR93	2450p

EDISON

Model	Price
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
VKH2545	2450p
VKH2639, VKH2439	3300p

FUNAI

Model	Price
E11, 1100, VIP1000, 1400, 3000, 5000, VCR4000, 4500, 4800, 5200, VCR5600, 6400, 6600, V1, V25	1100p
VCR4600, VCR5400, VCR5800	1200p
VCR5480, 5843, 8007, VIP2500A, 3000A, 6000, 150	2000p
VCR4530, VCR6000, VCR6100, VCR6800, VCR6803	1300p
VCR8103, VCR8107	2200p
VIP300A MKII	1900p

FISHER

Model	Price
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

Model	Price
HOS200, VCR600, VCR6100, VR900, VR9100	1500p
VCR100	1100p
VTR1000	1100p

GOLDSTAR

Model	Price
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.

Model	Price
4000H, 4001H, 4002H	1200p
V4001H, V4004	1200p
V4005H	1500p

GRANADA

Model	Price
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

Model	Price
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

Model	Price
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	4600p
MVS660, SE6160, VERONA, VS660, VS6690	3500p
MVS710, 720, 910, SE7120, 9120, VS710, 720, 800, 810, 910, 920	1700p

HINARI

Model	Price
VXL2, 3, 4, 20, 35	1000p
VXL5, V20H	1050p
VXL6	1200p
VXL7	1300p
VXL8, 9, 10, 11, 90, VCR34H, VTV200	1100p

HITACHI

Model	Price
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.

Model	Price
HV1000, HV2000, HV3000, HV4000, HV7000, HV8000p	650p

I.T.T.

Model	Price
VR3605, 3905, 3935, 3943, 3954, 3958, 3985, 3993, 4993	850p
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, 3759, 9720	2000p
VR3907, VR3908	1600p
VR3968	700p

J.V.C. & FERGUSON

Model	Price
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

Model	Price
KV901, KV903, KV905	650p
KV917	2450p

LOGIK

Model	Price
VR960	1500p
VR950	1400p

LOEWE

Model	Price
OC410, OC420, OC440	2400p
OC50, OC55, OC60, OC65	1500p

LUXOR

Model	Price
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

Model	Price
VX500E, 800A, 810A, 820, 80A, 770B, 773B	1200p
VCRL3, VX730, VX750	1450p
VX735, VX755, VX990	1500p
VX735A, VX765, VX850	1750p
VX600	1100p

MITSUBISHI

Model	Price
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

Model	Price
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
AG6840	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	1550p
NV366	1850p
NV180, NVD48	2300p
NV788	2600p
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, 23, 200, NVD48	1800p
NVG50, NVG300	2650p
NVG45	1800p
NVH70	3600p
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.

Model	Price
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
N895	3150p
N9052, N9530, DX2000	3400p
VCP1	1700p
PVC2300, 2400, 740, 744, 760, 764	1400p
DS6000	3500p

NOROMENOE

Model	Price
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

Model	Price
VH3, VH555, VH600, VH700, VH844, VH900, VH1000 (ALL MODELS)	1100p
VH1, VH2A	700p

PHILIPS

Model	Price
VR6460, VR6520, 64VR60, VR6420	725p
VR6711 4 HEAD	1800p
6920, VR6440	2500p
VR6441, VR6540, VR6541, VR6640, VR6642	1300p

RANK

Model	Price
BV6900AS	1800p
N830EA, RV300, RV310, RV320, RV330, RV340, RV350, RV380	700p

REDSON

Model	Price
MR100	1700p

SABA

Model	Price
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	600p
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

Model	Price
VR100, 605, 705, 805, 905, 1000, 1100, 1200, 1600	1200p
VR3300X, VR3600X, VR3650, VR3800	1400p
VR3200, VR3500	1400p
VR2000, VR3300, VR3600	1400p

SALORA

Model	Price
6500, 6600	1600p
SV7300, SV8200, SV8300, SV9200	1500p
SV7400, 8400	1600p
SV8100	1200p

SAMSUNG

Model	Price
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

Model	Price
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, 5550, 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

Model	Price
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
VC6000, 6200, 6300, 7300, 7700, 7750, 8000, 8300	1800p
VC793	3000p
VC473, 785, 786	2200p
VC699, VCA501, VCA602	2800p
VC585, VC685	2000p
VC90ET	3900p
VFH815	2800p

SIEMENS

Model	Price
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

Model	Price
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	2600p

TOSHIBA

Model	Price
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	2600p
V700G	3700p
V500G, V509G	2500p
V9680	2900p
V300G, V301, V305, V309G	2550p
V61, V63	1700p
V110, V120, V130, V140, V210, V220	1500p

TRIUMPH

Model	Price
VR9500, VR9501, VR9525	1100p

TELEFUNKEN

Model	Price
A890	2700p
A920, VR1970, 2920, 2925, 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

Model	Price
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	165p
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	165p
VS22, 23, 25, 35, 37, 38, 53, 66, 75, 422, 425, 426, 427, 462, 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	165p
FIDELITY	
HQS200, VCR100, 600, 6100	165p
VTR100	165p
FUJITSU	
HS760, VX715, VX720D	165p
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	165p
VIP1000, VIP1400	165p
G.E.C.	
V4004	165p
GRANADA	
VHSAH1, 3, VHSVH4, VHSWH1, VHSXH1, VHSYH2	165p
VHSAN3, VHSBP1, VHSVN1, VHSVN2	165p
VHSAY3, VHSX42	165p
VHSBH1, VHSCH1, VHSFS1, VHSFS2, VHSEH2, VHSEH3	165p
VHSBY3, VHSCC1	165p
VHSDS2, VHSXN2	165p
VHSDP1, VHSFP2 (Pressure Roller Assembly) PS403-40205	350p
VHSEY1, VHSEY2, VHSFY2	165p
VHSFG2, VHSFG3, VHSFG4, VHSFH6	165p
VHSFJ2, VHSFJ4	165p
VHSF63, VBXAS1	165p

Model	Price
VHSTJ1, VHSTJ2, VHSTJ3	165p
VHSWJ1, VHSWJ2, VHSXJ3	165p
VBXYB3	165p
VHSEH3, VHSES2	165p
VHSF34	165p
VHSFP2	165p
GRUNDIG	
BARCELONA, MADRID, MVS500, 510, 600, 620, 660, 710, 720, 910, 9105, SE5110, 5140, 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	165p
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, 175, 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, 736, 740, 745, 746, VTS80, 85	165p
VT3000	165p
I.T.T.	
VR3605, 3826, 3905, 3906, 3916, 3926, 3935, 3946, 3948, 3976, 3985, 3986, 3995, 3997, 6348	180p
VR3913, 3914, 3943, 3954, 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, 225, 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	165p
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, 9295, 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, HSE51, HSE52	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, 25, 33, 40, 50	165p
NVD48, NVD80, NVG21, NVG45	165p

Model	Price
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, VH404, 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, VR6920	165p
VR2020, VR2021, VR2022, VR2023, VR2024	165p
VR6711	165p
VR6540	165p
DV856, 586, VR702, 703, 6485, 6589, 6785, 6880, 6948	165p
VR445, VR6442, VR6542, VR6843, VR6943	165p
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, 63SB7, 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, 4000, 4600, 4610, 4710, 4890, 6700, 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, 496, 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	165p
SALORA	
SV6500, SC6600	165p
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
SV601, SV800, SV900, SV901, SV6910, 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	165p
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	165p
FM204, 303, 304, 314, 325, 328, 374, 375, 376, 384, 386, 388, 404, 424, 428, 429, 488, 489	165p

Model	Price
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, 25, 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	165p
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	165p
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, VS105, 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	150p
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
OECCA	
VR8300	90p
VRH8945DK	80p
DUAL	
VR4430	90p
VR91, VR93, VR97	75p
VR70, VR71, VR74, VR81, VR90	85p
VR80	90p
VR96	85p

Model	Price
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
VR2008	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
VHSBP1	135p
VHSAN3	110p
VHSDS2	125p
VHSAY3	125p
VHSBY3	100p
VHSEY1, VHSEY2	70p
VHSCC1	100p
VHSDP1, VHSFV2	80p
VHFTJ1, VHSTJ2	150p
VHSTJ3	65p
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, 160, 250, 257, 455, 565, 566, 725, 755, HRP50	65p
HRD170, 180, 210, 230, 300, 320, 321, 330, 337, 350, 370, 400, 430, 440, 441, 530, 700, 750, 950, HRS5000, 5500, 9000	60p

A Welcome Initiative

A year or so ago the Department of Trade and Industry launched five, later to become six, 'taskforces' whose aim was to establish ways in which the role of engineers and technicians in industry could be enhanced, for the benefit of us all. It's an old problem of course, but there's a chance that this time the message will get through and result in positive action.

Clearly engineering know-how is vital in a modern industrial economy. Its application calls for suitably trained and qualified people at all levels in industry. The problem is to create a positive attitude to engineering, to align the educational system so that it can produce people with the required knowledge and skills, and to ensure that they then have the fullest opportunity to make use of their abilities. It sounds obvious, but somehow or other we've never managed to get it right in the UK.

There has for a start been a sort of cultural block when it comes to manufacturing. Perhaps because the UK became the first industrialised nation, engineering has tended to be associated in the public's subconscious with satanic mills and metal bashing rather than high technology. This attitude is totally out of place as we approach the twenty-first century.

Looking at things from a different angle, there is a perfectly understandable reluctance amongst those who are interested in engineering to become involved in management, finance and marketing, things they feel to be distractions from what they should and want to be doing. It is a paradox that firms increasingly rely on engineering and technology while being unable to get it right – just think of the millions and millions (yes!) that have been wasted on computer systems that don't work because the technolgy wasn't properly understood by those who had to commission them. The country would have been in a far better state than it is if an appreciation and knowledge of engineering and technology had played a greater part in our basic education.

There are largely self-made problems in all areas. The Japanese Ministry of International Trade and Industry no less, and Japanese firms investing in the UK, have been complaining about the shortage of good-quality engineering candidates for middle and top management positions in Japanese enterprises in the UK. The problem is as great on the shop floor, where lack of engineering know-how and the right attitude has made it difficult to achieve in the UK the efficient manufacturing, with zero-defect products, achieved in the Far East. If people, because of their training, simply chuck faulty components in the bin without any interest in why they might have failed we are not going to make the most of the ever evolving technical opportunities.

The heart of the problem, once the educational and cultural sides have been sorted out, is the management of manufacturing. It is a sad fact that firms headed by engineers and scientists have tended to perform less well than those headed by accountants and other non-technical people. Yet it should be natural for technically trained people to appreciate that products will sell only if they meet market needs and that efficient production is basic to everything. It has been said that any fool could design a Roller: the art of engineering is to get the same results at a fraction of the cost. How have the Japanese and, increasingly, the Koreans been able to produce advanced products at such affordable prices? We get an inkling of what it's all about from their ability to proceed from incredibly expensive prototypes to cheap, everyday products in such a short time span.

Let's hope then that the DTI's taskforces will be able to get the momentum going, since we all know what needs to be done. They have brought together, under the banner Action for Engineering, representatives of industry, education, the engineering professions and organisations and government, and are industry-led. The purpose is to assess the training and education of engineers and technicians and their potential in industry. A number of projects have been set in motion for development and implementation, mainly by the middle of this year when the initiative formally ends. The aims are to promote engineering careers in schools, make better use of engineers, train more technicians and supervisors, achieve standards of engineering excellence and promote the importance of technology. To which one could say "and about time too!"

It's recognised that there are no instant cures, and that getting things right could take a decade or more. The important thing is that a start has been made. Come to think of it, it would be strange if a new generation steeped in technology didn't adopt a more positive approach than that of its predecessors.

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REED BUSINESS

Consumer electronics seen in JAPAN

George Cole looks at some of the new technology on display at this year's Japan Electronics Show

This years's Japan Electronics Show, held in Osaka over October 17th-21st, attracted some 350,000 visitors. Although most of the halls were devoted to industrial components, there was plenty to see in the consumer electronics section.

The prices quoted in the following report are an approximate sterling equivalent of the Japanese yen prices. Being intended initially for the Japanese market, most of the models mentioned are not available elsewhere. They do however show how Japanese consumer electronics technology is developing.

TV Display Systems

This year's biggest development was the arrival of large, flat-screen TV displays, with the prospect of hang-on-the-wall TVs in the near future. Japanese companies are divided over which type of display holds out the greatest promise however.

Sharp, the world's largest liquid-crystal display (LCD) manufacturer, had much to show, including a 12·5in., 16:9 aspect ratio panel and a prototype dual-screen LCD. But the exhibit that made the biggest impact was the company's 28in. LCD panel, the world's largest direct-view TFT (thin-film transistor controlled) LC display. It has 921,600 pixels, offers 24-bit colour and a contrast ratio of 100:1. Its power consumption is about 100W and its weight 18kg. The pictures produced were good, but one wonders what the price of such a large LCD will be.

A widescreen Sony Plasmatron receiver.

Sony had on show TV sets fitted with its Plasmatron display, which uses a hybrid LCD and gas-plasma technique called PALC (Plasma Addressed Liquid Crystal). Briefly, PALC uses plasma discharges instead of transistors to switch on the pixels in an active LCD (for further details see *Television* September 1995, page 780). According to Sony this technology is cheaper to produce than the TFT LCD, which requires clean-room conditions. The Plasmatron sets produced very good pictures – especially as they were being demonstrated under bright lighting conditions. The first 25in. Plasmatron sets are due to go on sale in Japan this month at about twice the price of a conventional c.r.t. set with the same size picture.

Panasonic (Matsushita), Fujitsu, Pioneer and Mitsubishi showed gas-plasma displayes ranging in size from 21 to 40in. Picture quality varied. The Panasonic displays were clear and bright with a good viewing angle. In comparison, the Fujitsu and Pioneer plasma displays looked coarse. Panasonic plans to launch its first plasma display TV sets in Japan later this year (1996). Fujitsu is to start mass producing 21in. plasma TV sets in February. They will cost around one million yen (about £5,800) each.

High-definition TV

Although there was much emphasis on flat-screen technology, there was also plenty to be seen in c.r.t. sets and technology. A number of companies had on show TV sets for the Japanese analogue HD-TV standard (MUSE), which has 1,125 picture lines in comparison with NTSC's 525. MUSE is transmitted via the BS satellite, the HD-TV sets being sold under the name HiVision.

Many of the latest HiVision sets use third-generation MUSE decoders. Panasonic's TH36HV30 (priced at the Japanese equivalent of £4,070) is a 36in. monster. Hitachi showed Model C39HD50 (£4,650) which has a 39in. back-projection display and connections for three VCRs, a LaserDisc player and a satellite receiver. The Hitachi 55in. Model C55HD1 comes with storage cabinets, weighs 149kg and costs around £14,500! Toshiba's 32in. Model 32HD3E (£3,080) uses a Super Brighton high-definition c.r.t.

Conspicuous by its absence was any form of digital TV. This is a sensitive subject for the Japanese, who have invested heavily in their analogue HD-TV system – consumers have had to pay a king's ranson for HiVision receivers. Sooner or later however the Japanese broadcasters and electronics companies are going to have to become involved in digital TV services.

Multimedia TV

Almost every stand sported the word multimedia: Japanese companies clearly see the PC and TV coming closer together. A number of companies showed TV sets that could also display computer graphics.

Sony's PowerWide Trinitron sets are designed to link an HD-TV receiver, a PC (via an RGB socket), a games machine, a VCR and a LaserDisc player. The sets provide Wide Clear Vision, which is the NTSC version of PALplus – 16:9 aspect ratio pictures that are cleaner and clearer than conventional NTSC ones. Sony's PowerWide Trinitron sets include the 32in. Model KV32PW1 at £1,918 and the 28in. KV28PW1 at £1,453.

JVC had on show a prototype TV set that can be linked to a PC. The Hitachi Model C29HMV1 PC Vision at £1,686 is a 29in. set with an RGB socket for PC connection. Toshiba MM TVs are also designed for PC connection: models in this series include the 21in. 21MM3S at £872 and the 29in 29MM1B at £2,442.

PIPs, POPs etc

Many sets had PIP (picture-in-picture), multiple PIP, POP (picture-outside-picture) and split-screen displays. The Hitachi 32in. Model C32HE50 at £1,800 could display two, three, seven or nine PIPs and had three YC sockets.

Toshiba's Double Window set enables the viewer to split the screen into two halves to provide displays with a number of different configurations. Both sides can show same-sized TV pictures for example, or one half of the screen can show nine PIPs or teletext while a half-sized diplay is present on the other side. There are three models in the Double Window range, with screen sizes ranging from 28 to 32in. The latter model costs £1,977. Panasonic's 32in. Model TH32WS40 at £1,850 also provided split-screen displays.

3D-TV

Sanyo had on show a large 3D-TV display receiver that attracted a lot of attention. Model C32SD1 at £2,200 uses the Sanyo LC77710 DSP (digital signal processor) chip to produce 3D images from a 2D signal. It employs a system called Modified Time Difference (MTD) to separate the 2D signal in time. The viewer has to wear LCD glasses, which offset the focal points for the left and right eyes, his brain interpreting these differences as picture depth.

The MTD system doubles the field frequency (to 120Hz for NTSC) to reduce flicker, with the LCD glasses acting as left and right shutters that alternately open and close at the same frequency. A single pair of glasses is supplied with the C32SD1, extra pairs costing £145 each. Despite these prices Sanyo claims that the set is being stocked by 500 shops around Japan and that over 4,000 sets have already been sold.

VCRs

Sharp showed its remarkable dual recording VCR, Model VCBF80, at the equivalent of around £540. It can record two TV programmes simultaneously and display them togther on a split-screen TV set. The VCBF80 has three tuners (two for terrestrial TV and one far satellite TV) and two timers. It uses an eight-channel drum with six heads.

Two TV programmes are recorded simultaneously on normal tape by dividing the standard track into two sections. For the NTSC system the VHS track is 58µm wide (for PAL the figure is 49µm). When dual recording, the 58µm track is split into 25µm and 19µm sections with guard bands between each section and track. The 25µm section is used for programme A and the 19µm section for programme B. The latter is the same track width that's used in the EP mode, which triples the NTSC recording and playback times. When EP recording the 19µm tracks are laid down without guard bands.

The head drum arrangement is interesting – see Fig. 1. There are two heads for SP/EP recording (58µm/19µm), two heads for 25µm track recording in the dual mode, and two hi-fi audio heads. I'd hate to think how much a replacement

DVC

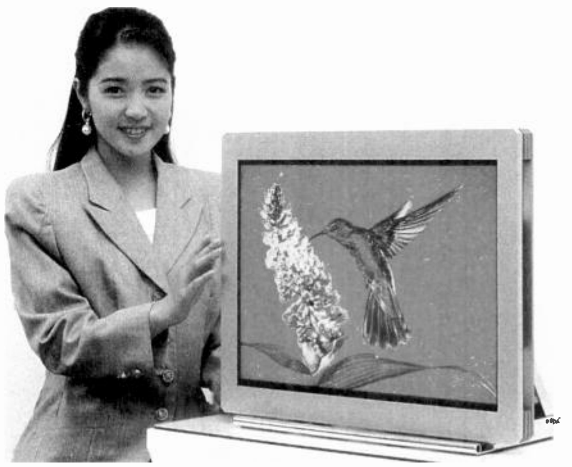
Camcorders that conform to the Digital Video Cassette (DVC) format were present in force. DVC was described in last month's issue of *Television*. To recap briefly, up to an hour of digital video is stored on a small cassette, with picture quality (the horizontal resolution is around 500 lines) that far surpasses Hi-8 and S-VHS.

Sony showed an intriguing DVC accessory, the HVLF7 video flash at £60. It's designed for use with the Sony DCRVX1000 DVC camcorder during the still video or photo-shooting mode, and is activated automatically via a LANC link. The flash is battery powered.

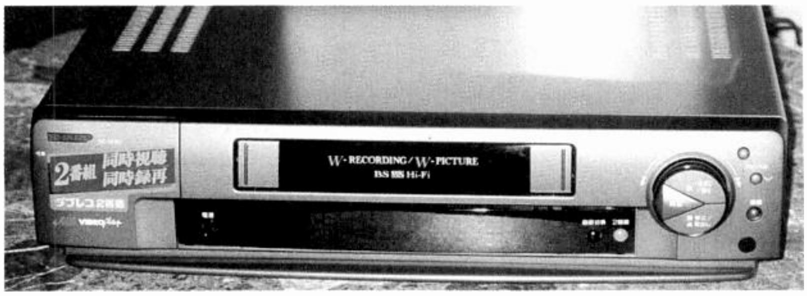
Panasonic showed a couple of DVC models. The NVDR1 at £1,280 has a large colour LCD viewfinder. It can be connected to a video modem, Model VMMD1 (£315), for faxing still images. A video image is frozen, scanned and then transmitted. To send a video image between two VMMD1 modems takes about 30 seconds. Alternatively the image can be sent to a conventional fax machine, taking about two minutes. The Panasonic Model NVDJ1 at £1,600 includes three CCDs, a x20 digital zoom and a massive vewfinder.

The JVC GRDV1 pocket-sized DVC camcorder at £1,300 and the Sharp VLDH5000 (Digital Viewcam) had many admirers. The Sharp model has a 5in. LCD monitor with nearly 225,000 pixels, three quarter-inch CCDs each with 440,000 pixels, a x30 zoom (x12 optional) and a PC connection. It weighs 1·2kg and has a price ticket of about £2,035.

Sharp's VLDH5000 digital camcorder.



Sharp's 28in. LCD panel.



Sharp's VCBF80 dual-recording capability VCR.

would cost! So far the technique is available only for NTSC operation: one wonders whether the same principle could be adopted for PAL, given the narrower video tracks.

JVC demonstrated a massive prototype Data VHS (D-VHS) machine. This format enables a VHS VCR to store large quantities of digital data. JVC was also showing its first VCRs that feature the new dynamic drum system (DDS). This has a drum whose angle can be altered in the trick play modes such as picture search or slow motion to give noise-free pictures. The DDS range includes Models HRVX5 at £610 and HRVX1 at £872. They both include S-VHS, the HRVX1 having in addition a built-in BS satellite decoder/receiver.

A format that's unlikely to be seen outside Japan is VHS-W, which enables MUSE satellite transmissions to be recorded. JVC's HRW5 and Panasonic's NVWV10 (both priced at £1,976) are awesome to look at but provide superb picture quality.

Toshiba showed a curious VCR, Model F51PC at £570, which has an RS232 connector for linking to a PC. Other features include VideoPlus and a Closed Caption decoder (this decodes and displays hidden subtitles in broadcasts and prerecorded tapes to aid viewers with hearing problems).

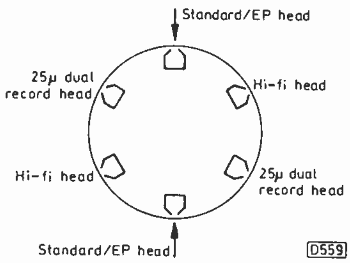
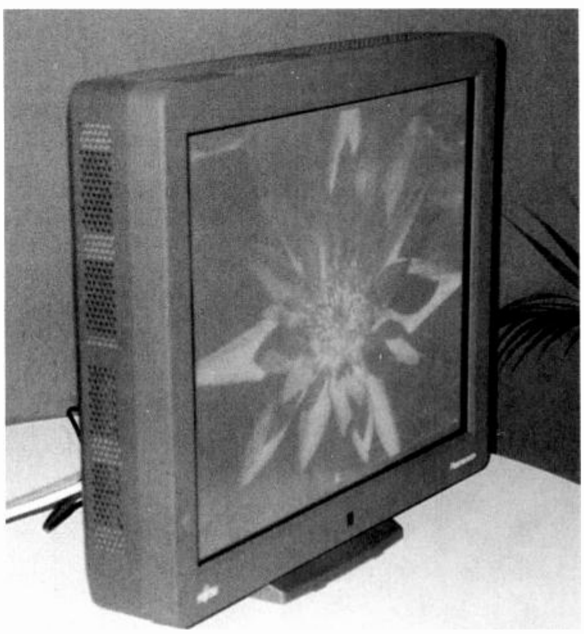


Fig. 1. Head drum arrangement used in the Sharp VCBF80 dual-recording VCR.



Fujitsu's prototype gas-plasma display.

The Panasonic NVFV7 at £960 has a built-in LCD screen and stereo speakers. It's been designed for use around the home.

Video Discs

The recent agreement between the Sony/Philips and Toshiba/Time Warner consortia to develop a single standard for the forcoming generation of high-density video CDs came too late for the exhibitors. As a result Sony was pushing its Multimedia CD (MMCD) system and Toshiba the Super Density (SD) disc system. JVC and Pioneer also showed prototype HD players.

Video CD is popular in Japan, its main use being for karaoke. Sony's VCPS55 at £250 is a stand-alone Video CD deck that conforms to the latest version of the Video CD standard, known as the White Book. This enables it to provide high-resolution still picture displays. Sony also showed a Video CD mini hi-fi system, Model VCMV1C with a five-disc changer at £800.

JVC also showed a Video CD hi-fi system, Model M500, with a three-disc changer. The price quoted was £808.

LaserDisc is also strong in Japan. Models on show included the Hitachi VIPK2889 at £574. The Panasonic LXHD20, Hitachi VIPHLD1 and Sony HLC2EX are high-definition video system (HDVS) versions that provide stunning picture quality at a price to match – around £1,730.

The Mini Disc System

The Sony Mini Disc was originally designed as a medium for storing high-quality digital audio. It's now finding other applications however. One of these is as a portable data storage system or floppy disc. The PC version is called MD Data. Each disc can hold up to 140Mbytes of data. Sony has launched MD drives and Sharp plans to market a couple.

Sony also showed how Mini Disc can be used as a photo storage device, working in a similar way to Kodak's Photo CD. Each Mini Disc can hold up to 200 high-quality photographic images.

The Sony Model EPX701 Mini Disc picture editor can be used to crop images electronically. The Mini Disc picture system will probably be launched later this year.

Another Mini Disc development is PDF5 or 'Data Eata' which, at £872, consists of a scanner, an 8in. LCD screen, an ink-jet printer and a Mini Disc drive. It's used as a document storage system. You can scan up to 1,000 pages of text and graphics, store them on a disc and use the LCD display to view them. If a hard copy is required, press a button and the document is printed out.

Mini Disc sells much better in Japan than in Europe or the USA. The discs and players are readily available. Around 400,000 players were sold during the first year (1992), and it's expected that about 1·3m will have been sold in Japan in 1995. A number of new Mini Disc machines were shown, including Sharp's dinky MDS45 which measures just 74 x 16 x 100mm, weighs 135g and has a price tag of about £350.

Miscellany

JVC and Hitachi were showing badged versions of Sega's Saturn 32-bit system in the games hall. Panasonic had its 32-bit 3DO player. Casio showed a curious toy computer called Loopy, which you connect to a TV set so that kids can watch interactive storybooks and print cartoons.

Finally, though I didn't spot it at the show, Hitachi has been advertising an intriguing combined 21in. TV set and refrigerator, Model CRK2150, in its promotional literature. The TV set is atop the fridge, which can be used to store beer, wine and other essentials of life. I've no price details, but suspect that the device would go down well with sports viewers! ■

VCR BELT KITS / REPLACEMENT VIDEO LAMPS

VCR Belt Kits

Model	Price
HRD520, 600, 620, 637, 641, 650, 830	95p
HRD540, 550, 580, 660, 860, 960, HRS5800	130p
KENWOOD	
KV901	70p
KV903	90p
LOEWE	
OC11, OC40	95p
OC410, OC420, OC440, OC460	130p
OC50, OC55, OC60, OC65, OC70, OC75	120p
LOGIK	
VR955	180p
LUXOR	
9245, 9251	130p
9252	140p
9253	140p
9254	100p
9255	130p
9256	130p
9270, 9271, 9273, 9274	115p
9272, 9280	140p
9281, 9284, 9285, 9292, VR3701, 3721, 3731, 3761, 3781	95p
MATSUI	
VX850	75p
MITSUBISHI	
HS200	200p
HS300, 301, 302, 307, 310, 337, 338, 347, 349, 411, 412, 421, HSB10, 20, 30, HSE10, 20, 30, 70	150p
HS303, HS304, HS306, HS307, HS330, HS400, HS700	150p
HS318, HS319, HS410	130p
N.E.C.	
N830, N831, N832, N833	100p
N895	80p
PVC2300, PVC2400	180p
DX1000, 1600, 2000, 3000, N9012, 9013, 9014, 9016, 9033, 9034, 9053, 9054, 9055, 9066, 9110, 9120, 9510, 9520, 9530, 9610	95p
NATIONAL PANASONIC	
NV300, NV332, NV333, NV340, NV366	125p
NV777, NV788	100p
NV2000, NV2010, NV3000	130p
NV7000, NV7200, NV7800	95p
NV8600, NV8610, NV8620	145p
NV230, 250, 280, 430, 431, 433, 450, 460, 465, 470, 730, 770, 810, 870, 890, AG1000, 1050	125p
NV370, NV380, NV480, NV630, NV780, NV830, NV850	100p
NV600, NV688, AG6010, AG6015	110p
NVG7, 10, 12, 14, 15, 18, 30, 130, 400, NVH70	70p
NORDMENDE	
V100, V140	70p
V1000M, 1005M, 1205, 1215, 1235, 1245, 1305, 1403, 1405, V1500P, 1503, 1505K, 1805K, 2000D, 2405, 2500H, 3000H, V3405H, 3105, 4405H, 5000, 8005, 900, 905	65p
V1001, 1005, 1015, 1025, 1035, 1041, 1055, 1065, 1105, 3005, 304, 5005, 502, 503	80p
V101, V102, V103, V112, V141, V142, V301, V302	90p
V110, V333	110p
V1500T, V2000B, V2000P, V400H	95p
V250, V460, V9460, V20035542, V20035543	130p
V300, V303, V380	75p
V500	75p
ORION	
COMBI15000, 16000, NEVHM, TVP230RC, 900MVH1012, VH1030, 1040, 1060, 1070, 1100, 1120, 1440, 1500, 1660, 1800, 2150, 2308, 2400, 2500, 2600, 2700, 2960, 300, 358, 360, 362, 4010, 4015, 4016, 4020, 4300, 5010, 5015, 530, 535, 536, 630, 635, 640, 730, 735, VP220, 225, 245, VR1032, 2966, 2980, 821, 925, VXL25	30p
NEVHL, VCP, VH1204, 2004, 2204, 3050, 3060, 4008, 400, 4012, 412, 512, 600, 666, 744, 774, 7905, 800, 820, 900, 974, VP200, VR2949, 2956, 2957, VXL20	90p
VC150, 180, VH1000, 200, 201, 205, 212, 250, 254, 288, 300, 303, 3030, 312, 33, 3312, 404, 555, 700, 704, 708, 712, 770, 780, 844, 900, VHF2, VH3	80p
VH1, VH2A	150p
PHILIPS	
VR6460, VR6920	170p
VR6540	100
DV186, 286, 291, 292, 468, 471, 562, 571, 761, VR201, 202, VR20DV1, 20DV2, 20RW7, 25BO1, 25BO2, 302, 303, 305, VR30DV2, 35BO2, 35BO3, 635B7, 715B4, 715B5, 715B8, VR865B2, 915B2, 925B3, VR6180, 6185, 6285, 6290, 6291, 6293, 6367, 6390, 6391, 6393, 6467, 6468, 6470, 6561, 6570, 6581, 6670, 6676, 6760, VR68SB4, 86SB1, 92SB3	85p
VR6442, VR6542	70p
VR2025, VR2580	100p
VR445B9, BR445B920, VR445B922, BR6843	100p
VR6548, VR6648, VR49SB620, VR644869S	110p
SABA	
VR6420, 6435, 6440, 6460, 6480, 6620, 6770, 7200, 8420, 2A10, 70, 2B20, 3B20, 4A10, 4B20, 6A10, 6A70, 6B20, 8B20	65p
VR6004, 6005, 6011, 6014, 7004, 7011, 7014, 8011, 8014, BERLIN	90p
VR2000, VR6000, VR6012, VR7000, VR7720, PVR6068	130p
VR5005, VHR7000	135p
VR6006, 6007, 6008, 6009, 6015, 9016, 9018, 6038, 7006, 7007, 7016, 7018, 9006	65p

Model	Price
VR6010, VR9010	70p
VR6020, VR6022, VR6023, VR6028, VR7730	75p
VR6024	75p
VR6520, VR6540, VR6560	90p
VR6710, VR6720, VR6735, VR8720	130p
VR6720, VR6730, VR6760, VR6775, VR6780	160p
SAISHO	
VR2000, VHL3	90p
VR3800	75p
SALORA	
SV6500	100p
SV6600	150p
SV8000	120p
SV8100	60p
SV8500, SV8520, SV9500	150p
SV7400, SV8400, SV8420, SV8550	120p
SV6700, SV8710, SV8750, SV9700	120p
SV6800, 6900, 8810, 8820, 8870, 8910, 8920, 8970	95p
SV8600, 8620, 8700, 8720, 8830, 9600, 9810	130p
SAMSUNG	
SV716, 717, V1616, V1621, V1626, VX616, VX617, VX619, VX626, VX627, VX629	85p
VB520, 510, 610, 616, 617, 619, 620, 626, 627, 629, VI510, 520, 611, 616, 621, 626, VX510, 520	100
VB900, VB910, V1900, V1910	110
PX980, 981, 982, SE9001, SV9001, SVX307, 319, 322, VB770, 8220, 8225, V1770, 790, 8220, 8225, VK8220, VPX31, VX750, VX790, 8220, 8225	135p
SVX301, 303, 305, SX7301, VB710, 971, V1730, 710, VX712, VX720, 730, 970, 971, 972	230p
VX9880	110p
SANYO	
VTC5000, 5150, 6000, 6500, VTCM10, 11, 20, 21, 30, 31, 50	75p
VTC5300, VTC5350, VTC5400, VPR5800	100p
VTC5500	95p
VTC9100, VTC9300	220p
VTC1100, 1300, 1500, 1100, 1150, 1200, 1300, 1500	90p
VHR2100, VHR2300, VHR2500, VHR2700	150p
VHR3100, 3300, 3310, 3400, 3700, 3800, VHRD500, 700	110p
VHR4100, 4150, 4200, 4300, 4350, 4770, 5100, 5200, 5300, 5350, 5700, 7100, 7200, 7500, 7530, 7540, 7800, 7810, 8100, 8200, 8250, 8500, VHRD4400, 4410, 4500, 4600, 4610, 4710, 4890, 6700	90p
SHARP	
VC200, 384, 385, 386, 388, 390, 9300, 9500, 9700	100p
VC7300, VC7700, VC7750, VC7800, VC8000	150p
VC8300	150p
VC300, 387, 471, 473, 481, 482, 483, 486, 488, 496, 8481	80p
VC402, 500, 571, 573, 581, 582, 583, 584, 585, VCSF3	80p
VC600, 651, 682, 684, 685, 693, 783, VC6F3, VC6V3	70
VC772, 779, 781, 782, 785, 786, 793, 800, 7810, 7822, VCA100, VCA102, 104, 131, 140, 170, 202, 203, 234, 501, 602, 5011, VCD806, 810, 815, VCH80, 865, 910, VC51000, VCT310, 410, VCT1314, VCTS312	115p
SIEMENS	
FM350, FM352, FM355	60p
FM484, FM485	55p
FM391, FM392, FM394, FM462	100p
FM461, FM464, FM468, FM561	150p
FM361, FM362, FM363, FM364	120p
SONY	
SLC6, SLJ10, SLT6ME	140p
SLC5, SLC7, SLJ7, SLJ9	140p
SLC9, SL8000, SL8080, SLT50	165p
SL8000E, SL8080E, SL8200, SL8600	175p
SLV255	95p
TELEFUNKEN	
VR400, VR410, VR440, VR449	130p
VR450, VR540, VR549, VR640	70p
VR520, VR529, VR620, VR920	70p
VR530, VR535, VR539, VR550, VR630, VR650	75p
A940, VR1925, 1930, 1940, 1950, 2960, 925, 930, 940, 950	90p
A920, VR1970, 1980, 2920, 2925, 2930, 2970, 7921, 7926, 7931, 7970, 7971, 7980, 970, 7981, 975, 980	65p
A1200, 930, 932, 935, 960, 980, 990, VR2931, 2935, 2941, 2971, 3935, 3945, 3950, 3965, 3975, 4935, 4940, 4942, 4945, 496, 5VR4970, 6000, 7932, 7959, 7979	65p
VR1935	100p
VR2915	90p
THOMSON	
SV1000, V410, 430, 450, 510, 520, 530, 540, 620, 630, 640, 4240, SV5540	65p
TX8000, V309, V357, VK411	75p
TX8500, V342, 343, 351, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, 5500, 6000, 8564	90p
V320, V321, V323, V326, V4200, V4300	90p
V333	100p
V340	90p
V4100, VK308, VK309, VK410	120p
VK300, VK301, VK302, VK303, VK305, VK3301	135p
VK312	65p
TOSHIBA	
V55, V57	85p
V33, V31, V51, V53, V9600, V9680	85p
V61, V63, V65, V66, V67	150p
DV80B, DV80D, V71, 73, 74, 75, 81, 83, 85, 86	120p
V108, V109, V199, V209, V609	120p
V91G, V95G	115p

Replacement Video Lamps

Models & Description	Order Code	Price
UNIVERSAL VIDEO LAMP 9V 80mV (310mm WIRES)	VL01	25p
PANASONIC VIDEO LAMPS	VL02	35p
SHARP VIDEO LAMPS	VL02	35p
HITACHI 5381682 (VT63, VT64) VIDEO LAMPS	VL04	135p
AIWA, AKAI, ALBA, AMSTRAD, BLAUPUNKT, FERGUSON, FIDELITY, FISHER, FUJITSU, FUNAI, G.E.C., GOLDSTAR, GRANADA, GRUNDIG, HINARI, HITACHI, ITT, JVC (HRD SERIES), MATSUI, MITSUBISHI, NEC, ORION, NATIONAL, PHILIPS, SAISHO, SALORA, SAMSUNG, SANYO, SHARP, SIEMEN, SONY, TELEFUNKEN, THOMSON, TOSHIBA	VL05	150p
AKAI, GRANADA (VHSTJ2), HITACHI (VT3000), ITT (VR3912, VRP3833), JVC (HR2200, 3300, 3330, 3660), MITSUBISHI (HS200), TELEFUNKEN (VR510, 519, 610), THOMSON (VK300, 305, 306, 3301), FERGUSON (3V00, 16, 22, 24, 3292, 8900, 8901, 8902, 8903, 8909, 8912, 8922, 8925)	VL01	25p
BLAUPUNKT, ORION (VH1, 2A), NATIONAL (NV200, 2010, 3000, 7000, 8150, 8200, 8400, 8600, 8610, 8620), SHARP (VC2300, 6000, 6200, 6300, 7300, 7700, 8000, 8300)	VL02	40p
AKAI (VS10), GRANADA (VHSXJ3), ITT (VR3993, 3994), JVC (HR2650, 7600, 7610, 7650, 7655), TELEFUNKEN (VR530, 535, 539, 550, 630, 650), THOMSON (V309, 316, 357, VK309, 411, TX8000), FERGUSON (3V31, 8941, 8942)	VL06	40p
AUTHENTIC (N850), DECCA (VR8300), GRANADA (VHSTJ3, WJ1, WJ3), ITT (VR3913, 3914, 3963), JVC (HT7200, 7300, 7350, 7700), TELEFUNKEN (VR450, 520, 529, 540, 549, 620, 640, 920, 1920), THOMSON (V4100, VK308, 309, 312, 410), FERGUSON (3V23, 29, 30, 8923, 8924, 8929, 8930, 8931, 8940)	VL07	40p
GRANADA (VHSAY3), SHARP (VC200, 381, 384, 385, 386, 388, 390, 393, 9300, 9500, 9700)	VL08	60p

PANASONIC MODE SWITCHES

NV2000, 2010, 7000, 7200, 7800 (VSS0048)	£3.50
NV230, 260, 430, 810, 870, 2300, 4300 (VSS0110)	£2.25
NV830 (VSS0091)	£2.10
NV300, 333, 340, 366, 688, 777, 778 (VSS0060)	£3.75
NVG21, 25, NVH65, NVD80 (VSS0175A)	£2.00

ON/OFF MAIN SWITCHES

GRUNDIG
PART NO: 29703, 29102
USED ON: C7500, C7500TT, C8500, C8502, C8712, C8714, C8894, M68-190, M68-190/99, M70-195, P40-345, ST66-1602, T55-340, V7722
PRICE: £2.25

ITT
PART NO: 13/1074
USED ON: CP0200, 0211F, 0323, 0323/1, 0341/14, 0345F, 0351/1, 0361, 0361/1, 9350, CT0500, 0500/1/T, 0500T
PRICE: £3.00
PART NO: LFC 005
USED ON: CVC40
PRICE: £2.00

MATSUI/SAISHO
USED ON: MATSUI-2190, SAISHO-PST2130TX
PRICE: £2.00

PHILIPS
USED ON: K30, K35, K40, KT3, KT4
PRICE: £0.95

SONY
PART NO: (POWER SWITCH + REMOTE SWITCH)
USED ON: KV1612 MK1, KV1612 MK2, KV1614, KV2052, KV2056, KV2062, KV2068, KV2212, KV2216, KV2252, KV2256, KV2704, KV2705, KV2706, KV2752PE3, KX20PS1, KX20PS2, KX27PS1
PRICE: £2.75
PART NO: (POWER SWITCH + REMOTE SWITCH)
USED ON: KV2022, KV2024
PRICE: £3.00
PART NO: (POWER SWITCH)
USED ON: KV1810 MK1, KV1810 MK2, KV1820, KV1822, KV2000 MK1
PRICE: £8.00
PART NO: (POWER SWITCH 26mm)
USED ON: KV1400, KV1440, KV2040, KV2060
PRICE: £2.00
PART NO: (POWER SWITCH 21mm + REMOTE SWITCH)
USED ON: KV2020
PRICE: £2.00
PART NO: 2 PIN (FUNCTION SWITCH)
USED ON: KV1612 MK1, KV1612 MK2, KV2052, KV2056, KV2212, KV2215, KV2216, KV2252, KV2256, KV2704, KV2705, KV2706, KV275PE3, KV2756PE3
PRICE: £0.40
PART NO: (4 PIN FUNCTION SWITCH)
USED ON: VARIOUS
PRICE: £0.50

REPLACEMENT IDLER TYRES

AKAI	M132773	IT01
	MZ366960J2	IT02
GOLDSTAR	VXP0521	IT17
HITACHI	6861471	IT03
	6861482	IT04
	6886971	IT05
JVC/FERGUSON	PU 48967B	IT06
	PU 51380	IT07
	PU 51402A	IT08
	PU 55373	IT09
	PU 55374	IT10
NATIONAL PANASONIC	VXP 0329	IT11
	VXP 0343	IT12
	VXP 0344	IT13
	VXP 0401	IT14
	VXP 0433	IT15
	VXP 0463	IT16
	VXP 0521	IT17
	VXP 0581	IT18
SANYO	1430662T15620	IT19
SHARP	NIDL005GEZZ	IT20
	NIDL0006GEZZ	IT21
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VIDEO SERVICE KITS

AMSTRAD
VCR700
Contents
BELT SET PINCH ROLLER. REEL IDLER VIDEO LAMP
Order Code: SK41 £5.50

FERGUSON & JVC
3V42/43
HRD455/HRD725

Contents	Economy Kit Contents
BELT SET PINCH ROLLER CLUTCH MECHANISM. TENSION BAND	BELT SET PINCH ROLLER SUPPLY CLUTCH. TAKE UP CLUTCH
Order Code: SK37 £16.00	**Order Code: SK38** £9.00

3V58/59/64/65
HRD170/180/210/230/300/320/370/400/430/530/700/750
HRS5000
Contents
BELT SET PINCH ROLLER IDELR ARM TENSION BAND
Order Code: SK44 £7.00

3V29/3V30
HR7200/7300/7350
Contents
BELT SET PINCH ROLLER TENSION BAND IDLER TYRES
Order Code: SK05 £5.00

3V35/36 38/39/49
HRD110/111/120/225
Contents
BELT SET PINCH ROLLER TENSION BAND IDLER TYRES
Order Code: SK04 £5.00

3V31/3V42
HR7600/7610/7650/7655

Contents	Economy Kit Contents
BELT SET T/U REEL TABLE TYRE PINCH ROLLER REEL IDERL T/U CLUTCH T/U IDLER TENSION BAND VIDEO LAMP	BELT SET T/U REEL TABLE TYRE PINCH ROLLER REEL IDLER TYRE T/U IDERL TYRE T/U CLUTCH
Order Code: SK33 £11.00	**Order Code: SK34** £5.00

3V35/36/38/39/49
HRD110/111/120/121/225

Contents	Economy Kit Contents
BELT SET T/U REEL TABLE TYRE SUPPLY REEL TABLE TYRE PINCH ROLLER T/U CLUTCH T/U IDLER REEL IDLER TENSION BAND	BELT SET T/U REEL TABLE TYRE SUPPLY REEL TABLE TYRE PINCH ROLLER T/U CLUTCH T/U IDLER TYRE REEL IDLER TYRE
Order Code: SK35 £10.00	**Order Code: SK36** £5.50

3V29/3V30
HR7200/7300/7350

Contents	Economy Kit 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	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: SK31 £10.00	**Order Code: SK32** £5.00

3V44/45/48/53/54/55/57
HRP50/HRD140/150/158/160
HRD250/257/565/566/755

Contents	Economy Kit Contents
BELT SET PINCH ROLLER CLUTCH MECHANISM TENSION BAND	BELT SET PINCH ROLLER
Order Code: SK39 £15.00	**Order Code: SK40** £9.50

FISHER
FVHP905/906/907/908/910/911/916/918

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

FVHP615/618/620/622/710/711/715/716/720/721/722/725/730/830/840

Contents	Economy Kit Contents
BELT SET PINCH ROLLER IDLER GEAR IDLER UNIT TENSION BAND	BELT SET PINCH ROLLER IDLER TYRE
Order Code: SK68 £11.00	**Order Code: SK69** £3.00

HITACHI
VT11/VT33
Contents
BELT SET PINCH ROLLER TENSION BAND IDLER TYRES
Order Code: SK08 £5.00

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VIDEO SERVICE KITS *(Cont.)*

VT11/VT33

Contents	Economy Kit Contents
BELT SET T/UP REEL TABLE TYRE SUPPLY REEL TABLE TYRE PINCH ROLLER FF/REW IDLER CLUTCH PLATE TENSION BAND	BELT SET PINCH ROLLER FF/REW IDLER TYRE T/UP REEL TABLE TYRE SUPPLY REEL TABLE TYRE
Order Code: SK45 £13.00	**Order Code: SK46** £3.75

VT52/61/62/63/64/65/85/86/640

Contents	Economy Kit Contents
BELT SET PINCH ROLLER FF/REW ARM CLUTCH PLATE TENSION BAND	BELT SET PINCH ROLLER FF/REW IDLER
Order Code: SK49 £14.00	**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
Contents
TIMING BELT PINCH ROLLER FF/REW ARM CLUTCH BASE TENSION BAND
Order Code: SK52 £9.75

VT100/110/111/113/115/118/120/125/128/130/135/138/145/150/175/220/225/250/255/258/260/VTL30
Contents
BELT SET PINCH ROLLER FF/REW ARM CLUTCH PLATE TENSION BAND
Order Code: SK51 £14.00

PANASONIC

NV2000/NV2010	NV7000/NV7200/NV7800
Contents	*Contents*
BELT SET PINCH ROLLER TENSION BAND. IDLER TYRES	BELT SET PINCH ROLLER TENSION BAND IDLER TYRES
Order Code: SK03 £5.00	**Order Code: SK02** £5.00

NV300/NV330/NV333/NV340/NV366
Contents
BELT SET PINCH ROLLER TENSION BAND IDLER TYRE
Order Code: SK01 £5.00

NV2000/NV2010

Contents	Economy Kit Contents
BELT SET PINCH ROLLER FF IDLER PLAY IDLER TENSION BAND VIDEO LAMP	BELT SET PINCH ROLLER IDLER TYRE PULLEY TYRE
Order Code: SK13 £6.00	**Order Code: SK14** £3.50

NV7000/NV7200/NV7800

Contents	Economy Kit Contents
BELT SET PINCH ROLLER IDLER UNIT PLAY IDLER TENSION BAND	BELT SET PINCH ROLLER IDLER TYRE CLUTCH TYRE
Order Code: SK11 £8.50	**Order Code: SK12** £3.25

NV300/NV330/NV333/NV340/NV366

Contents	Economy Kit Contents
BELT SET PINCH ROLLER IDLER UNIT PLAY IDLER TENSION BAND	BELT SET PINCH ROLLER IDLER TYRE PLAY IDLER TYRE
Order Code: SK15 £7.00	**Order Code: SK16** £3.25

NVG7/NVG9/VNG10/NVG11/NVG12/NVG14/NVG15/NVG16/NVG18/NVG30/NVG120/NVG130/NVG400/NVH65 (PX/AC)/AG1810 (P/K)

Contents	Economy Kit Contents
LOADING BELT CAPSTAN BELT PINCH ROLLER IDLER TENSION BAND	LOADING BELT CAPSTAN BELT PINCH ROLLER IDLER TYRE
Order Code: SK27 £6.00	**Order Code: SK28** £3.00

NV332

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

NV230/250/260/280/430/450/460/470/650/810/890/AG1200PK/AG1500PK

Contents	Economy Kit Contents
BELT SET PINCH ROLLER IDLER TENSION BAND	BELT SET PINCH ROLLER IDLER TYRE
Order Code: SK23 £6.00	**Order Code: SK24** £3.25

NV600/NV688

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

NV730/NV770

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

NV370/NV380/480/630/780/830/850/AG2100PK/AG2200PK

Contents	Economy Kit Contents
BELT SET PINCH ROLLER IDLER TENSION BAND	BELT SET PINCH ROLLER IDLER TYRE
Order Code: SK21 £5.00	**Order Code: SK22** £2.75

NV777/NV788

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

VIDEO SERVICE KITS *(Cont.)*

SHARP
VC381

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

VC500/VC571/VC581/VC582/VC583/VC584/VC5F3

Contents	Economy Kit Contents
BELT SET PINCH ROLLER REEL IDLER TENSION BAND	BELT SET PINCH ROLLER REEL IDLER
Order Code: SK60 £9.50	**Order Code: SK61** £5.00

VC781/VC7810/VC7822/VC785/VC786/VC793/VC800/VCA100/VCA102/VCA104/VCA202

Contents	Economy Kit Contents
BELT SET PINCH ROLLER REEL DRIVE UNIT TENSION BAND	BELT SET PINCH ROLLER REEL DRIVE UNIT TYRE
Order Code: SK64 £13.50	**Order Code: SK65** £3.75

VC681/VC682/VC684/VC685/VC693/VC699/VC6F3/VC700

Contents	Economy Kit Contents
BELT SET PINCH ROLLER REEL DRIVE UNIT TENSION BAND	BELT SET PINCH ROLLER REEL DRIVE UNIT TYRE
Order Code: SK62 £13.50	**Order Code: SK63** £5.00

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

BACKUP BATTERIES

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 1150/1	1500p	LOT21
ITT COMPACT 80	1500p	LOT22
FE TX100 GREEN	1450p	LOT23
HINARI CT4/5 5113	1500p	LOT24
SELECO 6320410	1600p	LOT25
BLAUPUNKT 8667	1600p	LOT26
ITT COMPACT B1	1450p	LOT27
ITT CT3326 MUL	1500p	LOT28
ITT D066/37 EQ	1600p	LOT29
ITT 3546 EQ	1500p	LOT30
LUXOR 5810110	1600p	LOT31
SABA 849380920	1600p	LOT32
HITACHI 2434141 CP	1450p	LOT33
FE TX100 110 D	1700p	LOT34
HANTAREX 28021	1600p	LOT35
SHARP C3700 EQ	1600p	LOT36
HITACHI 2432981 CP	1500p	LOT37
FERGUSON 00D3-508-002 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 TLF14568F 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

We stock line output transformers for over 100 different models. Please ring 0181-900 2329 for more information.

IDLERS & PULLEYS REPLACEMENT

AKAI

VS1-2, VS4-5, VS15	FF-REW IDLER	M1327773	400p
VS3, 6, 12, 56, 58, 59			
VS1-2, VS4-5, VS15	T-UP IDLER	BV327815	500p
VS3, 6, 12, 59, 59			
V9700	IDLER	BV321979	600p
VS125, 126, 155,	IDLER ASSY	MZ366960J2	900p
VS165, 240, 244, 245, 247, 248, 250, 512, 515, 516			
VS22, 38, 105, 112, 115, 116, 205, 220			
VP7100, VS9300	T-UP IDLER	PU47752	£4.50
VS9500, VS9800			
VP7100, VS9300	UNLOADING IDLER	PU46381	£4.00
VS9500, VS9800			
VP7100, VS9300	REW IDLER	PU46380	500p
VS9500, VS9800			
VP88	IDLER	BV336067	£5.00
VS1, 3, 4, 9, 12	REEL TABLE	BR347731	450p
VS15, 58			
VS23, 35, 37, 53, 55	CLUTCH	ML373043	1100p
VS66, 75, VSA77			
VS9700	FF IDLER	BV321761	£3.20
VS9700	REW IDLER	W321762	£4.25

AMSTRAD

VCR7000	IDLER	150280	£1.50
TVR1, VCR4500	CLUTCH	150873	£3.75
VCR4600, VC5200, VCR9000			
TVR1, VCR4500	GEAR HOLDER	151284	£3.50
VCR4600, VCR5200, VCR9000			
TVR1, VCR4600	REF CLUTCH		£3.50
VCR5200			
VCR6000, VCR6100	CLUTCH	153202	£3.80
VCR4500, VCR9000	CLUTCH		£4.00
VCR4500, VCR4600	MOD KIT	(TAPE 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			
3V23, 3V29 3V30,	REEL IDLER	PU48967	175p
3V31, 3V32, 3V35, 8923, 8924, 8929, 8930, 8931, 8940, 8941, 8942			
3V23, 3V31	ROLLER ASSY	PU49042A	350p
3V29, 3V30, 3V31	T-UP IDLER	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
3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8947, 8948			
3V42, 3V43, 3V44	SUPPORT CLUTCH	PU56044-1-5	160p
3V45, 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, 8900, 8901, 8904, 8906			
3V16, 3V22, 8902	IDLER	PU49281	£1.70
8909, 8912, 8922			

FISHER

FVHP420, 520, 530	FF-REW PULLEY	HI638531	80p
FVHP615, 618, 620	COMP. IDLER ASSY	FI1430420400300	£220p
FVHP622, 710, 711, FVHP720, 721, 722, FVHP725, 730, 830			
FVHP840,905, 906, FVHP908, 910, 911, FVHP915, 916, 918			
FVHP615, 618, 620	GEAR IDLER ASSY	FI1430490400900	380p
FVHP622, 710, 711, FVHP720, 721, 722			
FVHP725, 730, 830, FVHP840			
FVHP615, 618, 620	REEL T-UP ASSY	FI1430410400900	£5.50
FVHP662, 710, 711, FVHP720, 721, 722			
FVHP725, 730, 830, FVHP840			
FVHP905, 906, 908,	GEAR IDLER ASSY	FI1430490402400	275p
FVHP910, 911, 915, FVHP916, 918			
FVHP975, 980, 990,	IDLER	FI1430420400700	300p
FVHP999, 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		250p
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	£7.50
111, 113, 115, 118, 200		6886972	
125, 128, 130, 135, 138, 145, 150, 175, 225, 250,			
255, 258, 260, VTL30			
VT8000-8300, 7000	FF-REW IDLER	6413663	£2.80
VT8500-8700			
VT8000-8300, 7000	PLAY IDLER	6414221	290p
VT8500-8700			
VT8000-8300, 7000	FF-REW PULLEY	6383531	80p
VT8500-8700			
VT9300-9500, 6500	FF-REW IDLER	8681471	250p
VT680, 6800, 9700, 9900			
VT9300-9500, 6500	PLAY IDLER	6861482	230p
VT680, 6800, 9700		6861481	
VT 9900			
VT9300-9500, 9700	IDLER	681505	230p
VT9900, 6500, 680, 6800	IDLER	687043	£3.80
VT11-33, VT63-64	FF-REW IDLER	6886971	125p
VT14, 16S, 17, 19, 34, VT35, 38, 39, 52, 61, 62			
VT65, 85, 86, 88, 330, 640			
VT1000, 110, 111, 113	FF REW ARM	6886792	240p
VT115, 118, 119, 120, 125, 128, 130, 135, 138, 145, 150			
VT175, 220, 225, 250, 255, 258, 260, VTL30			
VT400, 405, 410, 413	FF-REW ARM	6897094	£1.30
VT414, 415, 418, 420, 425, 426, 428, 430, 431, 435			
VT438, 450, 498, 510, 518, 520, 525, 526, 530, 535			
VT536, 540, 545, 546, 548, 570, 575, 576, 580, 585			
VT588, VTM625, 626, 630, 635, 636, 640, 645, 646, VTS80, 85			
VT400, 405, 410, 413	CLUTCH BASE	6896951	£3.25
VT414, 415, 418, 420, 425, 426, 428, 430, 431, 435			
VT438, 450, 498, 510, 518, 520, 525, 526, 530, 535			
VT536, 540, 545, 546, 548, 570, 575, 576, 580, 585			
VT588, VTM625, 626, 630, 635, 636, 640, 645, 646, VTS80, 85			
VT3000	T-UP IDLER (LARGE)		£4.50
VT3000	REW IDLER		£6.00
VT680, 6500, 6800	FS-BRAKE	6861505	230p
VT9700, 9900			

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OUTPUT MUDULE HM 6251			£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 ASSY		£1.30
VX770, 800, 810, 880			
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	641C3430	£2.00
HS400, 410, 710			
HS347, 349, 412	IDLER	522902002	£3.00
HSB10, HSB20, HSB30, HSE10, HSE20, HSE30, HSE70			
HS337, 338, 411, 421	IDLER	552B0180	320p
HS200	TAKE UP IDLER (LARGE)		£4.50
HS200	UNLOADING IDLER		£4.00
HS200	REWIND IDLER		£6.00
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	522C0630	£3.00
HS337, 338, 411, 421	REEL DISK	522P0060	£5.00
HS300, 301, 302, 310	PULLEY	522C0520	£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, 9066, 9110			
N9510, 9520, 9530, 9610			

NATIONAL

NV322, NV600, NV688,	IDLER UNIT	VXP0463	£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, AG6015			
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, NVG15, NVG16, NVG18			
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
NV8150, 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, NVG45			
NV230, NV250, NV280	WORM WHEEL	VXP0604	160p
NV430, NV450, NV460, NV465, NV650, NV730, NV770, NV810			
NV870, NV890, AG1000			
NV370, NV380, NV630	IDLER	VXP0523	300p
NV780, NV830			
NV370	CLUTCH GEAR	VXP0595	£1.00
NV370, 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			
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NV230, NV250, NV260	CLUTCH GEAR		£2.50
NV280, NV430, NV450, NV730, NV770, NV810, NV870, NV890			
NVG7, NVG10, NVG11, NVG12, NVG14, NVG15, NVG18, NVG30			
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NV230, NV250, NV260	LIMITER ROLLER		£1.50
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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

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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
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VHR1300, 1500			
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VTC6500, VTCM10, M11, M20, M21, M30, M31, M50			
VTC9100, VTC9300	IDLER	143-0-551T-01400	95p
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	IDLER	NIDL0006GEZZ	110p
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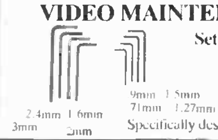

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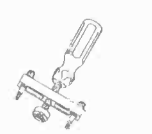

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Toshiba's
V3 Series VCRs

The V3 series deck has a third fewer parts than its predecessor while the VCRs have user-friendly features and improved performance. Philip Blundell looks at some of the technology used

The V3 range of VCRs is produced at the International Video Product (IVP) factory, which is jointly owned by Toshiba and Thomson, in Singapore. The designers of the V3 range set out to make the machines easy to use, with the features prople really want, and to have better performance than the previous range. The mechanism has a faster winding speed and a third fewer parts than the previous deck. The current V3 range is as follows:

V204B with two video heads, mono sound and standard-play speed.
V254B with two video heads, mono sound and standard/long play.

V404B with four video heads, mono sound and standard/long play.
V454B with four video heads, mono sound and standard/long play.
V804B with four video heads, two hi-fi sound heads, standard/long play, Nicam sound and jog shuttle control.
V854B with four video heads, hi-fi sound heads, a flying erase head, standard/long play, PDC, Nicam sound and jog shuttle control.

Features

All models have Video Plus programming, on-screen programming and on-screen error messages for the seven most common operator errors. These include trying to record on a

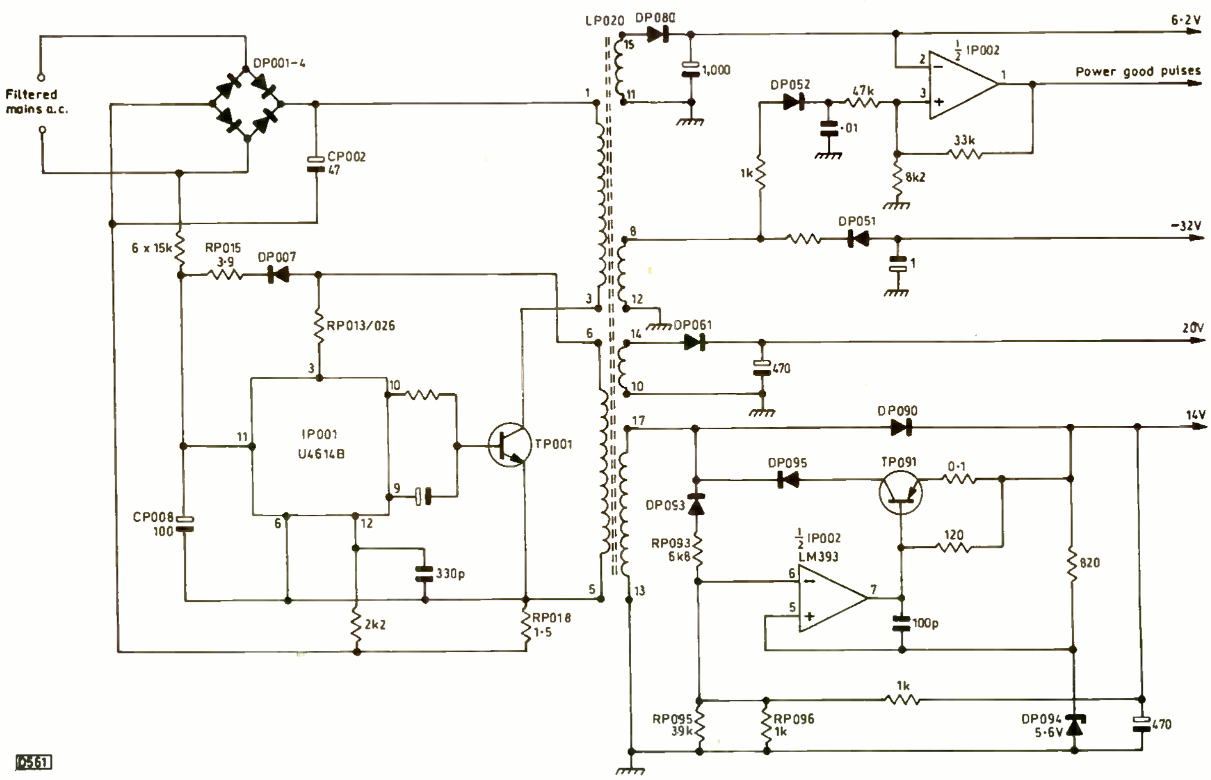


Fig. 1: Simplified circuit of the power supply used in mono sound models.

cassette with the safety tab removed, mistakes in setting up for a timed recording, trying to change channels while a recording is in progress and setting the timer without a cassette inserted.

The VCRs in the V3 range use the new PRO head drum. With mono sound models the head preamplifier is fitted in the lower drum. In hi-fi sound models a flying preamplifier is fitted in the upper drum. More about this later.

All two-speed models have Auto Speed Adjust – this means that the machine switches to the LP mode automatically if the timer is set to SP but the event is too long to fit on the tape available.

If a wide-screen (16:9 aspect ratio) programme is recorded, this is identified by the changed duty cycle of the pulses on the control track. A change in the scart status voltage occurs, enabling a suitable TV set to switch to the 16:9 mode.

All models have a satellite monitor facility: when the sat moni button on the remote control handset is pressed the AV signal is looped between the two video scart sockets, even when the VCR is in standby.

Those who wish to feed the aerial signal on to other rooms will be glad to know that the aerial mixer can be switched to on or off during play as required. The u.h.f. modulator's output can be tuned from ch. 53 to ch. 67.

All models have satellite receiver control. This enables the VCR to change the satellite receiver's channel when a timed satellite recording is made. For this purpose an infra-red LED is fitted towards the top of the machine, in the display window, to transmit channel commands to the satellite receiver. Most satellite receivers will have to be brought out of standby for this feature to work. An LED pyramid on a short cable can be obtained from Toshiba to avoid problems where the signal might be obscured by a shelf. It plugs into a jack socket on the front panel. Not all satellite brands or models can be controlled however.

Depending on the model, one of three remote control handsets may be supplied. These are as follows:

(1) A basic (normal) remote control unit.

(2) A multi-brand remote control unit. This enables the basic adjustments to be carried out with a number of TV brands. In addition, by routing the command signal through the VCR a satellite receiver's channel can be changed – subject to the qualification already noted.

(3) A CS (Customer Satisfaction) remote control unit. This can also be used for basic TV set adjustments. If the set is controllable linked functions are possible: for example, if you press the handset's programming screen button the TV will switch out of standby and the VCR will come on showing the VideoPlus screen.

Hi-fi models have front audio sockets and allow audio dubbing on the mono (longitudinal) sound track.

As long as the TV set can cope with a 60Hz field frequency, the current models will play NTSC 4·43 and 3·56MHz NTSC tapes of the correct speed format – extended play tapes won't play back via a PAL TV set.

Power Supplies

There are different power supply circuits in the mono sound and hi-fi sound models. Fig. 1 shows in simplified form the power supply used in Models V204B, V254B, V404B and V454B. There are two chips, a U4614B (IP001) for chopper transistor control on the primary side and an LM393 dual voltage comparator (IP002) on the

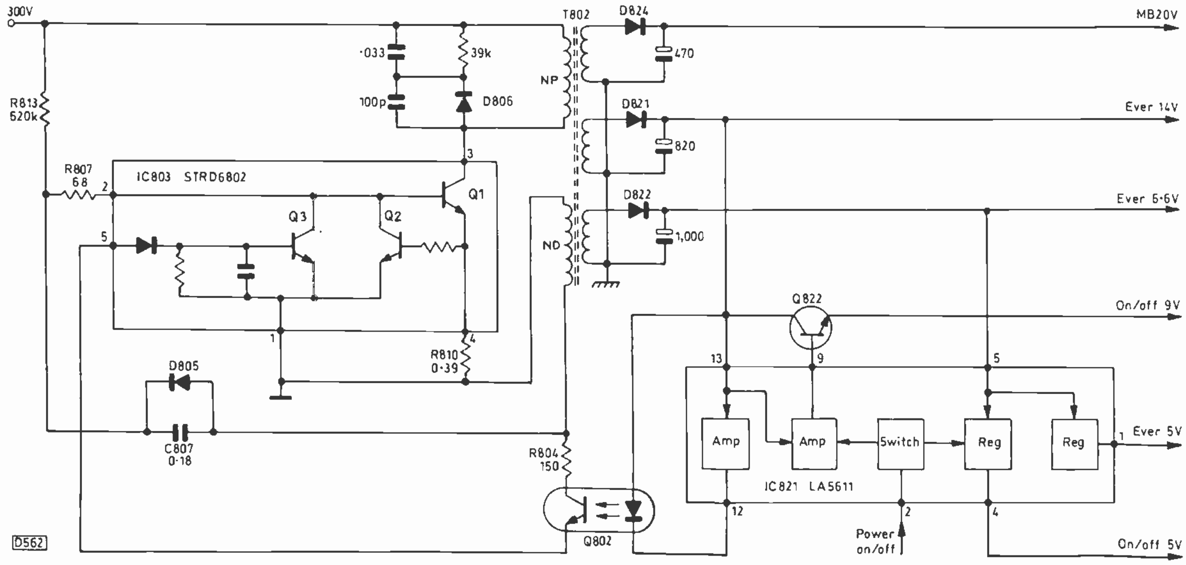


Fig. 2: Simplified circuit of the power supply used in hi-fi sound models.

secondary side. One of the comparators provides a 'power good' pulse signal which is fed to the microcontroller chip. The other comparator forms part of the voltage control system. This is rather unusual – see the circuit description below.

The outputs obtained on the secondary side of the chopper transformer LP020 (not all are shown in Fig. 1) are as follows:

(1) A fluorescent display filament supply from rectifier DP041.

(2) A 20V motor supply from rectifier DP061.

(3) A 33V varicap tuner tuning supply from rectifier DP071.

(4) A –32V fluorescent display cathode bias supply from rectifier diode DP051.

(5) A pulse input for the LM393 comparator that produces the 'power good' pulses for the microcontroller chip. The input pulses arrive via diode DP052.

(6) A 6·2V supply from rectifier diode DP080 for the servo/logic board. This supply becomes 5V. The 6·2V supply is also the second input to the LM393 comparator that produces the power-good pulses.

(7) The main 14V supply, which is derived from rectifier diode DP090.

At switch on the six series-connected 15kΩ resistors feed a start-up voltage to pin 11 of IP001. The chip begins to oscillate at approximately 30kHz, delivering base drive to the chopper transistor TP001 from pins 9 and 10. When running, IP001 produces a 3·5V reference voltage at pin 5.

The chopper transistor's emitter current flows through RP018 (1·5Ω), the voltage developed across this resistor appearing between pins 12 and 6 of IP001. Should TP001's emitter current exceed 0·4A, IP001 will cease to produce a drive output for TP001.

Voltage control is centred on one comparator section of IP002 and transistor TP091 on the secondary side of the circuit. The principle is to pass a current pulse, whose amplitude is directly proportional to the voltage on the 14V line, back to the primary side of the circuit via the transformer.

Pin 5 of IP002 is held at 5·6V by zener diode DP094. Negative-going pulses are fed to the comparator's other, non-inverting input, at pin 6, via diode D093. The pulse output produced at pin 7 drives the base of the pnp transistor TP091, which in turn feeds pulses to pin 17 of the transformer via DP095. The amplitude of these pulses is determined by the bias at TP091's emitter, which is connected to the 14V supply. The current pulses in the transformer are stepped up by the turns ratio of winding 13/17 to 5/6 and are fed back to pin 3 of IP001 via RP013/RP026 to control the on/off time of TP001.

During normal running the voltage at pin 11 of IP001, produced by the rectifier circuit DP007/CP008, is 9·4V.

The PRO Drum

This range of models uses two types of PRO video drum. Both have the head amplifier fitted inside the drum: putting it there improves the signal-to-noise ratio and reduces the crosstalk. Mono sound models have the preamplifier in the lower drum, the drum assembly being avilable only as a complete unit.

With hi-fi models the preamplifier is in the upper drum, which introduces the problem of how to get power and switching signals to a rotating mechanism. Power is supplied via a slip ring, while the r.f. switching signals are passed via the hi-fi transformer to the preamplifier section. An envelope comparator is contained in the preamplifier. During trick-mode playback, i.e. search or still, this produces either a high or a low voltage depending on which head (LP or SP) has the greatest output. This information is passed back via the rotary transformer as the 1·2MHz envelope comparator signal, then acted on by changing the r.f. switching signal. The r.f. switching signal is a composite one with both amplitude and frequency modulation. The timing of the head switching signal is critical: to minimise any switching noise, it occurs during the line flyback.

The frequencies used for r.f. switching (see Fig. 3) are between 9·4MHz and 11·4MHz. These are sufficiently high to avoid crosstalk with the video f.m. signal. Similarly the 1·2MHz envelope comparator signal falls between the 627kHz chroma signal and the 1·4MHz and 1·8MHz hi-fi audio carriers.

In the still mode, if the tape stops on a ch. 1 track the heads will repeatedly scan the same track. To give the smallest noise band on the picture, the switching signal selects the SP and LP ch. 1 heads alternately.

For normal play the LP/SP switching will stay in one state depending on the speed.

In the search mode the LP/SP switching signal changes state at the same rate as the heads cross the tracks, thus maximising the output at all times.

To optimise the LP picture quality the video heads are narrower than usual (24μm).

It will be higher if the chip is in the over-voltage mode.

Fig. 2 shows in simplified form the power supply used in Models V804B and V854B. It's based on an STRD6802 chopper chip, with regulation from the secondary side of the circuit via optocoupler Q802. The LA5611 chip IC821 on the secondary side of the circuit senses the chopper circuit's output voltages, drives the optocoupler and generates the ever 5V and other supplies. A d.c.-to-d.c. converter that takes its feed from the ever 6·6V supply generates filament and cathode bias supplies for the fluorescent display, also the tuning voltage.

The secondary side supplies (not all shown) are as follows:

(1) Ever 14V from rectifier diode D821. IC821 generates the on/off 12V, on/off 9V, on/off 5V and ever 5V supplies from the ever 14V line.

(2) 20V from D824 for the drum, loading and capstan motors.

(3) Ever 6·6V, from D822, to feed the d.c.-d.c. converter.

(4) On/off 12V from Q823 for the tuner, i.f. and Nicam circuits. This source also provides the fluorescent display heater supply.

The primary side circuit acts as a blocking oscillator. At switch on Q1 is turned on by the bias provided by resistors R813 and R807. Current flows via winding NP on the chopper transformer, with feedback to the base of Q1 from winding ND so that Q1 rapidly saturates. The voltage across winding ND then reverses, switching Q1 off for a period that depends on the charge on C807. When this capacitor has discharged sufficiently, Q1 turns on again. The conditions at the base of Q1 and thus the discharge of C807 are determined by Q3 under the control of Q802 and IC821. Two zener diodes D807/8 (not shown) connected across winding ND limit Q1's drive waveform, keeping the drive constant irrespective of mains input voltage variations.

This is a variable-frequency power supply. When the load is light, the chopper transistor conducts only briefly and the oscillation frequency is high – it's 160kHz in standby. When the load is heavier, the chopper transistor conducts for longer periods. In normal operation the oscillation frequency is 75kHz. IC821 monitors the 14V supply, in turn controlling Q802. When the phototransistor in Q802 conducts more heavily, the voltage at the base of Q3 is increased and C807 discharges more rapidly.

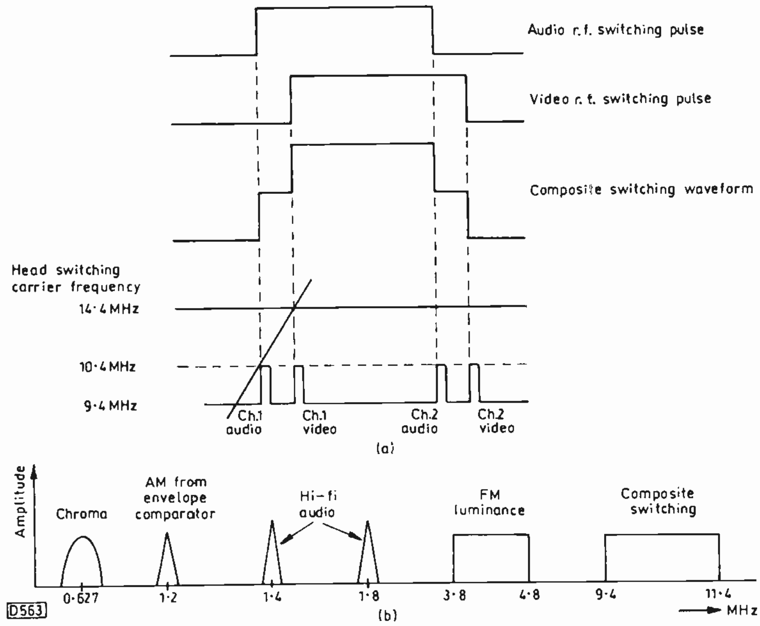


Fig. 3: V3 series head switching waveforms and carrier frequencies (a), frequency spectrum for the various signals (b).

Q1's emitter current flows via R810 (0·39Ω). The voltage across this resistor is monitored by Q2. If it reaches 0·6V Q2 switches on, removing the chopper drive. Thus in the event of a fault condition Q1's on time is limited.

Self-diagnosis

If the VCR has a mechanical problem that results in the machine shutting down, a code is stored in the EEPROM. This code can be recalled and displayed by putting the machine into the self-diagnosis mode.

To recall the error message, press the VCR's ch. up and ch. down buttons simultaneously, holding them down for five seconds or more. Then, within two seconds, press the remote control unit's still button. The front display will then show the error mesage.

Fig. 4 shows an error display. The first two digits/letters show the mode in which the fault occurred, the code being as follows:

00	standby
01	stop
02	rewind
03	review
04	fast forward
05	cue
06	playback
07	still/slow playback
08	x2 playback
09	stop – dew (moisture) sensed
0A	reverse playback
0B	still/slow reverse playback
0C	recording
0D	record pause
0E	power-off eject
0F	eject
10	short FF
11	short rewind
13	audio dub
14	audio dub pause

The middle section shows the error found, as follows:

E01	drum stopped
E02	take-up reel stopped
E03	supply reel stopped
E04	cassette load/unload fault
E05	tape threading fault

The final two digits/letters indicate the mechanism position error:

00	front loading in progress
01	front loading out
02	front loading in progress
03	front loading down
04	tape lacing
05	tape lacing
07	reverse rotation with pinch roller on
08	between playback and review
09	playback with pinch roller on
0B	stop with main brake on
0D	fast forward/rewind
0F	position detection not possible

The error message must be erased after the repair. Press the counter reset button while the VCR is displaying the self-diagnosis message: the display will then show '–'. ■

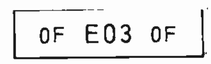


Fig. 4: A typical error display.

Acknowledgement

I would like to thank the Training Department of Toshiba UK for help in the preparation of this article.

What a Life!

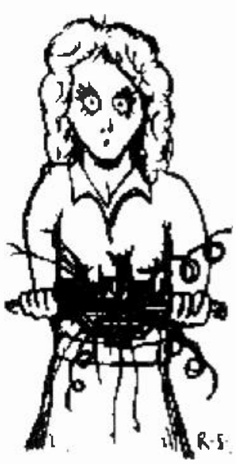
Donald Bullock recalls some of the troubles that beset him during the month

Four or five people called upon me this week for help in resetting their TV sets and VCRs following a couple of power cuts. They were well educated people – one a surgeon and another an ex-airline pilot – and three of them had the maker's handbook, yet none of them could operate the equipment they'd paid so much for. And since it's confession time, I have to admit that I was little better off.

I suffer of course from the disadvantage of having had a sensible and practical education by proper people in a proper world. I can't begin to think like today's whizz kids, and tend to throw in the towel when I find that once simple jobs have been turned into complex games. When, I wonder, will manufacturers discover that the bulk of the products they now offer can't be used for their intended purpose by those who have bought them?

My problem these days is not in repairing the stuff that folk bring to me: it's in trying to discover how to operate them. More than once I've spent valuable time trying to repair an apparently dead set only to discover, sometimes from my kids, that it's been child-proofed or that it isn't supposed to come to life until this, that and the other has been pressed or keyed or activated.

If any designer boys are reading this, let me offer them some advice that may well make their companies rich. Design a TV set that anyone can work, with a proper on-off switch coupled to the volume control and a set of knobs for brightness, contrast and colour adjustment. And, not too far from them, a set of easily tuned pushbuttons for programme selection. While these are being snapped up by ninety per cent of the population, sit down again and design a VCR along similar lines. You'd make a lot of people happy and unfurrow a lot of brows, including mine.



"My boyfriend could mend this if he had a meter thing"

Ethel's TX10

"They calls it a TX10" said Ethel McCrapenny. "It clicks and crackles then the mute light comes on and the picture flickers."

I switched it on to confirm the symptoms then checked carefully for dry-joints, especially around the chopper and line output transformers. Sadly, every joint was sound and my thoughts of a fast buck quickly evaporated. On switching back on again I thought I could hear a faint crackling from the area of the tube's neck. I was right! A huge bluebottle had wedged itself into the spark gap on the tube base board. When it was removed the set worked well. The bluebottle didn't.

Fred's Sharp VCR

Fred Horsefly brought in his Sharp VCA615HM VCR. It was pink.

"Painted it mesself" he said proudly, "only it won't accept a cassette and the clock is stuck at 10.59 a.m."

"What time did you paint it?" I asked.

In fact the reason for the failure to accept a cassette was the usual one with this deck – the mode switch. And when we'd fitted a replacement the clock started to behave.

Another Sharp

"My boyfriend could mend this if he had a meter thing" pouted Fiona Fossett, who brought in a Sharp VC780HM. "The tape shoots back every time we put one in."

As some of the case screws were missing it seemed sensible to treat the unit as a hostile witness. I soon found that the cassette sensor LED and its holder were broken in half. In view of the fact that the machine had been tampered with, I tried it out before doing any work. To fool the mechanism I switched on, inserted a tape then pulled out the mains plug as soon as the cassette had been accepted. Then, after a few seconds, I plugged it in again and pressed the operate button. The cassette loaded properly and the machine worked well in every way. My fears had been groundless. After ordering a new LED and holder, which arrived from Willow Vale next day, I was able to complete the job.

Mr Emery's Hitachi

As I moved the VC780HM off the bench Mr Emery entered. "I've called for my Hitachi telly" he said. I couldn't find it anywhere. "When did you bring it in?" I asked. "Half eight this morning. I left it next door, they said you were quick."

I collected his set and put it on the bench. It was a CPT2508 (G7P Mk 2 chassis) and was dead. I opened it and followed my nose, which took me to the pretty blue 4·7nF, 2kV disc capacitor C919 in the chopper transistor's snubber circuit. It had cracked open. The BUT11A chopper transistor had died, so had the fuse. Fortunately the TDA4601 chopper control chip was o.k., and the set worked well after replacing the items just mentioned.

A Bush 2059NTX

"Thrup, dead, thrup. That's all it does" said Mr Renton of the Bush 2059NTX he'd brought in. I carried out some checks and found that there was no 17V output on the secondary side of the chopper circuit. This was an easy one: the 6·8Ω surge limiter resistor had popped open, just to be awkward and make us a few bob. After fitting a replacement the set ran cool and survived some current checks and a soak test.

Screeching

Steven had written "screeches" on the ticket attached to a Panasonic TX2231. For once he wasn't guilty of understatement. When I plugged it in there was a horrendous noise that I could have sold to Hammer Films.

As far as I could hear, before tugging at the speaker leads, the sound was all right. But I fancied that I could smell some health-giving ozone. So I put out the lights, drew the blind and settled at the set. The line output transformer was producing an impressive e.h.t. display that crawled around the focus and first anode areas. As I disconnected the set Greeneyes came in with my tea.

"Why are you in here alone with the lights off and the blind drawn" she wanted to know. "You're well over sixty you know. And what's that funny smell?"

A new line output transformer from Willow Vale cured the trouble. The original type is no longer available, but Willow Vale supply an alternative that works. ■

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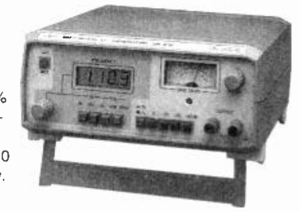

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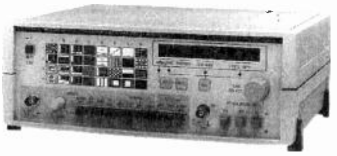

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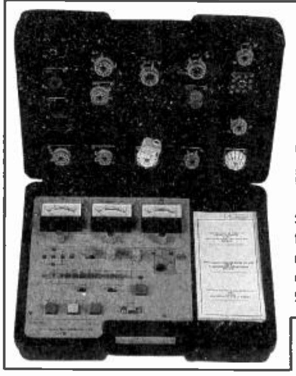

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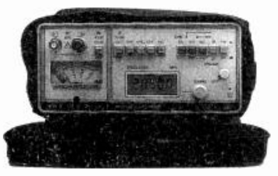

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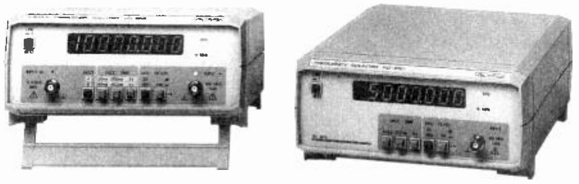

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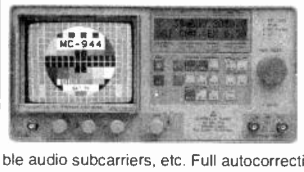

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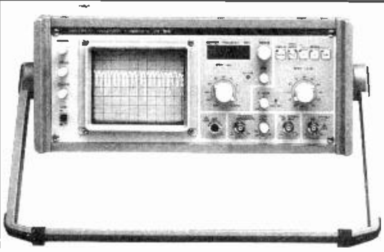

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Camcorner

A selection of recent camcorder servicing problems

Reports from David C. Woodnott Brian Storm Nick Beer

Panasonic NVS20

A 'whining' noise was being recorded on the sound. The cure was to clean and lubricate the drum earthing brush. This is a common problem, once encountered with early JVC designs. **D.C.W.**

Sanyo VAR30B Adaptor

This unit charged batteries very slowly – it took about four hours for a normal one and a half hour type – and would power a camcorder for only a short time before ceasing to operate. We found that the value of R201 had increased from 0·1Ω to 0·3Ω! It's in the excess current detect circuit on the secondary side of the supply. A check on this resistor is worthwhile whenever one of these units comes in for repair. **D.C.W.**

Sharp VLC790H

The 5V regulator transistor Q920 in the power supply had failed. As a result there were no E-E or viewfinder pictures. The cause of the failure was C011 (220μF, 6·3V) on the EVF PCB. It had leaked and carbonised the area between its wire connections – no, it's not a can type this time! The effect was to place a near short-circuit across the 5V rail. We were able to revive the unit by scraping the affected area, giving it a general clean up and replacing the failed components. **D.C.W.**

Chinnon VC1500

The viewfinder had fallen off, which is normal with one of these camcorders! We were also asked to check the batteries and the adaptor, as only a short (fifteen-minute) recording could be made before 'BATT' showed in the viewfinder. The unit worked all right when powered via the adaptor. Further checks then showed that the battery down adjustment (R1001) had been set incorrectly. As no fault could be found in this area, we set the unit up as specified in the manual and gave it a long soak test. It seemed to be perfectly satisfactory – but don't these machines make a noise when loading and unloading! **D.C.W.**

Panasonic NVMC20

Incorrect capstan control was the problem here. The capstan speed was about right, but the phase wasn't being controlled correctly. Because of this a noise bar rolled through the picture slowly, at a consistent rate. After much testing and probing we found that the voltages around the AN3798NS chip IC2003 were incorrect. Replacing this chip restored accurate capstan control. **B.S.**

Panasonic NVM1

The camera picture colours produced by this vintage camcorder were incorrect – blue and red predominated. The tube was still o.k., the culprit eventually being identified as IC401 (AN2431LF) in the colour-difference signal processing circuitry. After replacing this item we adjusted the electronic focusing and the beam current. The outcome was a very acceptable picture. **B.S.**

Panasonic NVS90

There was no playback picture, though recordings were fine. No playback luminance was the basic problem. Checks around the hybrid luminance chip IC3001 showed that the playback luminance signal was o.k. as far as pin 42, where it leaves via buffer transistor Q3014 to go to the timebase corrector (TBC). On its return it should appear at pin 2 of IC3001. It didn't.

Checks in the TBC circuit showed that everything was fine as far as the output pin (36) of the chip (IC3501). The luminance signal then passes to discrete-component amplifying stages, where it was being lost at Q3511. This transistor's d.c. base voltage was high, upsetting its operation. Further checks brought us to pin 2 of the sync reinsertion chip IC3504, where the voltage was also incorrect, in turn because of the loss of the composite sync input at pin 4. The pulses were being lost farther back in the circuit, at the 120pF chip capacitor C3562 which was cracked. It's on the back of the main PCB – the side that faces the back of the mechanism. **N.B.**

Canon A2HiE

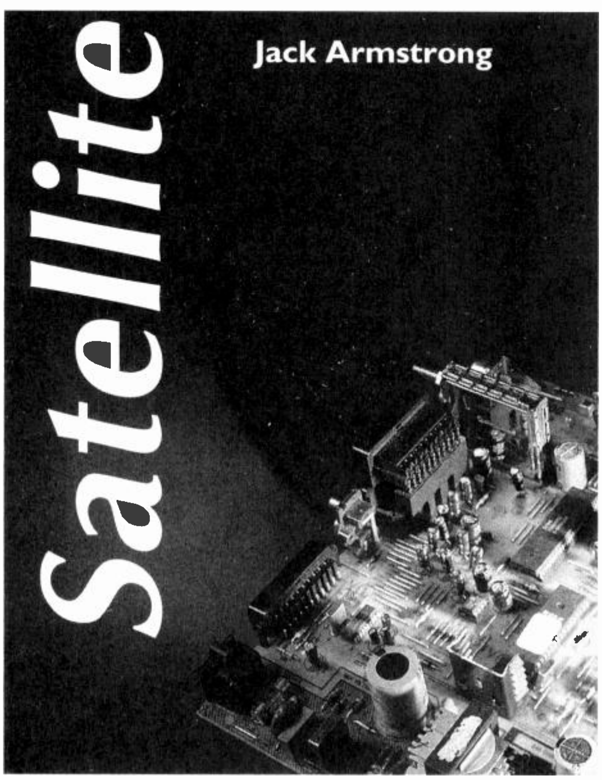
Hi8 recordings were marred by phenomenal amounts of dropouts and over-modulation. I wondered whether the fault had occurred suddenly or developed over a period of time. The problem was not present when the machine was used for low-band V8 recording. Obviously such a fault will show first with hi-band recordings, but what a difference! The cause of the problem was the heads, which are Sony DGR62s. If you have a Sony account, you'll probably find that a cheaper source. **N.B.**

Canon E50E

Playback was o.k. but there was no camera E-E picture. Once again the cause was traced to a leaky electrolytic, this time C2651 (47μF) on the camera process PCB. It had leaked over a print run that connects the CAM ON L signal to the PWR ON pin of the camera d.c.-d.c. converter. This meant that the pin was permanently high, thus no E-E picture. A link had to be fitted as the print had been almost completely corroded away.

At switch on we were surprised to find that we still had no E-E picture, though a healthy burst signal was now present. This time we found that the iris remained closed. Gentle movement of the iris mechanism revealed that the camera circuits worked in general, but when the mechanism was released the iris closed automatically. After a long search in the iris drive circuitry we found that the 0·047μF chip capacitor C2224 on the SUB PCB was open-circuit. It appears to act as a reservoir for the iris drive circuit. After replacing it we at last had a good picture. **D.C.W.** ■

Satellite WORKSHOP



Jack Armstrong

Up here in the Far North (just 550 miles south of John o' Groats) we get some rather lah-di-dah types. This very week I've been bothered by one of the huntin', shootin' and fishin' crowd. He owns a large tract of land, and likes to lord it over his supposed inferiors. Since I'm a "soldering-iron plonker", as a well-known chairman of a well-known company once remarked, I clearly fall into this category.

A local shop had installed a Pace MSS1000 and a Churchill D2MAC decoder at his mansion. Everything was fine for a few months then, as Christmas approached, it stopped working. Well, not quite: the receiver still worked, but the D2MAC pictures were not being decoded.

The shop couldn't help, and this was the gentleman's third visit to our premises. On the first he'd brought with him the Churchill decoder. We tested it and couldn't find anything wrong. On the second he brought the decoder and the MSS1000. They both worked perfectly for hours in the workshop. This time he'd brought them yet again: I watched him pull them out of his Range Rover, along with what looked like a gun bag. This time he clearly meant business!

I backed away when he entered, but he thrust the bag towards me. It contained the handset and connecting leads, he explained – he wouldn't be seen dead with a plastic carrier bag. He left the lot on my counter then hurried off to shoot some poor, unsuspecting birds.

The problem

The units worked perfectly when I tested them, with his card in the decoder slot. So I left them to warm up while I had a cup of tea. I then rummaged in the bag to find the handset, and came across a scart lead. It was definitely not the one the shop had supplied when the equipment was installed. I know, because the shop buys them from me. I had a hunch and tried his lead. Sure enough the picture was now scrambled! Just to be silly, I tried his scart lead with a VideoCrypt decoder. It worked perfectly. But it wouldn't work with the D2MAC decoder. The cable was of very wide diameter, which suggested that it was fully screened, and about one and a half metres in length. The plug screen and the pins were gold-plated. With my workshop scart lead – a short, nine-wire cheap thing – the Churchill decoder worked perfectly.

When his Lordship returned I asked him about the scart lead. He admitted, rather sheepishly, that he'd treated himself to a new one for Christmas. In fact it was just about the time that the decoder stopped working! I'm not sure whether the light dawned, but he turned a little pink and left quite hurriedly.

This gold-plating of leads seems to be the in thing at present. My understanding however is that there is no advantage in putting gold-plated pins into a socket which has tin-plated contacts. The connection is no better, and putting dissimilar metals together can cause problems, can't it? Do any experts out there know a bit more about this?

Pace MSS500 Numbers

A Pace MSS500 IRD was brought in the other day with a curious complaint. It worked perfectly, but there were some numbers that changed from time to time in one corner of the screen. It was almost like a signal-strength display. I rang the Pace Technical help line, assuming that it was some sort of 'hidden' test display. The helpful man explained that this was indeed a factory test function, which indicated correct a.f.c. operation. Pressing 'F' then 'i' on the handset turned it off.

The customer couldn't understand how this had happened, and was extremely pleased that there was no repair charge. I'm a soft touch, but have found that customers often come back and spend money later if you treat them right.

Extra channels with the Amstrad SRD400

While browsing through the Usenet section of the Internet I came across some information from a young man called Mike Ginger. Now Mike seems to spend a lot of time experimenting with his Amstrad SRD400 satellite receiver. In doing so he has discovered that more than 48 channels are available, with no modification at all. He writes:

"Selecting the extra eighty channels available is simplicity itself. Go over to the SRD400 and press 'preset' then 'recall'. The display will show a frequency, then the audio mode, then 0 (zero). Extra channels can be selected only sequentially, by pressing the 'channel down' key to scroll through them – you can use tuning up or down however. While in this mode, which we'll call the 'extended mode', you can return to the standard 48-channel mode by pressing the channel up key or by selecting one of the 48 standard channels. If you press 'channel down' you'll notice that the display changes to channel 95. Pressing it again will show channel 94 and so on in steps of –1.

The first eighty of these extended mode channels are extra presets. The next 48 are repeats of the standard 48. So changing any of them in the extended mode will also change them in the standard mode. The next 80 presets are repeats of the first extended-mode presets. So I suggest that you don't store anything while displaying these, or be aware that any change made will also change the first

80 presets! After scrolling through these you return to the standard (48-channel) mode.

If you press 'channel down' in the extended mode until you reach channel 31 you should see Astra 1D channels. Pressing 'recall' will show the frequency to be around 6,297 (16·297GHz), which is incorrect. Channels 31 through to 20 step –1 show these funny frequencies, also Astra 1D channels 55 and 56. Have fun experimenting".

Mike Ginger goes on to explain that a standard handset can be modified to add the preset and recall functions. Thanks Mike for permission to publish this.

A Pace MSS1000

An old lady brought in an MSS1000 IRD which had apparently died when her son had tried to tune in Hot Bird after fitting a second LNB on the dish. When I checked it on the bench the set lit up and was clearly not dead. The screen flashed the warning message "LNB short" however, so I disconnected the cable in a hurry. The warning flash continued until I disconnected the mains supply.

On checking the installation menu I found that LNB input two was selected on channel one. When I tried to change the setting to inputs "1 + 2", as it should be, I got the warning message again. Before stripping the unit down, I decided to try the factory reset. This is not a problem with the MSS1000, because it resets the installation menu and channel one but leaves the tuning of the other channels alone. The receiver worked perfectly as soon as I'd punched in the button sequence. It seems that some of them don't like to have just one input selected.

Another fault I've had is failure of the output chips on the sound board. The result is a ticking noise from the power supply. Check by withdrawing the two-pin connector next to D54.

Bits 'n' Pieces

A few weeks ago my wife dragged me all the way to Shrewsbury. She wanted to shop and visit the 'Cadfael' centre (this was before the sad news that Ellis Peters, the author of the Cadfael books, had died). My wife and children found the centre fascinating. For me however the most interesting part of the trip was the discovery of the Durrants shop in the high street. There are counters full of goodies for the electronics enthusiast. Not exactly satellite TV, but well worth a look. Oddly, my wife didn't find it in the least interesting, and dragged me off before I had a chance to go inside. I was forced to drive home without spending any money at all!

The Philips STU824

I've had several of these receivers in recently with similar faults, usually no handset response and sometimes no front panel button response. There have been other odd things, such as no V/H switching because the receiver thinks it has skew control instead. In each case there was a dry-joint in the infra-red receiver circuit, but resoldering it didn't cure all the problems.

A replacement microcontroller chip made no difference. In desperation, convinced that it was a microcontroller chip problem, I fitted a 1006 version for the Pace PRD900. The display then showed –E2, indicating that the EEPROM was being reprogrammed. After that the receiver worked with a PRD handset.

When I replaced the original Philips microcontroller chip I found that –E2 again appeared, after which the receiver worked perfectly. I assume that corruption of the information stored in the EEPROM was the cause of the fault. Was it coincidence that there was an IR module dry-joint, or had this caused the corruption? ■

Test Case 397

This time of year is a busy one for us. Hence the heavy load of new and repaired equipment our man-on-wheels Doc Colin had with him as he set out on this chilly winter day. One of his calls was to return a newly-repaired large-screen stereo TV set. Having got it into the house, installed and set up, he noticed that the VCR to which it was connected was a new stereo model. But the only link between them was an r.f. cable that linked the VCR to the TV set's aerial input socket. To watch video playback, the customer used the remote control unit's 0/VCR button. The signal then went to the receiver via the VCR's modulator, on channel 36.

Ever helpful, Doc Colin suggested that the owner bought and used a scart lead so that he could have the benefits of stereo sound and better picture quality. He pointed out how the AUX button could be used with a link lead, mentioned the type of cable required, and suggested a call at the shop to buy one. If he could have foreseen the consequences he mightn't have been so helpful!

A few days later the Service Department phone rang. It was Doc Colin's customer, with a problem – two in fact. The scart cable had been bought and installed. But when the TV remote control unit's AUX button was used to select video playback the sound and picture were both worse than with the r.f. link! The wonderful results predicted by our man were not forthcoming. Could we come and check it out? Service Manager could see no profit in this job. He nominated Doc Colin to make the call, since he'd recommended the use of the ****** cable in the first place. Service Manager is very money conscious: the profit from the cable sale was probably less than two pounds, but the house call was going to cost over twenty. . .

So it was that a chagrined Colin returned to the house. He inserted a cassette in the VCR, set it to play, and pressed the TV remote control unit's AUX button. While the resultant sound was certainly in stereo, it was at a lower level than that of off-air transmissions received by the set. As a result the volume control had to be advanced, then backed off when returning to TV reception. In addition the treble response of the tape playback sound was poor, and the audio was more 'woolly' than when played back via an r.f. link.

The playback picture degradation took the form of a kind of sparkly ghost image on the screen, with vague unlocked fragments of colour and outlines floating and falling about. The effects were particularly noticeable with dark scenes or a momentarily blank display.

The sound and vision faults were also present in the E-E mode, with the VCR switched on in the stop position. Strangely the vision degradation virtually disappeared when, with AV operation, the aerial lead was withdrawn from the TV set's u.h.f. input socket.

Colin had brought with him another scart lead of the same type. But when he tried this the results were exactly the same. He didn't have another VCR to try, and anyway the one involved had been supplied by Doug's Discount on the other side of town. He retreated to the privacy of his van and got on the radio-telephone to his friends in the warmth and calm of the workshop. He was given some good advice. What was it, and how were the problems resolved? Don't go straight to page 212 without giving it some thought!

VCR Signal Processing

In part 3 of his series Joe Cieszynski deals with basic luminance signal processing in the playback mode

Part 2 last month covered luminance signal processing in the record mode. We also showed, in Fig. 2 on page 112, a block diagram of a typical VHS luminance playback system and ran through the basic requirements. In this instalment we'll consider the luminance playback processing operations in greater detail.

Record/playback Switching

Fig.1 shows in outline form a two video head record/playback arrangement. The two heads, labelled Ch. 1 and Ch. 2, are coupled to two rotary transformers, L1 and L2, which are built into the drum. Record/playback switching is performed by transistors Tr1-4.

In the record mode transistors Tr3 and Tr4 are switched on by the record 9V supply, connecting point A at the end of each rotary transformer secondary winding to chassis. Thus the inputs to the playback amplifiers 1 and 2 are earthed and the record signal from the luminance/chroma mixer is applied to point B at each rotary transformer secondary winding.

In the playback mode the conditions are reversed. This time transistors Tr1 and Tr2 are switched on by the playback 9V supply, connecting point B at the end of each rotary transformer secondary winding to chassis. Thus the signal currents flowing in the secondary windings leave at points B to pass to playback head amplifiers 1 and 2.

The Playback Head Amplifiers

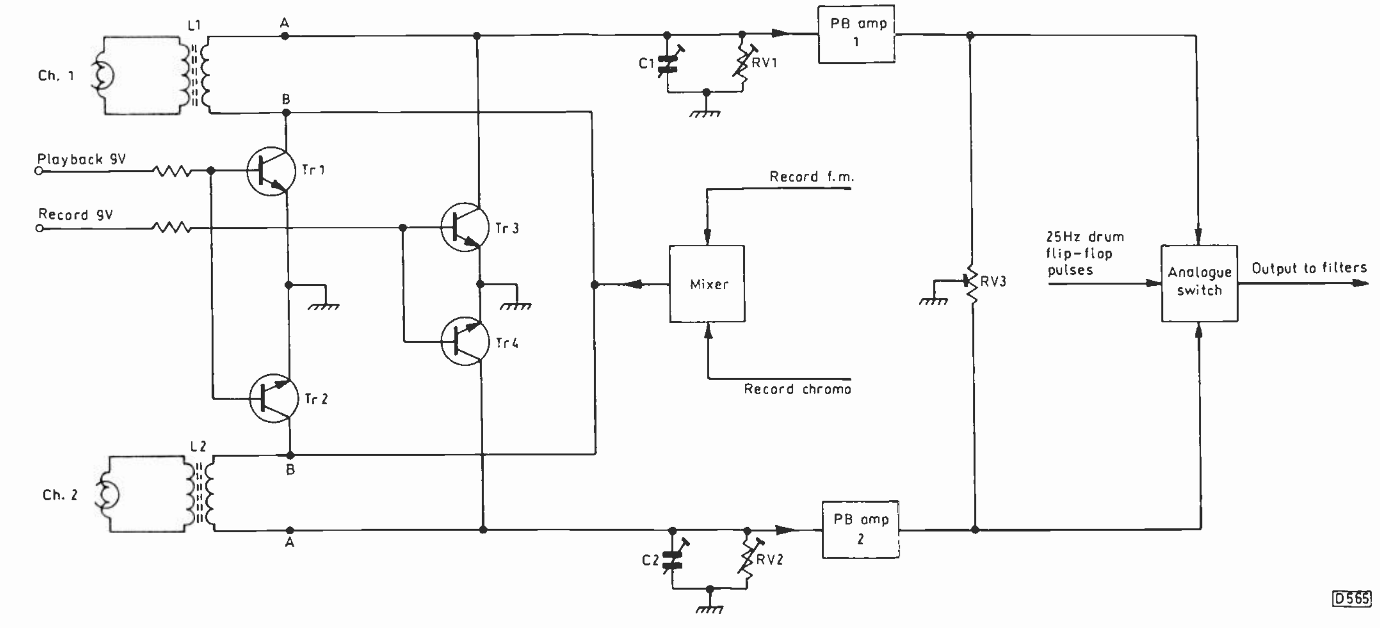
The f.m. output produced by the heads is very small. Therefore the signal-to-noise ratio is poor. Because of the high input impedance of the head amplifiers, the rotary transformers that couple the video heads to them behave in effect as radio receiving aerials. This adds to the poor noise performance. Remember also that the signal-to-noise ratio of the recorded f.m. signal is poor to begin with, because of the low modulation index. The head amplifiers must therefore have high gain and a low noise figure, the aim being to boost the f.m. signal (with the superimposed chroma) and maintain a signal-to-noise ratio of around 40dB.

The head coils are largely inductive. Thus to obtain the required flat response the amplifier input circuit must be tuned. Capacitors C1 and C2 resonate with the inductance of the rotary transformers. As a result, the amplifers' response peaks at around the centre frequency. The parallel resistors RV1 and RV2 have a damping effect on the tuned circuits, the net result being an overall flat response. Improvements in manufacturing techniques long ago made it unnecessary for these components to be adjustable. But if you look at modern VCR circuits you will still often find that fixed-value peaking capacitors and damping resistors are included.

Where head damping and Q adjustment are possible, it is as well to set them up. The VCR will more than likely be an older model, and someone may well have had a go before the machine arrives on your bench. Misadjustment of these controls results in black-to-white inversion streaks. But, as should be plain from various points made last month, this symptom can arise as a result of a number of possible faults and misadjustments in the luminance signal processing stages of a VCR.

The usual sequence of events is that the heads begin to wear and black-to-white inversion appears. Some 'helpful'

Fig. 1: Basic two-head record/playback switching arrangement.



person decides to adjust the head tuning controls to compensate. In many cases this will reduce the effect for a brief period – at least long enough to get out of the house. Then, when the machine is finally brought into the workshop for new heads to be fitted, the result is that the streaking is worse than ever. Peaking and damping adjustment have to be carried out to match the circuit to the new heads.

Most Q adjustment procedures given in service manuals call for the r.f. sweep section of an alignment tape to be played while the f.m. output is scoped. The Q capacitors are set so that the waveform peaks at around 5MHz. In practice however the Q can be set simply by observing the black-and-white inversion on the screen when a tape with a large amount of h.f. information is played – anything that contains captions is ideal.

Playback amplifiers 1 and 2 generally employ f.e.t.s. Their high input impedance prevents the rotary transformers and head coils being damped. Playback equalisation is usually carried out in these head amplifier stages (see Fig. 2).

The f.m. channel balance control RV3 (Fig. 1) enables the output from each head to be set at the same level. Note that the control won't increase the signal level from the head with the lower output: it simply reduces the signal level from the head with the higher output.

From the point of view of the f.m. signal this amplitude balancing is not essential, as amplitude variations are removed by the subsequent limiter. But if the f.m. levels differ greatly the levels of the chroma signals that ride on them will differ. This could lead to 25Hz chroma flicker, as the saturation will be different with successive fields. In practice channel balancing is seldom critical because the a.c.c. circuit at the input to the chroma processing channel is able to cater for small differences. If the head outputs are greatly different however a 25Hz flicker, or patterning, may be evident.

Analogue Switch

The analogue switch is used to pass the output from one head or the other to the next stage on successive tracks, so that during playback the head that's not in contact with the tape is muted. If head switching was not employed, the head not in contact with the tape would, being a tuned circuit, pick up interference that would appear on the picture as speckles.

The switch is driven by the 25Hz flip-flop signal, whose phase can be adjusted to ensure that switching occurs at the correct point for each head. For standard VHS operation the switching must occur 6·5 lines (±1 line) before the start of the field sync pulse, see Fig. 3.

If the head switching takes place too early there will be a band of distortion at the bottom of the picture. If it occurs too late, the playback picture will be prone to field bounce or rolling.

Alternative Arrangements

The switching and head amplifier arrangements with a four-head machine are basically the same, but with circuit duplication. Many variations in detail will be found in practice.

The High-pass Filter

The next requirement after the head amplifier is a high-pass filter to prevent the chroma, the hi-fi sound carriers and the ATF signals (8mm system) from entering the luminance playback channel. Its passband, f.m. as well as sidebands, is 3·8-4·8MHz with standard VHS, the cut-off frequency being around 1·2MHz.

Dropout Compensation

A dropout is a momentary loss of the off-tape f.m., which would result in a white flash on the playback picture. There

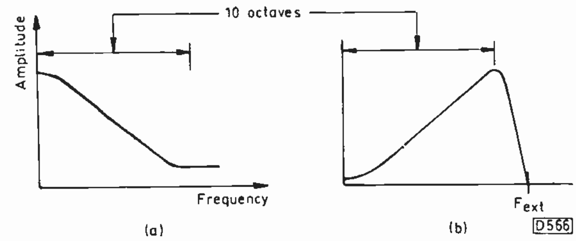


Fig. 2: The response (a) of the playback head amplifier is designed to compensate for the 6dB/octave rise in the output (b) from the video head. This form of playback equalisation is the same as that employed in audio machines.

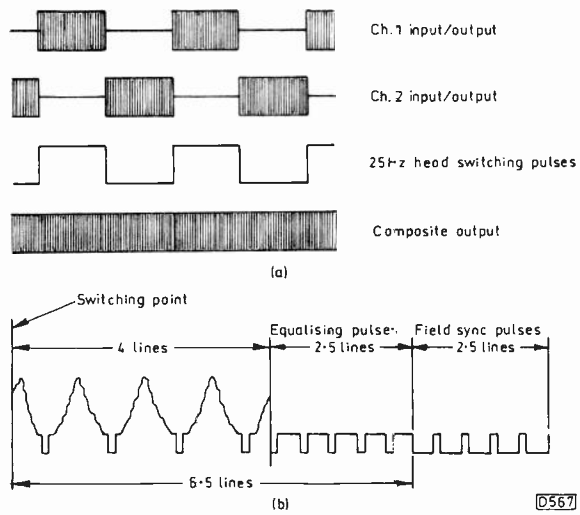


Fig. 3: Obtaining a composite f.m. signal from the outputs of the two heads (a). Switching between the heads must occur 6·5 TV lines (VHS system) before the start of the field sync pulse (b). Check the switching by scoping the composite video output at line speed, using the drum flip-flop signal to trigger the scope. Switching between the negative and positive waveform slopes enables the switching periods for chs. 1 and 2 to be observed.

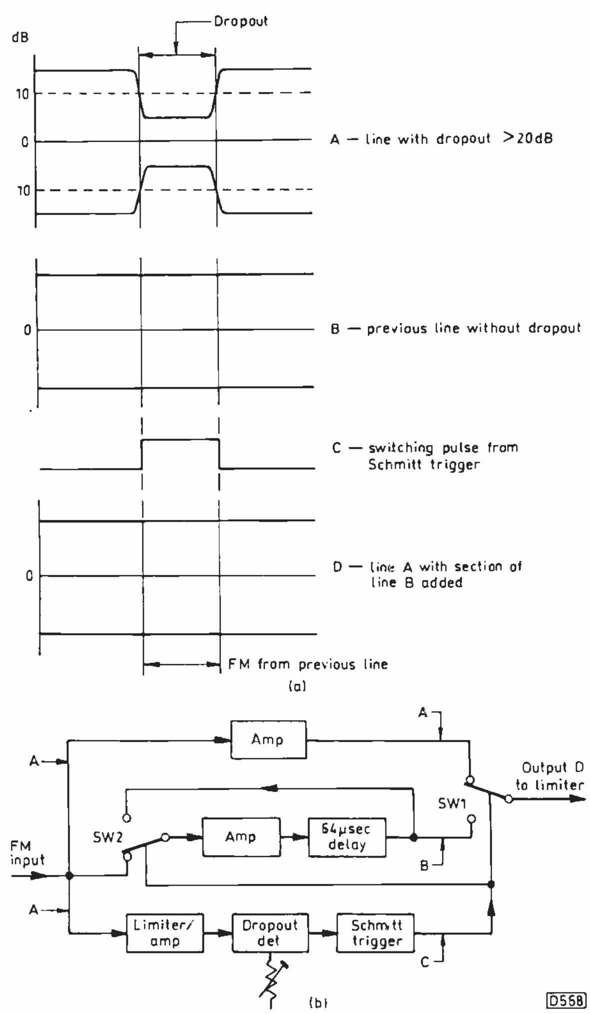


Fig. 4: A recycling dropout compensator arrangement.

are several causes of dropouts: missing tape oxide, video head wear, tape oxide thickness variations, dirt on the tape and dirt on the head drum for example.

The purpose of the dropout compensator is to avoid these white flashes by inserting the signal from the previous good line. Fig. 4 shows a recycling dropout compensation arrangement. The f.m. input is taken to three paths. The direct path, shown at the top, is the normal f.m. signal route to the following limiter stage. The centre path leads to a 64µsec delay line. In most VCRs this consists of a glass ultrasonic delay line, though in many modern machines a CCD delay system is used instead. The bottom path goes to the dropout detector, which is followed by a Schmitt trigger.

This operates whenever a significant drop in the level of the off-tape f.m. signal is detected. If the switching level is adjustable, it should be set to operate when the signal level falls by about 20dB.

When the f.m. signal level is correct, the output from the Schmitt trigger holds the two electronic switches in the positions shown in Fig. 4. Should the level of the f.m. signal fall significantly, the Schmitt trigger changes state and the switches change over to their alternative positions. The output from the dropout compensator circuit now comes from the delay line. The second switch SW2 loops the output from the delay line back to its input.

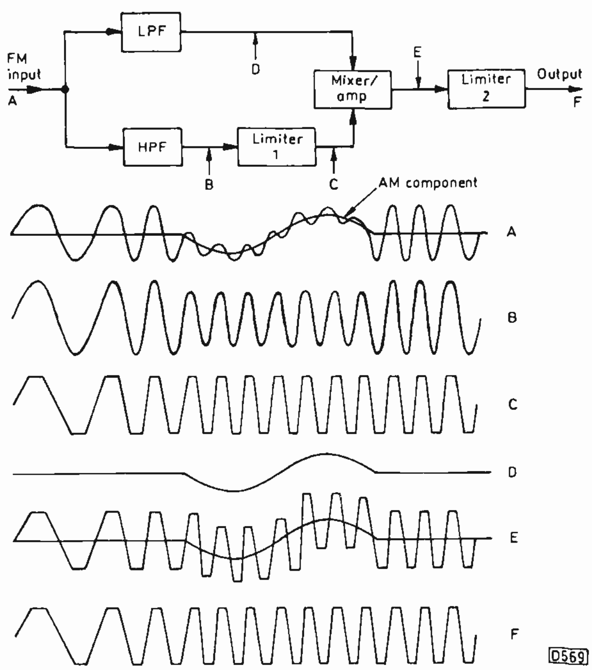


Fig. 5: Block diagram of a duplex limiter, with associated waveforms.

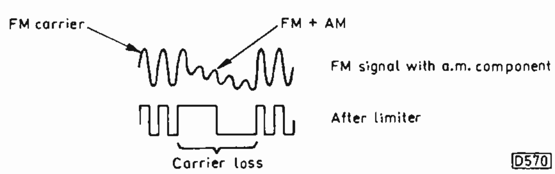


Fig. 6: Effect of using a single limiter to remove a.m. Single limiting will also remove h.f. signal components, leaving an l.f. carrier that gives a black signal. Thus where sudden white peaks occur the VCR produces a black image, i.e. white-to-black inversion.

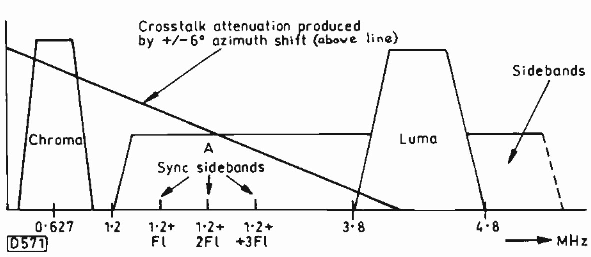


Fig. 7: Crosstalk attenuation provided by the slant azimuth technique over the range of frequencies within the standard VHS signal spectrum.

This is called recycling dropout compensation. It's not used in all machines. The advantage it has is that the last good section of f.m. of up to one line duration can be continuously recycled. There's a problem however: the recycled signal deteriorates after a number of reinsertions. Thus machines have a maximum number of reinsertion times. This number varies from model to model.

If the dropout period is considerable the picture will break up into snow. In some machines a black level is inserted. In others a coloured raster might be displayed, with on-screen graphics such as the brand name, or an instruction to the customer to operate the head-cleaning mechanism that some machines have.

The AM Limiter

The vast majority of VCRs use a duplex limiter to remove unwanted a.m. from the playback luminance signal. A duplex limiter is simply a double-limiter circuit. Any of the following factors will introduce a.m.:

(1) Luminance bandwidth restrictions.

(2) Low available f.m. power level.

(3) Head response deficiencies.

(4) Dust particles.

(5) Tape-to-head contact problems.

(6) Tape coating deficiencies.

We'll consider these in turn, starting with (1) and (2). When the f.m. carrier deviation is at maximum, the sideband information would want to extend over a considerable bandwidth. But the lower sideband is limited to 1·2MHz. Since all the power is contained in the sidebands, this means that less power is available at h.f.

(3) Head losses increase as the recorded f.m. approaches the extinction frequency. Thus the playback output falls at the higher frequencies.

(4) and (5) With the VHS system the recorded tape area occupied by one TV line is approximately 33µm by 49µm. Particles of dust are much larger than this, and thus cause considerable dropout problems. Dust can also lodge on the head drum assembly, with the result that the tape wanders away from the head, producing signal amplitude variations. Because of the reduced tape penetration depth, this problem is more acute at h.f.

(6) Even the highest quality tapes can suffer from variations in the thickness of the tape oxide coating. This again results in amplitude modulation, more acute at h.f. because oxide particle size is a greater proportion of the recorded signal cycle.

Fig. 5 shows a duplex limiter in block diagram form, along with waveforms at the various points in the system. The f.m. signal is fed to two filters where the sideband energy, also the amplitude variation, is split into low- and high-frequency components. This separation is important since, with a composite f.m. signal, l.f. amplitude variations will swamp the limiter operation, the result being loss of the h.f. information – see Fig. 6.

Waveform A in Fig. 5 shows the incoming f.m., with an unwanted a.m. component. B and D show the separated h.f. and l.f. signals. C shows the h.f. signal after limiting by limiter 1. The signal appears to be clear of a.m., so one may wonder why this is not sufficient. The removal of the l.f. component has produced an f.m. carrier phase shift however – remember that the following f.m. demodulator will see a phase shift no differently from a frequency shift. In other words, the output obtained by demodulating waveform C would not be correct. Restoring the l.f. component, as shown at E, corrects the carrier phase. The second limiter then removes the carrier ripple caused by the restoration of the l.f. component. The final output is shown at F.

Incorrect adjustment of the duplex limiter will result in black-to-white inversion.

FM Noise Cancelling

Since the launch of VHS and Betamax machines in the late Seventies, the section of the VCR that has been most subject to redevelopment is the mechanism. On the electronics side, manufacturers have devoted much time and effort to improving picture quality by means of noise-cancelling systems. Some of the techniques that have been developed are in general use: others remain specific to one manufacturer.

F.M. noise gives the picture a generally grainy look. There are several causes of f.m. noise in the record/playback process. For a start, background noise is endemic with any magnetic recording system. Add to this the fact that crosstalk between the signals from adjacent tracks is not completely eliminated by the use of the head slant-azimuth technique, and the poor f.m. signal-to-noise ratio as a result of the low modulation index and single-sideband recording, and you have a considerable noise problem.

We'll next take a look at some of the more common noise-cancelling techniques.

Line-correlated Noise Cancelling

Fig. 7 shows the crosstalk attenuation (above the line) achieved by the use of the slant-azimuth technique across the standard VHS signal spectrum. It's generally taught that the technique removes luminance crosstalk but is not very effective with the chroma frequencies. As Fig. 7 shows however, the slant-azimuth technique is also largely ineffective at the lower luminance f.m. sideband frequencies. This means that sideband crosstalk in area A will be evident on the picture as fine patterning.

Manufacturers were aware of this problem right from the start of VHS VCR production. By 1981 a method of employing a comb filter to cancel the most prominent and regular crosstalk sideband components in this region, namely the line sync sidebands, had been developed. The basic idea is that the channel 2 f.m. signal is recorded with a frequency shift of 7·8kHz (half a TV line). This is done by feeding the drum flip-flop signal, at a suitable amplitude, to the f.m. modulator – see Fig. 8.

Cancellation is achieved by passing the playback f.m. through the comb filter arrangement shown in Fig. 9(a). When the incoming carrier frequency is added to a carrier which has been delayed by a period (128μsec) equal to half the line frequency (7·8kHz), the comb-filter response shown in Fig. 9(b) is obtained. As you can see, at multiples of the line frequency the output falls to zero.

Because the crosstalk between channels is phase shifted by half the line frequency, the large crosstalk sync sidebands occur at the zero points in Fig. 9(b). As there is no output at these frequencies, the crosstalk is cancelled out – see Fig. 9(c) and (d). Unfortunately, any legitimate luminance sidebands at these points in the filter's response will also be lost. This sacrifice is justified by the overall improvement in picture quality achieved.

Tape Characteristic Noise

High-grade or S-VHS tapes may be used to reduce luminance and chrominance noise. When such tapes are used in a standard VHS machine however there may be a loss of resolution caused by the incorrect pre-emphasis level. In a standard VHS machine the pre-emphasis level is optimised

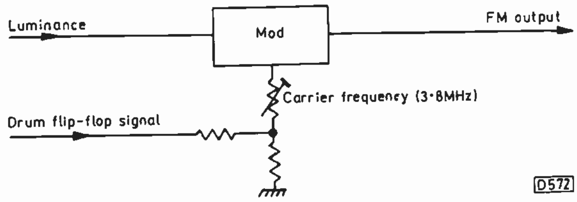


Fig. 8: Feeding the drum flip-flop signal to the f.m. modulator results in a shift in the carrier frequency. The circuit is arranged so that the ch. 2 head's f.m. carrier frequency is at 3·8MHz + 7·8kHz. A similar circuit must be employed in the playback processing to shift the d.c. level of the demodulated luminance signal back to the correct level.

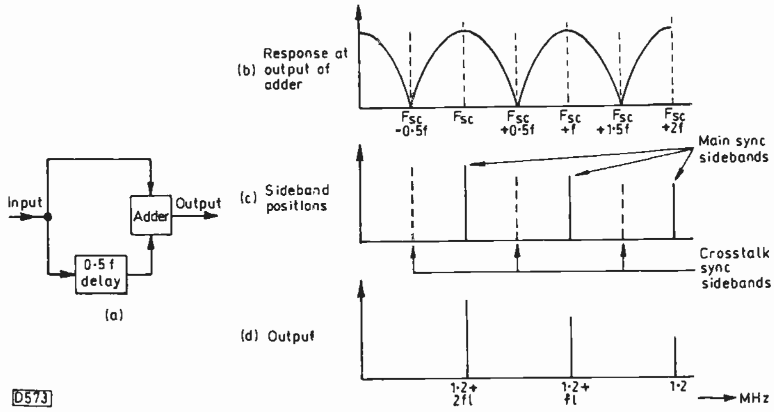


Fig. 9: A comb filter arrnagement used to cancel crosstalk between line sync sidebands. Fsc is the carrier frequency, f the line frequency (15·625kHz). At points Fsc + 0·5f, Fsc + 1·5f etc. the crosstalk will cancel.

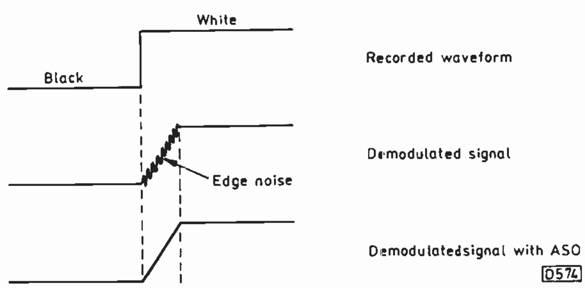
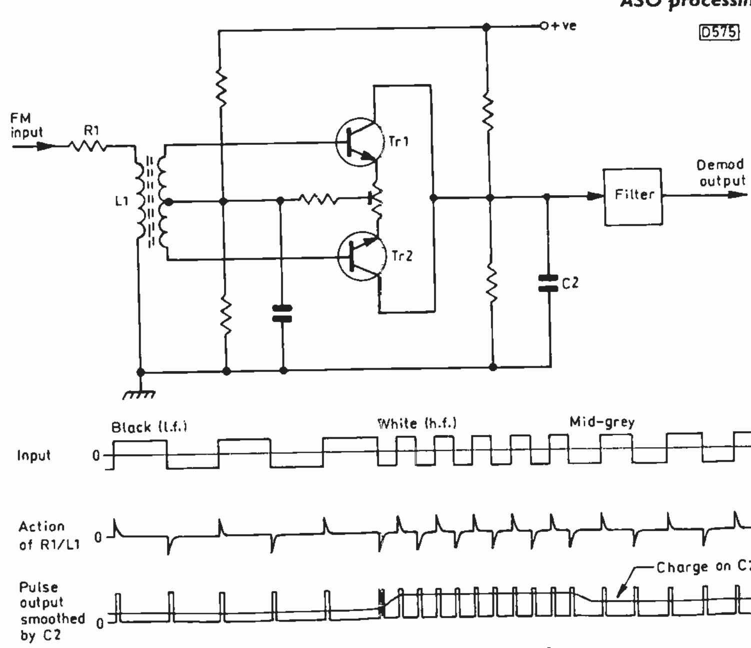


Fig. 10: Nokia's ASO system removes noise on h.f. transisitions caused by propagation delay. (a) Recorded transition, (b) demodulated transition with noise, (c) effect of ASO processing.



Above, Fig. 11: A simple f.m. demodulator arrangement of the frequency doubling and pulse-counting type.

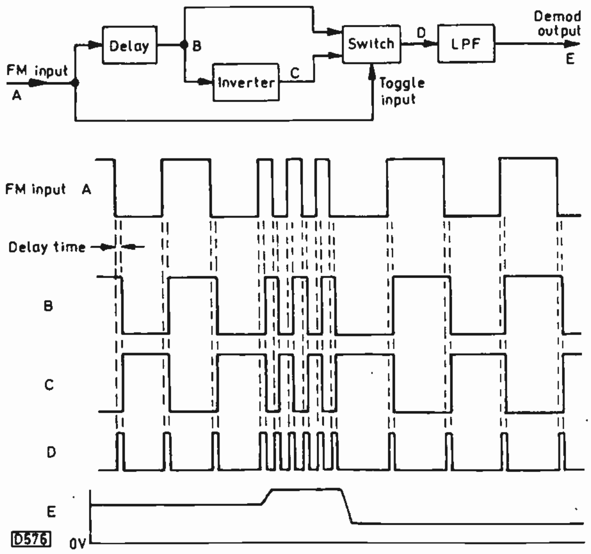


Fig. 12: Pulse-counting f.m. demodulator arrangement using a delay line.

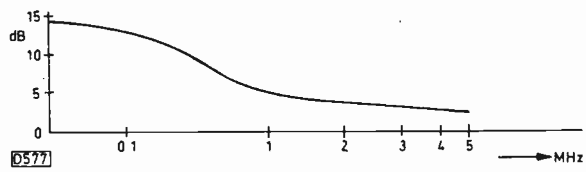


Fig. 13: Typical de-emphasis amplifier response curve.

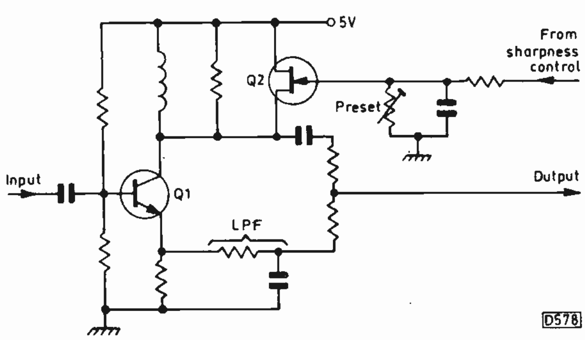


Fig. 14: A simple sharpness control arrangement.

for use with standard VHS tape. The ability of higher grade tapes to store h.f. signal components at higher energy levels means that, when played back, these will be of far greater amplitude than with standard tape.

The f.m. a.g.c. system will reduce these excessive signal components, which occur predominantly in the lower sideband region. The visible effect produced by this action is poor contrast in areas of the picture with a lot of detail.

Some higher-quality machines incorporate circuits that attempt to overcome this problem.

Active Sideband Optimum

The Active Sideband Optimum (ASO) system was developed by Nokia. It's a picture edge sharpening method that does not, unlike some luminance noise reduction systems, add noise to sharp edges in the picture.

The f.m. signal is subject to phase shift (propagation delay) as it passes through the playback circuits. Because there is a greater shift with the h.f. components of the signal than the l.f. components, edge noise is generated. As a result, what should have been a clean black-white transition becomes a ragged moving edge – see Fig. 10.

The ASO system uses an active filter circuit to pick out the l.f. signal components and adjust their phase delay to correspond with that of the h.f. components. Restoration of a constant phase relationship across the bandwidth produces much cleaner edges.

The ASO circuit is also designed to overcome the problems that arise when using high-grade or S-VHS tapes in standard VHS machines. This circuit is located in the head amplifier section of the playback signal path.

Intelligent High Quality

Akai's Intelligent High Quality (IHQ) noise-reduction system is designed to reduce background noise without increasing edge noise. Note that it operates on the demodulated luminance signal, not the f.m. signal.

During playback the noise-reduction system alters its operating threshold to suit the noise level. When a good-quality recording with low noise is played back, the system functions at only low signal levels, leaving the higher signal levels unaffected. When a poor recording is played back the IHQ system raises its threshold to reduce the noise. The drawback here is that there is some reduction of the higher luminance signal levels, the result being a slightly softer picture.

IHQ recording is more complex. The machine carries out a brief record/playback test initially, to determine the type of tape being used – standard, high-grade of S-VHS. It then sets an appropriate l.f. f.m. boost, so that during playback the l.f.will be in correct proportion to the h.f. components.

The FM Demodulator

The f.m. demodulator used in a VCR generally operates on the principle of doubling the incoming carrier frequency then using a pulse counter. This technique is used because the f.m. carrier is recorded without bias and therefore suffers from crossover distortion. It's essential therefore that the demodulator acts on the peaks of the carrier, to avoid operating in the distorted region of the waveform.

Two examples of frequency-doubling systems are shown in Figs. 11 and 12, though it should be pointed out that in practice the demodulator will be contained within a luminance processing chip.

In Fig. 11 the filtered and squared input from the limiter is fed to the *RL* differentiator formed by R1 and L1. The accompanying waveforms show the action. Tr1 and Tr2 provide full-wave rectification (frequency doubling). The amplitude of the charge developed across reservoir capacitor C2 is proportional to the input signal frequency, i.e. we have frequency-to-voltage conversion. In this way the analogue luminance signal is recreated.

Fig. 12 shows a pulse-counting f.m. demodulator using a delay line. The squared f.m. input is fed to a switch and to a delay line, whose delay time is about a quarter of the f.m. carrier's centre frequency (4·3MHz). Inverted and non-inverted outputs from the delay line are fed to the switch. When the switch's toggle input (a – the direct input) is low, delayed waveform (b) is passed to the output. When (a) is high, the inverted delayed signal is passed to the output. The effect of this action is to double the f.m. carrier frequency. Pasing the output (d) through a low-pass filter to provide integration recreates the luminance signal.

As with any demodulator, the output from the filter contains a large carrier component. This is clearly visible when an oscilloscope is connected to the relevant processing chip output pin. This carrier component could cause patterning and must therefore be removed before the luminance and chroma signals are combined to form the composite video signal. A further low-pass filter, with a cut-off at about 3MHz, is therefore included in the post-demodulator circuit. Because of the higher f.m. carrier frequency (5·4MHz) the problem is not so acute with S-VHS, but filtering is still necessary.

De-emphasis

De-emphasis is carried out by an amplifier with frequency-selective feedback to provide a response the opposite to that of the record pre-emphasis circuit. A typical response curve is shown in Fig. 13.

Picture Sharpening/Noise Reduction

Loss of the upper luminance signal frequency components with domestic VCR systems naturally leads to loss of definition with sharp edges in the picture. Manufacturers have for many years offered a 'soft/sharp' control facility so that the user can select the type of picture preferred. The basic sharpness control circuit tends to offer the viewer only two options: a grainy, noisy picture with very sharp, if somewhat noisy, edges; or a smeary, low-definition picture that at least appears to be noise free!

A simple sharpening circuit is shown in Fig. 14. The output at the emitter of Q1 is followed by a low-pass filter that removes the h.f. signal components. A second output, from the collector of Q1, is added to the output from the LPF. The amount of h.f. luminance at the collector of Q1 depends on the Q factor of coil L1, which is damped by Q2. Adjustment of the sharpness control alters the conduction of Q2 and thus the damping effect it provides.

The problem with simple VCR sharpness controls is that in addition to highlighting sharp edges they also boost any noise in the signal, the result being ragged verticals. For this reason the sharpness control circuit is generally followed by some form of noise-cancelling circuit.

Fig. 15 shows a typical arrangement. Low- and high-pass filters separate the l.f. and h.f. components of the signal. The former are fed directly to the final mixer stage. The h.f. signal components are fed to the mixer stage via a non-linear filter which removes low-level noise.

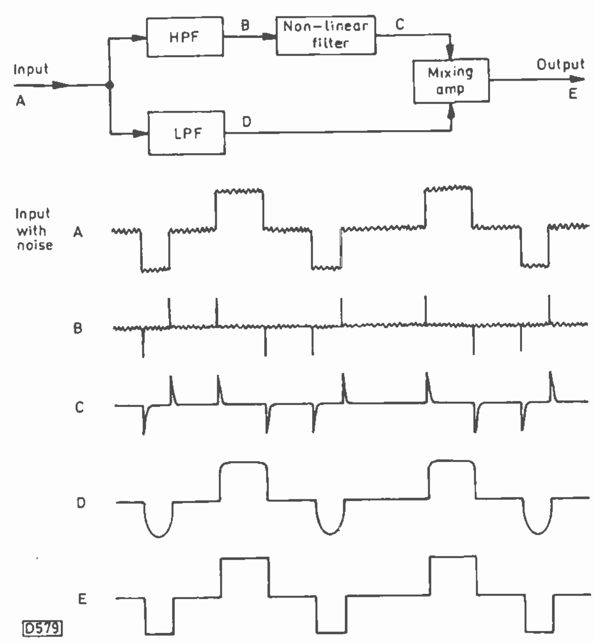


Fig. 15: A simple noise-cancelling arrangement.

The Mixer Stage

The mixer stage enables the processed luminance and 4·43MHz chroma signals to be combined to provide a 1V CCIR-standard composite video output signal. With some formats separate Y and C or component outputs are standard.

In addition to Y and C inputs, the mixer stage will also have a tuning/test signal input or, in many modern machines, an input from an on-screen display graphics generator.

Summary

This completes our examination of VCR luminance signal processing. Individual manufacturers use many variations on the theme, but the block diagrams in Figs. 1 and 2 last month show the basic record/playback signal processing required.

In Part 4 we will go on to chrominance signal processing.■

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Panasonic Z3 Chassis

There was no colour in this portable's display. So we turned our attention to the circuitry around IC101, where amongst other things the colour decoding is carried out. Voltage checks drew our attention to a small ceramic capacitor connected to pin 29. C616 was leaky of course, being one of the dreaded 10nF, 50V ceramic type capacitors. **B.S.**

Panasonic Euro-1 Chassis

This digital TV set seemed to work all right – until you asked it for the on-screen menus. All that would be displayed over the picture were random numbers and characters. As the information for the on-screen menus is held in an EPROM on the digital board, this was the first thing we checked. Another reason for homing in on it was the fact that it's a plug-in chip. But a replacement made no difference at all. We eventually traced the cause of the trouble to the TPU2735 teletext processor chip, despite the fact that teletext worked perfectly. **B.S.**

Panasonic Alpha 2W Chassis

This beast had come from another dealer, who'd given up. It had come to him as a dead set, so he'd replaced the regulator chip IC801. This made no difference. He then found that the over-voltage protection diode D854 was short-circuit. He'd removed it and tried again. This is where his problems started. Without the protection, the voltage on the 160V rail shot up to about 300V. The reservoir and smoothing capacitors started to smoke. Then the line output transistor winced and went short-circuit, blowing the fusible link R567. This is where I came in.

I fitted another STR45051M chip in position IC801 and checked the circuit around pin 5, which is where the regulation control takes place. R815 (5·6Ω) was open-circuit, and I also replaced C808 – as a precaution. After replacing D854 then Q551, C851 and R567 in the line output stage I gingerly powered up the set. Fortunately the friendly rustle of e.h.t. preceded a very good picture. **B.S.**

Panasonic TC14S1R (Z5 Chassis)

This portable was completely dead. Should be simple, I thought. But the chopper power supply chip IC801 in this chassis has a standby and a power mode. The standby circuit was completely dead. Voltage checks around IC801 showed no real signs of life – but it was getting hot! After extensive tests in the power supply I found that D806 was leaky. A replacement AU02V0 diode restored normal operation.**B.S.**

Philips GR2-1 Chassis

Dead set was the complaint. In fact it wouldn't turn on, though the power supply was running (phew!). Checks showed that the microcontroller chip wasn't working, but a replacement didn't help. I then did what I should have done to start off with – unplug the text panel. The faulty component was IC7880 (PCA84C81AP/098). If the chip from the earlier version is used, the Fastext keys won't work. **G.D.**

Ferguson TX10 Chassis with Sweep Tuning

There are still lots of these sets around. A common fault is failure of the tuning to stop, or the LED flashing constantly with no effect. The faulty chip is always IC344 (MC1449-9PB). Many suppliers regard it as obsolete, but SEME still seem to have some left. **G.D.**

Philips KT4 Chassis

There was sound but no raster. When the tube's first anode voltage was increased we found that the field timebase was working. So the next thing to check was the sandcastle pulse. If it's present, the TDA3561A colour decoder chip is probably faulty. If it's absent, as on this occasion, replace the TDA3576B timebase generator chip IC7200. But be careful: the drawing on the component side of the board is upside down – the print side diagram is correct. If you install the chip the wrong way round the fault is almost identical! **G.D.**

Philips GR1-AX Chassis

The symptoms were as follows: very excessive height, non-linearity and field blanking to the extent that only a quarter of the picture was displayed. They were all intermittent.

Replacing the field output and timebase generator chips made no difference. Neither did replacing any relevant electrolytics. We removed and checked every resistor in the field output stage. Several hours later we traced the cause of the trouble to C2043 (82pF), which was intermittently leaky. It feeds pulses from the line output transformer to the field generator section of the TDA8305 timebase generator chip IC7020, at pin 2. **D.J.F.**

Loewe Opta Profi T28

"It's difficult to start from cold" the customer said. At switch on the standby LED would glow for about three seconds then gradually fade. C626 (100μF) in the start-up circuit for the TDA4601 chopper control chip had fallen in value to 50μF. **D.J.F.**

Sony KVX2172

This set was brought in because its the volume level couldn't be altered. The cause was the EAROM chip IC072, a replacement putting matters right. **M.M.**

Matsui 2095

This set was thought to be dead though the power supply was working and there were no shorts across any of the circuits on its secondary side. We quickly found that there was no drive to the line output transistor. In fact there was no line oscillation, because C607 (3·3nF) which determines the oscillator's free-running frequency had a 3kΩ leak. A replacement restored normal operation. **M.M.**

Mitsubishi CT25A2STX

This set would sometimes trip when it came out of standby. While I was carrying out some checks the line output transistor went short-circuit. So I fitted a 60W bulb as a dummy load instead. When the set was brought out of standby the bulb glowed brightly, with the h.t. well above its correct value. The cause of this was traced to C609, the 47μF capacitor in the chopper transistor's base circuit. A new capacitor reduced the h.t. voltage to the correct level while a new line output transistor restored the picture. **M.M.**

Sanyo CBP2572 (ED1 Chassis)

There was intermittent loss of the off-air vision signal. For once the fault wasn't on the digital board! There was simply a dry-joint at the emitter of Q173 (2SA608). **M.M.**

Sharp DV5132H

When one of these sets goes into the protection mode you have approximately five seconds before it reverts to standby. Fortunately all that was wrong with this particular set was that R612, the fusible resistor that feeds the supply to the field output chip, was open-circuit. A replacement restored normal operation. **M.M.**

JVC AV25S1EK

This set's picture was dim with a slight green tint. The cause was no voltage at IC201's contrast control pin because capacitor C1206 had become leaky. A new 3·3μF capacitor restored good pictures. **M.M.**

Toshiba 2112DB

The reported fault was that this set would go to standby after about half an hour. I couldn't instigate the fault in the workshop, but found that pin 64 of the microcontroller chip appeared to be dry-jointed. After resoldering it and giving the set a long soak test I decided that all was now well. **M.M.**

Matsui 2092T

A number of different line output transformers that are not interchangeable were used in these sets. This one was fitted with a Philips transformer, part no. 043221008P. It was short-circuit, a replacement bringing the set back to life. **M.M.**

Ferguson ICC5 Chassis

Failure of the EW loading coil LG11 in models fitted with 110° tubes can produce the dead set symptom. In addition to replacing LG11, the following items must be replaced, using Ferguson approved components: CL44 330nF; RL44 56Ω + 120Ω fusible; J134 22Ω fusible; IG01 TDA4950 EW modulator driver chip. Note that RL44 consists of two resistors in series. Also check the 1nF ceramic capacitor CG11 which may well have gone short-circuit. **M.M.**

Philips 14TVCR240

This is the Philips contribution to the range of combination TV sets/VCRs available. It was dead with a short-circuit line output transformer, a replacement restoring normal operation. **M.M.**

Grundig P37-050

There was no remote control operation, nor did the channel change buttons on the set itself work, though the volume control was o.k. I assumed that the main microcontroller chip was faulty, but on investigation I found that the remote control input line was stuck at 0V with a short-circuit across it. Disconnecting the line removed the short, which was cured by replacing the TFMS4300 infra-red receiver chip. Obviously the channel change is linked to the remote control line and was also being dragged down. **T.L.**

Matsui 1091

I though the customer who brought this set in was crazy. He claimed that it wouldn't power up unless it was laid on its right-hand side! But he was right. When the set was switched on normally it wouldn't power up even when tapped etc. On its left-hand side it wouldn't work, but turn it over on to its right-hand side and up it came. I removed the back and fortunately the cause of the fault showed up. A wire near the on/off switch was dry-jointed. It had been arcing and as a result was conductive on only one side. A good clean up and a resolder cured the problem. I'll never disbelieve a customer again! **T.L.**

GoldStar CIT2181FG

The complaint with this set was that the colour disappeared after about twenty minutes. On test that's exactly what happened. Good old freezer came to the rescue. Use of this soon established that the chroma delay line was dodgy. A replacement cured the fault. How ever did we manage without freezer?! **T.L.**

Matsui 2095T

Be careful if distorted sound is the complaint with one of these receivers. Don't order a new audio chip: reseat the old one, using some hot melt to hold it. **T.L.**

Philips NC3 Chassis

This set was dead with a blackened mains input fuse. A quick check in the power supply revealed that the BUT11AF chopper transistor Q401 was short-circuit and the 4·7Ω surge limiter resistor R401 open-circuit. There were also various dry-joints around the chopper transformer and the line output transformer. Resoldering these and replacing the failed parts brought the set back to life again. **T.L.**

Matsui 1481B

There was barely audible sound. Some tapping soon revealed dry-joints at the 6MHz filter CF301 in the i.f. section. Resoldering brought the sound back to its full level. **T.L.**

Toshiba 1720RB

If line tearing after a while is the problem with one of these sets, try freezing the STRD4412 chopper chip Q801 in the power supply. A replacement should cure the fault. Part no. is 23314510. **T.L.**

Sanyo CTP3106

This set suffered from extreme bowing at the sides of the raster, especially the last three quarters of the scan. Some one had already replaced most of the capacitors and resistors in the power supply, then given up. A meter check across the mains bridge rectifier's reservoir capacitor produced a reading of only about 113V instead of the 300V or so you would expect. On removal this 100μF, 400V high ripple current capacitor was found to have fallen in value to just 1·5μF. A replacement cured the fault. **J.H.**

Hitachi C14-P216 (G7P Mk 2 Chassis)

This set had been in the workshop twice during the past month, the complaint being that it would occasionally fail to start up, only the standby LED indicating that there was some life in it. It hadn't gone wrong during soak tests. The third time it came in the symptom was permanent. R903 and R902 (both 82kΩ) in the bias feed to the chopper transistor were open-circuit. Note that in the fault condition the mains bridge rectifier's reservoir capacitor is fully charged, at 300V. Use a 1kΩ resistor to discharge it before commencing work. This will avoid accidental destruction of the power supply, turning a simple job into a nightmare. **J.E.**

Alba CTV4805/Bush VCR155

Here's a good one for you! The job sheet said "when the TV set is switched off the VCR ejects the tape even when no tape has been inserted". This seemed very hard to believe, but on arrival at the customer's house I found that the description was quite accurate. When the customer unplugged the TV set from the multi-adaptor (yuk!), the VCR flew into a frenzy of trying to eject a tape although there wasn't one in the machine. When the TV set was switched off using its own mains switch however the VCR behaved itself. At this point the customer mentioned that the text was "a bit funny".

Switching to text provided a clue. The text over-filled the screen, to the point where it was severely cramped at the bottom. High h.t. and thus high e.h.t. I thought (the set did rustle quite a bit at switch off). C610 (47μF, 50V), which couples the drive to the chopper transistor, can cause high h.t. when faulty. But when I removed the set's back the cause of the trouble was immediately apparent. The tube's Aquadag earthing strap had parted company with its spring. As it didn't want to reach the spring I had to extend it with some solderwick (I'm in the field, remember!). This solved the e.h.t. discharge problem, but for good measure I replaced C610 and reset the h.t.

I can only conclude that the micro chip in the VCR was being upset when the receiver used the r.f. lead as a discharge path for the e.h.t.

Incidentally the Alba CTV4805 uses a similar chassis to the **Matsui 1455,** which was the subject of a servicing feature in the magazine a few months ago. **A.T.**

Beko 12220

At switch on there was no colour in the display. But if the set was switched to standby and back, or the channel was changed, the colour would appear and remain until the set was switched off with the mains switch. The cause of the fault was traced to dry-joints on the main board, where the colour decoder panel plugs into it. **A.T.**

Grundig CUC220 Chassis

This fault could possibly apply to any set that uses a TDA4600 type power supply. The set would squeal and rumble at switch on, with the LED display flashing like a Space Invaders game. But the set would come on if it was repeatedly switched off then on again. A check on the h.t. output from the power supply when the fault was present showed that it was varying. Although the set could be made to work, I suspected that there was a fault in the power supply. Replacing C633 (220μF, 25V), which smooths the TDA4600 chip's 12·5V supply, and the chip itself cured the fault. I also replaced C631 (100μF, 40V) which couples the drive to the BU208A chopper transistor as it looked tired. **A.T.**

Toshiba 150R6B

This set just emitted a whining noise. Nice and simple for a change: the line output transformer was dead short to chassis. The replacement comes with a couple of capacitors that have to be changed. Once we'd fitted the replacements we had a really excellent picture. **R.N.**

Philips G110 Chassis

This set came in dead, but it wasn't the usual power supply breakdown. When I powered the set it whined. The power supply ran perfectly with the feed to the line output stage disconnected and a 60W bulb connected across the h.t. line as a dummy load. It turned out that the line output transformer was the cause of the trouble: it's the first one I've had to replace.

The picture was a bit strange when the replacement had been fitted. Part of the on-screen display was shifted to the left, with the first letter missing. It soon became apparent that the width was at maximum and the EW correction circuit wasn't working. Further checks brought me to the 10kΩ width control R3525 which was open-circuit. A replacement and setting up corrected the display. **R.N.**

Ferguson TX10 Chassis

It's amazing how many of these sets are still around, giving really excellent pictures. This ex-rental Baird set (pre 1560 PCB version) was no exception, but the customer complained of intermittent operation and a black bar across the screen.

A good solder up in the power supply and around the line output transformer cured the intermittent operation. The set then ran for several hours, after which a field sync bar would slowly drift down the screen. A check showed that the field hold control was at one end of its travel, after which I found that R773 (330kΩ) had increased in value to around 700kΩ. A replacement put this final problem right. **R.N.**

Granada C41GS5

The complaint was of intermittent operation, with sparking noises and flashing across the screen. On test the receiver ran for some time without fault, but a good tap around transformer T391 produced a faint arcing noise and severe interference on the screen. With the workshop lights out, a sharp tap produced a corona discharge around one leg of T391. Close inspection then revealed that the riveted connection was loose. I removed the transformer, thoroughly cleaned and tinned the tags, then refitted it using plenty of solder around the rivets. After doing this the set worked perfectly. **R.N.**

Philips 2A Chassis

This set was eating line output transistors. The dealer who brought it to me had fitted several – the correct BU508V type – and had also replaced the line output stage tuning capacitor. The usual dry-joints had been attended to.

I decided to check the line drive waveform. It didn't look too bad, but every so often there was an odd shake. Although the line driver transformer connections appeared to be all right, I decided to resolder them. When the soldering iron touched one of the legs the solder fell away, leaving a rather blackened tag poking through the board. I removed the transformer, cleaned the legs then refitted it. For good measure I also replaced the damping components R3633 (6·8kΩ) and C2633 (1·2nF). The set then ran with no further problems. **R.N.**

NEI TV

There was no identifying model number on this teletext set and I was a bit reluctant to take it on. The set was dead, but my spirits rose when I removed tha back and found a conventional TDA4601 type power supply. There were a number of dry-joints in this area, including the start-up posistor. The main problem was a dry-joint at D805, which is connected to the base of the chopper transistor.

After dealing with these dry-joints the set still seemed a little reluctant to start, sometimes taking eight to ten seconds to get going. This was caused by C810 (100μF, 16V) which couples the drive to the base of the chopper transistor. It's mounted very close to a wirewound resistor, and looked rather sad. Much to my relief, a replacement put things right. **R.N.**

Editorial note: The component reference numbers tie up with the Indiana 100 chassis.

Matsui 6092

This set was dead. There appeared to be a short-circuit line output transformer, but the fault was actually caused by C312 (0·056μF, 200V). This capacitor is part of a voltage-doubling circuit in the line output stage. T.A.

Panasonic TX28G1 (Alpha 2 Chassis)

The output from the left-hand sound channel was distorted. We traced back to PCB H, where the output at pin 1 of IC2401 was distorted though its input at pin 22 was without distortion. The d.c. level of the input was low however, because the 100pF ceramic capacitor C2442 had a 5kΩ leak. The circuitry in the right-hand channel is identical. So C2441 could cause a similar problem. T.A.

Sony KVS3412U (AE2 Chassis)

This set would work for a few minutes, then the picture would collapse into lines in the centre of the screen, with a high-pitched whine coming from the line output transformer. Voltage checks showed that when the fault was present the h.t. was low at 70V. The cause of the trouble was traced to the audio protection circuit, where Q613 (2SA1162G) shuts the power supply down should d.c. be present at the audio outputs. The h.t. was being reduced because Q613 had developed an intermittent leak. The type of transistor used in this position seems to be quite critical (part no. 8-729-216-22). T.A.

Sony KVG2515U (AE2B Chassis)

The satellite section of this receiver didn't work because its 21V supply was missing. Circuit protector PS605 on PCB D was found to be open-circuit. The circuit diagram shows the rating for this device as 2·7A, but an N15 (600mA) is the correct replacement. T.A.

Sanyo CBP2162 (E4 Chassis)

There was sound but no picture. When the first anode control setting was advanced a blank raster appeared. Apparently the picture had disappeared during a thunderstorm. Checks around the colour decoder chip revealed that the amplitude of the sandcastle pulse was low at 0·2V p-p, the line part of the waveform being absent. Replacing the TDA4505M multifunction chip IC101 cured the fault. It produces a sandcastle pulse output at pin 27. **M.Dr.**

Sony KV2092

If the problem with one of these sets is intermittent failure of the 2SD1398 line output transistor, desolder the base drive coupling coil L801 then re-tin and refit it. It's also a good idea to go over the connections to the line driver transformer. **M.Dr.**

Tatung 170/180 Chassis

If you find that the S2000AF line output transistor is short-circuit you will almost certainly have to replace the BY228 EW modulator diode D404, the BD239C EW modulator driver transistor Q303 and R433 (1·2Ω, safety) in the field timebase power supply. A TIP31 will do in position Q303. **M.Dr.**

Hitachi C2118T

At switch on this set tripped back to standby and the e.h.t. sounded rather too healthy – on test it peaked at about 40kV. Checks in the power supply revealed that R909 (39kΩ), which is in series with the set h.t. control, had risen to 45kΩ. Luckily there was no other damage. **M.Dr.**

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15/80H	3.83	2SC2073	0.77	2SD639	0.60	BC252B	0.07	BF470	0.33
1N4001	0.04	2SC2078	0.86	2SD667	0.38	BC258	0.09	BF493	0.36
1N4002	0.07	2SC2120	0.23	2SD669A	0.64	BC300	0.48	BF494	0.12
1N4003	0.05	2SC2166	1.29	2SD716	1.46	BC301	0.28	BF757	0.43
1N4004	0.07	2SC2229	0.28	2SD718	2.21	BC303	0.24	BF758	0.32
1N4005	0.00	2SC2230	1.66	2SD734	0.26	BC307	0.06	BF759	0.38
1N4006	0.06	2SC2235	0.36	2SD762	1.80	BC307B	0.14	BF760	0.26
1N4007	0.06	2SC2236	0.36	2SD820	5.06	BC307C	0.15	BF762	0.30
1N4148	0.06	2SC2240	0.16	2SD837B	1.12	BC308	0.06	BF788	0.52
1N5061	0.00	2SC2271	0.67	2SD856	1.03	BC308A	0.09	BF869	0.25
1N5062	0.51	2SC2274	0.35	2SD863	0.35	BC308C	0.06	BF870	0.29
1N5400	0.07	2SC2314	0.38	2SD869	5.18	BC309	0.04	BF871	0.41
1N5401	0.14	2SC2335	1.12	2SD870	3.81	BC309C	0.14	BF959	0.18
1N5402	0.12	2SC2458	0.14	2SD871	5.08	BC327	0.10	BF960	0.30
1N5404	0.13	2SC2482	0.35	2SD880	0.36	BC327B	0.17	BF966	0.26
1N5406	0.12	2SC2570A	0.30	2SD882	0.43	BC328	0.07	BF970	0.30
1N5408	0.09	2SC2581	3.08	2SD898B	6.41	BC337	0.14	BFR34A	0.78
1N914	0.04	2SC2603	0.25	2SD965	0.67	BC337L	0.22	BFR90	0.59
2N2222	0.22	2SC2625	2.94	2SD973	0.38	BC338	0.06	BFR90A	0.68
2N2222A	0.23	2SC2655	0.31	2SJ115	7.69	BC368	0.11	BFR91	0.60
2N2369A	0.18	2SC2705	0.22	2SK1117	3.06	BC369	0.17	BFR91A	0.92
2N2907	0.20	2SC2724	0.19	2SK192A	0.36	BC372	0.43	BFR96	0.55
2N3053	0.38	2SC2979	2.74	2SK794	6.41	BC461	0.31	BFY51	0.39
2N3055	0.50	2SC3117	0.60	3SK88	2.57	BC517	0.14	BR100	0.21
2N3440	0.35	2SC3153	2.40	74LS247	0.62	BC546A	0.07	BR103	0.53
2N3442	1.00	2SC3156	6.61	7805	0.78	BC546B	0.12	BR303	1.22
2N3707	0.12	2SC3179	0.82	7806	0.60	BC547	0.11	BRX44	1.02
2N3773	1.34	2SC3182	2.49	7808	0.72	BC547A	0.04	BRX49	0.43
2N3819	0.55	2SC3199	0.43	7809	0.69	BC547B	0.11	BRY55	1.20
2N3904	0.32	2SC3225	0.60	7812	0.52	BC548A	0.11	BRY56	0.43
2N3906	0.00	2SC3242	0.19	7815	0.82	BC548B	0.06	BSR50	0.75
2N4123	0.30	2SC3310	2.12	78L05	0.35	BC548C	0.06	BSS38	1.77
2N5296	0.69	2SC3311	0.29	78M05	0.35	BC549B	0.11	BT139600	1.29
2SA1013	0.35	2SC3330	0.26	7905	0.35	BC550	0.15	BT151/500R	1.44
2SA1015	0.11	2SC3355	0.96	7915	0.82	BC550C	0.09	BT151800	1.15
2SA1015GR	0.11	2SC3358	0.69	AA119	0.36	BC556A	0.06	BU104	1.43
2SA1016	0.26	2SC3420	0.55	AA143	0.13	BC557	0.05	BU205	1.07
2SA1020	0.44	2SC3423	0.60	AC127	0.52	BC557A	0.15	BU208A	1.44
2SA1029	0.26	2SC3502	0.45	AC151	0.52	BC557B	0.06	BU208AT	1.25
2SA1048	0.19	2SC3656	0.18	AC153K	0.40	BC558B	0.08	BU208D	1.61
2SA1286	0.60	2SC3679	4.45	AC187K	0.53	BC560C	0.06	BU326A	1.36
2SA1370	0.43	2SC3788	0.77	AC188	0.40	BC635	0.19	BU406	0.69
2SA1489	2.40	2SC3795	1.97	AC188K	0.82	BC636	0.14	BU406D	1.02
2SA1706	0.52	2SC3795B	2.63	AD149	0.52	BC637	0.11	BU407	0.53
2SA562	0.17	2SC3807	0.84	AF124	1.75	BC639	0.09	BU407D	0.98
2SA564	0.33	2SC3883	5.92	AF125	0.82	BC640	0.06	BU426A	1.03
2SA608	0.24	2SC3892A	4.79	AF126	2.23	BC879	0.40	BU500	1.41
2SA673	0.12	2SC3953	0.72	AF127	0.77	BCY71	0.27	BU505DF	1.35
2SA684	0.43	2SC4106	2.05	AF139	0.29	BD131	0.26	BU506DF	2.31
2SA733	0.18	2SC4242	2.31	AN5265	1.76	BD132	0.26	BU508A	0.95
2SA769	1.29	2SC4517	4.70	AN5435	1.46	BD135	0.33	BU508AF	1.08
2SA844	0.26	2SC4517A	2.52	AN5512	1.01	BD136	0.20	BU508APH	1.99
2SA872	0.35	2SC458	0.12	AN5515	1.29	BD137	0.46	BU508D	1.32
2SA872A	0.35	2SC4742	4.70	AN5521	1.66	BD139	0.18	BU508DF	1.88
2SA916	0.57	2SC536	0.30	AN6610	0.94	BD140	0.24	BU508V	1.51
2SA933	1.00	2SC639	0.56	AN7161N	3.47	BD203	0.47	BU526	1.61
2SA940	0.82	2SC710	0.12	AN7171K	4.74	BD232	0.45	BU536	1.65
2SA950	0.18	2SC828	0.29	BA154	0.06	BD233	0.23	BU608	1.46
2SA965	0.52	2SC867A	7.13	BA157	0.09	BD234	0.24	BU801	1.37
2SA966	0.54	2SC945	0.12	BA158	0.07	BD237	0.31	BU806	0.82
2SA970	0.19	2SD1071	4.31	BA159	0.11	BD238	0.24	BU807	0.51
2SA984	0.38	2SD1128	1.02	BA5406	2.14	BD239	0.29	BU826A	1.06
2SB1010	0.35	2SD1191	1.49	BA5410	2.57	BD243	0.45	BU908	1.68
2SB1012	0.77	2SD1207	0.33	BA5412	2.48	BD243C	0.44	BUK444500B	1.51
2SB1143	0.77	2SD1246	0.30	BA6109	1.85	BD244A	0.34	BUK454600C	2.57
2SB1243	0.60	2SD1265	1.08	BA6209	1.46	BD244C	0.42	BUK455600B	2.54
2SB560	0.35	2SD1266	0.82	BA6209N	1.27	BD245C	0.92	BUT11	1.71
2SB562	0.26	2SD1275	1.23	BA6219	1.76	BD246C	0.97	BUT11A	1.51
2SB600	8.54	2SD1276	1.39	BA6219B	1.46	BD433	0.29	BUT11AF	1.18
2SB633	1.31	2SD1292	0.60	BA6222	1.70	BD434	0.34	BUT12A	0.84
2SB641	0.21	2SD1330	0.31	BA6247	1.95	BD435	0.38	BUT12AF	1.08
2SB642	0.37	2SD1376	0.60	BA718	1.08	BD436	0.41	BUT18AF	1.37
2SB644	0.35	2SD1379	0.39	BAT43	0.11	BD437	0.28	BUT56A	1.19
2SB646	0.23	2SD1397	2.31	BAT85	0.19	BD438	0.38	BUT56AT	2.65
2SB647	0.43	2SD1398	2.14	BAV20	0.26	BD441	0.34	BUV46A	0.84
2SB649A	0.96	2SD1409	2.57	BAV21	0.21	BD529	1.61	BUV48	2.05
2SB686	2.05	2SD1426	1.54	BAW62	0.17	BD530	1.71	BUW11	1.51
2SB688	1.61	2SD1427	2.91	BAX13	0.12	BD675	0.32	BUW11A	1.63
2SB698	0.35	2SD1432	5.04	BAX14	0.17	BD677	0.32	BUW13A	2.80
2SB740	0.36	2SD1439	3.76	BAX16	0.09	BD678	0.51	BUW41B	1.03
2SB772	0.48	2SD1441	5.98	BB105B	0.24	BD681	0.47	BUW81A	2.31
2SB774	0.36	2SD1453	2.05	BC221	0.09	BD839	0.38	BUW84	1.03
2SB793	0.43	2SD1497	7.26	BC107B	0.20	BD901	0.52	BUX84	0.60
2SB891	0.52	2SD1497-02	13.96	BC108	0.16	BD902	0.52	BUZ11	1.54
2SB892	0.35	2SD1541	4.96	BC108A	0.26	BD911	0.47	BUZ71	0.89
2SC1008	0.24	2SD1548	5.95	BC108C	0.15	BD912	0.63	BUZ71A	1.03
2SC1096	0.54	2SD1554	3.25	BC109A	0.28	BD939F	0.74	BUZ80A	2.57
2SC1162	0.31	2SD1555	2.57	BC141	0.36	BDT64C	1.18	BUZ90	3.90
2SC1213	0.14	2SD1577	4.64	BC143	0.36	BDT65C	1.66	BUZ90A	2.55
2SC124	0.48	2SD1609	0.43	BC147A	0.06	BDW93C	0.64	BY127	0.14
2SC1306	1.16	2SD1649	2.05	BC148A	0.06	BDW94C	0.60	BY133	0.08
2SC1318	0.19	2SD1651	2.38	BC148B	0.04	BF194	0.22	BY164	0.67
2SC1383	0.32	2SD1680	3.85	BC149	0.04	BF197	0.52	BY179	0.77
2SC1413A	2.57	2SD1710	2.52	BC157	0.13	BF199	0.04	BY184	0.42
2SC1473	0.21	2SD1877	2.14	BC161	0.27	BF244	0.43	BY206	0.20
2SC1573	0.35	2SD1878	3.59	BC182L	0.06	BF244A	0.60	BY210400	0.19
2SC1675	0.09	2SD1884	3.16	BC182LB	0.06	BF245A	0.19	BY226	0.16
2SC1685	0.21	2SD1911	5.98	BC183L	0.09	BF245B	0.41	BY227	0.08
2SC1730	0.26	2SD2012	0.85	BC184L	0.06	BF256C	0.00	BY228	0.26
2SC1740	0.16	2SD2125	4.70	BC204	0.14	BF258	0.04	BY229600	0.92
2SC1741	0.31	2SD350A	1.97	BC212B	0.06	BF324	0.12	BY229800	1.02
2SC1815	0.17	2SD362	1.02	BC212L	0.14	BF337	0.34	BY238	0.43
2SC1826	1.03	2SD400	0.34	BC213	0.11	BF338	0.43	BY252	0.14
2SC1827	0.98	2SD401A	0.77	BC214C	0.08	BF355	0.48	BY255	0.14
2SC1845	0.26	2SD438	0.35	BC214L	0.09	BF393	0.21	BY298	0.15
2SC1923	0.14	2SD468	0.24	BC237B	0.08	BF420	0.21	BY299	0.14
2SC1942	7.48	2SD555	8.54	BC237C	0.18	BF421	0.24	BY359	1.86
2SC1959	0.18	2SD592	0.21	BC238	0.11	BF422	0.19	BY398	0.18
2SC1969	2.48	2SD613	0.94	BC238A	0.06	BF423	0.14		
2SC1983	1.87	2SD636	0.19	BC238B	0.07	BF458	0.31		
2SC2001	0.23	2SD637	0.16	BC238C	0.07	BF459	0.29		
2SC2060	0.29	2SD638	0.41	BC239	0.04	BF469	0.34		

BY399	0.11	HA13119	2.05	MJE18004	1.80	STK7358	5.81	TDA1519A	2.74	TDA8178FS	3.81
BYD14J	0.26	HA13403	3.59	MJE2955	0.68	STR40090	6.28	TDA1520B	2.48	TDA8180	4.87
BYD33D	0.43	HA1377	2.62	MJE2955T	0.68	STR4211	12.63	TDA1521	3.36	TDA8190	2.91
BYD33J	0.27	HA51338SP3	7.69	MJE3055	0.52	STR441	28.40	TDA1524A	1.88	TDA8305	7.21
BYD33M	0.21	HM6232	10.46	MJE3055T	0.74	STR451	23.50	TDA1553Q	4.79	TDA8380	2.53
BYV10–40	2.55	HM6251	9.57	MJE340	0.50	STR50020	9.02	TDA1554Q	8.12	TDA9503	2.13
BYV95B	0.19	J0B	0.00	MN650	5.98	STR50103	4.10	TDA1670A	2.98	TEA1014	1.87
BYV95C	0.21	KA2206	1.32	MPSA06	0.35	STR54041	4.36	TDA1675A	3.85	TEA1039	2.14
BYV96D	0.27	KA2223	0.60	MPSA42	0.23	STR5412	3.68	TDA1701	2.65	TEA2018A	1.70
BYW56	0.31	KA2263	0.55	MPSA43	0.15	STR58041	6.41	TDA1770A	30.29	TEA2029C	5.69
BYW95C	0.65	KA8301	1.46	MPSA55	0.26	STR59041	6.67	TDA1872A	4.83	TEA2031A	3.40
BYW96E	0.94	KBL08	1.42	MPSA56	0.12	STR6020	5.38	TDA1905	2.12	TEA2164	2.96
BYX55600	0.23	KIA6210AH	6.15	MPSA92	0.18	STR6020KIT	15.05	TDA1908A	2.14	TEA2165	4.27
BYX71600	1.45	KSR1001	0.14	MR854	0.65	STRD4420	11.16	TDA1950	1.86	TEA2165A	9.58
BZT03C120	0.62	KSR1004	0.14	MR856	0.11	T6064V	2.63	TDA2002	1.12	TEA5101A	3.95
BZV10	1.34	KSR2001	0.14	NE545B	3.20	T6076V	5.04	TDA2003	0.90	TEA5115	2.91
BZV85C5V1	0.15	KSR2004	0.14	NE555N	0.40	T9053V	0.93	TDA2004	2.57	TIC106D	0.82
BZX6110	0.19	L200CV	2.19	NE556	0.43	T9064V	1.51	TDA2005	1.63	TIC106M	0.75
BZX6112	0.12	LA1230	1.95	NE592N	1.91	TA7109AP	3.23	TDA2006	1.06	TIC225M	1.02
BZX61120	0.09	LA1503	1.29	NE646N	4.45	TA7205AP	1.68	TDA2030H	0.74	TIC226D	0.68
BZX6113	0.11	LA4261	2.29	0A200	0.22	TA7217AP	1.46	TDA2030V	0.74	TICP106D	1.95
BZX6120	0.19	LA4270	2.73	0A90	5.23	TA7222P	1.28	TDA2040H	2.11	TIL111	0.64
BZX6127	0.19	LA4282	8.89	OC71	1.03	TA7227P	2.29	TDA2170	7.08	TIP110	0.36
BZX6133	0.19	LA4422	1.36	P600A	0.33	TA7233P	1.97	TDA2270	2.45	TIP112H	0.95
BZX615V6	0.11	LA4440	1.80	PC814	1.29	TA7240P	2.74	TDA2540	1.12	TIP121	0.42
BZX616V2	0.07	LA4445	2.99	PIC16C57XTS0	6.61	TA7250	4.07	TDA2541	0.72	TIP127	0.47
BZX617V5	0.09	LA4460	2.31	R2M	0.67	TA7250BP	3.74	TDA2576A	5.95	TIP132	0.65
BZX618V2	0.19	LA4461	1.71	R4050	3.04	TA7270P	1.59	TDA2577A	2.99	TIP137	0.48
BZX619V1	0.09	LA4475	2.99	R4051	4.80	TA7271P	11.33	TDA2578A	2.91	TIP2955	0.94
BZX7910	0.30	LA4476	2.99	RB156	2.40	TA7273P	4.10	TDA2579A	4.91	TIP29C	0.31
BZX7912	0.10	LA4508	2.77	RC4558	0.48	TA7274P	2.74	TDA2581	4.27	TIP29E	0.47
BZX7915	0.09	LA4700	4.27	REGBABY10	17.56	TA7280P	2.74	TDA2581Q	2.99	TIP3055	0.94
BZX7930	0.11	LA6358S	0.60	RGP10G	0.26	TA7281P	2.98	TDA2582	2.05	TIP30C	0.17
BZX7936	0.10	LA6510	2.94	RGP15G	0.33	TA7288P	2.04	TDA2593	0.76	TIP31A	0.33
BZX794V7	0.07	LA7520	4.80	RGP15J	0.24	TA7299P	2.65	TDA2594	2.21	TIP31C	0.77
BZX795V6	0.05	LA7800	2.41	RGP15M	0.44	TA7317P	3.44	TDA2595	3.19	TIP32A	0.41
BZX796V2	0.08	LA7801	1.41	RGP30M	0.30	TA7609P	2.19	TDA2600	4.86	TIP32C	0.40
BZX79C3V9	0.09	LA7820	2.71	RM11C	1.71	TA7680AP	4.55	TDA2611A	0.64	TIP35C	1.39
BZX79C5V1	0.05	LA7830	1.88	S2000A	1.98	TA7698AP	4.60	TDA2611AQ	1.32	TIP36C	1.37
BZX83C6V2	0.13	LA7835	1.80	S2000A3	1.54	TA7769P	3.01	TDA2653A	2.99	TIP41C	0.43
BZY8810	0.11	LA7837	1.63	S2000AF	1.68	TA7784P	2.25	TDA2655B	19.93	TIP42A	0.35
BZY8811	0.11	LC7132	4.70	S2055AF	2.02	TA8201	3.93	TDA3190	1.27	TIP42C	0.35
BZY8812	0.07	LED3G	0.10	SAA129302	8.20	TA8205	3.93	TDA3301B	6.75	TIPL761A	1.59
BZY8813	0.11	LED3R	0.10	SAA129303	10.25	TA8205AH	4.50	TDA3330	12.29	TIPL791A	1.20
BZY8824	0.11	LM1203	10.47	SAA5012	3.34	TA8207	2.74	TDA3505	2.40	TL062	0.60
BZY8827	0.11	LM1303N	0.88	SAA5243PE	10.87	TA8210H	5.28	TDA3541	0.98	TL071	0.69
BZY882V7	0.11	LM317T	1.29	SAB3035	1.71	TA8215H	5.73	TDA3560	2.96	TL071CP	0.60
BZY8833	0.11	LM324N	1.48	SG264A	11.57	TA8216H	8.01	TDA3561A	5.30	TL072	1.03
BZY883V6	0.11	LM339N	0.50	SGSIF344	7.28	TA8220H	7.69	TDA3562A	3.90	TL072CP	1.03
BZY883V9	0.03	LM340T5	0.41	SL1430	1.92	TA8221H	6.56	TDA3562ATF	3.34	TL074	1.15
BZY884V7	0.06	LM358	0.60	SL1431	2.40	TA8221L	7.19	TDA3565	3.40	TL082CP	0.21
BZY885V1	0.13	LM358N	0.42	SL1432	6.19	TA8410K	4.27	TDA3566	6.41	TMP47C432AP8188	15.19
BZY886V2	0.11	LM380N	1.03	SL471	1.70	TA8691N	7.01	TDA3576B	11.31	TMP47C432AP8189	15.19
BZY888V2	0.27	LM386N	0.57	SN76705AN	1.70	TAA550B	0.26	TDA3640	5.92	TPU2732	10.05
BZY889V1	0.11	LM3914N	2.74	STA341M	3.35	TAA550C	0.30	TDA3650	9.91	TPU2735-45	12.30
CARBB	9.95	LM393N	1.19	STA441C	2.82	TBA120	0.53	TDA3653B	1.18	UA741CN	0.28
CD4001	0.21	LM741	2.96	STK4122II	6.70	TBA120C	0.65	TDA3653C	1.37	UAA2001	12.50
CD4008	0.31	M104B1	5.30	STK4132II	10.00	TBA120S	0.89	TDA3653CQ	2.57	UC3842	1.46
CD40106	0.52	M192B1	1.88	STK4141II	8.29	TBA120T	0.51	TDA3654	1.34	UC3844	1.00
CD4011	0.38	M293B1	23.49	STK4141V	11.03	TBA120U	0.40	TDA3654Q	2.82	UC3844N	1.91
CD4013	0.45	M491	7.94	STK4142II	9.40	TBA800	0.51	TDA4420	0.32	ULN2003AN	1.58
CD4016	0.14	M494B1	5.65	STK4152II	10.68	TBA820M	0.23	TDA4427A	3.98	UPA81C	1.12
CD4017	0.47	M51387P	10.68	STK4171II	13.20	TBA920	2.75	TDA4500	4.66	UPC1188H	5.08
CD4024B	0.23	M51393AP	4.64	STK4192II	14.64	TBA950	1.68	TDA4501	7.43	UPC1230	2.82
CD4049	0.26	M5218L	1.59	STK4392	6.43	TCA440	2.75	TDA4501H	5.69	UPC1230H	3.95
CD4050	0.31	M5231L	0.94	STK463	10.87	TCA800Q	1.65	TDA4502A	5.47	UPC1238V	1.44
CD4053	0.69	M54519P	1.17	STK5211	16.12	TDA1004A	4.35	TDA4503	4.00	UPC1278H	2.66
CD4060B	0.76	M54543L	1.97	STK5331	2.87	TDA1011	1.27	TDA4505E	6.46	UPC1335V	3.95
CD4066	0.30	M54544L	1.87	STK5332	3.59	TDA1013A	1.56	TDA4505M	8.97	UPC1363C	2.13
CD4070	0.21	M54548L	3.63	STK5333	13.57	TDA1015	1.37	TDA4580	10.05	UPC1365C	1.70
CD4081	0.15	M54648L	6.87	STK5338	3.16	TDA1035T	2.48	TDA4600	1.88	UPC1378H	1.47
CD4093	0.32	M58655P	4.96	STK5342	4.07	TDA1044	1.43	TDA4600/2/3	1.46	UPC1394C	1.58
CD4094	0.36	MB3730	3.85	STK5372	3.51	TDA1060	1.03	TDA46002D	4.27	UPC1420CA	7.69
CNX62A	3.83	MB3732	14.89	STK5372H	6.84	TDA1082	4.27	TDA4601	1.66	UPC1488H	2.99
CNX82A	1.12	MC13002P	7.69	STK5421	2.62	TDA1085C	1.88	TDA4601D	1.54	UPC4558C	0.65
CNX83A	0.94	MC1310P	0.85	STK5466	5.66	TDA1170	1.85	TDA4605	6.10	UPC574J	0.86
CR02AM	3.16	MC1377P	7.51	STK5471	4.87	TDA1170N	1.35	TDA4950	1.76	UPD1937C	3.85
DTA114ES	0.24	MC1391P	2.02	STK5473	4.70	TDA1170S	1.54	TDA7052	1.70	X0065CE	3.42
DTA124EF	0.13	MC14426P	1.71	STK5476	5.03	TDA1180P	1.69	TDA7240A	2.36	X2402	4.62
DTA144EF	0.63	MC3357P	2.14	STK5481	8.01	TDA1270	1.79	TDA7350	5.98	X2402P	5.16
DTA144ES	0.18	MDA2062	4.54	STK5482	4.51	TDA1420	3.04	TDA8140	2.38	ZPD5.6	0.07
DTC124ES	0.19	MJ15003	4.02	STK5490	7.69	TDA1510	3.40	TDA8153	14.63	ZTK33B	0.12
DTC144ES	0.19	MJ15004	5.08	STK6962	2.60	TDA1515A	2.57	TDA8170	1.97	ZTX300	0.37
HA11423	2.84	MJ2955	0.98	STK7226	8.14	TDA1516Q	3.59	TDA8172	2.65	ZTX650	0.51
HA13001	1.47	MJ3001	1.56	STK7253	6.49	TDA1518Q	4.27				
HA13108	2.57	MJ4502	1.84	STK7308	5.13	TDA1519	4.23				
HA13117	2.05	MJ802	2.40	STK7348	4.65						
HA13118	1.88	MJE13005	0.86	STK7356	5.66						

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

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

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SATKIT2	PACE	SS9000	SS9200	£6.95
		SS9010	SS9210	
		SS9020	SS9220	
SATKIT3	AMSTRAD	SRD510	SRD520	£5.95
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Satellite TV

Eutelsat has signed a contract with Arianespace for the launch of three more of its satellites, Hot Bird 4 and two others known as W24. These will replace two Eutelsat II series satellites. Hot Bird 4 will be placed in orbit at 13°E, Eutelsat's primary slot for analogue and digital radio and TV transmissions, along with Hot Bird 3 which is due for launch in the first quarter of 1997.

Italian pay-TV operator Telepiù has demonstrated its new digital satellite TV service via transponder 45 aboard Eutelsat II F1 at 13°E. When the service starts commercially, it is expected to be the first direct-to-home package of basic and premium digital TV channels in Europe. NTL supplied the MPEG-2 equipment used.

The Confederation of Aerial Industries has recommended that in future crimp type F connectors instead of the older twist type should be used for all satellite installations. Satellite Solutions comment that "poorly fitting twist connectors are often responsible for poor signal level and general system difficulties, properly installed crimp connectors being faster, more secure and tamper proof". To help installers make the change, Satellite Solutions (1 Hartburn Close, Crow Lane Industrial Park, Northampton NN3 9UE – 01604 787 888) has introduced a "professional strip and crimp F connector kit" at £29.95 plus VAT. The kit contains 100 crimp F connectors to fit Raydex CT100 coaxial cable, a crimping tool, a fixing tool and coaxial stripper.

Two new satellite TV recievers from Satellite Solutions (address above) are of interest. The Palcom 8000IRD motorised satellite receiver incorporates a VideoCrypt decoder with a smart card reader at the rear of the unit to preserve the neat lines. Its picture-in-picture facility enables two different channels, possibly from different satellites, to be viewed at the same time. Either channel can provide the main display, with the other approximately a quarter of screen size. The viewer can select the position for the PIP display, its size, and can freeze it. The Nokia SAT1800 incorporates a VideoCrypt smart card reader and an industry first, Videoplus+ remote control with advanced PDC/VPC features that automatically adjust a VCR's timer settings should a programme overrun or start late.

LSI Logic has introduced a 100-pin chip for use in digital satellite TV receivers: the L64704 combines a QPSK demodulator and a decoder for Viterbi and Reed-Solomon error correction.

Lloytron

Would readers please note that there is no connection between Lloytron Electronics Ltd. and Key Electronics. Unfortunately the layout/spacing in the last issue of our Spares Guide (October 1995) suggests, under the Kyoshu entry, that these companies are linked. All orders/enquiries for Key Electronics should be directed to the company at Unit 5, Bow Mills Industrial Estate, Brighouse Road, Hipperholm, Halifax HX3 8EF (01422 203 676), not to Lloytron.

Flat-screen displays

Cambridge Display Technology Ltd. is raising £4m to develop a flat-screen display system that uses light-emitting polymers (LEPs). Such displays are claimed to be cheaper to produce than the active-matrix LCD type. Initial applications are expected to be in mobile phones and hand-held computers, though TV receiver and computer monitor use is a longer-term aim. Present work is directed at extending the lifetime, at present 1,500 hours, at increasing the brightness of the display and at producing a full range of colours.

A glut in LC displays has been forecast: though the market is growing by 30 per cent a year, production capacity will double this year. A fall in prices is expected, with 10in. displays falling from about £300 at present to £230 in 1997.

BUSINESS NEWS

Chung Hwa, which is the world's largest producer of c.r.t.s and is 91·1 per cent owned by Tatung, is to build a £240m c.r.t. plant at Mossend in Lanarkshire. The new plant will increase Chung Hwa's production capacity from the 20m achieved this year to 30m and will create over 3,000 jobs. Growth in the PC industry has led to a shortage of c.r.t.s world wide. Production is expected to start in mid 1997. Tatung itself plans to become the world's largest monitor manufacturer, doubling output to 5m a year by the end of 1996.

Matsushita Electric Industrial of Japan is setting up a joint venture, Shandong Matsushita Television and Visual Co., with three local companies in China to develop and produce colour TV receivers. Production is expected to start this June and the company hopes to manufacture 100,000 sets by the end of the year, with 21, 25 and 29in.

Channel 5 retuning

Channel 5 Broadcasting plans to hire sub-contractors to retune, at £4-5 a time, the estimated four-five million VCRs, plus other equipment, that will be affected by its transmissions. Up to 1,000 electrical retailers are expected to provide local back-ups. Trade opinion is that this is totally unrealistic. Call-outs are far more costly, and many installations will involve more than one TV set and VCR. Then there is the question of rented equipment being handled by third parties. It's going to cost a lot more than C5B seems to think.

CHS appointed sole AKAI spares distributor

Charles Hyde and Son Ltd., Prospect House, Barmby Road, Pocklington, York YO4 2DP (01759 303 068, fax 01759 303 620), has been appointed by Akai (UK) Ltd. as sole authorised spares and components distributor to non-Akai account holders in the UK.

Widescreen TV

Nokia and Radio Telefis Eireann (RTE) have introduced widescreen TV in Ireland. During 1996 RTE will transmit at least 250 hours of widescreen TV – the first broadcast, Batman, took place on December 2nd.

Sales of widescreen TV sets in France increased from 3,500 in 1992 to over 100,000 in 1994. In Japan, 35 per cent of all large-screen sets produced last year (1995) were of the widescreen type. Philips has introduced a 24in. widescreen set, Model 24PW6321, at a suggested prince of £800. Features include a high-contrast Super-flat tube, Nicam and a variety of AV sockets.

Intercasting

A group of companies that includes Intel, Gateway 2000, Packard Bell, CNN and Turner Broadcasting has formed the Intercast Industry Group. Its aim is to promote a system that enables additional information to be sent, during the field blanking interval, to a PC used for TV. The user of a PC equipped with a TV card could receive this information or go to an Internet site. Gateway 2000 and Packard Bell plan to launch PCs with the Intercast system built in. Intel will produce an Intercast card later this year.

Servicing
the Tatung 120 Chassis

John Coombes

The Tatung 120 series chassis went into production in 1981, the run continuing for several years. Large numbers of sets fitted with the chassis were produced, under the Tatung, Decca and other brand names. Decca and Tatung sets that incorporate the chassis can be identified by the fact that the second digit in the model number is 2, e.g. CN1271, DN1251, DN1253, DN1256 and DN9256.

The circuitry is straightforward, with a TDA4600 based switch-mode power supply (see Fig. 1). Note that the emitter of the BU426A chopper transistor Q801 is at –315V, the positive side of the mains bridge rectifier's reservoir capacitor C804 being connected to chassis – the chopper transformer does not provide mains isolation in this design. The chassis is designed to drive 90° tubes in sizes 14 to 22in., so there's no EW correction circuitry. A large-screen version, the 130 chassis, was also produced: this incorporates EW correction circuitry and uses a different field timebase chip (TDA1670) but is otherwise virtually the same as the 120 series chassis.

Power Supply Faults

If the 2AT mains fuse F801 has blown, the first item to check is the degaussing posistor R901 – by substitution. If necessary go on to check the mains filter capacitor C801, the mains bridge rectifier diodes D801-4 and their parallel protection capacitors C802/3/5/6.

If the two fuses F801 and F802 are both o.k. but the set fails to start, check the diode (D805) and the resistor (R802) in the start-up circuit.

If the 1AT d.c. fuse F802 is open-circuit a replacement may well get the set working again. If the replacement blows, check whether the chopper transistor Q801 is short-circuit. If it is check the values of R808 and R810 before fitting a replacement. These are usually both 150kΩ. They tend to go high in value. Some sets have a lower value resistor in position R808. Also check that I801 is operating corectly. You should get voltage readings of 2·2V and 1·8V respectively at pins 4 and 8, using a 20kΩ/V meter on the 10V d.c. range – these readings are with respect to the chip's heatsink tab, which is at –315V.

If the set is not in standby but still won't operate, I801 or D805 could be in an intermittent open-circuit condition.

If the 120V h.t. supply is missing at the reservoir capacitor C822, check whether D812 is open-circuit. If the h.t. voltage is low, check whether C822 is low in value or open-circuit. If the h.t. voltage is incorrect or varying, check R812 (22kΩ), D808 (BA157), C814 (1μF) and R813 (10kΩ) whose carbon track can deteriorate. If these items are all o.k., suspect the chip (I800).

If the 12V supply is missing, check the LM340T-12 12V regulator chip I802 which could be open-circuit. If it's o.k., check that there is 18V at its input. If this voltage is missing, check R817 and D811.

Line Timebase Faults

If there's no e.h.t., check for h.t. at the collector of the BU500 line output transistor Q402. If this is missing, check whether the fusible feed resistor R430 (15Ω, 2·8W) is open-circuit. If so, try resoldering it. If it goes open-circuit again, check whether the line output stage tuning capacitor C425 is short-circuit or leaky. Its value is 8·2nF in the 120, 122, 125 and 126 chassis, 9·1nF in the 121, 123 and 124 chassis – ratings 2kV, 5 per cent in both cases. Other things to check if necessary are the line output transistor, then the tripler by disconnecting the lead to the line output transformer. If the sound and h.t. are o.k. with the tripler disconnected, fit a replacement. If this action makes no difference replace the line output transformer T402, which probably has shorted turns. Note that a faulty tripler will nearly always damage R432 and R433 (both 330kΩ, 1W) on the earthy side of the e.h.t. circuit. Replace them if at all suspect.

If there's no raster because the tube's heaters are out, check whether R902 (1Ω, 1·5W) is open-circuit then, as necessary, for dry-joints at pins 9 and 10 on the tube base and at the relevant connections to the line output transformer.

If there's poor focus or a bright raster, check the focus/A1 voltage module Z402 by replacement.

If there's no e.h.t. and no line drive, check for 105V at the collector of the BF419 line driver transistor Q401. No supply here most likely means that R427 (470Ω, 2W fusible) is open-circuit or the driver transformer T401 is open-circuit or dry-jointed. If necessary check whether the TDA2576A sync/line generator chip I401 is providing a line drive output at pin 10. It should have a 12V supply at pin 16. If this is missing, check whether L401 (10μH) is open-circuit or dry-jointed.

Field Timebase Faults

Field collapse is the usual fault here. Check whether the TDA1170 field timebase chip I301 is receiving its 23V supply at pin 2. It's derived from the line output transformer. If missing, check whether D404 (BA159) or R434 (10Ω metal film fusible) is open-circuit or C423 (1,000μF, 40V) short-circuit. If the supply is o.k. the chip is suspect. But check for dry-joints at the pins, also the flyback boost capacitor C304 (100μF, 50V). Another possibility is open-circuit field scan coils or dry-joints at the connector M301.

R316 (1kΩ, 0·5W 5 per cent) can cause intermittent field collapse. It's used to introduce a degree of field scan shift and is not fitted in all sets.

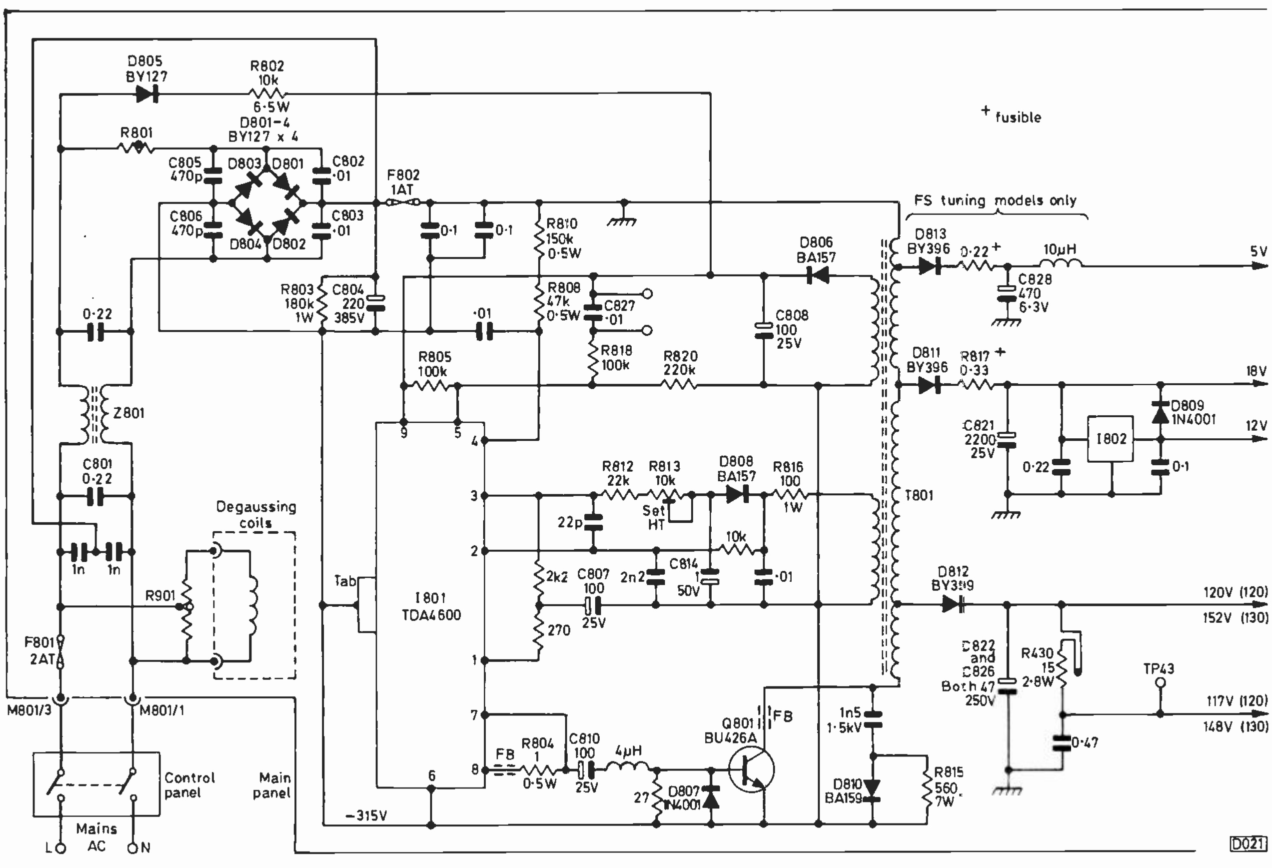


Fig. 1: The chopper power supply circuit used in the Tatung 120 and 130 series chassis. R805 is not fitted in models with frequency-synthesis tuning, in which R818, R820 and C827 are added.

For lack of height, check whether R311 (470kΩ) has gone high in value. If necessary check the height control R310 (470kΩ) for change of value or a deteriorated track.

For field linearity faults check C308 (0·1µF) and/or C310 (0·22µF) by replacement. Other possibilities are C305 (10µF, 40V) and R307 (220kΩ).

Sync Faults

Check the d.c. conditions at the pins of the TDA2576A sync/line generator chip I301. The following readings should be obtained: pin 1 1·35V; pin 2 0·1V; pin 3 4·6V; pin 4 4·5V; pin 5 6·2V; pin 6 4·4V; pin 7 2·4V; pin 8 1·1V; pin 9 0V; pin 10 1·6V; pin 11 4·1V; pin 12 2·7V; pin 13 12V; pin 14 0·8V; pin 15 5·2V (with loss of line hold); pin 16 12V. If any voltages are suspect, check I301 by replacement.

For no or poor field sync, check R301 and/or R302 (both 10kΩ) for change of value.

No Picture/Uncontrollable brightness

Check C504 (10µF, 16V) which is a clamp reservoir capacitor connected to pin 3 of the µPC1365C colour decoder chip I501. It can go open-circuit. It may be necessary to check I501 by replacement.

Colour Faults

For loss of colour, check that the 4·43MHz oscillator is working correctly. Crystal X502 may be faulty or dry-jointed. The other obvious item to suspect is the µPC1365C colour decoder chip I501. Check the pin voltages or check by replacement. There should be a 12V supply at pin 1. If this is missing, check whether C502 (47µF, 16V) is short-circuit. If the voltage is low, check whether C502 and/or C503 (0·1µF) is open-circuit. Other possibilities for loss of colour are the delay line X501 which may be open-circuit or dry-jointed, and Q501 (2N3906) which can go open-circuit.

I501 can also be responsible for loss of one colour. Alternatively the transistors in the appropriate output stage may need to be checked. These are Q203 (BF715 or BF787) and Q204 (BC547) red; Q208 (BF715 or BF787) and Q210 (BC547) green; and Q211 (BF715 or BF787) and Q212 (BC547) blue. The output stages are of the cascode type. Another possibility here is the feedback/bias resistors R226 (red), R244 (green) and R251 (blue). These are 100kΩ metal film resistors with a 2 per cent tolerance. Check whether the relevant one is high in value or open-circuit.

Tuner and IF Stages

The tuner has proved to be reliable but can be responsible for drift. The TAA550 33V stabiliser I001 can also be responsible for drift. Check it by substitution. If there is just a snowy display, check whether I001 is short-circuit and/or R003 (10kΩ, 1W) is open-circuit.

If the picture is slightly grainy, ensure that the tuner a.g.c. control R105 (47kΩ) is correctly set and check the condition of its carbon track.

For a blank screen with no snow suspect the TDA2540 i.f. chip I101. Check that its 12V supply is present at pin 11. If not, check L103 which could be open-circuit or dry-jointed. Another possibility is the BF959 SAWF driver transistor Q101. If its collector voltage is missing, check R103 (10Ω).

If there's a halo effect or double image around figures on the screen, check for dry-joints around the SAWF (Z101).

Sound Faults

For no sound carry out some mechanical checks first. Start with the 8Ω loudspeaker then move back through the connections to pins 3 and 5 of plug/socket M501, looking for open-circuits. The audio coupling capacitor C616 (220µF, 25V) is another possibility for being open-circuit.

The TDA3190 sound i.f. amplifier/demodulator/audio output chip I601 should have 18V at pin 14. If the device's pin voltages are incorrect, check it by substitution. ■

Letters to Television
Quadrant House
The Quadrant
Sutton Surrey
SM2 5AS

LOW-QUALITY TRANSMISSIONS

What is the point of technical innovations such as digital VCRs and high-definition TV when during a large percentage of peak viewing time the broadcasters, especially ITV, transmit low-quality pictures that are line converted from US 525-line NTSC video recordings?

The resultant picture quality is reminiscent of that produced by a Seventies hybrid colour TV set with a low-emission tube. Virtually everything that comes from the USA now suffers from this degrading treatment, even programmes that start off on 35mm film, such as cartoons, TV movies and even some films originally made for the cinema. Couldn't UK broadcasters insist on a good-quality 35mm film copy whenever possible when they buy programmes from the States. If the programme originates on tape there is obviously no alternative to line conversion.

Possibly work is being carried out somewhere to produce better quality pictures from standards converters. Maybe the broadcasting authorities would be prepared to comment on this.

Martin McCluskey,
Billingham, Cleveland.

HEAT DISSIPATION WITH WIRE-ENDED COMPONENTS

In the December VCR Clinic Paul J. Charlton mentioned that in repairing an Amstrad DD8900 he mounted a 15Ω fusible resistor and a BA157 diode off the board to increase the air circulation. This technique may however result in the component's temperature being higher than if it was mounted close to the PCB. The reason for saying this is that, with the exception of physically large components, the major heat conduction path is usually through the component leads.

For power devices diode manufacturers specify current ratings when a lead length of say a quarter of an inch is used connected to a defined area of copper at each end. The semiconductor material is of course directly connected to the leadout wires, while the body plastic or glass is a poor heat conductor.

Unless the PCB is being locally heated by another component, the best practice is to use the shortest possible leads. Power resistors are sometimes mounted well clear of the PCB by the manufacturer: this same style of mounting should be used for replacements, as the intention may be to keep the solder joint temperature low and thus prevent joint ageing.

Ray Porter, M.Sc., C.Eng., M.I.E.E.,
Stourbridge, West Midlands.

FREE ESTIMATES ETC

In reply to Rodney Drysdale (Letters, September), perhaps I should have elaborated on the free estimates issue in my previous letter (July).

There are various reasons why a customer may chose to contact a company that offers no call out charge, free estimates, etc. For example, budgeting may be strict for those who have old equipment and a low, fixed income. They may not wish to shell out for an estimate only to find that the repair cost is above their means or in their opinion uneconomical, leaving them out of pocket with just the thought that another estimate may be lower.

Another is the fear of being ripped off. As we all know, there are in this trade cowboys who prey on those with little technical knowledge. An offer of a free estimate etc. can give such customers a sense of security. They know that it will cost them nothing to refuse to have the work done, and will feel that if an engineer is willing to provide the initial service free of charge he is likely to be competent and honest.

Yes, overheads have to be met, but this can be managed. Most of the time it's possible to get some idea of what the customer is prepared to pay for a repair, and whether they will if necessary allow their equipment to be taken to the workshop for attention. Knowing how to handle the customer is obviously a key factor.

I agree that there are those who will take advantage of such an offer, in some cases wasting the time of several companies. A typical example is someone who has purchased equipment at a boot fair. It may well have been tampered with by the owner or his mate who knows all about auto electrics. But personally I find that such people are in a minority, and that over ninety per cent of my estimates are accepted.

I also agree that customers' attitudes and expectations are occasionally unrealistic. But I don't think that charging for estimates will have much effect on this. I'm not suggesting that no one should charge for estimates: it's for the individual to decide, on the basis of what he feels is appropriate. Fixed opinions unfortunately are one of the problems encountered in this, and no doubt many other, trades. Above all you have to remember that the public is only human, and that we are all somebody's customer.

In closing I would like to express my agreement with P.C. Martin, who wrote in the same issue on a BBC programme that criticised the trade. I believe that the programme's conclusions were partially based on ignorance. The problem when Trading Standards uses engineers from other branches of electronics is their lack experience of the problems in this trade. Had an experienced, reputable engineer within the trade been consulted, different and probably fairer conclusions would in all likelihood have been reached.

K. Docwra, DTV Service,
Manston, Ramsgate.

VIDEO PLUS PROBLEM

A problem that has come to light with VCRs which have built-in Video Plus is that it's very easy to de-initialise (if that is the right word) the remote control unit and re-initialise it with the wrong programme, for example Channel 3 is recorded instead of Channel 4 but at the correct times. This is especially easy with Philips remote control units, but may be just as simple with others. This 'fault' involved me in several visits to a customer before I realised what was the cause of the trouble. I hope this will help some other engineers.

R.F. Maynard, G4YRM,
Exmouth, Devon.

MITSUBISHI HSM34

In the December VCR Clinic Paul J. Charlton suggested pushing a cracked capstan pulley back on to save the cost of a new capstan motor. There is no need to resort to this however, the pulley being available from Mitsubishi as a spare part. The replacement is a tight fit: you need to warm the pulley before fitting it, and apply freezer to the capstan where the pulley is to be fitted. The part number for the replacement pulley is 999D126010.

Mike Orr,
Bristol.

22kHz SWITCHING

The 22kHz switching modification article for Pace receivers (November issue) was excellent. In practice however the Cambridge LNB won't switch at 22kHz in the H mode. The solution is to reduce the value of R3 to 660Ω, giving a 16V output.

Ken Suddes,
Welwyn Garden City.

ANY IDEAS?

A customer of mine has a Sony KVG2515U TV/satellite receiver combination. Recently he asked me whether it was possible to wire through to another room so that he could watch satellite TV there. I built a modulator unit so that I could get a u.h.f. feed from the TV scart socket. It worked all right until the Sony equipment was put into standby, when the satellite receiver also goes off. According to Sony the only way round this is to use the TV timer option for satellite timings, then put the set in standby. It works, but if the user wants to change the satellite channel he has to go through the whole procedure again.

Why couldn't Sony have left the satellite section and the IR device powered when the TV is in standby, and also provided a modulated u.h.f. output for use with a distribution system? Does anyone know of a modification to the power board to at least provide the satellite section with power when the set is in standby. My customer is seriously thinking of getting a stand-alone satellite receiver, forgetting the one in the TV set.

P. Thorneycroft, Thorneycroft Satellite Systems, Tamworth, Staffs.

DOMESTIC TV DISTRIBUTION

Having read Bill Wright's articles (September and October) I thought it worth mentioning that BBC Engineering Information has a number of leaflets that give information and advice on obtaining good TV and radio reception. *Filters and Combiners* and *Television Reception the Professional Way* are useful to read with the articles. Copies can be obtained from BBC Engineering Information at the address below (telephone 0181 231 9191). In addition, page 698 of Ceefax on BBC-2 gives information on our transmitters and the introduction of new services.

Simon Lloyd Hughes,
BBC Engineering Information,
Villiers House, The Broadway,
Ealing, London W5 2PA.

AUDIO TAPE PATH PROBLEM

While listening to one of my audio cassettes I noticed a ticking sound on one channel. This occurred whichever machine was used for playback. In fact over 150 of my tapes are similarly affected, different tapes to different extents. Some have an almost continuous, train-like drone superimposed on the music. My liking for a cassette can almost be gauged by the amount of clicking.

By playing a blank cassette in each of my fifteen or so decks, then playing it back, I identified a five-year old Aiwa midi system as the culprit. Its tape path was given a thorough scrub and degauss, but the problem remained. In case static discharge was the cause of the trouble, I strapped the capstan bearing, the head mounting plate and the main deck to chassis. Again this had no effect on the symptom.

More careful listening revealed that the clicks were not random. They were in fact regular. So the deck was run while I looked for anything that rotated at the same frequency as the clicks were being laid down. The capstan was too fast, the take-up spool and associated idlers a little too slow, but the pinch roller seemed to fit the bill. Out it came for closer examination.

Although it seemed to be as clean as they come, I noticed that there was a minute oxide-filled pit that had been hidden from view when the roller was in situ. To my relief a replacement provided a complete cure.

This proves how important it is to have a really clean tape path. I now run a few seconds of blank tape through every machine that comes my way for servicing, just in case. Paranoid? Well, maybe – but I have a feeling that this wasn't just a one-off case.

Nicholas P.B. Arnold,
Birmingham.

OBTAINING SPARES

I read with interest the letter from a Cambridgeshire reader (December) about difficulty in obtaining spare parts from some manufacturers. While I cannot comment directly on his Clarion problem, I would like to point out that the answer is in most cases simple. Wizard Distributors, along with others, regard solving such difficulties as part of our normal service. We have accounts with a multitude of suppliers, and are able to combine many individual enquiries into worthwhile orders for them. This saves the customer having to administer many accounts, some of which are used once in a blue moon; it saves the supplier having to service small and pro-forma accounts; and should prove that Wizard and other component distributors are here to help! The number of times a customer says "I wish I'd come to you first" confirms this.

Distributors of spares and components are here to help: all we ask is the opportunity to do so. Don't leave distributors to the last, try them first – you could be surprised!

Ron Blyth, Managing Director,
Wizard Distributors,
Empress Street Works,
Empress Street, Manchester M16 9EN.

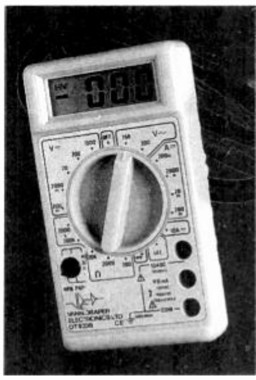
Television reader offer: Versatile dmm & tester for just £14.95

Featuring 10A dc measurement capability and transistor h_{FE} test facility, the DT830B is a compact, 3.5-digit multimeter with six measurement functions. This attractive meter normally sells at £23.44, excluding postage. As a special introductory offer open to all *Television* readers in the UK*, instrument distributor Vann Draper Electronics is offering this meter for just £14.95 – fully inclusive of vat and postage.

In addition to reading dc and ac voltage, dc current and resistance, the DT830B has a diode-test function and a transistor h_{FE} range indicating gains from 0-1000. Supplied with test leads and battery, this compact multimeter weighs just 170g and measures 70 by 126 by 24mm – truly a pocket sized instrument. Its liquid crystal display has high-contrast 0.5in high characters.

DT830B key specifications

DC voltage	0.2/2/20/200/1000V
Basic accuracy	±0.5%
Input impedance	1MΩ
Max input	1000V dc
AC voltage	200/750V
Basic accuracy	±1.2%
Input impedance	0.45MΩ
Frequency range	45-400Hz
Max input	750V ac
DC current	200μ/2000μ/20m/200m/10A
Basic accuracy	±1%
Overload protection	0.2A fused 10A not fused
Resistance	200/2000/20k/200k/2M
Basic accuracy	±0.8%
Overload protection	250V dc/ac



Avaialable at the special price of just £14.95 to Television *readers, the DT830B is a six-function DMM including transistor gain measurement.*

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*Overseas readers can also obtain this discount but details vary according to country. Please ring, write or fax to Vann Draper Electronics

Satellite Notebook

Reports from
Hugh Cocks
Brian Storm
Stephen Leatherbarrow
Christopher Nunn
Chris Watton
Nick Beer

Pace MSS Series Receivers

The remote control volume adjustment with these receivers seems to confuse many of our customers. It's quite common to find that a "poor sound" complaint means that the signal from the satellite receiver is low, the TV set's sound output having to be turned up to compensate. When we install a system we leave a note telling the customer about this, though problems still arise.

There's a solution with the new MSS100. This has a 'power on options' menu which enables the volume level to be preset when the receiver is switched on from standby. Another option with this menu is to stop the LNB supply in standby. In addition a channel to go to after a power cut can be preset. This model seems to run a lot cooler, and because of its shape it's not easy to place things on top of it! **H.C.**

SVA1 VideoCrypt Decoder

The SVA1 VideoCrypt decoder is getting a little long in the tooth now. I always seem to get the ones with intermittent dry-joints that produce strange effects and on-screen messages. The sight of one of them with a 'faulty' label attached is guaranteed to ruin my day.

One that came in recently passed only very weak video and refused to decode. Flexing the board restored normal results, but lack of a circuit diagram didn't help. Video entered at the scart connector but soon died off, around the de-emphasis switch. Further investigation here showed that the adjacent Toko type coil LA02 was intermittently open-circuit – bending the board hard enough re-established contact. Bypassing the coil didn't degrade the picture noticeably, so I left it at that.

I also resoldered the connections around the mains transformer, as this is often a source of trouble, and replaced the fuses which seem to die of old age.

A problem I had some years ago with one of these decoders was intermittent picture break up. The cause was traced to the 28MHz crystal associated with the 8052 microcontroller chip IW01. In the process the viewing card was destroyed: I now remove the high-voltage supply to the card to avoid this possibility. To do this, cut the middle leg of TP05 (the regulator on the left-hand side or the metal assembly, looking from the front). Hopefully Sky card issue 10 won't need this voltage – they stopped communicating with the card in this way back around issue 5. **H.C.**

VideoCrypt Decoder Interference

The interference caused by VideoCrypt decoders tends to be much worse at v.h.f. than u.h.f., and is therefore more likely to cause problems in Ireland and Continental Europe than in the UK.

If you get patterning on local Band I or Band III transmissions, unplug the decoder or IRD to see if the interference disappears, thus confirming the diagnosis.

Check that the braid of the coaxial TV aerial downlead is making good contact with the plug body, and that the cable itself is of reasonable quality. In ninety per cent of cases these steps will put matters right. Try moving the decoder or IRD to see if the interference varies. Keeping the terrestrial TV aerial cable well away from the VideoCrypt decoder can also help.

If reception is still poor, check the signal level from the terrestrial TV aerial. With stubborn cases a poor aerial system often gives a just about viewable picture before the addition of the VideoCrypt decoder.

The Pace MSS series IRDs I've seen here in the Algarve produce quite a high level of interference in Band I – they can cause a nasty crosshatch pattern on ch. E4. Try to use scart leads only. If r.f. has to be used to link the satellite receiver to the TV set, one cure in Band I is to take the output from the IRD via a u.h.f. high-pass filter to the splitter where the inputs to the TV set are combined. The idea is shown in Fig. 1. A u.h.f./v.h.f. diplexer could be used instead of the made-up filter, with a 75Ω terminating resistor connected to the diplexer's v.h.f. input.

At the time of writing this I don't know whether VideoCrypt-2 decoders will produce less interference. MAC decoders give few problems in this area. One wonders what MPEG will bring! **H.C.**

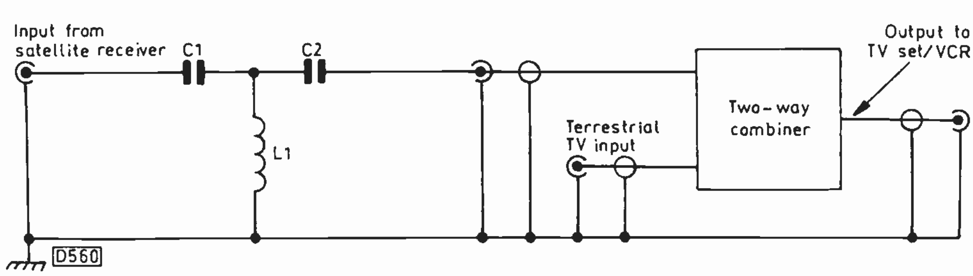

Fig. 1: Use of a simple u.h.f. high-pass filter to remove spurious v.h.f. signals produced by a VideoCrypt decoder. Capacitors C1 and C2 are 4·7pF, 50V. L1 is not critical: say two-three turns of coaxial cable inner conductor, diameter 5-10mm spaced over 5-10mm.

Panasonic TUSD200

The problem with this receiver was no VideoCrypt decoder operation and no on-screen decoder messages. Because of licensing agreements with Thomson, the decoder circuit is not shown in the Panasonic service manual. We didn't need the circuit in this case however as the cause of the fault was loss of the supply to the digital-to-analogue converter chip U20. There was open-circuit print from one end of L20. **B.S.**

Panasonic TUSD250

The 47µF, 400V main reservoir capacitor C2 seems to be causing trouble in these receivers. In the first one I investigated the chopper transistor had blown and the input fuse was open-circuit. The next one just spluttered about every ten seconds. Despite the different symptoms, C2 was in both cases open-circuit. **B.S.**

Panasonic TUSD200

No reception with these receivers is usually caused by failure of either Q60 or Q61. These transistors supply LNB voltages to the dish. A replacement FXT749 transistor or two soon restores normal reception. **B.S.**

Amstrad SRD510

The fault was failure to decode the pay channels, with no corresponding insert-card message on the screen. IC6 (TEA2029C), which is on the daughter board, was the cause of the trouble. As we had little information to go by we had to resort to comparison checks with a working receiver. When we scoped waveforms we found that in the faulty receiver XL10 produced bursts of oscillation only during the period between a channel change, when the screen blanks. In the working receiver these oscillations were present at all times. **S.L.**

Pace PRD800

If the problem is intermittently disappearing video signals, the audio not being affected, save yourself time and seek out the BC846A surface-mounted transistor Q105 on the underside of the board, at approximately the centre. It tends to go open-circuit base-to-emitter. Because of its intermittent nature, the cause of this fault can be very difficult to track down. **S.L.**

Editorial note: See page 14, November about this and the possible need to remove R559 when replacing Q105.

Amstrad SRD510

This receiver's LEDs lit up without an LNB connected. As soon as an LNB was connected the receiver went into the trip mode. The culprit turned out to be R609 (4·7Ω) in the power supply. Its value had risen to 6·8Ω. R609 is connected to pin 3 (current monitoring) of IC600. **C.N.**

Amstrad VS1000

The complaint with this combined VCR/satellite receiver was poor pictures (bent, with bars moving vertically down the screen) when the signals were in the clear. Scrambled signals were not decoded. Heating the decoder PCB improved the situation. Since information on the operation of the decoder is not available, I had to proceed by heating and cooling components. This eventually brought me to CA05 (100μF, 16V) which was open-circuit. A new electrolytic cured both the poor pictures and the failure to decode. Phew! **C.N.**

Amstrad SRD510

There was a blank raster. Sound was present when there were on-screen graphics: it ceased when the graphics disappeared. Checks showed that the video signal was present at the emitter of TR7 but not at TR6, which produced a d.c. reading of 12V at each electrode. Resistance checks then showed that R9 (470Ω) was open-circuit. This resistor is not easy to find, as it's usually hidden beneath the brown stuff that Amstrad slap here and there in these receivers.

Streaky pictures are a common problem with these receivers. For this fault check R80 (10kΩ), which is also covered with the sticky-looking compound.

The reason for failure of these resistors is probably that the brown stuff causes hot spots. **C.N.**

Amstrad SRD500

The quite common symptom of an odd channel indicator display with the set then going off is usually caused by faulty electrolytics in the power supply. This one showed JI then went to standby. We eventually traced the cause to D3. As we didn't have the type listed in the manual we fitted a BYD33J which made a suitable replacement. **C.W.**

Amstrad SRD540

You can get various intermittent problems with this model because of trouble with the socket for the large chip in the middle of the main panel. If cleaning the socket doesn't cure the problem, try removing it and soldering the chip directly to the panel. This will ensure that there are no further connector problems. **C.W.**

Ferguson SRD4

This receiver permanently displayed a test pattern and the text "no video signal". Our field engineer had confirmed that there was a supply to the LNB and that signals were being received from the dish. The cause of the fault was lack of the switched 15V supply to the tuner, because the BC369 switching transistor TP71 in the power supply was short-circuit base-to-collector. **N.B.** ■

Long-distance Television

A review of DX-TV conditions and reception, also satellite news and sightings and a note on the beginnings of FM radio

There was little tropospheric excitement from the sustained high-pressure systems that developed during October, though better than average conditions were experienced along north-south paths. The best period was over October 11-20th. Sporadic E produced a late season boost, the following reception being logged by Garry Smith in Derby and Peter Schubert in Rainham, Essex:

11/10/95	RAI (Italy) chs. IA, B; TVE (Spain) ch. E2.
12/10/95	TVE E2, 3; Canal Plus (France) L2.
23/10/95	+PTT (Switzerland) E2; RAI IA, B, E2; TVE E2, 3, 4; TVE-2 E2; RTP (Portugal) E3; Canal Plus Corsica L3.
25/10/95	TVE E3.
28/10/95	Radio Vidẹo (Italy) E2.

During the anticyclonic spell mentioned above Garry Smith received a very slow fading (over a half-hour period) TVE signal on ch. E3. He feels that it must have been SpE. On the south coast TVE chs. E3 and E4 are occasionally received via tropospheric ducting, the latter more often. I've received ch. E3 at Ventnor via tropospheric ducting, using just a 55MHz vertical helical aerial, the path from Spain being largely a sea one. It's quite possible therefore that TVE could be received farther north via trop ducting.

Solar cycle number 23 has begun. On August 12th a spot was sighted at the Big Bear Solar Observatory, New Mexico, at latitude 21°N and of opposite magnetic polarity to all other sunspots since 1984 – sunspots reverse polarity with successive solar cycles. Although this confirms that cycle 23 has started, cycle 22 is still decaying and should end some time in 1996. My thanks to *Six News* for this information.

Belgacom Liedekerke, a Belgian SNG identification, inserted in the field blanking period. The identification can be seen by adjusting the field hold control so that the field slips down.

Satellite Sightings

Another Satellite Festival from The Satellite Shop, Holland, took place on the weekend October 20th-22nd. It differed somewhat from the previous festival in August, the event being on-air continuously for fifty hours with Country Music Radio, played live from the shop, filling down times. Echosphere and IRTE were amongst the manufacturers featured, along with various equipment suppliers. Demonstrations covered C-band reception and inclined tracking for smaller dishes.

Videos of old pirate radio, factory visits, satellite earth station operations and satellite providers were also included. In all it was an excellent, informal weekend. Transmission was this time exclusively via Eutelsat II F3 (16°E, 11·159GHz horizontal), though SNG operator VTN turned up and used a parallel Telecom band downlink at 16°E. Views within and from the Lopik tower, a well-kown DX-TV transmitter and, it seems, a hot patch for Amateur TV repeater use, were highlights. Amateur TV was in operation throughout the show, with demonstrations and distant picture contacts.

The Paris Metro bomb blast on October 16th produced high drama. I first saw a warning of an upcoming video on the Reuters' VisEurope transponder aboard Intelsat K (21·5°W, 11·531GHz horizontal) but was unable to find any on-the-spot SNG downlinks. The only live coverage was from the TF1 broadcast service, via Telecom 2B (5°W). I suppose there are many fibre optic insert points for TV around the French capital, making the use of an SNG truck unnecessary.

On October 18th I saw a test pattern with the caption CBUT – VCR via Intelsat K. A check with the *World Radio and Television Handbook* showed that this was a TV station in Vancouver, British Columbia. The following two-way interview with a UK TV company revealed a seven-hour time lag behind GMT.

When I first started monitoring satellite TV transmissions I thought that the Asiavision news service via the EBU relay was something quite exciting, what with the simplicity of reception and the huge distances. Now there's an Asian Report daily at 0730 GMT via Reuters' Intelsat K transponder.

PAS-4 at 68·5°E is being well received across the UK. John Locker manages it in Merseyside though the signal elevation is only 2-3° above the south eastern horizon. Ku band signal levels are relatively high. So too are the seven C band feeds that Ian Waller receives in Lincoln, between 3·79-4·19GHz, all in the clear and in English. Ian has also received midday WTN and BSN news feeds. These are weak signals, from a Raguda satellite (3·78GHz at 60°E, with the sound at 7·5MHz). Out in Sri Lanka Bandula Gunasekera manages C band PAS-4 reception using a 1·5m dish. He has not to date seen any Ku band signals.

Roy Carmen has run into planning problems with his 1·2m dish after moving to Lake, Isle of Wight. Meanwhile Bob French in the midlands is awaiting arrival of a 3·1m KTI mesh dish from the States for C band experiments.

Finally David Thorpe, publisher of *Transponder* bulletin, has taken up a job with a satellite company in Canada. We wish him well but regret the loss of the bulletin.

The Birth of FM Radio

The idea of using frequency modulation for radio broadcasting was first put forward by Major Edwin H. Armstrong in the USA. He also undertook much of the early development work. E.H. Armstrong was born in 1890. From 1912 he became active with Dr. Lee DeForest, the valve pioneer, being keenly involved with regenerative and superhet receivers during the Twenties and into the Thirties.

A general concern had been static, the plague of a.m. radio. Armstrong opted against the usual anti-static measures – narrow receiver i.f. bandwidths and higher transmitter powers – and in 1930 applied for four patents for a wideband f.m. system. These were granted in late December 1933. Despite its large investment in conventional a.m. radio, in 1934 RCA allowed Armstrong to construct and test his f.m. transmitter alongside the RCA equipment atop the Empire State Building, using the callsign W2XF.

This didn't last for long, as RCA was more interested in using the Empire State facilities for the development of television (despite the depression). In November 1935 Armstrong arranged an impressive demonstration of his f.m. system in New York, for the IRE. This made clear the superiority of f.m. in providing good quality reception. As a result the Yankee Network offered Armstrong a 50kW f.m. transmitter at Mount Wachusett, Princeton. This transmitter, W1XOJ, started broadcasting in January 1938, at 44·8MHz. At the same time Armstrong started to build his own 50kW f.m. transmitter (he invested half a million dollars in the project) W2XMN across the Hudson from New York, at Alpine, New Jersey. He used a 400ft tower that stands to this day, operating at 42·8MHz. By 1939 W1OXJ was transmitting sixteen hours of f.m. programming daily, and W2XMN started to broadcast.

In the autumn of 1939 the FCC received over a hundred and fifty applications to open f.m. transmitters, and by 1941 about 48 experimental transmitters were in operation. Zenith was not only making receivers but operating a 5kW transmitter in Chicago. With the US entry into WW2, narrowband f.m. came into extensive use by the troops. Broadcasting f.m. applications had piled up by the end of the war in 1945. With the simultaneous growth of TV, in 1946 the FCC decided to move the f.m. allocation up to the familiar 88-108MHz, with 200kHz channel spacing.

By 1949 over 700 commercial f.m. stations were on air, though public interest was minimal in comparision with medium-wave a.m. TV was the main public interest, and by 1954 only about 520 f.m. radio transmitters were still in operation. Armstrong had become involved in legal action against RCA/NBC over patent infringement. The action meandered on for several years, being finally settled in 1955 – a year after Armstrong had leapt to his death from a 13th floor apartment in New York. A tragic end for one so inspired and determined. There are now nearly 6,000 f.m. stations on air in the USA alone.

At the end of WW2 the occupying powers in Germany were reluctant to allow local broadcasters to resume transmissions beyond local borders. So encouragement was given to research into v.h.f. f.m. radio, which would provide limited regional coverage. One of the prime movers in such research was Rhode and Schwarz, which started Band II f.m. broadcasting in the late Forties.

The BBC had also been experimenting with f.m. transmission from the late Forties, as a way of providing high-fidelity sound. Its first f.m. transmitter, at Wrotham, Kent, came on air in May 1955. Thereafter the BBC's f.m. transmitters were, with very few exceptions, co-sited with main TV transmitters, sharing the mast, power and proved service area.

The Orion Atlantic satellite at 37·5°W is still used for feeding news packages and inserts to BBC London.

Terrestrial Broadcast News

Finland: SBS (Scandinavian Broadcasting Systems) plans to start a national commercial TV channel as a rival to the present monopoly

Herbalife transmits a sales programme via Eutelsat II F1 at 13°E several times a week, in clear PAL.

commercial TV operator Mainos TV.
DAB: Experimental Digital Audio Broadcasting services are expected to start in Sweden and Germany within the next few months, following the start of the BBC's DAB service across London.
Ireland: There are fresh plans to start a third commercial TV service, with new backers including Ulster TV. Start up could be as early as 1997, using a mixture of conventional terrestrial transmitters, MMD and cable to reach about eighty per cent of the population within the first year.
Latvia: PICCA TV, previously a mystery identification, turns out to be an independent programme producer that uses Latvian TV2 network time between 0500-0800 GMT daily. The identification has been seen on ch. R1 from the 10kW e.r.p. Kuldiga transmitter during summer SpE openings.

Satellite News

Digitrona, a German company, has introduced a slim multidecoder that will switch between VideoCrypt 1/2 and Eurocrypt M/S. An ADR board is to be made available, also an MPEG-1/2 board. It sounds good from a German review, though no price is quoted. We're seeking more information on the unit.

The African Satellite Entertainment Corporation (ASEC) has leased Ku band transponders aboard Intelsat 704 (66°E) to provide a four-channel service covering South Africa. Programmes are in the clear or with VideoCrypt for pay-per-view films. The service is to start on an analogue basis: ditigal transmissions will be considered later as an add-on. There will also be twelve radio channels. An IRD plus 90cm dish is to cost about R1,000 plus VAT.

KoreaSat has been launched into orbit, though failure of a booster rocket to ignite properly means that station-keeping fuel had to be used to attain the correct orbital position. This will reduce the expected life of the satellite from twelve to four-five years.

NHK Tokyo has changed its European link from PAS-1 at 45°W, which involved a trans-US hop, to PAS-4 at 68·5°E. This provides a single hop between Japan and Europe. A France Telecom transponder lease is being used.

Panasonic, Philips and Pace are to produce digital IRDs for the Nethold group's pay-TV operations in Europe, Africa and the Middle East. A record order for over a million units has been placed.

Rome-based Orbit International, which transmits sixteen TV and numerous radio channels across the Arab world, is to introduce monthly subscription charges, ranging from $50 depending on the service required. Until now anyone who bought a decoder was able to view the programmes without charge.

Tunisia has lifted its dish ban, though a tax has been imposed.

Rivalry between pay-TV operators in Australia has claimed its first victim: ABC has axed the Australian Information Media. This leaves Galaxy, Foxtel and Optus Vision. ■

Answer to Test Case 397

– see page 187 –

Colin, browbeaten by Service Manager and the customer, almost regretted suggesting a proper AV link between this VCR and TV set pair. To have a stereo TV set and a stereo VCR yet be able to hear only mono playback sound seemed daft to him, but he was being made to pay dearly for pointing this out.

Workshop Sage suggested that he could solve the vision problem either by using a more expensive scart cable, with individually-screened signal conductors, or by dismantling the TV set's scart connector and snipping the wire to pin 19. Colin did the latter, which produced good playback pictures. Pin 19 carries the TV set's video output. In the AV mode this is, in many designs, the demodulated off-air signal. In a two-metre length of unscreened multicore cable there can be crosstalk between the video output and the video input, producing the effect described. It's quite a common problem in fact.

The sound problem was not such an easy one. It stemmed from the TV set's design: the gain and frequency response of the left/right AV sound channels both differed from those of the path from the internal tuner to the audio output stages. Rather than pay an unknown bill for investigation and modification of the TV set, the customer decided to leave things as they were.

LNB Test Signal Source

An LNB can be converted so that it generates a microwave output from an IF input, thus providing a workshop signal source for testing other LNBs. Hugh Cocks writes on the practicalities and details for converting a Swedish Microwave LNB.

I'd always wanted a quick way of testing LNBs in the workshop, without having to instal the LNB on a dish and point it skywards. After giving the problem some thought, a relatively easy solution became apparent.

An LNB down-converts the incoming microwave signals from the satellite to a lower intermediate frequency band. Why not reverse this, converting the i.f. in the workshop to s.h.f. using a modified LNB? An LNB contains all that's required – a local oscillator, an i.f. amplifier, a mixer and an s.h.f. amplifier. Fig. 1 shows a basic, conventional LNB block diagram and its adaption to act as an up-converter.

Basically what needs to be done is to rearrange the LNB's innards, so that the 10/9·75GHz local oscillator signal is mixed with a 950-1,750MHz (or 950-2,000MHz) i.f. signal, the mixer's output being amplified by the original LNA before exiting at the waveguide flange. To all intents and purposes the modified LNB represents a satellite, providing an output that can be received over short distances without the need for a dish. This makes it possible to check an LNB's sensitivity and oscillator tuning easily on the bench.

Selecting an LNB for Modification

I'm quite fortunate in having a stock of used, single-polarisation LNBs with a WR75 flange. When Astra 1A was launched back in 1989, only the vertical channels could be received here in the Algarve. We sold a lot of installations with a single-polarisation LNB and a prime-focus dish. After the launch of Astra 1B and 1C we carried out several upgrades to dual-polarisation LNBs.

The main difficulty is in reversing the low-noise amplifier section so that the output appears at the waveguide flange.

After inspecting the innards of numerous LNBs, I found that the easiest type to convert is the cylindrical, cream Swedish Microwave LNB with the large black label. The modification will of course in principle work with any LNB. I'd be interested to hear how readers fare with other models.

The noise figure of the LNB to be converted is not critical, so an old one that's been replaced, say with an Astra 1D type, is an ideal candidate. The Marconi blue cap springs to mind, but as there were never many of them here I've not looked into its suitability for conversion. Sendz has had ex-rental LNBs for £2 – if nothing else a source of GaAs FETs!

Some experience with r.f. circuitry is essential. If you don't feel confident, don't attempt LNB conversion.

Initial Steps

To remove the outer cover, take off the black plastic nut on the F connector, then the circlip. Push down on the F connector and out comes the body. The metal cover over the LNA is easily removed. This gives access to the LNA and the mixer on one side. The 10GHz local oscillator lives inside a cover at the F connector end of the LNB, its frequency being set by the large screw through its internal cover.

The PCB on the other side carries the 950-1,750MHz i.f. amplifier, which is connected to the F connector, with the power supply assembly alongside. See

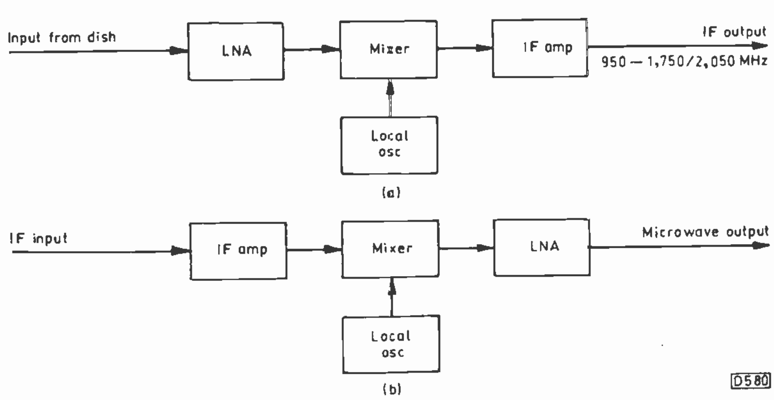

Fig. 1: Block diagrams showing at (a) the basic LNB arrangement and at (b) the LNB rearranged as an up-converter.

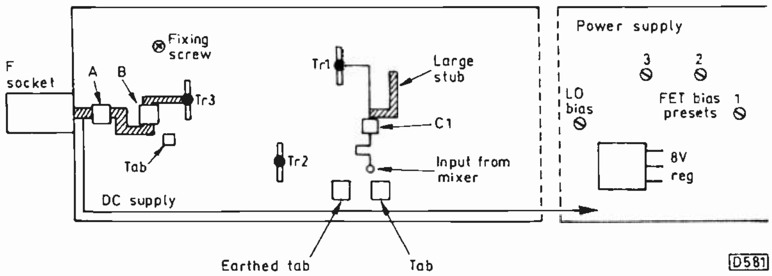

Fig. 2: I.F. amplifier modifications: the initial arrangement – to clarify the situation most of the components are not shown.

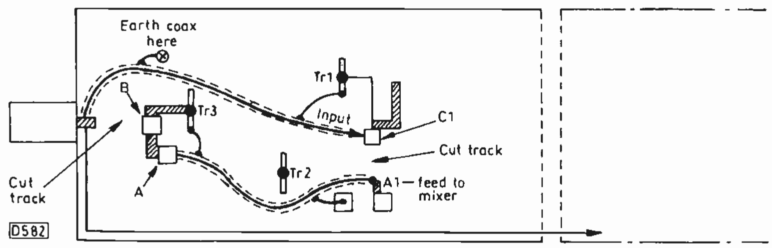

Fig. 3: The i.f. amplifier after modification. Add a coaxial cable link from the F socket to chip capacitor C1 and a further link from the tab by Tr3 to A1 (the mixer feed). See text.

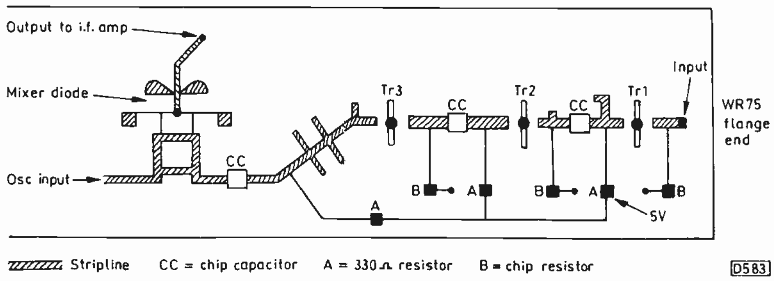

Fig. 4: The original LNA/mixer PCB layout. Note that the GaAs FET leads at 90° to the stripline are the source leads. Points marked A are 330Ω chip resistors in the 5V feeds from the supply to each GaAs FET drain. Points marked B are the negative gate bias feeds from the power supply.

Fig. 2. The GaAs FETs require a small negative gate bias which is generated by the i.c. The three co-located presets power each LNA stage, the end one, by the 8V regulator, providing bias for the oscillator FET.

IF Amplifier Modifications

We'll start with the i.f. amplifier as this is the easiest part. What needs to be done here is to couple the input at the F connector (the original output) to Tr1 and the output from Tr3 to the mixer/LNA.

The final i.f. transistor Tr3 is connected to the F connector via a chip capacitor and an 18Ω resistor – these are shown as A and B in Fig. 2. The original input from the mixer enters from the other side of the LNB body, being connected to Tr1 via the chip capacitor identified as C1 in Fig. 2.

Chip capacitor A, connected to the F socket, must be unsoldered. With the units I've had it can then be soldered to the tab that's conveniently located between Tr3's earthed emitter leg and the track to which the tab is connected.

Cut the original input track adjacent to where it is connected to chip capacitor C1. Solder a short length of coaxial cable between C1 and the F socket. The braid can be soldered to Tr1's emitter lead. Earth the coaxial cable braid at the F socket end by the nearby fixing screw.

Cut the track between the F socket and the output from Tr3. Be careful not to sever the thin track connected to the F socket – it feeds the incoming d.c. to the voltage regulator.

Use another piece of coaxial cable to link the amplifier's output (from chip capacitor A, see Fig. 3) to the mixer (point A1). Earth the braid via Tr3's emitter at one end and the plated through tab adjacent to point A1 at the other end.

I've had no stability problems with the i.f. amplifier altered in this manner.

LNA Modifications

This is the difficult part! Some previous experience with GaAs FETs is helpful. They can be touchy devices. The gate has a negative bias and is a very high impedance connection. The soldering iron bit should be well earthed and linked to the LNB assembly as well.

As reversing the PCB would be difficult, the FETs have to be turned around instead. A three-stage LNA is used in the Swedish Microwave LNB, see Fig. 4. The gates and drains of the FETs are 180° apart, with the two earthed source leads at 90° to the other two leads. The FET at the input end is often different from the other two, with a lower noise figure. Interstage coupling is via chip capacitors, the probe in the waveguide being connected directly to the first stage. Track width determines circuit impedance. There is often a small stub soldered to the input track to the first stage to optimise the transistor's noise performance.

Turning the FETs round doesn't do wonders for the matching, but some experimentation afterwards can help to optimise the performance. We're not looking for perfection in this application, just for sufficient signal from the waveguide to travel over a short distance. I tried taking the signal direct from the mixer, but this didn't work very well.

Power for the LNA is connected from the reverse side, through the body. The FET drains are usually at about 3V, the source leads are earthed and the gates have a small negative bias voltage set by the presets on the power supply PCB. Each stage has a gate and a drain power supply wire that passes through the body of the unit.

Check and note the original voltages before you start, also the effect of varying the presets on the power supply PCB. Avoid connecting the meter to the gates (I've never blown one up in this way, but you never know. . .). Many models now dispense with the presets, though the power supply arrangements are similar. Note that with an H/V switching LNB changeover between the two input stages is carried out by diverting the supply from one to the other as either 13V or 17V is applied: the second and third (if present) LNA stages have constant supplies.

It's easiest to reverse the FETs one at a time, starting with the one nearest to the mixer. Use a very fine screwdriver to prize the FET leads away from the PCB track. This is firmly bonded to the Teflon substrate, so there's little danger of the track peeling off. Fortunately with the LNBs I've seen so far the device leads have been long. and not too much solder has been used. Other makes may be different and it may be necessary to unsolder the devices. With some makes it may be easier to turn the LNA PCB section around. If it's possible mechanically, this would be the best approach to adopt.

Note the FET connections before removing the device: they can be very confusing once the FET has been removed from the board.

The gate bias and drain connections are via very fine printed tracks that act as r.f. chokes. Reverse these – see Fig. 5 – by using thin wire at the chip resistor end.

After soldering the first FET back in place, apply power and check that there is about 3V at its drain and that this voltage varies when the relevant bias preset in the power supply is adjusted. If the voltage is low and doesn't vary, the FET has probably died – if this is the case, invest in a Sendz Components LNB for some spare devices.

If all is o.k., repeat the procedure with the second FET. The results should be the same. After refitting the final FET, remove the power to the first two before you check the voltages. The reason for this is that if the amplifier becomes unstable, which it may do, strange voltages will be present at the first stage. These will vary dramatically when you place your hand near the waveguide. Stability should be o.k. when the cover is back in place.

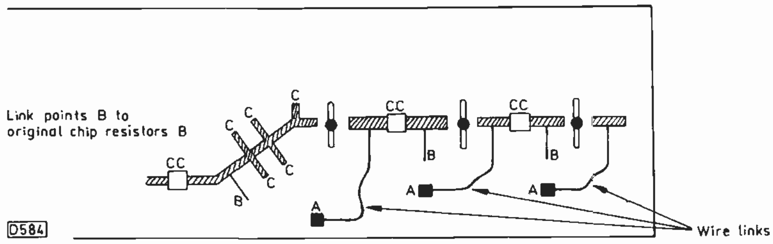

Fig. 5: The modified LNA, with the FETs turned around and the power feeds adjusted. Link the 330Ω chip resistors to the points marked A. Apply the gate bias voltages to the tracks marked B. A better output may be obtained by cutting the stubs marked C flush with the track to the first transistor's input. Note that there are small pads linked to the thin tracks which feed the bias voltages to the transistors (gates with the transistors connected the original way round). They are for decoupling and are not shown.

Testing

Line powering is required. This can be provided via a modified i.f. splitter, so that d.c. is available from one of the splitter ports (see Fig. 6) along with the satellite i.f. signal from the LNB at the receiving dish (the signal input to your up-converter).

If you have some form of spectrum analyser available, connect a known good LNB to it. Power the up-converter, feeding in the satellite i.f. as well. The LNB should start to produce a display, resembling what comes from a dish. Place the LNB approximately three metres from the up-converter initially.

If you don't have an analyser, power the up-converter in the same way and connect a known good LNB via a short cable to a receiver which is tuned to say the Eurosport i.f. (1,258MHz, assuming a 10GHz local oscillator frequency). Place the up-converter about three metres from the receiving LNB, and switch on. All being well, something may be seen on the screen.

Adjust each preset on the power supply PCB for the strongest signal output.

You may find that the response across the band is not flat. In this case try connecting a short stub to the stripline from the mixer – it can be fixed to a piece of plastic and moved around. If an optimum point is found, solder it in position. Make it out of thin tinplate or, failing that, a small piece of wire.

By way of an experiment you can add an i.f. line amplifier in the feed to the up-converter. This seems to degrade the picture, but is worth trying if one is to hand. Don't forget that the output from the amplifier goes to the up-converter, otherwise there will be no results.

If an old feedhorn is available, fix it to the converter. Range is difficult to suggest: I'd be interested in hearing of any results obtained by doing this. The converter can also be placed at the focus of a dish to reflect its output, providing a lot of extra gain.

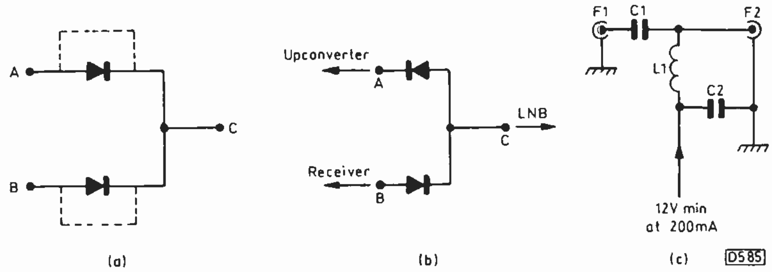

Fig. 6: Line powering arrangements. (a) and (b) Modifying an i.f. splitter to pass d.c. to the up-converter. (a) Conventional two-way splitter with d.c. bypass diodes. C is the connection to the LNB, A and B the split i.f. outputs. Power passes to the LNB from either A or B via the relevant diode. (b) The diode between A and C turned round so that power and the i.f. signal are available at A for feeding to the up-converter. B is the signal to the receiver and the d.c. source. C is the connection to the dish LNB. (c) A simple d.c. injection system. Items required: two F sockets; a 6·8pF, 50V ceramic capacitor (C1) – keep the lead lengths short; a 1,000pF, 50V ceramic decoupling capacitor (C2) – solder the earth lead to the connector tag; a small r.f. choke (L1) – this is not critical, it could consist of four-five turns of coaxial cable inner conductor wound over a small screwdriver blade. Use a small length of 75Ω coaxial cable to link between C1 and the output socket, with the braid soldered to the connector earthing tag at each end. Keep all lead lenghts short. Alternatively use a commercial unit such as the Global DCBF.

Using the Converter

Position the up-converter in a convenient, out-of-the-way place in the workshop, at a distance that produces results comparable to those from a known satellite signal source. Low sensitivity LNBs will be obvious, and better noise figure LNBs immediately apparent with the signal kept to near the receiver threshold. The converter works quite happily with either a 9·75GHz or a 10GHz signal source at the dish. If the local oscillator frequencies are the same, Sky News will appear at an i.f. of 1,377MHz. With a 9·75GHz oscillator at the dish and a 10GHz oscillator in the up-converter all frequencies will be offset by 250MHz.

One use of the up-converter is to help an old LNB to work with an Astra 1D converter. These old LNBs often work to some extent but the lowest frequencies (Superchannel/ARTE) are poor. A dramatic improvement can be seen if the old LNB's i.f. is shifted up by 50MHz or so when a 1D converter is in use (RTL-5 is then tuned in at the bottom end of the band, and CNN ends up at around 1,700MHz). This is normally because the i.f. amplifier's response falls away rapidly at around 700MHz, the LNA part working reasonably or very well.

To retune an old LNB, point it at the up-converter and turn the local oscillator's tuning screw anticlockwise until you've moved by four Astra channels – say from Sky News to Sky One. The screw is by then often fully outside the case.

Another use for the up-converter is to readjust an Astra 1D LNB to 10GHz so that it can be used with an old receiver where the customer has no interest in recieving 1D and the old LNB has died or a new dual one is being installed. All Astra 1D LNBs that I've come across will tune back to 10GHz, though CMW oscillator tuning screws are very tightly secured.

Normally about two turns clockwise are required. Use an old 10GHz LNB as a reference on a particular channel, say Sky News. Connecting a 1D LNB will then produce Galavision. Turn the oscillator screw slowly until Sky News appears – you'll pass through intermediate channels of course. Remember to lock the screw with Loctite or something similar afterwards.

The potential for playing about is very good, particularly around April 1st: no dish needed any more, just an LNB – place a hand over the LNB and the picture goes – watch their faces! ■

VCR CLINIC

Reports from
Eugene Trundle
Philip Blundell
Gerald Smith
David Belmont
Bob McClenning
V.W. Cox
Brian Storm
John Pitt-Francis
Glyn Dickinson
Christopher Nunn
Chris Watton
Nigel Burton
E.J. Edwards
Michael Maurice
John Edwards

Ferguson FV77

The cause of the problem took us a long time to track down, the fault being very intermittent. When it did appear the machine wouldn't perform any deck functions, even eject, though the clock, E-E operation and channel selection were all o.k. If one was requested, the machine would present a flashing cassette symbol for a few seconds then go back to sleep. The culprit was the cassette-down (FL) switch ST71, which was noisy and sometimes failed to make contact at all. **E.T.**

Mitsubishi HSB12

Failure to wind or rewind the tape can be caused by the machine trying to operate through the reel-drive clutch, slide-bar B having failed to latch. We've never had the fault stay long enough to be able to confirm a diagnosis, but have found that replacing the latch magnet coil (part no. 299P124010) and its driver transistor Q5B5 has, along with a check on their interconnections, provided a cure. **E.T.**

Toshiba V110/210

Intermittent loss of playback capstan servo lock was the problem here. We thought that a replacement ACE head had cured the fault but the machine bounced. Further tests showed that the pulses at pin 6 of the U2561B FG/CTL control pulse amplifier chip IT18 were very weak and noisy. In fact the chip itself was the culprit, as repeated attacks on it with a freezer aerosol and a hairdryer proved. **E.T.**

Toshiba V423

This machines lives in a house where all the residents smoke like chimneys – the contents of the living room are all nicotine brown, especially the TV set and the VCR. The complaint was that the picture had a horizontal shift which was worse in the record mode. Expecting a sticky guide roller, I marked them all with a fine felt-tip pen. Sure enough the no. 1 guide was not turning smoothly. A new one improved matters, but the problem was still present.

I pressed pause while playing a known good tape. The shift could be seen. A drum servo problem? All was revealed when the bottom PCB was removed. The drum PG/FG photosensor was contaminated while the plastic interrupter blades were caked with fluff. Cleaning the optical faces with a cotton bud soaked in foam cleaner and removing the fluff from the interrupter restored the picture stability. **P.B.**

Toshiba V703

Playback was o.k. but there was no E-E picture and no baseband video from the scart sockets. The on-screen graphics and the E-E sound were o.k. Scope checks along the video path showed that the signal was present at pin 8 of ICF01 on the terminal board and TP201 but not at TP203. A visual check revealed a crack in the print to pin 1 of plug 201 on the motherboard. **P.B.**

Panasonic NVJ47

There was a colour phase fault with playback, which would intermittently became black and white. It looked like a delay line fault, but the cause was IC302. **G.S.**

Sanyo VHR274

The playback picture had lines on it, because the drum to capstan sync drifted off cyclically. IC351 was the cause of the fault. **G.S.**

Panasonic NVFS1

There was intermittent colour with this machine's recordings. We found the cause to be dry-joints around the luminance/chroma pack, at pin 34 in particular. **G.S.**

Nokia VR3615

This machine worked but the power supply buzzed and ran hot. We found that the voltages on the secondary side of the power supply were too high, and the over-voltage protection diodes were conductive. The cause of the problem was D804, which was short-circuit. **G.S.**

Nokia VR3615

Rewind and fast forward were intermittent, and when eject was operated the machine would sometimes leave the tape hanging out. A replacement mode state assembly cured the problem. **G.S.**

Finlux VR3400

Distorted Nicam stereo sound was the problem with this machine. Checks revealed that one channel was overmodulated at the input to IC1808. The cause was the TDA1543 DA converter chip IC1803. **G.S.**

Nokia VR3615

There were hum bars and the E-E picture was too bright (playback was normal). I found dry-joints at various components in the i.f. unit, i.e. Q102, Q101, Z103, Z102 and L104. After resoldering these the machine performed correctly. **G.S.**

Akura VX140

This machine would intermittently leave tape out on eject or not play or record, with the mechanism overloading and the loading belt slipping. A faulty mode switch was the cause of all these symptoms. **G.S.**

Panasonic NVSD30

Intermittent tape damage was the complaint. There was also a clicking noise between modes. On close examination I found that the slide cam was damaged. As a precaution I replaced the mode switch as well. **G.S.**

Samsung VIK306

There was no playback picture, with the drum rotating at excessive speed. The drum FG and PG pulses were present but too fast. When the drum drive from pin 7 of IC201 was checked it was found to be too high, at a full 5V, and didn't vary when the drum was slowed by hand. Replacing IC201 cured the fault. **G.S.**

Sharp VCA55HM
This machine was totally dead. The cause turned out to be R905 in the power supply. **D.B.**

ITT VR3938
There was a waving pattern on the E-E and playback pictures – it looked as if waves were moving from right to left on the screen. Quite pretty, really! The cause was C3 in the power supply. **B.McC.**

Panasonic NV333
A thick hum bar appeared when play or record was pressed. The cause was failure of one of the diodes in the bridge rectifier circuit that provides the 15V motor supply. **V.W.C.**

Panasonic NVSD30
There was a problem in the cue mode: any attempt to cue forward resulted in loss of line lock because the drum speed changed incorrectly. Checks in the system control circuit showed that IC6001 was changing to the NTSC default condition, despite this machine not being fully equipped for NTSC playback.

The cause of the problem was poor head-to-tape contact. Further checks showed that the performance in the review mode was very poor, the top half of the picture being covered with noise. A badly worn and very shiny pressure roller confirmed the diagnosis. The drum was badly worn: because of the relative newness of the machine this was something we hadn't considered initially. **B.S.**

Toshiba V309
This machine would stop during playback or record, after anything from twenty minutes to two hours. The cause was high reel motor drain current, though the motor provided very fast rewind and wasn't particularly noisy. A new motor cleared the fault, which can also occur with the **V109** and **V209**. **J.P-F.**

Ferguson 3V35/JVC HRD120
The tuning department wouldn't light up: in fact this VCR behaved as if it was in the camera mode, though the camera/tuner switch was o.k. Replacing the HD552 088C chip put matters right. **J.P-F.**

Grundig VS500
This VCR produced the dead machine symptom initially, with very low voltages at the secondary side of the chopper transformer. Over the course of half an hour however the voltages gradually increased, creating a chatter from the deck solenoid and eventually normal operation. The cause of all this was C1409 (33µF) in the primary side of the chopper circuit. It had gone low in value. The replacement must be a 105° type. **J.P-F.**

JVC HRD540
There was a severe tracking error with this machine – about four tracking bars were present towards the top of the screen. On investigation we found that the left-hand guide pole didn't engage with the end stop. A thorough check for a foreign body, i.e. something that might have caused the problem by blocking its path, was carried out. As we couldn't find anything we came to the conclusion that pole was just a bit too loose, snagging before it entered the end stop. The cause of this was stopper 2 (item 17). Because it was a poor fit, it had worked loose. A replacement (part number PQ43525) cured the problem.

An improved pole kit is available to deal with severe cases – part numbers PTU96102E (supply) and PTU96103E (take-up). **J.P-F.**

Sharp VCA105
The mode switch and master cam assembly cause various problems with this model. The suspect cam is black, replacements being white. Unlike earlier models, replacement is not too difficult. To confuse matters, a modified assembly was introduced after serial number 659812 and in later models that have a mode switch with a yellow centre. These require a different cam and switch. They are not interchangeable. **G.D.**

Samsung SI3260
Rewind and fast forward were both o.k., but in play and record there was no capstan drive. A check on the 12V feed to the capstan motor in play, at pin 15 of CN201, produced a reading of only 2-3V. Replacing L201 and D110 (1N4001) cured the fault. **C.N.**

GoldStar RQ5041
There was no drum rotation. It was soon apparent that the motor was faulty, as the chip on the motor PCB had a hole in it. This is the second faulty motor we've had in these comparatively new machines. When the cause of the fault is not as obvious as in this case, the important motor connector pins to check are 4 earth, 5 always 12V and 6 where the control voltage should be present. When this reaches 1V the motor should be turning. The other pins are for the PG and FG pulses, playing no part in starting the motor. Pin 1 of the connector is identifiable by the black wire. The part no. for the lower drum/motor assembly s 413-220A. **C.W.**

Samsung SI3260
The E-E signal produced by this machine consisted of the blue mute raster. It refused to tune in any stations. A check at the collector of Q401, which supplies the tuner's VT (voltage tuning) pin, produced a reading of zero volts. There was no 33V feed because D105 (1N4001) was open-circuit. **C.N.**

Philips VR6462
There was no sound in any mode. The cause was traced to C2007 (330µF, 16V) on the audio panel. We've had a number of these blue Philips capacitors on the audio panel fail, causing a number of symptoms. They usually go dead short, so a faulty one is not too hard to find. **C.W.**

Hitachi VT220
This machine was almost dead, with no clock and no deck functions. But the power supply voltages were all present at the output connector. Circuit protector IC405 (N5) was open-circuit. It's not easy to find, as it hides close to the side of PG604. There was no apparent cause for its failure, and the machine worked perfectly after fitting a replacement. **C.W.**

Amstrad VCR6000
The loading belt is suspect if the machine goes to standby when a tape function is selected. Often however the control cam's brush assembly is the cause. This fits into the cam. When fitting a replacement, clean the static part of the mode switch and smear a small amount of silicone grease on it.

Another fault you get with these machines is failure to rewind or wind fast forward because the trigger lever sticks. This has been a common problem for several years, and has been mentioned before in these pages. The cause is the rubber damper which becomes soggy with age (like Hitachi drive belts), preventing the trigger from going far enough.

The CPC part no. for the brush is AM153114 and for the damper AM153091. **C.W.**

Hitachi VT150
There were no playback or E-E pictures, though the sound was o.k. On several occasions we've found

that the cause has been the HT4757 chip IC203 on the YC subpanel. So we carried out a check at pin 1 in the E-E mode. The scope displayed a nice composite video signal, but there was no output at pin 27. Before replacing this very expensive chip I checked for 5V at pin 6. The reading here was 0V. Checks in the power supply revealed that there was no 5V output at pin 1 of the STK5476 multi-regulator chip IC881. Replacing this item cleared the playback and E-E mode faults. **C.W.**

Samsung VI710

Playback was in monochrome only and there was no vision in the E-E mode. Power supply checks showed that there was no supply to the three-pin regulator fixed to the lower drum assembly. The cause was the 2Ω safety resistor FR02 being open-circuit. No cause for its failure could be found. **C.W.**

Panasonic NV430

The E-E picture was o.k. but there was no colour at the top and bottom of the playback picture. After initially suspecting a fault in the chroma circuitry we turned our attention to the electrolytics in the power supply. Replacing C1001-C1004 and C1101-C1104 cured the fault. **N.Bu.**

Panasonic NV870 (DI Deck)

When review was selected this machine would sometimes unlace, with the play symbol appearing in the display. Then, after realising its mistake, the machine would lace up again, usually successfully but sometimes with tape chewing. Replacing the mode switch cured the fault. **N.Bu.**

Hitachi VT11/13

There was no playback picture though E-E operation was o.k. We traced the cause of the fault to Q905, a replacement restoring the picture. **E.J.E.**

Panasonic NV366

There was no rewind and only 2V at the motor plug. The cause of the fault was traced to Q6022, a replacement putting matters right. **E.J.E.**

Philips VR6362

The original complaint with this machine was of sound warble. When it arrived on my bench it would eject the tape whenever a deck function was selected. Now before it will allow any functions, the microcontroller chip requires sample capstan FG pulses. When a tape is inserted, the capstan does a shuffle for about half a second. In this machine the capstan turned for about five seconds.

The capstan FG pulses are picked up by a tacho coil that's mounted close to the capstan flywheel. They are amplified by the tacho amplifier, which is mounted under the sub-plate. It receives an 11V supply that's derived from the +13a rail via a 1kΩ resistor with a 47μF, 16V decoupling capacitor, C2206. This last item was short-circuit. When a replacement had been fitted we had some FG pulses, but they were too low in amplitude for the micro to recognise them. After replacing the tacho amplifier PCB and the tacho head the machine worked normally – with no trace of any sound warble. **M.M.**

Sony SLVE25UY

Tape chewing was the complaint with this machine. On investigation I found that the exit guide had parted company with the load arm. Refitting this guide provided a complete cure. **M.M.**

Matsui VP9401

The customer's complaints were of failure to load a tape and a burning smell. A previous engineer had diagnosed "incorrect data from IC1001": he obviously hadn't noticed the large hole in the loading motor drive chip. Replacing this item cured the trouble. **M.M.**

Akai VS485

This machine would very intermittently leave a loop of tape hanging out when the cassette was ejected. The cause was the capstan motor, which wasn't turning freely. A replacement motor cured the fault. **M.M.**

Ferguson FV42

Intermittent cutting out was the reported fault with this machine. On test we found that there was no mechanical fault. When playback was selected however the tape laced up and the play symbol appeared in the display but the machine stayed in the E-E mode. The PB12V supply is derived from pin 4 of the MC14094 chip IW27, via a couple of transistors. There was no voltage at pin 4 of IW27, so we swapped it over with IW18. This restored the playback signals. Replacing IW18 and IW27 cured the trouble. **M.M.**

Amstrad UF20

This machine wouldn't play prerecorded tapes. Playback of its own SP recordings was o.k., but LP recordings were unwatchable. The upper drum had already been replaced without producing any improvement. Replacing the lower drum cured the fault. **M.M.**

Sony SLV373

The customer complained about intermittent tape chewing. He provided three samples that showed they were looping on eject. The cause was the capstan motor, whose base plate had warped. A new motor solved the problem. I understand that Sony is aware of this problem and that replacement base parts are available. **M.M.**

Hitachi VTM930

An intermittent buzzing noise, especially when the machine was hot, was the complaint with this machine. The mains transformer proved to be the culprit, a replacement ensuring silent operation. **M.M.**

NEC PX1200K

Playback was o.k., but if a timed or a manual recording was attempted "error" would be displayed followed by either tape eject and/or the machine going into the standby mode. The anti-record inhibit switch mounted on the carriage had come adrift. Its plastic support legs were weak but not broken, so a drop of modelling glue provided the answer to the problem. **J.E.**

Hitachi VT120

This machine wouldn't record or play back in colour. The playback picture also had what can best be described as an "orange peel" effect which was more noticeable in light grey to white areas. In addition white flaring occurred when the picture contained sudden light to dark areas, this symptom being more pronounced when the sharpness control setting was advanced. Slight finger pressure on the HT4539 hybrid decoder module would restore normal colour for an indefinite period. We wasted a lot of time soldering in the area around the module and the module's pins, but in the end it was a new module that restored the colour. The part is available from Charles Hyde but is expensive, the trade price at the time of the fault being nearly £40. **J.E.**

Mitsubishi HSM59

Slow rewind and eject was the customers complaint. When we turned the machine upside down and removed the bottom cover to inspect the mechanism the plastic capstan belt pulley fell on to the bench. After fitting a new pulley (Mitsubishi part no. 999D126010) the machine worked normally. **J.E.** ■

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.

HELP *WANTED*

Wanted: 240V mains motors for the Tandberg 1600X and Ferguson 2010 reel-to-reel tape recorders. Francis Berry, 6 Woodland Avenue, Hindley Green, Wigan, Lancs WN2 4PN.

Wanted: Service data for the Oritron Jupiter D2-MAC satellite TV decoder. G.D. Betney, 2 Kurtus, Dosthill, Tamworth, Staffs B77 1NX. 0121 733 5515.

Wanted: Service manual for the Ekco CT100 all-valve colour receiver. Alan Rockett, 216 Ashington Road, Rochford, Essex SS2 4SL. 01702 544 641.

Wanted: Circuit diagram for the Questar VR100 VCR. L.W. High, 26 Northdene, Chigwell, Essex IG7 5JT. 0181 500 6526.

Wanted: EMO1ZVI or equivalent diodes for the Salora SV8800 (Mitsubishi HSB10/20) VCR. Frank Hagan, 2 Stratford Road, Lytham-St-Annes, Lancs FY8 3TF. 01253 726 780.

Wanted: Ipsalo transformer FM237 and BG2000-641 tripler for the Salora J chassis, also a circuit diagram (photocopy will do) for the Toshiba Model C2220B. Kenneth Cargill, 1 Stradowen Drive, Strathfoyle, Londonderry BT47 1XN. 01504 861 268.

Wanted: Chopper transformer for the Alba Model CTV711. G. Smith, 83 Avenue Vivian, Fence Houses, Tyne and Wear DH4 6HZ. 01913 852 316.

Wanted: Service manual (photocopy will do) and a teletext board for the Panasonic Model TC2232. D. Kenney, 45 Bicton Avenue, St Peters, Worcester WR5 3TF. 01905 357 059.

Wanted: Reasonable used replacement 370KRB22 Tatung black stripe tube. A. Tomkinson, 10 Lodge Court, Station Grove, Wembley, Middx HA0 4AP. 01819 035 574.

Wanted: Service manual for the Grundig Super Colour Cinema 9000GB 50in. projection TV set. K.C. Liu, 33 Dudwell Lane, Skircoat Green, Halifax, W. Yorkshire HX3 0SD. 01422 381 002.

Wanted: Information/schematics/tube bases for the 4A tube tester made by CE Developments of High Wycombe, also an A51EBD10X tube. Mike Irving, Sutton Wick House, Sutton Wick, Drayton, Abingdon, Oxon OX14 4HJ. 01235 464 470.

Wanted: Old copies of *World Radio and TV Handbook*. Malcolm Shaw, 11 Clarke Court, Lough Road, Antrim, Co. Antrim BT41 4JS.

Wanted: Circuit information and technical specification for the Bischke CCTV camera type CCD-90. T. Wiltshire, UQ Presentations, Bramblings House, Pelican Road, Pamber Heath, Basingstoke, Hants RG26 3EL. 01734 701 163.

Wanted: Does anyone know of a supplier of spares for the Huanyu Model 37C-3? H. Preston, 5 Blayberry Close, Lakes Estate, Redcar, Cleveland TS10 4PX.

Wanted: Service manual or circuit diagram (loan for copying would do) for the NordMende Model UW342U. W.B. Mansell, 48 Bowling Green Road, Thatcham, Newberry RG18 3DA.

Wanted: Circuit diagram for the Rotel RA500 power amplifier and data on the Sunken SI-1725HDF amplifier chip. Vince Stanley, 36 Meadow Court, Littleport, Ely, Cambs CB6 1JW. 01223 203 824 days, 01353 862 076 evenings, 01223 441 249 fax.

Wanted: Lower drum assembly for the Panasonic NV730 VCR. T.W. Cawte, 69 Dorchester Gardens, Worthing, W. Sussex BN11 5AY.

Wanted: Circuit diagram (photocopy would do) for the Triumph CTV8210, also details of the AN5610N chip. Does anyone know of an equivalent to this Currys set? E. Longton, 47/49 Back Victoria Street, Fleetwood, Lancs FY7 6EJ. 01253 778 338.

Wanted: Does anyone know of a parts supplier for the following TV brands: RS, GBI (Korea)? H. Lawson, 49 Duke Road, Silverhill, St Leonards-on-Sea, East Sussex TN37 7DN.

Wanted: Telefunken AC701 valve or any subminiature, single triode wire-in valve. Tony Arnold, Court House Facilities, 27-29 Salisbury Street, Cranborne, Dorset. 01725 517 359.

Wanted: Circuit diagram for the L + G L2800 audio amplifier. P.J. Shepherd, 25 Tomkins Close, Stamford Le Hope, Essex SS17 8QU. 01375 640 618.

Wanted: Circuit diagram (photocopy would do) for the Elonex CD1442 VGA computer monitor and any relevant information. E.W. Ingarfill, 44 Pitts Lane, Earley, Reading RG6 1BU. 01734 265 357.

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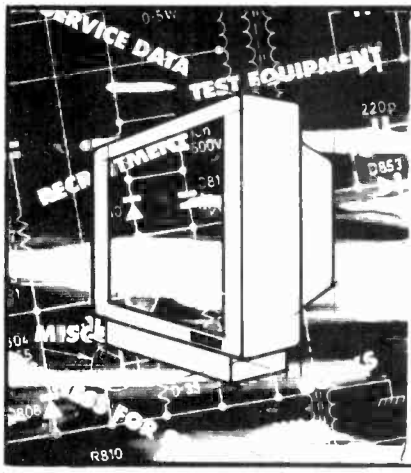

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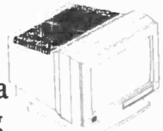

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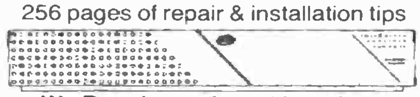

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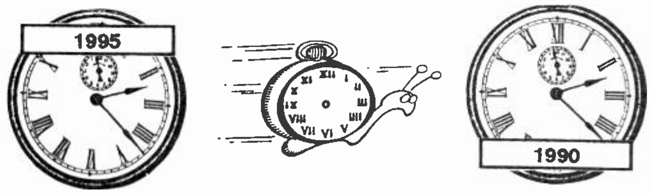

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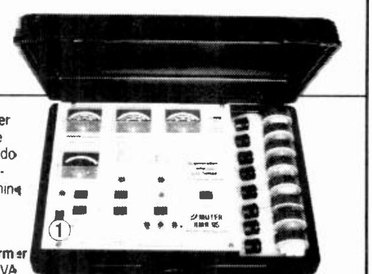

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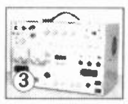

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2434494 - £12	TFB 4023AD
2434492 - £12	TFB 4039AD
2434274	TFB 4066AD
2434393	
2432981	FCC 2115BE
2435372	TLF 14567F
2435701	TLF 14568F
2432351	LOPTS £10 EACH
2432211	
2432984	
2432491	Y260482
2432871	2435121
2432851	
3220029	FERGUSON TUNERS TX90/TO100 - £4
3714016	
3216001	
47003481	

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DST 88N 234/400086 AD / 47805200 L
DST 81N 243/472593 00
DST 186N 243/473058 00
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VHF Tuner for ICC5 £5.00

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Amstrad-Long Chassis and Short Chassis Power Supply £4.00
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Ferguson U/V Camcorder Battery VA310 £4.00

Desolder Pump £2.00

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Philips Solder Iron 25w-240v £6.00

Portasol Hobby Gas Solder Iron £10.00

Philips KT3 £7.00
Text Decoder K40 £7.00

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ICC5 Decoder Panel each £5.00

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Handset £8.00
KT3/K30 Full Remote £8.00
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KT3/K30 Chassis
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Mains Stand-by Switch with Coil £1.00

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Texas Instruments MkII £10.00

Toshiba Nicam Board £6.00

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TDA3581	£3.00	BYV95C	12p
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TDA3591	£1.00	BYZ106	10p
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TDA3650	£7.00	BYW56 2A/	
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TDA3653AQ	£2.00	2SC3795	30p
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TDA3803A	£4.00	80v/t	15p
TDA3180	£2.00	2SD200	£2.00
TDA4260	50p	2SD401	£1.00
TDA4501	£3.00	2SD716	£1.00
TDA4505NE	£3.00	2SD787	30p
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TDA4439	£2.00	2SD820	£1.00
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TDA4601	£2.00	2SD880	30p
TDA8190	£3.00	2SD1264	£1.00
TDA8703	£3.00	2SD1266	£1.00
TDA8349	£3.00	2SD1398	£1.00
TDA9403	£1.50	2SD1415	£1.00
TDA9503	£3.00	2SD1427	£1.00
TDB2033	£1.00	2SD1432	£1.00
TDD1610S	50p	2SD1453	£1.00
TD6303P	£2.00	2SD1556	£1.00
TDA1060	£3.00	2SD1576	£1.00
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ST6393 B1/1M	£3.00	TDA3562A	£0.00
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BU207	£1.00
BU208	80p
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BU705	£1.00
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BUK445/600	£2.00
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TDA3047	£1.00
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TDA3083	£2.00
TDA3190	£1.00
TDA3301	£3.00
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