THE LEADING UK CONSUMER ELECTRONICS TECHNOLOGY MAGAZINE

TELEVISION

SERVICING · VIDEO · SATELLITE · DEVELOPMENTS

MARCH 1996 £2.35

A REED BUSINESS PUBLICATION

Servicing the Panasonic Z1 chassis

The signal pre-echo problem

Setting up a PC

Bowling alley monitor problems

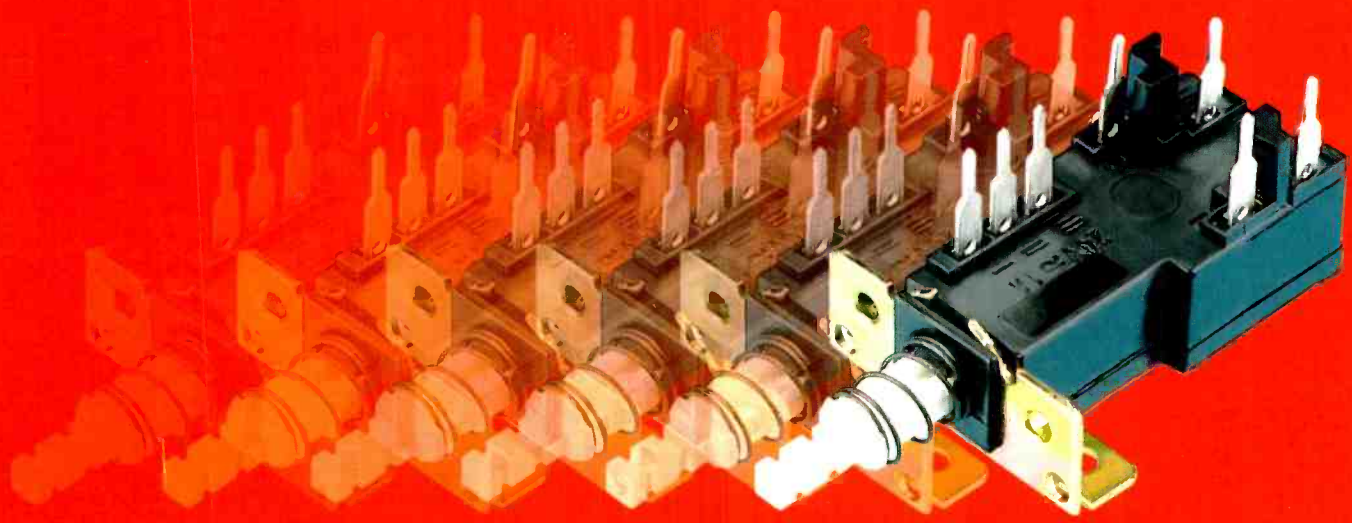
Fault Reports

TVs, VCRs, camcorders and satellite

03>

9 770032 647031

TV MAINS SWITCHES



There are 8 good reasons why you should buy TV Mains Switches from Philex plc.

QUALITY ▪ All switches are BS approved

VALUE ▪ Very competitive prices

COMPATIBILITY ▪ Rigorous quality control helps to ensure the correct specifications for every switch

UNIVERSAL SWITCHES ▪ Some switches are available with a selection of brackets to extend the range of models covered

RANGE ▪ Covers many popular TV models and is continually expanding

CROSS REFERENCES ▪ Full cross references on request

SERVICE ▪ The Philex " availability" network through major distributors and wholesalers offers fast and efficient service

GUARANTEED STANDARDS ▪ Philex operate to ISO 9002 standards Accreditation by ASTA

PHILEX ALSO STOCK GENUINE MAINS SWITCHES AND A COMPREHENSIVE RANGE OF GENUINE VIDEO SWITCHES.

FOR MORE INFORMATION ON SWITCHES AND OTHER TV, VIDEO AND CD COMPONENTS AVAILABLE THROUGH OUR DISTRIBUTORS CONTACT

PHILEX ON : TELEPHONE 0181 202 1919 . FAX: 0181 202 0015

PHILEX PLC

PHILEX PLC - 110 - 124 THE BROADWAY - WEST HENDON - LONDON - NW9 7PP

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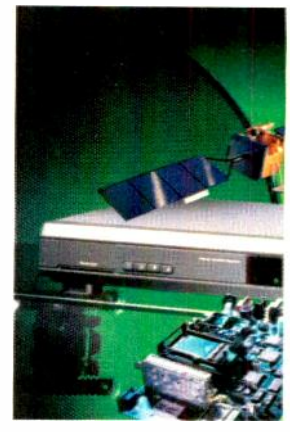

This month's cover. Satellite reciever courtesy Pace Micro Technology Ltd.

REGULARS

NEXT MONTH

Servicing VCR Audio Systems. Eugene Trundle starts a two-part series that provides guidance on audio fault diagnosis in all types of VCR and deals with the practical aspects of head replacement and alignment, together with the other mechanical and electrical factors that affect audio performance. **Servicing the B & O 37XX and 38XX chassis.** Nick Beer on problems you could experience with these fine Beovision sets and how to tackle them. **VCR Signal Processing.** The concluding instalment deals with chroma signal processing in the playback mode, including the jitter correction techniques required. **The Pace Link.** Hugh Cocks finds a PC method of tuning and reconfiguring Pace receivers helpful.

Our April issue will be published on March 20th.

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Note that we are unable to answer technical queries over the telephone and cannot provide information on spares other than given in our Spares Guide

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Telephone: 0181-900 2329 Fax: 0181-903 6126

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
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BD203	42p
BD204	42p
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BD234	32p
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BD237	21p
BD238	24p
BD239	30p
BD240	40p
BD241A	40p
BD243A	50p
BD244	50p
BD245	50p
BD246A	50p
BD265	45p
BD267	45p
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BD317	150p
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BD332	40p
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BD371	30p
BD410	50p
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BD437	28p
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BD441	40p
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BD536	38p
BD537	40p
BD538	40p
BD643	50p
BD645	50p
BD647	50p
BD649	50p
BD675	40p
BD676	40p
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BD828	50p
BD839	55p
BD897	50p
BD899	50p
BD977	50p
BDX33	60p
BDX65	80p
BDW24	55p
BDW93	50p
BDW94	50p
BDY92	100p
BF137	35p
BF187	30p
BF181	18p
BF183	20p
BF195	7p
BF199	8p
BF200	16p
BF225	30p
BF240	16p
BF245	25p
BF254	15p
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BF337	20p
BF338	20p
BF362	30p
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BF422	21p
BF423	25p
BF455	12p
BF458	19p
BF462	50p
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BF472	28p
BF479	30p
BF494	18p
BF495	18p
BF595	16p
BF596	16p
BF615	30p
BF617	30p
BF760	40p
BF763	40p
BF870	22p
BF871	22p
BF960	38p
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
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
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BU110	90p
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BU508D	90p
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BU508VF	100p
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BU536	100p
BU546	125p
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BU626	120p
BU705	130p
BU706DF	175p
BU706F	150p
BU801	70p
BU806	70p
BU807	60p
BU902	110p
BU903	110p
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BU930	130p
BU2508A	130p
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BU2508D	130p
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BU2520AF	225p
BU2520DF	225p
BU2525AF	325p
BUH515	200p
BUT11AF	55p
BUT12	80p
BUT56A	100p
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BUX12	150p
BUX20	350p
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BUZ11	200p
BUZ71	75p
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BY448	20p
BYT11	25p
C106D	28p
IRF630	150p
J174	38p
J300	50p
MJ900	200p
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MJ1001	200p
MJ10012	300p
MJ15003	250p
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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	38p
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
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TIP34	50p
TIP34C	60p
TIP35C	65p
TIP36C	65p
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TIP42A	20p
TIP42C	22p
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TIP107	65p
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TIP112H	50p
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TIP150	90p
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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	18p
ZTX302	10p
ZTX303	20p
ZTX304	10p
ZTX320	20p
ZTX501	13p
ZTX502	10p
ZTX503	18p
ZTX504	25p
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2N698	40p
2N78	22p
2N914	28p
2N930	18p
2N1131	28p
2N1132	28p
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	180p

RECTIFIER DIODES

BY127	8p
BY133	8p
BY164	40p
BY179	35p
BY184	32p
BY206	11p
BY207	9p
BY227	19p
BY228	28p
BY298	15p
BY299	18p
BY448	20p
BYX10	15p
BYX55/600	25p
BYX70/500	32p
OA47	10p
OA91	10p
OA202	10p
IN4001	3p
IN4002	3p
IN4003	3p
IN4004	3p
IN4005	3p
IN4006	3p
IN4007	4p
IN4148	2p
IN5400	9p
IN5401	8p
IN5402	8p
IN5403	8p
IN5404	8p
IN5405	11p
IN5406	12p
IN5407	12p
IN5408	12p
RGP15	25p
RGP30	16p
SKE4F2/06	60p
SKE4F2/08	80p
SKE4F2/10	100p
SR2M	60p

I.C. SOCKETS

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

ZENERS

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

CRYSTALS

Freq in MHz	
2.4576	180p
3.276	115p
4.0	110p
5.0	130p
10.0	140p
11.0	250p
12.0	120p
14.756	200p
15.0	160p
24.0	250p

VOLTAGE REGULATORS

7805	25p
7806	25p
7808	25p
7812	25p
7815	25p
7818	25p
7824	25p
7905	25p
7906	30p
7908	30p
7912	30p
7915	30p
7918	30p
7924	30p
78L05	24p
78L08	24p
78L12	24p
78L15	24p
78L18	24p
78L24	24p
79L05	35p
79L08	35p
79L12	35p
79L15	35p
LM309K	100p
LM317T	100p
LM323K	350p
78H08KC	800p
79H12KC	700p
79HGKC	800p

VALVES

DAF96	100p
DY87	80p
EBF80	60p
ECC84	80p
ECH84	90p
ECL84	100p
EF183	75p
EF184	85p
EL500	100p
EY86	70p
EY87	70p
EY88	80p
PC97	100p
PCC85	60p
PCF80	100p
PCF801	110p
PCF806	115p
PCH200	100p
PCL81	65p
PCL82	80p
PCL84	60p
PFL200	110p
PL36	120p
PL83	60p
PL84	80p
PL95	180p
PY81	100p
PY500A	190p

LEDs

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

RECTANGULAR LEDs

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

OPTO COUPLERS

4N37	48p
4N38	68p
AN203	210p

BRIDGE RECTIFIERS

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

TRIACS

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

THYRISTORS

2N5061	20p
0.8A/60V	
TIC116C	59p
8A/300V	
TIC116D	70p
8A/400V	
TIC126D	75p
12A/400V	
TIC126M	90p
12A/600V	
C106D	28p
4A/400V	
BR103	37p
BR303	85p
BT106	180p
BT119	100p
17088	200p
17089	200p
17127	200p
15/80H	230p
15/85R	230p
SG264	800p
SG613	1600p

COMPUTER ICs

Z80ACPU	100p
Z80ADMA	200p
Z80ACTC	140p
Z80ASIO-1	210p
Z80ASIO-2	210p
75107	65p
75110	75p
75113	100p
75122	110p
75154	100p
75162	700p
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	380p
65C02	930p
6522	280p
6800	210p
6802	220p
680	500p
36808	500p
6809	500p
6810	150p
6818	380p
6821	130p
6840	290p
6845	200p
6850	90p
8085A	300p
8086	500p
8088	480p
8156	300p
8224	240p
8226	240p
8250	750p
8251	200p
8253	160p
8257	220p
8271	3400p
8279	270p
8283	400p
8284	440p
8287	260p
8288	650p
8748	700p
8755	800p
8T26	95p
8T28	110p

LINEAR ICs

AN203	210p
AN210	165p
AN214Q	170p
AN228	280p
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
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LM319	165p
LM324	30p
LM335Z	120p
LM339	35p
LM348	50p
LM358	45p
LM380	80p
LM381	150p
LM382	130p
LM386	60p
LM387	100p
LM393	45p

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LINEAR ICs / JAPANESE TRANSISTORS

Part	Price
LM431	50p
LM710	45p
LM723	40p
LM741DIL	18p
LM741MET	45p
LM747	55p
LM1889	300p
LM1894N	200p
LM3900	40p
LM3909	100p
LM3914	160p
LM3915	180p
LM3916	270p
L200	200p
M491BB1	500p
M494B1	700p
M50115P	320p
M50117P	500p
M50119P	525p
M50784	300p
M50786	500p
M50790	600p
M51161	300p
M51381P	200p
M51387P	800p
M51544	150p
M51848	150p
M54523P	200p
M54563P	200p
M58484	500p
M51516	260p
M51518	200p
MB3712	140p
MB3713	130p
MB3714	270p
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MB3756	160p
MB3759	200p
MB8719	360p
MC1455	45p
MC1496	65p
MC3401	45p
NE555	20p
NE556	40p
NE558	80p
NE565	110p
NE567	115p
NE571	290p
NE592	85p
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Part	Price
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STK463	950p
STK465	720p
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Part	Price
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U427B	70p
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UPC574	60p
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ZN429	215p
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Part	Price
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Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price
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2SA1380	75p	2SC1010	225p	2SC1735	70p	2SC2271	30p	2SC2751	270p	2SC3280	200p	2SC3895	400p	2SD837	55p	2SD1288	175p	2SD1825	60p
2SA1381	100p	2SC1012	75p	2SC1739	800p	2SC2274	15p	2SC2752	140p	2SC3281	200p	2SC3897	400p	2SD838	300p	2SD1289	250p	2SD1843	100p
2SA1382	120p	2SC1013	170p	2SC1740	10p	2SC2275	50p	2SC2767	300p	2SC3284	600p	2SC3907	250p	2SD841	110p	2SD1291	400p	2SD1846	350p
2SA1385	180p	2SC1014	140p	2SC1741	35p	2SC2278	70p	2SC2769	400p	2SC3293	85p	2SC3927	250p	2SD844	200p	2SD1292	60p	2SD1849	325p
2SA1386	400p	2SC1030	150p	2SC1755	90p	2SC2290	1800p	2SC2773	700p	2SC3298	50p	2SC3950	120p	2SD845	250p	2SD1297	300p	2SD1850	325p
2SA1423	30p	2SC1047	20p	2SC1756	35p	2SC2291	40p	2SC2774	500p	2SC3299	120p	2SC3953	60p	2SD850	170p	2SD1302	20p	2SD1858	40p
2SA1489	300p	2SC1050	280p	2SC1758	30p	2SC2295	60p	2SC2785	60p	2SC3300	400p	2SC3973	210p	2SD856	48p	2SD1308	80p	2SD1877	250p
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2SB546	45p	2SC1106	180p	2SC1815	10p	2SC2316	150p	2SC2808	40p	2SC3317	350p	2SC4056	350p	2SD868	260p	2SD1347	70p	2SD1910	280p
2SB560	25p	2SC1114	415p	2SC1819	70p	2SC2320	10p	2SC2810	360p	2SC3323	480p	2SC4106	200p	2SD870	190p	2SD1348	65p	2SD1911	300p
2SB561	50p	2SC1115	280p	2SC1826	60p	2SC2324	120p	2SC2812	40p	2SC3327	60p	2SC4123	450p	2SD871	300p	2SD1350	150p	2SD1913	50p
2SB562	25p	2SC1116	290p	2SC1827	60p	2SC2329	480p	2SC2814	40p	2SC3331	25p	2SC4124	250p	2SD879	60p	2SD1376	125p	2SD1929	60p
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2SB600	500p	2SC1165	750p	2SC1845	15p	2SC2344	150p	2SC2832	300p	2SC3355	50p	2SC4301	550p	2SD895	200p	2SD1391	250p	2SD1978	50p
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2SB703	90p	2SC1212	35p	2SC1870	700p	2SC2365	280p	2SC2878	20p	2SC3378	120p	2SD201	260p	2SD921	320p	2SD1399	300p	2SJ49	425p
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2SB775	100p	2SC1306	90p	2SC1923	10p	2SC2458	10p	2SC2928	550p	2SC3416	30p	2SD380	650p	2SD973	60p	2SD1417	125p	2SJ115	525p
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2SB795	60p	2SC1312	40p	2SC1940	110p	2SC2470	65p	2SC2934	75p	2SC3419	120p	2SD388	150p	2SD985	120p	2SD1426	160p	2SJ119	700p
2SB825	135p	2SC1317	15p	2SC1941	27p	2SC2481	120p	2SC2937	250p	2SC3420	80p	2SD389	60p	2SD986	120p	2SD1427	180p	2SJ161	650p
2SB861	110p	2SC1318	10p	2SC1942	350p	2SC2482	20p	2SC2938	235p	2SC3422	75p	2SD400	14p	2SD1012	40p	2SD1428	220p	2SJ162	680p
2SB882	180p	2SC1325	400p	2SC1944	350p	2SC2483	120p	2SC2939	400p	2SC3423	60p	2SD401	50p	2SD1020	40p	2SD1429	410p	2SK19	45p
2SB886	90p	2SC1327	20p	2SC1945	350p	2SC2484	185p	2SC2944	300p	2SC3446	150p	2SD402	120p	2SD1021	120p	2SD1430	280p	2SK40	50p
2SB950	180p	2SC1328	15p	2SC1946	1500p	2SC2491	200p	2SC2958	50p	2SC3447	200p	2SD415	55p	2SD1022	400p	2SD1431	400p	2SK49	50p
2SB951	190p	2SC1342	15p	2SC1947	450p	2SC2495	1900p	2SC2962	800p	2SC3456	200p	2SD424	350p	2SD1024	130p	2SD1432	400p	2SK55	100p
2SB1009	110p	2SC1345	15p	2SC1957	70p	2SC2498	50p	2SC2979	160p	2SC3457	125p	2SD426	150p	2SD1030	75p	2SD1433	750p	2SK68	100p
2SB1077	180p	2SC1346	100p	2SC1959	10p	2SC2500	25p	2SC2987	250p	2SC3459	180p	2SD427	350p	2SD1031	70p	2SD1438	140p	2SK73	75p
2SB1109	55p	2SC1358	270p	2SC1967	1300p	2SC2502	200p	2SC2988	150p	2SC3460	180p	2SD438	35p	2SD1046	200p	2SD1439	165p	2SK106	40p
2SC182	75p	2SC1359	15p	2SC1969	160p	2SC2519	60p	2SC2995	60p	2SC3461	350p	2SD467	15p	2SD1047	180p	2SD1441	280p	2SK107	40p
2SC372	25p	2SC1360	70p	2SC1970	100p	2SC2527	300p	2SC2999	50p	2SC3466	225p	2SD468	15p	2SD1051	130p	2SD1445	200p	2SK118	50p
2SC380	10p	2SC1364	25p	2SC1971	400p	2SC2534	150p	2SC3001	1400p	2SC3468	70p	2SD471	20p	2SD1060	130p	2SD1450	60p	2SK125	100p
2SC382	50p	2SC1383	25p	2SC1972	600p	2SC2535	300p	2SC3012	300p	2SC3481	300p	2SD525	50p	2SD1062	150p	2SD1451	260p	2SK133	650p
2SC388A	60p	2SC1384	20p	2SC1973	150p	2SC2538	100p	2SC3019	320p	2SC3482	275p	2SD526	70p	2SD1063	200p	2SD1452	350p	2SK134	415p
2SC394	60p	2SC1393	20p	2SC1983	75p	2SC2540	1900p	2SC3025	500p	2SC3486	275p	2SD545	18p	2SD1064	250p	2SD1453	140p	2SK135	415p
2SC403	25p	2SC1394	15p	2SC1984	150p	2SC2542	300p	2SC3026	550p	2SC3502	100p	2SD549	120p	2SD1065	160p	2SD1455	250p	2SK147	160p
2SC454	15p	2SC1398	55p	2SC1985	100p	2SC2545	55p	2SC3030	300p	2SC3503	50p	2SD551	300p	2SD1069	150p	2SD1457	165p	2SK150	150p
2SC458	10p	2SC1400	50p	2SC1986	100p	2SC2546	25p	2SC3037	125p	2SC3504	120p	2SD555	500p	2SD1071	450p	2SD1459	120p	2SK163	40p
2SC460	10p	2SC1403	500p	2SC2001	15p	2SC2547	65p	2SC3038	125p	2SC3505	240p	2SD560	50p	2SD1073	350p	2SD1468	60p	2SK168	40p
2SC461	15p	2SC1407	50p	2SC2002	15p	2SC2550	50p	2SC3039	80p	2SC3506	250p	2SD571	20p	2SD1088	150p	2SD1479	200p	2SK176	800p
2SC495	45p	2SC1413	150p	2SC2003	20p	2SC2551	70p	2SC3040	260p	2SC3507	650p	2SD575	530p	2SD1094	520p	2SD1487	225p	2SK192	45p
2SC496	25p	2SC1419	50p	2SC2004	20p	2SC2552	60p	2SC3042	300p	2SC3509	750p	2SD600	30p	2SD1110	225p	2SD1491	100p	2SK195	150p
2SC497	85p	2SC1429	50p	2SC2021	10p	2SC2553	200p	2SC3057	150p	2SC3518	120p	2SD601	40p	2SD1111	20p	2SD1494	300p	2SK197	140p
2SC515	100p	2SC1444	275p	2SC2022	110p	2SC2555	120p	2SC3058	2500p	2SC3519	250p	2SD602	60p	2SD1113	225p	2SD1496	350p	2SK214	170p
2SC535	30p	2SC1446	55p	2SC2023	180p	2SC2562	90p	2SC3068	60p	2SC3531	225p	2SD612	50p	2SD1128	200p	2SD1497	230p	2SK216	200p
2SC536	20p	2SC1447	70p	2SC2026	30p	2SC2563	200p	2SC3070	35p	2SC3549	200p	2SD613	70p	2SD1133	100p	2SD1497-02	350p	2SK218	400p
2SC558	275p	2SC1448	100p	2SC2027	200p	2SC2564	230p	2SC3074	200p	2SC3552	300p	2SD636	10p	2SD1135	75p	2SD1505	120p	2SK240	140p
2SC563	120p	2SC1449	120p	2SC2028	75p	2SC2565	260p	2SC3075	150p	2SC3568	200p	2SD637	15p	2SD1138	50p	2SD1507	60p	2SK312	750p
2SC605	100p	2SC1450	200p	2SC2029	120p	2SC2568	120p	2SC3077	120p	2SC3584	200p	2SD638	15p	2SD1140	40p	2SD1509	100p	2SK315	70p
2SC619	100p	2SC1454	250p	2SC2037	50p	2SC2570	30p	2SC3086	150p	2SC3595	220p	2SD639	20p	2SD1142	350p	2SD1511	100p	2SK320	120p
2SC641	80p	2SC1470	120p	2SC2053	120p	2SC2571	350p	2SC3089	130p	2SC3605	60p	2SD640	350p	2SD1148	175p	2SD1519	250p	2SK323	130p
2SC644	10p	2SC1472	40p	2SC2055	150p	2SC2577	110p	2SC3101	750p	2SC3606	100p	2SD655	18p	2SD1159	90p	2SD1521	70p	2SK386	600p
2SC647	300p	2SC1473	15p	2SC2058	20p	2SC2578	170p	2SC3112	35p	2SC3607	150p	2SD661	60p	2SD1160	150p	2SD1541	350p	2SK405	450p
2SC681	250p	2SC1474	45p	2SC2060	60p	2SC2579	110p	2SC3114	40p	2SC3636	280p	2SD666	25p	2SD1163A	220p	2SD1548	450p	2SK413	500p
2SC683	35p	2SC1475	60p	2SC2061	75p	2SC2580	175p	2SC3116	75p	2SC3657	400p	2SD667	20p	2SD1164	75p	2SD1554	170p	2SK415	500p
2SC708	100p	2SC1505	80p	2SC2068	60p	2SC2581	225p	2SC3117	120p	2SC3659	600p	2SD668	120p	2SD1168	270p	2SD1555	170p	2SK429	180p
2SC710	15p	2SC1507	45p	2SC2071	140p	2SC2588	600p	2SC3122	50p	2SC3668	120p	2SD669	35p	2SD1169	280p	2SD1556	400p	2SK511	450p
2SC711	15p	2SC1509	35p	2SC2073	40p	2SC2590	40p	2SC3148	185p	2SC3675	100p	2SD673	350p	2SD1173	350p	2SD1564	100p	2SK513	325p
2SC730	350p	2SC1514	35p	2SC2075	60p	2SC2591	50p	2SC3149	180p	2SC3678	280p	2SD676	250p	2SD1185	400p	2SD1565	75p	2SK531	350p
2SC732	40p	2SC1515	60p	2SC2078	95p	2SC2592	200p	2SC3150	125p	2SC3679	180p	2SD716	80p	2SD1186	400p	2SD1571	170p	2SK534	700p
2SC733	15p	2SC1520	45p	2SC2085	100p	2SC2603	10p	2SC3151	230p	2SC3680	380p	2SD717	180p	2SD1187	250p	2SD1572	100p	2SK537	900p
2SC735	40p	2SC1541	110p	2SC2086	60p	2SC2610	60p	2SC3152	130p	2SC3685	450p	2SD718	85p	2SD1189	55p	2SD1576	250p	2SK538	350p
2SC738	15p	2SC1545	120p	2SC2092	100p	2SC2611	30p	2SC3153	230p	2SC3687	600p	2SD722	240p	2SD1190	150p	2SD1577	250p	2SK539	1100p
2SC739	150p	2SC1567	40p	2SC2094	1200p	2SC2621	70p	2SC3156	350p	2SC3688	550p	2SD725	270p	2SD1191	120p	2SD1579	120p	2SK555	400p
2SC761	110p	2SC1568	35p	2SC2097	2300p	2SC2625	190p	2SC3157	200p	2SC3692	150p	2SD734	15p	2SD1192	90p	2SD1589	60p	2SK556	500p
2SC762	150p	2SC1569	55p	2SC2099	2500p	2SC2626	600p	2SC3158	260p	2SC3715	480p	2SD741	120p	2SD1196	150p	2SD1590	100p	2SK557	400p
2SC783	85p	2SC1570	40p	2SC2118	1100p	2SC2631	20p	2SC3159	200p	2SC3717	120p	2SD743	130p	2SD1197	150p	2SD1591	310p	2SK566	475p
2SC790	50p	2SC1571	50p	2SC2120	10p	2SC2634	10p	2SC3164	350p	2SC3729	450p	2SD756	100p	2SD1207	40p	2SD1593	125p	2SK695	550p
2SC792	380p	2SC1573	25p	2SC2131	550p	2SC2636	40p	2SC3169	150p	2SC3746	100p	2SD757	120p	2SD1210	280p	2SD1595	160p	2SK719	300p
2SC805	225p	2SC1580	600p	2SC2141	60p	2SC2637	120p	2SC3170	300p	2SC3747	120p	2SD758	140p	2SD1211	120p	2SD1608	210p	2SK724	600p
2SC828	20p	2SC1583	25p	2SC2153	40p	2SC2640	1800p	2SC3173	180p	2SC3752	250p	2SD762	100p	2SD1218	75p	2SD1609	70p	2SK725	600p
2SC829	15p	2SC1586	540p	2SC2166	80p	2SC2653	100p	2SC3175	150p	2SC3781	150p	2SD763	140p	2SD1223	75p	2SD1632	500p	2SK727	800p
2SC839	20p	2SC1617	340p	2SC2168	120p	2SC2654	180p	2SC3178	175p	2SC3783	300p	2SD768	180p	2SD1225	120p	2SD1637	50p	2SK735	600p
2SC870	100p	2SC1623	50p	2SC2188	70p	2SC2655	75p	2SC3179	70p	2SC3787	100p	2SD772	200p	2SD1227	40p	2SD1647	40p	2SK758	300p
2SC898	275p	2SC1624	60p	2SC2200	250p	2SC2656	550p	2SC3181	200p	2SC3789	75p	2SD773	20p	2SD1229	250p	2SD1649	260p	2SK787	900p
2SC930	15p	2SC1626	55p	2SC2221	650p	2SC2660	100p	2SC3182	120p	2SC3790	120p	2SD774	30p	2SD1237	300p	2SD1650	180p	2SK794	500p
2SC941	15p	2SC1627	15p	2SC2228A	60p	2SC2665	200p	2SC3199	40p	2SC3795	175p	2SD777	400p	2SD1246	20p	2SD1651	150p	2SK872	650p
2SC943	160p	2SC1628	75p	2SC2229	15p	2SC2668	10p	2SC3209	120p	2SC3798	220p	2SD784	650p	2SD1247	40p	2SD1663	450p	2SK903	500p
2SC944	140p	2SC1634	50p	2SC2230	80p	2SC2671	100p	2SC3210	550p	2SC3807	120p	2SD786	100p	2SD1248	270p	2SD1666	90p	2SK1057	600p
2SC945	10p	2SC1669	100p	2SC2233	100p	2SC2681	170p	2SC3211	220p	2SC3811	80p	2SD787	20p	2SD1251	180p	2SD1667	120p	2SK1058	800p
2SC950	40p	2SC1674	15p	2SC2235	60p	2SC2682	70p	2SC3212	260p	2SC3832	200p	2SD788	30p	2SD1263	90p	2SD1668	120p	2SK1117	250p
2SC959	225p	2SC1675	90p	2SC2236	20p	2SC2688	27p	2SC3225	50p	2SC3833	250p	2SD789	20p	2SD1264	55p	2SD1677	300p	2SK1118	225p
2SC980	40p	2SC1678	80p	2SC2237	540p	2SC2690	75p	2SC3244	45p	2SC3853	220p	2SD792	400p	2SD1265	75p	2SD1730	350p	3SK45	100p
2SC982	20p	2SC1683	100p	2SC2238	45p	2SC2705	50p	2SC3246	50p	2SC3854	250p	2SD794	33p	2SD1266	180p	2SD1732	400p	3SK51	100p
2SC983	120p	2SC1684	30p	2SC2240	15p	2SC2710	50p	2SC3259	350p	2SC3855	220p	2SD795A	140p	2SD1267	55p	2SD1739	275p	3SK59	100p
2SC1000	20p	2SC1685	30p	2SC2258	30p	2SC2712	20p	2SC3260	220p	2SC3857	500p	2SD811	450p	2SD1271	55p	2SD1740	125p	3SK74	50p
2SC1001	950p	2SC1729	900p	2SC2259	60p	2SC2716	50p	2SC3261	230p	2SC3858	550p	2SD819	200p	2SD1271A	225p	2SD1748	90p	3SK77	50p
						2SC2719	25p	2SC3262	280p	2SC3870	200p	2SD820	250p	2SD1272	200p	2SD1760	80p	3SK81	50p
						2SC2721	120p	2SC3263	280p	2SC3883	280p	2SD821	550p	2SD1273	50p	2SD1762	50p	3SK85	160p
						2SC2738	200p	2SC3264	390p	2SC3884A	300p	2SD822	290p	2SD1275	50p	2SD1773	160p	3SK88	70p
						2SC2740	450p	2SC3269	50p	2SC3886A	400p	2SD826	30p	2SD1276	60p	2SD1783	100p	3SK121	150p
						2SC2749	350p	2SC3270	50p	2SC3890	150p	2SD836	60p	2SD1277	190p	2SD1796	180p		

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REPLACEMENT VIDEO HEADS

Model	Price
AIWA	
AV66/AV77	1200p
G700	1100p
G900	1500p
AKAI	
VS105, 112, 115, 116, 125, 126, 201, 202, 205, 220, 240, 244, 245, 247, 248, 250, 301, 303, 304, VSP8, VSP82	1000p
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	
VCR4000, VCR5000, VCR6000	1650p
AMSTRAD	
VCR4500, VCR5200, VCR9000, TVR1	900p
VCR7000	1000p
VCR6000, 6100, 6200, 8600, 8602, 8700, DD8900, 8904, TVR4	1100p
TVR2, TVR3, VCR4600, VCR4600 MKII, VCR4700	1100p
AUTHENTIC	
N850	800p
AWA	
ATVI	800p
BAIRD	
8900, 8901, 8902, 8903, 8906, 8922, 8928	650p
8904, 8923, 8924, 8925, 8929, 8935, 8943, 8944	650p
8909, 8912	800p
8930, 8931, 8933, 8940	800p
8942	2300p
8945	2000p
8947, 8948	1600p
8950	1700p
VC141L	3000p
VH582	7000p
BLAUPUNKT	
RTV100, 200, 202, 211, 214, 222, 224, RTX100, 200	800p
RTV301, RTX250, RTV333	800p
RTV306, 307, 309, 311, 315, 316, 520, 707	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	
VRH50	1000p
VRP20	1000p
VRP25	1000p
VRP30	3350p
CANON	
VR10	1000p
VR30A, VR30B, VR30E, VR40A	3350p
DAEWOOD	
912, VCR12, VCR30, VCR32, VCR50, VCR52	1800p
VCP11 RAF	1800p
DECCA	
8300	1000p
8400, 8500	650p
DUAL	
EVR101	2300p
VR70, VR71, VR74, VR81, VR90, VR91	650p
VR85, VR96	2300p
VR97	3300p
VR80, VR92	650p
VR93	2450p
EDISON	
VC2130, 2133, 2135, 2140, 2830, 2930, 2932, 2934, 3122	650p
VK2132, VK2512	2300p
VK2436, VK2340	650p
VK2530, VK2532, VK2631, VK2541	1600p
VK2632	1700p
VK2637	3050p
VKH2545	2450p
VKH2639, VKH2439	3300p
FUNAI	
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	
FVHP420, 510, 520, 530, 615, 618, 620, 622, 710, 711, 715, 720, 721, 722, 730, 830, 905, 906, 908, 910, 911, 915, 916, 918, 5000, 5001, 5005, 5050, 5075	1100p
VBS3500, 7100, 7500, 7600, 9900, VBR330	1800p
VBS7000, VBS7100, VBS9000	2000p
FVHP500, 711, 715, 721, 722, 730, 830, 5100, FVHD720	1100p
FVHP725, 830, 980	2500p
FVHP990	2700p
FVHP975	2400p
FVHD40, FVHD140, FVHP1, FVHP10, FVHP20	1150p
FIDELITY	
HQS200, VCR600, VCR6100, VR900, VR9100	1500p
VCR100	1100p
VTR1000	1100p
GOLDSTAR	
8000 3HSSDB	1900p
GVH51, GVH122, VCP4000, VCP4100, VCP4200	1100p
GHV1232, 1233, 1241, 1242, 1243, 1244, 1245, 1246, 1290, 1291, 1295, 1296, 1891, 8210, 8215, GVHP1240, 1241, 1247, 1248, VCP400, VCP4130, 4300, 4301, 4305, 4306, 4310, 4311, 4315, 4316, 4320, 4321, 4326	1100p
G.E.C.	
4000H, 4001H, 4002H	1200p
V4001H, V4004	1200p
V4005H	1500p
GRANADA	
CS1, DS2	1600p
VHSAH1	1100p
VHSAH3	2400p
VHSAN3	800p
VHSAY3	1200p
VHSBH1, VHSCH1	2100p
VHSBP1	850p
VHSBY3	2600p
VHSD52	1600p
VHSEH2	1600p
VHSEY1, VHSEY2	1400p
VHSFG2, VHSFG4	1300p
VHFS1, VHSFS2	1300p
VHSTJ1, VHSTJ2, VHSTJ3, VHSWJ3, VHSYJ2	700p
VHSVH4, VHSWH1, VHSXH1, VHSYH2	1600p
VHSWJ1, VHSXJ3	700p
GRAETZ	
4312, 4605, 4905, 4912, 4913, P4833, TR4605, TR4812, TR4905, TR4912, TR4913, TR4914, TR4943	650p
4935, 4943, 4963, 4985, 4993, TR4833, TR4935, TR4985, TR4993	650p
4920, 4927, 4930	1700p
4946, TR4906, TR4916	1600p
TR4994	2300p
TR4995	3300p
GRUNDIG	
VS410, 450, 460, 500, 505, 510, 520, 521, 530, 546	1600p
BARCELONA, MVS400, 440, 500, 600, SE5100, 6100, 6110, 9100, TVR4500, 4510, 5510, VS400, 440, 500, 505, 510, 518, 600, 610, 5180, VS6190, 700, 900	1400p
MADRID, SE5140, VS540, VS5480	3000p
MVS550, 620, VS550, 620, 630, 640, 790, 930, 940	2400p
VS120	2300p
VS680	4600p
VS160, VS740	4400p
VS170	4600p
MVS660, SE6160, VERONA, VS660, VS6690	3500p
MVS710, 720, 910, SE7120, 9120, VS710, 720, 800, 810, 910, 920	1700p
HINARI	
VXL2, 3, 4, 20, 35	1000p
VXL5, V20H	1050p
VXL6	1200p
VXL7	1300p
VXL8, 9, 10, 11, 90, VCR34H, VTV200	1100p
HITACHI	
VT11, 14, 15, 16, 30, 33, 34, 330, 340, 503, 640, 5030, VTP10, 30	1000p
VT7, VT17, VT18, VT19	2200p
VT35, VT38, VT39	2400p
VT100, 110, 111, 112, 113, 115, 118, 120, 125, 128, 220, 225, 400, 405, 410, 413, 414, 415, 418, 510, 518, 520, 525, 526, VTM625, 626, 725, 726, 728	1400p
VT3000	650p
VT4000, 4200, 5000, 5500, 5600	1100p
VT77, 680, 6500, 6700, 6800, 7000, 8000, 8030, 8040, 8100, 8300, 8500, 8700, 9000, 9300, 9500, 9700, 9900	1000p
VT8, 9, 56, 57, 570, 575, 576, 580, 585, 588	3200p
VT65	2400p
VT130, 135, 138, 145, 250, 255, 258, 420, 425, 426, 428, 430, 431, 435, 438, 535, 536, VTL30, 301, VTM630, 635, 636	1900p
VT52, VT60, VT61E, VT62E, VT63, VT64, VT640	1200p
VT168, VT150, VT260, VT498 (4 HEAD)	2300p
VT530	2050p
VT522, VTM620, VTM622, VTM720, VTM722, VTM822	1650p
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HV4000, HV7000, HV8000p	
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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
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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
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HRD455	2000p
HRD520	1400p
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HR4100	1000p
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HRD330, 337, 440, 637, 641, 660, HRFC100, FV44L	2100p
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KV901, KV903, KV905	650p
KV917	2450p
LOGIK	
VR960	1500p
VR950	1400p
LOEWE	
OC410, OC420, OC440	2400p
OC50, OC55, OC60, OC65	1500p
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9245, 9251, 9254	1225p
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9272, 928217	2700p
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9253	2500p
9281	2700p
9284, 9295, VR3701, VR3721, VR3731, VR3761	2100p
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VX500E, 800A, 810A, 820, 80A, 770B, 773B	1200p
VCRL3, VX730, VX750	1450p
VX735, VX755, VX990	1500p
VX735A, VX765, VX850	1750p
VX600	1100p
MITSUBISHI	
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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
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NVF65, NVH75	3200p
NVF51	4200p
NVG19	2300p
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NVJ35, NVG46	2100p
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AG2100, AG2200	700p
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NV366	1850p
NV180, NVD48	2300p
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NVG20, 21, 22, 25, 28, 200, NVD48	1800p
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NVG45	1800p
NVH70	3600p
NV688	2400p
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NV780	2400p
NVG15, NVG400	2600p
NVM7, NVMC20	3800p
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V110, V333	2000p
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V380	2300p
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VR2000, VR3300, VR3600	1400p
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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	
V63	1500p
V9680	3400p
V8600, V8700	3000p
V21, V31, V33, V50, V51, V53, V9600	1450p
V55, V57	700p
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V450	2300p
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Cable Prospects

It is difficult to know what to make of the prospects for cable TV in the UK. A great deal of money, estimated at around £5bn, has already been spent on laying cables, which at the end of last year passed well over six million homes. This year over £2bn is due to be spent on increasing the number of homes passed to around nine million: at present £6m a day is being spent on cable networks. Yet at the end of last year only about 1·3m homes had been connected, a penetration rate of 21 per cent, and the churn rate – the number of those who decide not to renew their subscriptions – is as high as forty per cent in some areas. So far, no one is making any profits out of cable TV – the shares of the three cable companies quoted on the stock exchange are languishing at well below their issue price. Meanwhile satellite TV operator BSkyB is going from strength to strength, with profits surging.

On the face of it the cable TV business has so far been a disaster. It has been largely driven by US and Canadian companies, whose home experience has been much better. But their costs on home ground are probably cheaper, as they tend to string the cables along utility posts with other services rather than digging trenches, and the off-air services don't provide the same overall quality programming as in the UK. There is, too, a considerable cloud developing over the American cable scene. The Direct TV service, which offers US viewers 200 or so digital TV channels via satellite, has turned out to be a great success and is reputedly taking forty per cent of its subscribers from US cable operators.

Yet optimism continues to be a feature of the UK cable business. Why else shell out all those millions more? It's significant that Carlton Communications, which has been highly successful in assessing media prospects, has recently bought the rights to the SelecTV cable channel. Carlton's chairman Michael Green has spoken of his "increasing enthusiasm" over the future of cable TV in the UK. Carlton is paying £5.2m for the SelecTV channel.

Cable seems to be having greater success as a provider of cheap telephony services. It has been taking around 50,000 customers a month from BT. Current estimates are that it will be providing four million telephone lines by the year 2000 and have around nine per cent of the telecoms market by 2004.

But the start of cable TV services was slow and hesitant. Some franchises were cancelled because of the time taken to raise funds and get anything done. Does this matter? Well, with developments in satellite TV and communications, a laggardly approach to cable laying is hardly a help. Then the salesmanship has been rather woeful and, really, what favourable can be said about the programmes on offer? You might as well stick up a dish, which is how many prospective customers have reacted.

Eventually, the question will be whether the services of the future will be provided via satellite, cable or both. Possibly a combination of both will prove to be a reasonable solution, with each providing the services it's best suited for. After all, despite this being the satellite age cables continue to be laid across the globe. But there is no sense in expecting the public to subscribe to the same services via satellite and cable. So far as TV is concerned, it has to be one or the other – and digital TV developments are giving satellite delivery the advantage.

The prospect of a dish on every rooftop, even a small, unobtrusive one, does not appeal. Far neater to plug into an unseen cable. Had the cable industry got its act together earlier and managed to achieve the sort of penetration rate we get with telephones, that is the way things would have gone. The delay has given the edge to satellite operations. It does rather look like a re-run of the old cable vs off-air controversy of the Fifties. And we all know where that left cable distribution.

The one thing that seems certain is that there will be a consolidation in the cable industry before long. It's likely that the market will be dominated by six to eight large operators rather than the many minor ones at present running small franchises.

Oh yes, and what if someone manages to do it all via MMD networks operating way up the SHF band or at EHF?

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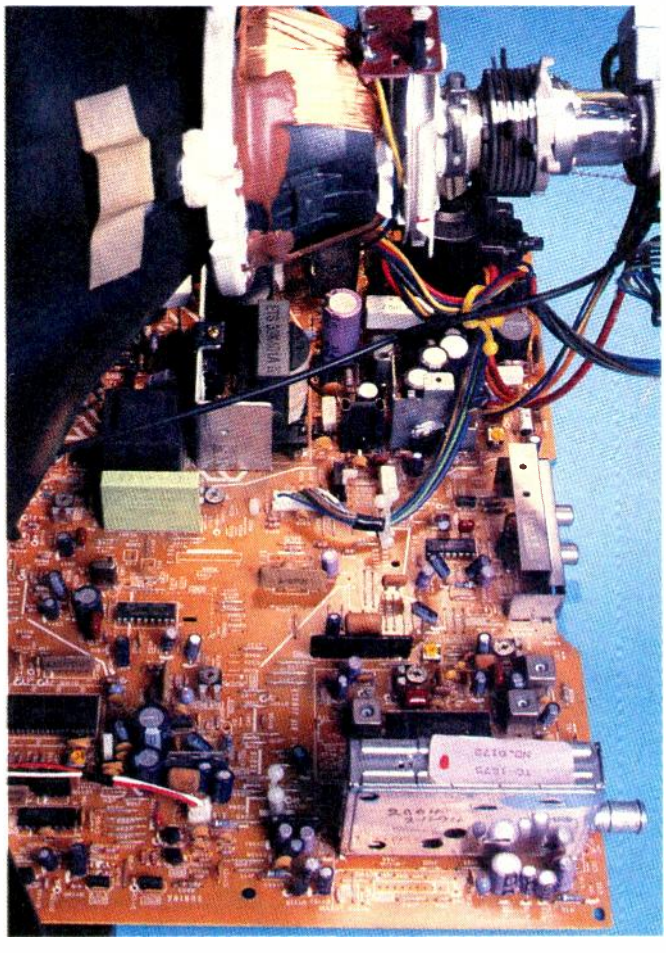
REED BUSINESS PUBLISHING

Servicing the Panasonic Z1 Chassis

The Panasonic Z1 chassis was used in several 14, 16 and 21in. models that were on sale during the years 1986-8. Models fitted with the chassis include the TC1460, TC1465, TC1470, TC1475, TC1665, TC1675 and TC2175.

John Coombes



The Z1 chassis is fairly straightforward, with everything under the control of an MN14841 microcomputer chip (IC1101). The self-oscillating chopper power supply also provides mains isolation. IC101 (AN5150N) contains the i.f. circuitry and the timebase generators. A somewhat unusual chip is the TAHBX6267 (IC501) which produces the sandcastle pulses at pin 7, a mute output from a coincidence detector at pin 10, and an 'X-ray protection' output at pin 12. This output is fed to pin 27 of IC101, where it shuts down the line oscillator in the event of excessive beam current or a shorted line output transformer – input sensing is at pin 13, via zener diode D502 for beam current and D510 for a line output transformer short.

Power Supply Circuit

Fig. 1 shows the basic power supply circuit. The chopper transistor Q3 is within the STR55041N chip IC801. It's connected as a blocking oscillator, with feedback to its base (pin 2) from a secondary winding on the transformer (T801) via R812 and C809. There are two other connections to pin 2. D809 feeds in pulses from a winding on the line output transformer to synchronise the operation of the chopper and line output stages. The other connection is to the collector of Q801, whose base senses the voltage across R811. This resistor is in series with the emitter of the chopper transistor. In the event of excessive chopper current, the voltage across R811 rises and Q801 switches on, shorting out the input to the base of the chopper transistor. R803 supplies the chopper transistor with base bias, providing the start-up action and a discharge path for C809.

D807 produces a negative voltage across C808. This voltage is applied to pin 1 of IC101 for regulation. Q1 is the error amplifier, comparing the fixed zener voltage at its emitter with the voltage produced at its base by a potential divider. Q1's collector sets the voltage at the base of Q2, which in turn sets the d.c. conditions at the base of Q3.

No Results

The first thing to do is to check the chopper circuit outputs. There should be 103V at TPE1 and 16V at TPE4. If both voltages are missing, check the 3·15A mains fuse F801. If this is open-circuit, check the bridge rectifier diodes (D801) and the chopper chip (IC801) for shorts.

If the fuse is o.k. and there are low output voltages from the power supply IC801 is probably faulty. Check it by replacement.

Low h.t. voltage can be caused by the C2408N rectifier D851 being defective, its 33µF reservoir capacitor C854 being open-circuit or the R2G over-voltage protection diode D854 being leaky. If these items are all o.k., there's probably a fault in the line output stage.

If the line output transformer T551 goes short-circuit the voltage at pin 6 (h.t. input) falls. This is communicated via the MA165 diode D510 to pin 13 of the TAHBX6267 chip IC501, which produces a high output at pin 12. This shuts down the line oscillator in IC101.

If T551 is not short-circuit, the main possibilities are that the 2SD1439RL line output transistor Q551 is short-circuit or T551 has shorted turns.

Intermittent fuse blowing can be caused by the degaussing posistor D805.

A dead line output stage can also be caused by failure of the line driver stage. Check the driver transformer T531 for dry-joints then, if necessary, check whether the 1kΩ feed resistor R531 or the 2SC1573AH driver transistor is open-circuit.

There's an optocoupler (D811) in the power on/off circuitry in some models. If this is at fault there will be no operation. Also check, if necessary, Q1109 and the microcomputer chip IC1101.

If the set is stuck in standby, check whether crystal X1101 is faulty or dry-jointed then suspect IC1101.

No Line Sync

For loss of line sync check whether C505 (4·7nF) or C506 (33nF) is short-circuit. If necessary check the associated components then replace IC101 (AN5150N).

Field Timebase faults

The field drive output from pin 26 of IC101 is fed to pin 4 of the AN5521 field driver/output chip IC451 via C467 (33µF, 25V) and R452 (180Ω).

If the fault is field collapse, check the field oscillator waveform at pin 24 of IC101 (AN5150N). If it's missing, check R401 (33kΩ), R402 (20kΩ – field hold) and C401 (1µF) which could be short-circuit. If it's o.k., check for a field drive output at pin 26. Replace IC101 if it's missing.

The first check in the field output stage should be for 24V at pin 7 of IC451. If the supply is missing, check D555 (EU02) and R482 (TSF19631) which could be open-circuit, and C572 (2,200µF, 35V) which could be short-circuit. Then check whether there's an output waveform at pin 2. Replace IC451 if there is no waveform here.

Other possibilities for field collapse are open-circuit scan coils (check at pins 4 and 2 of connector E4), R461 (3·3Ω, 0·5W) which could be open-circuit and C458 (1,000µF, 35V) which could be short-circuit.

For lack of height, check the values of R455 (150Ω) and R456 (500Ω – height control). R456's carbon track could be faulty. The other things to check are diodes D455 (MR4270L) and D453 (MA700), by replacement if necessary.

Picture Faults

Distorted picture: Check the voltage at pin 3 of IC101 (TPE9). The reading should be 4·5V. If it's incorrect, IC101 could be faulty, giving incorrect or no r.f. a.g.c. output. If the voltage is correct, check whether R104 (1kΩ) is open-circuit or C14 (22µF, 16V) short-circuit.

Double image/ringing effect: Check for dry-joints at the F1045A SAW filter X101. Resolder as necessary.

Low contrast: Can be caused by an incorrect a.f.c. output from IC101 (AN5150N). If replacing IC101 doesn't provide a cure, check the components connected to pins 12, 13 and 14.

No Picture/Snowy Picture/Poor Sound

These symptoms can be caused by a faulty tuner. Check also that the receiver is tuning, and if so that it's memorising the channels. If this is not happening, check the TAHBX6289 memory protector chip IC1106. Check the voltages carefully. There should be 5V at pin 4. If this is missing or low, check whether D1112 (MA165) and/or C1130 (1µF, 50V) is open-circuit. Also ensure that the 5V series regulator transistor Q1105 (2SC1317) is operating correctly. The feed to its collector comes via R115 (10Ω) which could be open-circuit – this resistor also supplies the tuner's BU pin, via L18.

If these points are in order, check that the –27V supply is present at pin 9 of the MN1220T memory chip IC1102. If this voltage is missing, check whether R552 (0·82Ω, 0·5W) or D553 (ERA22-04) is open-circuit and/or C563 (22µF, 50V) is short-circuit. Alternatively R1165 (270Ω safety) could be open-circuit. If the –27V supply is present, suspect IC1102. Check it by replacement.

Returning to the tuner, check that its 12V supply is

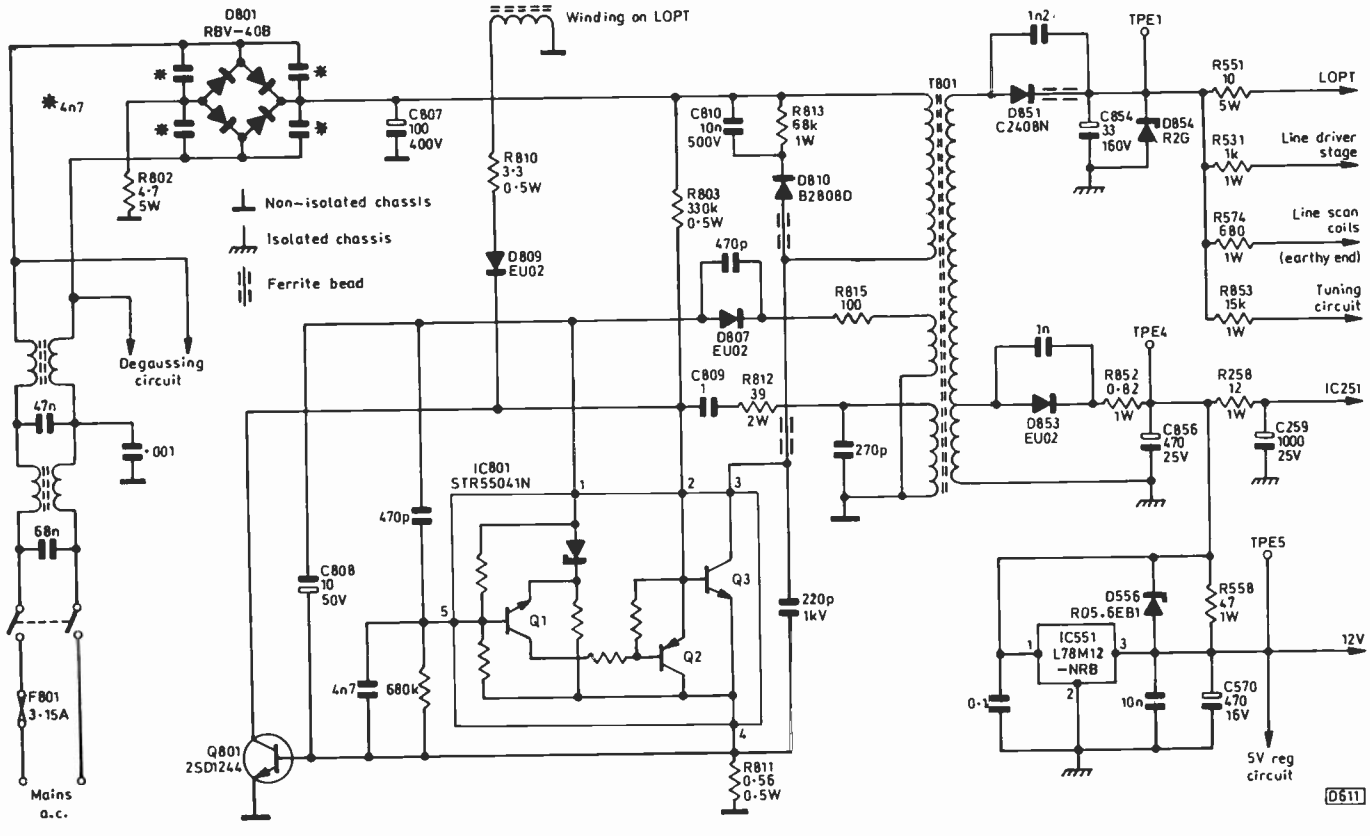


Fig. 1: Basic power supply circuit used in the Panasonic Z1 chassis. Some models incorporate remote on/off control, with an optocoupler (D811) to provide the link to the non-isolated side of the supply.

present at pin 2 (BM). The tuner is type ENV-87455F1. If the 12V supply is missing, check the filter components: C19 (33µF, 16V) could be short-circuit and/or R12 (8·2Ω, 0·5W) open-circuit. Alternatively the L78M12N 12V regulator chip IC551 could be faulty. It should produce 12V at pin 3. If it has no input at pin 1, check whether R852 (0·82Ω, 1W) is open-circuit (this will remove the 16V supply at TPE4).

If still in trouble, check that the r.f. a.g.c. control R102 (2kΩ) is set up correctly. Its carbon track could be dirty – check by replacement. If R102 is o.k., suspect the AN5150N i.f./timebase generator chip IC101. Check the pin voltages carefully. If necessary, check it by replacement.

If the problem is tuning drift, D1118 (µPC574J) could be leaky. The tuning voltage is supplied by IC1104 (TAHBX6270). If there is no tuning, check whether its 33V supply is present at pin 3 – R1142 (10Ω safety) could be open-circuit. If loss of tuning or tuning drift is still the problem, check IC1104 by replacement.

Colour Faults

No sync/colour smearing: Check that the amplitude of the sandcastle pulses at pin 7 of the TDA3565 colour decoder chip IC601 is correct. If the pulses are missing, suspect IC501 (TAHBX6267). If necessary, check it by replacement.

Loss of one colour: Check whether the relevant 2SC1473A output transistor is open-circuit – Q351 (green), Q352 (blue) and Q253 (red). Alternatively one of the 1·5kΩ, 0·5W flashover protection resistors could be open-circuit – R367 (green), R366 (blue), R365 (red). The bases of the output transistors should be at about 3·3V. If this voltage is incorrect, check the associated MA165 diodes (D357 and D351 red, D356 and D352 blue, D355 and D353 green). D355/6/7 are in the switch-off spot suppression circuit, with Q356, while D351/2/3 with Q355 and Q354 provide on-screen displays. If everything is in order on the tube base panel, check the RGB outputs at pins 10 (red), 11 (green) and 12 (blue) of the TDA3565 colour decoder chip IC601. If necessary, check IC601 by replacement.

No colour: First check whether the 8·8MHz crystal X601 is dry-jointed or faulty (replace to test). Then check the waveforms at pins 13, 14 and 18 of the TDA3565 colour decoder chip IC601. Pin 18 provides the feed to the chroma delay line circuit, whose outputs are fed to pins 13 and 14. There could be a fault in the delay line DL601 or an associated component. Check that the sandcastle pulses are present at pin 7. If missing, check the continuity between pins 7 of IC601 and IC501 (TAHBX6267) which produces the sandcastle pulses. There could be a track break, R621 (220Ω) could be open-circuit or IC501 could be faulty.

If all these points are in order, check IC501 by replacement.

No/low Sound

The AN5265 audio amplifier chip IC251 should have a 16V supply at pin 9 and a 12V supply at pin 1.

Check first that the 16V supply is present. If missing, check whether D853 (EU02), R852 (0·82Ω, 1W) or R258 (12Ω, 1W) is open-circuit.

If D556 (RD5.6EB1) is short-circuit there will be no sound.

If the 12V supply is missing, IC551 (L78M12N) could be faulty, R251 (10Ω safety) open-circuit and/or C254 (100µF, 16V) short-circuit.

If the supplies are o.k., suspect IC251. The cause of the problem could be IC101 (AN5150N), which produces a demodulated audio output at pin 11.

No Remote Control Operation

Some of the models that use the Z1 chassis feature remote control.

If there is no remote control operation, check the handset – for poor battery connections and dry-joints to the LED and maybe the crystal.

Worn touch pads can be a problem with the handset. Water damage is another possibility.

Within the set, IC1105 (µPC1475HA) is the remote control receiver chip which is coupled to the MN14841 microcomputer chip IC1101. Problems here are minimal. Check that the l.t. supply is present at pin 9 of IC1105 – the reading should be about 5V. IC1105 can cause loss of remote control when faulty. ■

IC Complement

IC101	AN5150N	I.F. strip and timebase generators
IC251	AN5265	Audio amplifier
IC451	AN5521	Field driver/output
IC501	TAHBX6267	Sandcastle pulse generator, muting and X-ray protection
IC551	78M12N-RB	12V regulator
IC601	TDA3565	Colour decoder
IC801	STR55041N	Chopper chip
IC1101	MN14841	Microcomputer control chip
IC1102	MN1220T	Memory chip
IC1104	TAHBX6270	Tuning voltage generator
IC1105	µPC1475HA	Remote control receiver (some models only)
IC1106	TAHBX6289	Memory protection chip

VCR BELT KITS / REPLACEMENT VIDEO LAMPS

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	85p
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	80p
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

Models & Description	Order Code	Price
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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
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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: £0.35
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
	NPLY0107GEZZ	IT22

PRICE
20p EACH
15p EACH FOR A PACK OF 5 FOR EACH MODEL
13p EACH FOR A PACK OF 10 FOR EACH MODEL

VIDEO SERVICE KITS

AMSTRAD

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Order Code: SK41 **£5.50**

FERGUSON & JVC

3V42/43
HRD455/HRD725

Contents		*Economy Kit Contents*	
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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
Contents
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES
Order Code: SK03 **£5.00**

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

NV300/NV330/NV333/NV340/NV366
Contents
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRE
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**

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GRUNDIG 2922010	1600p	LOT09
ITT CVC800/1/3	1500p	LOT10
ITTD218/37 EQ	1600p	LOT11
NORMENDE 5255	1600p	LOT12
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SABA 811-50-24	1600p	LOT15
SABA 770223500	1600p	LOT16
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SABA 849380920	1600p	LOT32
HITACHI 2434141 CP	1450p	LOT33
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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

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VP7100, VS9300	T-UP IDLER	PU47752	£4.50
VS9500, VS9800			
VP7100, VS9300	UNLOADING	PU46381	£4.00
VS9500, VS9800	IDLER		
VP7100, VS9300	REW IDLER	PU46380	500p
VS9500, VS9800			
VP88	IDLER	BV336067	£5.00
VS1, 3, 4, 9, 12 VS15, 58	REEL TABLE	BR347731	450p
VS23, 35, 37, 53, 55 VS66, 75, VSA77	CLUTCH	ML373043	1100p
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VS9700	REW IDLER	W321762	£4.25
AMSTRAD			
VCR7000	IDLER	150280	£1.50
TVR1, VCR4500 VCR4800, VC5200, VCR9000	CLUTCH	150873	£3.75
TVR1, VCR4500 VCR4800, VCR5200, VCR9000	GEAR HOLDER	151284	£3.50
TVR1, VCR4600 VCR5200	REF CLUTCH		£3.50
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3V16, 3V22 8903, 8908, 8912, 8922	T-UP IDLER	PU49280	£5.50
3V23, 3V29 3V30, 3V31, 3V32, 3V35, 8923, 8924, 8929, 8930, 8931, 8940, 8941, 8942	REEL IDLER	PU48967	175p
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 3V32, 8930, 8931, 8940, 8941, 8942	T-UP CLUTCH	PU51380	200p
3V35, 3V36, 3V38 3V39, 3V49, 8943, 8944	REEL IDLER	PU55374	200p
3V35, 3V36, 3V38 3V39, 3V49, 8943, 8944	T-UP CLUTCH	PU55373	150p
3V58, 3V59, 3V64 3V65, FV10, FV11, FV12 FV13, FV14, FV20, FV21, FV22, FV26 FV30, FV32, FV33, 8950, VC141L	IDLER ARM	PU58645	£2.25
3V42, 3V43 3V43, 3V44, 3V45 3V48, 3V53, 3V54, 3V56, 3V57, 8947, 8948	CLUTCH ASSY CLUTCH ASSY	PU55822 PU57668	1200p 1050p
3V42, 3V43, 3V44 3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8947, 8948	T-UP CLUTCH	PU56043-1-4	240p
3V42, 3V43, 3V44 3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8947, 8948	SUPPORT CLUTCH	PU56044-1-5	160p
3V00, 3V01, 3V16 3V22, 3292, 8900, 8901, 8902, 8903, 8904, 8906, 8909 8912, 8922	LOADING IDLER	PU43681	£4.00
3V00, 3V01, 3V16 3292, 8900, 8901, 8904, 8906	REW IDLER	PU46380	500p
3V16, 3V22, 8902 8909, 8912, 8922	IDLER	PU49281	£1.70
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FVHP615, 618, 620 FVHP622, 710, 711, FVHP720, 721, 722 FVHP725, 730, 830, FVHP840	GEAR IDLER ASSY	FI1430490400900	380p
FVHP615, 618, 620 FVHP622, 710, 711, FVHP720, 721, 722 FVHP725, 730, 830, FVHP840	REEL T-UP ASSY	FI1430410400900	£5.50
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FVHP975, 980, 990, FVHP999, 5000, 5005 FVHP5050, 5075, 5100	IDLER	FI1430420400700	300p
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FVHP975, 980, 990	CLUTCH	F12430510404200	£9.50
FVHP420, 520, 530	IDLER		£2.80
FVHP420, 520, 530	TAKE UP IDLER		290p
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VBS3500	IDLER		250p
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GHV1221, 1232, 1240 GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000, GHV8200, 8210, 8215, GHVP51, VCP4100, 4130	IDLER		110p
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VXL3, VXL20	REEL IDLER	40000009	110p
VXL2	IDLER		110p
VXL4, VXL35	IDLER		£2.75
VXL4, VXL35	CLUTCH		£8.50
VXL4, VXL12, VXL25 VXL30, VXL35, VTV300	LIMITER POST		£1.30
VXL5, VXL6	CLUTCH		£3.75
VXL5, VXL8	GEAR HOLDER		£3.50
VXL7, VXL8, VXL9	CLUTCH		£3.80
HITACHI			
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VT120-220, 100, 110 111, 113, 115, 118, 200 125, 128, 130, 135, 138, 145, 150, 175, 225, 250, 255, 258, 260, VTL30	CLUTCH ASSY	6886824 6886972	£7.50
VT8000-8300, 7000 VT8500-8700	FF-REW IDLER	6413663	£2.80
VT8000-8300, 7000 VT8500-8700	PLAY IDLER	6414221	290p
VT8000-8300, 7000 VT8500-8700	FF-REW PULLEY	6383531	80p
VT9300-9500, 6500 VT880, 6800, 9700, 9900	FF-REW IDLER	8681471	250p
VT9300-9500, 6500 VT880, 6800, 9700 VT 9900	PLAY IDLER	6861482 6861481	230p
VT9300-9500, 9700	IDLER	681505	230p
VT9900, 6500, 680, 6800	IDLER	687043	£3.80
VT11-33, VT63-64 VT14, 16S, 17, 19, 34, VT35, 38, 39, 52, 61, 62 VT65, 86, 88, 330, 640	FF-REW IDLER	6886971	125p
VT1000, 110, 111, 113 VT115, 118, 119, 120, 125, 128, 130, 135, 138, 145, 150 VT175, 220, 225, 250, 255, 258, 260, VTL30	FF-REW ARM	6886792	240p
VT400, 405, 410, 413 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, 638, 640, 645, 646, VTS80, 85	FF-REW ARM	6897094	£1.30
VT400, 405, 410, 413 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	CLUTCH BASE	6896951	£3.25
VT3000 VT3000	T-UP IDLER (LARGE) REW IDLER		£4.50 £6.00
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HR7200, 7600, 7650	T-UP CLUTCH	PU53462A	220p
HR7655, 7300, 7350, 7610			
HR7200, 7300, 7350	REEL IDLER	PU48967	175p
HR7600, 7610, 7650, 7655, 7700			
HR7800, 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, HRD225, HRD111	T-UP CLUTCH	PU55373	150p
HRD110, HRD120-121, HRD225, HRD111	IDLER ARM	PU55374-3-8	200p
HRD170, 180, 210, 230 HRD320, 370, 400, 430, 470, 530, 700, 750, 950, 3000	IDLER ARM	PU58465	£2.25
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 HR3660, HR4100	REW IDLER	PU46380	500p
HRD140, 150, 157, 158	TAKE UP CLUTCH	PU56043-1-4	240p
HRD160, 250, 257, 455, 565, 566, 725, 755, HRP50			
HRD140, 150, 157, 158 HRD160, 250, 257, 455, 565, 566, 725, 755, HPR50	TAKE UP CLUTCH	PU56044-1-5	160p
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VX800A, VX820	REEL UNIT CLUTCH		280p
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HS306, 307, 318, 319, HS400, 410, 710	GEAR ASSY	522B00201	£6.25
HS337, 338, 347, 349	IDLER	552B01701	325p
HS411, 412, 421, HSB10, HSB20, HSB30, HSE10, HSE20, HSE30, HSE30, HSE70			
HS306, 307, 318, 319 HS400, 410, 710	IDLER	641C34301	£2.00
HS347, 349, 412 HSB10, HSB20, HSB30, HSE10, HSE20, HSE30, HSE70	IDLER	522902002	£3.00
HS337, 338, 411, 421	IDLER	552B01801	320p
HS200	TAKE UP IDLER (LARGE)		£4.50
HS200	UNLOADING IDLER		£4.00
HS200	REWIND IDLER		£8.00
HS306, 307, 318, 319	SUPPLY REEL	522A00101	£3.20
HS400, 410, 710	DISK		
HS306, 307, 318, 319 HS400, 410, 710	TAKE UP REEL DISK	522A00102	£3.20
HS320	REEL DISK	522C06301	£3.00
HS337, 338, 411, 421	REEL DISK	522P00601	£5.00
HS300, 301, 302, 310	PULLEY	522C05201	£2.25
HS306, 307, 318, 319 HS400, 410, 710	GEAR WHEEL	641D71101	£1.50
HS306, 307, 318, 319 HS400, 410, 710	GEAR WHEEL	641D71001	£1.50
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, NV777, NV788, NV332, AG6100, 6200, 6800, 6810	IDLER UNIT	VXP0463	£2.75
NV300, NV333, NV340 NV366	IDLER ARM	VXL0997	£3.60
NV300, NV330, NV333 NV340, NV366	IDLER UNIT	VXP0401	60p
NV300, NV330, NV333 NV340, NV366, NV8620	PLAY IDLER	VXP0433	£2.75
NV300, NV332, NV333 NV340, NV366, NV600, NV777, NV788, NV2000, NV2010, 3000, 7000 AG6010, AG6015	ACTION GEAR	VDG0016	£0.80
NV333, NV688, NV2000 NV3000, NV7800	LOADING GEAR	VXP0325	£2.00
NV300, NV332, NV333 NV340, NV366, NV600, NV777, NV788, NV2000, NV2010, 3000, 7000 AG6010, AG6015	INTERMEDIATE GEAR	VXG0017	£0.65
NV330, NV333, NV340 NV366, NV777, NV788	CAM GEAR	VXG0158	£1.00
NV230, NV250, NV260 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, VG18 NVG30, NVG400, AG1000, AG1200, 1500, 1810, 2100, AG2200, NVH65, NVH70	IDLER ARM	VXP0521	110p
NV370, NV430, NV870, NV730, NV7700, NV830, NV850, NVG10, NVG12, NVG18	CAM GEAR	VDG0200	£1.20
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, NV8400, 8600, 8610, 8620	IDLER UNIT	VXP0245	80p
NV8200, 8400, 8600 NV8610, 8620	PLAY IDLER	VXP0243	80p
NV8520	CLUTCH	VXP0343	250p
NV332, NV600, NV688	IDLER	VXP0488	300p
NVG20, NVG21, NGV25 NVG40, NVG45	PULLEY UNIT	VXP0767	400p
NV230, NV250, NV280 NV430, NV450, NV460, NV465, NV650, NV730, NV770, NV810	WORM WHEEL	VXP0604	160p
NV870, NV890, AG1000 NV370, NV380, NV630 NV780, NV830	IDLER	VXP0523	300p
NV370	CLUTCH GEAR	VXP0595	£1.00
NVG7, NVG11, NVG12 NVG14, NVG15, NVG18, NVG30, NVG120, NVG130, NVG400, NVH70	WORM WHEEL	VXP0691	£1.50
NV2000, 2010, 3000 NV7000, 7200, 7800, 8050	LOADING GEAR	VDG0035	£0.80
NV230, NV250, NV370 NV430, NV450, NV460, NV630, NV730, NV770, NV780, NV810 NV830, NV890, NVG7, NVG10, NVG12, NVG15, NVG30, NVG120 NGV130, NVG400, NVH70, AG1000	LOADING GEAR	VXP0520	£1.50
NV230, NV250, NV260 NV280, NV430, NV450, NV730, NV770, NV810, NV870, NV890 NVG7, NVG10, NVG11, NVG12, NVG14, NVG15, NVG18, NVG30 NCG120, NVG130, NVG400, NVH70, AG1000	CLUTCH GEAR		£2.50
NV230, NV250, NV260 NV280, NV300, NV333, NV340, NV366, NV370, NV430, NV450, NV460 NV465, NV630, NV650, NV777, NV780, NV788, NV810, NV830, NV850, NV870, NV890, NV2000, NV2010, 7200, 7800, NVG7, NVG10, NVG12, NVG14, NVG15, NVG18, NVG30, NVG120, NVG130, NVG400, NVH70, AG1000	LIMITER ROLLER		£1.50
SANSHO			
VR605, VR800, VR900	CLUTCH	850A20000	420p
VR1100, 1200, 1600, 2500, 3200, 3300			
VR3500, 3600, 3800	LIMITER POST		£1.30
VR1100, 1200, 1600, 2500, 3200, 3300, 3500, 3600, 3700			
VR605, VR800, VR900	IDLER		280p
VR2500, 3200, 3300, 3500, 3600, 3800			
VR705, VR805, VR905	IDLER		110p
SANYO			
VHR1110, 1150, 1200 VHR1300, 1500	IDLER	143-0-662T-14730	£5.00
VTC5000, 5150, 6800 VTC6500, VTCM10, M11, M20, M21, M30, M31, M50	FF-REW IDLER	143-0-741T-20001	250p
VTC9100, VTC93□ VTC9300 VTCM10, M11, M20, M21 VTCM30, M31, M50 VHR2100, 2300, 2500 VHR2700	IDLER	143-0-551T-01400	95p
	FF ROLLER ASSY	143-0-547T-00200	200p
	REEL DRIVE PULLEY	143-0-662T-10350	£5.00
	IDLER	6130374899	300p
VTC5000, 5150, 6400 VTC8500 VTCM10, M11, M20, M21 VTCM30, M31, M50 VHR100, 3300, 3810 VHR3400, 3700, 3800 VHRD500, VHRD700	PULLEY	143-0-662T-01201	£5.20
	PULLEY	143-0-662T-10350	£5.50
	REEL DRIVE ROLLER	143-0-662T-15621	350p
VPR5800, VTC5300 VTC5400	LOADING ROLLER	143-0-661T-03800	80p
VTC3000	FWD LIMITER		£3.50
VTC3000	IDLER		750p
SHARP			
	IDLER ASSY	NIDL0005GEZZ	110p
	IDLER	NIDL0006GEZZ	110p
VC600, 651, 681, 682 VC684, 685, 693, 699, 700, 783, VC6FR, VC6V3 VC7300, VC7700, 7750	IDLER ASSY	NPLYV0107GEZZ	£8.15
	PLAY IDLER KIT	NPLYV0041+ NDA1V1007	£7.50

JUST ARRIVED!!! NEW ITEMS

Satellite PSU Repair Kits

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

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

Replacement Video Heads

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

Original Video Heads

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

Audio Control Head

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

AMSTRAD ORIGINAL NO: 153134
Used on: AMSTRAD OD8900, 8904, VCR2000, 6000, 6100, 8600, 8602, 8603, VCR8604, 8700, 8704, 8714, 8800, 9005, 8244
Also fits: ANITECH, BONDSTEC, CASIO, CROWN, FIDELITY, GOLDHAND, GRANADA, HINARI, MARQUANT, OMEGE, PROFEX, SCHNEDIER, SEG, SENTRA, SHINTOM, TASHIKD, TATUNG, TOWADA, UNIVERSUM **ORDER CODE: AH02 PRICE: 1450p**

Replacement Audio Control Video Sound Head for National Panasonic

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

8 way Preprogrammed Universal Remote Control

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

Order Code: 8 WAY Price 1450p + VAT

Replacement Video Cassette Housings

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

Service Aids

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

All the above items are manufactured by Servisol

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

CD Pick Ups

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

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

Cassette DC Motors

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

Cassette Tape Heads

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

Soldering Accessories

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

Transistors & ICS

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

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

REMOTE CONTROLS

Description	Order Code	Price
GRUNDIG		
TP160E	RC 107	900p
TP200, TP300	RC 380	800p
TP400	RC 401	675p
TP590-600	RC 600	850p
TP390,TP610	RC 610	850p
TP621	RC 621	850p
TP630, TP650	RC 650	850p
TP660	RC 660	850p
TP661	RC 661	850p
HITACHI		
CLE800-CLE830	RC 140M	700p
A617402/655602	RC 192	875p
A512120/230	RC 900	800p
A514790	RC 901	800p
A5088470	RC 902	800p
A518612	RC903	900p
SCL002	RC904	850p
C2096	RC 905	850p
A511940	RC 906	750p
655602H	RC 907	800p
ITT		
IFB13, 14, 15	RC 143	875p
FS4	RC 148	850p
RG305	RC 305	675p
RG306	RC 306	825p
FS9/1-10/1	RC 307	850p
VS5 RUK	RC 308	825p
VS4-1	RC 310	850p
MULTICONTROL (17C20)	RC 311	800p
KORTING		
18279, 18396, 18460, 18521 SE	RC 108	850p
40540 VTS	RC 108	900p
LOEWE		
DC11	RC 146	850p
MATSUI		
010270601	RC 889	850p
VX770	RC 892	850p
METZ		
JAVA COLOR (6890)	RC 166	850p
COLOR (7156)	RC 183	850p
JAVA (7180)	RC 184	850p
MITSUBISHI		
939P/03607, 939P/03609	RC 140M	850p
NOKIA		
SATELLITE	RC 550	850p
NORDMENDE		
TC2336	RC 351N	850p
CMC1, TC3519	RC 356	875p
OCEANIC		
390C9500	RC 339	900p
ORION		
RC53	RC 892	850p
PANASONIC		
EUR51200	RC 200	800p
TC2200	RC 201	850p
VSQ0357/NV730	RC 202	875p
TNQ1621	RC 203	900p
PHILCO		
CARVEL, CONCORDE, MERCURY, TELESTAR	RC 108	850p
TC10	RC 152	900p
PHILIPS		
RC5002,5154	RC 134	850p
KT3 NON TEXT	RC 135	825p
69117032	RC 178	875p
69117194	RC 180	875p
RC5991-UNIV	RC 300	580p

Description	Order Code	Price
PHILIPS (continued)		
RC38	RC 301	750p
KT3 TEXT	RC 5301	750p
RC5352	RC 5352	800p
RC5375	RC 5375	850p
RC5 STANDARD	RC 5534	850p
RC5901	RC 5901	850p
RC5903	RC 5903	700p
SABA		
T6772	RC 149	900p
TC319-320	RC 328	875p
TC356	RC 356	875p
TC358	RC 358	850p
TC360	RC 360	800p
TC365	RC 365	800p
SALORA		
SERIES L	RC 190	875p
86173	RC 882	850p
SANYO		
RC218, RC222, RC228, RC238	RC 140M	700p
JXGE	RC 878	850p
JXDE	RC 884	850p
VHR2300	RC 890	850p
RC628	RC 865	900p
SHARP		
G0121CESA, 123CESA, 204, 251	RC 140M	850p
SIEMENS		
FC616	RC 130	850p
FC631	RC 132	850p
FC742	RC 164	900p
SONY		
RM604, RM605, RM606	RC 140	700p
32 CHANNEL	RC 140M	700p
RM613	RC 141	750p
RM632, RM636	RC 160	675p
TATUNG		
FXA	RC 877	850p
RC70	RC 883	750p
FX70 FASTTEXT	RC 894	850p
TELEFUNKEN		
FB632	RC 632 ST	850p
FB639	RC 639 ST	850p
THORN/FERGUSON		
3V35-42	RC 342	650p
3V31-32	RC 344	800p
3V57-58	RC 628	800p
TX10 TEXT	RC 732	575p
TX10 STEREO TEXT	RC 738	575p
TX9-90-100	RC 740	675p
3V55, FV11	RC 783	800p
TX100 FASTTEXT	RC 785	650p
TX100 STEREO FASTTEXT	RC 789	650p
PROFESSIONAL	RC 790	650p
TOSHIBA		
CT937	RC 950	850p
CT9117	RC 951	800p
201R4B	RC 952	800p

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

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

VCR ALIGNMENT KIT

CONTAINS:

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

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

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

Order Code: TOOL10 Price: 2900p

FUSES

	TIME LAG (20mm)		QUICK BLOW (20mm)	
Value	Order Code	Price	Order Code	Price
160mA	FUSE01	75P	FUSE17	60P
250mA	FUSE02	75P	FUSE18	60P
315mA	FUSE03	75P	FUSE19	60P
400mA	FUSE04	75P	FUSE20	60P
500mA	FUSE05	75P	FUSE21	60P
630mA	FUSE06	75P	FUSE22	60P
800mA	FUSE07	60P	FUSE23	60P
1A	FUSE08	60P	FUSE24	60P
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1.6A	FUSE10	60P	FUSE26	60P
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2.5A	FUSE12	50P	FUSE28	60P
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Did we STRIKE it lucky?

Chris Watton solved the problems at the local bowling alley – but did he score a strike ?

Have you ever been sitting in the pub when someone says "you can fix a telly thing, can't you?" and in your relaxed state you stupidly say "done hundreds of 'em, no problem". Yes, of course you have.

Then they say – this one did, anyway – "well I run a ten-pin bowling alley and one of my fella's bust the glass thing sticking out at the back, that's as thick as a brush shaft. So can you put me a new one on? See you tomorrow, o.k.?"

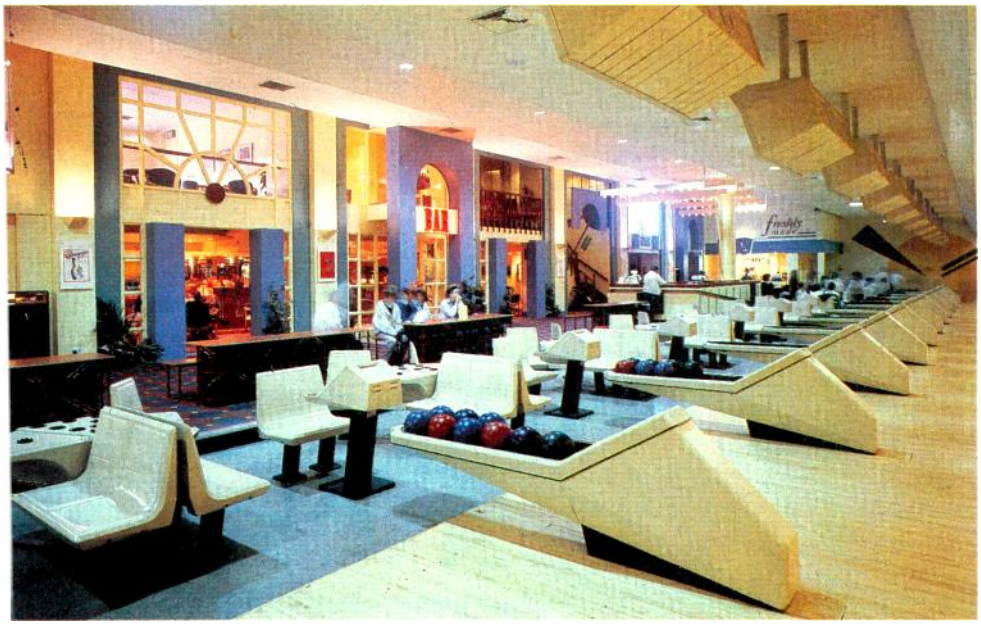
When you wake up and this brush shaft is sticking in your mind, you begin to wonder what the dood was talking about? Three days later he's on the phone, saying that the spare screen he put in thplace of the one whose shaft was busted has gone down, and if the score machine isn't on, the bowl can't run.

The Job

So we went to look at the job. On entering we saw twelve screens that were showing either a score-board grid or, on non-working lanes, a very poor Eurosport picture. Some of the score grids were good. Others were, for want of a better word, wobbly. The ones that were showing off-air pictures were in serious need of grey-scale adjustment and setting up of the customer controls (all internal, and ten feet in the air). With people lobbing sixteen 1B balls past you, this was obviously a job for an out-of-hours visit.

Setting aside for the time being the broken shafted set, it was decided that as the establishment opened for bowling at ten in the morning two engineers would call at 0800 (they didn't even know such a time existed. . .).

When we arrived we found that lane technicians, whom we supposed had an easy time, certainly had a job to do. All the lanes had to be dressed with some sort of oil. Every pin setter had to be maintained and lubricated – this is a machine that records which pins have been knocked down, which ones should be replaced, and puts them all back where they should be. The technicians were running around doing all sorts and didn't want us in the way.



Pictures

Well, back to our problems. We decided to get as many good pictures as we could – nothing like instant fame! The pictures were all very blue and snowy, as the saturation was too high.

When the back covers were removed we found that there were two large PCBs, the video one being on the left-hand side and the power/deflection one on the right. At the extreme left there was a small panel with the color (note that spelling!), contrast and brightness controls.

First, we decided to find out where the signals came from. The score-board grid, which the staff told us came from the control desk computer, was linked via a ribbon to an RGB connector. The Eurosport signal came via a 75Ω feeder, first to one monitor then in series to the rest. A third connector supplied a 12V switching voltage, to switch between the video and RGB inputs. We found that removal of this plug when a unit was set for a video input produced the score grid.

As we had only sketchy service information, we played it by ear – or should I say by eye. We found one monitor that produced a reasonable display and set up the rest to look the same. There were six controls in the RGB section. The three white ones affected the grey scale while the other three, coloured red, green and blue, affected the computer RGB signals. There was a first anode control on the line output transformer: we left this one alone if we could.

As a first step we turned off the colour and tried for a more stable picture. Sky News was used as no other signal was available. Using a mirror and our judgement, we managed to get something of a reasonable picture on all the monitors. We then selected the bowling introduction screen. This is a blue screen with a name on it. Most of the screens displayed some sort of purity error, strangely at the top right-hand corner. So we degaussed the lot of them.

Now I hear you all shouting "you should have degaussed them first". But the pictures were so poor initially that we had to establish some sort

of standard to start with.

It was soon apparent that in the video mode the pictures were too large for the screens. The height and width had been set so that the score grid filled the screen. When the normal picture filled the screen, the score grid had borders and was too small to read.

The broken shaft

So the saga continued. We still had to sort out the "broken shaft". We couldn't find a tube of the original type, and calls to a number of regunners and suppliers mainly produced the reply "no chance mate". So we decided to fit the nearest thing we had.

The original tube was an A68. We had an A67. When we told the owner he said "what's a b****y centimetre?" We agreed and had a go. With a little adjustment to the fixings, followed by purity and convergence setting up, we had the monitor working again. It produced a much better picture than the other ones, despite the smaller screen. But every cloud has a silver lining. When the monitor was fitted in position, the escutcheon covered the edges of the screen.

Wobbling screens

We had the monitors all up and running, with good pictures from the satellite stations. Then the governor said "why are screens 4 and 5, and 9 and 10, wobbling?"

We checked and found that the only "wobbly" pictures came from the computer/scoring machines. So we said, quick as a flash, "we can't touch that mate". Only as usual we ended up with the problem in our laps.

On removing the lid of one of them we saw row upon row of chips. It made the Digi 3 chassis look like a matchbox toy. We also saw a power supply unit which had a label saying "100-250V AC, 5V 6A-30W". There were only a few connections to it, and it was obvious that the 105°C capacitors at the outputs had cooked until they were dry. After replacing them and resoldering the chopper transformer the thing was as good as new.

We had a discussion with the head man, after which we replaced the electrolytics in all his sealed units. The monitors now produced good pictures with both video and RGB inputs. This was all done for a very meagre charge. As usual, the owner then told us how much the bowling machine company charges to repair a sealed unit. I was so sick I could have filled his alley.

As a final suffering, there was this mains supply confusion. The power supplies inside the sealed units were, as noted above, marked 100-250V. The label on the inside of the monitors said "120V". The company technician said that the entire system worked off the mains, and that we had no need to use our variac with the monitors. So we connected one of them to the normal mains supply. It came on and the h.t. was correct. It was left running – for a few minutes. Then BOOOOOOOM, the mains rectifier's reservoir capacitor just passed the Astra satellite slot. Bother! I won't do that again. . .

Epitaph

The following weekend I decided to try out my bowling skills. Needless to say when I approached the ticket desk the very nice man charged me the full price and said "nice job mate!" When will I learn. . . Will I ever learn. . . . ■

VCR CLINIC

Reports from
Mike Leach
Brian Storm
Ronnie Boag
Gerald Smith
Eugene Trundle
E.J. Edwards
Michael Maurice
Jeff Herbert
Michael Dranfield
Nick Beer
John Coombes

Hitachi VTF860

This machine would sometimes shut down when loading in the record mode. The tape guides would reach about half way towards the full loading position, after which the display would go out briefly and the loading motor would shut down. This would last for about a second. The machine would then start up again and revert to standby. I suspected a fault in the power supply, and my diagnosis turned out to be correct. Q7 (2SC1741) was the culprit – it was breaking down when warm. I replaced the 2SK1611 chopper transistor (f.e.t. type) as well. **M.L.**

Samsung SI1260

If there's no drum and capstan rotation and the tapes get severely chewed you'll probably find that D109 on the main panel is open-circuit. This diode is in the 5V supply. **M.L.**

Sharp VCA100

If you pressed fast forward when this machine was in the stop mode it would automatically go into fast forward search. The loading belt was in very poor condition, but the cause of the problem turned out to be the mode switch. After stripping, cleaning and re-timing, normal results were obtained. **M.L.**

Panasonic NVJ30

There were display problems with this machine. Although it worked perfectly, it was difficult to operate because the channel information and cassette functions were not shown on the front display panel. As the deck functions were not affected, it seemed logical to assume that the system control chip IC2001 and the timer and front display control chip IC7501 were both o.k. So a thorough check was carried out on the serial data connections between these chips. This revealed that R6044 had risen in value from 220Ω to over 900Ω. The problem was cured by fitting the correct value resistor in this position. **B.S.**

Panasonic NVSD200

This machine would sometimes shut down while accepting or ejecting a tape. A check on the built-in error codes told us that the mechanism was jamming whilst loading or unloading. As the tapes used for testing were known good ones, we turned our attention to the loading motor drive and the gearing from the loading motor. Checks at the loading motor connection PCB, which is on the back of the loading motor, revealed cold soldering at all four connections. After resoldering these the machine worked faultlessly. **B.S.**

Panasonic NVFS200

This machine wouldn't record, though every other function worked perfectly. A few seconds after pressing the record button the machine would go back to the stop mode. Checks on the various record switching lines showed that the delayed record 12V supply was missing. A check back through the various switching transistors then revealed that the Q4004 (2SB790) was faulty. A replacement restored the missing function. **B.S.**

Panasonic NVSD25

The complaints with this machine were of poor recorded sound and slow rewind or tape wind. We decided to concentrate on the sound fault initially. There was some bottom edge damage with the tapes supplied: they seemed to play all right in the workshop, but when the tape was cued forwards it would run down the guide next to the audio/control head. We first suspected that arm P5 was slightly bent, as can happen with the K mechanism. But a replacement made no difference. We then tried AC head tilt adjustment, again to no avail.

The cause of the trouble was eventually traced to excessive back tension. We found that the supply spool brake was permanently engaged because the brake lever assembly (VXZ0313) had a broken lever. After replacing this the machine worked perfectly, even in the wind and rewind modes.

The worrying thing about this fault was that the tape remains threaded around the drum in the wind and rewind modes. With the tape tension so dramatically increased, how much wear had been imposed on the drum while the fault was present? **B.S.**

Pansonic NVHD100

"Bad picture" was the complaint with this machine. Sure enough the playback picture had very bad drop-outs, with lots of black flashes and glitches. Clearly the drop-out compensation circuit wasn't working. Checks in the video processing circuitry showed that there was no 5V feed at pin 44 of IC301 – this pin supplies the drop-out compensation part of the chip. The cause was coil L304, which was open-circuit. A much cleaner playback picture was produced when a replacement coil had been fitted. **B.S.**

Panasonic NVJ35

This machine's mechanism operated very erratically: the mechanism solenoid would sometimes chatter and often disengage before an operation was complete. Our first step was to check the supply to the solenoid for ripple – we suspected a faulty decoupling capacitor. As the supply was o.k. we replaced the solenoid, but the fault was still present. We subsequently discovered that R6022

in the solenoid drive circuit was dry-jointed. A bit of resoldering was all that was required. **B.S.**

Mitsubishi HSM37

Noisy rewind was the complaint with this machine. The cure was to replace gear idler and gear reel S (part numbers 522C077020 and 522C083010) as their edges were chewed. **R.B.**

JVC HRD720

This machine wouldn't play or record and cut off in the fast forward and rewind modes. In addition the drum didn't rotate when a tape was inserted. Voltage checks showed that the motor 13V supply was missing at plug CN401. The cause was CP401 (ICP-F15) which was open-circuit. A replacement restored normal operation. **R.B.**

Hitachi VTM722

The power up and cassette lights were on all the time and the machine wouldn't accept a tape. The cause of the trouble was dry-joints at the end sensors. **R.B.**

JVC HRFC100

This machine wouldn't accept tapes: the guides would half load then the machine would cut off to standby. The cure was to replace the cont plate assembly. This controls the alignment of the mechanism – part of the plate was broken. **R.B.**

Nokia VR3761

This machine wouldn't come out of standby properly and would occasionally pulse on and off. Checks while the voltages on the secondary side of the supply were pulsing on and off showed that noise was present on the main data lines associated with IC301. Replacing IC301 cured the problem. **G.S.**

Nokia VR3615

Bands of colour flashed on the playback picture – this happened only with prerecorded tapes with colour guard etc. Replacing IC301 cured the fault. **G.S.**

Nokia VR3761

The customer said that the sound was faulty when he gave a tape to a friend to play. On checking we discovered that the linear sound was the old sound track while the hi-fi sound was the new sound, i.e. the machine didn't erase the linear sound when it made a recording. The cause was dry-joints at C2019 and CN202 on the linear audio PCB. **G.S.**

Sanyo VHR3300

If the symptoms with one of these machines are that the programme indicator is flashing and the tuning system is unable to memorise tuning instructions, it's likely that the –30V supply to its EPROM section has increased to about –55V. The culprit will be the GZS33X zener chip D5102 in the power supply – it goes open-circuit. We find that a ZTK33B is an acceptable replacement. **E.T.**

Ferguson 3V31

This machine wouldn't accept a tape. As the cassette loading belt was slack a replacement was fitted, but this made no difference. The next step was to check the motor voltage during the loading cycle. It was low, because transistor Q8 was faulty. A replacement restored normal operation. **E.J.E.**

Panasonic NV333/366

Rewind was normal to start with but it would then slow and subsequently shut down. All other functions were o.k. The cause of the fault was transistor Q17 (Q6017), a replacement restoring correct rewind operation. **E.J.E.**

Amstrad UF20

There was no digit display or E-E operation. The deck functions were o.k., but the playback picture was just lines. We traced the cause of the trouble to R1024 (10Ω) in the power supply. Replacing it restored normal operation. **E.J.E.**

Ferguson FV13R

There were no E-E signals. The cause was LT03 which had gone open-circuit, removing the tuner's 12V supply. A new coil cured the fault. **M.M.**

JVC HRS5500

This machine had been looked at by another engineer. The problem was that although it would respond to simple remote control commands such as play, stop, rewind etc. it wouldn't respond to either clock setting or programming by remote control. I eventually discovered that the cause of the fault was in the remote control receiver section: the IR detector diode had been bent over and didn't face the cut-out in the metal box. Bending it back cured the trouble.

When replacing the front panel unit you have to take care that the operation button's peg doesn't go into the receiver, bending the IR detector diode over. In other words, ensure that the front panel unit is offered up to the machine squarely. **M.M.**

JVC HRJ205

The customer thought that this machine needed a new head drum. In fact the cause of the trouble was an incorrectly set head switching point. This had possibly been misadjusted by the engineer who tried to cure the static problem! **M.M.**

Ferguson FV81L

The customer complained that the eject button didn't work. On investigation we found that the cabinet button didn't contact the switch. The cure was to remove the front panel and refit. **M.M.**

Matsui VS888

There was no through r.f. and no E-E operation. On investigation we found that there was no AT12V supply to the modulator because the print to Q502 in the power supply had disintegrated. Remaking the connections to Q502 restored normal operation. **M.M.**

Ferguson 3V32

There were two faults with this old timer. One was that the motors didn't work – because there was no 12V output from the regulator circuit on the bottom PCB. We found that ZD34 had gone open-circuit and Q16, on the mechacon board, had literally blown up. When this had been repaired the machine worked normally. It came back three days later, this time with no functions and no display.

We found that CP1 on the tuner/timer control board was open-circuit. After replacing it the machine worked for a few minutes then failed again. To cut a long story short, and three CPs later, we discovered that there's a capacitor connected between pins 5 and 10 of IC205. It's glued to the back of the PCB and is not shown on the circuit diagram. What had happened was that the leg connected to pin 5 (chassis) of IC205 was almost touching pin 4 (supply). We moved the capacitor and secured it with hot-melt. This finally cleared the trouble. **M.M.**

JVC HRD610

Picture rolling was the complaint with this VCR. When we examined the video f.m. waveform we saw that there was a gap in the envelope: the head switching point was out. It's set up using the

presetter remote control unit from JVC. **M.M.**

GoldStar RDD01

The capstan motor in the VHS section of this VHS/Video 8 deck ran slowly in reverse, even without a tape. The motor itself was faulty. A replacement put matters right. **M.M.**

Matsui VSR1500

This combined satellite receiver/VCR has many similarities with the Amstrad Model VS1000. This one wouldn't record. On investigation we found that there was no signal to the head amplifier because of a broken track between Q4013 and pin 6 of the head amplifier connector. Fitting an insulated wire link between these points restored the f.m. input to the head amplifier, curing the fault. **M.M.**

Akai VSG64

This machine bounced in and out of the workshop like a yo-yo. Each time the mechanism was out of alignment. In the end we decided that it was easiest to replace the mechanism block complete.

Akai is the only manufacturer, as far as I know, that will supply a mechanism which is complete apart from the drum and audio/control head assembly. After fitting this and setting it up we returned the machine to the customer and haven't heard from him since. The part number for the mechanism is BBV1172A020A. It can be used with all models that use this deck. **M.M.**

Saisho VR3400

When a tape was inserted it would be laced up then ejected. The cause of the trouble was no capstan drive because the OEC9011 chip IC2001 had failed. **M.M.**

Samsung VIK326

There was no playback picture, just a blank raster. Resoldering all the joints on the head amplifier connector CN302 cured the fault. **M.M.**

Sanyo VHR135

There were large hum bars on the E-E picture and the drum was rotating flat out all the time. Scope checks showed that there was 2V of ripple on the 5V supply and 4V of ripple on the 13V supply. The cause was eventually traced to an open-circuit secondary winding on the mains transformer, between pins 7-8. As a result, only half of this centre-tapped winding was in circuit.

When we removed the tansformer we saw that one end of the heavy-gauge, enamel-coated wire was only wrapped, not soldered, to the terminal. Scraping off the insulating enamel and soldering the pin cured the hum and drum faults. **J.H.**

Sharp VCBS97HM

In the E-E mode there was poor sync (ragged verticals and occasional field roll) with both satellite and terrestrial TV signals. Playback was fine, ruling out a fault in the r.f. modulator.

Scope checks through the complicated signal switching stages on the bottom PCB brought us to C2527, a coupling capacitor to the record source select chip. There was a good video waveform at one side, but at the other side the line sync pulses were rounded. When we tested this 10µF, 16V capacitor we found that its value had fallen to zero. A replacement restored the E-E signals and the record signal quality. **J.H.**

Akai VS23

There was no fluorescent clock display and none of the function buttons worked. The auto-play function worked when a prerecorded tape was inserted. Playback picture quality was good, but there was no sound. The tape had to be removed from the machine manually, as the stop button had no effect.

I found that pin 5 of the clock microcontroller chip IC901 was at 0V instead of 5V. This is the power-down detect line, which senses loss of mains power by monitoring the always 12V supply. This supply was low at 4·2V and was the cause of the problem. TR7 (2SA1286) and TR15 (2SB1010) on the power supply PCB were both found to be leaky. When they were replaced, the 12V supply was restored along with the clock display and playback sound. I wonder how many machines can load up and play a tape with an always 12V supply virtually missing?! **J.H.**

Philips VR6870

This machine had previously been in for replacement of the loading belt, which was worn and slipped. It was now back because the clock gained approximately one hour a day. We had to put up with the old story that "it was all right before". The cause of the trouble turned out to be a faulty 1·2V nicad battery. Strangely, the tuning data had been retained. **M.Dr.**

Samsung SI3240/3260

For poor E-E picture stability, especially when the machine has just been plugged in from cold, replace C4112 (0·47µF, 50V), C4110 (47µF, 16V) and C4120 (2·2µF, 50V), which are all in the i.f. can. The cause of the problem is that the i.f. chip runs very hot. Hence the three electrolytics dry out. **M.Dr.**

Samsung VIK326

This machine wouldn't come out of standby. The clock display (unset) was present, but when the power-on key was pressed nothing happened. When a cassette was inserted the unit tried to power up then returned to standby. One clue as to the cause of the fault was present – a low-level but raucous noise from the power supply can. Voltage checks here showed that the ever 5·9V supply was low at about 4·8V. As a result, the 5V supplies were too low to be of use. A scope check showed that there was a lot of hash on the supply. C35 (470µF, 16V) was open-circuit. **N.B.**

Toshiba V212B

The cause of field jitter/picture rolling can be difficult to find. Sometimes the fault is intermittent. The cure is very easy however. Dust build up on the drum flywheel slats is the cause. Carefully brush off all the dust. **J.C.**

Mitsubishi HSM45

A jammed tape is a problem you sometimes get with these machines – the fault can be intermittent. The cause is a broken capstan pulley. It can be obtained as a separate part from Mitsubishi, i.e. you don't have to order the complete flywheel. **J.C.**

Toshiba V110B

There were no results and no display. The cause of the fault was obviously in the power supply, and it didn't take us long to find that the ZPD6V8 zener diode DP09 was open-circuit. In addition DP011 (ZPY15) was short-circuit. **J.C.**

Panasonic NVL25

The symptoms were wow on sound and picture flicker. Our first steps were to replace the pinch roller and stator unit, but the fault persisted. It was cured by replacing the XRA6435S capstan drive chip IC2101. **J.C.**

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First DVD Players on Show

Toshiba had on display at the recent Las Vegas Consumer Electronics Show the first two DVD players to be seen, Models SD1006 and SD3006. They are due for release in the USA this autumn. According to a Toshiba spokesman, a DVD machine with record capability is a prospect for 1998. Sony also plans to have DVD players available later this year.

The Toshiba models have composite video and S video outputs, a Dolby AC-3 digital Surround Sound decoder, special picture effects, chapter/track search, multi aspect ratio facilities, a subtitle decoder, and parental control. The latter works in an interesting way. Some discs will carry more than one version of the same film: parents simply select the rating version to be viewed, then the deck automatically plays the relevant version of the film, which has been edited by the producer to that rating level. Prospective prices of the SD1006 and SD3006 are $599 and $699, which is about £400/£470. There is no information at present on likely UK launch dates/prices.

The use of different audio signal coding systems for the NTSC (Dolby AC-3) and PAL/Secam (MPEG Musicam) areas could complicate matters. Both of these audio coding systems can provide up to six separate signals: left, right, centre, surround left and surround right sound plus an effects channel with a frequency response of 20-120Hz. AC-3 is an advance on Dolby ProLogic in having separate, full-bandwidth Surround Sound left and right channels. The MPEG system seems to differ mainly in that the 5 + 1 signals are matrixed to form modified signals prior to compression: this makes the system compatible with earlier MPEG sound specifications. The bit rate for either system has still to be agreed.

Sony is to open an MPEG-2 video encoding facility at Culver City, California, this year, also a DVD replication plant elsewhere in the USA.

Flat-screen Display Technology

Sony appears to be backing alternative flat-screen display technologies. Its Plasmatron TV sets were demonstrated at the Japan Electronics Show (see January issue). This display system, which combines plasma switching control with liquid-crystal light control, was developed by Sony and Tektronix, which still owns the patents. More recently, Sony, Sharp and Sanyo have announced the development of techniques that enable polycrystalline silicon (Poly-Si) TFT displays to be processed at much reduced temperatures, so that an inexpensive glass substrate can be used. The advantage of Poly-Si over conventional amorphous silicon technology is the higher electron mobility in polycrystalline silicon. Higher resolution is possible, and the driving circuits can be built into the substrate instead of being mounted on the glass, reducing production costs.

But until now Poly-Si displays have had to be processed at over 1,000°C, requiring an expensive quartz substrate. Sony's new technique uses chemical vapour deposition and works at temperatures of less than 400°C. Sony has produced sample 5·6in. colour LCDs: production 5in. versions are due for release this autumn. According to Sony the new process can be used to produce TFT LCDs up to 20in. in size. Sanyo and Sharp have also developed lower-temperature processing technology. Sony and Sanyo have just announced an agreement to pool research and development on low-temperature Poly-Si TFT display panels.

Matsushita has bought Plasmaco, a US company with advanced plasma display panel (PDP) technology. The deal will add to its PDP know-how and provide Plasmaco with funds for further research. Matsushita has been working on PDPs with Texas Instruments, DuPont and NHK.

One of the problems with a PDP is that the plasma discharges produce ultraviolet light to activate the display phosphors. This UV light gradually ages the phosphors. The commonly quoted 10,000 hour useful life of a PDP is the time in operation for the phosphors to fall to half their initial efficiency.

Sharp has launched a range of large-screen LCD rear-projection models in Japan, based on a 16:9 aspect ratio TFT LC device with 610,000 pixels. There are two models, XV-R36 and XV-R43, with 36- and 43-inch screens respectively. Prices are the yen equivalent of £2,320 and £2,655 – there are no plans so far for a UK release.

Matsuhsita Electric Industrial has signed an agreement to manufacture DVD players for Thomson Multimedia. They are expected to sell, in the North American and European markets initially, at a starting price of $500.

Manufacturing news

Hitachi is to cease production of VCRs and the cheaper TV models at Hirwaun, South Wales. Production of Nicam VCRs is being moved to Malaysia while cheaper VCRs will be obtained from a source in Austria. Production of top-of-the-range TV sets, with Dolby ProLogic and Nicam sound, will continue at Hirwaun, where a production line for computer monitors has been added. The 17 and 21in. SVGA monitors will go on general sale in June. Some 60 out of 800 jobs at the plant will be lost.

Nokia is reducing its TV set production capacity following a five-ten per cent fall in European demand last year. Most of the job losses, totalling some 600, will be at the company's Bochum plant in Germany and its Turku plant in Finland.

Matsushita is setting up a TV plant at Pilsen, in the Czech Republic, to meet the growing demand in eastern Europe. Production is planned to reach 300,000 sets a year from April 1997. Daewoo Electronics is to build a plant in Brazil for the production of TV sets, VCRs and other consumer goods including washing machines and refrigerators.

Excess capacity has been the problem recently in China. Last year supply, at 18m plus smuggled sets (estimated at anything up to 5m receivers), is thought to have exceeded demand by 30-40 per cent. One of the larger manufacturers, Shijiazhuang Television Factory, has been declared bankrupt. The problem is mainly with smaller local manufacturers that use outdated technology to produce sets aimed at the cheaper end of the market.

Interactive TV Starts

Two Way TV has started an interactive TV service in the Birmingham area. It transmits extra information (data and graphics) during the vertical flyback interval, as with teletext. This enables viewers to take part in competition programmes such as *Mastermind* and *A Question of Sport*. Home equipment consists of four IR handsets and a black box that incorporates a simple modem for the return link to the studio. The company is raising funds to expand coverage, first throughout the Central Televison area and then across the UK.

Viewers pay £5.95 a month for the service, plus £195 to buy or £6 a month to hire the equipment required. Two Way TV is already broadcasting material with over thirty programmes a week. Take up in Birmingham has so far been eight per cent: a TV advertising campaign is planned. The company has reached agreements with all UK broadcasters to use their programmes and receive copies in advance so that the additional game material can be prepared by Two Way TV.

Tatung Spares

Wizard Distributors has been appointed an official spares distributor by Tatung (UK) Ltd. for its full range of consumer electronics, microwave, fax, PC and monitor spares. Wizard will supply trade customers who don't have a direct account with Tatung. Trade customers who do not have a copy of the Wizard spares catalogue and wish to open a credit account should contact Wizard Distributors, Sales Office, Empress Mill, Empress Street, Manchester M16 9EN. Telephone 0161 872 5438 or 0161 848 0060, fax 0161 873 7365.

Digi TV - Correction

Last month we reported (page 263) that the DVB had adopted QAM as the modulation system for terrestrial digital TV transmissions in Europe. We should have said 2,000/8,000 carrier COFDM (Coded Orthogonal Frequency Division Modulation).

COFDM uses a large number of carriers within the channel: the carriers have equal frequency spacing and are each modulated by a sub-band of frequencies, the frequency spectra of adjacent carriers overlapping in an orthogonal manner. The combined spectrum is virtually flat, and channel capacity is maximised. Other advantages are the technique's ability to coexist happily with analogue transmissions and much reduced power requirements. Broadcasters will be able to choose between the use of 2k or 8k carriers per channel. According to Pace Micro Technology, which is currently developing a set-top box for reception of digital satellite, terrestrial and cable TV signals, COFDM had until recently been used only for secure defence applications; but reduced chip set prices, and the technique's ability to increase the number of channels in a given spectrum without generating adjacent channel interference, have made it highly relevant for public broadcasting.

TV/video Notes

Sharp has launched several new TV sets in the UK, including Model 66AS06H, a 28in. Nicam receiver with AI optical picture control. This monitors the ambient light level continuously, automatically adjusting the colour, brightness and contrast levels to suit. Other features include an NTSC playback facility, front AV sockets, an S terminal and dual scart sockets. Suggested price is £650.

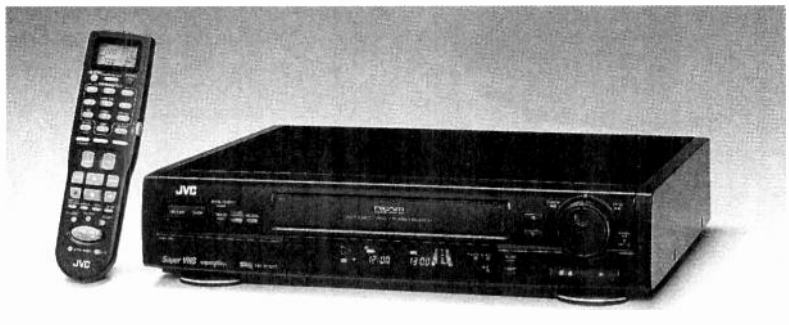
The Loewe Opta range of TV, video and audio products is to return to the UK market. It will be handled by Linn Audio-Visual, which can be reached on 0141 307 7777. Loewe Opta withdrew from the UK market four years ago.

An i.c. that provides TV ghost cancellation was shown in working equipment at the Las Vegas Consumer Electronics Show. Oren Semiconductor's OR43100 chip was demonstrated in set-top units from Philips and Audio Alchemy. The system works in NTSC countries where a ghost-cancellation reference signal is added to the transmission. The chip uses this signal to calculate filter coefficients that provide ghost cancellation. Reflected signals arriving from 7·5µsec before to 42·5µsec after the main signal can be rejected. The chip incorporates an adaptive equaliser controller and a 576-tap digital filter.

New from JVC

JVC has launched a new S-VHS deck, Model HRS7000, at a suggested price of £700. See photo. Features include a dynamic contrast system that uses a digital linear-phase aperture circuit, a Nicam decoder, Video Plus. PDC, a flying erase head and audio dub. The zero cross-switching noise reduction system carries out head switching at the zero cross point. As a result there is minimum effect on the audio signal and switching noise is 4dB lower than with conventional systems.

JVC is to launch a series of VCRs that feature its BES (Best Equalised Signal) tuning system later this year. The system operates in both the record and playback modes, and is designed to obtain optimum performance from VHS tape. VCRs featuring BES will include the HRJ235, HRJ435, HRJ635 and HRJ935. The latter will also include the JVC dynamic drum system, which moves the drum in the trick play modes so that the heads provide noise-free pictures and sound – for more on the dynamic drum and BES, see *Television* June 1995, pages 558-9. The HRJ935 will also offer NTSC playback: unlike existing models, it can play back NTSC tapes with stereo sound. No price details have been released to date.



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Toshiba

Service Briefs

The following fault notes are based on Toshiba Technical Bulletin no. CDH56, dated October 1995

Model 155R8B

***Drifts off tune and search tuning will not stop*:** Replace CA36 (0·01µF) in the a.f.t. circuit. It can become leaky.

Models 1440RB, 1440TB, 1722TB, 2140RB, 2140TB, 2141RB and 2141TB (C4 Chassis)

No on-screen display and flyback lines visible at the top of the screen: Replace the TA8403K chip IC301, part no. B0377890. Cause of the problem is that IC301 is not supplying field pulses, only 24V d.c., at pin 7. Because of this microcontroller chip ICA01 won't produce graphics.

Models 2100RB, 2100TB, 2112DB, 2500TB, 2512DB and 2812DB

Should the line output transformer fail, with a short from the primary to the core, the 2SC2023 standby switch transistor should also be checked – it often goes short-circuit. In the 2100RB, 2100TB and 2500TB the circuit reference number is Q803: in the other models it's Q845. The part no. is 23314246.

Models 2132DB, 2145DB, 2545DB (C3 Chassis)

The no on-screen display fault listed under Models 1440RB etc. above also applies with these receivers.

Model 2512DB

Static discharge from the loudspeaker grilles has been mentioned before, the suggested cure being to replace the cabinet. Toshiba now has a simpler cure that can be fitted in the customer's home. This is to connect the speaker grilles directly to the TV chassis earth with the aid of a simple spring kit. This is available as part no. STATKIT, which includes fitting instructions.

Model 2927DB

Whistling/whining noise from the surround sound speakers, only when in the Dolby/DSP modes. Also a faint watermark-type pattern on the screen: Replace the 5V –2 supply's 1,000µF, 16V reservoir capacitor C854. It can lose capacitance.

Model 2939DB

Dark shadows (bands) down either side of bright areas or objects in the picture: Replace C201 (10µF, 50V) at pin 58 (video input) of IC501. It can lose capacitance.

Set works all right when the contrast is low, but the power supply shuts down when the contrast is increased. When working, the h.t. is low at 117V: Replace L844 in the 8V supply to the constant-current circuit. It goes open-circuit. The coil is type TEM2011, part no. 23103859.

VCRs

Model V110B

No functions, with the 5V logic supply low at 4·5V: Replace the U2559B servo control and regulator chip IT46. Part no. 70010170.

Models V204B and V254B

No playback audio: Replace the 0·22µF coupling capacitor CS012 at pin 12 of IS001. It's a chip type capacitor and can go open-circuit.

Power cuts out, very intermittently: Replace the U4614B chopper control chip IP001 in the power supply. Part no. 70011972.

Dead with no 'power good' signal at pin 5 of BP002 in the power supply: Replace the BAV20 diode DP052, part no. 70011966. When it fails it leaves only 1V at pin 3 of IP002.

Models V804B and V854B

No E-E or playback picture: Cause is no video output at pin 2 of the TA8892N chip IC201. Replace IC201, part no. 70011884.

No playback colour, but picture has random coloured areas: The TL8843P chroma comb filter chip IC431 has failed. Replace it – part no. 70011841.

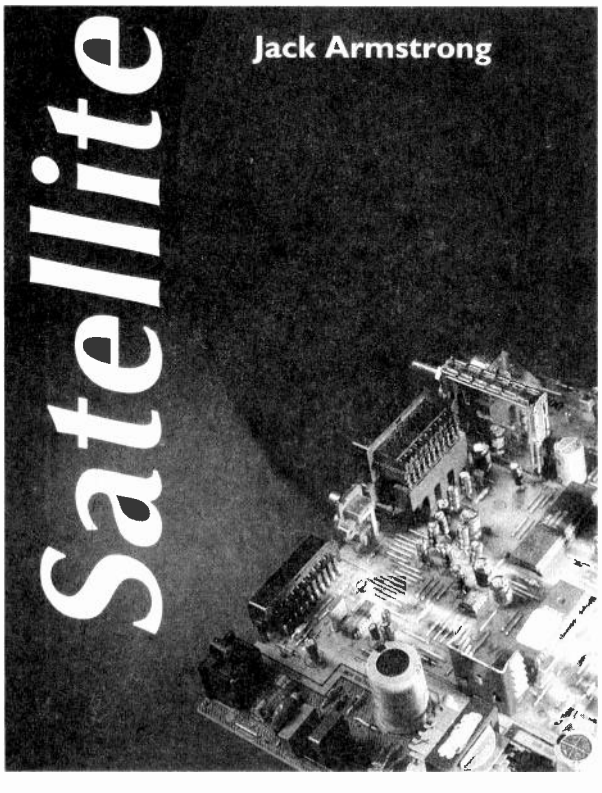
Floppy Disc Database

The complete Toshiba Technical Repair Database is now available on floppy disc. It comes as a self-running DOS program that can be installed from a single 3·5in. disc on to the C drive of a PC with 550Kbytes of free base memory available.

The disc is available at £5 from Toshiba (UK) Ltd., The Technical Centre, Unit 6 and 7, Admiralty Way, Camberley, Surrey GU15 3DT. Order under part no. TTDD95. As the database is copy protected, personal editing is not possible. Updated versions will be made available at regular intervals.

Satellite WORKSHOP

Jack Armstrong



I had a strange request recently from a customer who owns a Nokia SAT1700 Mk 1 satellite receiver. He's one of those enthusiasts who like to flick through every channel on every satellite across the sky. They seem to get the greatest thrill from pictures that are hardly discernible through the sparklies. "Look" they cry, "I can receive Bator TV from Outer Mongolia!" Then they fiddle with the video bandwidth, the audio bandwidth and the tuning controls to try to minimise the sparklies they found so exiting in the first place. But I digress.

Threshold Improvement

His request was "to improve the threshold". I was about to refer him to the builder next door, assuming that his doorstep was crumbling, but it was his tuner's threshold he wanted lowering. The SAT1700's tuner has a threshold of, I think, around 6dB. He wanted it to be better than that. A quick call to Nokia's Technical Department produced a negative response: it was not their policy to provides upgrades, a new receiver being the answer.

Maybe I had asked the wrong question, or phrased it badly, because when I put the same question to Davenham Satellites (0160 649 085) I was told that the tuner in Model SAT2202 has a slightly lower threshold and is a direct replacement. The new tuner (order code 55-31755-03) was not cheap, but my customer seemed to be happy to pay any price to improve his receiver's performance.

The day after I'd installed it he called to thank me and announce that he could almost receive pictures from 60° W. Well, I think I'll stick to Discovery and CNN. The excitement of owning a motorised system and almost be able to receive such exotic signals might be bad for my health.

A Hot Amstrad SRD520

Regular readers will know how cross I become about the way in which owners treat their satellite receivers. The most popular installation arrangement seems to be to place the receiver on top of a hot VCR in a so-called "hi-fi cabinet". Place newspapers on top, close the doors and simmer gently for at least six months. Oh, and never use the standby button.

This method seldom fails to ensure that the receiver becomes faulty within the guarantee period. It seems to me to be criminal that customers who abuse their equipment in this way get a free repair while those who look after it are rewarded with a large bill a year or so later.

On this occasion the owner suffered from what I believe was poetic justice. His Amstrad SRD520 lasted for exactly thirteen months – definitely unlucky for him! When I went to collect the receiver I found that it was in a hi-fi cabinet that was placed against a radiator! Was it still under guarantee he wanted to know? I asked whether he'd taken out the extended warranty option? No. Oh dear, what a shame!

Back at the workshop I had the cover off in an instant. Everything inside was black. The picture quality was abysmal, with the video level extremely low and only the occasional sync pulse. It made me feel that I was on to a loser. Even if I found the main fault, there were bound to be others.

To make matters worse, another dealer had apparently "mended the power supply" some time after purchase. Instead of the recommended 47kΩ resistors rated at 350V, some idiot had fitted a pair of elephant size 5W resistors that had clearly been arcing. So my first job was to remove them and fit the correct type.

Use of my scope enabled me to track down the cause of the main signal loss to the 10µF capacitor C6 near the video level trimmer. Once this had been replaced I had a locked picture, but there were interference lines and it lacked sharpness. To cut a long story short, if you get this problem measure the value of all the biasing resistors at the front end, before the filter and clamp circuit, and replace any electrolytic capacitors that are discoloured or low in value. Also ensure that the customer hasn't set the video bandwidth to "wide" in the menu!

I returned the receiver with the recommendation that the back of the hi-fi cabinet be knocked out and the radiator turned off. Even with the new components, I doubt whether the receiver will give reliable operation. But it would have been impossibly expensive to replace every resistor and electrolytic on the board!

Cleverness

A local dealer brought me a Pace PRD800 receiver he had attempted to repair. He had apparently fitted a standard power supply kit, after which the receiver had simply "ticked". He had then fitted another kit, this time "made up from the spares box". Several components had gone bang, and the PCB had black streaks. I quoted him a silly price. As he agreed, I was committed to repair his damage.

The first problem was that he had removed three solder pads and used

pieces of insulated wire to make the connections. Not the single-core, Teflon-coated Kynar that I use (order code 143-378 from Farnell), but multistrand mains wire!

The other obvious problem was that in place of the 100kΩ, 2W start-up resistor R2 he had fitted a ceramic-bodied 1Ω resistor! Needless to say, the TEA2018 chopper control chip hadn't survived the 240V or so and nor had several other components. I replaced all the electrolytic capacitors and semiconductor devices, and the resistors that were open-circuit. After repairing the broken tracks and checking for short- and open-circuits, I plugged in and switched on. The power supply ticked.

At this point a friend came in. I decided to take a break and brew a pot of tea. While I was doing that my friend peered intently at the board on the workbench.

"Careless today, aren't we?" he remarked.

You have to appreciate that my friend has a sarcastic streak and loves to find fault with my work, though he can't solder for toffee.

"Big solder splash there" he continued.

I looked and he was right, though exaggerating. A tiny blob of solder in the middle of the board straddled a surface-mounted capacitor. But it wasn't mine. It had the appearance of dry, grey powder. I've seen it before – the result of careless use of a pump-action solder sucker. I don't have one, relying on solder wick and anelectrically-operated solder sucker. These don't produce dry solder balls. This was clearly a problem caused by the dealer.

Once I'd removed the offending short the PRD800 was up and running. My friend drank his tea and gloated, before wandering off to annoy someone else with his cleverness.

Handset Source

A customer who visited me recently was a dog lover. Unfortunately for him his dog was partial to the occasional remote control unit. He wanted a handset for the old Uniden Model UST7007. Since Uniden pulled out of the UK it has been almost impossible to obtain this. I didn't bother to look through the usual catalogues but instead checked my address book: Trackdown Consultants, which is run by Alex Hoyle claims to be able to find or repair almost any make of handset – his prices aren't bad either

I gave Alex a call and shortly after the required handset arrived. Although it was apparently second-hand it was in good, clean condition and worked.

If you require or have surplus or old or new handsets, you might like to phone Alex on 01608 678 057, or alternatively fax 01608 677 872. He tells me that he has a ninety per cent success rate with either finding a replacement or repairing the old one.

A Dead Grundig

A very dead Grundig GRD250 receiver arrived in the workshop recently. It was accompanied by a note that simply said "lightning damage". Although the receiver would light up, I could get no menu or picture on the screen.

Lack of activity around IC4 led me to suspect this beast, and the service manual told me "to fit an IC4 emulator upgrade kit". An order has been placed with Willow Vale, and once the device has been fitted everything will doubtless be o.k. ■

Test Case 399

The typical service workshop has to deal with a vast range of consumer equipment. Awaiting alongside a 1996 satellite receiver you might find a twelve year old VCR and a microwave oven: the products of twenty or more manufacturers could well be present on the racks and benches. The Test Case workshop supports a long-established rental business, whose hired goods have come from some ten different makers as prices and marketing ploys have changed over the years.

The best earners are the sets that have been out on rental for many years. Typical of these was the 1986 vintage 22in. Tatung TV set that graced TechnCrat's bench recently. Fault diagnosis turned out to be a rather drawn-out affair. It started with Colin Doc in the customer's home.

The problem related to the remote control system. It seemed that the receiver was insensitive to the handset's commands, and was rather sluggish when it did respond. Several stabs at the button and, often, an approach to the TV set with the remote control unit were required to get a response. Colin fitted new batteries and cleaned the windows at the sender and the TV set. Since all this had no effect he trotted back to his van and found a similar remote control unit that he knew worked properly. Even when it had been fitted with the new batteries it did no better than the original handset. So a loan set went into the house and the old Tatung was loaded into the van.

When it was on the bench next day the set was found to be fitted with a 165 series chassis. Its remote control receiver and decoder arrangements are straightforward – as indeed is the entire chassis, with its single-board design. Yet another known good zapper was tried, again without success. Time to delve into the set. The first suspect here was the IR receiver diode DS01, which has been known to become noisy and insensitive, causing the low-gain symptom. A new BPW41D produced no improvement however, so tests were started around the IR amplifier chip IS01. Its 5V supply was present and correct, but the output at pin 1 was rather low and noisy. This output goes to the microcontroller chip.

TechnoCrat checked that the screening can around the IR amplifier chip was present and properly earthed, then turned his attention to the peripheral components associated with this i.c. The four electrolytics CS01-4 were checked by substitution, an ohmmeter then being used to measure the value of the five fixed resistors. They were all o.k. The fact that the fault was still present indicated that the electrolytics had also been in order. So it had to be the chip itself. Out came the eight-legged bug, in went a replacement. When the whole low had been reassembled the remote control system still lacked sensitivity!

A strange thing was discovered during subsequent tests by the exasperated TechnoCrat: operation was better with the room light on than when the workshop was in darkness. The red IR filter window could not have been responsible, since the results obtained were much the same when it was removed.

The culprit was not far away however. We can afford a couple of clues on this occasion: the faulty item was something that in many IR systems is not present; and it doesn't feature in the spares list in the service manual for the 165 series chassis. What was it? For the answer, see page 363.

Long-distance Television

DX-TV conditions and reception and news on the satellite front. Also the Radio Authority's proposals for the reallocation of Band I frequencies. Roger Bunney reports

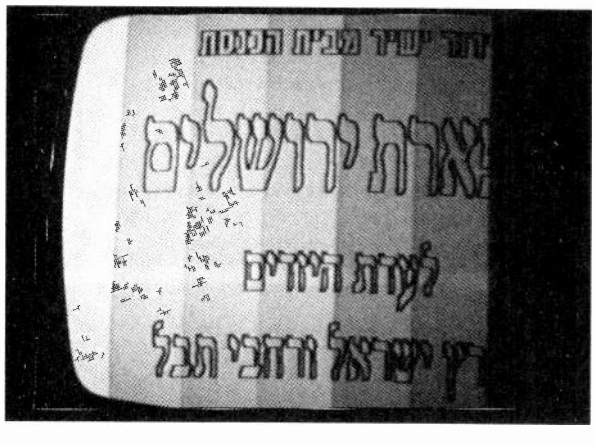
December 1995 was another dull month for terrestrial DX-TV reception, with little worthy of note. Peter Schubert (Rainham) experienced a short period of tropospheric enhancement on the 10th, with Band III/u.h.f. reception from the Benelux countries. For the vigilant, Christmas Eve produced a minor Sporadic E opening, with TVE-1 signals in channels E2 and E4. There was some random MS reception around the period of the Geminids shower.

The past year has been disappointing. With the sunspot cycle at its minimum point, there should have been a lift in SpE activity. After a slow start to the season in May and June however things just faded away. Experience in Australia later in the year was little better. The autumn tropospheric openings were also missing.

I have hopes that 1996 will produce a good SpE season, as in earlier years, but the Band I spectrum is due for reallocation for mobile radio and other uses and some of the new allocations could come into effect by the end of the year. They could have a serious effect on TV-DXing. The accompanying box shows details of the proposed Band I reallocation.

On a personal note, caterpillar tracked Hitachi demolition machines are at present devouring the nearby giant Whitbread warehouse that has dominated the centre of Romsey for the past thirty-five years. It has been the source of interference on occasions, reported in this column, and has prevented full reception from the east.

Hugh Cocks, who moved to the Algarve, Portugal some years ago to set up a satellite business, reports that tropospheric conditions there are at present fantastic. When enhancement occurs he can pick up strong 127MHz ground traffic control signals from the Canary Is. on his scanner, a distance of around 800 miles. RTP still has no text and features numerous Brazilian soaps. Programme time keeping is poor – often a feature film will start ninety minutes late. RTP is trying to rival the new commercial SIC operation. RTP-2 has dropped commercials and become cultural.



Can anyone identify the language superimposed on this grey scale? Hebrew maybe?

Satellite Sightings

With the arrival of US peace-keeping troops in the Balkans several US TV networks have been sending news packages and live reports back to the home country. At the time of writing this there is usually a feed from Tuzla each night via Eutelsat II F3 at 16°E.

It was good to see an analogue Associated Press (AP-TV) feed via Eutelsat II F1 (13°E) on Boxing Day – though the transmission identification at the end showed the source as being a 'BBC UKI 20 GORNJI VAKUF' unit!

Newsforce, which pioneered digital compression for SNG work some two years ago in Africa, has been seen using analogue signals via Eutelsat II F3, in the Telecom band.

From a caption via Intelsat 601, at 11·052GHz horizontal, on December 22nd I noted that the new TCC Nordic downlink was due to run up on January 1st. The Christmas break would, I thought, provide a chance for a prolonged tune around the Clarke Belt. But the tuning line went faulty on one receiver and an improved shelter had to be constructed for the main rear dish. This cut down my activites somewhat! Boxing Day was better, with a rare analogue feed from Worcester, Mass via Orion Atlantic, showing the 1996 World Junior (Ice) Hockey Championships – an NTSC signal at 11·469GHz horizontal, from 2000 GMT. Audio was effects only, at 6·2/6·8MHz.

Christmas highlights for me were the Hungarian Duna TV Christmas night carols programme recorded by ORF, Vienna, and the NBC Christmas in Washington complete with President Clinton. Christmas TV as one feels it should be.

At least twice during December the European Business Network channel transmitted, via Eutelsat II F1 at 11·262GHz horizontal, a

recorded interview with Keith Hamer on the HS Publications test card books and interest in the subject generally. For further information write to Keith at 7 Epping Close, Mackworth Estate, Derby DE3 4HR.

Ian Waller (Lincoln Satellite) reports reception of a very weak NTSC Dubai TV programme feed via Intelsat K, at 12·725GHz vertical. The signal produced just visible results using an 80cm dish. This must be the new programme feed to the USA via a west spot beam – it will provide a good DX system performance check. A 1m dish should produce identifiable signals, an 80cm dish evidence that signals are present. Ian saw the first day of the South African test cricket series via Intelsat at 34·5°W, in band C. By the second day the signal had disappeared – Ian suggests that it went digital. During the first day he saw a dish of about 1·5m diameter in the cricket ground, with a BT logo – it could have been for a C band digital uplink.

Ian Roberts (Randpark Ridge, South Africa) reports reception of signals from the Turksat craft at 42°E, using a 3m dish, an 0·8dB noise LNB, reduced bandwidth (15MHz) and very careful polarisation adjustment. At least seven channels have been seen to date. PAS-4 at 68·5°E provides Ian with very strong Ku/Telecom band signals (49dBW), requiring just a 95cm dish and a 1dB noise LNB to provide a carrier/noise ratio of 18dB. Of the eight downlinks it provides, three use MPEG-2 while the others are all analogue. There could be a change to 100 per cent MPEG-2 within two years. The satellite also carries digital 'traffic' below 3·7GHz, but no C band TV has been seen – the linear polarisation is not quoted to the Earth's horizon however, so that horizontal polarisation is received with the LNB adjusted to 45°!

France 3 is to use Telecom B at 5°W, which may also have RTL-TV1 + digital TV packages, thus becoming a dedicated TV hot spot! The new Telecom C has been slotted in at 3°. It has at least two transponders dedicated to commercial/business (VSAT) use.

Terrestrial Broadcasting News

Italy: RAI plans to start a pay-TV service within the next three years and has been given government approval for digital transmissions – provided there is no cost to the viewer. Before taking further steps however RAI is awaiting the new broadcasting bill and clarification on the transmission standard.
Finland: YLE is to introduce digital audio broadcasting in the Helsinki area later this year.
USA: To encourage people to go digital, the government has decided to subsidise set-top decoder boxes. The aim is for digital TV to be the predominant method of transmission by the year 2005. Fifty dollar vouchers that can be redeemed against the purchase of a decoder unit are to be issued. Analogue TV transmissions could come to an end by 2012.
Czech Republic: Nova TV is using a circular pattern with the identification 'KANO-N', followed by colour bars, during tests prior to programme transmissions; CT-1 and -2 use the circular pattern with 'KANO-1' and 'KANO-2' idents; Premiera TV uses colour bars with 'PREMIERA' inlaid.
The Netherlands: The ch. E49 ZHTV transmitter at Rotterdam has closed.
UK: Radio Wales and Radio Cymru will be the first regional BBC stations to adopt DAB when digital radio is extended next year.
Slovakia: A new commercial station, Markiza-TV, is to commence broadcasting in July.

Satellite TV News

Intelsat is already planning satellite feed coverage for the Summer Olympics (July/August) in Atlanta. To date the arrangements involve the use of ten satellites for direct downlinks and seven more for occasional feeds. The following Intelsat craft that can be received in the UK will be used: 515 at 18°W, 603 at 34°W, 601 at 27·5°W, K at 21°W, 605 at 24·5°W, 602 at 60°E and 604 at 63°E. Both the C and Ku bands will be used. It remains to be seen how many analogue feeds will be available.

Intelsat 805 has been scheduled for launch in March 1998, at 33°E. This will give coverage across India/Africa and into Europe. The Russian GALS-2 high-power Ku band satellite was launched in late November and is now being tested – at around 71°E. It has only three transponders: later GALS craft are to carry up to twelve.

Fininvest (Italy), a Swiss consortium and the Vebacomm group (Bavaria) are seeking, with CTL/RTL, ARD and ZDF, a common European encryption/decoder standard.

TCC Nordic, a new channel available via Intelsat 601 at 27·5°W.

SES is thinking of using Astra 1A as an SNG/programme backhaul satellite after 1998, when Astra 1H is to be launched. The vintage 1A would be moved to 24·3, 26·2 or 28·2°E, with possibly an inclined orbit to conserve fuel.

ArabSat 2A at 26°E will soon be another bird in the European sky, with both C and Ku band transponders. The 2B satellite to follow will be at 30·5°E. Bahrain TV and Future Vision (Beirut) have both booked space aboard 2A.

Proposed Band I frequency allocations

Frequency range	Use
47-47·3MHz	LM
47·3-47·425MHz	SA
47·425-47·55MHz	CT1
47·55-48·0875MHz	OB
48·0875-48·4MHz	RES
48·4-48·65MHz	OB
48·65-48·965MHz	RES
48·965-49·5MHz	PAG
49·5-49·8MHz	LM
49·8-50MHz	LP
50-51MHz	AMA
51-52MHz	AMA + GOV
52-52·4625MHz	OB
52·4625-52·85MHz	RES
52·85-53MHz	OB
53-53·75MHz	GOV
53·75-55·75MHz	OBRM
55·75-56MHz	T+D
56-57·5MHz	PMR
57·5-58MHz	T+D
58-60·75MHz	PMR
60·75-62·75MHz	OBRM
62·75-63MHz	T+D
63-64·5MHz	PMR
64·5-65MHz	T+D
65-67·75MHz	PMR
67·75-68MHz	T/R

Key

AMA	Amateur radio
CT1	Analogue cordless phones
GOV	Government use
LM	Land mobile
LP	Low-power devices (intruder detectors etc.)
OB	Outside broadcast use
OBRM	OB radio microphones
PAG	Low-power local-area paging
PMR	Private mobile radio – see below
RES	Reserved for future low-power devices
SA	Security alarms
T+D	Test and development
T/R	Foreign broadcasters

There are two duplex PMR bands, each with 7MHz separation, as follows:

56-57·5MHz	Mobile transmit
63-64·5MHz	Base transmit
58-60·75MHz	Base transmit
65-67·75MHz	Mobile transmit

Individual channels have a 12·5kHz bandwidth

BT has brought into service, at Martlesham Heath, Suffolk, 13m (Ku band) and 16m (C band) dishes for use with the PAS-4 satellite at 68·5°E, giving access to SE Asia, India and Africa.

Proposed Band I Reallocations

The Radio Authority has circulated proposals (see accompanying box) for reallocating the frequencies in Band I (47-68MHz). Some of them represent a serious threat to DX-TV reception, in particular the two pairs of duplex communication/PMR bands – the lower sections sit atop ch. E3 and the upper ones atop ch. E4. The idea is that 55·75–60·75MHz and 62·75-67·75MHz will be used for mobile and base communications. Although these are still only proposals, it's almost certain that they will be adopted.

I spoke to Ivor Davies of the Diplomat Communications Ltd. team which has designed equipment for the projected bands. Ivor says that although the final specifications have yet to be agreed by the CBS Working Group, their design brief included both base and mobile transmitters applying 25W to the aerial. The first duplex band will be 55·7625-56·425MHz (mobile) and 62·7625-63·435MHz (base). This will provide, with a 7MHz separation, some 54 12·5kHz channels. It follows that the other band will have a similar specification. Both Diplomat Communications and Alan Jones of the Radio Authority comment that this specification is subject to confirmation. The first PMR allocation in Band I is expected to be operational within twelve months however, i.e. early next year.

Other allocations present less of a threat to DX-TV reception. The allocations in the band 47–55·75MHz have already been agreed and are in use. There are additional 47MHz allocations for higher-powered, long-range analogue phones in rural areas.

The potential for interference to DX-TV reception is considerable. With a number of PMR channels in use, interference-reduction techniques such as notch filtering may pove to be ineffective. Thus greater attention will have to be paid to aerial structures to minimise the problems. This will not be easy with the relatively large aerial dimensions involved. Perhaps active electronic phase-shifting techniques would work – until the scope of the problem is known, we can but speculate!

There has in recent years been a gradual decrease in Band I TV transmissions across Europe. Many countries continue to use Band I because of the wide coverage it provides, especially in remote and rugged terrain. Satellite technology may accelerate the decline of terrestrial TV, in which case DXers will increasingly have to look to the heavens for exotic signals. ■

This winter view has often been featured prior to news feeds from the Balkans back to London via Eutelsat II F3 at 16°E.

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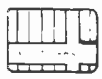

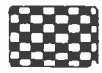

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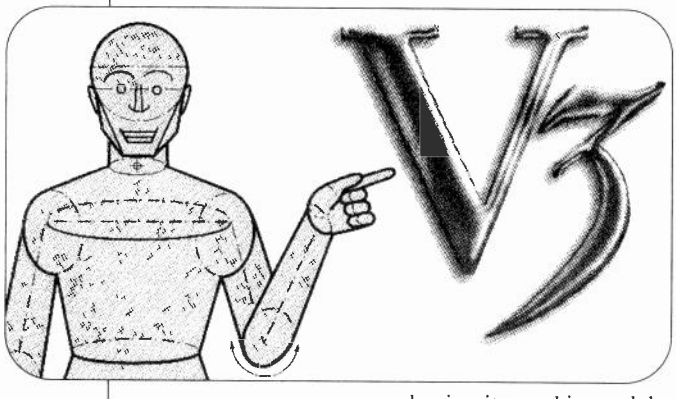
VISA

More on the Toshiba V3 range

The technical features of the new Toshiba V3 range of VCRs were outlined in Philip Blundell's article in the January issue (pages 176-179). **Michael Maurice** provides some additional notes

The Toshiba V3 VCR model range is split into two categories, Cat 1 which includes all mono sound models and Cat 2 which includes the models with Nicam stereo and hi-fi sound. Manufacture is at the joint Thomson/Toshiba plant in Singapore. Cat 1 machines are mainly Thomson designed while Cat 2 machines have mainly Toshiba design. This explains, amongst other things, the different



power supply circuits used in models with mono sound only and those with hi-fi stereo sound.

Toshiba claims that in comparison with its previous range there has been a thirty per cent component reduction in the electronics used and a fifty per cent reduction in the number of mechanical components. The former has been achieved by increased electronic integration, the latter by designing the mechanics so that items such as guide locking screws, spool retention circlips etc. are no longer required.

The Mechanics

The new and in my view simpler mechanism is based on a U-shaped pressed steel chassis. The carriage mechanism is fitted into this while the plastic carriage guides are moulded in. The loading motor, together with its control cam and the mode switch, are fitted on top of the deck. The mode motor is held in by clips. It can be easily and quickly removed, giving access to the pinch roller. Refitting is simple. This assembly includes a method of lacing/unlacing by hand so that a jammed tape in a dead machine can be released.

The drum with its integral preamplifier is of course mounted on the deck. The rotor is fitted to the underside of this assembly while the stator is on the main PCB. When the main PCB is fitted to the deck, the stator sits inside the rotor. This means that the mechanics cannot be operated separately from the main PCB, which could make fault finding more difficult – especially when there's an intermittent mechanism fault. It could also, I presume, make life more difficult in the event of an intermittent or heat-sensitive fault with the electronics in this area.

The deck makes extensive use of plastic assemblies, far more than in previous models, though this appears to be the way all manufacturers are going. The entry/exit guides are plastic for example, relying on friction between the plastic and the metal rollers to maintain the guide height alignment. This can work – the Philips Turbo decks use the technique – but I've had a couple of these guides go out of alignment.

The cog that drives the carriage seems to be a weak spot. It's driven by a metal rack slider and can be damaged if subjected to excessive force when a cassette is inserted incorrectly.

For most repairs the deck will have to be removed from the machine. This involves removal of the main PCB, which can be awkward. An exception is the pinch roller. Once the mode motor assembly has been removed this can be replaced without the need to remove the deck.

Most parts, such as the guides and cogs, fit in through cut-outs in the chassis. In the normal working modes they don't come out. This dispenses with the need for circlips etc.

The Drum Assembly

The head drum assembly is the interesting bit. It's a well-known fact that the closer an amplifier is to the source of the signal to be amplified, the better the signal-to-noise ratio will be. In the past, manufacturers have had to use cables to couple the video (and audio) heads to the preamplifiers. In early machines the cables could be several inches long. More recently the preamplifier has been positioned at the back of the drum assembly, usually with a flexible coupler about an inch long. Thomson/Toshiba have taken this one step farther, fitting the preamplifier inside the drum. This is a feature previously found only in professional decks, hence Toshiba's name for the new arrangement – the PRO drum.

In Cat 1 machines the preamplifier is part of the lower drum. The usual rotary transformer arrangement is used to provide coupling between the lower and upper drum. In Cat 2 machines (hi-fi stereo) the preamplifier is part of the upper drum. Rotary transformers couple the preamplifier to the lower drum, but the transformers also have to be capable of carrying the head switching, LP/SP, record/playback, envelope comparator and other signals.

Cat 2 machines, on which we will concentrate here, have three rotary transformers, with a slip ring assembly to provide the 9V d.c. supply for the preamplifier. The assemblies also include the earthing brush.

The lower drum consists of a plastic rotor assembly that houses a 23-pole magnet. This produces, via sensors on the main PCB, the FG and PG pulses. The lower drum also contains the rotary transformers.

In addition to the f.m. video, the chroma and the f.m. hi-fi audio signals, an r.f. switching pulse (25Hz or SW25), an r.f. audio switching pulse and LP/SP switching have to pass through the rotary transformer. The audio and video switching

signals are combined into a composite switching signal. This frequency modulates a carrier over the range 9·4-11·4MHz. The frequency band is high enough to avoid crosstalk with the other signals.

During playback an envelope comparator produces an output that varies between high and low depending on which dual-azimuth head is producing the largest signal output. This high/low output is digitally processed within the preamplifier to produce a 1·2MHz a.m. signal that, after passing through the rotary transformer, is reprocessed for SP/LP head selection. This head select signal sets the amplitude of the composite AV/FM head selection control signal. As the 1·2MHz output from the envelope comparator lies between the 627kHz chroma signal and the 1·4-1·8MHz hi-fi audio, there is again no interference.

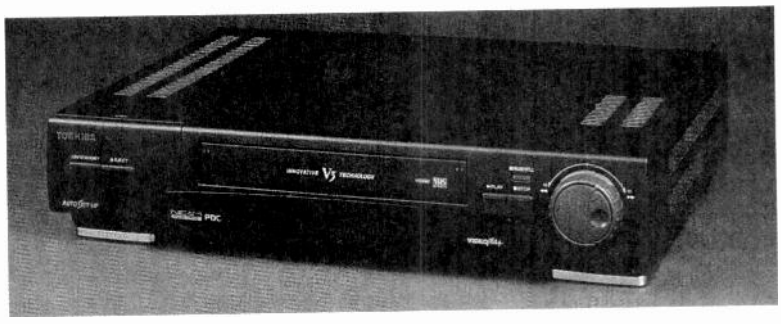
Cat 2 machines also incorporate a flying erase head. This ensures that clean pictures with no chroma content from the previous recording are produced from the start of a new recording. A flying erase head comes into its own with insert editing, where a precise section of the tape needs to be erased prior to insertion of the new recording.

The RF Block

The RF block, as Thomson/Toshiba call it, combines an RF converter (modulator) and a tuner/IF strip. Both sections are controlled by an I2C bus, which enables the user to set the RF output between channels 53 and 67 – it's set to ch. 60 at the factory.

The aerial booster can be set to either off or mix during playback. This is done via menus, the factory default setting being the mix mode. Those who have an aerial system that includes video wired throughout the house will find this a benefit – previously the RF booster was switched off during playback.

The RF block otherwise follows conventional practice. In Cat 1 machines the video output is at pin 6 and the demodulated audio output at pin 7. In Cat 2 machines, which have Nicam capability, the audio output from the IF strip is an SIF signal (sound IF) which is fed to the MPX unit. This contains an MSP3410 digital multi sound processor chip that can process all TV sound systems available, including 5·5MHz and 6MHz f.m. sound and Nicam sound. If this chip fails it means that you will get no sound, either Nicam or f.m. According to Toshiba these modules are designed to be replaced in the event of failure, not repaired.



The Toshiba V855B

Microcontrollers

As you would expect, microcomputer chips are used for system control, a main one and a second one for the display. The display microcontroller chip is connected to the main one via four lines – system data in, system data out, system clock and start code (strobe).

There are two I2C bus networks. Bus 1 controls the signal processing - hi-fi sound, video, pre-record control and the multi-sound processor (Cat 2 models). Bus 2 controls the RF block, PDC where fitted, video in/out and the EEPROM.

The EEPROM enables the machines to be set for use in different countries with different languages. It also stores tuning data, RF output data and the playback head switching phase. When the EEPROM is replaced the correct data must be entered and stored. Consult the relevant service manual – each model is different in this respect.

Satellite Control

A rather neat feature is the ability to use the VCR to control a satellite TV receiver in the Video Plus timer recording mode. An infra-red LED inside the front top of the case transmits the relevant data to the satellite receiver. Thomson/Toshiba provide a comprehensive list of receivers that can be operated in this way, with clear instructions on how to set up the machine for this use.

Power Supplies

In Cat 2 machines the power supply is on the main PCB. In Cat 1 machines the power supply is separate, in a metal can. Basic circuit operation was described in the earlier article (January).

In Cat 1 models the power supply provides a "power good" output. This tells the microcontroller chip whether there's a power failure. The idea is let the microcontroller know of the failure before the capacitors in the 6·2V supply have had a chance to discharge, so that it can ensure the back-up clock is running correctly.

The Cat 1 power supply has been used in previous Thomson/Toshiba VCRs. In the event of failure, check the diodes on the secondary side for short-circuits then replace the chopper control chip IP001, the chopper transistor TP001, RP021 and RP018 as required. With the exception of RP021 these items were shown in Fig. 1, page 176 (January). RP021 (2·2kΩ) is connected to pin 12 (current sensing) of IP001.

As previously mentioned, the Cat 2 power supply is on the main PCB – so care is required when servicing, or you'll be in for a nasty surprise!

In Conclusion

The models in the V3 range give excellent results. They should prove reliable, but only time will tell.

The main source of my information is the excellent courses run by Toshiba. ■

TV Fault Finding

Reports from Philip Blundell, AMIEEIE Brian Storm Tony Ashworth Chris Watton Michael Dranfield Terry Lamoon Mike Leach Blair McEwan Graham Thompson Stephen Leatherbarrow J.S. Ruwala

Philips CP90 Chassis

For a dot pattern visible in grey areas of the picture check whether C2691 (330µF) has fallen in value. It's the reservoir capacitor for the +22 (19·5V) supply. **P.B.**

Toshiba 2100TBT

For no sound or vision, with the 120V h.t. supply low and the standby light flashing, check the value of the mains bridge rectifier's reservoir capacitor C820. It should be 120µF (385V) but can fall in value. **P.B.**

Panasonic Euro-1 Chassis

This digital set produced a dark picture with weak sync. The first thing I did was to check whether the AV inputs were similarly affected. They were, which suggested that the cause of the fault was in the digital circuitry. A textbook video waveform entered the SAD2140 analogue-to-digital converter chip IC1601, but data checks after this were less informative. My usual approach to these sets is to revert to guesswork. So I replaced IC1601. Fortunately this cured the fault. **B.S.**

Panasonic TX25W2A (Alpha 3 Chassis)

This set, which has a built-in Astra receiver, had a reputation for intermittent operation from cold. Sometimes it couldn't be brought out of standby. The set spent a long time on our test bench before we found that C1251 (a dreaded 10nF capacitor) was leaky. Since it decouples the main microcontroller chip's reset pin (IC1213) it was hardly surprising that the set was troublesome. **B.S.**

Panasonic Alpha 2 Chassis

The complaint with this set was intermittent black lines on the right-hand side of the picture. On one occasion both sides of the picture were affected. This should be regarded as an early warning sign with all Alpha 1 and 2 sets. It means that the line output transistor Q551 is in imminent danger of going short-circuit because of dry-joints on the secondary side of the line driver transformer T531. **B.S.**

Sony KVX2972 (AE2B Chassis)

This set produced a peak white raster with faint chroma information. The cause of the fault was traced to the CXA1587S chip IC304 (part no. 8-752-056-54). **T.A.**

Matsui 1424 (Tatung 190 Chassis)

Once this set had warmed up the sound would be lost when the channel was changed. The cause of the fault was traced to the HD401220 microcontroller chip (part no. 1983156). **T.A.**

Sony KV2962 (AE2 Chassis)

After several hours' use this set would momentarily cut out and then come back on again. It would eventually go to standby, giving the error code 13 indication (Nicam LED flashing thirteen times). This could indicate one of three things: a field fault; operation of the X-ray protection system; or excessive h.t. current (135V rail). After disconnecting each protection circuit in turn we traced the cause of the trouble to the excess current circuit on board D, where D620 was going open-circuit intermittently. A 1N4148 diode proved to be a suitable replacement. **T.A.**

Bush 3114

This Orion-made portable produced a picture with intermittent blue flooding. The fault could be instigated by tapping almost anywhere on the main PCB. Careful examination with a magnifying glass revealed that C801 was dry-jointed. **T.A.**

Sanyo CBP2872 (ED1 Chassis)

If this set was switched off then back on once it had warmed up there would be no sound. Replacing the ADC2301E chip IC560 on the signals PCB cured the fault, though it was not possible to prove that IC560 was the cause by subjecting it to heat and freezer. The part no. is 409 211 9404. **T.A.**

Sharp VT3700H

This combined TV/video suffered from a problem with timer recordings. If the recording was made with the TV section switched off it would be off tune. Voltage checks showed that the tuning voltage supply (VT) to the tuner rose slightly when the set was switched to standbly. The cause of the fault was the RH-IZ0249CEZZJ 33V stabiliser IC005. **T.A.**

Goodmans C1401R

Every few days this set's picture would disappear. We traced the cause of this to dry-joints at the 12V regulator IC502. **T.A.**

Matsui MB10

This set's power supply wouldn't start up because Q805 was leaky. It's type 2SC2120Y – a BC639 proved to be a suitable replacement. **T.A.**

JVC AV25S1EK (MX II Chassis)

If the values for height and vertical geometry become corrupt it is best to replace the 24C01A/P memory chip IC1707 that's connected to the bus line. Reprogramming it may provide only a temporary cure. **T.A.**

Sony KVE2512 (AE1A Chassis)

The cause of intermittent cutting out was traced to dry-joints at the 12V regulator IC608. With these sets it's

also worth resoldering the audio output chips and T1, T2 and T5 in the i.f. can (UIF101) as they can be responsible for various faults. **T.A.**

Matsui 209T

Very intermittent loss of the signals was traced to L101 (150µH) going open-circuit. It feeds the 12V supply to pin BM on the tuner. **T.A.**

Sharp DV5132H (Deco 5 Chassis)

The problem with this set was lack of height, which became progressively worse as it warmed up. Replacing the RH-IX1426BMNO chip IC1400 on the digital PCB cleared the fault. **T.A.**

Salora J Chassis

We seem to have had more than our fair share of these sets in lately. In the past the cause of a dead set has generally been failure of the 4·7µF base drive coupling capacitors in the ipsalo circuit. Nick Beer told us about this years ago in these pages. More recently the cause of this fault has in a number of cases been the ipsalo circuit control chip HB1, where pin 2 has been at a much higher voltage than the stipulated 7V. Replacement is the only remedy. **C.W.**

Grundig CUC70 Chassis

Although getting on a bit, these sets still give a good account of themselves. This one gave us some pain however: it would run for hours, go dead for a minute, then come back on. We eventually traced the cause of the fault to D661, which responded to some freezer one day. A BY399 was fitted as a replacement for the original SKE type. **C.W.**

Sony KV1412

Although this set appeared to be dead there was 320V at the output from the mains bridge rectifier. So we carried out voltage checks at the chip in the power supply. The voltage at pin 4 was very low because R602 (2·2MΩ) was open-circuit. **C.W.**

Philips NC3 Chassis

The symptom was lack of height, which couldn't be cured by adjusting the height control – the raster wouldn't quite reach the top and bottom of the screen. We wasted a lot of time in the field driver and output stages before we moved back to the TDA4505 chip that contains the field oscillator. The timing components are connected to pin 2 of this chip. Checks here revealed that R581, which is connected to the 95V rail, had risen in value from 3·9MΩ to around 7MΩ. **C.W.**

Finlux 1000 Chassis (early version)

There was no picture though the power supply and line timebase were working and the tube's heaters were alight. So we suspected the field timebase or sandcastle pulse trouble. Everything was o.k. here however. Checks were next made around the TDA3652 colour decoder chip, where we found that Cb21 (2·2µF, 35V) was open-circuit. This capacitor is connected to pin 19 and is part of the black-level clamp circuit. The picture was back when a replacement had been fitted – after the usual delay while the chip sorts out the grey scaling. **C.W.**

Grundig CUC2401 Chassis

There was no picture. While trying the set out in a dark corner of the workshop we noticed that a faint line down the screen would put in an appearance every few seconds. Line collapse was the trouble, because the line output transformer was open-circuit. H.T. was present, but wasn't reaching the collector of the line output transistor. While looking for a replacement transformer we found that the cost of a pattern one was about half that of the original. **C.W.**

Saisho CT141X

Low sound was the complaint with this set – a simple fault for a change. Checks in the volume control circuit revealed that the hot end of the control was at 4V instead of 5·9V. The series resistor R145 (4·7kΩ) had risen in value. **C.W.**

Matsui 1440

There was a very bright picture except for the first inch at the left-hand side of the screen. A voltage check showed that the supply to the RGB output stages was low. The cause of this was traced to C431 (4·7µF, 250V) which was open-circuit. **C.W.**

Tatung 180 Chassis

This set was dead because the line output transistor was short-circuit. We fitted a replacement then looked for some reasons for the failure of the original one. After attending to a few possible dry-joints, we decided to start up the power supply with a 60W bulb as the load instead of the line output stage. As the h.t. was correct, we reconnected the line output stage and confidently switched on. Bad move! The line output transistor once again turned into a wire link. Further checks in the line output stage revealed that C433 (6·8nF, 2kV), one of the capacitors in the EW diode modulator circuit, was leaky. **C.W.**

Ferguson TX9 Chassis

The crowbar would fire at switch on, blowing the fuse. We've had this fault quite a few times now, but only with 14in. models, never with the 20in. version. The cause is the 1kΩ line hold control RV206 going open-circuit, presumably at its rivets. **M.Dr.**

Amstrad TVR2

If the STK7348 chopper chip blows at switch on or has a very short life, replace C1509 (3,300pF, 1kV) in the snubber network. If you have any old Rank T20/T22 chassis power supply panels you'll find an excellent, more robust replacement for C1509! **M.Dr.**

Ferguson ICC9 Chassis

When this set was switched on the picture flashed and pulsated and had a very red tint. As it warmed up the fault cleared. We suspected the TEA5101 RGB output chip on the tube base panel – cooling it down brought the fault symptom back. As we didn't have a TEA5101 in stock we decided to make a few more checks before placing an order. This brought us to RB24 (39kΩ, 1W) which provides d.c. feedback in the red amplifier channel. It was open-circuit. After fitting a replacement the picture remained the same no matter how cold the chip was. **M.Dr.**

Sony KV2212

The cause of field collapse was traced to R851 (1·2Ω) which is connected to pin 9 of the line output transformer. We could find no reason for its failure. **M.Dr.**

Matsui 1420

This set came in with a green screen. It nearly always pays to carry out a visual examination. Sure enough R807 on the c.r.t. base panel had been badly overheating. When removed and checked this 8·2kΩ resistor was found to have risen in value to 450kΩ. Somewhat

different! A new resistor restored normal operation. **T.L.**

Philips CP90 Chassis

There was no sound or picture. I usually tap around in case of dry-joints, but this didn't reveal anything. Visual inspection of the PCB then showed that the line output transistor T7677 was dry-jointed all round. I resoldered the connections and did the line output transformer as well. When the set was switched on after this there was perfect sound and vision. What amazes me is how some sets ever work with such defects, but I'm always grateful for a simple job. **T.L.**

Philips Anubis A Chassis

The complaint was no power. It was soon apparent that the h.t. voltage was being dragged down by a fault in the line output stage. A d.c. resistance check between the collector of the line output transistor and chassis produced a reading of 20Ω. Isolating the pins of the line output transformer proved that this was the culprit, a replacement then curing the problem. **T.L.**

Matsui 209R/T

There was no illumination from the power or standby lights, just a ticking noise. A quick visual examination revealed that C613 had a fine crack in it. As it was the dreaded 4·7nF, 1kV pulse type capacitor I quickly changed it. This restored the set to life. These capacitors are now quite a common cause of faults in a number of sets, so be wary of them. Fortunately you can usually see the damage to them. **T.L.**

Mitsubishi 25A2STX

The complaint with this large set was intermittent loss of the sound and vision. Leaving the set on test showed us that it was an i.f. type fault, a tap around the i.f. module then producing quite positive results. I removed the i.f. module from the main PCB and resoldered all the connections. After reassembling it the set was left on test for several days. There were no further problems. **T.L.**

Matsui 1436

This portable didn't come on and there was no light from the red standby indicator. A check showed that the relay wasn't being operated. There's a 160mA fuse, which had failed, in the circuit that controls the relay. Repair was simply a matter of replacing the fuse. **T.L.**

Matsui 2199

There was no power. Our field engineer had replaced the line output transformer but the fault persisted. What he had missed was the safety fuse CP401 in the h.t. feed to the transformer. When this had been replaced the set was fine. The transformer had probably been faulty – it looked very much like the Philips type. **T.L.**

ITT TX3326 (Monoprint B Chassis)

This set would come on for several seconds, then shut down. It wouldn't stay on long enough to produce a raster. A quick check in the short time available revealed that when the set came on the h.t. was too high, at 156V. It should have been around 115V.

So the set was detecting an overvoltage condition and shutting down. In these receivers the set h.t. potentiometer isn't in the power supply area: you'll find it near the line oscillator. As I suspected, adjusting it made no difference to the fault condition. What had happened was that the 300kΩ resistor in series with it, R613, had gone high in value. When this had been replaced the h.t. could be set up and the receiver performed normally. **M.L.**

Samsung CI6230WN

When the mains switch was used this large-screen set would come on all right from cold. You could then use the remote control unit to make it go into standby, but after that it wouldn't come on again unless it was first switched off with the mains switch then switched on again. To start with it seemed that this was a remote control problem, but this wasn't so because a click could be heard from the relay inside the set when it tried to switch back on.

We first cleaned the relay contacts, as we've known them to give trouble in some of the newer Samsung sets. This got us nowhere, so more in-depth checks were necessary.

We found that when the set had been on for about half an hour the remote control unit would switch it on and off in the normal way. This suggested a heat-related problem. Luckily it was: a quick spray around the power supply area revealed that there was a problem with the 100µF, 25V capacitor C806, which is the reservoir capacitor for the supply to pin 9 of the TDA4601 chopper control chip. A replacement restored normal remote-control operation from cold.

I have to add that when this capacitor had been frozen the set wouldn't come on at all. I assume that we caught C806 in the early stages of its deterioration. **M.L.**

JVC AV21F1EK

This set would drift off tune intermittently. We traced the cause to dry-joints at all the pins of the 5V regulator IC522. **B.McE.**

Beon CTV1412

This set wouldn't come out of standby. We found that the 12V supply from the l.t. transformer was low. The fault was with Q006 and Q007 in the start circuit, which is on the front panel. **B.McE.**

Finlux 5000 Series Chassis

The picture would go pink intermittently, with flyback lines. It sometimes blanked out completely. We found that wire link JE38 was dry-jointed. It's partially covered by the plastic at the front of the chassis. **B.McE.**

Sharp DV5107H

This set wouldn't come out of standby. The LED is of the bi-coloured type, and was showing both red and green. Voltage checks revealed that the 5V supply was low, subsequent resistance checks showing that there was a short on the video PCB. The cause of this was a blob of solder that had shorted between the positive connection to C1402 and the negative connection to C1403. Removal of this restored full operation of the set. **B.McE.**

Soundwave CTV1405R

This portable was dead. No current was being passed by the start-up resistors R104 and R105. At the bottom of the potential divider we measured 334V with respect to the primary side earth. The chopper transistor Q101 was short-circuit and the 3·3Ω safety resistor R121 open-circuit. **G.T.**

Matsui 1455

There was no line drive. A quick check showed that the supply to the driver transformer's primary winding was missing. We then noticed that the feed resistor R308 was under stress. The associated decoupling capacitor C311 was leaky. **G.T.**

Akai CT2879/Nokia Compe De 110° FST

The picture was shifted to the left and the line phase control had no effect. To cut a long story short, the cause of the fault was C516 which is a pulse capacitor mounted behind the line output transformer. It's not shown on the circuit diagram. Thank you Nokia Technical for your help. **G.T.**

Orion 14LR/Matsui 1466

When it was switched on this portable remained dead apart from the seven-segment display which flashed A0. This fault has caught a few people out. Before you start looking at or around the microcontroller chip, check the main power supply. You'll probably find that it is not working because the start-up resistors R502/3 are open-circuit. In fact anything that prevents the main power supply firing up will produce this symptom. **G.T.**

Ferguson TX99 Chassis

Field collapse is quite a common problem with these sets. You will usually find that one or other of the series-connected 11Ω resistors R134-R137 are burnt up. My advice is to replace both the output transistors TR5 (TIP29B) and TR6 (TIP111 – a Darlington device) as well. Other components we replace as a matter of course are R109 (33Ω safety), R108 (91Ω safety and the 56V zener diode D30. **S.L.**

Ferguson A10R (later TX90 Chassis)

The cause of intermittent results turned out to be the 7nF, 1·6kV flyback tuning capacitor CP18. It was badly swollen and one leg was charred. Note that the value is different with Model A14R. **S.L.**

Sharp DV5105H

This Nicam set failed to wake up from the standby state, the LED at the front alternating between green and red. Fortunately we've seen this before: we went straight to R751, an 0·33Ω Sharp safety component in the 7V supply. This is one to remember – if you are not familiar with the chassis you might suspect a line timebase fault. The set appears to be in a tripped state. You'll find R751 connected to pin 13 of the chopper transformer. The cost of this tiny component also takes some swallowing! **S.L.**

Mitsubishi CT21M1TX

A recent case of intermittently dead from cold had us reaching for the freezer can and hairdryer. This soon brought us to C905 (470µF, 25V), which is in the start-up supply.

Another of these sets had no sound because an l.t. supply to the audio chip was missing. We found that Q952 (2SA950) was open-circuit. A BC640 proved to be a suitable replacement. **S.L.**

Sony AE1A Chassis

One of these sets came in with two faults. First poor field linearity, the bottom bit blanked and hum. This fault would clear as the set warmed up. The second fault was a delay of a minute or so for the sound to come on after the picture appeared. The field fault was cleared by replacing the 680µF, 25V field scan coupling capacitor C531. We traced the cause of the sound fault to C615 (1,000µF, 25V), the reservoir capacitor in the 14V supply. Amongst other things this supply feeds the audio mute circuit. **J.S.R.**

Sony KV2764

The customer complained that it took a long time to get a picture – from half an hour to an hour. On checking the voltage rails we found that the 12V supply was very low. Even the collector voltage at Q655 (2SD795A) was low. Replacing C656 (1,000µF, 25V) produced an instant, clear picture. **J.S.R.**

Help Wanted

The Help Wanted column is intended to assist readers who require a part, circuit etc. that's no longer generally available. Requests are published at the discretion of the editor. Send them to the editorial department – do not write to or phone the advertisement department about this feature.

Wanted: Scart conversion kit for the Ferguson TX100 chassis; service information for the Philips PM5508 pattern generator; video heads for the Philips 2020 etc. (V2000 series) VCR (or source of supply). T. Martini, 122B Cannon Street Road, Shadwell, London E1 2LH. 0171 702 8774, fax 0171 702 8216.

For disposal: Panasonic NV730 and Ferguson 3V32 VCRs for spares. Monty Alter, 18 Twyford House, Chisley Road, London N15 6PA. 0181 800 7636.

Wanted: Pin connections for c.r.t.s type CV218L and 3HP7. Also Tritch circuit (from *Practical Television*) using EF91 valves. J.D. Bennett, 10 Glendevon Road, Huyton, Knowsley L36 0XL.

Wanted: Service information and a modulator for the National Panasonic NV8170 VHS video player. Have for disposal electronics magazines from 1950 to 1988, over 670 in all, also Barco manual. Ken Domminney, 7 Chestnut Close, Eastbourne BN22 0SZ. 01323 500 174.

For disposal: Philips V1700 VCR with 14 tapes and a cleaning maintenance cassette; Toshiba Betamax VCR with one tape; copies of *Television* from June 1980 to December 1990 (except Oct/Nov/Dec 1987). Dennis E. Peace, 24 Emmott Drive, Rawden, Leeds, W. Yorks LS19 6RF. 01132 502 796.

Wanted: Pinch roller, arm and spring for the Technics RS630T cassette deck. Pinch wheel condition unimportant. S. Ralph, 63 Belle Green Lane, Ince, Wigan, Lancs WN2 2EP.

Wanted: Working Y/C board for the Panasonic NV777 VCR, or alternatively subpanels IC3001Y-3, IC8001C-3 and IC8002C-4. The machine at present has a weird chroma fault – excessive amplitude and severe dropout – though no obvious fault is present on the board. Paul Hardy, 43 Sheridan Avenue, Caversham, Reading, Berks RG4 7QB. 01734 475 869.

Wanted: Panasonic NV730 audio/control head, part no. VEH0259. Colin McCormick, 23 Shapleys Gardens, Plymouth PL9 9TY. 01752 405 201 (evenings).

Wanted: Circuit diagram or power supply information (photocopy o.k.) for the Tystar TY3438 14in. computer monitor. Mike Harris, 13 Westfield Road, Cheadle Hulme, Cheadle, Cheshire SK8 6EH. 01614 851 621.

Wanted: TDA2170 field output chip for the ITT Digi 3 chassis, part no. 3763-12-43. John Langley, 125 Station Road, Burton Latimer, Kettering, Northants NN15 5PA. 01536 723 411.

For disposal: *Television* issues from 1985-90 inclusive, free to youth club or other good cause. Collect or pay for delivery. Also have, for sale, an Avo valve tester bought in 1948 and seldom used – it's in new condition. Quintin Blane, 69 Holland Crescent, Cumnock, Ayrshire KA18 1PY. 01290 420 491.

Wanted: Blaupunkt RTV311 VCR function PCB (ff/rew/play etc.). Hans Leiner, Leiner Electronics, PO box 73165, Fairland, 2030, South Africa.

Wanted: Circuit diagram (photocopy o.k.) for the AM4020-01U 14in. VGA colour monitor made by Mitac Int. Corp., Taiwan. R.J. Grounds, 101 Honeysuckle Way, Witham, Essex CM8 2XQ. 01376 510 881.

Wanted: Early colour TVs for restoration, in particular the Baird 700, Philips G6, Decca 30, ITT CVC1/2/5, Pye 691, GEC dual-standard and B+O 2000/3000. Also wanted LOPTs for these sets and the Philips K70, RBM CTV25 and Decca CTV25. Richard Gregory, 52 Gleave Road, Selly Oak, Birmingham B29 6JR. 01214 140 094.

Wanted: Front panel, steel top cover and remote control unit for the Akai VS8EK – or a complete non-working machine. D. Hodgkinson, 42 Victoria Avenue, Cliftonville, Margate, Kent CT9 2UB. 01843 297 276.

Wanted: Circuit diagram and any other information on the Ferranti Model T1002 TV receiver – a 405-line, channel 1 OAP! Bill Barrett, Stevina, Ludchurch, Narberth, Dyfed SA67 8JF.

Wanted: Circuit diagram for the Sinclair FTV1 pocket TV receiver (monochrome). W.G. Hall, 67 Selwyn Drive, Bishopsgarth, Stockton, Cleveland TS19 8XF. 01642 581 570.

Wanted: Circuit diagram for the Pioneer RT909 tape recorder. Ken Smith, 43 Lourdes Avenue, Preston PR5 5TB. 01772 321 709.

Wanted: Promax MC-360 TV and satellite level meter. Hugh Tamney, Bridge Road, Portumna, Co. Galway. 00 353 509 41324.

Wanted: Twelve-pin lead, or information on the connections, for the Ferguson 3V06 colour camera, also handbook or manual. Also I require a remote control unit for the Philips DMAC satellite receiver. Desmond Casey, Cloonloo, Boyle, Co. Sligo.

Wanted: Circuit diagrams for the Barco 9D33 RGB monitor (c. 1981) and 14in. SVGA CTX monitor Model CVP5468NI. Does anyone know the whereabouts of a company called Invertec, or a source of their i.c.s IVT001/2 for low-voltage fluorescent lamps? C. Raynor, 39 Northway, Lymm, Cheshire WA13 9AT. 01925 822 673.

For disposal: *Television* magazines from 1972 with colour receiver project; incomplete set with tube (useful for spares?) and test instruments required for construction. These items are free but must be collected (from Cheshire area). Please write to Olive Holbrook, c/o Television, Quadrant House, Sutton, Surrey SM2 5AS.

Wanted: Drawbridge PCB and fluorescent display PCB (VEP07598) for the Panasonic NVJ35. Drawbridge PCB part no. not known due to damage. John Andrews, 15 Gambier Terrace, Liverpool L1 7BL. 01517 098 917.

Wanted: Turntable drive belt for the Beomaster 900 stereogram Model 900-RGD, type 2219-4 serial no. 33930. Alternatively a 1m length of 1·2-1·5mm round- or square-section rubber belting. M.R. Tancock, 44 Gowing Road, Mulbarton, Nr. Norwich NR14 8AT. 01508 578 676.

Wanted: Service manual or circuit diagram for the Pioneer TA210L stereo receiver. E.T. Plumb, 44 Railway Road, Downham Market, Norfolk PE38 9EB. 01366 384 099.

For disposal: Tektronix 2225 scope for £300, and Gould OS4000 storage scope for £250. Phil Main, 75 Swan Lane, Hindley Green, Wigan, Lancs WN2 4HD. 01942 253 017.

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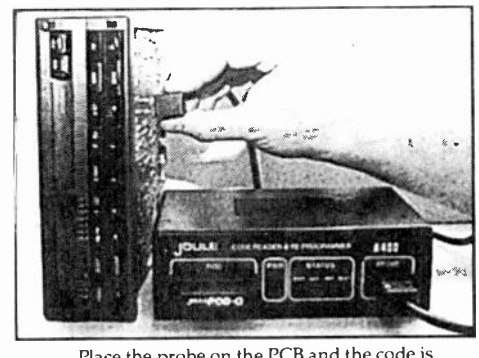

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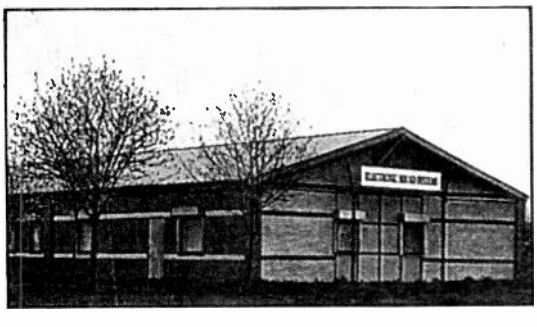

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VCR Signal Processing

In Part 5 of his series Joe Cieszynski describes the basic processes involved when recording a VHS chroma signal

Last month we provided a simplified outline of the VHS chroma record process and considered the basic problems involved, in particular crosstalk cancellation. This time we will look at the chroma record processing in greater detail. Fig. 1 shows in block diagram form a typical VHS chroma record arrangement. It starts with low-pass and bandpass filtering to separate the luminance and chrominance components of the composite video signal. Each subsequent block will now be considered in turn.

ACC

The automatic colour control section maintains the chroma signal at a constant level irrespective of variations in the input: it is in effect an automatic gain control circuit that uses the amplitude of the chroma burst as the measure of the basic signal level. The only time that the burst amplitude alters is when the amplitude of the composite video signal changes.

Some machines do not incorporate ACC, relying instead on the fact that variations in the input signal level will have been dealt with by the AGC system in the IF strip when an off-air signal is being recorded, or by the source machine's playback ACC circuit when the input is from another VCR or a camera.

Burst Enhancement

This is very often incorporated in the ACC circuit. We have shown it separately here in order to highlight its significance. There are two types of burst enhancement.

The first is burst extension, which is incorporated in some machines to counter the fact that only 1·4 cycles of burst are recorded on the tape once the chroma subcarrier has been down-converted to 627kHz. This is because 4·433619MHz (the PAL chroma subcarrier frequency) divided by 627kHz (the down-converted VHS chroma subcarrier frequency) results in a division factor of approximately 7·1. Thus the ten cycles of burst, divided by 7·1, give us 1·4 cycles.

Burst extension increases the duration of the burst signal beyond ten cycles prior to the frequency changing. This provides the playback APC circuits with a longer duration and hence more reliable signal. It also results in more effective recovery of the burst following down-conversion then up-conversion.

Burst extension is performed by a ringing crystal circuit: the incoming burst signal is used to drive a damped 4·43MHz crystal oscillator. Naturally the duration of the extended burst must not exceed the duration of the back porch period. As burst extension is not part of the basic VHS specification, it's not used in all machines.

The second type of enhancement is burst expansion, which is sometimes called burst emphasis. As the name implies, this is pre-emphasis of the burst signal. It's included, as with any other pre-emphasis, to improve the signal-to-noise ratio during playback. The low-amplitude burst signal is susceptible to playback noise (effectively tape hiss), especially after down-conversion.

The Colour Killer

To simplify matters we'll jump to the colour-killer stage before considering down-conversion. The function of the colour-killer stage is the same in a VCR as in a colour TV set. Many older machines include a manual switch to enable the user to select monochrome recording. This option is seldom included in modern machines, as the majority of users were unaware of its function. Manual colour-killer control is still included in machines that are designed for semi-professional editing.

Operation of the colour-killer circuit is generally based on the amplitude of the chroma burst.

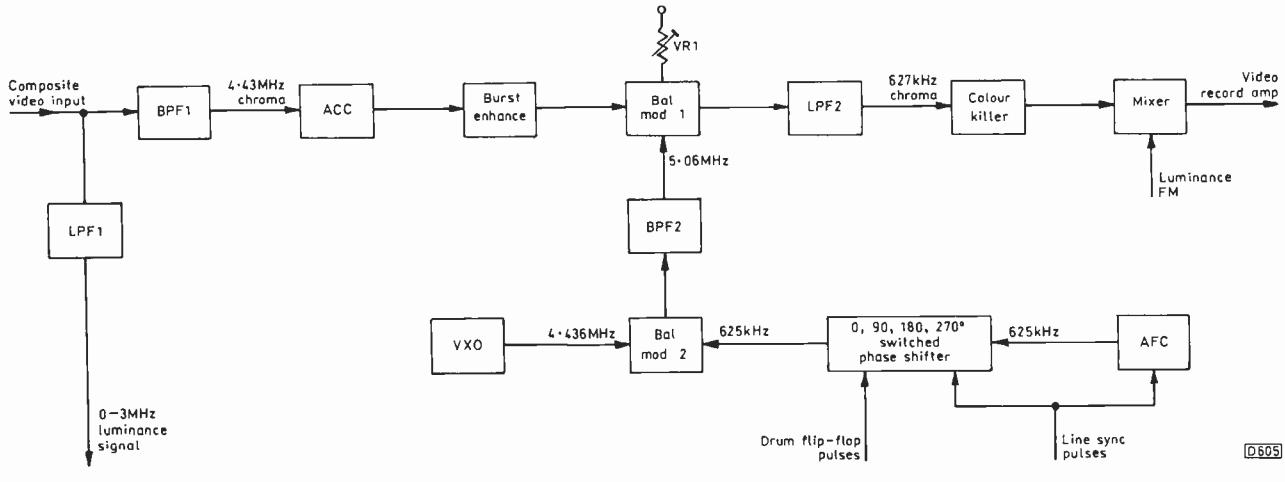

Fig. 1: Block diagram showing the signal processing carried out in a VHS chroma record channel, with down-conversion of the incoming 4·43MHz carrier to 627kHz.

Down-conversion

A VHS machine incorporates two heterodyne circuits, known as balanced modulators, to perform the down-conversion from 4·43MHz to 627kHz. Although they serve the same purpose, a balanced modulator is not the same as the simpler mixer circuit used in a superhet radio receiver.

The output from a mixer, see Fig. 2(a), consists of the fundamental (input and local oscillator) frequencies as well as the sum and difference frequencies. If such an arrangement was used in a VCR's chroma record channel the fundamental frequencies (f1 and f2) at the output would fall within the luminance FM passband. The result would be serious patterning on the playback picture. With a balanced modulator, see Fig. 2(b), the fundamental frequencies do not appear at the output, leaving just the sum and difference frequencies.

Balanced modulator 1 is often referred to as the main converter or converter 1. Balanced modulator 2 is often referred to as the sub-converter or converter 2.

The 'local oscillator' frequency required by balanced modulator 1 can be found by adding the incoming 4·43MHz to the 627kHz output. Thus the 'conversion frequency' is 5·06MHz.

Although we generally refer to the output as 627kHz, the precise frequency is in fact 626·952kHz. The reasons for this somewhat odd figure are complex. Put simply, it's necessary to provide correct frequency interleaving of the chroma signal sidebands to reduce cross-modulation with the luminance signal FM sideband components. If the required output is 626·952kHz and the input is actually 4·433619MHz, the conversion frequency comes out at 5·060571MHz – which is generally referred to as 5·06MHz.

This 5·06MHz is itself the sum of the inputs to balanced modulator 2, i.e. 625kHz and 4·436MHz. 625kHz is used because the signal must be a multiple of the line frequency (see following section). This fixes the output from the crystal-controlled oscillator (VXO) at 4·436MHz. Put precisely, 5·060571MHz minus 625kHz gives us 4·435571MHz, the actual VXO output.

In the VHS system the difference signal output from balanced modulator 1 and the sum signal output from balanced modulator 2 is used. The reason for this will become clear when we consider the playback process.

The Balanced Modulators

The 90° phase-shift circuit at one input to balanced modulator 2 must increment the phase of the 625kHz signal during the sync period, so that no interference is seen on the picture. This is the reason why the signal to be incremented has to be a multiple of the line frequency – so that it's synchronised with the transmission. The frequency chosen for VHS is 625kHz, which is forty times the line frequency. As we shall see in a moment, when we come to the AFC circuit, the 625kHz signal is locked to the line sync pulses.

The 4·436MHz input to balanced modulator 2 is generated by a free-running crystal oscillator. It's shown as a voltage-controlled crystal oscillator (VXO) in Fig. 1, but the DC voltage control is required only in the playback mode.

Fig. 1 shows a control, VR1, connected to balanced modulator 1. This is referred to as the modulator balance control. If the modulator is not correctly balanced, its output will contain the fundamental frequency components f1 and f2, resulting in severe playback picture patterning.

Filters

A filter is included at each of the balanced modulator outputs. This is necessary to select the required output, i.e. either the sum or difference. Thus low-pass filter 2 has a centre frequency of 627kHz while bandpass filter 2 has a centre frequency of 5·06MHz.

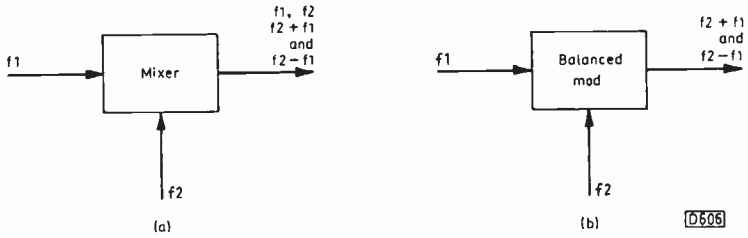

Fig. 2: The difference between a simple mixer circuit (a) and a balanced modulator circuit (b). With a balanced modulator there is no fundamental frequency (f1 and f2) output.

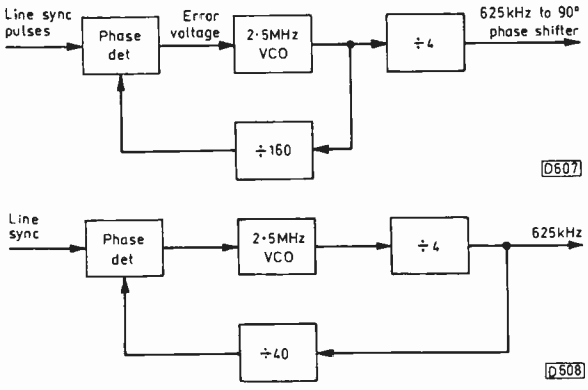

Fig. 3: A widely used AFC arrangement for generating the 625kHz signal.

Fig. 4: An alternative AFC circuit arrangement, with division by four then 40 in the phase-locked loop.

The Phase Shifter

This circuit is responsible for phase shifting the record chroma subcarrier, via the 625kHz signal, by 90° on each successive line during record/playback of the channel 2 signals (see crosstalk cancellation last month). The line sync pulse input increments the phase-shift switch, while the drum flip-flop input brings it into operation when the channel 2 head is in contact with the tape.

The AFC Circuit

The primary function of the AFC circuit in the record mode is to generate an output that's locked to the incoming line sync pulses. Two ways of doing this are shown in Figs. 3 and 4.

Fig. 3 shows a widely used arrangement with a 2·5MHz oscillator whose output is divided by four to give 625kHz prior to the phase shifter. The oscillator's output is also divided by 160 to provide one of the inputs to the phase detector, the other input being the line sync pulses. The error voltage generated by the phase detector locks oscillator's frequency to that of the line sync pulses. This is the same principle as flywheel line sync in a TV set.

The alternative arrangement shown in Fig. 4 operates in the same way as Fig. 3, the difference being in the frequency division arrangement.

In many machines the frequency of the 2·5MHz oscillator is adjustable. In this case the adjustment is critical and can be carried out only by using a frequency counter and the procedure given in the relevant service manual. Slight misadjustment of the AFC circuit will result in intermittent loss of colour, either with all tapes or perhaps with only the machine's own recordings.

The Mixer

This circuit is generally part of the FM record amplifier. It's where the down-converted chroma and the luminance FM signals are added together prior to final amplification and application to the record heads.

The chroma signal uses the FM carrier as a record bias, to lift it into the linear portion of the tape's BH characteristic.

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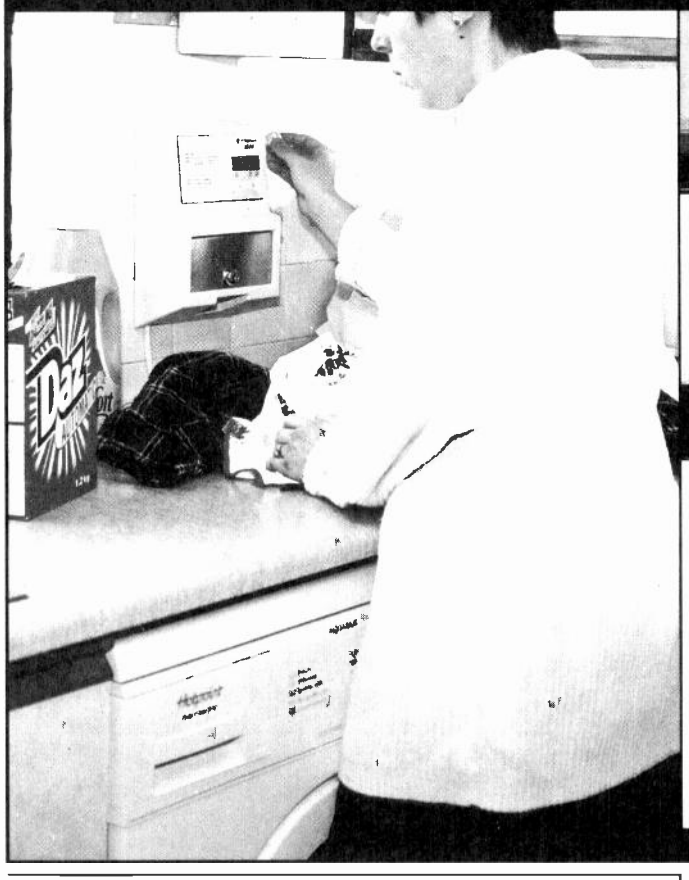

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The Problem of Pre-echo

Where the field strength is high, signals may be picked up directly as well as via the aerial system. These pre-echo signals can make viewing very difficult, can affect the sync and cause teletext and Nicam reception problems. Bill Wright on how to identify the problem and deal with it

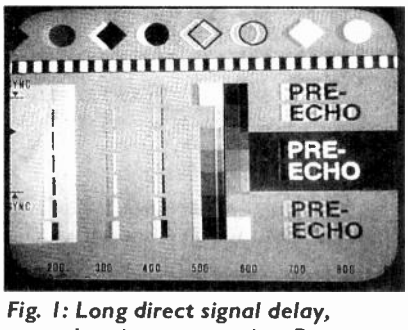

Fig. 1: Long direct signal delay, secondary image negative. Pre-echo-to-system signal ratio 0dB.

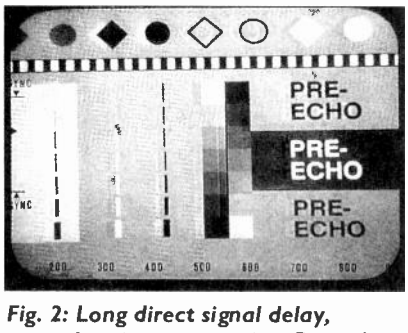

Fig. 2: Long direct signal delay, secondary image negative. Pre-echo-to-system signal ratio –9dB.

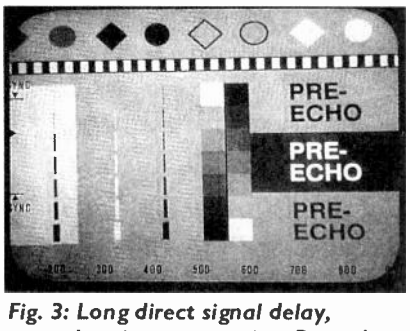

Fig. 3: Long direct signal delay, secondary image negative. Pre-echo-to-system signal ratio –18dB.

Picture the scene: a pleasant, modern development of forty bungalows for the elderly. Well-spaced semis, a nice community centre, a good type of tenant, a friendly atmosphere. Everything, well almost everything, is just fine at Sunset Gardens. There's one little problem however. A problem that, during the three years since the place was built, has gradually soured the relationship between the tenants and the housing association until finally – well let's eavesdrop on the warden talking on the phone to Head Office.

"Look, the fact is that Mrs Rabblerouser is organising a rent strike. . . Yes, I know – but they can't watch television properly Mr Watchpenny. They're so fed up I think they might just do it this time. . . Well, can't you send a different firm to look at it? Those you've been sending are absolutely useless. . . "

What's all this about then? The communal TV system at Sunset Gardens is simple and straightforward. There's an aerial, an amplifier, and an arrangement of trunk cables, tap-off units, downleads and outlet plates. The output from the amplifier is sufficient for every dwelling to receive a normal signal level. It's an area of excellent off-air reception – the high-powered local transmitter is about ten miles away, and because the ground slopes gently in that direction the mast can be seen clearly through most of the living room windows.

Direct Signal Pick-up

It's the strong signal in fact that's the cause of the trouble. In an area where the field strength of the local signal is high, the TV set and other components can pick up signal directly off air. This direct signal can be strong enough to compete with the signal provided by the aerial system. We call this pre-echo. It's surprisingly common and is the cause of a variety of strange faults.

The most obvious symptom is a ghost image. With normal ghosting, the interfering signal arrives after the main signal and thus produces a shadow to the right of the main image. But where the interfering signal is received by the TV set directly, it arrives before the aerial signal (hence the term pre-echo) and produces an image to the left of the main image. This shadow can be very strong, producing a double image that may pull sideways. Teletext and Nicam sound may be garbled. Moving the set or its leads even slightly will have a great effect on reception, because this affects the strength of the signal that's being picked up and its phase relationship with the main signal.

If the two signals arrive in phase, the secondary image will be positive. If they arrive out of phase it will be negative. Strong anti-phase signals may cause sync disturbances. An intermediate phase relationship between the two signals will produce a weaker secondary image, though the edges will often be strongly delineated. This is reminiscent of secondary ghosting – not surprisingly, since pre-echo and ghosting are both forms of multi-path reception.

The off-screen shots shown in Figs. 1-12 illustrate various pre-echo conditions.

Main Signal Delay

Two factors contribute to the main signal delay. One is the difference between (a) the distance from the transmitter to the receiving aerial and (b) the distance from the transmitter to the point where the unwanted signal enters the system. The latter is usually at or very close to the TV set. This factor can either add to or subtract from the total delay, because either the receiving aerial or the TV set may nearest to the transmitter (see Fig.13).

The second factor is the delay within the system itself. This can only add to the total delay of course. It will always exceed the value of the first factor, because the cable velocity factor is less than unity. In other words, the speed at which a signal travels along a coaxial

cable is slower than its speed through the air. A typical coaxial cable velocity factor is 0·8. In addition, cables rarely take a direct path from A to B. So, if you imagine a system where the aerial is at one end of the site, nearest to the transmitter, with a trunk cable then running more or less directly to a straight line of dwellings, there will still be a signal delay even though the distance over the ground from the transmitter to the TV set is virtually the same along both paths.

This all boils down to the following: of two images on the screen, the one on the left is always the direct signal since this arrives first. The one on the right is always produced by the signal that has passed through the system. Either of them may be the strongest, appearing on the screen as the 'main' signal with the other as the ghost. But it must be said that if the signal provided by the system is weaker than the direct signal, something is seriously wrong.

Effects at Different Sites

At Sunset Gardens the aerial is at the middle of the site (see Fig. 13). Pre-echo is quite unmistakable at the bungalows nearest the transmitter. The main signal's total delay is considerable here, since its path extends to the aerial and then back again. On a 55cm screen, the shadow is about 6mm to the left of the main image and is quite clearly defined. Towards the other end of the site, things aren't so clear cut – just a few bungalows away from the aerial. Here the pre-echo is hardly visible in its own right, because the time delay is so small. In fact the two images are virtually superimposed. But there is lack of definition, teletext is garbled, colour is weak and there are other symptoms. The effect looks something like the result of a severe impedance mismatch or a cable termination fault.

In a high-rise block, pre-echo is likely to be a problem only at the side of the building that faces the transmitter (see Fig. 14). The system delay is usually short. As the outlets are more or less directly below the receiving aerial, the only delay is introduced by the trunk cable. There are normally a number of these, each dropping straight down via a vertical stack of outlets. With a ten-story building, each trunk will be only about 40m long. Pre-echo is less likely to be visible towards the end of the bunks, near ground level. Padded outlets with integral tap-off units are commonly used, so there's no downlead delay.

Pre-echo can be savage on the higher floors of high-rise buildings, where there are very strong direct signals and the sort of very short delay factor that wipes out teletext and horizontal definition. At the top floor the delay may be so small that the phase relationship between the signals produces simple additive or subtractive effects on signal strength. It's sometimes possible for a TV set to be taken from a good picture to almost nothing and back again simply by rolling it half a metre across the carpet, as the phase relationship between the two signals changes. This can result in some very unlikely sounding calls, such as the recent "it's a good picture with the TV set facing my husband, but not when it faces me!"

Pre-echo will not show up – unless the downlead is damaged – in the normal domestic setting, where one aerial feeds one TV set via one length of coaxial cable, because the aerial signal will always be much stronger. In an area with moderate field strength, the effect of a damaged downlead would show up as a snowy picture. In a 'swamp' area, the main symptom produced by a damaged downlead might be picture flutter when a bus goes past the living room window. No secondary image is visible on the screen because the delay is so small, but reflections from the body of a large moving vehicle can result in rapid phase variations at the TV set.

The same effect can occur with small domestic distribution systems, should the signal level from an outlet be much below the level that would be obtained directly from the aerial. If this sounds odd, remember that in a strong signal area a signal that arrives at the TV set directly may give noise-free reception although it's 20dB below the aerial output.

Back at the Ranch

Wyatt and Roy are two good-natured blokes who rig aerials when the ice cream round isn't busy. Roy is the boss, because it's his van. He lives two streets away from Sunset Gardens. He and Wyatt had been on hard times, and couldn't believe their luck when the girl at Head Office found their names in the Yellow Pages.

Since then the light blue and cream Transit van bearing their hand-painted and misspelled boast "Earp and Rogers – Ariel Experts" has been a frequent visitor to the Gardens. The Tranny is probably the only aerial rigger's van in the UK to have musical chimes. But Wyatt and Roy haven't done a thing to improve reception at the bungalows. On each visit they have tinkered ineffectively. They have then submitted their account, which dozy fools at Head Office have paid without question.

During one of his first visits Roy was behind a TV set fiddling about with the aerial flylead. He was intrigued to discover that simply moving the lead affected reception. With the lead in one position, the annoying shadow almost disappeared from BBC-1. But when he tried the other channels it was worse. After some further experimentation, which was fruitless in terms of both practical results and an increase in his understanding of the phenomenon, he accidentally unplugged the flylead from the wall plate.

"Oh, that's better!" chorused Gerry and Mavis. Gerry put his other glasses on, squinted at the screen, and pronounced with all the quavering gravitas of his 83 years "that's the best picture we've ever had young man".

"Well no Dad, I don't think it's as good as when we lived at Acacia Avenue" said Mavis.

"Of course not" snorted Gerry, "I mean it's the best we've ever had here." After a moment's reflection he added, as if stating the obvious, "we'll never get it as good as it was at the Avenue".

The picture was now snowy, but the awful

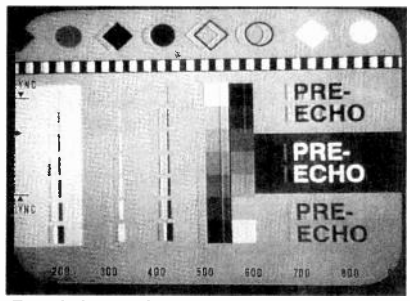

Fig. 4: Long direct signal delay, intermediate secondary image. Pre-echo-to-system signal ratio –9dB.

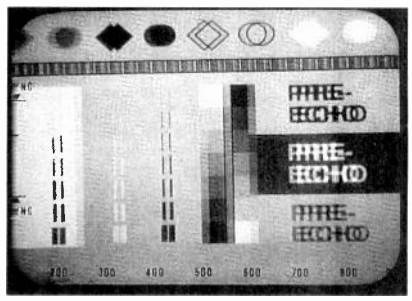

Fig. 5: Long direct signal delay, secondary image positive. Pre-echo-to-system signal ratio 0dB.

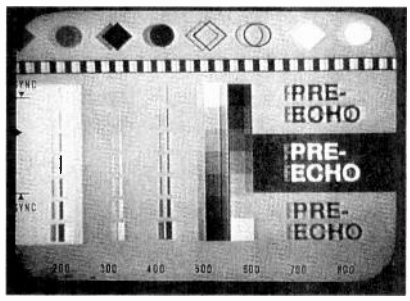

Fig. 6: Long direct signal delay, secondary image positive. Pre-echo-to-system signal ratio –9dB.

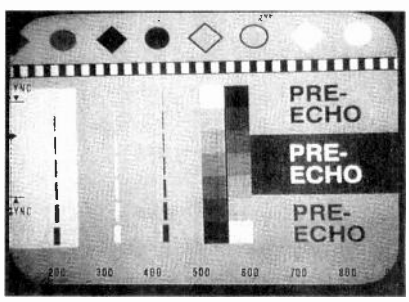

Fig. 7: Long direct signal delay, secondary image positive. Pre-echo-to-system signal ratio –18dB.

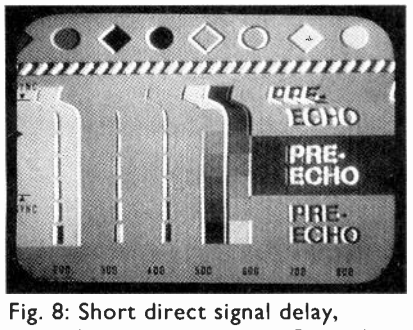

Fig. 8: Short direct signal delay, secondary image negative. Pre-echo-to-system signal ratio 0dB.

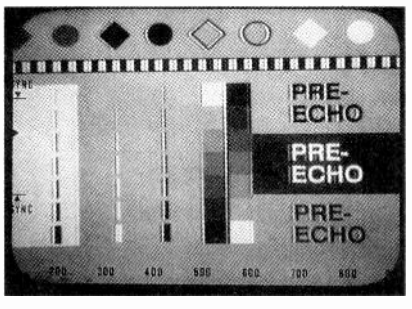

Fig. 9: Short direct signal delay, secondary image negative. Pre-echo-to-system signal ratio –9dB.

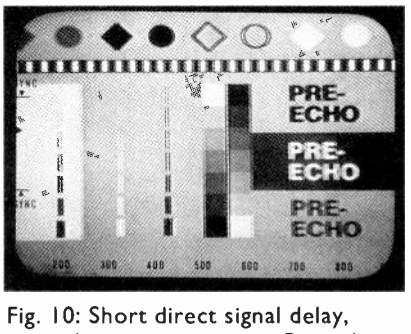

Fig. 10: Short direct signal delay, secondary image positive. Pre-echo-to-system signal ratio 0dB.

double-vision effect had gone. Now disconnected from the aerial system's delayed signal, the set was picking up only the weak signal from the cheap white flylead.

Had Roy thought about it, he could have touched a screwdriver to the end of the flylead and, standing where he was near the window in full view of the half-megawatt transmitter, shown Mr and Mrs Attrick a fairly good picture. But he didn't think of it. Muttering something about a "faulty booster", he left the flylead unplugged and made his escape.

A few days later the Attricks' son gave them a set-top aerial. This provided a great improvement on anything that had gone before, but the picture fluttered when traffic passed the bungalow – which was almost all the time.

Signal-to-Noise Ratio

In the end, like a lot of other things in this game, pre-echo boils down to the relative strength of two competing RF voltages or fields. The only significant difference between them is in this case their exact time of arrival. We can nevertheless think in terms of the traditional signal-to-noise ratio, just as we can with conventional ghosting.

We strive to increase the signal-to-noise ratio in two ways. First, we cultivate the signal assiduously, giving it every encouragement to grow big and strong. Secondly we pour weedkiller on the noise and let the dog bury his bones amongst its roots, in the hope that it will wither and die. We will deal with these in turn.

Increasing the System Signal

The first aim is the normal requirement with every system: that the signal level at each outlet is adequate. Where pre-echo is a possibility however this requirement is writ very large. In this case adequate doesn't mean the usual 0 to +6dB/mV. The likely strength of the direct signal has to be taken into account. When pre-echo is present, it will vary from outlet to outlet, because the screening from the transmitter will vary. But there's a useful rule of thumb. It applies where some or all of the TV sets are screened from the transmitter by only a few brick walls or the equivalent, and assumes that the flylead etc. is up to standard

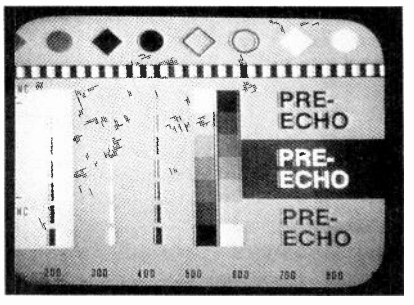

Fig. 11: Short direct signal delay, secondary image positive. Pre-echo-to-system signal ratio –9dB.

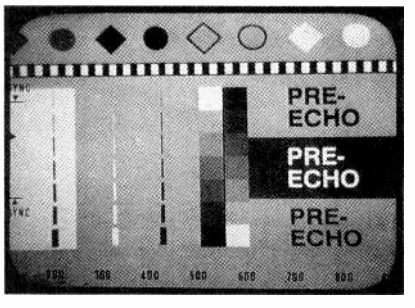

Fig. 12: No pre-echo.

(see Part 2). Measure the signal received by a good 18-element aerial mounted with a clear line of sight to the transmitter. If the signal is above 35dB/mV, pre-echo is probably going to be unavoidable unless channel changers are used. Below 35dB/mV, you're in with a chance. Proceed as follows.

Subtract 15dB from the reading. This gives the minimum signal level that should be available at each outlet, and must be above +6dB/mV. As an example, the line-of-sight aerial signal picked up from Emley Moor at fifteen miles from the transmitter, in the direction of maximum ERP, is about +27dB/mV. Each outlet therefore needs at least +12dB/mV (27 – 15dB/mV). This is a lot of signal, but is typical of the levels required to overcome pre-echo. With a system of moderate size it can usually be achieved at not too great a cost.

System planning is outside the scope of the

Fig. 13: Pre-echo at a bungalow complex. The signal path within the system, from the aerial to the TV set, can be surprisingly long – much longer than might be suggested by the across-the-ground distance. For example, distance A may be only half the equivalent distance through the system. Where detached or semi-detached houses are linked by underground cables, the lengths that rise up the cavity wall can often double the total run. This has two consequences for pre-echo: the image spacing will be greater, making the condition more noticeable; and signal loss will be worse than might be expected, with the result that the secondary image is stronger.

At No. 12 the secondary image is some distance from the main image, because the main signal travels to the aerial then back to the set. The two delays add. At No. 20 the two images are quite close, the delay being simply the difference between the delay in the air and the delay in the system.

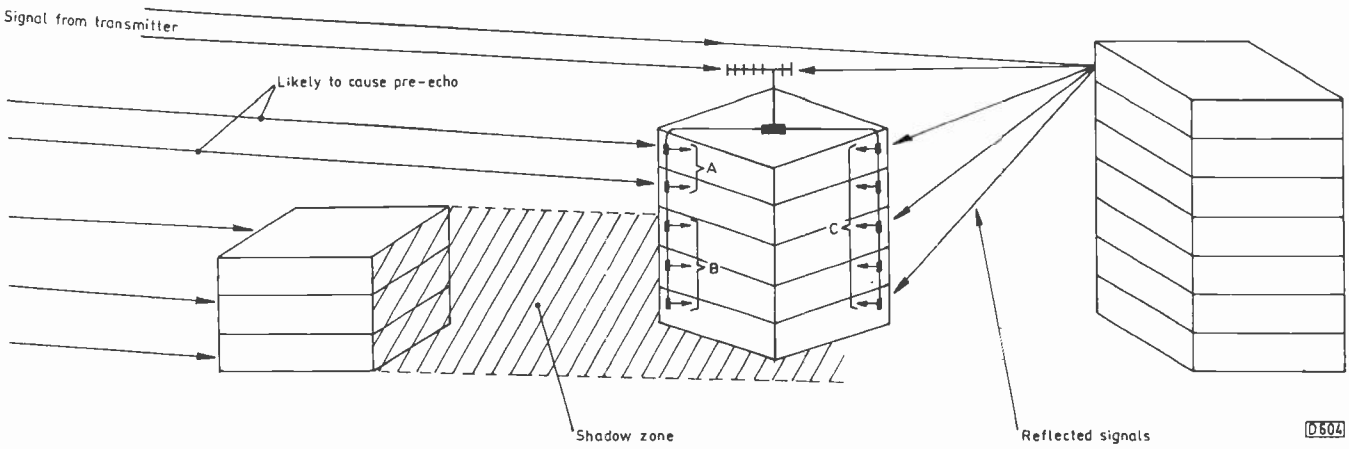

Fig. 14: Pre-echo with a high-rise development. Nearby buildings can greatly affect the likelihood of pre-echo at any particular flat. A pre-echo likely, B pre-echo unlikely because the nearby building provides screening, C pre-echo possible if the reflected signal is very strong – a strong reflection from a nearby building can cause a sort of post-pre-echo (the reflected signal via the aerial will give rise to conventional ghosting of course).

present article, but a brief word is appropriate here. If the system is new, the planning should take these final output requirements into account. Thus if you go out to price a new job, consider the possibility of pre-echo. Virtually every component will be affected if you have to allow for pre-echo: the tap-offs, cable grades, repeater positioning and head-end output.

With an existing system where the original installer hasn't allowed for pre-echo (a very common occurrence), the best approach is to consider how signal levels can be increased sufficiently at minimum cost. The head-end output levels should be set at a safe maximum (don't be tempted to overdo it), though it's unlikely that this will be sufficient by itself. Wholesale replanning and rebuilding is likely to be expensive, as is replacement of every tap-off unit. Almost inevitably some tap-off units will have to be changed, but careful use of repeater or line-extender amplifiers can often keep this to a minimum.

It's quite likely that the system planning will have been optimistic, which means that signal levels will be low throughout, especially so at outlets near the end of a tap-off line. In such a case you may have to install line-powered repeater amplifiers somewhere along each tap-off line. It should then be unnecessary to alter the tap-off values following the repeater. Where necessary the tap-offs between the head-end and the repeater – there are unlikely to be more than four or five – can be exchanged for ones of lower tap value. The reduced signal levels that this will cause farther down the line can be compensated for at the repeater, whose gain will normally be 10 or 20dB.

The practical approach is to proceed down the line from the head-end, checking levels at each tap-off and fitting new units of lower value where necessary. When the point has been reached where levels on the tap-off line are appropriate, fit a repeater. Typically, a repeater with a gain of 10dB should be fitted at the point where its output will be 25-30dB/mV. Within limits, repeaters can be cascaded along the tap-off line.

The above assumes that the system is in reasonable condition. If it is hopelessly outdated or badly installed, pre-echo is likely to be just one of many reception faults. The steps necessary to bring the system up to scratch may well cure the pre-echo without this problem requiring any special consideration, though it's always as well to bear pre-echo in mind when selecting components and planning signal levels.

In Part 2 next month we'll consider ways of decreasing direct signal pick-up.

Answer to Test Case 399

– see page 339–

The Test Case workshop and its leading light, TechnoCrat, thought that they had the Tatung 165 series chassis sussed out by now: hundreds of these sets had passed in and out, after having had their ills cured. On the odd occasion however something with which one is not familiar can spring a surprise. So it was in this instance.

The diagnostic process continued with the aid of another, fully-working, 165 chassis and its remote control unit. A substitute feed was taken from the good set to the microcontroller chip in the faulty one. Remote control was then o.k., with a quick response to remote commands from a good distance. This eliminated the micro chip and several other things. Only when the complete IR receiving front-end assemblies were interchanged between the two sets did the cause of the trouble become clear.

Clear is the key word in fact because, unusually, Tatung fits an optical filter in front of the IR detector diode. It consists of a block of translucent plastic that's downstream in the light path from the red IR filter at the front of the cabinet. In this set the block had become cloudy with poor light transmission, perhaps because of crystallisation. All that effort, testing and toing and froing for the sake of a small lump of plastic!

Alberice Meters

To mark its 40th anniversary, Alberice Meters Ltd. has introduced a "pay as you wash" model for use with washing machines. The new 3500 meter has been developed to complement Alberice's Teletime "pay as you view" meters, which are extensively used by TV rental companies – including Thorn EMI (Radio Rentals).

Both meters take £1 coins. Remaining credit is shown is minutes and seconds by an LED display, and credit time can be preset. A money counter is incorporated to help counteract theft: the counter records the total amount of money inserted since the meter was last emptied, resetting each time the cash box is emptied. The meters are designed so that they do not stand out in the home.

Amongst the features built into the new 3500 meter is a facility to record the use of the washing machine. This is a help when working out servicing and replacement schedules.

Alberice Meters Ltd. is based at 87 Sterte Avenue West, Poole, Dorset BH15 2AW (telephone 01202 674 272).

Camcorner

Reports from David C. Woodnott

Samsung VCE805P

We initially thought that the cause of the two faults with this camcorder might be the same. There were no camera E-E or electronic viewfinder pictures, just a white screen. In the playback mode the AV picture was o.k. but there was still no EVF picture, just the white raster. Loss of the E-E picture was caused by the camera control chip being locked up – remove and replace the back-up battery. The viewfinder problem was causedby VR701, which was open-circuit. It's part of a composite resistor assembly.

Sony CCDTR105E

Intermittent recording and playback was the complaint with this smallest of small (so far!) camcorders. When we tried it out in the playback mode we noticed that the drum speed varied, producing the symptom. The cause was simply an ill-fitting connector between the drum motor and the main PCB. On subsequent test however the unit failed completely! The capstan drive chip had given up. Ah well, a replacement chip is not too expensive. It was a good job we'd given a reasonably high estimate.

A few days later the unit was brought back because "it failed to operate at all". Although it had been checked and found to be o.k. as part of the service, the take-up guide assembly had fallen apart. Fortunately it was possible to re-attach the detached roller guide with Loctite without dismantling the unit. After a long test it went back to its owner again. I am now working with my fingers permanently crossed, which is not easy!

Ferguson F801/Hitachi E10E

When an attempt was made to rewind a tape this machine would shut down after a few seconds. If rewind search was requested in the play mode however all was well. Every other function worked normally.

Checks on the supply and take-up reel sensor signals showed that the output from the supply sensor was at only half the correct amplitude. In addition the leading edges of the squarewave pulses were rounded off. The mechanism has to be dismantled to replace a reel sensor. While the operation is not too difficult with this model it's still time consuming. And of course the replacement didn't alter either the amplitude or shape of the supply-reel sensor signal. Oh well!

Various checks were then carried out around the 'trouble-detect'chip IC907, all to no avail – even cold tests brought us to a dead end. We decided to compare the supply and take-up sensor input circuits at PG905 on the main board, and found that there was a measurable capacitance to chassis at pin 9 (supply input) but no such capacitance at pin 6 (take-up input). It was then a simple (?) matter of tracking down the cause of the pulse level reduction and rounding. The culprit turned out to be C101 (220µF, 6·3V), which of course is not connected to the sensor circuits in any way: it merely bridges the print that carries the sensor signal.

Sony CCDF380

There was no E-E picture and the playback picture disappeared when the DATA button was pressd. The cause of the failure was traced to the camera function microcontroller chip IC651 on board CK19P

JVC GRC7E

This oldie lost its E-E picture intermittently. The cause of the fault was not in the camera section but on the YC board, where R49 was dry-jointed. As a result there was intermittent video muting. The resistor was under one of those large lumps of JVCgoo.

Panasonic NVG202

The electronic viewfinder pictures were dark. The cure was to replace the scan transformer assembly.

Sony CCDTR750E

This Hi8 unit came in with a list of faults. They included an intermittent viewfinder picture, eject sticks, and no record or playback colour. All these symptoms were caused by the fact that the unit had at some time been dropped. As a result, various connectors had parted company with their respective PCBs. This included the separate chroma processing PCB, which had become completely detached from the main board. Carefully refitting the connectors cured the various faults – fortunately there was no damage to the PCBs.

Panasonic NVR50A

This camcorder powered down almost immediately after powering up. Previously to this it had apparently lost its digital functions, which are controlled by a rotary knob below the lens assembly. Both symptoms were caused by dry-joints at connectors on the main and MDA boards. We had to refit the connectors that link the twoPCBs – the digital function connector had in fact becomecompletely detached from the PCB.

Sony CCDTR45E

The E-E picture would occasionally disappear and then return. All other functions were o.k. After a look around for dry-joints we decided to check the iris mechanism, as there have been problems in this area with these camcorders. When we opened the iris manually there was an E-E picture, but it was not up to the normal standard. In addition there was no autofocus or zoom operation in this condition.

We checked for a missing supply, but they were all present. Checks around the camera control chips then revealed that the signal on the SCKL line was present but of low amplitude. This line links IC611/2/3. A resistance check to chassis produced a reading of 213Ω. We eventually traced the cause of the trouble to C648 (100µF, 10V) which had leaked over CN304, tracking between the GRND and SCKL pins. A replacement capacitor along with a clean up of the area around CN304, which had to be removed, restored normal operation.

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What *a Life!*

Donald Bullock recalls the Luxor set that wore him down – with a little help from his customers

As our VCR had been taken over by our two youngest children, I arranged for Santa Claus to present each with an Alba VCR7200 for Christmas. When they arrived I rather liked the look of them. So much smaller than many others, very well styled and bristling with features that even I might be able to cope with – given time.

One reason for chosing Alba was that the company has been particularly helpful whenever we've had servicing queries or needed circuit diagrams. With so many manufacturers nowadays, the dealer is on his own unless he has a substantial account with the maker.

The Good and the Bad

The day started off all right, with the Reverend Goode giving me a raffle ticket.

"Just one left. Number 13. Somehow can't sell it. Can't think why. We're going to make the draw this afternoon."

It was the Luxor set that wore me down as the day went on. Mind you the Bush 2020 had weakened me. And when I was at my lowest the crowd started to come in.

The Luxor was a 18067849 – a nice easy model number. It was brought in, while I was wrestling with the Bush 2020, by the local character who looks like the Pied Piper gone wrong. He stood puffing and blowing for a while, then pursed his lips to produce a tiny, thin voice.

"It's lost. . . it's lost its. . ." He rubbed his brow. "It's lost. . ."

"It's memory?" I bawled.

"Yes, yes!" he piped, "that's it, it's lost its. . er. . "

I drew a card towards me. "Name?" I said.

"Luxor" he replied. So I wrote down "Luxor" and waved him out.

Isn't Daddy good to buy us a video each. Shall we have a look inside and see how it works . . .

Trials and Tribulations

For most of the time the Bush 2020 had no proper colour, just random flashes of colour over a monochrome picture. But as soon as I got near it with a meter or scope the colour returned. The sound was all right. I'd changed all sorts of things, including the TDA3562A colour decoder chip, but had got nowhere. So I decided to look at the Luxor, in the hope that I'd be able to mend it quickly.

I popped the back on the Bush, slipped it on to the soak test bench and left it running. Up came a perfect colour picture. . . I then managed to tune in a picture on the Luxor set, at which point a reptile wearing a cravat bounced in with a VCR and a portable TV set. It seemed that he had just been wound up.

"Bought this from Crubb's Foodstore, chum" he breezed. "Right price too. And a year's supply of caraway seeds, and forty plastic cups. They said you're the chap to tune them together. Said it takes only a few seconds."

I hissed an evil word in his ear and he raced off, looking daggers at me over his shoulder.

Back to the Luxor. As I didn't have a circuit diagram it was a matter of surmising and trying. An hour later I was no further forward, so I put it aside and took the Bush set back.

The colour was still there, and I couldn't get rid of it – not with the hairdryer, the freezer, a selection of bad language or a bout of violence. I put it back on soak test and returned to the Luxor set.

A GoldStar CIT4785

Then Mr McGorickle danced in with a GoldStar CIT4785 14in. portable. He put it on the bench, brought up his arms and started to wave them to and fro.

"It's gone all like this" he said, "all like this."

I waved him off and tried the set. The screen displayed a milky raster with flyback lines. Sound was o.k. Steven came in and I thought I'd consult with him.

"There's vision trouble with this GoldStar" I said, "but the sound is all right. Now if you think of the signal path, the sound and vision travel together until they get to the end of the i.f. strip. The fact that the sound is o.k. though the vision is bad points to. . ."

"It's the TDA3560 chip" Steven cut in. "I'd fit a TDA3561. That'll cure it."

I did and it did. One up to Steve. Puffed up loon, I thought, he's getting like Greeneyes.

The Bush and the Pye CTX-E

I turned once more to the Luxor set, suffered a while, then had another go at the Bush. Maybe there was a print break somewhere around the TDA3562A chip. As I looked for my huge illuminated magnifier, Steve glanced at the screen.

"Break in the panel around the TDA3562 chip I expect" he said, "had one like it the other day."

I tapped and flexed the board in the vicinity of the chip and found that I could make the colour come and go, especially when I was working around the key end of the chip. Then, homing in on it, I found a break in one of the tracks. Remaking the connection with a jumper lead cured the fault. At least that one had been put to rest.

Meanwhile Steve had pulled a Pye 43KT2196 on to the bench.

It's fitted with the Philips CTX-E chassis. When he switched the set on the colours were all wrong. A ploughed field was green, so was the post office van. The grass was red.

"Had this before" he said, "it'll probably be coil 5153." But he got nowhere. "Seems to be ident trouble" he said.

"No it's not" I said, noticing that the sky was purple. "Take out the degaussing posistor and rattle it." Sure enough one of the tablets in the posistor had crumbled, the odd picture colours being the result of the tube's severely corrupted purity.

Some VCRs

"Can't be much" said Mr Hardshaw as he popped his JVC HRDX22EV VCR on the counter. "Only I'm a pensioner, and the missus has gout. Have a look and give me a ring, then we'll see."

This machine remains in the fully laced-up position when in the stop mode: it unlaces only for eject, fast forward and rewind. The complaint was that it occasionally left a loop of tape that would get caught up when the cassette was ejected. The capstan, which should have turned at the last second to activate the mechanism, didn't do so – because the mode switch didn't tell it to. It was dirty. Cleaning it cured the trouble, and while we were at it we made sure that the screws which earth the mode switch panel were tight. With early models the panel isn't properly earthed if they are not tight, giving rise to the came trouble.

Just then Miss Peach glided in with her Panasonic NVL25B. "Can one of you clever gentlemen tell me why it has died?" she asked. Steve went straight to the power pack and checked C9, a 1µF, 400V electrolytic. It was open-circuit. Once a replacement had been fitted the machine was back in health.

As she departed, Greeneyes came in with our tea. "What an awful looking girl!" she said.

"I know, terrible" I replied.

Incidentally we always fit a capacitor rated at 105°C in this position now, after some earlier bounces.

The Luxor Finale

The day was wearing on and the Luxor was still there. It wasn't much fun trying to deal with it without the circuit. I spent more time getting nowhere, then I got around to taking out the front panel. Behind it I found a PCB with a 1·2V back-up cell that had died. A replacement cured the trouble. As I was boxing the set up the piper returned.

"I've got it done" I said. "It turned out to be a tiny battery behind the front panel."

"Thought it would be" he replied, dropping a one pound coin on the counter. "It's happened before."

That Evening

"I can't understand why you get so nasty over these sets and customers" Greeneyes said that evening.

"Can't you really?" I retorted. "I've had a frustrating day with nearly twenty awful sets and just as many prats. It's now twenty past eight and I still can't be sure I've finished. That phone might go at any minute. It did.

"Sorry to ring so late, Mr Bullfight, but you mended my sister's husband's set in 1965. He's dead now, and she married a Turk. But they've a lovely cat and they now live in Wimbledon. She's put a bit of weight on, but haven't we all? Ha, ha, ha. What I rang to ask about is this. Which really *is* the best set?"

I said a certain word to the phone and put it down. Then it went again. It was someone in a noisy pub.

"I've just bought a shet offofa mate Mr Blooper. And I'm gonna let you mend it. I'll be with you as soon as I can get a push in my car. You can give me a push to get me going again, can't you?"

Another naughty word and the phone went dead.

Then the doorbell rang and a shifty gent in a mac poked his head around the door.

"Sorry to call at the house" he said, "but that set you mended last June wasn't really right when we had it back. We kept hoping it would settle down, but it's gone again. Can you look at it now? Only we wants to see the Chain Saw Massacre afore we goes to bed?"

I had a word in his ear and he quickly departed.

The phone rang again. I snatched it up and snarled.

"Oh, er, sorry" said the voice of the Reverend Goode. "I've dialled the wrong number! Sorry to have troubled you. It was Mr Bullock I wanted, to tell him he's won the raffle. I'll try again." ■

Setting up PCs

Your PC may need setting up should relevant information be lost or need checking or updating. Anthony Grizzle describes the steps to take

This article describes how to set up an IBM-compatible personal computer (PC for short). Three reasons for wanting to know how to do this are:

(1) The PC has lost its set-up information and needs resetting.

(2) The set-up information needs to be modified because, for example, hardware has been added to the PC.

(3) The set-up information needs to be checked because, for example, the PC isn't 'booting up' properly.

What do we mean by set up? Let's start by looking at what happens when a PC that uses the Microsoft Disc Operating System (MS-DOS) is switched on. When power is applied, the PC goes through a self-test procedure called POST (Power On Self Tests). This is a set of diagnostic routines that verify correct operation of the PC's hardware, i.e. the chips and electronics on the mother board, including the DMA (Direct Memory Access) and interrupt controllers, the memories (RAM, ROM and CMOS), the timers, the keyboard, the adaptor cards, the display sub-system, the input/output ports (parallel, serial and games) and the hard and floppy disc drives. If all is well, the end of the POST is followed by initialisation of the hardware by the BIOS (Basic Input Output System – see below).

Boot up

Once the POST has been completed successfully, the machine starts to 'boot up'. This involves the following steps. System files IBMBIOS.COM and IBMDOS.COM (in later DOS versions they are called IO.SYS and MSDOS.SYS) are sent to the RAM from the hard or floppy disc. The PC then searches the root directory (C:\) for a file called CONFIG.SYS. If it's present, it contains information on such things as how large the system stack should be, the maximum number of files that can remain open at a time, and the directory location of additional device drivers in the system (such as memory managers, mouse drivers, etc.). After this the system loads the third and final system file, the command interpreter COMMAND.COM. The last stage of the boot up is a search (in the root directory) for a file called AUTOEXEC.BAT: if it's found, the commands in it are carried out.

This completes the boot-up sequence. The PC is now ready for use. The time between switching on and the completion of the boot up is usually less than a minute, but depends on the complexity of the set up and the AUTOEXEC.BAT file commands that have to be carried out.

The CONFIG.SYS and AUTOEXEC.BAT are not system files: they are referred to as the start-up files and can be altered by the user, i.e. the user can choose what commands etc. to put in them. In fact the user has an option as to whether to have them in the PC. The PC will work without them, but with reduced effectiveness.

The BIOS

The BIOS (Basic Input and Output System) is the program that, in addition to other duties, runs and co-ordinates the POST, initialises the hardware and boots the PC. It's held in ROM on the PC's mother board and is separate from the operating system (MS-DOS).

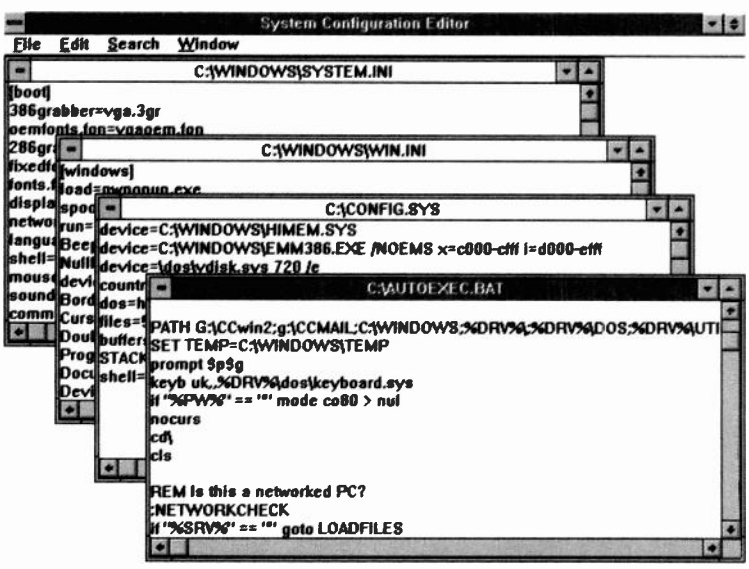
The set-up memory

PCs are designed so that several parts within them can be changed and/or others added. The owner may for example wish to change the hard disc to a larger sized one (called upgrading the hard disc), or may wish to change the video mode display system from say EGA (Enhanced Graphics Adaptor) to VGA (Very enhanced Graphics Array). This will involve changing the video adaptor PCB (usually referred to as an adaptor card in computer literature). He may also wish to add an extra floppy disc drive.

The BIOS needs to be informed of changes such as these, so that when it carries out the POST (whenever the PC is switched on) it knows what hardware is installed. Details of user-changeable hardware are held in the set-up memory, which is examined by the BIOS each time the machine is switched on.

The set-up memory must have at least two characteristics:

(1) It must be modifiable, i.e. it must



Within the Windows system folder, there's a little-known but useful piece of software called sysedit.exe. It brings up autoexec.bat, config.sys and both Windows initialisation files ready for checking and editing, and even has its own icon.

have a write as well as a read capability.

(2) It must remember its contents even when the power is switched off (this is referred to as being non-volatile).

The first requirement is met by using a RAM type memory (a Random Acces Memory), the second by connecting a battery to the memory.

For long battery life the set-up memory uses CMOS chip technology. This has resulted in the alternative and more commonly used name 'CMOS memory'. The CMOS memory chip and its battery are to be found on the mother board.

If the PC is not used for a long period of time (say several weeks), the battery will lose its charge and the set-up information will therefore be lost. To restore this information, the user will have to gain access to the set-up: we will look at this next.

Set-up access

The access method varies with different PCs and manufacturers. There will be either a sequence of key depressions that have to be carried out during the boot up, or a program that has to be loaded from a disc in order to start the set up. The following are common key-depression sequences:

(1) Hit the 'Del' key a number of times (say two or three), or

(2) press the 'Esc' key, or

(3) press the 'Ctrl, Alt and enter' keys at the same time.

With some PCs, for example certain Dell machines, you can reach the set-up after PC booting. With some others access for setting up is possible only by loading an external program held on a hard or floppy disc: Compaq and Wang PCs are in this category.

How do you know that you have reached the set-up successfully? The screen shows a message to say so!

Setting up

The set-up process is normally divided into elementary (basic) and advanced stages. Never fiddle with the advanced set up unless you know what you are doing – incorrect settings can make your PC unusable. For basic setting up the user is normally presented with the following questions, with spaces in which to fill the correct answers:

(1) The current time of day.

(2) The current date.

(3) The type of hard disc installed and its parameters.

(4) Whether a second hard disc is installed and if so its parameters.

(5) The type(s) of floppy disc drives installed.

(6) The amount of RAM installed in addition to the basic RAM. The additional memory is also referred to as an 'extended' memory.

(7) The type of video display adaptor card fitted.

(8) Whether a second CPU (Central Processing Unit) is fitted – this is called a maths or numeric co-processor.

Once the correct answers have been supplied, the user can save the contents (by pressing a designated key that will be identified on the screen – usually function key F10) then reboot the PC by following the Y/N (Yes/No) prompts on the screen.

There is usually provision to correct any mistakes made on the set-up screen by moving the flashing cursor (using the up/down/left/right navigation keys) to the error and correcting it. There is always the option of saving the new settings or discarding them and retaining the previous ones.

If, either wittingly or unwittingly, you get to the advanced set-up screen then alter values here and come unstuck, there's the option to 'leave without saving' or 'reset parameters to default (i.e. the factory) settings'. The advanced set up provides options such as turning on or off shadow ROM, memory paging and memory parity error checking.

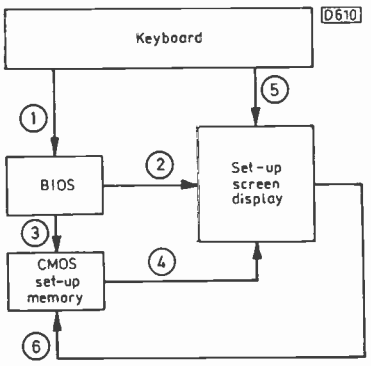


Fig. 1: PC set up alteration, the sequence of events. The user presses keys that (1) instruct the BIOS to activate the set-up program, which (2) produces the set-up screen display. The BIOS also (3) instructs the CMOS set-up memory to (4) display its contents on the screen. If necessary, the user (5) types in new values that appear on the screen. These are (6) sent back to the CMOS memory where they replace the previous values.

There are normally 47 different types of hard drives that the system knows about. These are referred to as drive type 1, drive type 2, etc. The idea is to select the drive type that matches the installed hard disc.

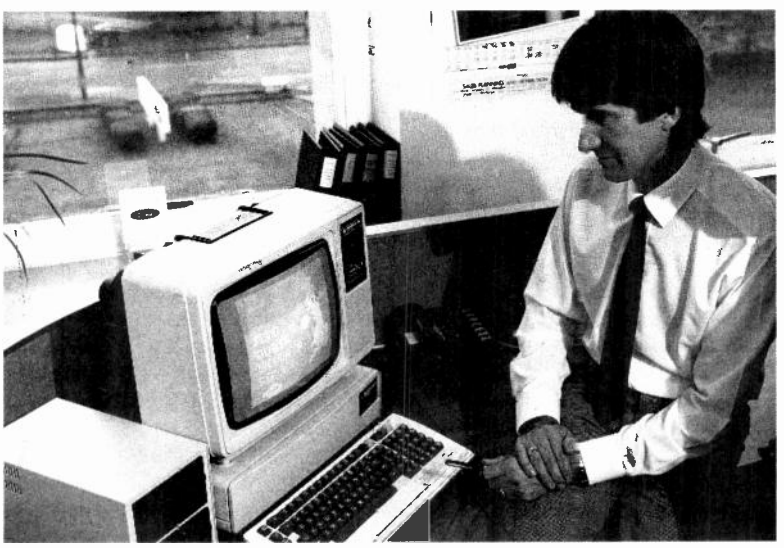
Drive type 47 is usually user-definable, i.e. the user supplies the parameter values such as the number of cylinders, landing zone, write precompensation, number of sectors and size. Thus even obscure discs can be added to the system.

A final word on POST

The POST checks consist of the BIOS, which is in charge of the POST, sending data to each piece of hardware in the system and checking the response from it. If the response is as expected, the item concerned is ticked off by the BIOS as o.k. If the hardware fails to respond, or responds incorrectly, the BIOS will interpret this as a failure and will halt the POST (it may try checking with the device again). It then produces either an error code that's displayed on the screen, or alternatively beeps from the loudspeaker, to report or indicate the nature of the failure.

Failure of the POST will halt the boot-up. In this condition the PC is unusable.

Fig. 1 illustrates the sequence of actions involved in changing a PC's set up. ■



Satellite Notebook

Storms and the damage they cause were once again a feature of the month.

Hugh Cocks reports

The worst storm occurred on a Sunday, when the lightning was accompanied by a hailstorm the like of which I've not seen before. It lasted for about an hour, and at the end the ground outside looked as though it had been snowing. To top it all my old Polarotor servo motor gave up the ghost, after providing good service for many years. It crossed my mind that there would be one or two calls for help come Monday morning: little did I know the treat that awaited me!

Pace PRD Power Supplies

In the past we've not had much trouble with the power supply in Pace PRD series receivers. The storm changed all that. About twenty receivers came in the following day. The repairs had to be organised on a production-line basis. C5, C7 and C8, the electrolytics by the chopper control chip U1, were replaced at once, then all the other components in the power supply were checked and the necessary action was taken.

A number of people had quite rightly unplugged their receivers from the mains supply during the storm, only to have problems when they plugged in again. Quite a few PRD series power supplies refuse to start when the capacitors just mentioned dry up. As long as the owner doesn't unplug/plug the receiver too many times in this situation, under the impression that the mains plug/socket is to blame, nothing else is damaged. If they are too keen on trying however there will be a bang. One owner described it more accurately as a "ping, ping, bang". A PRD death rattle in fact.

By the end of the day the bulk of the repairs had been completed – after obtaining extra supplies of BUT11A chopper transistors and 10/22µF electrolytics.

One visitor, late in the afternoon, was Professor Magrew. He repairs electronic equipment farther down the coast and had popped in earlier for some PRD power supply components. This time he had a PRD800 in his hand – a not very welcome sight at that moment. "The fuse blew after I'd replaced all the bits, and the customer wants it in a hurry" he said.

The fuse had indeed gone. It looked as if it had met an even more violent death than usual. After a quick check we found that the professor had replaced the 100kΩ start-up resistor R2 with a 1Ω type. The 1Ω (R8) and 100kΩ resistors I'd given him did look alike, and the yellow multiplier band on R2 was a little faint. That's the diplomatic way of putting it anyway. Surprisingly, the only component that had died with the 1Ω quick-start was the chopper control chip U1.

LNB Trouble

The professor also had a Continental Microwave LNB with him. It had been filled with water by the storm. I looked into this later in the week.

The water seemed to have got in because the screws, though secure, weren't tight enough to make a good seal with the rectangular rubber gasket. The PCB print that feeds the d.c. input to the regulator had burnt away. In this model water can't seem to get out via the F socket. As a result it builds up until something gives way, usually the print that takes the d.c. supply from the F socket. If you are a pessimist, it might be an idea to drill a drain hole in the case! If, like me, you are an optimist, fit a cover over the LNB and you won't have any more water problems.

After repairing the print, cleaning up and reassembling the LNB I obtained good signals when I checked it with the satellite upconverter previously described (January issue). I tightened the outer case screws as much as possible, and put some silicone sealant around the rubber gasket.

Two Continental Microwave LNBs were damaged by the lightning, though the receivers survived. The LNBs were stuck on horizontal polarisation whatever the applied voltage. While not too bad, reception of the horizontally-polarised signals was not up to standard. The case runs very hot in this condition. These LNBs will become a source of GaAsfets to repair MTI LNB local oscillators (see December 1995).

A Pace MSS200

The owner of a Pace MSS200 receiver phoned to say that the sound was o.k. on some channels but bad on others – picture quality was not affected. The problem had arisen after some lightning in the neighbourhood. Although he offered to bring the receiver in, I made a house call – with a fault of this type I like to see or hear the equipment, as the receiver might not be to blame.

It was the culprit. On most channels the sound was hissy and distorted – for some reason the higher-frequency radio channels at 7·74/7·92MHz were only marginally affected. The receiver behaved in exactly the same way in the workshop. A look at the circuit diagram showed that the 'audio r.f./i.f. input' is routed to pin 58 of U14 via transistor Q30. This is a surface-mounted npn device that's preceded by a Murata trap (X5) and a filter circuit. As soon as I came to measure the voltages around the transistor the sound returned to normal. It stayed that way for several hours, then went again.

This time I used an insulated tool to prod and poke the PCB in the vicinity of Q30. It didn't get me anywhere, but the moment I earthed myself to the case and touched Q30 with a metal screwdriver the sound returned. Replacing Q30 cured the problem. As I didn't have any surface-mounted transistors to hand a BC148 went in. So far so good – maybe until the next bout of lightning. . .

Pace SS9000/9200

These receivers seemed to suffer little from the storms. There were two strange faults however.

There had been a lightning strike quite close to an SS9200 – it had cut off the telephone and electricity supplies. When the power was eventually restored, the receiver produced no sound output – it was linked to the TV set via an r.f. cable as the set had no scart socket.

Checks showed that there was audio at the satellite receiver's scart socket but no sound carrier at its r.f. output. Perfect results were obtained when the modulator from a scrapped SS6000 receiver had been installed. The damage must have been caused by the outside aerial that was connected to the modulator unit's r.f. input.

The SS9000 came in with the usual power supply trouble. A new BUT11A chopper transistor and 1µF base coupling capacitor (C9) soon put that right. I first tested the receiver with the decoder unplugged. As everything was o.k. with the clear channels I refitted the decoder and cover, then retested it. On applying power there was just a bright raster and, after a short while, a vague smell of burning.

I hurriedly removed the cover, whipped out the decoder board and tried again. Sky News, Eurosport etc. were fine – they don't need a decoder. When the decoder was replaced there was the same bright raster and the burning smell. Must be the decoder panel then. Fit a replacement and confidently switch on. Exactly the same as before.

At this point I remembered that the owner no longer bothers with the scrambled channels. So I phoned him. The receiver had been overheating in the past, and in view of its life expectancy and the owner's lack of interest in the scrambled channels it didn't seem worth pursuing the matter. The outcome was that he was happy to have a decoderless receiver – he uses it mainly for Italian TV on Eutelsat. If anyone else has had this fault and knows the cause, we'd like to know more!

Fax Machines

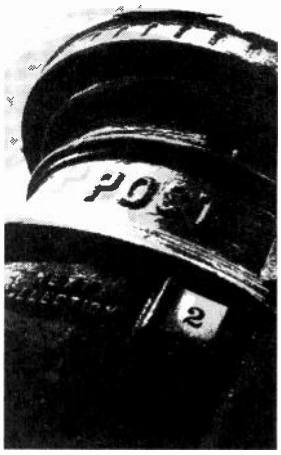
The lightning also caused some fax machine faults. I don't normally get involved with these, mainly because of lack of time. But if the customer is a good one I may feel obliged to at least take a look – a fax machine isn't the easiest thing to get repaired in this neck of the woods.

The first one was a Philips model with a separate 24V switch-mode power supply. This was dead – a sticker said it was made in Taiwan. The mains fuse looked rather black, and on test one of the mains bridge rectifier diodes was found to be short-circuit. I replaced all four and the fuse, then switched on. The power supply was now o.k.

The next step was to connect the fax and see if it worked. If lightning had come down the telephone line it might be a write-off. I connected it to our phone line and faxed our machine. All was well. The owner is now ready to disconnect everything the moment a cloud is seen in the sky!

Flushed with success, I attempted another one. This was an obscure make, again with a separate 24V power supply that produced no output. The fuse was o.k. however, and nothing looked really black.

All was revealed when the PCB was removed. Lots of PCB print had just vaporised. The mains bridge rectifier diodes were short-circuit, also the chopper transistor. I decided to call a halt at this point and try the fax with a lashed-up 24V supply. Sadly it was not a happy fax at all. The owner is now trying to claim for the damage on his household insurance policy.



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

Low-Quality Transmissions

The letter from Martin McCluskey in the January 1996 issue of *Television* highlights the increasing role that economics plays in the production of television programmes. It is simply cheaper to edit a show on videotape than to cut 35mm film. It also allows sophisticated video effects to be used. So, in many cases the finished production does not exist on film, the raw 'rushes' having been transferred to tape prior to editing. Because the PAL community has developed effective standards converting equipment, US distributors no longer see the need to put out material in a universal format.

I don't know how widespread this practice is amongst UK programme makers, but over here another insidious technique is creeping on to our screens. Originally confined to ITV and Channel Four, it is also making an appearance on BBC.

Instead of originating on film, companies are shooting and editing on videotape. At some stage the pictures are being degraded – by omitting alternate fields and repeating the remaining ones – in order to give the look and feel of film. To my eyes the only resemblance to film is the 25 f.p.s. temporal resolution. The pictures are reminiscent of the early 'dropped field' off-screen telerecordings used to preserve such 405-line treasures as *'Hancock'*.

Vertical resolution is halved, with horizontal transitions appearing oddly abrupt, and near-horizontal lines taking on a jagged look. Vertical transitions have the overshoot associated with crispened video camera output and have additional colour artifacts, caused by the manipulation of the chroma to fit the PAL eight-field sequence. Video cameras handle high- and low-lights in a way far inferior to film, and this stands out in these productions.

I doubt whether broadcasters have received a single complaint from viewers, but once recognised the effect is irritating in the extreme. Culprits include *'Heartbeat'* on ITV and *'Coogan's Run'* on BBC2. If you can't spot them from the above descriptions, there are two key elements missing from these shows – specks of dust on the picture and mention of 'film editor' in the credits.

Alan Pemberton,
Sheffield, South Yorkshire

Internet Integrity

I note with some trepidation that Internet addresses are beginning to appear in *Television*. This leads me to wonder whether the very openness of the network, and its apparent lack of control, could cause problems in the future.

The number of network users continues to grow at a great pace and it is easy to pull down pages of highly technical information which is intended for reference. It is also possible for users to generate their own information pages. How long will it be before these two opportunities merge? To me, this poses a number of questions that need to be considered:

How much thought is given to the integrity of the data that can be pulled down from the Internet?

Can we really believe that all we read has not been corrupted by a determined hacker?

Should we accept all the high-calibre technical information that is available without question?

Perhaps it is time that these points are given an airing!

Geoff Lewis,
Canterbury,
Kent

Tatung 190 Chassis

John Coombes' useful article on the Tatung 190 chassis (February issue) prompts me to write in with details of problems I've had with one. . .

A friend recently asked me to look at her 14in. colour portable, the complaint being that the set wouldn't switch on. Needless to say her diagnosis – the on/off switch – was a bit optimistic! It was a Thorn P1465R, apparently about 18 months old. Inside, I was heartened to see not a tricky Thomson chassis, as I had been expecting, but a very neat looking board which I couldn't identify until I spotted the legend '190 series' on the foil side near the mains switch.

When asked to perform, the set tried to start up then tripped almost immediately, this being repeated a couple of times before it reverted to standby (indicated by three horizontal bars in the LED channel display). So it was not the start-up resistors, but was it the power supply or the line output stage? As my circuit diagram was virtually unreadable, I decided to phone the Tatung service department in Telford for advice: despite not officially being in the TV trade (and therefore not having an account), I was without hesitation put through to an engineer – a real luxury these days – and spoke to an extremely helpful man, Gerry Lawson, who gave me the following information.

First check the power supply: decrease the load on the HT (109·5/115V) rail by winding down the A1 control to minimum. If the power supply then ceases to trip, R827 (a square, white resistor, shown as a link in some manuals/PCBs) will be found to be open-circuit, usually as a result of a round green resistor mounted off the board having arced across to a nearby heatsink. As a further check, isolate the power supply from the line output stage by lifting one end of L403, load it with a 100W lamp (surprisingly not 60W as John Coombes says, even for the small-screen models), then check the output with a DMM. If the power supply now functions correctly (as indeed mine did), check the line output transistor Tr403 (BU508AF), the efficiency diode D401 (BY133), the flyback tuning capacitor C404 (6·8nF/2kV, but can vary) and finally the line output transformer T402, which my tester revealed had shorted turns.

It's worth noting that the d.c. resistances of the windings of T402 are all too low to measure accurately with most meters, also that different types have been used during the production run, some with integrated A1, focus and EHT leads and others without. As always, it's imperative to quote the number printed on its case – mine was a Samsung FCV1412-E15, Tatung part no.15-7748-4. Don't

bother shopping around for pattern replacements, as the originals are very reasonable (less than £15 trade). Nobody seems to be able to provide one anyway, although the Philex HR7162/7163 looks similar to me.

This chassis is also used in many other 14in. portables, including the **Tatung** TN8904, **Matsui** 1424 and certain **Boots** models.

To conclude, these sets are incredibly well put together, using easily-obtainable, good quality components (thankfully no SMDs!) neatly mounted on a compact PCB to which access is excellent – there are none of the dry-joints, amateurish modifications, pools of hot-melt glue or other nasties so common with today's budget models. Picture quality is very good, the customer controls won't confuse even the most confusable of customers, the sets run very cool, the circuitry is straightforward and logical, and above all the spares back-up and technical advice seem second to none. If I were in the retail trade, I would have no hesitation in recommending Tatung sets to my customers.

N. Arnold,
Bournville, Birmingham.

LNB Modifications

I would like to offer a word of caution to anyone considering carrying out LNB modifications in the manner suggested by Hugh Cocks in his article in the January 1996 issue.

What he is proposing is not just a convenient signal source: it's an unlicensable (in the UK) microwave transmitter. Whilst it may be argued that the output power from such a device will be very low, bear in mind that there is an amateur radio band allocation at 18GHz and that amateurs regularly make contact over several tens of kilometres using only milliwatt powers on this band.

It should also be borne in mind that a microwave dish has considerable gain: should the transmitting LNB be placed at the focus of such a dish, a substantial increase in the transmitter's e.r.p. would result.

Generally speaking, none of these factors are likely to cause any problems if the unit is set up in an average workshop where the microwave signals will probably be contained by the walls. However, should the device be lined up with say a window, the microwave signals could well 'escape'. Now whilst this may be an acceptable state of affairs in the Algarve, where the idea has come from, it most certainly isn't here in the UK.

There are many legitimate users of the s.h.f. bands in the UK, from 1GHz upwards, including commercial air traffic control radar. Rogue interfering signals can cause havoc to these services and the DTI is particularly diligent at tracking them down. The most likely outcome of being found responsible for transmitting such a signal is a slap on the wrist and a polite request to take it off the air, but remember that the DTI has far reaching powers encompassing equipment seizure and prosecution, should they wish to use them.

Two final points on the subject are first that, having made such modifications to a microwave device, it is impossible, without extremely sophisticated test equipment, to tell how clean or dirty the transmitted output is.

So, although you may believe you are transmitting only a few milliwatts or less at the desired Astra frequency, there could be considerable harmonic and sub-harmonic radiation within other bands.

Secondly, although there is no conclusive proof that I know of, a number of safety related articles have appeared in various technical publications over the last couple of years with regard to odd symptoms, such as headaches and nausea, experienced by people exposed to very low levels of microwave emissions.

Basically, I believe that the idea is a good one, well presented, and nothing I have said in this letter is intended to be to the detraction of Hugh or his project. However, I feel that the points I have made are valid and relevant in the UK, and anyone contemplating carrying out the mods would be well advised to take heed of them.

Geoff Darby,
Earls Barton, Northampton.

Practical Experience

If Ms C. Raynor (Students Dilemma, February issue) can get someone to scavenge for her, she will be able to obtain practical servicing experience on television sets that have been thrown out. I suggest starting on monochrome sets which may have minor faults, mainly with power supplies and battery-mains sockets.

With a colour set, first check the CRT and LOPT. If these are faulty I would not proceed with servicing. There have been simple designs in *Television* magazine for CRT and LOPT testers.

Untraceable numbers on integrated circuits and obsolescent chips might cause problems. I would if possible remove touch tuners (they are not worth the headache) and replace with a press button type.

Don't despair if it's not possible to get the sets working, occasionally I have found design faults.

K.J. Treeby,
St. Judes, Plymouth.

Thanks

May I express a few words of thanks to the readers who have volunteered help each time I have had occasion to use the '*Help Wanted*' column.

Having been unfortunate enough to fracture the neck of a 370KRB22 tube, I appealed to readers for a good used replacement. This appeared in the January issue and on the day of publication I was offered a good tube, free of charge, by J. Danes of Aylesbury. I collected and fitted it without problem. Thanks again John.

I subsequently had a further five offers in much the same vein. The camaraderie amongst engineers and ex engineers still seems to live on!

Thanks to *Television* and all readers of the '*Help Wanted*' column.

A. Tomkinson (Retired),
Wembley, Middx.

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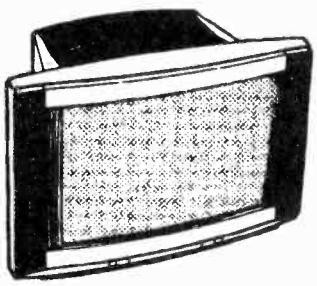

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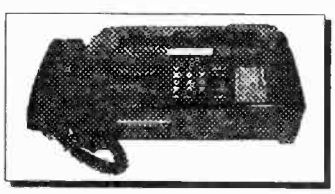

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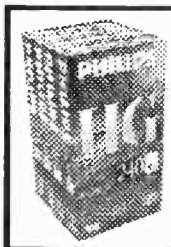

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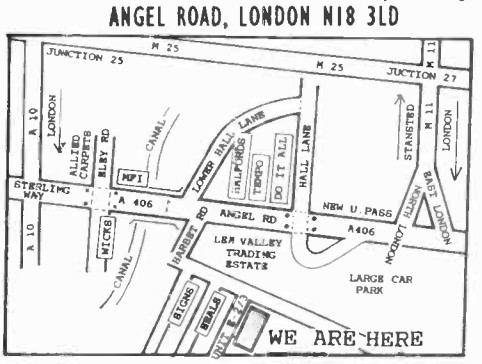

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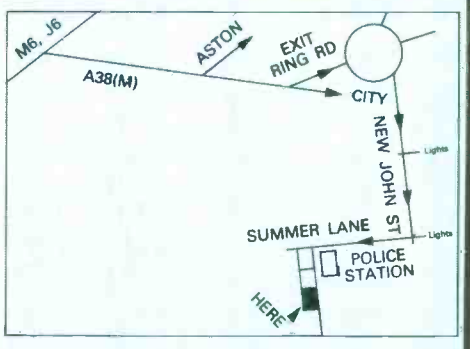

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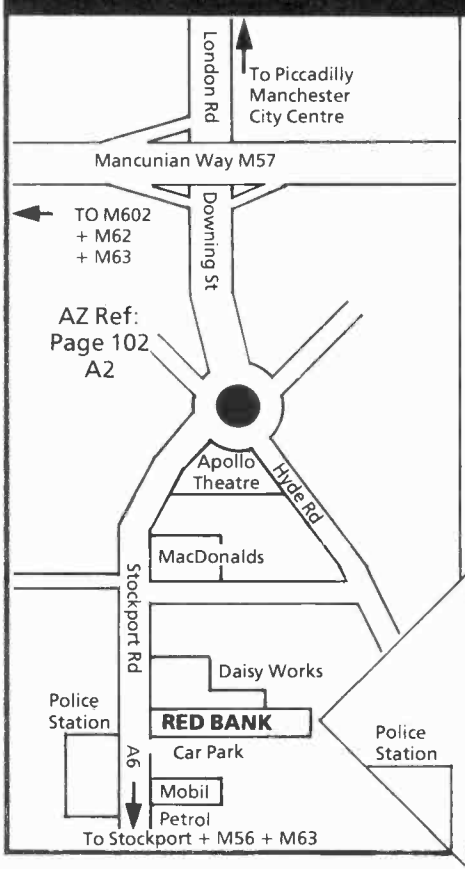

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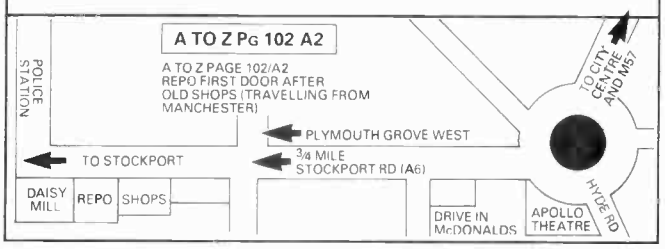

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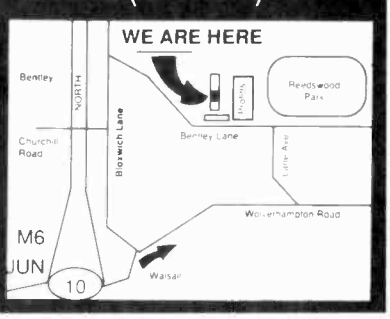

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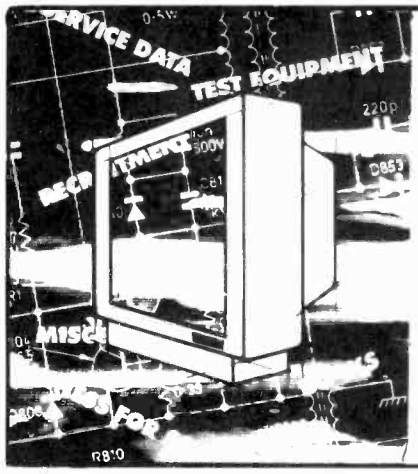

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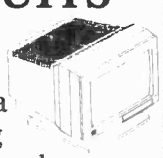

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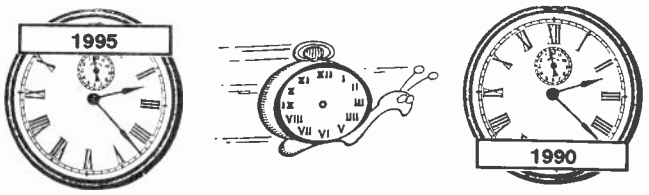

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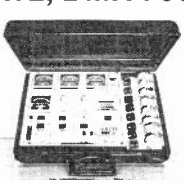

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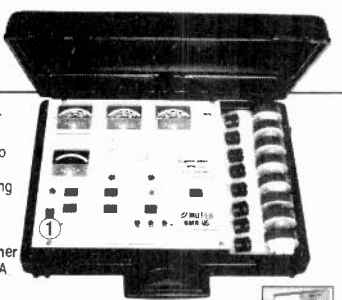

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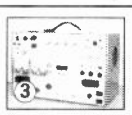

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TDA3048	£1.00	BYV95	£0.03	HD6140425 J11	£0.50
TDA3564	£3.00	BYV95B	£0.04	HEF4029BP	£0.20
TDA3565	£3.00	BZW – C110	£0.05	HEF4093	£0.20
TDA4650	£3.00	BZW83 – C20	£0.03	HE4528BP	£0.15
TDA8417-3	£3.00	CA3123Q	£0.50	HM6264ALP-15	£3.50
BU801	£0.50	CD4555BE	£0.20	IN5401	£0.03
BUK454/600	£0.40	FE3B – General Inst		IR106A	£0.10
BUW11	£0.40	Diode	£0.04		

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BYV28/200	£0.10

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STR4211	£5
STK4793	£5
LA7830	£1
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ST6391BI/BC	£2

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TDA3564	£4.00	BYV95B	10p
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TDA3652	£3.50	2SC3973B	30p
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TDA4439	£2.00	2SD1264	£1.00
TDA4600	£3.00	2SD1266	£1.00
TDA4601	£2.00	2SD1398	£1.00
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TDA1060	£3.00	TDA3654	90p
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Handsets for models: TC1632, TC1642, TC2232, TX2034, TX2044, TX2200, TX2234, TX2244, TX2200, TX2234, TX2244, TX2300, TX2636, TX3300, RC201 replaces TNQ1411/2 £8.00 each

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STR6020	£6.00	Amstrad U/V	£3.00
SS2000AF		Amstrad 6800	£4.00
line o.p.	£1.00	Amstrad 6900	£15.00
2SC940	£1.00	Amstrad 4700	£5.00
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BU108	£1.00		
BU124	50p	IQ081 GEC	£3.00
BU126	80p		
BU180e	65p	**FERGUSON Handsets**	
BU204	60p		
BU205	75p	BSB	£1.50
BU206	£1.00	ICC5	£5.00
BU207	£1.00	IK2000	£5.00
BU208	80p	IK7000	£5.00
BU208A	£1.50	SRD 2	£1.00
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BG 2087-642-1005 Triplers BG 2032-642-3002	£7.00 £7.00
PERDIO PV 1188 Handsets	£3.00
BU 208A, BU 508A, BU 508D, BU 508AF, BU 508DF	£1.00 each
BU 801	60p
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