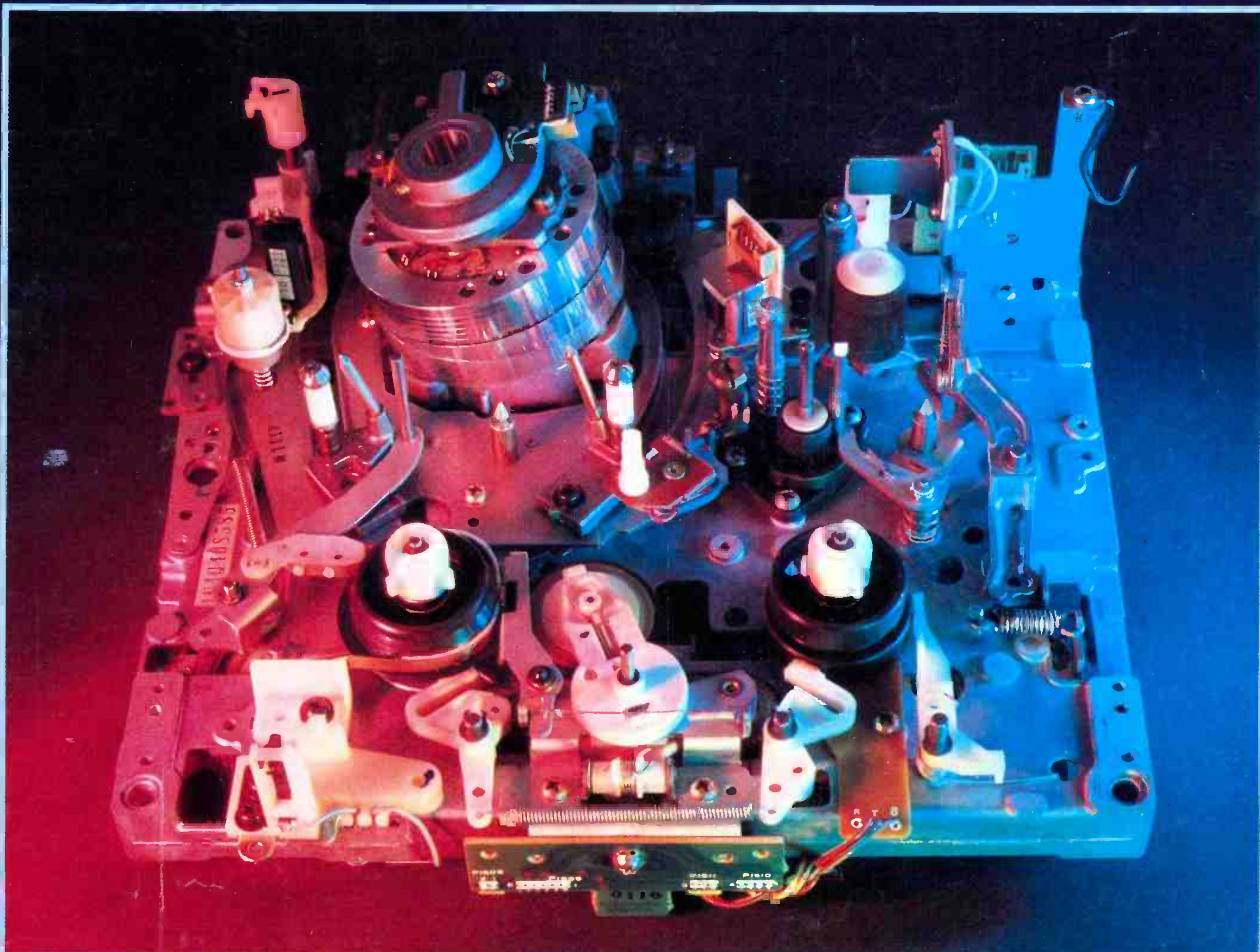
MAY 1990

Ireland £IR2·35 (inc. VAT) **£1·60**

TELEVISION

SERVICING·PROJECTS·VIDEO·DEVELOPMENTS



Servicing the Panasonic D1 Deck

Intercarrier Sound Converter

TV Fault Finding • VCR Clinic

Transferring Film to Videotape

CD Player Fault Finding Charts

The Zigzag Aerial • DX-TV

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TELEVISION

May 1990

Vol. 40, No. 7
Issue 475

On sale April 18th

CORRESPONDENCE
All correspondence regarding advertisements should be addressed to the Advertisement Manager, "Television", King's Reach Tower, Stamford Street, London SE1 9LS. Editorial correspondence should be addressed to "Television", IPC Magazines Ltd., King's Reach Tower, Stamford Street, London SE1 9LS.

INDEXES AND BINDERS
Indexes to Vols. 36 and 37 are available at 80p each from the Editorial Office (address above).
Binders that hold twelve issues of *Television* are available for £4·50 from Television Binders, 78 Whalley Road, Wilpshire, Blackburn BB1 9LF. Make cheques out to "Television Binders".

SUBSCRIPTIONS
Annual subscription £20 UK, £24 overseas by surface mail (air mail rate on application). Send orders with payment to Quadrant Subscription Services Ltd., Oakfield House, Perrymount Road, Haywards Heath, Sussex, RH16 3DH.

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Subject to availability, copies of issues published during the last 12 months are available at £1·80 each from Television, John Denton Services, Unit 13, Thornham Grove, Stratford, London E15 1DN. Please make cheques/postal orders payable to IPC Magazines Ltd.

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

this month

OUR NEXT ISSUE DATED JUNE WILL BE PUBLISHED ON MAY 16

AA119	9p
AAY32	9p
AC107	40p
AC125	25p
AC126	25p
AC127	21p
AC128	21p
AC128K	26p
AC141K	30p
AC142K	30p
AC176	22p
AC176K	28p
AC187	21p
AC187K	28p
AC188	21p
AC188K	28p
ACY18	48p
ACY19	48p
AD142	100p
AD149	60p
AD161	35p
AD162	35p
AF124	50p
AF125	50p
AF126	50p
AF127	50p
AF139	30p
AF239	30p
AF379	45p
ASZ15	100p
ASZ17	100p
BA145	10p
BA148	10p
BA154	6p
BA157	12p
BA526	188p
BB105B	18p
BB205B	24p
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2N.6403	160p
3N.143	65p
DIODES	
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BY103	32p
BY126	6p
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BY133	8p
BY164	40p
BY179	35p
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BY196	20p
BY206	11p
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BY210	22p
BY225	120p
BY226	18p
BY227	19p
BY228	32p
BY296	20p
BY298	26p
BY299	28p
BYX10	15p
BYX55/350	30p
BYX55/600	30p
BYX70/500	32p
BYX70/800	36p
OA47	6p
OA90	6p
OA91	8p
OA200	7p
OA202	7p
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IN.4001	4p
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SKE4F2/08	70p
SKE4F2/10	90p
I.C. SOCKETS	
8pin	6p
14pin	8p
16pin	9p
18pin	12p
20pin	14p
22pin	16p
24pin	18p
28pin	20p
40pin	25p
ZENER	
400MV BYZ88 RANGE 2V7 to 39V	6p
1.3W BZX61 RANGE 2V7 to 39V	12p
CRYSTALS	
Freq in MHZ	
1.00	260p
2.00	200p
2.45670	180p
2.5	200p
3.276	115p
3.5795	95p
4.0	110p
4.194	130p
4.43	95p
4.9152	150p
5.0	130p
6.0	115p
8.0	125p
8.867	125p
10.0	140p
11.0	250p
12.0	120p
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16.0	130p
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24.0	250p
48.0	160p
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7806	35p
7808	35p
7812	35p
7815	35p
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78L08	28p
78L12	28p
78L15	28p
78L18	28p
78L24	28p
79L05	40p
79L08	40p
79L12	40p
79L15	40p
7818KC	100p
7824KC	100p
LM309K	100p
LM317K	220p
LM317T	180p
LM323K	420p
LM723	40p
78HGKC	570p
78HO5KC	800p
78H12KC	700p

78GU1C	190p
79GU1C	215p
79HGKC	800p
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DF96	50p
DL92	60p
DY86	50p
DY87	60p
DY802	75p
EABC80	60p
EB91	44p
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EZ80	70p
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PC97	100p
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PCF801	110p
PCF802	80p
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PL500	110p
PL504	120p
PL508	200p
PL519	450p
PY81	90p
PY88	70p
PY500A	190p
L.E.D.'S	
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LED 3MM YEL	10p
LED 3MM GRN	10p
LED 5MM RED	5p
LED 5MM YEL	10p
LED 5MM GRN	10p
RECTANG. L.E.D.'s	
RED	10p
GREEN	15p
YELLOW	15p
LINEAR IC'S	
AN-203	210p
AN-210	165p
AN-214Q	170p
AN-228	280p
AN-236	235p
AN-240P	150p
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AY3-1350	450p
AY3-8910	360p
AY3-8912	400p
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BA-526	188p
BA-527	95p
BA-532	140p
BA-534	290p
BA-536	180p
BA-546	180p
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TDA-5800	600p
TDA-5820	480p
TDA-7000	200p
TDA-7040	250p
TDA-7050	200p
TDA-7211	150p
TDA-7220	150p
TDA-7240	300p
TDA-7250	600p
TDA-7255	600p
TDA-7270	150p
TDA-7274	100p
TDA-8115	300p
TDA-8140	300p
TDA-8170	320p
TDA-8190	280p
TDA-8440	380p
TDA-9403	250p
TDA-9503	240p
TDA-9513	350p

LINEAR IC'S — Cont.

TEA-1002	650p
TLO-61	40p
TLO-64	80p
TLO-71	38p
TLO-72	55p
TLO-74	92p
TLO-81	40p
TLO-82	46p
TLO-83	67p
TLO-84	80p
ULN-2002	70p
ULN-2003	69p
ULN-2004	69p
ULN-2068	270p
ULN-2803	130p
ULN-2804	170p
UPC-16C	160p
UPC-20C	220p
UPC-554	130p
UPC-555	60p
UPC-556H	80p
UPC-566	60p
UPC-571	220p
UPC-574	60p
UPC-575C2	90p
UPC-576	200p
UPC-577	64p
UPC-580	300p
UPC-592	95p
UPC-595	190p
UPC-596	190p
UPC-1001	220p
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UPC-1028	90p
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UPC-1032	60p
UPC-1158H2	70p
UPC-1167CL	170p
UPC-1181	110p
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UPC-1186	80p
UPC-1187	150p
UPC-1188H	400p
UPC-1197	140p
UPC-1200	325p
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UPC-1263	230p
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UPC-1368H	425p
UPC-1373	85p
UPC-1378	210p
UPC-1382	110p
UPC-1394	170p
UPC-1397	450p
UPC-1403CA	750p
UPC-1420CA	500p
UPC-1458	100p
UPC-1470	200p
UPC-1504C	400p
UPC-1505C	400p
UPC-1517CA	400p
UPC-1525C	400p
UPC-1536C	550p
UPC-1571C	300p
ZN-423	100p
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ZN-425	320p
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ZN-428	425p
ZN-429	215p
ZN-435	340p
ZN-448	510p
ZN-459	190p
ZN-1034	170p
ZN-1040	640p
ZNA-134H	2150p
ZNA-234E	920p

JAPANESE TRANSISTORS

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2SA-509	120p
2SA-550	150p
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2SA-608	15p
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2SD-973	60p
2SD-973A	70p
2SD-985	120p
2SD-986	120p
2SD-1012	120p
2SD-1021	120p
2SD-1022	400p
2SD-1024	130p
2SD-1031	130p
2SD-1046	200p
2SD-1051	130p
2SD-1060	130p
2SD-1064	250p
2SD-1071	450p
2SD-1073	350p
2SD-1094	520p
2SD-1111	60p
2SD-1128	200p
2SD-1135	150p
2SD-1138	80p
2SD-1159	90p
2SD-1160	150p
2SD-1163A	220p
2SD-1164	120p
2SD-1168	425p
2SD-1169	280p
2SD-1185	400p
2SD-1186	400p
2SD-1189	125p
2SD-1190	150p
2SD-1196	150p
2SD-1207	50p
2SD-1210	280p
2SD-1211	120p
2SD-1225	120p
2SD-1229	250p
2SD-1237	300p
2SD-1248	270p
2SD-1251	180p
2SD-1266	180p
2SD-1272	200p
2SD-1273	100p
2SD-1275	160p
2SD-1276	200p
2SD-1277	190p
2SD-1279	600p
2SD-1289	300p
2SD-1291	400p
2SD-1292	60p
2SD-1297	425p
2SD-1308	140p
2SD-1309	140p
2SD-1310	140p
2SD-1326	200p
2SD-1328	60p
2SD-1347	70p
2SD-1348	85p
2SD-1350	150p
2SD-1376	125p
2SD-1379	100p
2SD-1380	100p
2SD-1383	100p
2SD-1390	350p
2SD-1391	450p
2SD-1392	150p
2SD-1395	150p
2SD-1396	240p
2SD-1397	250p
2SD-1398	170p
2SD-1399	300p
2SD-1400	280p
2SD-1402	280p
2SD-1406	120p
2SD-1407	160p
2SD-1409	190p
2SD-1415	190p
2SD-1425	360p
2SD-1426	350p
2SD-1427	380p
2SD-1428	450p
2SD-1429	410p
2SD-1430	280p
2SD-1431	400p
2SD-1432	600p
2SD-1433	750p
2SD-1438	140p
2SD-1439	270p
2SD-1441	440p
2SD-1448	140p
2SD-1450	60p
2SD-1451	260p
2SD-1453	170p
2SD-1455	320p
2SD-1457	220p
2SD-1459	120p
2SD-1468	60p
2SD-1496	450p
2SD-1497	450p
2SD-1505	120p
2SD-1554	500p
2SD-1555	450p
2SD-1576	450p
2SD-1577	480p
2SD-1579	120p
2SD-1591	310p
2SD-1595	160p
2SD-1604	200p

2SD-1608	210p	2SD-1941	500p
2SD-1609	100p	2SD-1984	150p
2SD-1632	500p	2SJ-49	425p
2SD-1649	260p	2SJ-50	425p
2SD-1651	270p	2SJ-77	350p
2SD-1663	450p	2SK-19	45p
2SD-1666	120p	2SK-49	50p
2SD-1667	120p	2SK-55	100p
2SD-1668	120p	2SK-68	100p
2SD-1677	300p	2SK-134	415p
2SD-1739	450p	2SK-135	415p
2SD-1783	100p	2SK-147	160p
2SD-1815	100p	2SK-192	45p
2SD-1825	120p	2SK-195	150p
2SD-1843	100p	2SK-197	140p
2SD-1846	350p	2SK-312	750p
2SD-1884	300p	2SK-323	130p
2SD-1910	280p	3SK-88	70p

BRIDGE RECTIFIERS

W005	1A/50V	16p
WO1	1A/100V	18p
WO2	1A/200V	19p
WO4	1A/400V	21p
WO6	1A/600V	23p
WO8	1A/800V	28p
BR81D	2A/100V	33p
BR82D	2A/200V	33p
BR84D	2A/400V	37p
BR86D	2A/600V	43p
BR88D	2A/800V	43p
BR32	3A/200V	43p
BR34	3A/400V	43p
BR36	3A/600V	44p
BR62	6A/200V	80p
BR64	6A/400V	72p
BR251	25A/100V	150p
BR252	25A/200V	165p
BR254	25A/400V	185p
BR256	25A/600V	200p
BR258	25A/800V	240p
BR351	35A/100V	185p
BR352	35A/200V	200p
BR354	35A/400V	225p
BR356	35A/600V	230p
BR358	35A/800V	260p
BY164	1.5A/100V	40p
BY179	1.5A/800V	40p

TRIACS

TIC206D	— 4A/400V	60p
TIC225D	— 6A/400V	69p
TIC226D	— 8A/400V	68p
TIC236D	— 12A/400V	85p
TIC246D	— 16A/400V	105p
TIC253D	— 20A/400V	190p
TIC263D	— 25A/400V	205p
T2800D	— 8A/400V	52p

THYRISTORS (SCR's)

2N.5061	— 0.8A/60V	20p
2N.5062	— 0.8A/100V	28p
2N.5064	— 0.8A/200V	29p
C106D	4A/400V	28p
TIC116C	8A/300V	59p
TIC116D	8A/400V	70p
TIC116M	8A/600V	79p
TIC126D	12A/400V	75p
TIC126M	12A/600V	90p
2N.4444		76p
BR103		37p
BR303		85p
BT106		180p
BT116		80p
BT119		100p
OT121		120p
TIC44		22p
TIC45		27p
TIC47		32p
17088		200p
17089		200p
17127		200p
15/80H		230p
15/85R		230p
SG613		850p

UHF TUNERS

U322LO	600p
U341	500p
U342	500p

VIDEO LAMPS

UNIVERSAL VIDEO LAMPS 12V.60 mA (300mm WIRES) RED OR BLUE	30p
VIDEO LAMP FOR PANASONIC	60p

CASSETTE DC MOTORS

6V	240p
9V	240p
12V CW	240p
12V CCW	240p
13.2V CW	290p
13.2V CCW	290p

CASSETTE TAPE HEADS

MONO HEAD	90p
STEREO HEAD	150p
MINI HEAD	230p
AUTO REVERSE HEAD	260p

UNIVERSAL TRIPLERS	450p
SONY ON/OFF SWITCHES	200p
PHILIPS SWITCHES K30, K35, K40, KT3, KT4	150p

VIDEO HEADS

JVC/AKAI/FERGUSON 3HSS (For all Models)	£9.50
NATIONAL PANASONIC 4HSS = 3HSSN (NV322, NY332, NV340, NV2000, NV2010, NV7000, NV8170, NV8200, NV8400, NV8600, NV8610, NV8620).	£9.40

AKAI

VS-109/201/202/301/303	£24.00

AMSTRAD

VCR 4500, 5200, 9000 VCR 7000	£18.00

FERGUSON

3V32/JVC HR7655	£34.50
3V42/44/45/46/47	£21.00

FISHER

FVHP510/520/530/615/620/622/710/715/720/721/722/910	£19.00
FISHER VBS 7100/VBS 7500	£29.00
FISHER VBS 9000/VBS 9900	£29.00
FISHER VBS 7000	£30.00

HITACHI

VT11/14/33/61/63	£16.50
HITACHI VT7-17, VT35-38, VT39	£36.95
HITACHI VT19	£38.00
HITACHI VT120, VT 220	£31.50
HITACHI VT3000	£14.00
HITACHI VT5000, VT 5500	£19.00
HITACHI VT65, 7000, 8000, 8300, 8500, 8700, 9300, VT9500, 9700	£16.50

NATIONAL

NV 777/NV 330	£22.30
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NV 366 4 HEAD	£28.50
NV 180 PORTABLE 4 HEAD	£41.00
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NVG 400	£42.00

SANYO

VTC 5000, VTC 5400, VTC 6000, VTC 6500	£27.00
VTCM10/11/20/21/25/30/31/35/40/50	
VTC 5100, VTC 5150, VTC 5300	£28.00
VTC 5350/5370, VTCNX 10/15/20/30, VTC 5550	£28.00
VTC 5100, VTC 5150, VTC 5300	£26.50
VTC 9100/9300/9455/9500	£28.80
VTC 9350/9355	£28.80
VTC 5500	£30.50

SHARP

VC 381, VC 383, VC 386, VC 387, VC 388, VC 482, VC 483	£18.75
VC 486, VC 3300, VC 8381, VC 9100, VC 9300, VC 9500, VC 9700, VC 582, VC 583, VC 651, VC 681, VC 750, VC 781	£18.75

SONY

DSR-35R (FOR C20, 30, 40 SLF1, SLF1UB, SLF1E)	£18.00
DSR-43R (FOR SLC7 RANGE SL 5000, SL 5100, SL 3000)	£14.95

TOSHIBA

V21/V9600	£17.80

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VCR PINCHROLLERS

AKAI

VS9300, VS9500, VS9700, VS9800	280p
VS1, VS2, VS3, VS4, VS5, VS6, VS9, VS10	360p

AMSTRAD

VCR4500, VCR4600, VCR4600 Mk2, VCR4700	280p
VCR5200	360p
VCR7000	360p

FERGUSON

3V00, 3V16, 3V22, 3V23	280p
3V29-30, 3V31-32	280p
3V35-36, 3V38-39, 3V42-43, 3V44-45, 3V48,	280p
3V53, 3V54-55, 3V56-57, 3V58-59, 3V64-65, FV10-11, FV12-14	

HITACHI

VT11, VT33	280p
VT61-62, VT63-64, VT65, VT86-88,	280p
VT110-122, VT120-128, VT130-135, VT138-150, VT168,-220	
VT5000, VT8000, VT9300, VT9500	280p

JVC

HR3300, HR3330, HR3360, HR3660, HR4100, HR7700	280p
HR7200, HR7330, HR7660, HR7610, HR7650, HR7655	280p
HRD110, HRD111, HRD120, HRD121, HRD140, HRD150	280p
HRD160, HRD225, HRD455, HRD565, HRD725	

MITSUBISHI

HS200, HS300, HS301, HS302, HS303, HS304, HS310, HS320, HS700	280p

NATIONAL

NV100, NV180, NV300, NV333, NV340, NV366, NV600, NV777, NV788	280p
NV230, NV370, NV430, NV460, NV730, NV810, NV830,	280p
NV850, NV870, NV890, NV2000, NV2010, NV3000, NV7000, NV7200, NV7800, NV8600, NV8610, NV8620, NVG14	
NVG7, NVG10, NVG12, NVG18	360p
NVG21, NVG25, NVH65	360p

PHILIPS

VR6460	280p

SANYO

VHR1100, VHR1300, VHR1500, VHR2300	360p
VTC5000, VTC5150, VTC5500, VTC9300, VTCM10, VTCM20	280p

SHARP

VC381, VC386, VC2300, VC3300, VC7300, VC7700, VC8300	360p
VC9100, VC9300, VC9500, VC9700	
VC387, VC481, VC482, VC483, VC486, VC496, VC581	360p
VC582, VC583, VC585	
VC651, VC681, VC685, VC750, VC780, VC781, VC785, VC787	360p
VC793, VCT72	

SONY

SLC5, SLC6, SLC7	360p
SLC9, SLC20, SLC24, SLC30, SLC33, SLC44, SLHF100	360p
SLF1, SLF11, SLF25, SLF30, SLF60, SLF100	

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AKAI

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

AMSTRAD

TVR-1-2-3	210p
VCR-4600 & Mk 2	210p
VCR-4700	210p
VCR-5200	210p
VCR-7000	80p

FERGUSON

3292, 3V00, 3V01	150p
3V16, 3V22, 3V23	65p
3V29/30	120p
3V31/32	85p
3V35/36	80p
3V38-39	80p
3V42/43	65p
3V44/45	65p
3V45/54	65p
3V55	65p

FISHER

VBS-7000	245p
VBS-9000	120p

HITACHI

VT-11, VT-33	100p
VT-5000	120p
VT-5500	130p
VT-8000	60p
VT-8500	60p
VT-9300	50p
VT-9500	50p
VT-9700	60p

JVC

HR-3300, HR-3330, HR-3360, HR-3660,	150p
HR-4100	180p
HR-7200	70p
HR-7600	80p
HR-7610	95p
HR-7650	75p
HR-7655	90p
HR-7700	77p
HRD-110, HRD-111,	100p
HRD-120, HRD-225	
HRD-250, HRD-455,	100p
HRD-565, HRD-566, HRD-725, HRD-755	

MITSUBISHI

HS-200	200p

NATIONAL

NV-300	160p
NV-333	135p
NV-777	100p
NV-2000	150p
NV-3000	160p
NV-7000	95p
NV-7200	90p
NV-8600	160p

PHILIPS

VR-6460	170p

SANYO

VTC-5000	75p
VTC-5300	100p
VTC-5500	95p
VTC-9300	220p

SHARP

VC-381/383/386	125p
VC-6300	150p
VC-7300/7700/7750	150p
VC-8300	150p
VC-8381, VC-9100	125p
VC-9300, VC-9500	135p

SONY

SL-C.., SL ..6	140p
SC-C7	140p
SC C9	165p
SL-8000-8080	200p

TOSHIBA

V-55/57	85p
V-5250/5280	230p
V-5480	210p
V-5475	160p
V-7540	160p
V-8600	150p
V-9600	85p

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VIDEO MOTORS

AMSTRAD

VCR-7000 REEL MOTOR	1700p

FERGUSON & JVC

CAPSTAN MOTOR PU-45979	2100p
CAPSTAN MOTOR PU-55371V	1950p
DRUM MOTOR PU-46414	1950p
REEL MOTOR PU-51381V	2650p

NATIONAL

REEL MOTOR MYN-135V5L FOR NV333, NV366	1350p

SANYO

REEL MOTOR 4-529V-10800	630p

SHARP

REEL MOTOR RMTOV 1008 GEZZ	1350p

SONY

CAPSTAN MOTOR A-6751131A FOR SLC6	700p
CAPSTAN MOTOR BHF 1100D FOR SLC7	2500p

VIDEO LAMPS

VIDEO LAMPS UNIVERSAL 12V60mA (300mm WIRES)	30p
PANASONIC VIDEO LAMPS	60p

IDLERS & PULLEYS REPLACEMENTS

HITACHI

FF REW IDLER 6886971	190p
PLAY IDLER V-6861482	320p

JVC

IDLER ASSEMBLY PU-47752	450p
TAKE UP IDLER PU-51402A	145p
TAKE CLUTCH PU-55373	225p
IDLER ARM PU-55373-3-8	285p
FAST FORWARD IDLER PU-45896C	210p

NATIONAL

IDLER	200p

SANYO

REEL PULLEY 143-0-662T-01201	520p

SHARP

IDLER NIDL0005 GEEZ	195p
IDLER NIDL0006 GEEZ	195p

SONY

REW. PULLEY A-6706-348-B	400p
REW. PULLEY A-6706-391-A/B	300p

SERVICE AIDS

SERVISOL PRODUCTS

V. HEAD CLEANER	100p
SWITCH CLEANER	115p
SILICONE GREASE	135p
FREEZE IT	125p
FOAM CLEANER	120p
ANTI STATIC	120p
AEROKLEANE	100p
AERO DUSTER	125p
PLASTIC SEAL	115p

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★ **UNIVERSAL TRIPLERS 450p** ★
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★ ★ ★ ★ ★ ★ ★ ★ ★
★ **SONY ON/OFF SWITCHES 200p** ★
★ ★ ★ ★ ★ ★ ★ ★ ★

★ ★ ★ ★ ★ ★ ★ ★ ★
★ **PHILIPS SWITCHES 150p** ★
★K30, K35, K40, KT3, KT4★
★ ★ ★ ★ ★ ★ ★ ★ ★

4000B SERIES CMOS IC's

4000	13p
4001	13p
4002	13p
4006	34p
4007	13p
4008	38p
4009	20p
4010	21p
4011	13p
4012	13p
4013	19p
4014	32p
4016	18p
4017	29p
4018	30p
4019	28p
4020	33p
4021	36p
4022	36p
4023	13p
4024	25p
4025	13p
4026	60p
4027	18p
4028	29p
4029	34p
4030	17p
4031	90p
4032	52p
4033	60p
4034	76p
4035	42p
4036	180p
4037	75p
4038	46p
4039	180p
4040	30p
4041	36p
4042	30p
4043	36p
4044	36p
4045	72p
4046	42p
4047	45p
4048	27p
4049	18p
4050	20p
4051	38p
4052	35p
4053	35p
4054	53p
4055	52p
4056	52p
4060	40p
4063	52p
4066	20p
4067	120p
4068	13p
4069	13p
4070	13p
4071	13p
4072	13p
4073	13p
4075	13p
4076	42p
4077	13p
4078	13p
4081	13p
4082	13p
4085	36p
4086	30p
4089	75p
4093	18p
4094	44p
4095	58p
4098	50p
4099	42p
4501	27p
4502	36p
4503	30p
4504	55p
4505	180p
4506	58p
4507	30p
4508	67p
4510	32p
4511	30p
4512	38p
4513	80p
4514	65p
4515	65p
4516	36p
4517	100p
4518	36p
4519	28p
4520	36p
4521	86p
4522	43p
4526	38p
4527	41p
4528	38p
4529	65p
4532	48p
4551	75p
4553	140p
4555	29p
4556	36p
4557	140p
4583	60p
4584	30p
4585	40p
40100	120p
40101	78p
40102	150p
40103	120p
40104	80p
40105	140p
40106	35p
40107	50p
40108	260p
40109	74p
40110	170p
40114	180p
40117	180p
40147	240p
40160	55p
40161	55p
40162	55p
40163	55p
40174	48p
40175	60p
40181	170p
40182	70p
40192	48p
40193	48p
40194	58p
40208	240p
40257	120p

74 SERIES

7400	20p
7401	16p
7402	18p
7403	20p
7404	35p
7405	10p
7406	36p
7407	36p
7408	25p
7409	20p
7413	30p
7414	45p
7416	40p
7417	32p
7420	22p
7421	25p
7425	15p
7430	25p
7437	28p
7438	32p
7442	38p
7447	60p
7450	22p
7451	10p
7454	25p
7470	30p
7473	25p
7474	35p
7475	25p
7481	90p
7482	60p
7485	28p
7486	28p
7489	75p
7490	35p
7492	45p
7493	35p
7495	48p
7497	80p
74107	30p
74111	52p
74116	85p
74119	85p
74122	40p
74123	20p
74125	40p
74126	45p
74132	42p
74141	55p
74145	70p
74153	45p
74155	45p
74157	45p
74160	50p
74164	50p
74167	35p
74173	50p
74174	60p
74175	65p
74176	45p
74180	50p
74182	45p
74192	40p
74196	40p
74197	45p
74393	70p

74HC SERIES HIGH SPEED CMOS

74HC00	14p
74HC02	14p
74HC03	14p
74HC04	15p
74HC08	18p
74HC10	20p
74HC11	14p
74HC14	26p
74HC20	19p
74HC21	20p
74HC27	20p
74HC30	20p
74HC32	20p
74HC42	30p
74HC51	20p
74HC73	24p
74HC74	24p
74HC75	28p
74HC76	28p
74HC77	35p
74HC85	33p
74HC86	29p
74HC93	50p
74HC107	28p
74HC109	28p
74HC112	28p
74HC113	28p
74HC123	35p
74HC125	32p
74HC126	33p
74HC131	36p
74HC132	33p
74HC133	33p
74HC137	52p
74HC138	33p
74HC139	22p
74HC147	42p
74HC148	38p
74HC151	32p
74HC153	32p
74HC154	90p
74HC155	48p
74HC157	34p
74HC158	34p
74HC160	44p
74HC161	44p
74HC162	44p
74HC163	44p
74HC164	44p
74HC165	56p
74HC166	60p
74HC173	52p
74HC174	38p
74HC175	38p
74HC181	180p
74HC182	60p
74HC190	46p
74HC191	55p
74HC192	53p
74HC193	41p
74HC194	46p
74HC195	46p
74HC221	80p
74HC237	50p
74HC238	55p
74HC240	48p
74HC241	47p
74HC242	55p
74HC243	60p
74HC244	44p
74HC245	48p
74HC251	25p
74HC253	36p
74HC257	40p
74HC258	50p
74HC259	52p
74HC273	42p
74HC279	35p
74HC280	61p
74HC283	61p
74HC298	50p
74HC299	105p
74HC354	38p
74HC356	48p
74HC365	34p
74HC366	36p
74HC367	36p
74HC368	36p
74HC373	46p
74HC374	48p
74HC375	52p
74HC377	52p
74HC386	20p
74HC390	50p
74HC393	47p
74HC423	65p
74HC533	65p
74HC534	61p
74HC540	70p
74HC541	70p
74HC563	60p
74HC564	60p
74HC573	68p
74HC574	65p
74HC583	90p
74HC595	85p
74HC597	80p
74HC620	110p
74HC623	110p
74HC640	90p
74HC643	90p
74HC646	120p
74HC648	120p
74HC651	100p
74HC652	100p
74HC670	75p
74HC688	80p
74HC690	110p
74HC691	110p
74HC4002	25p
74HC4015	85p
74HC4016	75p
74HC4017	48p
74HC4020	50p
74HC4022	40p
74HC4024	34p
74HC4028	40p
74HC4040	34p
74HC4049	38p
74HC4050	38p
74HC4051	85p
74HC4052	85p
74HC4053	85p
74HC4059	85p
74HC4060	33p
74HC4066	33p
74HC4072	31p
74HC4075	26p
74HC4078	32p
74HC4094	50p
74HC4316	100p
74HC4351	110p
74HC4352	160p
74HC4510	120p
74HC4511	70p
74HC4514	120p
74HC4515	120p
74HC4516	125p
74HC4518	55p
74HC4520	60p
74HC4538	75p
74HC4543	75p
74HC7266	75p
74HC22106	580p
74HC40104	190p
74HC40105	250p

74LS SERIES LOW POWER SCHOTTKY T.T.L.

74LS00	12p
74LS01	12p
74LS02	12p
74LS03	12p
74LS04	12p
74LS05	12p
74LS08	12p
74LS09	14p
74LS10	12p
74LS11	12p
74LS12	12p
74LS13	20p
74LS14	24p
74LS15	14p
74LS20	14p
74LS21	14p
74LS22	14p
74LS24	35p
74LS26	14p
74LS27	14p
74LS28	14p
74LS30	14p
74LS32	15p
74LS33	15p
74LS31	15p
74LS38	15p
74LS40	15p
74LS42	25p
74LS47	52p
74LS48	48p
74LS51	13p
74LS54	13p
74LS55	15p
74LS73	24p
74LS74	18p
74LS75	24p
74LS76	24p
74LS78	24p
74LS83	37p
74LS85	37p
74LS86	25p
74LS90	26p
74LS91	55p
74LS92	32p
74LS93	26p
74LS95	41p
74LS96	52p
74LS107	28p
74LS109	28p
74LS112	28p
74LS113	28p
74LS114	28p
74LS122	35p
74LS123	35p
74LS124	85p
74LS125	30p
74LS126	30p
74LS132	30p
74LS133	30p
74LS136	30p
74LS138	28p
74LS139	28p
74LS145	65p
74LS147	90p
74LS148	75p
74LS151	27p
74LS153	31p
74LS154	78p
74LS155	36p
74LS156	36p
74LS157	22p
74LS158	27p
74LS160	38p
74LS161	38p
74LS162	38p
74LS163	36p
74LS164	36p
74LS165	50p
74LS166	55p
74LS168	60p
74LS169	55p
74LS170	68p
74LS174	30p
74LS175	32p
74LS190	47p
74LS191	43p
74LS192	41p
74LS193	41p
74LS194	41p
74LS195	44p
74LS196	45p
74LS197	42p
74LS221	45p
74LS240	45p
74LS241	42p
74LS242	43p
74LS243	50p
74LS244	40p
74LS245	40p
74LS247	40p
74LS248	40p
74LS249	70p
74LS251	24p
74LS253	36p
74LS256	52p
74LS257	32p
74LS258	35p
74LS259	50p
74LS260	30p
74LS266	22p
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74LS293	26p
74LS365	26p
74LS366	31p
74LS367	28p
74LS368	30p
74LS373	45p
74LS374	45p
74LS375	46p
74LS390	42p
74LS393	37p
74LS399	68p
74LS629	95p
74LS641	88p
74LS642	105p
74LS644	105p
74LS645	105p
74LS670	62p
74LS674	310p
74LS687	250p

COMPUTER IC'S

2114	200p
2532	330p
2716	200p
2732	280p
2732A	300p
2764	240p
27C64	550p
27128	350p
26256-25	400p
41256-12	250p
256DRAM	250p
4116	75p
4164	150p
6116	180p
6264	270p
6502	300p
6502A	400p
65C02	930p
6503	570p
6520	170p
6522	330p
6530	1050p
6532	460p
6545	880p
6551	530p
6800	210p
6802	220p
6803	800p
6808	500p
6809	600p
6810	150p
6818	380p
6820	140p
6821	140p
6840	310p
6845	620p
6850	110p
8080A	400p
8085A	300p
8086	500p
8088	500p
8155	360p
8156	360p
81LS95	120p
81LS96	130p
81LS97	130p
81LS98	130p
8224	240p
8226	240p
8228	270p
8243	250p
8250	850p
8087	11000p
8251	270p
8253	230p
8255	200p
8256	1200p
8257	220p
8259	280p
8271	3400p
8272	1200p
8279	270p
8282	300p
8283	400p
8284	440p
8287	360p
8288	650p
8748	1100p
8755	1400p
AY3-1015	290p
SP0256AL2	500p
Z80ACPU	150p
Z80BCPU	400p
Z80ADMA	500p
Z80AP10	220p
Z80BP10	340p
Z80ACTC	200p
Z80BCTC	320p
Z80AS10	460p
Z80AS10-1	580p
Z80BP10-2	580p
Z80ADART	500p
74S289	180p
74S387	200p
75107	65p
75110	75p
75113	100p
75122	110p
75150	95p
75154	100p
75162	700p
75182	95p
75183	95p
75188	55p
75189	55p
75195	185p
75451	40p
75454	65p
75492	55p
8T26	95p
8T28	110p

OPTO COUPLERS

4N25	50p
4N26	50p
4N27	50p
4N28	50p
4N29	50p
4N30	90p
4N31	90p
4N32	100p
4N33	100p
4N36	58p
4N37	58p
4N38	58p

LED DISPLAYS

MAN 72	115p
MAN.74	115p
MAN.4640	180p
MAN.8910	230p
DL.747	160p

SOLDERING IRON

ANTEX XS25W 240V Soldering Iron 240Vac	540p
Spare Element for XS25W 240V	260p
ANTEX C15W 240V Soldering Iron 240Vcm	540p
Spare Element for C15W 240V	260p

DESOLDERING PUMP SOLDERING IRON

ANTEX XS25W 240V Soldering Iron 240Vac	540p
Spare Element for XS25W 240V	260p
ANTEX C15W 240V Soldering Iron 240Vcm	540p
Spare Element for C15W 240V	260p

DESOLDERING PUMP

Desolder Pump	290p
Spare Nozzle	60p

SOLDER MOP	65p

SOLDER

18 SWG	500g	500p
20 SWG	500g	650p

SOLDERING IRON STAND

Soldering Stand	200p
Spare Sponge	40p

FLOPPY DISCS

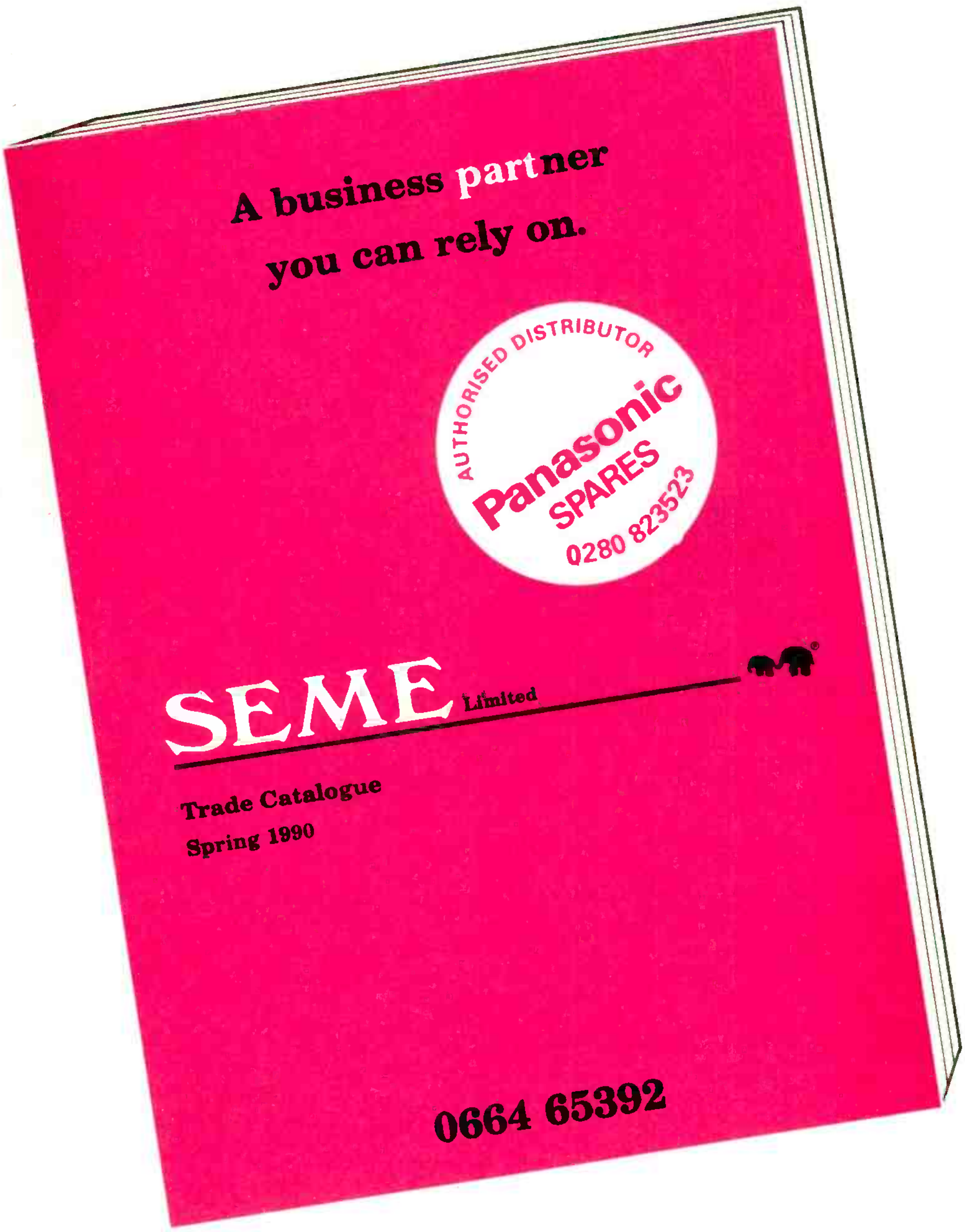
5 1/4 inch DSDD (10 in box) Branded Name	£7.50
5 1/4 inch DSDD (bulk pack) 25	£10.00
3 1/2 inch DSDD (10 in box) Branded Name	£13.00
3 inch CF2 Branded Name	£2.40
3 inch CF2D Branded Name	£3.00

PLEASE PHONE US FOR TYPE NOT LISTED HERE AS WE ARE HOLDING 5000 ITEMS AND QUOTATIONS ARE GIVEN FOR LARGE QUANTITIES.
Please send 70p P&P and VAT at 15%. Govt. Colleges, etc. Orders accepted. Quotations given for large quantities. Please allow 7 days for delivery. All brand-new Components. All valves are new and boxed. Prices quoted are subject to stock availability and may be changed without notice.

GRANDATA LTD

K.P. HOUSE, UNIT 15, POP IN COMMERCIAL CENTRE, SOUTHWAY, WEMBLEY, MIDDLESEX, ENGLAND
Telephone: 081-900 2329 Telex No: 932 885 (Sunmit)
Fax: 081-903 6126
Access & Visa Card accepted. Open Monday to Saturday.

OUR ELEPHANTS ARE TRULY IN THE PINK!



SPRING '90 CATALOGUE NOW AVAILABLE

(TRADE ONLY)

BARCLAYCARD VISA

EAST CORNWALL COMPONENTS

Access

EAST CORNWALL COMPONENTS
119 HIGH STREET
WEM
SHROPSHIRE SY4 5TT TEL: 0939 32689
TELEX: 35565
FAX: 0939 33800

SATELLITE CABLE

CT 100 – BRITISH MADE –
Manufactured by VOLEX
AVAILABLE IN 3 LENGTHS –
PRICE: Incl. VAT & P&P

100 Mts	**£35.00 per reel**
250 Mts	**£85.00 per reel**
500 Mts	**£165.00 per reel**
Available by the metre	**0.60p per metre**

1990 Catalogue — over 200 pages incl. Credit Tickets (3), Special Offer sheets, Prepaid Envelope & Order Form — £1, or free on application with orders of £15 and over. Prices in Catalogue may vary as material for advert is prepared 6/8 weeks before issue.

MAY SPECIAL OFFER

Each kit contains 1000 Popular Resistors – E12 - Every value individually packed and marked - Min 5 pieces per value 30+ of more popular values.
1/4W kit 10R-10m 1/2W kit ZR2-10M

20mm FUSES

QUICK BLOW – 80mA, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1A, 1.25, 1.5, 1.6, 2, 2.5, 3.15, 4, 5, 6.3 — 45p/10
TIME DELAY – 50mA, 60, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1A, 1.25, 1.6, 2, 2.5, 3.15, 4, 5, 6.3, 10 — 1.20/10

1" DOMESTIC MAINS FUSES

2A, 3A, 5A, 13A — £1.20/10

1" QUICK BLOW FUSES

500mA, 1A 1.25A, 2A, 12A — 50p/10

OSCILLOSCOPE

TEKTRONIX D755 – 50 meg. Solid State.
Price £295.00 incl. V.A.T. Carriage £12.00

VIDEO HEAD TESTER

A VHS video head tester for determining whether a video head is in good condition by detecting the wear state and displaying it on a meter. Complete with carrying case and leads.
SPECIAL PRICE £35

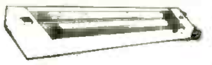
★★ NEW LINE ★★
VIDEO REPAIR KITS

AMSTRAD, JVC, FERGUSON, PANASONIC, HINARI, SHARP, HITACHI – Price on Application

QUARTZ-HALOGEN SPOTLIGHT

Hand held or hanging. Heat resistant poly-carbonate housing; highly polished reflector. Protective lens cover, doubles as base stand. With On/Off switch and 12ft curly cable terminating in cigar lighter plug. Produces 250,000 candle power – 5 times the intensity of average car headlamps.
Power. 12Vd.c. 4.5A 55W. Dims: 160 × 88 × 110mm. £5.99

12V Twin Fluorescent Lamp 12" Double Tubes



Attractive white fitting, ribbed perspex diffuser. On/off switch. 3ft cable. Transistorised circuitry. Keyhole fixing. 12V D.C. 8W Tubes. Dimensions: 368 × 67 × 43 mm.
Ideal for Caravans, Boats, Vans etc.

	1+	10+	50+
PRICE	**£5.99**	**£4.99**	**£4.50**

NI-CAD BATTERIES

AAA	£1.50 ea	£1.30 ea/10
AA	.95 ea	.85 ea/10
C	£1.95 ea	£1.80 ea/10
D	£2.00 ea	£2.20 ea/10
PP3	£3.90 ea	£3.75 ea/10

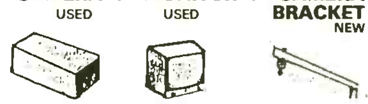
NI-CAD BATTERY CHARGER

Universal	1+	£4.99 each
PRICE:	10+	£4.75 each
4 × AA Charger		£4.95 each

SURVEILLANCE EQUIPMENT

TYPE 1: Camera, Monitor, Camera Bracket, 40m Lead — Ready to use.
PRICE: £149.99 Carriage: £15.00
TYPE 2: Identical to the above camera but with Built-in Intercom.
PRICE: £199.00 Carriage: £15.00

1× CAMERA USED 1× MONITOR USED 1× CAMERA BRACKET NEW



PRICE £175 Plus £12.00 carriage

SOLDERING SECTION

Soldering Gun Kit – 100W Pistol Type – complete with 2 Tips, Solder & Solder Paste	15.99
XS25 W Iron kit/complete with stand, 1m lead & plug attached	10.85
CS17 Iron Kit	10.75
C15 Iron Kit	10.75
Antex 15W iron	7.65
Antex 18W iron	7.75
Antex 25W iron	7.85
Antex elements	3.75
Antex bits	1.60
Antex stands	2.99
Soldersucker	3.44
Spare nozzles for Soldersucker	0.69

ORVX PORTASOL GAS SOLDERING IRON

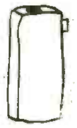
PRICE £18.75 each. SPARE TIPS – 1, 2.4, 3.2, 4.8mm £5.50 each

SOLDER: 60% TIN 40% ALLOY

22g. Non-corrosive Multi-core Solder. 500gm Reel £5.75 each.
18g. Non-corrosive Multi-core Solder. 500gm Reel £6.25 each.

FM TRANSMITTER

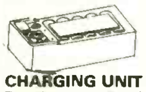
Very High Quality 'MINI-BUG' – Ideal for Baby Alarm etc.!!



A Very good range is obtainable – we have obtained over 1/2 mile, but it does depend on conditions.
Simply remove cover – insert battery – and you're ready to go.
Reception can be obtained on any F.M. Radio.
Frequency: 105-109 MHz F.M.
Power: PP3 9V Battery (not included)
Dimensions: 4.25" × 2.25" × 0.75".
Order Code – SO/034
Price: **£9.99**

12 VOLT RECHARGEABLE UNIT

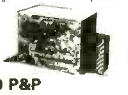
10 × D × Size Ni-Cads (4 Ah) encapsulated in a black plastic case.



Fuse holder. Gives 12 volt output when charged. Ex-equipment. Fully guaranteed. Dimensions: 245 × 75 × 75mm.
£9.19 each + P&P £2.12
£8.34 for 10 + P&P £4.50

CHARGING UNIT FOR THE ABOVE 12V UNIT

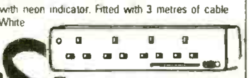
These chargers are suitable for the above battery packs (as advertised in the May issue of "WHAT VIDEO" — Page 6). The chargers are stated as we have modified them to a standard charger. Full charge of the packs is obtained after 10-12 hours (overnight) charging. Supplied complete with main lead and charging lead fitted with a 4-pin plug (6-pin plug version available upon request). Although ex-equipment, these chargers are fully tested and guaranteed.
Dimensions 335 × 260 × 150 mm.



4-PIN £11.50 6-PIN £11.50 + £2.00 P&P

4-WAY — WITH LEAD & PLUG

A 4-way 13A socket, fused and with neon indicator. Fitted with 3 metres of cable terminating in a 13A fused plug. White



PRICE
£5.75 each.
5+ £5.25 each

RESISTOR KITS – each value individually packed

1/4W pack 10 each value E12 – 10R to 1M 610 pieces	5.10
1/4W pack 5 each value E12 – 10R to 1M 305 pieces	3.75
1/4W pack Popular – 10R to 10M 1000 pieces	6.99
1/2W pack 10 each value E12 – 2R2 to 2M2 730 pieces	8.75
1/2W pack 5 each value E12 – 2R2 to 2M2 365 pieces	5.40
1/2W pack Popular – 2R2 to 10M 1000 pieces	10.75
1W pack 5 each value E12 – 2R2 to 1M 365 pieces	15.25
2W pack 5 each value E12 – 10R to 2M2 317 pieces	25.00

ADDITIONAL KITS

DISC CERAMIC 50V	125 pieces	£3.99
ZENER DIODES 5ea	55 pieces	£3.99
ELECTROLYTICS CAPS. RADIAL	100 pieces	£8.50
FUSES Q/BLOW 20mm	80 pieces	£4.75
FUSES T/DELAY 20mm	80 pieces	£8.50
PRE-SET POTS.Hor.	120 pieces	£7.75
PRE-SET POTS.Vert.	120 pieces	£7.75

BT APPROVED EQUIPMENT

Master Socket (Flush)	£3.30	Wiring Tool	0.35
Master Socket (Surface)	£3.25	Plug 431A	0.35
Secondary Socket (Flush)	£2.05	Slimtel Phone	£19.95
Secondary Socket (Surface)	£2.50	Betacom Flamingo Phone	£9.95
B.T. Cable (per metre) .15 100M £12.00		Cordless Phone - Freeway	£89.95
Line Jack Cord with Plug	£2.20	Conversion Kit & Wiring Diagram	£9.50
Extn. Lead 5 metres	£4.30		

VALVES

Type	Price (£)	Type	Price (£)	Type	Price (£)
DAF96	0.70	EF85	0.50	PCH200	1.45
DF96	0.72	EF86	2.65	PCL82	1.35
DK96	3.10	EF95	0.80	PCL83	2.95
DY86/87	0.80	EF183	0.52	PCL84	0.95
DY802	0.98	EF184	0.64	PCL86	1.15
E88CC	4.75	EH90	0.45	PCL88	2.95
EABC80	0.85	EL34	3.95	PCL805	1.20
EAF42	1.78	EL36	1.60	PD500	3.75
EB91	0.65	EL81	8.05	PFL200	1.15
EBC41	1.45	EL84	1.30	PL33	1.80
EBC81	1.10	EL86	1.45	PL84	1.20
EBF80	0.60	EL509	7.25	PL504	1.80
EBF83	1.35	EL519	7.25	PL508	1.35
EBF89	0.85	EM80	1.50	PL519/509	5.55
EC92	2.10	EM84	0.80	PL802	8.40
ECC81	1.75	EM87	4.75	PY81/800	1.35
ECC82	1.08	EY51	1.10	PY88	0.85
ECC83	1.40	EY86/87	0.85	PY500A	2.35
ECC84	0.65	EY88	0.85	PY801	1.35
ECC85	1.20	EY500A	2.55	UABC80	0.55
ECC86	3.25	EZ41	3.45	UAF42	1.85
ECC88	1.50	GY501	1.65	UBC41	2.90
ECC189	1.75	GZ32	2.45	UBC81	2.05
ECF80	1.35	GZ34	3.80	UCH42	2.45
ECF82	1.35	KT88 (GEC Mullard)	43.50	UF41	1.50
ECF83	2.25	KT88 (Foreign)	18.80	UL84	1.05
ECH35	4.35	PC86	0.55	UY41	3.85
ECH42	1.75	PCC84	0.50	UY85	0.95
ECH81	1.15	PCC85	0.92	2D21	2.65
ECL80	0.80	PCC88	0.85	6AU6	1.60
ECL82	2.11	PCC89	0.85	6BA6	1.45
ECL83	3.80	PCC189	0.85	6BE6	2.20
ECL84	1.25	PCF80	1.35	6C4	1.20
ECL85	1.20	PCF82	0.75	6K7G	3.05
ECL86	1.25	PCF86	1.35	6X4	1.75
EF37A	4.25	PCF87	1.35	12AU6	3.20
EF80	0.50	PCF200	2.75	12AV6	1.35
		PCF800	1.05	30FL2	2.00
		PCF801	1.50	30PL1	1.95
		PCF802	1.10		
		PCF805	1.65		

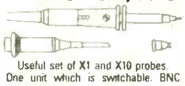
FULL RANGE IN CATALOGUE

8-way splitter amplifier to supply 8 TV's from one antenna. White plastic box with aluminium panel. On/off switch with neon.

Band width	40MHz-860MHz
Gain	3dB per channel. Total 21dB
Impedance	75Ω
Max. output	80mV (38dBmV) (signal/cross modulation = 6dB
Noise	6dB
Isolation between outputs	40dB min.
Power	240Vac 50Hz
Dims	250 × 100 × 60mm

£35.00

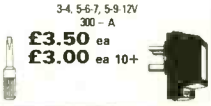
Probes – X1, X10



Useful set of X1 and X10 probes. One unit which is switchable. BNC connectors
Price £14.95

MAINS ADAPTOR

3-4, 5-6-7, 5-9-12V
300 – A
£3.50 ea
£3.00 ea 10+



VIDEO HEADS

AKAI	
VP-77	£19.99
VP-88	£19.99
VP-7100	£19.99
VS-1	£19.99
VS-2	£19.99
VS-3	£19.99
VS-5	£19.99
VS-10	£19.99
VS-77	£19.99
VS-9300	£19.99
VS-9500	£19.99
VS-9700	£19.99
VS-9800	£19.99
FERGUSON	
3V00	£19.99
3V01	£19.99
3V16	£19.99
3V22	£19.99
3V23	£19.99
3V24	£19.99
3V29	£19.99
3V30	£19.99
3V31	£19.99
3V35	£19.99
3V36	£19.99
3V38	£19.99
3V39	£19.99
8903	£19.99
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CORRECTIONS

The details of the spares ranges handled by HRS Electronics plc given in our Spares Guide (April) were incomplete. See Teletopics, page 539. Other corrections appear on page 549.

COVER PHOTO

This month's cover photograph shows the deck used in the Panasonic NV850 VCR. It's a variant on the D1 deck which is the subject of a servicing feature on pages 518-521.

End of the Road?

It would be interesting to know the names of those who led the teams that designed the UK's TV sets in the pre-war period, when the UK was the only country in the world with regular high-definition TV broadcasting. Between them they must have built up a considerable fund of electronic know-how. This couldn't be put to much purpose back in the Thirties, when only some 20,000 sets were produced. In fact there was much depression in the industry at that time. TV didn't take off. There was little to watch by way of programming, only London was served, and people couldn't afford the sets. The know-how certainly came in useful during the war however, where radar in particular benefited.

Some of the pioneering firms developed know-how over an amazingly wide field, EMI for example. This firm developed the 405-line system of course: almost everything from cameras to receivers, and for the latter the company could and did produce just about everything required, including c.r.t.s, valves, passive components, and of course those amazing timber cabinets. Apart from the Dutch-based Philips, for an equivalent spread of technological know-how one had to wait until the major Japanese manufacturers entered the field in a big way in the Seventies. It's sad that EMI never capitalised on its early technological know-how: in fact it was the first major firm to pull out of the domestic TV field in the UK.

The pre-war sets tended to operate on the brute force principle. Put enough valves in and give each one a job to do. Subtleties like line output stage tuning, which had been suggested by A.D. Blumlein in the early Thirties, weren't introduced until the post-war era, which saw a great deal of progress and development in TV receiver design. You can catch some of this by checking through the various editions of W.T. Cocking's famed book *Television Receiving Equipment*, the bible of those of us whose interest in TV receiver technology started in that period. Improved valves were constantly being introduced, including specialised ones for TV applications; there was the move to Band III operation; a.g.c. started to appear; and as the deflection angle of the tubes increased from around 60° to 110° the demands made on the scanning circuitry became much greater.

Although the UK's consumer TV industry never achieved international success, it continued to maintain a leading position with development work. Just think of the major changes that rapdily occurred. The change to transistor circuitry, via the hybrid period, then the introduction of i.c.s., colour, teletext and so on. Some of these major changes overlapped, in particular solid-state circuitry and colour, which meant that a major effort was required on the design front to keep the UK's production abreast of the technology. The move to transistors was not a simple matter of substitution. Transistor line scanning calls for a stabilised power supply for example, and much effort was required to achieve reliable operation. Line output transistors were destroyed by the dustbin full in carrying out the research required. It's a fact that UK designs were the first to tame the transistor line output stage. Despite the fact that the UK industry maintained a rather insular approach, the potential was there to develop in an international way.

The potential has gradually faded away in recent years however. Perhaps the first major UK manufacturer to sell out to a Japanese concern was Rank Radio International. It wasn't long before the sets emerging from Plymouth became wholly Toshiba designed. In the case of the GEC-Hitachi joint venture, as it was to start off with, the changeover took rather longer. Pye ceased to do its own design work soon after becoming a wholly owned subsidiary of Philips. Then Philips decided that its design work should be centred on the Continent. It was goodbye to the G series designs. The justly famed G8 and G11, many of which continue to go on and on, form a testimony to the achievements of Philip's UK designers.

During this long period of contraction in UK design work, at least there was always Thorn/Ferguson to keep the flag flying. One could feel reasonably happy about the future so long as a firm that was as innovative as Ferguson continued to produce new chassis. Its record was remarkable. The world's first large-screen all solid-state chassis, the 2000; the first domestic CTV to use a chopper power supply, the 3000; the amazingly simple 8000 chassis that broke through the £200 barrier; the 9000 chassis with its Syclops circuit; and then the TX series chassis which managed to get up-to-the-moment designs on to single boards of modest dimensions.

When Ferguson was taken over by Thomson of France, one's first concern was what would this mean for the firm's design activity? The sad news has now come out. Research and Development has ended at Enfield, with a loss of 180 jobs, and only two smallish teams are to be retained at Gosport. At last it seems the end of the line has been reached. When you consider that TV is a thriving industry internationally, with much still to offer, it's rather a bitter moment.

Possibly enough know-how is still available to enable design work to resume should it be feasible. But for how long will this be the case? The design of a TV chassis is not simply a matter of selecting circuitry and getting it to work. The manufacturing and component technology are as vital, and the ability to achieve high standards of reliability. Once development teams are split up the special know-how required is soon lost. It seems that the UK's indigenous TV industry has at last virtually ceased to exist.

Servicing the Panasonic D1 Deck

Nick Beer

The D1 deck mechanism was used in a large number of Panasonic VCRs released over a period of some years. It was also used in slightly modified form in many other machines. This article deals mainly with the overall mechanism, but also provides notes on electronic faults experienced with some models. VCRs that use the basic deck are as follows: NV230, NV430, NV810, NV870, NV-G7, NV-G10, NV-G12 and NV-G18. They are all front loaders and cover a wide range from the NV230, a basic machine with wired remote control, to models with dual-speed operation and hi-fi sound. We'll deal first with the mechanical operation of the deck.

Mechanical Operation

As in the NV730, which we dealt with in an earlier article, the cassette is loaded into the carriage by means of a slot-in belt (part no. VDV0151). The front loading motor drives a worm via this belt, the mechanism being located on the right-hand side of the carriage. It's easy to remove the carriage – usually there's a red screw or bolt at each of its four corners. Doing this makes for easier mechanism service. The carriage can be lifted out (see later) and placed upside down on a piece of paper or foam on top of the timer PCB to its right: with the connector refitted, it will load a cassette to enable the mechanism to run for observation purposes.

Reel drive is provided by idler VXP0521, which is of the same type as in the NV370/830/850. It's between the reel turntables and gets its drive from a belt (VDV0149) on the capstan rotor via a clutch (VXP0600). Capstan drive is by means of a direct-drive, fixed-stator motor. Thus the motor is split into two major, replaceable components, the rotor and stator (see faults list).

Tape loading and mechanism mode selection are driven by a loading motor (VEM0211) via a loading belt (VDV0152). As in earlier machines, a cam and lever principle is involved. Mode selection is by means of a linear mode switch which is mounted in parallel to the main lever. In earlier models this was type VSS0110 but in later ones with NV-G numbers it's type VSS0135. Physically the main difference consists of an extra tag, for an earthing lead to the mechanism chassis, below the centre contact. A single retaining bolt (XYE3 + BF10FZ) holds the mode switch. Whenever the switch is replaced this bolt should also be changed (see faults list).

The VXL1371 pinch roller is of the established Panasonic design – a pivoting arm with counterspring arrangement. The brake band (VXZ0165) is mounted in the same way as in the NV730, around the supply reel. Drum drive is via a direct-drive unit: as with the heads, the part numbers vary from model to model depending on the features included. Table 1 provides a list.

The video heads are all mounted in the same way: pins are soldered through the PCB on the head drum. Always remove the head drum carefully – I must repeat the warnings given in previous articles always to ensure that all pins are free from solder before removal and that the correct sequence is observed. The Panasonic head puller can be used.

The audio/control head (VEH0247) is prone to wear, especially in the NV430. As you would expect the symptoms are low and muffled sound. Replacement is straightforward: the three-screw adjustment method is used, with plug-in connections.

Maintenance Kit

The maintenance kit for this range of models is part number VUD4093KIT. It contains nothing unusual – idler, pinch roller, the three belts, impedance roller, etc. The price is very reasonable, representing a considerable saving on the cost of the individual parts.

Replacing Mechanical Parts

The video head drum is fixed to the lower drum with the standard two bolts, connection being by pins soldered through the small PCB in the upper drum. This has already been mentioned, along with the precautions to take. The number of connection pins varies depending on the number of heads in the drum, i.e. the features incorporated in particular models.

Replacing parts – other than the heads – on the upper side of the mechanism is much easier when the cassette carriage has been removed. After removing it you can replace the idler, brake band, pinch roller, etc.

The idler is secured by means of a split washer. After removing this and unhooking the spring across the back of the idler arm you can pull the idler up and off its shaft.

The brake band can be removed after undoing the adjustment screw and unclipping the other end from the

Table 1: Models using the D1 deck.

Model	*Features*	*Video head*	*DD unit*
NV230	Cord RCU, two heads, one event timer	VEH0296	VEG0397
NV430	IR RCU, two heads, four event timer	VEH0271/86	VEG0353
NV810	IR RCU, hi-fi audio, four event timer	VEH0294	VEG0396
NV870	IR RCU, hi-fi audio, eight event timer, dual speed	VEH0288	VEG0367
NV-G7	IR RCU, two heads, one event timer	VEH0296	VEG0397
NV-G10	IR RCU, super still, eight event timer	VEH0287	VEG0352
NV-G12	IR RCU (timer prog.) four event timer, optional DBS	VEH0287	VEG0352
NV-G18	IR RCU, dual speed, eight event timer	VEH0330/1	VEG0449

Abbreviations: IR infra-red, RCU remote control unit, DBS digital bar scanner (the Panasonic light pen for timer setting).

back-tension post arm. After replacement, reset the back tension – see later.

The pinch roller is secured by a single circlip that fits over its pivot.

The impedance roller (VDP0908) is held on its shaft by a nut. The replacement must be at exactly the right height otherwise there will be severe disturbance on the picture. Make a note of its approximate position before removing the old one. With non hi-fi machines, fine set the new one by playing a standard tracking tape (not your best one, as it may get marked when you adjust the height of the roller). With hi-fi machines align the roller while viewing the hi-fi audio envelope – the roller's position can have a drastic effect on the hi-fi envelope with minimal effect on the vision. If doing a general service, make impedance roller replacement the last job.

Underside of Deck

Now for the underside of the deck. The loading belt simply fits over the loading and loading-motor pulleys. The capstan belt fits over the capstan-rotor pulley and the large reel-clutch pulley (VDP0985). You will have to move the flywheel bracket over the rotor to replace the capstan belt. This is best done by removing the belt nearest the front of the machine and loosening the other one, giving you enough clearance to be able to replace the belt.

To replace the reel clutch (VXP0600), remove the capstan belt then the large clutch pulley on to which the belt fits. Beneath this you will have to remove the small gear to the left-hand side as you view from the front of the machine (see Fig. 1). The pulley and gear are secured with split fibre washers. With the gear removed you will have sufficient clearance to be able to lift out the reel clutch. When replacing it take care not to lose the washer. It's usually worth replacing the two slit washers as they become weak. Unfortunately the clutch is not part of the maintenance kit and you will usually find that it's noisy – see faults list.

The mode switch is mounted on the chassis with the arm connected to the main lever. Fig. 2 shows the connections. For alignment purposes the notches in the arm and body of the switch should be aligned in the stop mode.

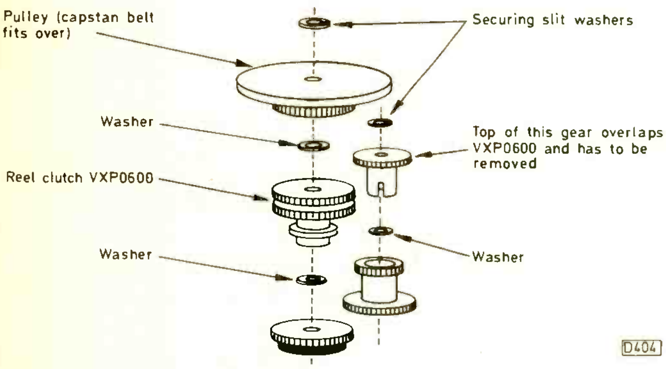


Fig. 1: The reel drive arrangement, viewed from the rear with the machine upside down.

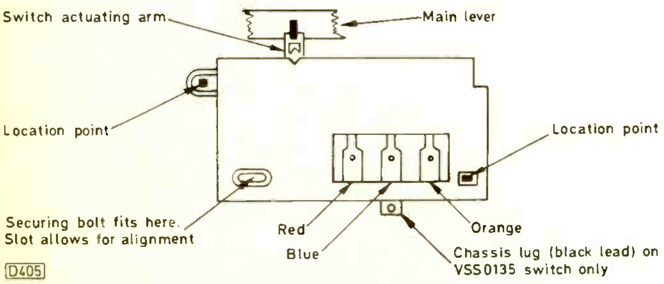


Fig. 2: Connections to and alignment of the mode switch.

Back Tension

The Tentelometer back tension is specified as 25-30g. For adequate noise suppression in the search modes and good still-frame performance it needs to be at the 29-30g end of the range. As usual, adjustment is by means of the slotted hole in the brake band. If you can't obtain adequate performance in the trick modes don't increase the back tension. Instead, try altering the back-tension post's landing position.

Reel Torques

The reel torques are over 350g-cm for fast forward and rewind, 105-155g-cm take-up.

Dismantling

Cabinet dismantling varies from model to model. In general however the following instructions apply. In the earlier machines the lids are secured by four large bolts, one in each corner. In the NV-G series the lid is secured by either two or four smaller screws. If two are used they are at the rear of centre. The bottom flap is either a small metal plate that covers just the bottom of the mechanism (NV-G series) or one that covers the whole bottom (earlier models). In either case the plate is secured by a number of gold-coloured screws.

The fronts are secured by clips around their edges and

red securing screws. The bottom flap must be removed first. With the small flap you'll find that there's a gold screw in the third clip along the bottom of the front, i.e. the clip not covered by the bottom flap. This screw has to be removed.

The cassette carriage is secured by four red bolts, one at each corner, or by just two bolts, one in each rearmost corner. When removing it, first pull out the multi-pin plug on the right-hand side to avoid damage. When it's out the carriage can be laid, upside down on an insulator, on top of the timer PCB. If you then reinsert the plug a cassette can be fed in to allow the mechanism to run without being covered by the cassette.

Remote Control Units

Quite a number of different remote control units were used by the different models in this series. They are usually pretty expensive to replace. Thus repair, which is usually not difficult, is very often a viable proposition. Notes on this subject were included in my article in the September 1989 issue. Except for the NV230 which uses a wired unit, the rest of the handsets are of the infra-red type.

Mechanical Faults

We'll deal first with mechanical faults applicable to all models.

(1) Knocking noise in play. Replace noisy clutch (VXP0600) and sometimes the idler (VXP0521).

(2) Squeaking noise in play. Replace the pinch roller and clean the complete tape path.

(3) Tape stuck laced up in deck. Replace the mode switch and bolt.

(4) No drum rotation, sometimes doesn't unlace as a result. Replace the mode switch.

(5) Tape loop left in machine when cassette is ejected. Check the condition of the idler and loading belt (VDV0152).

(5) Monochrome or noisy playback or recording. The video head needs replacement. Check the drum for signs of burring due to excessive back tension – check the back tension anyway.

(6) Cassette will not go in or comes straight back out. You've guessed it – the cassette up and down switches on the carriage (VSM0049).

(7) With hi-fi models, random dropouts on hi-fi recordings mean that the upper drum is dirty or worn and needs cleaning or replacement.

Electronic Faults – All Models

Here are some electronic faults applicable to all machines.

(1) Fluorescent displays dim but centre of elements remain bright. Replace low-emission digitron.

(2) No go, no display or timer inoperative. Timer microcomputer chip IC7501 is faulty. The type varies with the model.

(3) Machine dead, switches off intermittently and won't restart, or dew light permanently on. Syscon microcomputer chip IC6001 faulty. Type varies with model – ensure that you quote the exact part number when ordering a replacement.

(4) Won't accept or unload a cassette, or no mechanism shuffle at switch on, or switches off after a few seconds – especially after one or more of these symptoms. The loading and front loading drive chip is faulty. In some models this is IC6003, in others IC6004.

(5) No drum rotation. Check the drives at pins 1, 2 and 23 of IC2006. If abnormal, replace this chip. This has been another common failing with Panasonic VCRs over the years.

Electronic Faults – Specific Models

The following electronic faults have been experienced with particular models. Most could occur with other machines as well.

(1) Incorrect capstan speed. IC2001 (AN6359N) or IC2002 (AN3821K) faulty. Which chip is defective can usually be determined by the extent of the error, i.e. speed or phase. Model NV430.

(2) No capstan rotation or sometimes intermittent rotation depending on the position of the rotor over the stator. If the capstan can be kick started, suspect the stator (VEK2257) – check the continuity of the windings. Otherwise suspect IC2002 (AN3821K). Models NV430 and NV-G12.

(3) No sound with new recordings. No bias due to instability in IC402. A modified chip, type μPC1519HA, should be fitted in place of the TA7361P. Model NV430.

(4) No colour, intermittent colour or incorrect colour phasing. The VEFC009 hybrid film chip IC801 faulty. Model NV430.

(5) No reel drive in rewind, fast forward or cue/review. IC2004 in servo faulty. Model NV810.

(6) No go at all. Regulated −29V supply at pin 7 of P1001, the power supply output plug on the main chassis, absent as R1103 (8·2Ω) is open-circuit because Q1101 (2SA684RNC) and also possibly D1105 (MA4300) is short-circuit. Model NV-G7.

(7) Intermittent or complete loss of field sync on playback of own recordings. Dry-joint at pin 1 of the AN3215 chip on the hybrid assembly IC301 (VEFY014). Replacement of the hybrid assembly is not usually necessary, but be careful when resoldering. Models NV-G7 and NV-G10.

(8) Hum bar on the picture and colour intermittent. C1002 leaky. Models NV-G7 and NV-G10.

(9) Loss of colour in standard-play trick modes only. Incorrect head switching as the AN6359N chip IC2001 is faulty. Model NV-G18.

(10) No tuning, Model NV-G12 with serial numbers commencing E7. This was a very common fault when these machines were new. The primary cause was that R7573's legs, which are bent over, shorted to adjacent print lands. The trouble can sometimes be cured by straightening the legs and cutting them short, but usually one of the following components has failed: IC7551, Q7551, D7555.

Conclusion

As with most VCRs, the electronic faults are mainly one-offs but there's a definite mechanical fault pattern. That's why I've grouped these models in this way. The mechanism is not significantly different from earlier ones and the faults can easily be predicted. This makes servicing rather routine, but it also means that the machines are ideal for rental purposes and lend themselves to field servicing. The mechanism that followed this, the G, is another matter entirely. More on this in a later issue (some preliminary notes appeared in the September 1988 issue).

An Experimental Band IV Zigzag Aerial

Percy Lamb, C.Phys.

Although the zigzag aerial is not particularly well known in this country the configuration was used in France as early as 1928 for broadside h.f. curtain arrays. Some experimental work on the subject was done by radio amateurs in the Fifties and in 1956 O.M. Woodward, working in the USA, patented a v.h.f./u.h.f. transmitting aerial that used a single set of zigzags to provide wide-angle coverage and maximum radiation in the horizontal direction. Fig. 1 shows in diagrammatic form the set-up he used.

Large zigzag arrays for TV reception have been available in recent years from the Toner Cable Equipment Company of Horsham, Pennsylvania, while very simple low-gain aerials based on the zigzag principle have been marketed by Radio Shack, again in the USA.

The experimental design presented in this article uses a double zigzag. Provided a moderate gain is acceptable, it's suitable when a wide reception angle is required. It also has the advantage of being relatively insensitive to aircraft flutter.

Construction

Fig. 2 shows the general arrangement. A central vertical wooden support of square cross section carries seven rigid "chocolate-block" connectors spaced thirteen inches apart at the centre of the aerial reducing to eleven inches at the top and bottom. The two zigzags are constructed from ⅛in. diameter aluminium alloy rod which is threaded through the outermost connectors of the blocks and bent to the required shape. The zigzag legs were all made equal, at 10·5in., which is five per cent less than half a wavelength at 535MHz. Unused metal connectors in the blocks were removed. The centre-point aerial connection was made to 72Ω coaxial cable via a 4:1 balun fixed to the central support.

A reflector screen consisting of 3 × 1in. wire mesh, with the 1in. spaced wires horizontal, was fixed 5·5in. behind the zigzag elements. The mesh is supported by means of an alumimium right-angled member placed directly behind the main wooden support, together with three cross-members. Small struts are used to ensure that the members supporting the screen are held in position parallel to the plane of the zigzags.

Performance

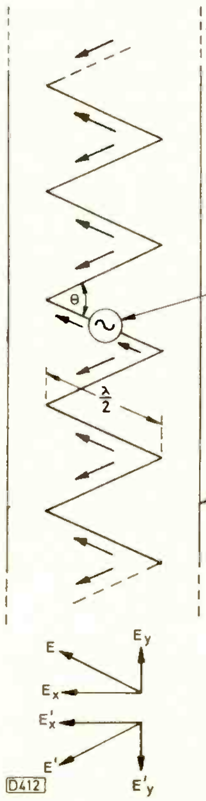
The aerial is reasonably light and was easy to fix to a rotatable mast for experimental purposes. Windage is reasonably small, both with regard to direct force and the torque exerted on the mast. Directivity was found to be quite sharp in the vertical plane but broad horizontally, as expected.

When mounted at a height of about 25ft excellent signals were received at a distance of forty miles from the Crystal Palace transmitter, on channels 23, 26, 30 and 33. Bluebell Hill was also well received at about seventeen miles on channels 40, 43, 46 and 65, though there was some reduction in sensitivity at the higher frequencies. Dover was also received here at Westcliffe-on-Sea, Essex on channels 50, 53, 56 and 66 at lower but acceptable strength. No aircraft flutter was apparent during the tests.

Measurements made with a signal-strength meter suggest that the gain at the design frequency is about 14dBi. This value agrees reasonably well with figures estimated from calculations based on the aerial aperture and from a gain value based on computations of the horizontal and vertical half power beam widths.

The performance could probably have been improved by using ⅜in. aluminium strip instead of the ⅛in. solid rod. The reflector's efficiency would probably have been enhanced by using ½in. spacing instead of the 1in. mesh. In addition a more precise matching to the cable would appear to be desirable. Even without these refinements however the zigzag configuration offers interesting possibilities when a wideband design with low horizontal directivity is to be combined with high directivity in the vertical plane.

My thanks to Roger Bunney for his assistance with research into the history and mode of operation of the zigzag aerial.



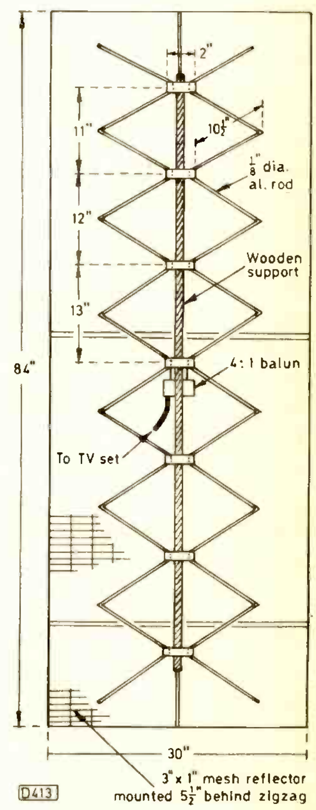


Fig. 1 (left): Principle of the broadside transmitting zigzag aerial developed by O.M. Woodward. R.F. power fed to the mid point produces travelling waves that give rise to horizontally polarised radiation, since the vertical components of the electric vectors cancel while the horizontal components add. Each leg is of half-wave length. The angle θ decreases gradually towards the top and bottom of the array.

Fig. 2 (right): The experimental double zigzag aerial with reflecting screen for broadside reception in Band IV.

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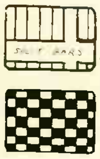

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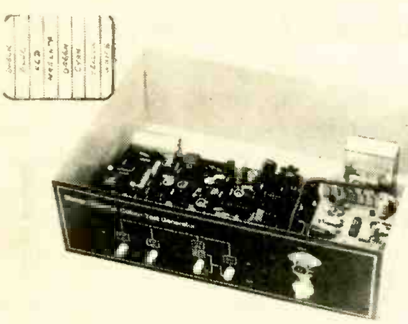

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Letters

SATELLITE TV INSTALLATIONS

A couple of queries have arisen following my article on the way in which the chaps from the Room at the Back aligned their first satellite TV dish using a magnetic compass (December 1989 issue). It's quite simple really. The satellite's position is given by the accepted convention of stating its orbital position in degrees east or west of true south. For Astra, the position is 19·2°E.

The only constant means of finding true south is to use a magnetic compass and add a further 7° of clockwise rotation to the reading obtained, see Fig. 1. One could use the position of the sun at noon, but this is hardly practical in our northern climes. It's not necessary however to know the position of true south when installing a fixed dish. You can instead calculate the satellite's position with respect to magnetic south. For a satellite east of true south you subtract 7° from the specified bearing while for a satellite west of true south you add 7°.

Matters are a little more complicated since the specified satellite bearing applies only to someone looking south from the North Pole (though for anyone at a latitude higher than about 80°N reception from a geostationary satellite is impossible). For those elsewhere, their geographical position in terms of latitude and longitude determines the satellite's bearing. Here are some examples for Astra's azimuth position at widely different locations in the UK:

At Edinburgh, which is 3·2°W and 55·95°N, Astra is at 26·46°E, i.e. 19·46°E of magnetic south (the compass reading).

At Great Yarmouth, 1·75°E and 52·66°N, Astra is at 21·57°E, i.e. 14·57°E of magnetic south.

At Plymouth, 4·15°W and 50·38°N, Astra is at 29·27°E, i.e. 22·27°E of magnetic south.

For mainland UK Astra's azimuth position varies between about 21·5°-31°E, i.e. 14·5°-24°E of magnetic south. This variation has to be taken into account of course but in practice, with Astra's strong signals, pointing the dish in roughly the right direction then adjusting it suffices. The final adjustment for optimum signal is important however, as explained in the article.

There has also been a query about the LNB not being straight. This is because the attitude of the satellite varies in accordance with its orbital position and the observer's position on the earth's surface. Fig. 2 illustrates this. The satellite "leans" a bit, which is why the polarisation will not be truly perpendicular to the earth's surface when vertical or truly parallel to the earth's surface when horizontal.

It has been pointed out that a magnetic compass will be affected by metal objects in the vicinity. I don't however envisage many problems that, when you are up an aluminium or wooden ladder against the wall of a house, can't be easily overcome by nudging the dish to peak the signal.

J. LeJeune,
Nottingham.

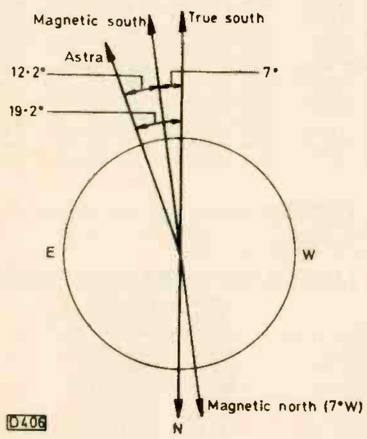


Fig. 1: Relationship between true/magnetic north/south.

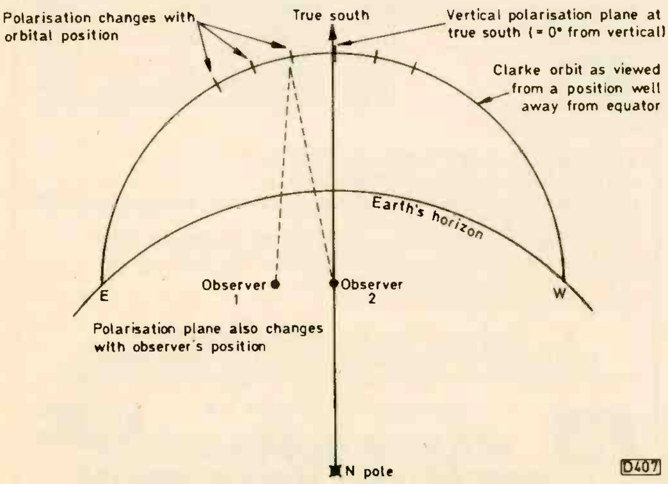


Fig. 2: Way in which a satellite's orbital position affects the signal polarisation at the receiving site.

SEALING LNB F CONNECTORS

We've noticed a potential problem arising from the use by installation engineers of various types of silicone sealant to prevent the ingress of water at LNB F-type plug connections. Unfortunately many of these sealants produce acetic acid during the curing process. This can and does penetrate the LNB case, causing damage to the internal components and PCB. The result is premature failure of the unit.

We recommend that self-amalgamating tape is used to seal the F connector against water penetration.

J.A. Glenton, MCES Ltd.,
Davyhulme, Manchester.

INTERLACED AND SEQUENTIAL SCANNING

In his article on Bandwidth Compression (December/January issues) Tom Ivall describes interlacing as a bandwidth compression technique, justifying this by comparing the bandwidth requirement of the present 625-line interlaced system with that required by a sequentially-scanned 625-line system. It's quite true that for a given field frequency and horizontal resolution the sequential system requires twice the bandwidth of an interlaced system, but this is not a meaningful comparison since the sequentially scanned picture is of significantly better quality. A more appropriate comparison is that between the 625-line interlaced system and a 312-line sequential system.

If we compare these two systems we find that they are very similar. They have the same field frequency and thus the same broad-area flicker. The line scan frequency is the same (almost) and hence the horizontal resolution/bandwidth trade-off is the same. Contrary to popular opinion, the vertical resolution is also virtually the same. The actual difference between these systems is in fact restricted to the greater visibility of the line structure of the sequential system and the small-area flicker of the interlaced system.

To assess the relative acceptability of these two impairments I modified a black-and-white camera so that it would produce either a 625-line interlaced picture or a 312-line sequential one at the flick of a switch. The results were displayed on a variety of monitors with screen sizes ranging from 9in. to 23in. In all cases I found that the 312-line picture was more acceptable. Though the line structure is quite noticeable, especially with a larger picture, it's really annoying only at a viewing distance where the small-area flicker is quite unacceptable.

It's notable that virtually all computer VDUs, with which close viewing is normal, use sequential scanning. I can only conclude that the overwhelming preference for interlaced systems shown over the years by those responsible for broadcast TV standards is due to the fact that since the number of lines quoted is double that of the nearest sequential system it sounds more impressive.

David T. Looser,
Harkstead, Ipswich.

DEFINITION STANDARDS

When I read about proposals for HD-TV I wonder what the point is since so much of what is at present transmitted doesn't make use of the achievable definition. A few transmissions are of really good standard, with sharp, good detail and faces in the background recognisable, but many programmes look as though they have been filmed using old 8mm cine cameras. Can anyone explain why standards are so low? One expects a rubbishy American soap to be pretty fuzzy, but much home-produced material is not what is should be.

Ray Turner,
Spinney Hill, Northampton.

HELP WANTED

Can anyone supply a c.r.t. for the Telequipment D83 scope? Type no. is Tektronix T7400-31-2, part no. 154-0640-10. A scrap scope with usable tube would do.

F.H. Brown, 28 Tib Street,
Denton, Manchester M34 1EN.
Tel. 061 320 0022.

Can anyone help me obtain a circuit diagram for the Samsung Model C1-330Z 14in. TV receiver? – no joy from Samsung.

T. Poole, 13 Broomhill Crescent,
Bellshill, Lanarkshire ML4 2BS.

Can anyone supply a service manual or circuit for the Unaohm EP684R PAL colour pattern generator?

David Barfoot, 65 Nortoft Road,
Bournemouth BN8 8QB.
Tel. 0202 23350.

Can anyone supply a tuner, type TNV87401EF, for the Panasonic Model TC361GM TV receiver?

Craig Taylor, 12 Reeds Close, Reedsholm,
Rossendale, Lancs BB4 8ND.
Tel. 0706 227 645.

An Orion VSP10 VCR I have had been got at. Transistors Q01, Q03 and Q06 are missing and there's slight damage to the PCB in this area. Can anyone advise on the transistor types and pin connections and suggest a possible source of a circuit diagram? Hinari can't help.

John Clarke, 27 Northumbria Close,
Prospect Hill Estate, Worksop, Notts S81 0SU.
Tel. 0909 486 438.

Can anyone supply a TDA2651 i.c. which I understand is no longer in production?

H.F. Loh, 2A Lebuh Shatin 6,
31650 Ipoh, Malaysia.

Does anyone have a cabinet front and power supply panel for the Sony KV1340UB colour portable? These parts are no longer available from Sony.

Tim Jarman, 7 Cadet Way, Church Crookham, Aldershot, Hants GU13 0UG.
Tel. 0252 616 938.

CURING INTERFERENCE PROBLEMS

Ivor Nathan's letter (March) reminds me of the days soon after World War II when I was responsible for finding solutions to interference problems with and created by EMI products, often as a result of viewers' and listeners' complaints to the Post Office.

Most interference from domestic sources is mains borne rather than radiated. Measurements made by myself and by PO engineers show that some interference signals are symmetrically and others asymmetrically borne, the latter being the most troublesome. As a result of these findings, standards were set. Most appliances are fitted with delta-connected suppression capacitors to try to make the source symmetrical and therefore less troublesome. Suppression at v.h.f. is improved by fitting two 5μH chokes in the appliance. At u.h.f. less interference is generated and the impedance of the mains cable provides suppression.

A receiver's signal input circuit is excited by a voltage received between an aerial and earth. At lower frequencies long-wire aerials are often used together with a connection to earth. The mains supply also returns to earth and has on it interference which will be injected into the signal path between the aerial and earth. A super low-resistance earth is required to bypass this and is difficult or impossible to achieve. The alternative is to isolate the receiver's input from the mains. This can be done by including suitable r.f. chokes in the receiver's mains connections. An effective receiver earth can then be obtained either by a radial earth, an earth stake or a counterpoise earth.

I remember a number of instances in flats in various parts of London where long-wave reception was marred by serious interference. The PO engineers having done all they could to provide suppression at source, I fitted a pair of r.f. suppression chokes in the receiver mains leads – these chokes were normally used in the mains leads of early a.c./d.c. EMI TV receivers. An aerial wire was run around the picture rail and a counterpoise earth around the skirting. A variable inductor was fitted in series with the aerial connection and the aerial (it was a width control, with ferrite plunger, from an early TV receiver). This was adjusted to tune the aerial/counterpoise, giving really excellent reception.

At v.h.f. and u.h.f. reception is generally with a Yagi aerial that's balanced, i.e. the connections to the dipole are at equal and opposite potential with respect to earth at any instant. Earth potential is the centre of a dipole but of course this is actually a gap and is therefore inaccessible. Unless a balun transformer is used or a balanced downlead is fitted interference will be injected between the aerial and earth as a result of pickup on the downlead. With a coaxial downlead the interference pickup can be greatly reduced by winding the cable four or five times around the cardboard tube from the centre of a kitchen towel roll, along with suitable chokes in the mains lead to the receiver.

Use of a balun transformer enables the dipole to provide an r.f. earth for the outer conductor of a coaxial downlead. Some commercial aerials have a transformer built into the cable harness. These are effective even in aircraft.

A suitable r.f. choke will have maximum inductance and minimum inherent shunt capacitance resonant below the frequency to be received. Thus the choke is really the minimum capacitance value that can be fitted in series with a load and still be able to provide a circuit for power to drive the load. To maintain the minimum capacitance the method of winding the inductor is important, and the inductance value must fall as the required frequency increases.

I'm sure that if the PO's anti-interference division still exists their engineers would be happy to provide help and advice. Incidentally one of my proudest moments at the time and what we thought was a great achievement was to suppress interference from the electrics in the Royal Coach (battery-powered fluorescent lights etc. using a vibratory power supply – transistors had not even been thought of then) spoiling reception on the dozens of TV and radio receivers along the route of the coronation procession.

In conclusion I feel that the vertical whip aerial suggested by Ivor Nathan could well be the answer along with a suitable tuning inductor or, in aerial parlance, a "loading coil" to substantially increase the signal level. Don't forget that the earth side of the aerial system is of equal importance to the aerial itself.

Ernie Kendall,
Ilton, Somerset.

Simple Intercarrier Sound Converter

J. LeJeune

The idea for this converter arose from a recent examination of several multi-standard colour TV receivers imported from the Continent. These were found to use paralleled ceramic sound filters and demodulator coils. This method of providing dual-sound capability is simple for the setmaker to incorporate in his design but does not lend itself to DIY modification of an existing receiver. The design presented in this article has the advantage of not requiring any coil winding and the considerable merit of simplicity. It's not critical, and the components used are readily available, many from the scrap box. By selecting the appropriate ceramic filters and oscillator coil, conversion of 4·5MHz, 5·5MHz, 6MHz or 6·5MHz f.m. sound can be achieved. In this article the circuit is arranged for 5·5MHz to 6MHz conversion. Thus a 6MHz (System I) receiver will, when modified, also be able to receive transmissions with a 5·5MHz sound signal (this is the sound-vision spacing of course). By changing the ceramic filter at the output, the circuit will work the other way round, converting a 6MHz intercarrier sound signal to 5·5MHz. The circuit consists of a self-oscillating mixer.

A receiver with dual-sound i.f. capability for 5·5MHz and 6MHz sound can be used throughout much of Western Europe, excluding only France and the signals from neighbouring countries like Luxembourg and Monaco. Eastern European countries mainly use the OIRT standard, with 6·5MHz sound. A DXer starting from scratch without a receiver would do well to consider one made for use in the Irish Republic, as it will have v.h.f./u.h.f. capability. The circuit described in this article can be used to convert almost any receiver, with just a little ingenuity, though those that already have ceramic filters in the sound i.f. channel are more readily adaptable. Those operating trawlers and cross-channel ferries are frequent customers for this type of conversion.

The converter does exactly what it says: it converts the alternative intercarrier sound i.f. to the one used by the receiver. The circuit, see Fig. 1, employs a single transistor as a self-oscillating mixer. Its frequency is 500kHz and the mixing is additive. The oscillator coil L1 is a fairly standard 465kHz type as used in the final i.f. stage of an a.m. radio receiver, the detector diode winding being used here as the transistor's collector winding. I found that a wide variety of similar transformers salvaged from defunct transistor a.m. radio receivers worked without any trouble once the correct phasing of the windings was determined.

Practical Details

The converter was tried in a number of modern TV sets, some about eight years old, others up to the minute models like the Ferguson 14J1. The easiest to convert are those that use a modular i.f. system. A supply of about 12V is required, but this is not critical – voltages between 9V and 15V gave no problems. The unit can be left permanently connected, as the standard i.f. signal passes straight through with just a slight amount of overall amplification.

In view of the relatively low frequencies involved, the converter can be built on a piece of Veroboard, though Fig. 2 shows a suggested PCB layout. The input/output/chassis connections have been arranged so that the unit can be connected into circuit in place of a ceramic sound i.f. filter. This enables the filter in the set to be used in the converter, saving money.

The converter's performance is not impeccable. After all, it's a compromise. Ideally the adjacent channel sound trap's frequency should be switchable to reduce sound/chroma beating, the luminance delay line should be switched to compensate for the different group delay characteristic, and the overall i.f. response shape should be altered to place the −20dB sound carrier "ledge" at 5·5MHz instead of 6MHz. If you convert a monochrome TV set you won't have these worries. In practice however the performance with "non-standard" signals is acceptable and the ability to receive 5·5MHz sound without having to throw a switch is a definite bonus.

The components used are all standard items that are listed in constructors' catalogues or are available from one of the many component suppliers to the TV trade. There are several equivalents to the BF197 transistor – in fact almost any silicon npn transistor that will work at up to 10MHz will do, though the results obtained will vary with different types. The unit took a wet afternoon to build and install, but had to wait for a high-pressure system over the Continent for it to be tested. An acquaintance found that it enables him to use a system G VCR with his portable colour TV receiver.

With appropriate modification the circuit will convert other intercarrier sound i.f.s. It won't work with the French 625-line system however as this has a.m. sound. Conversion of American System M sound from 4·5MHz to 6MHz works well, though the sound is sibilant due to the 75μsec pre-emphasis characteristic. For this application the oscillator coil has to operate at 1·5MHz – a 1·6MHz communications receiver final i.f. coil was used. Some experimentation is very rewarding here. 4·5MHz ceramic filters may not be easy to come by – a friend across the pond is a great asset! Propagation of American TV signals this far across the Atlantic is rare, and reception of the US forces stations in Europe is infrequent. This use of the converter has not been fully tried therefore.

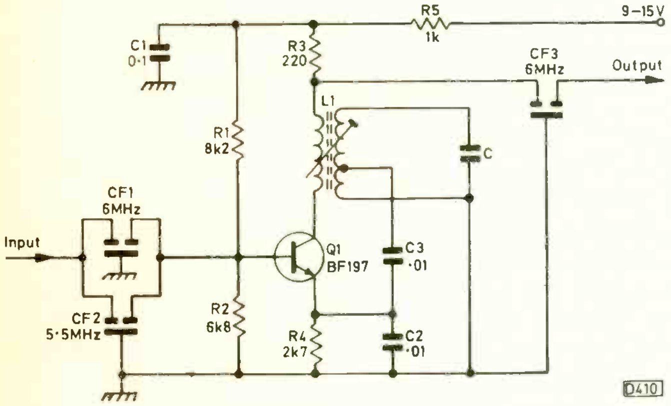


Fig. 1: The intercarrier sound converter circuit.

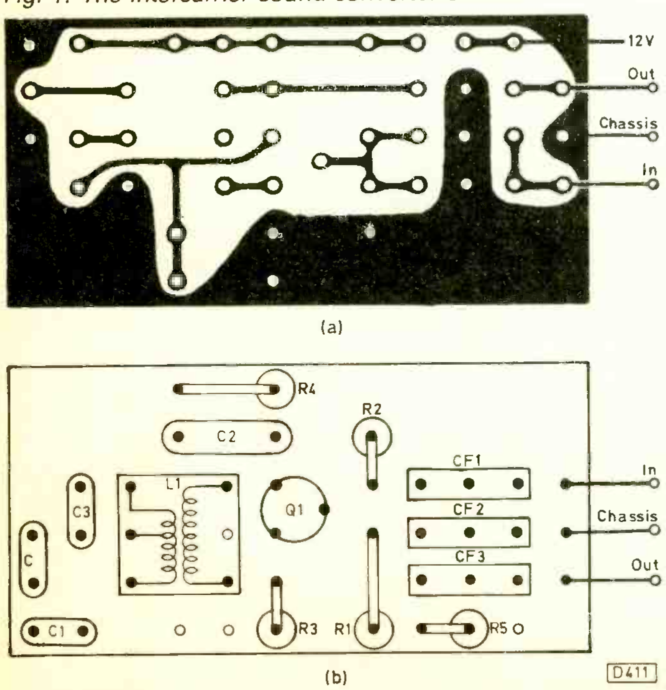


Fig. 2: Suggested PCB layout for the converter, (a) copper side, (b) component side. The actual board size is 1·5 × 0·75in. All resistors are ⅛W types. All capacitors are rated at 25V.

The prototype converter finally came to rest in an old Ferguson TX10 receiver which had been much modified to provide continuous tuning across Bands I, III and IV/V. Reception of local transmissions is normal, and when there's any DX about the set is ready to go!

The PCB (Fig. 2) is just 1·5 × 0·75in. As you can see the coil, from an old a.m. radio, has a tapped "primary" winding – the coil is used "backwards" in the converter, i.e. the winding intended to feed the detector diode is connected in series with the transistor's collector while the tap on the other winding is used to provide feedback to the transistor's emitter. Some experimentation is required to establish the correct connections, but this shouldn't present any difficulties for old r.f.-hands. Measure the d.c. resistances of the tapped winding to determine the end closest to the tap. Connect this to chassis. The tap feeds the transistor's emitter, which is a very low impedance point. Using a tap low down the winding helps to ease the tuned circuit damping so that the *Q* remains reasonable. To obtain oscillation it's then necessary to alter only the phasing of the collector winding. I made a test "bird's nest" initially to check the coil's phasing before laying out the PCB.

Use the same value of tuning capacitor C as when the coil is used as an i.f. transformer. This will make the tuning approximately right (465kHz is not far from 500kHz) and well within the core's range of adjustment. Some transformers have an integral capacitor within the screening can – its value is normally about 200pF. Avoid getting the tuning slug well into the former as this will increase the coupling between the primary and secondary windings and may upset the operationn of the circuit. Position the slug at the tuned winding end of the former and start the tuning adjustment with the core fairly well out of the end of the threaded former. Transformers that use ferrite pots and cup cores also work very well and need no precautions with placement of the tuning adjuster.

An a.m. radio tuned to the l.f. end of the medium-wave band will give a good indication of whether the circuit is oscillating. For accurate adjustment outside the TV set the second harmonic at 1MHz provides a good indication. Final tweaking of the oscillator coil can be done with a 5·5MHz sound signal – adjust the core for minimum intercarrier buzz.

This simple, inexpensive unit has enabled Continental stations to be enjoyed and has given no trouble during the six months that it's been permanently installed in the set. No safety requirements are breached with this type of fixed converter, and after conversion the set looks the same as it did before. Radiation from the mixer is well below the level of hash coming from the set. In any case, 500kHz is the 32nd harmonic of the line frequency!

If for any reason you prefer to be able to switch off the converter, add a 6·8kΩ resistor in series with the 12V supply and connect a single-pole shorting switch across this resistor. With a reduced supply the oscillator no longer works but the transistor provides sufficient gain to pass on the 6MHz sound carrier. Closing the switch restores the full supply so that the converter then works.

The circuit offers opportunities for experimentation and opened up other ideas for tunable sound detectors such as those used in satellite TV receivers, permitting selection of 4·5, 5·5, 6 and 6·5MHz carriers.

TV Fault Finding

Reports from Philip Blundell, AMIEIE, Nick Beer, J.S. Ruwala, Ian Bowden, Alan Shaw and Stephen Leatherbarrow

Philips 2A Chassis

When changing the TDA3654 field output chip in this chassis don't forget to refit C2565 (390pF) which is on the print side of the board. If you leave it off the output stage tries to become a l.w. transmitter and you get moiré patterning on the screen. **P.B.**

Philips 14GR1212/05

Hands up all of you who've been caught out by the store lock on these sets! If the open memory location button doesn't work someone, maybe even the factory, has locked it for you. To unlock, select program position 38 then press the store and control up buttons together. These sets also allow you to limit the maximum volume – which is very useful for when my lad is playing games on his computer! **P.B.**

Grundig CUC720 Chassis

The teletext panel in this set was faulty. When text was selected the TV picture still showed – the same as when mix is selected. We found that the RGB switch line – pin 15 of the module – was at only 0·3V when it should have been at 1·3V. As a result the decoder module didn't switch over. Checks around the SAA5050 chip showed that the PO (picture on) line was going low all right but the BL output was less than normal. Resistance checks were then carried out around transistors 2876 and 2881. We found that C2881 (1nF) was almost short-circuit – the reading was 12Ω! **P.B.**

Hitachi CBP260 (NP9A Chassis)

This set tripped at switch on. If it was tried with a reduced mains input voltage the set could be persuaded to strike up, but the 153V h.t. line was unregulated. Hence the crowbar firing with the full mains input. A 220μF electrolytic was fitted in position C919 and CP901 was replaced but these measures had no effect. We next tested the transistors in the error correction circuit. Q905 (2SA673) was found to be open-circuit. **P.B.**

Zanussi 21SM467

For tuning problems with this set check the ZTK33 regulator (DZ201) by replacement. The effect on this receiver was black bars and snow on the screen. **P.B.**

Philips CP110 Chassis

This set had no sound or vision, with the display going to F1. I disconnected the scan coil plug, connected a dummy load and found that the 140V h.t. supply was low at 50V. To check whether the power supply was at fault I disconnected the collector of transistor 7726. The 140V returned, so the power supply was o.k.

I've had quite a few faulty microcomputer chips so the next stop was at pin 14 of IC7840. But this was at 3·7V, which is normal for TV operation. In between these two items there's an inverter transistor, 7739 (BC548). When checked it was found to be open-circuit base-to-emitter. **P.B.**

Salora SRV5902

The customer complained of being able to receive only Screensport and Filmnet. As there were several faults at satellite TV installations I had a day out complete with ladder and bright yellow waterproofs!

The most common cause of this particular problem is loss of one polarisation because of a broken connection within the small polariser plug at the back of the receiver. This suspicion was reinforced by the fact that when I arrived the customer said the fault was intermittent. In fact the plug was o.k., but pulling it produced the symptoms described. So it was out to the dish where I found that the connections to the electromagnetic polariser were badly corroded. The waterproofing covers supplied had been fitted but were obviously inadequate. Once this had been sorted out the system worked well – after refitting the loose scart plug to cure the "whilst you're here the sound is intermittent" complaint. **N.B.**

Panasonic TC381G

There was a very odd looking fault on this set – a black area at the bottom right-hand side of the screen, with an irregular edge to it. In fact the border between the black area and the normal picture varied constantly. The fault was traced to C857, an 0·47μF bipolar capacitor in the blanking circuit. **N.B.**

Salora 15L37

There was intermittent loss of the sound and vision i.f. signals, as though the set had gone into the monitor mode. If the board was flexed the fault came and went – but it was the wrong way round for a print break, i.e. if you bent the board upwards the fault cleared but when you bent it downwards the fault appeared. After much searching I found that the legs of CM39 were shorting on the print side as they hadn't been trimmed during production. When I checked the next L sets to come in I found that they are all the same. **N.B.**

GEC C2036H

This touch-tune set came on with no neons alight: when any channel was selected the sixth neon would light up briefly. The neons and contacts seemed to be all right and further checks led to the SN70769N channel switching chip IC202. Normal operation was restored after replacing this. **N.B.**

Sony KV2756 (PE3 Chassis)

This set was dead. When I noticed that it was a PE3 chassis I was not too happy, but to my relief the 3·15A fuse was o.k. and the 135V supply was present. I soon found that there was no voltage at the collector of the line driver transistor Q801. The transistor was all right but R651 (1·2Ω) was open-circuit. When a replacement was fitted and the set was switched on R651 immediately went up in smoke. A further resistor was fitted and Q801's collector was disconnected. A check showed that its base voltage was high. Obviously this was switching the transistor fully on. The culprit was IC551, a replacement putting matters right. **J.S.R.**

Sanyo CTP7132 (80P Chassis)

This set had an EW fault. R4012 (2·2Ω) was burnt, transistor Q4005 was short-circuit and R4011 was also cooked. When these three items had been replaced the set was switched on and R4011 immediately began to smoke. All three transistors in the circuit were checked and found to be o.k. It turned out that the EW coil L4001 (green) was short-circuit. The type used in the Philips G11 chassis was tried as a replacement and worked well. **J.S.R.**

Philips G11 Chassis

The problem with this set was low brightness. It was still low after turning up the preset in the U200 module. The voltage at pin 2 of this module was very low but the 4·7V zener diode was o.k. This took me back to the beam limiter transistor in the power supply. A check showed that it was leaky. Incidentally I've carried out the beam limiter modification described in the January 1986 issue on most of the G11s I've come across and it works very well. My thanks to the contributor! **J.S.R.**

Ferguson ICC5 Chassis

There was no sound or raster. When the e.h.t. attempted to rise the receiver tripped and went into the shut-down state. The 8V supply reservoir capacitor CP37 (4,700μF) was leaky.

For no sound check whether resistor RS13 (4·7Ω) which provides the 30V feed to the TDA2030A audio chip IS11 is open-circuit. **A.S**

Ferguson TX90 Chassis

There was slight ripple on the picture. We found that the h.t. voltage was slightly low at 85V and that the h.t. preset R224 was inoperative. TR107 was open-circuit base-to-emitter and short-circuit base-to-collector. When this was replaced the h.t. could be adjusted but the transistor soon failed. The power supply storage choke L120 was short-circuit. **A.S.**

Ferguson TX9 Chassis (PC1044 Panel)

This set would very intermittently pulse off then on again. After running it for several hours the fault became more frequent, so the back cover was removed. Naturally the fault cleared . . . we then discovered that the fault could be instigated by twisting the main PCB very gently. Its cause was a dry-joint at one end of C136 (1·8nF) which is connected from pin 2 of T1 to chassis. **I.B.**

Ferguson TX9 Chassis

The problem with this set was poor sync lock when warm. If the channel was changed the line sync would sometimes pull in all right but at other times it would just keep slipping through, together with the field sync. We found that when the fault occurred, about ten minutes after switching on, the voltage at pin 6 of IC54, the input to the sync separator, rose from about 0·3V to 6V. The only other discrepancy around the chip was that the voltage at pin 8 was higher than it should have been – about 0·8V instead of 0·3V. After wasting some time trying to find the cause of the voltage at pin 6 rising we decided to examine the other change. This led us to D89 which had a reverse leak and was feeding a d.c. level to pin 8 via R210 from the 4V at pin 9. **I.B.**

Amstrad TVR2/TVR3

If one of these sets tunes but doesn't store the tuning signal suspect the MN1220 RAM. Failure to tune or to display on-screen graphics is almost always caused by the 14DN379/MN14831 chip.

If the set is dead, check whether the relay clicks. If it does, the 10Ω resistor in series with the bridge rectifier is open-circuit, usually for reasons of its own. If the relay doesn't click, check the 24V and 5V rails from the VCR. The former feeds the relay hold-on diode and the latter the 14DN379/MN14831 chip that switches the relay. Check this i.c.'s 500kHz clock and associated transistors before replacing it.

The large STK type chip in the power supply regularly fails, giving the dead set symptom. Other faults we've had have been failure of the 1μF, 50V start-up capacitor (but check the two 270kΩ resistors as well) and the h.t. rectifier going short-circuit. In the latter case the set sits there quietly.

A careful look for cracks on the PCB is often fruitful, particularly around the line output transformer. **S.L.**

Panasonic TC202G

Very bad text lines/slow field flyback was the fault with one of these nice sets. We found that C412 (4·7μF, 250V) had a leg missing. **S.L.**

Sanyo CTP7135 (80P Chassis)

A case of intermittent failure to start, or a very long start-up wait, was caused by C312 (10μF, 35V). **S.L.**

Decca 141 Chassis

The problem with this set was field roll. The field frequency was a fair bit out, but lock could just be obtained with the adjustment at one end. R423 (2·2MΩ, ½W) proved to be open-circuit. We used two 1MΩ, ½W resistors for the repair. **S.L.**

ITT 3732 (CVC825P Power Panel)

The symptoms with this set indicated that the h.t. was low. There was lack of width and height with poor regulation. A check on the h.t. voltage produced a reading of 120V with the h.t. preset at maximum instead of the correct 145V, which is usually obtained with the control at near its centre position. Checks were then made on the 10μF h.t. smoothing capacitor C636 and the two 20V zener diodes in the chopper circuit, but these were all o.k.

We were able to increase the h.t. to 145V by altering the value of the 22kΩ resistor connected to one side of the h.t. preset, but the regulation was abysmal. This provided a clue. A check on R651 (120kΩ) in the feedback network produced a reading of 240kΩ which varied. After replacing this resistor, using a 1W type, we were able to adjust the supply normally.

It was then possible to see the bands of defocusing that the tubes in these sets exhibit after a few years. Keeping the contrast setting as low as possible will provide a temporary "cure" until rejuvenation or tube replacement becomes necessary. **S.L.**

CD Player Casebook

Reports from Mike Leach, Philip Blundell, AMIEIE and Keith H.C. Parker

Technics SLPJ1

This was a good one. The customer complained that the machine wouldn't play past track four or five. When we tried the machine it played tracks one and two all right but when it reached track three it started to mute briefly. As the machine continued to play the symptom got worse until it eventually shut down in the stop mode. A quick inspection of the eye pattern revealed the source of the problem, but tracing it to component level was a little more difficult. The eye pattern waveform appeared to jitter at the right-hand side. I've seen this before, and it usually indicates that there's a fault in the CLV (turntable motor) section of the player. Without thinking any more about it I ordered an AN6638 turntable motor drive chip (IC501) – I've known failure of this chip cause identical symptoms in the past with this type of machine. So in went the new chip and, you've guessed it, the fault remained. I next stripped the turntable motor, cleaned the spindle and lightly oiled the top bearing. Still the same! When faced with a problem like this I often find that a good swear works wonders. So I went through all the four-letter words I'd not used recently, got out the circuit and proceeded to fix the machine.

To start with I checked the voltages at pins 12-16 of the AN6638 drive chip. These pins are connected to two Hall i.c.s, H501 and H502, on the turntable motor stator board. The voltages at pins 14 and 15 were high at 5·1V instead of 3·8V. These two pins are connected to H502. All the voltages around H501 were o.k. I removed H502 from the board and replaced it with a similar chip from a scrap Aiwa machine. The player then worked perfectly – H502 was open-circuit.

When this Hall i.c. is open-circuit there will be a slight glitch with each revolution of the disc. At the beginning of the disc the error is only slight but as the laser moves outwards the glitch error increases so that for a brief moment the turntable motor's speed is wrong. This interrupts the data flow from the disc, causing the brief mute. **M.L.**

Sanyo CP59

No go said the report on the ticket. Sure enough the disc didn't rotate. A quick check with the laser power meter showed that there was no light emission at all from the laser assembly. While making checks on the main panel however the machine started to work. Dry-joints and poor print were evident in the area of plugs CN1 and CN2. Some light soldering on these plugs restored normal operation. **M.L.**

Yamaha CD29

There had been a burn-up around the turntable motor drive circuit. Q103 and Q104 had both been damaged and we thought that a faulty turntable motor might have been the cause. So a new turntable motor, drive transistors and drive chip (IC106) were ordered. When these items had been fitted however there were no functions and no display.

R203 and R212 in the + and −13V supplies to the turntable drive transistors were both open-circuit, but when replaced with Yamaha specified parts there were still no functions and no display. We then found that the mains transformer was open-circuit, a replacement restoring full operation. I can't help thinking that two circuit-protection devices in place of R203 and R212 would have provided better power supply protection in the event of a short-circuit being present in the output stage. **M.L.**

Marantz CD873

The turntable motor ran excessively fast and there was no TOC readout. Fitting a replacement laser assembly cured the problem. **M.L.**

JVC XLV220

If you have one of these or a similar player that doesn't read the TOC you could well find that the pattern is as follows. The focus search is completed, the spindle motor starts, but no TOC is read and the spindle motor isn't braked. If you follow the spindle motor fault-finding tree you will start changing all sorts of perfectly good components. Try resetting the tracking offset control (after marking its initial position) then starting the machine again. Often this step coaxes the player into life. You've not found the fault yet however! If you are sure that no one has been twiddling, you'll probably find that a new Optima-2 is needed. With a good Optima-2 and the machine playing you can often turn the tracking offset control from one end to the other without any dropouts occurring. As a rough guide for setting the tracking offset, the better the eye pattern the faster the spindle motor is braked when you go from play to stop.

While you've got the player apart, check that it's got the latest (small) type of sled home switch. **P.B.**

Philips CD160

Problems with the CD tray are common with this range. Usually the tray gears go out of sync, as a result of which the disc clamper won't operate. If the gears need retiming, remove lever 123 and gear 119 (after removing the brass pin and circlip). Press the tray right in, position the disc clamper at the correct side of the main cam gear, then refit gear 119, the pin and circlip. If gear 119 is a sloppy fit on the tray gears, an oversize one (white coloured) is available, part no. 4822 522 32329.

Electrical problems with the tray usually mean that it will move in one direction but not the other. You'll have to carry out resistance checks on all five of the motor drive transistors on the front panel and replace R3074 (1Ω) if it's burnt. Models that use the Motorola 40-pin microcomputer chip on the control/display panel can be modified to prevent the microcomputer "hanging up" if one of the drive transistors fails. This is explained in supplement 4822 725 42251. **P.B.**

Philips CD380

For intermittent play or no TOC reading, check for dry-joints on the pins of the surface-mounted chips 6501 and 6503. **P.B.**

Philips CD150

No display or an incorrect one, the player working all right in all other respects, is a common fault with these machines. Usually the display itself is faulty. If you don't have one in stock you can prove the point by applying freezer to the display PCB. **P.B.**

Philips CD471/CD582

The fault report with this machine read "stops playing and resets; reads TOC when first loud sound on disc is reached". This was confirmed: the player would sometimes fail within seconds but could play a complete disc without failure. Having checked the inputs and outputs to and from IC6522 and IC6540 and found no faults I came to the conclusion that the DAC IC6541 must be at fault, but the problem remained when this had been replaced. After much searching I probed the part of the mute circuit identified as point 93 on the circuit diagram and found that I could induce the fault at will. The actual component failure was intermittent base-collector breakdown in transistor 6544. I suspect that the failure was caused by a voltage applied via the output sockets, as there are no output isolating capacitors in this design. **K.H.C.P.**

Yamaha CD Players

Should the fault complained about be skipping or jumping, here's a useful tip to check for sled or disc motor operation with most Yamaha players. Remove the motor from the player and connect it across an Avo Model 8 on the low ohms range – or alternatively use an Alkaline D cell. A good motor should rotate slowly, and if stopped by hand should continue after the load has been removed. The motor should be tested in the same way with the supply polarity reversed. If the motor fails fit a replacement, don't try to renovate it. **K.H.C.P.**

Philips CD104

If this player, or one of its clones, intermittently fails to focus or spin up it's worth looking at the motor assembly. Failure is possibly due to the fact that the turntable is not at the correct height. This can be adjusted, though the manual doesn't mention it. To set the height correctly, play a known good disc (or Philips 5A) track one and, with a DVM connected across R3240, adjust the threaded thrust bearing in the base of the motor until the voltage across R3240 is as close as possible to zero (±50mV). This assumes that you've corrected all dry-joints and resoldered all the through-board connections. **K.H.C.P.**

Fred's Fishy Fisher

Dave Mackrill

Fred brought in this Fisher FVHP615. "It belongs to my mate at work" he said, "but I don't know what's wrong with it." I gave him a rough idea of the cost of a service plus a replacement idler and belts.

Initial Discoveries

Next day, as I removed the case and cassette holder, I noticed two wood screws that held on the cassette lid. I turned the machine over and shook it. Out came one matchstick, two plastic shop pricing numbers ¾ × ⅝in. and a screw. It's surprising what you find in some of them. Wearing my specs and grabbing a mask I next took the machine out the back to blow out the dirt with a vacuum cleaner. As the plugtop was dangling nearly off, it was reconnected and the 13A fuse was replaced with a more suitable 3A type. A strengthening ring was fitted to the vulnerable aerial socket.

First Checks

Before too much work is carried out I like to check the video heads by getting a picture on the monitor screen. So I cleaned the tape path and warmed the drum with the hairdryer. The machine was powered up and, first with no cassette inserted, made to load. The loading motor had other ideas. It continued to run after completion of the loading sequence. Just a matter of a dirty mode switch I thought.

The deck was given a thorough clean and lubrication. The belts and reel idler were replaced, and all screws tightened – some missing ones were replaced. I removed, dismantled and cleaned the mode switch, tested its associated diodes, then reassembled and refitted it. Not only did this make no difference but the channel select was stuck on 1. I then had to put the machine to one side to attend to more urgent work. While refitting the case I spotted the label on the side. This proclaimed that the machine had been sold second-hand by Smashem and Bodgem down the road. Oh no! Not them again.

A few days later Fred called and I warned him that his repair could be a problem and was likely to be more expensive than originally expected. Little did I know how bad it was!

Let Battle Commence

After checking components in the loading motor drive and polarity switching circuitry I returned to the mode switch and replaced it with one from a scrap machine. The tape then laced and stayed laced as the loading motor stopped. When the stop mode was selected however the tape was left out instead of being rewound on to the supply reel. Fast forward and rewind didn't work either.

The "bottle-opener" shaped reel idler is responsible for fast forward and rewind. It's driven from a milled wheel at the top of the gear idler assembly, which is belt driven from the capstan flywheel. This gear idler provides reel take-up during play and supply reel reverse rotation during unlacing. To do this its plastic gear meshes with teeth at the bottom of the take-up and supply reel turntables.

As I'd fitted a genuine Fisher reel idler I knew that this was o.k. So I decided to install a new gear idler assembly. It would hardly go on the spindle, as this was bent. The spindle was carefully straightened but the idler still wouldn't rotate freely. I therefore fitted the shaft from the old idler to the new assembly. It could then be seen that while its gear just reached the take-up reel table teeth it was barely far enough on the spindle to meet the teeth on the supply reel table. There was something fishy about this deck . . .

As we had a reconditioned, working machine on display, it was dismantled and measurements were taken. Yes, the distance between the main chassis and the reel subdeck was slightly deeper on the fishy machine. Had it been dropped? And if so, how could it affect this spacing?

A Rebuild

To overcome this disparity the gear idler was dismantled, both shim washers were fitted at the bottom above the belt pulley, the shaft was pushed down the assembly and the washer between the reel subdeck boss and the idler was removed and fitted at the end of the spindle, under the pulley. This bodge did the trick, as it raised the gear part of the idler on its shaft and the spindle sufficiently just to mesh fully with the supply reel turntable teeth. It goes without saying that I was not entirely happy with this arrangement.

So far so good? Not so because when the idler control arm, which keys into the master cam, was refitted the gears still wouldn't meet together during unlacing, leaving the familiar tape loop. I had to retime the loading take-up gear to the master cam and loading rings, then readjust the mode switch. Correct operation was then obtained.

At last we had good fast forward and rewind, proper take-up torque, and the tape was reeled in during the unlacing operation. I was now able to adjust the tape back tension to the correct 30-40 g/cm. Feeling pleased with myself, I reconnected the aerial and monitor, thinking that the struggle was over. I should be so lucky!

The picture was fine but the exit guide arm sometimes seemed to stick in its slot. This didn't happen when the machine was made to load with no cassette however. Probably just needs greasing I thought. Hang on though, there's no sound. Time for lunch.

After the break I decided to tackle the channel change problem first. I soon found that the emitter of regulator transistor Q1307 on the front timer panel was unsoldered. Having attended to that, I hooked the scope to the inside of the audio output socket and played the 3kHz section of the alignment tape. When the audio/control head assembly was wound down with a nut spanner I was rewarded with a nice fat waveform and sound.

I greased both loading arm slots, refitted the cassette holder, inserted a cassette and put the machine in the play mode. What's this then? The cassette was wobbling about in the cassette holder. Both plastic cassette hold-down clamps and their springs were missing. I replaced them with those from the scrap machine then, monitoring the f.m. at TP221 and triggering the scope's channel 2 from the 25Hz head switching signal at TP205, I played the stair section of the tape. I was able to adjust the entry and exit guides for a nice, flat envelope. Good. But no, not yet, because every third time the tape laced the exit guide arm stuck, leaving the guide 1/16 in. out of its V block with consequent mistracking.

Second Rebuild

To cut part of this very long story short, after changing the guide arms and various other bits I noticed a small dent in the nylon lining to the exit side loading arm slot. I finally changed the chassis with the one from the scrap machine, which had a duff lower drum assembly, and fitted to it the best bits from both decks. This cured all the evils at a stroke and the gear idler was reassembled correctly with its new shaft and all shim washers in their correct places.

After cleaning and lubrication, complete mechanical retiming and adjustment – including some electronic adjustments – the machine laced properly every time and gave very good results. Two nice new flat-top "Panasonic" screws were fitted to the cassette lid. The case was cleaned with foam cleaner. I removed the nasty label spotted earlier and felt justified in attaching one of mine. A timer recording was then made and the machine was run on soak test.

When Fred called in I told him that his mate was "taking the p . . ." as the machine couldn't have run recently and, in my opinion, hadn't worked properly for some time. I suggested that his mate had probably either bought it at a car boot sale or found it somewhere. Using the old deck, I described some of the problems and the time it had taken to rebuild the machine twice. Fred seemed happy with the bill, which was for almost three times the original quote.

Final Problems

Fred disappeared to get more cash, but the machine fought back to the last. I loaded an old library tape when he had gone and, to my horror, got just noise on the screen. I whipped off the case and the head screening plate and cleaned the heads. This restored the picture. To be on the safe side I rechecked the back tension. It was off the clock on my gauge. I quickly adjusted it, but this made no difference. I released the reel brakes and tried to spin each reel table. They were both tight. I suddenly realised what had happened.

The final assault on the machine had taken place late at night. Being absorbed in the struggle I hadn't noticed how cold it was in the workshop. The machine had then been left plugged in, with a piece of cardboard and another VCR on top. This morning I'd turned on the workshop heater for the first time this winter. The increased temperature had taken all the up and down free play of the reel tables. Quick as a flash I removed one thick washer from the top of the supply reel table then took one thin one from the take-up side and fitted in on the supply side. Both stopper washers were refitted and the back tension was readjusted. There was just time to refit the head screen, screw on the case, then make a recording and play it back as Fred came in with the money.

Transferring Film to Videotape

Ivor Nathan

A means of transferring cine film and photographic material to videotape is useful to many people. Large stocks of cine film or slides can be transferred to videotape for easier storage and presentation. Transferring a silent film to videotape gives you the opportunity to add a soundtrack: if the film already has a soundtrack this can be recorded in its original form, enhanced, or be entirely remade.

Transfer Systems

Transfers can be made either by sending the original material to one of the many firms that provide a copying service or by setting up a suitable system at home. Slides can be transferred by using a slide adaptor that fits on to the front of a camcorder lens, by holding the slide in a frame that's illuminated from behind or by using back projection on to a translucent glass screen that's scanned by a camcorder at an appropriate distance.

The professional can use the flying-spot telecine technique to transfer cine film to videotape. This system scans the moving film continuously rather than frame by frame, jerkily, as in a projector. Because of its high cost, telecine equipment is beyond the reach of most of us. Back projection on to translucent glass offers an alternative approach. Several devices that use this principle are available. They incorporate an optical mirror, with the front surface silver-plated, to correct the image reversal that would otherwise occur. In addition they avoid the bright central spot, caused by the projector's lamp, that tends to spoil the image when a camcorder is pointed directly at a screen without back projection. A further advantage is that the film grain is substantially reduced. A disadvantage is that flicker is sometimes present with the copy, because silent film runs at 18 frames per second whereas videotape runs at 25 frames per second. There is no problem with sound films that run at 24 frames per second.

Simple Domestic System

I was making home movies in the Seventies and thus have a stock of Super 8 films that I'm now transferring to videotape. I'm also compiling a "family history" by combining old photographic prints (I have no slides) using the camcorder's macro facility, Super 8 movie film and newly-shot videotape: the edited product is being recorded on full-size VHS videotape using a Ferguson 3V30 VCR with Dolby sound and audio dub facilities. The edited videotape soundtrack is being produced from old sound recordings (from Super 8 magnetic-striped film, open-reel tapes and audio cassettes) and new sound recordings (via the camcorder's microphone and the 3V30's "audio dub" microphone input). Music and sound effects can be added at this stage as appropriate. By using the camcorder and home-made title cards, captions and titles can be inserted before the final soundtrack is recorded.

The simple home system I'm using produces excellent results. It consists of a no-frills JVC GRA-30E camcorder, a Eumig Mark S712D film projector (Super 8/Single 8/Standard 8) with built-in magnetic-stripe sound recording and playback, and a home-made projection screen measuring 24 × 18in. to accommodate the 4:3 aspect ratio used for cine and video pictures. A 22in. colour TV set is used to monitor the transfer.

The screen is the heart of the system and largely determines the quality of the end product. It consists of a piece of hardboard sprayed, on the smooth side, with several coats of silver aerosol paint. I originally tried a large, lenticular white movie screen but this was unsatisfactory. A small white hardboard screen was also tried but produced poor contrast and incorrect colour rendition from the videotaped copy. A yellow screen gave a marked improvement in quality compared to the white screen with its exaggerated reds and blues and its diminished yellows and greens. The silver screen was found to be the best however.

The Eumig S712D projector has a 1·6/17-30mm zoom lens. Fig. 1 shows the projector, camcorder and screen layout. The projector's zoom lens is set to give the maximum screen image which, at a distance of 38in., is 12 × 9in. The GRA-30E camcorder also has a zoom lens. This is adjusted, with film running through the projector, to completely fill the screen of the colour set being used as a monitor (see Fig. 2).

The dimensions given in this article are approximate since they depend on the actual equipment being used. To avoid keystone distortion, where one side of the image is taller than the other because the projector and camcorder are arranged side-by-side, the screen should not be too close. If the screen is at least a few feet away, but not so far as to reduce the amount of reflected light even in a darkened room, the camcorder will not be

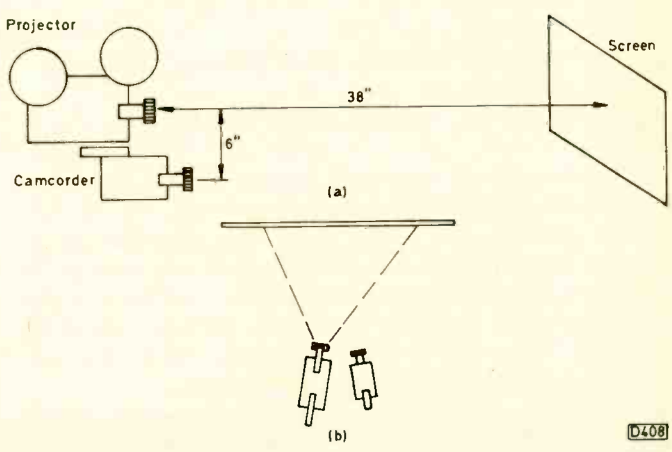


Fig. 1: Physical arrangement of the equipment. (a) Side view. (b) Top view.

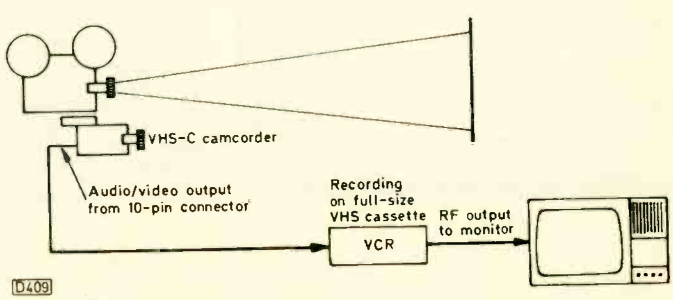


Fig. 2: The complete system.

looking through the side of a beam of light at such a great angle, because the two paths will be more nearly parallel.

The system described can be used to transfer to a compact cassette (VHS-C) in the camcorder, a full-size VHS cassette in the VCR or simultaneously to both. The latter arrangement is particularly useful if you want to keep a master tape for subsequent copying. It is invaluable if you want to repeat film sequences for special effects during the final edit on to a full-size VHS cassette, or for editing sequences of film into a different order.

Long-distance Television

Roger Bunney

The severe weather conditions experienced during the latter half of January continued into early February, with still more DX-TV aerial installations falling before winds that reached in excess of 100 m.p.h. at times. Towards the end of the month and into early March high-pressure systems advancing across Western Europe produced much more settled conditions. Despite the weather, several DXers have sent in quite reasonable logs. Better than mine anyway since I always seem to be at work or elsewhere when that elusive F2 signal or a short-lived Sporadic E event occurs. Such is life! Anyway here's the collated SpE log for February:

3/2/90	RAI (Italy) ch. IA; ORF (Austria) E2a; TSS (USSR) R1; MTV (Hungary) R1.
4/2/90	DR (Denmark) E3; TVP (Poland) R1; CST (Czechoslovakia) R1; RAI IA.
5/2/90	RAI IA; TVE (Spain) E2.
9/2/90	TVP R1, 2; CST R1.
10/2/90	ORF E2a.
11/2/90	TVE E2.
16/2/90	TVE E2; RAI IA; NRK (Norway) E2.
19/2/90	TVE E2, 4.
22/2/90	ARD (W. Germany) E2; TVP R2.

Iain Menzies in Aberdeen reports auroral activity on February 4, 12 and 15th in Band I.

The general view seems to be that the peak of the present sunspot cycle has now passed, and with it the best F2 layer reception. Certainly early 1990 has not seen a repeat of the excellent conditions we experienced last autumn. There was a little F2 activity during February however, reports received being as follows:

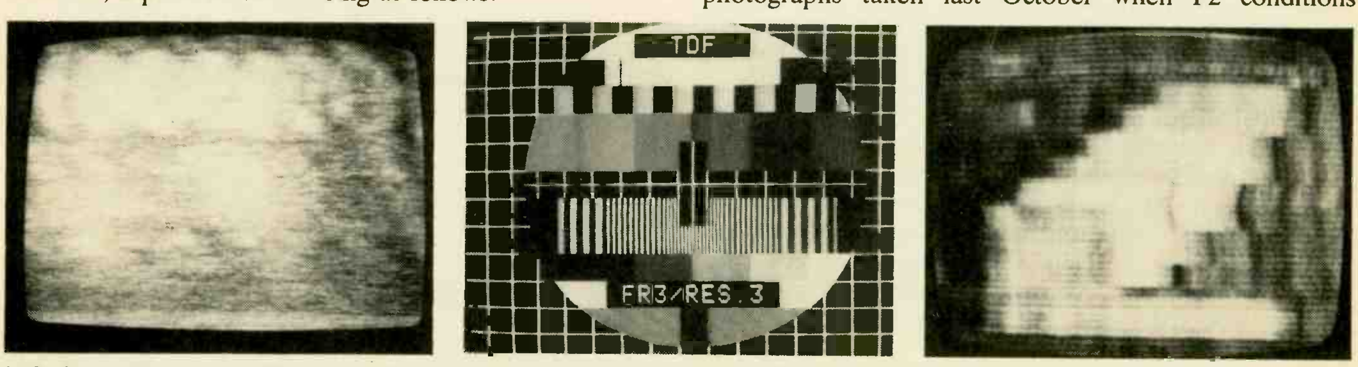
11/2/90	An Arabic station at 1300 on ch. E2.
12/2/90	Unidentified programmes on ch. E3; TSS ch. R1 at 0800.
15-16th	Two unidentified ch. E2 signals; TSS R1; a 525-line ch. A2 signal at 1300; also an unidentified ch. E2 signal at 1300.
27/2/90	Iran ch. E2, FUBK card, at 0800; TSS or China ch. R1/C1 at 0800.

There were, surprisingly, several periods of enhanced tropospheric reception. On the 8th there was reception from the south/south west, with TVE-1 chs. E5, 9; TVE-2 chs. 21, 37, 45 and 48; EST (Basque) ch. E35; and a mass of French Band III/IV/V stations. Reception extended well into the north midlands. On the 18th there was a minor lift with Belgian, Dutch and French stations being received in the midlands and Wales.

The major tropospheric opening however was on the 22/23rd, when quite remarkable signal levels and distances were recorded. No records were broken, but I feel that it was unusual for the time of the year. Simon Hamer's log illustrates the fine conditions during this two-day opening. On the 22nd he noted NRK E11; Denmark E5, 8, 10, 31; Denmark TV-2 E22, 27, 30, 35, 48, 53, 56; SVT (Sweden) E6, 9, 30, 48; a mass of West German networks – HR-1, RB, WDR-1, NDR-1, ZDF, Hessen-3, West-3, NDR-3, Sat-1, SSVC ch. E48; TVP R8, 35; CST R6, 10, 36; DDR (E. Germany) E5, 6, 8, 11, 12, 34. His reception on the 23rd illustrates the movement of the weather system: ORF E5, 8, 24; Switzerland E6, 7, 34; plus W. Germany SWF, ZDF and SWF-3. Congratulations on catching a very good tropospheric opening.

East Germany has now started teletext trials, and David Glenday has decoded MTV (Hungary) via SpE on ch. R1 using a D100 converter and a Philips set. The top teletext line, where it usually says Ceefax or Oracle, said "KEPUJSAG". We've also heard that Yorkshire TV was received in Finland during the December tropospheric openings.

Anthony Mann writes from Australia on recent F2 layer successes, though the SpE season there has not been good. His F2 reception, recorded in several photographs taken last October when F2 conditions



Left: Reception via the F2 layer of West Germany, ch. E2, by Anthony Mann in Perth, Western Australia on October 31st at 1000 GMT. The caption reads HEUTE. Centre: French Regions-3 test pattern received from Avignon by Alan Shaw in Southampton. Right: Back to F2 reception, this time Dubai Ch. E2 programme commencement received by Ryn Muntjewerff in Holland.

were at their peak, included West German TV on ch. E2. This particular reception was at 1000 hours, the programme caption "HEUTE" (today) being seen. The vision i.f. bandwidth was decreased to 0·5MHz to reduce interference from 50MHz amateurs and ch. R1/C1 signals.

New EBU Listings

Denmark: Nakskov TV2 ch. E52, 100kW e.r.p.; Vordingborg TV2 ch. E58, 600kW e.r.p. Both with horizontal polarisation.
Luxembourg: RTL ch. E49 at 320W e.r.p. horizontal.
Austria: The Klagenfurt 1 ch. E24 ORF-2 transmitter has closed.

News Items

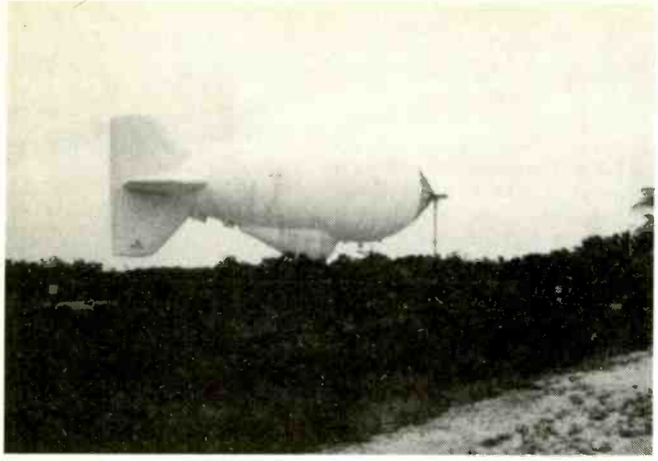
Gibraltar: A pilot scheme transmitting eighteen hours of BBC Europe programmes received via Intelsat at 27·5°W has started, using a microwave system. The service is at present in the clear though scrambling is intended. Ceefax is also being carried.
Spain: The Catalan TV3 service has been experimenting with the German stereo sound system though TVE intends to use the Nicam system.
Greece: The newly authorised Athens-based Megachannel and New Channel are now in operation. A number of other new stations are active, including at least one Pay-TV operation.
West Germany: All main transmitters in the ZDF/third programme network have been equipped with their own FUBK pattern generators. RIAS-TV/SAT-1 transmitting in West Berlin on ch. E25 is now producing its own teletext pages.
Czechoslovakia: Teletext is being transmitted by CST-2 from 0930 local time. A few sample pages are being transmitted by CST-1 during a very restricted time slot. Test transmissions from the new Prague TV tower are being conducted at 0800-1500 local time on chs. R37 and R51, using a special test card and running at only 50W.
Rumania: Regional programming is being transmitted from Cluj on ch. R11 at 25kW e.r.p., using the identifications "Tele-Cluj" and "Tele-Kolosvar" (Hungarian).
Belgium: The Brussels Canal Plus transmitter will close when Wavre opens on ch. E50 with 500kW e.r.p. Tele-21 is to have a new transmitter at the same site, operating on ch. E28 at 500kW e.r.p. Present Canal Plus Belgique transmitter powers are as follows: Liege ch. E39 4kW; Brussels ch. E50 1kW; Anderlues ch. E58 200kW.

Kenya: A new service known as Channel 62, with commercials, is in operation in Mombassa and Nairobi.
Faroe Islands: A transmitter on the outskirts of the capital Torshavn, running at 150W with a 15m high mast, is transmitting MTV Europe on ch. E22, BBC-TV Europe on ch. E30 and Scansat/TV3/Eurosport on ch. E34 without any scrambling.

Satellite TV News

The new Intelsat VI–F2 craft, which will be positioned at 24·5°W later this year, will have ten 11GHz transponders for TV services directed at Europe and thirty eight 4GHz transponders for downlinks to Africa and Latin America. Programme uplinking will most likely be from the USA.

Three of the ECS 7°E satellite's transponders are on



Marti TV, broadcasting to Cuba from a balloon over Key West, Florida on ch. A13, finally got going in late March – and was promptly jammed (so it's said). Anyway here's the very balloon, moored at a military base, photographed by a reader on holiday in the area. The guard at the gate showed interest, mainly in the car, and no further photographs were taken!

test. They will carry Spanish feeds, probably Antenna 3 TV, Tele 5 and Canal Plus Espana. Look at 11·025GHz horizontal, 11·555GHz and 11·59GHz vertical. An identification seen on colour bars is "Retevision Torrespana".

The Canal Plus Deutschland service is to be carried over TDF, TV–SAT 2 and DFS Kopernikus. Two of the new services to be transmitted by Olympus at 19°W will be RAI-SAT in PAL and the BBC's "The Enterprise Channel" with MAC encoding, initially during the 1600–2400 slot. RAI is currently transmitting for four hours a day and is to conduct HD-TV experiments. The footprint covers all of Western Europe extending into Scandinavia. Now that it's carried by DFS-1, Astra and TV SAT, RTL plus is no longer available from ECS at 13°E. RAI-UNO from ECS at 10°E is now scrambling some programmes, using Discret – as used by the Canal Plus terrestrial transmissions. Decoders are to be issued to cable networks and we understand that pirate units are already on sale in Northern Italy! Turkish TV is now available from ECS at 13°E, on 11·174GHz. The programmes, from 1800–0100 CET during the week and 1700–0100 at week-ends, are a compilation of TRT-1 and TRT-2 material. Good reception is possible with a 1m dish.

Launch of the Eutelsat II series of satellites has been delayed following the recent destruction of an Ariane rocket carrying a Japanese DBS satellite. Canal Plus may stop using Discret scrambling when TDF-1 carries its service, opting for a new system devised by the Swiss firm Nagra-Kudelski instead. This will allow pay-TV operation with an addressable system.

A new caption, "Starbird", seen via ECS at 7°E comes from one of two satellite news gathering trucks now operated in Europe by WTN/BAE. The trucks can uplink material within eight minutes of arriving on site, using PAL/SECAM, NTSC or B-MAC. During 1991 the Discovery Channel is to move from 27·5°W to Astra B.

Upconverter Review

We have recently received for assessment a new upconverter, type 3638, being marketed by Aerial Techniques. It's housed in a slim, low-profile black plastic case and is of Far Eastern manufacture. The unit was originally intended for the North American cable TV market and is described as "Cable Converter type 3638". It enables a block of v.h.f. frequencies, typically 45–230MHz, to be converted to a u.h.f. block, enabling a u.h.f. receiver to be tuned to the v.h.f. channels.

The only user control is a front-mounted edge potentiometer marked "fine tuning". It's used to provide a slight frequency shift to avoid interference between an upconverted channel and a signal received directly. There are three F sockets at the rear providing for v.h.f. input and v.h.f. and u.h.f. outputs. The specification indicates that the input range is ch. K2–S25 which is shifted to K36–K72 with a 3dB gain ±1dB. Cross-modulation is quoted as a relatively good −55dB with 15dB/mV input. If this relates to a single channel input the figure would fall somewhat with several strong signals present. Stability is quoted as being 0·25MHz after a one-hour warm up.

In practice I found that the unit will convert frequencies in the range 30–250MHz, though the response falls off at the extremes. Checking over the 50–250MHz bandwidth I found that the gain was 4dB at 50MHz falling to −4·5dB at 250MHz. The 100–230MHz spectrum was relatively flat with unity gain ±1·5dB. A range of ±4MHz at 50MHz and ±3MHz at 200MHz is provided by the fine-tune control – this applies to the upconverted signals.

The physical dimensions are 176mm wide, 83mm deep (plus 14mm F socket projection) and 41mm high (plus 6mm for the rubber feet). Weight is 0·4kg. Removing two screws underneath reveals the internal workings – a tightly sealed aluminium enclosure which, after taking out many screws and unbolting the F sockets, gives access to the electronics.

The sample unit shifted a 50MHz signal to ch. E35, the fine-tune control enabling the u.h.f. tuning point to be moved in the event of a coincident interfering signal being present. The noise performance is good. Use of F connectors would at one time have produced a shudder but fortunately leads, adaptors etc., are now widely available. Aerial Techniques can supply SO329 to F plug adaptors for use with the converter if required – the SO329 mates with a PL259, which is also known as a "UHF", "video" or "CB" plug.

Having tried the unit out I feel that if it's to be used as a DX-TV converter a preamplifier, ideally providing a wideband v.h.f. gain of 8–12dB, will be necessary prior to the input. An indication that the unit is powered – an LED or small on/off switch – would have been helpful. Apart from these two shortcomings, I found that the unit is stable and no signs of instability or spurious outputs were detected. It's an attractive piece of equipment that blends in well with the domestic scene. The price for a single unit is apparently £39 inclusive. My thanks to Aerial Techniques, 11 Kent Road, Parkstone, Poole, Dorset BH12 2EH (0202 738 232) for loan of the test unit.

For Sale

Steve Fuller of 20 Tunbridge Road, Southend-on-Sea, Essex SS2 6LT has the following items for disposal: a 1·2m dish, polar mount with 18in. jack and Zeta manual receiver, and a Salora multi-standard/band receiver (PAL/SECAM B/G/I/L plus NTSC 4·43MHz) that's fitted with the J40 chassis. He can be reached on 0702 610 073 after 7 p.m.

Modifications for Sky Movies Reception

Nick Beer

The commencement of scrambling on the Sky Movies channel has led to a surge of extra work for dealers who have supplied and are willing to modify satellite TV receivers not capable of being connected to a Videocrypt decoder directly. There have also been queries about equipment that doesn't require modification but uses a lead other than the scart-to-scart or scart-to-phono leads which are the only ones that Sky fits. On top of this it seems that rather than relying on dealers to fit the decoders Sky is in certain parts of the country getting almost anyone to fit them. There have been reports of taxi firms and even a greengrocer doing this work.

Conversion details for some of the receivers we deal with are as follows.

Luxor 9570 Mk 2

This receiver has no facility for looping the video back into it. To overcome this problem, the BNC audio output socket is used with suitable modifications to the circuit. These are as follows. Remove DA02 and replace it with a 47kΩ, 0·25W resistor. This removes the video output clamping. Next cut the green lead to the r.f. modulator at the PCB end. This is the video feed. Connect a 68Ω, 0·25W resistor in series with the disconnected end of this lead, then solder the other end of this resistor to the audio output socket, having first removed the screened audio feed lead at both ends. Fit a 180Ω resistor across the socket. As the socket is tricky to get at I find it easiest to connect the 180Ω resistor to the 68Ω one before soldering the latter to the socket. There's a wire bus bar between the four sockets at the back of the receiver, so connecting the earthy end of the 180Ω resistor is easy.

The receiver's r.f. output has to be used as the feed to the TV set and to provide vision loopthrough the decoder must be connected at all times. A certain amount of flicker could appear in the event of a decoder fault. In this case refitting DA02 will provide a temporary cure. Don't get confused by the apparently normal intermittent flicker with Screensport.

If after connecting a decoder there's a buzz or hum on sound not previously experienced remove the top can that covers the r.f. modulator and slightly reduce the video level by adjusting the white plastic bodied potentiometer. With the decoder connected there's an increase in the video level to the extent that highlights are overloaded.

Salora SRV1150

Chris Plaice provided brief details for this receiver in TV Fault Finding last month. A little extra information may help. Once again the problem is the absence of a video input connection. In this case use is made of pin 5 of the video DIN socket. The r.f. modulator's video feed is interrupted by removing R164 and replacing R163 with a 68Ω resistor. R163 is difficult to find and remove: it's between the tuner's case and the back of the plug that connects the modulator to the main PCB and is obscured by the tuner's case when viewed from above. Connect the modulator end of R163 to pin 5 of the DIN socket. Pin 2 is the video output and pin 3 is earth. The lead to the decoder should have a 6-pin 270° DIN connector at one end and a scart connector at the other. Again the decoder must be connected at all times – if it has to be removed, link pins 2 and 5 of the DIN socket.

B and O Beosat RX

The Beosat RX is the external receiver (the Beosat LX is built into the TV set). It has a pair of decoder sockets, for audio and video, but the video one is an 8-pin DIN socket. Connections are not difficult but the manual is a little confusing because a front view of the plug is used instead of the traditional front view socket/rear view plug. Simply connect as per the numbered connections on the body of the plug used. Pin 6 is the video output, pin 4 is the video input and pins 1-3 are earth. The decoder has to be switched in on the appropriate location(s) and the procedure for this varies from one software version to the next. Enter the tuning menu and if "decoder" appears at the bottom of the list switch it to on. If "clamp" is used instead, set it to off.

In Conclusion

Sky decoder installers are not allowed to touch the inside of a receiver, which is good news, but unless specifically asked to do so they are not supposed to leave the decoder should they be unable to connect it. You might feel it advisable to contact all those you've sold receivers to and advise them of the situation. I must say however that the local Sky installer seems to be friendly and helpful.

Teletopics

LATEST DISHES

Environmental friendliness seems to be the flavour of the month in the satellite TV aerial field. Zeta Services Ltd., which we mentioned last month in connection with their satellite TV receiver module, is about to introduce a dish made of toughened glass impregnated with metal fragments. The electronics, manufactured by Marconi Electronic Devices, will be mounted at the rear of the dish. With appropriate electronics the dish is suitable for use with the BSB and Sky transmissions.

Amstrad's contribution is a range of dishes made of black perforated steel mesh. Varying the dish profile to increase efficiency has, in conjunction with the use of an improved Marconi head unit, enabled Amstrad to offer a 45cm version of the dish for users living south of Milton Keynes. Amstrad is also introducing a combined receiver/decoder unit for the Sky services.

The new Marconi head unit is likely to come into wide use, combining as it does a small profile (there's no feedhorn) and improved performance. The design is described as integrating a dielectric aerial feed with special ferrite material. This gives accurate resolution of the vertically and horizontally polarised components of the signal so that there is high rejection of unwanted signals with minimum transmission loss for the wanted signal.

While on the subject of satellite TV, Microforge Ltd. (339 Clifton Drive South, St. Annes-on-Sea, Lancs FY8 1LP – telephone 0253 725 499) has introduced a 45-minute video plus training notes package entitled "Satellite Television Installation and Training". It's been designed for the retail industry to enable shop managers and sales people to achieve a thorough knowledge of domestic satellite TV broadcasting. The package comes at £39·95 inclusive of VAT, post and packing.

Domestic and General, the UK's leading provider of domestic appliance breakdown insurance, has launched a satellite TV insurance package that gives purchasers the option of buying protection in the post manufacturer's guarantee period. The insurance will be sold by dealers and depends on the value of the satellite TV system – up to £600, up to £1,200 or up to £2,000. For a system valued at up to £600 typical charges are £23·20 for an additional year and £69·80 for five year's protection.

1989 TRADE RESULTS

BREMA's figures for 1989 show that UK CTV deliveries declined by 15 per cent to reach a total of 3·7m receivers. At the year end stocks of small-screen sets were at their lowest levels since 1985. The split between large-screen and small-screen sets was 1·8m and 1·9m respectively. Of large-screen sets, 110,000 were fitted with Nicam decoders and two-thirds incorporated teletext facilities. About half a million satellite TV units were delivered and camcorder deliveries more than doubled to around 300,000.

TV SERVICES

The BBC is planning to start a scrambled subscription TV service that will be transmitted during the night hours. It will require a decoder, which is under development, to drive a VCR. The aim is to start the service, which will offer specialist programmes ranging from arts and nature subjects to farming and legal material for professionals, in the spring of 1991. The user would insert a smart card to obtain programmes. A BBC service along similar lines, aimed at the medical profession, recently went into receivership.

Nicam digital stereo sound has now been added to the ITV and S4C services in South Wales.

UP-GRADED CRT REACTIVATOR

A new, up-graded c.r.t. checker/reactivator, Model BMR90, is available from Blendown Ltd., Bank House, 17 Rhos Road, Rhos-on-Sea, Colwyn Bay, Clwyd – telephone 049 249 246. The instrument uses new technology which leaves the cathode preserved and takes into account changes in c.r.t. manufacture. We hope to publish a test report later this year.

DISC NAME CHANGE

Philips has announced that following consultations with major electronics companies, including Matsushita, Pioneer and Sony, the generic name for video disc systems will in future be Laserdisc, which was formerly a Pioneer trade mark. During a transitional phase in Europe software will carry both the Compact Disc Video (CD-V) and Laserdisc logos. The players will continue to carry both logos.

JVC's IMPROVED DUBBING FACILITY

JVC's Professional Products Division has announced a feature that will doubtless in time trickle down to domestic products. It's called a chroma enhancer or Faroudja circuit and is designed to restore the chroma bandwidth lost during the recording and playback processes. The circuit works by extracting the edge of the chroma signal, modulating it with the differentiated edge of the luminance signal, and adding the result to the chroma signal. This provides sharper colour pictures with reduced spreading at image borders, even after repeated copying. The effect is claimed to be comparable to increasing the chroma bandwidth by a factor of three.

PHILIPS ADDRESS CHANGE

The Philips Consumer Electronics Special Repair Workshop has been relocated to New Road, Mitcham, Surrey CR4 4XY – telephone 081 685 1212, fax 081 640 5462. The special repair facilities cover CDV players, LCD portable TV sets, camcorders and satellite TV tuners, both outside and under guarantee.

LATEST CATALOGUES

The summer 1990 edition of the Cirkit constructors' catalogue, just published, features more than 3,000 product lines in its 184 pages. For further details apply to Cirkit Distribution Ltd., Park Lane, Broxbourne, Herts EN10 7NQ – telephone 0992 444 111.

Greenweld Electronics Ltd. has moved to 27 Park Road, Southampton SO1 3TB – telephone 0703 236 363. The company has just published, free, its 1990 spring supplement with 32 pages.

LONDON TELEPHONE NUMBERS

The new London telephone codes come into effect on May 6th. With the exception of Megasat Ltd. and Olympus Optical Co. (UK) Ltd. whose code becomes

071 (instead of 01) all the firms with London addresses listed in our Spares Guide included with last month's issue change to the 081 code.

NEWS FROM HRS

Our entry for HRS Electronics plc in the spares guide last month omitted to mention some of the ranges for which the company provides spares. The following should be added: Bush, Citizen, Commodore, Crown, Fidelity, GEC, Logik, Matsui, Nikkai, Pye and Saisho.

HRS has recently introduced a range of SMD resistor, capacitor, potentiometer and transistor service kits. They come in individual boxes for each value, the boxes fitting into a wall-mounted racking system that locks together to enable any size of unit to be produced. The company is also marketing the Sadelta TC90 field strength meter which is tunable from 45-1,750MHz and has a four-digit display for direct frequency readout. For ease of use the signal level is shown by an analogue meter. A built-in loudspeaker enables a.m./f.m. sound to be monitored and is also used for the alignment of satellite TV dishes. For further details of these products apply to HRS Electronics plc, Garretts Green Lane, Birmingham B33 0UE – telephone 021 789 7575.

Trees and UHF Reception

Part 1

Bill Wright

All engineers involved with u.h.f. reception are aware that trees can cause problems. This article describes some of the interference mechanisms that commonly occur and suggests techniques which might help to overcome or at least alleviate poor reception.

Trees can do lots of nasty things to your customers' TV pictures, and they can do them in lots of different ways. Trees can suddenly and unaccountably have a severe effect on reception that's been perfect for many years. They can affect one channel to the point of eliminating it whilst having no effect on the others. They can affect sound but not vision. Reception can vary seasonally, daily or by the second. A tree doesn't have to be between the receiving aerial and the transmitter to cause trouble: clear line-of-sight reception can be affected by nearby trees.

Basic Rules

The basic rules of aerial rigging should be applied, only more so, when an aerial installation is to be undertaken at a location where signal disturbance from trees is expected. Use a good quality aerial. Approaching the job armed with a £1·50 ten-element aerial is a waste of time. A good quality 18-element array such as the Antiference XG18 has excellent directional characteristics, good performance even at the ends of the channel group, and accurate impedance matching. These factors can make a lot of difference where tree problems are involved. Unless signal strength is a problem there's no point in using a very large, high-gain array. Its lack of manoeuverability could be a positive disadvantage in fact. Don't use a wideband Yagi: the poor forward gain and directivity make it unsuitable. If a high-gain masthead amplifier is required, use a group rather than a wideband model.

Modes of Interference

Trees affect reception in a number of completely different ways. It's vital to understand the mode or modes of interference when attempting a cure. Those described in the following sections are classified by the position and density of the trees, but it must be borne in mind that each section is a broad generalisation and that in a real-life situation the categories often overlap. Signal attenuation through trees tends to increase with frequency, so more extreme effects will occur in Band V, especially at the top end, than in Band IV.

Distant Dense Woodland

We'll consider first a large area of dense woodland distant from the receiving site but obscuring the signal path. In a typical case there might be a substantial tall deciduous or coniferous woodland across the skyline on high ground 2-6km in front of the aerial. Topography rules out the possibility of obtaining line-of-sight reception over the trees, but it's the trees that cause the obstruction, not the hillside. In summer or winter no light shows through the trees at the receiving site.

Surprisingly this is usually quite an easy tree problem as tree problems go. If the trees are deciduous, the signal level is likely to be 10-25dB below the calculated line-of-sight figure in winter, falling to as much as 30 or even 40dB below the line-of-sight figure during a typical midsummer's day when the trees are in full leaf and wet from heavy rain. Path loss will vary between channels, but usually by not more than 10dB across a standard channel group. Daily variation seldom exceeds 10dB. Rapid signal fluctuation is unlikely.

If the line-of-sight signal is +20dB/mV or better the signal is likely to be a usable −10dB/mV or better for almost all the time but with occasional dips to −20dB/mV, which will result in noisy pictures no matter what amplification is used. I should mention at this point that all signal strengths quoted in this article are those obtained using a good 18-element array. This is not the true field strength as measured in dB/μV/metre, but is far more useful for our purposes.

There are unlikely to be enormous field strength variations from one location to another on the roof, but it's worth checking all possibilities. If the aerial can be installed anywhere on a large building or complex it's worth meter-checking the signal at a good selection of possible locations since significant variations can occur over distances of 25m or more, even where a survey confined to a smaller area seems pessimistic. Don't be put off by the fact that the trees look uniformly impenetrable. Concentrate on checking along a line at right angles to the direction of the transmitter. If a peak occurs it will be consistent as the test aerial is moved directly towards or away from the transmitter. This might help in finding a permanent position.

Aerial height is unlikely to have a dramatic effect on signal strength. There may be a gradual improvement with height or there may not. There may be a slight peak, which could be at any height. In a difficult case it's worth checking with a meter from ground level up to the maximum practicable height. If a peak is found it won't be very great or very well defined, but it might yield an extra 4-6dB, which can be very useful when you're struggling.

Where the required transmitter gives only a moderate signal level in the district a location behind trees may prove to be impossible on field strength grounds alone. Even within the nominal primary service area, the field strength behind distant dense tree cover of this kind is likely to be rather low. In an extreme case a very high-gain array such as an XG21, together with a masthead amplifier, will be required. More commonly however a good 18-element array with a masthead amplifier will provide the most cost-effective solution.

The range of signal levels entering the amplifier is likely to be great. There may be 20dB or more between the strongest channel during winter and the weakest channel during the summer months. It's possible that the input to a masthead amplifier may be too great at times, the result being cross-modulation. It's simple to find the maximum permissible input signal level for an amplifier from the manufacturer's figures for maximum output and gain. The quoted figure for gain is usually accurate, but the maximum output figure, usually quoted for a cross-modulation ratio of −46dB across four channels, is often rather optimistic for reliable operation. A good rule of thumb to find the maximum input is to assume a maximum output of +20dB/mV and subtract the gain. If there's any likelihood that this figure will be exceeded, use an amplifier with less gain.

Subjectively, cross-modulation is more annoying, dB for dB, than noise. It's thus more likely to result in a call-back. If this happens, remember that cross-modulation can occur in the masthead amplifier, a distribution amplifier, a VCR or the TV set. Often the masthead amplifier can handle the signal but these latter items can't. If the fault lies with the VCR or TV set, educate the customer in the seasonal use of an attenuator in order to avoid twice yearly call-outs. One of our customers calls her 12dB attenuator her "calmer downer".

If you have to feed a large communal system from a tree-screened aerial, channelised units with a.g.c. are essential prior to the power amplifiers.

This type of tree screening problem is often described by the customer as ghosting. When the direct signal from the transmitter suffers maximum path loss, the ratio between it and a reflected signal is at its least favourable. Normal anti-ghosting tactics can be employed, but you'll find the reliability less than you'd expect where trees are not involved. Co-channel interference may arise in the same way.

Fairly Close Trees in Signal Path

We'll deal next with fairly close trees that completely obscure the signal path. In a typical case there might be upwards of a dozen large, mature deciduous trees forming an irregular group right across the general direction of the transmitter with the closer trees 20-30m away. The transmitter is a high-power one not too far away and otherwise in line-of-sight. In summer there's little or no clear view through the trees, and even in winter the bare branches significantly obscure the line-of-sight to the transmitter.

The onset of bad reception is as likely in late autumn as in spring. Typically the customer will ring up just after an autumn gale to say that the wind has moved his aerial. He wants you to move it back. It's a simple job and he'd do it himself if he had a ladder/time/or it wasn't for his bad leg. In fact the wind has removed a lot of the leaves and possibly a few big branches overnight and this has affected reception. How? Read on. The customer is of course expecting an extremely modest bill for a very simple job.

The customer will say that he's enjoyed perfect reception – or what he regards as perfect reception – since the days of John L. Baird. "Those trees have always been there and they've never affected reception before" he'll declare. The dreaded credibility gap looms up in front of you! In reality the customer has probably always had rather unreliable reception, but it's never been quite this bad. Why does it happen? Why does one channel just disappear?

The cause of the problem is multipath reception through the trees. The signal takes a number of different paths through the leaves and branches. In the simplest case, if signals following two such paths arrive at the aerial more or less in phase no great harm is done. But if they chance to arrive exactly out of phase and of equal strength the result is no signal. It's never quite as clear cut as this of course. The signal may take a multitude of paths, resulting in a complex and unpredictable pattern of standing waves, or peaks and nulls, at the receiving site. Because a relatively minor change in the tree structure can completely alter this pattern, reception can be acceptable for years until a null happens to occur precisely at the aerial location. Normal movement of the trees, even on fairly still days, is enough to cause great variations in received signal strength.

The difference in path lengths is often not enough to produce visible ghosting, but teletext can be severely affected. Thus the call often originates as "bad text; picture o.k.". Close examination will show that the picture is not in fact o.k., but the customer hasn't noticed this.

This phenomenon is very frequency dependent. In comparison with the calculated line-of-sight signal strength, different channels may be received simultaneously at −3 to −40dB. This means that one or more channels might to all intents not be present, leaving the others unaffected. The sound signal on one or more channels might be attenuated to a greater or lesser extent than the vision. Occasionally the sound will be so severely attenuated that caption buzz, hissing or distortion will be present. TV sound is normally received at −10dB relative to the vision signal. TV sets and VCRs vary enormously in their tolerance of abnormal sound level signals, but if the sound drops to 30dB below the vision the receiver is in trouble. It's astonishing that Mother Nature can accidentally contrive to produce what is in effect a rather good notch filter.

In the face of such large signal level variations from channel to channel and from one time to another masthead amplifiers are of very limited use. One of the cowboys in our area customarily fits a cheap, unstable, wideband ultra high-gain masthead amplifier in such cases, without making any attempt to improve the signal from the aerial. The usual result is cross-modulation all over the noisy, weak channel. I don't know why people pay him.

Amplification can play a part, but the first essential is to find the optimum position for the aerial. Siting is usually very critical, sometimes astonishingly so. If the aerial is moved up or down or sideways by 300mm while keeping it pointed in the direction of maximum signal pick-up the signal level may vary by up to 20dB. Sometimes the signal at every point on the roof is unusable, but it's far more common eventually to find some small point where all four vision and sound signals are present at reasonable strength. With luck it will be feasible to install the aerial at this point.

These tests are not unlike water divining and need care, patience and experience, not to mention muttered incantations. Start with a prayer, then begin the search at the most convenient location for a permanent installation, working your way outwards. This normally means starting at the chimney and testing very thoroughly all over at all heights. There's a good chance that you will find a conveniently situated point in space that provides an acceptable signal on all channels. This point might be as little as 300mm from the original aerial position. Don't be afraid to fix the array in a position that looks somewhat unorthodox.

Jobs of this kind don't arise because the reception is representative of conditions generally in the district or even on the particular roof. They arise because, by dreadful mischance, the customer's aerial happens to occupy one of the relatively few small points in space where two or more multipath signals cancel out neatly. This explains the "why me?" syndrome that customers develop when neighbours say "we never have any trouble".

If the trees are really large, with the bulk of the foliage high up, the intensity of the peaks and nulls might be less with the aerial at a lower height. There might be a general improvement in signal levels below roof level. Thus the installer might put the aerial under the eaves or on an outbuilding. Where conventional multipath reflection from the rear is a contributory problem, the house can often be used as a screen.

Polarisation twisting may occur, but unfortunately usually not to an equal extent on each channel. Sometimes what appears to be a normal null is actually a region of near 90° polarisation twisting. If this is a factor the installer should try altering the polarity of the aerial at each possible location. Where polarisation twisting occurs it will not be consistent as the seasons change, so it might be necessary to install two cross-polarised arrays with separate downleads.

There can be such large differences in signal strength over small distances that direct signal pick-up on test equipment is a problem. If an unscreened portable TV set is taken on to the roof the results obtained may be confusing. If the set is in a position where the field strengths are 20dB higher than at the aerial a metre away, connecting the aerial will have little effect on the picture. Any tests made with unscreened equipment are meaningless. Although from an examination of the customer's TV picture it might seem that the problem requires the use of a TV set on the roof rather than simple monitoring of the field strength, in fact it's better to use a meter. Simply look for maximum field strength when all other problems, such as ghosting, should take care of themselves. As a measure of progress, compare the received signal strength with the calculated line-of-sight figure. If you can get within 10dB you're doing well. It's important not to settle for merely adequate signal strength if a better signal is available nearby.

If a masthead amplifier is used, remember that one channel or another will probably climb to within 10dB of the line-of-sight figure at some point during the next twelve months, so don't overdo the gain.

In such cases it's often possible to effect an apparent miracle cure. But if the cure relies on reception through dense foliage the miracle might be short lived. You should make this plain to the customer. In a bad case the customer might have to accept that he pays to have the aerial adjusted perhaps twice a year.

Sparse Woodland at Medium Distance

Next, sparse woodland in the direction of the transmitter, at a medium distance away. Typically there might be irregular mixed woodland across the general direction of the transmitter, with the nearest trees 100-500m away. Even in summer the far horizon can be seen at a number of points through and between the trees. Although quite sparse, the trees are fairly tall and it's not feasible to obtain line-of-sight above them.

In such a case, look at the trees to check whether a good signal can be obtained through one of the gaps. This is often possible, and if the transmitter is visible between the trees it will be found that u.h.f. screening is in approximate agreement with visual screening. The word approximate should be stressed however: don't dispense with the meter. Considerable signal variations will be found within clear line-of-sight areas and also within screened areas. Even where the screening looks quite solid you will discover u.h.f. "holes" when different aerial locations are tried. As always, strive for the strongest possible signal, even where this results in the need to use an attenuator.

Sparse tree screening of this sort can sometimes produce severe nulls and peaks, but the effect is usually of a much more gentle variation of signal level with location. What goes for one channel will nearly always go for the others, which makes things a lot easier. The feeling you get from the test equipment is quite different: with practice the distinction between multipath effects and straightforward screening becomes very clear.

It's necessary to experiment with height, but usually only within the normal range of fixing locations. It should be possible to obtain signal levels within 10dB of the line-of-sight figure. If you can do that the installation has a reasonable chance of proving to be reliable.

The above assumes that apart from the effect of the trees the signal levels in the area are good. In such circumstances masthead amplifiers should be used with the utmost caution. At some point during the next twelve months the signal will probably reach the line-of-sight figure. The installer should be certain that everything possible has been done to obtain the best possible signals from the aerial before an amplifier is used.

The situation is rather different in areas of generally low signal strength. In this case a masthead amplifier will almost certainly be required. Work on the assumption that signal levels might rise to the value that they would have if the trees were not there.

Trees to One Side of Signal Path

Problems with trees just to one side of the signal path are not common – which is just as well because they can be difficult or even impossible to cure. The situation might be as follows. The aerial can see the transmitter, which is high-powered and only about 25km away. Normally about 23 and 13dB/mV of vision and sound signal respectively will be available – enough to need an attenuator. The meter however reads as follows (vision/sound): ch. 41 21/12dB/mV; ch. 44 8/5dB/mV; ch. 47 13/9dB/mV; ch. 51 23/10dB/mV. The ch. 44 picture has multiple ghosting and is subject to some fluctuation. The ch. 47 picture is not good. Having checked everything that's obvious the rigger stands uncertainly on the roof. He looks at the transmitter, which he can see right down to the base of the tower. He looks at the aerial, then at the meter, then at the transmitter again. He scratches his head. He should look at the clump of leafy trees which innocently enhance the landscape, just to one side of the transmitter and about 100m away.

This is another job where the customer probably won't believe you. The signal path is bent by passing through the trees – in other words there's signal refraction. It's another form of multipath reception, but what makes it seem so odd is the fact that it's strong enough to compete with the line-of-sight signal. Actually for every case where this is a real problem it probably occurs to a slight and completely unnoticed extent a hundred times. Users of accurate meters will be aware that line-of-sight signals are often not quite what they should be.

The refracted signal can arrive at the receiving aerial at virtually the same strength as the direct signal. If the phase relationship is unfavourable the apparent field strength is much diminished. The effect is not usually sufficiently severe to produce signal strength problems pure and simple. The most usual consequence is ghosting, because the effect of reflections from the rear increases as the apparent field strength is reduced. The refracted signal is not itself the cause of the ghosting because there is little difference between its path length and that of the direct signal. Teletext can be affected however, without the customer being aware of any other faults.

The cause of this peculiar reception is usually a small, dense group of broad-leaved deciduous trees. They are likely to be about 100m away – the effect seems to fall off at greater distances. They may be so close to the line-of-sight path that the transmitter is only just visible to one side, or they may be as much as 15° from the line-of-sight path. The trees may form an isolated group in an otherwise unwooded area or they might form the edge of a larger group. The effect seems to occur only where the signal path through the trees is fairly short – less than about 20m. The worst possibility is a single row of trees roughly at right angles to the transmitter. I've never seen this effect caused by coniferous trees or by deciduous trees in winter, only by deciduous trees in full leaf.

So what can be done about it? The normal directional properties of the Yagi aerial are of little help because the angle between the direct and refracted signals is too small for the aerial to be able to discriminate between them. Attempts to find a better aerial position on the roof are likely to prove unsuccessful. The refracted signal is usually present over a large area: you can't get away from it. Height makes not a scrap of difference. Moving the aerial slightly to obtain a better phase relationship usually transfers the problem to a different channel, and anyway any improvement tends to be short lived.

The use of two stacked arrays, if done methodically and with an understanding of the principles involved (see *Television*, November 1978), can work fairly well. The two aerials need to be many wavelengths apart if the angle between the wanted and unwanted signals is very small. Rigid fixing is essential. Another solution, where the angle between the two signals is not too small, is to fix the aerial low down on the building, where it can still see the transmitter but where the building itself or another building obscures the offending trees. This can work well, but the rigger who can find such a spot is indeed a jammy beggar.

In a really unlucky case there will be line-of-sight between the transmitter and the trees and between the trees and the aerial, but not between the transmitter and the aerial. In these circumstances good, reliable reception is likely to prove impossible.

A similar refraction effect can occur when the transmitter is visible above a clump of trees. Here wide-spaced vertical aerial stacking can help, but the mast that supports the top aerial must be very rigid or the picture will suffer from flutter.

Reflection from Trees Behind

Signal reflection from trees behind the aerial is conventional multipath reception – ordinary ghosting. If trees are to blame they are likely to be part of a dense coniferous plantation on high ground, with line-of-sight to the transmitter and behind or to the side of the receiving aerial. The trees can be at any distance. If the aerial does not have direct sight of the transmitter the situation is likely to be much worse. Where some trees have been felled, revealing a large number of straight, closely-packed trunks, the reflected signals are likely to be strong. The trees reflect the signal just as a large building does: there's no great variation with time.

Conventional anti-ghosting tactics can be employed. If the wall of trunks is very long, subtending a large angle to the aerial, stacking two arrays will be ineffective as this technique rejects ghosting only from specific small angles. In such a case the ghosting often appears with bad definition.

Deciduous trees don't seem to be particularly inclined to produce ghosting in this way. They perform their mischief by absorption and transmission rather than by reflection.

Trees Screening a Reflected Signal

Next, trees that screen a reflected signal. "How can it be the trees when it's worse in winter?" askes the sceptical customer. The difference between slight and unacceptable ghosting, in terms of the strength of the reflected signal, is only 10 or 15dB. A solitary large sycamore can cause a signal that passes through it to vary by more than that between summer and winter. If a reflected signal has to pass through a tree on its way to the aerial, the ghosting will show some seasonal variation. If it has to pass through a substantial group of deciduous trees the variation can be extreme. The rigger will be called out to this in winter.

As usual the customer won't be able to understand why it hasn't happened before at the same time of year. Tell him that it's one of the mysteries of life and treat it as a normal anti-ghosting job. If you can solve it in winter it will stay solved in summer.

Use of an Alternative Transmitter

Obtaining TV reception through dense foliage should always be regarded as a last resort. If it's impossible to move the aerial to a location where the trees don't obstruct the signal, reception from another transmitter should be considered. The UK's u.h.f. TV network is very highly developed, and at many locations it's possible to obtain good reception from more than one transmitter. Those of us who live and work in the more densely populated inland areas should thank our lucky stars for our choice of transmitters. Let's not forget our unfortunate colleagues in places like Norfolk, where it's often Tacolneston or nothing. The availability of signals from an alternative transmitter can be a godsend where trees are involved. There will be fewer comebacks with an installation that uses a weak but clean signal from the next county than one that uses a very strong local signal received through dense trees.

If the installer is working on familiar territory he'll have a good idea of what other transmissions might be available, but in any case it's always worth having a good look up and down the u.h.f. bands. A serious contender would need to arrive at no less than −8dB/mV, with negligible ghosting. The installer will have to use his experience to assess the possibility of intermittent signal fading or co-channel interference in the case of reception from a rather distant transmitter.

If the transmitter carries other than the local regional programmes it will be necessary to provide the customer with reception of some sort from the local transmitter. The two aerials will probably be diplexed together, if the channel groups allow, and low signal levels will often lead to the use of a masthead amplifier below the diplexer. Cross-modulation may become a problem when, one winter's day, the signal from the local transmitter peaks. This will affect reception from both transmitters of course. In a severe case, consider the use of separate amplifiers and/or downleads. If both transmitters use the same channel group it will be necessary to use separate downleads anyway – except in rare, lucky cases. One such case is the combination of distant channels 21, 24, 27 and 31 with local ITV on ch. 29. Channel-pass filters are required: don't try to get away with a splitter. The other local channels must be excluded as they are adjacent to the wanted distant ones.

In places very close to a high-powered transmitter but with intervening trees it sometimes happens that an extremely strong signal is received but is unusable because of multipath conditions of one sort or another. Despite its directional properties an aerial directed at a distant transmitter might produce much stronger signals from the local transmitter than from the distant one. The required channels could be typically at about −8dB/mV, with four horrible scrambled messes coming down the same coax at +10dB/mV.

Masthead amplification is needed, but it's essential to filter out the unwanted strong signals. Use a channel-group filter, or a good quality diplexer with the unwanted input terminated with a 75Ω resistor. If the aerial is feeding a communal system it's worth using a four-channel pass filter immediately after the aerial – assuming that the required signals are strong enough for the 3dB filter loss not to be a problem. If the wanted and unwanted signals are in the same group you'll have to think of something else, because even if you can manage without a masthead amplifier the TV set and VCR will be unable to cope with adjacent channels at such strength.

Examples

In Part 2 we'll follow up with practical examples to illustrate some of the techniques outlined so far.

ECONOMIC DEVICES PO BOX 15, WOLVERHAMPTON, WV2 4AZ

15/80H	2.72
15/85R	3.28
17052	4.50
17053	5.61
17074	9.30
17089	3.45
17127	2.50
17376	1.58
1N4001	0.04
1N4002	0.06
1N4003	0.06
1N4004	0.05
1N4005	0.05
1N4006	0.08
1N4007	0.07
1N4148	0.03
1N4448	0.05
1N5401	0.11
1N5402	0.13
1N5403	0.18
1N5404	0.10
1N5408	0.15
1N914	0.04
1S1555	0.31
1S44	0.10
1S921	0.10
2N2219A	0.37
2N3053	0.35
2N3054	0.99
2N3055	0.66
2N3442	1.16
2N3702	0.14
2N3703	0.18
2N3705	0.15
2N3706	0.14
2N3707	0.16
2N3711	0.11
2N3771	1.56
2N3772	1.55
2N3773	1.95
2N3819	0.40
2N3823	1.17
2N3904	0.15
2N3908	0.62
2N4101	1.33
2N4240	1.95
2N4444	1.66
2N5293	0.50
2N5294	0.50
2N5296	0.50
2N5297	0.50
2N5298	0.61
2N6109	1.58
2N6130	0.85
2N6133	1.25
2N6180	0.73
2N6292	1.60
2SA1006	1.50
2SA1011	1.65
2SA1015	0.20
2SA1012	0.80
2SA1020Y	0.99
2SA1027R	0.45
2SA473	0.75
2SA766S	4.95
2SC1173Y	1.25
2SC1474	1.25
2SC1509	1.35
2SA1095	3.00
2SA1103	6.00
2SA329	0.40
2SA489	1.17
2SA490	1.32
2SA493	2.25
2SA562	0.57
2SA564	0.62
2SA614	4.88
2SA628	0.37
2SA639S	1.75
2SA659	0.49
2SA673	1.50
2SA684	1.20
2SA697	0.80
2SA699	1.25
2SA715	0.95
2SA748	1.95
2SA817	0.18
2SA835	2.50
2SA836	0.89
2SA844	0.65
2SA872	0.59
2SA884	2.15
2SA937R	0.97
2SA940	2.23
2SA940-2	2.14
2SA950	0.72
2SA951	1.75
2SA966-Y	0.85
2SA999	0.75
2SB774	0.65
2SB185	1.13
2SB375	3.87
2SB400	0.40
2SB405	1.03
2SB511	2.65
2SB54	1.39
2SB546	0.56
2SB56	2.80
2SB618A	2.22
2SB631	2.00
2SB643	0.50
2SB669	3.67
2SB681	3.96
2SB695	1.98
2SB774	0.65
2SB819	1.13
2SC1096	1.16
2SC1104	3.98
2SC1106	4.54
2SC1114	3.25
2SC1116	4.95
2SC1124	1.26
2SC1129	1.65
2SC1131	0.64
2SC1158	3.33
2SC1162	0.55
2SC1172	2.22
2SC1195	6.09
2SC1213	0.89
2SC1226	1.46
2SC1293	0.90
2SC1306	1.98
2SC1317	0.50
2SC1364	0.49
2SC1383	1.20
2SC1391	2.45
2SC1398	0.41
2SC1413A	2.10
2SC1446	1.25
2SC1447	2.07
2SC1475	0.60
2SC1505	1.00
2SC1514	1.37
2SC1573Q	1.91
2SC1583	0.34
2SC1617	3.89

2SC1678	1.98
2SC1741	1.25
2SC1810	1.70
2SC1815	0.20
2SC1826	0.67
2SC1829	2.25
2SC1875	4.50
2SC1893	3.02
2SC1906	0.98
2SC1921	1.37
2SC1923	0.30
2SC1929	2.25
2SC1942	1.98
2SC1959	0.20
2SC1957	0.95
2SC1953	1.93
2SC1962	1.93
2SC1969	1.83
2SC1983	0.51
2SC1985	1.55
2SC2009	0.34
2SC2029	2.33
2SC2028	2.11
2SC2063	0.99
2SC2078	3.39
2SC2073	1.54
2SC2085-Q	1.65
2SC2091	1.30
2SC2141	2.44
2SC2166	0.87
2SC2216	0.69
2SC2233	1.20
2SC2236	1.69
2SC2278	1.14
2SC2314	0.87
2SC2335+Kit	7.00
2SC2551	1.26
2SC2565	3.84
2SC2570	1.85
2SC2577	1.60
2SC2578	6.75
2SC2671	0.91
2SC288A	1.85
2SC3153	6.50
2SC372	1.40
2SC373	1.16
2SC383	1.33
2SC388	1.27
2SC394V	0.81
2SC403C	0.60
2SC458	0.34
2SC495	0.92
2SC515A	1.85
2SC535	0.79
2SC536	0.06
2SC537	0.54
2SC605L	1.16
2SC620	1.46
2SC643A	1.54
2SC668	0.67
2SC681	4.40
2SC682	1.88
2SC684	1.65
2SC693	0.63
2SC710	1.15
2SC711A	0.50
2SC717	1.28
2SC734	1.43
2SC783	3.98
2SC790Y	1.85
2SC828	0.28
2SC867A	3.04
2SC876	0.96
2SC930	0.54
2SC935	4.13
2SC940	4.68
2SD1128	2.90
2SD1138	0.94
2SD1273	1.48
2SD1453	1.33
2SD152K	2.64
2SD198	3.87
2SD234	0.47
2SD235	0.60
2SD24	2.29
2SD257	1.98
2SD292	4.09
2SD313	2.92
2SD325D	2.26
2SD350	3.05
2SD353	7.50
2SD389	2.41
2SD401	1.40
2SD414	1.98
2SD471	2.13
2SD560	2.95
2SD600	2.98
2SD601R	0.65
2SD613	1.03
2SD636	0.40
2SD639-R	0.72
2SD655	0.98
2SD657	2.80
2SD661A	0.80
2SD731	2.11
2SD773	0.60
2SD811	7.63
2SD823	1.98
2SD837	1.48
2SD841	1.75
2SD856	0.89
2SD857Q	1.84
2SD882	1.15
2SD894	1.75
2SD898	0.82
2SK105H	2.15
7805-T022	0.63
7808	0.45
7812-T022	0.35
7815	0.64
7905	0.80
AD140	1.06
AD143	1.93
AD145	1.60
AD161	0.64
AD162	0.45
AF114	2.47
AF115	0.90
AF118	1.20
AF127	1.00
AF139	0.40
AF178	1.45
AF179	0.55
AF180	0.55
AF181	0.53
AF186	0.53
AF239	0.53
AF279	0.88
AN115	3.98
AN155	1.89
AN206	2.58
AN208	3.55
AN210	2.28
AN211	3.25

AN214Q	2.40
AN234	5.09
AN236	3.33
AN240P	0.99
AN241	1.71
AN245	5.04
AN253	1.80
AN260	3.85
AN272	7.92
AN295	7.63
AN301	2.45
AN302	3.09
AN315	2.46
AN316	4.95
AN318	7.16
AN320	5.47
AN321	2.25
AN322	6.78
AN337	5.37
AN340P	1.53
AN355	1.65
AN362	1.50
AN370	3.95
AN5111	3.43
AN5120N	4.50
AN5132	4.42
AN5250	4.40
AN5610	7.43
AN5612	2.20
AN5613	4.20
AN5630	3.95
AN5701N	1.66
AN6250	1.75
AN6300	4.40
AN6310	4.54
AN6340	5.62
AN6341	2.22
AN6363	16.00
AN6531	1.95
AN6551	0.50
AN6552	0.68
AN6610	1.86
AN7111	1.25
AN7115	2.52
AN7145	2.80
AN7146	9.90
AN7151	2.37
AN7156	3.37
AN7158	2.10
AN7218	0.80
AN7223	4.55
AU107	7.72
AU110	5.68
AU113	14.63
AY105K	2.08
AY106	2.80
BA524	8.94
BA310	0.14
BA1310	1.50
BA1320	1.38
BA1322	3.95
BA1330	2.75
BA145	0.19
BA148	0.25
BA154	0.40
BA155	0.12
BA156	0.05
BA159	0.09
BA182	0.19
BA222	1.66
BA302	1.24
BA311	0.65
BA312	1.45
BA313	0.76
BA317	0.04
BA318	0.09
BA328	2.22
BA333	1.37
BA335	6.27
BA5102A	2.15
BA511	1.95
BA514	1.00
BA521	1.20
BA524	8.94
BA526	7.98
BA527	2.98
BA532	1.20
BA536	0.99
BA6209	3.21
BA656	1.00
BA7100	11.35
BA841A	28.98
BA843	3.96
BA854	5.76
BAV18	0.06
BAV19	0.24
BAV20	0.36
BAV21	0.12
BAW62	0.04
BAX12	0.49
BAX13	0.11
BAX16	0.08
BC107B	0.11
BC108B	0.15
BC109B	0.14
BC113	0.14
BC119	0.36
BC126	0.20
BC132	0.14
BC135	0.14
BC137	0.18
BC138	0.34
BC139	0.33
BC140	0.30
BC141	0.31
BC142	0.26
BC143	0.34
BC147	0.14
BC148B	0.13
BC148C	0.11
BC149B	0.13
BC153	0.14
BC154	0.14
BC159	0.16
BC160	0.40
BC161	0.28
BC168	0.36
BC169C	0.16
BC170	0.16
BC171	0.11
BC172B	0.27
BC173	0.17
BC174B	0.27
BC177	0.35
BC178	0.26
BC179	0.26
BC182	0.09
BC182LB	0.14
BC183LB	0.09
BC184	0.70
BC184LB	0.13
BC186	0.25
BC187	0.28
BC204	0.35

BC207	0.19
BC212B	0.26
BC213L	0.10
BC214	0.10
BC225	0.40
BC237	0.10
BC238	0.10
BC238B	0.08
BC239B	0.25
BC251A	0.31
BC294	0.50
BC300	0.35
BC301	0.34
BC302	0.53
BC303	0.48
BC307A	0.06
BC308A	0.11
BC309	0.17
BC317A	0.13
BC327	0.09
BC328	0.11
BC337	0.09
BC338	0.12
BC368	0.19
BC440	0.69
BC441	0.46
BC454	0.36
BC460	0.42
BC461	0.47
BC462	0.51
BC463	0.30
BC478	0.32
BC479	0.41
BC532	0.28
BC546	0.08
BC547	0.10
BC548	0.28
BC549	0.10
BC550	0.10
BC556	0.11
BC557	0.10
BC558	0.10
BC559	0.10
BC560C	0.14
BC635	0.34
BC636	0.20
BC637	0.24
BC639	0.15
BC640	0.24
BCX34	0.55
BD115	0.36
BD116	0.70
BD124	1.31
BD131	0.42
BD132	0.42
BD133	0.53
BD135	0.36
BD136	0.36
BD137	0.41
BD138	0.28
BD139	0.24
BD140	0.35
BD144	1.43
BD150	0.75
BD157	0.67
BD160	1.60
BD163	0.71
BD166	0.69
BD175	0.28
BD179	0.30
BD181	0.98
BD182	0.99
BD183	0.99
BD184	1.21
BD187	0.80
BD189	0.43
BD190	0.55
BD201	0.49
BD202	0.60
BD203	0.46
BD204	0.41
BD207	1.73
BD208	1.23
BD222	0.45
BD225	0.46
BD228	0.63
BD229	1.05
BD232	0.49
BD234	0.42
BD237	0.36
BD238	0.28
BD239	0.45
BD240	0.57
BD241	0.39
BD242	0.50
BD243A	0.62
BD243C	0.50
BD244	0.42
BD244C	0.72
BD245C	0.75
BD246C	0.85
BD253	1.05
BD278A	0.70
BD317	1.20
BD318	2.72
BD375	0.42
BD380	0.66
BD410	0.49
BD433	0.44
BD434	0.45
BD435	0.49
BD436	0.74
BD437	0.45
BD438	0.52
BD441	0.59
BD442	0.50
BD509	1.64
BD510	0.75
BD519	0.78
BD529	0.75
BD530	0.69
BD533	0.67
BD534	0.52
BD535	0.38
BD536	0.50
BD537	0.50
BD538	0.67
BD544B	0.75
BD677	0.33
BD679	0.43
BD680	0.66
BD681	1.48
BD696	2.47
BD699	1.85
BD700	3.70
BD707	0.60
BD709	0.80
BD710	0.80
BD809	0.45
BD810	0.57
BD879	0.74
BD895	2.18
BD901	0.55
BD902	0.56
BDW83C	0.99
BDW84C	0.99
BDX32	1.65
BDX53A	4.93
BDX53B	3.35

BDX54B	0.31
BDX62A	2.09
BDX63A	1.96
BDY20	1.21
BDY81	1.18
BF115	0.29
BF117	0.66
BF118	0.67
BF121	0.25
BF123	0.13
BF127	0.13
BF137	0.29
BF153	0.58
BF154	0.26
BF157	0.33
BF158	0.18
BF159	0.18
BF160	0.31
BF167	0.38
BF173	0.34
BF177	0.55
BF178	0.40
BF179	0.36
BF180	0.36
BF181	0.32
BF182	0.34
BF183	0.39
BF184	0.43
BF185	0.39
BF194	0.14
BF195	0.14
BF196	0.17
BF197	0.24
BF198	0.17
BF199	0.17
BF200	0.37
BF218	0.36
BF224	0.17
BF237	0.65
BF240	0.19
BF241	0.17
BF245	0.50
BF245B	0.49
BF246A	2.52
BF255	0.20
BF256	0.52
BF257	0.34
BF258	0.33
BF259	0.34
BF260	0.34
BF262	0.57
BF263	0.57
BF271	0.34
BF273	0.20
BF274	0.20
BF324	0.23
BF336	0.33
BF337	0.31
BF338	0.34
BF355	0.48
BF362	0.60
BF363	0.60
BF371	0.50
BF391	0.25
BF417	0.84
BF418	1.87
BF422	0.15
BF423	0.33
BF450	0.35
BF451	0.29
BF457	0.41
BF458	0.49
BF459	0.26
BF460	1.63
BF469	0.33
BF470	0.25
BF471	0.25
BF472	0.33
BF479	0.61
BF480	0.89
BF491	0.50
BF506	0.43
BF532	0.24
BF596	0.18
BF597	0.27
BF694	0.22
BF757	0.59
BF759	0.47
BF761	1.05
BF762	0.34
BF869	0.49
BF870	0.30
BF959	0.42
BF960	0.59
BF970	0.40
BFR39	0.44
BFR61	0.92
BFR62	0.50
BFR79	0.29
BFR81	0.29
BFR86	1.08
BFR88	1.63
BFR90A	0.67
BFX29	0.34
BFX84	0.37
BFX85	0.31
BFX86	0.36
BFX87	0.55
BFX88	0.34
BFX89	0.44
BFY50	0.30
BFY51	0.33
BFY52	0.27
BFY79	0.49
BFY90	0.89
BLY49	2.20
BR100	0.23
BR101	0.78
BR103	0.87
BR303	1.15
BRC84	2.08
BRX44	0.60
BRX49	0.46
BRY39	0.65
BSS38	0.70
BSTBD140G	4.93
BSTC0246	5.99
BSTC0233	6.12
BSTCC0143	3.07
BSTD1043	2.85
BSV57B	3.91
BSW68	0.60
BSX19	0.34
BSX20	0.19
BSY52	0.50
BSY79	0.51
BT108	1.45
BT119	1.76
BT120	2.17
BT121	2.48
BT123	1.98
BT151-800R	0.85
BTT6018	2.42
BU106	2.48
BU108	1.50
BU109	2.25
BU110	5.69
BU125	2.48

BU126	1.10
BU137	6.53
BU205	1.15
BU206	1.27
BU207	1.65
BU208	1.12
BU208/02	2.35
BU208A	1.12
BU208D	1.43
BU209	1.75
BU226	2.55
BU326A	0.99
BU406	1.24
BU406D	1.24
BU407	0.54
BU412	5.29
BU426A	1.67
BU500	1.53
BU508A	1.50
BU536	1.55
BU608	1.65
BU705	2.50
BU806	1.03
BU807	1.40
BU826A	1.95
BUW84	0.66
BUX84	0.50
BUX85	0.69
BY126	0.13
BY127	0.13
BY133	0.10
BY164	0.44
BY176	0.93
BY179	1.42
BY182	1.05
BY187	0.77
BY189	1.76
BY198	1.62
BY207	0.22
BY208	1.15
BY210-400	0.18
BY210-600	0.31
BY210-800	0.19
BY223	1.25
BY224-600	2.60
BY226	0.15
BY227	0.20
BY228	0.60
BY229-1000	1.12
BY229-600	1.20
BY255	0.13
BY295-600	1.23
BY298	0.20
BY299	0.60
BY407	0.90
BY409	1.49
BY448	1.40
BY713	1.12
BYW56	0.14
BYX55-600	0.23
BYX71-600	0.85
BYX71-350	0.88
BYY56	1.48
BZY93C30	1.86
C106D	0.37
C106M	0.76
CA3046	1.55
CA3089	0.83
CA3090AQ	3.25
CA3094	2.20
CA3131EM	2.95
CD4001	0.24
CD4002	0.27
CD4008	1.35
CD4011	0.20
CD4012	0.24
CD4013	0.33
CD4016	0.25
CD4017	0.30
CD4020	0.75
CD4021	0.39
CD4023	0.28
CD4025	0.64
CD4028	0.84
CD4040B	0.45
CD4047	1.06
CD4049	0.24
CD4052	0.33
CD4066	0.33
CD4069	0.29
CD4070	0.25
CD4081	0.14
CD4093	0.40
CD4511	1.10
CD4528	0.37
CD4556	1.44
CR02AM-8	1.70
CV12E	4.62
CX095D	3.14
CX104	8.77
CX108	12.48
CX109	7.20
CX130	8.76
CX134	4.50
CX136	11.49
CX139	11.83
CX157	5.52
CX158	10.45
CX177	8.80
CX187	5.26
CX725	12.95
CX885A	6.85
E1222	4.00
E5024	0.28
E5386	0.25
GD243	1.95
GF758	0.84
HA11215	1.75
HA11211	2.53
HA11225	4.29
HA11229	3.46
HA11235	1.95
HA11124	5.25
HA1125	4.29
HA1137W	1.38
HA1138	3.75
HA11414	4.20
HA1156	1.16
HA1160	5.79
HA1166X	6.60
HA1167	6.60
HA11706	3.61
HA11705	8.00
HA11703	3.45
HA11701	3.57
HA11710	3.45
HA11713	2.90
HA11711	3.10
HA11715	9.99
HA11714	7.76
HA11716	13.10
HA11725	18.26
HA11725MP	16.00
HA117555P	6.23
HA11781	21.15
HA1180	5.15

HA1196	7.43
HA13001	1.73
HA1306	2.26
HA13402	7.06
HA13342	2.65
HA13365	4.02
HA1366WR	2.17
HA1367	2.75
HA1368R	1.95
HA1368	2.65
HA1370	3.71
HA1374	1.80
AA117	9
HA1377	1.95
HA1389R	2.05
HA1389	2.39
HA1392	2.22
HA1394	2.65
HA1397	2.75
HA1398	2.75
HA1406	2.07
HA1452	0.85
HD14538	2.07
HD38702-A2	7.95
HD38750A53	5.77
HD38750A 7	7.25
HD38800A50	14.09
HD44801A05	14.07
HISH1010	14.60
HISH1004	6.00
HISH1002	9.50
HM6231	9.50
HM6232	7.20
HM6251	5.69
HM7103	4.85
HM9032	4.00
HM9012	3.22
HM9015	3.24
HT4207	13.25
HT4208	20.65
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KC581C	7.75
KC582C	4.85
L200CV	1.69
LA1201	0.75
LA1210	1.56
LA1230	1.18
LA1320	2.87
LA1357N	9.00
LA1363	1.05
LA1364	3.02
LA1365J	1.45
LA1385	1.53
LA1387	5.95
LA3350	1.43
LA3361	1.60
LA3390	5.52
LA4032P	2.35
LA4100	1.25
LA4101	1.30
LA4102	0.75
LA4112	0.86
LA4125	2.25
LA4138	4.98
LA4140	0.70
LA4192	1.50
LA4220	1.25
LA4420	1.72
LA4422	1.00
LA4430	2.88
LA4440	2.55
LA4445	1.80
LA4460	1.50
LA4461	1.60
LA5112N	1.18
LA7020	13.86
LA7025	11.97
LA7027	10.92
LA7040	9.20
LA7042	3.90
LA7800	1.30
LA7801	3.21
LB1274	3.61
LC7800	9.20
LD3120	1.13
LD3150	2.75
LM1017N	1.81
LM1877	2.95
LM2808	5.94
LM2877	7.45
LM317CKC	1.08
LM324N	0.98
LM339N	0.41
LM340K	11.85
LM348N	2.15
LM380N	1.50
LM567CN	1.71
LM6402/011	10.23
LM6402A093	10.15
LM748	0.69
LM8360	3.87
LM8361	2.95
LR3419	9.37
LR3471	9.37
LU1141	7.27
LU52012	20.62
LU52011	14.95
LU03112	12.37
M193	6.83
M21C	1.10
M23C	1.98
M293	6.71
M51102L	2.77
M5115P	5.24
M51203L	3.15
M51231P	0.95
M5134-9341	4.13
M51353P	5.25
M51381P	5.98
M51393AP	4.50
M51394P	14.50
M5142P	6.85
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M51515BL	2.75
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M5192	3.13
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M53274P	1.33
M54532P	1.50
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MA06	1.07
MA8001	0.82
MA8003	1.16
MB3705	1.98
MB3712	1.85
MB3713	1.69
MB3730	1.75
MC13002	3.86
MC1310P	1.95
MC1327P	1.33

MC1330P	1.98
MC1350P	0.45
MC1351P	1.25
MC1352P	1.40
MC1357P	2.15
MC1358P	1.48
MC14493P	5.50
MC14494P	2.15
MC14497	5.94
MC14510BAL	3.75
MC14511BCP	1.10
MC14528BCP	2.15
MC1712	3.88
MC5192	19.50
MC7724CP	3.49
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MCR220/7	1.25
ME0411	0.75
ME6002	0.26
ME6102	0.28
ME8001	0.34
ME0411	0.75
MJ2501	3.30
MJ3001	1.43
MJ481	1.53
MJE2955	3.30
MJE3055	1.25
MJE340	0.49
MJE520	0.49
ML231	0.99
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ML237B	1.95
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ML923	3.10
ML926	3.58
MM5314N	8.99
MM5316N	3.50
MM5318N	3.11
MM5369N	2.01
MM5387AA/N	6.20
MM5841N	6.93
MN1400VL	13.65
MN1405	7.92
MN1435VX	8.81
MP1192	5.07
MP2794	4.00
MP2812	5.07
MP8512	1.57
MPC596	2.13
MPF256C	0.60
MPS6570	0.48
MPSA42	0.15
MPSA56	0.08
MPSA92	0.30
MPSU05	0.86
MPSU10	1.70
MPSU56	0.65
MPSU60	1.33
MR818	0.33
MR854	0.50
MR914	1.20
MSM5816RS	17.35
MSM5840H	14.45
MVS460-02	0.34
NE542	2.75
NE555	0.35
NE556	0.65
NP1106	11.51
OA202	0.11
OA47	0.16
OA91	0.14
OA95	0.09
OC28	2.52
OC29	2.15
OC36	7.53
OC44	1.95
OC45	0.18
OC72	0.44
OC75	0.44
ON236	1.06
ON782	1.65
OT121	1.45
PT6042	3.25
PT8504	5.13
R1038	2.19
R1039	2.19
R2008B	1.33
R2009	1.98
R2010B	2.98
R2029	1.33
R2030	1.33
R2257	2.35
R2265	1.49
R2305	1.18
R2322	0.67
R2323	0.76
R2354A	0.64
R2354B	2.01
R2443	1.36
R2461	1.50
R2540	1.65
R2540X	3.30
R2615	0.67
RCA2060	2.00
RGP01-15	0.70
RGP10	0.23
RGP30M	0.28
RT402	1.58
RT905A	3.28
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SAA1025	4.40
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SAA1124	2.60
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SAF1032P	3.86
SAF1039	1.95
SAS5010	8.39
SAS560S	1.91

SAS560T	5.42
SAS570T	5.42
SAS570S	1.95
SAS580	2.85
SAS6600	1.33
SAS660	1.33
SAS6700	1.33
SAS670	1.33
SAS6710	2.21
SBA750	1.61
SC84203	19.35
SC9504P	1.95
SDA2006	17.10
SDA2112/2	9.20
SG264A	5.26
SG613	10.70
SG629	8.27
SG6533	9.00
SI1125H	7.50
SI1630HD	20.62
SKE2F1/04	1.25
SKE2G3/04	0.75
SKE4F1/06	0.30
SKE4F2/08	1.07
SKE4F2/06	0.80
SKE4F2/10	1.33
SKE4G2/02	0.96
SKE5F3/10	1.36
SKS1/10	2.15
SL1310	3.14
SL1430T	2.31
SL414	3.69
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SL439	2.48
SL471	2.13
SL480	3.14
SL490	2.37
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SL918A	9.07
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SN29716N	3.66
SN29715N	6.04
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SN7402N	0.65
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SN7408N	0.27
SN7410N	0.27
SN74121	1.60
SN7413N	0.37
SN74141N	2.65
SN74151AN	1.51
SN74154N	1.27
SN74190	1.35
SN7420N	0.34
SN7430	0.49
SN7440N	0.27
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SN7474N	0.44
SN7490AN	0.75
SN74LS26N	1.45
SN76001N	1.65
SN76013ND	3.50
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SN76228N	3.27
SN76242	5.23
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SN76549	2.45
SN76570	3.08
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SN76620	2.59
SN76660N	2.48
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STK022	8.95
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STK501	6.32
STK502	7.25
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STK5730	3.20
STK7216	14.90
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STR451	6.18
STR453	8.16
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STR6020	6.96
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T6052V	0.87
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T6059	4.22
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TA7051	1.74
TA7054	2.55
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TA7076P	7.50
TA7089P	3.10
TA7092P	9.94
TA7093P	3.99
TA7102P	5.88
TA7108P	1.61
TA7109	3.71
TA7122B/P	0.87
TA7124P	2.34
TA7129P	1.90
TA7130P	1.27
TA7136AP	1.89
TA7137P	0.98
TA7141AP	3.87
TA7146P	4.85
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TA7161P	4.50
TA7162P	3.61
TA7172P	1.41
TA7176P	1.75
TA7193P	4.80
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TA7207P	1.48
TA7208P	2.15
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TA7214P	3.63
TA7215P	2.58
TA7217AP	1.45
TA7222	1.95
TA7226	3.57
TA7229P	4.66
TA7230P	1.35
TA7233P	3.61
TA7240AP	2.55
TA7245P	1.95
TA7310P	2.15
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TA7323P	3.15
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TA7339P	1.85
TA7340P	5.95
TA7607AP	1.30
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TA7611AP	2.32
TA7616P	5.25
TA7622AP	8.94
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TBA700	1.85
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TBA730	3.55
TBA750Q	2.50
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TCA730	2.75
TCA750	2.25
TCA800Q	5.95
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TCA890	5.44
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X0035TA	6.18
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X0056CE	6.25
X0057GE	6.00
X0065CE	5.77
X0074GE	15.29
X0077GE	14.60
X0079CE	4.95
X0092CE	4.95
X0096CE	6.20
X0109CE	11.25
X0113CE	9.48
X0195CE	9.60
X0204CE	8.74
X0261CE	8.98
ZPY120	3.25

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VCR Clinic

Reports from Eugene Trundle, Mick Dutton, Philip Blundell, AMIEIE, John C. Priest, Ian Bowden and Nick Beer

Ferguson 3V65/JVC HRD170 etc

Failure of the M54644AL or M54644BL motor drive chips on the mechacon panel in these and clone models is not unusual – they control the capstan and reel motors. Recently we had one of these machines in which IC603 had died (all inputs and supplies o.k. but no output), so we confidently quoted for a replacement. When this was fitted the reel motor remained still and the new chip started to overheat. The reel motor was short-circuit through 300° or so of its rotation! It carries a high price tag for a brush motor, and a difficult telephone conversation with the owner prefaced the fitting of a replacement. **E.T.**

Sony SLC20

An unusual one this. The ch. 36 picture from the VCR was heavily overlaid with a herringbone pattern, whether its source was off-air, off-tape or E-E with a test pattern injected into the video input socket. The machine had also been accused of producing pictures that rolled, though they wouldn't roll for me. Experimental decoupling of the switched supply to the r.f. modulator, using a handy electrolytic capacitor, cleared up the trouble. It transpired that decoupler C319 in the power supply section had gone open-circuit. We replaced several others in the power supply for good measure. With that and a head clean the machine was as good as new. **E.T.**

Sharp VL-C73

The unfortunate owners of this little camcorder went through a whole holiday recording monochrome pictures. On the bench we found that the E-E pictures, via the video output port, were in full colour. This narrowed the field of search a lot! Scope checks showed that the 627kHz chroma signal was getting lost en route to the recording heads. We found that low-pass filter FL503 was open-circuit. With the filter shorted out to prove the diagnosis the colour picture recorded on the tape was surprisingly good! **E.T.**

Ferguson 3V43/JVC HRD725

When the fault occurred the only way to shut the machine off was to pull out the mains plug! Whether the machine was off or in standby, the capstan motor and the take-up reel would whiz up to a high speed, with the clock display extinguished. This strange combination of symptoms was due to loss of the unswitched 12V line. The cause was a dry-joint on the lowest wire link between the two PCBs that make up the power regulator section, isolating the base of Q1 from pin 8 of IC1. The other joints are also worth resoldering. **E.T.**

JVC HRD700

If the fluorescent display panel in one of these machines won't light, before delving into the rather inaccessible electronics on the front panel assembly it's worth having a look at R5 on the 01 power transformer panel. It may have gone open-circuit, deleting the −30V supply. As is common with these safety resistors, there may be no external cause of its failure. **E.T.**

Philips VR6180 (5V Version)

This repair took longer than it should as the machine had two faults – both man made! The eject, power and channel buttons had no effect at all. The play and wind buttons changed the display to play or wind for a second, the deck clicked, but the command wasn't carried out. On removing the display module a crack could be seen by the set clock switch, so the tracks were bridged and the panel was then refitted. All the buttons now worked but the deck still didn't react. Someone had shorted the start/end of tape sensor wires together!! While searching for the cause of this last symptom I was led a wild goose chase around the loom. When checking signals at plug B3 of the family board, just because there's a large one printed at one end of the socket it doesn't mean that pin 1 is at that end – the one is meant for the socket next door, pin 1 being at the other end! **P.B.**

Philips VR6660

The problem with this machine was flutter on sound and a panel swap proved that the cause was on the P604 servo board. In the past I've had the DAC cause this fault. As there was a 1V peak-to-peak squarewave at pin 13 of this chip I fitted a new one. To no avail. As I started to unsolder the servo microcomputer chip I noticed a solder blob that shorted pins 9 and 10 together. When the short was removed and the pins I'd unsoldered were resoldered the sound was fine. The soldering looked original, so why hadn't the customer noticed the fault before? **P.B.**

Matsui VX820

This machine would wind and rewind but when play was selected the loading started then jammed prior to engagement of the pinch roller. We first suspected that the loading belt was slipping, but when we turned the machine upside down to remove the base cover a small metal pin about 5mm long dropped out. On investigation we found that this came from a plastic arm just to the front of the pinch roller. After replacing it, using a dab of Araldite, the loading worked perfectly. **M.D.**

Sharp VC387

This machine led us a merry dance for several weeks. The complaint when it first came into the workshop was failure to record when warm. We soak tested it for a long time but couldn't find anything amiss. In fact it was some weeks before the fault returned. This time we saw the problem: when recording the picture went blank after about a quarter of an hour – the E-E picture and sound had disappeared.

A scope check on the output from the tuner/i.f. panel showed that this was missing when the fault occurred. We checked the 12V supply at pin 1 of plug IB and found that this also went missing. This supply comes, along with the 31V for the varicap tuning system, from a converter in the PSU. We resoldered some suspect joints in this area but the fault persisted. The next step was to try blanket replacement of semiconductor devices. This still didn't cure the fault, but when transformer T951 was replaced the fault had been cleared. We could find nothing wrong with the old transformer. **M.D.**

Panasonic NV2000

The problem with this machine was that the capstan ran slowly for the first ten minutes. The customer told us that the fault had developed gradually over the last few months. When we hooked up the machine in the workshop we selected the test signal to tune it to our test set and noticed that there was a sizeable hum bar which ran down the picture. Investigation of the power supply showed that the modulator's feed is provided by Q1008 which supplies a regulated 12V output derived from an 18V line. The 18V supply's reservoir capacitor was found to be almost open-circuit. When it was replaced the hum bar had gone and the capstan speed was correct from cold. **M.D.**

Ferguson FV10B

The now infamous power supply chip IC801 (STK5481) had failed, with the 5V line rising to 9V as a result of an internal short-circuit. We replaced this and the clock display returned to normal. When a tape was loaded it would wind and rewind all right but if play was selected the machine would lace and then unlace as soon as the pinch roller engaged. On investigation we found that there were no drum flip-flop pulses at pin 34 of IC601 (M50731-623SP), though the drum rotated normally. When we checked the servo chip IC401 (HD49712NT) there was no pulse output at pin 62. Replacing this i.c. provided a cure. We've had several machines since with similar problems, including a JVC HRD170 which has more or less the same circuit with different chip types. **M.D.**

Saisho VR1200

The problem with this machine was complete lack of sound in the E-E, play and record modes. We traced the incoming sound signal from the tuner/i.f. section through to pin 8 of IC5001 (BA7751LS) with a scope. Thereafter nothing. As this chip does just about everything in the audio department it was replaced. Success! It's fiddly to get at however. The control and bottom PCBs have to be hinged out as otherwise access to the top of the i.c. is limited by the plastic chassis/frame. In addition it's a 24-pin SIL with the pins quilled, so you need a fine-tipped iron. CPC's part no. is HN107T67751L. **J.C.P.**

Budget Machines – a Warning!

When working on budget machines where production costs are a major factor in the design it pays to take care as you open up the VCR for examination. I've come across several machines recently in which the finish of metal pressings used for casings, top and bottom covers and deck components leaves much to be desired. In many cases the sheet metal edges are straight from the metal press without turned-over edges or burnishing. They can take large pieces from unwary fingers. A recent Samsung 710 for example took one of my fingers down to the bone when I inadvertently ran my fingers along the edges of the top cover while opening up the machine. I've also frequently received painful nicks from bottom cover plates, edges of cassette lifts, etc. So be warned. **J.C.P.**

Ferguson 3V59

The complaint was of intermittently playing fast. This was confirmed by a field engineer who also noted that when pause was selected during play the tape didn't stop but moved forwards very slowly. Another symptom was that the fast-wind functions started off too fast – usually when fast forward or rewind is selected the tape winds for a second or so at a lower speed then steps up to a higher one. With this machine the tape started off fast then increased its speed slightly. A check in the pause mode revealed that there was no capstan drive though the tape was moving. The cause of all these symptoms was high take-up drive, even in the pause mode when there shouldn't be any. In short there was a reel motor drive problem.

The reel motor is driven by IC603. The voltage this chip supplies to the motor, and thus the torque produced, depends on the d.c. voltage at pin 8 of the chip. This is derived from a pulse-width modulated waveform at pin 4 of the mechacon chip IC601. The PWM switches transistors Q604/5 on and off, as a result of which C608 charges to produce the variable d.c level that's fed to the motor driver. In this case the voltage at pin 4 of IC601 didn't rise sufficiently high to switch Q604/5 off. The voltage across C608 was always high therefore, around 10·5V even in the stop mode. The mechacon chip IC601 was at fault, with an internal leak to chassis from pin 4. **I.B.**

B and O VHS91·2

There's a modification for this machine should the drum motor speed increase after a couple of hours' use. Mount a diode in the position occupied by 1C442, with its cathode to 1C402 (on the audio PCB). B and O's part number for the diode is 8300439. **N.B.**

Samsung VI616/VI626

These two machines are virtually the same, so you can expect the same faults to occur on them both. This one had no remote control operation because of a dry-joint at the base of the DTA144 transistor Q0609 on the timer microcomputer PCB. **N.B.**

Servicing Compact Disc Players

Part 15

Joe Cieszynski

Throughout this series we have mixed in with the basic theory of CD player operation practical guidelines on fault diagnosis. In this present instalment many of these guidelines are brought together in the form of diagnostic flow charts. These should be of particular assistance to those with little experience of CD player servicing. When you work through these charts however don't overlook obvious things such as power supply lines, the microcomputer chip's reset pulse and oscillator, and bits of the mechanism rattling around inside the player. Those with experience of servicing modern electronic equipment have learnt to neglect such things at their peril. The danger is that when you tackle something new for the first time you can get so wrapped up in investigating the beast's electronics that you forget to look for the obvious. The flow charts are intended to take over when you have checked the obvious and drawn a blank.

Start-up Routine

When servicing a CD player it's important to be aware of the general start-up routine, as this can often point you in the direction of the source of the fault. Most players use the routine shown in Fig. 1.

Flow Charts

The flow charts have been written on the assumption that the player has a test mode. The suggested tests may be difficult to carry out if the player doesn't have a test mode. They remain valid however. Some suggestions on how to make the tests in the absence of a test mode were made in last month's instalment.

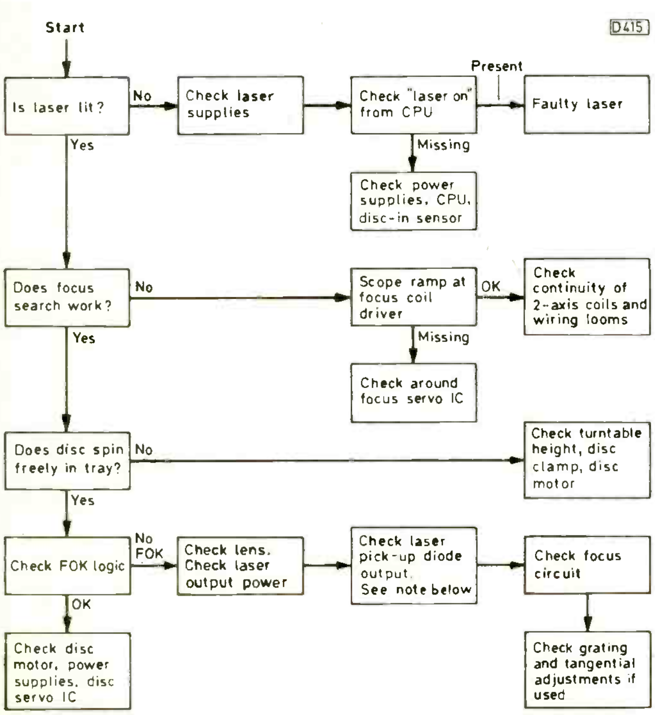
Distortion and Intermittent Working

In addition to the symptoms covered by the flow charts there are two other problems that you are likely to encounter with a CD player. These are distorted sound and intermittent operation. Ways of dealing with them have been discussed during the course of the series, so we'll provide just a summary here.

Apart from a fault in the final audio preamplifier stages, distorted sound is generally due to failure of one of the following: the RAM, the RAM address, the DA converter or sample-and-hold circuit. Fault location in these areas is fairly straightforward as there's a definite signal path that you can follow through. Furthermore as the fault is after the main decoder the CLV servo will be locked. Thus all the relevant signal waveforms will be available. Further guidelines on fault location in this area were given in Part 9 (November 1989, page 38).

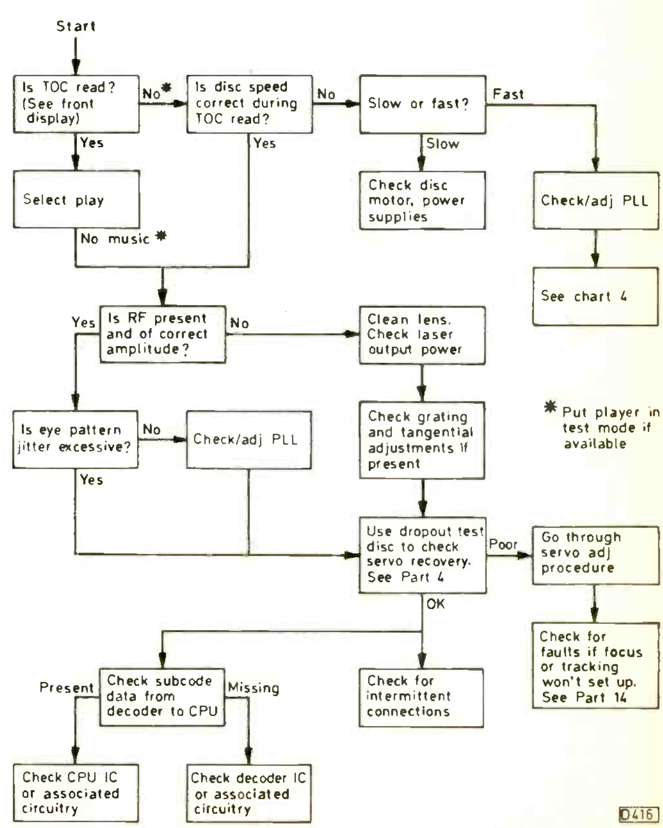
Intermittent problems are quite common with CD players and can occur for a variety of reasons. Failure to play certain discs, intermittent TOC reading, cutting out after a period of time or jumping is usually caused by a dirty optical lens, a laser with low output power, or

Chart 1: No disc rotation.



To check the laser pickup diode output, use a scope and look for a d.c. shift during focus search.

Chart 2: Disc spins then stops.



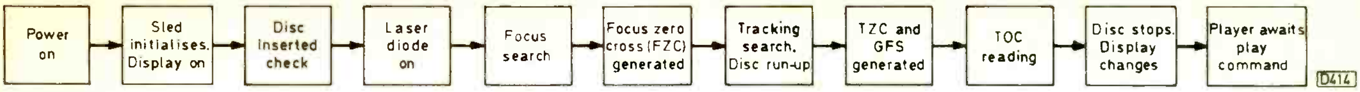


Fig. 1: Basic CD player start-up routine. At sled initialisation the sled moves forwards then back once to reset the limit switch. For further information see Part 11, January 1990, page 208.

misadjustment of the focus and/or tracking servos. Methods of cleaning and checking the optical assembly were looked at in Part 3 (May 1989, pages 521-2). Methods of checking and setting up the servos were discussed in Part 14 last month.

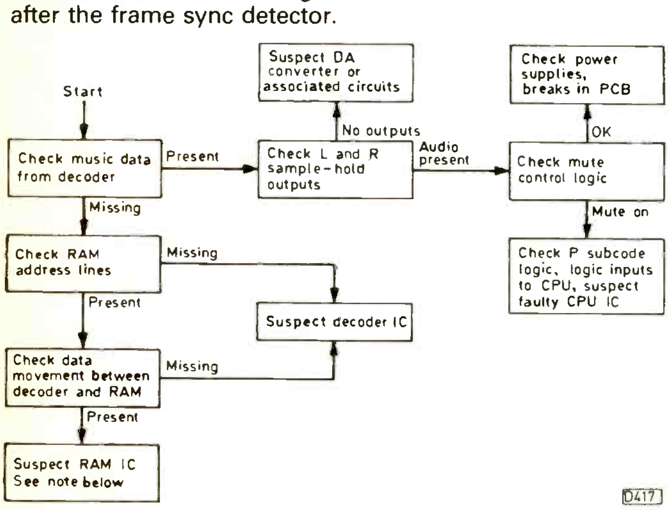
Common Abbreviations

A number of commonly used abbreviations have appeared in this series. Many are used in service manuals. An understanding of what they mean can thus be helpful. To save you having to thumb through back copies of *Television*, here's a list of the more common abbreviations:

APC	Automatic (laser) power control
BCLK	Bit clock (at 4·3218MHz)
CIRC	Cross interleave Reed/Solomon code
CLV	Constant linear velocity
CLVS	Constant linear velocity signal or servo
CRC	Cyclic redundancy check
CRCC	Cyclic redundancy check code
DA	Digital to analogue

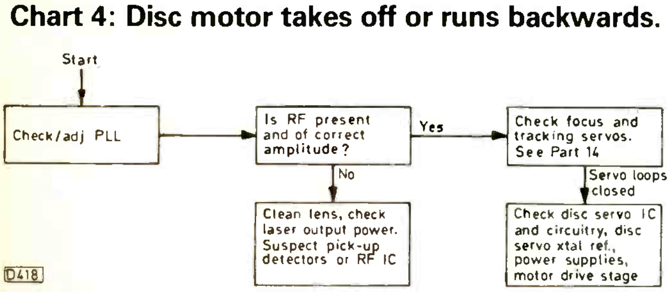
Chart 3: TOC and disc speed o.k. but no sound.

Since the disc servo is locked the r.f. and EFM must be o.k., also the focus and tracking servos. Therefore the fault lies after the frame sync detector.



Although RAM failure is a possibility, a defective RAM usually results in a rushing water sound.

Chart 4: Disc motor takes off or runs backwards.



DIN	Data in
EFM	Eight-to-fourteen modulation
FE	Focus error
FOK	Focus o.k.
FZC	Focus zero cross
GFS	Guard frame sync
LASER	The term is an acronym standing for light amplification by stimulated emission of radiation
LDon	Laser diode on (signal from CPU)
LRCK	Left/right clock (at 44·1kHz)
MLR	Mirror signal
PLCK	Phase-locked clock (at 4·3218MHz)
PLL	Phase-locked loop
RACS	RAM chip select
RAWE	RAM write enable
RF	Off-disc signal before squaring
RFCK	Read frame clock
R/W	Read/write (RAM control)
SCOR	Q subcode sync
SUBQ	Q subcode data
SYMBOL	At 8 bits this is one half of a 16-bit audio sample
TE	Tracking error
TOC	Table of contents
VCO	Voltage-controlled oscillator
WFCK	Write frame clock
WORD	A single 16-bit audio sample
WREQ	Write request
WSEL	Window select – enables frame sync detection when the disc speed is incorrect.

The majority of these abbreviations originate from Sony. They are now used by most CD player manufacturers. Philips has a number of its own abbreviations however. The more common ones are as follows:

CEFM	Clock eight-to-fourteen modulator
DEEM	De-emphasis control signal
HF	Off-disc signal before squaring
PD/OC	Phase detector/oscillator control. Same as PLL
QDA	Q subcode data
RE	Radial error. Same as TE.

To Follow

We have still to cover the mechanical aspects of the CD player, including adjustments and common problems, also the power supply and system control sections.

CORRECTIONS

(1) In VCR Clinic, March, page 363 under the heading Amstrad 4600/4700/6000/TVR2/TVR3 both references to the +28V supply should have read −28V.
(2) Line 30 of the Amstrad CPC464 program on page 449 last month (Letters) should have read:
30 FOR A = 80 TO 640 STEP 80

Service Bureau

Note: The Query Service has now ended.

MITSUBISHI CT2227TX

This teletext set has an irritating audio problem. A pulsating hum is present. It reaches a peak that can be clearly heard in the background with all but the loudest programmes.

The sound circuit in this set is rather complex due to the operation of the remote control receiver. We have however known this problem to be due to a noisy decoupling capacitor, C3109 on the "PCB video in". Try a substitute. C302 on the main PCB is also worth checking. If this fails it will be necessary to use an oscilloscope to trace the source of the hum interference.

PHILIPS CP20 CHASSIS

If the set is switched off when warm it won't come on again until it has cooled down. By using the remote control unit it switches off but not to standby, only a slight whistle being heard.

A likely cause of this fault is failure of the 680kΩ resistor R3661. Replace it and check carefully for dry-joints in the power supply section, particularly on the pins of the chopper transformer T5763.

FERGUSON 3V53

There are several faults, all intermittent. When trying to play or record (including timed recordings) the machine will, with increasing regularity, run for about three-four seconds then unlace and stop. In addition fast forward and rewind last for about five seconds then stop. A long-standing fault has been stopping in fast forward after a few seconds when past the first hour of a three-hour tape. The machine works all right most of the time and the tape path looks sound. Various makes of tape have been tried with the same results. Pressing the initialise button or unpowering the machine for several minutes has no effect.

Watch the take-up spool when the fault is present. If it doesn't turn, the reel belt or clutch mechanism is suspect. If however the spool continues to turn right up to the unlacing operation it's likely that reel sensor pulses are not reaching the syscon section. They should enter the CPU chip IC202 via pins 58 and 59. A quick check for the absence of sensor pulses is to key pause after play: if the deck stays in pause, the optocouplers under the turntables are suspect or their outputs are not reaching IC202.

PHILIPS K35 CHASSIS

I'm having trouble with e.h.t. leakage at the tube. The set has had two new e.h.t. leads fitted and the tube has been sprayed, but at switch-on you hear a succession of loud cracks. All is well after that.

First check the line flyback period – do this by scoping a low-potential pulse point on the line output transformer. If the period is shorter than 11μsec, replace the tuning capacitor C567. If the period is about 12μsec the e.h.t. voltage is probably correct. Clean the c.r.t. bowl with foam cleanser, thoroughly dry it then apply a thin film of silicone grease. Polish it off then fit a well-insulated e.h.t. cap.

KIMARI KIM86

This VCR is the same as the Fisher FVHP905. The problem is failure of the rewind and fast forward modes - all other functions are o.k., even picture search during play. When rewind or fast forward is selected the load motor drives briefly but the cam gear (the one with guide channels on the face) doesn't advance to the correct position (moves a little). The result is that although the spool drive gear train rotates at the correct speed it doesn't mesh with the final gear. All is o.k. if the cam gear is manually advanced before selecting rewind/fast forward. Very occasionally the machine drops out of the play mode after about three seconds, again because the cam gear has stopped just short of its normal play position.

You will find that the loading belt is slipping. Before fitting a replacement, clean and degrease the plastic pulleys. Occasionally the cam or associated gear is tight on its shaft, putting extra strain on the belt. If the mechanism is dismantled for lubrication, ensure that it's correctly phased during reassembly - refer to the manual for details.

ITT 80 CHASSIS

The problem is that the colour flashes on and off two or three times a second. The flashing rate varies on each channel. A good colour display can be obtained using a pattern generator.

The usual cause of this fault is timing jitter in the sandcastle pulse fed to the colour decoder chip. Check C721 (100μF) which decouples pin 4 of the TDA9503 sync/line timebase generator chip IC711 on the power panel.

SHARP VC9700

The problem with this machine is failure to record sound. We've raised the tape guide following the audio head: this seems to have cured the problem most of the time but with some tapes the sound is still faint and comes and goes. This seems to be intermittent, i.e. recording a second time on the same tape may be o.k.

This problem is usually due to faulty contacts in the bias oscillator switching relays. Clean their contacts or better still replace them. In addition change C648 to 0·01μF and R693 to 10Ω, ½W.

ITT DIGI-3 CHASSIS

There's sound but no picture. A visible raster is obtained only with the first anode voltage at maximum. This raster is covered with flyback lines and seems to have no vertical hold. There's no video at IC650's output pins but replacing this chip has made no difference. All the supply voltages are present and correct. Using the remote control for adjustment with the set in the service mode makes no difference.

First check that the clock signals are present at pin 22 of IC650, pin 4 of IC630 etc. Then look for data at pins 32 to 37 of IC630. If the data is absent, corrupted or incorrect, IC630 is suspect. Before replacing it consider the possibility of a fault in the RGB output section upsetting the black-level feedback line to pin 15.

SANYO 12T234

Though the sound and picture are present the raster is about three quarters of the correct size and the picture tends to pull to the left about a third of the way from the top. There's also slight ripple on the sound. Very occasionally the fault disappears for a short period.

These effects are almost certainly caused by partial failure of the series regulator circuit. Check by measuring the B+ voltage at the positive side of C702 when the fault is present: you'll find that it's less than the correct 11·5V. Possible culprits are the regulator transistor Q702, its driver Q701, the 7·5V zener diode D705 and the associated components. Use of a freezer aerosol and hairdryer may help pinpoint the culprit.

TEST CASE

329

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

Many VCR problems concern the operation of the deck. When a fault arises it's important to establish whether it relates to the deck mechanics or the action of the system control section. A case in point was the Fisher FVH-P905 that graced the repair bench recently. So far as the user was concerned the trouble was straightforward – no play or record. The machine would happily accept a cassette, wind it, rewind it and eject it. When asked to play or record however it would whirr and click, whirr and click, then go back to the stop mode.

The top cover was removed and the deck action in the play mode was studied. In response to operation of the play key the head started to rotate and the loading arms moved away from the cassette, with the tape. As soon as the fully threaded position was reached however the loading motor smartly reversed to unload the tape. The same action occurred in the record mode of course. This is a common fault, isn't it? – the loading belt was slipping.

A new belt was fitted and the pulleys were cleaned. After reassembly a cassette was fed in and the play button was confidently pressed. The VCR loaded the taped around the rotating head, the tape guides briefly kissed their location notches – then smartly retracted to the stop position. Now when the loading belt does slip, a common enough fault in this and similar models, the shutdown action is delayed while the motor pulley skids on the belt. Nought out of ten for diagnosis so far then!

The next conclusion our technician jumped to was that the mode switch sent false information back to the syscon. So a new mode switch was fitted. As the man on the job had taken no particular notice of the alignment of the switch's notches when he removed it, he now sought the advice of Sage, who had more experience of these machines. He was told to line up the notches with the mechanics set in the eject mode. The old switch must have been o.k., becaused the machine behaved in exactly the same way. Again nought out of ten for diagnosis.

Perhaps the deck mechanics were misaligned? The phasing of the cogs, levers and pinions was checked against that in another machine of the same type. It was correct. Some thought was next given to the possibility of lack of reel-sensor pulse feedback to the syscon. This has been known to cause shutdown of the machine after tape loading. In this case however the reels had no opportunity to rotate in either the play or record modes, so rapid was the reversing of the loading motor. The idea was therefore discounted, especially as the rewind and fast-forward functions were correct.

Dinner time came and the machine was gratefully put to one side for an hour while sandwiches were consumed, *Neighbours* was watched on TV, and so on. But thoughts kept returning to the troublesome Fisher VCR, and the decision was almost made to change the syscon control microcomputer chip.

There wasn't an LM8854 in stock, and one wasn't necessary anyway. Most of the correct tests had, in a rather stumbling and haphazard way, been done. When the repair was completed the new loading belt and mode switch would no doubt stand in good stead. One vital check had been missed, providing the key to the problem. What was it? See next month's *Television* for the answer.

ANSWER TO TEST CASE 328
– page 471 last month –

A very strange situation was described last month. It concerned a 28in. Bang and Olufsen colour receiver with a corona discharge problem on or near the c.r.t. base panel. It hardly ever affected the focusing and was not audible – or visible either to us – but the smell of ozone was unmistakable. We'd replaced the entire c.r.t. base connector assembly, which includes the tube socket, the focus spark gap and the PCB. This seemed to leave only the c.r.t. itself, though what sort of fault with it could cause this symptom was difficult to know. The picture focusing was correct with the control at about mid-position, and the e.h.t. had been checked and found to be correct.

Television Ted found the cause of the problem in the end, though a complete explanation of why it happened still eludes us. The tube's vacuum pinch and the pin-to-glass seals are protected by a top-hat shaped plastic moulding that also guides the socket on to the tube base. It looked all right, there were no signs of burning, sparking or decomposition, and it showed no sign of leakage when tested with a Megger. But it was the cause of the trouble. An identical one, pinched from a dud tube, stopped the corona discharge for ever!

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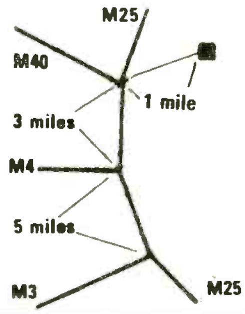

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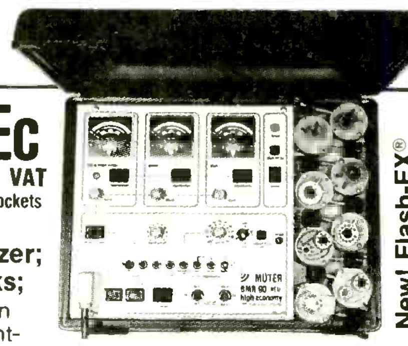

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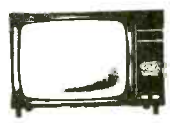

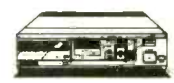

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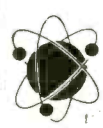

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NI.CD 5 Hours Battery Charger with battery test	£6
Hill Deluxe Universal Ni-Cad Charger	£6
Nickel Cadmium Battery Charger AA-C-D-PP9	£4.50
12 Volt Aerial Changer over Relays 144 Mc/s 45 watts	50p
6 Push Button Unit for GEC 2100 Series Replacement for Touch Button Unit	£8
8 SEG LED Display with driver I.C. LM1017	50p
15V, 015V, 1A Print Type Trans	£1
12v DC Relay 1½×1½×2 print type 10 amp D.P. Changeover	£1
Philips' Headphones Compact Disc Stereo Type	£10
ITT Display Tube 58705	50p
8 Seg Display FND500	20p
Model 3000 Pocket Personal D.M.M. Volts range AC. DC 200M/V to 400V. Res. 2000Km	£13
Export PYE731 6 Push Button unit with (UHF-VHF) band switch	£4
ITT Micro Phone M5 with switch	50p
1½ Volt Sub Min Relays	25p
Philips Solar Scientific SBC1730 Calculator	£12
15v-0-15v 1 Amp Transformers	£1
RGP30K	10p
RGP30G	8p
RGP10B	5p
RGP15	10p
RGP15G	6p
T6024WG1	10p
GP10	5p
GP15O	5p
THORN RGP80G	30p
DUBLE 7 SEG Displays LN5 26RA	15p or 10 for £1
Philips Digital Multimeter with memory and auto ranging SBC812	£63.00
PHILIPS 25 Watt Solder Iron	£4.00

Various Tools and Accessories

Self adjusting cutter stripper	£5.00
10 mixed tube bars	£4.00
5000 Diodes-Resistors	£3 pack
T/V V/Aerial 300Ω or 75Ω	£1.50
* D/P push mains switch	20p each
Mains lead & two pin socket for radio cassette	35p
T/V loop aerial	75p
Radio Telescopic Aerial	£1.00
Philips Silicon Grease	£1.50
Freeze Philips	£1.15
Foam Cleaner Philips	£1.15
Contact Cleaner Philips	£1.15
Cans of Anti Static, Degrease Cleaner and Anti Corona	£1.15
Lorlin Full Remote Relay Switch fit most TV sets, mains 4 tag, 2 tag 12 volt	£1.00
Mains timer, 13 amp — up to 2 hours: easy to use, plugs into socket	£3.00
Screen locking agent, large can	£1.50
Red E.H.T. LEAD and Anode Cap	£1.00
Weller Solder Iron 25 watt	£4.00
Hitachi Silver Oxide Battery G13 UCC357 IEC SR44 1.5V	60p
100 Coax Plugs	£12.00
De-solder pump + 2 nozzles Philips	£4.00
Flat Red LED and Green	5p
500gm 60/40 solder reel	£6
Dual v/u meter -20 — +10db	£1
K30 thermistor 232266298009	75p
De-solder Pump	£2.50
Portasol Flameless Gas Soldering Iron	£16.00
Green & Red, LED pack mixed	100 for £1.00
Hill Meter Leads, S/Rubber and Probes	£4.00

HILLS

Miniature Linesman Pliers	£2.20
Miniature Side Cutters	£2.20
Miniature Pliers	£2.20
Miniature End Cutters	£2.20

KT3 PANELS

Sound Output RGB Output Chroma Panel, I.F. Panel and Line OSC £7.00 each

MOD KIT PHILIPS VHS VCR

VR6467 or VR6760 and derived types gear box £19.50

PYE 6 Key Switch & Panel G11 Front Panel	£10
SONY 1400KV Chroma Panel	£6
SONY 1400KV Touch button unit	£3.50
GEC Decoder Panel PC772A3 PC446A5	£6
12 Volt Mains Trans 500M/A	£1.00
V.S.T. Module K4 with IC MSM5840H-84 RS	£15.00

Quantity Reductions

BY204/4	25 for £1.00
BY206	25 for £1.00
KT3 touch button black	6 for £1
G11 touch button red	6 for £1
K30 full remote Dawer Ass with 3 I.C.	£7.00
K30 VHF. UHF Dawer Ass	£6.00
BY298 3 amp/fast/R	20 for £1.50
OA90-OA91	40 for £1.00
50 Ceramic Condensers	£1.50
50 Mixed Mounting Kit for Power Transistors	30p
300 Condensers	£1.50
300 Resistors	£1.50
150 Electrolytics	£2.00
15 Bulbs Philips	40p
GEC-Hitachi Thick Film Frame	£5

Mixed Packs

TO66 12 Power Trans RCA 16182 NPN Replacement for BD124 and Mounting Kits	£1.00
25 Panel Mount Bulbs & Neons	£1.50
10A	£1.50
25 LED red/yellow/green	£1.50
20I/C Holders	£1.20
20 Large LED Red	£1.00
20 Small LED Red	£1.00
10×20 Turn 100K Pots	£1.00
Mixed 100 Transistor B.F. and B.C. and PET	£1.50 1000 for £10.00
12 Volt 4 Amp Video Battery Pack 10 of Type D Cells	£8.50
40 glass reed switch	£1
10 press to make switch	70p
40 Pots	£1.50
With Focus Pin, 10 Tube Bases, mixed	£2.00
1,000 Diodes, Condensers, Resistors on Bandolier	£1.00
20mm Fuse Holders Chassis Mount	20 for £1
EHT Diodes, small	20 for £1
300 Mixed Diodes	£2
100 500M/A Fuse	£1
Mixed V/Cap Pots ITT-GEC-Hitachi-Philips etc.	20 for £1
ITT Mains Switch with Remont CMC113	£1
12v DC relay 1½×1½×2 print type 10 amp D.P. change over	£1

SENDZ COMPONENTS

TO ORDER SEE BACK PAGE

SENDZ COMPONENTS
TO ORDER SEE BACK PAGE

LA11440 £1
TAA7750 50p
HA 411485 £1
UPC1373 50p
M58657P £1
M491BB1 £3
M50441/550 £1
M58658P £1

Receiver TX100 Panel
I.C. No. SAB3035
—MAB8440P D066 £6
—SAA1060
—PCF8571P

New Model Philips Meter £25.00

C. Cam Decoder with TDA3591 £5
Toshiba VHF/UHF EG522F £6

Mitsumi MECI-F51 £5

Thorn Spares
New 9000 Decoder £8.50
9000 Frame panel £8
9000 Cyclops panel £1.50
8800 convergence panel £6
8500 convergence panel £6
4000 Power supply £3
1600 Mains lead. switch
T605 1xNPN T066 80v/6A 10p
9000 Sound output panel £1
3500 Focus unit £1.50
3500 Mains Trans £4
3500 cut outs 10 for £4
3500 IF panel £2
3500 Frame panel £3
3500 A1 Diode 20p
4000 Tube base £4
3500 A1 pots 50p
Beam limiter panel £1.50
3500 Power panel with Y969 £1
3 Way regulated adaptor 240V 6V/7.5/9V/300mA £3.50
Rank/Toshiba preh unit 0354 £9.50
4 Push button unit preh £1.00
6 Push button VHF/UHF for v/cap. GEC-Decca type £7.00
7 Push button for CVC5 ITT £8.00
KT3 12 Push button unit £2.00
KT3 (Export) 12 P.B.u £2
6 Push button Unit Thorn £1.00
6 Push button GRC £6.00
6 Push button PYE 731 £6.00
Hearing aid unit £3.00
Rank Z718 4 P/B/Unit MECH £4.00
7 Button Unit GEC with Lamps £7.00
697 Push Button Unit £6.00
Z916B panel £5.00
T513AP panel £5.00

Video Tuner
Test-Dep Ex-Philips
V.6100/05 T/V and Tel/Text unit and hand set £50.00
Send for data.

TT14 GEC TEX-DECODER
13 IC Panel with cable form £9.50

PHILIPS
Decoder SAA IC 5020-5030 5040B-5050
K40 Text Panel £8.00

KT3-K30
OF-425
OF-550 E.W. 10p
OF-513 correction 10p
OF-557 50p

DIODES
Bridge KBF-08 40p
BY 126 10p
BY 127 10p
BY 133 10p
BY 134 10p
BY 176 25p
BY 179 40p
BY 184 25p
BY 187 10p
BY 190 40p
BY 196 30p
BY 198 10p
BY 204/4 8p
BY 206 — BY 407 Eqv. 8p
BY 208/800 8p
BY 210/400 5p
BY 210/800 10p
BY 223 60p
BY 224/600: 4.8A/600v bridge 50p
BY 226 15p
BY 227 15p
BY 228 1500v 20p
Flat BY229 black 15p
BY 299 Red 20p
BY 229/400 30p
BY 299/60p Tag 30p
BY 237 5p
BY 254 10p
BY 255 30p
BY 298 10p
BY 299 10p
BY 406 8p
BY 527 20p
BY 407a 10p
BY 448 10p
BY 500/200 — 5 amp 8p
BY 527 10p
BY 602 10p
BYV 26C 10p
F 247 10p
GP20G 5p
GRP80G (TX10) 30p
XK 3102 50p
BYV 28/200 20p
Bridge TX10 800/3 amps 30p
KBPC35-02 Bridge £1.50
Bridge Rec. D35B10 40p

K45 Decoder £8.00
K35 Sound OP £4.00
Thick Film Daughter KT3 3122-127-43891 £3
12 C.H. K30 Tex Rec Front Panel with I.C. £5
K35 IF £5.00

Plug In
K4 Focus Pot £1.00

Fidelity Tube Base with transitor & focus pot £1.50

Bush Tube Base on panel £1.00

TX10 Tube Base on Panel £3.00

1100 L.O.P.T. Green Spot

TX100 Thorn

Line Transformers
G8 Lopt £5.00
G9 Lopt £4.00
6 Diode Tripler. Mullard 75p
Line O.P. Trans. Mono T.X. 12"-14"
Philips G8
27482 £10
4822 £10
10273 £10
Thorn 1690 LOPT £7.50
2 J/Pots 3,500 1 off each type £3.00
G8 Trans Philips £7.00
G11 Split Diode £12.00
CVC820 Split Diode ITT £10.00
Thorn B/W AD5308F + Stik + Lead £1.50
GEC 2040 £3.00
GEC 2110 £7.00
Mullard AT 2036 £1.50
Pye 169 Line Trans £3.00
Pye mono £3.00
Rank mono T704A £3.50
Split Diode Trans £7.00
GEC 20 AX Rank Z522 £3.00
Rank L.O.P.T. Z970 £3.00
CVC800 Line Trans £6.00
CVC825 Split Diode £10.00
CVC 45 £5.00
GEC Portable G1OT2041 £3.00
GEC Portable G1OT2046 £3.00
EHT Split Diode Leads ITT £1.00
3500 L.O.P.T. & ITT Trans each £2.00
LOPT Rank Z763 £5.00
K35 Split Diode 3122/13835930 £10.00

Universal Tripler
with small focus pot. Green type £7.00

Black Triplers
KT3 Triplers £6.00
S.T.C. Universal Tripler £6.00
11 TJT £2.50
11 TGA £2.00
ITT CVC 5-8-9 £3.50
Rank T25LE Tripler £2.00
Rank 11TCP A823 £3.50
TU 25 30K Rank £3.00
11 TEZ Rank £3.00
G9 Philips £4.00
GEC 2110 £4.00
3500 Thorn £3.00
8500 Thorn £4.00
9000 Thorn £7.00
9500 Thorn £4.50
9600 Thorn £4.00
2040 GEC £3.50
GEC TVM25 Tripler £2.00
Universal Tripler £5.00
G8 Tripler £5.00
CVC20-32 £5.00
Decca 80 100 £4.50
Grundig TVK 52 £2.50
11TBO Pye 731 £3.00
11THY £4.00
D22 for Pye 18" colour portable £4.00
LP 1193/63 £4.00
BG 100/41 £3.25
ERO Tripler print type with foaes PO7 8G2087 £5
T/text ultrasonic rec'r panel £14.00
12-14V 20 for £5.00 200 for £25.00
GEC 8 touch unit assy complete with all I.C.'s + pots £4.00
G11 E.W. Transformer 50p
G11 E.W. coils £1.00
G11 Transient Suppressors 245V 20p
G11 Scan Coils £5.00
G11 100K tuner pots 12 for £1
KT3 IF panel £6.00
KT3 line OSC transformer £1
KT3/K30 infra-red receiver head £1
K30 drawer unit with IC's (home) £10
K30 drawer unit with IC's (export) £10
KT3 AE Sockets 50p
KT3 receiver panel £8
KT3 line driver transformer 50p
Pye. K30. GEC. etc. Pre-mains stand-by switch £1
Decca 80/100 IF panel £5
NPN PNP 80V 6 Amp TO66 O.P. Trans pair 25p
5 button touch tuner BBC1/2 ITV1/2 video with ic SAS 560T/570T £7.00
Control panel 5 sliders + mains lead £1.50
G11 8 touch button unit replaces old 6 P.B.U. £24
Tube base + base unit for 820 Euro chassis £4.00
GEC Line O/P Trans. & Rec Stick for Portable £3.00
CVC 20/25/30/35/40 decoder panel £10
CVC 20/25/30/35/40 decoder panel (untested) £5
CVC 40/45 IF panel £5
40K Transducer 50p
PHILIPS NE511N £1.20
LM337M Reg. 30p
20 GEC Black Spark Gaps £1.00
KT3 Front Panel Control Assy. £2.50
BTW 30/50 50p

International Rectifier EHT Diodes G770/HV34 6KV 3 for 8p
6A/600V Stud Diodes 20p
6A/1000V Stud Diodes 20p
BTW 92/800R £3
25A473 PNP C/P 10p

200V/200M 25p
400V/180M 50p
160V/220M 10p
160V/47M 10p
35V/3300M 15p

2SD1878 £1.00
TDA8443/C3 £1.00
SAA7020 /01 £3.00
HD614080SA90 £4.00

225m + .25m 380v £1.00
220m 385v £1.00
240m 400v £1.00
G11 470m 250v £2.00
400m 400v £1.00
175m/100m/100m 350v £1.00
TX9 500m + 500m 175v £1.00

G8 LOPT Panel £7.00
G8 Tuner Unit + Panel £4.00
G8 IF & Chroma £6.00
G8 Chroma £3.00

G11 Chroma Panel £4.00
G11 LOPT Panel £6.00
G11 IF Panel £5.00

G11 IF Detector £3.00
G11 Selector gain module £3
Pye G11 Front panel with transducer, pots, tuner pots, 6 pb switch+lead £5.00
Pye 6 button switch portable £1.00
GEC V/cap VHF/UHF tuner and IF+ sound O/P PC 706B3 (Export) £12.00
GEC Line O/P PC 659B3 £6.00
2110 GEC Power Panel £8.00
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CVC 40 PUSH BUTTON ASSY with sliders: complete with lamp assy + pots 8 button units £9.00
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Z718 Focus Unit £1.50
T20 Focus Unit £1.00
Large Type 75p
Decca Small 75p
KT3 Focus Unit 75p
K30 Focus Pot 75p
K30 Tube base on panel £1.00
TX10 Focus Units £8.50
CVC 32 Focus Unit 75p
Fidelity Focus Unit 14R–14S 30p
3500 Thorn Focus Unit £1.00
ITT Small for use with Split
Z718 Bush Focus £2.00
Diode 50p
Remo TV12SP 50p
1600 Thorn EHT Rec and Lead 50p
TV14 50p
TV20 £1.00
TV45 50p

TX9 8 Button Unit £6.00

TX90 8 Button Unit £6.00

TX90 TX925 8 Button £6.00

TX100 8 Button Unit £6.00

TX10 8 Button Unit £10.00

TX10/TX100 16 Button UHF-VHF BAND S.W. £10.00

G11 drawer ASS 3 pots Mains switch and lead £2.00

K30 Drawer Ass with pots cable forme £1.00

TX10 Drawer with 8 way pots. ass. £2.50

TX10 Ex. port with band switch (drawer) and U.H.F. only £2.50

Hills Meter for the car man, volts, amp, ohm with dwell and r.p.m. £35.00

Hills 9 piece tool kit in case £5.00

Abbey Security Smoke Alarm Model 101 £4.00

Philips Coaxial Cable Stripper SBC325 £7.50

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470M 380V £1.00
220/400V £1.00
1200PF 15KV 10p
.01 2KV 10p
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300 300/300V 80p
800/160 50p
.1/250 Pulse 5p
2,2 250v 10p
7N5 1500V 15p
3n3/250 A.C. 10p
.33/250V 20p
.39/250V 15p
4n7/250 tested 5KV 25p
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47/250 10p
100/250 20p
GEC600/250 60p
700/250 £1
2 200PF-2Kv 10p
300+300 MFD 350v £1.00
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32/300 20p
4/350 5p
8/350 8p
4.7M/350v 10p
33/350 20p
220/350 30p
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KT3 E/W .39/400 15p
.56K/400v 20p
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.22/400 10p
8/400 15p
33/400 20p
400/400 40p
394K/400V 20p
1000m-160v £1.00
220/450 40p
.47/500 25p
0.1/600 15p
0.1/1200V wire end 20p
0.1/450 A/C wire end 20p
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.047/600 15p
0.047/1000 10p
0.01/1000 10p
0.11/1600v
150m/385v £1.00
.47/1000v 65p
.47/250V A.C. 10p
.001K/1250 10p
0.0047/1500 10p
.005/1500 10p
.0105/1500 10p
1n8/1500 15p
2n2/1500 15p
.01/1600 15p
G11.8200/2KV 15p
0.1/2KV 20p
3n9/2KV 15p
0.0015/2KV 10p
6n2/2KV 15p
2n2/2KV 15p
470pf 4KV 10p
7500pf/2KV 10p
3000PF/3000V 10p
4n7/2KV 15p
6n2/2KV 10p
7n1/1500V 10p
8n2/1500V 10p
9n1/2000V and 1500V 20p
8n2/2KV 15p
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4.7nf/5KV 10p
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.47/100V 80p
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RANK & ITT Mains Remote On-Off Switch (720R) £1.50
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4 amp Mains Switch 25p
GEC Mains Switch 4 amp 30p
KT3 Mainswitch £1.00
G8 Mains Switch 75p
G11 Preh Red LED P/Button for C.H. Change 20p
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Mains Switch ITT Long Type Print 75p
Mains Switch Philip Long Type TAG 75p
Mains Switch GEC Long Type TAG 75p
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Teletext Adaptor Kit TY-500 Panasonic £12
Philips Battery Tester All Types and charger vis £6
Philips K4 Mains Switch with standby 80p

SENDZ

Philips Handset IC £3.00
SAA3010P £3
MAB8461/WO63 £3

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MAB 8440P-D070 £3.00
MAB 8440P-D033 £3.00
MAB 8440P-D056 £3.00
MAB 8441P-T001 £3.00
MAB 8441P-T132 £2.00

M58484P £2.00

Hand Sets — Fidelity £15.00 to £35.00

Philip New A/V Hand Set £10

ITT 8 and 6 Push Button £1.00
Pye 725 LOPTs £6.00
Pye 731 LOPTs £6.00
Thorn 8500-8800 LOPTs £5.00

CMC 301 front panel £5.00
CMC 303 front panel £5.00

CMC 302 Panel with TC mains switch etc £5.00

CMD 800 Decoder £8.00

C7 Hand Set £6.00

3 I.C. Power Supply G11 Full Remote Receiver Panel £3.00

Meters Hills 520 £17.00
Meters Hills 420 £10.00
Hills HD5000 Digital Meter 1000V DC 750AC 10 Amp 20 MRG Rangers £28

HT100 Multimeter £6.75
HT300 Multimeter £7.75
HT500 Multimeter £9.00
HT700 £15.00
HD1000 Digital £20.00
HD1200 Low Cost Digital £13.00
HD2500 £18.00
HD3000 Digital £25.00
HD5500 Digital £29.00
HD6000 Digital £32.00
HD8000 Digital £35.00
HD9500 Digital with capacity Temp Trans Volts Ohms and Amps ranges £60

Infra Red
Hanset Tester
Works at 24 feet – Sound repeater.
Works off 9 volt battery £8.00
Fits in top pocket.

Handset Tester with LED £4.50

Repaired Handsets
Philips K4-K35, RC5350-RC5300, RC5370, RC5375, repaired same day £10.00
RC4001 Full Remote KT3 K30 Teletext Handsets exchanged £15.00

NEW Type RC4001 9 CH not 12 £6.00

GEC Full Remote Infra-red, 1983 models £15.00

TOSHIBA HAND SETS
CT9185 £4.00
CT9176 £4.00
CT9133 £4.00

Rediffusion MK3 £5.00

TOSHIBA
HAND SETS
24 Button CT938 Fullremote £5.00
32 Button CT983 Videotext £6.00

THORN
VCR Front Display Panel £7.00

Large type ITT TV and V.C.R. Handset £15.00

GEC Ultrasonic 8CH Full Remote £10.00

G11 Full Remote Ultrasonic £32.00
G11 Ultrasonic Teletext Handset £20.00
8 C.H. Ultrasonic GEC Full Remote C2014H/C2219H £15.00
New Replacement for G11 Ultrasonic Full Remote £12.00
Thorn 4000 insert with 7 buttons £5.00
Decca RC 11 £14.00
Decca RC 12 £14.00
G11 Infra-red full teletext £20.00
Dynatron-Full remote CTV 62, 63, 64 £19.00
Hitachi infra red handset £18.00
Philips full remote KT3, 16C928/20C934; 7228/7324; K12 26C 797/1ST 66K 1826 £12.00
G11, Full remote top button assy. £12.00
G11, Full remote repair service (exchange unit) £18.00
GEC infra red full remote 8 channel (I.C.SAA1250) £14.00
Philips infra red full remote 9 channel for 60 CP2605 £6.00
Philips infra red full remote 12 channel for 60 CP2605 £12.00
K35
KT3/K30 T/Text £12.50
KT3/K30 Full remote £15.00
KT3 Power supply £4.00
GEC infra-red 2236-2026 £4.00
GEC 8 button full remote £14.00
GEC push pad handset button blobs each 10p
Pye & Philips handset KT3-K30 chassis. No RC5150-RC5176-RC5171-RC5177.
Special Price £13.00
RC4001 KT3 and Teletex £14.00
IT CVC 32 handset repaired £15.00
CVC 32 Hand Set £15.00
CVC 45 3 and 2 Pin
TX10 Hand Set Text £12.50
TX9 with Text £12.50
TX9 & TX10 button print £2.00
TX10 Focus Pots £5.50

ITT
T/V & Video Processor. 1200 Type £10.00

PHILIPS
UNIVERSAL HAND SET £12.00 RC5
KT3 – K45

We have all parts for Philips Handsets

RC5353 £15.00
RC5300 £12.00
Philips RC5 £15.00

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Replace Hand Set for
Philips KT3-K30, K4 etc £12.30

THORN HAND SETS
9000 – 9600 – TX9 – TX10 – TX100
Text and Non-Text £10.00

PHILIPS
RC5171 £12.00

K35-K4 HAND SET
Repaired for £5.00

p-583 572