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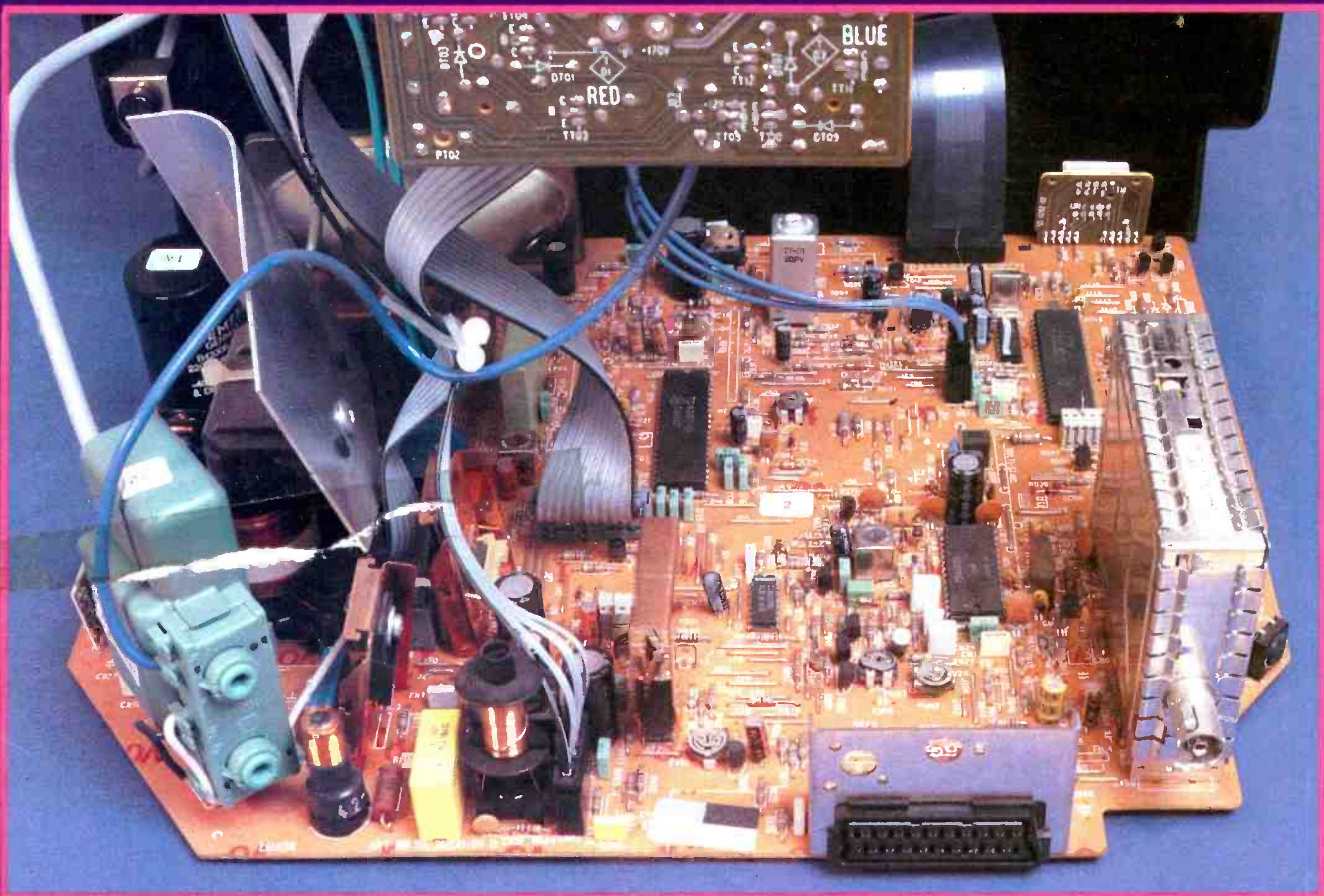

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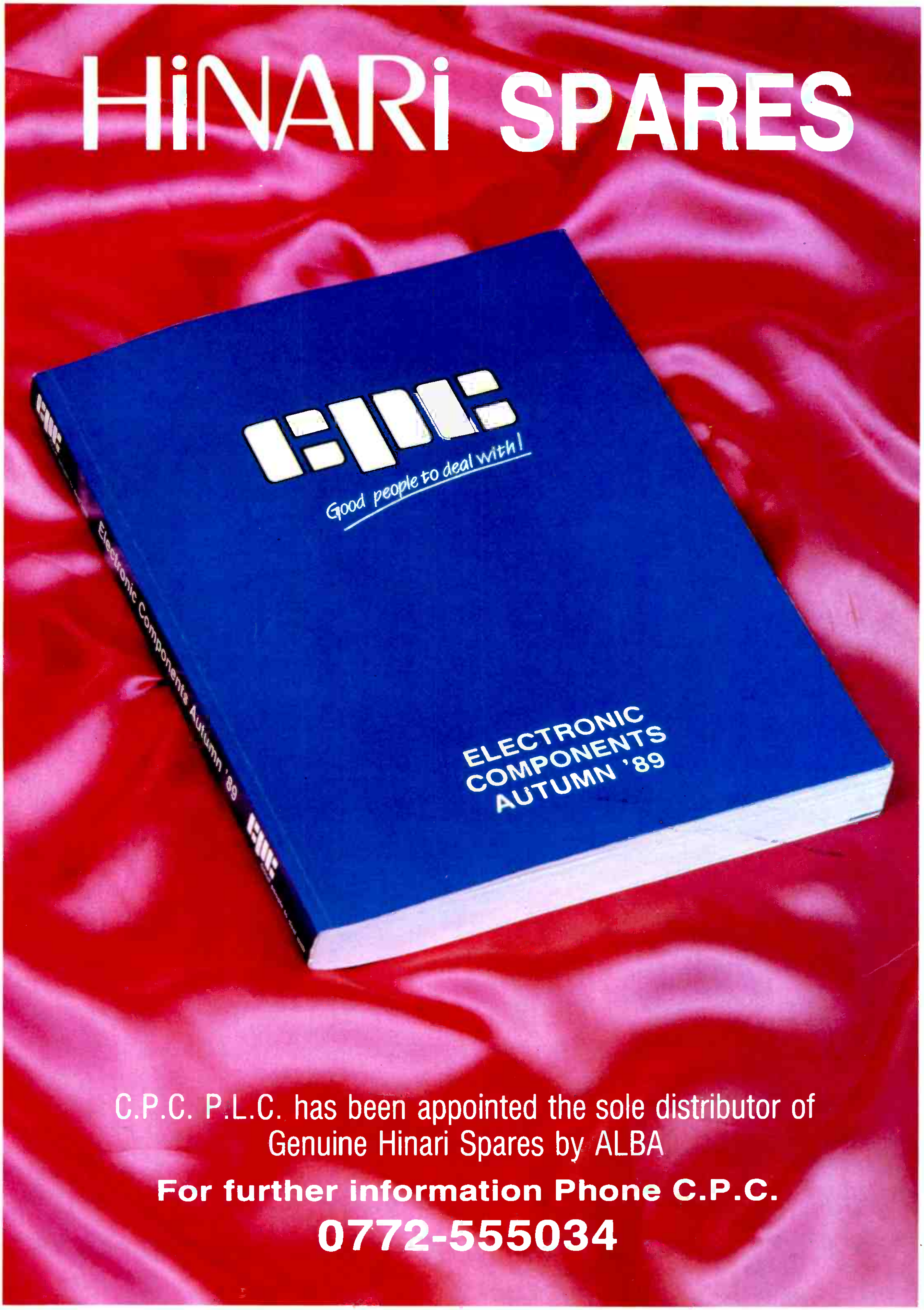
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TELEVISION

February 1990

Vol. 40, No. 4
Issue 472

On sale January 17th

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
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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".

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this month

OUR NEXT ISSUE DATED MARCH WILL BE PUBLISHED ON FEBRUARY 21

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
BB105B	18p
BB205B	24p
BC107	8p
BC108	8p
BC109	8p
BC109C	10p
BC115	10p
BC118	11p
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BD899	50p
BD901	50p
BD977	50p
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BDX33	60p
BDX53	60p
BDX65	80p
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BDW24	55p
BDW93	50p
BDW94	50p
BDY20	100p
BDY92	100p
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BF154	25p
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VN.88AF	115p
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2N.5496	80p
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2N.6292	40p
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BY100	40p
BY103	32p
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BY164	40p
BY179	35p
BY184	32p
BY196	20p
BY206	11p
BY207	11p
BY208	18p
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
IN.914	2p
IN.4001	4p
IN.4002	4p
IN.4003	4p
IN.4004	4p
IN.4005	4p
IN.4006	4p
IN.4007	5p
IN.4148	2p
IN.5400	9p
IN.5401	10p
IN.5402	10p
IN.5403	11p
IN.5404	11p
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IN.5406	13p
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CRYSTALS

Freq in MHZ

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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
14.0	125p
14.756	200p
15.0	160p
16.0	130p
18.0	130p
18.432	130p
24.0	250p
48.0	160p

VOLTAGE REGULATORS

7805	35p
7806	35p
7808	35p
7812	35p
7815	35p
7818	35p
7824	35p
7905	35p
7906	40p
7908	40p
7912	40p
7915	40p
7918	40p
7924	40p
78L05	28p
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

VALVES

DAF96	60p
DF96	50p
DL92	60p
DY86	50p
DY87	60p
DY802	75p
EABC80	60p
EB91	44p
EBF80	45p
EBF89	50p
ECC82	80p
ECC83	80p
ECC84	70p
ECC85	80p
ECH81	100p
ECH84	70p
ECL80	65p
ECL82	80p
ECL84	70p
ECL85	70p
ECL86	90p
EF80	65p
EF85	65p
EF89	85p
EF183	75p
EF184	85p
EL34	250p
EL36	90p
EL84	75p
EL95	85p
EL500	100p
EL504	130p
EY86	45p
EY87	45p
EY88	65p
EZ35	65p
EZ80	70p
EZ81	55p
GZ34	200p
PC97	100p
PCC85	60p
PCF80	80p
PCF200	135p
PCF801	110p
PCF802	80p
PCF806	115p
PCH200	100p
PCL81	62p
PCL82	80p
PCL84	50p
PCL85	80p
PCL86	80p
PCL805	80p
PFL200	110p
PL36	120p
PL82	60p
PL83	60p
PL84	80p
PL95	180p
PL500	110p
PL504	120p
PL508	200p
PL519	450p
PY81	90p
PY88	70p
PY500A	190p

L.E.D.'S

LED 3MM RED	5p
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
AN-241	135p
AN-245	290p
AN-247	230p
AN-252	150p
AN-259	250p
AN-262	140p
AN-271	230p
AN-272	480p
AN-274	250p
AN-301	330p
AN-303	250p
AN-304	360p
AN-305	320p
AN-315	210p
AN-316	350p
AN-318	460p
AN-360	100p
AN-362	140p
AN-366	150p
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AN-612	160p
AN-5151	600p
AN-5612	400p
AN-5620	330p
AN-5712	350p
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AN-5732	160p
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AN-6341	350p
AN-6344	440p
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AN-7222	300p
AN-7310	90p
AN-7311	90p
AN-7410	250p
AN-7420	250p
AN-7140	450p
AN-7145	195p
AN-7146	210p
AN-7154	180p
AN-7156	240p
AN-7158	310p
AN-7168	260p

AN-7178	270p
AY3-1015	290p
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TDA-4426	250p
TDA-4427	500p
TDA-4431	200p
TDA-4431	200p
TDA-4437	450p
TDA-4440	250p
TDA-4442	320p
TDA-4445	250p
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TDA-4510	400p
TDA-4555	600p
TDA-4556	650p
TDA-4560	450p
TDA-4600	200p
TDA-4601	250p
TDA-4610	650p
TDA-4950	200p
TDA-5600	450p
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TDA-7000	200p
TDA-7040	250p
TDA-7050	200p
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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	380p

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
UPC-1018	170p
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UPC-1032	60p
UPC-1158H2	70p
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UPC-1185H2	230p
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UPC-1187	150p
UPC-1188H	400p
UPC-1197	140p
UPC-1200	325p
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UPC-1263	230p
UPC-1277	240p
UPC-1278	240p
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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
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ZN-424	100p
ZN-425	320p
ZN-426	260p
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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-603	100p
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2SA-608	15p
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2SA-640	60p
2SA-673	20p
2SA-684	60p
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2SD-777	400p
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2SD-850	260p
2SD-856	80p
2SD-858	250p
2SD-863	60p
2SD-864	200p
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2SD-868	450p
2SD-870	400p
2SD-871	450p
2SD-879	60p
2SD-880	40p
2SD-882	80p
2SD-892A	100p
2SD-894	120p
2SD-895	200p
2SD-896	200p
2SD-900	400p
2SD-905	600p
2SD-916	130p
2SD-917	300p
2SD-921	320p
2SD-923	360p
2SD-946	120p
2SD-947	100p
2SD-950	300p
2SD-951	350p
2SD-957A	520p
2SD-958	60p
2SD-965	100p
2SD-970	170p
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	480p
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	210p
2SD-1399	300p
2SD-1400	280p
2SD-1402	280p
2SD-1406	120p
2SD-1407	180p
2SD-1409	190p
2SD-1415	190p
2SD-1425	430p
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	320p
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-1609	100p
2SD-1632	500p
2SD-1649	260p
2SD-1651	270p
2SD-1663	450p
2SD-1666	120p
2SD-1667	120p
2SD-1668	120p
2SD-1677	300p
2SD-1739	450p
2SD-1783	100p
2SD-1815	100p
2SD-1825	120p
2SD-1843	100p
2SD-1846	350p
2SD-1884	300p
2SD-1910	280p
2SD-1941	500p
2SD-1984	150p
2SJ-49	425p
2SJ-50	425p
2SJ-77	350p
2SK-19	45p
2SK-49	50p
2SK-55	100p
2SK-68	100p
2SK-134	415p
2SK-135	415p
2SK-147	180p
2SK-192	45p
2SK-195	150p
2SK-197	140p
2SK-312	750p
2SK-323	130p
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	280p

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)	£11.80
NATIONAL PANASONIC 4HSS = 3HSSN (NV322, NY332, NV340, NV2000, NV2010, NV7000, NV8170, NV8200, NV8400, NV8600, NV8610, NV8620)	£11.50

AKAI

VS-109/201/202/301/303	£24.00

AMSTRAD

VCR 4500, 5200, 9000 VCR 7000	£18.50

FERGUSON

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

FISHER

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FISHER VBS 7100/VBS 7500	£29.00
FISHER VBS 9000/VBS 9900	£29.00
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HITACHI

VT11/14/33/61/63	£17.50
HITACHI VT7-17, VT35-38, VT39	£36.95
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HITACHI VT120, VT 220	£31.50
HITACHI VT3000	£14.00
HITACHI VT5000, VT 5500	£20.00
HITACHI VT65, 7000, 8000, 8300, 8500, 8700, 9300, VT9500, 9700	£17.50

NATIONAL

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NV 430/NV 460	£21.00
NV 730 4 HEAD	£28.50
NV 366 4 HEAD	£28.50
NV 180 PORTABLE 4 HEAD	£41.00
NV 370/NV 380	£18.00
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NV 850/NV 870	£50.00
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NVG 33, NVG 45, NVG 46	£41.00
NVG 40, NVG 130	£28.00
NVG 400	£42.00

SANYO

VTC 5000, VTC 5400, VTC 6000, VTC 6500	£28.00
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
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VC 381, VC 383, VC 386, VC 387, VC 388, VC 482, VC 483	£18.75
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SONY

DSR-35R (FOR C20, 30, 40 SLF1, SLF1UB, SLF1E)	£19.00
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, HRD-120, HRD-225	100p
HRD-250, HRD-455, HRD-565, HRD-566, HRD-725, HRD-755	100p

MITSHUBISHI

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-C5, SL-C6	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	700p

SHARP

REEL MOTOR RMTOV 1008 GEZZ	1500p

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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★ TRIPLERS ★
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★ ★ ★ ★ ★ ★ ★ ★ ★

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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	160p
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	28p
7409	20p
7413	30p
7414	45p
7416	40p
7417	32p
7420	22p
7421	26p
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	160p
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	65p
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	86p
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	76p
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	36p
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
74LS273	44p
74LS279	33p
74LS280	88p
74LS283	51p
74LS290	26p
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	450p
256DRAM	450p
4116	75p
4164	150p
6118	180p
6264	400p
6502	300p
6502A	400p
65C02	930p
6503	570p
6520	170p
6522	330p
6530	1050p
6532	480p
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	820p
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
Z80AGTC	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

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Spare Nozzle	60p

SOLDER MOP	65p

SOLDER

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	no of belts	
VK1 AKAI VS9300/9500/9000 JVC HR3300/3320/3330/3360 TCE 8903/3V00/3V16/3V22	7	2.40
VK2 NAT.PAN. NV7000B/7200B	5	1.45
VK3 SONY SLC5/7	6	2.25
VK4 SONY SL8000/8500/8600	6	3.60
VK5 SONY SL3000UB	7	2.10
VK6 NAT. PAN. NV3000B	6	1.99
VK7 SANYO 9300P	4	2.75
VK8 NAT. PAN. NV2000B	6	1.73
VK9 NAT. PAN. NV8600B/8610/V011	7	1.50
VK10 TOSHIBA V8600	6	1.45
VK13 SANYO VTC5000	2	1.50
VK14 SANYO VTC5300	5	1.85
VK15 JVC HR7650/3V31	3	2.00
VK16 HITACHI 5000		1.90
VK17 SHARP 8300	6	1.76
VK18 SHARP 9300	5	1.47
VK19 HITACHI VT8000/8300/8500	3	1.05
VK20 HITACHI VT11/33	6	1.50
VK21 HITACHI 9500	3	1.12
VK22 SONY SLC6	6	1.90
VK23 SANYO 5500	3	1.05
VK24 NAT. PAN. NV300/NV333	6	1.55
VK25 TOSHIBA V7540	5	1.90
VK26 JVC/HR 7700/3V23	2	0.96
VK27 THORN 3V29	4	1.75
VK28 AMSTRAD 7000	3	1.45
VK38 AMSTRAD 4500/9000		3.25
VK39 AMSTRAD 4600/5200		2.95
VK29 NAT. PAN. NU777	4	1.80
VK30 SONY T9	6	2.20
VK31 TOSHIBA 9600	4	1.20
VK32 SANYO 1100-1300-1500		0.75
VK33 FERGUSON 3V35-36		0.85
VK34 FERGUSON 3V42-3-4-5-8		0.90
VK35 FISHER FVHP710-716-722		1.20
VK36 PANASONIC NV370-430		1.20
VK37 HITACHI 9300		0.85

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SONY T.C. GENERAL	3.75

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BETA ECCENTRICITY GAUGE	57.92
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CAPSTAN BELT	01X0-033-018	1.75
CAPSTAN MOTOR	01X0-040-014	33.00
CASSETTE HOUSING	01X0-040-030	21.00
CASSETTE LAMP	01X0-040-008	1.59
CASSETTE LAMP HOLOER	01X0-033-417	0.90
COUNTER PULLEY	01X0-040-197	0.50
LOADING BELT	01X0-040-006	0.60
LOADING MOTOR	01X0-034-059	12.02
PINCH ROLLER ASSEMBLY	01X0-040-015	7.21
REEL MOTOR	01X0-040-017	27.35
RF CONVERTER	01X0-040-003	67.09
TAKE UP CLUTCH ASSEMBLY	01X0-042-013	2.00
TAKE UP CLUTCH BELT	01X0-040-023	0.23
TAKE UP SPL.IDLER ASSY	01X0-040-007	2.13
UPPER ORUM ASSEMBLY	01X0-040-002	45.00
TAKE UP IOLER	01X0-040-019	1.44
TENSION BANDS		1.65

VCR3V31

CASSETTE LAMP	01X0-041-142	1.54

VCR3V32

BOOSTER	01X0-042-089	24.89

VCR 3V35/36/38/39

CAPSTAN BELT	01X0-066-014	1.20
CAPSTAN MOTOR	01X0-065-009	26.44
CASSETTE HOUSING ASSY	01X0-065-016	26.63
CASSETTE MOTOR	01X0-065-003	5.64
LOADING BELT	01X0-065-005	0.45
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UPPER OOOR FLAP	01X0-083-117	0.95

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CASSETTE HOUSING ASSY	01X0-083-069	26.25
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AKAI BV327815	4.87
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FERG 3V29 TAKEUP CL	2.08
FERG 3V29 TAKEUP SPL	2.13
FERG 3V29 TAKEUP IDL	1.44
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HITACHI 6413663	2.68
HITACHI 6414221	5.04
HITACHI 6383531	0.70
HITACHI 6861471	2.43
HITACHI 6861482	5.02
HITACHI 6345173	0.40
HITACHI 6886971	2.90
NAT PAN VXP0463	3.20
NAT PAN VXP0243	1.10
NAT PAN VXP0401	1.08
NAT PAN VXP0344	1.22
NAT PAN VXP0331	1.28
NAT PAN VXP0521	4.08
NAT PAN VXP0433	5.50
SANYO RELL DRIVE PUL	5.10
SANYO 5000 RLR ASSY	1.85
SHARP 0005	2.20
SHARP 006	2.20
SONY SLC5/7/3000	1.27

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BO131	0.33
BD235	0.60
BU208A	0.95
BU208D	2.20
BU326A	0.85
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BUT11	2.58
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GCA 514620/C2089H-C2090H-IR8823 C2290H.C2889	23.50
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T720	M739	
T721	M737	
T723	M737	
T724	M739	
T725	M750	
T731	M738	
T732	M739	
T733	M738	
T734	M734	
T736	M739	
T737	M737	
T738	M738	
T739	M739	
T740	M740	
T742	M742	
T748	M748	
T750	M750	
T769	M739	
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T772	M742	
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BD9	2	6V 1A mains transformers upright mounting with fixing clamps.
BD11	1	6½in speaker cabinet ideal for extensions, takes our speaker. Ref BD137.
BD13	12	30 watt reed switches, it's surprising what you can make with these – burglar alarms, secret switches, relay, etc., etc.
BD22	2	25watt loudspeaker two unit crossovers.
BD30	2	Nicad constant current chargers adapt to charge almost any nicad battery.
BD32	2	Humidity switches, as the air becomes damper the membrane stretches and operates a microswitch.
BD42	5	13A rocker switch three tags so on/off, or change over with centre off.
BD45	1	24hr time switch, ex-Electricity Board, automatically adjust for lengthening and shortening day, original cost £40 each.
BD49	5	Neon valves, with series resistor, these make good night lights.
BD56	1	Mini selector, one use is for an electric jigsaw puzzle, we give circuit diagram for this. One pulse into motor, moves switch through one pole.
BD67	1	Suck or blow operated pressure switch, or it can be operated by any low pressure variation such as water level in water tanks.
BD103A	1	6V 750mA power supply, nicely cased with mains input and 6V output leads.
BD120	2	Stripper boards, each contains a 400V 2A bridge rectifier and 14 other diodes and rectifiers as well as dozens of condensers, etc.
BD128	10	Very fine drills for pcb boards etc. Normal cost about 80p each.
BD132	2	Plastic boxes approx 3in cube with square hole through top so ideal for interrupted beam switch.
BD134	10	Motors for model aeroplanes, spin to start so needs no switch.
BD139	6	Microphones inserts – magnetic 400 ohm also act as speakers.
BD148	4	Reed relay kits, you get 16 reed switches and 4 coil sets with notes on making c/o relays and other gadgets.
BD149	8	Safety cover for 13A sockets – prevent those inquisitive little fingers getting nasty shocks.
BD180	6	Neon indicators in panel mounting holders with lens.
BD193	6	5 amp 3 pin flush mounting sockets make a low cost disco panel.
BD199	1	Mains solenoid, very powerful, has 1in pull or could push if modified.
BD201	8	Keyboard switches – made for computers but have many other applications.
BD211	1	Electric clock, mains operated, put this in a box and you need never be late.
BD221	5	12V alarms, make a noise about as loud as a car horn. Slightly soiled but OK.
BD242	2	6in × 4in speakers, 4 ohm made from Radiomobile so very good quality.
BD252	1	Panostat, controls output of boiling ring from simmer up boil.
BD259	50	Leads with push-on ¼in tags – a must for hook-ups – mains connections etc.
BD263	2	Oblong push switches for bell or chimes, these can mains up to 5 amps so could be foot switch if fitted into pattress.
BD268	1	Mini 1 watt amp for record player. Will also change speed of record player motor.
BD283	3	Mild steel boxes approx 3in × 3in × 1in deep – standard electrical.
BD305	1	Tubular dynamic mic with optional table rest.
BD400	4	Books, useful for beginners, describes amplifiers equipment and kit sets.
BD653	2	Miniature driver transformers. Ref. LT44. 20k to 1k centre tapped.
BD548	2	3.5V relays each with 2 pairs changeover contacts.
BD667	2	4.7 µf non-polarised block capacitors, pcb mounting.

There are over 1,000 items in our Bakers Dozen List. If you want a complete copy please request this when ordering.

TOASTERS. 2 slice toasters – may need slight attention. Only £3.00 each. Ref. 3P84.

PERSONAL STEREOS. Again customer returns but complete and with stereo headphones a bargain at only £3.00 each. Our ref. 3P83.

MAINS OPERATED MICROWAVE CONTROL PANEL with touch switches. This unit has a 4 digit display with a built in clock & 2 relay outputs – one for power & 1 for pulsed power level. Could be used for all sorts of timer control applications. Only £6.00. Our ref. 6P18.

EQUIPMENT WALL MOUNT. It is a multi-adjustable metal bracket that could be used for mounting flood light, loud speaker, TV camera, even a fan and on almost any sort of wall or ceiling even between wall and ceiling. The main fixing brackets rotate such that an inward or an outward corner can be accommodated. Front panel also tilts upwards or downwards to a reasonable angle and can be easily removed separately for wiring. A very useful bracket. Regular price would be around £6 each. Our price only £3. Our ref 3P72. Or 2 for £5. Our ref 5P152.

COPPER CLAD PANEL for making PCB. Size approx 12in long × 8½in wide. Double-sided on fibreglass middle which is quite thick (about 1/16in) so this would support quite heavy components and could even form a chassis to hold a mains transformer, etc. Price £1 each. Our ref BD683.

POWERFUL IONISER

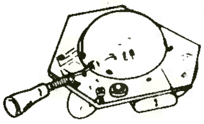
Generates approx. 10 times more IONS than the ETI and similar circuits. Will refresh your home, office, shop workroom etc. Makes you feel better and work harder – a complete mains operated kit, case included **£12.50 + £2 P&P.** Our ref 12P5/1.

REAL POWER AMPLIFIER for your car, it has 150 watts output. Frequency response 20hz to 20Khz and signal to noise ratio, better than 60 d/b. Has built in short circuit protection and adjustable input level to suit your existing car stereo, so needs no pre-amp. Works into speakers. Ref. 30P7 described below. A real bargain at only £57.50. Order ref: 57P1.

REAL POWER CAR SPEAKERS. Stereo pair output 100w each. 4-Ohm impedence and consisting of 6½" woofer, 2" mid range and 1" tweeter. Each set in a compact purpose built shelf mounting unit. Ideal to work with the amplifier described above. Prlc eper pair £29.96. Order ref: 30P7.

STEREO CAR SPEAKERS. Not quite so power – 70w per channel. 3" woofer, 2" mid range and 1" diameter. Again, in a super purpose built shelf mounting unit. Price per pair: £27.95. Order ref: 28P1.

VIDEO TAPES. These are three hour tapes of superior quality, made under licence from the famous JVC Company. Offered at only £3 each. Our ref: 3P63. Or 5 for £11. Our ref: 11P3. Or for the really big user 10 for £20. Our ref: 20P20.



ELECTRONIC SPACESHIP. Sound and impact controlled, responds to claps and shouts and reverses when it hits anything. Kit with really detailed instructions. Ideal present for budding young electrician. A youngster should be able to assemble but you may have to help with the soldering of the components on the pcb. Complete kit £10. Our ref 10P81.

12" HIGH RESOLUTION MONITOR. Black and white screen, beautifully cased for free standing, needs only a 12v 1.5 amp supply. Technical data is on its way but we understand these are TTL input. Brand new in maker's cartons. Price: £22.00 Free Delivery. Order ref: 25P10.

14" COLOUR MONITOR made by the American Display Tek company. Uses high resolution tube made by the famous Japanese Toshiba company. Beautifully made unit intended for console mounting, but top and sides adequately covered by plated metal panels. Full technical spec. on its way to us. We have a limited number of these. All brand new still in maker's cartons. Price: £89 each plus £6 insured carriage. Order ref: 89P/1.

COMPOSITE VIDEO KITS. These convert composite video into separate H. sync, V. sync and video. Price £8.00. Our ref: 8P39.

BUSH RADIO MIDI SPEAKERS. Stereo pair. BASS reflex system, using a full range 4in driver of 4ohms Impedance. Mounted in very nicely made black fronted walnut finish cabinets. Cabinet size approx 8½in wide, 14in high and 3½in deep. Fitted with a good length of speaker flex and terminating with a normal audio plug. Price £5 the pair plus £1 post. Our ref 5P141.

3½in FLOPPY DRIVES. We still have two models in stock. Single sided, 80 track, by Chinon. This is n the manufacturers metal case with leads and ICD connectors. Price £40, reference 40P1. Also a double sided, 80 track, by NEC. This is uncased. Price £59.50, reference 60P2. Both are brand new. Insured delivery £3 on each or both.

ATARI 65XE COMPUTER

At 64K this is most powerful and suitable for home and business. Brand new, complete with PSU, TV lead, owner's manual and six games. Can be yours for only **£45 plus £3 insured delivery.**

REMOTE CONTROL FOR YOUR 65XE COMPUTER. With this outfit you can be as much as 20 feet away as you will have a joystick that can transmit and a receiver to plug into and operate your computer and TV. This is also just right if you want to use it with a big screen TV. The joystick has two fire buttons and is of a really superior quality, with four suction cups for additional control and one handed play. Price £15 for the radio controlled pair. Our ref 15P27.

ASTEC PSU. Mains operated switch mode, so very compact. Outputs: +12v 2.5A, +5v 6A, ±5v .5A, ±12v .5A. Size: 7¼in long × 4⅜in wide × 2¾in high. Cased ready for use. Brand new. Normal price £30+, our price only £12.95. Our ref 13P2.

VERY POWERFUL 12 VOLT MOTOR. ⅓rd Horsepower. Made to drive the Sinclair C5 electric car but adaptable to power a go-kart, a mower, a rail car, model railway, etc. Brand new. Price £20 plus £2 postage. Our ref 20P22.

PHILIPS LASER

This is helium-neon and has a power rating of 2mW. Completely safe so long as you do not look directly into the beam when eye damage could result. Brand new, full spec, £30 plus £3 insured delivery. Mains operated power supply for this tube gives 8kv striking and 1.25kv at 5mA running. Complete kit with case £15, ditto for 12v battery. Also £15. Our ref 15p22.

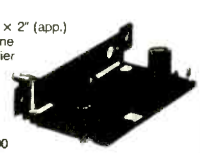
ORGAN MASTER. Is a three octave musical keyboard. It is beautifully made, has full size (piano size) keys, has gold plated contacts and is complete with ribbon cable and edge connector. Can be used with many computers, request information sheet. Brand new, only £15 plus £3 postage. Our ref 15P15.

FULL RANGE OF COMPONENTS at very keen prices are available from our associate company SCS COMPONENTS. You may already have their catalogue, if not request one and we will send it FOC with your goods.

HIGH RESOLUTION MONITOR. 9in black and white, uses Philips tube M24/306W. Made up in a lacquered frame and has open sides. Made for use with OPD computer but suitable for most others. Brand new, **£16 plus £5 post.** Our reference 16P1.

12 VOLT BRUSHLESS FAN. Japanese made. The popular square shape (4½in × 4½in × 1¾in). The electronically run fans not only consume very little current but also they do not cause interference as the brush type motors do. Ideal for cooling computers, etc., or for a caravan. **£8 each.** Our ref 8P26.

MINI MONO AMP. on p.c.b. size 4" × 2" (app.) Fitted volume control and ahole for a tone control should you require it. The amplifier has three transistors and we estimate the output to be 3W rms. More technical data will be included with the amp. Brand new, perfect condition, offered at the very low price of **£1.15 each or 13 for £12.00**



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POPULAR ITEMS – MANY NEW THIS MONTH

JOYSTICKS for BBC, Atari, Dragon, Commodore, etc. All £5 each. State which required.

TELEPHONE TYPE KEY PAD. Really first class rear mounting unit. White lettering on black buttons. Has conductive rubbers contacts with soft click operation. Circuit arranged in telephone type array. Requires 70mm by 55mm cut out and is connected by 10-pin IDC socket. Price: £2.00 each. Order ref: 2P251.

SUB-MIN PUSH SWITCHES. Not much bigger than a plastic transistor but double pole. PCB mounting. Three for £1. Our ref BD688.

AA CELLS. Probably the most popular of the rechargeable NICAD types. 4 for £4.00. Our ref. 4P44.

20WATT 4OHM SPEAKER. With built-in tweeter. Really well made unit which has the power and the quality for hi-fi reproduction. 6½in diameter. Price £5. Our ref 5P155. It is heavy so please add £1 to cover postage if not collecting.

MINI RADIO MODULE. Only about 2in square with ferrite aerial and solid dia tuner with its own knob. It is a superhet and it operates from PP3 battery and would drive a crystal headphone direct but be better with our mini mono amp. Price £1. Our ref BD716.

BULGIN MAINS PLUG AND SOCKET. The old faithful 3 pin with screw terminals. The socket mounts through a 1½in hole and the mains is brought in by the insulated plug. Used to be quite expensive but you can have 2 pairs for £1 or 4 of either plug or socket for £1. You could make yourself a neat and compact bench panel with these. Our ref BD715, BD715S or BD715P.

MICROPHONE. If you want a low cost microphone then just arrived we have a very small hand-held dynamic mic with on/off switch in the handle, its lead terminates with one 3.5 plug and the other a 2.5 plug for remote control. Price only £1. Our ref BD711.

MOSFETS FOR POWER AMPLIFIERS AND HIGH CURRENT DEVICES. 140v 100w pair made by the famous Hitachi Company. Reference 2SK413 and its compliment 2SJ118. Only £4 the pair. Our ref 4P42. Also available in H pack. Ref: 2SJ99 and 2SK343 £4.00 a pair. Ref. 4P51.

TIME AND TEMPERATURE LCD MODULE. A 12 hour clock a Celsius and Fahrenheit thermometer a too hot alarm and a top cold alarm. Approx 50×20mm with 12.7mm digits. Requires 1AA battery and a few switches. Comes with full data and diagram. Price £6.00. Our ref: 6P12.

REMOTE TEMPERATURE PROBE FOR ABOVE. £3.00. Our ref: 3P60.

A REAL AIR MOVER. Circular axial fan moves 205 cubic foot per min which is about twice as much as our standard 4½in fans. Low noise mains operated 6½in. dia, brand new. Regular price over £30.00. Our price only £10.00. Our ref 10P71.

600 WATT AIR OR LIQUID MAINS HEATER. Small coil heater made for heating air or liquids. Will not corrode, lasts for years. Coil size 3in × 2in mounted on a metal plate for easy fixing. 4in dia. Price £3.00. Ref: 3P78 or 4 for £10.00. Our ref: 10P76.

EX-EQUIPMENT SWITCHED MODE POWER SUPPLIES. Various makes and specs but generally +–5, +–12v ideal bench supply. Only £8.00. Our ref: 8P36.

ACORN DATA RECORDER. Made for the Electron or BBC computer but suitable for others. Includes mains adaptor, leads and book. £12.00. Ref: 12P15.

PFTE COATED SILVER PLATED CABLE. 19 strands of .2mm copper will carry up to 30A and is usually indestructable. Available in red or black. Regular price is over £120 per reel. Our price only £20.00 for 100m reel. Ref. 20P21 or 1 of each for £35.00. Ref 35P2. Makes absolutely superb speaker cable!

NEW PIR SENSORS. Infra red movement sensors will switch up to 500w mains, UK made. 12 month manufacturers warranty, 15-20m range with a 0-10min timer, adjustable wall bracket. Only £20.00. Ref: 20P24.

MITSUBISHI 3½" DISC DRIVES. Brand new drives, ½ height double sided, double density warranted. Our price £60.00. Ref: 60P5.

10 MEMORY PUSHBUTTON TELEPHONES. These are customer returns and 'sold as seen'. They are complete and may need slight attention. Price £6.00. Ref: 6P16 or 2 for £10.00. Ref: 10P77. BT approved.

NON-MEMORY PUSHBUTTON TELEPHONES. Same condition as above with radial £3.00. Our ref: 3P79. BT approved.

DEHUMIDIFIERS. Domestic mains powered dehumidifiers these are customer returns and sold as seen. Price £30.00. Our ref: 30P9. Callers only please. Also working dehumidifiers at £99.00 each.

SPECTRUM PRINTER INTERFACE. Add a centronics interface to your Spectrum complete with printer cable for only £4.00. Our ref. 4P52.

SPECTRUM SOUND BOX. Add sound to your Spectrum with this device. Just plug in. Complete with speaker, volume control and nicely boxed. A snip at only £4.00. Our ref. 4P52.

BBC JOYSTICK INTERFACE. Converts a BBC joystick port to an Atari type port. Price £2.00. Our ref: 2P261.

TELEPHONE EXTENSION LEAD. 5mm phone extension lead with plug on one end, socket on the other. White. Price £3.00. Our ref: 3P70 or 10 leads for only £19.00! Ref: 19P2.

LCD DISPLAY. 4½" digits supplied with connection data £3.00. Ref: 3P77 or 5 for £10. Ref: 10P78.

CROSS OVER NETWORK. 8 Ohm 3 way for tweeter midrange and woofer nicely cases with connections marked. Only £2.00. Our ref: 2P255 or 10 for £15.00. Ref: 15P32.

REVERSING LIGHT ALARM. Fits to car reversing light and sounds when reversing. Only £2.00. Our ref: 2P248.

BASE STATION MICROPHONE. Top quality uni-directional electret condenser mic 600r impedence sensitivity 16-18Khz – 68db built in chime complete with mic stand bracket. £15.00. Ref: 15P28.

MICROPHONE STAND. Very heavy chromed mic stand, magnetic base 4" high. £3.00 if ordered with above mic. Our ref: 3P80.

SOLAR POWERED NICAD CHARGER. 4 Nicad AA battery charger. Charges 4 batteries in 8 hours. Price £6.00. Our ref: 6P3.

MAINS SOLDERING IRON. Price £3.00. Our ref: 3P65.

SOLDERING IRON STAND. Price £3.00. Our ref: 3P66.

PIR SENSORS. Suitable for alarm systems etc. Nicely boxed. Priced at only £10.00. Our ref: 10P79.

SHARP PLOTTER PRINTER. New 4 colour printer originally intended for Sharp computers but may be adaptable for other machines. Complete with pens, paper etc. Price £16.00. Our ref: 16P3.

CAR IONIZER UNIT. Improve the air in your car, clears smoke and helps prevent fatigue. Case req. Price £12.00. Our ref: 12P8.

NEW FM BUG KIT. New design with PCB embedded coil 9v operation. Priced at £5.00. Our ref: 5P158.

NEW PANEL METERS 50UA. Movement with different scales that are brought into view with a lever. Price only £3.00. Ref: 3P81.

STROBE LIGHTS. Fit a standard edison screw light fitting 240V 40/min. flash rate available in yellow, blue, green and red. Complete with socket. Price £10 each. Ref. 10P80 (state colour required).

ELECTRONIC SPEED CONTROL KIT. Suitable for controlling our powerful 12v motors. Price £17.00. Ref: 17P3 (heatsink required).

EXTENSION CABLE WITH A DIFFERENCE. It is flat on one side making it easy to fix and look tidy. 4 core, suitable for alarms, phones etc. Our price only £5.00 for 50m reel. Ref: 5P153.

METAL PROJECT BOX. Ideal for battery charger, power supply etc. Sprayed grey size 8" × 4" × 4½". Louvred for ventilation. Price £3.00. Ref: 3P75.

TELEVISION

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John A. Reddihough

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COVER PHOTO

This month's cover photograph shows the Salora L chassis. See article on page 274. Because of production difficulties during the Christmas/New Year period when this issue was being prepared we have been able to include only a short introductory article on the Salora K and L chassis. The series will continue in future issues.

The Kingfisher-Dixons Saga

As the UK's largest retailer of consumer electronics goods Dixons must take considerable responsibility for the state of the market in recent years. For many years the company's growth in size and profitability continued without pause. But three years ago, despite a booming demand for consumer electronics goods, Dixons started to falter. Profitability fell from £103m pre-tax in the financial year 1987-8 to £78·4 in 1988-9 and is expected to fall to around £40m in the current year. Turnover has not fallen in proportion however. This suggests that Dixons' main aim has been to retain market share.

Dixons has traditionally followed a policy of aggressive pricing. This has had an effect on the industry's profitability overall. Other dealers have had to pare their prices, to the undoubted benefit of consumers. But there can come a point where lack of profitability affects the long-term health of both trade and industry. It could well be argued that Dixons' sales practices have not been exactly helpful to UK industry.

In this connection it's interesting, once again, to compare the situation in the UK with that in Japan. Japanese industry has been producing much of the product that Dixons and others have been able to sell at highly competitive prices. Over the last decade Japanese manufacturers have faced stiff competition from other far eastern manufacturers who have benefited from substantially lower costs. Nevertheless the Japanese industry has continued to prosper and, important for long-term survival, has continued to invest massively in research and development, thus keeping ahead in the technological race. The Japanese industry's ability to do this has been helped by the fact that price cutting is not a major feature in Japanese retailing. This is in turn helped by the fact that Japanese customers prefer to buy Japanese products, while access to Japanese markets for manufacturers in other countries has traditionally been extremely difficult. A profitable home market has provided a solid foundation for Japanese industry. Manufacturers in the UK have on the other hand faced the full blast of international competition. The result of course is that there is virtually no indigenous UK consumer electronics industry left. Free traders will argue that this unfortunate result is simply because not all markets are free. The moral would seem to be to ease up on free trading until they are. You do not find Continental manufacturers accepting this situation. It's straight to the European Commission with chapter and verse. Not that this has been all that helpful in practice.

One cannot complain that Dixons has taken any unfair advantages. It has every right to buy where it wants and to sell aggressively. But things haven't turned out all that well for Dixons over the last three years, as the figures quoted earlier show. It will be worrying for investors in Dixons that this fall in profitability has occurred during both booming and declining market conditions. Also that the share price has fallen by two thirds over the last two and a half years, during which the overall market has risen by a fifth.

Kingfisher, the Woolworths group that also owns B and Q, Superdrug and Comet, has mounted a strong attack on Dixons, maintaining in particular that its profits in recent years have been aided by property disposals and have relied excessively on income derived from credit and insurance sales. This may be so, though the full facts are not publicly known. It would, from the consumers' point of view, be ironical if their cheap purchases ended up being expensive when bought on credit. But then that's all part of what has soured the UK's trading situation in recent times.

Dixon's reply to Kingfisher's 120p a share offer is that this is an attempt to grab Dixons on the cheap and that Dixons has evolved a strategy to rebuild profitability, in particular through concentrating on higher-margin lines and on the prospects offered by new products. Maybe Kingfisher is taking advantage of a temporary setback at Dixons. But then that's what modern business practice is often all about. Dixons should be the last to complain, having made a £1·8bn bid for Woolworths back in 1986 after swallowing Currys in 1984! Would Kingfisher be able to run Dixons better? One can't say of course. It's relevant that Comet's profitability has also fallen sharply during the last year.

The whole business may be put on ice by being referred to the Monopolies and Mergers Commission. Dixons is understood to have a market share of about twelve per cent at present, with Comet's market share being put at ten per cent, giving a total of 22 per cent. Is this a monopoly situation or not? Here again there are other factors to take into account. The combined group would have a massive share of the out-of-town market, and meanwhile figures from Ferguson show that independent retailers have over the past year been taking a substantially larger share of the market.

Kingfisher's move is probably opportunist. Geoffry Mulcahy, Kingfisher's chief executive, has described the bid as being a strategic move to give the company market leadership and enable it to restructure a large part of the electrical retailing section with the aim of greater efficiency and profitability. Maybe. For the time being the unedifying attack and counter-attack continue. It certainly seems that Kingfisher will not get Dixons for 120p a share – Dixons' share price has hovered at around 135p since the bid was first announced.

Servicing the Salora K and L Chassis

Part 1

Nick Beer and Ian Bowden

The Salora K and L chassis employ the Ipsalo-3 power supply/line deflection circuit. Its features include the use of a single chopper transistor and yet another hybrid chopper control chip, this time type LF0059. The chassis themselves are very different in physical appearance, though the circuits are similar. The K is an upright, hinge-back type that's akin to the H and J chassis. It's used in sets fitted with 20, 21, 22, 24, 26 and 28in. tubes – from the sizes you'll note that some are "traditional" while others are FS tubes. The L is a horizontal, slide-out chassis which, in addition to the larger screen sizes, is also used in 14 and 15in. models. Both chassis are found under other guises, such as Hitachi, Granada, Finlandia and Luxor. Many of them are thus used as rental sets.

The Ipsalo-3 Circuit

Fig. 1 shows the Ipsalo-3 circuit used in the K chassis. We'll provide a brief run-down on the circuit operation, starting with the action of the start-up circuit.

The mains input is rectified by the bridge rectifier DB701-4 whose reservoir capacitor is CB707. Surge limiting is provided by RB702 and filtering by RB703/CB708. A d.c. supply of some 300V is thus present across CB708. As with the previous chassis a diac, DTB705 in this circuit, is used to get things going. CB711 charges from the 300V line via RB704, and when the voltage across it reaches approximately 30V the BR100 diac fires. The pulse produced in this way at the base of the BU508 chopper transistor TB701 switches it on. DTB705's conduction rapidly discharges CB711: when the voltage across it drops to about 22V the diac switches off, removing TB701's base drive. At this point the current flowing through the primary winding (pins 1-2) of the Ipsalo transformer MB600 reverses. The voltage developed across the secondary winding 17-18 brings rectifier diode DB603 into conduction, charging CB604. Meanwhile CB711 charges again and the cycle repeats. Thus the voltages across CB604 and CB621/2 gradually build up.

The TDA2579 timebase generator/sync chip ICB500 requires a switch-on supply at pin 16. During normal operation it's powered by a 12V supply at pin 10. As the voltage across CB621/2 builds up, a point is reached at which the voltage at pin 16 of ICB500 is sufficient for the line oscillator to start up. The set will now come into operation. The line-frequency pulses produced at pin 11 of the TDA2579 chip are fed to the line driver transistor TB502 and to pin 13 of the hybrid chopper control chip HB600, which now takes over the provision of drive for the chopper transistor. Once normal operation has been established, DB706 and RB705 ensure that the voltage across CB711 never reaches the level at which DTB705 will fire.

During normal operation HB600 provides a pulse-width modulated drive to the chopper transistor to regulate the supplies derived from the Ipsalo transformer. HB600 also incorporates overload protection circuitry. The LF0059 has twenty pins and the usual green and white appearance. It's driven by 2V peak-to-peak line-frequency pulses at pin 13. For regulation, the voltage developed at pin 14 of the Ipsalo transformer by the action of the line output stage is sensed at either pin 5 (90° tubes) or pin 6 (110° tubes). If an overload results in the voltage at pins 8 and 16 rising to 9·5V the protection circuit in HB600 operates and the set trips.

In the standby mode the control circuitry increases the voltage at pin 7 of HB600 from 0V to 5V. As a result of the action of the internal circuitry the chopper is switched on when the negative-going edge of the line pulse at pin 13 occurs. Thus the chopper and the line output transistors are on at the same time. The latter continues to conduct until energy has been drained from the secondary windings of the Ipsalo transformer. The close-coupled windings 17-18 and 19-20 continue to develop sufficient voltage however to keep the chopper circuit, the line oscillator and the remote control circuitry in operation, so that the set can be brought back from the standby mode.

In the K and large-screen L chassis the e.h.t. is derived from a diode-split winding on the Ipsalo transformer. With small-screen L chassis sets a tripler is used.

K and L Chassis Compared

The Ipsalo-3 circuit is the heart of these sets and is common to the K and L chassis. There are considerable variations in the rest of the circuitry however, and several different control systems are used. We will consider these latter arrangements in a subsequent instalment, when we give details of the enabling procedures, which again vary with the different versions of these chassis.

The timebase and signal circuits used in the K chassis are fairly conventional. There's a definite resemblance to the J chassis in fact. The colour decoder for example is based on the use of a TDA3562A chip (ICB200), and the notes on this device on pages 103-4 of the December issue apply here as well. The line and field timebase generators and sync circuitry are in a TDA2579 chip (ICB500) as previously mentioned. A TDA3654 (ICB501) is used as the field output device.

A parallel system is used for the vision and sound i.f. signals. The i.f. bandpass setting SAWF has two outputs, the sound i.f. going to a TDA2545A chip while the vision i.f. output goes to a TDA2549.

There are several options available as plug-in PCBs with this chassis. Thus there appear to be several unused connectors and you may find yourself going in all directions if you try tracing the print connections. The options include teletext, a stereo sound decoder, a satellite TV decoder, SECAM and NTSC decoders and an f.m. tuner for radio reception.

A pair of TDA2030 chips (ICE1/2) is used in sets with stereo sound facilities, with processing (tone and balance control etc.) carried out within a TDA1524A chip (ICE3). Non-stereo versions have a single TDA2030. The 6MHz f.m. output from the previously mentioned TDA2545A sound i.f. chip is fed to a TBA120T intercarrier sound chip on the audio module.

The arrangements used in the L chassis are somewhat simpler. This is mainly due to the use of a TDA4505 chip that includes the i.f. signal processing and also incorporates the sync circuits and timebase generators. The

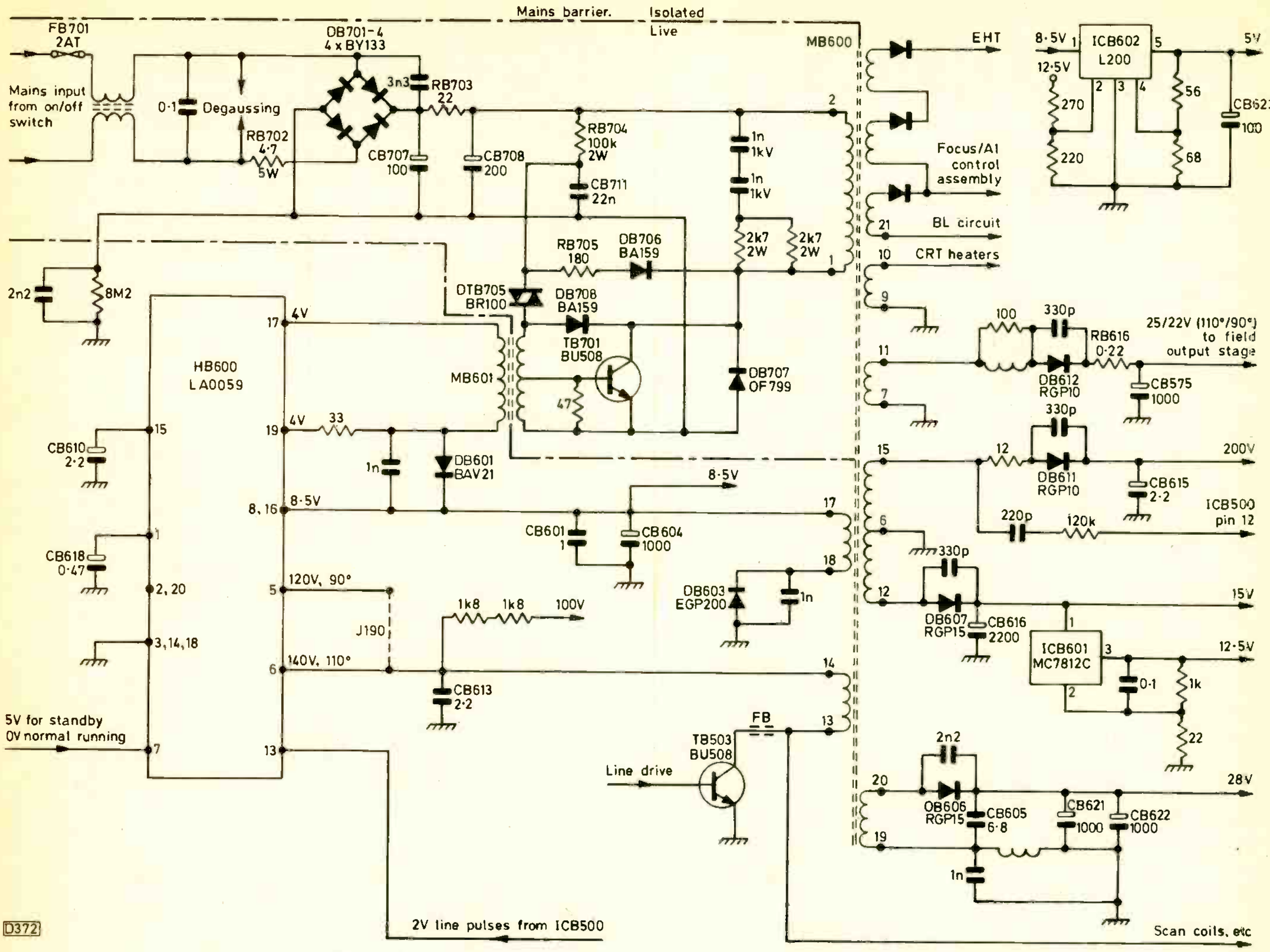


Fig. 1: The Ipsalo-3 circuit as used in the K30 series chassis.

colour decoder is a TDA3301. Once again a TDA3654 is used for field deflection.

Basic K Chassis Faults List

To round off this initial instalment on these chassis, here's a brief faults list covering common problems with the basic K chassis. Faults relevant to the Ipsalo-3 circuit also apply to the L chassis (but note that the circuit reference numbers differ with the small-screen version).

(1) No go. On several occasions we've found the chopper transistor TB701 to be short-circuit and the filter resistor RB703 open-circuit. DB707, which is in parallel with TB701, is usually also short-circuit.

(2) Set does not start initially but if left switched on will start after a time ranging from half a minute to several minutes. You will usually find that the 1,000μF 8·5V supply reservoir capacitor CB604 is open-circuit or leaky. We try to fit a replacement rated at 25V if the physical size permits in a particular set. CB601 which is in parallel with CB604 can also cause this problem. Several different values have been used in this position. We find that the higher value 1μF improves starting and cures any problems here. It's not unusual to have to replace both these capacitors for a no start condition.

(3) No sound, no picture but two bars present on the display. Monitor pin 11 of the TDA2579 timebase chip ICB500. You will find that line-frequency pulses begin to appear then, shortly after switch-on, stop. The cause is that the BC557 transistor TB541 in the switch-on line is short-circuit.

(4) Noise and "splashes" on the picture. Suspect CB101 (22nF) which decouples pin 4 (tuning voltage) of the tuner unit.

(5) Height and/or width twitch up/down or in/out. First check whether the height control RTB543 and/or the line phase control RTB542 is noisy. Usually however the LF0059 chopper control chip HB600 is faulty. You may, if you don't hold this device in stock, be able to monitor its output with a scope: usually however the fault is not regular enough for this.

(6) No sound or vision. On several occasions the TDA2579 chip ICB500 has been faulty. This chip can also sometimes load down the 12V rail with the result that the set trips.

(7) Intermittent no picture or sound with the channel display pulsing. This can occur with sets that incorporate teletext. Remove the teletext panel to confirm that the fault has cleared. If so the fault is due to misoperation of the crystal oscillator on this panel. Replace all associated components – the crystal, transistor, capacitors, etc. Then recheck. If the fault is still present suspect the DPU2540 chip.

Teletopics

THE BROADCASTING BILL

The government's Broadcasting Bill was published on December 7th. Its main purposes are to alter the method of awarding the ITV franchises and set up a fifth national TV channel covering seventy per cent of the UK, three national commercial radio networks and several hundred local and communal radio stations. It will enable TV broadcasting companies to be taken over, though only with the agreement of the Independent Television Commission, successor to the IBA. David Mellor, Home Office minister responsible for broadcasting, has said that the government does not regard the bill in its present form as final, and expects it to be amended. "It is the best fist the draughtsmen could make of it" he said in introducing the Bill, "we are certainly willing to listen." The aim is to increase competition and widen the choice of channels. Criticism so far relates mainly to the proposed method of awarding the ITV franchises – to the highest bidder after an initial assessement of applicants. Commenting on the Bill, George Russell, chairman of the IBA/ITC, said "I am encouraged that the government has taken account of the constructive comments and suggestions made over the past year since the publication of the White Paper. An initial look at the Bill shows that these have been carefully considered and that a significant number have been incorporated. Further debate and clarification are needed on a number of matters, including the franchise process, ownership and the structure of Channel Four."

SATELLITE TV SLOW DOWN

According to the *Financial Times'* Satellite Monitor, satellite TV installations plummeted in November to only 35,000, after a record 122,000 in October and 72,000 in September. The figures are produced by Continental Research whose chairman John Clements suggested that heavy advertising of Sky Television in September and October might have brought forward installations that would otherwise have been made later in the year while BSB's advertising in November could have resulted in many viewers delaying a decision. Continental concludes that the market has become very volatile.

Publisher Robert Maxwell is negotiating with Alan Bond to purchase his 36 per cent stake in BSB. Some uncertainty has been introduced by the Broadcasting Bill which would limit Robert Maxwell, as a newspaper publisher, to a stake of no more than 20 per cent. BSB has sought from its backers an urgent injection of a further £150m, part of a final funding operation that's eventually expected to raise an additional £700m for the project. Now that the problems with the receiver decoding/unscrambling chips have apparently been overcome, it's hoped that BSB will be able to start broadcasting in early April.

BUSINESS NEWS

Kingfisher, the ex-Woolworths group which owns Comet, has launched a takeover bid worth £568m for the Dixons group. The bid values Dixons' shares at 120p.

Paul Spring Electronics is to become a division of Ferguson, trading under the name Telefunken. This clears up an anomaly following Ferguson's takeover by Thomson, which owns Telefunken. Granada has sold its brown goods servicing division Serviscope to Computec of Doncaster. Beon Corporation, a Hong Kong based company, has bought Hinari's consumer electronics manufacturing operation: Beon plans to assemble TV sets at the Cumbernauld plant.

According to the latest BREMA figures CTV exports at £194·2m exceeded imports by £41·1m during the first nine months of 1989 while the trade deficit in VCRs was cut by more than half to £31m. The slow-down in consumer spending resulted in CTV deliveries to the trade falling by 27 per cent in the third quarter.

SERVICING SLUMP

Graham Knight, writing in *Electrical and Radio Trading*, mentions a survey of 150 dealers carried out recently by Colour Engineering Services of Davyhulm, Manchester into whether chargeable servicing had increased or decreased in comparison with the previous year. Thirteen per cent reported an increase, 20 per cent said that the service load was about the same while 67 per cent said that their income from servicing had fallen.

When times are hard, the servicing industry has traditionally fared relatively well. People tend to get their equipment repaired rather than replace it. Not this time it seems. The cost of spares and the time required to diagnose and repair faults, compared with the low cost at present of new equipment, appears to have altered the econommic equation. Let's hope, as forecast in various quarters, that the price of new equipment soon rises to a more realistic level. Spares companies and those selling second-hand equipment have also reported poor trading conditions.

NEW FROM FERGUSON

Ferguson's latest CTV chassis, the TX98, has been designed as a successor to the TX99. It's a single-board (two with the c.r.t. base panel) chassis which for the first time incorporates, without extra plug-in boards, remote control, Fastext and scart socket inputs/outputs. Features of the chassis include: frequency-synthesis tuning; 49-programme, 100-channel memory; on-screen graphics plus LED display; a scart socket for audio input/output, video input/output and RGB inputs; automatic switching to standby after ten minutes with no signal; snooze facility that puts the receiver into standby after half an hour; quick view recall of last programme. It's able to drive all current types of 90° tubes.

Ferguson has introduced its first 33in. set, Model 78M5. This high-specification model has a suggested retail price of around £1,300. Features include 40 programme tuning, an interactive menu control system with on-screen graphics, and Nicam stereo sound.

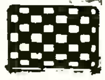
IN BRIEF

CCTV News has been launched as a monthly newsletter to give practical help and information on all aspects of closed-circuit TV. There's an introductory offer at £69·50 for a full year. For further details apply to CCTV News, 33 Duke Street, Kington, Herts HR5 3BL . . . The 1990 catalogue is now available from ElectroValue, 28 St. Judes Road, Englefield Green, Egham, Surrey TW20 0HB (0784 33603/35353) . . . Astra has set up a UK office at High Wycombe, telephone no. 0494 452 791.

MANOR SUPPLIES

MKV PAL COLOUR TEST GENERATOR FOR DOMESTIC TV & VCR.

TEST DEMONSTRATIONS AT 172 WEST END LANE



- ★ 40 different patterns and variations.
- ★ Fully interlaced sync pulses with correct picture blanking.
- ★ EBU colour bars, BBC colour bars, whole rasters & split bars (specially useful for VCR service), white, yellow, cyan, green, magenta, red, blue and black.
- ★ Chequerboard.
- ★ Mono outputs with border castellations, cross hatch, grey scale, vertical lines, horizontal lines and dots. UHF modulator output plugs straight into receiver aerial socket.
- ★ Additional video output for CCTV & VCR.
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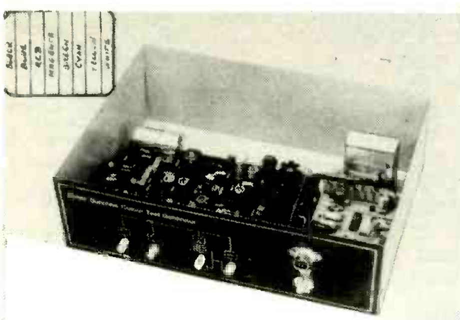
- ★ Easy to build kit, standard parts. Only 2 adjustments. No special test equipment required.
- ★ Mains operated with stabilised power supply.
- ★ All kits fully guaranteed with back-up service.
- ★ Also available with VHF Modulator.

Price of Kit	**£75.00**
Case (10″×6″×2¼″) app.	**£8.60**
Optional Sound Module (6MHz or 5.5MHz)	**£3.90**
Built & Tested in Case including Sound Module	**£115.00**

Post/Packing £3.00
Add VAT 15% TO ALL PRICES

PAL COLOUR BAR GENERATOR (Mk4)



- ★ Output at UHF, applied to receiver aerial socket.
- ★ In addition to colour bars R-Y, B-Y etc.
- ★ Cross-hatch, grey scale, peak white and black level.
- ★ Push button controls, battery or mains operated.
- ★ Simple design, only five i.c.s on colour bar P.C.B.
- ★ Backup service available.

PRICE OF MK 4 COLOUR BAR GENERATOR KIT £35.00. CASE £8.60. BATT HOLDERS £4.20. MAINS SUPPLY KIT £5.80 (Combined P&P £3.00).

ADD VAT 15%

VHF MODULATOR (CH 1 to 4) FOR OVERSEAS £6.80. EASILY ADAPTED FOR VIDEO OUTPUT & C.C.T.V.

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G11 PANELS (tested), frame, IF, decoder **£12.50** each. p.p. £2.00. Scan **£15.00** p.p. £2.80. Power tested exchange **£18.00** p.p. £2.80.
G11 PANELS EX-RENTAL (untested) Scan, Frame, Decoder **£2.50** p.p. £2.00.
G11 IF PANEL (new) less Tuner **£2.50** p.p. £1.30.
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TX9/TX10 Saw filter IF panel **£5.00** p.p. 80p.
TX9 Ultrasonic remote control panel **£7.50** p.p. £2.50.
TX9/10 Remote & tuning 1508A (incl. SAA5012) **£2.50** p.p. £1.80.
TX9/10 Remote & tuning 1536 (incl. SAA5012, SL471) **£3.50** p.p. £1.80.
TX Sweep Tune 1509G (incl. UAA1008 + BATT.) **£3.50** p.p. £1.80.
TX10 Stereo Audio Board **£3.50** p.p. £1.80.
TX90 20″ Chassis. Brand new (untested) **£25.00** p.p. £2.80.
TX90 Mains TX **£18.60** p.p. £2.80.
TX90/TX100 Chassis complete & boxed (untested) **£20.00** p.p. £2.80.

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M293B1	£5.80	SN76705	£9.80	TDA1180	£2.20	TDA2611A	£1.90	TDA3653A	£5.90
MC13002P	£5.80	STK5325	£6.80	TDA1190Z	£2.20	TDA2640	£3.20	TDA3653B	£3.20
ML237	£3.80	STK5332	£6.80	TDA1470	£2.80	TDA2653A	£3.20	TDA3654	£3.20
ML238	£6.80	STK5471	£6.50	TDA1670A	£3.20	TDA2654	£5.70	TDA4420	£2.20
ML923	£4.80	STK5481	£8.80	TDA1701	£3.80	TDA2655	£6.80	TDA4421	£3.21
SAA1024	£5.80	STK7308	£10.80	TDA1770	£3.20	TDA2670	£3.20	TDA4442	£6.80
SAA1025	£5.80	STK7348	£10.80	TDA1870	£6.80	TDA2680	£3.80	TDA4500	£5.80
SAA1124	£3.50	STR441	£7.80	TDA1908	£2.80	TDA2690	£3.80	TDA4501	£6.80
SAA1250	£3.80	STR450	£6.80	TDA1940	£3.20	TDA2780	£3.50	TDA4502A	£13.50
SAA1251	£6.80	STR451	£5.80	TDA1950	£3.50	TDA3190	£4.20	TDA4503	£5.80
SAA3027	£5.80	STR4090A	£8.80	TDA2150	£3.20	TDA3300	£6.80	TDA4505	£6.80
SAA5000	£2.80	STR4090S	£10.50	TDA2270	£2.80	TDA3301	£6.80	TDA4600	£2.80
SAA5010	£5.80	STR4211	£6.80	TDA2510	£6.80	TDA3330	£3.50	TDA4601	£2.80
SAA5012	£5.80	STR50103	£8.80	TDA2522	£3.80	TDA3500	£6.80	TDA4610	£6.80
SAA5020	£5.80	STR54041	£6.80	TDA2548	£5.80	TDA3510	£9.80	TDA5510	£5.80
SAA5030	£5.80	STR6020	£5.80	TDA2576A	£3.80	TDA3540	£2.50	TDA8180	£6.80
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SAF1039	£2.20	TCA270	£1.80	TDA2581	£2.20	TDA3565	£3.80	TEA1009	£2.20
SL470/471	£2.80	TCA800	£5.30	TDA2582	£2.80	TDA3566	£5.80	TEA1014	£3.50
SL486	£3.20	TDA1035T	£2.40	TDA2593	£2.80	TDA3571	£4.80	TEA2018A	£2.20
SL490	£2.80	TDA1037	£1.90	TDA2594	£3.80	TDA3576	£5.80		
SL1430	£1.80	TDA1044	£2.90			TDA3650	£5.80		

IC p.p 50p

VARICAP TUNERS: Grundig 8630 series **£5.00** p.p. £1.00. U321, U322/ U341/NSF204, ELC1043 (equiv), SC4, VHF NSF203 **£7.80** p.p. £1.80. UHF/VHF UV411 **£10.80**, U343 **£10.80** p.p. £1.00.

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FERG., HMV, MARCONI, ULTRA 1590, 1591, 1612, 1613, 1712	**£4.80**	**DECCA** 100, 80	**£8.80**
FERGUSON 3787 (Normende)	**£9.80**	**FIDELITY** ZX2000, 3000 (Not 22″)	**£15.50**
THORN 1600, 1615, 1690, 1691, 1790	**£9.00**	**GEC** 2110 series	**£10.60**
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Interference Problems

Roger Bunney

Those who are interested in DX-TV reception, involving elusive signals that are often at noise level, are all too aware of the problem of r.f. interference. As more and more equipment capable of producing interference is installed the problem has got steadily worse. Many notch, bandstop and bandpass filters have been described in these pages over the years, along with various electrical interference suppression circuits. I recall that we even published a long constructional article on an active phasing system to clear up co-channel interference, making possible a 45dB improvement in the wanted signal.

Perhaps I have been unluckier than most enthusiasts. Living at a town centre location adjacent to a brewery distribution depot, I've experienced the full range of possibilities including interference from industrial and domestic computer installations, fork-lift trucks, heating systems, water pumps, modern digital telephones, cordless phones, baby alarms, CB equipment, overheating electric shaver wall outlet isolating transformers, medical equipment, thermostats and 50MHz amateur radio equipment, not to mention research communications within Band I at Plessey Roke Manor and also occasional Band I activity at Middle Wallop airfield (army helicopter base). Some of these problems were sorted out easily. Others proved more difficult, and on at least one occasion legal pressure was required to reduce VDU radiation.

Interference is of course best sorted out at the originating source, before it starts to radiate. We often find however that the source of the problem cannot be traced, or that the owners of the offending equipment are less than helpful. This means that we have to resort to remedial action at the receiving site, something that's far less effective.

A contact recently told me how he'd successfully managed to suppress interference from a toublesome computer system at home. Since this is a common problem, due to poorly constructed/designed computer equipment, I sought further information and in due course ended up at AKD, Unit 5, Parsons Green Estate, Boulton Road, Stevenage, Herts SG1 4QG (telephone 0438 351 71). I'd been unaware of their extensive range of aerial filter systems, covering from Band I through to the u.h.f. bands, and their helpful leaflets on interference location and suppression.

Of particular interest are their clamp-on r.f. chokes (see Fig. 1) which can be used with computer wiring systems amongst other things. Fig. 2 shows suggested suppression points in a computer system. These chokes provide a considerable improvement. They consist of rectangular-limbed U cores around which the cables to and from the offending hardware can be wound, thus providing a high impedance to r.f. current flow in the cable harness. In most cable harnesses that radiate interference – the cables concerned are those that interconnect the various user items, i.e. the keyboard, VDU, disc drive, printer etc. – the current flow tends to be one way. An unbalanced current of this type doesn't cancel and consequently radiates easily. Peak switching currents, which are common with computer displays and associated hardware, can be transmitted over a wide r.f. spectrum – and over wide distances.

Ferrite cores have traditionally been used to provide such filtering. When correctly used they are very effective. Adding them to an existing installation can be a problem however as this involves the removal of plugs etc. so that the harness can be threaded around the core. ADK's chokes overcome this problem since the cables can be wound round the U section or sections while they are still connected to the equipment, with the plugs attached. Once the required number of turns has been completed, the bridging U-section return is clamped on. Simple and efficient. The filters can be used with all computer equipment, mains leads, audio wiring, industrial control and related test equipment, feeds to domestic kitchen equipment (washers, fridges, etc.) – in fact wherever a connecting cable could cause radiation. Attenuation figures exceeding 20dB can be achieved. Fig. 3 shows some possible applications.

Depending on the application, a single ferrite toroid with several turns or several toroids with larger turns may be better. Extended r.f. filtering, especially with

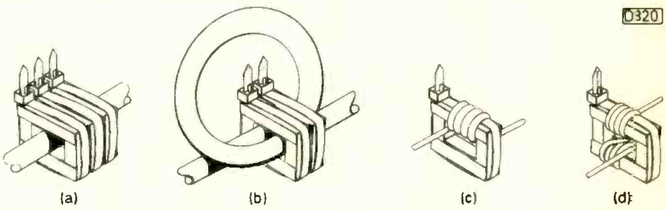


Fig. 1: Clamp-on r.f. chokes available from AKD. (a) A number of ferrite pairs can be assembled over a round cable of up to 9·9mm diameter or in a u-folded ribbon cable of up to 45mm width: the clamps can be joined together with the double-sided adhesive pads supplied. (b) With cables that are flexible but of such size that only a few turns can be encircled additional clamps can be used to obtain the required inductance. (c) With smaller cables an adequate single-layer multiturn winding can be obtained with a single clamp choke. (d) For wider bandwidth with cables of 4mm diameter or less use this low-capacitance "supertoroid" winding arrangement.

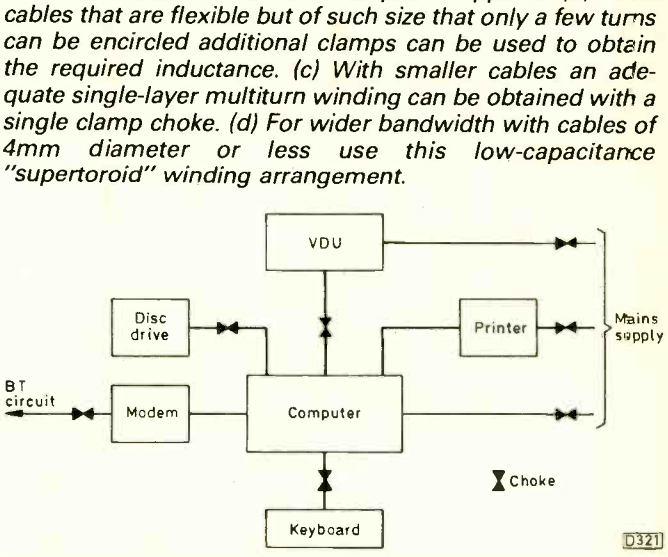


Fig. 2: Suggested suppression choke positions in a computer system. It's not often feasible to fit a choke to the keyboard link but this can be helpful.

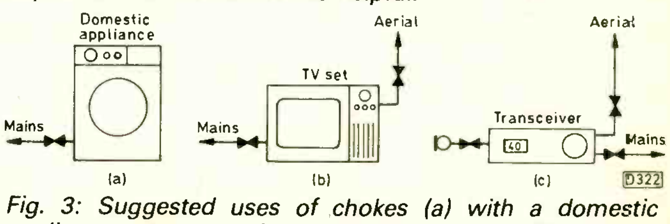


Fig. 3: Suggested uses of chokes (a) with a domestic appliance, e.g. a washing machine, (b) with a TV receiver and (c) with a CB/amateur transceiver or taxi/PMR base.

thin cable, can be achieved by using double winding on a toroid. The AKD literature provides guidance on use. The company has a large range of filtering equipment at reasonable prices for the telecommunications industry, radio/TV applications and the amateur radio field. Aerial Techniques (11 Kent Road, Parkstone, Poole, Dorset BH12 2EH) act as a retail outlet, but queries on the range, uses etc. should be sent to AKD direct (see address earlier). Enclose a stamped, addressed envelope.

Pat Hawker's Technical Topics column in the August 1988 issue of the RSGB's publication *Radio Communication* provided information on interference from British Telecom telephone units. I recall some years ago an Ambassador phone that radiated interference over several hundred yards, at a frequency within the two-metre amateur band. It seems that the problem was caused by lengths of stripline on the phone's internal PCB. Later models didn't have the problem.

We are always interested in any interference problems. Let us know of any interference difficulties you may encounter, and particularly of any techniques you may have used to provide successful suppression so that we can pass these on for the benefit of others.

CD Player Casebook

Reports from Mike Leach, Ian Bowden, Alfred Damp and Nick Beer

Technics SL-P350

This machine came to us from another dealer, the symptom being no play. The display came up at switch on but the disc didn't rotate. Checks around the power supply showed that everything was in order here.

On removing the main PCB it was evident that several chips had already been changed. IC301 (84 pins) which controls the EFM decoding, error correction and turntable servo, IC401 (64 pins) the system control microcomputer and various others had been replaced, with the odd blob of solder here and there chucked in for good measure.

After cleaning up the PCB I resoldered several of IC301's pins that were obviously shorting across to one another. The fault symptom remained the same however, no turntable rotation. The question was do we carry on or send it back? As the boss (who controls the pennies) wasn't around at the time I decided to carry on.

Considering the nature of the problem, I got to the bottom of it rather quickly. With the "no light, no spin" rule of thumb in the back of my mind I checked the laser emission with a power meter. There was laser emission and plenty of it. When checking with a laser power meter you usually get about five-seven seconds of light during which to make checks before the system control shuts the laser off because focus hasn't been achieved. I got about five minutes of light emission – it wouldn't shut down!

Checks were next made around the auto power control circuit and the associated AN8370S optical servo chip IC101. Nothing here made any sense at all, the d.c. voltages being way out. A new chip was ordered therefore. When this was fitted the problem had been cured and the machine ran up, but with distorted sound. This problem was due to more poor connections around IC301. This time I resoldered it fully, after which the machine performed perfectly. **M.L.**

JVC XLE300

Intermittent track skipping and TOC reading with this new machine turned out to be due to a faulty laser assembly. A new one was supplied free of charge by JVC. **M.L.**

Technics SL-P10

A customer brought in this big, heavy early machine and wanted it repaired for under £30. Our receptionist gave a little cough when the customer said this and duly noted the details. Intermittent play was the reported fault: sometimes the disc wouldn't rotate.

On test we found that the machine played fine for a short while but when another disc was inserted the turntable wouldn't rotate at all. A quick examination revealed a tight spot in the turntable motor. Out came the manual to obtain the part number for a replacement turntable motor. It seems however that you have to order the complete assembly with laser! We had to advise the customer that he could buy a new machine for less than the cost of repairing his old one. **M.L.**

Denon DCD300

This machine came in for a new loading belt to cure no TOC readout. A belt was fitted, the lens was cleaned and the machine was returned to the customer.

Two weeks later it was back again for skipping and jumping. This time we got the book of words out and set it up. Much better we thought – even played our much abused and scratched Philips 5A test disc. We ran it for a day or two then once more returned it.

A few weeks later it was back again, still skipping and jumping. A look at the r.f. waveform suggested that something was fundamentally wrong. The waveform was very poor and distorted and this time the machine wouldn't set up. We installed the laser assembly from a scrap machine we keep in the workshop for spares. This laser produced excellent results and after setting the machine up again the r.f. waveform display was perfect.

All we've got to do now is to explain to the customer that it didn't just need a loading belt, it also needed a new laser assembly. Are there any good PR men out there?! **M.L.**

Marantz CD45

The complaint with this Philips-based machine was intermittent failure to play. When it did play everything was fine, but occasionally at TOC readout a scraping noise could be heard from within the machine and noughts would appear on the screen.

When I first had this fault on one of these machines some months ago the fault-finding was a bit laborious. The problem is usually caused by a faulty laser assembly however. Changing it cured the trouble in this particular machine.

Philips usually supply the complete unit for around £40 plus VAT, including the laser and servo board. When you've accumulated a few old ones you can interchange boards and lasers to establish where the fault lies, which in the long run is cost saving since you can use one unit to repair two machines! **M.L.**

Pioneer PD-X99

Intermittent failure to play was the complaint with this machine – it wasn't confined to specific discs. With the top cover removed you could see that the optical assembly hunted at TOC readout. The machine would then go into the stop mode. This is a multiplay machine: it's easy to service the mechanical section of the optical unit as this is on the top of the deck assembly rather than underneath as with a conventional machine. When the optical unit was removed a slight film was visible on the lens. After cleaning this then relubricating the worm gear the intermittent operation was cured. **M.L.**

Philips FCD463 Midi System

When either the stop or the open/close button was pressed the CD player section of this midi system would spin the disc at a phenomenally high speed, with no brake action. Dry-joints were evident on the servo control chip, which in this machine is on the decoder/power supply panel. Careful resoldering in this area restored normal results. **M.L.**

Sharp DX450

The fault report with this popular machine was "no display". Sure enough the player didn't read the TOC, hence no display. With the top cover removed you could see that the disc didn't rotate.

There are many causes of this type of fault, i.e. no laser light, no focus, a faulty power supply or turntable motor or, something that's very common, a faulty microswitch indicating "disc loaded" to the microcomputer. In many machines fitting a new loading belt provides a simple cure. This case was different however. With the disc removed we found that the laser assembly was half way along its track, not close to the turntable for TOC reading. When we stripped the mechanism down we found that the slider motor had seized solid. A tiny drop of oil was applied to the top bearing and worked in. This restored normal operation. **M.L.**

B and O CDX

When a disc was inserted and the lid was closed the disc could be seen just to start to spin then stop, the display showing the ? figure. On examination we saw that the radial arm didn't swing to the centre of the disc to try to read the table of contents. The cause was loss of drive to the motor. The reason for this was evident when we looked at the servo PCB: there was a dry-joint on a through-the-board earthing link, a problem these units suffer from on the decoding board. When this particular link goes open-circuit the earth connection for the radial motor driver operational amplifier chip is lost. As you can see from the relevant bit of circuit (Fig. 1), the i.c.'s output pin is earthed, the two supply connections being used as the outputs to drive the push-pull output transistors. Remove the solder from the hole and insert a single strand of wire through it. Bend the wire over at each end and solder to the print on both sides. **I.B.**

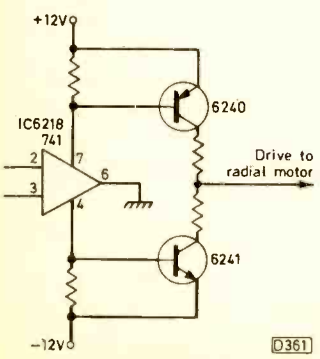
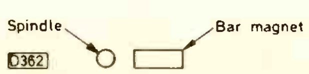


Fig. 1 (left): Radial motor drive circuit used in the B and O CDX player.

Fig. 2 (below): Adding a small magnet in the Pioneer PD-X303 to assist with playability problems.



Sony D-10 Discman

The problem was no results when the a.c. adaptor was being used, also the batteries wouldn't charge. We found that R445, a chip resistor, had increased in value from 2·2Ω to 60Ω. **A.D.**

Pioneer PD-X303

Playability problems, the machine being very sensitive to mechanical vibration, especially on the clamper arm, are the subject of a Pioneer modification/improvement. The first step to take is to add two strips of felt rubber (part numbers PEB-336 and PNM-054, large and small respectively) to the clamper arm. The second and far more effective step is to add a small magnet (PMF1001) as shown in Fig. 2. Note that the diagram on the modification sheet is incorrect – with the centre of the magnet alongside the motor's spindle the magnet would be ineffective. Another recommended step is to fit modified rubber floats to the mechanism, part numbers PEB-320 and PEB-321. You'll often find that the rubber strips have been added in production. **N.B.**

B and O CDX

The following faults have occurred with several of these machines. A completely dead unit is usually caused by the ICP on the mains input panel being open-circuit. It's a 200mA Wickman fuse, part number 6600061.

For intermittent or permanent loss of one or both channels, suspect breaks in the output lead, usually around the exit from the cabinet. **N.B.**

Pioneer PD7050

There seemed to be no display with this stock machine, though on close examination you could see slight illumination at the bottom right-hand corner of the digitron. The cause of the trouble was absence of the −25V supply. We found that Q18 (2SA1048) and D12 (a 5·1V zener diode) were short-circuit (3-5Ω) all ways round.

A point worth remembering with these machines is that if you reassemble the mechanism and find that the tray won't close when the disc clamp is fitted it's likely that ball bearing 04 in the hole in the metal rack at the rear left-hand side of the tray, underneath, has dropped out.

Another weak area is the soldering of the output phone sockets, while if these are handled heavily the print can break. **N.B.**

Simple Colour Pattern Generator

Malcolm Burrell

The colour-bar generators advertised in *Television* represent excellent value for money. Nevertheless the need arose for a low-cost unit that could be quickly constructed on a breadboard. The design presented here is no substitute for a professionally produced and field proven one, while the method of construction is more likely to give rise to problems. The unit produces very good results however, is relatively cheap and is an ideal basis for experimenting.

Optimum use is made of cheap TTL gates – a sort of electronic Lego. There's plenty of scope for variation in this part of the design. Two more specialised chips, the ZNA234 sync pulse/pattern generator and TEA1002 PAL colour encoder and video summer, are used. Both are available from Grandata.

The circuit shown (Fig. 1) provides the following: a red raster; a crosshatch pattern; colour bars; a blank black raster; and sound. Two additional switches provide selection of 75 per cent (IBA) or 95 per cent (BBC) colour saturation and colour on/off. These two switches operate with all patterns. Colour on/off is determined by the presence or absence of the colour burst gate pulse.

The heart of the pattern generator is a 10MHz crystal oscillator formed from two not gates (G1 and G2). Its output pulses are fed to a simple divide-by-four circuit, using a 74LS74 chip, whose 2·5MHz output pulses are used to trigger the ZNA234 interlaced sync generator chip IC3. This chip also has facilities to provide crosshatch and dot outputs – the latter is not used in this particular design.

The 2·5MHz pulses are also fed to IC4 (74LS393) which contains two independent divide-by-sixteen counters. These are connected in cascade. The outputs at pins 9, 10 and 11 correspond to inverted green, red and blue bars which, if used, would result in a "reversed" colour-bar pattern in order of increasing luminance from left to right on the screen. To preserve the normal convention, these outputs are fed via not gates to the three-input and gates G3, G4 and G5. These provide outputs only when Sla is in the colour-bar position.

The counters in IC4 are reset by inverted mixed sync and inverted mixed blanking inputs from the ZNA234 chip (inversion is carried out by the two gates in the feeds to pins 2 and 12 – note the use of a spare nand gate

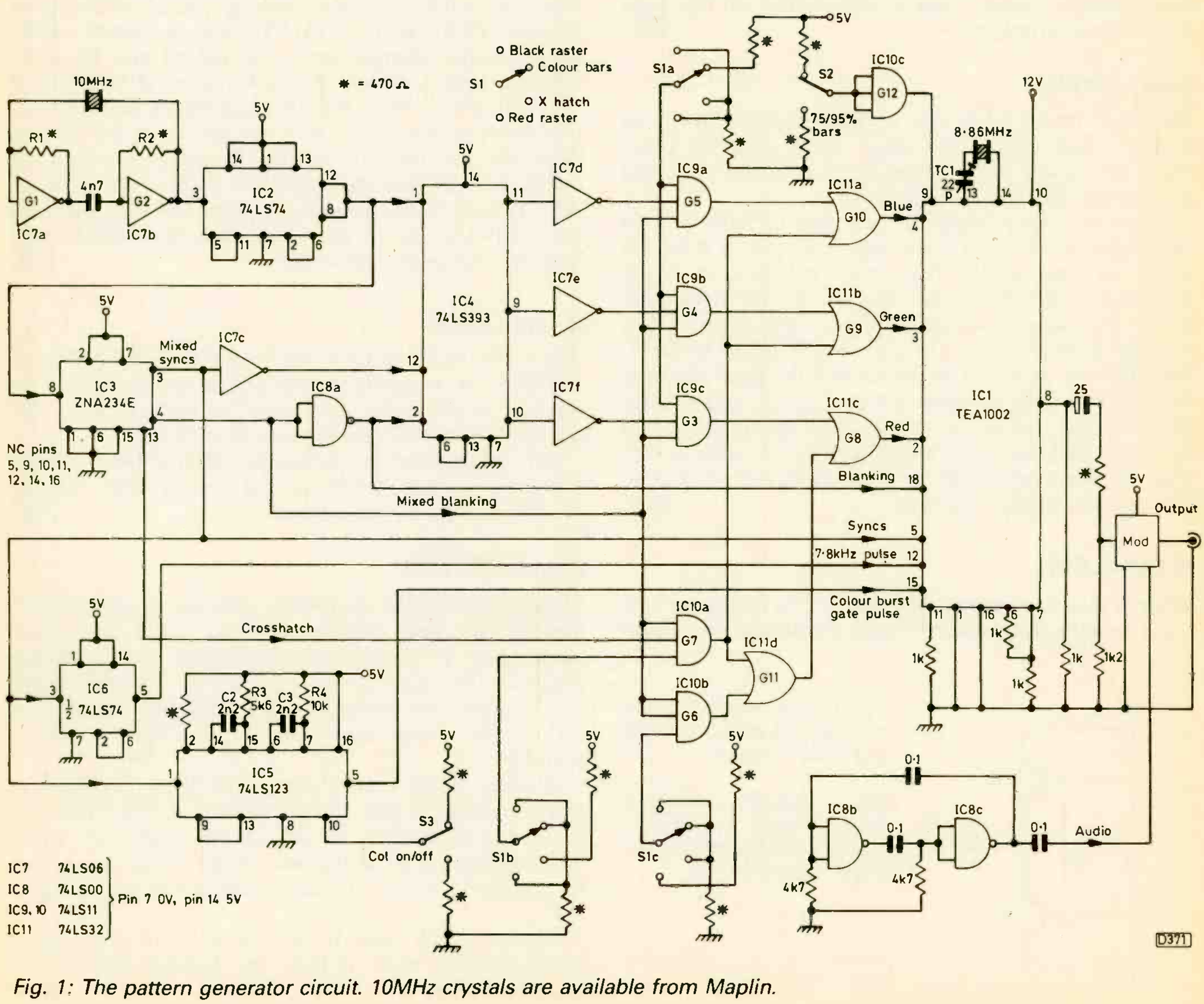


Fig. 1: The pattern generator circuit. 10MHz crystals are available from Maplin.

with the inputs strapped together). IC3's blanking output is also fed to gates G6 and G7. G6 is connected to Slc so that with a positive input a red raster is obtained. Slb is similarly arranged to gate G7 to obtain a blanked crosshatch. If preferred, the dot pattern from pin 12 of the ZNA234 chip could be connected to G7 instead.

The outputs from the gates so far mentioned are combined in the four or gates G8-G11 which consist of a single 74LS32 chip. Note that the fourth position of all sections of the rotary switch Sl is connected to chassis to produce a black-level raster.

The TEA1002 provides accurate colour rendition. It carries out all the processing/encoding required, with TTL inputs. It must have a stable 12V supply. Mixed sync, inverted blanking, 7·8kHz (PAL switching) and burst gate pulse inputs are required. The colour subcarrier is obtained from an internal 8·86MHz oscillator.

This chip has been used in its simplest configuration since the optional chroma bandpass limiting (pin 11) is not required. Pin 9 can be used to select either 75 per cent or 95 per cent saturation: this is accomplished by S2 and G12. Almost any gate could be used here or alternatively pin 9 can be earthed to give 75 per cent bars.

The burst gate pulse input is obtained from the 74LS123 dual-monostable IC5. R3 and C2 set the position of the pulse within the back porch period while R4 and C3 determine the pulse width. S3 enables the burst gate pulse output to be disabled by earthing pin 10 of IC5, thus removing the colour.

The 7·8kHz pulses required to trigger the PAL switch in the TEA1002 chip are obtained from half a 74LS74 dual D-type flip-flop (IC6) which is triggered by the mixed sync output from pin 3 of the ZNA234 chip.

A UM1286 u.h.f. modulator was used since this is available cheaply from several sources including Sendz Components. Its Ch. 36 output includes a 6MHz sound carrier which is modulated by a simple multivibrator circuit consisting of two nand gates (IC8b/c). The tone obtained is rather coarse since the signal is an imperfect squarewave but is adequate.

The unit requires a stable 12V supply for the TEA1002 chip and a 5V supply for the rest of the circuit. Decoupling capacitors (0·1μF) should be connected across the supply pins of the 74LS393 and TEA1002 chips. Also provide a decoupler at the modulator's supply input to remove any stray pickup.

Battery operation is not recommended since the consumption lies in the region of 250mA – the TEA1002 and ZNA234 chips are both quite "busy" and thirsty.

Testing

An oscilloscope used to monitor the output of the TEA1002 chip shows a very satisfactory waveform. It's interesting to note the changes when the input to pin 9 is altered. Treat the chip with some respect: it's not indestructible, and can partially fail giving symptoms such as no colour, loss of colour sync, poor sync – or simply no output – if abused by the over-enthusiastic experimenter. If a video output is required it's essential to use an emitter-follower buffer stage.

The only adjustment needed is to the 8·86MHz oscillator trimmer TC1. Feed the output to a good receiver via an attenuator and adjust TC1 for locked colour.

The UM1286 modulator and 8·86MHz crystal are available from Sendz Components.

TV Fault Finding

Reports from Philip Blundell, Eng. Tech., Ian Bowden, Stephen Leatherbarrow, Nick Beer, Hugh MacMullen, J.L. Howard, M.J. Austin and Mike Adye

Salora H and J Chassis

One of each type of set was brought in with the same fault. They were both dead, but with symptoms we'd not come across before. When the sets were switched on you could hear a very faint whistle from the start-up circuit. We found that the 28V supply (at RB554) was at only about 3-4V. This suggested that the fault was on the primary side of the Ipsalo circuit, since even with a short-circuit across the 28V supply you should expect to hear a loud whine from the combi-transformer due to the action of the start-up circuit. When we set about checking the components in the primary circuit we noticed a small black mark on the lower side of the transformer's primary winding. On removing the transformer we discovered that several turns on the winding had shorted together: the winding's d.c. resistance was about 1·3Ω instead of 3Ω. New transformers in both sets restored normal operation. **I.B.**

Philips K40 Chassis

This is a cautionary tale about jumping to conclusions. The fault report on the note said no sound or vision, but of course the set worked fine and the soak bench was full. A quick look around for dry-joints seemed to be an appropriate course of action and sure enough one was found on L5157. It would have removed the line drive. After resoldering it I was just giving the set a final test when luckily the phone rang. When I returned the line oscillator had stopped – the TDA3576B chip was faulty. Saved by the bell you might say! Needless to say after that the set was given a full eight hour test before being booked out. **P.B.**

Philips 2A Chassis

The problem with this set was intermittent loss of raster. When the fault occurred the voltage at pin 7 of the TDA3561 colour decoder chip (contrast control voltage) fell to 0V and a 60V peak-peak signal appeared at R3493. C2496 at the earthy end of the e.h.t. supply was going open-circuit intermittently. **P.B.**

Ferguson TX10 Chassis

For intermittent no raster or a dark picture, check the first anode preset control. In the case I had the slider was arcing to the ground pin. **P.B.**

Grundig CUC2401 Chassis

Early versions of this chassis used a BU508D line output transistor without the internal resistor between its base and emitter – many replacement BU508Ds do have this resistor. To use a transistor with the internal resistor the following changes have to be made to the base circuit: change R521 from 100Ω to 82Ω; add a BZX85C5V6 zener diode across R521, with its cathode to pin 1 of the TDA8140 chip; and finally change R523 from 0·15Ω to 0·12Ω.

If the BU508D is getting much too hot, check with a scope that it's being driven at line rate. According to the nice man at Grundig, when the TDA8140 line drive processor chip fails it can sometimes decide to drive the BU508D at twice the line rate – not something one would normally expect!

For intermittent no sound or picture with this range of sets, suspect the set-e.h.t. control, especially if it's made by Preh. **P.B.**

Philips NC3-CR Chassis

When this set was switched on the line timebase made a motorboating noise for the first few seconds then a green raster appeared. On removing the back I noticed that C2483 was dry-jointed, but resoldering it had no effect. With this capacitor out of circuit the voltage had risen, damaging the 78M05 5V regulator which was giving out 6·8V. A new regulator brought the voltage back to normal and cured the other problems as well. **P.B.**

Panasonic U4 Chassis

Intermittent tuning problems, with loss of the tuning voltage and/or no search, were traced to the SAB3035 chip. I've had dry-joints cause this problem with both these and certain Zanussi colour sets. **S.L.**

Astron/Etron EC142

We found that the line output transistor in this dead colour portable was short-circuit. After replacing it we powered the set via a variac. This revealed that there was no power supply regulation – the 112V supply rose in sympathy with the input voltage. Obvious really: the chopper transistor was short-circuit, but using the variac had enabled us to save the cost of another BU208A. We fitted a new BU326A chopper transistor and again wound the input up slowly. There was still no regulation as the 22kΩ resistor in series with the set-h.t. potentiometer was open-circuit. **S.L.**

Matsui 21in Model

This set was rather poorly. The 4AT mains fuse had blown, the STR58041 power supply chip was short-circuit, its 5·6Ω, 5W feed resistor was open-circuit and a nearby 0·47Ω, 1W resistor was also open-circuit. Thankfully the set worked after replacing these items, as we'd no manual.

As a postscript, I must add that the many STR/STK type power supply/audio output chips have not distinguished themselves with respect to reliability. **S.L.**

Philips K35 Chassis

The trouble with this set was slow warm up: for the first five-ten minutes the picture was dark, with a restricted brightness control range. Checks at the relevant colour decoder chip pins showed that there were normal variations as the plus and minus buttons were operated. A scope check then showed that during the fault condition the video drive was very low: as the set warmed up, the drive increased. Thermal cycling of components brought us to C583 (4·7μF, 250V) which decouples the 115V supply to the RGB output stages.

S.L.

B and O 5102 (77XX Series)

The report with this set said that there was intermittent negative vision. It would have been more appropriate to say that intermittently there was a good picture. Not dry-joints on the i.f. board edge connector this time, a common problem with these sets. There were dry-joints on every earthing lug inside the vision detector can. **N.B.**

Sanyo CTP6144

This is not a set I know well – we sold very few of them. Due to illness however all sorts of people were making field calls and all manner of gear was coming into the service department. The report on the card said something about the channel indicator flashing 88 or 99, and the engineer had added that the raster became pear shaped. The vital piece of missing information was that the set went off, the reported symptoms being ancillary ones. The cause of the trouble was evident as soon as the back had been removed and the set had been upended – there were dry-joints on all pins of the chopper transformer T301. **N.B.**

Grundig GSC100 Chassis

This 14in. set persistently blew the mains fuse for no apparent reason. It was a difficult one to prove: we never found any signs of an h.t. short-circuit to cause the fuse blowing. On a damp day however I saw the e.h.t. from the cap connector jump across to the degaussing coil. So this was the cause of the persistent failure of the 3·15AT fuse! **H.MacM.**

Sanyo CTP6143

The problem with this set was intermittent shut down about ten minutes after switch on. This turned out to be an easy one: there was arcing from the focus spark gap to link J105 immediately beneath it. Examination of the c.r.t. base panel revealed that it had been damaged at some stage by over-zealous use of a soldering iron. A replacement panel provided a complete cure. **J.L.H.**

Nikkai Baby 10

Loss of power with a Nikkai Baby 10 was traced to failure of the protection components F402 and D402. The cause had of course been reversed connections to the battery. Make sure that the user understands the importance of correct connection when you get this sort of thing. **J.L.H.**

Rank T22 Chassis

This was an unusual fault to say the least. As described by the customer, the fault was as follows. While he was watching ITV the sound for no apparent reason died, to be followed by the BBC-1 sound although the ITV picture was still present. This was followed by various noises, all of which sounded very unpleasant, then finally the picture disappeared.

I'm not sure whether a c.r.t. flashover was the cause, but there was certainly some damage. The c.r.t.'s heater supply was missing, and as the feed resistor on the tube base was o.k. we had to replace the line output transformer. The result was distorted sound but no e.h.t. A check at the collector of the line output transistor produced a reading of 5V, so the transistor was removed and checked with the Avo. It was partially short-circuit, from base-to-emitter, the reading being 80Ω. After fitting a new transistor we had a set that tripped. To cut a long story short, the new transistor was also found to be short-circuit though it gave the same readings on an Avo 8 as a known good one. Whatever next! Following this the whole set had to be retuned and set up. **M.J.A.**

Ferguson TX10 Chassis

This set bounced back on us after only a short time and severely upset our early morning coffee and toast break while watching the delights of Anne Diamond and taking a look at the latest porno mag left by our friendly newsagent . . . As usual it was a different fault, though along the same lines as the original one – dry-joints on pins 11 and 18 of the chopper/e.h.t. transformer had been speedily dealt with on the previous Saturday morning. On this occasion however the sound and e.h.t. disappeared intermittently, along with the tuning, producing the usual rushing noise from the loudspeaker.

This time a hot soldering iron and plenty of solder on the joints of the transformer failed miserably and every attempt to provoke the fault also failed. So we hitched an elderly Avo Minor to R666, which provides the 12V feed to the RGB output stages, while attending to other jobs. Shortly afterwards someone came in and breathed on the set and the Avo's needle dropped. I leapt over with another meter to check the supply at source (pin 2 of IC621) and the picture and sound re-appeared.

No fault could be found once normal operation had returned and the set continued to work happily all afternoon. I began to suspect the 22V supply to IC621 and for want of anything better to do monitored this with the original meter. Shortly afterwards success! The picture and sound disappeared but the 22V supply remained intact. The joints around IC621 were then very carefully checked. Using a large magnifying glass I discovered a tiny hairline crack in the solder around pin 2. Once this connection had been stripped down, scraped and resoldered no further trouble was experienced.

Incidentally we've found that for occasional repeated failure of the BU208B line output transistor TR831 the use of mica washers back-to-back provides a solution, assuming that no other cause for the demise of this transistor can be found. **M.A.**

Cathay CTV3000

No results with no bias at the base of Q501 was traced to R504 (150kΩ) which was open-circuit. We weren't out of the woods yet however since the set would intermittently shut down and refuse to operate. It belongs to the friendly greengrocer next door and as we always do well there we made a determined effort. After a thorough search we found a crack in the track from D301 to the line output transformer. A nice piece of tinned wire put things right and we had additional celery that weekend. **M.A.**

Test Report: Topward Oscilloscopes

Eugene Trundle

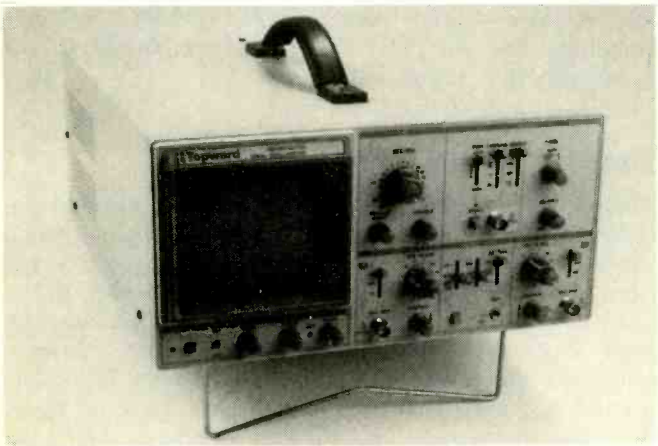
The market for service oscilloscopes is very competitive. Topward, a Taiwanese company, is one of the half dozen leading manufacturers in this field. It has a range of keenly priced instruments whose particularly intriguing feature is a triple-trace system. I selected a couple of bench-type oscilloscopes for review and had them on the bench in everyday service for three months.

Most of the tests were done on Model 7042, a 40MHz triple-trace instrument with 5mV basic sensitivity, a 10 × 8cm screen, a 12kV PDA tube, a delayed timebase and an X-Y facility. It doesn't have the component tester or d.c. output facilities provided by Hameg and Crotech machines, but offers every modern servicing facility as an oscilloscope, with an attractive price.

Y Amplifiers

I'll start with the Y amplifiers. At 42MHz they were 3dB down, which is better than the specification. The gain was within two per cent on most of the attenuator settings, and looking at a squarewave I saw no nasty habits or response inequalities between gain steps. The front panel calibration output waveform at 1kHz/500mV is useful for probe trimmer setting and gain checking. At the rear of the machine there's a Y output socket (BNC) offering a 50mV/div buffered signal from the Y1 channel. This is useful for driving a frequency counter or similar instrument.

The Y1 and Y2 amplifiers have a large output capability and can produce an undistorted drive waveform well in excess of full screen height. The maximum sensitivity at full bandwidth is 5mV/cm, expandable to 1mV/cm at the expense of half the bandwidth. This is similar to the Hameg range. I find that the loss of h.f. response at high gain is not usually a handicap, though I would like to see 1 or 2mV basic sensitivity in a scope. At the other end of the scale the lowest Y gain control setting gives you 5V/cm, corresponding (with a 10:1 probe in use) to 50V/cm and a maximum input signal (full screen deflection) of 400V peak-to-peak. This is more than adequate for audio and VCR servicing, but is rather restrictive when dealing with the line output stages in TV sets and monitors, where peak voltages in excess of 400V are regularly encountered – and need to be measured! There are solutions. You can use a 100:1 probe, which is inconvenient, or turn back the vernier gain control from its click-stop CAL position, though this loss of calibration leaves you guessing about the amplitude of the waveform you're measuring. Other scopes have greater headroom in the Y department: the Hameg types stop at 20V/cm, the Crotech ones at 10V/cm.



The Topward 20MHz Model 7021, available from Maplin.

There's no delay line in the Y amplifier department, so it's not possible to display a sweep-trigger event. This is seldom needed in everyday servicing however, and its absence helps keep the cost of the instrument down.

What about that third trace? It doesn't have a full-blown Y amplifier like the two main vertical deflection channels. Ch. 3 signals enter via the EXT SYNC socket (BNC) on the front panel and pass through a relatively narrowband channel with two fixed-gain settings (100mV/div and 500mV/div). Ch. 3 is brought into operation by a front panel mounted pushbutton, its screen position being set by a rotary control on the rear panel. With all three traces in use the beam chops or alternates – depending on the CHOP/ALT switch setting – between all three in sequence. As with all multitrace scopes, the more traces you have in use the lesser the brightness of each of them. This is important only at high frequencies, with low duty-cycle displays and with low-voltage monoaccelerator tubes – more about this later.

I found the third trace useful mainly for checking the waveform selected for external sync: this can be done at the touch of a button. Other occasional uses were for looking at three lines of a data bus simultaneously and for monitoring three test points at the same time when soak testing equipment. This latter application can be very helpful.

Timebase

The sweep speeds range from 0·5sec/div to 200nsec/div in twenty steps, which is an adequate range for the Y bandwidth and display tube. There's a vernier control with click-stop CAL position and a times ten magnification facility which gives a maximum sweep speed of 20nsec/div at the expense of brightness. The sweep linearity is excellent.

This 40MHz model has a dual-timebase facility that enables the main sweep to be delayed by a second timebase (TIME B) in order to be able to select and magnify a portion of the trace. This is a useful feature for examining waveforms in modern equipment and works very well here. The main sweep can be delayed by a period which you can preset between 0·5msec and 200nsec per division in twelve calibrated steps, with continuous vernier control between. For presetting you switch in an intensity-modulation system to give a trace bright-up, then adjust the main sweep and delay periods to highlight the section of the waveform you wish to magnify. Selecting the delay mode then fills the screen with the segment chosen.

The bright-up was not very prominent in the review model, but winding up the B-INT preset control on the front panel made it easier to see. The delay is an analogue one, but I was very impressed with its performance. Jitter is normally a problem with these delay systems, and a cruel test is to delay a single TV line for almost a field period then examine it. Thus set up the trace was rock steady and usable even with ten times magnification. An excellent performance, very little different from that of pulse-counting delay systems which are less versatile.

Triggering

To be able to use these delaying and magnifying tricks you have to have a good trigger selection. The one incorporated here worked very well for me, rigidly locking to any selected polarity or level of the Y signal so long as the trace was more than 1cm high. The sources that can be selected are Y1, Y2, mains (LINE), external and external via a divide-by-five attenuator. Whichever trigger source is selected can be a.c. or d.c. coupled, low-pass filtered or passed through a TV sync separator stage where line or field outputs are selected according to the setting of the main sweep speed. A single knob selects the trigger level and polarity, and I found it very easy to get a grip on almost any signal being displayed, giving a stable and jitter-free display. I even managed to lock steadily to a satellite TV video waveform with inverted line sync!

There's also a hold-off control to help with triggering from complex signals and aperiodic pulse waveforms. In addition a one-shot facility is provided, with reset button and indicator.

My only criticism of this section is that the external sync BNC socket is slap bang in the middle of the control panel so that the plug and lead make seeing and operating the controls more difficult.

Display

It's in the display section that a wideband scope stands out best. It has to have a high-voltage (in this case 12kV) PDA type tube, giving a good brightness reserve and sharp focus. The Matsushita tube used in this model worked better than those fitted in any of the comparable scopes I've seen. Once set, the focus remained correct at all levels up to full brightness, where the trace was pin-sharp.

With a single TV line being displayed the trace duty cycle is 625:1. The brightness is reduced by the same factor. Even with this display the tube provided a well-focused image that was bright enough to be seen in a well-lit room. The c.r.t. has an integral graticule, so there's no parallax error. Very good. The e.h.t. regulation is also good, with no perceptible blooming throughout the brightness range.

Screen illumination is controlled by a front panel mounted fader, and this highlights the graticule. It's very difficult to do this well when the lines are printed on the inside of a c.r.t.'s screen, and this one has a rather diffused and uneven illumination.

Table 1: Abridged specification, Model 7042.

Operating modes: Ch. 1, ch. 2, dual, triple with ch. 3. Sum/difference ch. 1 ± ch. 2. X-Y operation. Alternate/chop switching.
Y amplifiers: A.C. or d.c. coupled, response d.c. to 40MHz (−3dB point). 5mV to 5V per division in 10 steps with vernier control. Five times magnification at d.c. to 20MHz. Y1 output facility. Ch. 3 100mV or 500mV per division.
Timebase: 200nsec/division to 0·5sec/division in 20 steps with vernier control and times ten magnification. Sweep delay 200nsec to 0·5msec/division.
Trigger: Auto/normal/one shot from Y1, Y2, external, line. A.C., d.c., LPF, TV sync. Polarity ±. Holdoff variable to four times.
X deflection: 5mV to 5V/division, bandwidth 2MHz at the −3dB point.
Z modulation: 3V peak-to-peak, d.c. – 5MHz.
Display: 10 × 8cm screen, 12kV e.h.t., flat face, internal graticule with screen illumination.
Power input: 115-250V, 50/60Hz, 40VA.
Accessories supplied: User's manual, mains cord.
Optional accessories: Attenuator and switched probes.
General: Weight 9kg, size 165mm high, 314mm wide, 425mm deep. Colour cream/grey. Carrying handle and foldaway prop/stand.

Summary, Model 7042

I didn't like the user manual. It covers the whole model range of seven instruments and is thus full of ifs, buts and conditionals. It doesn't include a circuit diagram, alignment instructions or parts lists, though I'm assured by the importers that they can obtain parts and will be able to carry out repairs throughout the instrument's life. A look inside was reassuring. The power supply is based on a big, cool mains transformer, and in general the standard of construction is high, with adequate switches and potentiometers (the main items that wear) and glass-fibre PCBs.

None of the criticisms made above are serious ones, and I feel that at £434·74 (attenuator probes not included) this instrument offers very good value for money. Its main competition is the Philips PM3209 at about £595 and the RS Components Model 2225 (made by Tektronix) at £750, both of which are dual-trace instruments. These figures are all exclusive of VAT.

A protective front cover is not available, so if you buy this scope for use in the field you will have to devise some form of transit protection for the very vulnerable front panel.

20MHz Model 7021

The 20MHz Model 7021 is almost identical in construction and appearance to the 40MHz instrument. It has a less busy control panel, missing out on the delayed timebase, but retains the three-trace feature and excellent triggering facilities.

This model is fitted with a Toshiba 2kV monoaccelerator type display tube, of the same size and with the same type of built-in graticule as in the 40MHz scope. As with all similar 20MHz scopes, this one lacks the brightness and sparkle of the more expensive model, and at high frequencies and with short display duty cycles it runs out of brightness very quickly. The one thing that would have helped with this, a viewing hood, is not available as an accessory.

On test I found that it performed, within its bandwidth and brightness limitations, in similar fashion to the 7042. Most of the previous remarks, good and bad, apply equally to this model. It shares the same sweep generator and thus has a wider sweep range than most comparable 20MHz types and, I'm convinced, has a better trigger performance, especially at field rate from the Y channels.

In view of this and the three-beam capability I believe that it offers, at £249·57 plus VAT, probably the best value for money to be had in this class, which includes the Hameg 2036 (with component tester) at £314, the Philips PM3208 at £349 and the RS Components 9020 (Beckman made) at £357·60.

Availability

Both models are available from Maplin Electronics, PO Box 3, Rayleigh, Essex SS16 8LR (telephone 0702 554 161). The catalogue number for the 7042 is XJ60Q, price £499·95 including VAT, while the catalogue number for the 7021 is XJ61R, price £287·49 including VAT.

My thanks to Maplin for the loan of the review models.

Letters

COMPACT DISC QUALITY

I'd like to add a few points to the current discussion on the quality of compact discs. Like S. Kearson, I'm wondering how Les Sage measured his signal-to-noise ratio? The standard method is to record a tone, say 1kHz, at maximum recording level and set up the playback measuring system to read 0dB on an a.c. voltmeter. The recording is then continued with the tone switched off and the level of noise below the 0dB reference is measured. This figure is the signal-to-noise ratio expressed in dBs. It's impossible to quote precise figures unless you have a precise measurement method, and I don't know of any compact discs, tapes or vinyl discs that include a 1kHz reference level track. There are however ways of assessing the signal-to-noise ratio, based on experience. I'll come to these in a moment.

Here are some basic figures to bear in mind. The signal-to-noise ratio with a vinyl disc is typically 40-50dB – if the disc is in pristine condition. Typical stereo separation is around 35dB, perhaps a bit better or worse depending on the pickup, its arm, the tracking weight, etc. Studio master tapes generally have a signal-to-noise ratio of around 60-70dB. This figure is 20dB better than that for a vinyl disc and some 20dB worse than that for a compact disc system. Putting it another way, the vinyl disc degrades the performance of an analogue master tape while the analogue master tape degrades the potential performance of a compact disc by about the same amount. It's thus easy to see why modern recordings, for making CDs, are generally done with a digital master tape. The signal-to-noise limits are then set by the analogue part of the system (microphones etc.) and we can get nearer to the quoted 93dB signal-to-noise ratio of the CD. Stereo separation is also 93dB of course, and this makes for a much firmer stereo image than is usually achieved with a vinyl disc.

If you want to get a feel for the sound of a 20dB signal-to-noise degradation, find a weak stereo f.m. broadcast which is hissy on mono. Then switch to stereo. The signal-to-noise ratio degradation is approximately 22dB. Expressed in these terms, it's easy to understand why we can often hear the noise from an analogue master tape when playing a CD but not when playing a vinyl disc. If you played the master tape itself, you probably wouldn't be able to tell the difference between it and a CD made from it. Thus as Brian Renforth pointed out any deterioration in an old master tape becomes quite obvious, but be assured that it's the best you can get and is purely a function of the master tape and any digital remastering techniques employed.

Before leaving the subject of CDs, I'd like to say how much I am enjoying Joe Cieszynski's series of articles. Being so lucid, they are a great source of instruction and enjoyment from which I've learnt a lot.

Finally a few words in praise of Les. I visited him on a couple of occasions over the years – the visits duly reported in Les's column – and found him and HB both charming and hospitable. I think we can all empathise with Les because he is honest about his strengths and weaknesses. Most of us have had difficult times or done daft things, but few are as open as Les in admitting to them. His honesty deserves our praise and admiration and I guess we all wish him well for the future.

Keith Cummins,
Holbury, Hampshire.

A VERY INTERMITTENT ONE

Here's an interesting case that had several engineers baffled. The set was an ITT CT600/1, a 22in. model fitted with the 80 series 90° chassis, power/deflection board CVC823P. It suffered from a very intermittent fault that had been present for about eighteen months. As the customer was a friend I decided to use the set at home – otherwise I might never have seen the fault. The symptom was line pulling or jitter: the picture moved about 1cm horizontally, two or three times a second. This sometimes lasted only briefly, at other times for a few seconds. I also noticed that sometimes only part of the picture would move horizontally, usually the top third or middle section. Most of the time the set worked perfectly, the fault not putting in an appearance for several weeks.

Use of heat and freezer would neither clear the fault nor make it occur more frequently. The line generator and sync circuitry is contained in a TDA9503 chip, IC711. Various items in this area were suspected and checked but this didn't solve the problem because, as it transpired, I was concentrating on the wrong part of the set.

To cut a long story short, one day the fault occurred for a longer period and I found that the picture was stable only when the VCR button was pressed. A careful check on the voltage at pin 9 of IC711 with the VCR switch open and closed revealed that it varied as the fault came and went. When I examined the switch I found that there was black grease on the contacts. Since cleaning the switch the set has worked for several months without any trouble.

The fault would not have occurred in the VCR mode of course, but the customer didn't have a VCR. If he had used one, tracing the cause of the fault might have been easier. One wonders how the grease got there and whether other sets could be affected in this way.

A.R. Day,
Hull, North Humberside.

SAFETY OF SATELLITE TV INSTALLATIONS

I work for a county council audio-visual unit whose main purpose is to maintain equipment installed in schools and public buildings throughout the county. We are also responsible for the safety testing of this equipment.

I was recently asked to tune a satellite TV system, used in a language laboratory, to bring in other satellites now available. As signals from the West German DBS satellite were required I had to adjust the easterly limit of this Salora system. On attempting to do this the dish began to move then jammed. The entire system shut down after this.

So it was up on to the roof to inspect the dish assembly. I found that the dish mounting was badly corroded and that the bearings had seized up, with the result that the dish had turned on the two bolts that pass through the bearings. These bolts had worked loose and the dish was being held by only a couple of threads on the bolts.

The bolts that attach the mast assembly to the mounting bocks were also corroded, and had started to eat into the stand. I've since heard of other systems where the picture is lost when a high wind blows – they obviously require attention.

I eventually managed to free the bearings by using penetrating oil and leaving it to soak for a few days. I then oiled the bearings and coated the bolt heads with a liberal amount of grease. All that remains is for the rust to be removed from the stand and for it to be repainted.

It's important to inspect these installations on a regular basis as they can become potentially dangerous very quickly. I would also like to see a safety chain attached to the stand in case the aerial blows over at any time in a high wind. I would like to hear from anyone who has come across an installation in a dangerous state. The one mentioned above was just over a year old.

Jim Fenton, 14 Faircourt,
Orchard Park Estate,
Hull, N. Humberside HU6 8BG.

IMPROVED FIELD BLANKING

Our old ITT CVC5 still gives a fine picture, but suffered from secondary emission reflections from teletext and showed wandering flyback lines when used with a VCR. Inspired by readers' success stories with the Rank A823 chassis I thought I'd try my hand at curing the problem.

The GEC pulse stretcher circuit shown in S. George's article on multivibrators in the February 1983 issue was a great help. It requires a positive input pulse and provides a positive output pulse with adjustable length. The CVC5 requires a negative-going field blanking pulse of about 170V peak-to-peak amplitude – waveform (23). I

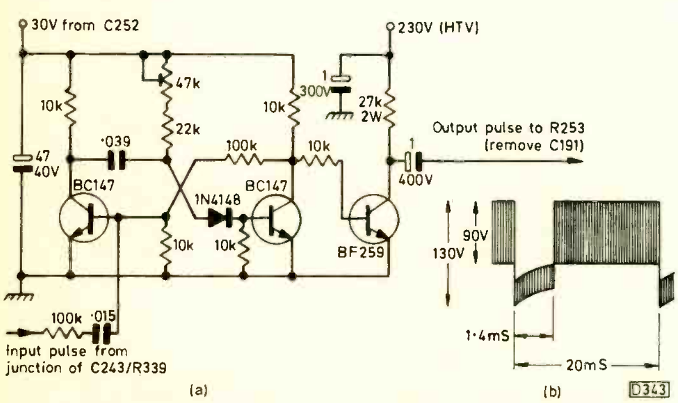


Fig. 1: Pulse stretcher circuit for use with the ITT CVC5 chassis (a), waveform at the junction of D32h/R254h (b).

found a suitable positive input pulse at the junction of R339f and C243f. Connecting this to the multivibrator input (see Fig. 1) via a 100kΩ resistor produced only a very slight disturbance that was easily corrected by means of the linearity controls. To invert the output, a BF259 transistor is used, fed from the 230V h.t. rail (V). A 2W 27kΩ collector load resistor runs almost cold. The output is taken via a 1μF, 400V capacitor to the C191h end of R253h – remove C191h as the original 170V blanking pulse in no longer required.

The circuit shown was built on a piece of Veroboard mounted, component side down so as not to foul the cabinet back, on the top left (looking from the back of the set) chassis member.

To set up the 47kΩ preset, turn it first to minimum resistance. Reduce the height so that the teletext lines are visible, then advance the setting of the 47kΩ potentiometer until all the teletext lines are blanked out. Finally readjust the height for a normal picture.

The arrangement described works very well with our set, completely eliminating all teletext and flyback lines. Although 1.4msec of blanking is sufficient, the circuit can be adjusted to give up to 2msec.

David Martin,
Bishop's Stortford, Herts.

HELP WANTED

I have been trying for some time to obtain a remote control kit for a Philips VR2020 VCR. The kit consists of a handset, a plug-in IR sensor and a power supply. So far I've had no success. Could any reader supply a new or second-hand kit?

Paul Hardy, 43 Sheridan Avenue,
Caversham, Reading, Berks. RG4 7QB.

Could anyone supply any information on the Hartley TP13A oscilloscope, such as a circuit diagram, operating instructions, etc.? Any expense involved would be paid.

L. Heald, 3 Poplar Street,
Chorley, Lancs PR7 3EN.

I have an intercom system that consists of an anodised aluminium outside unit and an internal handset. The only identifications are a logo made up of a telephone handset with the letter E between the ear and mouth-pieces and, on the back of the internal handset base, the words "URMET Made in Europe". Can anyone supply the manufacturer's name and address, a circuit diagram (the amplifiers are in the outside unit) and connection details?

S. Shaw, PO Box 1404,
Randfontein, 1760, S. Africa.

Could anyone suggest where I can obtain a pinout diagram and/or a replacement or good substitute for the UM2128-1 used in the Tatung 80 video card?

K.J. West, 3 Kennedy Drive,
Walmer, Deal, Kent CT14 7TQ.

I'm seeking information on the Sony Model 9-90UB. First either a circuit or a manual (a photocopy would do). Secondly modification details (a) for positive/negative switching (for the French system, for v.h.f. and u.h.f. retaining the a.m.) and (b) for using the Band I/III tuner with 625-line transmissions.

Mike Evans, 120 Loughton Way,
Buckhurst Hill, Essex IG9 6AR.

VCR Clinic

Reports from Philip Blundell, Eng. Tech., Eugene Trundle, Chris Plaice, Mick Dutton, Stephen Leatherbarrow and Nick Beer

Grundig VS340

When the tape was ejected there would occasionally be a loop left out of the cassette. This is usually due to a dead spot on the capstan motor, but a scope check on the motor seemed to show that this was not the case. Just then the capstan stopped. Some careful waggling of the wires showed that there was a dry-joint where the capstan motor wires are soldered to the small PCB at the back of the deck. **P.B.**

Philips VR6660

The magnets on the threading motor sometimes fall out, the result being that the deck doesn't initialise. If you can find the lost magnet, it does matter which way round it goes. You need to have the N pole pointing outside with one magnet and the S pole pointing outside with the other one. **P.B.**

Philips VR6362

One of the dealers we do work for regularly sends us repairs with no indication as to the fault. Luckily with this range of machines a look at the error memory usually gives a clue. Not this time however – the CMOS RAM battery was flat! The machine played all right but when I tried to tune in a station the picture was overlaid with diagonal black-and-white bars (like a monochrome barber's pole). A panel swap proved that the fault was on the signals panel P306. We found that the play supply switching transistor T7304 was short-circuit. **P.B.**

Philips VR6660

This machine would intermittently stop playing. If the tape deck test was called up it said that one of the tacho signals was missing – though a visual check showed that the reels, the capstan and the head drum were all rotating when the fault occurred. Scope checks revealed that the wind tacho signal was going missing. When the reel was removed you could see that the reel magnet rubbed on the Hall sensor: as the magnet wasn't glued to the reel it would stop rotating while the reel kept going. The sensor wasn't sitting correctly in its slot as a wire had been trapped underneath it. **P.B.**

Grundig VS400

I had just fitted a new mode control switch because the machine looped the tape on eject. When play was selected however noise bars ran through the picture as there was no output from the control track. A scope check showed that the control head's earth connection was floating, though the fault would clear if the chassis was disturbed. The cause of the problem was eventually traced to a poor connection at plug A3 on chassis board 1. **P.B.**

Philips VR6185

After a few minutes' use the E-E signal would fade off, leaving just snow on the screen. A scope check on the frequency divider signal at pin 13 of the tuner showed that it gradually got smaller and smaller until it reached 0·2V, when the picture went off. The U744 tuner was faulty. **P.B.**

Toshiba V55

For an intermittently dead machine – even the clock goes off – check for dry-joints at the a.c. input to the power supply module. **P.B.**

Sanyo VHR1100

If you come across a dead VCR of this type, one which will not eject a tape, perform any deck functions or respond to the remote-control handset, the likelihood is that its on/off key is stuck in. If so it will come up on "operate" (rather than standby) as soon as the machine is plugged into the mains supply. The cause is usually physical, the on/off button being stuck, jammed or gunged up. Check by removing the front cover. **E.T.**

Akai VS425

I've often found when working on the bench with these machines that the remote control operation is intermittent or doesn't work at all. This is not a fault: if the handset is too close to the machine there's no response. At normal operating distances you'll find that the outfit works perfectly.

The head drum motors in these machines can give trouble ranging from erratic speed and phase to a runaway condition in which the drum continues to whiz at high speed even when the rest of the deck has shut down in the stop mode. **E.T.**

Sharp VC486 etc

The service manuals for Sharp VCRs of this period don't give a setting up procedure for the mode switch. Though it's more reliable than the ones in Panasonic and some other makes of machine, it can fail and be in need of replacement. Don't pay attention to the notch in the rotary part. With the deck mechanics in the stop or eject mode, carefully turn the pinion (several turns if necessary) until you get a short-circuit reading between the lead-outs. Fix the switch in place in this position. **E.T.**

Ferguson 3V30/JVC HR7300 etc

The symptoms sometimes found with this range of machines are no E-E signals and no tuning signal though the r.f.-through signal is o.k. and the deck mechanics all work. In these circumstances check for a dry-joint at the always 9V regulator transistor Q101. **E.T.**

Sanyo VHR1100

We've had more than one of these VCRs with the following fault: while the clock/display works all right the machine won't switch on. Checks have shown that the power supply and the syscon microcomputer chip were doing their stuff, the cause of the problem being that the 12V switch transistor Q5006 is open-circuit. The equivalent books say that a BC328 can be used as a substitute. In practice we've found that this transistor is not man enough and recommend that the correct type is ordered and fitted. **E.T.**

Baird 8940/JVC HR7350

The complaint with this machine was that it had snapped four of the customer's tapes (will some people never learn?!). The cause was a badly fitted cassette lamp. It was so far down its holder that the sensor received no light when the leader appeared. Thus the tape got ripped out of its clip on the supply spool.

Here are a few other faults we've had with this model:
(1) Intermittent loss of playback picture was caused by the track of the noise-cancelling potentiometer R208 (470Ω) being open-circuit.
(2) No E-E sound. Q11 was open-circuit.
(3) No sound erasure. Q10 was short-circuit.
(4) No capstan motor operation. C62 and Q8 were both short-circuit.

The above component reference numbers were taken from the JVC HR7350 manual. **C.P.**

Time-saving Tip

Here's a time-saving tip, even if it seems a bit obvious. To insert those very tight self-tappers that screw into plastic, put a drop of oil on the screw first. It will then go in almost by finger pressure only. **C.P.**

Grundig VS180

This machine was dead, with just a momentary twitch of the capstan motor at switch on. The power supply is commendably simple and I soon found that D425 was short-circuit. A BY299 was used as a replacement. This made it possible to play back a tape to check the deck functions. No recording was possible however as there were no signals. The main 33V supply was missing at the relevant power supply pin, a short to chassis being recorded at this point. It was due to the 33V zener diode on the front panel. **S.L.**

Tatung TVP1311

This VCR was dead with F2 (2A) very definitely blown. As there was no obvious short-circuit we fitted a new fuse. When we switched on again the machine came to life for several seconds then the fuse once more blew. Several fuses later we found that there was a dead short across the 12V rail. This was pinned down to the servo board, then to the deck connection PCB. By further disconnection we isolated the fault to the reel sensor. When this was examined we found that a blob of solder shorted out the printed track to the metalwork. How the machine could have worked from new we were unable to see. **M.D.**

Sharp VC381

The complaint with this machine was that most functions didn't work. A quick check on the power supply showed that the 13V and 12V outputs at pins 1 and 8 were missing. When the power supply was taken apart we were able to check back through the regulators. This revealed that there was no output from the 2SD1308 14V regulator transistor Q01. I ordered a replacement and fitting this cured the problem. After a few weeks however the machine returned with the complaint that it would load but nothing else worked. This was the case and in addition the loading was very slow. A check on the power supply showed that while the 13V output was correct off load it dropped to 3V when a cassette was being loaded and the motor was running. It turned out that our new 2SD1308 transistor was faulty, though this was not obvious at the time due to the difficulty of taking measurements with the power supply apart. **M.D.**

Hitachi VT120

The customer complained that there had been intermittent problems for some time. Now none of the operation keys worked and the clock display was random. We found that there was no 5V supply at pin 32 of the timer control and operation (key scan) chip IC751. This supply follows a very devious route: we eventually found that circuit protector IC805 on the VS tuning PCB was open-circuit. **M.D.**

Philips VR6467

The complaint was no playback video. There was a healthy f.m. signal output from the head but no video output from the Y/C processing board. The f.m. signal entered the TDA3730 chip IC7351 at pin 17 but didn't reappear at pin 16 as it should have done. This was not surprising as the supply to this chip was missing. It comes via a BC238 series regulator transistor T7304 which we discovered had gone short-circuit base to collector. This was not the end of the story since there was still no output when we'd replaced this transistor. It turned out that C2329 (330μF, 16V) was also dead short. **M.D.**

Ferguson 3V57

The following note could apply to any of the machines in this range. The symptoms were not uncommon – clock alight but the machine wouldn't switch on. This is usually due to the absence of one or more of the switched supplies because of an open-circuit ICP in the power supply. In this case however the ICPs were intact, but the switched lines were missing because the power supply CRTL line at pin 9 of CN3 remained high at 3·2V. This high came from pin 1 of the syscon microcomputer.

The power switch input to pin 17 of the microcomputer chip was very low but was being earthed as the switch was pressed. The same applied to the timer input at pin 20. Separate pull-up resistors are used, so the fault had to be in the supply. In fact the unswitched 5V line was missing. It's obtained from the unswitched 12V supply via a regulator on the main panel (not the PSU). The 12V supply was present here but the regulator transistor Q602 was not being biased on as there was a 90Ω leak from its base to chassis. We found that the culprit was not the zener diode, as expected, but the parallel 0·022μF ceramic decoupler C6050. The interesting point was that the fault had been reported as intermittent some days earlier. We'd returned the machine with a "no fault found" note under the assumption that a mains lock-out had occurred, something that's not uncommon with these machines. **N.B.**

The Room at the Back

J. LeJeune

A lead-grey sky greeted Sid as he left home on his ten minute walk to work. A stiff breeze flapped the legs of his trousers and infiltrated the sleeves of his raincoat. He shivered and lengthened his stride.

Sid's bones ached by the time he reached the workshop. Inside, the old building smelt damp and the 1930s valve radio wheezed away relentlessly, 2kHz out of tune since the frequency changes introduced a few years ago. But no one seemed to mind – even if they noticed. Trade was slack and Ralph was miserable. He mooched around turning off any unwanted lights.

Norman was making something: two steel rods with tapered ends angled at 45° were taking shape. "What on earth are they?" asked Sid. "Cabinet braces" replied Norman. "One end goes in the screw hole at the top of the cabinet and the other goes in at the base. The idea is to stop those new skeletal plastic cabinets wobbling too much. They scare me the way they flex."

Gareth wandered in from the shop. "Electronic vandals struck last night" he said. "They used a remote-control handset to turn up the volume of all the TVs in the window. The row could be heard at the other end of the street!"

"They were at it the other night as well" said Sid. "We'll have to disable the remote systems." Sid went into the showroom and studied the window display. He stepped carefully around the items on show: it was a simple matter to rearrange the price cards to cover the infra-red windows of the sets affected, and in ten minutes the job was done.

Back in the workshop Sid encountered super-salesman Terry Green. He was bemoaning the lack of customers. No one seemed to want a satellite installation or a new set. They weren't even coming in for batteries. Gareth was fiddling with a microwave oven that had failed a leakage test. He was renewing the r.f. gasket on the door. "That's it!" cried Terry. "We'll offer everyone a free safety check on their household electrical goods. Check the fuses in the plugtops, for frayed cables, microwave leakage – that sort of thing! Should generate a bit of interest."

Gareth's next job was a Ferguson 51A2 – the TX100 chassis. There was absolutely no sync, neither line nor field, yet in every other way the set worked perfectly. He pored over the circuit diagram for several moments, then switched the set off and removed the TDA2578A line and field processor chip IC4. After fitting a new one and switching on again the fault was still there. "It's as though someone has shorted the set line sync pins together" he said to Norman. "Hang on!" Norman replied, "there's a capacitor across those pins, C63 – better check it." Gareth soldered a new 150pF capacitor in place and that was another problem solved.

Norman had prised the back off a 1930s valve radio. Until yesterday it had been serenading the mechanics at the Mogul Garage just down the road. Now it hummed loudly and did little else. Peering into its dusty interior, untouched for possibly more than thirty years, Norman could make out the rectifier valve. It was a full-wave type but only one half was working. The other heater had gone out. "Where do I get a UU5?" he asked. For once he was at a complete loss.

Gareth looked up from a half dismantled Fidelity ZX3000. "My mate renovates old valve radios" he said. "When he can't get a full-wave rectifier valve he fits two silicon rectifiers with series 470Ω resistors in its place."

Norman thought this a good idea and decided to try a couple of 1N4007s. He busied himself removing the UU5's base and finding the components for the modification. "Have to be careful" he muttered. "I'll get instant h.t. with no load on it. Have to make sure the electrolytics can stand it."

He stood back as he finished the job and switched the set on. After fifteen seconds it sprang to life. As good as new, except for the layer of grime and spray-drift that covered it. Better than the workshop one.

"Got that ZX3000 working yet?" he asked Gareth.

"I've replaced the TDA4600 chip and the BU426A chopper transistor and its base circuit components D9, R90 and C93" said Gareth. "It works at switch on but I'm not happy with it." At that point the set went off, with F2 flashing its destruction. The BU426A had gone short-circuit collector to base.

"Probably excessive current" said Norman. "Now as I recall R91 to pin 4 of the chip has a lot to do with it. We've had similar problems with the same resistor in Grundig and Ferguson sets."

Gareth set to with the solder pump and soon had the 270kΩ resistor between the probes of his bench Avo. "It's gone high" he announced, "will that be all?"

"R91 sets the current limit" Norman replied. "When it goes high the BU stays on too long. You'll have to replace all the other items as well."

Norman's current problem was a 20in. Ferguson TX9 set. There were all the appearances of someone having had a go and put back the leads to the c.r.t. base incorrectly. Norman checked, but they hadn't been changed. The colours were entirely wrong though – the greens were red, the reds were blue and the blues green. Purples were cyan, cyans were yellow and yellows purple. He fed in a red raster from the pattern generator. It came up green tinged with red and yellow in three corners and along the lower edge. He decided to phone the owner.

"We're puzzled by your set, Mr. Knowles. Did you drop it by any chance? . . . I see. I'm afraid it'll need a new tube. About £150." There was a long pause. "I'll see what I can do" Norman eventually said.

He went back to the TX9, switched off and began to interchange the leads, green to blue, red to green and blue to red. When he switched on there was a reasonable colour picture with micoloured patches. They said they'd try it, so Norman asked Gareth to deliver the set.

Andy was out in the rain, somewhere in the hills. A farm generator had gone crazy and seen off an old TV set that was its principal load each evening. Norman turned to a refurbishment job on a loan set that had seen better days. The chassis was willing but there was more tube trouble – the A56-120X was tired and Norman was trying to coax more life from it.

"This sort usually comes up a treat" he said to Sid, who was taking an interest. "But it refuses to budge a microamp." Sid bent over the Cathode Cruncher. "Does seem pretty lifeless" he agreed, but I can't believe the tube is all that flat. Maybe something's wrong with the booster."

Andy, rain soaked and breathing hard, muttering imprecautions about heathen hill farms, backed through the double doors and dumped the abused TV on the floor. "They'll have a new set up at Pickersgill Craggs" he told Sid. "Send them one with a wide mains input range – that generator has a will of its own!"

"Only because Arthur Longbottom insists on fiddling with it" Sid replied. "But we could do with the sale. I'll take one up later." Meanwhile he took the covers off the booster. Overheated resistors and a disintegrated capacitor greeted him. "Even the perishin' test gear needs repair in this dump" he moaned, then went on to disembowel the booster with gusto.

Norman left him to it and, while Andy turned his attention to a record turntable with a linear tracking system fault, took a look at a Ferguson SRA1 satellite TV receiver that had come in because of random remote control operation. The customer's complaint was that it had switched itself off once, gone into standby several times, and had changed channel on a couple of occasions. Not unusual with TV sets, but satellite TV receivers were still something of an unknown quantity in the workshop.

Norman took off the covers and snapped on the bench lamp. After an hour on the bench nothing had happened. "I might as well link it up and watch something" he muttered. He fetched a spare TV set from the soak bench and connected it to the SRA1, then plugged in the lead from the dish on the roof. Things soon began to happen, just as the customer said. By luck the unit sent itself into the sound mute condition. During the sudden silence a slight sizzling noise could be heard. Norman doused the bench lights to look for telltale sparks. Sure enough there were some on the underside of the board, near the IR receiver. He disconnected the unit from the mains and investigated.

The SRA1 has a three-cored mains lead and is thus earthed. The PCB is earthed to the metal case at only one point, near the IR receiver. This point was making poor contact. The arcing was due to the non-isolated aerial socket used with the TV set's isolated chassis allowing line-frequency currents to flow in sufficient quantity to cause a small spark at the indifferent earth connection. Norman felt pleased with himself.

Andy's problem turned out to be caused by a defective motor. Shortly afterwards Mr. Knowles was on the phone to thank them for their trouble and to say that the picture was splendid.

"Makes you wonder what some peoples' eyesight is like" was all that Norman could say.

What will 1990 Bring?

Les Lawry-Johns

Not a lot, I suppose. But at least we're still here. So many seem to have popped off recently. It makes you feel you're cheating by keeping going, but I suppose that there's still room for us even if we have to do without some of the things we'd become used to. As I sit here I'm crowded in by three dogs and a bird: dogs on the left, bird on the right. I don't know which is worse. The dogs keep quarrelling (quietly though) while the bird runs around her cage as though there's someone after her. Honey Bunch has gone out to do some shopping and, no doubt, gossiping. I mustn't say too much, because she'll read this before I send it in. But, good lord, don't I gossip as well?

There's not a lot to tell you about sets. That Fidelity VCR is still playing up. First there was no sound, now it buckles the tapes. However, we've still got the Sony Betamax machine, though the heads have needed cleaning several times – after a certain tape has been played I think. I clean the heads with my finger sprayed with Aero-Clene. A lazy man's way of doing it no doubt, but it seems to work. Sorry about that . . .

Some TV sets have been attended to, and that seems to be about all I've been capable of recently. A shorted diode in a Ferguson portable had blown the mains fuse, and there was a far eastern set with a faulty line output transformer. I couldn't do this one because I didn't have the transformer to fit in it. Anyway, it was only a few months old so still under guarantee.

The owner's complaint about an ITT set was that the aerial socket needed fixing because the picture and sound kept failing. I repaired the socket but the signals kept going because, as I found out after a while, of a dry-joint at the base of the tuner unit. It didn't look as though it was dry, but it responded to tapping. So I scraped it clean and resoldered it carefully. The signals didn't go off after that.

You may wonder how I can do these jobs. It's because the shop still hasn't been sold. It went into auction the other day, but hardly a sale was made (few reached the required price, including mine). So I suppose I'll have to keep hoping that someone will come along to clear my enormous bank overdraft. I've had offers, but they wouldn't clear my debt to the bank. When I look round at the dogs, cat and bird I wonder if they know more than us. They seem to get along without all the worry and trouble we've made for ourselves. We have to be clever and keep on inventing things like TV sets and so on. Where do we end up? Up to our ears in debt, that's where . . .

I've recently had a couple of jobs from the same house. One was a Grundig set that I had to cart off to the shop. There was reduced field scan at the bottom of the raster, but when I got the set on the bench nothing seemed to be wrong. I stripped it down and resoldered everything to do with the field output stage. After that I couldn't make the set do anything wrong however much I probed around. So in the end I took it back and explained the situation to its owners.

They asked me to look at another set of theirs, upstairs. Up I went to look at a dead HMV receiver, one fitted with the Thorn 9500 chassis. The mains input was o.k., so I went along the back to the red button cutout. This was open-circuit and I just happened to have a spare one in my case. After fitting it the set came on all right. I charged them £15 for the trouble and they paid up happily. I've been expecting them on the phone ever since about the Grundig receiver, but I've not heard so far. Maybe the soldering has been successful.

Well that's all for now. My best wishes to you all for 1990.

The Ferguson SRA1 Satellite TV Receiver

Nick Beer

The operation of the Ferguson SRA1 satellite TV receiver was described in the November issue. We've sold a number of Ferguson Astra installations. Only a modest number, since the satellite TV market here in North Devon has been somewhat cautious, but the results have been superb. The receiver is easy to operate and to install. Reliability however has been disappointing. We've had problems with about a third of the receivers. In the September issue (page 852) I commented on the high running temperature and the use of rivets to connect the regulators to the heatsinks. While not all problems are attributable to these arrangements, you can't say that I didn't warn you!

Absence of signals is usually due to no supply to the LNB. You will usually find that the fusible resistor R145 in the relevant supply has gone open-circuit due to an excessive load. There have been several versions of the receiver and the value of R145 varies with the different versions: fit the same value as a replacement. Naturally it should also be a fusible type. Common reasons for the failure of this resistor are: connection and disconnection of the LNB cable while the receiver is powered, thus inadvertently placing a short across the d.c. output to the LNB; the LNB cable being cut while the unit is powered during installation, with the same result; a faulty LNB, which is the Marconi combined feedhorn/polariser/LNB; breaking of the F connectors or ingress of water into them – outdoor connections should be waterproofed to prevent this. The point to remember is that the supply to the LNB is present even when the receiver is in the standby mode.

We've also had breaks in the print and plug leads to the LNB supply regulator REG3, type 340AT.

Failure to switch polarity, i.e. only one polarity being available (half the channels), has in our experience usually been due to a defective LNB. The less common cause is failure of the switching transistor Q32 (BC547).

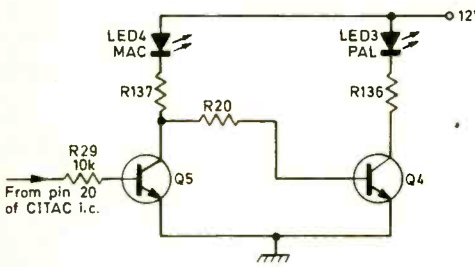
The receiver does buzz, as there's a fairly large mains transformer while the unit's case is small. A faulty transformer can be the cause of excessive noise however and will have to be replaced. Little by way of sealing can be done to quieten the transformer as it's an encapsulated type. On one occasion we found that the transformer was not sitting flat on the board at one side: putting this right quietened it down a bit.

Intermittent no go has been traced to dry-joints on the mains transformer, but on one occasion relay RL1 was faulty. This relay switches the 12V and 5V supplies when the unit is brought on from standby. The symptoms were that the standby LED went out but the PAL LED didn't come on: there was no sound or picture, just a black raster. A sharp tap on the top of the relay's case would bring the LED on and restore normal operation. This relay is also an encapsulated device, so it had to be cut open to reveal the cause of the fault – some of the potting compound was across the contacts. A new relay was thus required.

Some units use bulbs instead of red LEDs as indicatdors, though the circuit reference is still LED1 etc. We've had these bulbs fail, and you cannot replace the PAL bulb say with the MAC one as the latter is used in the switch biasing arrangement for the PAL bulb – see Fig. 1. LED3 is on for PAL operation because Q4, which is biased on by LED4 (the MAC bulb), R137 and R20, links its cathode to chassis. For MAC operation the CITAC chip switches Q5 on with the result that LED4 glows and Q4/LED3 switch off. Thus both bulbs must be intact for LED3 to come on. Interesting that instead of holders blobs of silicone rubber are used to support the bulbs!

Dry-joints on R149 in one of the 12V feeds to the u.h.f. modulator have been the cause of splashing.

Access for service is achieved by removing the five case screws and pulling off the top cover, thus allowing the Perspex front to fall off. Depending on the version, the PCB will be held in by screws or plastic clamps. As well as the ones through the board there are two plastic clamps to hold each scart socket. Fig. 2 shows the action of these clamps.



	Bulb	LED
R20	22k	100k
R136	S/C	560
R137	S/C	560

D345

Fig. 1: The PAL/MAC bulb/LED circuit.

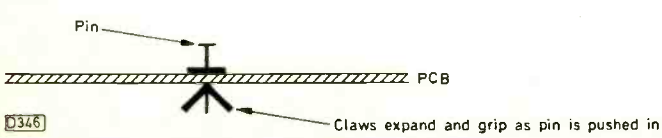


Fig. 2: Action of the plastic retaining clamps.

RIP

The deaths of several prominent people in our industry have recently been announced. Max Grundig died at Baden Baden on December 7th, aged 81. He founded Grundig in 1945, concentrating initially on radio sets in kit form in order to get round regulations imposed by the allies. The kits were a runaway success and started the rapid growth of Grundig to become West German's largest consumer electronics company. Grundig ran into difficulties when competition from the Far East intensified, and in 1984 Philips took control of the company.

Harold J. Leak, founder of one of the best known post-war UK hi-fi firms, has died in the Channel Islands aged 82. His famous Point One amplifier, introduced in 1949, was claimed to be the first commercial amplifier with a total distortion figure of less than 0·1 per cent.

M.G. Scroggie, B.Sc., M.I.E.E., who wrote numerous well-known books including *Television* in 1935 and *Foundations of Wireless* in 1936, and continued until recently to write for *Electronics and Wireless World* under the pen-name Cathode Ray, has died aged 87.

More on the Ferguson ICC5 Chassis

J. LeJeune

My article in the July issue of *Television* provided a conducted tour of Ferguson's top-of-the-range ICC5 chassis. We subsequently received requests for further information on some of the less usual circuitry. So here goes.

Video Circuitry

One area that calls for a more detailed look is the colour decoding and RGB output circuitry. Decoding and video signal processing are carried out by two chips, the AN5620X PAL decoder IV01 and the HA11498 processor IV21.

The PAL Decoder

Fig. 1 shows a block diagram of the PAL decoder chip IV01 which receives the chroma input at pin 1 and provides demodulated R – Y and B – Y outputs at pins 10 and 11 respectively. Prior to entering at pin 1, the video signal is filtered to attenuate frequencies below 3·5MHz. The initial amplifier is provided with automatic chrominance level control to ensure that a constant level of signal is fed to the chroma delay line and the rest of the chip. A.C.C. bias is obtained by peak rectification of the 7·8kHz PAL ident signal that's present at the output of the burst phase detector. This signal is directly proportional to the burst signal which is held at a constant level at the transmitter. The a.c.c. system is capable of maintaining a 600mV peak-to-peak burst signal amplitude at pin 4 despite a 26dB change in the input level.

Undelayed chroma tapped from the slider of PV09 re-enters IV01 at pin 8 while the delayed chroma enters at pin 9, with LV06 providing phase correction. The delayed and undelayed signals are summed prior to application to the two synchronous demodulators, colour-killing being undertaken at this point. The action of the summing circuitry corrects phase errors and also separates the V (weighted R – Y) and U (weighted B – Y) components of the chroma signal. Use of synchronous demodulation ensures maximum separation of the two colour-difference signals.

The undelayed chroma signal is also fed to the burst phase detector which is gated on during the burst period by the uppermost level of the sandcastle pulse. It provides an output to phase lock the voltage-controlled 4·43MHz crystal oscillator whose outputs are, via the phase-shift systems required, used to drive the two synchronous demodulators. A 90° shift is included in the feed to the U demodulator while a switched 0/180° shift is included in the drive to the V demodulator. The PAL switch is reset by the ident signal to ensure correct phase switching on alternate lines. Presence of the burst and ident signals means that the transmission is in colour and is therefore used as the basis of the colour-killing system to prevent coloured noise interference with a monochrome transmission.

All this is standard PAL signal decoding practice of course, but you don't often see it explained nowadays. The R – Y and B – Y outputs are buffered by emitter-followers within the chip and are then applied to external filters to remove unwanted products of the demodulation process. They are then passed to the processing chip IV21. This is where the less usual arrangements are to be found. A detailed block diagram of this chip was

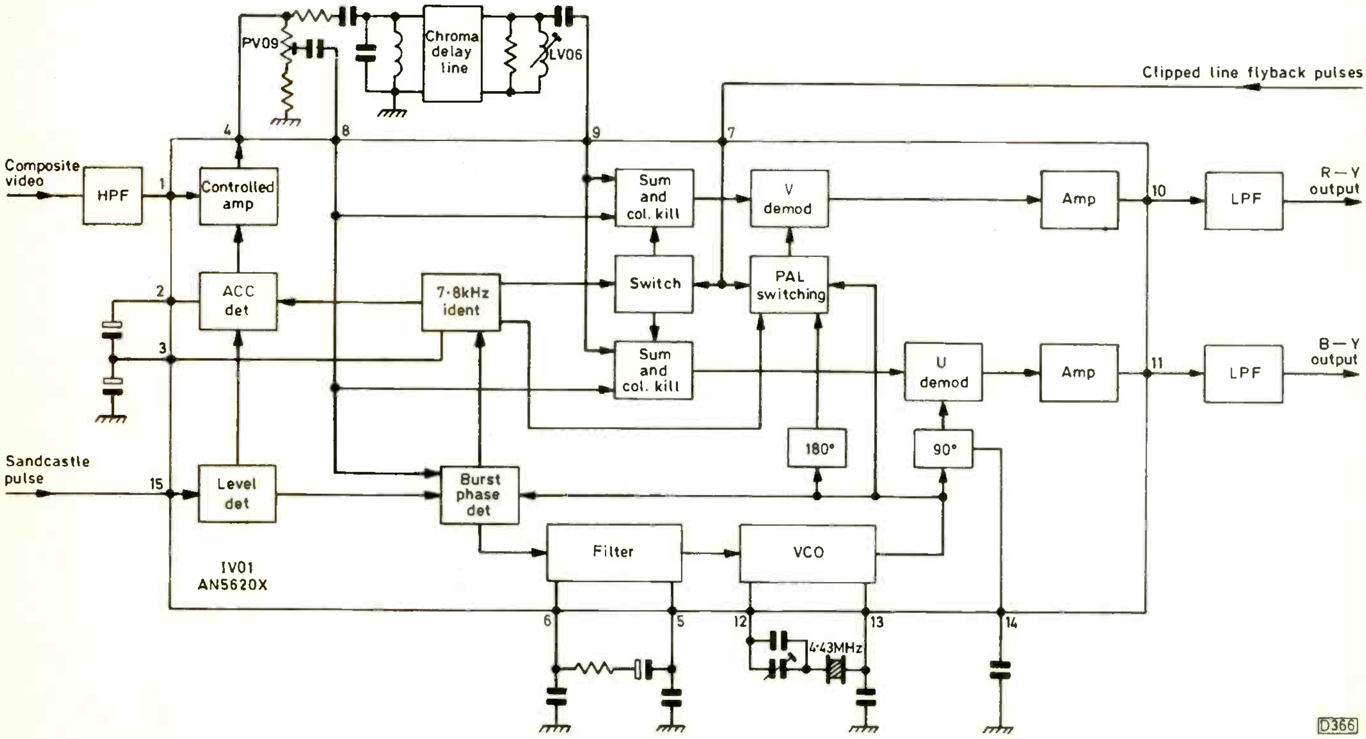


Fig. 1: Block diagram of the AN5620X PAL decoder chip.

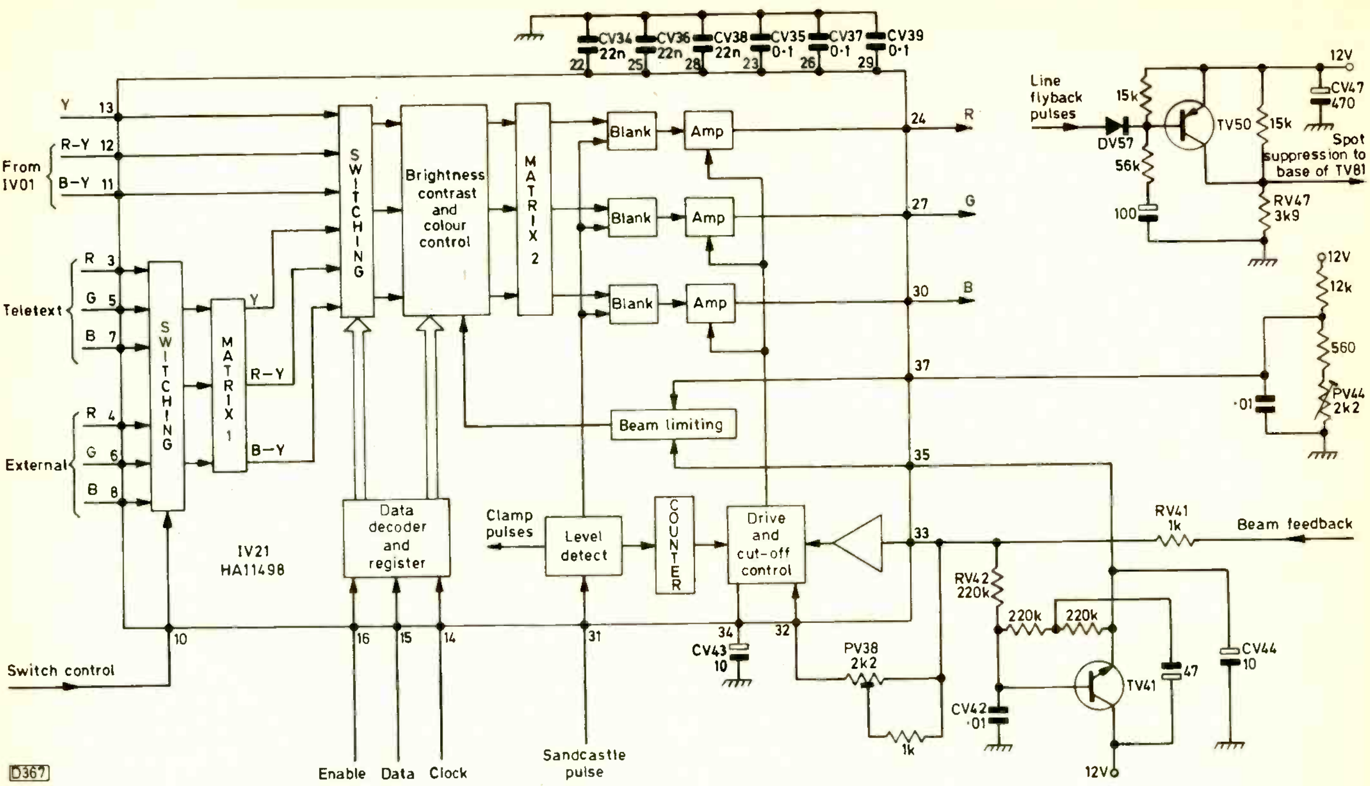


Fig. 2: Simplified block diagram of the HA11498 video signal processing chip. The beam limiting and switch-off spot suppression circuits are also shown. During normal operation TV50 is held cut off by the positive voltage at its base, produced by rectification of line flyback pulses by DV57. At switch off the line pulses cease and the voltage retained by CV47 brings TV50 into conduction: the increased voltage across RV47 then cuts off TV81 (see Fig. 4).

shown in Fig. 3 of the July article. Fig. 2 shows a simplified block diagram to clarify the processing, also the external circuitry associated with the beam limiting and automatic grey-scale correction processes.

Video Processor Chip

IV21 caters for teletext and external RGB signals as well as the luminance signal and the colour-difference outputs from IV01. The RGB inputs have to be converted to luminance/colour-difference form to enable brightness, contrast and colour saturation control to be carried out. This conversion is done by the block marked matrix 1. Matrix 2 converts the signals, from whatever source, back to the RGB form required to drive the tube's cathodes.

Sandcastle Pulse Use

Sandcastle pulses are coupled into IV21 at pin 31. The maximum level of this composite pulse, at about 11V, is used for clamping/gating. The middle section at about 4·5V, derived from a clipped line flyback pulse, is used for line blanking. The lowest level, at 2V, provides field blanking and, as it signals the start of the field flyback, it's also used to reset the internal counter within IV21.

Auto Grey-scale Correction

The counter provides timing for blanking and pulse insertion on lines 17 to 23 inclusive. The c.r.t. drive and cut-off pulses inserted are as follows, see Fig. 3: green white level line 17, red white level line 18, blue white level line 19, beam cut-off line 20, green dark level line 21, red dark level line 22 and blue dark level line 23.

Fig. 4 shows one of the RGB output stages. All three are identical and incorporate two emitter-followers, TV70 and TV71 in this case (blue output stage). The collector currents of TV71/61/51 are monitored by DV75/65/55 respectively. The cathodes of these diodes are linked via the 15V zener diode DV95 to RV95 which acts as a common summing point load. Feedback to pin 33 of IV21 is taken via RV41 (see Fig. 2) from the junction of DV95/RV95.

During lines 17-23 this feedback is sampled in sequence within the chip and compared to an internal reference voltage. The internal switching presents a low sampling impedance during lines 17, 18 and 19, when the drive level applied to each gun is measured in sequence and set for 500μA. This is done by adjusting the charge carried by the drive error-voltage storage capacitors CV34/36/38 (red, green and blue respectively). The charge set in this way adjusts the gain of the relevant drive amplifier.

On line 20 the c.r.t. is blanked off and only leakage current flows. The sampling impedance within IV21 is raised to a high value that allows for sensing of currents in the region of 25μA. CV43 provides charge storage in this case.

Dark-level pulses are applied to each c.r.t. gun in turn during lines 21-23. The corresponding cathode currents are measured and the resulting voltages are compared with the voltage at pin 34 (across CV43). The differences between these voltages are compared with an internal reference supply, the resultant error voltages being used to adjust the charges carried by CV35/37/39 for red, green and blue respectively. The voltages developed across these capacitors set the d.c. pedestal for each channel.

The ICC5's automatic grey-scale correction system

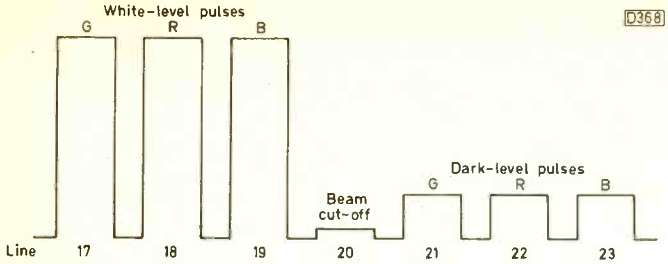


Fig. 3: The drive and cut-off pulses inserted on lines 17-23 for automatic grey-scale correction.

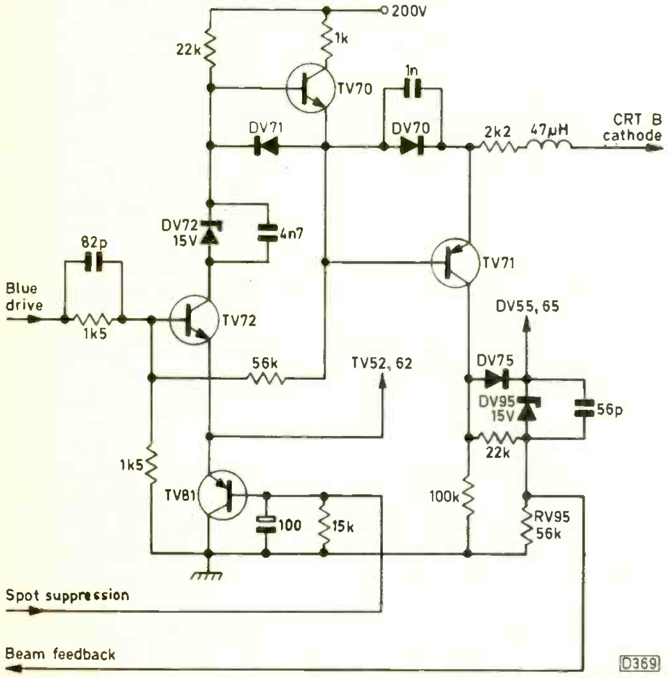


Fig. 4: The blue output stage circuit. Transistor TV81 is common to the three RGB output stages: it provides switch-off spot suppression. The feedback voltage developed across RV95 is used for automatic grey-scale correction during the field blanking period and for beam limiting.

ensures good tracking over the entire brightness range and avoids the need to measure very low c.r.t. gun cut-off currents.

Beam Limiting

The voltage at pin 33 of IV21 is determined by the total beam current at any instant. This voltage is applied via RV42 to the base of TV41, which sets the voltage developed across CV44 at pin 35 of IV21. The voltage at pin 35 is compared with an adjustable voltage that's applied to pin 37. Beam limiting is initiated when the total beam current rises to 70 per cent of the maximum permitted value. Contrast reduction of 50 per cent is employed initially: if this fails to bring about sufficient beam current reduction, the brightness is also reduced. This is done by modifying the d.c. pedestals – the levels of the control pulses on lines 17-19 are raised to bring this about. The time-constant of RV42/CV42 is such that short-term high-current transients are ignored. Thus picture highlights are not affected.

Switch-off Spot Suppression

TV50 is used to suppress the undeflected spot at switch off. It operates in conjunction with TV81 (see Fig. 4) on the c.r.t. base panel. At switch off the charge on

CV47 keeps TV50 conductive with the result that TV81 switches off, blanking the c.r.t. until its supplies have decayed sufficiently.

The Power Processor Chip

The "power processor" chip IL14 (type TEA2029C) was considered in some detail in the July article. It provides line drive pulses, a field-frequency sawtooth to drive the EW correction circuit, a pulse-width modulated drive for the chopper transistor and drive for the field output thyristor (again pulse-width modulated, for "class D" operation). Soft-start and safety shut-down circuitry are included.

IL14's chopper control action is particularly impor-

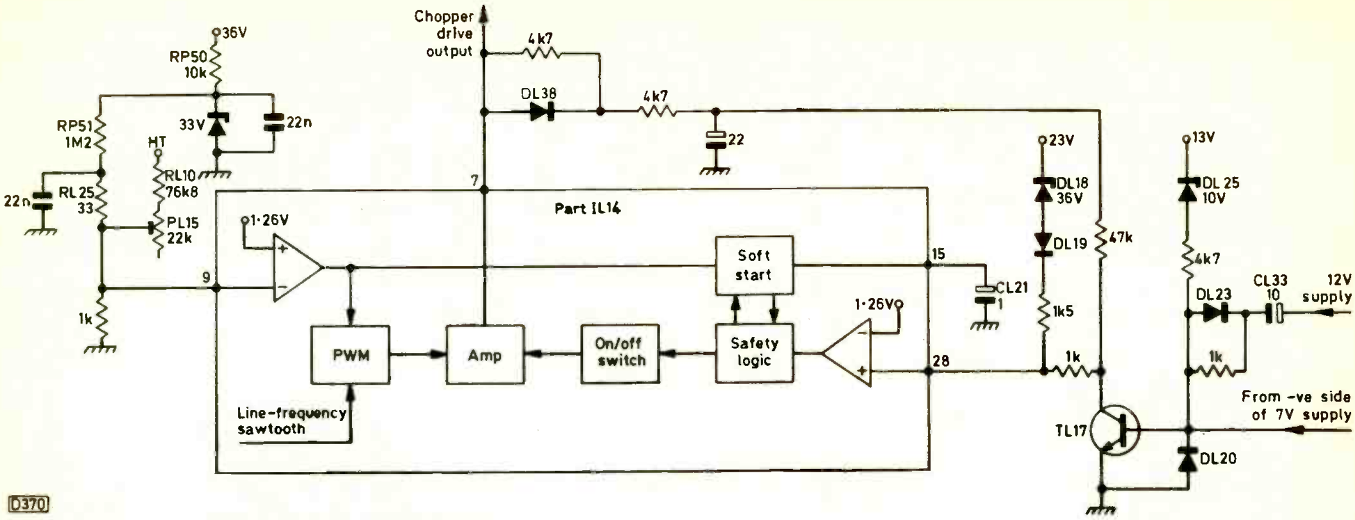


Fig. 5: Block diagram of part of the TEA2029C power processor chip, showing the monitoring arrangements for regulation and for protection against various fault conditions.

tant and deserves some further description. Our experience with the power supply circuitry in the ICC5 chassis has been very good, possibly due to the control arrangements within IL14. These provide comprehensive protection of the receiver and its power supply.

For supply regulation IL14 monitors the h.t. and 36V rails. This monitoring is carried out at pin 9, which is one input to an operational amplifier. Fig. 5 shows this part of the circuit. The other input to the operational amplifier is an internal 1·26V reference. RL10 and PL15 (set h.t.) sample the h.t. line while RP50, RP51 and RL25 provide a link to the 36V rail. The principle reason for monitoring the 36V rail is to prevent excessive modulation of the h.t. supply by the audio module under high drive conditions.

On no account should any attempt be made to measure the voltage at pin 9 when the receiver is in operation. The input impedance at this pin is very high and the application of any kind of meter probe here will cause instant failure of the power unit. If the voltage at pin 9 must be monitored, the use of an oscilloscope should be considered – but switch off the receiver while the connection is being made. Pin 19, which links crystal QL07 to the internal 500kHz voltage-controlled oscillator, is also sensitive. Use of a meter probe here could stop the oscillator, the result being destruction of the chopper transistor TP24.

The operational amplifier's output is a voltage that moves in the opposite direction to any variation in the supply rail voltages. This voltage is used to set the switching point of the pulse-width modulator, whose second input is a line-frequency sawtooth.

Soft Start

The soft-start circuit holds the operational amplifier's output high at switch on. By discharging CL21 it allows the operational amplifier's output voltage to fall gently to normal, thus bringing up the power gradually.

Protection Arrangements

Protection is provided by monitoring the conditions at pin 28 of the chip. Once again an operational amplifier is used, and this time three separate sources are monitored. During normal operation of the receiver transistor TL17 is conductive with the result that pin 28 is held at approximately 0V. Excess current in the 7V supply or a downswing in the line-flyback derived 12V supply (the latter is a.c. coupled to TL17's base) will result in TL17 turning off. The voltage at pin 28 of the chip will thus rise to about 6V. The third source, the 23V supply used by the field output stage, is monitored via the 36V zener diode DL18 (in the event of field drive failure the 23V rail can rise to 200V).

When the voltage at pin 28 rises above 1·26V a signal is sent to the safety logic system which inhibits the line, field and chopper drive outputs. An internal counter is activated, allowing three cyles of trip and soft-start before all drives are finally shut down. At this stage the voltage at pin 15 of the chip will be about 1·4V. To restart the receiver, you have to switch it off at the mains then back on again, thus resetting the internal logic.

As we saw in the July article, protection against excess chopper transistor current is built into the chopper circuit itself. The standby system and the vital role of the 5V supply were also described.

CORRECTION

Satellite TV Filter

In the June issue (page 603) I reviewed the Phantom IFP70 variable i.f. bandpass filter available from Micro-X. I indicated that the filter requires a 12V d.c. supply. In fact the filter requires a 12V a.c. input, which is rectified and stabilised internally. If a 12V d.c. input is provided, the internal l.t. supply will be only 9V, though a 15-16V d.c. input will be o.k. Several commercial d.c. mains units – of the type integrated with a 13A plug – give 16V on the 12V setting. This type of PSU should be suitable, but check the output on load.

My Phantom filter was an early import. Those currently supplied by Micro-X come with an a.c. adaptor that produces 12V a.c. from a 115V input, i.e. US standard. I've tried using this via a 240-115V step-down transformer. This works but after an hour the a.c. adaptor runs hot enough to heat the average living room! Far better I think to run the filter from a 6-0-6V UK transformer that runs cool. **R.B.**

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BFR39	0.44
BFR61	0.92
BFR62	0.50
BFR79	0.29
BFR81	0.29
BFR86	1.08
BFR89	1.63
BFR90A	0.85
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	0.42
BLY49	2.20
BR100	0.23
BR101	0.78
BR103	0.66
BR303	1.15
BRC84	2.08
BRX44	0.60
BRX49	0.34
BRY39	0.65
BSS38	0.67
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	1.43
BU208D	1.75
BU209	1.75
BU226	2.55
BU326A	0.99
BU406	1.49
BU406D	1.04
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	0.52
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	0.40
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	0.23
CD4069	0.29
CD4070	0.25
CD4081	0.14
CD4093	0.40
CD4511	1.10
CD4528	0.37
CD4556	1.47
CR02AM-8	1.70
CV12E	4.62
CX095D	3.14
CX104	8.77
CX108	12.48
CX109	7.20
CX130	0.76
CX134	4.50
CX136	11.49
CX143	11.83
CX157	5.52
CX158	10.45
CX177	8.80
CX187	5.26
CX755	12.95
CX885A	6.85
E1222	0.40
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
HA11755P	6.23
HA11781	21.15
HA1180	5.15

HA1196	7.43
HA13001	1.73
HA1306	2.26
HA13402	6.50
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	2.37
HA1397	2.75
HA1398	2.75
HA1406	2.07
HA1452	0.85
HD1453B	2.07
HD38702-A2	7.95
HD38750A53	5.77
HD38750A-7	7.25
HD38800A50	14.09
HD44801A05	12.50
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
KA2101	1.00
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	2.50
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	5.95
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
M5144P	4.27
M51513L	2.55
M51515BL	2.75
M51517L	2.90
M5192	3.13
M5194AP	5.74
M5231L	1.58
M53274P	1.33
M54532P	1.50
M54544L	2.97
M58478P	6.75
M58485P	14.05
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
MCR106-5/6	1.23
MCR220/7	2.28
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
ML232B	3.01
ML237B	1.95
ML238	5.77
ML923	3.10
ML926	3.58
MM5314N	8.99
MM5316N	3.50
MM5318N	3.11
MM5369N	2.01
MM5387AA/N	6.20
MM5841N	6.64
MN1400VL	13.65
MN1405	7.92
MN1435VX	9.50
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	0.60
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	0.19
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	1.91
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
S1299	5.34
S2800D	1.50
S2802	2.90
S2818	4.05
S3702S	5.21
S40W	13.10
S6080B	9.98
SA8063	5.17
SAA1006	1.85
SAA1020	4.76
SAA1025	4.40
SAA1024	2.50
SAA1075	4.25
SAA1121	7.44
SAA1124	2.60
SAA1130	6.69
SAA1174	7.77
SAA1250	3.95
SAA1251	3.20
SAA1351	8.11
SAA3027P	2.71
SAA5000	3.25
SAA5010	3.50
SAA5012	5.50
SAA5020	5.78
SAA5030	6.33
SAA5050	4.90
SAB1009B	5.98
SAB3011	7.34
SAB3013	4.37
SAB3021	3.95
SAB3024	6.36
SAB3209	5.82
SAB3210	3.21
SAF1032P	3.58
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
[illegible]	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	10.71
SG629	8.27
SG6533	9.00
SI1125H	7.50
SI1630HD	20.50
SKE2F1/04	1.39
SKE2G3/04	0.85
SKE4F1/06	0.30
SKE4F2/08	1.07
SKE4F2/08	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
SL432A	3.44
SL439	2.48
SL471	2.13
SL480	3.14
SL490	2.37
SL901B	8.32
SL918A	9.07
SN16861AN0	0.82
SN16862AN	2.98
SN16966N	10.25
SN29717N	7.19
SN29716N	3.66
SN29715N	6.04
[illegible]	11.95
SN29723AN	8.77
SN29764AN	2.60
SN29767	3.90
SN29770BN	3.69
SN29772BN	5.75
SN29771BN	5.59
SN29791	1.67
SN29798N	5.56
SN2709	0.44
SN7400N	0.61
SN7401N	0.36
SN7402N	0.65
SN7404N	0.52
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
SN7472	1.54
SN7474N	0.44
SN7490AN	0.75
SN74LS26N	1.45
SN76001N	1.65
SN76013ND	3.50
SN76023N	2.97
SN76023ND	3.91
SN76033N	5.54
SN76110N	0.90
SN76115AN	1.61
SN76131	0.82
SN76227N	2.45
SN76226DN	2.98
SN76228N	3.27
SN76242	5.23
SN76243	5.23
SN76396	2.90
SN76533N	2.47
SN76532N	0.91
SN76545	4.87
SN76546N	3.47
SN76549	2.45
SN76570	3.08
SN76611	2.59
SN76620	2.59
SN76660N	2.48
SN76666N	1.20
SN76708	4.86
SN76709N	9.63
SN76707N	1.23
SN76705N	2.97
SN76730	5.54
SN76810N	0.60
SN76832N	1.35
SN94041	5.54
SN94042	4.35
SPS5384	1.98
ST1702L	0.99
STA401	2.49
STA441C	3.10
STA471C	8.70
STK0029	9.55
STK0050	7.85
STK016	6.91
STK022	8.95
STK031	12.95
STK040	13.34
STK054	9.35
STK058	27.50
STK077	9.28
STK1039	5.75
STK2110	7.33
STK2145	16.95
STK2240	16.65
STK2250	18.95
STK3042	5.63
STK3044	5.75
STK4019	9.29
STK433	4.78
STK4332	4.75
STK435	7.12
STK4352	1.95
STK436	5.95
STK437	6.50
STK4372	13.13
STK460	8.74
STK466	10.10
STK4833	9.52
STK501	6.32
STK502	7.25
STK5314	11.50
STK5730	3.20
STK7216	14.90
STK772	3.71

STR1096	11.20
STR4090	9.50
STR440	5.77
STR451	5.77
STR453	8.16
STR454	5.52
STR6020	6.96
T6029V	7.98
T6035V	0.73
T6036	0.67
T6037	2.11
T6044V	0.97
T6045	1.20
T6049	1.45
T6052V	0.87
T6058	3.08
T6059	4.22
T9003V	1.25
T9005V	2.38
T9011V	1.40
T9013V	4.95
T9014V	2.42
T9016	1.02
T9019W	1.98
T9034V	1.45
T9035V	6.65
T9051	7.70
T9054V	6.43
T9057V	2.77
T9062V	0.49
T9064	4.20
TA7027	4.80
TA7050	1.74
TA7051	1.74
TA7054	2.55
TA7060AP	0.71
TA7061AP	1.27
TA7069	3.13
TA7070P	1.83
TA7072P	2.57
TA7074P	1.98
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	7.83
TA7148P	1.67
TA7149P	3.26
TA7152P	2.98
TA7161P	4.50
TA7162P	3.61
TA7172P	1.41
TA7176P	1.75
TA7193P	4.80
TA7204P	1.95
TA7206P	12.49
TA7207P	1.48
TA7208P	2.15
TA7210P	1.45
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
TA7313AP	0.65
TA7314	3.50
TA7323P	3.15
TA7325P	1.15
TA7339P	1.85
TA7340P	5.95
TA7607AP	1.30
TA7609	2.35
TA7611AP	2.32
TA7616P	5.25
TA7622AP	8.94
TA7628P	1.40
TA7629P	7.50
TA7630P	0.95
TA7640AP	2.40
TA7672P	2.75
TA7676P	2.81
TA7726P	10.25
TAA320A	1.27
TAA350A	0.88
TAA570	1.85
TAA621AX1	4.85
TAA661B	0.95
TAA691	8.58
TAA700	2.37
TAA930	4.87
TAA970	2.83
TAG626-600	1.20
TBA120AS	1.45
TBA120SB	0.40
TBA120T	1.75
TBA120U	2.50
TBA120A	1.05
TBA1440	1.94
TBA1441	1.95
TBA395	1.10
TBA396	1.20
TBA400	2.39
TBA440C	2.34
TBA480Q	1.30
TBA510	1.37
TBA520	1.20
TBA530	1.30
TBA540	1.72
TBA560C	1.40
TBA570Q	1.60
TBA570A	1.71
TBA673	2.60
TBA700	1.85
TBA720	2.95
TBA730	3.55
TBA750Q	2.50
TBA760	1.71
TBA800	1.08
TBA810S	1.61
TBA810T	1.75
TBA820	0.66
TBA820M	0.82
TBA890	3.30
TBA920	1.65
TBA940	1.87
TBA950	1.55

TBA970	3.60
TBA990	1.98
TCA270S	2.15
TCA270SQ	1.05
TCA290A	2.39
TCA420A	2.16
TCA440	2.25
TCA530	2.24
TCA640	2.25
TCA650	3.05
TCA660B	2.60
TCA730	2.75
TCA750	2.25
TCA800Q	1.60
TCA830S	2.38
TCA890	5.44
TCA900	2.04
TCA910	1.65
TCA940	0.82
TCA940E	2.93
TD3F800R	4.78
TD3F900H	5.36
TDA1001B	2.31
TDA1003A	3.16
TDA1005A	2.22
TDA1006A	7.00
TDA1010AF	4.25
TDA1011	1.14
TDA1010	1.05
TDA1011A	1.51
TDA1028	2.45
TDA1034B	2.42
TDA1035S	2.95
TDA1035T	1.85
TDA1037	1.60
TDA1037D	2.05
TDA1044	2.10
TDA1047	3.25
TDA1059B	0.80
TDA1054M	1.21
TDA1060	2.60
TDA1082	3.25
TDA1151	0.95
TDA1190	1.27
TDA1190Z	2.48
TDA1200	1.51
TDA1235	3.88
TDA1236	4.30
TDA1270	3.74
TDA1327A	6.93
TDA1412	1.08
TDA1420	1.52
TDA1440	3.45
TDA1470	2.90
TDA1470P	4.25
TDA1506	5.74
TDA1510	4.60
TDA1512	2.89
TDA1515	2.55
TDA1559	3.15
TDA1670	4.48
TDA1770	2.88
TDA1905	1.27
TDA1908	2.55
TDA1940	5.20
TDA1950	2.50
TDA2005	1.30
TDA2006	1.35
TDA2004	0.99
TDA2002	0.90
TDA2003	1.00
TDA2030	1.05
TDA2140	2.14
TDA2150	6.20
TDA2151	1.30
TDA2160	4.01
TDA2161	5.11
TDA2170	4.75
TDA2270	2.50
TDA2520	2.25
TDA2522	11.20
TDA2524	4.50
TDA2525	5.58
TDA2532	2.50
TDA2530	2.20
TDA2541	1.00
TDA2540	1.95
TDA2545Q	5.94
TDA2560	2.50
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Servicing Compact Disc Players

Part 12: Servo Systems – 3

Joe Cieszynski

Last month we took a preliminary look at the CD player's disc servo, in particular the action of the run-up (rough) servo. As our main example we took the system employed in the Sony CX23035 chip. Fig. 1 shows in block diagram form the disc servo system used in this chip. During normal operation the disc motor is under the control of the section identified as the PLL servo. We will now look at this in greater detail.

PLL Servo Action

I've come across a number of sources which gloss over this by saying that the 4·3218MHz off-disc data is compared with a 4·3218MHz reference signal from a crystal oscillator, and that when the disc speed is incorrect the data rate shift with respect to the reference results in an error signal that the servo uses to provide the necessary correction. As an over-simplified explanation, this is correct. Circuit design is not so straightforward however. First of all we cannot feed in 4·3218MHz data "straight off the disc" because there isn't any: not at 4·3218MHz, anyway! If we recall the EFM rule (see Part 5, July 1989, page 694), there must be at least two zeros between consecutive ones. Remember also that only ones are stamped on the disc, the zeros being clocked in by the player's decoder. Thus the highest possible off-disc data frequency will occur with a signal consisting of 100100100 etc. The r.f. signal will then be at 4·3218/3 = 1·5MHz. In other words, the highest possible frequency in the off-disc information is 1·5MHz, and this is present only on occasions.

Clearly then it's not the raw off-disc data that's used as the servo's sample but the reconstituted data stream produced by the phase-locked voltage-controlled oscillator in the decoder section of the player. This VCO operates at 8·6436MHz, its output being divided by two to produce a 4·3218MHz data rate. This data is passed to the frame sync detector and timing generator 1 blocks in Fig. 1. The timing generator consists of a series of dividers. These reduce the data rate to 7·35kHz and lock this to the frame sync signal. The 7·35kHz signal thus produced is called the WFCK (write frame clock) signal. It acts as the disc speed sample for the servo and is also fed to the control microcomputer to assist in the timing of this and of the decoder and RAM operations.

The WFCK signal is compared with the divided down output from a free-running 8·4672MHz crystal oscillator. Timing generator 2 is responsible for this division, the output being referred to as the RFCK (read frame clock) signal. It may also be used by the microcomputer for timing purposes. It's worth noting that in some players the WFCK and RFCK signals are further divided by four or eight before comparison in the PLL servo, these signals being identified as "¼ WFCK" or "⅛ WFCK" etc.

One might have expected the crystal oscillator to run at 8·6436MHz, i.e. twice the data rate. In some cases it does, for example in the CX7934 chip used in early Sony players. Reducing the frequency to 8·4672MHz assists with correct phase detector operation by introducing a 90° phase difference between the two signals.

Having seen how the sample and reference signals are obtained we can now look at a typical PLL/rough servo system. Fig. 2 shows an example, as used in the Pioneer CDX1 and similar players. It shows more clearly the operations carried out by the timing generators in Fig. 1. You will see that the speed (coarse) error detector compares a 1·8kHz data signal with 1·8kHz from a crystal oscillator while the phase (fine) error detector compares much lower frequency inputs, i.e. 612·5Hz.

Fig. 2 also shows how the disc speed is altered fractionally in order to keep the audio data RAM approximately half full. If the RAM begins to under or over fill, the RAM address generator shifts the division by 576 by ±1, slightly altering the disc's speed.

Engineers familiar with VCR servos will know that the techniques used to achieve correction differ from model to model. For example, with some machines the tracking control acts on the capstan servo while in others it acts on the drum servo. The same applies with the disc servos used in CD players. The arrangements shown in Figs. 1 and 2 have served to illustrate the basic principles. While all disc servos rely on the same basic reference and sample sources, the way in which these are used and compared in various machines can differ.

The Fast Servo

The fast servo shown in Fig. 1 is used during large track jumps. If the optical assembly is moved across the disc in one second it will cross the track say 20,000 times, with the result that the mirror surface of the disc will produce a 20kHz signal that's superimposed on the EFM. During this time the normal disc servo will have unlocked due to the interruption of the guarded frame sync. The rough servo will try to take over control but since the 20kHz signal will obliterate the sync signal it will be unable to function. To overcome this situation the control microcomputer will switch in the fast (high-speed access) servo when a large track jump is selected.

The fast servo is not used in all players that employ the CX23035 chip. With players that use a conventional sled motor the track jump feature is not particularly fast, so that the rough and PLL servos are able to cope. Players that use a linear sled motor or a radial tracking arm are capable of very fast access times when performing track

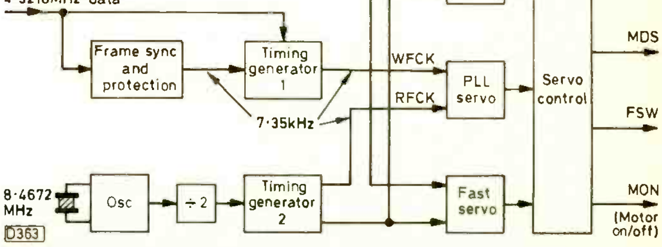

Fig. 1: Block diagram of the disc servo section of the Sony CX23035 decoder/servo chip.

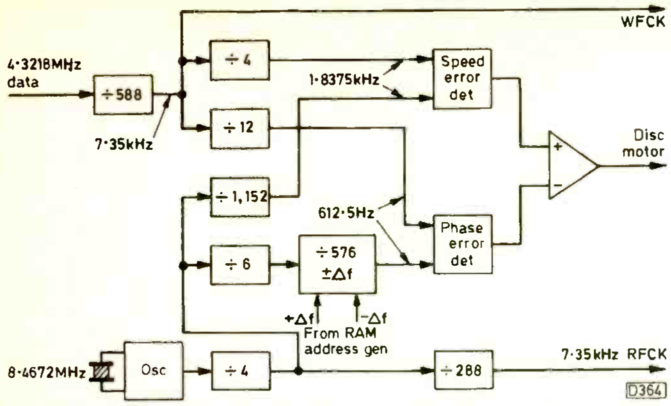

Fig. 2: Block diagram showing the detailed operation of a typical disc servo system. This particular arrangement is used in the Pioneer CDX1 and similar players that use the TC9178F decoder/disc servo chip. The frame sync (GFS) input to the disc servo is not shown above but is present in the main circuit diagram: the actual point at which it is injected is not clear from the information available.

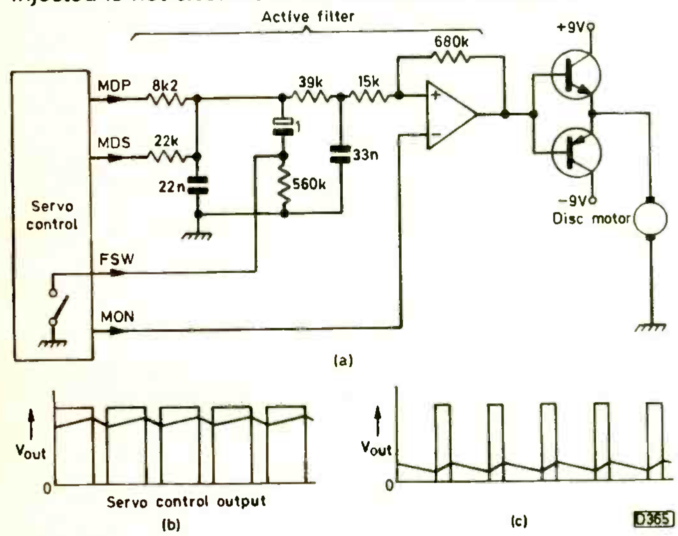

Fig. 3: Active low-pass filter used to convert the pulse-width modulated output from the servo into an analogue signal for motor control. (a) Block diagram/circuit configuration. The d.c. output obtained depends on the mark-space ratio of the p.w.m.: as shown at (b) a high mark-space ratio produces a high d.c. output while a low mark-space ratio, as at (c), gives a low d.c. output. When the filter switch FSW is closed the damping action of the 1μF capacitor is increased. This reduces the effect of sudden changes in the servo's p.w.m. output so that, during the run-up and speed correction periods, the servo action is "coarse".

search and jump operations. It's then that the additional servo is required. The action of the linear sled motor will be considered next month when we examine track search and jump techniques.

Motor Control

The MDS and MDP outputs from the servo control block shown in Fig. 1 are in the form of pulse-width modulation and must be converted to analogue form before they can be used for motor control. This is done by passing the p.w.m. outputs through an active low-pass filter that's usually based on an operational amplifier. As the mark-space ratio of the p.w.m. shifts, the d.c. output from the filter changes.

The motor drive speed and phase control outputs (MDS and MDP) require different filter values. This is the reason for the FSW (filter switching) output, which is used to switch the filter components. Fig. 3 shows a typical circuit. When the rough servo is in operation there will be an MDS output: the FSW switch closes, shorting out the 560kΩ resistor in series with the 1μF capacitor in the filter circuit. During normal play when the PLL is in control the MDP output will be present: the FSW switch opens, increasing the sensitivity of the servo action to give better phase control.

It will be apparent from Fig. 3 that the motor drive circuit can run the motor in either the forward or the reverse direction. Reverse drive is used purely for braking purposes since there's no reason why we should ever wish to run the disc backwards.

Fault Conditions

It's worth mentioning that I have on a number of occasions encountered a faulty player that rotates the disc backwards even though with adequate control microcomputer programming the player should cut out before this can happen. With some models the microcomputer programming is such that if data is not found during the initial run-up sequence the brake is applied (reverse current through the motor) and, because an r.f. signal is present and possibly the rough servo is able to detect the frame sync signal, the microcomputer maintains the brake current, running the motor in the reverse direction for a period.

My experience indicates that if the disc runs in the reverse direction after first attempting to run forwards the fault is never in the disc motor drive stage. The usual cause has turned out to be misadjustment in the focus or tracking servos. Some early players had an offset adjustment to balance the PLL servo. If this is incorrectly set the disc may run backwards, the difference in this case being that the disc doesn't attempt to run in the forward direction initially.

Apart from the common causes of disc reverse rotation just mentioned, any faults in the motor drive stage or its supplies will result in the disc either failing to start to rotate or immediately running up in either the forward or the reverse direction. Such faults are few and far between but are generally easy to diagnose. Just remember that the disc shouldn't run up until the FOK (focus o.k.) signal has appeared – this takes a brief period from the time when the disc is loaded. If the disc is keen to rotate when first loaded it's worth checking the motor drive stages first.

The only other problem encountered in the area of the disc servo is failure of the motor itself. I've come across players in which everything seems to be o.k. but there's no sound output and the usual checks in the focus and tracking servos have been fruitless. A more careful check on the disc in its tray shows that it's rotating slowly. The fault has been that the motor is unable to reach full speed.

Finally, beware of the player in which the disc fails to rotate at all. Before you spend a lot of time checking whether the laser is lit and the focus search, FOK, power supply and disc motor drive stages (as I did when still inexperienced) do check the obvious: is the disc able to rotate freely in its tray? If not, the disc motor spindle height is probably set wrongly or the clamp arm has seized. These are fairly common faults which we'll look at in more detail when we come to consider player mechanisms.

Next month we'll look at a different aspect of the disc servo, the track search and skip features.

Long-distance Television

Roger Bunney

November again produced quite remarkable DX-TV results. F2, Sporadic E, tropospheric and auroral activity was present on many days and there were reports of quite spectacular reception. We'll start off with the UK SpE log:

4/11/89 RTP (Portugal) ch. E3; TVE (Spain) ch. E4.
5/11/89 TVE E2; DR (Denmark) E4.
6/11/89 TVE E2, 3, 4; RAI (Italy) IA; TDF/Canal Plus (France) L2, 3; ARD (W. Germany) E2.
7/11/89 TVP (Poland) R1; RAI IA; TDF L2.
8/11/89 TSS (USSR) R1.
9/11/89 TVE E2.
10/11/89 TVE E2.
16/11/89 TVE E2.
17/11/89 TVE E2; NRK (Norway) E2, 3, 4.
18/11/89 TVE E2.
19/11/89 TSS R1, 2; YLE (Finland) E3; TVE E2; also unidentified signals.
20/11/89 TVE E2.
21/11/89 TSS R1.
22/11/89 TSS R1.
28/11/89 TVP R1, 2; TDF L4; TSS R1.
29/11/89 TVE E2.

That's a fairly good log for November, and makes up in part for the rather poor showing this year of the November Leonids meteor shower.

Tropospheric activity similarly had its moments. A settled high-pressure system lifted tropospheric activity during several days, with thick fog. The best spell was from the 12th through to the 20th, the peak activity being on the first three days. Bands I/III/IV/V were wide open during the period, giving reception in the UK of signals from Norway, Sweden (SVT), Denmark, the GDR, West Germany and the Benelux countries. Interesting that the SAT-1 service was seen on chs. E12 and E52. Simon Hamer (Powys) and David Glenday (Arbroath) sent in quite exceptional legs, resembling transmitter lists! F.M. radio reception was also very active – Simon logged signals from four BFBS (UK Forces) transmitters in W. Germany. The longest haul signals were perhaps on the 15th, when Simon received TVP (Poland) ch. R35 in North Wales. Meanwhile Tim Anderson (St. Leonards) noted Bands III/IV/V jammed with signals from W. German and French transmitters. Other unusual catches were American Forces transmissions on chs. A33 and A80. Conditions faded on the 20th, though signals from W. and E. Germany and Denmark were noted on that day.

A further tropospheric lift occurred on the 26/27th, with signals from the nearer French, Danish and W. German transmitters in Band III and at u.h.f., also extensive reception from RTE (Ireland) in the same bands.

The main excitement was produced by the F2 propagation associated with increased solar activity. Reception of exotic signals was noted throughout the UK and Europe, from Band I transmitters as far away as China and Australia! The F2 log is as follows:

4/11/89 Iran (IRIB) ch. E2; TSS R1; weak ch. A0 (Australia) pictures in the UK at 0800 GMT.
5/11/89 TSS R1; Iran and Dubai E2; RTM (Malaysia) E2; Australia ch. 0 – pictures with line pairing, i.e. two transmitters, at 0830 GMT. The m.u.f. rose to ch. E3, with unidentified pictures. At midday several ch. E2 PM5544 patterns, a FUBK pattern and Arabic captions were seen, all co-channel, many without VITS. F2 backscatter was also present. The best catch was China ch. C1, with a caption, noted by Simon Hamer at 0830 GMT. An outstanding day.
6/11/89 Iran and Dubai E2; TSS R1.
7/11/89 Iran and Dubai E2; TSS R1; ch. A0 received at scanner level at 0940 GMT, the measured carrier frequency being 46·172MHz.
8/11/89 Iran E2; TSS R1.
9/11/89 TSS R1; unidentified ch. E2 signal.
10/11/89 Iran E2; TSS R1.
11/11/89 TSS R1; RTM E2; ZTV (Zimbabwe) E2; weak ch. A0 pictures; floating weak ch. E3/A2 pictures at 1400 GMT.
12/11/89 TSS R1; unidentified E2 signals.
13/11/89 TSS R1; Iran E2; suspected China C1.
14/11/89 TSS R1.
15/11/89 TSS R1; unidentified ch. E2 signal; a weak ch. A0 video carrier buzz was heard.
16/11/89 Ch. A0 pictures at 0845-0850 GMT (carrier at 46·172MHz).
17/11/89 TSS R1; a ch. R1 525-line crosshatch pattern was received at 0900 GMT – it's been seen before, can anyone help with this mystery?
18th through to the 21st: Weak TSS R1 and ch. E2 signals.
22/11/89 TSS R1; Iran E2.
23/11/89 Strong ch. E2 and R1 pictures; a strong ch. A0 signal was seen at 1000 GMT, with positive syncs and a weak picture.
24/11/89 TSS R1; unidentified E2 signal.
26/11/89 Unidentified E2 signal.
27/11/89 Unidentified E2 signal.
28/11/89 TSS R1; unidentified E2 signal.
29/11/89 TSS R1.
30/11/89 TSS R1; unidentified E2 signal.

Auroral signals were received by Iain Menzies (Aberdeen) on the 9th, 11th, 12th, 13th, 15th, 16th, 17th, 25th and 26th. On the 17th he noted Band I signals at up to ch. R3, with TSS and SVT identified. There were observable effects in the southern UK on the 17th.

It was certainly an eventful month then, with some excellent F2 reception. On the 13th I was lucky in having a day without the presence of 49MHz baby alarm signals and measured an incoming TSS ch. R1 signal from a two-element aerial without amplification: it peaked at 0·45mV.

Tim Anderson points out that Iran uses the PM5544 (for short periods) and the FUBK patterns. The FUBK one is often present at 0700 when propagation from the Middle East starts, though much of the Iranian morning transmission time is taken up with low-frequency bars/colour bars. Late morning brings repeating pages of Arabic script – often the SECAM colour will lock with very weak signals and no VITS are included (Dubai uses simple VITS). The St. Leonards Radio Club recently had a talk by Ken Willis, G8VR who suggested that despite this year being the peak of the sunspot cycle we may, over the next two years, enjoy more F2 activity than at present due to reduced Polar Absorption (in turn due to fewer flares). It seems that after the last sunspot cycle peak there was better transatlantic 50MHz communication for up to two years.

Many thanks to the following for sending in reception reports/logs: David Oliver (Birmingham), Peter Schubert (Rainham), Iain Menzies (Aberdeen), Cyril Willis (King's Lynn), Tim Anderson (St. Leonards), Roger Fussell (Torpoint), David Glenday (Arbroath) and Simon Hamer (Powys).

Anthony Mann has sent in a report from Perth, Western Australia, covering October/November. He heard or saw European TV signals on November 2nd and 5th, though perhaps the most dramatic reception was on October 31st when ch. E2 signals were received from Muro, Portugal. The pictures showed a studio scene at 1759, a caption with five or six large letters at the top of the screen and then a female announcer with dark, shoulder length hair and white jacket, followed by programme material. A scanner check showed that the carrier frequency was 48·247MHz nominal. The Perth to Europe opening was confined to an arc from the UK/Holland to southern Sweden. An opening on October 28th produced Chinese signals at up to ch. C4 (77·25MHz). Lower frequency Chinese signals are commonly received in Australia via F2/TE openings.

On the space front Iain Menzies has bought an Amstrad package and reports a degree of success in receiving several satellites apart from the intended medium-power Astra. John Standen of North East Satellite Systems, Cropton, Pickering, N. Yorkshire has available at £50 each, buyer collects, a quantity of new spun-aluminium 1·5m dishes in black. Mounting hardware can be arranged. Write or phone 0751 5598.

News Items

USA: The US Information Services' Tele-Marti project was due to start test transmissions from Cudjoe Key off Florida in January. The idea is to broadcast a TV service to Cuba from a helium-filled balloon at 10,000ft (with a backup balloon moored at ground level). The balloon carries a ch. A13 1kW transmitter that feeds a directional aerial providing an e.r.p. of 33kW. Signals are uplinked at a microwave frequency. To date some $8m has been spent on the project, which has been criticised mainly on the grounds of possible co-channel interference to US domestic terrestrial transmissions.

France: Antenna-2 has decided to adopt Ceefax on a permanent basis. Due to the incompatibility between Ceefax and the French designed Antiope system, both will continue in use, the idea being to change eventually to Ceefax only. The TDF-1 satellite also uses Ceefax. All current production French teletext sets are now capable of handling Ceefax.

Satellite TV

Yet another Swedish cable channel is to start in autumn 1990, called Nordisk Television (TV4). The West German Screensport programme "Sportkanal GmbH" is to have national carriage on cable: CNN's operations have been stalled by a dispute over fees between CNN and the Bundespost. Iran intends to have a satellite with twelve TV channels in operation by 1995. Certain adult film offerings from RTL-Veronique at 19·2°E are now scrambled – but can be seen clear at 13°E!

Five transponders were seen testing, on carrier only, at 41°W on November 9th. The frequencies were 10·9975, 11·0735, 11·1541, 11·4913 and 11·6144GHz, with vertical polarisation and power levels up to 50dBW. It has been difficult to establish which craft transmitted the signals for a whole evening – they've not been seen since. One suggestion is that they originated from the NASA TDRS-D craft.

MAC signals with the caption "SG SUCCE" were seen at approximately 11·02GHz from 27·5°W in mid-November. Following the caption the signals went to scrambled MAC. Their source is not known. Another Dutch transponder has been seen on test at 13°E, with the caption "HOL 2" – frequency 11·13GHz with horizontal polarisation. The "PTT NEDERLAND" transponder has been seen in the half-transponder mode, with one half taking RTL-V and the lower half taking news feeds from Sky and others. The situation at the Berlin Wall brought many OB circuits into action, mainly via ECS at 7°E though the BBC was seen at 27·5°W.

NRK (Norway) has gone from the 10°E craft – Spanish corporate video servicing and other OB material has been seen at 11·2GHz, vertical. NRK has also disappeared from Intelsat 1°W at 11·684GHz, being replaced by a series of unknown sourced test patterns without scrambling. Both these feeds had been in D-MAC.

For real US TV watch PanAmSat at 45°W. Its downlink to the London Teleport carries NBC and CBS programming, apparently intended for Sky News, at varying power levels on 11·639GHz.

Remote Imaging Group

This group has been in touch with us recently. It specialises in weather satellite reception and issues an excellent newsletter that contains much information on orbital data, constructional and practical projects, details of commercial equipment, etc. The group has over 1,000 members and liaises with the European Space Agency, NASA, the Meteorological Office and the DTI. If you are interested in reception from this type of satellite, write including an A5 SAE to Des Watson, Norton, Gote Lane, Ringmer, Nr. Lewes, East Sussex BN8 5HX.

1990 Meteor Shower Dates

Our thanks to George Spalding of the Meteor Section, British Astronomical Association, for once again providing details of the MS periods for the coming year:

Meteor Shower	*Period*	*Peaking*
Lyrids	April 19-25	April 22 at 0800
May Aquarids	May 1-10	May 5
Delta Aquarids	July 15-Aug 20	July 29
Perseids	July 25-Aug 20	Aug 12 at 2000
Orionids	Oct 16-27	Oct 20-23
Taurids	Oct 20-Nov 30	Nov 1-10
Leonids	Nov 15-20	Nov 17 at 2100
Geminids	Dec 7-16	Dec 14 at 0300
Ursids	Dec 17-25	Dec 22-23

With the Orionids there's a fairly flat peak in activity over two-three days. The weak Taurids shower provides long activity with a flattish peak over ten days. The Ursids shower is usually weak. For various reasons UK activity times may vary. For example, the Leonids will not be visible in the UK at the peak time, so a pre-dawn check should be made.

Receiver Review: Supra Model STV660

Aerial Techniques has recently started to market the Supra Model STV660, a triple standard, PAL/SECAM receiver with a six-inch screen. It's a lightweight v.h.f./u.h.f. receiver capable of operating with system B/G, I or D signals. The tuning scale is arranged vertically on the right-hand side and the case is remarkably well ventilated.

The control system is versatile. At the lower left-hand side there are user controls for vertical hold, colour, brightness, picture (contrast) and slide switches for PAL/SECAM and systems B/G (CCIR), I (UK/HK) and D (OIRT – East Europe). These controls are recessed and don't protrude, which is important with a portable receiver. At the front there's a horizontal on/off switch below the tuning scale. At the top there are, from front to rear, pushbuttons for v.h.f./u.h.f. and for video input/off-air selection, then a series of phono sockets for audio and video inputs and outputs. A rear 3·5mm jack allows earphone monitoring. The large volume control knob is to the front upper. At the very rear the nine-section telescopic aerial reaches to 37in. when fully extended. On the right-hand side there are a very large tuning knob towards the front, a conventional recessed 75Ω coaxial socket, an a.f.c. on/off slide switch and, via a 2·1mm socket, provision for a 12V d.c. input. Presets accessible via small holes adjacent to the left-hand side user controls cover a great range of adjustments. A tilt-out stand beneath the set lifts it an inch upwards at the front.

Tuning coverage is 46·25-66·5MHz, 162-228MHz and 472-860MHz. When tuning from Band I to Band III there's automatic changeover. The 2in. vertical v.h.f. scale is calibrated chs. E2/3/4 in Band I and chs. E5/7/10/11/12 in Band III. The u.h.f. scale length is 2·5in., the calibration being every five channels from 21 to 69.

The set can be powered from the mains or a 12V car battery or dry cell. It comes with a large 13A plug integrated power supply that provides a 15-16V d.c. output at 1·2A. This is the usual Far East black-blob type power supply that runs warm after half an hour, though it's far cooler than some I've met.

I feel that the receiver's most useful feature is the provision for video and audio inputs and baseband outputs from the received signals. At v.h.f. there was a lack of snow on the screen: I like to see a receiver with a "lot of go", and this lack of displayed noise was not to my liking. I felt that the v.h.f. sensitivity is low. Matters improved at u.h.f., with snow visible on the screen, though again difficulty was experienced in displaying local signals received via the integral telescopic aerial. With a large, external aerial connected excellent quality pictures were displayed. The selectivity under these conditions is such that with adjacent channel signals present (here at Romsey LWT ch. 23 and the local BBC-2 ch. 24) there were no "floating" pictures. I feel that the tuning knob has too much slackness and backlash: circular packing beneath the knob would remove the wobble and make tuning easier.

The results with a baseband video input were excellent. Note that the SECAM colour option does not include the French System L.

It's an attractive set, though for me lacking in gain. It works well as a cheap off-air receiver with strong signals and as a monitor for baseband signals such as the output from a satellite TV receiver.

A Satellite TV Patterning Problem

In many domestic satellite TV receivers the u.h.f. output carries the local TV channels as well as the satellite TV tuner's output, which is typically at around ch. 35-40. This is done by feeding the output from the terrestrial TV aerial to a diplexer within the satellite TV receiver. Unfortunately wideband diplexing is used. As a result, if a signal from the terrestrial aerial is on the same channel as the satellite TV tuner's output the two will be mixed and patterning will appear on all the satellite TV channels.

A changeover switch could be incorporated, but there's a simpler way of overcoming this problem. Obtain a Band IV or V RSPK notch filter (single notch with 25dB depth) or a Band IV or V double-notch filter (40dB depth) in the TFV range. Both have in-line metal housings, the single-notch type being alloy based and lightweight. A Band IV filter is tuned to ch. 35 by screwing the brass slug out while for Band V you screw the slug into the housing. Fit the filter at the receiver's output, tune the TV set to satellite TV then adjust the brass slug slowly until the picture becomes snowy, i.e. is attenuated. Tune for maximum attenuation. When this tuning position has been found, remove the filter and insert it in series with the input from the terrestrial TV aerial, at the point where it plugs into the satellite TV receiver. Thus fitted the filter will attenuate any terrestrial signal interference to the satellite TV tuner's output. Remember that during periods of tropospheric enhancement channels that are normally empty can be filled with Continental signals, providing interference for hours or days.

Service Bureau

Note: the Query Service has now ended.

PHILIPS 2A CHASSIS

The picture is marred by a grid of parallel vertical lines that cover the whole screen area. Alternate lines appear to be broken, giving the impression that the picture is being viewed through a lace curtain. The lines are stationary and do not interact with the picture content, which is excellent. With a VCR input however the lines are sometimes curved, mostly on the left-hand side, and tend to move, but again don't interact with the picture.

The 2A chassis uses a self-oscillating power supply that normally runs at about 40kHz and is not tied to the line frequency. It seems that this frequency is breaking through into the signal circuits. Prove it by comparing the spacing of the interfering lines at very low and very high brightness levels. If the spacing changes, power supply hash breakthrough would seem to be confirmed. Possible causes are failure of reservoir/smoothing capacitors on the secondary side of the chopper transformer; faulty isolating components 2691 (33pF), 3691/2 (both 3·9MΩ); dry-joints in the power supply or earthing/screening problems in this area.

HITACHI CPT1444

The problem is that the picture flickers from colour to black-and-white. This occurs randomly though frequently and is not modulated by the sound. A replacement crystal in the colour decoder section has not improved matters and there don't seem to be any dry-joints in this area.

Ensure that a variable colour control voltage is present at pin 5 of the TDA3562A colour decoder chip and that C507 (2·2μF) which decouples this potential is o.k. Also check that the sandcastle pulse at pin 7 is present and correct. If the problem persists the chip itself is suspect.

SANYO VHR1100

The head drum intermittently fails to rotate – unless pushed! When the machine is playing the verticals are corrugated and the picture moves from side to side a few times per second. The colour stays on. Finger pressure on top of the drum momentarily cures the corrugated verticals but as the head slows down line lock is lost. The voltages around IC4003 are correct.

We suggest that you apply a variable voltage of about 4·4V from a stabilised source to pin 11 of IC4003. If you can momentarily get a steady picture by varying this voltage, suspect the servo circuit centred on IC4002. If not, try replacing IC4003 before suspecting the head drum motor.

ITT CVC25 CHASSIS

There's a curious effect like a hum bar except that the light and dark bands relate to colour saturation instead of brightness. They drift slowly upwards and are most noticeable on a colour-bar display with the luminance switched off. With this display the colour can disappear altogether in the dark bands, whose width is about one third of screen height. There's no hue distortion: only the saturation varies. The fault appeared after attention to other problems.

We suggest that you check the earthing of the decoder screening can and the earth print to the metal chassis and earth lands of the main chassis. Check also that the metal chassis frame is well soldered to the main print. Then try applying a smooth (externally derived) saturation control voltage to pin L6 on the decoder module. If this cures the problem, check for 50Hz leakage in the customer control panel and the cableform dressing.

AMSTRAD CTV1401

The problem is erratic tuning drift. At switch on, with any channel selected, there's no signal. After a few minutes the station may appear for two-three minutes then drifts off channel. Retuning helps for a while but the station drifts again. The whole of the area near the tuner seems to be heat sensitive. The channel switch contacts have been replaced.

The tuner itself is almost certainly responsible for the problem. Before you replace it, use a high-impedance voltmeter to check that the voltage at the tuner's tuning voltage pin doesn't vary widely. If it does, check the tuning potentiometer bank and the 33V stabiliser.

GRUNDIG CUC220 CHASSIS

The problem with this set is that the sound and raster switch off from time to time. They come back suddenly if the set is left on. The picture seems to get weaker before going off.

Intermittent switch-off problems with CUC series chassis are commonly due to failure of R646 (270kΩ) or the TDA4600 chopper control chip. It's also worth replacing and resetting the h.t. preset control R647 (2·5kΩ). Before embarking on component replacement, check thoroughly for dry-joints in the power supply and line output sections of the chassis.

AMSTRAD VCR4500/4600/9000

We've had the same trouble with all these machines. The problem is tape damage: the tape is pulled down across the audio/control head, damaging the bottom edge. Replacing the pinch wheel and slackening the tension spring to the pinch wheel assembly has been tried without success. The problem does not occur with all tapes.

This is a common problem with these machines. It's caused by a faulty reel-drive clutch, item 301. The part number is 150873.

SAISHO CM145R

Something keeps on destroying the M491 tuning/memory chip IC501. The first symptoms are a gradual loss of programme numbers, followed by an erratic display of numbers when pressing the channel change control. Also the memory cannot be held. A replacement restores normal operation after reprogramming for anything between a couple of days to several months. I've increased the value of the decoupling capacitors in the supply to the chip and checked the 12V and 5V lines, which are correct.

The almost certain cause of your problem is flashover somewhere in the high-voltage section of the set. First check that the 125V h.t. supply is not excessive. If it is, replace the STR3125 regulator chip Q801. If not, check the e.h.t. and focus connection areas of the c.r.t. and the tube base spark gaps. Ensure that the tube's Aquadag coating, the spark ring and chassis ground are correctly bonded together. If all these things are o.k. we would suspect the diode-split line output transformer T444.

TEST CASE

326

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.

We find Bill indispensible: he combines the virtues of a field technician, delivery man, diplomat and trouble-shooter. On these cold mornings he's as likely to be found in wellies as with a soldering iron and meter. Though not fully qualified, Bill is determined to sort out any problems that arise, with his own equipment at least – and there's a lot of it.

Some years back Bill had invested in a hi-fi VCR. It had seen much use since then but had lately developed a problem in the hi-fi sound department. The sound quality with the machine's own recordings had deteriorated. Prerecorded tapes, whether purchased or rented, gave good results (except for those badly duplicated tapes that give trouble with any VCR) provided the tracking was carefully adjusted. With its own recordings the sound reproduction was patchy, with spasmodic signal dropout, often a high level of background noise, critical setting of the tracking control and an undue fussiness regarding tapes – some makes and grades gave better results than others.

Bill's first action was to clean the tape path thoroughly, including all the heads in the drum. This brought little relief to the sound problem. It didn't cure the machine's tendency to produce very slight black streaking from white verticals either. These things all suggested worn heads, but after checking on the price (even the trade price!) of a new upper drum assembly Bill resolved to exhaust all other possibilities first. The wages in this trade do not permit you to throw money about . . .

With a borrowed manual, oscilloscope, alignment tape and other essential gear he got to work on the living room carpet. First came a careful check on the tape path – this was perhaps a little misguided since the sound tracks of prerecorded tapes played back well. As this bore no fruit he went on to the hi-fi audio recording section, where his first check was on the writing current. The scope showed a slightly high audio recording current level, which was restored to normal by a small adjustment, but a record-and-playback test with a particularly critical make of tape showed very little improvement.

Next day Bill borrowed a frequency counter with which to set the carrier frequencies: 1·4MHz for the left channel (ch. 1) and 1·8MHz for the right channel (ch. 2). They were so nearly correct that there was little point in readjustment. He reasoned that problems prior to the f.m. modulators would be unlikely to produce the symptoms, especially the sensitivity to tracking errors. So the head must be faulty: after perusing all the catalogues and price lists for the best terms, Bill ordered a head drum.

The test gear was borne home for the weekend to help with the fitting and alignment of the new drum assembly. The old one was carefully removed and the new one was fitted meticulously. All the relevant setting-up procedures in the video, servo and hi-fi departments were then followed – for the hi-fi adjustments a test tape made in the workshop on a brand new hi-fi machine was used. All went well – though many hours were spent doing it! – and at the end of the operation the faults had been cured. The machine's own recordings gave excellent playback sound and vision with all makes and types of tape.

Bill told Workshop Sage about it. Sage's opinion however was that head replacement may not have been necessary – yet. So strong was his conviction that, under Sage's supervision, the original drum was replaced in the machine. It lasted another nine months! What did he do to put matters right? For the answer see next month.

ANSWER TO TEST CASE 325

– page 223 last month –

The tiny viewfinder on the operating table last month gave every indication of having a fault in its line output stage. The output voltages, such as the e.h.t. and focus potentials, were low and the scan was of reduced amplitude.

The clue that the technician had overlooked was the combination of a short flyback period and low-amplitude, misshapen pulses in the line output stage. Such a situation could have been caused by a defective line output transformer, but if the technician had checked his oscilloscope's timebase setting he would have noticed that he was getting five pulses across the screen instead of the normal three at the usual 20μsec/division sweep setting. The problem was that the line oscillator was running at about 23kHz. At this frequency the line output stage was a mile off tune. The image displayed by the viewfinder was too blurred to show the mass of horizontal lines that would have indicated where the cause of the trouble lay.

In this particular viewfinder the line oscillator, and much else, is buried in an AN2510S chip, which is a surface-mounted device. When the peripheral components relevant to the line speed had been checked and found to be in order the chip itself was declared to be faulty. A new one restored correct operation. Does anyone want to buy a Sharp viewfinder line output transformer in good order?!

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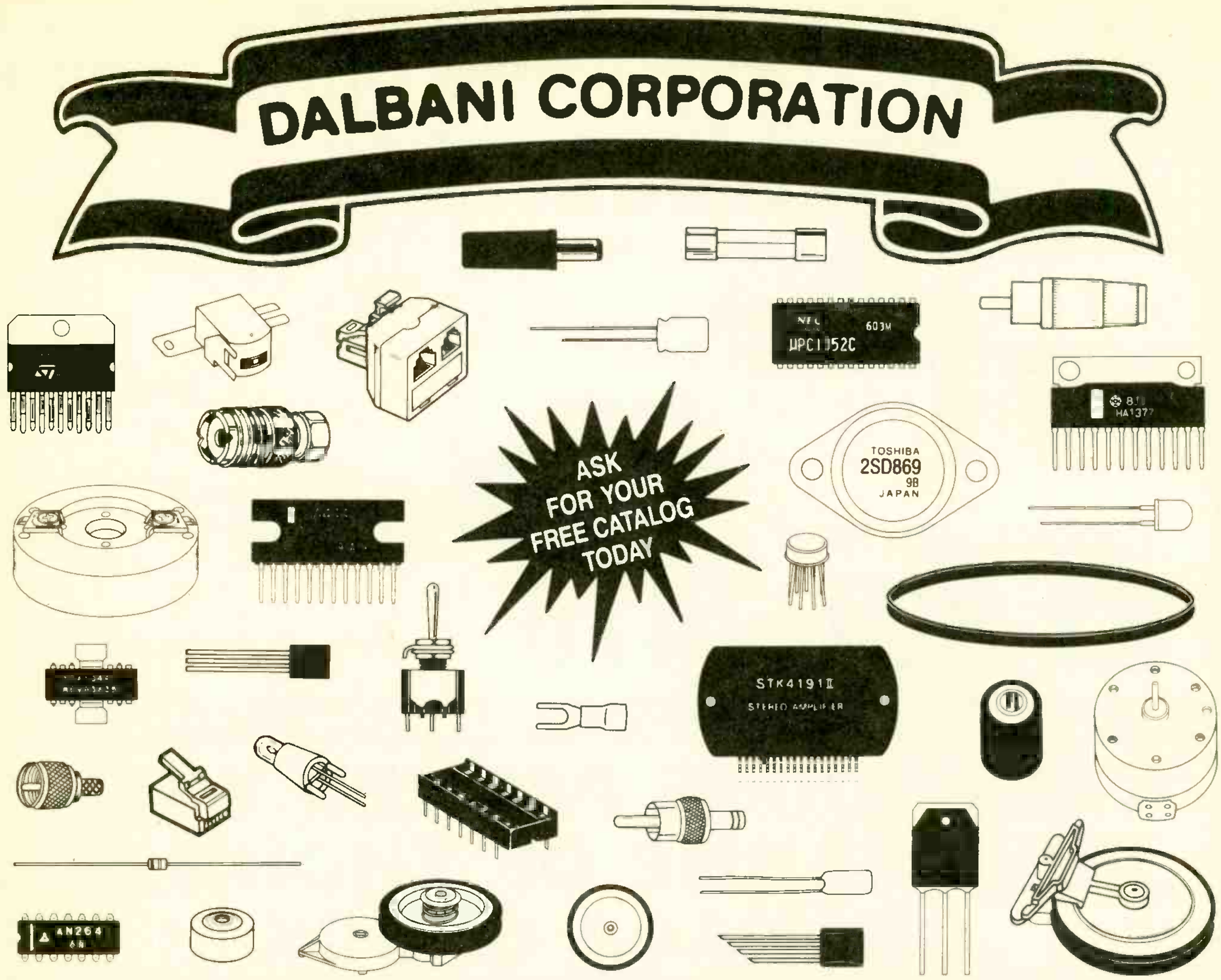

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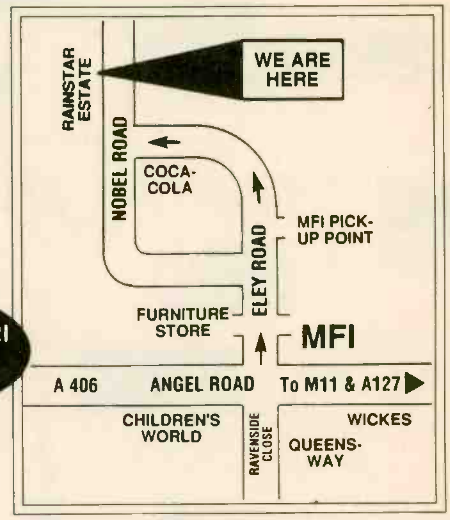

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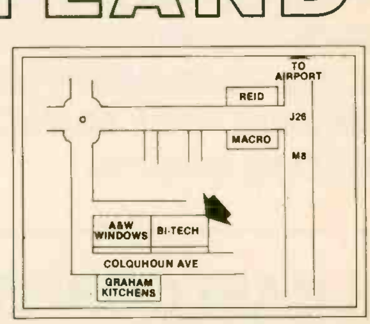

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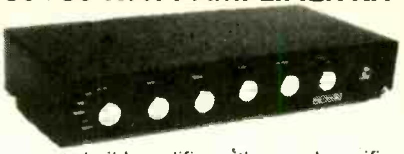

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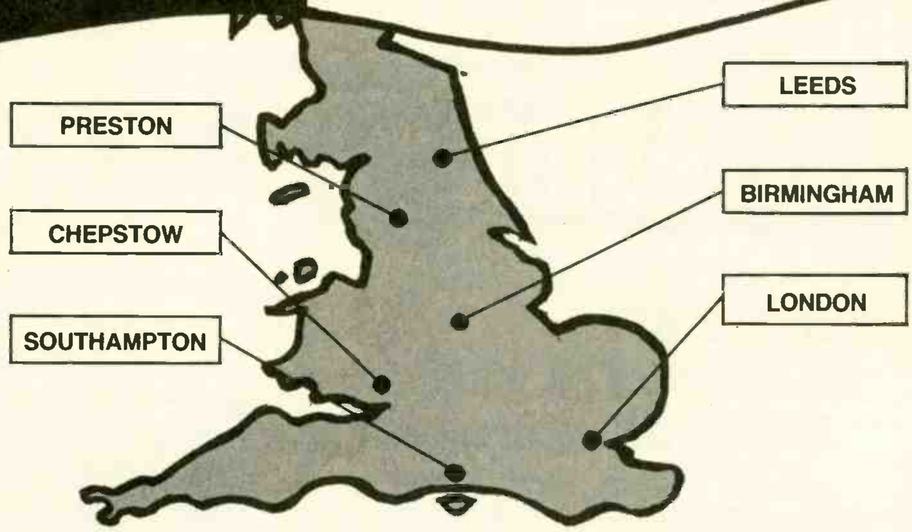

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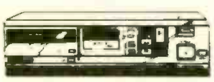

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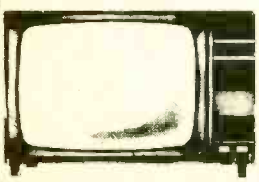

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2SC-959	65p
2SC-998	60p
2SC-1012	90p
2SC-1018	90p
2SC-1030	220p
2SC-1050	320p
2SC-1060	90p
2SC-1061	90p
2SC-1096	75p
2SC-1106	210p
2SC-1115	290p
2SC-1116	290p
2SC-1162	40p
2SC-1172	190p
2SC-1173	50p
2SC-1195	250p

2SC-1212	60p
2SC-1213	65p
2SC-1214	45p
2SC-1222	35p
2SC-1226	80p
2SC-1317	25p
2SC-1318	30p
2SC-1327	25p
2SC-1328	25p
2SC-1345	30p
2SC-1368	40p
2SC-1383	40p
2SC-1384	40p
2SC-1403	150p
2SC-1413	300p
2SC-1445	125p
2SC-1446	75p
2SC-1447	60p
2SC-1454	350p
2SC-1509	45p
2SC-1567	60p
2SC-1568	60p
2SC-1577	770p
2SC-1550	60p
2SC-1514	75p
2SC-1584	550p
2SC-1586	550p
2SC-1627	30p
2SC-1667	140p
2SC-1669	85p
2SC-1670	85p
2SC-1675	20p
2SC-1722	60p
2SC-1756	60p
2SC-1760	85p
2SC-1775	15p
2SC-1815	15p
2SC-1819	75p
2SC-1845	20p
2SC-1875	240p
2SC-1890	20p
2SC-1906	35p
2SC-1913	100p
2SC-1914	30p
2SC-1922	250p
2SC-1941	65p
2SC-1942	270p
2SC-1986	60p
2SC-2003	60p
2SC-2022	60p
2SC-2073	75p
2SC-2120	15p
2SC-2229	30p
2SC-2236	30p
2SC-2240	25p
2SC-2274	30p
2SC-2278	75p
2SC-2275	60p
2SC-2320	25p
2SC-2335	125p
2SC-2371	60p
2SC-2427	80p
2SC-2482	50p
2SC-2501	85p
2SC-2502	90p

2SC-2537	450p
2SC-2546	20p
2SC-2550	75p
2SC-2555	175p
2SC-2564	250p
2SC-2565	280p
2SC-2575	25p
2SC-2577	150p
2SC-2579	175p
2SC-2611	50p
2SC-2581	200p
2SC-3078	40p
2SC-3182	250p
2SC-3284	150p
2SC-3298	150p
2SC-3506	230p
2SC-3519	150p
2SD-1265	100p
2SD-198	200p
2SD-200	310p
2SD-235	40p
2SD-288	80p
2SD-299	160p
2SD-313	40p
2SD-315	75p
2SD-325	45p
2SD-352	50p
2SD-357	40p
2SD-358	40p
2SD-381	90p
2SD-386	80p
2SD-388	180p
2SD-389	100p
2SD-400	20p
2SD-401	50p
2SD-426	150p
2SD-428	150p
2SD-438	50p
2SD-468	30p
2SD-476	60p
2SD-478	100p
2SD-525	75p
2SD-526	75p
2SD-600	90p
2SD-612	40p
2SD-613	100p
2SD-669	45p
2SD-716	125p
2SD-718	125p
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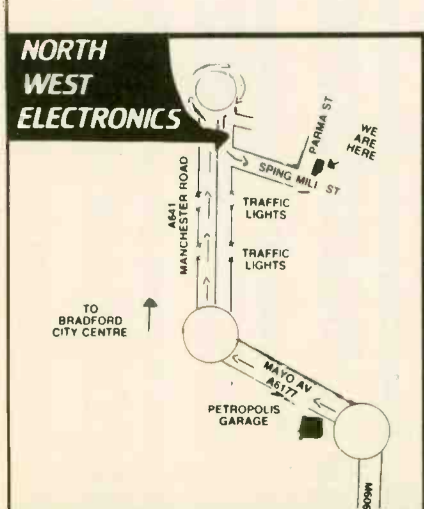

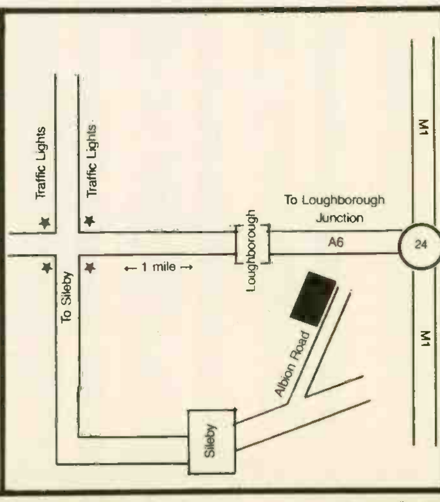

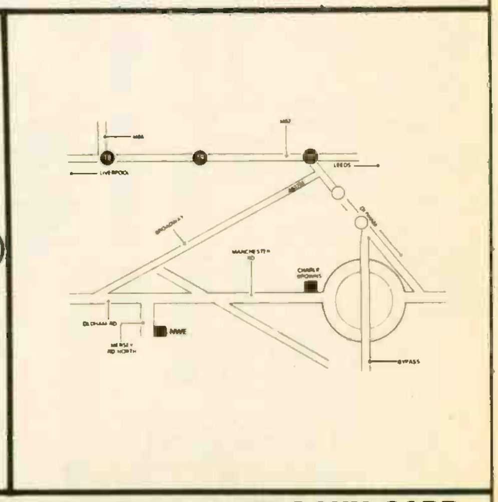

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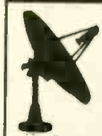

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GEC & Double etc. £1

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12 Volt Aerial Changer over Relays 144 Mc/s 45 watts	50p
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ITT Display Tube 58705	50p
8 Seg Display FND500	20p
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Philips Digital Multimeter with memory and auto ranging 5BC812 £63.00

PHILIPS
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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
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T/V loop aerial	75p
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Hitachi Silver Oxide Battery G13 UCC357 IEC SR44 1.5V	60p
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De-solder pump + 2 nozzles Philips	£4.00
Flat Red LED and Green	5p
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Solder 1 kilo reel	£5.50
Dual v/u meter -20 – +10db	£1
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Portasol Flameless Gas Soldering Iron	£16.00
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Hill Meter Leads, S/Rubber and Probes	£4.00

HILLS

Miniature Linesman Pliers	£2.20
Miniature Side Cutters	£2.20
Miniature Pliers	£2.20
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KT3 PANELS

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

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PYE 6 Key Switch & Panel G11 Front Panel	£10
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Quantity Reductions

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KT3 touch button black	6 for £1
G11 touch button red	6 for £1
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K30 VHF. UHF Dawer Ass	£6.00
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300 Condensers	£1.50
300 Resistors	£1.50
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GEC-Hitachi Thick Film Frame	£5

Mixed Packs

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25 Panel Mount Bulbs & Neons	£1.50
10A	£1.50
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20 Large LED Red	£1.00
20 Small LED Red	£1.00
10×20 Turn 100K Pots	£1.00
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40 glass reed switch	£1
10 press to make switch	70p
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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

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