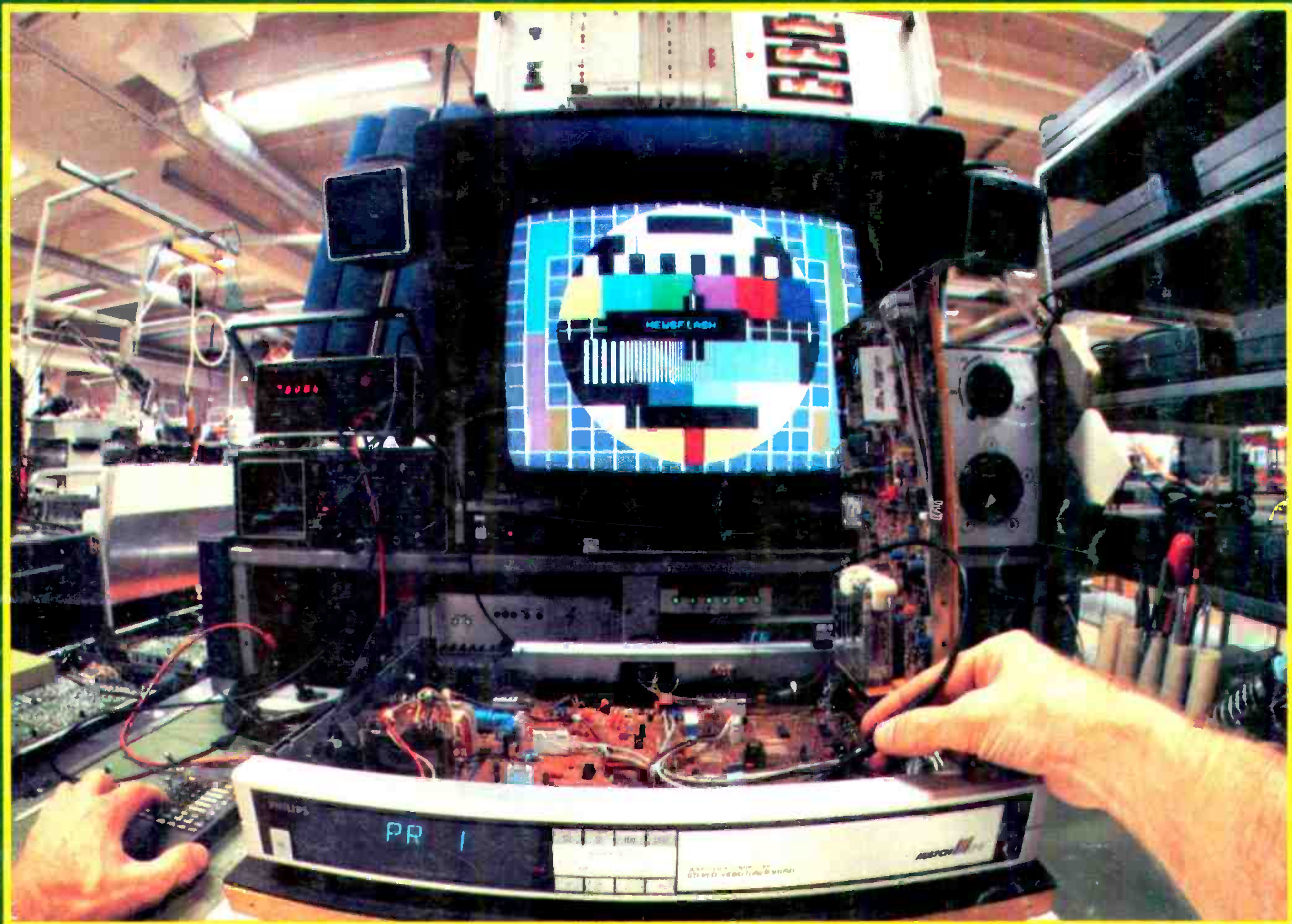
SEPTEMBER 1985

Australia $1·80, New Zealand $2·20, Malaysia $5·50 **£1·10**

TELEVISION

SERVICING·PROJECTS·VIDEO·DEVELOPMENTS



An Approach to Adding Teletext

Quick Steps in TV Servicing

VCR Clinic • A Visit to MCES

Variable Stabilized HT Supply

A Case of Liquid Spillage

TV Fault Finding • DX-TV

TELEVISION

September 1985

Vol. 35, No. 11
Issue 419

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.

SUBSCRIPTIONS
An annual subscription costs £13 in the UK, £15 overseas (by surface mail). Send orders with payment to Quadrant Subscription Services Ltd., Oakfield House, Perrymount Road, Haywards Heath, Sussex, RH16 3DH.

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QUERIES
We regret that we cannot answer technical queries over the telephone nor supply service sheets. We will endeavour to assist readers who have queries relating to articles published in *Television,* but we cannot offer advice on modifications to our published designs nor comment on alternative ways of using them. All correspondents expecting a reply should enclose a stamped addressed envelope. Requests for advice on dealing with servicing problems should be directed to our Queries Service. For details see our regular feature "Service Bureau". Send to the address given above (see "correspondence").

this month

OUR NEXT ISSUE DATED OCTOBER WILL BE PUBLISHED ON SEPTEMBER 18

P. V. TUBES

PLEASE NOTE OUR NEW ADDRESS – COME AND SEE US

104 ABBEY STREET, ACCRINGTON, LANCS BB5 1EE.

Tel: 0254 36521/32611 Telex: 635562 Griffin G (For P.V.)

HOW TO ORDER

ADD 75p per order P+P (U.K.). Heavier parcels e.g. cable, service aids, degaus. coils please allow £1.30 P+P (U.K.). Export orders charged at cost. First Class Mail is used whenever possible. Add 15% VAT to total except where it states zero rate.

Goods are despatched on the day we receive your order. If for any reason we are out of stock we will try to inform you as quickly as possible. We try our best to give a speedy, fair and efficient service. V.A.T. invoice on request. Give us a ring – we'll give you service. Please ask if what you need is not listed – we will try to help. Prices are subject to change without notice.

SEMICONDUCTORS

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AL102	4.90
AU106	2.50
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BC212L	13
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BC214	10
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BC261	18
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BC461	30
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BD124P	79
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BD132	49
BD133	60
BD135	38
BD136	38
BD137	38
BD138	35
BD139	35
BD140	44
BD144	1.70
BD150	60
BD159	65
BD166	52
BD179	70
BD182	1.20
BD183	75
BD201	85
BD202	91
BD203	80
BD204	99
BD222	46
BD223	56
BD225	47
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BD233	60
BD234	63
BD235	60
BD236	65
BD237	57
BD238	65
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BD410	79
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BD509	56
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BD517	60
BD520	75
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BD698	1.50
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BF259	35
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BFY51	30
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BR100	34
BR101	45
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BR303	1.46
BRC4443	94
BRC4444	98
BRY39	56
BRY55	45
BRY56	57
BSR59	1.80
BSV57B	89
BT100	1.65
BT101	1.20
BT102/500	1.20
BT106	1.60
BT108	1.69
BT109	99
BT116	1.21
BT119	3.66
BT120	3.66
BT151/800	1.20
BU104	2.00
BU105	1.58
BU108	1.80
BU124	1.90
BU126	1.75
BU204	1.50
BU205	1.42
BU206	1.80
BU208	1.60
BU208A	1.65
BU208D	2.20
=BU800	
BU208/02	2.10
BU326A	1.75
BU407	1.70
BU426	3.07
BU500	2.30
BU526	2.46
BU508	3.20
BU806	1.40
BU807	2.94
BUW84	1.45
BUX84	1.50
E1222	40
MCR101	45
MCR220	1.50
ME0411	20
MJE340	68
MJE520	50
MJ3000	1.98
MPSA92	35
MR814	45
MR854	55
MR475	2.46
MR479	2.60
OT112	1.91
OT121	1.91
R2008B	1.90
R2010B	1.92

R2265	1.50
R2322	62
R2323	67
R2461	1.50
R2540	2.80
RC4558	2.20
RCA16334	90
RCA16029	99
RCA16039	99
RCA16092	99
RCA16040	96
RCA16041	84
RCA16334	90
RCA16335	90
RCA16957	2.88
TIC45	90
TIC46	60
TIL32	65
TIL78	48
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TIP47	70
TIP120	65
TIP2955	90
TIP3055	63
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2N918	82
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2N3054	60
2N3055	60
2N3702	11
2N3703	10
2N3705	10
2N3706	10
2N3708	17
2N5294	48
2N5296	48
2N5298	69
2SB337	1.86
2N5496	53
2N6107	75
2N6109	81
2SA715	1.98
2SC495	1.10
2SC496	1.31
2SC643A	1.50
2SC1096	1.72
2SC1172Y	2.20
2SC1173Y	1.69
2SC1306	2.73
2SC1307	3.00
2SC1449	1.67
2SC1520	68
2SC1678	2.67
2SC1909	2.90
2SC1953	1.44
2SC2028	1.82
2SC2029	2.60
2SC2078	2.90
2SC2091	1.34
2SC2166	2.73
DEC1	2.20
DEC2	2.20
THY15/80	2.20
THY15/85	2.20
BUW81A	3.84
T6006V	1.50
T6021V	90
T5022V	1.80
T6026V	90
T6027V	63
T6028V	66
T6029V	2.50
T6034V	81
T6036V	90
T9002V	1.12
T9003V	60
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INTEGRATED CIRCUITS

AN214Q	3.91
AN240	3.84
AN318	3.98
AN262	2.45
AN301	5.15
AN715Q	3.97
AN6340	7.85
AN6341N	5.10
AN6344	7.85
BA521	2.80
BA536	3.00
CA555	46
CA556	84
CA741	25
CA748	45
CA3065	1.80
HA1151	3.89
HA1322	2.65
HA1342	2.49
HA1306N	2.60
HA1366WR	2.80
HA1392	3.95
HA11219	2.49
HA11244	1.98
LA4031P	3.21
LA4032P	2.90
LA4102	3.37
LA4400	3.05
LA4422	3.28
LC7130	5.93
LC7120	5.87
LC7137	5.50
LM1011	3.25
LM1340T	75
MB3712	1.95
MC1307	1.99
MC1310P	1.60
MC1327	1.70
MC1351P	2.93
MC1349	1.99
MC1350	1.50
MC1352	1.75
MC1358P	1.50
MC1495L	3.00
MC14011BCP	66
MC14049UB	43
MC7742	1.35
MC7812	1.35
ML231	2.20
ETTR6016	
ML232	2.20
ML236	5.35
ML237	2.50
ML238	6.00
ML239	2.50
ML920	4.12
ML922	3.29
ML928	2.18
MM5387ANN	4.15
MRF475	2.50
MRF477	10.00
MSN5807	7.87
MS1513L	2.80
MS1515L	3.28
SAA1025	4.40
SAA1124	2.50
SAA1250	3.94
SAA1251	4.90
SAA5000	4.39
SAA5010	6.30
SAA5012	6.50
SAA5020	5.90
SAA5030	8.25
SAA5050	8.50
SAA3210	2.93
SAS560S	1.89
SAS570S	1.89
SAS660	3.25
SAS670	3.25
SAS580	2.90
SAS590	2.90
SL901B	7.00
SL917B	8.00
SL1310	1.80
SL1327Q	1.20
SL1430	1.25
SL1432	3.36
SL76544	2.05
SN76003N	2.49
=SN76013N	
SN76023N	2.00
SN76110N	1.15
SN76115N	2.27

SN76131N	2.00
SN76226DN	2.00
SN76227N	1.18
SN76533N	1.70
SN76033N	2.49
SN76544N	2.35
SN76650N	1.05
SN76660N	80
SN76666N	80
SN76530A	1.47
STK015	6.25
STK032	=
STK078	13.25
STK043	11.05
STK433	5.65
STK435	9.06
STK436	5.50
STK437	7.85
STK439	6.62
STK459	8.20
STK441	8.10
STK461=465	9.60
STK463	14.30
SW153	2.74
TA7050P	95
TA7051P	95
TA7063P	2.20
TA7074P	1.00
TA7108P	3.43
TA7120P	2.43
TA7129AP	3.76
TA7130P	1.93
TA7146P	4.67
TA7193P	5.67
TA7171P	1.85
TA7172P	1.85
TA7173P	1.85
TA7176P	2.50
TA7202P	4.27
TA7204P	3.77
TA7205AP	3.72
TA7208P	3.40
TA7210P	6.60
TA7222	2.42
TA7223P	3.74
TA7227P	5.98
TA7228P	5.98
TA7310P	2.78
TA7609P	4.39
TA7611AP	2.92
TAA310	2.83
TAA320	2.00
TAA550	55
TAA630	3.90
TAA8400S1	1.96
TAA661B	1.20
TBA120A	80
(A),(S),(AS),(SA).	
TBA120B	1.30
TBA120SB	1.37
TBA120T	95
TBA120U	1.10
TBA395	1.20
TBA396	80
TBA440N	2.75
(TBA1441)	
TBA440P	2.50
TBA480Q	1.50
TBA510	3.00
TBA520(Q)	1.68
TBA530(Q)	1.38
TBA540	1.68
TBA5600	1.59
TBA570	1.79
TBA690	1.50
TBA641BX1	3.50
TBA673	2.45
TBA700	2.12
TBA720	2.64
TBA750	2.98
TBA800	1.62
TBA810AS	1.10
TBA820	1.70
TBA820M	1.25
TBA890	3.94
TBA920(Q)	3.00
TBA950(2X)	3.25
TBA970	4.09
TBA990	1.90
TBA14406	2.44
TCA760	2.30
TCA270SQ	2.50
TCA800	5.95
TCA830	3.44
TCA900	2.20
TCA910	2.20

TCA940	1.95
TDA440	2.20
TDA1002	1.95
TDA1003A	5.50
TDA1006A	2.50
TDA1005	3.60
TDA1010	1.54
TDA1035	4.70
TDA1037	2.95
TDA1044	4.37
TDA1060A	4.44
TDA1062	1.56
TDA1083	1.68
TDA1170S	3.00
TDA1190	3.50
TDA1180	2.91
TDA1200	2.95
TDA1220A	2.12
TDA1270	3.95
TDA1327	1.70
TDA1352B	1.60
TDA1412	1.20
TDA1415	1.40
TDA1470	4.67
TDA1770	5.60
TDA2002	2.80
TDA2003	1.20
TDA2004	2.52
TDA2006	1.78
TDA2010	2.00
TDA2140	5.95
TDA2150	2.22
TDA2190	4.95
TDA2020	4.66
TDA2030	2.80
TDA2522	2.40
TDA2523	3.40
TDA2524	2.25
TDA2525	4.00
TDA2530	2.70
TDA2532	2.56
TDA2540	3.84
TDA2541	3.84
TDA2560	3.50
TDA2571	2.56
TDA2576	3.75
TDA2576A	3.75
TDA2577	4.50
TDA2581	3.30
TDA2582	2.60
TDA2590	3.25
TDA2591	2.95
TDA2593	2.95
TDA2600	5.90
TDA2610	3.20
TDA2611A	1.95
TDA2640	2.92
TDA2652	7.31
TDA2653	5.90
TDA2680	3.40
TDA2690	1.35
TDA3190	2.00
TDA3500	6.90
TDA3560	6.00
TDA3561	6.50
TDA3562	6.00
TDA3571	3.75
TDA3651A	4.50
TDA4420	4.22
TDA4600	2.95
TDA9503	2.50
TEA1002	3.50
TEA1009	1.37
UPC554	1.34
UPC566H	2.95
UPC575C2	3.40
UPC576H	1.90
UPC587C2	1.60
UPC1025H	2.95
UPC1028H	2.52
UPC1032H	64
UPC1042C	1.56
UPC1156H	4.26
UPC1158H	78
UPC1163H	98
UPC1167C2	94
UPC1168C	1.28
UPC1176C	1.46
UPC1177H	1.56
UPC1178C	1.28
UPC1180C	1.84
UPC1181H	1.62
UPC1182H	2.95
UPC1183H	1.38
UPC1185H	3.66
UPC1188H	2.20

UPC1190G	1.20
UPC1198C	84
UPC1200V	1.18
UPC1211V	2.70
UPC1212V	1.34
UPC1215V	1.66
UPC1216V	1.20
UPC1217G	1.13
UPC1218H	1.80
UPC1223C	2.20
UPC1225H	2.00
UPC1226C	1.50
UPC1227V	1.20
UPC1228H	54
UPC1230H	3.95
UPC1238V	1.16
UPC1245V	1.35
UPC1350C	4.15
UPC1353C	1.92
UPC1365C	6.38
UPC1356C2	2.08
UPC1367	2.08
UPC1378H	2.70
UPC1358H	1.88
UPC1360C	2.20
UPC1363C	2.16
UPC1366C	1.84
UPC1368H2	2.15
UPC1370C2	2.58
UPC1382C	1.08
UPC1384	3.78
UPC1447H	58
UPC41C	2.80
UPC5743	38
UPC577H	2.46
UPC585C	1.28
TDA 1011	4.00
11A 4112	75
TAA570	3.98

while stocks last

We will try to supply the original part when we can. Under certain circumstances we may have to supply an equivalent.

COMPUTER SPARES

PLEASE ASK FOR ITEMS WHICH ARE NOT LISTED

2764	7.50
4116-2	2.17
4532	3.00
Z80 CPU	3.53
ZTX 213	17
ZTX 313	17
LM1889	1.77
8271	60.00
27128	9.50
4164	3.50
ZTX650	35
74LS260	55
UHF modulator UM1233	2.80
Micro cutters	5.00 a pair
Micro pliers	4.80 a pair
Anti static solder sucker Std	5.40
Lge	6.20
Double sided adhesive repair tape, Heavy duty	5.75 a roll

ALSO SEE 74LS RANGE

DIODES

AA119	9
BA102	17
BA115	13
BA145	17
BA148	17
BA154	6
BA155	14
BA156	15
BA317	26
BAX13	4
BAX16	8
BB105G	30
BY126	12
BY127	11
BY133	15
BY164	45
BY176	85
BY179	63
BY182	87
BY184	55
BY199	28
BY206	14
BY210/600	28
BY210/800	33
BY223	90
BY227	28
BY298	22
BY299	22
BYX10	20
BYX36/10	30
BYX55/600	30
BYX71/600	90
DY224	2.00
OA47	9
OA90	10
OA91	10
OA95	6
OA202	11
IN914	4
IN4001	4
IN4002	4
IN4003	4
IN4004	5
IN4005	5
IN4006	10
IN4007	10
IN4148	5
IN4448	10
IN5401	12
IN5402	14
IN5403	12
IN5404	12
IN5405	13
IN5406	16
IN5407	16
IN5408	20
ITT2002 = BAX16	
Y969 – Disc.	
REP BZX85 30V	
General Purpose Triac	95

SPECIAL DIODES

SKE 4F	£1.09
SKE 5F	£1.19
Y723	£1.30
Y827	£1.42

ZENER DIODES

BZX61 130V	28
BZX61 Range (1.3W)	20
BZX79 Range (400mV)	10
BZY88 Range (400mV)	10
BZY93, 90 (18V)	1.18

SONY REPLACEMENT PARTS

TL494CN	£4.70
SG6533	£12.36
Forward Belt C5, C7	23p
Capstan Belt C5, C7	87p
Capstan Belt SL8000/8080	87p
Extension Belt SL8000/8080	£2.11
Drum Belt SL8000/8080	£1.26
Rewind kit SLC5/SLC7	£5.95
Rewind kit SLC6	£3.00
Idler wheel and pulley kit SLC5, SLC7, SLC3000	£5.95
Idler assembly SL3000, C5 & C7	87p
Power switch KV1810/20/22 & KV2000	£5.50
Push button switch 2060/1400	£3.00
Power switch KV2704/2020/2022	£3.56
Slide switch REC	87p
Slide switch REC/PLAYBACK	£1.26
Push switch KV2020/2066	£3.66
Timer lid C5 & C7	87p
Motor DC BHF-110D C5, C7, SL3000	£28.83
2SD 870	£6.35

Sony C7 Video Motor	£30.00
Alignment tape KR52H	£64.40
Sony Video Heads DSR36R SL C5, C6 & C7	£42.00
DSR21R SL C9	£42.00

SONY MANUALS

Instruction manual SL-C9 UB	£2.00
Instruction manual SL-C6 UB Mk 2	£2.00
Instruction manual SL-C7 UB	£2.00
Instruction manual SL-C5 UB	£2.00
Instruction manual SL-C6 UB	£2.00
Service manual KV-1400UB	£8.25
Service manual SL-C5UB	£8.25
Service manual SL-C6UB	£8.25
Service manual SL-C9UB	£8.25
Service manual SL-C6UB Mk 2	£8.25
Service manual SL-C7UB	£8.25

WE WILL ONLY SUPPLY TOP QUALITY, BRANDED COMPONENTS. REPUTATION COUNTS WITH US

G.G.L.COMPONENTS

108 SCOTLAND ROAD, CARLISLE, CUMBRIA CA3 9EY
PHONE (0228) 20358/39693

BUY WITH

THORN SPARES AVAILABLE

INTEGRATED CIRCUITS

TYPE	PRICE (£)
AN214	1.95
AN301	3.45
AN303	3.45
AN305	3.50
AN7110	1.93
AN7114E	2.33
AN7115	2.37
AN7116	2.35
AN7145	3.25
BA312	1.25
BA511A	1.95
BA521	1.85
BA532	1.95
BA536	2.55
HA1166	2.65
HA1322	2.10
HA1338	2.78
HA1339	2.40
HA1342A	2.20
HA1366 W/WR	1.95
HA1370	2.75
HA1374	2.45
HA1377	3.80
HA1388	4.20
HA1397	3.90
LA1201	1.75
LA1230	2.30
LA1365	2.45
LA3350	1.65
LA4031	2.45
LA4032	2.30
LA4101	1.50
LA4102	1.95
LA4400	2.50
LA4430	2.45
LA4440	3.55
LA4460	2.95
LA4461	2.95
MB3712	2.30
MB3713	2.25
ML231B	2.35
ML232B	2.55
ML237B	2.50
ML238B	4.22
SAA1124	3.45
SAA1125	4.70
SAA1250	3.85
SAA1251	4.95
SAA5010	5.10
SAA5012	5.70
SAF1032P	3.25

TYPE	PRICE (£)
SAF1039P	4.55
SAS560S	1.95
SAS570S	1.95
SAS580S	2.40
SAS590S	2.40
SL901	5.65
SL907	7.35
STK0039	6.45
STK0040	5.95
STK0050	7.50
STK077	7.25
STK078	7.45
STK082	9.75
STK415	9.66
STK430	7.75
STK433	6.50
STK435	6.75
STK437	7.25
STK439	7.55
STK441	8.50
STK459	7.35
STK461	7.95
STK463	9.30
STK465	9.95
TA7193P	4.30
TA7202	2.25
TA7203P	2.25
TA7204P	1.90
TA7205AP	1.40
TA7208P	1.95
TA7222AP	1.85
TA7223P	2.85
TA7227P	2.95
TA7310	1.55
TA7313	1.45
TAA550	.43
TBA120AS	.95
TBA120SB	.90
TBA120T	1.25
TBA120U	1.00
TBA520	1.30
TBA530Q	1.00
TBA540	1.37
TBA550	2.45
TBA560	1.60
TBA720A	2.65
TBA750	2.45
TBA800	.80
TBA810	1.35
TBA820	1.40
TBA890	2.95
TBA920	1.50
TBA950	2.65

TYPE	PRICE (£)
TCA270	1.55
TCA800	5.45
TCA940	1.55
TDA1002	1.50
TDA1003	2.80
TDA1006A	2.95
TDA1035T	2.75
TDA1037	1.95
TDA1044	3.10
TDA1170	1.80
TDA1270	2.20
TDA2002	1.85
TDA2003	2.33
TDA2004	3.15
TDA2006	2.25
TDA2020	2.95
TDA2190M	4.95
TDA2522	1.80
TDA2523	2.25
TDA2530	2.10
TDA2532	2.20
TDA2540	1.95
TDA2560	1.80
TDA2581	2.15
TDA2582	2.20
TDA2591	2.30
TDA2593	2.30
TDA2594	2.95
TDA4500	5.85
TDA2600	5.95
TDA2611A	1.50
TDA2640	2.40
TDA3560	5.10
TDA3561A	5.35
TDA3562A	5.50
TDA4600	2.85
TDA9503	2.35
UPC555C	.70
UPC566C	2.10
UPC585C	1.40
UPC1031H	2.95
UPC1032H	.95
UPC1156H	2.45
UPC1181H	2.20
UPC1182H	2.20
UPC1185H	3.30
UPC1230H	3.95
UPC1238H	2.35
UPC1350C	4.50
UPC1353C	2.60
UPC1365C	5.05
UPC1377C	4.60
UPC2002H	1.85

TRANSISTORS

TYPE	PRICE
BC107	14
BC108	14
BC109	14
BC141	26
BC142	23
BC143	25
BC147	09
BC148	09
BC157	10
BC158	11
BC159	11
BC182L	11
BC183L	11
BC184L	11
BC212L	10
BC213L	10
BC237	11
BC327	11
BC328	12
BC337	11
BC338	10
BC547	10
BC548	10
BC557	10
BC558	10
BD124M	1.05
BD131	33
BD132	33
BD201	80
BD202	70
BD203	70
BD204	83
BD222	50
BD225	55
BD232	50
BD233	37
BD234	40

TYPE	PRICE
BD235	32
BD236	43
BD237	40
BD238	39
BD410	50
BD434	50
BD437	70
BD438	78
BD707	1.05
BF194	12
BF195	13
BF196	11
BF197	11
BF241	15
BF256LC	25
BF258	25
BF259	26
BF337	28
BF338	30
BF458	30
BF459	36
BF757	75
BFR90	1.60
BR100	18
BR101	32
BR103	55
BR303	2.95
BT106	1.15
BT116	1.30
BT151/800R	1.10
BU126	1.78
BU205	1.42
BU208A	1.45
BU208D	1.85
BU326A	1.48
BU407	1.12
BU407D	1.45
BU500	1.80

TYPE	PRICE
BU508A	1.95
BU526	2.00
BU826A	3.20
R2010B	1.45
R2540	2.35
TIP31C	46
TIP32C	47
TIP33	80
TIP34	95
TIP41C	48
TIP42C	48
TIP47	75
TIP2955	70
TIP3055	70
2N3055	50
2N3773	3.45
15/80H	2.25
15/85R	2.25
2SA 771	2.35
2SA 835	1.55
2SB 618	2.45
2SC 867A	3.25
2SC 1034	4.85
2SC 1061	1.15
2SC 1114	4.75
2SC 1124	.97
2SC 1316	3.20
2SC 1413A	3.95
2SC 1739	2.45
2SC 1942	2.95
2SC 1962	1.65
2SC 1969	1.95
2SC 2078	1.55
2SC 2335 (Kit)	7.55
2SC 2369	3.25
2SC 257	2.45
2SD 588A	1.97
2SD 725	7.95
2SD 870	5.95

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DECCA 100	8.50
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PCL86	1.07
PL504	1.59
PL508	2.99
PL509/519	5.99
PY500A	2.25

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DECCA 100	7.35
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PHILIPS KT3	9.75
RBM T20/T22A	7.35
THORN 8500/8800	7.60
THORN 9000	8.70
Universal	5.95

DIODES

TYPE	PRICE
BY127	.10
BY133	.15
BY164	.40
BY179	.65
BY210/800	.30
BY223	.86
BY227M	.23
BY229/600	.87
BY298/400	.24
BY299/800	.25
BYX10	.20
BYX55/600	.26
BYX71/600	.93
SKE4F2/06	.80
SKE5F3/10	1.45
W005	.55
1N4001-7	.07
1N5401-8	.16

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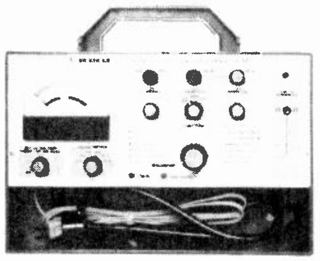

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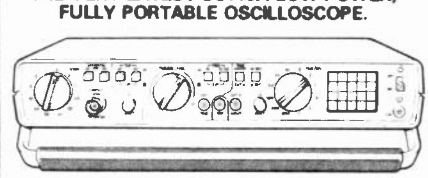

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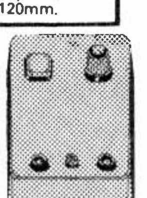

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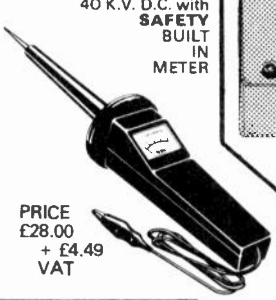

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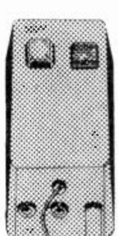

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- *LARGE RECTANGULAR SCREEN 8 × 10 cms.
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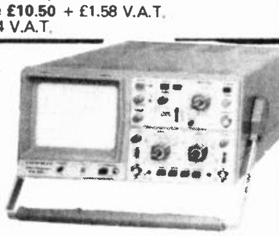

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AN240P	3.42	SN76226DN	1.80	TBA700	2.85
AN214Q	3.88	SN76227N	1.10	TBA750	2.80
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CA3065	1.75	SN76533N	1.60	TBA810P	1.10
CA4031P	2.88	SN76650N	1.05	TBA810S	1.20
CA4102	3.30	SN76660N	0.75	TBA820	1.60
CA4400	2.98	SN76666N	0.80	TBA890	3.88
CA4422	3.07	STK015	6.50	TBA920/Q	3.00
LC7120	5.33	TA7108P	3.20	TBA950/2A	3.05
LC7130	5.26	TA7120P	2.20	TBA970	4.05
LC7137	5.16	TA7129AP	3.65	TBA990	1.88
LM380N	1.65	TA7130P	1.65	TCA270S	4.00
LM1303N	2.52	TA7172	1.80	TCA270SA	4.02
HA1151P	3.12	TA7193	5.50	TCA940	1.90
MC1307P	1.85	TA7172P	1.80	TDA440	3.80
MC1310P	1.85	TA7176	2.50	TDA1002	1.90
MC1312P	2.25	TA7202P	4.18	TDA1003A	5.50
MC1327P	1.25	TA7204P	1.86	TDA1006A	2.40
MC1330P	0.83	TA7205AP	1.50	TDA1035S	4.50
MC1349P	1.85	TA7208P	3.27	TDA1044	4.30
MC1350P	1.20	TA7210P	6.50	TDA1170S	3.00
MC1351P	2.50	TA7222P	2.12	TDA1190	3.50
MC1352P	1.50	TA7223P	3.68	TDA1270Q	3.70
MC1357P	2.88	TA7227P	5.60	TDA1327A	1.66
MC1496L	1.15	TA7310P	1.80	TDA1352A/B	1.56
ML231B	2.10	TA7611AP	2.88	TDA1412	1.20
ML232B	2.10	TAA263	2.46	TDA2002	2.80
ML237B	2.30	TAA550	0.50	TDA2020	4.60
MRF475	2.50	TAA570	1.99	TDA2030	2.78
MRF479	5.20	TAA611A12	3.50	TDA2140	5.90
MRP477	10.00	TAA630S	3.90	TDA2521	4.10
NE555	0.50	TAA661B	1.70	TDA2523	3.50
C-mos 555	0.88	TAA700	2.80	TDA2530	2.70
NE556	0.80	TAA840	3.38	TDA2540	3.80
SAA1024	5.35	TAD100	2.80	TDA2541	3.80
SAA1025	8.40	TBA120 AS,		TDA2560	3.50
SAS560A	2.50	S,SA,SB	1.30	TDA2581	3.20
SAS560S	1.85	Q,T,U,UQ	1.32	TDA2590	3.20
SAS570S	1.85	TBA120B	1.30	TDA2591	2.98
SAS580	2.85	TBA231	1.45	TDA2593	2.98
SAS590	2.82	TBA281	2.65	TDA2611A	1.94
SC9503P	1.10	TBA395	1.20	TDA2640	2.90
SL432A	4.00	TBA480Q	1.50	UPC554C	1.32
SL901B	5.20	TBA400	2.30	UPC557H	0.90
SL917B	7.25	TBA510	2.60	UPC566H	2.95
SL1327Q	1.10	TBA510Q	2.60	UPC575C2	3.20
SN76023ND	2.90	TBA520/Q	1.60	UPC1025H	2.90
SN76033N	2.45	TBA530/Q	1.30	UPC1032H	0.90
SN76110N	1.12	TBA540/Q	1.40	UPC1156H	4.20
SN76115N	2.00	TBA560C	1.70	UPC1158H	0.76
SN76131N	1.65	TBA560CQ	1.60	UPC1163H	0.98
		TBA570	1.50	UPC1222C	1.88
		TBA673	2.40	UPC1228H	0.54
				UPC1350C	4.25
				UPC1353C	2.78
				UPC1356C2	3.40
				UPC1365C	8.70
				UPC1367C	3.40
				UPC1377C	4.68
				UPC1382C	1.88
				UPC2002V	2.78
				CA723	0.35
				CA741	0.35

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10nF 1000V DC	22p
10nF 500V AC	80p
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100nF 1000V DC	46p
470nF1000V DC	60p

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Thorn 1500	350R + 20R + 148R + 1.5K + 317R	1.34
Thorn 3000/3500	6R + 1R + 100R Fused	0.93
Thorn 8000	56R + 1K + 47R + 12R	0.95
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Brand new 3 channel pen recorders complete with charts. Full spec. upon request. Once only price **£40 + £10 p&p + VAT.**

Fuseholders

20mm Panel Mounting	0.28
20mm Chassis Mounting	0.06
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	1400	150+100+100+100+150/320V	2.70
	1500	150+150+100/300V	1.50
	3000	1000/63V	0.56
	3500	175/400V+100+100/350V	1.70
	8000	400/350V	2.10
	8000/8500	2500+2500/6.3V	1.35
	8000	700/250V	2.10
		1000/70V	0.58
	9000	400/400V	2.25
Timer Amp		4700/25V	0.70
DECCA 10/30		400+400/350V	2.45
	1700	200+200+400/350V	3.52
GEC	2047	2048 2083 2084 2104	
		200+200+150+50/300V	2.32
		600/250V	1.50
ITT/KB		200+200+75+25/350V	2.15
		220/100V	1.95
PHILIPS	G8	600/300V	1.70
	G8 G9	600/300V	1.50
	G11	470/250V	1.50
	G9	2200/63V	1.26
EKCO	T148	125+200+100+32/275V	2.65
	691 Series	200+300/350V	2.15
		600/300V	1.80
RANK		300+300/300V	2.05
	A823	2500+2500/30V	0.98
		220/400V	1.75
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2W 10R to 2M2 (E6 Range)	8p each. 70p/10. 6.00/100

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½W pack 10 each value E12 – 2R2 to 2M2 730 pieces	6.00
½W pack 5 each value E12 – 2R2 to 2M2 365 pieces	3.50
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2W pack 5 each value E6 – 10R to 2M2 317 pieces	18.00

RESISTORS – WIREWOUND. Generally 5%

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4W – 1R0 to 10K – Available in preferred values	0.21
7W – 0.47R to 22K – Available in preferred values	0.25
11W – 1R0 to 22K – Available in preferred values	0.29
17W –1R0 to 22K – Available in preferred values	0.37

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Service Manual		20.00

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DY802	0.88	AC127	0.30	A,B or C	0.12	BC303	0.32	BD375	0.32	BF271	0.26	BT108	1.30	BYX55/600	0.33	TIP41C	0.46	2SC1957	0.76
DY86/87	0.75	AC128	0.30	BC113	0.14	BC307	0.10	BD410	0.76	BF273	0.18	BT109	1.18	BYX71/600	1.18	TIP42A	0.52	2SC1969	2.88
ECC81	0.95	AC128K	0.34	BC114	0.12	BC308A	0.10	BD434	0.68	BF274	0.32	BT116	1.25	BYZ12	0.42	TIP47	0.60	2SC2028	0.73
ECC82	0.65	AC132	0.55	BC115	0.12	BC323	0.99	BD436	0.68	BF323	0.92	BT119	3.62	C106D	0.80	TIP110	0.88	2SC2029	2.10
ECC83	1.10	AC141	0.26	BC116	0.15	BC327	0.14	BD437	0.76	BF336	0.26	BT120	3.60	E1222	0.40	TIP2955	0.60	2SC2078	1.05
ECC84	0.65	AC141K	0.40	BC117	0.22	BC328	0.14	BD438	0.75	BF337	0.26	BT121	3.02	E5024	0.30	TIP3055	0.60	2SC2091	0.73
ECC85	0.90	AC142	0.26	BC118	0.17	BC337	0.12	BD439	0.68	BF338	0.26	BT138/600	1.30	GET872	0.48	TIS43	0.32	2SC2098	2.90
ECC88	0.95	AC142K	0.48	BC119	0.30	BC338	0.12	BD517	0.56	BF355	0.42	BT151/560R	0.90	ITT44	0.04	TIS88	0.36	2SC2122A	3.20
ECF80	0.95	AC151	0.45	BC125	0.12	BC350	0.14	BD520	0.66	BF363	0.82	BT151/300R	1.15	ITT2002	0.11	TIS90	0.25	2SC2314	0.80
ECH81	0.75	AC152	0.45	BC140	0.28	BC440	0.30	BD699	1.25	BF367	0.24	BTY79/400R	2.80	ME0402	0.20	TIS91	0.28	2SC2335	1.50
ECH84	0.75	AC176	0.28	BC141	0.42	BC441	0.32	BD707	0.88	BF371	0.27	BU100A	2.30	ME0404/2	0.24	ZTX108	0.12	2SC2371	0.90
ECL82	0.75	AC176K	0.46	BC142	0.30	BC461	0.32	BDX18	2.35	BF422	0.38	BU104	2.00	MEU21	0.60	ZTX109	0.12	2SC2749	2.70
ECL86	0.98	AC187	0.42	BC143	0.30	BC547	0.12	BDX32	2.10	BF450	0.38	BU105	1.20	MJ400	1.25	ZTX212	0.28	2SC2752	0.60
EF80	0.65	AC187K	0.48	BC147	0.42	BC548	0.12	BF115	0.32	BF457	0.33	BU105/02	1.56	MJ2955	0.90	IN4001	0.05	2SD234	0.64
EF86	1.60	AC188	0.44	A or B	0.10	BC549	0.12	BF117	0.54	BF458	0.36	BU108	1.80	MJ3000	1.98	IN4003	0.05	2SD348	3.30
EF183	0.75	AC188K	0.50	BC148	0.08	BC550	0.18	BF119	0.82	BF459	0.44	BU124	1.75	MJE240	0.60	IN4004	0.06	2SD986	0.62
EF184	0.75	ACY40	0.88	A or B	0.10	BC550C	0.18	BF120	0.38	BFR39	0.22	BU126	1.25	MJE340	0.54	IN4006	0.07	2SJ50	5.20
EH90	0.94	AD142	1.10	BC149	0.09	BC557	0.12	BF123	0.40	BFR40	0.22	BU133	1.80	MJE370	0.88	IN4007	0.07	2SK134	3.80
EL34	3.25	AD143	1.10	BC157	0.10	BC558	0.12	BF125	0.42	BFR41	0.22	BU204	1.35	MJE520	0.48	IN4148	0.05	2SK135	4.60
EL84	0.69	AD149	0.96	BC158	0.10	BCX34	0.27	BF127	0.38	BFR51	0.30	BU205	1.30	MJE2955	0.99	IN5400	0.12	3N126	1.90
EL509	7.85	AD161	0.42	BC159	0.10	BCY70	0.15	BF152	0.16	BFR61	0.32	BU206	1.70	MJE3055	0.70	IN5402	0.15	3N211	2.52
EM87	2.55	AD162	0.42	BC160	0.30	BCY71	0.17	BF154	0.23	BFR62	0.28	BU208	1.55	MPSLO1	0.28	IN5405	0.16	3SK45	0.76
EY86/87	0.67	AD161/AD162	0.98	BC161	0.30	BCY72	0.18	BF157	0.40	BFR88	0.28	BU208A	1.63	MRF475	2.50	IN5406	0.18	3SK88	0.66
EY500A	1.65	AF106	0.48	BC168B	0.12	BCZ10	1.68	BF158	0.22	BFR90	1.72	BU208/02	2.05	MRF479	5.20	IN5408	0.20	3SK135	5.20
PCC84	0.50	AF114	2.10	BC169C	0.10	BCZ11	1.45	BF159	0.24	BFT41	0.38	BU326S	1.75	MRP477	10.00	IS920	0.08		
PCC85	1.36	AF115	2.10	BC170	0.14	BD124P	0.80	BF160	0.23	BFT43	0.38	BU407	1.65	OA47	0.10	2N697	0.55		
PCC89	0.74	AF116	2.10	BC170B	0.12	BD130Y	0.68	BF167	0.30	BFW10	0.79	BU407D	1.80	OA90	0.08	2N706A	0.33		
PCC189	0.85	AF117	2.10	BC171	0.10	BD131	0.34	BF173	0.25	BFW44	0.76	BUX80	3.70	OA91	0.09	2N2904	0.28		
PCF80	0.75	AF118	0.85	BC171	0.10	BD132	0.34	BF177	0.42	BFX29	0.28	BUY20	1.75	OA95	0.18	2N2906	0.24		
PCF86	1.25	AF121	0.62	A or B	0.08	BD131/BD132	0.95	BF178	0.30	BFX30	0.38	BUY69A	2.60	OA200	0.06	2N2926G	0.10		
PCF200	1.95	AF124	0.48	BC172	0.08	BD135	0.32	BF179	0.32	BFX80	3.56	BUY69B	1.98	OA202	0.15	2N3053	0.40		
PCF801	1.45	AF125	0.48	A or B	0.12	BD136	0.36	BF180	0.35	BFX84	0.24	BY101	0.48	OC25	2.10	2N3054	0.56		
PCF802	1.00	AF126	0.48	BC177	0.20	BD137	0.36	BF181	0.35	BFX85	0.26	BY118	1.10	OC26	1.70	2N3055	0.45		
PCF806	1.20	AF127	0.48	BC178A	0.22	BD138	0.38	BF182	0.32	BFX86	0.26	BY122	0.68	OC28	1.50	2N3702	0.10		
PCL82	0.90	AF139	0.68	BC182	0.09	BD139	0.38	BF183	0.32	BFX87	0.26	BY126	0.12	OC29	2.47	2N3704	0.10		
PCL83	2.50	AF178	0.68	A,B or C	0.09	BD140	0.38	BF184	0.32	BFX89	0.65	BY127	0.10	OC35	1.75	2N3708	0.10		
PCL84	1.30	AF239	0.68	BC182L	0.09	BD144	1.60	BF185	0.32	BFY50	0.21	BY133	0.16	OC36	1.75	2N3772	1.90		
PCL86	1.15	AF279S	0.75	A,B or C	0.09	BD145	1.82	BF194	0.08	BFY51	0.21	BY135	0.25	OC42	0.72	2N3773	2.70		
PCL805/85	1.35	AL100	2.50	BC183	0.09	BD150A	0.51	BF195	0.10	BFY52	0.21	BY164	0.44	OC42K	1.40	2N3904	0.16		
PD500	3.75	AL102	5.90	A,B or C	0.10	BD159	0.65	BF196	0.10	BFY57	0.40	BY179	0.66	OC44	0.72	2N3906	0.16		
PFL200	1.35	AL113	2.20	BC183L	0.08	BD160	1.65	BF197	0.10	BFY90	0.90	BY182	0.87	OC45	0.58	2N5294	0.48		
PL33	1.50	ASY80	1.75	A,B or C	0.12	BD165	0.45	BF198	0.14	BFY90S	1.34	BY184	0.40	OC71	0.50	2N5296	0.71		
PL36	1.45	AU110	1.40	BC184L	0.10	BD175	0.60	BF199	0.16	BR100	0.20	BY187	0.72	OC72	0.52	2N6126	0.68		
PL81	0.85	AY102	4.32	A,B or C	0.10	BD182	1.00	BF200	0.38	BR101	0.44	BY189	4.75	OC81	0.68	2SB337	1.65		
PL82	0.75	BA110	0.67	BC207	0.15	BD183	1.10	BF222	0.48	BR103	0.58	BY198	0.44	OC200	2.46	2SC495	0.65		
PL83	0.65	BA121	0.40	BC208	0.16	BD184	1.20	BF224	0.20	BRC4443	1.76	BY199	0.47	OC202	2.20	2SC1172Y	2.90		
PL84	0.75	BA129	0.38	BC212	0.09	BD201	0.72	BF224J	0.16	BRY39	0.38	BY206	0.24	ORP12	0.85	2SC1173Y	0.82		
PL95	2.00	BA148	0.16	A,B or C	0.10	BD202	0.87	BF240	0.20	BRY56	0.42	BY207	0.24	R2008B	1.50	2SC1302	1.40		
PL504	2.20	BA154	0.08	BC212L	0.08	BD204	0.80	BF241	0.20	BRY61	0.86	BY210/400	0.25	R2010B	1.52	2SC1226	0.84		
PL508	2.40	BA155	0.10	A,B or C	0.10	BD222	0.80	BF244	0.26	BSS17	0.56	BY210/600	0.26	SHG1.5	0.40	2SC1279	0.50		
PL509/519	5.95	BA156	0.08	BC213	0.09	BD225	0.86	BF244A	0.28	BSS27	0.92	BY210/800	0.30	TIC44	0.40	2SC1306	0.92		
PY88	1.80	BA157	0.28	A or B	0.10	BD232	0.45	BF244C	0.24	BSX19	0.34	BY223	1.20	TIC45	0.45	2SC1307	1.40		
PY500A	2.40	BA164	0.14	BC213L	0.10	BD233	0.60	BF245A	0.28	BSX20	0.34	BY227	0.26	TIC46	0.48	2SC1413A	2.70		
U26	1.90	BB104B	0.52	A or B	0.10	BD234	0.62	BF254	0.15	BSX59	0.62	BY229	0.30	TIC47	0.70	2AC1449	0.63		
UCH81	0.90	BB105B	0.30	BC237	0.11	BD235	0.63	BF256	0.40	BSX76	0.29	BY238	0.68	TIC106A	0.70	2SC1507	0.63		
UCL82	1.70	BB105G	0.48	BC238	0.10	BD236	0.63	BF257	0.32	BT100A/02	0.94	BYX10	0.24	TIP30A	0.46	2SC1678	1.06		
6J5GT	1.75	BB110B	0.42	BC239C	0.14	BD237	0.65	BF258	0.30	BT101/300	1.15	BYX36/150	0.22	TIP31C	0.54	2SC1758	0.68		
6SJ7	2.20	BC107	0.10	BC251	0.12	BD238	0.56	BF259	0.32	BT101/500	1.25	BYX36/600	0.22	TIP32	0.40	2SC1909	1.20		
30FL12	1.60	A or B	0.12	A,B or C	0.14	BD241	0.60	BF262	0.30	BT102/300	1.35	BYX48/300	0.72	TIP32C	0.60	2SC1923	0.30		
		BC108	0.10	BC301	0.30	BD243A	0.80	BF263	0.30	BT102/500	1.65	BYX49/300	0.47	TIP33A	0.63	2SC1945	2.88		
				BC302	0.32	BD244A	0.65	BF270	0.30	BT106	1.50	BYX55/350	0.29	TIP34A	0.72	2SC1953	0.74		

VDRs, etc.

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E299DD/P116-P354 all 0.23
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VA1055s/56s/66s/67s all 0.23
VA1074 0.20
VA1077 0.31
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COVER PHOTO
This month's cover photo shows adjustment and final checking of a Philips Matchline video tuner/source selector in the Philips factory at Norrköping, Sweden. The Matchline TV system was launched in European markets last year. There are three Matchline models at present on sale in the UK, the 6620, 6720 and 6820 (20, 22 and 26in. screens respectively): they are complete sets with teletext, remote control and optional speaker arrangements. Our thanks to Philips for permission to reproduce the photograph, which was taken using a fish-eye lens.

CORRECTION
An error occurred in line 180 of the Commodore 64 Test Pattern Program published last month: CHR$(152) should be followed by a semicolon, not a colon.

ADDRESS PLEASE
Would Mr. R. S. Narwan of Visionhire please send his address (omitted from VCR fault notes) to the editorial department.

NO MORE GLAMOUR?
It's difficult to recall a time of woe quite like the present in the electronics industries of the West. There've been downturns before, in particular a chip glut that led to severe price cutting in the early seventies, but there's not previously been a period in which business has been poor generally throughout the electronics industry.

The chipmakers have been doing badly for some time. The latest news on this front comes from Texas Instruments, the world's largest semiconductor manufacturer, which made a loss of $3·9m on turnover down by 16 per cent during the second quarter of the year. Texas Instruments has cut back on its investment plans, laid off another 1,800 employees, and is expecting a further business deterioration in the third quarter.

Poor sales of semiconductor devices reflect poor business in the computer field. We all know about the collapse of the microcomputer market. It seems that the makers of large computers haven't been doing all that well either. IBM's half year results show profits down by 15 per cent though turnover was up slightly – by two per cent. Reduced earnings during the period have also been reported by Honeywell, Burroughs, Data General, NCR and Control Data. Lay-offs and shut-downs have been widely reported.

The major electronics and computer group Hewlett-Packard has announced that most of its US operations will be closed for one or two days a month from August – its 45,000 US employees are expected to take unpaid time off during the shut-downs. In Europe Philips, the only truly multinational European-based electronics group, has reported "appreciably lower" income in the second quarter of 1985 compared to 1984, mainly due to the performance of its US subsidiaries. The UK scene has been one of declining profits, with STC – owners of ICL since last year – reporting a loss for the six months to June 30th. In this case the computer side of the business (ICL) is said to have "performed satisfactorily", the problems being on the components, telecommunications and submarine cable sides of the business. The components industry worldwide seems to have been doing poorly, as one would expect when end-product business is in decline. Reports on the European telecommunications industry comment on increased competition and lower profits, and we all know that with the exception of the Japanese it has been hard to make any money out of producing consumer electronics products in recent times. In this field the Japanese continue to report improved results. Matsushita, the world's largest manufacturer of electrical/electronic consumer goods, has reported pre-tax profits up by 17 per cent during the first half on turnover up 11 per cent. Matsushita's largest single line is VCRs: sales of these increased by 20 per cent and "continued strength" in this market is reported.

Even the Japanese consumer goods manufacturers seem to be concerned about future prospects however. As mentioned in Teletopics last month, both Matsushita and Sony have announced plans to diversify substantially into other fields, specifically component manufacture and industrial electronics. In view of the weak state of electronics markets generally one wonders how successful this policy will turn out to be – and about its implications in terms of increased competition.

Is all this woe just a temporary phenomenon? Certainly there's pessimism about the prospects for an upturn in the immediate future. It's nevertheless worth making the point that many of the reduced profit figures that have been reported have been made on increased turnover, indicating severe competition rather than a market collapse. Mullard's managaing director Ivor Cohen has commented that "in terms of fundamental usage of electronic components the trend is not far from the usual pattern". But it's difficult to see the electronics industry returning to the high growth rates experienced during recent decades.

Most of the present pessimism originates in the USA, in particular from the computer industry. It's contagious because the US is still the world's largest market. One tends to feel that if US chip and computer manufacturers can't make a good living, what hope is there for the rest of us? Nevertheless conditions in the US economy in recent months have been rather different from those elsewhere. A boom phase has come to an end, and the excessive value of the dollar has had depressing implications for the competitiveness of much US industry. More logical exchange rates would doubtless help, but these are subject to uncontrollable shifts in currency demand – and, in the case of the dollar, the effect of the budget deficit.

It would probably be true to say that the electronics industry worldwide will never again be a very comfy place in which to operate. Excessive investment has led to over capacity, and this is something that's very hard to deal with – which firms would willingly forgo the chance to have a share in the next generation of electronic components/equipment? In the past, stockmarkets have often given electronics firms "glamour stock" ratings. The glamour has quite definitely gone for the time being. Perhaps this doesn't matter too much. The situation in the industry is nevertheless disconcerting, since through much of the post-war era it's been in the forefront of economic advance. Are we to expect a continuation of the present worldwide economic stagnation until some other industry comes along to take the lead?

Letters

NOTES ON RANK CHASSIS

The problem of ringing on the left-hand side of the screen with the Rank T20 chassis came up on the July issue problems page. The cause in every case I've come across has been 5C17 (0·47μF) open-circuit or more often intermittent – it's the same type of capacitor that blows the BD131 line driver transistor in the older A823 series chassis. It's easy to check 5C17: just bridge the PC connections with an 0·1μF capacitor and the lines will disappear.

On the subject of the A823, I've always cured the IBA's "new" teletext lines by changing the value of the field flyback tuning capacitor 5C35 (5C34 in the A823A chassis) from 2·2μF to 0·47μF – there's often a spare, i.e. redundant, 0·47μF capacitor on the convergence panel (7C1).

I recently had a T22 with a star-shaped crack in the neck of the A56-510X tube and a black mark in the plastic convergence clamp. Suffolk Tubes mentioned the Philips G11 when I took the tube to them for regunning, i.e. the problem of C4029. I haven't found any likely capacitor trouble in the T22 and have put extra polythene under the clamp to increase the gap length. I reckon it's tube weakness rather than anything else, but no one's going to admit it!

D. A. Ferriday, Rowlands Radio,
Rowlands Castle, Hants.

THE NORDMENDE FV1/90° CHASSIS

I was sorry to read (June issue) of Les Lawry-Johns' problems with a set (Ferguson 3787) fitted with the NordMende FV1/90° chassis. As importer for NordMende television sets in Ireland we've distributed thousands of sets using this chassis, both manual and remote control versions, and while I would hesitate to be the expert Les is seeking perhaps the following points would help him and others in a similar position.

With a dead set, check that h.t. is reaching the anode of the flyback thyristor DA12. The usual culprit is one of the thyristors in the line output stage, DA12 or DA14 – if one of them proves to be faulty, change them as a pair. These thyristors can cause other problems, for example a tendency to blow the TDA1170 field timebase chip on an irregular basis: if you have a set with a blown TDA1170 the odds are that DA12 or DA14 was the cause. Faulty output thyristors can also give you a set with no raster but plenty of e.h.t. and arcing at spark gap VA26: if this is experienced, be prepared to refurbish the line output stage completely to be confident of not seeing the set again. In this instance the capacitors in the gate circuits of the two thyristors – CA13, CA15 and CA16 – should be changed.

The set that gave Les such a headache had the top core of the line output transformer missing. This situation is now quite common with these sets since they are fairly lightweight portables and get moved around a fair bit. The missing core will normally be found in the bottom of the set, but note that there's a mica insulator at each of the junctions of the two cores: these must be positioned correctly before reglueing. Such repairs to the transformer are not always successful and in some cases a replacement is the only answer. Similarly if the loose core is found to be damaged in any way it's best to discard the transformer, as a replacement will prove to be the only long-term solution.

The e.h.t. adjustment must be checked after any work is carried out on the line output stage. Set RZ13 for 55V d.c. at pin 10 of the line output transformer with the contrast and brightness controls at minimum. At this setting the e.h.t. and all the other voltages derived from the line output stage are correct.

Finally a problem that can cause some trouble. An earthing strip runs to the right-hand side of the sound and line oscillator panels, from the top of the chassis to the bottom. If either of these panels, more especially the line oscillator panel, is removed the strip can become dry-jointed. This can cause intermittent start-up, random cutting out, and persistence of the e.h.t. at switch off – the latter condition can eventually lead to a burn in the tube. Soldering a wired bridge between the chassis and the part of the main panel to which the anode of DA06 is connected is a good idea whenever one of these sets requires attention.

Apart from the above there are no real pitfalls waiting to trap the unwary. Despite their advancing years, the excellent pictures these sets give will amply justify the work involved in returning them to a fully working condition.

Anthony Cronin, Service Manager,
Reynolds Electronics Limited,
Dundalk, Co. Louth.

BBC MICRO PROGRAM

The pixels produced by the BBC microcomputer are not quite square and in order to produce a true circle it's necessary to increase the lengths in the horizontal direction by 8·4 per cent. In Patrick Kniveton's program for example (July issue, page 516) the following lines should be changed:

```
790 PLOT5, 1·084 * 350 * COS C, 350 * SIN C
800 PLOT5, 1·084 * 352 * COS C, 352 * SIN C
```

Similar changes should be made in PROCcard. This technique will improve the appearance of many designs which use circles (or squares) which would otherwise be stretched vertically. Incidentally, this means that the aspect ratio of the active part of the raster is 1·15:1 rather than 1·25:1 as suggested by the co-ordinate size of the screen (1280:1024).

The colons in lines 100-180 should be the double-bar character found on the key above the pound sign key on the BBC micro.

Alan Pemberton,
Sheffield.

PROGRAMMING OFFER

Following my article on a Spectrum test card program it became apparent that many readers with home computers don't have the time or inclination to write programs for them. If readers with ideas for programs that may be suitable for publication in *Television* would like to write in I would be willing to write the program and let the first reader with the idea have a copy for evaluation. Programs about VAT, bookkeeping etc. are excluded as there are many of these already in circulation. I mainly use a

Spectrum computer but can also produce programs in BASICODE2, the BBC's computer esperanto system that will run text and numbers programs on most home computers. BASICODE2 will not produce colour or graphics however, so it would not be suitable for test card or colour bar programs. A BASICODE2 kit is available for £3·95 from the BBC: it covers most popular makes in one booklet and cassette.
John de Rivaz, B.Sc. (Eng.),
Truro, Cornwall.

THORN TX90 TIP

Anyone using a Ferguson 14in. colour set (TX90 chassis) as a monitor may be interested in a modification from Ferguson to shift the picture slightly to the right – useful with computers. Simply short out R106.
Derek Snelling,
Brownhills, Staffs.

SOFT START FOR THE G8

Several articles on the Philips G8 chassis have appeared in *Television* over the years, the most recent being excellent articles by Tony Thomson in the May issue and Dennis Apple in the July issue. I agree that when correctly adjusted, and provided the tube is good, these sets are still capable of providing very worthwhile results. One problem with this chassis however is the omission of a soft-start circuit in the power supply. In fact on several examples of these sets I've been alarmed by the tendency for the h.t. line to overshoot the correct 205V at switch on, causing a large surge current and strain on the line output and related stages.

When repairing a G8 with a picture jitter fault recently (the fault was caused by defective zener diodes in the power supply, D1397 and D1371) I decided to look at the possibility of adding a soft-start circuit. After some investigation I discovered that the power supply circuit is very similar to that used in the GEC C2110 series which do have soft start.

In both cases the operation of the power supply is controlled by sensing the d.c. output and mains input voltages and adjusting the firing point of a thyristor to compensate for varying load and changing mains input conditions. Both circuits have a 7·5V zener diode in series with the emitter of the control transistor to provide temperature stabilisation – D1371 in the case of the G8. If the components shown in Fig. 1 are added to the G8 power supply circuit, in parallel with D1371, the result will be soft start, with the output voltage rising from zero to 205V in about two seconds.

The operation of the circuit is as follows. At switch on Tr1 shunts D1371. This delays the firing point of the thyristor until very late in the positive-going half-cycle of the mains, the result being minimum output voltage. As

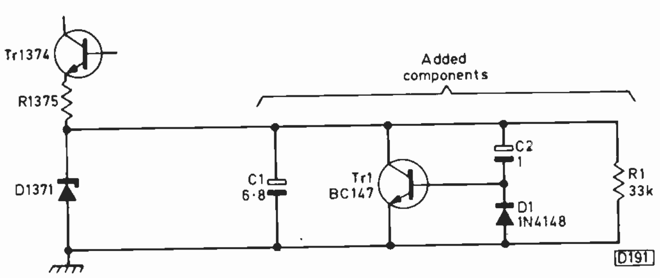

Fig. 1: Soft-start circuit for the Philips G8 chassis.

C2 charges the shunt is slowly removed, until at the end of the soft-start period normal control action is restored. D1 and R1 provide rapid discharge of C2 at switch off: C1 is included to prevent ripple across D1371 from forward biasing D1.

The action of the circuit appears to be completely compatible with most versions (see note below) of the G8's power supply and does not affect the operation of the overvoltage trip and the setting up procedure. The extra components are normally readily to hand and can easily be added on the print side of the panel. Note that some very early versions of the G8 had D1371 in the base instead of the emitter circuit of Tr1374: these cannot be modified in the way described. In some other versions the positions of R1375 and D1371 are transposed – check that the anode of D1371 is connected to chassis.

In conclusion I feel that this modification will increase the life and reliability of a G8 considerably.
D. R. Bracknell,
Farnborough, Hants.

CONVERGENCE ERROR POSSIBILITY

A number of microcomputer test pattern programs have appeared in the magazine recently. I'm sure these are excellent but would like to point out a possible source of error. Much convergence circuitry consists of reactive components which are frequency dependent. When setting up the convergence of a colour set these components are supplied with waveforms at line frequency, adjustment being made for optimum convergence of the displayed raster. As most modern colour receiver line timebases will lock with a frequency error of up to ±20 per cent from the correct frequency the accuracy of the alignment will depend on the accuracy of the computer's sync generator.
B. D. Webb,
Havant, Hants.

BUZZING TRANSFORMERS

Hugh Allison's report on a mains transformer with lamination buzz interested me as I've just cured a really noisy one in a disco deck. Toroidal transformers, C cores and vacuum impregnation have made this a rare fault nowadays, but it was common in the days of valves, when home radios had transformers with stacks held by bolts. Hugh's tormentor would appear to be a U-clamp version. The cure for open types is a few taps from a clouting iron to the end of the stack – varying the tension of the bolts

sometimes helps. I learnt this in the "good old days" (?) when a tester was allowed twenty minutes to put a radiogram with record changer through its paces – the pay was 6·4p per hour, 7·2p for troubleshooters, and we worked a 47 hour week . . .
William Harrison,
Windsor, Berks.

BBC MICRO PROGRAM

Users of the BBC Micro Test Pattern program (July) should be cautioned that the circles it produces aren't circular! Instead of being square, the graphics units produced by the BBC micro are rectangles with a height:width ratio of 13:12 when displayed on a correctly adjusted TV set or monitor. To produce a properly proportioned circle, the program should be written as if to plot an ellipse with a height of 12/13 its width. The following modifications to Patrick Kniveton's program will have the desired effect:

```
 790 PLOT5, 350*COSC,323*SINC
 800 PLOT5, 352*COSC,325*SINC
1460 PLOT85, 315*COSD,291*SIND
1510 PLOT5, 320*COSC,295*SINC
1560 PLOT85, 309*COSF,285*SINF
1700 DRAW-60,280
```

I hope that not too many BBC Micro owners have been diligently adjusting the aspect ratio of their monitors using the program published!
Richard Russell, M.A., C.Eng. M.I.E.R.E.,
Gravesend, Kent.

VIDEOTAPE WARNING

In view of the poor availability and greater cost of V2000 type cassettes I decided to try my hand at transferring the tape from a new VHS E120 cassette to a VCC240 cassette – they both use half inch wide tape so I could see no reason why this shouldn't work. Accomplishing the transfer was a very fiddly job and when I tried the cassette in my V2000 recorder the results were hopeless: only a very weak and noisy monochrome picture with very poor sync was obtained. The tape had not been damaged during the transfer because when I put it back in the VHS cassette and tried it in a VHS machine it still worked well.

I'm rather puzzled about this. Although there's about twice as much information stored on a V2000 tape as there is on a VHS tape used in the standard way, half-speed recordings are now made on some VHS machines. I assume therefore that there are fundamental differences in the composition of the tapes, making them incompatible. My advice to anyone thinking of trying this idea is not to bother – and I'm not inclined to try it with a Beta tape.
M. Catchpole,
Broughton Radio (Worthing).

AERIAL SOCKET PROBLEM

An aerial rigger friend recently rang me very worriedly. He had fitted a mains-powered aerial amplifier and the fuse had blown when the set was switched on. When I called to help I found that the trouble was due to the chassis being, as so often today, at half mains potential, i.e. approximately −170V d.c., while the negative side of the aerial socket was not isolated – in fact it was directly connected to chassis. This raises several points of interest.

First, the technical aspects. The negative side of the aerial socket was at −170V from a bridge rectifier while the aerial amplifier was connected to earth, thereby taking the negative side to earth. One could leave the amplifier's earth disconnected, but this would be negligent since it's designed to have an earth connection. Or one could use a battery-powered amplifier. But what if a masthead amplifier is required as well? Assuming you fit a battery-powered amplifier you must remember that the coaxial plug and cable will be at −170V. These are exposed and potentially lethal. Thus an insulated coaxial plug is required as a minimum. But even this isn't safe!

The obvious and I believe correct action is to fit an isolated socket. But if the set is under guarantee doesn't this invalidate it? The set in question was an Hitachi one. Other sets use similar techniques.

Secondly there's the legal side of the question. Under the present liability laws the last person to service a TV set or any other equipment must ensure its safety. Who is liable in the event of someone coming into contact with a coaxial plug on a set of this type? Does responsibility lie with the aerial rigger, the service engineer or the setmaker? Personally I believe it would be the setmaker's responsibility. What are your views?
Rothley Stevens,
Coventry.

COMMODORE 64 PROGRAM

May I, with acknowledgements to D. J. Jackson (letters, June), offer the following version of his Commodore 64 colour bar program? The entry is considerably simplified – the result is the same. Incidentally I assume that the opening statement on line 15, PRINT"*s*", is intended to be a clear-the-screen command for which the keystrokes are "SHIFT – CLEAR HOME". This command prints as a reversed heart – see the second statement on line 10 of my program – but in any event in neither program is it strictly necessary.

```
 5 REM COLOUR BAR SHORTENED ENTRY
10 POKE53280,11:PRINT"♥"
20 FORB=1TO8:READA:GOSUB40:NEXT
30 GETA$:IFA$=""THEN30
40 FORY=0TO24:FORX=ZTOZ+4:
   POKE1024+X+40*Y,160:POKE55296+X+40*Y,A:
   NEXTX,Y
50 Z=Z+5:RETURN
60 DATA0,6,2,4,5,3,7,1
```

I trust this simplified entry will encourage more readers to try it.
R. A. Ramsden,
London N8.

SETS FOR DISPOSAL

Owing to a move to a smaller house I have for disposal the following sets: three Thorn colour receivers fitted with the 2000 chassis, two working well, and a Ferranti 20T4 table type projection set dating from about 1954. As the 2000 was the first large-screen, all solid-state chassis to go into production and the 20T4 is certainly a venerable item I'm wondering if they would be of interest to a TV collector or historian. No payment would be required but they would have to be collected by appointment.
C. E. Williams, 6 Swallowdale, Wightwick,
Wolverhampton, WV6 8DT.

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250MA	10 for 50p	750MA	10 for 65p
315MA	10 for 50p	7A	10 for 50p
500MA	10 for 50p	10A	10 for 50p
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3.15A	10 for 1.00	50A	10 for 50p

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AC128	39	BC174B	23	BCX33	22	BF173	29	BFR81	29	OT112	1.92
AC131	40	BC177	24	BCX34	11	BF179	32	BFR87	25	OT121	2.08
AC138	40	BC182LB	12	BD115	49	BF180	33	BFR90	1.74	R1038	80
AC141K	39	BC183L	12	BD131	30	BF181	30	BFR91	2.08	R1039	80
AC142K	38	BC184L	13	BD132	46	BF184	30	BFT42	30	R2008B	1.40
AC153	39	BC187	24	BD133	59	BF185	30	BFT43	30	R2010B	1.10
AC176	33	BC204	15	BD139	36	BF194	16	BFX38	40	R2030	70
AC176K/		BC208	9	BD140	38	BF195	16	BFY50	30	R2265	1.30
AC128K	93	BC212L	9	BD144	1.70	BF196	16	BFY51	34	R2305	80
AC188	38	BC213L	12	BD150	50	BF197	15	BFY52	34	R2322	50
AD142	1.18	BC237	12	BD163	98	BF198	19	BRC116	1.50	R2443	25
AD143	1.08	BC238B	8	BD201	74	BF199	15	BRC1693	1.43	RCA16446	30
AD149	98	BC238L	8	BD203	78	BF223	18	BU105	1.00	RCA16599	1.25
AD161	32	BC250A	15	BD204	99	BF224	19	BU126	1.10	RCA16600	1.40
AD162	32	BC251	8	BD222	48	BF238	20	BU207	1.05	RCA16799	1.13
AD263	1.05	BC252A	20	BD225	52	BF240	9	BU208	1.15	RCA16800	1.42
AF127	45	BC294	37	BD232	50	BF241	21	BU208A	1.15	RCA16802	1.38
AF139	38	BC301	32	BD233	60	BF255	10	BU326A	1.30	RCA16815	1.20
AF239	41	BC303	31	BD234	60	BF256LB	38	BU407	1.70	SP8385	65
BC107	15	BC307	10	BD237	55	BF256S	20	BU408	2.76	S1299	2.25
BC108	15	BC308	8	BD238	65	BF257	28	BU500	2.30	S28000	1.25
BC109	15	BC309	14	BD241	59	BF259	28	BU526	2.46	T6050V	1.30
BC115	16	BC327	18	BD244	85	BF271	25	BU806	1.80	T6052V	1.30
BC117	21	BC328	18	BD278A	81	BF274	11	BU807	2.94	T9003V	1.25
BC125	26	BC337	17	BD386	68	BF337	29	C1129	9	T9010V	1.45
BC126	23	BC338	17	BD433	71	BF338	34	C1172B	9	T9053V	1.30
BC139	27	BC347	8	BD437	83	BF355	40	E5386	54	T9054V	1.00
BC141	34	BC394	8	BD592	1.20	BF362	50	E9003	28	T9039V	1.10
BC142	30	BC454	8	BD589	1.20	BF391	21	E9005	25	TIC45X	50
BC143	31	BC455	8	BD677G	1.35	BF394	16	ME0404	10	TIC46	48
BC147	12	BC456	10	BD679	1.42	BF422	47	ME0412	10	TIC106C	40
BC148	12	BC460	40	BD701	1.04	BF423	53	ME6002	10	TIP29	42
BC149	12	BC463	22	BD702	1.12	BF450	43	MJ2501	2.36	TIP30	42
BC153	16	BC546	8	BD707	95	BF453	53	MJ3001	2.21	TIP31	35
BC1540R	16	BC547	12	BD708	95	BF458	37	MJE340	50	TIP32	43
BC154YL	16	BC548	12	BD839	1.30	BF459	40	MJE520	50	TIP33	61
BC157	12	BC549	8	BDX10	93	BF461	59	MJE2955	1.40	TIP41	42
BC158	12	BC557	10	BDY20	1.09	BF556B	35	MJE3055	15	TIP42	45
BC159	15	BC558	10	BDY82	99	BF596	15	NKT241W	8	TIP110	61
BC171	9	BC559	8	BF137	20	BF694	16	NKT241G	8	TIS91	25
BC172	9	BC595	8	BF153	20	BF757	62	NKT241Y	8	ZTX550	30

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BRC/M/300	1.00	SN76115	2.00	TBA641	2.05	TDA2540	3.50
CA3060	1.58	SN76131N	1.58	TBA651	2.50	TDA2560	3.50
LM1303P	1.48	SN76226N	1.25	TBA720A	2.49	TDA2581	3.00
ML231B	2.20	SN76227N	1.00	TBA750	2.20	TDA2591	1.96
ML237B	2.00	SN76530P	1.30	TBA800	1.62	TDA2611A	1.95
ML239B	2.86	SN76622N	1.00	TBA810S	1.00	TDA2640	2.90
MC1327AP	1.25	SN76660N	80p	TBA810AS	1.00	TDA2690A	1.50
MC1358P	1.30	SN76666N	75p	TBA920	2.08	TDA3560	6.00
MC1455P	18p	SN76744	1.92	TBA950	1.95	TDA4500	5.40
MC14516BCP	60p	SY153A	2.50	TBA1440	1.92	TDA9503	2.90
SAA1025	7.20	TA7117P	1.00	TCA270SA	1.05	TCEP100	3.48
SAA1124	4.50	TA7109AP	2.80	TCA270C	1.05	TEA1009	1.95
SAA5010	6.00	TAA611	1.40	TCA270CQ	1.05	MC14426P	4.80
SL432A	1.80	TBA120B	1.20	TDA1004A	4.00	MC14429P	4.50
SL1430	2.50	TBA120C	1.20	TDA1035T	3.50	MC14514	5.00
SL1432	2.50	TBA120CQ	70p	TDA1037	2.72	UA758PC	2.50
SN15846N	60p	TBA120S	70p	TDA1170	2.15	UA1003A	2.66
SN74123N	65p	TBA120U	1.00	TDA11705	1.50	ULN2165	1.30
SN74154N	1.40	TBA395	1.00	TDA1200	2.42	ULN2216A	1.25
SN76001N	1.40	TBA480Q	1.40	TDA1270	2.76	UPC1365C	5.75
SN76110N	1.14	TBA510	1.90	TDA1327	2.53	SC9488P	1.40
						SC9511P	1.40
						SW153	2.50

Thorn 8/8K5 ex equip panels untested
PSU 2.88
FTB 3.75
Decoder 4.00

Thorn 9K ex equip panels untested
PSU 12.00
Decoder 5.00

Thorn 9K6 ex equip panel untested
Decoder 5.75

Thorn 3/3K5 ex equip panels untested
PSU 3.75
LTB 3.75
Video 2.50
Chroma 2.00
FTB 2.75
IF 1.75
Conv. 3K 3.00
Conv. 3K5 3.75
Autovox Decoder FG/01 new boxed 5.00

Thorn 4000 Convergence panel ex-factory 3.75
Thorn 4000 PSU panel ex-factory 2.50
Thorn 3K5 beam limiter board new 1.75
Thorn 3/3K5. EHT & scan TX + R2008B on alum chassis ex-equip 1.80
Thorn 8/8K5 damaged FTB for spares 1.25
Thorn 8/8K5 damaged decoder for spares 2.25

UHF TV Aerial for portable	50p	Coax Plugs	10 for 1.65
Indoor Aerial With Reflector to Help Combat Ghosting Problems	2.50	Band Change Switch Assy, Pye 725	40p
		Coax Cable Low Loss	Metre 22p
Line Connectors	38p	Switched Flush Fitting Aerial Outlet	1.00

Pye 78+161	50p
Pye 147+260	50p
Thorn 56+1K+47+12	1.24
Thorn 50+40+1K5	60p
Thorn 128+16+1K7+116+462+126	50p
Thorn 120+72+300	50p
RBM 250+14+58 (TV161)	63p
Pye 3R5+15+45 (713)	90p
Philips 2R2+682	90p
Philips 47R	52p
Thorn 6+1+100	92p

Thermal Cut-Out
Thorn 3000 Metal 1.45
Thorn 8/8500 Plastic 1.45

EHT TRAYS

Thorn 3000	5.50
Thorn 8000	4.50
Thorn 8500	6.00
Thorn 9000	7.90
Thorn 9600	6.00
Thorn 900/950	1.50
Thorn 1500 3 stick	2.40
Pye 713 4 lead	5.83
Pye 713 5 lead	5.97
Pye 725	6.35
Decca Bradford	5.00
Baird 8750	7.10
Korting AZ9100	7.10
Philips G8 (520)	6.50
Philips G8 (550)	6.50
Universal	5.00

MULTISECTION CAPACITORS

220+47	350V	65p	200+200+100	350V	55p
200+150+50	350V	60p	200+200+75+25	350V	60p
200+200+100	325V	54p	50+50+8	300V	55p
32+32+16	275V	52p	100+50+100	350V	55p
200+200+100+32	350V	70p	100+150+50	350V	55p
100+50+150	350V	58p	2500+2500 (Thorn 8K)	63V	1.20
400+400	200V	72p	150+150+100	300V	1.80
32+32+16	350V	52p	200+47	250V	65p
200+32+300+100	350V	70p	500+500 175V Thorn TX9		1.00
225+25	350V	50p	175+100+100 350V Thorn 3K5		2.25
200+200+100	350V	70p	400 400V Thorn 9K		2.50
200+100	325V	65p	470 250V Philips G11		1.50
200+100+100+50	350V	60p			

CAN TYPES

0.2MF 250V	50p	1250MF 40V	50p
2MF 250V	50p	1250MF 50V	50p
22MF 275V	50p	1500MF 100V	1.05
50MF 275V	50p	2000MF 30V	50p
100MF 150V	65p	2200MF 40V Thorn 4K	95p
100MF 250V	70p	2200MF 63V Philips G9	1.25
220MF 450V Thorn 4K	1.30	2500MF 35V	65p
400MF 350V Thorn 8K	1.00	2500MF 40V	65p
400MF 400V Thorn 9K	2.95	3000MF 30V	65p
800MF 250V	70p	3300MF 16V	50p
1000MF 100V Thorn TX90	2.90	3300MF 25V	60p
		4700MF 16V	72p
		4700MF 40V	75p

Thorn/Decca/GEC On/Off Switch. Push to make	75p
Philips G11 On/Off Switch. Push to make	75p
ITT CVC9 On/Off Switch + Relay	90p
Philips G8 On/Off Switch	75p
Thorn 3/3500 A1 Switch	50p
Thorn 4000 A1 Switch	50p
Korting Shift Pot 50Ω	65p
2·5A Push to make on/off switch	15p
Thorn TX90 On/Off Switch	1.85
10K Lin Pot. TX9/TX90	75p

DIODES

AA112	8p	IN4003	4p
AA119	8p	IN4004	5p
AA143	8p	IN4005	5p
BA115	8p	IN4006	5p
BA154	8p	IN4007	6p
BB103	8p	IN4148	2p
BB105B	30	IN4149	6p
BR103	52p	IN4742A	8p
BR303	78p	IN5254B	8p
BT106	1.50	IN5349	14p
BT116	1.00	IN5400	12p
BT119	2.56	IN5401	12p
BT120	2.82	IN5402	14p
BT151 650	1.00	IN5404	12p
BY127	12p	IN5406	16p
BY188	16p	IN5408	16p
BY204	26p	IS025	8p
BY206	16p	IS131	8p
BY207	16p	IS1658	8p
BY208/800	38p	MR854	35p
BY223	95p	SKE1/02	20p
BY225	1.20	MCR106/1	1.00
BY227	28p	MCR406	35p
BY298	22p	2N4444	1.50
BYX22/400	30p	Y827	80p
BYX55/600	30p	Y969	75p
BYX71/350	80p	ZX150	12p
BZV15 C12R	1.16	OA91	5p
BZV15 C24R	1.16	MCR106/7	1.00
IN60	8p	MCR106/8	1.50
IN2070	8p	TD3F800H	2.80
IN4001	4p	TD3F800R	3.00
IN4002	4p	BY255	30p

The Vet's Problem

Les Lawry-Johns

Not BO but B&O – one that gave me almost as much heartache as that NordMende. If it had been anyone else's I'd have told him to take it back where he got it from, but he's such a nice chap and we do have a dog, a cat and a bird. That bird is definitely female by the way: she doesn't talk but makes a lot of noise. You can't touch her unless she's having one of her freak outs, when she hunches her shoulders, sticks her neck out and babbles away in some strange alien tongue. You can then stroke her till she comes to. She then straightens up and lashes out with her beak. I think it's part of the mating game but she hasn't got one (so far).

The Spiders

Which brings me to the next horror story. Upon removing the B and O's rear shell – release bottom catches, lift up and off the top tongues – I caught sight of a long brown envelope stuck to the right side of the chassis. Removing the envelope and opening it I found a folded booklet with the circuit details. Inside the fold were the bodies of two spiders which must have been there a long time: one was complete but only the shell of the other remained, no doubt the male who had provided the female with her last meal.

The Set

The actual repair (having buried the spiders with due ceremony) turned out to be something of an ordeal, as the fault was intermittent. The set would suddenly trip (partially) after it had been on for quite some time, the picture shrinking and then returning rapidly to normal. It didn't shut off to enable proper tests to be made. The power unit is at bottom centre and was removed so that we could try to make some voltage checks. After a long time it transpired that the voltage at the collector of the chopper transistor remained steady while the base and emitter voltages varied, suggesting an overload. I rather doubted this, feeling that the fault was in the power supply itself.

Cold tests were out of the question as the fault was of such an intermittent nature, so we invoked Dante's Law: go where the heat is. This proved valid and the fault no longer occurred when the chopper driver transistor, BD something or other, was replaced. My fading memory suggests that we fitted a BD203 but I could be wrong. I can't check up on it as the circuit is back inside the set, at the vet's home (sans spiders), and I don't have another copy to jog my memory. I've even forgotten the model number and as no bill was presented I can't look up the copy.

Who's a Ninny?

Next balls up. Who was it who completely stripped down a Fidelity IS100 audio stack system to get at the cassette head in order to solder one wire on, then put it all together again only to find that removal of two screws from the front cassette cover exposes the head and just gives room to resolder? I won't tell you who it was but I won't do it again.

Mack and Millie's G11

You remember me calling at Mack and Millie's house, parking on the pavement and getting a rocket from Millie . . .

"Curb crawlers are creepy Les but pavement parkers are putrid."

"Only two wheels, Millie."

"Half a wheel is enough – MORE THAN ENOUGH!"

Well they don't seem to have much luck with their G11. They phoned to report "a white line across the screen".

So along I went and parked in their driveway. I'd taken with me a spare timebase panel (upper left) and some fuses. I checked the second fuse up on the line output panel. It was intact. I checked the soldering to the base of the TDA2600 field timebase i.c.'s holder, and as this seemed to be o.k. I fitted my spare panel. After this I switched on, confidently expecting to see a full raster. Just a white line. Feeling a bit deflated, I tapped the top centre dynamic convergence correction panel. The line flicked to a full raster then collapsed again. Oh dear, I've brought the wrong panel.

I removed the correction panel and examined it closely for cracks and dry-joints. As there didn't seem to be any I refitted the panel and without clipping it down switched on to see if a bit of probing might help to identify the culprit. There was a good, full picture. It wouldn't collapse until I clipped it down. So I unclipped it and told them I'd be back on the morrow with a replacement but that the set would meanwhile be all right as I'd taken the pressure off the trouble spot.

Next day I returned with the required panel and to save time I ran the car up on the pavement outside. I fitted the panel and prepared to depart. Millie said she had to collect her grandchildren from school and came out with me to get her car from the garage.

"THAT CAN'T BE YOUR CAR STUCK UP ON THE PAVEMENT AFTER ALL I'VE SAID!"

"After all you've shouted Millie. See you in court dear."

The Repair

Back at the shop it took an ohmmeter to locate the intermittently open-circuited track, very near to connector 15A4. A jumper lead was quickly soldered in place to put paid to any further hanky-panky.

A Solution

I'm fed up with the way this country's going. Everybody seems to be convinced that unless they put up prices, charges, wages – everything every year – they'll be uneconomic and go under. What we need is a universal catch phrase for use at every check out, written on every invoice and bill. Everybody together then, "LESS TEN PER CENT". Salaries, wages, fares, charges. O.K., some won't do it, some perhaps can't. They'll be the unpopular minority. Leave marked up prices as they are, but subtract ten per cent at the time of payment. "Less ten per cent, less then per cent" – can't you just hear it? I can hear the objections: importers etc. But it could be done if we really wanted to. All right we don't. But dafter things have happened.

A Visit to MCES – VCR Head Alignment Principles

Steve Beeching, T. Eng.

Regular readers will recall that I had a problem over obtaining suitable video heads when I was busy rebuilding some VHS machines earlier this year. The VCRs were of the very early type, with a round video drum turntable. The later type with relay connector pins wouldn't fit. I needed a supply of the earlier type of drum with the PCB type terminal connector.

This was when I came across the video head drum reconditioning service provided by MCES of Stretford near Manchester. Provided a drum is in good condition and is not scratched or marked they will fit new ferrite tips for less than half the cost of a new head assembly.

I was sceptical about the idea of replacing head tips because of the accurate alignment required but nevertheless decided to try a few. The results they provided were very good, much better than I had expected. It seemed worth investigating further and I was invited along to MCES to see for myself.

MCES's Services

MCES are fairly well known in the TV trade for their tuner, teletext and remote control panel repair services. They now handle VCR aerial booster amplifiers and modulators in addition to providing the drum reconditioning service. The investment that was required to install equipment for tuner repair work was considerable but the cost of equipment for fitting video heads is very high indeed, well into six figures. At the time of writing a single alignment jig console is in use: a second is on order for delivery this autumn and a third is due next spring.

The alignment equipment is situated in a room entered via an air lock of two doors, though you are not obliged to wear a space suit! Air conditioning maintains a clean air supply and the temperature is stabilised to maintain correct alignment conditions.

Head drums sent to MCES are first stripped of the old tips, then washed in detergent and dried. This is followed by further cleaning in an ultrasonic bath. New heads are then fitted, ready for aligning.

Alignment Console

The alignment jig (see Fig. 1) has a central turntable on which the drum to be aligned is clamped. Microscope lenses are situated at either side, precisely 180° apart. Cameras are fitted to the lenses, the images being displayed on two monitors mounted above and behind the lenses. A view of each video head tip is thus seen, along with vertical and horizontal cursor lines that seem to be electronically generated. There are also three digital readouts, two beneath the monitors and a third in the centre.

Head Projection

A micrometer vernier adjuster on the left-hand lens moves it towards and away from the drum. It's used to measure the head tip projection. The head tip is first moved out of the way by revolving the turntable. The lens is then adjusted to focus on the drum surface. The projection counter is zeroed, the lens is moved out again and is refocused upon the head tip when this has been revolved back into view. Correct focus occurs when a special moiré interference pattern appears – at the precise focal point on both surfaces. The distance moved by the vernier adjuster is displayed by the digital projection counter. For correct alignment the tip projection from the drum is 51·5μm. The projection of both tips is set by the same lens – the drum is revolved on the turntable by 180° to bring the second head into view.

Head Differential Adjustment

The 180° differential is set to a lateral tolerance of 1μm by adjusting the head tips so that they sit between two vertical cursor lines displayed on each monitor, the cursor lines having been calibrated to exactly 180°. If one head is out of specification, the cursor line is set to centralise the gap within the pair on the left-hand monitor, using an electronic shift of both the left-hand and right-hand pairs of lines in tandem, thus maintaining calibration. The gap shown on the right-hand monitor is then moved into the cursor area by means of the lens vernier adjuster, the counter beneath the right-hand monitor showing the lateral shift in microns. Each head is then adjusted by half this figure to bring them into line. This is repeated a number of times, gradually adjusting the heads so that they are 180° apart to within a lateral tolerance of 1μm.

Head Height

An interesting point I learnt is the difference in head tip height between different types of drums. MCES had determined their own 0μm reference level then measured a large number of standard production heads to obtain an accurate height value above this reference, including production spreads.

The counter in the centre is used for height adjustment. The right-hand microscopic lens can be moved up and down by a vernier adjuster, the counter reading the

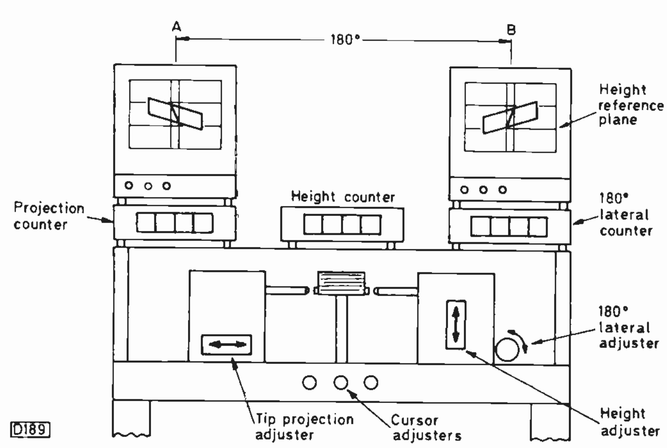


Fig. 1: Layout of the head alignment console.

amount of this adjustment. The difference in height between the two heads in the drum is measured by first setting the lower edge of one head tip on a horizontal cursor line on the right-hand monitor. The drum is then rotated through 180° and the counter zeroed. The lens is adjusted so that the lower edge of the second head is aligned on the same cursor, the amount of adjustment being displayed on the counter. The height difference between the two heads on a drum is kept to within 2μm, though the overall height of the pair may be within 5μm of the value for a particular type of drum.

In general, the height of Hitachi head tips is 36μm while for Panasonic the figure is 45μm. JVC head heights are 54μm (F), 62μm (J), 64μm (L) and 66μm (M): the early D types are 104μm and the G10 series 95μm. In terms of replacement drums this means that replacing an F type with a G10 type will result in the new head tips being 41μm higher in the VCR. This is almost a track width, and the audio/sync head will require lateral adjustment to set the tracking range to compensate, using a standard test tape as a reference. MCES ensure that reconditioned heads for Ferguson/JVC machines have head tip heights that conform with the suffix letter to within ±5μm. They have found that other "general purpose" heads do not conform to any height specification, some being more than 12μm out. Whether or not this is critical depends on the engineer's ability to set the tracking range by the audio/sync head.

VCR Adjustments

One normally sets up the PG switching points and the response of the replay preamplifiers as necessary after drum replacement. The preset tracking control is set for maximum f.m. output on replay of the machine's own recordings with the main tracking control set midway. The final adjustment, to compensate for head tip height difference, is to replay a standard reference tape and adjust the audio/sync head laterally (sideways).

Tip Thickness

So that the heads are suitable for a wide range of models, MCES use a ch. 1 head tip that's 60μm thick and a ch. 2 head tip 80μm thick (thickness being the track width). This makes the heads equally suitable for standard or slow motion/still picture machines. Note that whilst the two heads have a width greater than the standard 49μm track the alignment of their lower edges on the same plane ensures that the recorded tracks are 49μm wide – by over recording of the excess track width. The head gaps are glass filled, and in order to maintain consistent quality all head tips come from the same Japanese manufacturer.

In Conclusion

After alignment, the drums are vacuum packed in polystyrene boxes for long shelf life.

MCES have spent a lot of time and money on ensuring that their reconditoned head drums are of high quality. Output is at present limited – at least until more alignment jigs have been installed – due to the careful quality control exercised. They have a large quantity of JVC drums in stock awaiting reconditioning but are short of Hitachi, Panasonic and Sharp drums – they'd welcome surplus drums. MCES can be contacted at 42-46 Moss Road, Stretford, Manchester (061-865 6021).

TV Fault Finding

Reports from Mick Dutton, Larry Ingram, Keith Hamer and Garry Smith

Philips K30 Chassis

Tripping was the complaint with this set. We checked the diodes in the line output stage, the line output transistor, and swapped the power supply panel. There was no obvious fault so we decided to lift the line output transistor's collector to see whether the power supply then produced the correct output. As the h.t. voltage was right we came to the conclusion that the line output transformer was probably defective, but the fault was still present when a replacement had been fitted. Drastic action was now called for so we supplied the set via a variac and removed R7354 to disable the excess current trip. We increased the supply slowly and a small, bottle-shaped raster appeared: the h.t. started to fall despite increasing the supply. The penny then dropped. The output from the mains bridge rectifier was low at only 220V instead of 285V because the reservoir capacitor C1560a (200μF) had gone completely open-circuit. **M.D.**

Grundig 8610

This was one of the last models to use a thyristor line output stage. It has an in-line gun tube and an EW diode modulator module. The symptoms were bends in the centre of the raster, similar to a hum effect, and not quite enough width. After no more than fifteen minutes the bends went and just enough width was obtained – none of the adjustments gave any more width. No voltage readings or scope displays gave any clues, except that the output from the EW module seemed to be a little on the low side. A great many things were tried before we discovered that the culprit was the +D (36V) supply reservoir capacitor. Obvious when you realise that the +D supply to the field output stage is derived from the EW modulator circuit, but not at the time! **L.I.**

ITT CVC45/1 Chassis

"Dead" said the job card but on switching the set off it momentarily came to life, suggesting that the line timebase was all right. A replacement power supply panel was to hand and fitting this restored normal operation. The offending item turned out to be R809 (220kΩ) in the trip circuit: it was completely open-circuit. **K.H.-G.S.**

Hitachi/GEC NP8CQ Chassis

Intermittent chroma on one of these sets was traced to an uncropped lead on R620 on the main panel – it's part of the field flyback pulse coupling network. The rear plastic panel support retaining strip was pressing against the lead, causing it to short intermittently to jumper lead J723. **K.H.-G.S.**

Thorn TX9 Chassis

This receiver (PC1040 main panel) was dead and on inspection the mains input filter choke L64 was found to be short-circuit. There was also some evidence of burning. Replacement of the choke revived the set but after a short soak test it would intermittently go dead. The trouble was found to be due to the mains rectifier thyristor CSR1 (T9053V): freezing it brought the set back to life, heat it and the set went dead again. The only other snag was a badly fitting back cover: those top turnbuckles are something of a nuisance. **K.H.-G.S.**

Pye 725/735 Series Chassis

The main complaint was that the sound level fluctuated, especially at low settings of the volume control. The field engineer had already checked the plug/socket connections at the front control subpanel. Movement of the volume control at low settings produced the fault so a replacement was fitted. On soak test the fault was still found to be present however. A TBA750Q intercarrier sound/audio amplifier i.c. is used, with the slider of the d.c. volume control linked to pin 13 which is decoupled by C238 (10μF). This electrolytic gave a leaky reading, replacement providing a complete cure. After replacing the usual first anode supply feed resistors and a couple of the presets, which had fallen in value, the overall picture quality was much improved. **K.H.-G.S.**

Thorn TX10 Chassis

The fault with this set was e.h.t. but no raster. The tube's first anode voltages at pins 5, 7 and 11 on the base panel were correct but the voltages at all three cathodes were high at 200V instead of 120-150V. The voltages at the emitters of TR651/2/3 in the RGB output stages were all higher than the correct 2·2V and it turned out that the green LED D657, which should link them to chassis, was open-circuit. This LED acts as a voltage stabilizer. **K.H.-G.S.**

GEC C2110 Series

The complaint was intermittent colour. Fortunately the colour was absent when we switched on. Our luck soon vanished however when the colour suddenly returned a few seconds later. Then it disappeared again.

Attention was directed to the small subpanel that bridges the upper and lower decoder panels. Slight movement of this made the chroma come and go and examination revealed dry-joints at both ends of C251 (0·33μF), which is connected to pin 13 of the TBA540Q reference oscillator i.c. In fact the capacitor could be pulled from the panel with very little effort. Thinking back, we came across the same fault some years ago. The capacitor in question is a green rectangular block type bearing the name "FILMCAP". **K.H.-G.S.**

Thorn TX9 Chassis

We've encountered two cases of an effect not unlike sound-on-vision on receivers fitted with this chassis. When the first one came along a fault on the i.f. subpanel was suspected and a replacement board cleared the fault. The culprit was traced with the help of a can of freezer. In both cases it turned out to be C38 (0·22μF) in the a.g.c. circuit. This capacitor sits directly below the SAWF. **K.H.-G.S.**

Approaches to TV Servicing: Quick Steps

S. Simon

Last month in this series we discussed the ITT CVC20 chassis. This time we propose to dwell for a little while on the later CVC800-CVC801 chassis employed in models such as the CT0500 etc. But before doing so we should make good an unforgivable omission that occurred in the original Approaches article which dealt with several chassis including the Philips G11. Sorry. Whenever a set fitted with this chassis is serviced the colour of the 470μF h.t. reservoir capacitor C4029 should be checked – it's at the upper centre of the lower right power board. If it's red or green, remove it (three tags). Examine the rivets of these tags. If they appear at all blackened, fit a new capacitor – one with larger rivets. If there's no sign that arcing has occurred, apply a screwdriver blade to the rivet and hit the screwdriver's handle with a heavy object such as a hammer to indent the rivet on to the tag. Only the red and unmarked tags require this treatment – the yellow tag is unused. It's essential that the rivet makes good contact with the tag as arcing here can and does harm the BU208A line output transistor, the TDA2600 field timebase chip and the tube. Most of you will already know about this, but there may be one or two who don't.

ITT CVC800/CVC801 CHASSIS

The CVC800/CVC801 chassis employ a switch-mode power supply that can cause some headaches – and severe depression – on occasions. Many factors can cause complete shut down, and some can be difficult to trace. Routine steps to take are to check that the mains supply is reaching the bridge rectifier and that this is producing some 300V or so across its reservoir capacitor C658 (220μF). This voltage should be present at the collector (body) of the BU126 chopper transistor (right side front). The similar looking transistor farther to the rear of the panel is the BU208 line output transistor, which is driven by a secondary winding on the chopper transformer. The BU126 is driven by a small transformer whose secondary winding is connected between its base and emitter. The emitter of the BU126 is also connected to pin A of the chopper transformer. 110V should be present at the output from this transformer, pin C. This output is taken to a point marked +110V on the lower part of the board.

Now note this. It's marked +110V and that's what it should be. If a reverse or pulsed reading is obtained, as it often is, it's most likely that the h.t. smoothing capacitor C757 is open-circuit. This is a 10μF electrolytic and one of 450V rating should be fitted as a replacement. Failure of this capacitor is becoming quite common on these and several related ITT chassis that use a switch-mode power supply.

If on the other hand the voltage is d.c. but very low, remove the scan coils plug (the one with the loop on it) from the horizontal panel and try again. This action disconnects the h.t. supply to the line output stage. If the 110V supply is then restored, check for shorts in the line output stage, starting with the BU208 output transistor. This simple line of attack will be found to be successful in a surprising number of cases.

In cases where the 300V supply is present at the body of the BU126 but there's no output at the +110V point, the condition of the driver stage should be checked. Look for the driver transistor T750, a BC546A, just below the small transformer it drives. The 300V line supplies its collector via the 33kΩ wirewound resistor R752. Check these items carefully before continuing the search by checking the transistors, diodes etc. in the rest of the switch-mode power supply.

We cannot speak with any authority about the rest of these sets simply because we've not had any troubles worth speaking about. These few remarks should help to clear up most faults in the power supply however. Remember that 10μF electrolytic.

THORN 3000/3500 CHASSIS

The first switch-mode power supply to appear in a UK TV set was that in the Thorn 3000-3500 series chassis. Many of these sets are still giving sterling service. Although they are often considered to be unworthy of serious servicing attention, the condition of the tube should really be the deciding factor. The power supply and line timebase panels are available at very reasonable prices if a repair proves too difficult or time consuming. A replacement panel can be fitted if held in stock, the repair being completed when time permits.

Several items on an old power supply panel may need to be replaced. Neglect to do so may cause trouble later – being a lazy person myself, I know only too well what the penalties are. Reverse the panel and examine the condition of the large multisection main electrolytic can. Bumps and corrosion are a sure sign of trouble to come and one or two of the tags may be found badly burnt. Replace this item then turn the unit over and examine the 1,000μF, 63V electrolytic at the front end. All too often this is responsible for failure to start up. A voltmeter connected to the positive tag should record 45V. If the electrolytic has dried up a lower voltage reading will be obtained and this will prevent the chopper firing.

Small Picture

Quite often the fault is a small picture with the bottom folded up. This may be intermittent. The voltage at the h.t. fuse (should be 60V) may be low when the fault occurs. One common cause of this is often overlooked. The large preset (red) at the rear of the power supply is the main voltage control. To the right of it there's a small preset. This is the item to replace (R631). It's in series with the main preset.

Serrated Picture

Other, smaller electrolytics on the power supply panel can become open-circuit or partially open-circuit. The 140μF, 75V h.t. smoothing capacitor C619 for example. This causes serrated verticals. A word of warning. Don't just slap a similar capacitor across the suspect while the set is working unless the test capacitor is already charged: switch the set off, wire the test capacitor across the suspect and then switch on to note the effect. If the serrations are still present, move over to the line timebase panel where you may well find that the core of L502 has dropped out on to the decoder panel. If it has dropped out and can be found, refit it and seal it in. No more dropouts.

No HT

If there's a high voltage at the body of the chopper transistor but nothing at the h.t. fuse (F603) proceed as follows. First check the voltage at the right side tag of the rear upper "dropper" resistor. The reading should be 12V. If the reading is very low, check at the second tag from the right where you should find 45V. If this is also low, remember what we said about the 1,000μF electrolytic (C607). If however the voltage at the inner tag is approximately correct but the voltage at the right side tag is low, the dropper section concerned (R607, 100Ω) should be running hot. If it's cold, waste no time – fit a new 100Ω section. Nearly always however you'll find it running hot, the usual cause being an emitter-collector short in the chopper driver transistor VT605 (E1222) – under the left side with a heatsink on it. There are other possibilities, including the dynamic trip, but VT605 is the usual cause.

Attention may need to be paid to the diode in series with VT605's emitter. This can go open-circuit, as a result of which VT605 ceases to conduct – thus leaving the right side tag of the dropper at a higher than normal voltage. The voltage at this tag is therefore a key check.

The second thing to do is to ensure that the 30V line is present and correct. Check the 30V regulator transistor VT601 (front right) and its base and emitter tags which may be dry-jointed. Still at the right front, note the diode in front of the 400μF electrolytic – the 30V zener diode W605. There should be 30V at its cathode and 0·7V at its anode. This 0·7V is part of the start-up cycle: it switches the delay transistor VT602 (BC184LC) on. This item is another suspect that will often be found faulty.

Another essential for the chopper circuit to get going is pulses from the line oscillator. Hence the power supply cannot be checked on its own: you need the upper right side line timebase panel if a test rig is being used.

THORN 8000 SERIES

The following notes should prove helpful when servicing the 8000, 8000A, 8500 and 8800 chassis. We must start with an item found only in the 8000 and 8000A – the extreme left side "dropper", a black wirewound vertically mounted. The one in the 8000 has two main sections. The bottom consists of two 6Ω elements to make up the 12Ω surge limiter required at the input to the thyristor (via a BY127 diode). The upper 47Ω section is the h.t. smoothing resistor. In the event of a "no results" condition, start at the dropper. Check for a.c. at the bottom tags. It's very common to find that one of the 6Ω sections is open-circuit. The temptation to transfer the tag connections and use only the active 6Ω section must be resisted. The makers intended 12Ω and 12Ω it should be. Well perhaps 10Ω can be permitted, but not less. A 10Ω, 17W wirewound resistor could be used to bridge the faulty sections or a 4·7Ω resistor to shunt the open-circuit section only.

The upper 47Ω section in the 8000 can give trouble, but the stress is more on the lower 6Ω sections. We mentioned the BY127 diode in series with the BRC4443 thyristor. This diode is suspect, also its contact with the panel – this will often be found burnt away. When a BRC4444 thyristor is fitted you may find that the BY127 has been omitted.

The 8500 and 8800 chassis don't have the 12Ω dropper section. A VA1104 thermistor is used instead as the surge limiter. This device tends to corrode and fall apart, leaving the thyristor with no a.c. supply.

One may ask why no h.t. should result in no sound? It's because in these chassis the MJE340 sound output transistor is supplied from the h.t. line, with transformer coupling to the speaker. This means that the transistor must be a high-voltage type, MJE340 or equivalent.

Whereas the power panel is fitted under the tube, in the centre, in the 8000 and 8000A, the panel is at the left side in the 8500 and 8800. This makes access much easier.

Also at the top left is the a.c. input panel which carries the fuses, l.t. rectifiers, mains filter capacitor C801 and the degaussing components. If the mains fuse F802 has failed and is blackened, suspect C801 – disconnect one end to check. In some cases its appearance leaves no doubt. If there's no a.c. supply at the fuse, check at the on/off switch and if the supply is present here move over to the rear centre red button cutout: an overload, e.g. a short-circuit line output transistor (VT401), will trip this rather than blow the fuse.

EHT but No Picture

If the symptoms are e.h.t. rustle but no picture, with normal sound, the first test to make is at the tube base – to ascertain whether the first anode supplies are present. Their absence is the usual cause of these symptoms. Check the rectifier circuit on the lower left of the right side timebase panel. The small 3·3kΩ resistor (R402) in series with the BY184 rectifier diode may present a scorched appearance and when measured prove to be open-circuit. The most frequent cause of this is that the 0·047μF reservoir capacitor C401, to the right, has gone short-circuit. A replacement must be rated at 1kV at least, the capacitance being of secondary importance.

Line Output Stage Hint

One last hint on these chassis. When you're faced with an inactive line output stage though the line oscillator and driver stages are working, don't immediately jump for the line output transistor. Check it by all means, but pay particular attention to the reading between the base and emitter. This should be very low both ways round due to the low value resistors and the driver transformer's secondary winding. These resistors may need to be checked.

THORN 9000 CHASSIS

The 9000 chassis was discussed in some detail in our last servicing series (see the May 1983 issue), so we'll make these notes very brief and to the point. Apart from any minor routine repairs that may be necessary, say to the switch selector unit where cleaning may be required, the more troublesome repairs centre around the power supply and the tripler.

The Syclops Circuit

There are two items to check first in the power supply. One is the centre section Syclops transistor VT701

(R2540) which lives in its heatsink house. The great thing to remember is that the base and emitter pins are not soldered but clip into the holder, the collector being secured by two screws. If the transistor hasn't gone short-circuit (this blows the mains fuse) try removing it then bending the base and emitter pins slightly to improve their contact before refitting it. Screwed to the side of the heatsink housing is the second villain, the SKE4F diode which is connected in series with VT701. It will often be found short- or possibly open-circuit. A replacement for this is the SKE5F3.10.

A general check on the diodes on the centre section usually pays dividends, particularly on the right side where one of the EW modulator diodes W711/W712 may be found decomposed. A BYX71-600 may be used as the replacement, neatly soldered under the panel, observing the polarity.

Weak Points

These models tend to develop dry-joints under the rear of the main panel, particularly in the region of the the interconnecting plugs, scan coils etc. The other weak point is the e.h.t. tripler, which is screwed to the upper metal support strut. This proximity of 25kV to a chassis member leads to all too frequent breakdown of the insulation, the consequent arcing and sparking leaving one in little doubt as to the source of the trouble.

THORN 9600 CHASSIS

This unwise siting of the tripler was rectified in the later 110° 9600 chassis. Failure of the tripler is far less common in this chassis. The weak link here is diode W810 in the EW modulator circuit. Again a BYX71-600 can be used.

THORN 9800 CHASSIS

The 9800 chassis is a very close relative of the earlier 8800 chassis: it has similar panels and a 90° delta-gun tube. There is one important difference. The 45V supply is derived from the line output transformer instead of from the mains. As a result, a start-up circuit is required. This makes a difference to the fault-finding routine.

Start by listening carefully at the moment of switching on. If the e.h.t. rustles up momentarily or a pulse of sound is heard one knows that the start-up circuit is working. If there's no noise other than the degaussing buzz, the start-up circuit should receive attention. For this purpose an external source of 24V is most useful. First check the mains input and make sure that some 200V is present at the anode of the thyristor (via diode W704 which should be carefully checked for condition, soldering etc. if necessary). Then identify socket 4 on the decoder panel and apply the external 24V supply to pin 5 (mauve lead), negative to chassis of course. If the receiver fires up and continues to work when the external supply is disconnected the start-up circuit is at fault and should be carefully checked. You may well find that R814 (470Ω) on the right side of the upper left degaussing/start-up panel is open-circuit.

Unlike the 8800, the 9800 chassis has a separate line output stage panel with a diode-split line output transformer. As with the 9000 series chassis, dry-joints in this area can be a problem. Lift the panel to gain access to the connector etc. A dry-joint on connection 851-10 is the usual cause of field collapse.

An Approach to Adding Teletext

Keith Cummins

I recently decided to try to interface a Tifax XM11 module and wired keypad with a Sony Model KV1820UB. The exercise was successful and the majority of this article relates to it. Consideration will also however be given to the general problems that such interfacing raises, in the hope of assisting readers first to assess the viability of a proposed modification and secondly to carry it out successfully.

In my case the Sony set with its Trinitron tube was working reliably, producing a well-converged picture – regular readers may recall the GCS/transistor line output stage modification I carried out in this set (see March 1985 issue). The set seemed to be a more suitable candidate for teletext conversion than my other one (a B and O set) for reasons that will become clearer later.

The Tifax module and wired remote control keypad were obtained from Manor Supplies. Examination of the keypad showed that in addition to the teletext controls there are four channel selector buttons and a sound muting facility. This led to a knock-on situation: in addition to incorporating teletext it seemed sensible to build in remote channel selection and sound muting. There seemed little point in having a remote control keypad some of whose controls did nothing. The result of this has been the design of a relatively simple remote channel selection facility and sound muting. This part can stand alone if required, not having to be part of the complete teletext modification.

In order to assess whether or not a proposed modification will be viable we have to carry out a feasibility study – which is a nice way of saying engage brain before grabbing the sidecutters and soldering iron. This feasibility study may involve a lot of thought before anything is done, the objects being (a) to identify the problems and (b) to see whether there are viable solutions. It could happen for example that there isn't a viable solution to a problem that has been identified: far better to think this through in the first place rather than do a lot of work on something that won't yield satisfactory results.

Tube Drive

Take for example a hybrid colour set with colour-difference tube drive (my B and O set fell into this category). The colour-difference output stages that drive the tube's grids must provide a large voltage swing, which is incompatible with a wide bandwidth. For ordinary colour reception this doesn't matter since the colour-difference signals are of reduced bandwidth anyway – the tube gets its high-definition information from the full-bandwidth luminance signal that drives the cathodes.

If we tried to use the colour-difference output stages for teletext the reduced bandwidth would result in very poor text definition, though the graphics wouldn't be too bad. Is there an answer? There's usually a solution of some sort to a problem. In this case it would involve changing over to RGB tube drive. This would mean dematrixing the colour-difference and luminance information and designing new output stages. It could be done, but what a tremendous amount of work it would involve! It just wouldn't be worth it, particularly if the existing set was working very nicely thank you. Further, unless one is prepared to carry out careful design and testing it's possible that the end result would be a TV set that gave results inferior to those before the modification was carried out.

The Sony Trinitron tube requires RGB drive – there are separate cathode connections but only a single grid connection. As a result Sony sets look interesting from the point of view of teletext modification – because of their tube drive arrangements and good convergence, which is especially important with a text display.

Other Receiver Considerations

From the channel selection point of view the KV1820UB uses a varicap tuner, which lends itself to remote control operation. This is another point in the set's favour.

Further investigation is needed however before we can feel confident that the set is a "good bet". There are other aspects to be considered, some of which can still leave us taking calculated risks.

One such factor is the amplitude and phase response of the i.f. strip – if unsatisfactory, the result could be reduced eyeheight and the risk of data corruption. It's not easy to assess these factors by looking at a test card: a receiver whose i.f. characteristics are unsuitable for text can still produce a respectable picture.

In modern sets the performance in this area is maintained by the use of a SAW i.f. bandpass filter and synchronous demodulation. A look at the circuit diagram shows that the KV1820UB has conventional i.f. shaping filters between the i.f. preamplifier and the main i.f. strip while demodulation is carried out in IC201 (CX100D) – and the circuit doesn't tell us much about what goes on inside this device.

While it looked as if little could be done with the demodulator it was possible to hedge our bets in the selectivity circuits. One problem that affects the phase/

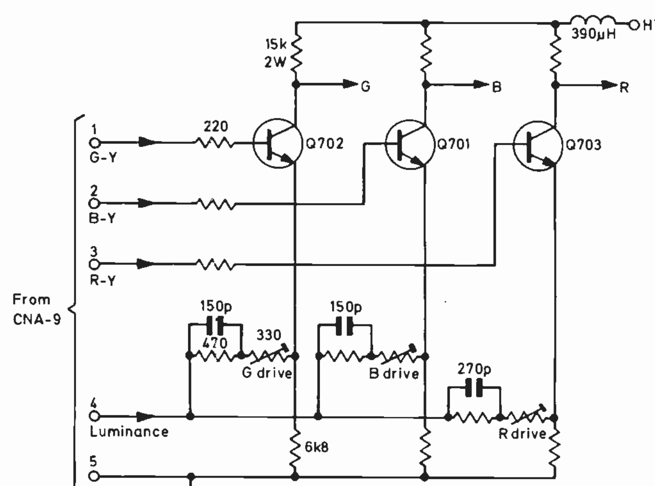


Fig. 1: RGB output stage circuits, Sony Model KV1820UB.

amplitude characteristic adversely is asymmetry in the slope of the i.f. response around the 39·5MHz vision carrier frequency. The slope is a necessary part of satisfactory vestigial sideband reception, but it often slopes away too quickly from the ideal shape because of the presence of the 41·5MHz trap which was included to prevent breakthrough of the old channel 1 sound carrier. Since 405-line transmissions have now ceased there's no need for this trap which can thus be removed. The circuit used in the KV1820UB allows the trap to be removed completely without need for further modification. All that remains in circuit is a 6·8Ω resistor.

I decided to remove this trap (T204) before doing anything else. Removing the screening plate from the bottom of the PCB is a tedious task since it's soldered down in several places. Solder wick and patience are required. Once the plate is off it's easy to unsolder the trap can and remove it. The plate must then be replaced.

The Video Signal

Having done this I decided to take a look at the video waveform just ahead of the luminance delay line. The scope, a Philips 3215, was connected to the junction of L301/R314: by manipulation of the timebase speed and with the TV sync facility in use it was possible to look at the teletext lines. Use of the ×10 expansion revealed pulses of approximately the right height (70 per cent of peak white) with rounding at the top and bottom. Between there was an area of fast transitions, indicating that the teletext decoder's data slicer shouldn't have much difficulty in seeing the difference between data highs and lows. My faith in this "poor man's eyeheight" check seems to have been justified, since error-free text reception was achieved over a wide range of input signal levels when the modifications had been completed. There was no need to alter the i.f. response and none of the i.f. adjustments were touched.

The above test also suggested a suitable point for extracting a video feed to drive the Tifax module, via an emitter-follower. The latter was incorporated on the interface panel. A positive-going video signal of between 1-2·7V is required to drive the Tifax module: the nominal signal level at the point mentioned in the KV1820UB is 2·8V, positive-going. All very nice and convenient. An emitter-follower with a level-control potentiometer as its emitter load is all that's needed. Had the signal level been too small, or inverted, it would have been necessary to include an amplifier (inverting or not as required) ahead of the emitter-follower.

Up to this point the modifications to the KV1820UB had been minimal – only the 41·5MHz trap had been removed. It remained to work out what was needed (apart from the video feed) to interface the teletext decoder with the set.

Inserting the Text Signals

The next critical problem concerned substitution of the text information in place of the normal picture. Examination of the KV1820UB's circuit diagram showed that matrixing of the colour-difference and luminance signals takes place on the c.r.t. base panel, on which the RGB output stages are mounted (panel C). The luminance signal is applied via drive potentiometers to the emitters of the RGB output transistors while the colour-difference signals are applied to their bases (see Fig. 1). As the drive potentiometers vary the gain they also affect the amplification given to the signals at the bases. An important point is that while the colour-difference signals are bandwidth limited there's no bandwidth limiting in the RGB output stages themselves, whether looked at from the emitters or bases.

As a consequence of this we can consider using the text signals to drive the bases of the RGB output transistors while connecting their emitters to a d.c. reference level in the text mode. As the output stages are on their own board, it's a simple business to break into the interboard connections (connector CNA-9) to introduce the teletext interfacing. This arrangement was found to work well in practice.

Interfacing

Now to the details of the interfacing. The Tifax module's outputs are at TTL level (5V) and have to be translated to any other level that may be needed – the d.c. level on the colour-difference drive lines in the KV1820UB is typically 7V. There are also TTL monochrome and blanking signals that need level shifting. Furthermore it's a good idea to buffer the Tifax module to reduce the chances of damage due to calamities elsewhere – including such horrors as flashovers.

The requirements of the interfacing unit thus become clearer. We have to buffer the digital signals; switch between digital and analogue (ordinary picture) video; and feed the selected signals as drives to the RGB output stages.

Simple switches or maybe even relays could be used to switch between the digital and analogue signals were it not for the fact that the switching has to be controlled by the blanking signal, which comes from the Tifax module. One of the facilities provided by the module is boxed display of subtitles or newsflashes. For this purpose it's necessary to cut a hole or holes in the picture and insert the text. This involves blanking on a line-by-line basis, which calls for fast electronic switching. Relays and suchlike are out: solid-state analogue gates are in! Now analogue gates are not very tolerant of voltage transients, so to be careful when taking their outputs to the c.r.t. drive circuits it's advisable to include emitter-follower buffer stages to protect against the transients that occur with tube flashovers.

In the particular case under consideration it's also necessary in the text mode to switch out the luminance signal and substitute for it a d.c. voltage. Variation of this d.c. voltage provides control over the text background level.

Tifax Module Connections

Before describing the interface board in detail we should first consider the Tifax module's needs.

The Tifax module has pins marked 1 to 22 (see Table 1). There is no connection to pin 9 while pins 11 and 14 are intended for polarising key positioning. Pins 1 to 8 connect to the keypad. When the equipment is first switched on, pins 3 and 8 have to be linked temporarily to "initialise" the decoder in the picture mode.

There are two 0V connections and two 5V supplies are required, one for the digital circuits and the other, with extra smoothing, for the analogue signal processing. There are five outputs, RGB, monochrome and blanking, and inputs for the video and for a line pulse.

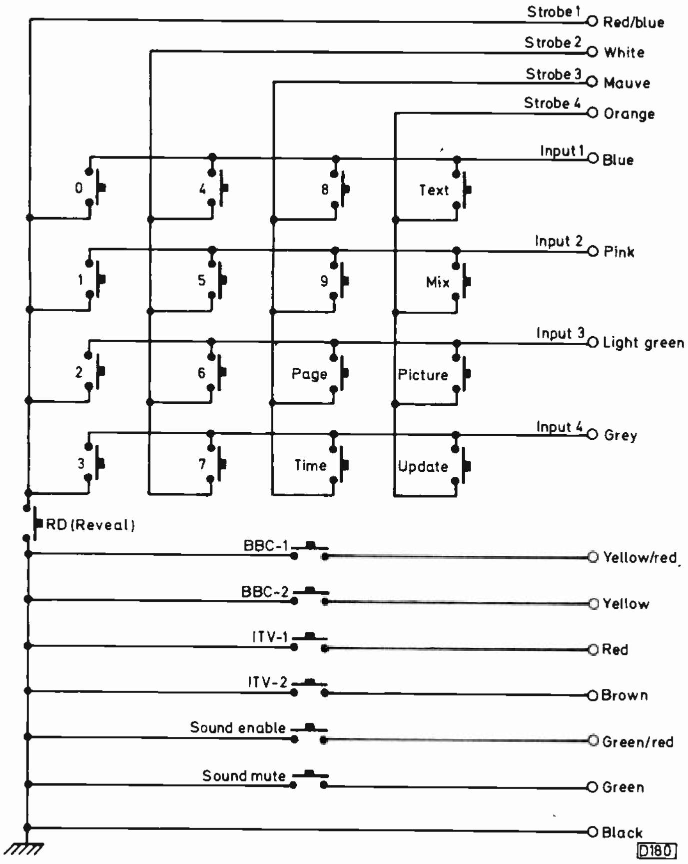


Fig. 2: Circuit of the keypad.

It's possible for the Tifax module to consume nearly 1A at 5V. Since it's not easy to provide such a supply in a TV set unless this is done at the initial design stage a separate power supply forms part of the interfacing exercise. The same unit provides the 12V supply required by the analogue and some digital parts of the interface board and by the separate channel selector board.

The keypad operates by either cross-connecting the control lines from the Tifax module in a 4 × 4 matrix or by pulling lines down to 0V (for audio control and channel selection) – see Fig. 2.

The interface board has four i.c.s, six transistors and 26 connections. These are listed in Table 2.

Interfacing Circuit

The circuit of the interface board is shown in Fig. 3. We'll start by considering the situation during normal picture reception, when the board is "transparent" to the TV set's signals and the set behaves as though nothing had been done to it.

The three colour-difference signals come on to the board at connections 1, 2 and 3 and pass via the 4053 triple changeover analogue switch chip IC2 to the three emitter-followers Tr2, Tr3 and Tr4. They leave the board at connections 12, 13 and 14, going to the bases of the RGB output transistors. The d.c. level is maintained, except for an approximately 0·6V offset introduced by the base-emitter voltage difference of the three emitter-follower transistors. The signals pass through the three analogue switches because the switching bus line is high. This switching bus is the key to the changeover process and we'll give more details when we come to the text mode.

The luminance signal comes on to the board at connection 9 and passes via one section of a second 4053 (IC3) to emitter-follower Tr5. This is a pnp device since it needs to be "on its head" to supply the emitters of the RGB output transistors. Diode D4 is included to provide flashover protection. Note that the combination Tr5/D4 performs the same function as Q305/D303 in the KV1820UB.

So when the switching bus is high the interface is transparent to picture video and in effect we've done nothing – the TV picture appears as normal.

When we come to viewing text we first need to know the normal conditions of the Tifax module's outputs. The three RGB and the monochrome outputs are all open-collectors which pull active low, i.e. they are high until something happens. The blanking output is normally low and goes high when blanking is required.

You'll see that the outputs from the Tifax module are returned to the 5V line via resistors R1-5. The outputs are also connected to five of the inputs of the 7416 TTL hex inverter buffer chip IC1. This chip has open-collector outputs that can withstand 15V, though the chip is operated from a 5V supply.

When the user presses "text" on the handset the blanking input at connection 8 goes high and pin 12 of IC1 goes low. This is the switching bus line, which is otherwise held at 12V via R11. When the switching bus line goes low the states of the four analogue switches in IC2 change over. As a result Tr2/3/4 are linked to pins 2/4/6 of IC1 instead of to input connections 1/2/3. As the outputs from IC1 try to rise to 12V they are caught by diodes D1/2/3 whose cathodes are taken to the pnp emitter-follower Tr1. This transistor's base voltage is set by VR2, which can be varied to determine how far the outputs from IC1 are allowed to move in the positive direction. By this means the amplitude of the text signal drive to the RGB output stages is adjusted, i.e. VR2 sets the text signal brightness. It's a preset control since there's no need to adjust the text display once it has been set up satisfactorily.

In the text mode the luminance signal is disconnected by its analogue switch (in IC3). In its place a d.c. level set by VR1 is introduced. This is the text background control which sets the pedestal level on which the text signal sits in the video stages. For initial setting up test points 1 and 2 are linked, forcing the switching bus low. With no text present VR1 can be set for a true black background in readiness for the text when it appears.

The switching process, including the creation of subtitle boxes as mentioned earlier, is under the control of the blanking signal. The Tifax decoder also has a "mix" mode in which text is superimposed upon the picture. In this mode the monochrome signal, after passing through two inverting buffer stages to get its polarity right, cuts character shaped holes in the main picture. Because the Tifax module's RGB outputs all go low together in this mode the result is an inlay of monochrome text and graphics. Personally I don't like this mode very much, preferring the picture or text on its own.

Note that this interface arrangement allows the set's picture controls to work normally in the picture mode: they have no control over the text display, which is preset as described above.

Rest of the Circuitry

Now to the other circuitry on the interface board. The Tifax module needs a carefully smoothed 5V supply for its analogue circuits. This is provided by the decoupling

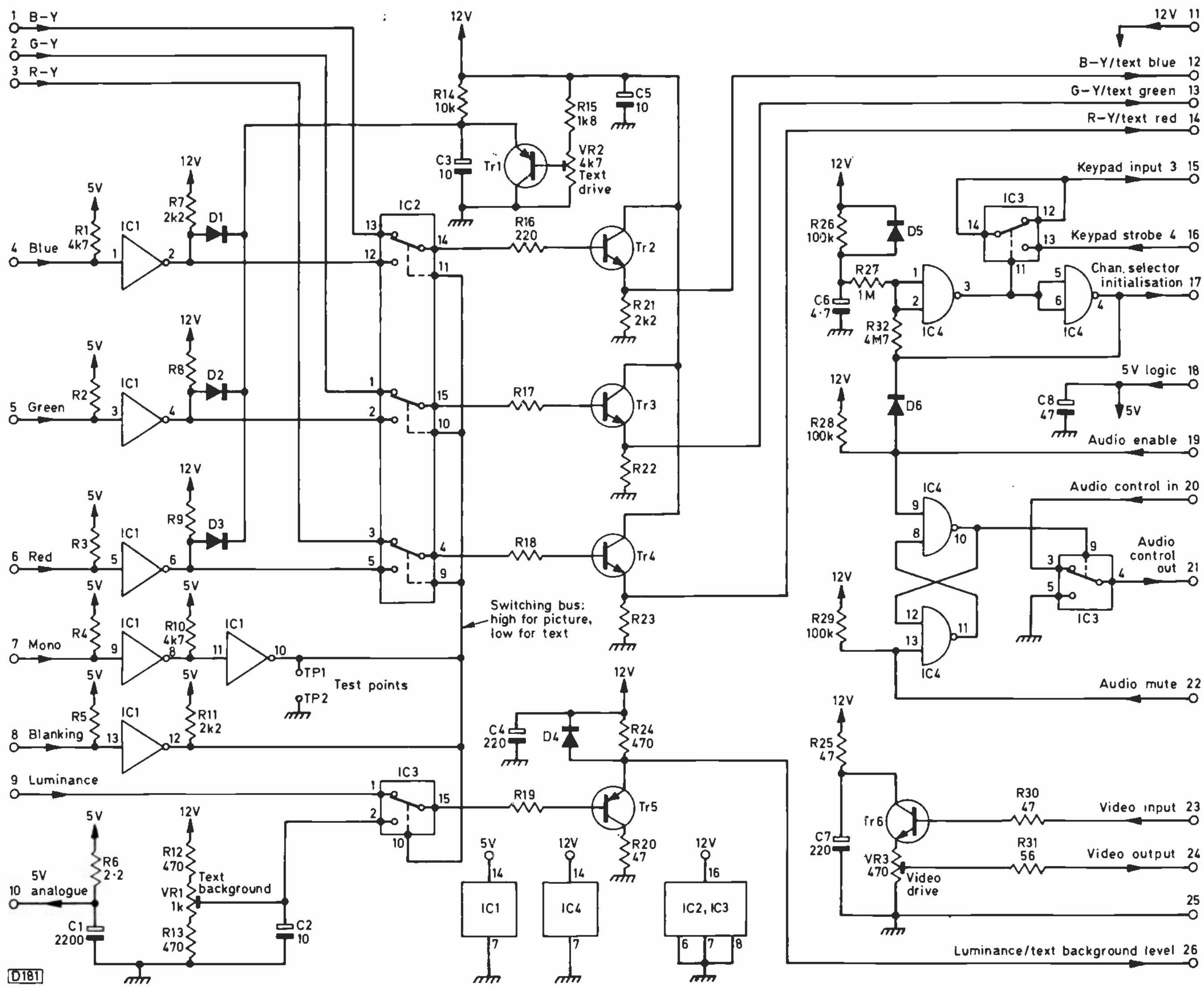


Fig. 3: Interface board circuit.

network R6, C1 which is fed from the logic 5V supply.

Buffering and level adjustment of the video drive to the Tifax module are provided by the emitter-follower Tr6. The video input comes from board A in the receiver as described earlier – see Fig. 4. The transistor's base is biased positively by the standing voltage of around 4V. R25 and C7 filter the supply to this transistor. Screened lead is used to link the video to and from the interface board.

A latch circuit using two sections of a 4011 quad dual NAND gate i.c. to control an analogue switch is used for audio muting. This switch can handle a.f. or d.c. audio level control. The KV1820UB uses a d.c. volume control which sets the voltage at pin 13 of the CX095C intercarrier sound chip IC203. The analogue switch passes either the d.c. voltage corresponding to the required volume, i.e. the voltage from the volume control, or 0V which corresponds with zero volume. Lines from the keypad set the latch one way or the other to give audio enable or mute. In common with all latch circuits of this type the circuit could settle in either of its two states at switch on. To overcome this difficulty an initialisation circuit is used to set it in the enable condition when the set is switched on.

As mentioned earlier, the Tifax module also needs initialising at switch on. This is done by momentarily linking keypad input 3 to keypad strobe 4 to ensure that the TV set starts off in the picture mode – otherwise there's a possibility that it would start off in the mix mode. The last remaining analogue switch is used to carry out this procedure. It's controlled by a Schmitt trigger circuit that uses the two remaining parts of the 4011 chip as inverters. At switch on C6 is discharged: it then charges to 12V via R26. While it's charging, pin 3 of IC4 is high, closing the analogue switch to initialise the Tifax module. Pin 4 of the i.c. is low, taking pin 9 low via D6 to set the audio mute latch in the audio enabled position. The output from pin 4 also leaves the panel at connection 17, passing to the channel selector board which will be described later. When C6 has charged to the level at which the gate connected to R27 and R32 starts to invert, the circuit rapidly switches to its opposite state because of the positive feedback via R32. Initialisation of the Tifax module and the audio mute circuit is thus achieved and these circuits are ready to accept commands from the keypad. At switch off C6 discharges via D5 into the collapsing 12V line.

C4 decouples the 12V line and C8 the 5V line.

Channel Selector Circuit

The circuit of the remote channel selection board is shown in Fig. 5. Its main components are a quad latch

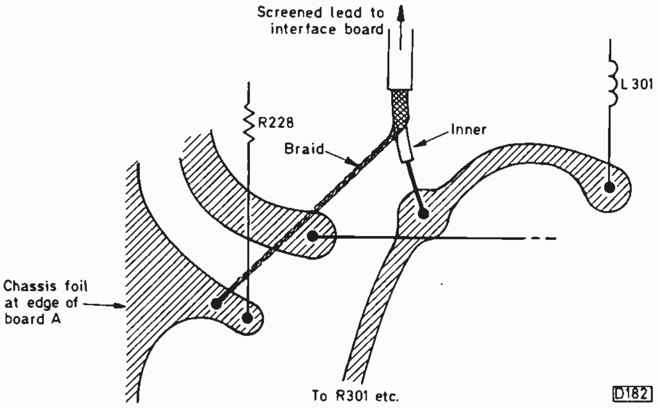


Fig. 4: Method of tapping the video from board A in the Sony Model KV1820UB.

(IC2), a four-input dual NAND gate (IC1) and four relays with their drivers. The function of the channel selector is to remember which channel selection button on the keypad has been pressed. This is achieved as follows.

The four channel selection lines from the keypad are taken to data inputs D1-4 of the 4042 quad latch IC2. These lines will be at 12V, via R3-6, until one is taken to 0V by pressing one of the channel selector buttons. The four lines are also connected to the four inputs of one of the NAND gates. When a button is pressed, the appropriate data line goes low. Let's say that the BBC-1 button has been pressed. Thus pin 4 of IC2 goes low and because one of its inputs has gone low pin 13 of IC1 goes high. This latter excursion is differentiated by C3 and R8 and used to clock IC2 via R7. When the button is released, the D1 latch has clocked in a low while the other three latches have clocked in highs. The outputs (inverted-Q) at pins 3/9/12/15 are applied to the bases of the relay driver transistors Tr1-4. These outputs go high when the clocked-in data is low. Thus having pressed the BBC-1 button we ensure that the output at pin 3 is high. Tr4 then switches on, closing RL4. If another button is pressed the pattern of clocking three highs and a low into IC2 is changed. The appropriate output pin goes high and the associated relay operates.

Initialisation is used to ensure that the same channel, BBC-1, is selected at switch on. When the system has been powered and can accept a clock pulse the back edge of the initialisation pulse from the interface board is coupled to the other half of IC1, which is used as a simple inverter, via the differentiating network C2, R2 and R1. This positive-going edge produces a momentary low at pin 1, forcing a low on to the BBC-1 select line via D1. Thus the set always comes on tuned to BBC-1.

The four relays used are of the reed type – those in the prototype had a resistance of 1kΩ. Quenching diodes D2-D5 are fitted to limit the back-e.m.f. when the driver transistors switch off.

One side of the relay contacts is taken to the local/remote switch SW1 which enables either the keypad or the original channel selector buttons to be used. The other sides of the relay contacts go direct to the sliders of the tuning potentiometers on their PCB. The system could be extended to control more channels by using say two 4042 chips and a common clock generator with an eight-input NAND gate (4068). Another gate or maybe a transistor could be used for initialisation.

The Power Supply

The last bit of circuitry is the power supply, which is shown in Fig. 6. This is very simple, using a transformer with a 9-0-9V secondary winding rated at 1A. Its primary winding is connected to the switched 240V supply from the set's on/off switch. One half of the secondary winding feeds a bridge rectifier whose reservoir capacitor is C2. This is followed by a 78H05 5V regulator, a chunky device with very low ripple on its output – a prime requirement with the Tifax module. It's very much underrun in this application and should therefore prove very reliable. The

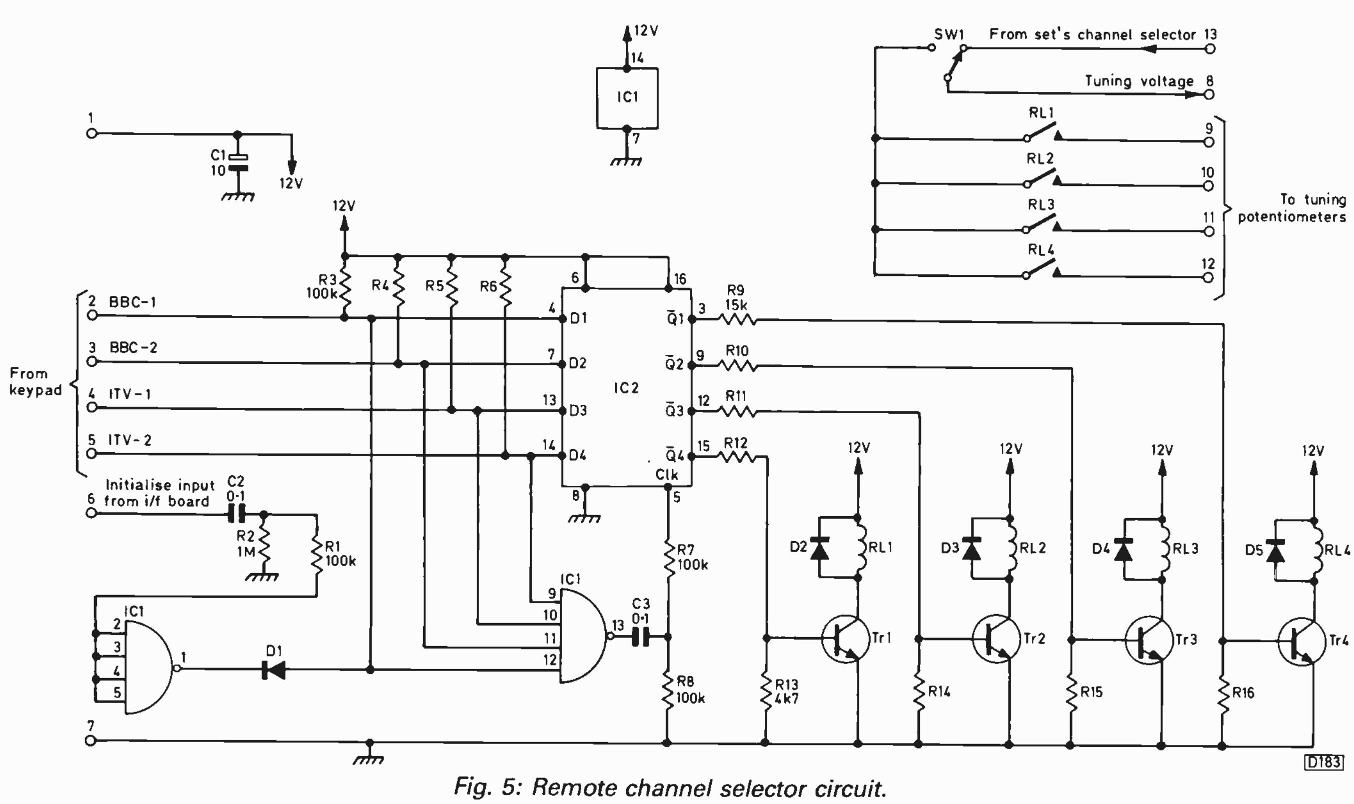


Fig. 5: Remote channel selector circuit.

Table 1: Tifax module connections

Pin	Connected to	Coded
1	Keypad input 1	Blue
2	Keypad input 4	Grey
3	Keypad input 3 and pin 15, interface board	Light green
4	Keypad input 2	Pink
5	Keypad strobe 1	Red/blue
6	Keypad strobe 2	White
7	Keypad strobe 3	Mauve
8	Keypad strobe 4 and pin 16, interface board	Orange
9	No connection	
10	Pin 10, interface board (analogue 5V)	Blue
11	Polarising key connection – not used	
12	Chassis	Black
13	Chassis	Black
14	As 11	
15	Line pulse from TV set	Screened
16	Pin 24, interface board (video input)	Screened
17	Pin 4, interface board (blue output)	Blue
18	Pin 5, interface board (green output)	Green
19	Pin 6, interface board (red output)	Red
20	Pin 7, interface board (mono output)	White
21	Pin 8, interface board (blanking output)	Brown
22	Pin 4 power supply/pin 18 interface board (logic 5V)	Red

Tifax module is intolerant of excessive voltage and could end up as a write-off in the event of regulator failure. Note that the 78H05 is in a TO3 can.

Some readers may not have come across the crafty use of the other half of the secondary winding with a half-wave rectifier (D1) as a means of getting 12V. If you think about what happens in a bridge rectifier you will note that one of the diodes completes the path to chassis while the top end of the secondary is at 18V r.m.s. above 0V. This enables the half-wave rectifier to work: because of the low load on the 12V supply, half-wave rectification is acceptable. In this case C1 is the reservoir capacitor which is followed by a 7812 regulator. A word of warning if you're not familiar with these regulators: don't be tempted to leave out any of the decouplers C3/4/5/6 – the devices can "hoot" and put noise on the lines. In extreme cases they can damage themselves and fail.

Table 2: Interface board connections.

Pin	Connected to	Coded
1	CNA-9 pin 2, KV1820UB	—
2	CNA-9 pin 1, KV1820UB	Plain White
3	CNA-9 pin 3, KV1820UB	—
4	Pin 17, Tifax module	Blue
5	Pin 18, Tifax module	Green
6	Pin 19, Tifax module	Red
7	Pin 20, Tifax module	White
8	Pin 21, Tifax module	Brown
9	CNA-9 pin 4, KV1820UB	—
10	Pin 10, Tifax module	Blue
11	Pin 3, power supply	Orange
12	Pin 2, KV1820UB board C	Blue
13	Pin 1, KV1820UB board C	Green
14	Pin 3, KV1820UB board C	Red
15	Pin 3, Tifax module	Light green
16	Pin 8, Tifax module	Orange
17	Pin 6, ch. select board	Pink
18	Pin 22, Tifax module/pin 4 power supply (logic 5V)	Red
19	Keypad	Green/red
20	Slider of TV set's volume control	
21	CNA-1 pin 2, KV1820UB	
22	Keypad	Green
23	Junction L301/R301 on board A, KV1820UB	Screened
24	Pin 16, Tifax module	Screened
25	Chassis	Black
26	Pin 4, KV1820UB board C	White

Note: Some of the colour codes are suggestions only.

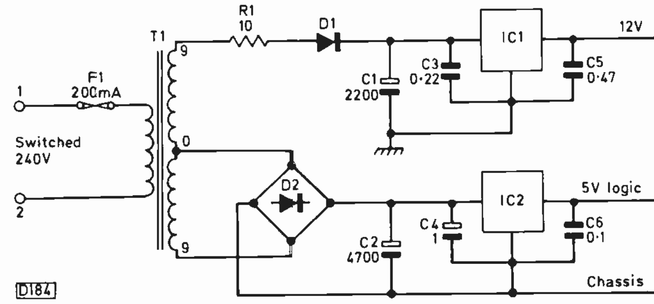


Fig. 6: Circuit of the power supply for the Tifax decoder and the interface and remote channel selector panels.

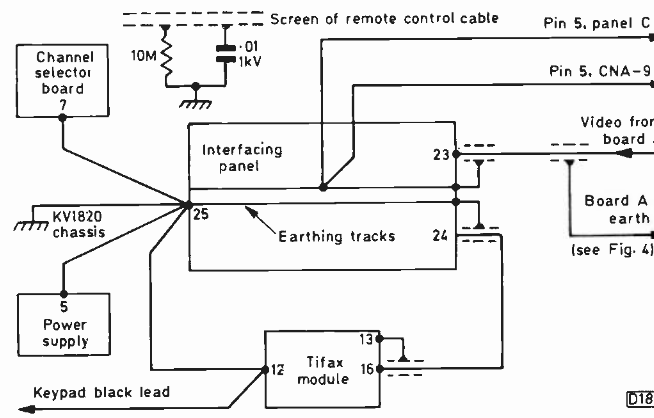


Fig. 7: Recommended earthing arrangements.

Construction

The power supply can be built on a small chassis which doubles up as a heatsink for the bridge rectifier and the regulators, then fitted in the vacant area behind the loudspeaker.

The earthing arrangements are important – see Fig. 7. Component layout is not critical, though common sense should prevail. The basic sketches (Fig. 8) show the positions of the main components. I used Veroboard but haven't given all the track cuts and component locations: constructors may well have their own ideas and different TV sets will need different shaped boards. My opinion is that if you need a detailed board layout you're not ready for this kind of exercise! Component lists are provided.

The Big Question

Could you fit teletext to your TV set? The foregoing remarks and technical details should help you to make up your mind. Knowledge of the pitfalls helps enormously if success is to be achieved. There is always an element of risk, and we have to live with this. If you don't want the teletext bit you can still use the remote channel selector

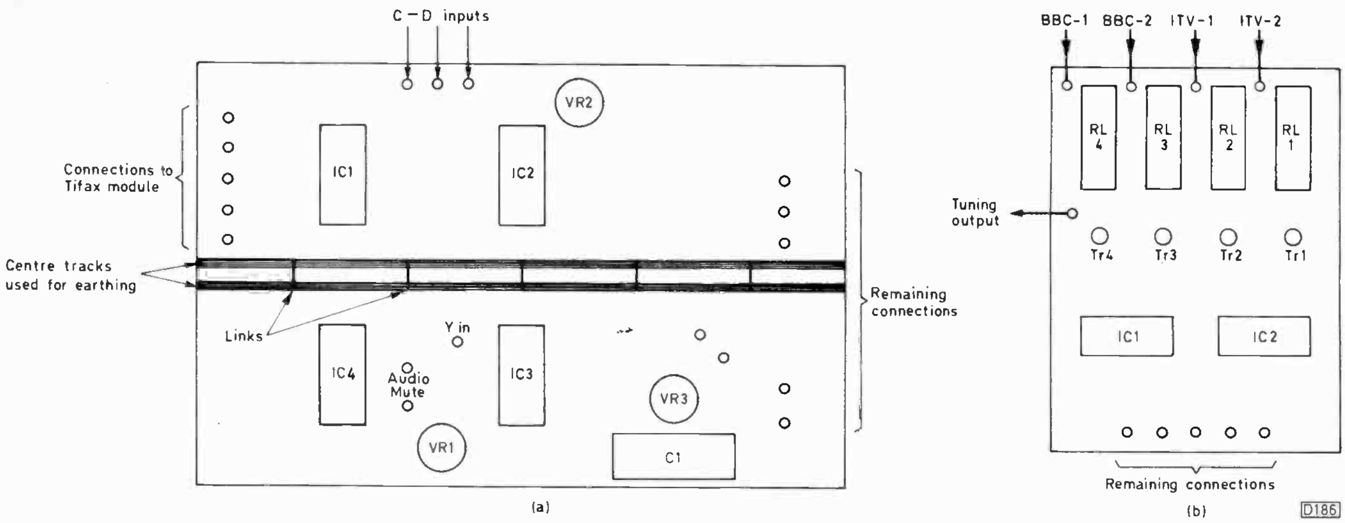


Fig. 8: Basic board layouts: (a) interface panel; (b) remote channel selector panel.

section on its own (provided you lay on local initialisation). Even the sound mute bit could come in useful somewhere.

Hopefully I've provided some ideas which you will find useful about interfacing. As I said at the beginning, the smart thing is to identify the problems carefully in the first place, to ensure that you don't come across a difficulty that makes it pointless to go any further with the exercise.

Testing

It's a good idea to test the separate assemblies on the bench before incorporating them in the TV set, applying voltages to the inputs and seeing for example that the outputs follow. Likewise test the power supply on dummy load before installing it. Make sure that all the other parts work properly in the set before fitting the Tifax module. Remember that without the Tifax module fitted you'll have to pull the blanking input low to get the switching bus to go high and select pictures. Also, because of the d.c. offsets introduced by the interfacing circuitry, you may have to adjust the first anode voltages – VR705 in the KV1820UB. By tackling the job in this way I found that I had only one change to make after everything had been connected up – that was to change the values of R7-9 on the interface board from the original 4·7kΩ to 2·2kΩ to

Components list

Interface board

Resistors:

R1-R5	4·7k
R6	2·2, ½W
R7-R9	2·2k
R10	4·7k
R11	2·2k
R12, R13	470
R14	10k
R15	1·8k
R16-R19	220
R20	47
R21-R23	2·2k
R24	470
R25	47
R26	100k
R27	1M
R28, R29	100k
R30	47
R31	56
R32	4·7M

0.3W 10% unless otherwise indicated

Presets

VR1	1k
VR2	4·7k
VR3	470

Capacitors

C1	2200, 10V
C2, C3	10, 16V
C4	220, 16V
C5	10, 16V
C6	4·7, 16V tant
C7	220, 16V
C8	47, 10V

Semiconductor devices:

IC1	7416
IC2, IC3	4053
IC4	4011
D1-D6	1N4148
Tr1, Tr5	BC212L
Tr3-4, Tr6	BC109B

Sundries:
IC carriers, Veroboard, link wire, terminal pins

Channel selector board

Resistors:

R1	100k
R2	1M
R3-R8	100k
R9-R12	15k
R13-R16	4·7k

All 0·3W 10%

Capacitors:

C1	10, 16V
C2, C3	0·1, 30V ceramic

Semiconductor devices:

IC1	4012
IC2	4042
D1-D5	1N4148
Tr1-Tr4	BC109B

Hardware:

SW1	SP change-over
RL1-RL4	12V, 1k reed relays with single-make contacts

Veroboard, i.c. carriers, etc.

Power supply

Semiconductor devices:

IC1	7812
IC2	78H05
D1	1N4002
D2	2A bridge, 100V p.i.v.

Capacitors:

C1	2200, 25V
C2	4700, 16V
C3	0·22, 30V ceramic
C4	1, 16V tant
C5	0·47, 30V ceramic
C6	0·1, 30V ceramic

Resistor:

R1	10, 0·3W, 10%

Hardware:

F1	200mA, 20mm, slow fuse with carrier
T1	Pri. 240V a.c.; sec. 9-0-9V, 1A

Aluminium chassis/heatsink, wire, etc.

ensure a fast enough pull-up (the character verticals were a bit weak).

Care and planning cannot be stressed enough – imagine how you'd feel if the Teletext decoder blew up because of a power supply fault or a wrong connection!

Remember too that because of the use of a mains bridge rectifier in the KV1820UB the chassis is always live. So the use of a mains isolating transformer when testing is essential.

Teletext Operation

Finally, here are some "driving instructions" for the teletext facility.

(1) With the TV set running normally, select the channel appropriate to the service required, i.e. BBC-1 for Ceefax pages from 100, BBC-2 for Ceefax pages from 200, ITV for Oracle pages from 100 and Ch. 4 for Oracle pages from 400.

(2) Press the text button. The picture will disappear and a few random characters will appear on the screen.

(3) Press the page button, followed by the page number. To get the index pages, call up 100 on BBC-1, 200 on BBC-2 and 100 on either ITV or Ch. 4.

(4) Wait for the page to appear. When you want another page, press page again and enter the new number via the keypad. The page number called up appears at the top left-hand corner of the screen. When the required page is found the rolling numbers at the top centre of the screen stop, frozen at the number called up.

(5) To hold a page, press page but do not enter a new number. To continue a series of pages, re-enter the page number (the one at the top of the screen).

(6) The real-time clock at the top right of the screen gives an idea of the signal integrity. If it jumps and changes data, the signal is suspect. A good test of the system is the clockcracker page 391 on Oracle, 197 on Ceefax.

(7) Alarm clock. Ceefax provides an alarm clock facility on page 196. The time is entered using the 24-hour clock, by pressing the time button after first selecting the page.

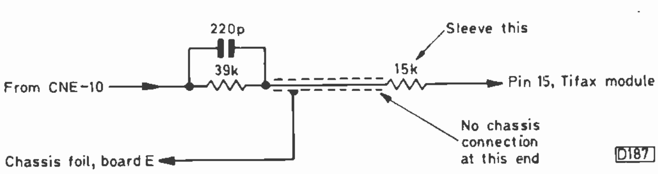


Fig. 9: Providing the line pulse required by the Tifax decoder.

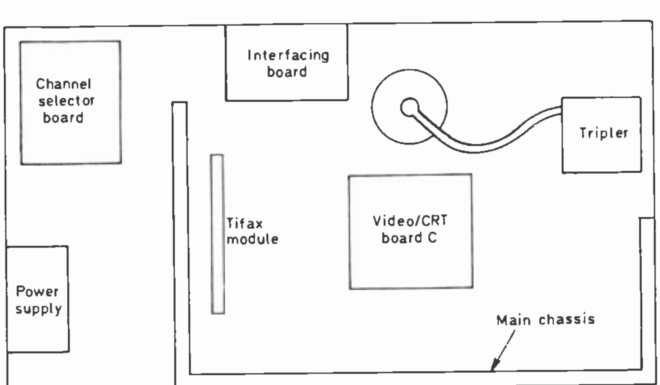
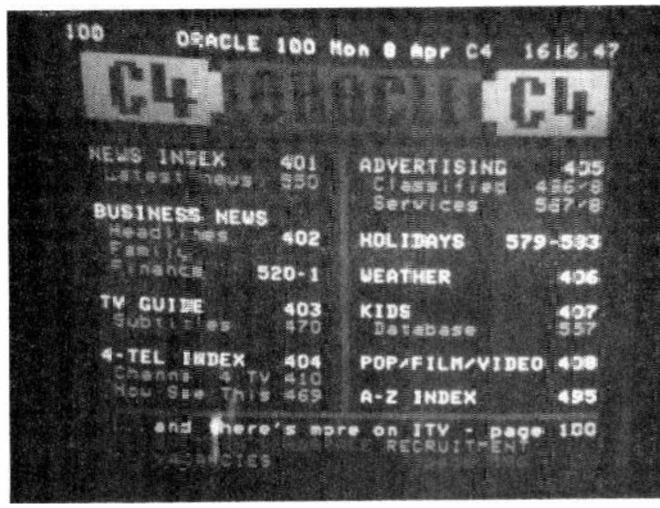
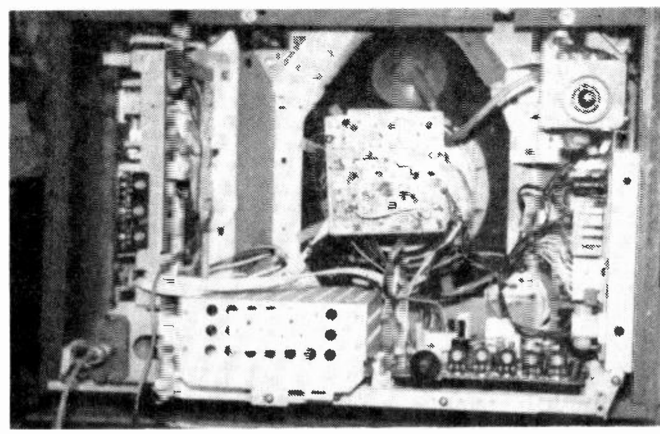
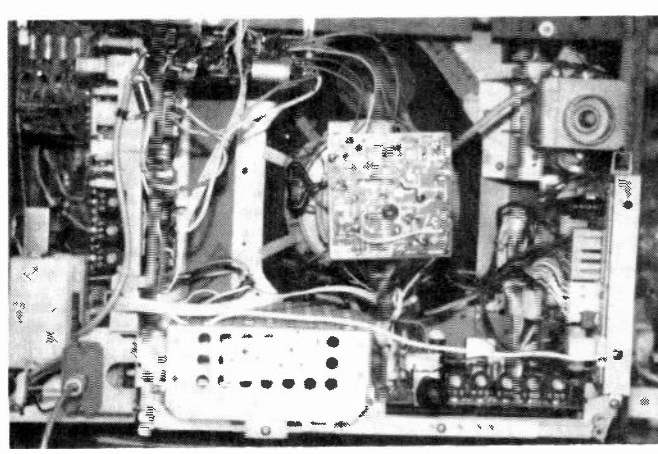


Fig. 10: Positions of the extra panels and the Tifax module in the Sony Model KV1820UB.



Teletext on the Sony KV1820UB.





The Sony KV1820UB before (top) and after (bottom) adding teletext and remote channel selection/sound muting.

Instructions are given on the alarm clock page.

(8) A page can be called up at a particular time, e.g. the stock market figures which are constantly changing. First enter the page, then press time and enter the time via the keypad. Get back to the picture by pressing update. Upon returning at the specified time – by pressing text – the updated page will be found.

(9) Switching between text and picture is done by pressing the appropriately marked buttons.

(10) The reveal facility is labelled RD (reveal data?) on the keypad. This is used under instruction from the screen to give answers to puzzles, riddles, etc. – mainly on the fun pages.

(11) Missing characters or a garbage display of nonsense is generally caused by noisy or ghosty signals.

ECONOMIC DEVICES, PO BOX 228, TELFORD TF2 8QP

16181	1.04
16182	1.04
16334	0.51
16335	0.80
16446	0.98
16600	1.38
16799	2.88
16801	0.54
16802	1.14
16803	5.30
16905	0.86
17074	6.60
17127	3.51
1N4001	0.06
1N4002	0.06
1N4003	0.06
1N4004	0.04
1N4005	0.08
1N4006	0.08
1N4007	0.07
1N4148	0.04
1N4448	0.05
1N5401	0.14
1N5402	0.15
1N5403	0.16
1N5404	0.15
1N5408	0.35
1N914	0.04
1S44	0.09
1S5012A	0.81
1S921	0.10
2N1302	0.27
2N1303	0.38
2N2218	0.42
2N2219A	0.40
2N2222	0.38
2N2646	0.80
2N2904	0.36
2N2905	0.43
2N2906	0.38
2N3053	0.27
2N3054	0.99
2N3055	0.61
2N3055H	0.85
2N3442	1.16
2N3702	0.14
2N3703	0.14
2N3704	0.14
2N3705	0.14
2N3706	0.14
2N3707	0.16
2N3711	0.11
2N3771	2.04
2N3772	1.71
2N3773	2.29
2N3819	0.40
2N3823	1.17
2N3904	0.62
2N3908	0.62
2N4101	1.33
2N4240	3.30
2N4444	0.90
2N4914	0.72
2N5064	0.71
2N5293	0.50
2N5294	0.50
2N5296	0.49
2N5297	0.50
2N5298	0.61
2N5490	1.49
2N5496	0.59
2N6107	0.59
2N6109	1.58
2N6122	1.76
2N6130	0.72
2N6133	1.25
2N6178	0.73
2N6180	0.73
2N696	0.43
2N698	0.43
2N707	0.43
2SA1027R	0.45
2SA1076	1.96
2SA329	0.40
2SA351	1.17
2SA489	1.17
2SA490	1.67
2SA493	1.05
2SA628	1.14
2SA637	1.46
2SA673	1.27
2SA683	1.61
2SA684	1.33
2SA748	1.08
2SA818	1.82
2SA835	2.50
2SA940	1.81
2SA951	1.26
2SA966-Y	1.16
2SB325	3.87
2SB375	3.87
2SB400	0.40
2SB407	3.24
2SB411	3.30
2SB511	2.50
2SB54	1.39
2SB56	2.23
2SB618A	2.22
2SB681	3.96
2SB695	1.98
2SB75	1.04
2SB861	0.85
2SC1034	6.75
2SC1050	4.03
2SC1061	1.26
2SC1096	1.16
2SC1104	3.98
2SC1106	4.54
2SC1114	6.75

2SC1124	1.26
2SC1151A	4.72
2SC1152	4.68
2SC1162	1.05
2SC1172	2.22
2SC1172Y	2.20
2SC1195	3.26
2SC1213	0.89
2SC1226	1.46
2SC1306	1.98
2SC1307	1.98
2SC1316	4.10
2SC1364	0.49
2SC1383	1.20
2SC1398	0.84
2SC1410	2.39
2SC1413	3.55
2SC1505	1.00
2SC1578	8.74
2SC1617	3.89
2SC1670	3.13
2SC1678	1.98
2SC1810	1.70
2SC1815	0.66
2SC1829	2.22
2SC1855	1.88
2SC1875	4.77
2SC1891	3.69
2SC1893	3.02
2SC1929	2.25
2SC1942	5.70
2SC1945	4.53
2SC1953	1.93
2SC1957	0.95
2SC1959	0.31
2SC1962	1.93
2SC1969	2.92
2SC1985	1.75
2SC1983 TR	7.00
2SC2009	0.34
2SC2029	2.33
2SC2027	1.42
2SC2028	2.11
2SC2057	1.18
2SC2073	1.54
2SC2078	2.39
2SC2091	1.30
2SC2122A	5.12
2SC2141	1.86
2SC2166	1.98
2SC2216	0.69
2SC2233	2.20
2SC2271	4.01
2SC2278	1.14
2SC2314	0.87
2SC2335	10.41
2SC2526	1.87
2SC2551	1.26
2SC2570	2.39
2SC2570A	1.05
2SC2578	6.75
2SC264A	4.82
2SC2671	1.99
2SC2728	0.95
2SC2785	0.75
2SC372	1.40
2SC373	1.16
2SC383	1.33
2SC388	0.50
2SC394V	0.81
2SC41	2.19
2SC458	0.34
2SC495	0.92
2SC508	3.70
2SC515A	1.85
2SC536	0.29
2SC537	0.54
2SC558	3.69
2SC605L	1.16
2SC620	1.46
2SC673	1.23
2SC681	4.40
2SC684	1.65
2SC685A	2.89
2SC693	0.63
2SC710	0.69
2SC717	1.14
2SC734	1.43
2SC735	1.16
2SC782	2.47
2SC790	1.27
2SC806	11.29
2SC814	1.39
2SC828	0.28
2SC867A	3.04
2SC876	0.96
2SC901	4.55
2SC926A	1.42
2SC930	0.54
2SC935	4.13
2SC936	5.25
2SC937	3.58
2SC940	4.68
2SC982	0.70
2SD1051	0.75
2SD1128	2.25
2SD1138	0.94
2SD1265	0.76
2SD1398	2.25
2SD1453	0.75
2SD198	3.87
2SD234	0.47
2SD235	0.60
2SD257	2.94
2SD291	2.94
2SD292	2.59
2SD313	2.59
2SD315	2.94
2SD325D	0.91

2SD348	16.13
2SD350	5.20
2SD350A	2.29
2SD353	7.50
2SD389	2.41
2SD401	3.55
2SD551	2.42
2SD588A	1.99
2SD600	3.25
2SD621	12.67
2SD636	0.40
2SD657	2.80
2SD679	3.35
2SD731	2.11
2SD787E	0.62
2SD811	5.54
2SD823	1.98
2SD856	6.61
2SD869	7.17
2SD898B	7.45
40408	0.50
40594	1.53
40595	1.53
40636	1.43
40871	1.53
40872	1.53
60857	1.21
74LS30	0.32
7805 TD-220	0.63
7805 TD-3	1.16
7806	0.73
7808	2.39
7812 TD-3	0.64
7812 TO-220	1.16
7815	0.64
7818	0.70
7824	0.64
AC107	0.73
AC117	0.43
AC123K	0.43
AC128	0.34
AC138	0.09
AC141	0.29
AC142K	0.43
AC151	0.28
AC153	0.34
AC176	0.30
AC179	0.28
AC183	0.72
AC187	0.39
AC187K	0.43
AC188	0.37
AC188-01	0.44
AC188K	0.43
AC193K	0.65
AC194K	0.65
AD140	1.06
AD145	1.60
AD149	0.90
AD161	0.56
AD162	0.45
AD262	1.05
AF114	2.47
AF115	1.24
AF117	0.75
AF118	1.20
AF127	0.50
AF139	0.53
AF178	1.45
AF179	0.55
AF180	0.55
AF181	0.53
AF182	0.55
AF186	0.53
AF239	0.53
AF279	0.88
AL100	4.03
AL102	5.69
AL103	2.68
AL113	1.36
AN115	3.98
AN155	1.89
AN206	2.58
AN208	3.55
AN210	2.28
AN214	2.26
AN214Q	2.40
AN231	14.89
AN234	5.09
AN236	3.33
AN238	6.79
AN239	4.35
AN240P	1.72
AN241	1.71
AN245	4.49
AN247P	3.95
AN252	2.57
AN253	2.97
AN262	1.98
AN272	7.92
AN281	5.45
AN295	5.52
AN301	5.55
AN302	3.99
AN303	4.39
AN305	8.88
AN313	3.41
AN315	2.46
AN316	5.53
AN318	6.20
AN320	5.47
AN331	4.59
AN337	5.37
AN340P	1.17
AN355	5.98
AN362	1.75
AN5111	2.92
AN5132	4.39
AN5250	2.89

AN5435	3.08
AN5610	7.43
AN5612	3.51
AN5613	3.41
AN6320N	4.28
AN6326	3.98
AN6342	1.61
AN6344	5.87
AN6363	16.00
AN6551	0.68
AN6552	0.68
AN7115	2.52
AN7145	2.80
AN7146	9.90
AN7150	2.45
AN7151	2.26
AN7156	2.40
AN7158	6.75
AN7218	1.64
AP58076	4.68
AS560S	1.58
AU113	2.97
AY105K	2.08
AY106	1.09
BA130	0.14
BA1310	1.98
BA1320	1.38
BA1330	2.75
BA145	0.19
BA148 DIDD	0.33
BA154	0.40
BA156	0.05
BA157	0.22
BA159	0.12
BA182	0.19
BA222	1.66
BA284/2	0.17
BA301	0.87
BA302	1.24
BA311	1.32
BA312	0.97
BA313	0.76
BA317	0.04
BA318	0.09
BA328	4.77
BA333	1.37
BA401	0.64
BA511	2.18
BA521	2.02
BA524	8.21
BA526	7.98
BA532	1.91
BA536	3.44
BA6304A	2.92
BA843	3.96
BAV18	0.21
BAV19	0.11
BAV20	0.11
BAV21	0.34
BAX12	0.11
BAX13	0.11
BAX16	0.11
BB119	0.17
BC107	0.13
BC107B	0.11
BC108	0.15
BC108B	0.15
BC109	0.12
BC109B	0.15
BC113	0.14
BC116A	0.25
BC119	0.36
BC126	0.20
BC132	0.14
BC135	0.14
BC137	0.18
BC138	0.34
BC139	0.28
BC140	0.45
BC141	0.34
BC142	0.34
BC143	0.33
BC147	0.11
BC147A	0.12
BC148	0.13
BC148B	0.13
BC148C	0.11
BC149	0.11
BC149B	0.13
BC153	0.14
BC154	0.14
BC157	0.14
BC158	0.10
BC159	0.16
BC160	0.40
BC161	0.28
BC167	0.36
BC168	0.36
BC169C	0.16
BC170	0.16
BC171	0.11
BC172	0.10
BC172B	0.27
BC173	0.17
BC174B	0.27
BC177	0.20
BC178	0.26
BC179	0.26
BC182	0.09
BC182	0.11
BC182B	0.26
BC182L	0.10
BC182LB	0.14
BC183	0.10
BC183L	0.11
BC183LB	0.26
BC184	0.13
BC184L	0.14
BC184LB	0.26

BC186	0.27
BC187	0.20
BC204	0.16
BC207	0.14
BC212	0.11
BC212B	0.26
BC212L	0.10
BC212LB	0.26
BC213	0.10
BC213L	0.10
BC213LB	0.15
BC214	0.10
BC214L	0.14
BC214LB	0.26
BC225	0.40
BC237	0.10
BC238	0.10
BC238A	0.13
BC239	0.12
BC239B	0.25
BC251A	0.12
BC252	0.10
BC258	0.25
BC261A	0.22
BC262	0.22
BC287	0.50
BC294	0.50
BC301	0.45
BC302	0.53
BC303	1.04
BC307	0.18
BC307A	0.14
BC308	0.18
BC308A	0.11
BC309	0.17
BC317A	0.13
BC327	0.15
BC328	0.11
BC337	0.08
BC338	0.12
BC360	0.34
BC368	0.24
BC440	1.09
BC441	0.44
BC454	0.36
BC455	0.36
BC460	0.42
BC461	0.47
BC462	0.30
BC463	0.64
BC464	0.64
BC465	0.64
BC477	0.32
BC478	0.32
BC479	0.41
BC532	0.28
BC546	0.17
BC547	0.10
BC548	0.10
BC549	0.10
BC550	0.40
BC556	0.16
BC557	0.10
BC558	0.10
BC559	0.10
BC560C	0.14
BC635	0.36
BC636	0.20
BC637	0.24
BC638	0.20
BC639	0.20
BC640	0.24
BC879	0.31
BC880	0.31
BCX32	0.42
BCX33	0.27
BCX34	0.40
BCX37	0.67
BCY70	0.30
BCY71	0.21
BCY72	0.20
BD115	0.36
BD116	0.70
BD124	1.31
BD124P+KIT	0.69
BD131	0.42
BD132	0.42
BD133	0.53
BD135	0.36
BD136	0.36
BD137	0.36
BD138	0.46
BD139	0.34
BD140	0.37
BD144	1.43
BD150	0.75
BD157	0.67
BD159	0.53
BD160	1.60
BD163	0.71
BD165	0.62
BD166	0.42
BD168	0.73
BD175	0.43
BD177	0.43
BD179	0.49
BD181	0.99
BD182	0.99
BD183	0.99
BD184	1.21
BD187	0.53
BD189	0.69
BD190	0.69
BD201	0.67
BD202	0.60
BD203	0.60
BD204	0.40
BD207	1.79
BD208	1.23

BD222	0.49
BD225	0.49
BD228	0.63
BD229	1.05
BD231	0.50
BD232	0.50
BD234	0.42
BD237	0.47
BD238	0.45
BD239	0.45
BD240	0.37
BD241	0.39
BD242	0.50
BD243	0.50
BD243A	0.37
BD244	0.51
BD244A	0.85
BD245C	0.99
BD246C	0.86
BD253	1.05
BD278A	0.70
BD317	2.60
BD318	2.59
BD375	0.42
BD377	0.26
BD379	0.76
BD380	0.76
BD410	0.49
BD412	6.27
BD418	0.84
BD433	0.41
BD434	0.43
BD435	0.49
BD436	0.60
BD437	0.41
BD438	0.49
BD441	1.42
BD442	0.66
BD507	0.60
BD509	1.42
BD510	0.75
BD518	1.50
BD519	1.50
BD529	1.32
BD530	1.10
BD533	0.67
BD534	0.53
BD535	0.77
BD536	0.61
BD537	0.74
BD538	0.67
BD544B	0.83
BD580	1.17
BD590	1.17
BD598	1.25
BD677	0.53
BD679	0.57
BD680	0.76
BD681	1.48
BD695	2.30
BD696	2.47
BD697	3.60
BD698	1.85
BD699	3.49
BD700	3.70
BD702	3.70
BD707	1.06
BD709	1.12
BD710	0.80
BD807	0.34
BD809	0.75
BD810	0.69
BD879	0.74
BD880	0.79
BD895	2.18
BD899	2.48
BD901	0.79
BD902	0.61
BDV64B	1.26
BDV65B	1.26
BDX32	1.75
BDX53	1.25
BDX53A	4.93
BDX53B	3.35
BDX54B	2.61
BDX62A	1.96
BDX63A	1.96
BDX64A	2.61
BDX65A	2.61
BDX76	0.59
BDY20	1.21
BDY62/01	4.62
BDY81	1.18
BF115	0.40
BF117	0.66
BF118	0.67
BF121	0.25
BF123	0.13
BF127	0.13
BF137	0.29
BF152	0.31
BF153	0.58
BF154	0.26
BF157	0.33
BF158	0.18
BF159	0.18
BF160	0.31
BF167	0.38
BF173	0.34
BF177	0.55
BF178	0.40
BF179	0.36
BF180	0.36
BF181	0.32
BF182	0.34
BF183	0.39
BF184	0.43
BF185	0.39
BF194	0.14

BF195	0.14
BF196	0.17
BF197	0.16
BF198	0.17
BF199	0.17
BF200	0.37
BF216	0.36
BF218	0.36
BF222	0.55
BF224	0.17
BF237	0.65
BF240	0.17
BF241	0.17
BF244	0.47
BF245A	0.37
BF255	0.20
BF256	0.28
BF256LC	0.42
BF257	0.34
BF258	0.33
BF259	0.34
BF262	0.57
BF263	0.57
BF264	0.37
BF271	0.34
BF273	0.20
BF274	0.20
BF324	0.23
BF336	0.33
BF337	0.36
BF338	0.40
BF355	0.49
BF362	0.60
BF363	0.60
BF371	0.50
BF391	0.25
BF393	1.59
BF417	0.84
BF418	1.87
BF422	0.29
BF423	0.29
BF435	0.54
BF450	0.35
BF451	0.29
BF457	0.41
BF458	0.39
BF459	0.52
BF460	0.99
BF469	0.31
BF470	0.55
BF471	0.31
BF472	0.33
BF479	0.61
BF480	0.60
BF491	0.49
BF495	0.64
BF506	0.43
BF509	0.41
BF523	0.20
BF594	0.27
BF595	0.27
BF596	0.18
BF597	0.27
BF617	1.05
BF618	1.05
BF694	0.22
BF757	0.59
BF758	0.65
BF759	0.47
BF760	0.65
BF762	0.34
BF870	0.30
BF871	1.81
BF900	0.83
BF959	0.42
BF970	0.69
BFR39	0.44
BFR52	0.50
BFR62	0.50
BFR79	0.29
BFR81	0.50
BFR86	1.08
BFR89	1.63
BFT41	0.30
BFT42	0.43
BFT43	0.43
BFT84	0.40
BFW10	0.60
BFX29	0.34
BFX30	0.65
BFX84	0.37
BFX85	0.39
BFX87	0.55
BFX88	0.34
BFX89	0.44
BFY50	0.32
BFY52	0.27
BFY90	0.61
BLY49	2.20
BR100	0.22
BR101	0.70
BR103	0.66
BR88B	0.64
BRC-M-300	0.97
BRC116	0.67
BRC1330	1.76
BRC300	2.01
BRC4443	1.02
BRC4444	1.02
BRC5296	0.77
BRC6109	0.83
BRC82	1.08
BRC83	2.19
BRC84	2.08
BRX44	0.60
BRX49	0.53
BRY39	0.69
BRY55	0.67
BRY56	0.50

BSR59	1.29
BSS38	0.59
BSTBD1409	2.73
BSTC0146	2.48
BSTC0246	6.99
BSTC0233	6.12
BSTC1233	4.34
BSTC3146	0.79
BSTCC0143	3.07
BSTC0643	3.37
BSV57B	3.49
BSW68	0.60
BSX19	0.34
BSX20	0.34
BSX21	0.87
BSY52	0.50
BSY79	0.51
BT100A	1.61
BT106	1.18
BT108	1.45
BT109	1.45
BT112	2.48
BT113	2.48
BT116	1.20
BT119	1.76
BT120	2.17
BT121	2.48
BT122	2.48
BT123	1.98
BT125	2.48
BT126	2.48
BT128	2.48
BT128P	3.07
TBA970	3.06
BT151-800R	1.15
BT151 500R	1.38
BTT6018	2.42
BTT6218	2.42
BTT8024	4.43
BTT8124	4.89
BTT8214	5.99
BTT8224	2.97
BU105	1.50
BU106	2.48
BU108	1.50
BU109	2.25
BU110	5.69
BU111Y	4.16
BU124	1.38
BU126	0.90
BU134S	4.57
BU204	1.58
BU205	1.08
BU206	1.27
BU207	1.65
BU208	1.12
BU208/02	1.97
BU208A	1.12
BU208D	1.43
BU209	1.93
BU226	2.45
BU312	2.38
BU326	2.00
BU326A	2.20
BU326S	2.20
BU406	1.49
BU407	0.82
BU407D	1.29
BU412	5.29
BU426	1.90
BU426A	1.67
BU500	1.78
BU508A	1.89
BU526	2.02
BU608D	1.57
BU807	1.40
BU826A	3.94
BUV46	1.53
BUV84	1.24
BUW84	1.39
BUX84	1.00
BY126	0.13
BY127	0.13
BY133	0.11
BY164	0.47
BY176	1.52
BY179	1.42
BY182	1.05
BY184	0.47
BY187	0.77
BY189	1.76
BY198	1.62
BY201/2	1.50
BY203/20	0.20
BY206	0.17
BY207	0.22
BY208	0.46
BY210-400	0.18
BY210-600	0.27
BY210-800	0.34
BY223	0.85
BY224-400	0.99
BY225-100	1.13
BY226	0.25
BY227	0.49
BY228	0.60
BY255	1.07
BY298	0.20
BY299	0.60
BYW56	0.34
BYX10	0.29
BYX55-350	0.53
BYX55-600	0.15
BYX61 RANGE	0.18
BYX71-600	1.25
BYX71-350	0.72
BYX71-600	0.85
BYX94	0.14
BYY56	1.20

BZX79 RANGE	0.10
BZY88 RANGE	0.10
C106D	0.46
C1129	0.58
CA1310E	2.70
CA3044	3.50
CA3046	2.06
CA3060	1.65
CA3065	1.29
CA3089	0.83
CA3089E	1.43
CA3090	1.38
CA3094	2.20
CA3131EM	3.12
CAH76023N	6.60
CBF16848N-07	1.56
CD4001	0.38
CD4002	0.27
CD4008	1.06
CD4011	0.29
CD4012	0.24
CD4013	0.47
CD4016	0.45
CD4017	0.82
CD4020	1.23
CD4021	0.39
CD4023	0.28
CD4025	0.64
CD4028	0.84
CD4047	1.06
CD4049	0.58
CD4050	0.55
CD4052	0.75
CD4053	0.80
CD4069	0.24
CD4081	0.35
CD4093	0.72
CD4511	1.10
CP5521	17.83
CV12E	3.07
CX034	11.83
CX095D	3.14
CX104	9.64
CX108	8.16
CX109	7.86
CX121	11.83
CX130	5.55
CX131	11.83
CX134	11.04
CX136	11.49
CX137	11.83
CX139	11.83
CX157	4.84
CX158	4.10
CX170	7.62
CX177	6.75
CX506	9.33
CX507	7.62
CX755	12.95
CX758	7.62
D1693	2.59
DEC1	2.20
DEC2	2.20
E1222	0.40
E5024	0.28
E5386	0.25
E5529	0.25
E8021	1.29
E9003	0.46
E9005	0.50
ESM432C	4.60
ESM532C	4.60
ESM632C	4.60
ESM732C	4.60
ETTR6016	3.33
FND500	5.78
FT3055	1.16
GF758	0.84
GF759	1.13
GF761	1.20
GH3F	1.82
HA11211	2.53
HA11215	5.06
HA11223W	0.00
HA11225	4.29
HA11226	8.71
HA11229	2.88
HA11235	2.48
HA1124	5.25
HA11244	2.82
HA1125	4.29
HA11251	4.47
HA1137W	4.87
HA1138	5.03
HA1141	5.65
HA11414	5.65
HA1144	7.52
HA1156	1.16
HA11580	9.00
HA1160	3.80
HA1166X	5.36
HA1166	2.22
HA1167	5.36
HA11711	20.16
HA11713	8.13
HA11714	7.76
HA11714	8.13
HA11715	8.13
HA11724	22.25
HA11725	18.26
HA11738	22.25
HA1180	5.15
HA1192	0.00
HA1196	7.43
HA12005 IN	9.00
HA1203	1.72
HA1306	2.26
HA1308	6.95
HA1322	2.18

IF YOU DON'T SEE IT LISTED ASK FOR QUOTE. GIVE MAKE MODEL LOCATION. REMEMBER TO ADD 0.60p POST & HANDLING. ADD 15% VAT TO TOTAL

VCR Clinic

Reports from Derek Snelling, Eugene Trundle, Les Grogan and Hugh Allison

Ferguson 3V29

This machine had an interesting fault. When switched on channel 1 would come up as normal but the machine would then select channel 8 and stay there no matter which programme button was pressed. Spillage was at first suspected, but a thorough clean of the presetter panel did no good. A check with the remote control unit then showed that channel change this way was also inoperative. Checks around the UPC1362C i.c. on the panel (IC201) proved that the oscillator was working and that pulses were present when the buttons were pushed, but a replacement chip made no difference. Further checks showed that the voltages at pins 2 and 3 were incorrect though the most significant difference was at pin 13, which was low at 3V. The voltage at this pin should normally be high at 9V, going low when channel change is pressed on the remote control unit, initiating channel change and preventing further channel change until the pin goes high. Further investigation showed that diode D221 was leaky, a replacement curing the problem. **D.S.**

Mitsubishi HS700

The complaint with a Mitsubishi HS700 was "smoking". When the machine was stripped down and set to play we found that the drum didn't revolve and that the HA11715 drive i.c. had gone up in smoke. A replacement was fitted and worked all right for a couple of days after which it went up in smoke again. This time when we replaced it the head went flat out – a few seconds of this would cause the i.c. to overheat and go up in smoke. The fault was traced to IC4P0 (TL082CP). **D.S.**

Mitsubishi HS306

On the subject of fuse blowing (see VCRs and the Mains Supply, July), the rating of the mains fuses in the Mitsubishi HS306 has now been officially increased to 630mA (previously 400mA). **D.S.**

Hitachi VT5000

This machine had nasty intermittent mechanical problems. It would sometimes refuse to come out of the pause mode, going to stop instead after a few seconds: in addition speed variations were sometimes present during record or playback. These things were all caused by the after-load switch S931 – its contact was erratic. The speed variations occurred because of insufficient pinch roller pressure against the capstan, due in turn to the slightly premature termination of the loading process. **E.T.**

Sony SLC9/F1

We were left with an excruciating noise from the threading mechanism after we'd sorted out the primary fault on one of these machines. It sounded exactly as if the teeth of a cog were catching against a stray cable. In these models a small threading motor belt drives a tight little assembly of gears whose final drive simultaneously turns the threading ring clockwise and the slider arm (carrying the pinch roller) anticlockwise. It's not easy to see down into this lot, so we carefully dismantled the threading drive system. It looked all right, and no problems could be felt when we rotated things by hand.

Back together it all went, but the results were exactly the same as before. After a great deal of investigation the problem was traced to the loading pulley. This plastic member consists of a pulley and cog moulded in one piece. The cog section had a tiny radial crack between two teeth: the resultant irregular tooth spacing had caused the shocking rattle. Sony part no. X-3670-087-0. **E.T.**

Sanyo VTC5000

The complaint with this machine was no colour. We so seldom encounter real colour faults on VCRs these days that we find ourselves a bit rusty when it comes to the principles of colour-under systems! It wasn't necessary to look very far in this case however. The fault was present in both record and playback, and we found that the signal from the sub-mixer in IC1006 (pin 30) was virtually non-existent. Both the sub-mixer inputs were present and correct – 4·43MHz at pin 27 and the divided-by-eight voltage-controlled oscillator output at pin 26. The voltages at pins 26-30 of the i.c. were also correct, so what was happening to the mixer's 5·12MHz output? It was getting lost in T1010, the first half of the bandpass filter. The tiny signal downstream at C1179 increased as we wound the core of T1010 right out: either this little transformer had developed short-circuit turns or the tiny resonant capacitor built into it had gone bad. Since the transformer is connected to the 9V rail there was no effect on the voltage at pin 30 of the i.c. A replacement transformer (part no. 4-259V-20800) cured the problem. **E.T.**

Sharp VC381

The motors used in Sharp VCRs have not distinguished themselves in the reliability stakes. A recent example occurred in a VC381 which suffered from intermittent failure to rewind and sporadic tape spillage during unthreading – when the supply spool would fail to take up the slack from the returning guide poles. These symptoms are often down to a worn reel idler, but on several occasions we've found that the reel motor has been at fault. The problem seems to be due to the design of the brushgear and commutator: its effect is to make the motor lazy and current hungry, sometimes to the point where one of the power supply fuses F901 or F902 (on panel PWB-0) blows. Miraculously, the reel motor drive chip IC706 seems to survive all this. A modified motor is now being supplied for replacement purposes by Sharp and its spares agents. **E.T.**

Ferguson 3V29/30, JVC HR7200/7300

One or two mechanical faults are beginning to occur with some regularity now that these machines are three or so years old. A slipping loading belt can give rise to misleading symptoms: the machine will thread up (but not quite fully) on play, then after a few seconds of nothing signal-wise unthreading will take place, the machine going to stop. The clue here is that the loading motor continues to rotate when the tape is apparently fully laced. We replace the belt rather than boil it – the latter practice is confined to an establishment at Newark, Notts!

Another problem arises due to the end of loading switches not being activated as a result of the operating lever being bogged down in old, stiff grease. The symptoms here are that the drum and capstan motors come to life at switch on (regardless of whether a cassette is present) or the machine accepts a cassette and loads the tape, only to crunch it when the pinch roller comes in. The cure is fairly obvious: a good degrease and light oiling of the offending lever and its contact surfaces. **E.T.**

Panasonic NV7200

The "shoulder" of the supply spool turntable is made in two sections in this machine, the lower part being held in place by a plastic retainer. Between the lower and upper sections there's a coil spring. We had a case recently where the two halves had parted company, with the result that in the play mode the table and reel jammed. Fast transport worked all right. Repair wasn't possible – a new "supply reel table unit" had to be ordered and fitted. **E.T.**

Ferguson 3V23/JVC HR7700

This machine would play back library tapes all right but with its own recordings there was noise due to the capstan servo being unlocked. A scope check showed that control track pulses were not being recorded, so with the machine in the record mode we checked the voltages around IC8 on the servo-1 panel – this i.c. is used to square the pulses and send them to the control head. The 12V supply at pin 3 was absent due to transistor X6, which is connected across the 12V supply, remaining on. X6 is controlled by the output from pin 14 of IC9 (UPD4027C). The voltage at this pin should go low on record, turning X6 off to enable IC8 – also turning X11 on to cut out the tracking controls. Replacing IC9 cured the fault. **L.G.**

Ferguson 3V29/JVC HR7200

From time to time you come across one of these machines that's stuck on channel one with fuse F5 on the power supply panel blown. F5 is in the 40V supply to the 32V regulator on the tuner/i.f. panel. The cause of the trouble is that the 32V regulator transistor Q8 (2SB644) and its reference zener diode IC3 (UPC574J-KL) go short-circuit. The regulated 32V line feeds the presetter panel. **L.G.**

Baxall V3401 Camera

I've had quite a lot of these TV cameras in for repair – they've all suffered from the same fault. The first time it happened to us caused some trouble. The symptoms were no heater supply and no e.h.t. Problem: no circuit diagram . . . It quickly transpired that a good, hefty line pulse was going to TR3 but nothing was coming out. Various transistors were tried to no avail, then a smarty pants junior noticed that the original was marked 512. Success was achieved when an IRF512 was fitted – it's the first VMOS device I've come across in an inverter. Note that the e.h.t. winding on the pot core often develops shorted turns: it's quite an easy job to rewind it yourself. **H.A.**

The Lid off Microcomputers

Part 5

Mike Phelan

Last month we talked about storing computer programs on ordinary audio tape cassettes. This has the advantage of using tapes that are readily available and comparatively cheap. In addition, if the microcomputer doesn't have a built-in cassette recorder any small mono cassette recorder can in most cases be used. There are exceptions however. One popular make of home microcomputer requires a special dedicated cassette recorder that contains part of the interfacing circuitry. Note that we said a mono recorder: with stereo machines the track width is less and the output is thus more susceptible to the effects of azimuth errors and pinholes in the tape's oxide coating. A good treble response is necessary. Different machines vary in their degree of tolerance on all these points.

On the debit side, loading from tape is slow – with some machines a complex game can take twenty minutes. More importantly the tape must be played or fast wound to the part required if there's more than one item on it. If we have stored a file of data on tape, say names and addresses etc., we cannot load just one name and address, we must continue loading until the required information appears.

Disc Systems

These disadvantages can be solved by using one or more disc drives. These come in several sizes: the one that can be added to the Amstrad CPC464 is a three inch floppy disc drive. The discs themselves are made from flexible plastic sheeting and are covered on both sides with magnetic oxide. They are permanently fitted in rigid plastic cases – see Fig. 1. The slot in the case enables the disc drive to gain access to the disc surface to read and write (play and record) information. With a three inch disc these slots (one on each side) are normally covered by metal shutters which slide back when the disc is put in the drive. These discs have a capacity of 180Kbytes per side. On this machine there is only one head, so only one side can be used at a time. When the disc is inserted the centre, exposed part is gripped by two limbs to rotate it: the head is lowered into a position where it just contacts the disc.

The head is mounted on a sliding carriage that travels radially along the slot, from the centre to the periphery, under the control of a servo-operated stepping motor and the spiral track. Head position and disc rotation are controlled by the computer and disc drive electronics.

A new disc is totally blank and must be "formatted". This process remagnetises the disc in such a way that it's divided into 40 concentric tracks and nine radial sectors (see Fig. 2), giving a total of 360 sectors each of which can hold 512 bytes, i.e. 180Kbytes per side. Formatting can be thought of as the equivalent to ruling lines and columns on a sheet of paper before use. The alignment or index hole tells the electronics, with the aid of an optical sensor, the rotational position of the disc.

The total of 180Kbytes is a lot of information in such a small space, so the data is stored in a very compact form. The head gap is quite small and, for good h.f. response, the rotational speed is quite rapid. The system is intolerant of disc wear, dust and damage (such as fingermarks on the oxide coating) but is very reliable when looked after properly.

Two of the disc's tracks are reserved for a special purpose. These are the directory and file allocation table. Between them they hold information on the files on the disc, on what type of files they are and on what sectors and tracks the files occupy. Thus if the computer looks here first it can rotate the disc and move the head directly to the required sector and track. In this way the two disadvantages of tape storage are overcome – loading speed is typically a few seconds.

The DD1 disc drive used with the CPC464 needs an interface for connection to the computer – the newer CPC664 has a built-in disc drive in place of the cassette deck. A second disc drive can be added to either machine to enable discs to be copied.

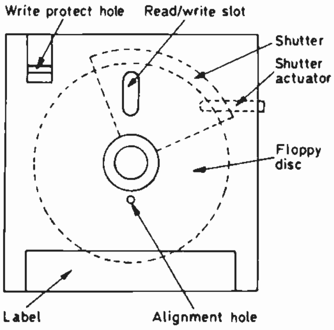
Copying and formatting cannot be done using the microcomputer's resident language, BASIC. Renaming or erasing files or copying single files only are useful features. For all these purposes a disc operating system, like another language, is needed. There are various disc operating systems: the one used with the Amstrad machines is CP/M, which stands for Control Program for Microcomputers. Part of it resides permanently in the disc drive ROM – this part is sufficient only to load the rest of the program from a CP/M disc, or to give the appropriate error message when a disc is not inserted or the disc doesn't contain CP/M. The disc drive contains the CP/M command processor and other CP/M programs to do things like formatting and copying discs.

When a disc drive is fitted the microcomputer starts off with BASIC as normal, selecting CP/M from BASIC as required. Alternatively some but not all CP/M commands can be operated from BASIC – the converse is not true. Note that the disc drive must be switched on before the computer for the latter to recognise the drive's presence. Any or all the CP/M programs can be copied on to a disc: there is also a facility to embed a command line so that, when CP/M is entered, a command can be executed automatically.

Copying can be done with only one disc drive, but it's a laborious business as the source and destination discs have to be swapped several times. This is because only so many tracks at a time can be read into the RAM: the discs are then swapped over and the information written out to the second disc.

In contrast, with most business machines the operating system(s) and language(s) have to be loaded in before use. There could be several of each – some languages are available only with a particular operating system. Some of these machines use a hard disc system with a capacity of 5 or 10Mbytes per disc – this is a sealed item that never comes out of the machine. One way of arranging things is for the operating system to start, automatically, a program that loads a language, then to execute a program that allows the user to select various languages and/or programs. After switching on, the next thing to appear is a menu of choices – after a minute or so since some 640K of RAM takes more than a second or two for the machine to check.

Unless the fault is a fairly obvious one it's best not to



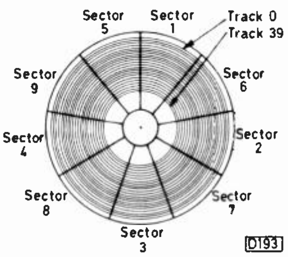
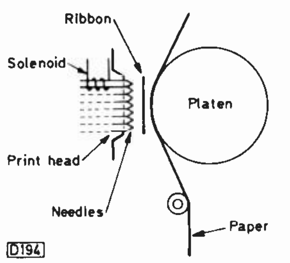


Fig. 1 (left): Three inch floppy disc.
Fig. 2 (right): Arrangement of tracks and sectors.



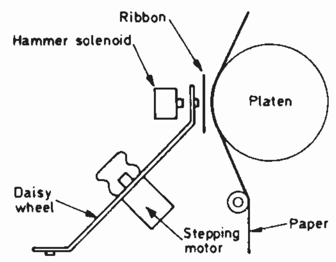


Fig. 3 (left): Matrix printer operation.
Fig. 4 (right): Daisy wheel printer operation.

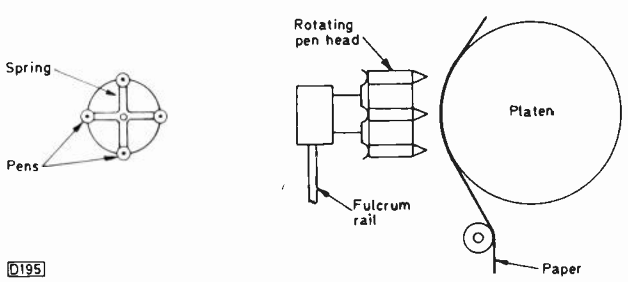


Fig. 5: Printer/plotter system.

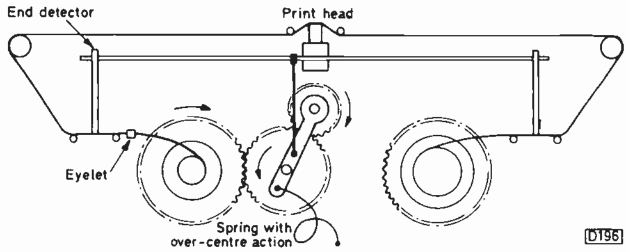


Fig. 6: Ribbon reversing mechanism.

attempt to carry out repairs to disc drives – though we said that about Band III tuners at one time!

Printers

The other popular peripheral for the home microcomputer is a printer. There are bascially three types, matrix, daisy wheel and printer/plotter – there are also some very sophisticated types that are used for commercial purposes.

The matrix printer (see Fig. 3) is usually the cheapest and fastest in operation. Printing is done by a vertical row of steel pins operated by tiny solenoids. Each character is constructed from say a 6 x 8 matrix of dots. This means six printing operations, one for each vertical row of up to eight dots: between each the print head moves laterally the width of one dot or slightly less. A stepper motor is used to drive the print head laterally – another stepper motor drives the platen that feeds the paper.

The daisy wheel printer (see Fig. 4) is slower, usually noisier, but gives better quality printing. It works like a modern typewriter. The daisy wheel itself is made of springy plastic or metal and has as many radial arms as there are characters in the character set: each arm has a typeface character at its end, which is struck by a solenoid-operated hammer. A stepper motor rotates the wheel to bring the required character in front of the hammer, the rotational position of the wheel being optically sensed by a short arm or wide gap. The daisy wheel can be quickly changed to get a different typeface – thus the characters printed out may not be identical to those appearing on the monitor's screen.

The printer/plotter (see Fig. 5) is much slower but is quieter than either of the above: it can draw or print in a mixture of different colours. It draws the characters rather than printing them, using four miniature coloured ball-point pens mounted on a rotating head that tilts forward to contact the paper. The usual method of rotating the head to bring a different colour into use is to traverse the pen head to a position past the margin, where it contacts a detent or pawl that rotates it through 90°. Printing and drawing are done by a combination of lateral movement of the pen head and vertical movement of the paper, by rotating the platen in either direction. Often the software can select up to 64 sizes of letters as well as the colour.

All printers require some fairly sophisticated electronics to translate the serial or parallel code from the computer into the various mechanical operations required. Provision is also usually made for feeding one line or form length by switches, or taking the printer "off line" – in effect pausing it. Switching back on line enables the printer to carry on where it left off. Some printers have error lights to show things like "no paper" etc. As a rule an error takes the printer off line.

Printers can develop faults and require regular cleaning – paper, dust and fragments accumulate. Daisy wheels must be cleaned because the typefaces become clogged with ink. Ribbons can be on a spool or in a cassette, fabric or plastic. The spool type operates like that in a typewriter, the direction of travel reversing when either end is reached – eyelets in the ribbon reverse the drive. Fig. 6 shows the arrangement.

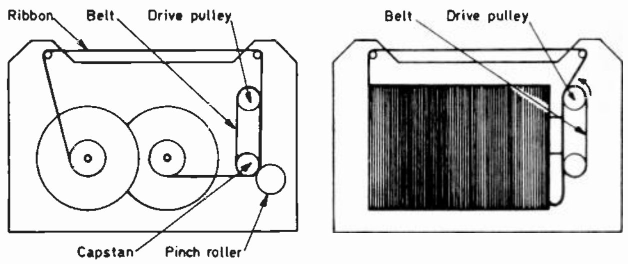


Fig. 7: Two types of ribbon cassette.

The cassette type of ribbon (see Fig. 7) usually travels with the print head. They don't usually auto-reverse – the extra drive tension when the ribbon reaches one end operates a warning light. Others store the ribbon in concertina form, as an endless loop from which it's pulled by a flat belt. This type just gets progressively fainter. Both types can sometimes be obtained for a given printer, the once-only type being plastic based, the other usually fabric based. The plastic ribbon has just a coating of ink rather than being soaked in it, so there will be a bare

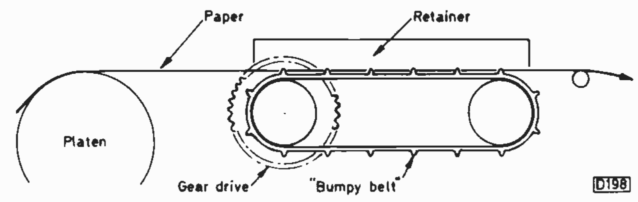


Fig. 8: Tractor feed arrangement.

patch where a character has been printed.

Sheet and tractor feeds are common printer accessories. The sheet feeder prints out on separate sheets, e.g. for letters: the cut sheets are stored in a bin, loaded automatically, then ejected into another bin. The feeder usually has its own motor and electromagnetic clutch. The tractor feed transports the perforated edge sheets that we think of as typical computer printout. To appreciate the reason for using this arrangement, consider printing out fifty feet of continuous sheet, relying on the platen for drive. There's no way of ensuring that the paper will travel squarely so before the fifty feet could be printed there would be an awful crumpling noise, as the paper would have gradually crept over to the right or left. The use of tractor feed gives positive paper transport via the perforations, using two drives best described as "plastic belts with bumps on"! It's usually driven by gears on the platen – see Fig. 8.

Next month the Amstrad monitor and fault finding.

Teletopics

FIRST QUARTER RESULTS

Sales of colour sets to the public during the first quarter of 1985 rose by over 7·5 per cent in comparison to the same period last year, though deliveries to the trade decreased (there was a certain amount of destocking). So while the high street tills were ringing away merrily there's been increased financial pressure on setmakers. VCR deliveries increased by 7·6 per cent, with about a sixth being UK assembled. CTV imports decreased slightly despite a continuing trend towards small-screen sets, which now account for approaching fifty per cent of deliveries to the trade.

ECONOMIES ALL ROUND IN BROADCASTING

The BBC has announced economies to meet the financial problems it faces following the less than asked for increase in the licence fee. The aim is to spend more on programmes and the provision of extended services while cutting down severely on the office and engineering side. Some 4,000 of the present 25,500 staff jobs are expected to go while over 1,000 of the 7,000 staff engaged in programme making are to be transferred to a contract basis. The proposals are described by the director general Alasdair Miln as the "most radical changes in thirty years". Engineering research and the design and production of in-house equipment are to be cut back; catering, cleaning, security and building maintenance are to go to outside tender if this is cheaper; and a ten per cent cut in secretarial jobs is to be sought. In addition, more programmes will be bought in from independent producers and the regional structure is to be changed, with single management teams for regional TV and local radio.

On the positive side, a full daytime BBC-1 service is to be introduced next year; there's to be a twenty per cent increase in news magazine budgets, both national and regional; an extra £3 million a year is to be devoted to the production of "blockbuster" TV drama; the local radio chain in England is to be completed as a matter of priority; and Radio 1 at v.h.f. is to be started as an "urgent" priority. As an economy on the radio side, Radio-2 will be broadcast by all local radio stations after 7 p.m.

As a result of the IBA's intention to increase the charges it makes to the ITV companies by five per cent more than the rate of inflation, the Independent Television Companies Association has been in talks with the BBC and the IBA on ways of cutting costs. Suggestions include shared transmitter costs, privatising the provision of transmitters or allowing the ITV companies to own instead of rent the transmitters; a reduction in the research and development work carried out at the IBA's Crawley Court engineering centre, with equipment research carried out by industry under contract; and a proposal that the IBA should be allowed to fund its capital investment by means of long-term commercial loans instead of via rentals from the ITV companies.

UK SATELLITE TV MOVES

The Satellite Broadcasting Board has been wound up, since there's at present no industry for it to regulate. It was chaired by the IBA's chairman Lord Thomson, who has been asked by the government to investigate whether companies might be interested in starting a DBS service organised by the IBA. It's understood that this time those intending to start such a service would be able to put out to tender the provision of a satellite system – the government's insistence that a UK satellite system provided by Unisat should be used was the main stumbling block that lead to the collapse of the proposed consortium of 21 DBS service.

Sky Channel, which is at present available to over three and a half million cable TV subscribers in twelve European countries, is to extend its broadcasting hours. The service will run from 7.45 a.m. to 12 p.m. on weekdays and 7 a.m. to 12 p.m. at the weekends, UK time.

VIDEO CAMERA MARKETS

A survey of international video camera markets has been published at £25 by Euromonitor Market Direction, 87-88 Turnmill Street, London EC1M 5QU. It points out that while VCR market penetration in the UK is high camera sales have been weak – a mere 35,000 last year out of total world sales of 1,165,000. Most video cameras are sold in W. Germany, Japan and the USA.

VCR TARIFF INCREASE

EEC industry ministers have agreed to increase the tariff on imported VCRs from 8 to 14 per cent from next year. A compensation plan, required by GATT regulations, includes a proposal to reduce the tariff on imported semiconductor devices from 17 to 14 per cent. Not unexpectedly, the proposed increase in VCR tariffs has come in for criticism from the Electronics Industry Assocation of Japan and from South Korean trade ministry officials. Counter measures are being considered by South Korea while Japanese manufacturers are expected to concentrate on increasing the output from their European plants.

Philips is to set up a joint venture with the South Korean manufacturer Dongwon Electronics to build a plant to produce VHS machines for sale in the Far Eastern and US markets. Initial plans are for production to start at 500,000 machines a year, rising to a million a year by 1989. The plant would require an investment of \$50 million and would be 70 per cent owned by Philips.

DTI RADIO SERVICE CHANGES

The Department of Trade and Industry has decided to alter the services provided by its Radio Investigation Service. More resources are to be devoted to tracing those who operate without a licence or fail to keep to the terms of their licence, and there's to be a phased withdrawal from dealing with domestic radio/TV reception problems. A booklet is to be issued to help members of the public to deal with their own problems. Business users are to be charged a commercial rate for RIS advice and domestic users will be charged a call-out fee of £21 to investigate cases of poor reception.

FERGUSON'S PROBLEMS

The reduced profit announced by Thorn EMI for the year to March 31st, despite an increase in turnover, has been partially attributed to the Ferguson consumer electronics side of the business – also to difficulties at Inmos, which Thorn EMI bought during the year. A provision of £28 million has been made for reorganisation at Ferguson, which will involve job losses of around 1,000 and rearranged production facilities. In future the Enfield plant will produce subassemblies – remote control and tuning systems etc. – with all complete receiver assembly work being carried out at the Gosport plant.

The problems at Ferguson, which have continued into the first quarter of the present financial year, are put down mainly to over-capacity in the UK television manufacturing industry: profits fell from £85·3 million to £65·5, with the situation worsening towards the end of the year. The retail and rental side announced increased profits however, up from £77·9 million to £86·6 million.

Sir Graham Wilkins has replaced Peter Laister as chairman and chief executive of Thorn EMI.

The Ferguson service department at Chadderton, Lancashire has been closed down with a loss of fifty jobs: the trade counter and dealer training school remain in operation.

TELETEXT PROMOTION

The industry and broadcasters are combining to promote teletext set sales this autumn. The aim is for one million teletext set sales/rentals over the next twelve months. According to the latest IBA annual report over 2·6 million homes now have a teletext set, i.e. over eight million people have access to teletext.

Both the BBC and the IBA are planning to use spare teletext capacity to provide commercial services.

DEMONSTRATION TVRO PACKAGES

Both Luxor and Salora have introduced demonstration 11GHz band satellite receiver packages for sale to dealers. Details can be obtained from Luxor (UK) Ltd., 87-89 Farnham Road, Slough, Berks, SL1 4UL; and Salora (UK) Ltd., Techno Trading Estate, Swindon, Wilts, SN2 6EZ. Several 11GHz satellite channel programme providers, including Premiere and Music Box, have set up a marketing company called Galaxy Satellite Television. A demonstration agreement charge from Galaxy costs £25 a month (this is included in the Salora package).

NEW MULLARD LINE OUTPUT TRANSISTORS

The BU506 and BU706 line output transistors from Mullard are lower-current rated versions of the established BU508A, intended for use in small- and medium-screen size sets. Both transistors have the same electrical characteristics – 3A rated collector saturation current and 1·5kV maximum collector-emitter voltage – the difference being in the encapsulation. The BU506 is housed in a TO220 pack and the BU706 in a SOT93A pack.

PUBLICATIONS NOTED

The latest issue of the BATC's journal *CQ-TV*, no. 131, includes an interesting practical article on converting the Thorn TX90 chassis for receiver/monitor use. A PCB for the interface circuit is available from the author. For British Amateur Television Club membership details, write to D. Lawton, Grenehurst, Pinewood Road, High Wycombe, HP12 4DD.

A new catalogue is available from Anglia Components, Burdett Road, Wisbech, Cambs. PE13 2PS.

A brief but helpful introduction to DX-TV, "TV DX for Beginners" by Simon Hamer, is available from HS Publications, 7 Epping Close, Derby DE3 4HR at £1·65 including post and package. Airmail despatch is extra. Roger Bunney's more substantial publication "Long Distance Television Reception (TV-DX) for the Enthusiast" (Bernard Babani Publishing Ltd.) is at present out of print – a new edition is expected shortly.

VIDEO NEWS

The latest VCRs from Ferguson, Models 3V44 and 3V45, replace the 3V38 and 3V39. They are slim-line models featuring simple operation and use the same basic chassis as the JVC HRD140. The 3V45 incorporates remote control. Grundig has added a hi fi machine, Model VS380, to its VCR range: the suggested retail price is around £650. A version of the Sony Super Beta machine (see Teletopics, July), Model SLHF950, is to be released in the UK with a suggested price of just under £800: the performance is claimed to be of almost broadcast standard. Canon is to launch an 8mm camcorder in the UK this autumn.

BUSINESS MOVES

ITT Consumer Products (UK) has relocated its head office in Basildon in a move that takes it from premises shared with STC. The new address and telephone number are: ITT Consumer Products (UK), Paycocke Road, Basildon, Essex, telephone 0268 27788. The service departments remain at Chester Hall Lane, Basildon; East Kilbride, Glasgow; and Kearsley, Bolton.

NordMende consumer electronics products are in future to be handled in the UK by Hayden Laboratories Ltd. (0753 888447) who will take on all outstanding guarantee commitments. Previously NordMende (and Saba) products were handled by the European Electronics Corporation of Aylesbury, which has now ceased to trade. NordMende, Saba – and the European Electronics Corporation – are all part of the Thomson Brandt group.

A Case of Liquid Spillage

Nick Lyons

The spillage of liquids on to and into electrical equipment is always bad news. The situation will be much worse if the equipment is on at the time of the spillage, though many liquids will cause bad corrosion when the equipment is off. I find that soft drinks and household cleansers are the usual cause of the trouble, closely followed by cups of tea. Really, accidents are almost bound to happen – and children will be children.

The result of one such accident appeared on the workbench recently – a very sad looking Sharp VC381H. The owner seemed unsure of the nature of the spillage. I tend to think it was a soft drink, but whatever it was it had certainly done considerable damage. The company from whom the machine had originally been purchased – a large retail chain – had declared it to be a write off, being more costly to repair than to replace. This had rather upset the owner as the machine was not that old, so he'd brought his custom to me.

Layout

For those not familiar with this machine I'll give a brief outline of its layout. The majority of the electronics are arranged on two large boards. The lower one encompasses the entire bottom of the machine and is mounted foil side down, component side up. It's mainly concerned with the servo systems. One nice feature of this board is that all the "tweaks" are at the rear right-hand corner. Thus with the top cover off and the top PCB hinged up, which takes but a minute, the full range of servo adjustments can be immediately performed without the usual tedious business of hunting around the board for the various VRs.

The other major board sits foil side up beneath the top cover: it's about two thirds the area of the lower board and carries the circuitry for signal processing from off-tape r.f. through to composite video. Off-air demodulation, the power supply etc. are arranged on much smaller boards dotted around the chassis.

The liquid had entered the machine through the ventilation holes in the top cover, mainly on the right-hand side. It had run over the print side of the top board, dripping off the right-hand side of this on to the board beneath. The lacquer on the foil side of the top board had saved the print, though some of the soldered joints were blackened.

Repairs

The first step was to clean up the panels, then assess the damage. Most of the crystalline deposits were removed with the dust brush: sponging the panel down with a damp (not wet) cloth removed the rest and much of the staining. The contaminated areas were next washed down with isopropanol – we use this for head cleaning and have a quantity on hand – aided by an old toothbrush to make sure that the isopropanol got everywhere. The isopropanol served more than one purpose: it helped remove the remaining contamination and, being volatile, readily evaporated driving off the remaining water. Not being enough of a solvent it didn't damage the board – if you use too much on the foil side it makes the lacquer go sticky.

The next move was to plug the machine in and see what happened. The good news was that the machine threaded up and went into the play mode, the bad news was that there was no picture. Video information was present however, in the form of a pattern that looked as if the monitor's line hold control was grossly misadjusted. This was obviously due to the speed of something or other being wrong. Well, the sound seemed to be of the correct pitch, so the capstan circuit was probably o.k. When we looked at the head drum beneath the workshop fluorescent lights it appeared as just a blur. I should perhaps point out that the strobing effect of the mains supply in relation to the head drum can be a useful aid to fault diagnosis. Because of the strobe effect the larger drum details should appear to be virtually stationary, slight apparent rotation being caused by the difference between the machine's 50Hz reference and the mains frequency. As these features were just blurs the drum must have been running grossly off speed. It's usually possible to see whether a drum is running very slow. This one appeared to be running too fast however. To test this I rested a finger lightly on the upper rim of the drum to slow it down, gradually increasing the pressure. Sure enough when the drum was slowed down sufficiently the picture dropped into lock. In monochrome, but a picture nonetheless.

This gave me a clue as to where to start. The head drum servo circuitry is on the bottom board, in an area that had been badly contaminated. Close examination revealed that some of the legs of the relevant IZ0003GE i.c. had rotted through. Substantial corrosion of the legs of the surrounding transistors and diodes had also taken place. There are only a few passive components in this area. I took the decision to replace these as well.

This time switching on produced a fully locked monochrome picture. Further investigation was required on the upper panel therefore. Suspicions centred on the HA1178INT chroma chip IC501. Unfortunately the manual doesn't give the waveforms to be expected with this i.c. so a bit of educated guesswork was required: some of them didn't look too good, so the chip was replaced. At this point colour returned. It would stay for hours and hours then twitter up and down in level, subsequently disappearing.

Much alternate freezing and heating of the components in the area of IC501 and IC502 revealed little of help, so the wrong conclusion that the replacement chip was faulty was drawn – the machine would work for entire days with the first replacement. After tediously working around one component after another with the freezer, using a piece of card to shield adjacent components from the spray, I eventually found that filter unit FL503 was the culprit. The agents supplied an alternative type: maybe the original type has given trouble elsewhere.

And trouble elsewhere was exactly what was happening in the shuttle-search department. This had a tendency to go from play into search in either direction, but wouldn't change direction. Replacing miniature relay RY7751 cured the problem – its armature was sticking.

During the exhaustive soak testing the machine underwent in the course of the repair work the video heads clogged quite frequently, so it was decided to change these as well.

The machine now gave first-class results, fully justifying the trouble that had been taken. A final touch to try to secure the maximum reliability possible was to desolder and resolder all joints blackened by corrosion. The bill came to rather less than half the cost of the cheapest new machine available, which I think justified the repair as being economical. The owner was very pleased to have his VCR back – the only sour note was a problem over the order for spares and its invoicing.

A Variable Stabilised HT Supply

Gordon Haigh

Some of the stabilised power supplies used in TV sets turn out to be nothing of the sort: they may regulate correctly only when the load is exactly what the designer intended. A faulty line output stage may present the power supply with an open-circuit or excessive current demand condition. In addition, the inclusion of excess current/voltage trips can make diagnosis awkward, i.e. which trip is tripping? Then again the power supply itself could be the cause of the trouble, producing a too high or maybe too low h.t.

When a misrepaired Philips set fitted with the E2 chassis came my way with faults in both the power supply and the line output stage I needed an independent source of 215V d.c. to sort things out. This was nicely provided by a Philips G8 power supply unit used with flyleads. The set-voltage control needed only slight advancement. This speeded up diagnosis greatly and I later decided to build a unit for occasional bench use.

Design Notes

A check on the h.t. supplies used in various chassis suggested that a unit able to produce 100-220V d.c. with some stabilisation and modest output current would be attractive. A switch-mode design was ruled out first because of complexity and cost, secondly because they need special wound components and can be rather touchy under variable conditions. A full-wave thyristor design was discounted because a rather complex drive circuit is required.

The circuit shown in Fig. 1 was finally adopted. It's based mainly on the Philips G8 power supply unit and uses a minimum number of components, most of which can be pruned from old chassis. The input choke L1 is from the Rank A823 chassis: this was preferred for quiet running. The VA1104 thermistor will check an h.t. burst at switch on and wall socket contact bounce trouble. The 15W bulb at the output may appear to be wasteful of current but a thyristor design needs some kind of load for it to be turned down effectively. The bulb provides for this if no external load is connected: it also discharges the electrolytics at switch off and provides a relative output and an on indicator.

Construction

Most of the components can be mounted on a piece of Veroboard, with the thyristor bolted to a section of L-shaped aluminium screwed into the base of a wooden box. The "dropper" unit from the Philips G8 chassis is used for R1/R11. This needs to be positioned high and clear of wires and components, with ventilation holes provided. It's best to use 5 per cent, high-stability carbon film resistors in positions R2, R3, R4, R5, R6 and R9. Make the fuses accessible but safe. The h.t. control VR1 becomes a panel control. The mains filter capacitor C1 should be of the type designed for this purpose.

Check that everything is wired up correctly then connect a 240V bulb of up to 100W and a d.c. voltmeter across the output. Switch on and adjust the preset control VR2 to obtain a range of about 100-220V d.c. with the swing of VR1.

Use

When using the supply as a substitute, don't leave the TV set plugged in at the same time. Don't earth either output. In some sets the power supply may need to be disconnected to avoid interaction: if you do this, don't switch a set on with a chopper output open-circuited – chopper transistors can die! The use of an extra bench supply giving 0-30V may be needed with some chopper circuits.

Fuse replacement may seem to be a bit of a bind but an electronic trip would have doubled the number of components used. If you suspect an overload, you can start off with a low h.t. output, with perhaps wirewounds in series.

In addition to the obvious missing h.t. substitution check the unit can be used for proving other power supply faults, e.g. flutter, jitter, etc.

Finally, I built a similar, miniature version of the circuit into a Sony Model KV1340UB to check for conversion evaluation. The only give away was a faint hum bar. These sets tend to suffer from a domino effect on the power supply panel, damage also spreading to the line output stage. The thyristor circuit was fitted in place of the series regulator arrangement used in the KV1340UB, with a BU208 used in one of the line output/e.h.t. output positions.

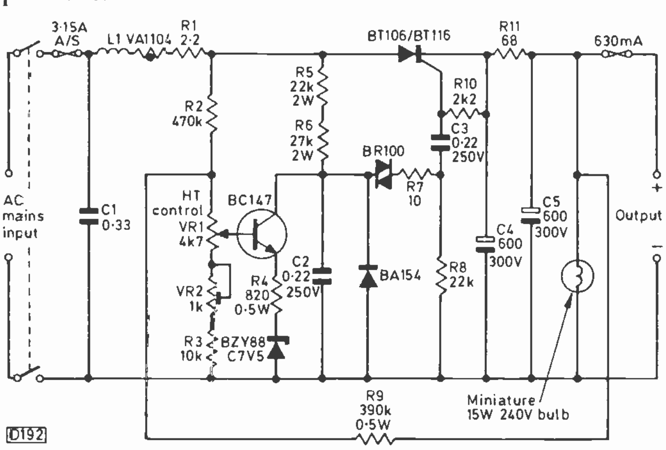


Fig. 1: Circuit of the variable stabilised h.t. supply.

Long-distance Television

Roger Bunney

The month of June 1985 was one of the most intense ever for Sporadic E reception, with openings on all days. Arabic signals were received in profusion and there have been numerous mystery signals. Without further ado herewith the log, which is extensive.

6/6/85 RAI (Italy) ch. IA, B; JRT (Yugoslavia) ch. E3; ORF (Austria) E2a, E3; NCT (private commercial station at Udine, North Italy) IA; EPT (Greece) E3; +PTT (Switzerland) E2, 3; MTV (Hungary) R1, 2; DFF (GDR) E4; ARD (West Germany) E2; CST (Czechoslovakia) R1; TVP (Poland) R1, 2; TSS (USSR) R1, 2; SR (Sweden) E2, 3, 4; TVE (Spain) E2, 3, 4.

7/6/85 TVE E2, 3; RAI IA, IB; RTP (Portugal) E2, 3; TVE-2 E2; JTV (Jordan) E3.

8/6/85 RAI IA, IB; TVE E3; JRT E3, 4; TVP R1; CST R1; TSS R1; SR (Sweden) E2, 3, 4; RUV (Iceland) E3, 4; NRK (Norway) E2, 4 – SR carried a programme called MTV during the day!

9/6/85 RAI IA, IB; TVE E2, 3, 4; TVR (Rumania) R2; TVP R1, 2; MTV R1; CST R1; TSS R1, 2; YLE (Finland) E4.

10/6/85 SR E2, 3; TSS R1, 2, 3, 4; NRK E2, 3; TVP R1, 2, 3; ORF E2a; CST R1; MTV R1: JRT E3, 4; RAI IA, IB; +PTT E2; TDF (France) L3; TVE E2, 3, 4; RTP E3; DR (Denmark) E3, 4.

11/6/85 ARD E2, 3; DR E3; +PTT E3; CST R1, 2; MTV R1; RTS (Albania) IC; JRT E3; DFF E4; TVP R1; SR E2, 3, 4; NRK E2, 3, 4; YLE E3, 4; TSS R1, 2, 3, 4; TVE E2, 3, 4; TVE-2 E2; RTP E2, 3; TVR R2; RUV E3, 4.

12/6/85 YLE E3, 4; TSS R2; SR E2, 3, 4; DR E3; NRK E2, 3; MTV R1; TVR R2; JRT E4; TVE E2, 3, 4; RTP E2, 3; TVE-2 E2; RAI IA, IB.

13/6/85 TVE E2, 3, 4; RAI IA; JRT E3, 4; NCT IA; ORF E2a; CST R1; MTV R1; TVP R1; TSS R1, 2; SR E2, 3, 4; NRK E2, 3; YLE E3, 4.

14/6/85 RTP E3; RAI IA, IB; JRT E3, 4; NCT IA; ORF E4; TVE E2, 3, 4; TDF L3; ARD E2; EPT E3; TVP R1; TSS R1, 2; SR E2, 3, 4; NRK E2, 3; RUV E4; CST R1, 2; MTV R1; DR E3, 4.

15/6/85 RAI IA, IB; ARD E2; +PTT E2; MTV R1; ORF E2a; NCT IA; JRT E3; EPT E3; TVE E2, 3, 4; RTP E3; CST R2; SR E2, 3; NRK E2, 3, 4.

16/6/85 ORF E2a, 3, 4; RTS IC; RAI IA, IB; JRT E3; ARD E2; TVR R2, 3, 4; CST R1, 2, 4; DFF E4; MTV R1, 2, 4; TVP R1, 2, 3; DR E3; JRT E3; TSS R1, 2, 3, 4; SR E2, 3, 4; NRK E2, 3, 4; TVE E2, 3, 4.

17/6/85 RAI IA, IB; JRT E3, 4; RTS IC; ORF E2a; TVE E2, 3, 4; CST R1, 2; TVP R1, 2, 3; TSS R1, 2, 3, 4; NRK E2; YLE E3; SR E2, 3, 4; RUV E3, 4; ARD E2..

18/6/85 TSS R1, 2, 3, 4; CST R1, 2; DFF E4; TVP R1, 2; DR E3; YLE E3, 4; SR E2, 3, 4; NRK E2, 3, 4; +PTT E2, 3; RUV E4; EPT E3; RAI IA, IB; TVE E2, 3; RTP E3.

19/6/85 TSS R1, 2; TVP R1; ARD E2, 3, 4; CST R1; RAI IA, IB; TVE E2, 3, 4; RTP E2, 3; JRT E3; NRK E3.

20/6/85 RAI IA; ORF E2a; EPT E3; JRT E3, 4; JTV E3; MTV R1, 2; TSS R1, 2, 3; SR E2, 3, 4; CST R1, 2; TVE E4; DFF E4.

21/6/85 RAI IA; TVE E2, 3, 4; RTP E2, 3; JRT E3; JTV E3; CST R1, 2; DFF E4; TSS R1; SR E2; TVP R1, 2; NRK E2, 4; also Arabic signals on chs. E2, 3, 4 carrying a similar programme.

22/6/85 MTV R1, 2; CST R1; ORF E2a; RAI IA, IB; SR E3; DR E3; TVE E2, 3, 4.

23/6/85 RAI IA, IB; RTP E3; TVE E3; JRT E3, 4; JTV E3; ORF E4; SR E3.

24/6/85 RAI IA, IB; TSS R1, 2; EPT E3; JRT E3; TSS R1, 2; TVP R1; TVE E2, 3; RTP E3; DR E3; SR E2, 3, 4; JTV E3; UAE E2.

25/6/85 DR E3; TVP R1; SR E2, 3, 4; TSS R1, 2; RAI IA.

26/6/85 TSS R1, 2, 3, 4; YLE E3, 4; MTV R1, 2; CST R1; TVP R1, 2; DFF E4; ORF E2a; JRT E3, 4; NRK E2, 3; SR E2, 3, 4; RAI IA, IB; TVE E2, 3, 4; EPT E3; DR E3; +PTT E2, 4; ARD E2, 3; RTP E2, 3; RUV E4.

27/6/85 NRK E2, 3, 4; RUV E3, 4; TVP R1; DR E3; JRT E3; RAI IA, IB; TVE E2, 4.

28/6/85 TVE E2, 3, 4; RAI IA, IB; +PTT E2; JRT E3; EPT E3; RTP E3; MTV R1; TSS R1, 2, 3, 4, 5; DFF E4; ARD E2; RUV E4; NRK E2, 3, 4; TVP R1, 2; YLE E3; CST R1, 2.

29/6/85 TSS R1, 2; TVP R1, 2; SR E3; RAI IA, IB; NCT IA; TVE E2, 3.

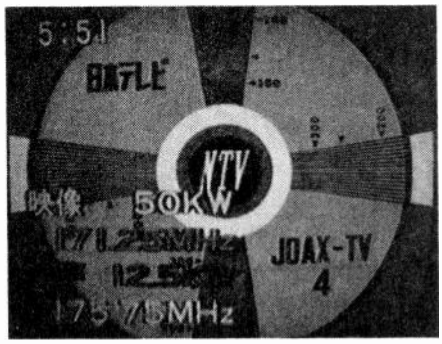
30/6/85 TVP R1, 2; CST R1, 2; ORF E2a; TSS R1, 2.

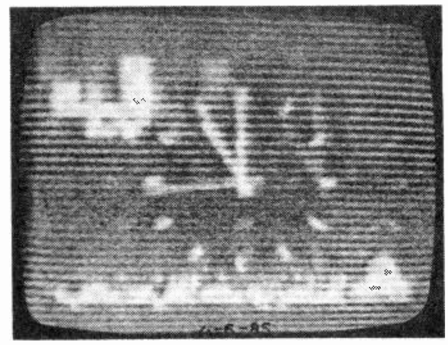
1/7/85 RAI IA, IB; TVE E3, 4.

2/7/85 TSS R1; RAI IA, IB; JRT E3, 4.

4/7/85 TSS R1.

Now to various points of interest. Ryn Muntjewerff (Holland) received Bulgarian TV (BT) on ch. R3, at 1410 CET on June 5th. The test card was followed by a clock with studio identification at 1429, news at 1430 and fade out at 1445. From 0825-0840 BST on June 12th Bill Cotterill (Tipton) received a coloured announcer with a programme on satellite dishes and equipment on ch. E3. Any ideas? Mike Gaskin (Caterham) logged the TSS clock at plus four hours UK time (plus one hour Moscow time) on ch. R1, at 0600 BST on June 19th. Despite the low power of the ch. L3 TDF/Canal Plus relay stations signals from several of them have been received in the UK. Mike Gaskin reports that at Caterham Band III





Left: NHK identification (Japan). Centre: NTV test card (Japan). Photos taken by Gordon McCrae during a recent visit. Right: Syrian clock, ch. E3, received by Ryn Muntjewerff (Holland) on May 20th at 1927 GMT.

suffers invasion from a British Telecom speaking clock: this must be the start of Band III PMR tests.

Tim Anderson (St. Leonards) logged TVE ch. E9 via meteor scatter on June 6th! At the time of writing this (on July 4th) the humid, hot weather is producing enhanced tropospheric propagation, though with thunderstorms forecast it seems unlikely that there will be reception over long distances. On several occasions during June SpE propagation occurred in the 144MHz band but there have been no reports to date of SpE activity in Band III. At 0200 GMT on June 23rd the RSGB 50MHz beacon was heard across the Atlantic in both Washington and Maine.

An extensive log covering a busy period. My thanks to the following for sending in details of their reception: Cyril Willis (Downham), Trevor Rose (Lowestoft), Dave Shirley (Hastings), Allan Beech (Dollar), Reg Roper (Torpoint), Joe Dickson (Belfast), Bill Cotterill (Tipton), Keith Chaplin (Barrow/Soar), Tony Privett (Basingstoke), Mike Gaskin (Caterham), Ian Johnson (Bromsgrove), Roger Pates (Nottingham), Iain Menzies (Aberdeen), Tim Anderson (St. Leonards), Simon Hamer (Powys) and Ryn Muntjewerff (Holland).

Frank Lumen (Denver, Colorado) paid us a two-day visit during the month. He told us that he can receive entertainment quality programmes on approximately 150 channels from nineteen 4GHz satellites via his 12ft dish!

The 50MHz Amateur Band

The Minister for Industry and Information Technology has announced that the band 50-50·5MHz is to be devoted to amateur radio. No information is available at the time of writing on permitted powers and modes of operation, though rumours suggest that Class A licence holders only will be able to use the band.

With the present excellent SpE conditions in mind, this announcement raises the question of interference to DX-TV reception in Band I. The relatively small band allocation given to amateur radio means that notching out the majority of amateur signals should be fairly easy, though ch. R1 vision at 49·75MHz could suffer excessive attenuation if a poorly made filter is used. To this end, details of a very simple ferrite toroid notch filter are given below. It provides a notch depth of 26dB: −10dB at +0·5MHz, −5dB at +1MHz, −2dB at +2MHz and −0·8dB at +3MHz. Alternatively a quarter-wave stub filter could be employed: a 3·9ft length of 75Ω, 0·8 velocity factor cable would provide attenuation at 50·4MHz. The stub filter is simply a length of coaxial cable connected at one end to the feeder between the aerial and the receiver, with the other end left open-circuit. It produces signal cancellation due to the 180° phase reversal at resonance.

The toroid notch filter is simple to make using an Ambit/Cirkit T50-12 ferrite toroid. Wind ten turns of 26 s.w.g. enamelled wire around the toroid, with a centre-tap at turn five. The aerial is connected (inner coaxial cable conductor) to the centre tap and a 2-20pF or 3-30pF subminiature trimmer is connected across the coil – take the output from either end of the winding. The filter can be housed in a small diecast box with coaxial sockets: it covers the whole of Band I.

News Items

Scandinavia: Swedish TV broadcasting is to be reorganised. From March 1986 the various regional centres will opt out of the network for their own programme blocks. Use of the whole v.h.f.-f.m. band is being reorganised in Finland, with the Finnish first programme at the bottom of the band, followed by regional, local and Swedish language programming at the top end.

Belgium: A German language programme was transmitted for the first time on May 25th by Belgischer Rundfunk, using the identification BRF and the familiar BRT/RTB logos. There are plans for this to be a regular service from Brussels on ch. E45 at 1kW, with possibly a 1,000kW ch. E42 transmitter at Liege coming into operation at a later date. The government proposes to allow advertising on the radio/TV services. Programme interruption would not be allowed and advertising periods would not exceed eight minutes. Cable networks would be expected to comply with the regulations.

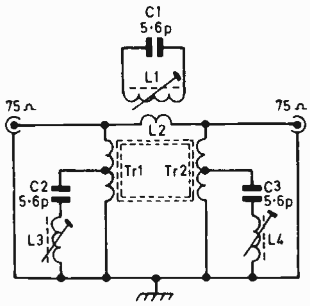
W. Germany: Radio Bremen is now using a ch. E45, 10kW e.r.p. transmitter instead of the former ch. E5 outlet in Band III.

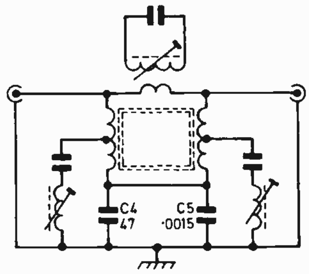
Portugal: Because of interference caused by current transmissions it's proposed to move RTP-TV from Band I to Band III/u.h.f. when funds allow. Local radio has now been legalised and nearly 30 independent commercial local radio stations have been set up.

Tunisia: Following agreement between the Tunisian and Italian governments, RAI-1 is to be transmitted by eight high- and low-power stations in Tunisia.

Middle East: Both Jordan and Kuwait are carrying out teletext test transmissions, using the French Antiope system.

USA: The land mobile radio lobby has petitioned the FCC for greater use of Bands IV/V for mobile radio. At present chs. A14-20 are shared between TV and mobile radio in thirteen of the larger cities. The lobby want to extend this and eventually to open the whole of the 470-





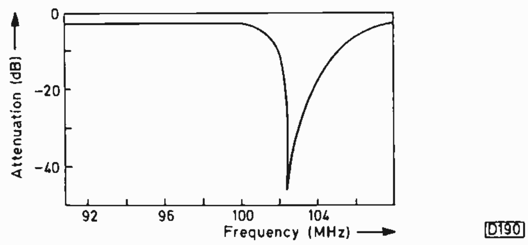


Fig. 1 (top left): Czech notch filter.
Fig. 2 (top right): Version for use with a d.c. feed.
Fig. 3 (above): Response of the notch filter.

806MHz band (chs. A14-69) for land mobile use, arguing that the band is under utilised by broadcasters.

Australia: SBS-TV network transmitters at Wollongong (ch. 59), North Wollongong (ch. 44), Newcastle (ch. 55), Brisbane (ch. 28), Gold Coast (ch. 61), Adelaide (ch. 28) and Adelaide Foothills (ch. 43) came into operation on June 30th. Transmitters at Perth (ch. 28) and Hobart (ch. 28) are due to open next January. There is talk of ABC-TV transmitting for 24 hours a day once the Aussat satellite becomes operational.

Publications

The 1985 edition of the IBA's *Transmitting Stations – a pocket guide* is now available, free of charge, from the Engineering Information Department, IBA, Crawley Court, Winchester, Hants SO21 2QA. Include a foolscape s.a.e. with requests.

The second edition of my DX-TV book, published by Bernard Babani (BP52), has sold out. A revised and expanded third edition is in preparation and should be available in the late autumn.

From our Correspondents . . .

Gordon McCrae of Kesh Electronics, Kesh, Fermanagh has entered the satellite TVRO field, offering a range of dishes and electronics. Following a recent visit to Japan he reports that sales of satellite TV equipment there are at present very slow, with only NHK available on a 12GHz downlink.

Mohammed Hanif is able to receive Oman chs. E7 and E10, Abu Dhabi ch. E9 and Bombay ch. E12 on a fairly regular basis in Karachi but experiences considerable interference from the local ch. E4 outlet. He would like to contact other enthusiasts in Pakistan to share experiences and develop filters: letters sent in to us will be forwarded.

Satellite TV

Transponder 9 on the Intelsat bird at 1°W is now carrying a new 4GHz TV channel, SEB TV. This AFRTS programme/entertainment feed is intended for US forces in Italy. The signal is reported as being "very strong" – thought to be a spot beam at 30dBW, with the sound at 6·8MHz. Sky Channel has been received in the Canary Islands using a 4·5m dish. This is very good going considering the footprint and has produced considerable interest – two cable firms in Gran Canary are putting Sky on to their networks.

French Channel Allocations

In future French system L channel allocations will be denoted as L2, L3 etc. instead of F2, F3 – the frequency allocations remain the same, i.e.:

Ch.	*Vision MHz*	*Sound MHz*	*Ch.*	*Vision MHz*	*Sound MHz*
L2	55·75	49·25	L7	192	198·5
L3	60·5	54	L8	200	206·5
L4	63·75	57·25	L9	208	214·5
L5	176	182·5	L10	216	222·5
L6	184	190·5			

All system E (819-line) transmitters in Bands I/III have now been taken out of service. The Monaco ch. F10 system E transmitter has been replaced with a ch. L8 transmitter (50kW e.r.p. with horizontal polarisation) for the TMC-1 service.

The following Canal Plus transmitters are now in operation: Le Plessis-Robinson ch. L 3 (16W H), Clermont Ferrand ch. L4 (75W H), Mont Brian ch. L4 (70W H), Étampes ch. L4 (15W H), Le Mans ch. L5 (200kW V), Lille ch. L5 (200kW H), Toulouse/Pic du Midi ch. L5 (100kW H), Gex ch. L5 (30kW V), Le Havre ch. L5 (2kW H), Paris/Eiffel Tower ch. L6 (100kW H), Cherbourg ch. L6 (8kW H), Hyeres/Cap Benat ch. L6 (2kW H), Rouen ch. L7 (65kW H), Bordeaux ch. L8 (50kW H), Nantes ch. L9 (300kW V), Caen ch. L9 (200kW H), Lyon/Mt. Pilot ch. L10 (400kW H), Saint Raphael ch. L10 (70kW V), Saint-Etiene ch. E38 (10kW H), Paris-East ch. E53 (5kW H).

Czech Notch Filter

As previously mentioned in this column, Czech f.m. radio stations are being moved from the 68-73MHz band to 87·5-108MHz – this is part of a general move in E. Europe to Band II for f.m. radio. Unfortunately problems have arisen. Communal TV systems aligned to receive W. European Band III transmitters (low-level fringe reception) have been suffering from second harmonic interference and severe head amplifier overloading due to nearby Czech Band II transmissions which are often 70-80dB higher in level.

Various filters have been designed to overcome the problem and a particularly interesting circuit (see Fig. 1) appeared recently in the Czech magazine *Amatorsk Radio*. It provides an attenuation of 45dB over a bandwidth of 1MHz, with an insertion loss of 2dB at ±2MHz. The circuit consists of a lightly coupled absorption trap (L1, C1) with series acceptor circuits L3, C2 and L4, C3 tapped via a four-turn toroid at either side of the absorption trap. Fig. 2 shows a version for use where a d.c. feed to a masthead amplifier is required. All the coils are wound using 26/24 s.w.g. enamelled wire. Tr1 and Tr2 have four turns, centre tapped, on a single toroid (Cirkit FXHO balun core). L1, L3 and L4 consist of 6½ turns on a 7mm former (Maplin 351/8BA). L2 consists of a half turn positioned at the centre of L1. A single hole toroid could be used.

Service Bureau

Requests for advice in dealing with servicing problems must be accompanied by a £1·50 cheque or postal order (made out to IPC Magazines Ltd.), the query coupon and a stamped addressed envelope. We can deal with only one query at a time. We regret that we cannot supply service sheets nor answer queries over the telephone.

PHILIPS G11 CHASSIS

The trouble is field roll which is difficult to stop with the field hold control. When the picture does stop rolling there's a blank space at the bottom of the screen (three-four inches). Lock cannot be held for long.

The two 4·7μF electrolytics C2080 and C2072 mounted close to the TDA2600 field timebase i.c. can cause this fault. Also check for dirty field hold and height controls and intermittent contacts in the TDA2600's holder. The holder nowadays needs replacement more frequently than the chip.

THORN 3500 CHASSIS

This set gives quite a good picture but the voltage across the beam sensing resistor is 1·8V with the aerial out and 2·2V with the aerial in instead of 1·3V. By disconnecting circuits I've found that the voltage returns to normal when the line scan coils are disconnected. Are these suspect? – there doesn't seem to be anything wrong with them and they both measure 5Ω. Also a small bending of the verticals on the right-hand side can be seen with a test pattern.

It's unlikely that the yoke is faulty – the balanced readings really exonerate them. Much more likely is short-circuit turns in the shift coil L504 which can be removed as a check. If the voltage across R907 then returns to normal and the picture centring is reasonable L504 can be left out. The bent verticals on the right may well be due to a faulty transductor – T751. Also check the associated 120Ω resistor R773.

ITT CVC32 CHASSIS

The line output transistor blows after about four hours. Until then the picture is first rate and steady. The h.t. voltage is correct.

The problem seems to be due to excessive dissipation in the BU208. Try replacing R1101 (0·47Ω) which is in series with its base and C56 (0·1μF) which decouples the supply to the line driver transistor. If this fails to do the trick it could well be that the driver transformer has short-circuit turns. The waveform at the collector of the line driver transistor would be most revealing.

SONY KV2206UB

When the on switch is pressed the standby light comes on instead of channel one. If you press the channel change or use the remote control the standby light just flickers or goes out, none of the channels coming on. Jabbing the on button a few times sometimes produces channel one, the set then working normaly. The on switch and the small make-and-break switch that should produce channel one both work correctly.

Transistor Q003 on board M2 should turn off when on is invoked from the standby mode. To turn it off a low from pin 6 of IC001 is required. If this low occurs, Q003 is suspect. If the low does not occur the chip (SAA5010) is suspect. Before condemning it, check that 5V is present at pin 24, that input data is present at pin 22, and that the oscillator is running – waveform 33 at pin 18.

ITT CVC9 CHASSIS

With the brightness and contrast controls adjusted for normal viewing the picture along the centre horizontally is pulled towards the edges, giving bowed edges and wavy verticals. Retard either control and normal linearity is restored. The width is otherwise correct.

This symptom is sometimes present in the ITT hybrid colour chassis and is to some extent inherent in the design. We've found that it occurs if the c.r.t.'s outer Aquadag coating is not properly earthed to chassis via the c.r.t. base panel. If all is well here and the beam limiter control is correctly adjusted check R426h (470Ω) in the e.h.t. adjustment tapping arrangement then try fitting a new universal type e.h.t. tripler.

GRUNDIG CUC95 CHASSIS

The problem is that this set persistently destroys the TDA4600 chopper control i.c. There is nothing obviously wrong with the chopper circuit and the only possible clue is that the e.h.t. appears to be on the high side, going by the noises.

It's unusual for the i.c. to blow in this type of circuit – it's the chopper transistor that normally takes the brunt of any malfunctioning. We suggest you replace the BU208A chopper transistor along with the associated base feed components C631 (100μF) and R631 (0·68Ω), also R646 (270kΩ) which is connected to pin 4 of the i.c. It may be that the output voltage is excessive due to the tuning capacitor C634 (0·0022μF, 2kV) being open-circuit, so replace this too. Before applying power, make a resistance check on the rectifier diodes fed from the chopper transformer.

THORN 9000 CHASSIS

After about half an hour the picture takes on a slight greenish fuzziness, with a definite green ghost to the right of whites. From then on the picture corrects itself every few seconds but after a few hours the fault stays.

Interchange the red and green tube drive leads (at the top of the signals panel), turn down the colour and watch

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TELEVISION SEPTEMBER 1985

in monochrome. If the fault remains in green the tube is probably faulty – before replacing it, check that the contacts at the tube base socket are good. If the symptom now appears in red, check the 560pF correction capacitor C175 in the green channel (the most likely suspect) then if necessary the presets R190 and R194 and transistors VT106 and VT109 in the green output stage. Check carefully for dry-joints in this area of the panel.

TEST CASE

273

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

When colour TV systems were first being considered one of the main criteria was compatibility with monochrome reception. In 1985 this factor has lost much of its significance. The ratio of monochrome to colour sets in use is now very low indeed. New large-screen monochrome sets are almost non-existent – try and find one in a retail shop! – small-screen portables accounting for such sales activity as still exists. On the servicing front too the repair of monochrome sets is becoming rare and the demand for such nostalgic hardware as PL504 and PY88 valves has virtually dried up. We had occasion recently to get out these very items however: readers who can drag themselves away from their microcomputers and s.h.f. dishes may be interested in the problem we had.

The set was an ITT model fitted with the VC200 chassis. The symptom was straightforward: lack of width – the 50cm tube was underscanned by about 3cm on each side, while a degree of ballooning was present on high-brightness scenes. This was a fairly common problem with the VC200 and similar chassis, the usual cause being a defect in the width control circuit. The preset width control was in order however – indeed the control worked to some extent. The two high-value resistors that provide the d.c. feed to the control, R159A/B, were then confidently changed – with virtually no effect on the width. In went the aforementioned PL504 and PY88 bottles, along with a PCF802 line oscillator valve for good measure. These produced a small increase in scan amplitude but it was plain that we hadn't got to the source of the fault. Off we went for some coffee and a service manual.

On our return the abnormally high temperature of the two new valves in the line output stage, after ten minutes' running, indicated that we had been barking up the wrong tree in investigating the width stabilisation loop. We decided that the problem was due to excess line output stage loading and kicked off by replacing the e.h.t. rectifier stick – getting a sharp nip and spilling the coffee in the process. The stick having been proved innocent we went on to carefully examine other suspect components for signs of distress, checking them either by measurement or substitution. The boost capacitor C137, third harmonic tuning capacitors C135/C141, scan-correction capacitor C138 and the l.t. supply rectifier and reservoir capacitor D9/C132 were all checked, but no defects were found. The h.t. voltage at the anode of the PY88 was on the low side, but this was to be expected in view of the excessive line output stage current flowing through section R106 of the dropper resistor.

What was left other than the line output transformer? Resistance checks on the windings are seldom conclusive in such cases so a replacement was prescribed. We didn't have one in the stores (plenty of digital i.c.s and VCR head drums but no VC200 LOPTs), so we cannibalised a scrap set with a dud tube. Fitting didn't take long, though we removed the wire links to the print side of the board, beneath the transformer – these can arc to the transformer's windings. Lo and behold the trouble was still present when we switched on again!

Maybe we should have swapped the chassis over? We didn't, but fitting one other component from the scrap set got the patient going. What was it? Answer next month.

ANSWER TO TEST CASE 272
– page 582 last month –

We dropped so many clues last month that most readers must have solved the Mitsubishi CT2206TX puzzle! The set features remote control and having obtained the infra-red handset we were able to demonstrate more clearly what was going on. As with all modern remote-control systems, the analogue function commands (brightness, volume etc.) are decoded by a chip, in this case an SAA5010, which produces squarewave outputs whose mark-space ratios vary when the appropriate up/down buttons on the remote handset are operated.

The longer we dwelt on the "colour-up" button the thinner the grey lines on the display became. When we held the "colour-down" button the grey lines increased in width to a point where we had a black-and-white picture with narrow, diagonal lines of bright, locked colour superimposed. What was happening of course was that the colour up/down squarewave from the command decoder chip was finding its way to the colour decoder section of the set. The cause was failure of the colour command integrating capacitor C752 (10μF, 50V). Normally an *RC* low-pass filter integrates the squarewave output from the chip to produce a d.c. control voltage whose level depends on the mark-space ratio. With C752 open-circuit integration was not taking place and raw pulses were being passed to the colour control line.

The interference frequency is governed by the SAA5010's clock oscillator of course: this runs with no particular relationship to any other signals in the set, hence the unlocked grey bars.

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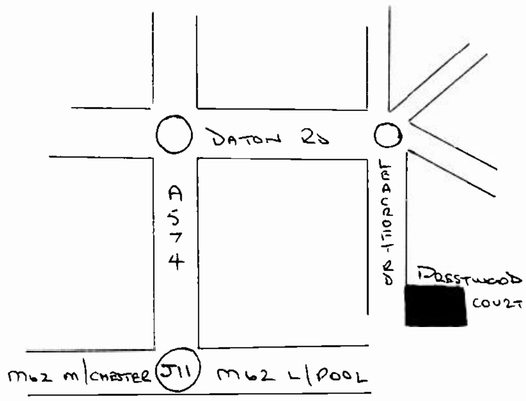

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BC148	6p
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BC157	6p
BC159	6p
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BC182L	6p
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2N.2904	20p
2N.2905	20p
2N.2906	18p
2N.2907	18p
2N.2926	8p
2N.3019	28p
2N.3053	18p
2N.3054	35p
2N.3055	35p
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2N.3440	58p
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2N.3704	9p
2N.3705	9p
2N.3706	9p
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2N.3819	29p
2N.3866	68p
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2N.3904	11p
2N.3905	11p
2N.3906	11p
2N.4031	25p
2N.4036	25p
2N.4037	26p
2N.4058	13p
2N.4443	76p
2N.4444	76p
2N.5061	20p
2N.5294	30p
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BY126	6p
BY127	8p
BY133	8p
BY164	40p
BY176	85p
BY179	35p
BY182	32p
BY184	32p
BY187	32p
BY196	20p
BY206	11p
BY207	11p
BY208	18p
BY210	22p
BY223	72p
BY225	120p
BY226	18p
BY227	19p
BY228	32p

BY296	20p
BY298	26p
BY299	28p
BY476	90p
BYX10	15p
BYX55/350	30p
BYX55/600	30p
BYX55/800	32p
BYX70/300	29p
BYX70/500	32p
BYX70/800	36p
BYX71/600	80p
OA47	6p
OA90	4p
OA91	4p
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
IN.5405	12p
IN.5406	13p
IN.5407	13p
IN.5408	13p
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BYZ88 Range	
2V7 to 39V	6p
1.3W Zeners	
BZX61 Range	
2V7 to 39V	12p
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2SC2028	75p
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40pin	28p
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7812	35p
7815	35p

7818	35p
7824	35p
7905	35p
7912	40p
7915	40p
7918	40p
7924	40p
78L05	28p
78L12	28p
78L15	28p
78L18	28p
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79L05	40p
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DAF96	60p
DF96	50p
DL92	47p
DY86	50p
DY87	50p
DY802	45p
EABC80	50p
E891	44p
EBF80	45p
EBF89	50p
ECC82	40p
ECC83	43p
ECC84	40p
ECC85	40p
ECH81	49p
ECH84	52p
ECL80	57p
ECL82	59p
ECL84	57p
ECL85	57p
ECL86	49p
EF80	31p
EF85	34p
EF89	43p
EF183	45p
EF184	63p
EL34	190p
EL36	60p
EL84	50p
EL95	50p
EL500	80p
EL504	100p
EY86	31p
EY87	31p
EY88	42p
EZ35	45p
EZ80	50p
EZ81	55p
GZ34	180p
PC97	100p
PCC85	42p
PCF80	58p
PCF200	135p
PCF801	110p
PCF802	57p
PCF806	115p
PCH200	100p
PCL81	54p
PCL82	63p
PCL84	60p
PCL85	55p
PCL86	55p

PCL805	55p
PFL200	85p
PL36	80p
PL82	45p
PL83	32p
PL84	50p
PL95	140p
PL500	110p
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PL508	170p
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PY81	70p
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AY3-1350	300p
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AY3-8912	400p
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CA270	40p
CA3046	60p
CA3048	190p
CA3060	280p
CA3080E	70p
CA3086	55p
CA3089E	150p
CA3090AQ	300p
CA3130E	80p
CA3130S	100p
CA3140E	38p
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HA-1156W	110p
HA-1197	150p
HA-1306W	170p
HA-1319	250p
HA-1339	170p
HA-1342	170p
HA-1366WR	160p
HA-1368	140p
HA-1377	220p
HA-1389	140p
HA-1392	230p
HA-1397	250p
HA-1398	240p
LA-1201	35p
LA-1352	120p
LA-1365	140p
LA-3301	120p
LA-3350	120p
LA-3361	115p
LA-4030	200p
LA-4031	140p
LA-4032	140p
LA-4050	130p
LA-4051	160p
LA-4100	120p
LA-4101	100p
LA-4102SK	140p
LA-4112	250p
LA-4125	210p
LA-4140	70p
LA-4201	120p
LA-4220	120p
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LA-4420	140p
LA-4422	130p
LA-4430	130p
LA-4460	170p

LA-4461	180p
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LM301	26p
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LM324	35p
LM325	45p
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LM348	60p
LM380	100p
LM381	150p
LM382	130p
LM387	100p
LM709DIL	30p
LM723	40p
LM741DIL	18p
LM741 MET	45p
LM747	58p
LM748	35p
LM1458	33p
LM3900	30p
M-51513L	180p
M-51515BL	270p
M-51516	280p
M-51517L	280p
MB3712	150p
MB3730	260p
MB3756	260p
MC1327	70p
NE555	20p
NE556	40p
SAS560	110p
SAS570	110p
SN76003N	140p
SN76013N	140p
SN76023N	140p
SN76033N	150p
SN76110N	70p
SN76115	70p
T2800D	52p
TA-7120	55p
TA-7137P	83p
TA-7146P	400p
TA-7193P	400p
TA-7200	200p
TA-7201	200p
TA-7203	180p
TA-7204	110p
TA-7205	80p
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TA-7310P	100p
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TDA1412	60p
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74LS10	17p
74S11	17p
74S12	17p
74S13	26p
74S14	30p
74S15	17p
74LS20	17p
74LS21	17p

74LS22	17p
74LS24	38p
74LS26	17p
74LS27	17p
74LS28	17p
74LS30	17p
74LS32	17p
74LS33	17p
74LS37	17p
74LS38	17p
74LS40	17p
74LS42	39p
74LS47	70p
74LS48	60p
74LS51	17p
74LS54	17p
74LS55	17p
74LS73	28p
74LS74	28p
74LS75	32p
74LS76	28p
74LS78	34p
74LS83	46p
74LS85	50p
74LS86	30p
74LS90	39p
74LS91	75p
74LS92	46p
74LS93	40p
74LS95	52p
74LS96	63p
74LS107	35p
74LS109	36p
74LS112	38p
74LS113	32p
74LS114	38p
74LS122	44p
74LS123	50p
74LS124	85p
74LS125	36p
74LS126	42p
74LS132	44p
74LS133	34p
74LS136	35p
74LS138	38p
74LS139	40p
74LS145	83p
74LS147	120p
74LS148	110p
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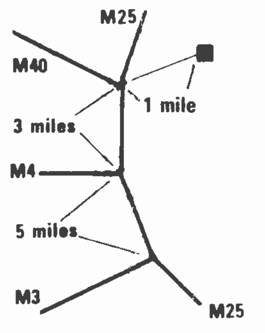

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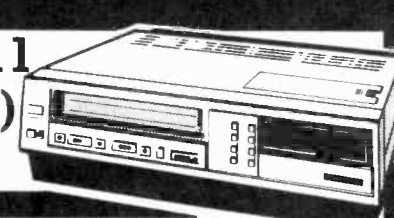

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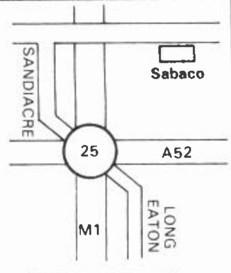

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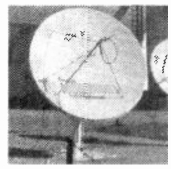

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6A/1000V Stud Diodes	20p

XK 3123 THORN	50p
Hitachi 2A/1500V metal case wire end FARST/REC	20p
Fidelity Tube Base with transitor & focus pot	£1.50
Bush Tube Base on panel	£1.00

Line Transformers

Hitachi Split Diode and GEC 1981 to 1984	£13
2 J/Pots 3,500 1 off each type	£3.00
G8 Symmetry Coil	£2.00
G8 Trans. Philips	£7.00
G11 Split Diode	£12.00
CVC820 Split Diode ITT	£10.00
Thorn B/W AD5308F + Stik + Lead	£1.50
1690 Thorn EHT over-wind with diode lead & anode cap	£2.50
GEC 2040	£3.00
GEC 2110	£7.00
Mullard AT 2036	£1.50
Pye 169 Line Trans	£3.00
Pye mono	£3.00
Rank mono T704A	£3.50
Split Diode Trans	£7.00
GEC 20 AX Rank Z522	£3
Rank L.O.P.T. Z970	£3
CVC 5-8-9	£3.00
CVC20 ITT	£3.50
AT2080/15	£5.00
CVC30 ITT	£5.00
CVC32 Line Tran	£4.75
CVC800 Line Trans	£6.00
CVC40 Slip/Diode	£12.00
CVC 45	£5.00
GEC Portable G1OT2041	£3.00
GEC Portable G1OT2046	£3.00
EHT Split Diode Leads ITT	£1.00
Ex panel "14" Fidelity portable	£5
3500 L.O.P.T. & ITT Trans	each £2
LOPT Rank Z763	£5

Triplers

ITT CVC 5-8-9	£3.50
Rank T25LE Tripler	£2.00
Rank 11TCP A823	£3.50
ITU 25 30K Rank	£3.00
8500 Triplers	£6.50
11 TEZ Rank	£3.00
G9 Philips	£4.00
GEC 2110	£4.00
3500 Thorn	£3.00
9000 Thorn	£5
9500 Thorn	£4.50
2040 GEC	£3.50
GEC TVM25 Tripler	£2.00
Universal Tripler	£5.00
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G8	£4.00
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G11 Scan Coils	£5.00
G11 100K tuner pots	12 for £1
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KT3 line OSC transformer	£1
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K30 drawer unit with IC's (home)	£10
K30 drawer unit with IC's (export)	£10
KT3 AE Sockets	50p
KT3 receiver panel	£8
KT3 line driver transformer	50p
Pye, K30, GEC, etc. Pre-mains stand-by switch	£1
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NPN PNP 80V 6 Amp TO66 O P Trans	pair 25p
5 button touch tuner BBC1/2 ITV1/2 video with ic SAS 560T/570T	£7.00
Control panel 5 sliders + mains lead	£1.50
G11 8 touch button unit replaces old 6 P.B.U	£24
Tube base + base unit for 820 Euro chassis	£4.00
GEC Line O/P Trans & Rec Stick for Portable	£3.00
CVC 20/25/30/35-40 decoder panel	£10
CVC 20/25/30/35 40 decoder panel (untested)	£5
CVC 40/45 IF panel	£5
40K Transducer	50p
PHILIPS NE511N	£1.20
LM337M Reg.	30p
20 GEC Black Spark Gaps	£1.00
G11 Line Driver Transformer	35p
KT3 Front Panel Control Assy.	£2.50
BTW 30/50	50p

TELETEX DECODER

I.C SAA 5051 K30	
I.C. SAA 5042	
I.C SAA 5030	
I.C. SAA 5020 etc	£8.00

BTW 92/800R	£3
25A473 PNP C/P	10p

NEW 161Z THORN Chassis with ICs & AU113	£8.00
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6 Diode Universal Triplers	£3.25
NEW PYE 725 line O/P panel with L.O.P.T. & Tripler	£10.00
Thorn Mains Isolator unit for 70-80W. Ex-speaker	£2
NEW GEC 20AX Power Supply Switch Mode	£12.00
Complete new GEC portable chassis M1201H/M1501H with P.B U/v.cap/LOPTI	£10
Field + Jungle panel for GEC 3133/3135	£1.50
GEC 2110 line panel with transformer	£7.00
GEC 2110 tuner unit + IF Panel	£12.00
Pye/Chelsea Line op panel	£12.00
Pye 713 IF panel and tuner	£7.00
Pye 713 Chroma	£10.00
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Pye 731 Convergence Panel	£5.00
Pye 731 Chroma	£10.00
Pye 731 IF panel + tuner	£10.00
Pye CDA/205 panel	£6.00
GEC portable chassis + LOPTI 2114 New	£4.00
Thorn 1613/1713 chassis	9.75
G9 Power Panel	£6.00
Mono RANK Chassis 127A NEW	£10.00

NEW MULLARD TELETEX

Decoder Panel (VM6230)	£15.00
Panel 6101	£15.00
Panel 6330	£15.00
G8 Tuner Unit + Panel	£5.00
G8 Convergence Panel (late type)	£12.00
G8 Power Supply	£6.00
G8 6 Sloping PBU	£8.00
G8 IF & Chroma	£10.00
G8 Chroma	£6.00
G11 IF Detector	£3.00
G11 Selector gain module	£3
Complete CVC 825 Chassis (both panels)	£40.00
AEC V/Cap Resistor Unit UHF with IC SAS660 SAS670	£3.00
Z714 RANK IF Panels 6MHz 1 I.C. SL437F	£3.00
Z909B RANK IF Panels Export 5.5MHz 2 I.C.'s TBA1205B TCA2705Q	£2.50
K35 IF	£6.00
Z743 RANK IF Panel Export 5.5MHz 3 I.C.'s TBA750+SC9504P+SC9503P	£1.50
Pye G11 Front panel with transducer, pots, tuner pots, 6 pb switch+lead	£5.00
Pye 6 button switch portable	£1.00
GEC V/cap VHF/UHF tuner and IF+ sound O/P PC 706B3 (Export)	£12.00
GEC Line O/P PC 659B3	£6.00
2110 GEC Power Panel	£8.00
GEC Power Supply (Export)	£10.00
G11 dynamic correction panel	£6
CVC 20 Front panel with sliders + mains input panel	£4
CVC 40 PUSH BUTTON ASSY with sliders complete with lamp assy + pots	£14
CVC9 slider pots panel	50p
CVC 5 Mains on/off + 5 pots	£2
Universal Focus Fits Pye, Thorn and Decca Units.	
Large Type	75p
Decca Small	75p
KT3 Focus Unit	75p
K30 Focus Pot	75p
TX10 Focus Units	£6.00
CVC 32 Focus Unit	75p
Fedility Focus Unit 14R-14S	30p
3500 Thorn Focus Unit	£1.00
ITT Small for use with Split	
Z718 Bush Focus	£2.00
Diode	50p
TV11	50p
Remo TV12SP	50p
TV13	50p
TV14	50p
TV18	60p
TV20	£1.00
TV45	50p
Thorn 14/1500 rec stick	5p

G7000 Philips Video Games Packs 11 types	**£8.00 each**
G11 drawer ASS 3 pots Mains switch and lead	£2.00
Line O/P panel GEC 2217/2218/2213/2214/2226/2227/2228	£10

CLOCK DISPLAY

4 SEG ACDM45	£1.00
4000 thick film	£2.00

DISPLAYS

4040 Clock	£1.00
7seg Red LED	50p
2 digit LED 8.8	50p
2 digit LED ÷1.8 with panel + MCI4511	£1.00
4700/63	£1.50

250/64	10p
3300/70	50p
.1/100	5p
1/100 × 10	30p
22/100	10p
4.7M/100	5p
470/100	20p
2000/100	70p
4700/100	75p
47/160	10p
300 300/300V	80p
800/160	50p
.1/250 Pulse	5p
2.2 250v	10p
3n3/250 A C.	10p
.33/250V	20p
39/250V	15p
4n7/250 tested 5KV	25p
91/250	35p
91/400	30p
22/250	15p
47/250	10p
100/250	20p
G11 470/250V	£1.75
GEC600/250	60p
700/250	£1
300+300 MFD 350v	£1.00
800/250	40p
32/300	20p
4/350	5p
8/350	8p
4 7M/350v	10p
33/350	20p
220/350	30p
300/350	40p
400/350	50p
10/375	10p
22/375	15p
220/385	75p
330/385 CVC 820ITT	60p
0 1/400	15p
KT3 E/W .39/400	20p
56K/400v	20p
4700pf/400	10p
22/400	10p
8/400	15p
33/400	20p
400/400	40p
394K 400V	20p
220/450	40p
47/500	25p
0 1/600	15p
0.1/1200V wire end	20p
0.1/450 A.C wire end	20p
047/600	15p
0.047/1000	10p
0.01/1000	10p
0.1/1000	10p
47/1000v	65p
.47/250V A.C	10p
001K/1250	10p
0 0047/1500	10p
.005/1500	10p
.0105/1500	10p
1n8/1500	15p
2n0/1500	10p
2n2/1500	15p
.01/1600	15p
G11.8200/2KV	15p
0 1/2KV	20p
10n/2KV	15p
3n9/2KV	15p
0.0015/2KV	10p
5n2/2KV	10p
6n2/2KV	15p
2n0/2KV	15p
2n2/2KV	15p
7500pf 2KV	10p
4n7/2KV	15p
8n2/2KV	15p
0.0082 2500	15p
150/3500	10p
1800/4KV	5p
4.7nf/5KV	10p
170/8KV	10p
180/8KV	10p
210/8KV	10p
1000/10KV	10p
.47/100V	80p

CVC 20-25-30 Mains Switches	75p
Infra Red and Ultrasonic G11 Teletext Decoder Panel	£30
RANK & ITT Mains Remote On-Off Switch (720E)	£1.50
RANK & ITT Mains Remote Switch 2865 ohm	£1.50
RANK & ITT Remote Switch 2800 ohm	£1.50
G11 Mains Switch	50p
4 amp Mains Switch	25p
GEC Mains Switch 4 amp	30p
KT3 Mainswitch	£1.00
THORN Rotary Mains Switch	50p
G8 Mains Switch	75p
Thyristor 600/4 amp C106/2	24p
G11 Preh Red LED P/Button for C.H. Change	20p
RANK TOSHIBA Transductors TPC-2011	50p
Mains Switch ITT Long Type Print	75p
Mains Switch Philip Long Type TAG	75p
Mains Switch GEC Long Type TAG	75p
Thorn 12 or 24 volt battery convertor for portable colour T/V	£6.00
Tape Heads R/Play/Back Mono/Stereo	£1.00

9V Power Supply THORN 9V 200 M/A	£2.00
Rank Secam Decoder Panel UHF & VHF 1115A	£13.00

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Set No SC4127, SC4337, SC6217; SC6237

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Tuner IF AF TRX LOP TP preamplifier Tuning board Colour RGB LED Board Deflection Board

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350V 400M	60p
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200/100/100/350v	£1.50
500/500/25v	50p
150/150/100/300v	75p
200/150/150/300v	1.00

ITT Panels

CVC 40/2 Chassis, new £30, complete with intrface panel	
CVC 820 Line O/P Panel	
CVC20 Mains Panel	£3.00
ITT 8 & 6 Push Button Unit	£1.00
CVC 40/2 New Chroma Panel	£10.00
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CMA 11	£2.00
CMA 30	£2.00
CMA 40	£1.50
CMC 10/2	£5.00
CMC 16	£4.00
CMC 38	£8.00
CMC 45	£1.50
CMC 47	£1.00
CMC 52	£15
CMC 57	£6.00
CMC 58	£8.00
CMC 59	£8.00
CMC 67	£3.75
CMC 67/2	£4.00
CMC 68	£4.00
CMD 12	£10
CMD 32	£5.00
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CMD 40	£5.00
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CMD 800	£10.00
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CMH 10	£1.50
CMH 31	£1.00
CMK 12 (untested)	£4.00
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CMN 20	£1.50
CMN 21	£1.50
CMN 40	£1.00
CMN 45	25p
CMP 10	£2.00
CMP 11	£4.00
CMP 40	£2.00
CMS 11	£2.00
CMS 40	£2.00
CMU 12	£10.00
CMU 14	£8.00
CMU 30	£7.00
CMU 45	£7.00
CMZ 30	£5.00
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Hand Sets

G11 Ultrasonic Teletex Handset	£24.00
8 C H. Ultrasonic GEC Full Remote C2014H/C2219H	£15.00
New Replacement for G11 Ultrasonic Full Remote	£12.00
Thorn 4000 insert with 7 buttons	£5.00
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Rank, Infra-red	£10.00
Dynatron-Full remote CTV 62, 63, 64	£19.00
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G11, Full remote repair service (exchange unit)	£12.00
Philips infra red full remote 9 channel for 60 CP2605	£6.00
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Philips Key Pad set KT3 K30	£3.00
KT3/K30 T'Text	£15.00
KT3/K30 Full remote	£15.00
KT3 Power supply	£4.00
Hitachi 8 button unit with resistor unit Last year mod	£7.00
GEC infra-red 2236-2026	£4.00
GEC push pad hand set button blobs	10p each
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NEW G8 Tuner V/Cap £5.50
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GEC 6 Push Button Unit £6
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Small V/Cap Mitsumi
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THORN 8500 Mech Tuner
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